Centennial Wash Floodplain Delineation Study: Gila River to La Paz County

Centennial Wash, Maricopa County

Technical Support Data Notebook

Contract Number: FCD 2012C004

Prepared for:

Flood Control District of Maricopa County
2801 W. Durango Street
Phoenix, AZ 85009

Prepared by:

WEST Consultants, Inc.
8950 S. 52nd Street, Suite 210
Tempe, Arizona 85284

October 2013

Flood Control District
of Maricopa County

INTEROFFICE MEMORANDUM

Date: January 15, 2014

To: Timothy S. Phillips, P.E., Chief Engineer and General Manager

From: Jeff Shelton, P.E., Senior Civil Engineer

Subject: Centennial Wash Floodplain Delineation Study: Gila River to La Paz County Technical Support Data Notebook, Contract FCD 2012C004

The floodplain re-delineation of Centennial Wash south of I-10 is complete and ready to be used as the best available technical information for floodplain management. The study Technical Support Data Notebook will be sent to FEMA for review and incorporation into the County's DFIRM.

The background for the study includes the following:

This study replaces 40 linear miles of effective Zone AE with floodway along the main branch of Centennial Wash and 13 linear miles of Zone AE and A from Centennial Wash Left Overbank in the Harqualaha Valley. The two dimensional model and mapping of Centennial Wash Left Overbank is an improvement over the current floodplain for water surface accuracy and applicable Special Flood Hazard Area zone. The main Centennial Wash remapping is also more accurate than the existing floodplain because it was compiled on four-foot topography. The study consultant is WEST Consultants, Inc. The project manager for the consultant is Chuck Davis, P.E. The project manager for the District is Jeff Shelton, P.E.

Please concur and authorize below the use of this new study. Mr. Philips, please find a "Sign Here" flag in the Technical Support Data Notebook where your signature on the Overview and Concurrence Form is required.

(1) Date: 1-15-14 Jeff Shelton, P.E. Project Manager	Date: 1/27/14 (6) Timothy S. Phillips, P.E., Chief Engineer and General Manager
(2) Date: 1.24.14 Amir Motamedi, P.E. Hydrology/Hydraulics Branch Manager	Date: 1/27/2014 (5) Kelli Sertich, AICP Floodplain Management & Services Division Manager
(3) Date: 1/24/14 Ed Raleigh, P.E. Engineering Division Manager	Date: 1/27/14 (4) Don Rerick, P.E. Planning and Project Management Division Manager
File Copies: 1. Model Library 2. MFR Folder	☐ GIS Posted (Pending Floodplain Only) Date: 01/15/14 No: In Progress

2801 West Durango Street Phoenix, Arizona 85009 Phone: 602-506-1501 Fax: 602-506-4601

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Contract Number: FCD 2012C004

Prepared for:

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2801 W. Durango Street
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Expires 12/31/2014

Prepared by:

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Tempe, Arizona 85284

October 2013

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Registered Professional Engineer (Civil)
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DAVIS
Date Signed 10-31-2013
ARIZONA, U.S.A.
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Exhibit A	Hydraulics Study Work Maps, 1" = 400' scale (reduced scale version reproduced herein, roll of entire map set provided to the District with the final copy)
Exhibit B	Annotated Flood Insurance Rate Maps
Exhibit C	DVDs Containing Electronic Files

1 Introduction

WEST Consultants, Inc. (WEST) has prepared this floodplain delineation study (FDS) as a Physical Map Revision (PMR) request package to re-delineate the Special Flood Hazard Area (SFHA) for Centennial Wash in western Maricopa County from its confluence with the Gila River to the boundary between La Paz and Maricopa Counties. The PMR package has been sent to FEMA's Letter of Map Change (LOMC) Clearinghouse to encourage FEMA to prioritize it as a PMR produced by a Cooperating Technical Partner (CTP)—that is, the Flood Control District of Maricopa County (District). The District commissioned this study under Contract Number FCD 2012C004. District personnel affiliated with the project included Mr. Jeff Shelton, P.E. (Project Manager) and Mr. Amir Motamedi, P.E. WEST personnel included , Mr. Chuck Davis, P.E., CFM (Project Manager), Dr. Brian Wahlin, Ph.D., P.E., D.WRE, Ms. Suzie Monk, CFM, and Ms. Sarah Bengtson. The project began in July 2012. WEST would like to acknowledge the excellent work done by our internal quality assurance team; Tom Lute, RLS, who performed our subcontracted field survey work with David Evans and Associates; and the review performed internally by District staff for the study.

This Technical Support Data Notebook (TSDN) has been prepared according to the standards as specified in the Arizona Department of Water Resources (ADWR) State Standard SS1-12 (Arizona Department of Water Resources, 2012). Supporting technical information has been prepared as specified in Appendix C of the Federal Emergency Management Agency's (FEMA) Guidelines and Specifications for Flood Hazard Mapping Partners (Federal Emergency Management Agency, 2009).

This FDS for Centennial Wash in western Maricopa County from its confluence with the Gila River to the boundary between La Paz and Maricopa Counties was necessitated due to an update in the hydrology of Centennial Wash based on a FEMA CLOMR (case number 12-09-0043R) completed by RBF (RBF Consulting, Inc., 2011). The effective SFHA for the study reach was delineated in 1989 by Cella Barr and Associates (Cella Barr Associates, 1989) for the 100-year peak discharge calculated using an HEC-1 model from the same study. The effective hydrology was updated due to the inclusion of 20 additional years of gage record (see FEMA CLOMR case number 12-09-0043R included in Appendix D.6 of this report). The 1-percent-annual-chance flood was re-delineated herein based on the updated hydrology. This area includes 40 linear miles of Centennial Wash modeled with HEC-RAS and approximately 13 linear miles of Centennial Wash Left Overbank modeled with FLO-2D.

This study covers the portion of Centennial Wash located in western Maricopa County (community number 04012) from the La Paz County line downstream to the confluence with the Gila River. The study area covers the following townships and ranges: T1NR8W, T1NR9W, T1NR10W, T1SR5W, T1SR6W, T1SR7W, T1SR8W, T2NR8W, T2NR9W, T2NR10W, T2SR5W, and T2SR6W. A vicinity map showing the study reach is shown in Figure 1-1.

The hydrology used in this re-study was taken from the CLOMR submitted to FEMA updating the hydrology from the values used in the previous delineation (case number 12-09-0043R). The peak 100-year flow from this CLOMR was used here for SFHA delineation.

Water flowing in Centennial Wash enters Maricopa County through a well-defined channel. Roughly five or six miles downstream, the channel becomes less well defined. At high flows, water no longer remains in the low-flow channel, with some water flowing into the left overbank. Water in the left overbank eventually returns to the main channel at approximately Baseline Road. FLO-2D is used in this study to determine the amount of water which flows into the overbank. This left overbank flow is modeled with FLO-2D, as discussed in Section 5 of this report. Flow in the main channel is modeled with HEC-RAS, as discussed in Section 6 of this report. A steady state HEC-RAS was used for the entire approximately 40 river miles of the main branch of Centennial Wash for floodplain and floodway delineation. An unsteady FLO-2D model was used to map floodplain boundaries in the area of the flow split in the upper reach of Centennial Wash (i.e., the Centennial Wash Left Overbank from the effective study). Peak flows calculated in the unsteady FLO-2D model at specified locations in the modeling domain (see Figure 6-4) were used directly as steady-state flows in the HEC-RAS model. The peak flow calculated by FLO-2D at one of these locations was used for a specified portion of the HEC-RAS reach, and changes in flows were accomplished using flow change locations in HEC-RAS which designates a change in constant steady flow from that cross section until a flow change location is specified downstream.

To briefly summarize the study results, the special flood hazard area was re-delineated throughout the study reach to best reflect the most recent topographic and hydrologic information available. Zone AE floodplain and floodway was delineated for the entirety of the main stem of Centennial Wash. Zone AO and Zone AE floodplains were delineated in the area of the current Left Overbank channel in the Harquahala Valley outside of the main channel of Centennial Wash. This mapping improved on the currently effective Zone A and Zone AE definitions of flood hazard zones for this area.

Regarding the layout of this document, the title of Sections 5 and 6 vary slightly from the specification in State Standard SS1-12 (Arizona Department of Water Resources, 2012), due to the complexity of floodplain mapping for this study. Floodplain mapping for the Centennial Wash area was completed using a combination of one-dimensional and two-dimensional hydraulic modeling. For clarity, the mapping results from each of these modeling efforts are documented separately in this TSDN. Section 5 herein is titled "Hydraulics: FLO-2D" and Section 6 herein is titled "Hydraulics: HEC-RAS" with each section title reflecting the numerical model used to complete the modeling effort for two-dimensional and one-dimensional modeling, respectively. The title of Section 6 as specified in State Standard SS1-12 (Arizona Department of Water Resources, 2012) is "Erosion, Sediment Transport, and Geomorphic Analysis." However, no erosion, sediment transport, or geomorphic analysis was performed for this study. Therefore, Section 6 was appropriated in this document as the section in which to document the results of the one-dimensional modeling effort using HEC-RAS. The reason for documenting the two-dimensional modeling results prior to the documentation of the one-dimensional modeling results is that the two-dimensional model was used to assess the breakout of flow into the Centennial Wash Left Overbank area as defined in the effective Centennial Wash study (Cella Barr Associates, 1989). This flow split analysis was then used to provide input to the one-dimensional model and as such "precedes" the one-dimensional model in regards to the way the analyses were performed.

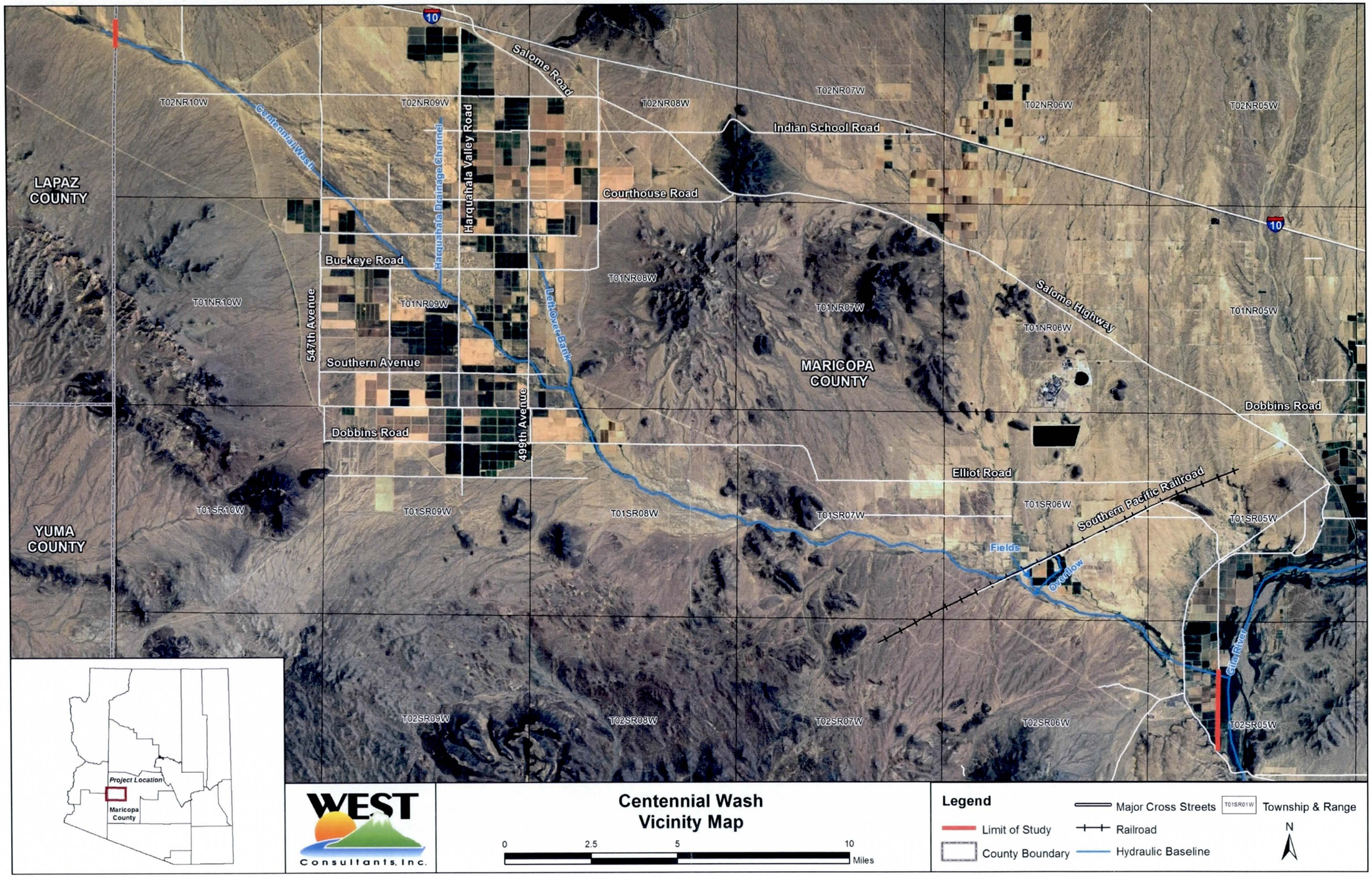


Figure 1-1. Project location map

2 FEMA Forms

FEMA MT-2 Forms are provided on the following pages.

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
	See attached page				

2. a. Flooding Source: Centennial Wash

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

3. Project Name/Identifier: Centennial Wash Floodplain Delineation Study: La Paz County to the Gila River

4. FEMA zone designations affected: AE, AO, A (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 *(see cover letter for 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: Jeffery Shelton, P.E.	Company: Flood Control District - Maricopa County	
Mailing Address: 2801 W. Durango Street Phoenix, AZ 85009	Daytime Telephone No.: (602) 506-1501	Fax No.: (602) 506-4601
	E-Mail Address: JefferyShelton@mail.maricopa.gov	
Signature of Requester (required):	Date:	

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: Timothy S. Philips, P.E., Chief Engineer and General Manager	Community Name: Maricopa County, Arizona	
Mailing Address: 2801 W. Durango Street Phoenix, AZ 85009	Daytime Telephone No.: (602) 506-1501	Fax No.: (602) 506-4601
	E-Mail Address: tsp@mail.maricopa.gov	
Community Official's Signature (required):	Date:	

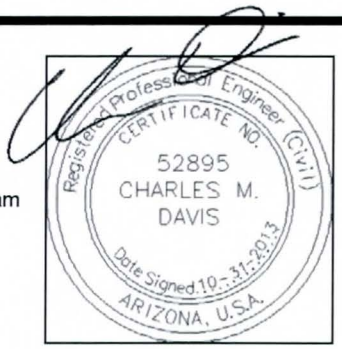
CERTIFICATION BY REGISTERED PROFESSIONAL ENGINEER AND/OR LAND SURVEYOR

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: Chuck Davis, P.E., CFM	License No.: 52895	Expiration Date: 12/31/2014	
Company Name: WEST Consultants, Inc.	Telephone No.: (480) 345-21555	Fax No.: (480) 345-2156	
Signature:	Date: 10/31/2013	E-Mail Address: cdavis@westconsultants.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



Expires 12/31/2014

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
040037	Maricopa County, Arizona (Unincorporated Areas)	AZ	04013C	1500L	10/16/13
040037	Maricopa County, Arizona (Unincorporated Areas)	AZ	04013C	1525L	10/16/13
040037	Maricopa County, Arizona (Unincorporated Areas)	AZ	04013C	1975L	10/16/13
040037	Maricopa County, Arizona (Unincorporated Areas)	AZ	04013C	2000L	10/16/13
040037	Maricopa County, Arizona (Unincorporated Areas)	AZ	04013C	2025L	10/16/13
040037	Maricopa County, Arizona (Unincorporated Areas)	AZ	04013C	2500L	10/16/13
040037	Maricopa County, Arizona (Unincorporated Areas)	AZ	04013C	2525L	10/16/13
040037	Maricopa County, Arizona (Unincorporated Areas)	AZ	04013C	2530L	10/16/13
040037	Maricopa County, Arizona (Unincorporated Areas)	AZ	04013C	2540L	10/16/13
040037	Maricopa County, Arizona (Unincorporated Areas)	AZ	04013C	2545L	10/16/13

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

RIVERINE HYDROLOGY & HYDRAULICS FORM

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

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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.**

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Flooding Source: Centennial Wash

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*	Gila River	0.0	778.1	764.97
Upstream Limit*	La Paz County border	40.65	1320.1	1324.45

*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: HEC-RAS and FLO-2D

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		Floodway Run		Datum
Duplicate Effective Model*	File Name: N/A for PMR	Plan Name: N/A for PMR	File Name: N/A for PMR	Plan Name: N/A for PMR	N/A
Corrected Effective Model*	File Name: N/A for PMR	Plan Name: N/A for PMR	File Name: N/A for PMR	Plan Name: N/A for PMR	N/A
Existing or Pre-Project Conditions Model (HEC-RAS)	File Name: BaselineRdtoGila_LS	Plan Name: Final_100-year Encroachments	File Name: BaselineRdtoGila_LS	Plan Name: Final_100-year Encroachments	NAVD88
Existing or Pre-Project Conditions Model (HEC-RAS)	File Name: BaselineRdtoGila_LS	Plan Name: FinEncr_noEmbank	File Name: BaselineRdtoGila_LS	Plan Name: FinEncr_noEmbank	NAVD88
Existing or Pre-Project Conditions Model (HEC-RAS)	File Name: CW_CanaltoBaseline	Plan Name: FLO2DQs-Encroach	File Name: CW_CanaltoBaseline	Plan Name: FLO2DQs-Encroach	NAVD88
Existing or Pre-Project Conditions Model (HEC-RAS)	File Name: LaPaztoHVIDCanal	Plan Name: 100yrEncr	File Name: LaPaztoHVIDCanal	Plan Name: 100yrEncr	NAVD88
Existing or Pre-Project Conditions Model (FLO-2D)	File Name: FPLAIN.DAT**		File Name: N/A	Plan Name: N/A	NAVD88
Existing or Pre-Project Conditions Model (FLO-2D)	File Name: FPLAIN.DAT***		File Name: N/A	Plan Name: N/A	NAVD88
Revised or Post-Project Conditions Model	File Name: N/A	Plan Name: N/A	File Name: N/A	Plan Name: N/A	N/A
Other - (attach description)	File Name: N/A	Plan Name: N/A	File Name: N/A	Plan Name: N/A	N/A

* For details, refer to the corresponding section of the instructions.
**See 'Base_06142013_withARF-WRF_Hydstr' folder on project CD (FLO-2D projects in Appendix E.5)
***See 'NoLevee_06032013' folder on project CD (FLO-2D projects in Appendix E.5)

☒ 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: See documentation in Section 3 of the TSDN

Source: Multiple surveys Date: August 2012

Accuracy: 2-ft contour intervals; documentation in TSDN

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. (*see Appendix B.3 for public notification documentation*)

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.) (*see Appendix B.3 for public notification documentation*)

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.

DEPARTMENT OF HOMELAND SECURITY
FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE STRUCTURES FORM

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

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Flooding Source: Centennial Wash

Note: Fill out one form for each flooding source studied.

A. GENERAL

Complete the appropriate section(s) for each Structure listed below:

Channelization.....complete Section B
Bridge/Culvert.....complete Section C
Dam.....complete Section D
Levee/Floodwall.....complete Section E
Sediment Transport.....complete Section F (if required)

Description Of Modeled Structure

1. Name of Structure: Harquahala Valley Irrigation District Drainage Channel Culvert

   Type (check one): ☐ Channelization ☒ Bridge/Culvert ☐ Levee/Floodwall ☐ Dam

   Location of Structure: One-half mile west of the intersection of Centennial Road and Harquahala Valley Road

   Downstream Limit/Cross Section: Represented in FLO-2D as rating curve, DS grid element is #467406

   Upstream Limit/Cross Section: Represented in FLO-2D as rating curve, US grid element is #466480

2. Name of Structure: _____

   Type (check one): ☐ Channelization ☐ Bridge/Culvert ☐ Levee/Floodwall ☐ Dam

   Location of Structure: _____

   Downstream Limit/Cross Section: _____

   Upstream Limit/Cross Section: _____

3. Name of Structure: _____

   Type (check one) ☐ Channelization ☐ Bridge/Culvert ☐ Levee/Floodwall ☐ Dam

   Location of Structure: _____

   Downstream Limit/Cross Section: _____

   Upstream Limit/Cross Section: _____

NOTE: FOR MORE STRUCTURES, ATTACH ADDITIONAL PAGES AS NEEDED.

B. CHANNELIZATION

Flooding Source: _____

Name of Structure: _____

1. Hydraulic Considerations

The channel was designed to carry _____ (cfs) and/or the _____-year flood.

The design elevation in the channel is based on (check one):

☐ Subcritical flow ☐ Critical flow ☐ Supercritical flow ☐ Energy grade line

If there is the potential for a hydraulic jump at the following locations, check all that apply and attach an explanation of how the hydraulic jump is controlled without affecting the stability of the channel.

☐ Inlet to channel ☐ Outlet of channel ☐ At Drop Structures ☐ At Transitions

☐ Other locations (specify): _____

2. Channel Design Plans

Attach the plans of the channelization certified by a registered professional engineer, as described in the instructions.

3. Accessory Structures

The channelization includes (check one):

☐ Levees [Attach Section E (Levee/Floodwall)] ☐ Drop structures ☐ Superelevated sections

☐ Transitions in cross sectional geometry ☐ Debris basin/detention basin [Attach Section D (Dam/Basin)] ☐ Energy dissipator

☐ Weir ☐ Other (Describe):

4. Sediment Transport Considerations

Are the hydraulics of the channel affected by sediment transport? ☐ Yes ☐ No

If yes, then fill out Section F (Sediment Transport) of Form 3. If No, then attach your explanation for why sediment transport was not considered.

C. BRIDGE/CULVERT

Flooding Source: Centennial Wash

Name of Structure: Harquahala Valley Irrigation District Drainage Channel Culvert

1. This revision reflects (check one):

☒ Bridge/culvert not modeled in the FIS

☐ Modified bridge/culvert previously modeled in the FIS

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

2. Hydraulic model used to analyze the structure (e.g., HEC-2 with special bridge routine, WSPRO, HY8): FLO-2D
If different than hydraulic analysis for the flooding source, justify why the hydraulic analysis used for the flooding source could not analyze the structures. Attach justification.

3. Attach plans of the structures certified by a registered professional engineer. The plan detail and information should include the following (check the information that has been provided):

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

4. Sediment Transport Considerations

Are the hydraulics of the structure affected by sediment transport? ☐ Yes ☒ No

If Yes, then fill out Section F (Sediment Transport) of Form 3. If no, then attach an explanation.

D. DAM/BASIN

Flooding Source: _____
Name of Structure: _____

1. This request is for (check one): ☐ Existing dam/basin ☐ New dam/basin ☐ Modification of existing dam/basin

2. The dam/basin was designed by (check one): ☐ Federal agency ☐ State agency ☐ Private organization ☐ Local government agency

   Name of the agency or organization: _____

3. The Dam was permitted as (check one): ☐ Federal Dam ☐ State Dam

   Provide the permit or identification number (ID) for the dam and the appropriate permitting agency or organization

   Permit or ID number _____ Permitting Agency or Organization _____

   a. ☐ Local Government Dam ☐ Private Dam

   Provided related drawings, specification and supporting design information.

4. Does the project involve revised hydrology? ☐ Yes ☐ No

   If Yes, complete the Riverine Hydrology & Hydraulics Form (Form 2).

   Was the dam/basin designed using critical duration storm? (must account for the maximum volume of runoff)

   ☐ Yes, provide supporting documentation with your completed Form 2.

   ☐ No, provide a written explanation and justification for not using the critical duration storm.

5. Does the submittal include debris/sediment yield analysis? ☐ Yes ☐ No

   If Yes, then fill out Section F (Sediment Transport). If No, then attach your explanation for why debris/sediment analysis was not considered?

6. Does the Base Flood Elevation behind the dam/basin or downstream of the dam/basin change? ☐ Yes ☐ No

   If Yes, complete the Riverine Hydrology & Hydraulics Form (Form 2) and complete the table below.

FREQUENCY (% annual chance)	Stillwater Elevation Behind the Dam/Basin FIS	REVISED
10-year (10%)	_____	_____
50-year (2%)	_____	_____
100-year (1%)	_____	_____
500-year (0.2%)	_____	_____
Normal Pool Elevation	_____	_____

7. Please attach a copy of the formal Operation and Maintenance Plan

E. LEVEE/FLOODWALL

1. System Elements

a. This Levee/Floodwall analysis is based on (check one): ☐ upgrading of an existing levee/floodwall system ☐ a newly constructed levee/floodwall system ☐ reanalysis of an existing levee/floodwall system

b. Levee elements and locations are (check one):

☐ earthen embankment, dike, berm, etc. Station _____ to _____
☐ structural floodwall Station _____ to _____
☐ Other (describe): Station _____ to _____

c. Structural Type (check one): ☐ monolithic cast-in place reinforced concrete ☐ reinforced concrete masonry block ☐ sheet piling ☐ Other (describe): _____

d. Has this levee/floodwall system been certified by a Federal agency to provide protection from the base flood?

☐ Yes ☐ No

If Yes, by which agency? _____

e. Attach certified drawings containing the following information (indicate drawing sheet numbers):

1. Plan of the levee embankment and floodwall structures. Sheet Numbers: _____
2. A profile of the levee/floodwall system showing the Base Flood Elevation (BFE), levee and/or wall crest and foundation, and closure locations for the total levee system. Sheet Numbers: _____
3. A profile of the BFE, closure opening outlet and inlet invert elevations, type and size of opening, and kind of closure. Sheet Numbers: _____
4. A layout detail for the embankment protection measures. Sheet Numbers: _____
5. Location, layout, and size and shape of the levee embankment features, foundation treatment, Floodwall structure, closure structures, and pump stations. Sheet Numbers: _____

2. Freeboard

a. The minimum freeboard provided above the BFE is:

Riverine

3.0 feet or more at the downstream end and throughout	☐ Yes	☐ No
3.5 feet or more at the upstream end	☐ Yes	☐ No
4.0 feet within 100 feet upstream of all structures and/or constrictions	☐ Yes	☐ No

Coastal

1.0 foot above the height of the one percent wave associated with the 1%-annual-chance stillwater surge elevation or maximum wave runup (whichever is greater).	☐ Yes	☐ No
2.0 feet above the 1%-annual-chance stillwater surge elevation	☐ Yes	☐ No

Please note, occasionally exceptions are made to the minimum freeboard requirement. If an exception is requested, attach documentation addressing Paragraph 65.10(b)(1)(ii) of the NFIP Regulations.

If No is answered to any of the above, please attach an explanation.

b. Is there an indication from historical records that ice-jamming can affect the BFE? ☐ Yes ☐ No

If Yes, provide ice-jam analysis profile and evidence that the minimum freeboard discussed above still exists.

3. Closures

a. Openings through the levee system (check one): ☐ exists ☐ does not exist

If opening exists, list all closures:

Channel Station	Left or Right Bank	Opening Type	Highest Elevation for Opening Invert	Type of Closure Device

(Extend table on an added sheet as needed and reference)

Note: Geotechnical and geologic data

In addition to the required detailed analysis reports, data obtained during field and laboratory investigations and used in the design analysis for the following system features should be submitted in a tabulated summary form. (Reference U.S. Army Corps of Engineers [USACE] EM-1110-2-1906 Form 2086.)

4. Embankment Protection

a. The maximum levee slope land side is: _____

b. The maximum levee slope flood side is: _____

c. The range of velocities along the levee during the base flood is: _____ (min.) to _____ (max.)

d. Embankment material is protected by (describe what kind): _____

e. Riprap Design Parameters (check one): ☐ Velocity ☐ Tractive stress
Attach references

Reach		Sideslope	Flow Depth	Velocity	Curve or Straight	Stone Riprap			Depth of Toedown
						D_{100}	D_{50}	Thickness	
Sta	to								
Sta	to								
Sta	to								
Sta	to								
Sta	to								
Sta	to								

(Extend table on an added sheet as needed and reference each entry)

f. Is a bedding/filter analysis and design attached? ☐ Yes ☐ No

g. Describe the analysis used for other kinds of protection used (include copies of the design analysis):

Attach engineering analysis to support construction plans.

5. Embankment And Foundation Stability

a. Identify locations and describe the basis for selection of critical location for analysis:
_____

☐ Overall height: Sta.: _____, height _____ ft.

☐ Limiting foundation soil strength:

Strength ϕ = _____ degrees, c = _____ psf

Slope: SS = _____ (h) to _____ (v)

(Repeat as needed on an added sheet for additional locations)

b. Specify the embankment stability analysis methodology used (e.g., circular arc, sliding block, infinite slope, etc.):
_____

c. Summary of stability analysis results:

E. LEVEE/FLOODWALL (CONTINUED)

5. Embankment And Foundation Stability (continued)

Case	Loading Conditions	Critical Safety Factor	Criteria (Min.)
I	End of construction		1.3
II	Sudden drawdown		1.0
III	Critical flood stage		1.4
IV	Steady seepage at flood stage		1.4
VI	Earthquake (Case I)		1.0

(Reference: USACE EM-1110-2-1913 Table 6-1)

d. Was a seepage analysis for the embankment performed? ☐ Yes ☐ No

If Yes, describe methodology used:

e. Was a seepage analysis for the foundation performed? ☐ Yes ☐ No

f. Were uplift pressures at the embankment landside toe checked? ☐ Yes ☐ No

g. Were seepage exit gradients checked for piping potential? ☐ Yes ☐ No

h. The duration of the base flood hydrograph against the embankment is _____ hours.

Attach engineering analysis to support construction plans.

6. Floodwall And Foundation Stability

a. Describe analysis submittal based on Code (check one): ☐ UBC (1988) ☐ Other (specify): _____

b. Stability analysis submitted provides for: ☐ Overturning ☐ Sliding If not, explain: _____

c. Loading included in the analyses were: ☐ Lateral earth @ P_A = _____ psf; P_p = _____ psf

☐ Surcharge-Slope @ _____, ☐ surface _____ psf

☐ Wind @ P_w = _____ psf

☐ Seepage (Uplift); _____ ☐ Earthquake @ P_{eq} = _____ %g

☐ 1%-annual-chance significant wave height: _____ ft.

☐ 1%-annual-chance significant wave period: _____ sec.

d. Summary of Stability Analysis Results: Factors of Safety.
Itemize for each range in site layout dimension and loading condition limitation for each respective reach.

Loading Condition	Criteria (Min)		Sta	To	Sta	To
	Overturn	Sliding	Overturn	Sliding	Overturn	Sliding
Dead & Wind	1.5	1.5				
Dead & Soil	1.5	1.5				
Dead, Soil, Flood, & Impact	1.5	1.5				
Dead, Soil, & Seismic	1.3	1.3				

(Ref: FEMA 114 Sept 1986; USACE EM 1110-2-2502)
Note: (Extend table on an added sheet as needed and reference)

E. LEVEE/FLOODWALL (CONTINUED)

6. Floodwall And Foundation Stability (continued)

e. Foundation bearing strength for each soil type:

Bearing Pressure	Sustained Load (psf)	Short Term Load (psf)
Computed design maximum		
Maximum allowable		

f. Foundation scour protection ☐ is, ☐ is not provided. If provided, attach explanation and supporting documentation:

Attach engineering analysis to support construction plans.

7. Settlement

a. Has anticipated potential settlement been determined and incorporated into the specified construction elevations to maintain the established freeboard margin? ☐ Yes ☐ No

b. The computed range of settlement is _____ ft. to _____ ft.

c. Settlement of the levee crest is determined to be primarily from : ☐ Foundation consolidation ☐ Embankment compression ☐ Other (Describe): _____

d. Differential settlement of floodwalls ☐ has ☐ has not been accommodated in the structural design and construction.

Attach engineering analysis to support construction plans.

8. Interior Drainage

a. Specify size of each interior watershed:

Draining to pressure conduit: _____ acres
Draining to ponding area: _____ acres

b. Relationships Established

Ponding elevation vs. storage	☐ Yes	☐ No
Ponding elevation vs. gravity flow	☐ Yes	☐ No
Differential head vs. gravity flow	☐ Yes	☐ No

c. The river flow duration curve is enclosed: ☐ Yes ☐ No

d. Specify the discharge capacity of the head pressure conduit: _____ cfs

e. Which flooding conditions were analyzed?

• Gravity flow (Interior Watershed)	☐ Yes	☐ No
• Common storm (River Watershed)	☐ Yes	☐ No
• Historical ponding probability	☐ Yes	☐ No
• Coastal wave overtopping	☐ Yes	☐ No

If No for any of the above, attach explanation.

e. Interior drainage has been analyzed based on joint probability of interior and exterior flooding and the capacities of pumping and outlet facilities to provide the established level of flood protection. ☐ Yes ☐ No If No, attach explanation.

g. The rate of seepage through the levee system for the base flood is _____ cfs

h. The length of levee system used to drive this seepage rate in item g: _____ ft.

E. LEVEE/FLOODWALL (CONTINUED)

8. Interior Drainage (continued)

i. Will pumping plants be used for interior drainage? ☐ Yes ☐ No

If Yes, include the number of pumping plants: _____ For each pumping plant, list:

	Plant #1	Plant #2
The number of pumps		
The ponding storage capacity		
The maximum pumping rate		
The maximum pumping head		
The pumping starting elevation		
The pumping stopping elevation		
Is the discharge facility protected?		
Is there a flood warning plan?		
How much time is available between warning and flooding?		

Will the operation be automatic? ☐ Yes ☐ No

If the pumps are electric, are there backup power sources? ☐ Yes ☐ No

(Reference: USACE EM-1110-2-3101, 3102, 3103, 3104, and 3105)

Include a copy of supporting documentation of data and analysis. Provide a map showing the flooded area and maximum ponding elevations for all interior watersheds that result in flooding.

9. Other Design Criteria

a. The following items have been addressed as stated:

Liquefaction ☐ is ☐ is not a problem

Hydrocompaction ☐ is ☐ is not a problem

Heave differential movement due to soils of high shrink/swell ☐ is ☐ is not a problem

b. For each of these problems, state the basic facts and corrective action taken:

Attach supporting documentation

c. If the levee/floodwall is new or enlarged, will the structure adversely impact flood levels and/or flow velocities floodside of the structure?
☐ Yes ☐ No Attach supporting documentation

d. Sediment Transport Considerations:

Was sediment transport considered? ☐ Yes ☐ No

If Yes, then fill out Section F (Sediment Transport). If No, then attach your explanation for why sediment transport was not considered.

10. Operational Plan And Criteria

a. Are the planned/installed works in full compliance with Part 65.10 of the NFIP Regulations? ☐ Yes ☐ No

b. Does the operation plan incorporate all the provisions for closure devices as required in Paragraph 65.10(c)(1) of the NFIP regulations?
☐ Yes ☐ No

c. Does the operation plan incorporate all the provisions for interior drainage as required in Paragraph 65.10(c)(2) of the NFIP regulations?
☐ Yes ☐ No If the answer is No to any of the above, please attach supporting documentation.

E. LEVEE/FLOODWALL (CONTINUED)

11. Maintenance Plan

Please attach a copy of the fomal maintenance plan for the levee/floodwall

12. Operations and Maintenance Plan

Please attach a copy of the formal Operations and Maintenance Plan for the levee/floodwall.

CERTIFICATION OF THE LEVEE DOCUMENTION

This certification is to be signed and sealed by a licensed registered professional engineer authorized by law to certify elevation information data, hydrologic and hydraulic analysis, and any other supporting information as per NFIP regulations paragraph 65.10(e) 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: _____ License No.: _____ Expiration Date: _____

Company Name: _____ Telephone No.: _____ Fax No.: _____

Signature: _____ Date: _____ E-Mail Address: _____

F. SEDIMENT TRANSPORT

Flooding Source: _____

Name of Structure: _____

If there is any indication from historical records that sediment transport (including scour and deposition) can affect the Base Flood Elevation (BFE); and/or based on the stream morphology, vegetative cover, development of the watershed and bank conditions, there is a potential for debris and sediment transport (including scour and deposition) to affect the BFEs, then provide the following information along with the supporting documentation:

Sediment load associated with the base flood discharge: Volume _____ acre-feet

Debris load associated with the base flood discharge: Volume _____ acre-feet

Sediment transport rate _____ (percent concentration by volume)

Method used to estimate sediment transport: _____

Most sediment transport formulas are intended for a range of hydraulic conditions and sediment sizes; attach a detailed explanation for using the selected method.

Method used to estimate scour and/or deposition: _____

Method used to revise hydraulic or hydrologic analysis (model) to account for sediment transport: _____

Please note that bulked flows are used to evaluate the performance of a structure during the base flood; however, FEMA does not map BFEs based on bulked flows.

If a sediment analysis has not been performed, an explanation as to why sediment transport (including scour and deposition) will not affect the BFEs or structures must be provided.

DEPARTMENT OF HOMELAND SECURITY
FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE STRUCTURES 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 7 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 20598-3005, 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; 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: Centennial Wash

Note: Fill out one form for each flooding source studied.

A. GENERAL

Complete the appropriate section(s) for each Structure listed below:

Channelization.....complete Section B
Bridge/Culvert.....complete Section C
Dam.....complete Section D
Levee/Floodwall.....complete Section E
Sediment Transport.....complete Section F (if required)

Description Of Modeled Structure

1. Name of Structure: Southern Pacific Railroad (SPRR) Bridge

   Type (check one): ☐ Channelization ☒ Bridge/Culvert ☐ Levee/Floodwall ☐ Dam

   Location of Structure: 7.37 miles upstream of the confluence of Centennial Wash with the Gila River

   Downstream Limit/Cross Section: RM 7.35 along Centennial Wash for HEC-RAS model "BaselineRdtoGila_LS.prj"

   Upstream Limit/Cross Section: RM 7.39 along Centennial Wash for HEC-RAS model "BaselineRdtoGila_LS.prj"

2. Name of Structure: _____

   Type (check one): ☐ Channelization ☐ Bridge/Culvert ☐ Levee/Floodwall ☐ Dam

   Location of Structure: _____

   Downstream Limit/Cross Section: _____

   Upstream Limit/Cross Section: _____

3. Name of Structure: _____

   Type (check one) ☐ Channelization ☐ Bridge/Culvert ☐ Levee/Floodwall ☐ Dam

   Location of Structure: _____

   Downstream Limit/Cross Section: _____

   Upstream Limit/Cross Section: _____

NOTE: FOR MORE STRUCTURES, ATTACH ADDITIONAL PAGES AS NEEDED.

B. CHANNELIZATION

Flooding Source: _____

Name of Structure: _____

1. Hydraulic Considerations

The channel was designed to carry _____ (cfs) and/or the _____-year flood.

The design elevation in the channel is based on (check one):

☐ Subcritical flow ☐ Critical flow ☐ Supercritical flow ☐ Energy grade line

If there is the potential for a hydraulic jump at the following locations, check all that apply and attach an explanation of how the hydraulic jump is controlled without affecting the stability of the channel.

☐ Inlet to channel ☐ Outlet of channel ☐ At Drop Structures ☐ At Transitions

☐ Other locations (specify): _____

2. Channel Design Plans

Attach the plans of the channelization certified by a registered professional engineer, as described in the instructions.

3. Accessory Structures

The channelization includes (check one):

☐ Levees [Attach Section E (Levee/Floodwall)] ☐ Drop structures ☐ Superelevated sections

☐ Transitions in cross sectional geometry ☐ Debris basin/detention basin [Attach Section D (Dam/Basin)] ☐ Energy dissipator

☐ Weir ☐ Other (Describe):

4. Sediment Transport Considerations

Are the hydraulics of the channel affected by sediment transport? ☐ Yes ☐ No

If yes, then fill out Section F (Sediment Transport) of Form 3. If No, then attach your explanation for why sediment transport was not considered.

C. BRIDGE/CULVERT

Flooding Source: Centennial Wash

Name of Structure: SPRR Bridge

1. This revision reflects (check one):

☐ Bridge/culvert not modeled in the FIS

☐ Modified bridge/culvert previously modeled in the FIS

☒ Revised analysis of bridge/culvert previously modeled in the FIS

2. Hydraulic model used to analyze the structure (e.g., HEC-2 with special bridge routine, WSPRO, HY8): HEC-RAS
If different than hydraulic analysis for the flooding source, justify why the hydraulic analysis used for the flooding source could not analyze the structures. Attach justification.

3. Attach plans of the structures certified by a registered professional engineer. The plan detail and information should include the following (check the information that has been provided):

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

4. Sediment Transport Considerations

Are the hydraulics of the structure affected by sediment transport? ☐ Yes ☒ No

If Yes, then fill out Section F (Sediment Transport) of Form 3. If no, then attach an explanation.

D. DAM/BASIN

Flooding Source: _____
Name of Structure: _____

1. This request is for (check one): ☐ Existing dam/basin ☐ New dam/basin ☐ Modification of existing dam/basin

2. The dam/basin was designed by (check one): ☐ Federal agency ☐ State agency ☐ Private organization ☐ Local government agency

   Name of the agency or organization: _____

3. The Dam was permitted as (check one): ☐ Federal Dam ☐ State Dam

   Provide the permit or identification number (ID) for the dam and the appropriate permitting agency or organization

   Permit or ID number _____ Permitting Agency or Organization _____

   a. ☐ Local Government Dam ☐ Private Dam

   Provided related drawings, specification and supporting design information.

4. Does the project involve revised hydrology? ☐ Yes ☐ No

   If Yes, complete the Riverine Hydrology & Hydraulics Form (Form 2).

   Was the dam/basin designed using critical duration storm? (must account for the maximum volume of runoff)

   ☐ Yes, provide supporting documentation with your completed Form 2.

   ☐ No, provide a written explanation and justification for not using the critical duration storm.

5. Does the submittal include debris/sediment yield analysis? ☐ Yes ☐ No

   If Yes, then fill out Section F (Sediment Transport). If No, then attach your explanation for why debris/sediment analysis was not considered?

6. Does the Base Flood Elevation behind the dam/basin or downstream of the dam/basin change? ☐ Yes ☐ No

   If Yes, complete the Riverine Hydrology & Hydraulics Form (Form 2) and complete the table below.

FREQUENCY (% annual chance)	Stillwater Elevation Behind the Dam/Basin FIS	REVISED
10-year (10%)	_____	_____
50-year (2%)	_____	_____
100-year (1%)	_____	_____
500-year (0.2%)	_____	_____
Normal Pool Elevation	_____	_____

7. Please attach a copy of the formal Operation and Maintenance Plan

E. LEVEE/FLOODWALL

1. System Elements

a. This Levee/Floodwall analysis is based on (check one): ☐ upgrading of an existing levee/floodwall system ☐ a newly constructed levee/floodwall system ☐ reanalysis of an existing levee/floodwall system

b. Levee elements and locations are (check one):

☐ earthen embankment, dike, berm, etc. Station _____ to _____
☐ structural floodwall Station _____ to _____
☐ Other (describe): Station _____ to _____

c. Structural Type (check one): ☐ monolithic cast-in place reinforced concrete ☐ reinforced concrete masonry block ☐ sheet piling ☐ Other (describe): _____

d. Has this levee/floodwall system been certified by a Federal agency to provide protection from the base flood?

☐ Yes ☐ No

If Yes, by which agency? _____

e. Attach certified drawings containing the following information (indicate drawing sheet numbers):

1. Plan of the levee embankment and floodwall structures. Sheet Numbers: _____
2. A profile of the levee/floodwall system showing the Base Flood Elevation (BFE), levee and/or wall crest and foundation, and closure locations for the total levee system. Sheet Numbers: _____
3. A profile of the BFE, closure opening outlet and inlet invert elevations, type and size of opening, and kind of closure. Sheet Numbers: _____
4. A layout detail for the embankment protection measures. Sheet Numbers: _____
5. Location, layout, and size and shape of the levee embankment features, foundation treatment, Floodwall structure, closure structures, and pump stations. Sheet Numbers: _____

2. Freeboard

a. The minimum freeboard provided above the BFE is:

Riverine

3.0 feet or more at the downstream end and throughout	☐ Yes	☐ No
3.5 feet or more at the upstream end	☐ Yes	☐ No
4.0 feet within 100 feet upstream of all structures and/or constrictions	☐ Yes	☐ No

Coastal

1.0 foot above the height of the one percent wave associated with the 1%-annual-chance stillwater surge elevation or maximum wave runup (whichever is greater).	☐ Yes	☐ No
2.0 feet above the 1%-annual-chance stillwater surge elevation	☐ Yes	☐ No

Please note, occasionally exceptions are made to the minimum freeboard requirement. If an exception is requested, attach documentation addressing Paragraph 65.10(b)(1)(ii) of the NFIP Regulations.

If No is answered to any of the above, please attach an explanation.

b. Is there an indication from historical records that ice-jamming can affect the BFE? ☐ Yes ☐ No

If Yes, provide ice-jam analysis profile and evidence that the minimum freeboard discussed above still exists.

3. Closures

a. Openings through the levee system (check one): ☐ exists ☐ does not exist

If opening exists, list all closures:

Channel Station	Left or Right Bank	Opening Type	Highest Elevation for Opening Invert	Type of Closure Device

(Extend table on an added sheet as needed and reference)

Note: Geotechnical and geologic data

In addition to the required detailed analysis reports, data obtained during field and laboratory investigations and used in the design analysis for the following system features should be submitted in a tabulated summary form. (Reference U.S. Army Corps of Engineers [USACE] EM-1110-2-1906 Form 2086.)

4. Embankment Protection

a. The maximum levee slope land side is: _____

b. The maximum levee slope flood side is: _____

c. The range of velocities along the levee during the base flood is: _____ (min.) to _____ (max.)

d. Embankment material is protected by (describe what kind): _____

e. Riprap Design Parameters (check one): ☐ Velocity ☐ Tractive stress
Attach references

Reach		Sideslope	Flow Depth	Velocity	Curve or Straight	Stone Riprap			Depth of Toedown
						D_{100}	D_{50}	Thickness	
Sta	to								
Sta	to								
Sta	to								
Sta	to								
Sta	to								
Sta	to								

(Extend table on an added sheet as needed and reference each entry)

f. Is a bedding/filter analysis and design attached? ☐ Yes ☐ No

g. Describe the analysis used for other kinds of protection used (include copies of the design analysis):

Attach engineering analysis to support construction plans.

5. Embankment And Foundation Stability

a. Identify locations and describe the basis for selection of critical location for analysis:
_____

☐ Overall height: Sta.: _____, height _____ ft.

☐ Limiting foundation soil strength:

Strength ϕ = _____ degrees, c = _____ psf

Slope: SS = _____ (h) to _____ (v)

(Repeat as needed on an added sheet for additional locations)

b. Specify the embankment stability analysis methodology used (e.g., circular arc, sliding block, infinite slope, etc.):
_____

c. Summary of stability analysis results:

E. LEVEE/FLOODWALL (CONTINUED)

5. Embankment And Foundation Stability (continued)

Case	Loading Conditions	Critical Safety Factor	Criteria (Min.)
I	End of construction		1.3
II	Sudden drawdown		1.0
III	Critical flood stage		1.4
IV	Steady seepage at flood stage		1.4
VI	Earthquake (Case I)		1.0

(Reference: USACE EM-1110-2-1913 Table 6-1)

d. Was a seepage analysis for the embankment performed? ☐ Yes ☐ No

If Yes, describe methodology used:

e. Was a seepage analysis for the foundation performed? ☐ Yes ☐ No

f. Were uplift pressures at the embankment landside toe checked? ☐ Yes ☐ No

g. Were seepage exit gradients checked for piping potential? ☐ Yes ☐ No

h. The duration of the base flood hydrograph against the embankment is _____ hours.

Attach engineering analysis to support construction plans.

6. Floodwall And Foundation Stability

a. Describe analysis submittal based on Code (check one): ☐ UBC (1988) ☐ Other (specify): _____

b. Stability analysis submitted provides for: ☐ Overturning ☐ Sliding If not, explain: _____

c. Loading included in the analyses were: ☐ Lateral earth @ P_A = _____ psf; P_p = _____ psf

☐ Surcharge-Slope @ _____, ☐ surface _____ psf

☐ Wind @ P_w = _____ psf

☐ Seepage (Uplift); _____ ☐ Earthquake @ P_{eq} = _____ %g

☐ 1%-annual-chance significant wave height: _____ ft.

☐ 1%-annual-chance significant wave period: _____ sec.

d. Summary of Stability Analysis Results: Factors of Safety.
Itemize for each range in site layout dimension and loading condition limitation for each respective reach.

Loading Condition	Criteria (Min)		Sta	To	Sta	To
	Overturn	Sliding	Overturn	Sliding	Overturn	Sliding
Dead & Wind	1.5	1.5				
Dead & Soil	1.5	1.5				
Dead, Soil, Flood, & Impact	1.5	1.5				
Dead, Soil, & Seismic	1.3	1.3				

(Ref: FEMA 114 Sept 1986; USACE EM 1110-2-2502)
Note: (Extend table on an added sheet as needed and reference)

E. LEVEE/FLOODWALL (CONTINUED)

6. Floodwall And Foundation Stability (continued)

e. Foundation bearing strength for each soil type:

Bearing Pressure	Sustained Load (psf)	Short Term Load (psf)
Computed design maximum		
Maximum allowable		

f. Foundation scour protection ☐ is, ☐ is not provided. If provided, attach explanation and supporting documentation:

Attach engineering analysis to support construction plans.

7. Settlement

a. Has anticipated potential settlement been determined and incorporated into the specified construction elevations to maintain the established freeboard margin? ☐ Yes ☐ No

b. The computed range of settlement is _____ ft. to _____ ft.

c. Settlement of the levee crest is determined to be primarily from : ☐ Foundation consolidation ☐ Embankment compression ☐ Other (Describe): _____

d. Differential settlement of floodwalls ☐ has ☐ has not been accommodated in the structural design and construction.

Attach engineering analysis to support construction plans.

8. Interior Drainage

a. Specify size of each interior watershed:

Draining to pressure conduit: _____ acres
Draining to ponding area: _____ acres

b. Relationships Established

Ponding elevation vs. storage	☐ Yes	☐ No
Ponding elevation vs. gravity flow	☐ Yes	☐ No
Differential head vs. gravity flow	☐ Yes	☐ No

c. The river flow duration curve is enclosed: ☐ Yes ☐ No

d. Specify the discharge capacity of the head pressure conduit: _____ cfs

e. Which flooding conditions were analyzed?

• Gravity flow (Interior Watershed)	☐ Yes	☐ No
• Common storm (River Watershed)	☐ Yes	☐ No
• Historical ponding probability	☐ Yes	☐ No
• Coastal wave overtopping	☐ Yes	☐ No

If No for any of the above, attach explanation.

e. Interior drainage has been analyzed based on joint probability of interior and exterior flooding and the capacities of pumping and outlet facilities to provide the established level of flood protection. ☐ Yes ☐ No If No, attach explanation.

g. The rate of seepage through the levee system for the base flood is _____ cfs

h. The length of levee system used to drive this seepage rate in item g: _____ ft.

E. LEVEE/FLOODWALL (CONTINUED)

8. Interior Drainage (continued)

i. Will pumping plants be used for interior drainage? ☐ Yes ☐ No

If Yes, include the number of pumping plants: _____ For each pumping plant, list:

	Plant #1	Plant #2
The number of pumps		
The ponding storage capacity		
The maximum pumping rate		
The maximum pumping head		
The pumping starting elevation		
The pumping stopping elevation		
Is the discharge facility protected?		
Is there a flood warning plan?		
How much time is available between warning and flooding?		

Will the operation be automatic? ☐ Yes ☐ No

If the pumps are electric, are there backup power sources? ☐ Yes ☐ No

(Reference: USACE EM-1110-2-3101, 3102, 3103, 3104, and 3105)

Include a copy of supporting documentation of data and analysis. Provide a map showing the flooded area and maximum ponding elevations for all interior watersheds that result in flooding.

9. Other Design Criteria

a. The following items have been addressed as stated:

Liquefaction ☐ is ☐ is not a problem

Hydrocompaction ☐ is ☐ is not a problem

Heave differential movement due to soils of high shrink/swell ☐ is ☐ is not a problem

b. For each of these problems, state the basic facts and corrective action taken:

Attach supporting documentation

c. If the levee/floodwall is new or enlarged, will the structure adversely impact flood levels and/or flow velocities floodside of the structure?
☐ Yes ☐ No Attach supporting documentation

d. Sediment Transport Considerations:

Was sediment transport considered? ☐ Yes ☐ No
If Yes, then fill out Section F (Sediment Transport). If No, then attach your explanation for why sediment transport was not considered.

10. Operational Plan And Criteria

a. Are the planned/installed works in full compliance with Part 65.10 of the NFIP Regulations? ☐ Yes ☐ No

b. Does the operation plan incorporate all the provisions for closure devices as required in Paragraph 65.10(c)(1) of the NFIP regulations?
☐ Yes ☐ No

c. Does the operation plan incorporate all the provisions for interior drainage as required in Paragraph 65.10(c)(2) of the NFIP regulations?
☐ Yes ☐ No If the answer is No to any of the above, please attach supporting documentation.

E. LEVEE/FLOODWALL (CONTINUED)

11. Maintenance Plan

Please attach a copy of the fomal maintenance plan for the levee/floodwall

12. Operations and Maintenance Plan

Please attach a copy of the formal Operations and Maintenance Plan for the levee/floodwall.

CERTIFICATION OF THE LEVEE DOCUMENTION

This certification is to be signed and sealed by a licensed registered professional engineer authorized by law to certify elevation information data, hydrologic and hydraulic analysis, and any other supporting information as per NFIP regulations paragraph 65.10(e) 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: _____ License No.: _____ Expiration Date: _____

Company Name: _____ Telephone No.: _____ Fax No.: _____

Signature: _____ Date: _____ E-Mail Address: _____

F. SEDIMENT TRANSPORT

Flooding Source: _____

Name of Structure: _____

If there is any indication from historical records that sediment transport (including scour and deposition) can affect the Base Flood Elevation (BFE); and/or based on the stream morphology, vegetative cover, development of the watershed and bank conditions, there is a potential for debris and sediment transport (including scour and deposition) to affect the BFEs, then provide the following information along with the supporting documentation:

Sediment load associated with the base flood discharge: Volume _____ acre-feet

Debris load associated with the base flood discharge: Volume _____ acre-feet

Sediment transport rate _____ (percent concentration by volume)

Method used to estimate sediment transport: _____

Most sediment transport formulas are intended for a range of hydraulic conditions and sediment sizes; attach a detailed explanation for using the selected method.

Method used to estimate scour and/or deposition: _____

Method used to revise hydraulic or hydrologic analysis (model) to account for sediment transport: _____

Please note that bulked flows are used to evaluate the performance of a structure during the base flood; however, FEMA does not map BFEs based on bulked flows.

If a sediment analysis has not been performed, an explanation as to why sediment transport (including scour and deposition) will not affect the BFEs or structures must be provided.

Southern Pacific Railroad Bridge

The following table presents information entered into HEC-RAS for the SPRR bridge openings based on survey data. The bridges are numbered from west to east with bridge 1 being the main opening.

Table 1. SPRR Bridge Data

	Bridge 1	Bridge 2	Bridge 3	Bridge 4
Height of opening, maximum (ft)	10.8	8.1	6.0	8.9
Width of opening (ft)	281.2	276.9	296.9	300.7
Length in streamwise direction (ft)	15	15	15	15
Pier size (ft)	1	1	1	1
Number of piers	19	19	19	19
Distance to upstream cross section (ft)	60	60	60	60
Distance to downstream cross section (ft)	133.5	133.5	133.5	133.5
Low chord, upstream and downstream (ft)	855	855	853.5	851.5
Upstream top of road, average (ft)	858.8	858.9	857.5	855.4
Downstream top of road, average (ft)	858.9	858.9	857.6	855.5
Upstream invert elevation, minimum (ft)	844.2	846.9	847.5	842.6
Downstream invert elevation, minimum (ft)	844.4	847.7	847.4	843.0
Upstream cross section (RS)	7.39	7.39	7.39	7.39
Downstream cross section (RS)	7.35	7.35	7.35	7.35

3 Surveying and Mapping Information

The final topography used for floodplain mapping in this study was developed using six different topographic data sources (see Figure 3-1). These sources are summarized below:

1. The area west of the 530th Avenue alignment and north of the Centennial Road alignment—including approximately 8.2 river miles of the main branch of Centennial Wash from the border of Maricopa County and La Paz County at the upstream end to the intersection of Centennial Wash and Centennial Road at the downstream end—was mapped using 2-foot contour interval topography delivered in 2012 to the District by Stewart Geo Technologies (Stewart Geo Technologies, 2012).
2. From the intersection of Centennial Wash with Centennial Road at the upstream end to approximately the 470th Avenue alignment at the downstream end (i.e., near the intersection of Centennial Wash with the Elliott Road alignment), the topography utilized for the final mapping was a mixture of the Stewart 2-foot contour interval topography (Stewart Geo Technologies, 2012) and 2-foot contour interval topography developed by Vertical Mapping Resources. A certification document was provided to WEST by the District for the Vertical Mapping Resources topography (Flood Control District of Maricopa County, 2012a). This area covers approximately 13.2 river miles of the main branch of Centennial Wash and the entirety of the previously effective Centennial Left Overbank floodplain area.
3. Moving further downstream, approximately 7.1 river miles along Centennial Wash from approximately 470th Avenue alignment (i.e., near the intersection of Centennial Wash with the Elliott Road alignment) downstream to 419th Avenue were mapped using 2-foot contour interval topography developed by Wilson & Company, Inc. (2012) for this study. As can be seen in Figure 3-1, a small area in between two previously existing topographic data sets used herein (Palo Verde topography and Gillespie topography, both discussed in greater detail below) was updated with a combination of additional topography collected by Wilson and another dataset collected directly by the District (discussed in greater detail below).
4. Approximately 9.2 river miles along Centennial Wash downstream of the 419th Avenue alignment were mapped using 2-foot contour interval topography developed in 2007 as part of the District's Palo Verde Area Drainage Master Plan (ADMP) Mapping Survey (Wilson and Company, 2008). This reach ended at approximately the 355th Avenue alignment near the downstream end (i.e., 1.2 miles above the intersection of Centennial Wash with the Old US Highway 80 alignment).
5. The lowest approximately 2.8 river miles along Centennial Wash (i.e., the approximately 2.8 river miles upstream of the confluence of Centennial Wash with the Gila River) were mapped using 2-foot contour interval topography developed in 2012 by the District specifically for this study (Flood Control District of Maricopa County, 2012b). The upstream end of this reach begins at approximately the 355th Avenue alignment (i.e., 1.2 miles above the intersection of Centennial Wash with the Old US Highway 80 alignment). This topography was referred to commonly throughout the project as the "in-fill topography" and may be referenced as such in meeting minutes and other correspondence provided in appendices to this TSDN.

6. A small portion of the south (right) overbanks of Centennial Wash for the downstream approximately 1.3 river miles were mapped using 2-foot contour interval topography developed in 2008 for the Gillespie area as part of the District's Gillespie ADMP Mapping Survey (Sandborn, 2009).

Each of these data sources has been reviewed in terms of national mapping accuracy standards. As will be shown in the remainder of this section of the report, they all are sufficient for this type of study individually, and the final merged product is sufficient for this type of study as well. Each of these topography data sources were provided directly by the District. Neither WEST, nor any of WEST's subconsultants for this project, developed any topographic datasets for use directly in floodplain mapping.

David Evans and Associates, Inc., (DEA)—working as a subconsultant to WEST—performed one field survey task under this contract. That task included the characterization of one set of culverts in the study area along the Harquahala Valley Irrigation District's (HVID) north-south drainage channel designed and constructed for the purpose of flood control and protection of downstream agricultural fields. This drainage channel, which runs from north to south, intercepts overland flow moving from west to east in the vicinity of the Centennial Wash Left Overbank area. The HVID north-south drainage channel is approximately one-half mile west of Harquahala Valley Road ending very near the thalweg of Centennial Wash at the southern end. This channel has only one hydraulic structure along its length: a set of three circular culverts conveying flow underneath Van Buren Street. DEA performed a detailed structure survey of this crossing.

Additionally, the District performed one field survey for this project as well. This task included the characterization of the Southern Pacific Railroad (SPRR) Trestle Bridge crossing over Centennial Wash approximately 7.35 miles upstream from the confluence of Centennial Wash with the Gila River. The trestle bridge is made up of 4 trestle openings that allow water to pass through, each of the openings being between 270 feet and 300 feet wide. These four openings are located from 1,800 feet to 2,400 feet apart from each other (spacing between the four openings on center) with no penetrations in the railroad embankment in between the openings. The District performed a detailed structure survey of the four openings in this trestle bridge using laser scanner survey technology.

The digital project information, the detailed structure survey, and the topography and mapping as mentioned above are discussed in greater detail in Sections 3.1, 3.2, and 3.3, respectively.

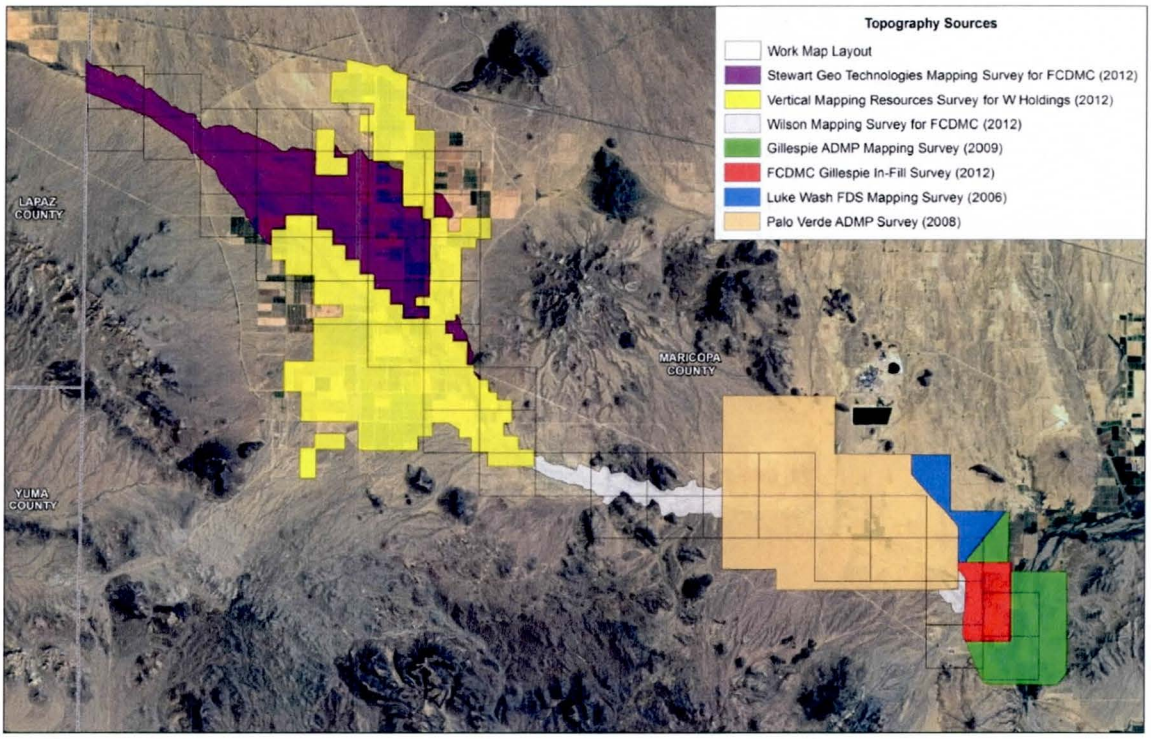

Figure 3-1. Topographic data sources for the final merged digital elevation model used in the study

3.1 Digital Projection Information

The vertical datum used for this study is the North American Vertical Datum of 1988 (NAVD88). The horizontal datum used for this study is the North American Datum of 1983 (NAD83) projected in the Arizona State Plane Central Zone coordinates. It should be noted that all data sources used in this study reference this horizontal projection using a High Accuracy Reference Network (HARN) with units of international feet.

Electronic data available to the project reviewers for this study include GIS shapefiles for topography data discussed in greater detail in Section 3.3 below. These files can be found on the disc in Appendix C.1.

Aerial photography shown on the work maps was provided by the District. These images were collected in September and October of 2010 and in September and October of 2011. The images were provided in MrSID format at 0.8-foot resolution. The images were georeferenced horizontally in the NAD83 HARN Arizona State Plane Central Zone projected coordinate system.

Elevation Reference Marks (ERMs) shown on the work study maps (see Sections 5.2 and 6.2 below) were provided by the District. Further details regarding the selection of those ERMs for this study can be found in a technical memorandum developed by WEST and delivered to the District (replicated in Appendix C.4 of this report).

3.2 Field Survey Information

Two structures were described using field survey techniques for inclusion in the hydraulic models for the study: the Southern Pacific Railroad (SPRR) Trestle Bridge and a culvert group along the HVID north-south drainage channel (approximately one-half mile west of Harquahala Valley Road) which pass water beneath Van Buren Road. This section will describe the survey data collected to describe these structures. All of the supporting documentation provided for these surveys can be found in Appendices C.1 and C.4 of this report.

The District's land survey group surveyed the SPRR Trestle Bridge for this project. They utilized a Leica Geosystems HDS Laser Scanner to collect point clouds of data defining the trestle openings in high resolution. John Stock, RLS, the head of the District's land survey group, provided oversight for this data collection and delivery. It should be noted that the majority of the railroad embankment between trestle openings was not scanned using the laser scanner; only the trestle openings and the portions of the embankment immediately adjacent to the trestle openings were assessed using this technology. The District provided two ASCII text files for each of the four trestles surveyed using this laser scanner. One was a thinned version of the total data cloud. For each trestle, the District collected millions of data points from the laser scanner, but Mr. Stock's team thinned these datasets to provide the minimum number of points per trestle that still provided a high-resolution definition of the trestle opening. These thinned datasets contained on the order of hundreds of thousands of points per trestle (as opposed to millions in the original datasets). The second text file provided by the District for each trestle was a very small dataset (on the order of 50 points) created by the District's survey team to define the skeletonized geometry of each trestle opening. This included bottom of pier coordinates (i.e., the center of each pier where it intersects the ground), top of pier coordinates (i.e., the center of each pier where it intersects the low chord of the bridge deck), a few coordinates along the top of the bridge deck, and the natural ground cross section at the bridge face. This skeletonized dataset was analogous to the two-dimensional representation of each trestle opening in the HEC-RAS model. Both of these files for each trestle (8 files total) as provided directly by the District are included in Appendix C.1 for review.

Next, a survey was performed to describe the culverts along the HVID north-south drainage channel (approximately one-half mile west of Harquahala Valley Road) which pass water beneath Van Buren Road. As a subconsultant to WEST Consultants, Inc. (WEST), David Evans and Associates (DEA) completed a detailed structure survey of these culverts, which consist of three 72-inch barrel culverts at approximately the same elevation. This detailed structure survey was used to enter roadway embankment data and culvert data into the HEC-RAS model created for the HVID north-south drainage channel and edited for input to the FLO-2D model. It should be noted that the field survey collected a natural ground cross section just upstream of the culvert (approximately 8 feet upstream of the culverts), and the points collected in the ground survey show the natural ground elevation above the invert elevation of the culvert at the upstream face. However, field reconnaissance and field photos from this reconnaissance show that the invert is not blocked immediately at the upstream face of the culvert, indicative of local scour processes occurring in the last 8 feet upstream of the culvert.

Therefore, the ground points in the HEC-RAS model were dropped in the internal bridge upstream cross section to reflect this observation.

This survey work was completed on January 24, 2013. Thomas J. Lute, RLS, was the registered surveyor in responsible charge of collecting this information for DEA. A hard copy of the stamped CD data deliverable provided by DEA, a printout of the surveyed data points (198 points collected), a hard copy of the field photos collected by the survey crew, and a copy of the field notes are all provided in Appendix C.4 of this report. In addition, each of these files is also provided digitally in Appendix C.1.

3.3 Mapping

As mentioned previously, the final topography used for floodplain mapping in this study was developed using six different topographic data sources (see Figure 3-1 above). These sources, summarized previously, are described in greater detail below. It should be noted that in Figure 3-1, the boundaries between the topographic datasets are discrete boundaries that were used directly to clip topographic data from each dataset; no blending or edge-matching was done between the datasets. It should also be noted that while the Luke Wash FDS topography was used in this project for development of the original digital surface for use in model development, the final flood inundation extents did not reach this area. As such, this topography is not presented in detail below.

The topographic data used for the area upstream of the 419th Avenue alignment including approximately 29 river miles of the main branch of Centennial Wash from the border of Maricopa County and La Paz County downstream to the 419th Avenue alignment and the entirety of the previously effective Centennial Left Overbank floodplain area was mapped using a 2-foot contour interval topography surface delivered in 2012 to WEST by the District and referenced as the "Combined DTM." This surface was delivered in ArcInfo GENERATE format. This surface was provided to WEST referencing the NAVD88 vertical datum and the NAD83 HARN Arizona State Plane Central Zone horizontal datum, international feet. As described previously, this "Combined DTM" was developed from three independent datasets as described below.

The first dataset used in the generation of the "Combined DTM" was developed for the District by Stewart Geo Technologies (Stewart Geo Technologies, 2012). The area west of the 530th Avenue alignment and north of the Centennial Road alignment—including approximately 8.2 river miles of the main branch of Centennial Wash from the border of Maricopa County and La Paz County at the upstream end to the intersection of Centennial Wash and Centennial Road at the downstream end—was mapped entirely using this 2-foot contour interval topography in the "Combined DTM." This dataset was based on the NAVD88 vertical datum and the NAD83 HARN Arizona State Plane Central Zone horizontal datum, international feet. A certification document for this topographic dataset can be found electronically in Appendix C.1 of this report.

The second dataset used in the generation of the "Combined DTM" was 2-foot contour interval topography developed by Vertical Mapping Resources. This dataset along with the previously described

Stewart Geo Technologies topography data (Stewart Geo Technologies, 2012) were both used in combination to provide topography data from the intersection of Centennial Wash with Centennial Road at the upstream end to approximately the 470th Avenue alignment at the downstream end (i.e., near the intersection of Centennial Wash with the Elliott Road alignment). A certification document was provided to WEST by the District for the Vertical Mapping Resources topography (Flood Control District of Maricopa County, 2012a). This area of combined coverage from Vertical Mapping Resources (Flood Control District of Maricopa County, 2012a) and Stewart Geo Technologies (Stewart Geo Technologies, 2012) makes up the data in the "Combined DTM" surface for approximately 13.2 river miles of the main branch of Centennial Wash and the entirety of the previously effective Centennial Left Overbank floodplain area. This dataset was based on the NAVD88 vertical datum and the NAD83 HARN Arizona State Plane Central Zone horizontal datum. A certification document for the Vertical Mapping Resources topographic dataset can be found electronically in Appendix C.1 of this report.

The third dataset used in the generation of the "Combined DTM" surface was 2-foot contour interval topography developed by Wilson & Company, Inc. (2012) specifically for this study. Approximately 7.1 river miles along Centennial Wash from roughly the 470th Avenue alignment (i.e., near the intersection of Centennial Wash with the Elliott Road alignment) downstream to 419th Avenue were mapped using this dataset (Wilson & Company, Inc., 2012) in the "Combined DTM" surface. This was the final dataset incorporated into the "Combined DTM" surface. This dataset was based on the NAVD88 vertical datum and the NAD83 HARN Arizona State Plane Central Zone horizontal datum. A certification document for this topographic dataset can be found electronically in Appendix C.1 of this report. As can be seen in Figure 3-1, a small area near the Gila confluence in between two previously existing topographic data sets used herein (Palo Verde topography and Gillespie topography, both discussed in greater detail below) was updated with a combination of additional topography collected by Wilson and another dataset collected directly by the District (discussed in greater detail below).

Moving downstream from the "Combined DTM" coverage area, approximately 9.2 river miles along Centennial Wash downstream of the 419th Avenue alignment were mapped using 2-foot contour interval topography developed in 2007 as part of the District's Palo Verde ADMP Mapping Survey (Wilson and Company, 2008). This reach ended at approximately the 355th Avenue alignment near the downstream end (i.e., 1.2 miles above the intersection of Centennial Wash with the Old US Highway 80 alignment). This dataset was based on the NAVD88 vertical datum and the NAD83 HARN Arizona State Plane Central Zone horizontal datum. The aerial photography for this topography dataset was flown on June 12, 2007. The District's Project RID for this topography dataset is 1013, and the contract number under which these data were collected was FCD 2006C028. Additional certification documentation for this topographic dataset can be found electronically in Appendix C.1 of this report.

The lowest approximately 2.8 river miles along Centennial Wash (i.e., the approximately 2.8 river miles upstream of the confluence of Centennial Wash with the Gila River) were mapped using 2-foot contour interval topography developed in 2012 by the District specifically for this study (Flood Control District of Maricopa County, 2012b). The upstream end of this reach begins at approximately the 355th Avenue alignment (i.e., 1.2 miles above the intersection of Centennial Wash with the Old US Highway 80 alignment). This topography was referred to commonly throughout the project as the "in-fill

topography" and may be referenced as such in meeting minutes and other correspondence provided in appendices to this TSDN. This dataset was based on the NAVD88 vertical datum and the NAD83 HARN Arizona State Plane Central Zone horizontal datum. The field survey data used to develop this topography dataset was collected on April 5, 2012. Additional certification documentation for this topographic dataset can be found electronically in Appendix C.1 of this report.

A small portion of the south (right) overbanks of Centennial Wash for the downstream approximately 1.3 river miles were mapped using 2-foot contour interval topography developed in 2008 for the Gillespie as part of the District's Gillespie ADMP Mapping Survey (Sandborn, 2009). This dataset was based on the NAVD88 vertical datum and the NAD83 HARN Arizona State Plane Central Zone horizontal datum. The aerial photography for this topography dataset was flown on June 28-29, 2008. The District's Project RID for this topography dataset is 1290, and the contract number under which these data were collected was FCD 2007C045. Additional certification documentation for this topographic dataset can be found electronically in Appendix C.1 of this report.

ERMs shown on the work study maps (see Sections 5.2 and 6.2 below) were provided by the District. Further details regarding the selection of those ERMs for this study can be found in a technical memorandum developed by WEST and delivered to the District (replicated in Appendix C.4 of this report). This memorandum provides detailed information regarding the status of each of these benchmarks to verify mapping accuracy if needed.

4 Hydrology

4.1 Method Description

The hydrology information used for this study was taken from a CLOMR (FEMA case number 12-09-0043R) submitted to FEMA that updated the hydrology from the previously effective floodplain delineation (RBF Consulting, Inc., 2011). The original hydrology (i.e., previously effective hydrology) was determined by means of an HEC-1 model developed by Cella Barr (Cella Barr Associates, 1989). The Flood Insurance Study (FIS) for Maricopa County (Federal Emegency Management Agency, 2005) reflects the hydrology developed by Cella Barr (Cella Barr Associates, 1989). The 2011 CLOMR (FEMA case number 12-09-0043R) was based on the addition of 20 years of gage record, statistical methods, and comparison to USGS Regional Regression Equations.

The CLOMR (FEMA case number 12-09-0043R) provided a list of peak flows at various locations in the study reach. Table 4 from the CLOMR document is reproduced as Table 4-1 below. As can be seen from this table, the reductions in peak flows due to this CLOMR analysis compared to the previously effective hydrology were significant. Additionally, the hydrograph locations from Table 4-1 are shown spatially in Figure 4-1 below. As can be seen in this figure, the location defined in the CLOMR as "At Confluence with Gila River" is approximately 1.3 miles upstream of the confluence at the intersection of the Centennial Wash thalweg with Old US Highway 80. This was the location of an historic USGS gage that is no longer maintained along Centennial Wash, the USGS Gage ID 09517500—Centennial Wash near Arlington, Arizona. This gage actively collected data from 1960 to 1979 before being discontinued by the USGS. The data from that time period was incorporated into the hydrology analysis in the CLOMR developed by RBF (FEMA case number 12-09-0043R).

For the hydraulic modeling conducted herein, the peak flow values shown in Table 4-1 were applied as flow change locations at the geographic locations shown in Figure 4-1. Computation of steady-flow profiles require only a single peak discharge value be entered into the model.

Table 4-1. Final discharges approved previously by FEMA (reproduction of Table 4 from the CLOMR FEMA case number 12-09-0043R)

Location Along Centennial Wash	Area (mi^2)	100-Year Q (cfs)*	FIS Q** (cfs)	Reduction in Peak Flow (%)
At Centennial Levee Reach 2	1109.7	34,347	52,300	34.2
Near Baseline Road	1398.1	38,552	58,100	33.6
At Railroad Bridge near Arlington***	1824.5	44,041	67,300	34.6
At Confluence with Gila River	1870.3	44,590	67,300	33.7

**This column refers to the updated flows used in this study* (RBF Consulting, Inc., 2011)
***This column refers to the previously effective FIS flows* (Cella Barr Associates, 1989)
****This is the bridge referred to herein as the SPRR Trestle Bridge*

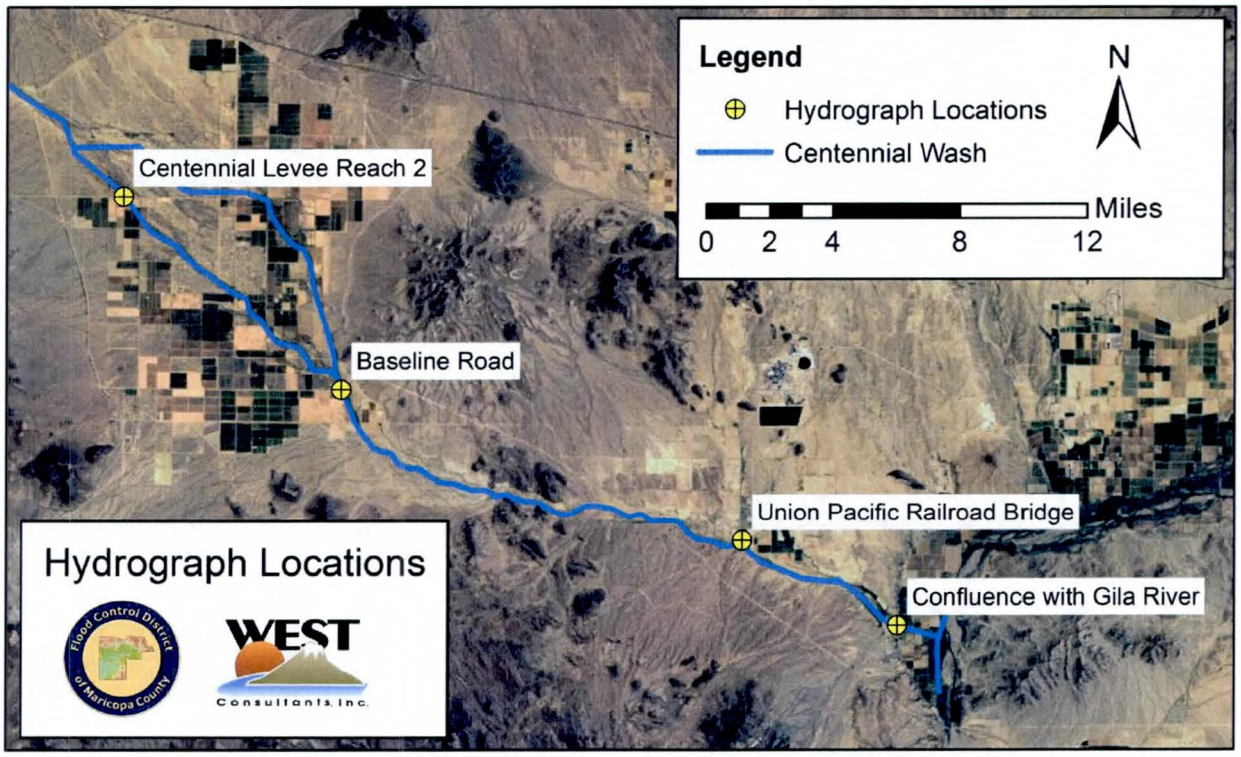

Figure 4-1. Hydrograph locations along Centennial Wash from the CLOMR (FEMA case number 12-09-0043R)

4.2 Determination of Inflow Hydrograph for the Hydraulic Model

For the hydraulic modeling, an unsteady flow hydrograph is required to develop the inflowing hydrology for the model. The following discussion will outline the development of the hydrograph at the location in the CLOMR (FEMA case number 12-09-0043R) titled "Centennial Levee Reach 2" along Centennial Wash using the updated 1-percent annual chance discharge developed by RBF (RBF Consulting, Inc., 2011). This hydrograph was used as an unsteady flow hydrograph input into the hydraulic model upstream of the Centennial Wash Left Overbank area.

The generalized shape of the hydrograph distribution (i.e., ordinates defining the hydrograph in time) was determined with the existing HEC-1 model developed by Cella Barr (Cella Barr Associates, 1989) for the effective hydrology model. This hydrograph was then scaled to reflect the updated peak flow from the CLOMR (FEMA case number 12-09-0043R) using linear scaling at each hydrograph ordinate. However, slight changes were required to the original model to (a) correct typographical errors in the electronic data provided to WEST and (b) reflect the removal of Narrows Dam from the physical system in the model. The steps required to complete this process are described below..

The first task to develop an input hydrograph for the hydraulic model was to rerun the HEC-1 model developed by Cella Barr. Peak flows and other output from the HEC-1 model were presented in the final

hydrology report by Cella Barr (Cella Barr Associates, 1989), but the complete hydrographs were not. The HEC-1 model data file was run in order to obtain these hydrographs (note that the HEC-1 schematic from the effective study is shown in Figure 4-2). Some minor corrections had to be made to the original data file to get the effective HEC-1 model to run. The new hydrographs computed in the slightly edited HEC-1 model herein were identical to the original modeling results as reported in the Cell Barr report (Cella Barr Associates, 1989) at all concentration points. Errors found in the original electronic files delivered to WEST appeared to be due to transcription errors, as if typographical errors were introduced into the data file as it was transcribed directly from hard copies of the appendix of the report by Cella Barr (Cella Barr Associates, 1989). One example of a change made in this electronic file was changing capital 'O' to a zero character when a numeric value was expected in the HEC-1 input data. Because some values were changed in the electronic HEC-1 input file provided to WEST, the updated model results were compared to the output presented in the Cella Barr report (Cella Barr Associates, 1989) to ensure that the results were the same. As mentioned previously, all of the peak flows matched exactly. After re-running the HEC-1 model developed by Cella Barr (Cella Barr Associates, 1989), the entire hydrographs at each concentration point were obtained.

The second task to develop an input hydrograph for the hydraulic model was to determine which hydrographs from the HEC-1 model corresponded to the reported peak values in the Cella Barr effective hydrology report (Cella Barr Associates, 1989) supporting the FIS discharges (Federal Emegency Management Agency, 2005). Specifically, WEST needed to determine which computed concentration point hydrograph corresponded to the "Centennial Levee Reach 2" location from the CLOMR (FEMA case number 12-09-0043R). After comparing the values in the Cella Barr HEC-1 model results, the Cella Barr hydrology report, and the FIS, the most reliable parameter to be compared between the three sources was determined to be the basin area that contributed rainfall runoff. Thus, the basin area was used to determine which concentration point in the HEC-1 model corresponded to locations reported in the FIS. Looking primarily at cumulative basin areas and verifying the location was correct by comparing the peak flows reported in the Cella Barr report with the peak flows from the HEC-1 model output, it was found that the "Centennial Levee Reach 2" from the Cella Barr report corresponded to HEC-1 station 14 in the HEC-1 model output (concentration point denoted by a diamond at the top of Reach "XIV" in Figure 4-2), the Gin Road site reported in the FIS (Federal Emegency Management Agency, 2005), and the Centennial Road/Courthouse Road site in the CLOMR (RBF Consulting, Inc., 2011). The site at Baseline Road corresponded to HEC-1 station 17 in the HEC-1 model output (concentration point in the middle of Reach "XV" in Figure 4-2, and WEST found the schematic provided in Cella Barr report to be erroneous in showing this additional concentration point in the middle of this reach). The SPRR Bridge site corresponded to HEC-1 station 20 in the HEC-1 model output (concentration point in the middle of Reach "XX" in Figure 4-2, and WEST found the schematic provided in Cella Barr report to be erroneous in showing this additional concentration point in the middle of this reach). The confluence with the Gila River location corresponded to HEC-1 station 26 in the HEC-1 model output (concentration point denoted by a diamond at the bottom of Reach "XX" in Figure 4-2). A schematic of the basin logic used in the HEC-1 model is shown in Figure 4-2. These four locations corresponded directly to locations for which peak flows were reported in the CLOMR (RBF Consulting, Inc., 2011) shown in Table 4-1 above.

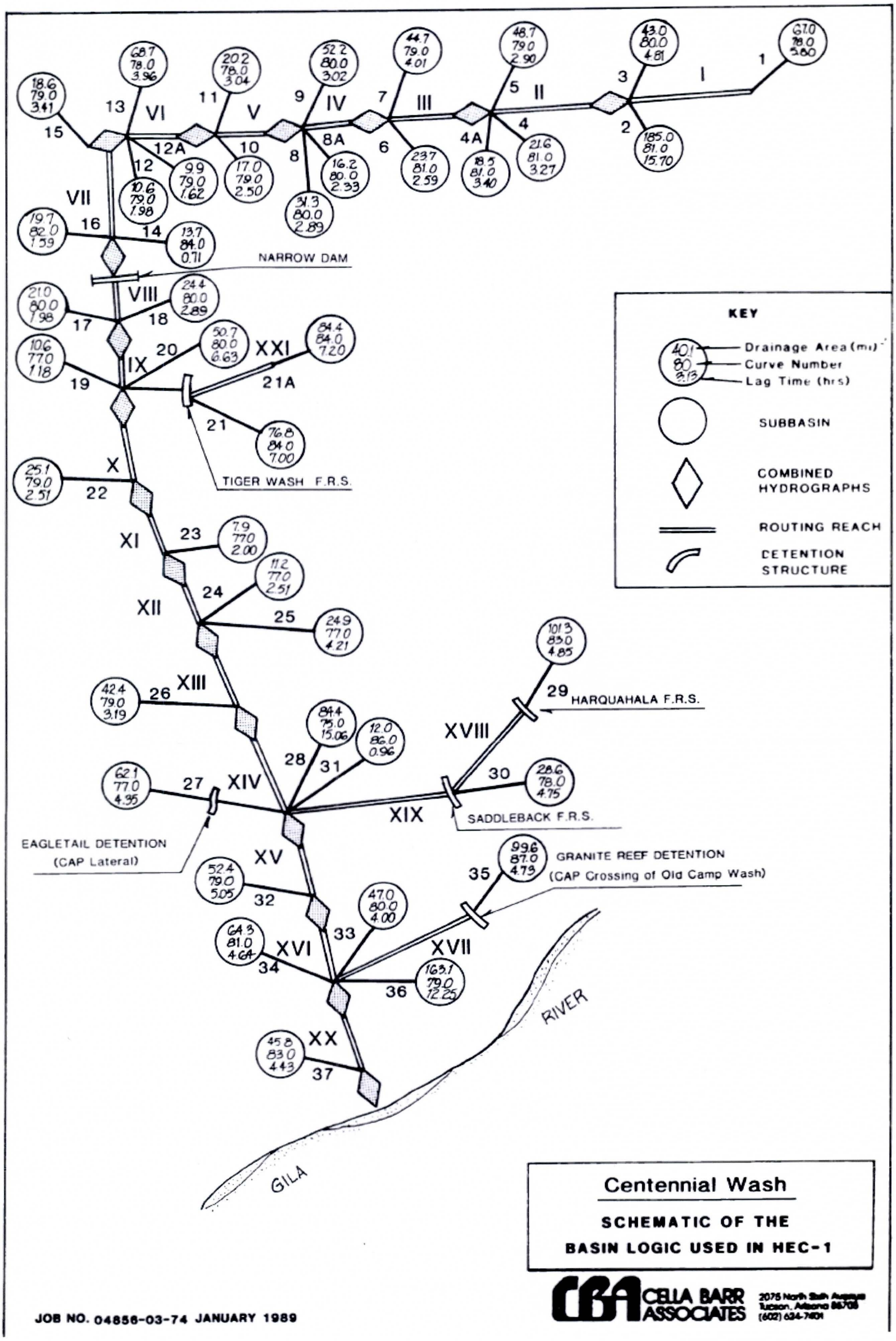

Figure 4-2. Effective HEC-1 model schematic from the Cella Barr study (Cella Barr Associates, 1989)

The third task to develop an input hydrograph for the hydraulic model was to remove Narrows Dam from the definition of the physical system in the HEC-1 model. As can be seen in Figure 4-2, the effective hydrology model (Cella Barr Associates, 1989) included the Narrows Dam in the representation of the physical system; however, the Narrows Dam failed in September of 1997 due to flooding from Hurricane Nora. This dam was not subsequently rebuilt. Therefore, the project team modified the effective HEC-1 model slightly to remove the detention routing associated with this facility from the numerical computations of the HEC-1 model. This raised the peak flow at "Centennial Levee Reach 2" location from 52,300 cfs as reported in Table 4-1 to 52,930 cfs, an increase of 1%.

The fourth and final task to develop and input a hydrograph for the hydraulic model was to extract the hydrograph from the location in the edited HEC-1 model without Narrows Dam for the "Centennial Levee Reach 2" location and linearly scale the hydrograph to reflect the new peak flow value. The scaling factor applied to all ordinates in a hydrograph was a ratio between the edited HEC-1 model peak flow at this location (52,930 cfs) and the updated peak flow from the CLOMR (34,347 cfs), which lead to a scaling factor of 0.649. The hydrograph from the HEC-1 model without Narrows Dam and the scaled hydrograph for the "Centennial Levee Reach 2" location are presented in Figure 4-3. This is the scaled hydrograph was used as input to the hydraulic model.

Since no additional hydrologic modeling tasks were performed for this study, the remainder of this section of the report as specified by the TSDN State Standard (Arizona Department of Water Resources, 2012) was not included herein. This included the following sections: *4.2—Parameter Estimation*; *4.3—Issues Encountered during the Study*; *4.4—Calibration*; and *4.5—Final Results*.

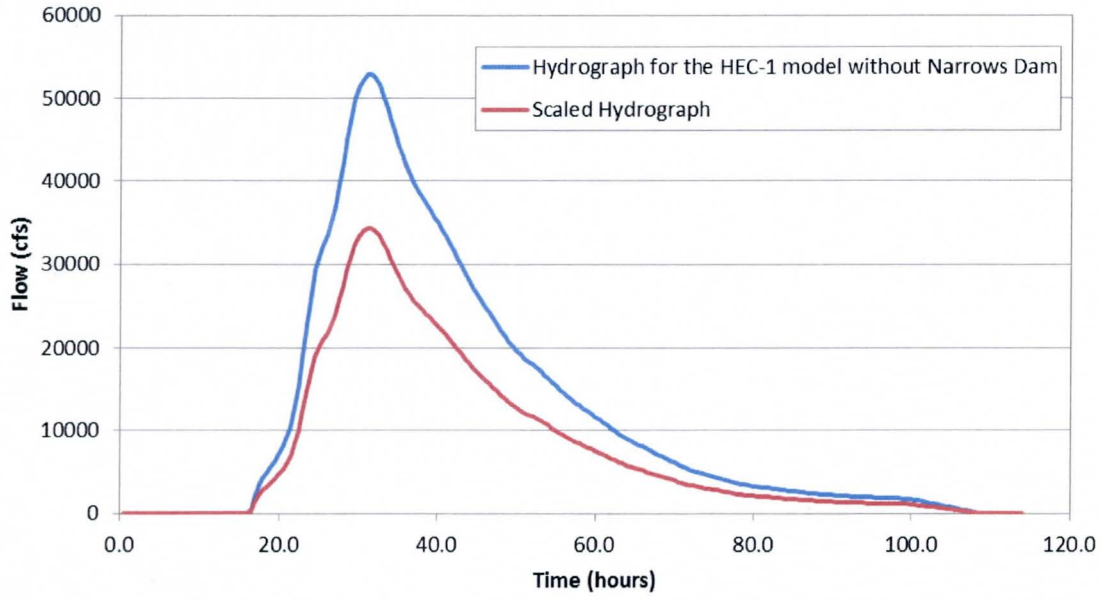

Figure 4-3. Hydrograph from the HEC-1 model without Narrows Dam and scaled hydrograph at "Centennial Levee Reach 2"

5 Hydraulics: FLO-2D

As mentioned in the introduction of this document, the title of this section varies slightly from the specification in State Standard SS1-12 (Arizona Department of Water Resources, 2012), due to the complexity of floodplain mapping for this study. Floodplain mapping for the Centennial Wash area was completed using a combination of one-dimensional and two-dimensional hydraulic modeling. For clarity, the mapping results from each of these modeling efforts are documented separately in this TSDN. Section 5 herein is titled "Hydraulics: FLO-2D" and Section 6 herein is titled "Hydraulics: HEC-RAS" with each section title reflecting the numerical model used to complete the modeling effort for two-dimensional and one-dimensional modeling, respectively.

The reason for documenting the two-dimensional modeling results prior to the documentation of the one-dimensional modeling results is that the two-dimensional model was used to assess the breakout of flow into the Centennial Wash Left Overbank area as defined in the effective Centennial Wash study (Cella Barr Associates, 1989). This flow split analysis was then used to provide input to the one-dimensional model. This section presents the results of the two-dimensional hydraulic modeling using FLO-2D.

5.1 Method Description

Floodplain limits and floodway boundaries were mapped in this overall TSDN for Centennial Wash from the intersection of Centennial Wash with the La Paz County-Maricopa County border in western Maricopa County downstream to the confluence of Centennial Wash with the Gila River. The study reach was broken into three primary areas of study due to the hydraulic characteristics of these three areas. The first area is defined from the La Paz County-Maricopa County border downstream to the Harquahala Valley Irrigation District's Westside Canal. The second area is defined from the Harquahala Valley Irrigation District's Westside Canal downstream to Baseline Road. The third area is defined from Baseline Road downstream to the confluence of Centennial Wash with the Gila River. In the first and third portions of the study area, the flow is contained within a relatively narrow channel cross section and was modeled with the one-dimensional model HEC-RAS (See Chapter 6). In the second portion of the study area as defined above (i.e., that portion of the study area within the Harquahala Valley from the Harquahala Valley Irrigation District's Westside Canal downstream to Baseline Road), the conveyance capacity of the main channel decreases and the flow spreads over a large area of shallow distributary flooding. This portion of the study area required a combination of one-dimensional and two-dimensional models to accurately define flooding extents. The main channel of Centennial Wash was modeled and mapped (for both floodplain and floodway extents) using a one-dimensional model (i.e., HEC-RAS) in all three portions of the study area as defined above, including the Harquahala Valley. The "breakout area" in the Harquahala Valley in what the effective study termed the Centennial Wash Left Overbank (within the Harquahala Valley Irrigation District's Westside Canal to Baseline Road portion of the study area defined above) was modeled and mapped (for floodplain extents only) using a two-dimensional model (i.e., FLO-2D). The amount of flow leaving the main branch and entering the breakout area in the left overbank was also determined based on the two-dimensional model results.

The steady flow in the one-dimensional model was based on the two-dimensional model results. This section presents the methodology and results of the two-dimensional FLO-2D numerical model.

The FLO-2D numerical model developed by FLO-2D Software, Inc., version 2009.06 (FLO-2D Software, Inc., 2009), was used to perform the two-dimensional hydraulic modeling calculations for the study reach to determine the floodplain limits in what the effective study termed the Centennial Wash Left Overbank reach within the Harquahala Valley. FLO-2D is a quasi-two-dimensional flood routing model that simulates channel flow and unconfined overland flow over a uniform rectilinear grid. The FLO-2D model is an unsteady flow model, and the 1% annual-chance-flood hydrograph (as described in Section 4 above) was routed across the grid and used as a basis for mapping special flood hazard areas in the distributary overbank flooding area of the Harquahala Valley. Bridge or culvert computations must be accomplished externally to FLO-2D using methodologies or models accepted by FEMA. For this study, HEC-RAS was used to develop the hydraulic structure rating curves for FLO-2D, as well as to map the flood plain boundaries. The average grid elevations, one-dimensional cross sections for one-dimensional channel features utilized in the grid, and other modeling parameters were developed using spatial processing tools available directly in FLO-2D and in ArcMap 10.0 (Environmental Systems Research Institute, 2011).

For the FLO-2D models, a normal depth routing computation was applied at the downstream grid elements of each model (defined as outflow nodes) submitted herein in support of floodplain mapping.

The following sections discuss the existing FIS effective models and the pre-project conditions models (also referred to as the Existing Conditions Models). A PMR request replacing the mapping of entire stream reach does not require the development of Duplicate Effective Models, Corrected Effective Models, or Revised or Post Project Conditions Models.

5.1.1 Effective Models

The Centennial Wash effective study, including SFHA delineation and floodway determination, was based on HEC-2 modeling done by Cella Barr (Cella Barr Associates, 1989). The effective models were provided to WEST by the District as HEC-2 input files (in the typical *.DAT format). These files have been included on the disc in Exhibit C of this report.

5.1.2 Duplicate Effective Models

No duplicate effective models are required for a PMR request to replace the entirety of the flooding source being modeled and mapped.

5.1.3 Corrected Effective Models

No corrected effective models are required for a PMR request to replace the entirety of the flooding source being modeled and mapped.

5.1.4 Existing or Pre-Project Conditions Models

The pre-project conditions models were the updated models created for this study. In this project, a suite of six models make up the basis of pre-project conditions models for the study. Four of the six

models are HEC-RAS models, and two of the six models are FLO-2D models. The pre-project conditions FLO-2D models for the second portion of the study area from the Harquahala Valley Irrigation District's Westside Canal downstream to Baseline Road (i.e., within the Harquahala Valley) are defined briefly below. For descriptions of the HEC-RAS pre-project conditions models in the portions of the study reach upstream and downstream of the Harquahala Valley, see Section 6.1.4. Again, it should be noted that Section 5 will only be presenting the results of the FLO-2D models.

1. HEC-RAS model for the main branch of Centennial Wash in the Harquahala Valley: Immediately downstream of the Harquahala Valley Irrigation District's Westside Canal, flow enters a very wide, shallow area of distributary flooding that takes flow away from the main branch of Centennial Wash. HEC-RAS was used to model the flow that remains in Centennial Wash as a basis for the determination of both floodplain and floodway extents.

2. "With embankment" FLO-2D model for the breakout area in the left overbank in the Harquahala Valley: Immediately downstream of the Harquahala Valley Irrigation District's Westside Canal, flow enters a very wide, shallow area of distributary flooding that takes flow away from the main branch of Centennial Wash. FLO-2D was used to determine the amount of flow leaving the main branch of Centennial Wash. That breakout flow was then routed across the overbank area using FLO-2D to serve as a basis for the determination of floodplain extents in the overbank area. The "with embankment" description for this model is just to contrast between the second FLO-2D model listed below. The "with embankment" model includes every ground feature in the field as it exists in the topography data provided by the District.

3. "Without embankment" FLO-2D model for the breakout area in the left overbank in the Harquahala Valley: Several stock tanks and small embankments exist as part of the agricultural improvements in the Harquahala Valley area. A second FLO-2D model was developed that removes the stock tanks from the model grid by filling in the excavated areas and removing the adjacent embankments built to hold water in the stock tank. Additionally, a large, continuous embankment that runs north-south along the east side of a drainage channel built by the Harquahala Valley Irrigation District was removed from this model grid as well to determine the impacts of this on the flooding results calculated using FLO-2D. A "worst-case" scenario was developed for mapping purposes by using the greater depth of the two models at every location in the FLO-2D domain for mapping purposes in the left overbank area.

5.1.5 Post-Project Conditions Models

No post-project conditions model was developed for this study, as only the existing conditions hydraulics were modeled and mapped herein.

5.2 Work Study Maps

Topographic work study maps were developed at a scale of 1" = 400' to provide sufficient detail of the new Zone AE Floodplain and Floodway mapping along Centennial Wash as well as the combination of Zone AO and Zone AE Floodplain mapping in the breakout area of the effective Centennial Wash Left Overbank reach in the Harquahala Valley. Contour mapping depicted on the work study maps is based upon the combined topography described in Section 3. Rectified aerial photographic backgrounds are provided on sheets that are 24" x 36" in size. The study work maps references the North American Vertical Datum of 1988 (NAVD 88). Each work map includes the following (when applicable): cross section locations, floodplain and floodway water surface elevations, 1% annual-chance-flood peak discharges, base flood elevations (BFE's), floodplain/floodway boundaries, gridded flooding elevations (for Zone AE zones) and depths (for Zone AO zones) from FLO-2D results, stream/flooding source names, zone designations, elevation reference marks, road names, coordinate grid tic marks, section lines, and corporate boundaries.

The FLO-2D model grid information for the existing conditions models are consistent with the contour mapping as it appears on the work study sheets throughout the study area.

5.3 Parameter Estimation

5.3.1 Roughness Coefficients

To estimate Manning's roughness coefficients for the Centennial Wash Floodplain Delineation Study, aerial photography was used to delineate areas that differed in roughness characteristics (i.e., land use, presence/density of vegetation, etc.), and this information was digitized into a polygon shapefile. The aerial photographs used to complete this delineation were obtained in the fall of 2011 by the District (flights occurred in September and October) when available, and aerial photographs from the fall of 2010 (flights occurred in September and October) that were provided by the District were used for those areas that did not have 2011 aerial photographs available. Identical Manning's *n*-value delineations were used for both the HEC-RAS and FLO-2D model.

To select the Manning's roughness coefficient for each roughness area delineated above, the Manning's *n*-values were estimated for that roughness area as outlined in "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" (Phillips & Tadayon, 2006), a US Geological Survey (USGS) report prepared in association with the District. In this methodology, the *n*-value estimated for each roughness area includes the following:

- A base Manning's roughness coefficient value for a straight uniform channel;
- A correction to Manning's roughness coefficient value for degree of irregularity;
- A correction to Manning's roughness coefficient value for variation in channel cross section;
- A correction to Manning's roughness coefficient value for the effect of obstructions
- A correction to Manning's roughness coefficient value for the amount of vegetation; and
- A correction to Manning's roughness coefficient value for the degree of meandering.

Table 5-1 below provides the ten (10) roughness areas and Manning's roughness values used in the modeling effort for the floodplain and floodway delineation. A copy of this shapefile can be found on the disc in Exhibit C of this document.

Another report used significantly to assign Manning's *n*-values for this study was "Estimated Manning's Roughness Coefficients for Stream Channels and Flood Plains in Maricopa County, Arizona" (Thomsen & Hjalmarson, 1991), a USGS report also prepared in association with the District. Aerial and ground photographs from that report that appeared similar to each Centennial Wash category were identified. The composite *n*-values assigned to the Thomsen and Hjalmarson (1991) regions were then tabulated and compared to the calculation from Phillips and Tadayon (2006) for the corresponding Centennial Wash roughness classification to verify the final values used herein.

Finally, an older USGS report was also available that provided *n*-values for Arizona titled "Roughness Coefficients for Stream Channels in Arizona" (Aldridge & Garrett, 1973). This report contains only ground photographs of various streams throughout Arizona. The ground photographs in Aldridge and Garrett's (1973) report were examined and matched to the ground photographs taken during the field trips during the Centennial Wash FDS project. If the Manning's *n*-values reported by Aldridge and Garrett (1973) were similar to the values reported by Thomsen and Hjalmarson (1991), then this acted as independent verification that the estimated Manning's *n*-values were appropriate for Centennial Wash. If they did not, then final selections herein were inspected more closely to ensure the authors confirmed that the disagreement with the Aldridge and Garrett (1973) values were justified.

A more detailed report titled "Centennial Wash Floodplain Delineation Study: Gila River to La Paz County—Selection of Manning's Roughness Coefficients" was developed in October of 2012 by WEST Consultants and approved by the District shortly thereafter. This report has been included in its entirety in Appendix E.1 of this document. Appendix E.1 also contains a trip log with photos from the field supporting the selection of roughness values in the study reach.

Table 5-1. Summary of the Manning's n categories and values estimated for the Centennial Wash FDS

Category Name	Classification Type (Channel or Overbank)	Manning's n-value	Area (acres)	Percent of total area
Open Water	Channel	0.018	30	0.06%
Unvegetated Channel	Channel	0.025	99	0.21%
Sparse Vegetation	Overbank	0.035	8,824	18.42%
Tall Sparse Vegetation	Overbank	0.040	15,444	32.23%
Tall Medium Vegetation	Overbank	0.062	6,807	14.21%
Tall Dense Vegetation	Channel	0.111	4,691	9.79%
Extremely Dense Vegetation	Channel	0.200	835	1.74%
Agricultural—Cultivated Fields	Overbank	0.060	8,732	18.22%
Agricultural—Fallow Fields	Overbank	0.030	2,421	5.05%
Canal Embankment	Overbank	0.016	30	0.06%

As mentioned above, identical Manning's *n*-value delineations were used for both the HEC-RAS and FLO-2D models. However, the FLO-2D model applies Manning's roughness coefficients in a different format than the one-dimensional HEC-RAS model. For a given grid element in the FLO-2D modeling grid, the Manning's roughness coefficient was computed within the FLO-2D Grid Developer System (GDS) by computing the area-weighted average roughness coefficient from the underlying Manning's *n*-value shapefile discussed previously. Therefore, the base roughness coefficient for each grid cell varies spatially based on the Manning's roughness delineations.

However, the base *n*-value for a given cell is not the only *n*-value applied for routing computations across that grid cell in the FLO-2D model. For flow depths below a certain threshold on a given grid element, a single global *n*-value—known as SHALLOWN in the model nomenclature—is applied to the routing computations for that grid element. The threshold value below which SHALLOWN is applied to the routing computations is 0.2 feet, and this parameter is not editable by the user. The value of SHALLOWN is user-editable, however, and this study set that value to be 0.2 (as recommended in the FLO-2D documentation (FLO-2D Software, Inc., 2009)). For flow depths between 0.2 feet and 0.5 feet, the roughness coefficient is set to the maximum of SHALLOWN divided by 2 (0.1 for the study herein) or the base roughness coefficient assigned to the grid element. For flow depths between 0.5 feet and 3.0 feet, the roughness coefficient decreases with increasing depth following an exponential decay function defined as follows:

$$n = n_b * 1.5 * e^{-(0.4 * (depth/3.0'))}$$

where n_b is the base Manning's roughness coefficient assigned to the grid cell, and *depth* is the flow depth in feet (FLO-2D Software, Inc., 2009).

Finally, there is one more numerical technique to automatically adjust Manning's roughness coefficients based on the physics of shallow sheet flow that aims to stabilize numerical instability in the model. This technique is known as the limiting Froude number option. This option allows the *n*-value to be automatically increased in a given grid element that is approaching some limiting Froude number (set to 0.95 in this study) thereby forcing a more highly subcritical flow regime for that computation. This adjustment results in increased model stability over model results that would otherwise approach and possibly become numerically unstable near critical depth. The District and WEST decided to utilize this option in the model in addition to depth-varying Manning's roughness values. In addition, after the first iteration of the model, the base Manning's roughness coefficients for the entire computational domain were replaced with the maximum roughness value computed in each element based on the limiting Froude number correction from one of the first model iterations. It should be noted that additional minimal adjustments were made to the model after this first replacement to address numerical stability issues. The differences in final Manning's *n*-value used in the FLO-2D model compared to what was selected for this study (as documented in Appendix E.1) is warranted for shallow flows through undulating terrain with agricultural fields where wide, shallow flow characteristics create significant floodplain storage and reduce flow velocities.

5.3.2 Expansion and Contraction Coefficients

Expansion and contraction coefficients are not applicable for a two-dimensional gridded model.

5.3.3 Flow Obstructions and Floodplain Surface Storage Area Modifications

FLO-2D has two numerical techniques to address flow obstructions and floodplain surface storage area modifications that can be caused by physical structures such as residential/commercial/industrial buildings; walls/fences that do not allow flow to pass; and miscellaneous items such as silos, water storage tanks, stockpiled materials, etc. These types of flow hindrances, which create backwater effects upstream of the structure and have implications on the calculations of flow diversion in the vicinity of the structure, are of specific importance in areas of shallow distributary flooding.

The two numerical techniques in the FLO-2D model to represent these types of flow hindrances are referred to in the model nomenclature as area reduction factors (ARFs) and width reduction factors (WRFs). These parameters are simply multiplicative coefficients that modify the individual grid element surface area storage and flow width, respectively.

ARFs are values less than or equal to 1.0 that represent the percentage of the total grid element surface area that is not available for active storage. To state this in another way, 1.0 minus the ARF value on a particular grid element is the total area available for storage. These values are applied to each grid element individually, and they can vary spatially for each grid element in the computational domain.

WRFs are a value less than or equal to 1.0 that represent the percentage of one side of a grid element that is not available for active flow. WRFs can be assigned to any combination or all of the possible eight flow directions in a grid element to partially or completely obstruct flowpaths in any of the eight directions simulating floodwalls, buildings or berms. To state this in another way, 1.0 minus the WRF value for a particular direction leaving a given grid element is the total width available for flow to/from the next grid element moving away from that particular element. The only time fewer than 8 WRFs would be available for definition would be for border elements along the edge of the computational domain. With all of this in mind, the following consideration is stated in the FLO-2D reference manual (FLO-2D Software, Inc., 2009):

> *It should be noted that only four width reduction factors need to be specified for the eight possible flow directions [of a non-boundary grid element]. The other four flow directions are assigned automatically by grid element correlation. Two of the specified width reduction factors are for flow across the diagonals.*

WRF values are applied to up to eight sides of each grid element individually and can vary spatially throughout the computational domain.

For the two-dimensional study area defined for the FLO-2D model herein, WEST digitized a shapefile representing flow obstructions by using aerial photographs provided by the District and tracing the outer boundaries of visible structures that appeared to create obstructions to flow. WEST created a

polygon shapefile representing the outer boundary of these structures. This polygon shapefile was used directly as input to the FLO-2D model to compute ARFs and WRFs automatically on the grid. FLO-2D computes appropriate ARFs and WRFs for each grid cell intersecting a building polygon automatically. Seventy-one (71) separate structures were identified as flow obstructions. Most of the structures were residential homes or commercial buildings; however, several of these seventy-one would be classified as miscellaneous structures. For example, twenty-four (24) of the delineated structures represented individual stacks of tires adjacent to the stock tank near the upstream flow split just east of the HVID Westside Canal. Several of the other seventy-one structures were outbuildings supporting agricultural practices in the area (e.g., barns and other animal/crop shelters, groundwater pump houses, etc.) that would be classified as miscellaneous structures in addition to the tires. All seventy-one structures in the digitized shapefile were represented as flow obstructions in the final model grid using the same computation techniques for ARFs and WRFs, regardless of structure type.

5.3.4 Grid Size Selection

WEST worked closely with the District to determine an adequate grid size for this two-dimensional model. Again, the FLO-2D model requires a uniform, rectilinear grid with square elements. For this study, WEST and the District decided on a 40-foot grid size. In other words, each grid cell was 40 feet long by 40 feet wide, and 1,600 square feet in area.

5.4 Cross Section Descriptions

FLO-2D is a two-dimensional gridded flood routing model that does not use cross sections for hydraulic computations. However, FLO-2D does have an option to utilize a one-dimensional channel feature to route portions of the flood hydrograph that travel in a primarily one-dimensional direction. One such one-dimensional channel feature was used within the FLO-2D model to represent the HVID north-south drainage channel located approximately one-half mile west of Harquahala Valley Road (mentioned previously in Section 3). The cross sections developed for use in FLO-2D to represent this channel were taken from an HEC-RAS model cut from the final topography used for this study. This HEC-RAS model is described in greater detail in Section 5.5.2 below. This HEC-RAS model was developed for the entire length of the HVID north-south drainage channel (from its origination at the north end at the Bethany Home Road alignment until its terminus in the main channel of Centennial Wash just north of the effective floodway boundary). The HVID north-south drainage channel is an engineered channel designed by Franzoy, Corey & Associates (currently Stantec Consulting). This channel increases in size in the downstream (southern) direction to account for additional required capacity from increased overland runoff area. As-built plans of this channel have been included in Appendix E.4 of this report.

The HEC-RAS model cross sections were imported into FLO-2D to create the one-dimensional channel feature of the model.

HEC-RAS was used to develop the one-dimensional portion of the FLO-2D model for three reasons. First, the HEC-RAS model has been built with very convenient and efficient tools to extract cross section data from digital topography information—namely, the HEC-GeoRAS (U.S. Army Corps of Engineers, 2012) extension for ArcGIS and a few other software tools available in ArcGIS (Environmental Systems Research Institute, 2011). The cross section data for the one-dimensional portion of the FLO-2D model were extracted from the final topography provided by the District presented in Section 3 and entered into an HEC-RAS model using these tools. Secondly, the culvert rating curve needed in the FLO-2D model (discussed in Section 5.5.2 below) needed to be developed using HEC-RAS as FLO-2D cannot build culvert rating curves directly. Therefore, developing the one-dimensional portion of the FLO-2D model using HEC-RAS was especially useful for this rating curve development task. Finally, FLO-2D can read HEC-RAS models directly to build the one-dimensional components of FLO-2D models. For all of these reasons, the one-dimensional portion of the FLO-2D model was first developed in HEC-RAS as opposed to building it directly in FLO-2D.

The typical convention was used for cross section stationing for the HEC-RAS modeling used as the basis for the one-dimensional channel feature (i.e., cross section stationing is from left to right when looking in the downstream direction). Cross section spacing in the HEC-RAS model for the HVID north-south drainage channel was 400 feet. After extracting this information and developing the culvert rating curve in HEC-RAS, the HEC-RAS model of this channel was converted into a one-dimensional channel in FLO-2D. The interpolation algorithm in FLO-2D was used to develop cross sections in every grid cell containing the one-dimensional channel feature (i.e., every 40 feet).

The only edits made to the cross sections for the one-dimensional FLO-2D component were near the southern terminus of the HVID north-south drainage channel. In order to transition the channel from a one-dimensional type of flow back to a shallow, sheet flooding condition on the two-dimensional flood routing grid, the channel banks were transitioned from the elevations representing the physical berms on either side of the channel to elevations much closer to the channel invert. This is required in FLO-2D to allow flow from the channel to "spill" back onto the 2-dimensional grid. Figure 5-1 and Figure 5-2 below show graphically the transition of the banks near the downstream end of the model. This was done over the lowest approximately 2,800 feet of the one-dimensional channel. This distance was chosen as an adequate distance to smoothly transition the channel from a deep, one-dimensional channel back into shallow sheet flooding with depths on the order of a foot or less. Also, this distance (corresponding to a northern limit approximately 1,500 feet above the Buckeye Road alignment) did not negatively impact the homes near the intersection of Buckeye Road and Harquahala Valley Road. The left bank transitioned more quickly than the right bank due to numerical instabilities in the model and a trial-and-error approach to altering the left bank elevations. This is discussed briefly in Section 5.7.1 below.

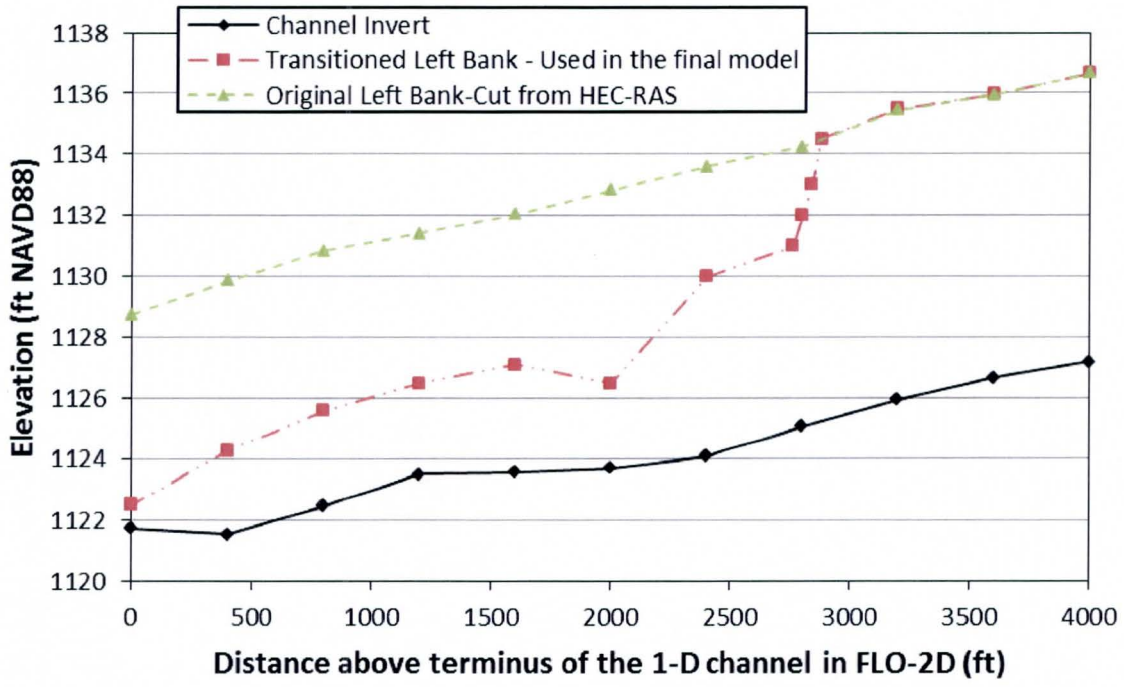

Figure 5-1. Transition of the left bank to approximately the channel invert near the downstream end of the one-dimensional channel in FLO-2D for the HVID north-south drainage channel

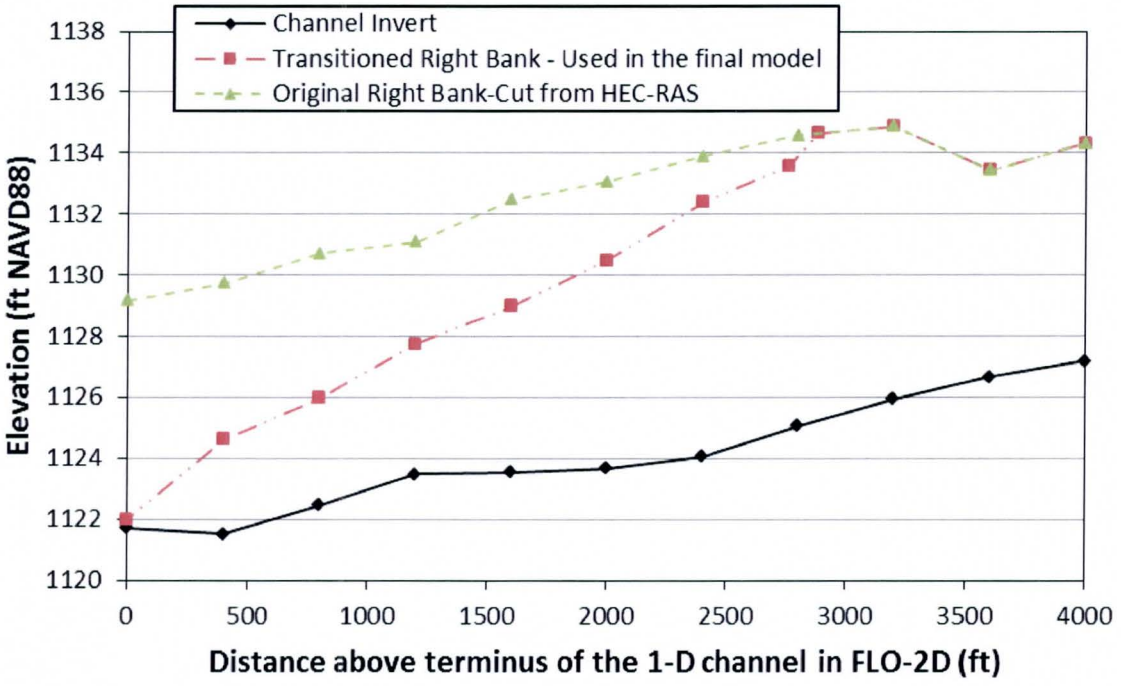

Figure 5-2. Transition of the right bank to approximately the channel invert near the downstream end of the one-dimensional channel in FLO-2D for the HVID north-south drainage channel

5.5 Modeling Considerations

5.5.1 Hydraulic Jump and Drop Analysis

Hydraulic jumps or drops do not occur in this system since the flow regime is highly subcritical throughout the computational domain of the two-dimensional modeling area in the Harquahala Valley. Also, grid elements that might have produced supercritical flow are limited numerically by Froude number in the model computations as discussed in section 5.3.1. Additionally, no significant constructed drop structures designed for supercritical flow have been constructed in the study area.

5.5.2 Bridges and Culverts

Two primary structures were included in the models for the Centennial Wash FDS. The first is the Southern Pacific Railroad (SPRR) Bridge along the main stem of Centennial Wash near the confluence with the Gila River, which is only applicable to the HEC-RAS model and is discussed in greater detail in Section 6.5.2. The other structure included in the modeling effort is a triple-barrel culvert structure under Van Buren Road along the HVID north-south drainage channel in the Harquahala Valley. This structure was only included in the FLO-2D modeling domain; therefore, this section only discusses this triple-barrel culvert.

Triple-barrel culvert structure along the HVID north-south drainage channel

Hydraulic structures are simulated in FLO-2D by specifying either discharge rating curves or rating tables. As mentioned previously, culvert computations cannot be completed within FLO-2D using FEMA-approved methodologies; therefore, the representation of a hydraulic structure in FLO-2D must be accomplished external to FLO-2D using methodologies or models accepted for NFIP usage. HEC-RAS was used herein to develop hydraulic structure rating curves for FLO-2D. The purpose of this portion of the report is to outline the development of the rating curve for use in FLO-2D to represent the culverts along the HVID north-south drainage channel (approximately one-half mile west of Harquahala Valley Road) which pass water beneath Van Buren Road.

As a subconsultant to WEST, David Evans and Associates (DEA) completed a detailed structure survey of these culverts—three 72-inch barrel culverts with approximately the same elevation and slope (survey results can be found in Appendix C.1). This detailed structure survey was used to enter roadway embankment data and culvert data into the HEC-RAS model created for the HVID north-south drainage channel (with cross sections cut from the final electronic digital elevation model discussed in Section 3) and edited for input to the FLO-2D model as discussed in Section 5.4 above and shown in Figure 5-3. Once again, it should be noted that the HEC-RAS model discussed in this section was not used for floodplain mapping, only for rating curve development for input to the FLO-2D model.

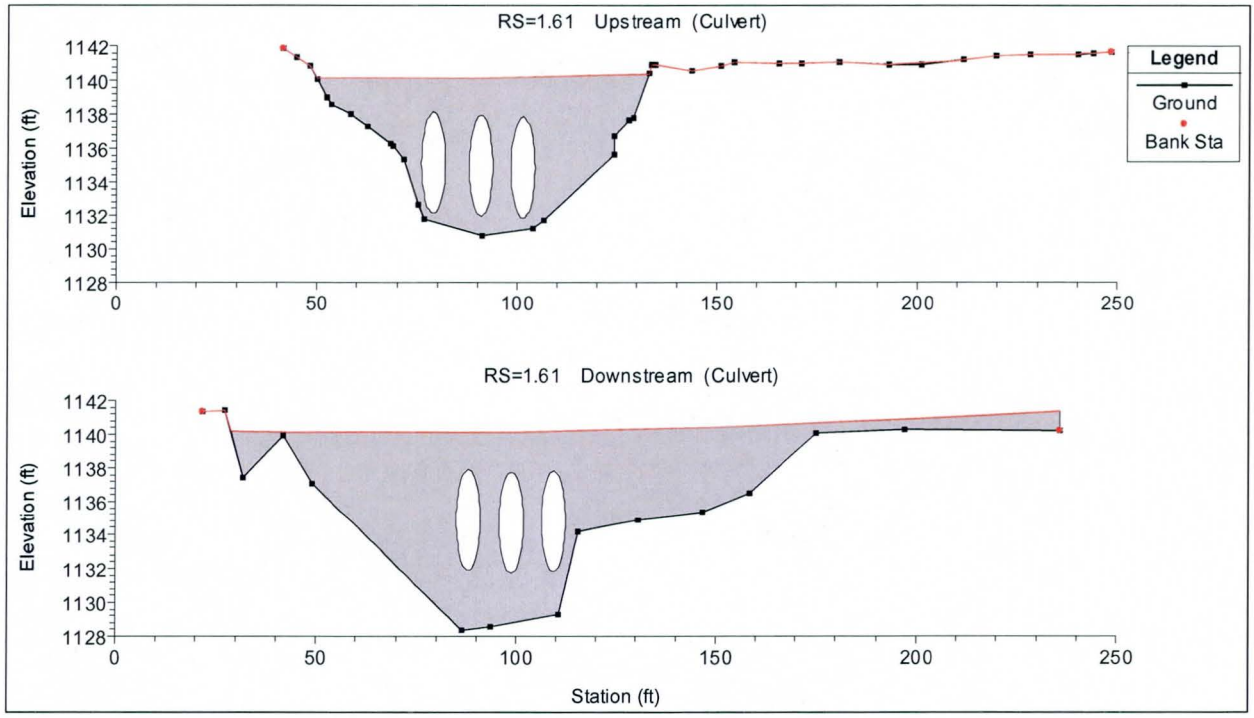

Figure 5-3. Representation of the three 72-inch barrel culverts under Van Buren Road in the HEC-RAS model of the HVID north-south drainage channel

Figure 5-4. Triple barrel 72-inch diameter culvert under Van Buren Road in the HVID north-south drainage channel, viewed from upstream

It should also be noted that the field survey collected a natural ground cross section just upstream of the culvert (approximately 8 feet upstream of the culverts), and the points collected in the ground survey show the natural ground elevation above the invert elevation of the culvert at the upstream face. However, field reconnaissance and field photos from this reconnaissance (Figure 5-4) show that the invert is not blocked immediately at the upstream face of the culvert, indicative of local scour processes occurring in the last 8 feet upstream of the culvert. Therefore, the ground points in the HEC-RAS model were dropped in the internal bridge upstream cross section to reflect this condition.

The HEC-RAS model was built, and flows were entered into the model from 1 to 7,000 cfs. From these results, a rating curve could be built relating upstream stage (depth referencing an elevation of 1132.59 feet NAVD88 as the datum, as this elevation was the minimum cross section elevation for the natural ground cross section upstream of the culvert) to flow. This relationship is shown in Figure 5-5 below. This figure shows two changes in flow regime. First, the apparent "break" in the curve below approximately 12 cfs or 0.6 feet of depth occurs because below these depths the HEC-RAS model results default to critical depth. This is expected for very low flow values, since the Manning's roughness applied in the model is not representative of flow conditions for very low flow values. These calculations were not edited, however, as it was assumed less than 12 cfs or less than 0.6 feet of depth in the cross section upstream of the culvert would not significantly affect the results at the maximum depth on the FLO-2D grid. Secondly, the break in the curve near approximately 650 cfs or 7.7 feet of depth occurs because flow begins spilling over the roadway embankment at this depth. A table of data representing the points shown in Figure 5-5 was entered into the FLO-2D model using the HYSTRUC.DAT input file (discussed in greater detail in a technical memorandum provided in Appendix E.5 herein).

Early model results from FLO-2D show that the range of flows calculated for the culverts was sufficient for the FLO-2D model, since the maximum culvert flow computed was less than 3,000 cfs.

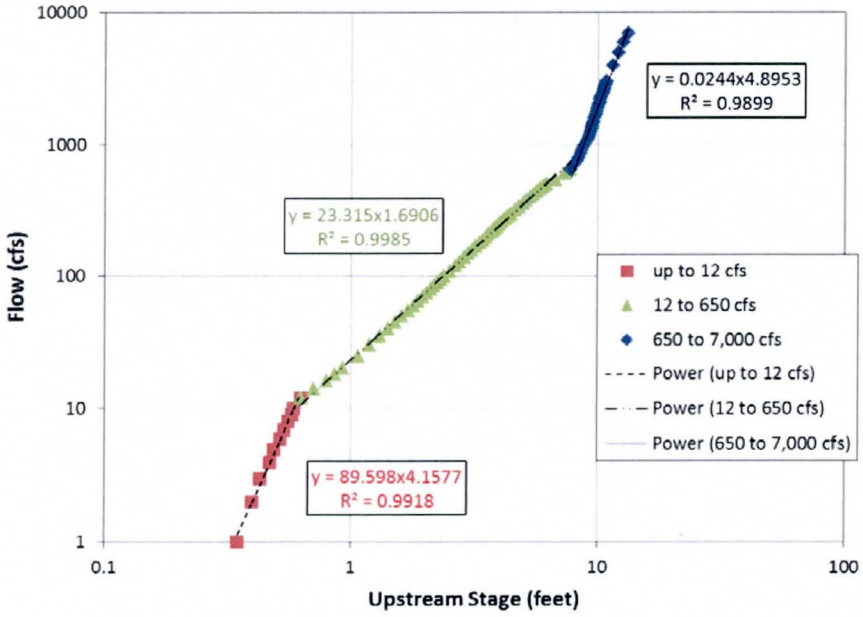

Figure 5-5. Van Buren Road culvert rating curve for FLO-2D model from HEC-RAS runs

5.5.3 Levees and Dikes

No levees, dikes, or levee-like structures meeting FEMA's stringent levee certification criteria exist in the two-dimensional modeling study area. However, the "levee" option as per the FLO-2D model nomenclature was utilized in both FLO-2D models as a numerical technique to improve model stability. This section will discuss the use of modeled "levees" in this capacity for the models.

Surface depressions (excavated area) can cause numerical instabilities in the hydraulic computations due to significantly steepened localized slopes. Under initial conditions of very low flows, this can cause numerical difficulties due to very steep energy grade slopes calculated for flow entering the surface depression. Also, if the volume of the surface depression is very small compared to the overall volume from the incoming flow (intended to be the determination of whether an excavated area is relatively "shallow" as per the descriptor of excavated areas in the preceding discussion), then the amount of storage volume in the excavated area could be considered inconsequential in its impact on the overall flood wave routing. Finally, if the excavated area is not regularly maintained for flood control purposes, then the additional storage provided by the excavated area possibly should not be included in the flood wave routing to lessen overall hydrograph attenuation and creating a conservative estimate of downstream flow depths and velocities.

Due to all of the reasons discussed above, a small number of relatively shallow excavated areas in the FLO-2D computational domain were precluded from hydraulic routing computations by surrounding the shallow excavated areas with levees much higher than the peak flooding depth in the surrounding grid cells. This method was chosen to remove these areas from the computational domain to provide clarity as to which areas were being artificially precluded from flood wave routing computations due to numerical stability issues. In other words, an area surrounded by a FLO-2D levee in this model is not representing a physical levee, but instead is only representing a numerical technique to improve model stability. The areas defined with levees in the FLO-2D model along with this corresponding documentation will provide quick reference when opening and reviewing the models regarding which excavated pits were removed in this way. Another methodology to complete this task would be to just raise local grid cell elevations in the bottoms of the excavated areas to be comparable to grid elevations surrounding the excavated areas. However, this methodology did not provide an intuitive, easy way to identify these areas quickly.

The remainder of this section presents each of those areas individually. The removal of shallow excavated areas from the FLO-2D computations are discussed for the "with embankment" and "without embankment" FLO-2D models individually below.

Removing shallow excavated areas in the FLO-2D computational domain from the "with embankment" FLO-2D model using levees

Four shallow excavated areas were precluded from the FLO-2D computational domain from the "with embankment" FLO-2D model using levees. This section will present these four areas individually.

The first shallow excavated area removed from the flood wave routing computations due to numerical stability issues through the use of high levees in the "with embankment" FLO-2D model was the large stock pond near the upstream end of the FLO-2D computational domain near the primary flow split area. This stock tank includes both a large, above-grade embankment surrounding a shallow, below-grade excavated area that was initially causing very significant numerical instabilities in the model computations and results. Therefore, the entire stock tank area was "walled off" and removed from further routing computations through the use of FLO-2D levees for numerical stability reasons. 173 cells were blocked off by this levee, which was set to 1,240 feet in elevation (NAVD88). That number of cells equaled 6.35 acres in surface area removed from the computational routing grid (i.e., 0.020% of the total surface area of the computational domain or 0.028% of the total surface area of the grids that computed flow depth during the computations).

The second shallow excavated area removed from the flood wave routing computations due to numerical stability issues through the use of high levees in the "with embankment" FLO-2D model was a small stock pond near the downstream end of the FLO-2D computational domain near the Saddleback Flood Retarding Structure (FRS) outfall channel. This stock tank includes both a small, above-grade embankment surrounding a shallow, below-grade excavated area that was initially causing significant numerical instabilities in the model computations and results. Therefore, the entire stock tank area was "walled off" and removed from further routing computations through the use of FLO-2D levees for numerical stability reasons. 25 cells were blocked off by this levee, which was set to 1,085 feet in elevation (NAVD88). That number of cells equaled 0.92 acres in surface area removed from the computational routing grid (i.e., 0.003% of the total surface area of the computational domain or 0.004% of the total surface area of the grids that computed flow depth during the computations).

The third shallow excavated area removed from the flood wave routing computations due to numerical stability issues through the use of high levees in the "with embankment" FLO-2D model was an irrigation return ditch near the Van Buren Road and 499th Avenue alignments. Irrigation return ditches capture runoff irrigation water from a farm field and store that water to be pumped to the highest end of the field and recycled for irrigation purposes. Several of these ditches exist in the agricultural fields of the Harquahala Valley. The irrigation return ditch near the Van Buren Road and 499th Avenue alignments begins at the southwest corner of this alignment intersection and runs to the south for approximately one-half of a mile. The ditch is approximately 90 feet wide throughout the entire length. The depth of the pit is approximately ten feet at its deepest point. This pit was represented in FLO-2D based on the 40-foot grid element size with a width of 2 elements (80 feet across) and a length of 63 elements (2,520 feet long). This irrigation return ditch was initially causing significant numerical instabilities in the model computations and results. Therefore, the entire ditch area was "walled off" and removed from further routing computations through the use of FLO-2D levees for numerical stability reasons. All 126 cells

mentioned above were blocked off by this levee, which was set to 1,120 feet in elevation (NAVD88). That number of cells equaled 4.62 acres in surface area removed from the computational routing grid (i.e., 0.015% of the total surface area of the computational domain or 0.020% of the total surface area of the grids that computed flow depth during the computations).

The fourth shallow excavated area removed from the flood wave routing computations due to numerical stability issues through the use of high levees in the "with embankment" FLO-2D model was another irrigation return ditch near the Southern Avenue and 495th Avenue alignments. The irrigation return ditch near these alignments begins at the southeast corner of this alignment intersection and runs to the south for approximately one-third of a mile. The ditch is between 100 and 120 feet wide throughout the entire length. The depth of the pit is approximately six to eight feet at its deepest point. This pit was represented in FLO-2D based on the 40-foot grid element size with a width of 3 elements (120 feet across) and a length of 46 elements (1,840 feet long). This irrigation return ditch was initially causing significant numerical instabilities in the model computations and results. Therefore, the entire ditch area was "walled off" and removed from further routing computations through the use of FLO-2D levees for numerical stability reasons. All 138 cells mentioned above were blocked off by this levee, which was set to 1,085 feet in elevation (NAVD88). That number of cells equaled 5.07 acres in surface area removed from the computational routing grid (i.e., 0.016% of the total surface area of the computational domain or 0.022% of the total surface area of the grids that computed flow depth during the computations).

The total surface area of the computational domain removed from the routing calculations by these levees for the "with embankment" FLO-2D model is 16.96 acres. The total volume of water in the inflow hydrograph shown in Figure 4-3 is approximately 1,460 acre-feet. Therefore, if another method had been utilized to improve numerical stability introduced to the computations by these shallow excavated areas (e.g., filling the grid elements representing the bottom of the excavated areas) and resultant flows depths over these cells had been on the order of 1 foot, a total of approximately 1.2% of the total hydrograph volume would have been routed through these areas. If the resultant flow depths over these cells had been on the order of 3 feet, then a total of approximately 3.5% of the total hydrograph volume would have been routed through these areas. Therefore, the assumption that the area removed by adding levees to the model area would be inconsequential from a volumetric perspective to the overall flood wave routing was confirmed.

Removing shallow excavated areas in the FLO-2D computational domain from the "without embankment" FLO-2D model using levees

Two shallow excavated areas were precluded from the FLO-2D computational domain from the "without embankment" FLO-2D model using levees, the methodology discussed at the beginning of this section to remove surface depressions from the model to improve model stability. The two areas removed from the "without embankment" FLO-2D model using levees were the two irrigation return ditches discussed above for the "with embankment" FLO-2D model (i.e., the ditch near the Van Buren Road and 499th

Avenue alignments, and the ditch near the Southern Avenue and 495th Avenue alignments). The other two shallow excavated areas precluded from the FLO-2D computational domain from the "with embankment" FLO-2D model using levees discussed above (i.e., the large stock pond near the upstream end of the FLO-2D computational domain near the primary flow split area and the small stock pond near the downstream end of the FLO-2D computational domain near the Saddleback FRS outfall channel) were not precluded from the "without embankment" FLO-2D model using levees; other means were utilized to remove these shallow excavated areas from the model domain. Namely, the shallow excavated areas of these two stock tanks were artificially filled in the model by raising the grid cell elevations to correspond with the surrounding natural ground elevations, and the above-grade embankments associated with these stock tanks were removed from the model by lowering the grid cell elevations representing these embankments to correspond with the surrounding natural ground elevations. A more thorough discussion of the method used to remove these embankments from the modeling domain is provided in the following section, Section 5.5.4.

In summary, the two irrigation return ditches precluded from the "with embankment" FLO-2D model domain using levees were also precluded from the "without embankment" FLO-2D model using levees. The two stock tanks removed from the "with embankment" FLO-2D model using levees were removed from the "without embankment" FLO-2D model using a technique that did not utilize the levee feature in the model; the method used to remove the stock tanks from the "without embankment" FLO-2D model is discussed in Section 5.5.4. Therefore, only two levee structures exist in the "without embankment" FLO-2D model as opposed to the four levee structures in the "with embankment" FLO-2D model. Also, for the same reasons discussed in the preceding section for the "with embankment" FLO-2D model levees, the area removed by levees from the "without embankment" FLO-2D model can be considered negligible in regards to the impact of the available routing volume removed from the grid compared to the total hydrograph volume in the model. The increases in numerical stability and runtime far outweigh the reduced numerical accuracy due to removing area from the computational domain.

5.5.4 Non-Levee Embankments

Non-levee embankments, defined by FEMA in Procedural Memorandum 51 (Federal Emergency Management Agency, 2009), are embankments that were not designed or constructed as flood control structures such as those for highways and railroads. These embankments are considered "non-certifiable" as providing protection against flooding downstream. Several of these non-levee embankments existed in the FLO-2D modeling domain, and a correct understanding of flooding risk in the project area required investigation of the removal of these structures from the modeling domain. The purpose of this section is to outline the process used to remove the non-levee embankments from the topography as represented in the FLO-2D model grid for the "without embankment" scenario modeling. This discussion includes a review of the original topographic data to determine those "embankment-like features" that should be removed and a presentation of the final technique utilized to remove embankments from the FLO-2D model.

In reviewing the general topography of the FLO-2D model area with District staff, the project team identified three areas in the model that would require the removal of non-levee embankments to better understand the impacts that these features would have on flood inundation extents and depths throughout the system. These three areas are (1) the embankment on the east side of the HVID north-south drainage channel, (2) the stock tank embankment near the flow split area close to the upstream end of the FLO-2D model domain, and (3) the stock tank embankment near the Saddleback FRS outfall channel close to the downstream end of the FLO-2D model domain. Each of these areas will be discussed in greater detail below.

Embankment on the east side of the HVID north-south drainage channel

The north-south drainage channel owned and operated by the HVID that parallels Harquahala Valley Road approximately one-half mile west of the roadway alignment was designed to protect downstream agricultural fields from damages by overbank flooding from Centennial Wash. As this channel and embankment will not be certified by FEMA to be a flood control feature in the system, a without embankment analysis will be required to determine if a "worst-case" flooding condition exists downstream of the embankment if it were to be washed away during a flooding event. Interestingly, a canal is on the downstream (i.e., east) side of the large embankment on the left bank (east side) of the channel which has a smaller embankment above natural grade as well (as can be seen in Figure 5-6). Figure 5-6 shows the station and elevation data associated with a cross section cut from the final topography approximately 500 feet upstream of the Thomas Road alignment (the Thomas Road alignment is 1 mile north of the Centennial Road alignment).

This channel is approximately 5 miles in length from its origination at the north end where the Bethany Home Road alignment would be until its terminus in the main channel of Centennial Wash (just north of the effective floodway boundary). This channel is an engineered channel designed by Franzoy, Corey & Associates (currently Stantec Consulting). This channel increases in size in the downstream (southern) direction to account for additional required capacity from increased overland runoff area. As-built plans of this channel have been included in Appendix E.4 of this report.

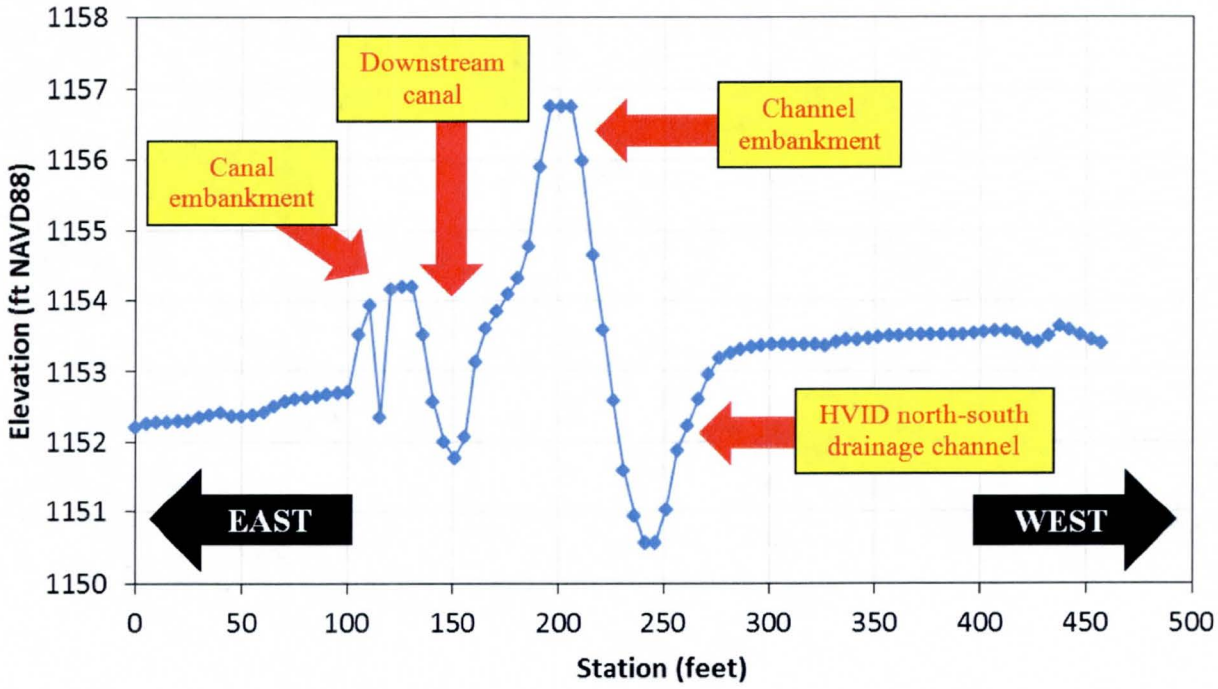

Figure 5-6. Station and elevation data associated with a cross section along the HVID north-south drainage channel approximately 500 feet upstream of the Thomas Road alignment (the cross section is oriented left-to-right looking downstream)

Stock tank embankment near the flow split area close to the upstream end of the FLO-2D model domain

A large stock tank exists in the main flowpath of Centennial Wash near the upstream end of the FLO-2D model domain. This stock tank is near the intersection of what would be the Indian School Road alignment and the 551st Avenue alignment although the site is accessible only by dirt roads. The stock pond is shown in Figure 5-7. The stock pond itself (i.e., the area in Figure 5-7 shown with ponded water) is excavated below natural grade. The stock pond and entrance to the stock pond is surrounded by an embankment approximately 4 to 5 feet above surrounding natural grade. Also, an embankment runs to the north approximately 1,200 feet, which is used to guide runoff into the stock tank, and this embankment is approximately 2 to 4 feet above surrounding natural grade. This stock tank is referred to commonly as the Allison Stock Tank by local residents in the area.

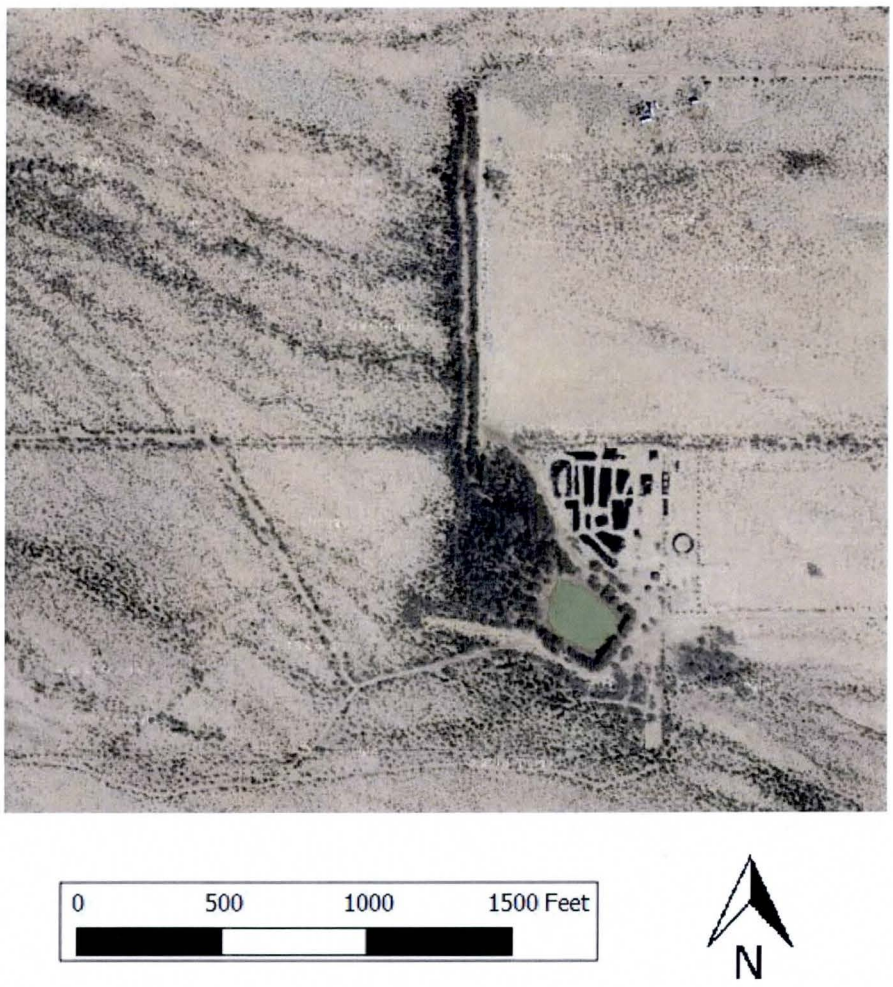

Figure 5-7. Stock pond near the upstream end of the FLO-2D model domain in the main branch of Centennial Wash, approximately 2 miles downstream of the Westside Canal Siphon under Centennial Wash

Stock tank embankment near the Saddleback FRS outfall channel close to the downstream end of the FLO-2D model domain

A stock tank exists in the left overbank flowpath of Centennial Wash near the downstream end of the FLO-2D model domain. This stock tank is near the intersection of what would be the Broadway Road alignment and the 491st Avenue alignment and is located approximately 3,000 feet southwest of the end of the Saddleback FRS Outfall Channel. The stock pond itself (i.e., the area in Figure 5-8 shown as bare ground) is excavated below natural grade. The stock pond is surrounded by an embankment approximately 4 to 5 feet above surrounding natural grade.

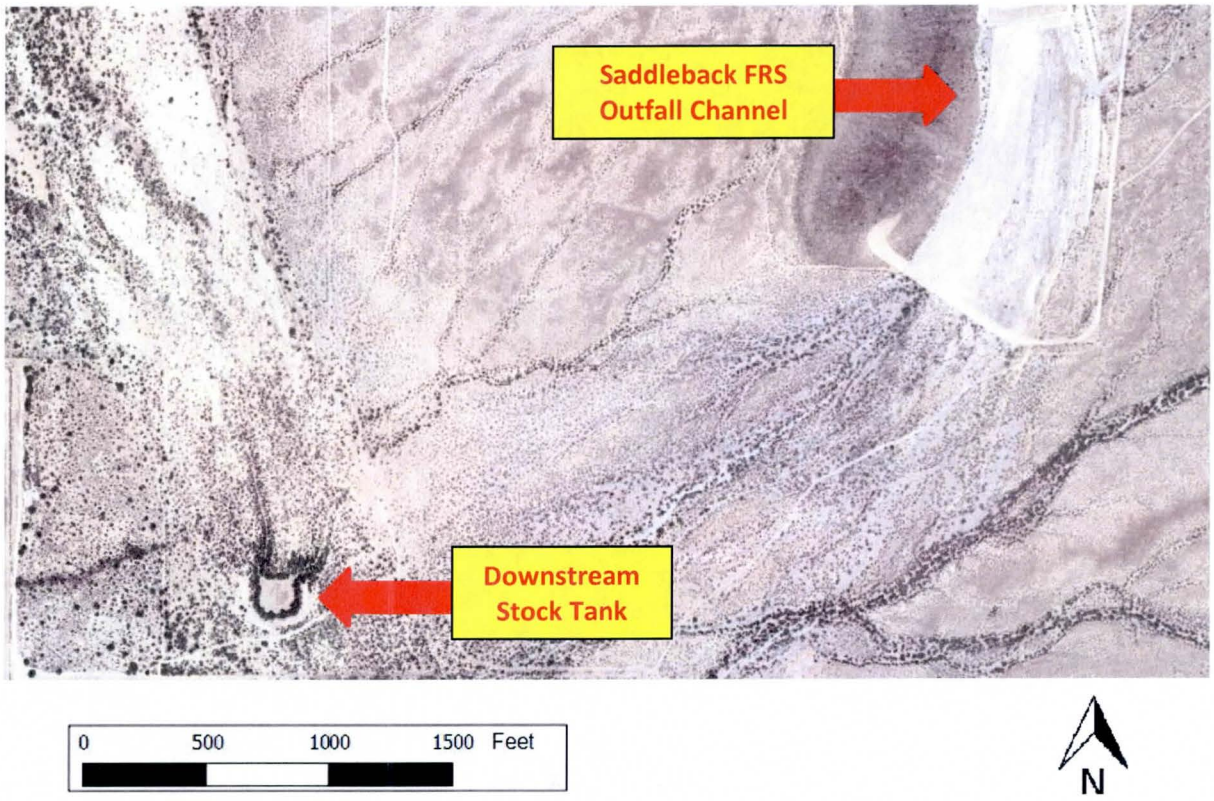

Figure 5-8. Stock pond near the downstream end of the FLO-2D model domain southwest of the Saddleback FRS Outfall Channel

Final techniques utilized to remove embankments from the FLO-2D model

For the three embankments listed above that needed to be removed from the topography of the FLO-2D grid in order to create a FLO-2D model for the without embankment scenario, various methodologies to remove the embankments from the topography were presented in a technical memorandum provided to the District dated May 8, 2013. This memorandum is replicated in Appendix E.5 of this report for additional reference and information. This section presents the final methodology used for the stock tanks and for the HVID north-south drainage channel embankments.

To manually edit the representation of the two stock tanks in the FLO-2D model, cross sections were taken from the FLO-2D grid and manually edited to visually follow the slope of the surrounding grade in the vicinity of the stock tanks. Results of this process can be seen in the documents titled "Remove_Lower_Stock_Tank.pdf" and "Remove_Upper_Stock_Tank.pdf" for cross sections upstream, through, and downstream of the stock tanks.

To automatically remove the drainage channel embankment, the canal just east of the drainage channel, and the canal embankment (see Figure 5-6) from the FLO-2D model grid, WEST developed a Microsoft Excel macro to automatically read the grid elevations surrounding the embankments and plot these elevations. The macro was designed to then project the slope of the natural grade in the fields downstream of the canal embankment (i.e., east of the canal embankment) back through the drainage channel embankment providing a smoothed model grid that effectively removed the drainage channel embankment and the canal embankment from the model while not lowering the canal thalweg. Since the distance from the drainage channel embankment to the natural grade east of the canal embankment was approximately 120 feet in most places, WEST edited the macro to determine the grid element elevation three cells away (each cell in FLO-2D is 40 feet by 40 feet so three grid cells is 120 linear feet) from the cell representing the drainage channel embankment (defined herein as the left bank station of the 1-D channel cross sections entered into the FLO-2D model to represent the channel as a 1-D element in the FLO-2D model) and then used the next seven cells (280 linear feet) to determine an average slope for the natural grade in the field downstream of the canal to project grid elevations following that slope back through the drainage channel embankment. Once these calculations had been performed, the macro was further edited to rewrite the floodplain grid elevations for the FLO-2D input files, update the corresponding 1-D cross section left bank elevations to more closely match the new floodplain grid element without the levee embankment, and rewrite the 1-D channel cross section files with these updated left bank elevations. Examples of the visualization for this process at various cross sections can be found in the memorandum in Appendix E.5 mentioned above. Also, the full visualization PDF file mentioned in this document can be found with the "without embankment" FLO-2D model electronically on disc in Appendix E.5 as well. An embankment also exists on the right bank (i.e., west side) of the channel near the downstream end, and this embankment was removed from the model as well manually.

5.5.5 Islands and Flow Splits

The primary flow split that occurs near the Allison Stock Tank in the second portion of the study reach as defined above (i.e., from the Harquahala Valley Irrigation District's Westside Canal downstream to Baseline Road) is a crucial component of the overall mapping effort. At the upper end of this reach, flow is contained by a canal siphon crossing. As the flow moves downstream (i.e., southeast), the flow spreads out over a wide, relatively flat distributary flooding extent. The effective study mapped a Zone AE with BFE's (although with no floodway) in the Left Overbank reach. The areas that appeared to be less prone to concentrated flooding were mapped as Zone A's in the effective study. Determining the amount of flow leaving the main branch and entering the breakout area was paramount to an accurate understanding of flooding extents and risk in what was termed the "Left Overbank" reach in the effective study.

In the effective model, the flow at the upstream end of the main branch of Centennial Wash in this reach (i.e., at the Harquahala Valley Irrigation District's Westside Canal) is 52,200 cfs. The effective

model has a flow change location approximately at Baseline Road which increases the flow to 58,100 cfs in the main branch of Centennial Wash. In the effective model Left Overbank reach, the initial flow at the upstream end of the breakout is 3,100 cfs. This is above the first smaller Zone A area mapped in the overbank of Centennial Wash. In between the first smaller Zone A area and the second larger Zone A area mapped in the overbank of Centennial Wash, the flow increases in the Left Overbank to 6,500 cfs. These locations correspond to flow decreases in the main branch of Centennial Wash of 49,100 cfs and 45,700 cfs, respectively. Therefore, the sum of flows in the main branch of Centennial Wash and the Left Overbank was always 52,200 cfs. This accounted for first 6% and then 12.5% of the flow entering the Left Overbank, respectively. Therefore, the effective mapping is based on a maximum of 12.5% of flow leaving the main branch and entering the Left Overbank. No documentation was available to show how the effective study calculated this flow split. This was likely based on a series of hand calculations.

As a first attempt, WEST utilized lateral structures in HEC-RAS to connect the alignments of the main branch of Centennial Wash with the Left Overbank reach near the flow split. As can be seen in Table 7-1 below, the updated flows in this reach are as follows: (1) the updated flow at the upstream end of the main branch of Centennial Wash in this reach (i.e., at the Harquahala Valley Irrigation District's Westside Canal) is 34,347 cfs (reduction of 34.2% from the effective flow at this location), and (2) the updated flow at approximately Baseline Road is 38,552 cfs in the main branch of Centennial Wash (reduction of 33.6% from the effective flow at this location). A technical memorandum describing the results of this effort was provided to the District on November 30, 2012. The findings of this preliminary study were multi-faceted. To summarize, the sensitivity to lateral structure input parameters—including the lateral structure geometry definition, lateral weir coefficients, and the number of lateral structures in the model–were shown to be highly impactful on the final estimates of flow split. These results ranged from 8,000 cfs to 13,500 cfs; in other words, the flow splits ranged from 23% to 39% of the total peak flow from the new hydrology of 34,347 cfs. These numbers seemed excessively high, since the original analysis showed a maximum of 6,100 cfs leaving the main channel which represented 12.5% of the original 52,200 cfs. Also, it seemed counterintuitive that the new, lower flow estimates from the updated hydrology study would cause a much higher relative percentage of the total flow to enter the overbank flowpath. However, this was due to the new detailed topography in this area. The significantly lower thalweg elevation of the historic alignment of Tiger Wash compared to the main branch of Centennial Wash simply caused more flow to enter the breakout channel. A copy of the technical memorandum described above can be found in Appendix E.5 of this report.

Due to the high percentage of flow leaving the main branch of Centennial Wash due to this initial lateral structure analysis in HEC-RAS, the District initiated a two-dimensional modeling study of this flow split and what was termed the Centennial Wash Left Overbank reach in the effective models to better define the flood hazards in this area. The results of this study (for both the FLO-2D results presented in Section 5 and the HEC-RAS flow split analysis presented in a technical memorandum in Appendix E.5) showed a significant proportion of the flow leaving the main branch of Centennial Wash in the vicinity of this flow split as well. The scaled hydrograph shown in Figure 4-3 above was used directly as input to the unsteady FLO-2D model with a peak flow of 34,347 cfs. This hydrograph was shifted such that the time ordinate shortly before flow begins was set equal to zero; in other words, the ordinate 14.0 as shown in

Figure 4-3 was moved to 0.0 hours as can be seen in Figure 5-9, and the first time step with flow greater than zero cfs in the FLO-2D model was 1.5 hours (as opposed to 15.5 hours from the output of the effective HEC-1 model). It should be noted that this did not change the inflow to the FLO-2D model; the shift in the time ordinate was simply for simplification of the modeling input data for FLO-2D. This shifted inflow hydrograph is shown relative to the outflow hydrograph from the FLO-2D grid to show the relative attenuation across the grid during the flood routing simulations. Keeping this in mind, we see that our flow change locations in HEC-RAS (see Section 6.5.5 below) define our flows in the main channel of Centennial Wash adjacent to the overbank areas between 16,051 cfs and 23,512 cfs at different points longitudinally along the main branch of Centennial Wash. Based on the original flow of 34,347 cfs, this implies that between 31.5% and 53.3% of the flow was estimated to leave the main channel and enter the Left Overbank reach. Based on the attenuated flow leaving the grid of 27,660 cfs, this implies that between 15.0% and 42.0% of the flow was estimated to leave the main channel and enter the Left Overbank reach. These numbers agree well with the estimates from the initial HEC-RAS lateral structure modeling procedure described above.

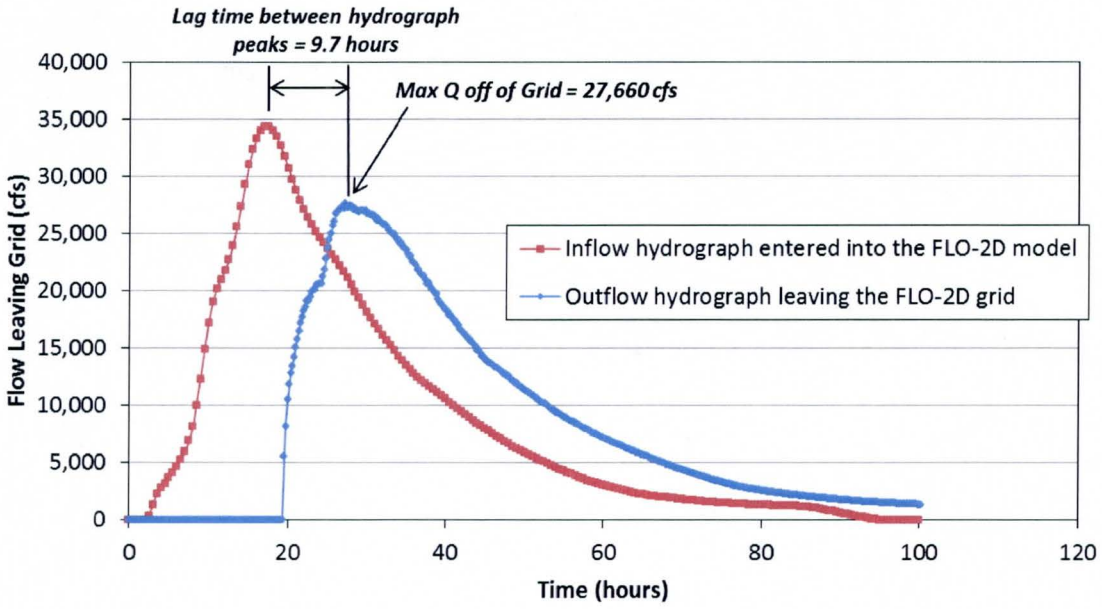

Figure 5-9. Inflow and outflow hydrographs from the FLO-2D model run (with embankments) plotted against each other to determine impacts of attenuation in the model

5.5.6 Ineffective Flow Areas

Ineffective flow area is not considered explicitly in FLO-2D as this is an unsteady flow model that accounts for volumetric routing and hydrograph attenuation across the high-resolution gridded computational domain. Conceptually, ARF's and WRF's (discussed in Section 5.3.3 above) could be considered ineffective flow areas in the FLO-2D model.

5.5.7 Supercritical Flow

Supercritical flows do not occur in this system as the flow regime is highly subcritical throughout the length of Centennial Wash.

5.6 Floodway Modeling

Floodway modeling was not completed using the FLO-2D modeling results. For a discussion of floodway modeling in the main stem of Centennial Wash, see Section 6.6 below.

5.7 Issues Encountered During the Study

5.7.1 Special Issues and Solutions

As discussed in Section 5.4 above, the outfall of the HVID north-south drainage channel represented in the model as a 1-D channel feature had to be transitioned from deep, higher-velocity, concentrated flow in the channel back to shallow, sheet-type flooding across the floodplain grid elements immediately downstream of the channel. The bank stations near the downstream end of the model initially represented the crest elevations of berms that are much higher than the surrounding floodplain grid element elevations (averaged over the 1,600 square foot grid cell area). FLO-2D only allows interaction of flow from the 1-D channel to the 2-D grid in the lateral direction (i.e., over the right and left bank stations) of the downstream-most cross section in the channel. Therefore, for both the with- and without-embankment FLO-2D models, the last several cross sections near the downstream end of the 1-dimensional channel feature were altered to transition more smoothly from channel to floodplain. Based on the District's recommendations, WEST decreased the height of the channel banks for the last several cross sections near the downstream end of the channel to allow the banks to transition back to approximately the elevation of the grid. The details of this process are discussed in Section 5.4. This was necessary to avoid numerical instability in FLO-2D.

5.7.2 Modeling Warning and Error Messages

No model warning or error messages were encountered for either the with- or without-embankment FLO-2D model runs in the final ERROR.CHK file created by the FLO-2D program.

5.8 Calibration

No measured field data was available for model calibration.

5.9 Final Results

5.9.1 Hydraulic Analysis Results

As shown throughout this section, the hydrology approved for the main branch of Centennial Wash from the concentration point titled "At Centennial Levee Reach 2" (i.e., 34,347 cfs – see Section 4) was used as input to the FLO-2D model. FLO-2D was then used to route the 1%-annual-chance flood hydrograph over the breakout area downstream of the HVID Westside Canal to the point where the breakout flow rejoins the main branch of Centennial Wash near Baseline Road. The FLO-2D model included the entire area of the main branch of Centennial Wash and the breakout area throughout the Harquahala Valley (see Figure 6-8 below for a graphical representation of the FLO-2D computation domain boundary).

This hydraulic modeling analysis allowed the FLO-2D model to be used for mapping in the left overbank area (see discussion in Section 6.7.1.3 and Figure 6-8 below). The results of this FLO-2D model were then used to provide input to the HEC-RAS model by taking flows computed at discreet flow change locations in FLO-2D (discussed in greater detail in Section 6.5.5 below) and entering these flows directly into the HEC-RAS model in the reach. Therefore, FLO-2D was used for mapping in what the effective model terms the Left Overbank reach while HEC-RAS was used for floodplain and floodway mapping in the main branch of Centennial Wash without losing the additional information regarding floodplain attenuation computed using the unsteady FLO-2D model when mapping in HEC-RAS. The wide, shallow, flat nature of flow in the Harquahala Valley lends itself to significant floodplain storage and hydrograph attenuation as shown in Figure 5-9. This attenuation is captured in the HEC-RAS model by using steady-state flows from the results of the FLO-2D model. As we can see from the comparison of results in Section 6.9.2, the results of the two models in regards to water surface elevation agree well, providing further confidence in this approach for using the peak flows from FLO-2D in the HEC-RAS model.

Based on discussion between the District and WEST, a boundary was drawn as a line of distinction between mapping based on the HEC-RAS model and based on the FLO-2D model results (see discussion in Section 6.7.1.3). Everything towards the main channel relative to this boundary line was mapped using results from HEC-RAS model, and everything away from the main channel relative to this boundary line (i.e., in the Centennial Wash Left Overbank area) was mapped using results from the FLO-2D model.

After determining the area that would be mapped based on the FLO-2D results, the "worst-case" scenario was first determined for each grid element by determining the maximum flooding depth at each location in the model domain. Results of this analysis are shown in Figure 5-10 below. As can be seen in this figure (and is intuitively obvious based on the function of the HVID north-south drainage channel and embankment which act as a flood control feature), the "with embankment" FLO-2D model creates the worst case flooding in the majority of the main branch of Centennial Wash, and the "without embankment" FLO-2D model creates the worst case flooding in the majority of the overflow reach off of Centennial Wash. Interestingly, the "without embankment" model is the worst-case flooding depth on the eastern side of the HVID north-south drainage channel south of approximately Centennial Road. This is because more flow is contained in the channel further upstream creating a larger volume of water escaping the channel once the embankment is finally overtopped in the "with embankment" FLO-2D model. Taking all of this into consideration, the worst-case flooding depth from each grid cell in the

model was used for final floodplain mapping. It should be noted that the boundary of the FLO-2D mapping area was left "gridded" (i.e., the external boundary reflects those grid cells that were wetted in the model run as computed in a gridded format, and the boundary was not smoothed to follow the shape of adjacent topography lines).

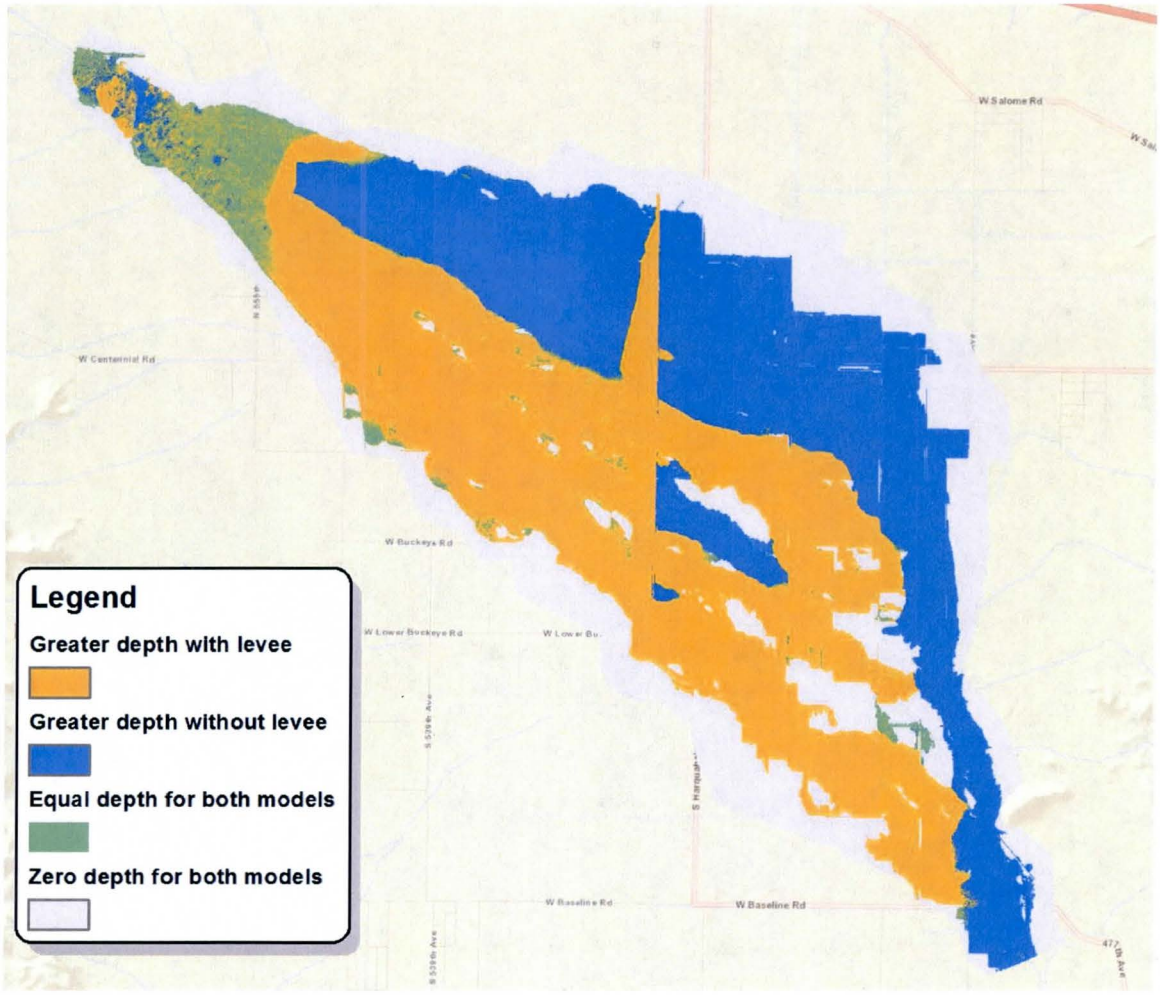

Figure 5-10. Determination of "worst-case" FLO-2D results by comparing maximum depth for the "with embankment" and "without embankment" models

Based on the identification of the worst-case flooding depth in each grid cell, WEST and the District reviewed the results in the overflow mapping area (i.e., the area away from the main branch of Centennial Wash relative to the mapping boundary line shown in Figure 6-8) and realized that a large majority of the flooding depths in this area were less than approximately 3.0 feet. This lead the District to investigate the use of Zone AO special flood hazard areas for floodplain mapping as opposed to Zone A, AE, or any other flood hazard zone definition. To accomplish this, WEST utilized GIS processing tools to finalize the mapping of the FLO-2D results in this area.

To begin, WEST grouped the FLO-2D results in this area based on maximum flooding depth into Zones AO1, AO2, AO3, and AE (corresponding to maximum flooding depths of 1, 2, and 3 feet for Zones AO1, AO2, and AO3, respectively, and greater than 3 feet for Zone AE). Results were grouped into polygons in shapefile format with adjoining grid cells identified in the same zone merged into a single polygon. The minimum depth reported by the FLO-2D model was 0.01 feet, and all cells reported to have this depth or greater were included in the initial grouping polygons. After this general grouping, WEST applied a threshold area of 10 grid cells (16,000 square feet or just over one-third of an acre) to remove small islands of Zone AO's below this threshold that would not show up at the scale of the work maps developed. This was done using an automated GIS process in ArcMap known as a majority filter with a four block neighborhood. This reduced the number of small disconnected areas of Zone AO's by approximately half. From this point, manual review and discussion between the District and WEST further reduced the number of small disconnected areas of Zone AO's during the work map development stages. These discussions included consideration of FEMA's guidance that states that small scale topographic relief that is not evident on existing topographic mapping should be ignored; this guidance lead to the removal of many more smaller disconnected Zone AO areas. In the end, 178 Zone AO areas were mapped in the Centennial Left Overbank.

For those areas mapped using FLO-2D with depths greater than 3.0 feet, Zone AO3 is not a valid flood hazard area. Fourteen areas were identified that exceeded this criterion. Two of these areas were connected to the main branch of Centennial and were consistent with a typical Zone AE with a sloped energy grade line and computations of BFE's. These areas included (1) the one-dimensional channel included in the model for the HVID north-south drainage channel and (2) the area collecting flow from the left overbank overland flow before converging with the main branch of Centennial Wash. These two areas are shown in yellow in Figure 5-11 below. The other twelve areas identified exceeding this criterion (i.e., flow depths greater than 3.5 feet) were associated with ponded areas in the FLO-2D model, primarily behind roadway embankments. These areas are shown in red in Figure 5-11 below. In each of these twelve areas, zonal statistics were extracted from the final maximum water surface elevation results raster. After reviewing the statistics of each zone, it was decided that the maximum integer water surface elevation within each of these twelve flat, ponded Zone AE areas would be used to define the regulatory BFE within that zone.

Final input and output files of the two FLO-2D models (both "with embankment" and "without embankment" models) are provided on disc in Exhibit C of this document. Standard input and output files are provided in ASCII text and binary formats. Additionally, the TIMEDEP.OUT has been provided on the discs in Exhibit C as well, but in a ZIP file to reduce the excessive file size from this large model of 844,255 grid elements.

In addition to the standard input and output files from the FLO-2D models themselves, the District's FLO-2D GIS post-processing tool was run for the results of both of these models to develop additional spatial data to aid in the review process. The output files for each model are provided on the discs in Exhibit C as well. This is a tool developed to operate inside of ArcGIS, and the spatial files generated by this process are stored within an ArcGIS geodatabase structure. Some of the output files generated by this tool are outlined briefly below:

- Point files
    - FLO2DGIS point file - information for each cell including grid number, elevation, n-value, time to peak flow, max discharge, max direction, max depth, max velocity, max wsel, cdischarge, cdir, dtimep, dmax, vmapx, wsel max, time to one foot, time to two feet, arfs, and wrfs.
    - FPXSec_gis point file- floodplain cross section information including cross section ID, grid number, n-value, and elevation
- Rasters
    - CDischarge raster- Max flow computed for each cell
    - Dmax raster- Max depth computed for each cell
    - ELEVATION raster- Ground surface elevation assigned to each cell
    - N raster- Manning's n-value assigned by the modeler for each cell
    - QTimeP raster- Time to peak flow computed for each cell
    - ToneFt raster- Time to one foot depth computed for each cell
    - TtwoFt raster- Time to two feet depth computed for each cell
    - Vmax raster- Maximum velocity computed for each cell
    - WSELMAX raster- Maximum water surface elevation computed for each cell
- Tables
    - ARF table- similar to ARF.DAT from the FLO-2D input files
    - CADPTS table- similar to CADPTS.DAT from the FLO-2D input files
    - DEPTH table- similar to DEPTH.OUT from the FLO-2D output files
    - FPLAIN table- similar to FPLAIN.DAT from the FLO-2D input files
    - MAXQHYD table- similar to MAXQHYD.OUT from the FLO-2D output files
    - MAXWSELEV table- similar to MAXWSELEV.OUT from the FLO-2D output files
    - TIMEONEFT table- similar to TIMEONEFT.OUT from the FLO-2D output files
    - TIMETOPEAK table- similar to TIMETOPEAK.OUT from the FLO-2D output files
    - TIMETWOFT table- similar to TIMETWOFT.OUT from the FLO-2D output files
    - VELFP table- similar to VELFP.OUT from the FLO-2D output files

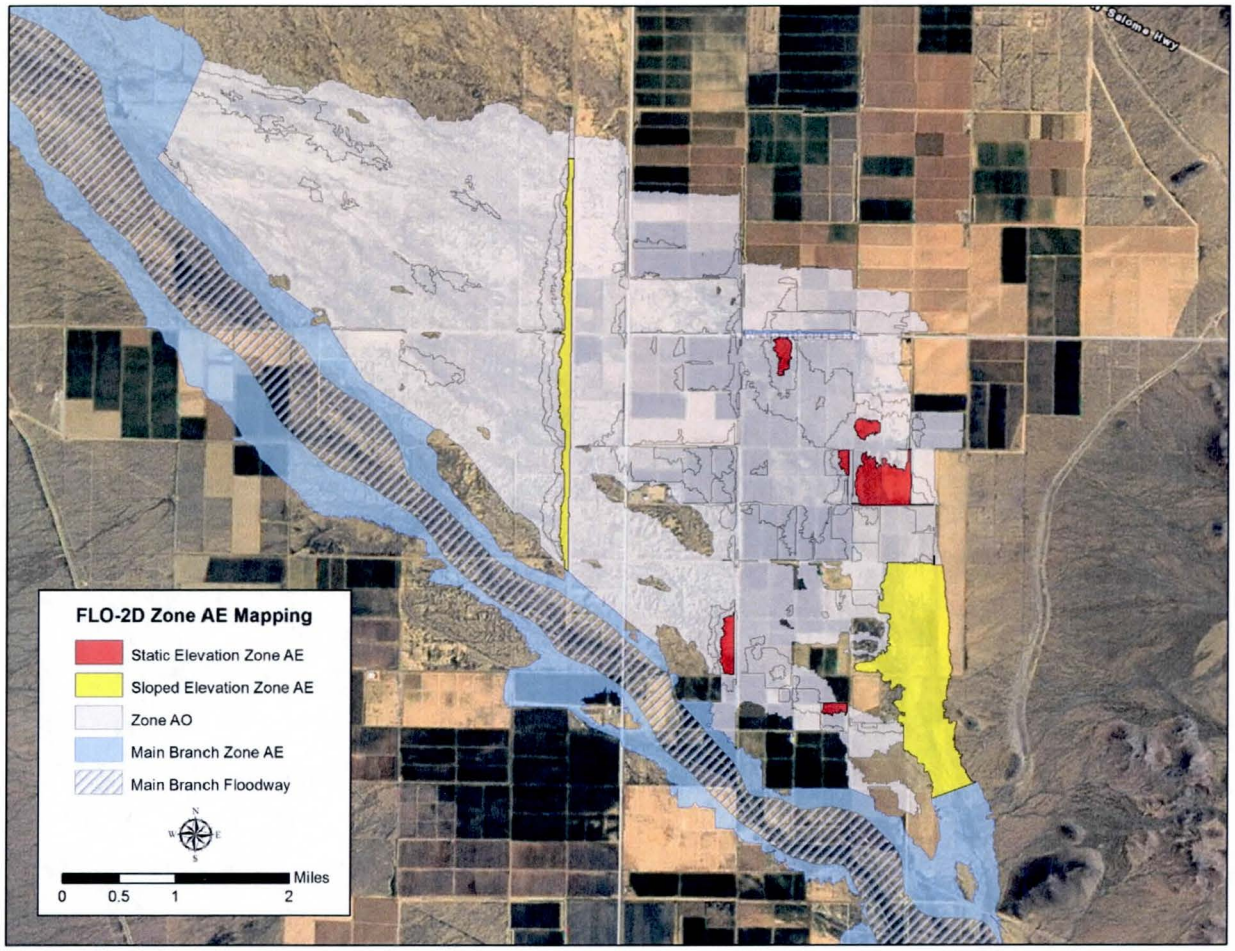

Figure 5-11. FLO-2D results mapped as Zone AE areas. The legend items labeled "Main Branch Zone AE" and "Main Branch Floodway" were both mapped from HEC-RAS results.

5.9.2 Verification or Comparison of Results

For comparison of results to the HEC-RAS model output, see Section 6.9.2 below.

6 Hydraulics: HEC-RAS

As per the Arizona Department of Water Resources (ADWR) State Standard SS1-12 (Arizona Department of Water Resources, 2012), Section 6 of a TSDN should be titled "Erosion, Sediment Transport, and Geomorphic Analysis." However, no erosion, sediment transport, or geomorphic analyses were performed for this study.

Due to the nature of this study as previously discussed in Section 5 above, floodplain mapping for the Centennial Wash area was completed using a combination of one-dimensional hydraulic modeling and two-dimensional hydraulic modeling. This section presents the results of the one-dimensional hydraulic modeling using HEC-RAS.

6.1 Method Description

Floodplain limits and floodway boundaries are defined herein for Centennial Wash from the intersection of Centennial Wash with the La Paz County-Maricopa County border in western Maricopa County downstream to the confluence of Centennial Wash with the Gila River. The study reach was broken into three primary areas of study due to the hydraulic characteristics of these three areas. The first area is defined from the La Paz County-Maricopa County border downstream to the Harquahala Valley Irrigation District's Westside Canal. The second area is defined from the Harquahala Valley Irrigation District's Westside Canal downstream to Baseline Road. The third area is defined from Baseline Road downstream to the confluence of Centennial Wash with the Gila River. In the first and third portions of the study area, the flow is contained to a relatively narrow channel area, and the entirety of the modeling effort was completed with one-dimensional modeling techniques, as described in this chapter. In the second portion of the study area as defined above (*i.e.*, that portion of the study area within the Harquahala Valley), the conveyance capacity of the main channel decreases and the flow spreads over a large area of shallow distributary flooding. This portion of the study area required a combination of one-dimensional and two-dimensional modeling techniques to accurately define flooding extents. The main channel of Centennial Wash was modeled and mapped (for both floodplain and floodway extents) using a one-dimensional modeling technique in all three portions of the study area as defined above. The "breakout area" in what the effective study termed the left overbank reach (within the second portion of the study area defined above) was modeled and mapped (for floodplain extents only) using a two-dimensional modeling technique.

The U.S. Army Corps of Engineers' Hydrologic Engineering Center's River Analysis System (HEC-RAS) was the modeling software used to perform the one-dimensional hydraulic modeling for the study reach to determine the floodplain limits and floodway boundaries. HEC-RAS is a one-dimensional hydraulics model, and the steady-state module of the software was used to compute steady-state flood profiles in the study reach for the 1% annual-chance-flood hydrologic event. This study utilized HEC-RAS version 4.1.0 (January 2010) for flood profile modeling. The cross section ground points, reach lengths, and bank stations were developed from the terrain data (provided by the District as discussed in Section 3 of this document) using the HEC-GeoRAS Version 10.0 extension (U.S. Army Corps of Engineers, 2012) in ArcMap 10.0 (Environmental Systems Research Institute, 2011).

The FLO-2D computer program developed by FLO-2D Software, Inc., version 2009.06, was used to perform the two-dimensional hydraulic modeling for the study reach to determine the floodplain limits in what the effective study termed the left overbank reach within the Harquahala Valley, as discussed in Chapter 5. FLO-2D is a quasi-two-dimensional flood routing model that simulates channel flow and unconfined overland flow over a uniform grid. The FLO-2D model is an unsteady flow model, and the 1% annual-chance-flood hydrograph was routed across the grid and used as a basis for mapping special flood hazard areas in the distributary overbank flooding area of the Harquahala Valley. More information regarding this analysis can be found in Chapter 5.

For HEC-RAS models, either a normal depth routing computation or a specified water surface elevation—depending on which was most appropriate at a given location—was applied at the downstream cross section of each model submitted herein in support of floodplain and floodway mapping. The downstream-most model of the HEC-RAS models submitted in support of this floodplain delineation study (i.e., the model that confluences with the Gila River) uses a normal depth routing computation for the downstream boundary condition. The models upstream of this downstream-most model each share a cross section from the top of one reach to the bottom of the next, and each of these upper models uses a specified water surface elevation as the downstream boundary condition based on the backwater computation of water surface elevation at the same cross section in the next model downstream.

The following sections discuss the existing FIS effective models and the Pre-Project Conditions Models (also referred to as the Existing Conditions Models). A PMR request replacing the mapping of entire stream reach does not require the development of Duplicate Effective Models, Corrected Effective Models, or Revised or Post Project Conditions Models.

6.1.1 Effective Models

The Centennial Wash effective study, including SFHA delineation and floodway determination, was based on HEC-2 modeling done by Cella Barr in 1989. The effective models were provided to WEST by the District as HEC-2 input files (in the typical *.DAT format). These files have been included on the disc in Exhibit C of this report.

6.1.2 Duplicate Effective Models

No duplicate effective models are required for a PMR request to replace the entirety of the flooding source being modeled and mapped.

6.1.3 Corrected Effective Models

No corrected effective models are required for a PMR request to replace the entirety of the flooding source being modeled and mapped.

6.1.4 Pre-Project Conditions Models

The pre-project conditions models were the updated models created for this study. In this project, a suite of six models make up the basis of pre-project conditions models for the study. Four of the six

models are HEC-RAS models, and two of the six models are FLO-2D models. Each of these models is defined briefly below.

1. Models for the first portion of the study area from the La Paz County-Maricopa County border downstream to the Harquahala Valley Irrigation District's Westside Canal.

    a. HEC-RAS model for the main branch of Centennial Wash: This reach required only one hydraulic model to support floodplain and floodway mapping.

2. Models for the second portion of the study area from the Harquahala Valley Irrigation District's Westside Canal downstream to Baseline Road.

    a. HEC-RAS model for the main branch of Centennial Wash: Immediately downstream of the Harquahala Valley Irrigation District's Westside Canal, flow enters a very wide, shallow area of distributary flooding that takes flow away from the main branch of Centennial Wash. HEC-RAS was used to model the flow that remains in Centennial Wash as a basis for the determination of both floodplain and floodway extents.

    b. "With embankment" FLO-2D model for the breakout area in the left overbank in the Harquahala Valley: Immediately downstream of the Harquahala Valley Irrigation District's Westside Canal, flow enters a very wide, shallow area of distributary flooding that takes flow away from the main branch of Centennial Wash. FLO-2D was used to determine the amount of flow leaving the main branch of Centennial Wash. That breakout flow was then routed across the overbank area using FLO-2D to serve as a basis for the determination of floodplain extents in the overbank area. The "with embankment" description for this model is just to contrast between the second FLO-2D model listed below; this model includes every ground feature in the field as it exists in the topography data provided by the District.

    c. "Without embankment" FLO-2D model for the breakout area in the left overbank in the Harquahala Valley: Several stock tanks and small embankments exist as part of the agricultural improvements in the Harquahala Valley area. A second FLO-2D model was developed that removes the stock tanks from the model grid by filling in the excavated areas and removing the adjacent embankments built to hold water in the stock tank. Additionally, a large, continuous embankment that runs north-south along the east side of a drainage channel built by the Harquahala Valley Irrigation District was removed from this model grid as well to determine the impacts of this on the flooding results calculated using FLO-2D. A "worst-case" scenario was developed for mapping purposes by using the greater depth of the two models at every location in the FLO-2D domain for mapping purposes in the left overbank area.

3. Models for the third portion of the study area from Baseline Road downstream to the confluence of Centennial Wash with the Gila River.
    a. "With embankment" HEC-RAS model for the main branch of Centennial Wash: Due to the existence of two small levee-like embankments associated with agriculture improvements near the SPRR Bridge, two HEC-RAS models were built for the third portion of the study area from Baseline Road to the confluence with the Gila River. The only difference between these two models occurs from approximately one mile upstream of the bridge to approximately 0.8 miles downstream of the bridge. The "with embankment" description for this model is just to contrast between the second HEC-RAS model for this area listed below; the "with embankment" model includes every ground feature in the field as it exists in the topography data provided by the District. The upstream flows for both the "with embankment" and "without embankment" HEC-RAS models in this reach were identical.

    b. "Without embankment" HEC-RAS model for the main branch of Centennial Wash: A second HEC-RAS model was developed for this portion of the study area that removes the levee-like embankments from the HEC-RAS model geometry. This was done by removing the embankments from the ground points in the cross section information and from the lateral structure information connecting overflows and creating hydraulic interactions among reaches. A "worst-case" scenario was developed for mapping purposes for the area immediately adjacent to the SPRR Bridge by using the greater depth of the two models at every cross section in the HEC-RAS domain for mapping purposes near the bridge. The upstream flows for both the "with embankment" and "without embankment" HEC-RAS models in this reach were identical.

6.1.5 Post-Project Conditions Models

No post-project conditions model was developed for this study, as only the existing conditions hydraulics were modeled and mapped herein.

6.2 Work Study Maps

Topographic work study maps were developed at a scale of 1" = 400' to provide sufficient detail of the new Zone AE Floodplain and Floodway mapping along Centennial Wash as well as the combination of Zone AO and Zone AE Floodplain mapping in the breakout area of the effective left overbank reach in the Harquahala Valley. Contour mapping depicted on the work study maps is based upon the combined topography described in Section 3. Rectified aerial photographic backgrounds are provided on sheets that are 24" x 36" in size. The study work maps references the North American Vertical Datum of 1988 (NAVD 88). Each work map includes the following (when applicable): cross section locations, floodplain and floodway water surface elevations, 1% annual-chance-flood peak discharges, floodplain/floodway boundaries, gridded flooding elevations (for Zone AE zones) and depths (for Zone AO zones) from FLO-

2D results, stream/flooding source names, zone designations, elevation reference marks, road names, coordinate grid tic marks, section lines, corporate boundaries, etc.

The HEC-RAS geometry information for the existing conditions models are consistent with the contour mapping as it appears on the work study sheets throughout the study area except in the vicinity of the Arlington Valley Solar Energy I Project. For additional discussion of the incorporation of as-built plans from this site into the final modeling and mapping, see Section 6.7.1 below.

6.3 Parameter Estimation

6.3.1 Roughness Coefficients

To estimate Manning's roughness coefficients for the Centennial Wash Floodplain Delineation Study, aerial photography was used to delineate areas that differed in roughness characteristics (i.e., land use, presence/density of vegetation, etc.), and this information was digitized into a polygon shapefile. The aerial photographs used to complete this delineation were obtained in the fall of 2011 by the District (flight dates in September and October) when available, and aerials from the fall of 2010 (flight dates in September and October) that were provided by the District were used for those areas that did not have 2011 aerial photographs available. Identical Manning's n delineations were used for both the HEC-RAS and FLO-2D modeling efforts. (See section 5.3.1 for a discussion of how Manning's n values are used in FLO-2D).

To select the Manning's roughness coefficient for each roughness area delineated above, the Manning's n-values were estimated for that roughness area as outlined in "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" by Phillips and Tadayon (2006). That report was prepared in association with the Flood Control District of Maricopa County (FCDMC). In this methodology, components of the n-value estimated for each roughness area include the following: a base Manning's roughness coefficient value for a straight uniform channel, a correction to Manning's roughness coefficient value for degree of irregularity, a correction to Manning's roughness coefficient value for variation in channel cross section, a correction to Manning's roughness coefficient value for the effect of obstructions, a correction to Manning's roughness coefficient value for the amount of vegetation, and a correction to Manning's roughness coefficient value for the degree of meandering. Table 5-1 below provides the final ten (10) Manning's roughness values and associated areas for the various categories used in the modeling effort for the floodplain and floodway delineation. A copy of this shapefile can be found on the disc in Exhibit C of this document.

Another report used significantly to assign Manning's n-values for this study was "Estimated Manning's Roughness Coefficients for Stream Channels and Flood Plains in Maricopa County, Arizona" by Thomsen and Hjalmarson (1991). That report was also prepared in association with FCDMC. Aerial and ground photographs in Thomsen and Hjalmarson (1991) that appeared similar to each Centennial Wash category were identified. The composite n-values assigned to the Thomsen and Hjalmarson (1991)

regions were then tabulated and compared to the calculation from Phillips and Tadayon (2006) for the corresponding Centennial wash roughness classification to verify the final values used herein.

Finally, an older n-value report was also available that provided n-values for Arizona titled USGS Open-File Report 73-3 "Roughness Coefficients for Stream Channels in Arizona" by Aldridge and Garrett (1973). This report contains only ground photographs of various streams throughout Arizona. The ground photographs in Aldridge and Garrett's (1973) report were examined and matched to the ground photographs taken during the field trips during the Centennial Wash FDS project. This acted as independent verification that the estimated Manning's n-values were appropriate for Centennial Wash.

A more detailed report titled "Centennial Wash Floodplain Delineation Study: Gila River to La Paz County—Selection of Manning's Roughness Coefficients" was developed in October of 2012 by WEST Consultants and approved by the District shortly thereafter. This report has been included in its entirety in Appendix E.1 of this document. Appendix E.1 also contains a trip log with photos from the field supporting the selection of roughness values in the study reach.

Table 6-1. Summary of the Manning's n categories and values estimated for the Centennial Wash FDS

Category Name	Classification Type (Channel or Overbank)	Manning's n-value	Area* (acres)	Percent of total area
Open Water	Channel	0.018	30	0.06%
Unvegetated Channel	Channel	0.025	99	0.21%
Sparse Vegetation	Overbank	0.035	8,824	18.42%
Tall Sparse Vegetation	Overbank	0.040	15,444	32.23%
Tall Medium Vegetation	Overbank	0.062	6,807	14.21%
Tall Dense Vegetation	Channel	0.111	4,691	9.79%
Extremely Dense Vegetation	Channel	0.200	835	1.74%
Agricultural—Cultivated Fields	Overbank	0.060	8,732	18.22%
Agricultural—Fallow Fields	Overbank	0.030	2,421	5.05%
Canal Embankment	Overbank	0.016	30	0.06%

**Includes overbank areas*

6.3.2 Expansion and Contraction Coefficients

HEC-RAS expansion and contraction coefficients were set equal to 0.1 and 0.3 throughout due to the shallow nature of flow (i.e., high width to depth ratios) throughout the modeled reach. The only exception to this were the cross sections immediately around the bridge structure, for which expansion and contraction coefficients were set equal to 0.3 and 0.5, respectively, for two cross sections upstream of the bridge and one cross section downstream of the bridge (i.e., RS 7.62, 7.39, and 7.35 in the model).

6.4 Cross Section Descriptions

Typical convention was used for cross section stationing for all HEC-RAS modeling in this study, i.e., cross section stationing is from left to right when looking in the downstream direction. Cross section spacing varies throughout the study area on a reach-by-reach basis depending on the variability of geomorphic characteristics in a given reach such as the cross sectional channel geometry, bed slope breaks, degree of meandering, roughness characteristics, etc. On average, a typical cross section spacing of 400 feet was used throughout the study reach for HEC-RAS cross section spacing. This spacing value was later subjected to sensitivity testing (including typical cross section spacing increased up to 800 feet), and the results of this sensitivity analysis provided further confidence in the selection of 400 foot spacing for the final models. Cross sections were also placed at specific locations of interest such as gaging stations, effective FEMA cross sections, and others. Typically the cross section alignments defined in the effective study were maintained in this study as they generally followed the direction of flow throughout the study reach. Minor adjustments were made to cross section alignments in limited portions of the study, and major adjustments were made to cross section alignments around the SPRR Bridge. The cross section data were obtained from the final topography data provided by the District and presented in Section 3 above using primarily HEC-GeoRAS (U.S. Army Corps of Engineers, 2012) and a few other software tools available in ArcGIS (Environmental Systems Research Institute, 2011).

6.5 Modeling Considerations

6.5.1 Hydraulic Jump and Drop Analysis

Hydraulic jumps or drops do not occur in this system as the flow regime is highly subcritical throughout the length of Centennial Wash.

6.5.2 Bridges and Culverts

Two primary structures were included in the models for the Centennial Wash FDS. The first is the Southern Pacific Railroad Bridge along the main stem of Centennial Wash near the confluence with the Gila River, and the other is a triple-barrel culvert structure under Van Buren Road along the HVID north-south drainage channel in the Harquahala Valley. Each of these structures is discussed individually below.

Southern Pacific Railroad Bridge

One bridge structure crosses the main branch of Centennial Wash approximately 7.4 river miles above the confluence with the Gila River. This is the Southern Pacific Railroad (SPRR) Bridge. This bridge may also be referenced at certain places in this document as the Union Pacific Railroad (UPRR) Bridge (e.g., meeting minutes documents, technical memoranda, etc.). The reason for this discrepancy is the District streamgage at this bridge is still referenced as the "Centennial Wash at SPRR" (gage ID 5103). However, UPRR incorporated the SPRR in 1996. Therefore, the line is now technically owned and operated by UPRR. Due to the District's streamgage naming convention SPRR is used primarily in this document; however, references to the SPRR Bridge and the UPRR Bridge are interchangeable herein.

The bridge itself is composed of the railroad embankment for the approach and exit sections along with four bridge trestle openings across the width of the bridge. Each trestle opening is between 270 feet and 300 feet wide, and the openings are located between 1,800 feet to 2,400 feet apart from each other (spacing between the four openings on center). Solid railroad embankment persists in between the bridge trestle openings. The railroad embankment stands anywhere from approximately 3 feet to approximately 11 feet above adjacent grade in the vicinity of the railroad trestle openings. The lowest point along the railroad embankment in the vicinity of the trestle openings is approximately 800 east of the left abutment of the easternmost trestle with an elevation of 854.18 feet. The highest point along the railroad embankment in the vicinity of the trestle openings is approximately 100 east of the left abutment of the westernmost trestle with an elevation of 859.06 feet.

No as-built information was available for this structure. As mentioned in Section 3 above, the District's survey crew performed a laser-scanning survey of the SPRR Bridge. This survey data was provided to WEST in an XYZ format, and the resultant dataset is a separate "cloud" of survey points representing each of the individual trestle openings. These data "clouds" were used for several purposes, including gathering measurements of the bridge pier widths, gathering measurements of total trestle widths, gathering measurements of high chord and low chord elevations for each trestle, and extracting natural ground surveys along cross sections immediately upstream/downstream of the bridge. As mentioned previously, more documentation regarding this survey can be found in Appendix C.4.

This bridge exhibits complex hydraulics for high river flows through the structure. As mentioned above this bridge contains four (4) separate and distinct trestle crossings of the wash; these four openings were designed to allow flood flows from Centennial Wash that overwhelm the primary trestle crossing to pass through the other three trestle crossings and not overtop the embankment. Figure 6-1 below shows the locations of the four separate trestle crossings of the railroad embankment over the wash. The primary trestle crossing, Bridge Opening Number 1 in Figure 6-1 below, is the southwestern-most opening along the railroad embankment. This opening contains the gaging station maintained by the District. This opening has a high feature on the left overbank that persists for at least a mile upstream. This trestle crossing is also the lowest bridge opening as far as invert elevation, followed by bridge openings 4, 3, and 2 in order from lowest to highest. This is shown graphically in Figure 6-2, an elevation profile taken directly from the final surface along the top of the embankment for the railroad bridge along with the invert elevation data populated from the laser-scan survey performed by the District's survey team in the portions of the cross section showing the bridge openings.

Based on this description of the topography of the system, site visits performed by WEST and District personnel, and further discussions with additional WEST and District personnel, the hydraulics of the bridge were described conceptually by the project team. This conceptualization of the bridge hydraulics is provided below. It was assumed that the main opening, i.e., bridge opening 1, would contain a majority of the flow for low-magnitude hydrologic events. As water surface elevations increased during higher flow events towards the crest of the railroad embankment and the crest of the embankment on the left side of the channel (which is actually higher than the crest of the railroad embankment itself), water would begin spilling over the crest of the railroad embankment and subsequently spill over the crest of the embankment on the left side of the channel. At that point, water flowing over the

embankment on the left side of the channel would flow along the railroad embankment to the northeast. Flow would move to the downstream side of the railroad embankment (i.e., to the south) through the other three trestle openings in sequential order, i.e., first flowing through bridge opening 2, then flowing through bridge opening 3, and finally through bridge opening 4. The amount of flow through each of these trestle openings would be dependent on the capacity of the individual opening compared to the total flow that spilled over the left embankment along the main channel. If the amount of flow leaving the main channel at that location were less than the conveyance capacity of bridge opening 2, then theoretically most or all of the flow leaving the main channel would flow downstream of the embankment through bridge opening 2, leaving bridge openings 3 and 4 relatively dry. Alternatively, if the flow leaving the main channel were greater than the conveyance capacity of bridge opening 2, then the flow above the conveyance capacity of bridge opening 2 would continue downstream along the upstream side of the railroad embankment, and some flow would flow downstream of the railroad embankment at bridge opening 3. Again, the comparison of the flow remaining in the overbank flowpath downstream of bridge opening 2 would need to be considered relative to the conveyance capacity of bridge opening 3 to determine how much flow would pass downstream of the railroad embankment through bridge opening 3 and how much would continue to be conveyed downstream to bridge opening 4.

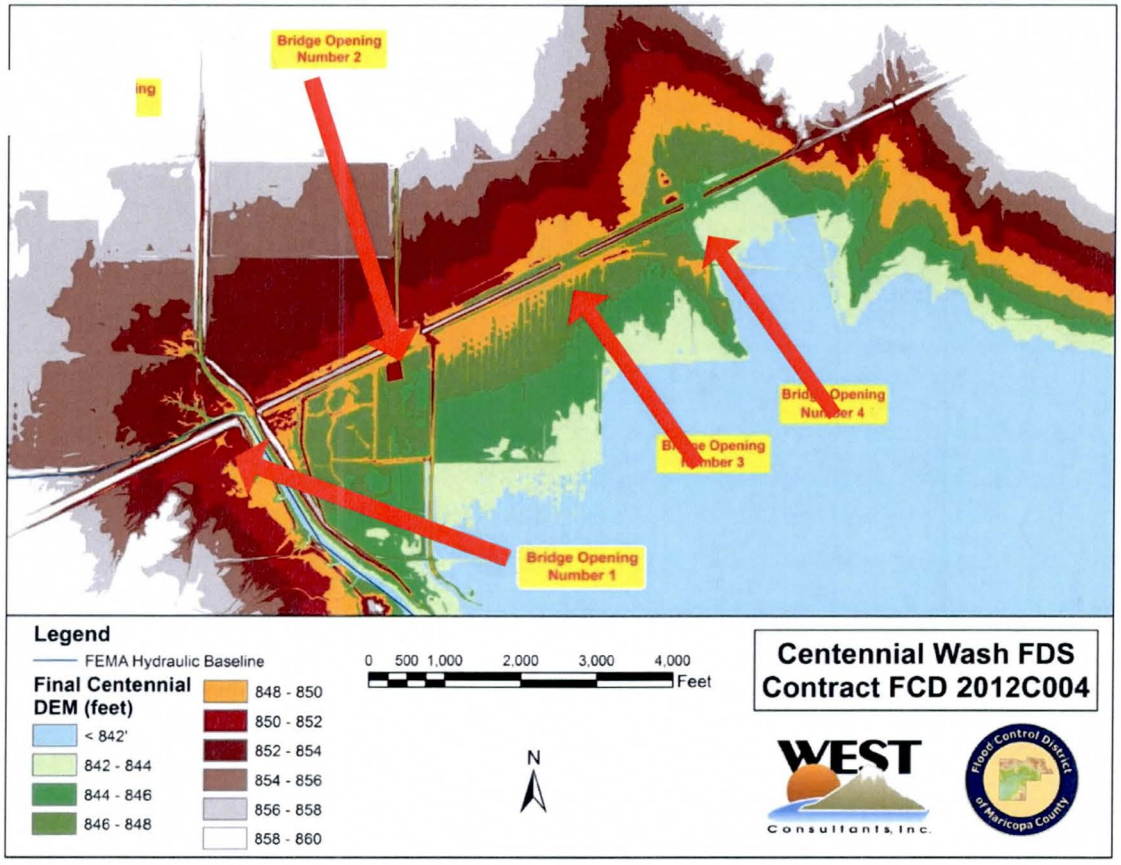

Figure 6-1. Trestle crossing locations for the SPRR Bridge

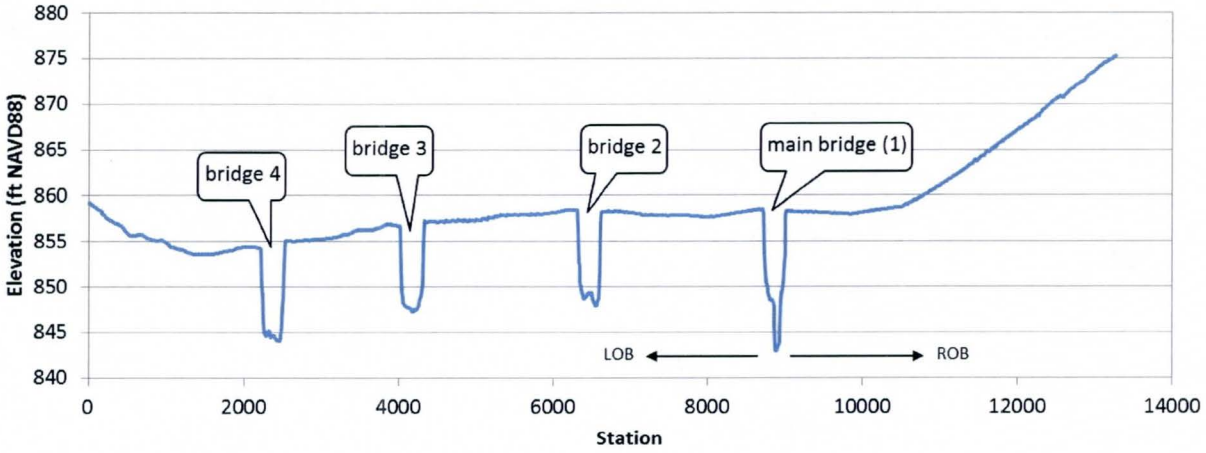

Figure 6-2. Profile from the final DEM along the top of the railroad embankment

To capture the complex hydraulics described above in HEC-RAS, the final existing conditions bridge geometry included four reaches connected at a single junction. The main stem of Centennial Wash follows the thalweg through the bridge, similar to the effective study. Bridge opening 1 is modeled as a bridge structure in HEC-RAS along this reach. Cross sections upstream of the bridge were ended at the top of the embankment on the left side of the channel, and lateral weir structures were entered into the model geometry to represent flow over the large embankment on the left side of the channel. Flow going over the lateral weir structures used to define the left embankment upstream of the bridge on the main channel would enter another flowpath that flows along the bridge to the northeast, discussed below.

The next flowpath was defined to parallel the railroad embankment starting from the left embankment along the main channel just upstream of bridge opening 1, moving to the northeast past bridge openings 2 and 3, and finally turning and passing through bridge opening 4. The flow at the top of this reach is the amount of flow from the main channel flowing over the left embankment along that reach. These cross sections were drawn with their left endpoints far enough to the northwest to contain flow, and their right endpoints were ended immediately at the top of the railroad embankment. Along the right side of these cross sections, lateral weir structures were defined to represent the top of the railroad embankment. These structures served two purposes. First, they would allow flows that created water surface elevations higher than the railroad embankment (if that much flow was calculated to leave the main stem upstream) to overflow over the top of the railroad. Secondly, these lateral structures allowed bridge openings 2 and 3 to be represented using culverts entered into the lateral structure embankments in the model geometry. Culverts were defined as box culverts with the invert being approximately the average invert elevation between two piers, the culvert crown being the deck's low chord elevation between two piers, and the culvert walls being the stations of the edges of the piers defining a given "opening." Therefore, the number of box culverts used to represent bridge openings 2

and 3 was equal to the number of piers plus the number of abutments minus one for each individual opening.

Approaching bridge opening 4, the cross sections along this overbank flowpath were turned such that the cross sections immediately upstream and downstream of bridge opening 4 were parallel to the roadway embankment (as opposed to being perpendicular to the roadway embankment as the cross sections adjacent to bridge openings 2 and 3 were oriented). This allowed bridge opening 4 to be represented as a bridge structure in the model as opposed to a culvert approximation in lateral structures as done for bridge openings 2 and 3. The reach then continued south of the embankment along the flowpath immediately downstream of bridge opening 4 until this flowpath converged with the main branch of Centennial Wash again. The right overbank endpoint of the cross sections downstream of bridge opening 4 were not adjacent to the left overbank endpoint of the cross sections along the main flowpath downstream of bridge opening 1, however. This is explained in greater detail in the following section.

The reach defined parallel to the railroad embankment had flow leaving through lateral structures and culverts used to define bridge openings 2 and 3 in the HEC-RAS geometry file. These flows cannot be added into a lower cross section in the same reach in HEC-RAS, however, as this would create a problem numerically when trying to iterate towards a solution in which the water surface profile is computed from downstream to upstream for a single flow profile in the reach (i.e., the standard step solution methodology in HEC-RAS steady flow computations). Therefore, flow leaving this reach from bridge openings 2 and 3 would either have to enter the main stem of Centennial Wash directly or another reach entirely. The cross sections along the main stem of Centennial Wash downstream of bridge opening 1 were not extended to the east to allow for this, however, because a large embankment exists downstream of bridge opening 1 on the left bank of the channel (very similar to upstream of bridge opening 1). This embankment acts to both keep flows in the main branch of Centennial Wash from leaving and spilling into the agriculture fields east of the main branch downstream of bridge opening 1 as well as effectively preventing flows passing through bridge openings 2 and/or 3 (primarily 2 based on local topography) from immediately reentering the main branch of Centennial Wash. Therefore, another reach was established to connect the left overbank cross section endpoints along Centennial Wash (defined along the top of the embankment discussed above) and the right overbank cross section endpoints along the flowpath defined through bridge opening 4.

As a final consideration for hydraulic complexity in this system, lateral structures were added downstream of the railroad embankment between the right overbank cross section endpoints along the flowpath defined through bridge opening 4 and the left overbank cross section endpoints along the additional flowpath defined downstream of bridge openings 2 and 3. Similarly, lateral structures were added downstream of the railroad embankment between the right overbank cross section endpoints along the additional flowpath defined downstream of bridge openings 2 and 3 and the left overbank cross section endpoints along Centennial Wash. This allowed for water surface elevations computed to be higher than the embankment along the left bank of the main branch of Centennial Wash downstream of bridge opening 1 in either of the reaches adjacent to that embankment or for water surface elevations computed to be higher than the natural ground elevations in the agriculture fields

downstream of the railroad embankment between bridge openings 3 and 4 (between the two reaches in that area) to share water and balance energy across these cross section breaks.

All three of these upstream reaches (the main branch of Centennial Wash, the flowpath defined parallel to the railroad embankment upstream and passing through bridge opening 4, and additional flowpath defined downstream of bridge openings 2 and 3) combined in a single junction placed in the HEC-RAS geometry approximately 0.8 miles downstream of the bridge. This was placed just downstream of the end of the left bank embankment along the main branch of Centennial Wash downstream of bridge opening 1. Below this junction, a single reach follows the primary thalweg of Centennial Wash to its confluence with the Gila River. This geometry as described above is shown in Figure 6-3.

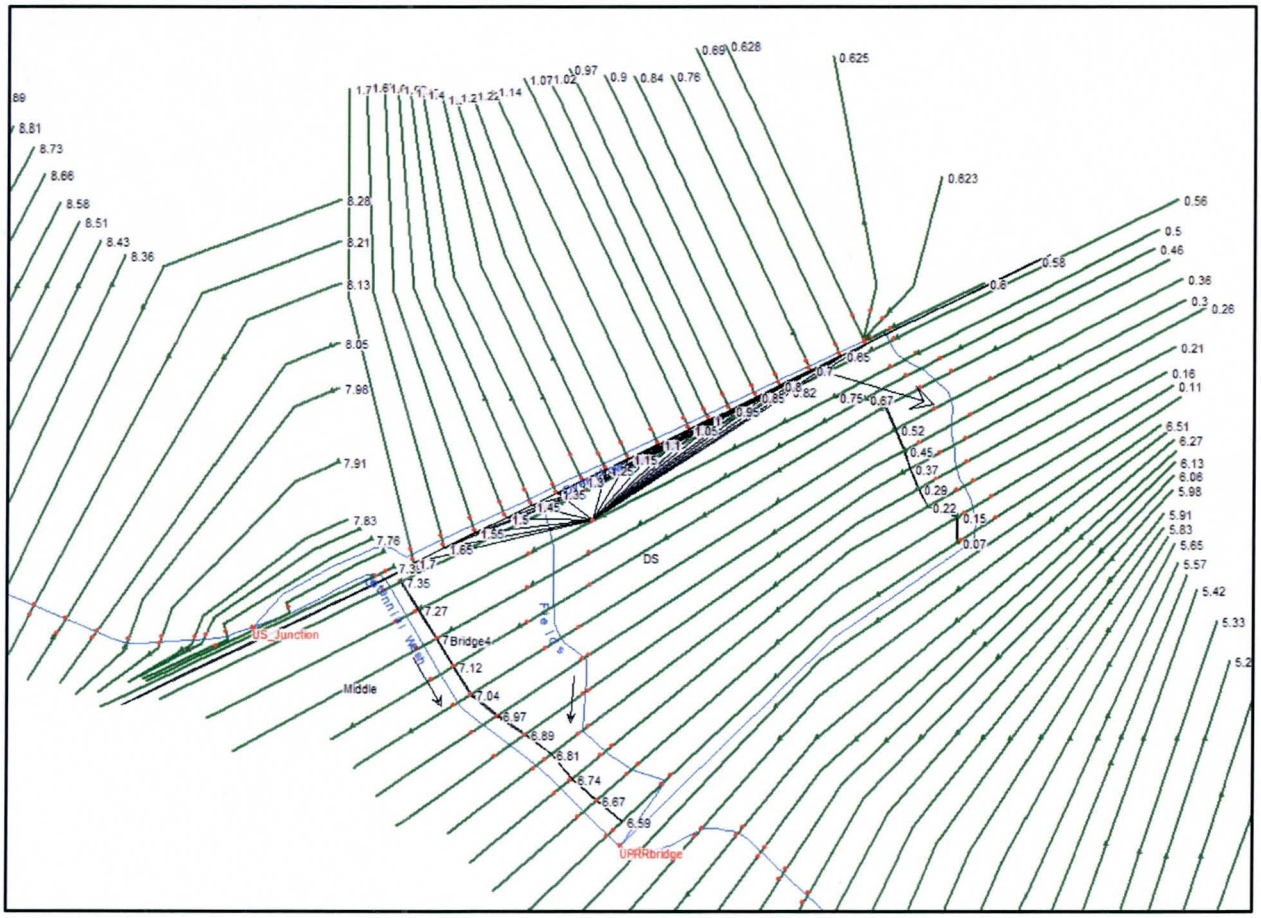

Figure 6-3. Plan view of HEC-RAS geometry near the SPRR Bridge taken from the HEC-RAS geometric data editor (positive flow direction arrows shown for each reach, north is directly towards the top of the figure)

6.5.3 Levees and Dikes

No levees, dikes, or levee-like structures meeting FEMA's stringent levee certification criteria exist in the one-dimensional modeling study area (i.e., along the length of the main stem of Centennial Wash).

6.5.4 Non-Levee Embankments

Two "non-certifiable" embankment exist in the study reach that were addressed in the HEC-RAS modeling using a "with non-certifiable levee" and a "without non-certifiable levee" conditions model. These two embankments are near the SPRR Bridge; the first is immediately upstream of the primary trestle opening along the left bank of the main branch of Centennial Wash, and the second is immediately downstream of the primary trestle opening along the left bank of the main branch of Centennial Wash. Both of these embankments were constructed to keep water within the main low-flow channel of Centennial Wash during flood events to protect agricultural fields immediately to the east of these embankments. Each embankment is approximately the height of the railroad bridge deck at the intersection of the embankment with the bridge, and each embankment lowers in height and breadth moving away from the bridge (either upstream or downstream depending on the embankment).

The project team determined through internal model analysis and review that the "with non-certifiable levee" scenario was the worst case for the flooding depths in the main channel Centennial Wash (i.e., flows going through Trestle #1), and the "without non-certifiable levee" scenario was the worst case for the flooding depths in the overbanks (i.e., flows going through Trestles #2, #3, and #4 using the "Centennial W RR Spill" and "Centennial Field" reaches in the HEC-RAS model).

For the "without non-certifiable levee" conditions model, the lateral structures defined above representing the large embankment downstream of the bridge immediately on the eastern side of the bridge opening for Trestle #1 were lowered to represent natural grade without the embankment. Upstream of the bridge, lowering these lateral structures along a sloping reach in the main channel of Centennial Wash to spill into a single cross section at the upstream end of the overflow reach running parallel to the railroad embankment (to capture flows eventually passing through Trestles #2, #3, and #4) caused numerical optimization issues in the model. Therefore, a second junction was added in this "without non-certifiable levee" model to connect the main channel to the overflow reach. This is a better representation of the hydraulics at this location as well because if that embankment were to wash away, the ponded water immediately upstream of the bridge opening at Trestle #1 would be the water that would flow into the overflow reach as defined above.

Optimization was turned on for both the "with non-certifiable levee" and "without non-certifiable levee" conditions models to optimize the computations of flows through the various trestle bridge openings. Results in the main branch of Centennial Wash were all taken from the "with non-certifiable levee" conditions model because water surface elevations in this reach were higher at every cross section for this model compared to the "without non-certifiable levee" conditions model. Similarly,

results in the two overflow reaches were all taken from the "without non-certifiable levee" conditions model because water surface elevations in this reach were higher at every cross section for this model compared to the "with non-certifiable levee" conditions model.

6.5.5 Islands and Flow Splits

The one primary flow split in the study reach occurs just downstream of the HVID Westside Canal. For a full discussion of the computation of flow split at this location using the FLO-2D model, refer to Section 5.5.5 above. This section will present the inclusion of the flow split computations from the FLO-2D model presented in Section 5.5.5 into the HEC-RAS modeling effort.

After discussion with the District, it was determined to assign five flow change locations in the RAS model based on data extracted directly from the FLO-2D model. In FLO-2D, flows are not reported from every cell for every time step. However, by using what is termed in the FLO-2D model as a "floodplain cross section," the model will export flow data at contiguous grid elements (either directly above, below, beside, or diagonal to one another) as defined by the modeler. These "floodplain cross sections" are not one-dimensional channel cross sections (as was used for the HVID north-south drainage channel in FLO-2D); instead, these "floodplain cross sections" are merely a reporting tool from that model. To avoid confusion, these report features of the FLO-2D model will be referred to for the remainder of this report as "FLO-2D flow reporting locations." Figure 6-4 shows the locations of these FLO-2D flow reporting locations as they were defined by WEST compared to the HEC-RAS cross sections. It should be noted that this figure shows seven FLO-2D flow reporting locations. The two uppermost FLO-2D flow reporting locations were reviewed together to determine the flow patterns around the stock tank near the primary flow split; however, only the downstream of these two flows was defined in the HEC-RAS model representing a flow change location corresponding to the second FLO-2D flow reporting location. As will be discussed in Section 6.7.1.3 below, floodplain mapping was completed using only the HEC-RAS results from the upstream end of the study reach at the La Paz County Border to river station 33.58 (i.e., 11 cross sections upstream of the last cross section representing the full flooding width before the immediate significant reduction in cross section width shown in Figure 6-4 near the northwest corner of the figure). Therefore, all of those cross sections had to include the full regulatory flow rate of 34,347 cfs.

Figure 6-5 and Figure 6-6 each show the location of these FLO-2D flow reporting locations as they overlay the maximum "worst-case" velocity grid and maximum "worst-case" depth grid, respectively, obtained from the final FLO-2D model results for the with and without embankment models. As can be seen from Figure 6-5 and Figure 6-6, each of the FLO-2D flow reporting locations has a leftmost point (i.e., with the typical cross section convention of left-to-right looking in the downstream direction) corresponding to an area of very low depth and low velocity. These FLO-2D flow reporting locations were selected to provide a representative flow in a reach between locations where flow appears to be leaving the main channel and moving into the overbank or vice versa. Results from early model runs with FLO-2D flow reporting locations defined near the flow splits did not capture a representative flow rate for the reach downstream of the location of flow interaction with the main stem and the overbank.

Therefore, it was decided to define these FLO-2D flow reporting locations in the middle of the reach where clear differentiation between main channel and overbank flow could be obtained from the model results. Peak flows from the hydrographs extracted from the FLO-2D flow reporting locations shown in Figure 6-4 were applied as steady flow rates either upstream in the HEC-RAS model at the cross section near the "upstream end" of the reach for which the FLO-2D flow reporting locations was defined in the middle or very near the overlapping HEC-RAS cross section. Finally, the with-embankment FLO-2D model was used to extract final peak flows for HEC-RAS from flow hydrographs at the FLO-2D flow reporting locations since the with-embankment model represents the worst-case scenario for flows in the main channel of Centennial Wash.

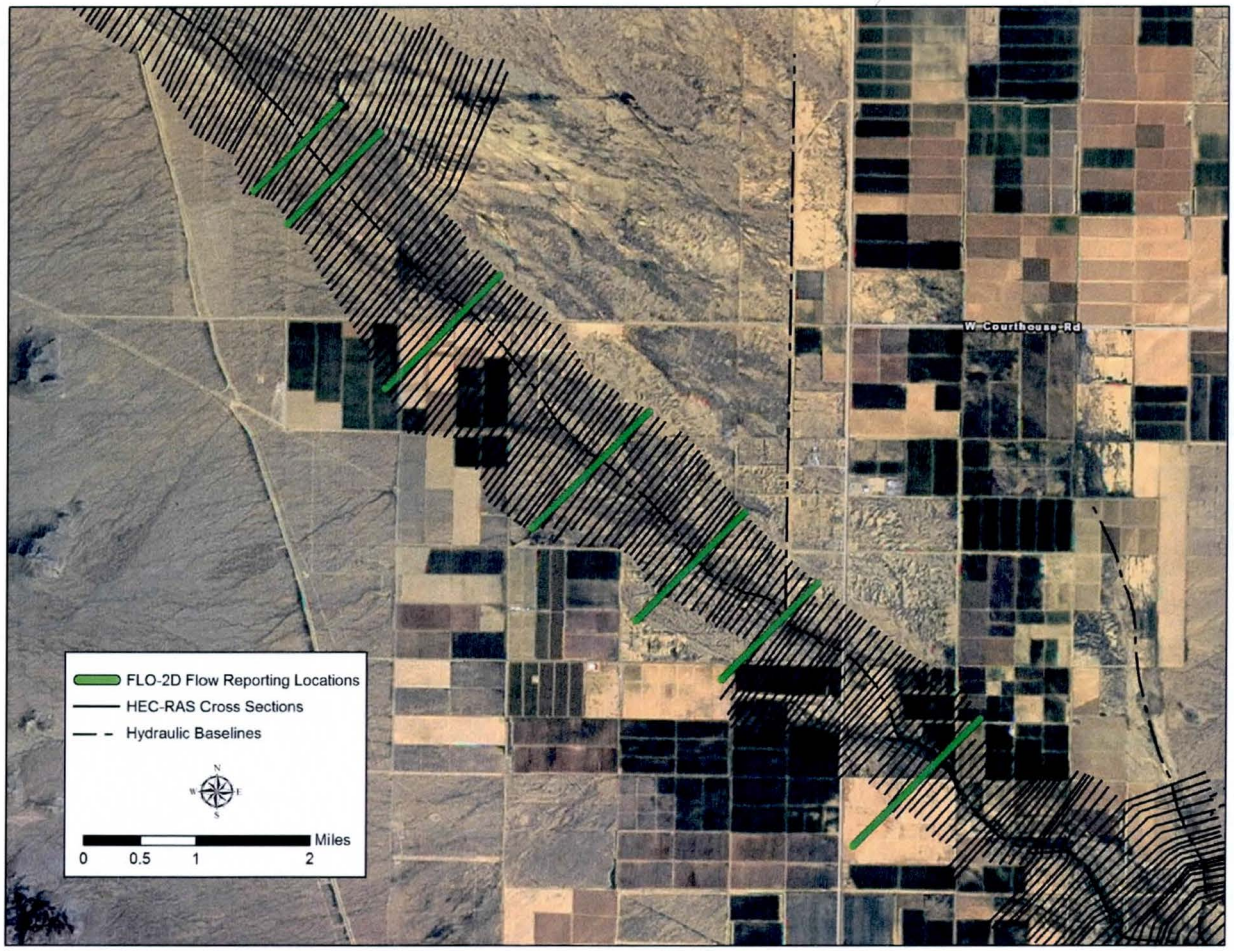

Figure 6-4. Location of the FLO-2D flow reporting locations used to extract peak flow data to enter into the HEC-RAS model (green lines) and all of the HEC-RAS cross sections (black lines). Flow is from northwest to southeast in this figure.

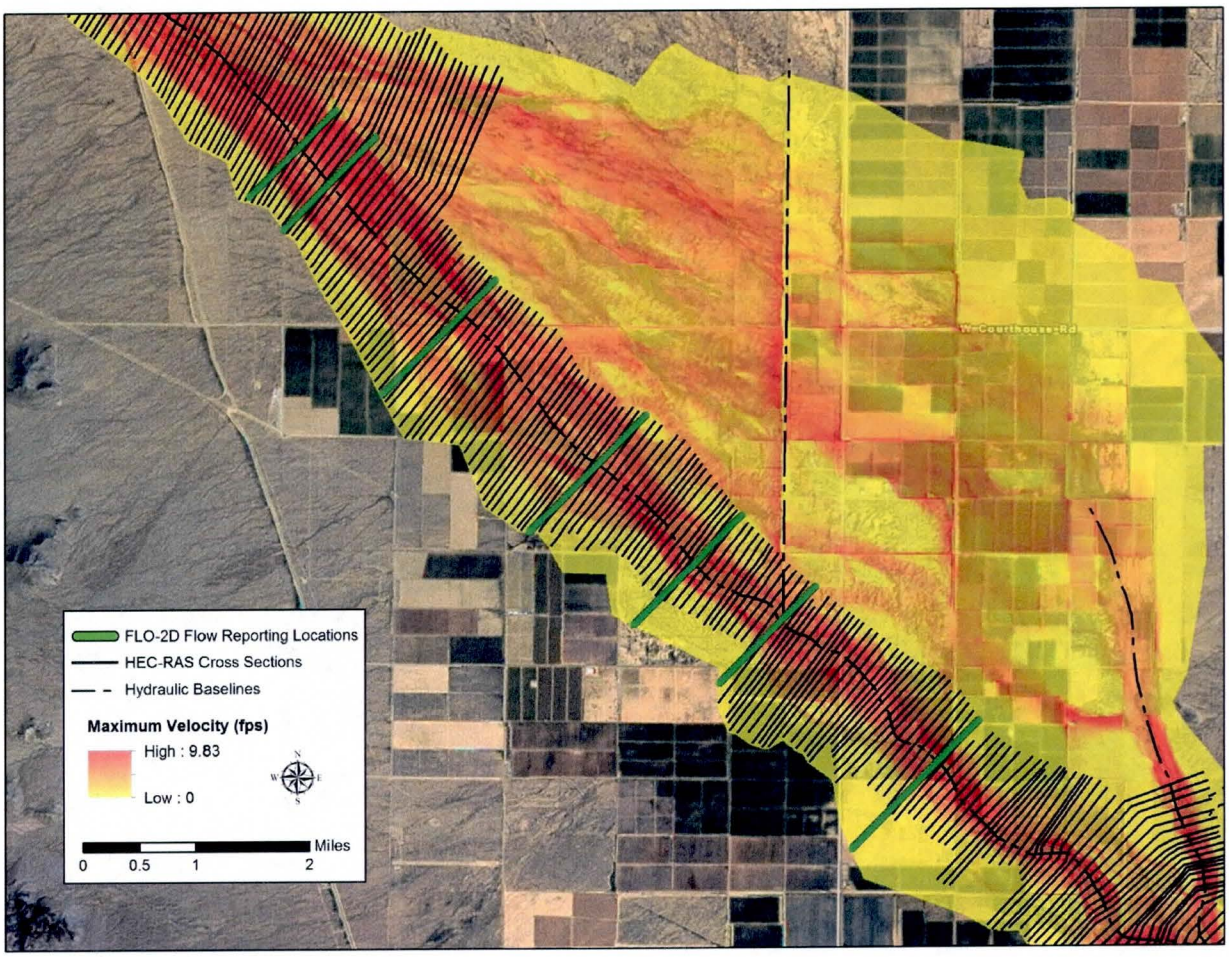

Figure 6-5. Location of the FLO-2D flow reporting locations used to extract peak flow data to enter into the HEC-RAS model (green lines) and all of the HEC-RAS cross sections (black lines) overlaying the maximum "worst-case" velocity grid from the FLO-2D results files. Flow is from northwest to southeast in this figure.

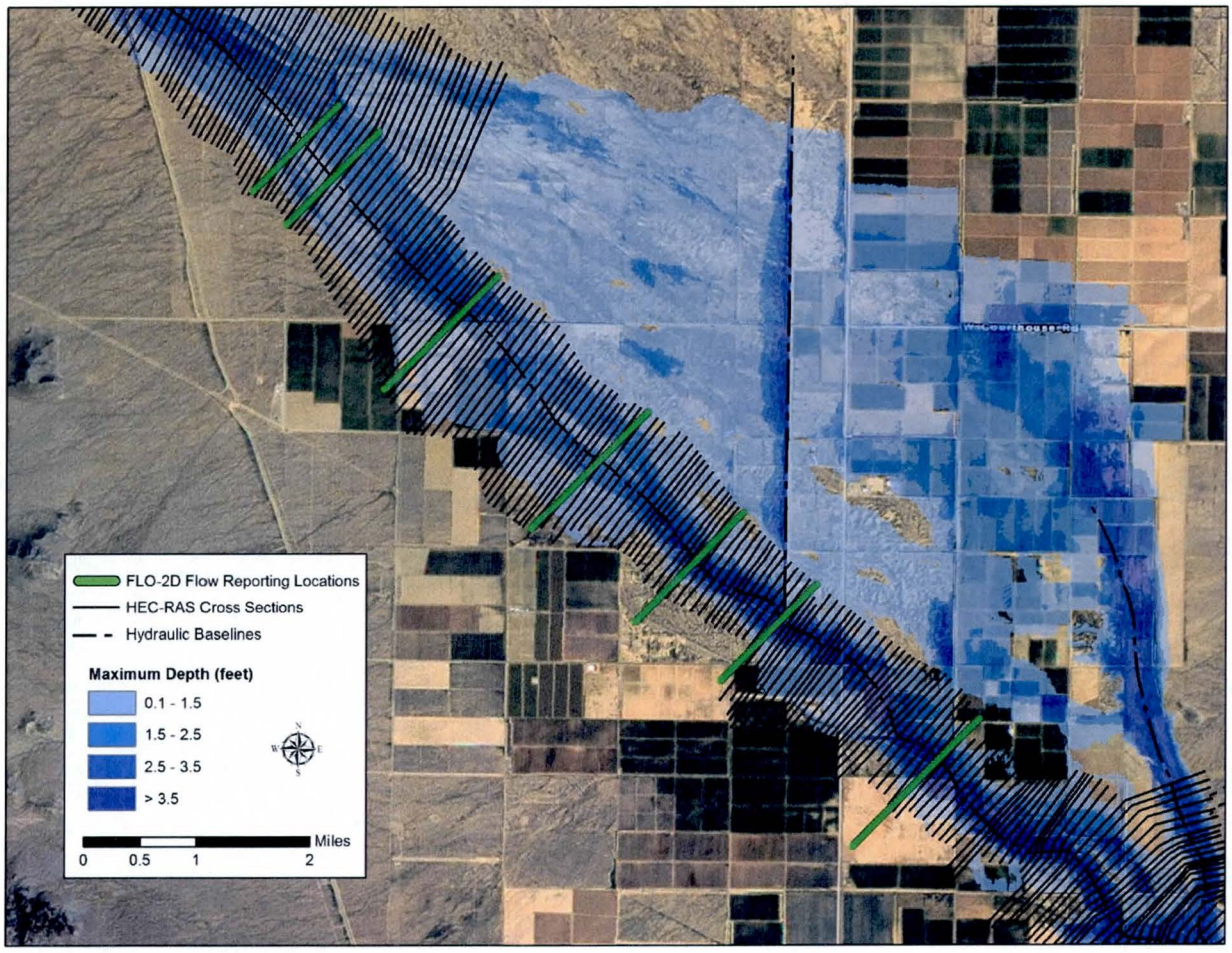

Figure 6-6. Location of the FLO-2D flow reporting locations used to extract peak flow data to enter into the HEC-RAS model (green lines) and all of the HEC-RAS cross sections (black lines) overlaying the maximum "worst-case" depth grid from the FLO-2D results files. Flow is from northwest to southeast in this figure.

6.5.6 Ineffective Flow Areas

Ineffective flow areas were used significantly throughout this model due to the wide, shallow nature of flow in this system. The most common use of ineffective flow areas in this model corresponded to the edges of agricultural fields. Permanent ineffective areas were assigned on cross sections where existing ineffective areas corresponded to agricultural fields. The elevation of these ineffective areas was assigned as the approximate height of edge-of-field berm elevations, usually 1-1.5 feet above the average ground surface in the field. Multiple block ineffective areas were used in cross sections where there was an inaccessible low point in the cross section beyond the fields where permanent ineffective flow area was assigned. These ineffective areas were assigned to cross sections in all models except for La Paz County Line to HVID Westside Canal, since there are no agricultural fields in that area.

Other ineffective areas applied in the model were either permanent or non-permanent ineffective areas used to represent disconnected areas of flow. In wide, shallow cross sections, water surface extents may be beyond the limits of flow connectivity to the upstream or downstream cross sections. Due to this, ineffective flow areas were used to remove these extraneous "wetted areas" in a given cross section from the actively conveying flow area. These disconnections in flow areas represented using ineffective flow areas were caused by various factors including natural high ground; roadways and canal embankments (such as the Old US Highway 80, the Arlington Canal, etc.); or excessively wide cross sections where the flow upstream and/or downstream is confined by natural ground elevations, but the flow in the cross section containing an ineffective flow area was far wider in top width than those constricted sections and an ineffective flow area was used to limit the top width even though a natural ground point did not create a "divided flow" warning in HEC-RAS.

6.5.7 Supercritical Flow

Supercritical flows do not occur in this system as the flow regime is highly subcritical throughout the length of Centennial Wash.

6.6 Floodway Modeling

Floodway modeling was completed in a simplified manner in which the original floodway stations were repopulated in the updated model. If the surcharge in the updated model based on the effective floodway stations at a given cross section was greater than 1.0 foot, the floodway stations in that reach were expanded to decrease the surcharge. If the surcharge in the updated model based on the effective floodway stations in a given reach were far less than 1.0 foot consistently throughout the reach (e.g., 0.5 feet or less), the floodway stations in that reach were contracted to attempt to "squeeze" the floodway and increase the surcharge. The result of this exercise was a smoothed floodway that follows approximately the original shape of the effective floodway while observing the floodway surcharge limitations.

Two areas were of particular interest for floodway modeling. First, the area downstream of the primary flow split just downstream of the HVID Westside Canal was based on the flow in the HEC-RAS model after removing flow that entered the area of the effective Left Overbank reach (as calculated in FLO-2D). In the effective model, the floodway modeling was based on only that portion of the flow that remained in the main branch of Centennial Wash; in other words, the floodway encroachment was calculated on only a portion of the total flow in the system. This implies that a regulatory floodway existed in the Left Overbank reach as well (because the entire single-source flooding flow was not contained in the encroachment stations along the main branch of Centennial Wash with less than a 1.0-foot surcharge), but the effective study chose not to delineate that regulatory floodway. Similarly, based on this precedence in the study reach, the study herein delineated a floodway in the Harquahala Valley HEC-RAS model using the reduced flow (as computed by the FLO-2D model). This would imply that a

regulatory floodway would exist in the Left Overbank reach, but this study chose not to delineate that floodway as per the effective study.

The second area of particular interest for floodway modeling was the area around the SPRR Bridge. Due to the complex hydraulics around this bridge structure and the representation of these bridge hydraulics with a system of split flow reaches and lateral structures (see Section 6.5.2 above), the floodway modeling was completed in a very specific manner near this structure. Flows in each reach were determined using the flow split optimization routines in HEC-RAS in the base conditions 100-year flow plans. Then these optimization calculations for flow splits into the different reaches were hard-coded into a second flow file which was used for floodway encroachment modeling (i.e., no optimization techniques were used to determine flow splits in these models).

In the reach layout shown in Figure 6-3, only left encroachment stations were used in the overflow reach that passes through Trestle Opening #4 (i.e., the easternmost split flow reach near the bridge), and only right encroachment stations were used in the main branch of Centennial Wash immediately upstream and downstream of the bridge. The middle reach collecting water from the lateral structures that allowed flow to spill through Trestle Openings #2 and #3 had no floodway encroachment stations, as this was considered to be within the encroachment stations of the neighboring reaches. Identical encroachment stations were set in the both "with non-certifiable levee embankment" conditions model and the "without non-certifiable levee embankment" conditions model to determine final encroachment stations to create an acceptable surcharge condition. The final surcharge results were compared to the base conditions water surface elevations for the corresponding plan depending on the reach. In other words, the results for the "with non-certifiable levee embankment" conditions model were used as the base conditions for the main stem of Centennial Wash, and the results for the "without non-certifiable levee embankment" conditions model were used as the base conditions for the overflow reaches as described above.

6.7 Issues Encountered During the Study

6.7.1 Special Issues and Solutions

6.7.1.1 Lack of Topography Data West of the Maricopa/La Paz County Border

The topography data collected for this study did not extend beyond the border of Maricopa County and La Paz County to the west (i.e., upstream along Centennial Wash above the study reach herein). Therefore, the upper three cross sections in the model from the La Paz County border downstream to the HVID Westside Canal were taken directly from the effective model after applying a vertical datum shift of +2.14' to go from NGVD29 to NAVD88. +2.14' is the average of the VERTCON conversion factors for the 4 corners of the Courthouse Well USGS Quad that contains all of these cross sections as per the methodology proposed in FEMA's Guidelines for Flood Hazard Mapping Partners (2002).

6.7.1.2 *Construction of Solar Plants Near the SPRR Bridge*

The next special issue encountered during this study was the incorporation of as-built data from recent construction near the downstream end of the study reach herein. There are one proposed and two existing solar energy sites located along the north bank of Centennial Wash near the SPRR Bridge. Plans and / or as-built drawings were examined for each one of these three sites to determine if they impacted the floodplain delineation for Centennial Wash. These three sites are the Mesquite Solar 1 Project, the Arlington Valley Solar Energy I Project, and the Arlington Valley Solar Energy II Project. These projects and their impact on the Centennial Wash floodplain are discussed in detail below. The general location of these sites can be seen in Figure 6-7.

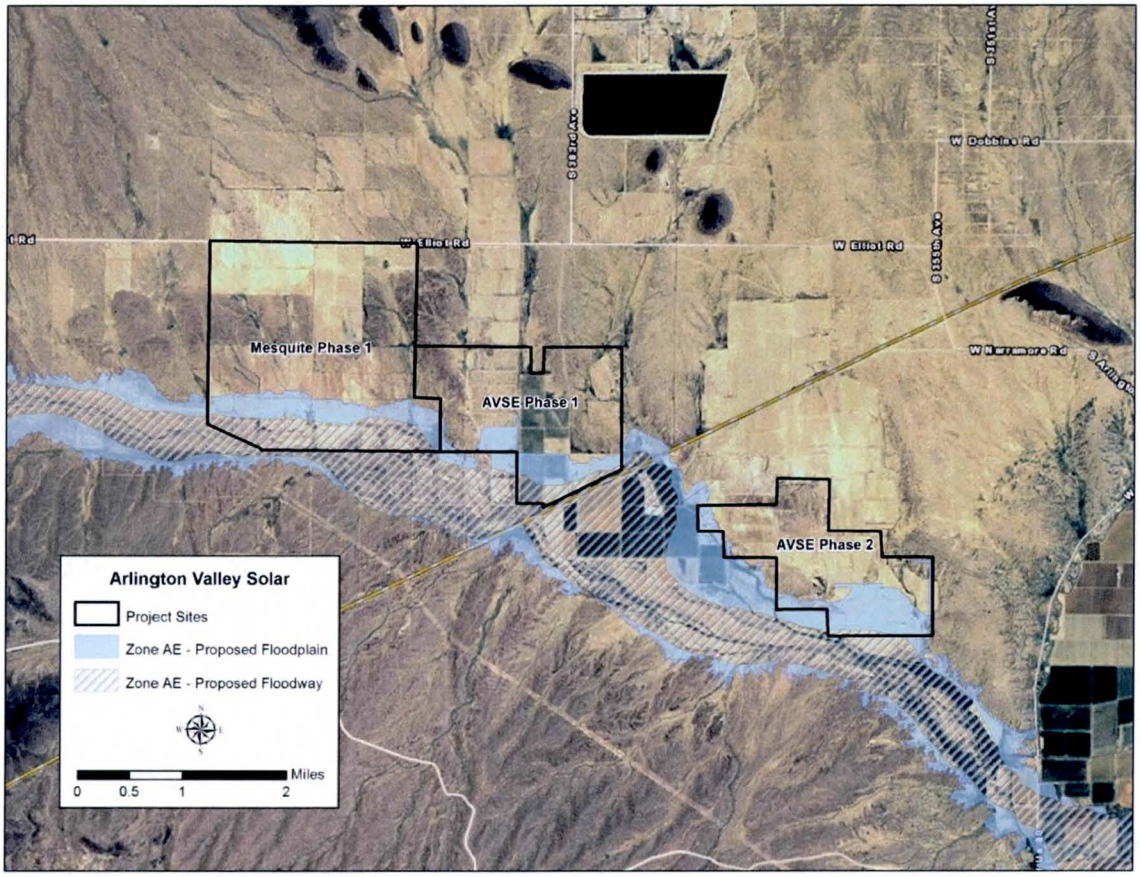

Figure 6-7. Location of the solar plants near the SPRR Bridge

Mesquite Solar 1 Project

The Mesquite Solar 1 Project by SEP II, LLC (a subsidiary of Sempra Generation) is a solar photovoltaic electrical generating facility that was completed in 2012. The total project site is approximately 6 square miles. The construction of the Mesquite Solar 1 Project caused changes to the topography and drainage patterns. The major drainage features constructed within the Mesquite Solar 1 Project are North and East Perimeter Channels as well as several retention basins designed to store on-site hydrology. A

LOMR (Case No. 12-09-2621P, effective on January 25, 2013, re-issued as LOMR Case No. 13-09-3112P) was applied for and granted which essentially maps a large portion of the Perimeter Channels as Zone A floodplains. The impact on the Centennial Wash floodplain is minimal as the flooding source for this LOMR is one of the tributaries to Centennial Wash (i.e., Wash T1S-R6W-S28N). The southernmost channel on the Mesquite Solar 1 Project has an as-built elevation of 876.10 feet NAVD88, which is higher than the BFE near this site of 872 feet NAVD88. Thus, water from Centennial Wash will not enter any of the drainage facilities associated with the Mesquite Solar 1 Project.

Arlington Valley Solar Energy I Project

The Arlington Valley Solar Energy I Project (AVSE I) is a proposed 125-MW solar photovoltaic power project site located near the left bank of Centennial Wash just upstream of the SPRR Bridge, adjacent to the Mesquite Solar 1 Project. This project has not begun construction and thus was not considered in the floodplain mapping for Centennial Wash.

Arlington Valley Solar Energy II Project

The Arlington Valley Solar Energy II Project (AVSE II) is also a 125-MW solar photovoltaic power project site located near the left bank of Centennial Wash just downstream of the SPRR Bridge, adjacent to the AVSE I Project. The AVSE II Project consists of a solar field of PV modules; inverters/step-up transformers; and a Common Services Area consisting of water treatment facilities, plant substation, wastewater ponds, and control buildings. Construction on the AVSE II Project is complete and as-built drawings have been generated (see Appendix C.1 for digital copies of the as-built drawings). As with the Mesquite Solar 1 Project, the construction will result in major changes to the topography and drainage on the site. The plans for the site call for large perimeter drainage channels as well as retention basins designed to store runoff from on-site changes in hydrologic conditions. Because of these changes, a CLOMR (Case No. 11-09-2791R) was applied for and approved prior to the construction of the AVSE II Project.

Because the AVSE II Project extends into the effective floodplain, the construction of this site modifies the topography and the floodplain on Centennial Wash. The topographic changes associated with the AVSE II Project site covers 35 cross sections (RS 6.20 to 3.21) in the HEC-RAS model developed for this FDS study. However, the AVSE II Project topography is not reflected in the digital topographic datasets that were used to develop the hydraulic model for Centennial Wash (see Section 3 of this report). Additionally, the final as-builts did not become available until August of 2013 (near the end of this study). Thus, the decision was made to incorporate the as-built drawings from the AVSE II Project into the HEC-RAS model developed for Centennial Wash. To accomplish this task, the as-built plans were georeferenced in ArcGIS and compared to the cross section cutlines to determine the extent to which the AVSE II Project construction would affect the HEC-RAS topography. The cross sections in HEC-RAS were then manually adjusted to reflect the as-built topography for the AVSE II Project. Floodplain

mapping in this area was also done on a manual basis to reflect the AVSE II Project as-built grading and topography. The areas impacted by these manual changes are called out on the work maps developed herein (see Exhibit A). The work maps showing these changes include Sheets 42, 44, and 45.

6.7.1.3 Distinct Mapping Boundary between FLO-2D and HEC-RAS Results

The next special issue encountered during this study was the mapping of the HEC-RAS and FLO-2D results in the Harquahala Valley. As discussed earlier, the one-dimensional approach to assessing the flow split area was insufficient to fully capture the hydraulics of Centennial Wash. Thus, a FLO-2D model was developed to better depict the flow split area and the spreading of water along the various irrigated farm fields located in the Centennial Wash Left Overbank.

The computational domain for the FLO-2D model includes the primary flow split area, the entire main channel of Centennial Wash and the Centennial Wash Left Overbank, and the confluence of these two flowpaths downstream. This total area is approximately 46 square miles (see Figure 6-8). This size of FLO-2D model allowed for the accurate depiction of the flow split, accurate depiction of the spreading of water across the agricultural land, and interaction of flow between the Centennial Wash main stem and the Centennial Wash Left Overbank area. The gird size utilized was 40 feet.

The computational domain of the HEC-RAS model is mainly composed of the main stem of Centennial Wash. HEC-RAS cross sections do cover a portion of the Centennial Wash Left Overbank near the flow split and then again near where the Centennial Wash Left Overbank converges back into the main stem of Centennial Wash. However, the HEC-RAS model does not extend into most of the Centennial Wash Left Overbank Area. Near the flow split, the HEC-RAS cross sections extend all the way across the flow split into the Centennial Wash Left Overbank area. These "full width" cross sections extend all the way down past the stock tank in the Centennial Wash Left Overbank area (see Figure 6-8). Extending the HEC-RAS model in this manner has the distinct advantage of simplifying the mapping process by having all HEC-RAS cross section widths match in the modeling and the mapping. In addition, the transition between the HEC-RAS and the FLO-2D model results becomes much smoother (i.e., the mapped floodplain widths are much more similar at this location than upstream near the stock tank embankment). While this approach does not utilize the FLO-2D results for mapping the flow split around the stock tank, the flow changes from the FLO-2D model were still utilized to inform the HEC-RAS flow change locations/values.

Once the two models were set up, the results from the FLO-2D model needed to be entered into the HEC-RAS model along the reach that bordered the Centennial Wash Left Overbank. After discussion with the District, it was determined to assign six flow change locations in the RAS model based on peak flow data extracted directly from hydrographs computed at the FLO-2D flow reporting locations as assigned in the with embankment FLO-2D model.

For mapping the floodplain, it was assumed that the floodplain for the HEC-RAS model was the correct floodplain in the Centennial Wash main stem even though there are FLO-2D results in this area. Doing this allows one model (i.e., HEC-RAS) to be used to map the entire main stem of Centennial Wash. The

FLO-2D results were used to map the floodplain in the Centennial Wash Left Overbank areas. These are the 2-dimensional flow areas that are not covered by the HEC-RAS model. A gutter line between the FLO-2D results and the HEC-RAS results (i.e., the line dividing the Centennial Wash main stem from the Centennial Wash Left Overbank) was assumed to be the end of the HEC-RAS cross sections. To summarize, HEC-RAS results were used to map in areas without FLO-2D results and FLO-2D results were used to map in areas without HEC-RAS results. In areas where there were both FLO-2D results and HEC-RAS results, the HEC-RAS results were used for mapping.

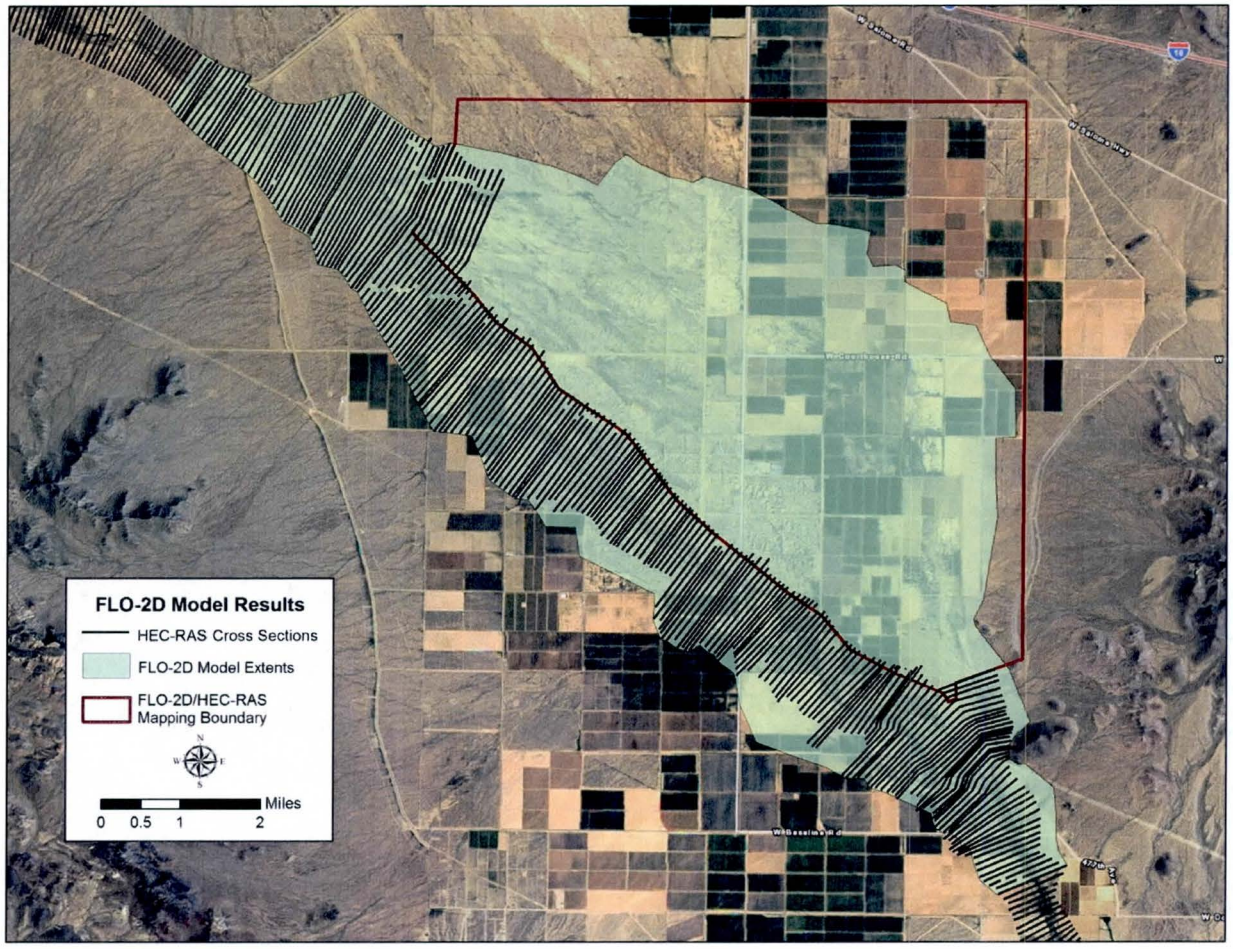

Figure 6-8. Mapping boundary between FLO-2D results and HEC-RAS results in the Harquahala Valley

6.7.1.4 Mapping HEC-RAS Results Near the SPRR Bridge

Due to the complex hydraulics represented in HEC-RAS near the bridge (see Section 6.5.2 above for a more detailed description), the mapping in this area was problematic as well. There were two areas of differing base flood elevations (BFE's) mapped near the bridge: one area includes the main branch of Centennial Wash upstream and downstream of Trestle #1, while the other area includes what will be termed herein as the "Centennial Wash RR Spill" (corresponding to the reach naming convention in the HEC-RAS model) area which drains through Trestles #2, #3, and #4. The reason for different mapping in

these two areas was the use of a "with embankment" and "without embankment" modeling scenario for the embankment adjacent to Trestle #1 as described in Section 6.5.4 above.

As mentioned in Section 6.5.4, the "with embankment" model computed the worst case scenario in regards to flooding depths in the main channel of Centennial Wash. The "without embankment" model computed the worst case scenario in regards to flooding depths in the overbank reach. However, as mentioned in Section 6.5.2, the overbank reach was represented using two reaches in the HEC-RAS model (the "Centennial W RR Spill" and "Centennial Field" reaches) because flow leaving this channel through Trestles #2 and #3 cannot enter into the same channel further downstream; another channel had to be created downstream of Trestles #2 and #3 to accept flow from these lateral structures. However, there is no physical division between these two reaches (similar to the large embankment that exists on the left bank of the main branch of Centennial Wash upstream and downstream of Trestle #1). Therefore, it did not seem commensurate with the modeling technique to map a broken BFE across these two reaches in the overbank area downstream of the bridge. Therefore, the worst case flooding depth from the two reaches downstream of the bridge in the overflow area was used for mapping in this part of the system. In all cases, the worst-case flooding depth between these two reaches occurred based on the computations in the "Centennial Field" reach downstream of Trestles #2 and #3. Intuitively, this makes sense as well. As flow that has spilled out of the main branch of Centennial Wash near Trestle #1 moves to the northeast along the railroad embankment, a significant amount of the remaining flow would spill through Trestle #2 first, then a lesser amount through Trestle #3, and finally the least through Trestle #4. Imagining this flooding in a two-dimensional environment, it seems likely that, while the flow would be primarily perpendicular to the bridge moving downstream, the water surface would likely have a slope in the direction parallel to the bridge, with the higher water surface elevations being near Trestle #2 and lower water surface elevations being near Trestle #4.

However, since only a one-dimensional modeling approach was used in the area downstream of the bridge and no physical feature separates the "Centennial Field" reach from the "Centennial W RR Spill" reach, WEST projected the higher BFE across the "Centennial W RR Spill" reach and utilized that elevation for the final elevation in floodplain mapping. Figure 6-9 shows both (a) the floodplain inundation boundaries and BFE's as if they were mapped in each reach from HEC-RAS independently with gutter lines in between the reaches and (b) the final floodplain inundation boundaries and BFE's shown in the digital information and work maps with the BFE's from the "Centennial Field" reach projected across the "Centennial W RR Spill" reach. This created an interesting situation immediately adjacent to the Trestle #4 opening. Since the BFE at the uppermost cross section in the "Centennial Field" reach (which is still downstream of Trestle #4) was approximately 852 feet and the computed water surface profile along the "Centennial W RR Spill" reach did not reach approximately 852 feet until upstream of Trestle #4, a flat water surface elevation (WSEL) of 852 feet NAVD88 was mapped in between the exact locations of the two BFE's based on the computed profiles of the two reaches (as shown in Figure 6-9a). The area mapped with a flat WSEL of 852 feet NAVD88 can be seen clearly in Figure 6-9b. We had to extend this methodology upstream of the bridge because a flood study cannot have increasing BFE's in the downstream direction. If we had stopped this methodology at the bridge, the BFE's downstream of the bridge would have been higher than the BFE's upstream of the bridge.

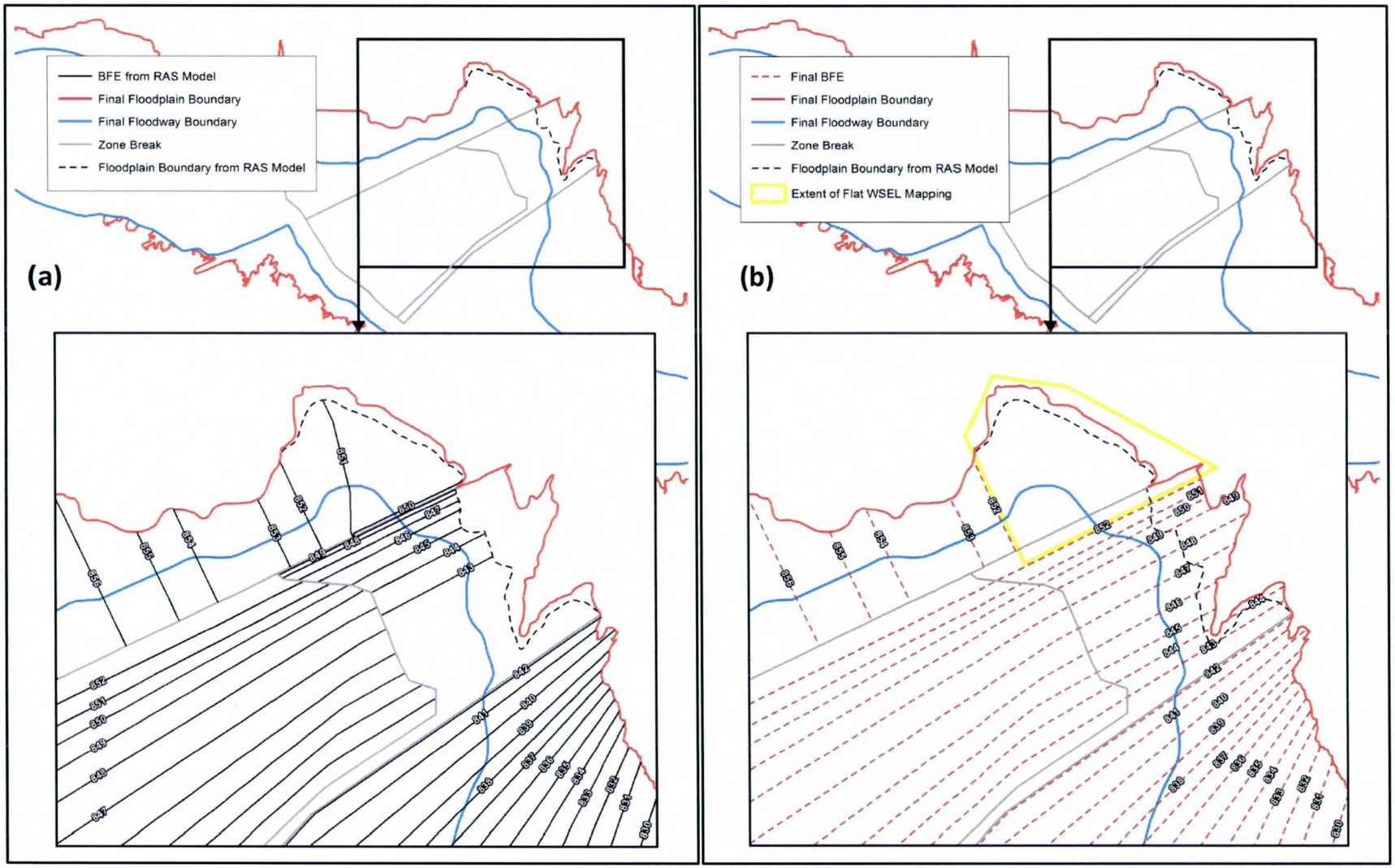

Figure 6-9. (a) Initial floodplain inundation boundaries and BFE's near the SPRR Bridge and (b) Final floodplain inundation boundaries and BFE's near the SPRR Bridge and flat WSEL mapping near Trestle #4

6.7.2 Modeling Warning and Error Messages

A summary of CHECKRAS warning and error messages for the HEC-RAS models developed herein can be found on disc in Appendix E.5. As can be seen from that summary document, all remaining CHECKRAS warning and error messages from CHECKRAS v1.4 were addressed in context of the study approach herein and were subsequently ignored.

6.8 Calibration

No measured field data was available for model calibration.

6.9 Final Results

6.9.1 Hydraulic Analysis Results

HEC-RAS summary output tables and encroachment tables are printed in Appendix E.5. Complete reporting documents and cross section plots can be found electronically on discs in Exhibit C. Final total cross sectional velocities in the models range from 0 feet per second (near the Trestle #4 bridge structure in the "Centennial W RR Spill" reach due to backwater in this reach) to 9.6 feet per second for both base conditions and encroached conditions. At no cross sections in any of the models does HEC-RAS default to critical depth, providing further confidence in the results calculated fully in the subcritical flow regime. Additionally, the variation in cross sectional area and top width is consistent from one cross section to the next throughout the models. The results are indicative of a hydraulic model representing the physical system well.

Several additional technical memoranda were developed and provided to the District throughout the duration of the project outlining various components of the hydraulic analyses. These additional memoranda can be found in Appendix E.5 herein.

6.9.2 Verification or Comparison of Results

Figure 6-10 below shows a comparison of FLO-2D and HEC-RAS results using two different methods. The first method, shown in the blue line, was completed by extracting water surface elevations from the FLO-2D results grid along each HEC-RAS cross section line. From these data, WEST then computed the average WSEL from the FLO-2D results grid at each HEC-RAS cross section location. Then the average WSEL from the FLO-2D results was subtracted from the HEC-RAS water surface elevation for the corresponding cross section. The second method, shown in the red line, was completed by extracting water surface elevations from the FLO-2D results grid along the HEC-RAS hydraulic baseline and computing the WSEL for the FLO-2D grid cell at which each HEC-RAS cross section line intersects the hydraulic baseline. The point value from FLO-2D was then subtracted from the HEC-RAS water surface elevation for the corresponding cross section. These models generally showed good agreement in calculated water surface elevation.

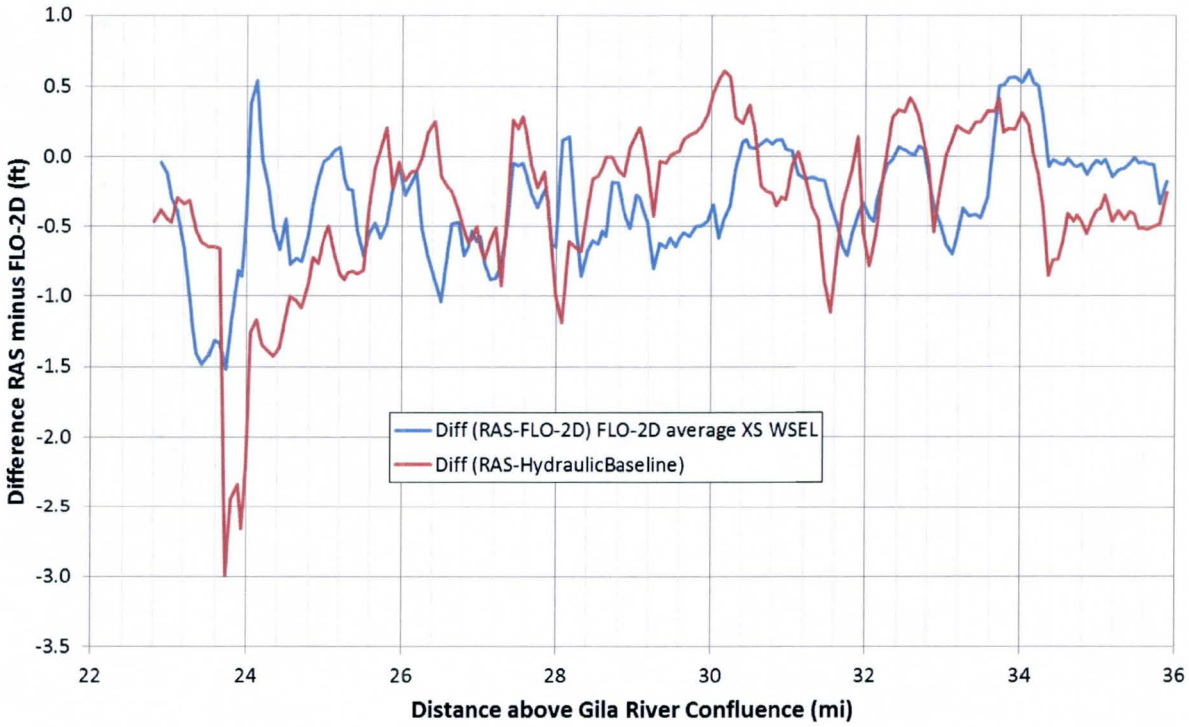

Figure 6-10. Comparison of HEC-RAS WSEL's to the FLO-2D results (a) averaged along each HEC-RAS XS line (shown in blue), and (b) the profile of FLO-2D results extracted along the HEC-RAS hydraulic baseline (shown in red).

It should also be noted that the results of this study do not compare well with the effective model results, as the flows were decreased for this study compared to the effective model but the BFE's computed herein were higher in many places with larger flood inundation extents. The project team determined these differences to be due to two primary issues. First, the effective topography is based on a 4-foot contour-interval topographic mapping dataset which, assuming an error on the order of +/- one half of the contour interval, has an error of +/- 2 feet. On a related note, the District noticed the original survey monuments used to develop this topographic dataset were significantly lower than the current information the Maricopa County Department of Transportation (MCDOT) has on file for these corner monuments. Finally, the District and WEST noticed a visual shift in the cross section information (primarily in the vicinity of the AVSE Phase II site but also in other locations throughout the reach).

The second reason for a difference between the results in the study presented herein and the effective study is the significant use of ineffective flow areas in this updated model. As is the case with many older studies, the effective model only uses ineffective flow areas at a few locations in the study reach. This update uses ineffective flow areas significantly throughout the study reach, primarily to represent agricultural areas for which flow will not be actively conveying water in the downstream direction. The difference this creates in available flow area would significantly increase the water surface elevations for the same flow between these two models.

7 Draft FIS Data

7.1 Summary of Discharges

As discussed in Section 4 above, the approved hydrology used herein was taken from a CLOMR (FEMA case number 12-09-0043R) submitted to FEMA that updated the hydrology that had been used in the previously effective floodplain delineation (RBF Consulting, Inc., 2011). The original hydrology (i.e., previously effective hydrology) was determined by means of an HEC-1 model developed by Cella Barr (Cella Barr Associates, 1989). The Flood Insurance Study (FIS) for Maricopa County (Federal Emegency Management Agency, 2005) reflects the hydrology developed by Cella Barr (Cella Barr Associates, 1989). The 2011 CLOMR (FEMA case number 12-09-0043R) was based on the addition of 20 years of gage record, statistical methods, and comparison to USGS Regional Regression Equations.

Table 7-1 below provides a summary of discharges in FEMA format for the Centennial Wash. The flow changes along the main branch of Centennial Wash as determined from the FLO-2D modeling task as discussed in Sections 5.5.5 and 6.5.5 above are shown in Table 7-2. It should be noted that the "calculated flow in the Left Overbank reach (cfs)" for this study as shown in this table were not taken directly from FLO-2D; these numbers are just a calculation of the total regulatory flow in this reach (34,347 cfs) minus the flow change entered into HEC-RAS. In other words, this calculation conserves volume by keeping the total flow rate the same, but this calculation does not account for the attenuation of the hydrograph calculated in FLO-2D as discussed in Section 5.5.5 and shown in Figure 5-9. We see the impact of the HVID north-south drainage channel in the results shown in Table 7-2; the increase in flow from 16,051 cfs to 22,085 cfs from RS 29.03 to 28.07 reflects the overland flow captured by the HVID north-south drainage channel that reenters the main branch of Centennial Wash in between these two flow change locations.

Table 7-1. 100-year discharges for Centennial Wash

Flooding Source and Location	Drainage Area (Square Miles)	Current Effective FEMA Discharge in cfs based on CLOMR (FEMA case number 12-09-0043R)	Previously Effective FEMA Discharge in cfs (Cella Barr Associates, 1989)
Centennial Wash at the confluence with the Gila River	1,870	44,590	67,300
Centennial Wash at the Union Pacific R.R. Bridge (formerly Southern Pacific)	1,825	44,041	67,300
Centennial Wash at Baseline Road	1,398	38,552	58,100
Centennial Wash at Centennial Road/Courthouse Road	1,110	34,347	52,300

Table 7-2. Distribution of flows in the vicinity of the primary flow split near the HVID Westside Canal

Flooding Source and Location	Proposed Floodplain Delineation Study Herein		Currently Effective Floodplain Delineation Study	
	Flow in Centennial Wash (cfs)	*Calculated flow in the Left Overbank reach (cfs)*	*Flow in Centennial Wash (cfs)*	*Flow in the Left Overbank reach (cfs)*
Centennial Wash RS 33.58 (flows from FLO-2D Floodplain XS 2 as shown in Figure 6-4)	23,512	10,835	49,100	3,100
Centennial Wash at RS 32.10 (flows taken from FLO-2D Floodplain XS 3 as shown in Figure 6-4)	20,282	14,065	49,100	3,100
Centennial Wash at RS 30.25 (flows taken from FLO-2D Floodplain XS 4 as shown in Figure 6-4)	17,111	17,236	45,700	6,500
Centennial Wash at RS 29.03 (flows taken from FLO-2D Floodplain XS 5 as shown in Figure 6-4)	16,051	18,296	45,700	6,500
Centennial Wash at RS 28.07 (flows taken from FLO-2D Floodplain XS 6 as shown in Figure 6-4)	22,085	12,262	45,700	6,500
Centennial Wash at RS 26.12 (flows taken from FLO-2D Floodplain XS 7 as shown in Figure 6-4)	21,677	12,670	45,700	6,500

7.2 Floodway Data

A draft floodway data table has been provided on the following pages in FEMA format (Table 7-4). It should be noted that the notes for the regulatory floodplain elevation for the "Centennial Wash RR Spill" reach are based on the discussion of the floodplain mapping in the vicinity of the SPRR Bridge in Section 6.7.1.4. It should also be noted that the regulatory 1-percent-annual-chance flood water surface elevation for the lowest 1.11 river miles of the main branch of Centennial Wash are interpolated values from the current effective Gila River floodplain BFE's (which were higher than the computed water surface elevations in this study for these lowest twelve cross sections).

7.3 Annotated Flood Insurance Rate Maps

Annotated Flood Insurance Rate Map (FIRM) panels showing the revised 1% annual chance event floodplains and floodway boundaries are provided in Exhibit B of this report. These annotated FIRM panels are designed to inform FEMA how the requester anticipates the FIRM panels will be revised.

The updates to the SFHA's proposed in this study intersect ten FIRM panels. Of these ten, three are at the scale of 1" = 1000' while seven are at the scale of 1" = 2000'. Panel numbers, effective panel dates, impacted communities, scale, and effective model reach are provided in Table 7-3 below.

Table 7-3. Summary of FIRM panels impacted by this study and shown in Exhibit B

FIRM Panel	Effective Date	Communities Impacted (FEMA Community Number)	Map Scale	Centennial Wash Effective Model Reach(es)
04013C1500L	10/16/2013	Maricopa County (040037)	1" = 2000'	Reach 3
04013C1525L	10/16/2013	Maricopa County (040037)	1" = 2000'	Reach 3
04013C1975L	10/16/2013	Maricopa County (040037)	1" = 2000'	Reach 2-Right, Reach 3
04013C2000L	10/16/2013	Maricopa County (040037)	1" = 2000'	Reach 2-Right, Reach 2-Left
04013C2025L	10/16/2013	Maricopa County (040037)	1" = 2000'	Reach 1, Reach 2-Right, Reach 2-Left
04013C2500L	10/16/2013	Maricopa County (040037)	1" = 2000'	Reach 1
04013C2525L	10/16/2013	Maricopa County (040037)	1" = 2000'	Reach 1
04013C2530L	10/16/2013	Maricopa County (040037)	1" = 1000'	Reach 1
04013C2540L	10/16/2013	Maricopa County (040037)	1" = 1000'	Reach 1
04013C2545L	10/16/2013	Maricopa County (040037)	1" = 1000'	Reach 1

7.4 Flood Profiles

FEMA-format draft annotated flood profiles were not generated as part of this deliverable, as the review contractor for FEMA has recommended that they generate these products for PMR map change requests. Instead, HEC-RAS export files (DXF) are provided in the electronic data for Appendix E.5 on the disc located in Exhibit C for all of the HEC-RAS models, and RASPLOT export files (DXF) are provided in the electronic data for Appendix E.5 on the disc located in Exhibit C for the two Zone AE areas mapped with sloping water surface elevations based on the results of the FLO-2D models.

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SECOND)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
Centennial Wash								
	0.34	7960	24638	1.8	777.3 [2]	764.9	765.4	0.5
	0.39	8426	22335	2.0	777.4 [2]	765.3	765.8	0.5
	0.46	8512	19015	2.3	777.4 [2]	766.0	766.5	0.5
	0.53	8355	19564	2.3	777.5 [2]	766.8	767.4	0.6
	0.60	7803	14311	3.1	777.5 [2]	768.0	769.0	1.0
	0.66	6022	15306	2.9	777.6 [2]	770.0	770.9	0.9
	0.73	4137	15312	2.9	777.6 [2]	771.7	772.3	0.5
	0.80	3853	13251	3.5	777.7 [2]	772.9	773.4	0.5
	0.88	3728	14683	3.0	777.8 [2]	774.2	774.7	0.5
	0.96	3551	14499	3.1	777.8 [2]	775.2	775.8	0.6
	1.04	3346	14223	3.1	777.9 [2]	776.0	776.7	0.7
	1.11	3354	12855	3.5	777.9 [2]	776.9	777.9	0.9
	1.18	2780	11721	3.8	778.2	778.2	779.2	1.0
	1.25	1689	7986	5.7	780.7	780.7	781.0	0.3
	1.31	1617	8416	5.6	782.6	782.6	783.0	0.4
	1.38	1679	9783	4.7	784.1	784.1	784.8	0.8
	1.44	1644	10509	4.3	785.1	785.1	785.9	0.8
	1.50	1401	10226	4.6	785.9	785.9	786.7	0.8
	1.56	1192	9832	5.3	786.5	786.5	787.4	0.9
	1.61	1680	10420	4.2	787.0	787.0	788.0	0.9
	1.66	1832	10419	4.2	787.5	787.5	788.4	0.9
	1.71	1854	10761	4.1	788.3	788.3	789.0	0.7
	1.77	1792	10766	4.1	789.1	789.1	789.8	0.6
	1.84	1902	11659	3.8	790.1	790.1	790.8	0.6
	1.90	1870	9945	4.4	790.9	790.9	791.5	0.6

[1]Miles above confluence with Gila River

[2]Regulatory (FEET NAVD) is taken from the Gila River base flood elevations

TABLE 7-4

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, ARIZONA AND INCORPORATED AREAS

FLOODWAY DATA

CENTENNIAL WASH

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SECOND)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
Centennial Wash (Cont'd)								
	1.96	1865	10543	4.2	792.1	792.1	792.7	0.6
	2.04	2159	15078	2.9	794.1	794.1	794.9	0.7
	2.12	2341	16611	2.7	795.3	795.3	796.1	0.8
	2.20	2602	18738	2.4	796.1	796.1	796.9	0.8
	2.27	2686	18650	2.4	796.6	796.6	797.5	0.9
	2.33	2737	17960	2.5	797.1	797.1	798.0	0.9
	2.38	2790	18298	2.4	797.7	797.7	798.6	1.0
	2.43	2833	17609	2.5	798.4	798.4	799.2	0.8
	2.51	2883	16880	2.6	799.5	799.5	800.2	0.7
	2.58	2893	18397	2.4	800.7	800.7	801.6	0.9
	2.66	2828	18611	2.4	801.8	801.8	802.6	0.9
	2.73	2726	18798	2.3	802.9	802.9	803.7	0.8
	2.81	2637	18956	2.3	804.0	804.0	804.8	0.8
	2.90	2558	18717	2.4	804.9	804.9	805.7	0.9
	3.00	2491	19106	2.3	805.8	805.8	806.8	0.9
	3.08	2506	19020	2.3	806.7	806.7	807.6	0.9
	3.16	2553	18910	2.3	807.4	807.4	808.3	0.9
	3.21	2773	20197	2.2	807.9	807.9	808.8	0.9
	3.27	3072	22761	1.9	808.3	808.3	809.2	0.9
	3.32	3271	22533	2.0	808.5	808.5	809.5	1.0
	3.38	3362	22156	2.0	808.7	808.7	809.6	1.0
	3.45	3239	19617	2.3	809.0	809.0	809.9	1.0
	3.53	2958	16590	2.7	809.4	809.4	810.3	0.9
	3.60	2873	14620	3.0	810.2	810.2	810.9	0.8
	3.66	2854	13638	3.2	810.9	810.9	811.6	0.7

[1]Miles above confluence with Gila River

TABLE 7-4

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, ARIZONA AND INCORPORATED AREAS

FLOODWAY DATA

CENTENNIAL WASH

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SECOND)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
Centennial Wash (Cont'd)								
	3.71	2733	13456	3.3	811.9	811.9	812.5	0.6
	3.77	2608	13517	3.3	812.8	812.8	813.3	0.5
	3.84	2364	12763	3.5	814.3	814.3	814.7	0.5
	3.90	2212	15024	2.9	815.4	815.4	815.9	0.5
	3.98	2138	15188	2.9	816.2	816.2	816.7	0.5
	4.07	2018	14151	3.1	816.8	816.8	817.3	0.6
	4.14	1940	13339	3.3	817.2	817.2	817.8	0.6
	4.22	1884	11737	3.8	817.8	817.8	818.5	0.7
	4.30	1981	11545	3.8	818.5	818.5	819.3	0.7
	4.37	2041	11447	3.9	819.4	819.4	820.0	0.6
	4.46	2109	13879	3.2	820.3	820.3	820.9	0.6
	4.54	2295	12990	3.4	820.9	820.9	821.5	0.6
	4.60	2439	12524	3.5	821.5	821.5	822.3	0.7
	4.68	2592	14428	3.1	822.3	822.3	823.2	0.9
	4.75	2618	12410	3.6	823.0	823.0	823.9	0.9
	4.83	2796	13777	3.2	823.7	823.7	824.7	1.0
	4.91	2770	12390	3.6	824.5	824.5	825.4	0.9
	4.99	2770	13146	3.4	825.2	825.2	826.2	0.9
	5.06	2666	11080	4.0	825.9	825.9	826.8	0.9
	5.13	2672	11995	3.7	827.1	827.1	828.0	0.9
	5.19	2673	13383	3.3	828.0	828.0	828.9	0.9
	5.27	2693	12987	3.4	829.1	829.1	829.8	0.7
	5.33	2735	13369	3.3	829.9	829.9	830.7	0.7
	5.42	2705	12822	3.4	830.9	830.9	831.7	0.8
	5.50	2752	13194	3.3	831.7	831.7	832.5	0.9

[1]Miles above confluence with Gila River

TABLE 7-4

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, ARIZONA AND INCORPORATED AREAS

FLOODWAY DATA

CENTENNIAL WASH

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SECOND)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
Centennial Wash (Cont'd)								
	5.57	2778	12967	3.4	832.4	832.4	833.3	0.9
	5.65	2839	13683	3.2	833.3	833.3	834.2	0.9
	5.74	2465	13997	3.2	834.1	834.1	835.0	0.8
	5.83	3104	13859	3.2	834.9	834.9	835.7	0.7
	5.91	3446	14858	3.0	835.7	835.7	836.3	0.6
	5.98	3748	14423	3.1	836.3	836.3	836.9	0.6
	6.06	4306	15066	3.0	837.2	837.2	837.8	0.6
	6.13	4722	16378	3.0	838.2	838.2	839.0	0.8
	6.20	5296	19760	2.5	839.1	839.1	840.0	0.8
	6.27	5636	20470	2.6	839.9	839.9	840.7	0.8
	6.36	5879	21611	2.4	840.8	840.8	841.6	0.8
	6.51	6171	23546	2.2	841.9	841.9	842.6	0.7
	6.59	557	2219	9.6	845.4	845.4	845.9	0.6
	6.67	599	3779	5.7	848.4	848.4	849.4	1.0
	6.74	572	3111	7.4	849.7	849.7	850.3	0.6
	6.81	512	2922	8.1	851.2	851.2	851.8	0.6
	6.89	717	4646	5.1	852.6	852.6	853.5	0.9
	6.97	658	4352	5.5	853.5	853.5	854.2	0.7
	7.04	534	4199	5.7	854.5	854.5	854.9	0.5
	7.12	589	4683	5.1	855.1	855.1	855.7	0.6
	7.19	541	4604	5.2	855.8	855.8	856.4	0.6
	7.27	601	5266	4.5	856.2	856.2	857.2	0.9
	7.35	534	4318	5.5	856.7	856.7	857.7	1.0
	7.39	550	5025	4.7	859.3	859.3	859.7	0.5
	7.62	2149	19516	1.3	859.4	859.4	860.4	1.0

[1]Miles above confluence with Gila River

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SECOND)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
Centennial Wash (Cont'd)								
	7.75	2556	18240	1.5	859.5	859.5	860.5	1.0
	7.81	2529	18379	1.6	859.6	859.6	860.5	1.0
	7.83	2553	17671	1.6	859.6	859.6	860.6	0.9
	7.90	3401	20061	1.8	859.9	859.9	860.7	0.8
	7.98	4059	22830	1.7	860.2	860.2	860.9	0.7
	8.05	4041	19737	2.1	860.4	860.4	861.1	0.6
	8.13	3753	17124	2.6	861.0	861.0	861.5	0.5
	8.21	3400	14314	3.1	861.8	861.8	862.1	0.3
	8.28	3095	12540	3.5	862.7	862.7	863.0	0.3
	8.36	3102	12248	3.2	863.4	863.4	863.8	0.4
	8.43	2975	11176	3.5	863.9	863.9	864.4	0.5
	8.51	3117	11732	3.3	864.6	864.6	865.2	0.7
	8.58	3229	11795	3.3	865.3	865.3	866.0	0.6
	8.66	3686	12220	3.2	866.2	866.2	866.7	0.5
	8.73	4006	12969	3.0	867.0	867.0	867.4	0.4
	8.81	4235	13346	2.9	867.8	867.8	868.2	0.4
	8.89	4497	13910	2.8	868.4	868.4	868.9	0.5
	8.96	4697	14149	2.7	869.0	869.0	869.5	0.5
	9.04	4619	12860	3.0	869.6	869.6	870.0	0.4
	9.11	4474	11712	3.3	870.4	870.4	870.8	0.3
	9.19	4303	11211	3.4	871.2	871.2	871.5	0.3
	9.27	4091	10884	3.5	872.1	872.1	872.3	0.2
	9.34	3703	10407	3.7	873.3	873.3	873.3	0.1
	9.40	3273	8926	4.3	874.3	874.3	874.4	0.1
	9.45	2838	9460	4.1	875.2	875.2	875.5	0.2

[1]Miles above confluence with Gila River

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SECOND)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
Centennial Wash (Cont'd)								
	9.50	2533	8987	4.3	875.9	875.9	876.2	0.4
	9.57	2325	8549	4.5	876.8	876.8	877.3	0.5
	9.65	2092	8415	4.6	878.0	878.0	878.6	0.6
	9.72	1793	8114	4.8	878.8	878.8	879.5	0.7
	9.78	1897	7316	5.3	879.6	879.6	880.3	0.8
	9.84	1899	7726	5.0	880.5	880.5	881.2	0.8
	9.89	1931	8124	4.8	881.1	881.1	881.9	0.8
	9.95	1949	8165	4.7	881.8	881.8	882.5	0.7
	10.02	1932	7869	4.9	882.7	882.7	883.3	0.7
	10.10	1893	7811	4.9	883.6	883.6	884.2	0.6
	10.17	1856	8052	4.8	884.5	884.5	885.1	0.7
	10.25	1866	7609	5.1	885.3	885.3	886.0	0.6
	10.34	1904	8438	4.6	886.4	886.4	887.0	0.6
	10.41	1912	8716	4.4	887.1	887.1	887.7	0.6
	10.49	1917	9000	4.3	887.8	887.8	888.4	0.6
	10.57	1903	8649	4.5	888.5	888.5	889.0	0.5
	10.63	1927	8682	4.4	889.2	889.2	889.8	0.5
	10.70	2001	8469	4.6	890.1	890.1	890.6	0.5
	10.77	1986	8695	4.4	891.1	891.1	891.6	0.5
	10.84	1929	8403	4.6	891.9	891.9	892.6	0.7
	10.92	1999	9372	4.1	893.1	893.1	893.9	0.7
	10.99	2165	10158	3.8	893.9	893.9	894.7	0.8
	11.08	2500	11035	3.5	894.8	894.8	895.6	0.8
	11.14	2519	10771	3.6	895.8	895.8	896.4	0.6
	11.22	2479	10037	3.8	896.8	896.8	897.2	0.5

[1]Miles above confluence with Gila River

TABLE 7-4

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, ARIZONA AND INCORPORATED AREAS

FLOODWAY DATA

CENTENNIAL WASH

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SECOND)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
Centennial Wash (Cont'd)								
	11.29	2279	9375	4.1	897.6	897.6	898.0	0.4
	11.36	2094	9003	4.3	898.3	898.3	898.8	0.5
	11.44	2021	8641	4.5	899.1	899.1	899.7	0.6
	11.50	2006	8634	4.5	899.9	899.9	900.5	0.7
	11.56	2014	8592	4.5	900.7	900.7	901.4	0.7
	11.61	1985	8928	4.3	901.4	901.4	902.2	0.8
	11.67	1945	8994	4.3	902.2	902.2	903.0	0.9
	11.74	1904	8664	4.5	903.3	903.3	904.2	0.8
	11.82	1860	8493	4.5	904.6	904.6	905.4	0.9
	11.90	1901	8972	4.3	905.7	905.7	906.7	1.0
	11.97	1836	9344	4.1	906.7	906.7	907.7	1.0
	12.03	1759	9269	4.2	907.3	907.3	908.2	1.0
	12.07	1610	8342	4.6	907.7	907.7	908.6	0.9
	12.13	1458	7831	4.9	908.6	908.6	909.4	0.8
	12.21	1398	7719	5.0	909.7	909.7	910.4	0.7
	12.28	1388	8154	4.7	910.7	910.7	911.4	0.7
	12.36	1373	8269	4.7	911.8	911.8	912.4	0.6
	12.43	1399	8334	4.6	912.7	912.7	913.3	0.5
	12.48	1418	8024	4.8	913.2	913.2	913.8	0.6
	12.52	1462	8027	4.8	913.7	913.7	914.3	0.6
	12.60	1514	7972	4.8	914.5	914.5	915.2	0.7
	12.69	1623	8386	4.6	915.5	915.5	916.1	0.6
	12.77	1859	9968	3.9	916.6	916.6	917.2	0.6
	12.85	2492	11295	3.4	917.5	917.5	918.3	0.8
	12.92	2557	11466	3.4	918.4	918.4	919.2	0.9

[1]Miles above confluence with Gila River

TABLE 7-4

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, ARIZONA AND INCORPORATED AREAS

FLOODWAY DATA

CENTENNIAL WASH

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SECOND)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
Centennial Wash (Cont'd)								
	13.00	2456	11121	3.5	919.5	919.5	920.4	0.9
	13.08	2540	11833	3.3	920.8	920.8	921.7	0.9
	13.15	2672	13253	2.9	921.8	921.8	922.7	0.9
	13.21	2780	14247	2.7	922.5	922.5	923.4	0.9
	13.25	2646	13963	2.8	922.9	922.9	923.7	0.8
	13.30	2371	13126	2.9	923.4	923.4	924.2	0.8
	13.38	2260	12844	3.0	924.1	924.1	925.0	0.9
	13.46	2305	12863	3.0	924.9	924.9	925.8	0.9
	13.53	2310	12746	3.0	925.7	925.7	926.5	0.8
	13.57	2294	12451	3.1	926.1	926.1	926.8	0.7
	13.61	2280	12172	3.2	926.4	926.4	927.1	0.7
	13.69	2277	10951	3.5	927.0	927.0	927.6	0.6
	13.77	2237	9830	3.9	927.6	927.6	928.2	0.6
	13.85	2233	9419	4.1	928.5	928.5	929.1	0.6
	13.93	1821	7735	5.0	930.0	930.0	930.3	0.3
	14.01	1425	7034	5.5	931.3	931.3	931.7	0.4
	14.09	1280	7919	4.9	932.7	932.7	933.0	0.4
	14.17	1168	7430	5.2	933.8	933.8	934.2	0.4
	14.24	1047	7049	5.5	935.3	935.3	935.8	0.5
	14.32	955	7353	5.2	937.1	937.1	937.6	0.6
	14.39	973	7595	5.1	938.7	938.7	939.3	0.6
	14.44	1090	8771	4.4	939.7	939.7	940.3	0.6
	14.49	1211	9760	4.0	940.4	940.4	941.1	0.7
	14.55	1404	10981	3.5	940.9	940.9	941.7	0.8
	14.62	1680	12243	3.2	941.5	941.5	942.3	0.8

[1]Miles above confluence with Gila River

TABLE 7-4

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, ARIZONA AND INCORPORATED AREAS

FLOODWAY DATA

CENTENNIAL WASH

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SECOND)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
Centennial Wash (Cont'd)								
	14.70	1827	11834	3.3	941.9	941.9	942.8	0.9
	14.75	1854	10954	3.5	942.2	942.2	943.0	0.8
	14.80	1859	10179	3.8	942.5	942.5	943.3	0.7
	14.85	1796	9355	4.1	943.2	943.2	943.7	0.5
	14.93	1654	8140	4.7	944.1	944.1	944.4	0.4
	15.02	1528	7574	5.1	945.1	945.1	945.4	0.3
	15.10	1538	7751	5.0	946.1	946.1	946.5	0.4
	15.18	1454	7469	5.2	947.1	947.1	947.6	0.4
	15.24	1389	7114	5.4	947.8	947.8	948.3	0.5
	15.29	1383	7233	5.3	948.4	948.4	948.9	0.5
	15.34	1391	7164	5.4	948.9	948.9	949.5	0.6
	15.41	1385	7269	5.3	949.8	949.8	950.4	0.6
	15.49	1403	7283	5.3	950.6	950.6	951.3	0.8
	15.56	1382	6837	5.6	952.4	952.4	952.7	0.3
	15.63	1424	6965	5.5	954.1	954.1	954.3	0.2
	15.71	1571	6016	6.4	955.2	955.2	955.4	0.2
	15.79	1760	8854	4.4	956.7	956.7	957.5	0.8
	15.84	1848	9345	4.1	957.2	957.2	958.0	0.7
	15.89	1831	8306	4.6	957.7	957.7	958.4	0.6
	15.99	1639	7812	4.9	958.9	958.9	959.2	0.3
	16.08	1401	6428	6.0	960.2	960.2	960.4	0.2
	16.17	1128	5048	7.6	961.7	961.7	962.0	0.3
	16.25	1182	6335	6.1	963.9	963.9	964.4	0.6
	16.32	1374	7117	5.4	965.1	965.1	965.8	0.6
	16.38	1395	7323	5.3	966.3	966.3	966.7	0.4

[1]Miles above confluence with Gila River

TABLE 7-4

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, ARIZONA AND INCORPORATED AREAS

FLOODWAY DATA

CENTENNIAL WASH

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SECOND)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
Centennial Wash (Cont'd)								
	16.43	1255	7192	5.4	967.4	967.4	967.9	0.5
	16.47	1110	6413	6.0	968.4	968.4	968.8	0.5
	16.55	958	5809	6.6	969.8	969.8	970.6	0.7
	16.64	834	5198	7.4	971.2	971.2	971.9	0.7
	16.71	887	6021	6.4	972.3	972.3	973.1	0.8
	16.79	1003	6185	6.2	973.3	973.3	974.1	0.8
	16.87	1051	6472	6.0	974.2	974.2	974.9	0.7
	16.94	1144	4986	7.7	975.2	975.2	975.7	0.4
	17.02	1243	5597	6.9	976.5	976.5	977.4	0.9
	17.09	1202	5854	6.6	977.6	977.6	978.6	1.0
	17.17	1127	5268	7.3	979.5	979.5	979.7	0.2
	17.25	924	4928	7.8	981.7	981.7	981.9	0.2
	17.33	809	5100	7.6	983.3	983.3	983.9	0.6
	17.40	700	4054	9.5	984.1	984.1	984.5	0.5
	17.47	686	4660	8.3	985.9	985.9	986.5	0.6
	17.55	729	4484	8.6	987.1	987.1	987.6	0.5
	17.62	776	4334	8.9	988.4	988.4	988.8	0.4
	17.70	767	5022	7.7	990.6	990.6	990.7	0.1
	17.76	745	4497	8.6	991.3	991.3	991.4	0.1
	17.80	772	4620	8.3	991.9	991.9	992.3	0.4
	17.85	804	5287	7.3	993.5	993.5	994.1	0.6
	17.92	784	5459	7.1	994.5	994.5	995.4	0.8
	18.00	772	5372	7.2	995.5	995.5	996.3	0.7
	18.07	724	4990	7.7	996.6	996.6	997.3	0.7
	18.15	689	4619	8.4	997.8	997.8	998.4	0.7

[1]Miles above confluence with Gila River

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SECOND)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
Centennial Wash (Cont'd)								
	18.22	646	4951	7.8	1000.3	1000.3	1000.9	0.5
	18.25	653	5376	7.2	1001.1	1001.1	1001.9	0.8
	18.30	660	5208	7.4	1001.5	1001.5	1002.5	1.0
	18.38	707	5228	7.4	1002.7	1002.7	1003.6	0.9
	18.46	731	4823	8.0	1003.7	1003.7	1004.4	0.7
	18.53	764	5629	6.9	1006.0	1006.0	1006.4	0.4
	18.59	798	6415	6.0	1007.4	1007.4	1007.9	0.5
	18.61	797	6570	5.9	1007.8	1007.8	1008.3	0.6
	18.69	812	6737	5.7	1008.8	1008.8	1009.5	0.6
	18.76	809	6279	6.1	1009.3	1009.3	1010.0	0.7
	18.84	783	5794	6.7	1010.6	1010.6	1011.0	0.4
	18.91	750	6672	5.8	1011.7	1011.7	1012.2	0.4
	18.99	708	5955	6.5	1012.6	1012.6	1013.3	0.6
	19.07	732	5930	6.5	1013.5	1013.5	1014.3	0.8
	19.14	756	5913	6.5	1014.5	1014.5	1015.3	0.8
	19.22	792	6072	6.4	1015.8	1015.8	1016.5	0.7
	19.27	784	5984	6.4	1016.7	1016.7	1017.4	0.6
	19.31	766	6260	6.2	1017.5	1017.5	1018.2	0.7
	19.37	763	6630	5.8	1018.6	1018.6	1019.4	0.8
	19.45	756	6428	6.0	1019.6	1019.6	1020.3	0.7
	19.53	779	5688	6.8	1020.3	1020.3	1021.0	0.6
	19.60	933	6654	5.8	1021.7	1021.7	1022.1	0.4
	19.67	973	6692	5.8	1022.7	1022.7	1023.0	0.3
	19.75	1119	7283	5.3	1024.1	1024.1	1024.6	0.5
	19.84	1167	7541	5.1	1025.6	1025.6	1026.3	0.7

[1]Miles above confluence with Gila River

TABLE 7-4

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, ARIZONA AND INCORPORATED AREAS

FLOODWAY DATA

CENTENNIAL WASH

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SECOND)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
Centennial Wash (Cont'd)								
	19.92	1287	8355	4.6	1026.8	1026.8	1027.8	1.0
	19.96	1291	8222	4.7	1027.6	1027.6	1028.6	1.0
	20.01	1253	7785	5.0	1028.5	1028.5	1029.4	0.9
	20.07	1197	7912	4.9	1029.4	1029.4	1030.3	0.9
	20.15	1104	7298	5.3	1030.9	1030.9	1031.8	0.9
	20.22	1211	8456	4.6	1032.4	1032.4	1033.4	0.9
	20.29	1350	9115	4.2	1033.6	1033.6	1034.5	0.9
	20.36	1244	8582	4.5	1034.9	1034.9	1035.6	0.8
	20.43	1212	8482	4.6	1036.3	1036.3	1036.9	0.6
	20.49	1230	8440	4.6	1037.2	1037.2	1037.7	0.6
	20.51	1136	7844	4.9	1037.6	1037.6	1038.1	0.6
	20.58	1040	7355	5.2	1038.9	1038.9	1039.5	0.6
	20.66	888	6992	5.8	1040.6	1040.6	1041.1	0.4
	20.74	778	7314	6.0	1042.5	1042.5	1042.9	0.3
	20.81	1014	8782	4.4	1043.8	1043.8	1044.4	0.6
	20.89	1170	9846	3.9	1044.7	1044.7	1045.3	0.6
	20.97	1256	9887	3.9	1045.4	1045.4	1045.9	0.5
	21.04	1299	9410	4.1	1045.9	1045.9	1046.4	0.4
	21.12	1293	8747	4.4	1046.4	1046.4	1046.7	0.4
	21.20	1337	8622	4.5	1046.9	1046.9	1047.2	0.3
	21.28	1333	8441	4.6	1047.4	1047.4	1047.6	0.2
	21.36	1344	10204	3.8	1048.8	1048.8	1049.6	0.8
	21.44	1403	11968	3.2	1050.3	1050.3	1051.2	0.9
	21.51	1442	11942	3.2	1051.2	1051.2	1051.9	0.7
	21.58	1464	11821	3.3	1051.8	1051.8	1052.5	0.7

[1]Miles above confluence with Gila River

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SECOND)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
Centennial Wash (Cont'd)								
	21.66	1457	11433	3.4	1052.3	1052.3	1053.0	0.8
	21.74	1406	11365	3.4	1052.7	1052.7	1053.5	0.8
	21.82	1407	11069	3.7	1053.5	1053.5	1054.2	0.7
	21.89	1561	12412	3.5	1054.8	1054.8	1055.6	0.8
	21.97	1070	15141	3.8	1056.1	1056.1	1057.0	0.9
	22.04	1103	17637	3.7	1056.9	1056.9	1057.7	0.8
	22.12	1217	19895	3.3	1058.0	1058.0	1058.8	0.8
	22.20	2136	18524	2.3	1058.8	1058.8	1059.6	0.8
	22.27	2085	17181	2.3	1059.2	1059.2	1060.0	0.9
	22.35	2222	16878	2.3	1059.7	1059.7	1060.5	0.8
	22.42	2396	18875	2.3	1060.4	1060.4	1061.2	0.8
	22.50	2613	19994	2.1	1061.0	1061.0	1061.9	0.9
	22.58	2749	20557	1.9	1061.4	1061.4	1062.3	0.9
	22.66	2798	19180	2.1	1061.6	1061.6	1062.5	0.9
	22.73	2822	18804	2.2	1061.8	1061.8	1062.7	0.8
	22.80	2846	17116	2.4	1062.3	1062.3	1063.1	0.8
	22.90	2879	16034	2.4	1063.2	1063.2	1063.9	0.7
	22.98	3032	16476	2.3	1063.8	1063.8	1064.6	0.8
	23.03	3247	18269	2.1	1064.2	1064.2	1065.0	0.8
	23.11	3385	19004	2.0	1064.7	1064.7	1065.5	0.8
	23.20	3278	15910	2.4	1065.2	1065.2	1066.0	0.8
	23.27	3078	12236	1.8	1065.6	1065.6	1066.3	0.8
	23.32	2915	10830	2.0	1065.8	1065.8	1066.4	0.7
	23.36	2858	9649	2.3	1066.0	1066.0	1066.6	0.6
	23.43	2745	8695	2.5	1066.5	1066.5	1066.9	0.5

[1]Miles above confluence with Gila River

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SECOND)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
Centennial Wash (Cont'd)								
	23.52	2588	8144	2.7	1067.2	1067.2	1067.4	0.3
	23.59	2513	8183	2.7	1067.8	1067.8	1067.9	0.2
	23.66	2536	8840	2.5	1068.3	1068.3	1068.4	0.1
	23.73	2510	7719	2.8	1069.1	1069.1	1069.2	0.1
	23.80	2397	8776	2.5	1070.6	1070.6	1070.7	0.1
	23.89	2279	9850	2.2	1072.0	1072.0	1072.7	0.6
	23.94	1845	8302	2.7	1072.5	1072.5	1073.4	0.9
	23.99	1816	7441	3.0	1073.6	1073.6	1074.5	0.9
	24.05	1933	8741	2.5	1075.1	1075.1	1075.6	0.5
	24.13	1783	8697	2.5	1076.0	1076.0	1076.5	0.6
	24.20	2247	9966	2.2	1076.7	1076.7	1077.6	0.9
	24.28	2460	11300	1.9	1077.5	1077.5	1078.4	0.9
	24.35	2396	10674	2.0	1078.1	1078.1	1078.8	0.7
	24.42	2301	9830	2.2	1078.9	1078.9	1079.5	0.6
	24.50	2285	9261	2.3	1079.8	1079.8	1080.4	0.6
	24.56	2335	10484	2.1	1080.5	1080.5	1081.3	0.7
	24.64	2465	11836	1.8	1081.1	1081.1	1081.9	0.9
	24.71	2658	12074	1.8	1081.7	1081.7	1082.5	0.9
	24.80	2890	11864	1.8	1082.6	1082.6	1083.4	0.8
	24.86	2971	12009	1.8	1083.3	1083.3	1084.0	0.7
	24.92	2999	12521	1.7	1083.9	1083.9	1084.6	0.7
	24.99	2989	13141	1.7	1084.9	1084.9	1085.6	0.7
	25.06	2857	13037	1.7	1086.0	1086.0	1086.7	0.7
	25.14	2699	12644	1.7	1086.8	1086.8	1087.5	0.7
	25.21	2436	11967	1.8	1087.5	1087.5	1088.3	0.9

[1]Miles above confluence with Gila River

TABLE 7-4

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, ARIZONA AND INCORPORATED AREAS

FLOODWAY DATA

CENTENNIAL WASH

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SECOND)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
Centennial Wash (Cont'd)								
	25.26	2226	11397	1.9	1088.0	1088.0	1088.9	0.9
	25.31	2131	11044	2.0	1088.4	1088.4	1089.3	0.9
	25.36	2088	9976	2.2	1088.8	1088.8	1089.6	0.8
	25.43	2025	9076	2.4	1089.4	1089.4	1090.0	0.7
	25.51	1938	7967	2.7	1090.0	1090.0	1090.5	0.5
	25.58	1657	6997	3.1	1091.0	1091.0	1091.3	0.3
	25.66	1386	5831	3.7	1092.0	1092.0	1092.3	0.3
	25.73	1275	5355	4.1	1092.9	1092.9	1093.4	0.5
	25.81	1392	6090	3.6	1094.2	1094.2	1094.8	0.6
	25.89	1544	8162	2.7	1095.5	1095.5	1096.3	0.8
	25.97	1693	9114	2.4	1096.5	1096.5	1097.4	0.8
	26.04	1777	9709	2.2	1097.2	1097.2	1098.0	0.8
	26.12	1803	9487	2.3	1097.8	1097.8	1098.5	0.7
	26.19	1805	8822	2.5	1098.6	1098.6	1099.2	0.6
	26.26	1816	8255	2.7	1099.4	1099.4	1100.0	0.6
	26.34	1859	8666	2.6	1100.3	1100.3	1100.8	0.5
	26.43	1920	9101	2.4	1101.2	1101.2	1101.7	0.5
	26.51	2002	9100	2.4	1102.2	1102.2	1102.8	0.6
	26.59	2053	9614	2.3	1103.4	1103.4	1104.2	0.8
	26.65	2028	9317	2.4	1104.2	1104.2	1105.1	0.9
	26.73	1942	9686	2.3	1105.0	1105.0	1105.9	0.9
	26.80	1784	8799	2.5	1105.6	1105.6	1106.5	0.9
	26.86	1624	7801	2.8	1106.2	1106.2	1107.0	0.8
	26.91	1765	7597	2.9	1106.8	1106.8	1107.5	0.7
	26.97	1901	7914	2.8	1107.5	1107.5	1108.0	0.5

[1]Miles above confluence with Gila River

TABLE 7-4

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, ARIZONA AND INCORPORATED AREAS

FLOODWAY DATA

CENTENNIAL WASH

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SECOND)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
Centennial Wash (Cont'd)								
	27.02	2063	8400	2.6	1108.2	1108.2	1108.5	0.4
	27.08	2023	7751	2.9	1108.7	1108.7	1109.0	0.3
	27.15	1852	7095	3.1	1109.5	1109.5	1109.7	0.2
	27.22	1786	6923	3.2	1110.5	1110.5	1110.9	0.4
	27.29	1793	6960	3.2	1111.7	1111.7	1112.2	0.4
	27.37	1849	5949	3.7	1113.6	1113.6	1113.8	0.2
	27.44	1907	7256	3.0	1115.5	1115.5	1115.7	0.2
	27.50	1920	8143	2.7	1116.5	1116.5	1116.7	0.3
	27.56	1961	9186	2.4	1117.4	1117.4	1117.7	0.3
	27.61	1986	9028	2.5	1118.0	1118.0	1118.5	0.4
	27.68	2105	7867	2.8	1118.8	1118.8	1119.3	0.4
	27.76	2287	7448	3.0	1120.2	1120.2	1120.5	0.3
	27.84	2344	8310	2.7	1121.9	1121.9	1122.4	0.6
	27.89	2368	8577	2.6	1122.7	1122.7	1123.5	0.8
	27.94	2355	8071	2.7	1123.5	1123.5	1124.5	1.0
	27.99	2328	7642	2.9	1124.5	1124.5	1125.4	0.8
	28.07	1017	8299	4.7	1126.9	1126.9	1127.3	0.4
	28.16	1452	10376	1.8	1128.4	1128.4	1129.1	0.7
	28.25	1851	9341	1.7	1128.9	1128.9	1129.6	0.7
	28.32	1811	8443	1.9	1129.3	1129.3	1130.0	0.7
	28.40	1721	7723	2.1	1130.1	1130.1	1130.7	0.7
	28.47	1696	7591	2.1	1130.8	1130.8	1131.4	0.6
	28.54	1658	6810	2.4	1131.7	1131.7	1132.1	0.5
	28.59	1664	6591	2.4	1132.5	1132.5	1132.8	0.4
	28.64	1626	6575	2.4	1133.5	1133.5	1133.7	0.3

[1]Miles above confluence with Gila River

TABLE 7-4

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, ARIZONA AND INCORPORATED AREAS

FLOODWAY DATA

CENTENNIAL WASH

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SECOND)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
Centennial Wash (Cont'd)								
	28.72	1586	7023	2.3	1134.7	1134.7	1135.0	0.3
	28.80	1567	6339	2.5	1135.7	1135.7	1136.2	0.5
	28.88	1535	5989	2.7	1136.8	1136.8	1137.3	0.5
	28.95	1519	6183	2.6	1138.0	1138.0	1138.5	0.5
	29.03	1541	6700	2.4	1139.2	1139.2	1139.7	0.6
	29.08	1584	6978	2.5	1139.9	1139.9	1140.6	0.7
	29.13	1608	7168	2.4	1140.5	1140.5	1141.4	0.9
	29.18	1598	6673	2.6	1141.1	1141.1	1142.0	0.9
	29.26	1594	5985	2.9	1142.3	1142.3	1143.0	0.8
	29.34	1554	5747	3.0	1143.8	1143.8	1144.3	0.5
	29.42	1488	5250	3.3	1145.1	1145.1	1145.5	0.4
	29.48	1438	5337	3.2	1146.2	1146.2	1146.7	0.5
	29.54	1395	5317	3.2	1147.0	1147.0	1147.5	0.5
	29.59	1354	5018	3.4	1147.8	1147.8	1148.3	0.5
	29.65	1342	4901	3.5	1148.7	1148.7	1149.3	0.6
	29.72	1313	4644	3.7	1149.9	1149.9	1150.6	0.7
	29.80	1304	4715	3.6	1151.2	1151.2	1152.0	0.8
	29.87	1310	4583	3.7	1152.4	1152.4	1153.3	0.8
	29.95	1364	4556	3.8	1153.8	1153.8	1154.6	0.8
	30.03	1456	4862	3.5	1155.4	1155.4	1156.1	0.8
	30.10	1644	5427	3.2	1156.5	1156.5	1157.2	0.8
	30.17	1980	5725	3.0	1157.8	1157.8	1158.5	0.7
	30.25	2298	5861	2.9	1159.1	1159.1	1159.7	0.6
	30.32	2526	6253	3.2	1160.7	1160.7	1161.3	0.6
	30.40	2736	7576	2.7	1162.1	1162.1	1162.8	0.7

[1]Miles above confluence with Gila River

TABLE 7-4

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, ARIZONA AND INCORPORATED AREAS

FLOODWAY DATA

CENTENNIAL WASH

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SECOND)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
Centennial Wash (Cont'd)								
	30.45	2836	7803	2.6	1163.0	1163.0	1163.6	0.6
	30.50	2995	7891	2.6	1163.9	1163.9	1164.5	0.6
	30.56	3161	7900	2.6	1164.9	1164.9	1165.3	0.5
	30.64	3309	8156	2.5	1166.1	1166.1	1166.6	0.5
	30.71	3294	8132	2.5	1167.4	1167.4	1168.0	0.6
	30.79	3235	7958	2.6	1168.7	1168.7	1169.4	0.7
	30.85	3174	8389	2.4	1169.7	1169.7	1170.5	0.8
	30.91	3125	8676	2.3	1170.7	1170.7	1171.6	0.9
	30.97	3076	8714	2.3	1171.6	1171.6	1172.5	0.9
	31.05	3037	8100	2.5	1172.9	1172.9	1173.6	0.8
	31.13	3022	7382	2.8	1174.3	1174.3	1174.8	0.6
	31.22	3001	7041	2.9	1175.5	1175.5	1176.1	0.6
	31.31	3013	7031	2.9	1176.7	1176.7	1177.4	0.8
	31.39	2974	6770	3.0	1177.8	1177.8	1178.6	0.8
	31.47	2894	6992	2.9	1179.0	1179.0	1179.8	0.9
	31.55	2765	6623	3.1	1179.9	1179.9	1180.7	0.8
	31.63	2640	6141	3.3	1181.0	1181.0	1181.5	0.6
	31.71	2512	4902	4.1	1182.1	1182.1	1182.4	0.3
	31.77	2380	4745	4.3	1183.0	1183.0	1183.2	0.2
	31.82	2303	4635	4.4	1184.1	1184.1	1184.3	0.2
	31.90	2291	4995	4.1	1185.8	1185.8	1186.1	0.3
	31.97	2338	5906	3.4	1187.3	1187.3	1187.8	0.5
	32.05	2411	7020	2.9	1188.8	1188.8	1189.7	0.9
	32.10	2533	7865	2.6	1189.7	1189.7	1190.7	1.0
	32.15	2607	8367	2.8	1190.4	1190.4	1191.4	1.0

[1]Miles above confluence with Gila River

TABLE 7-4

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, ARIZONA AND INCORPORATED AREAS

FLOODWAY DATA

CENTENNIAL WASH

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SECOND)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
Centennial Wash (Cont'd)								
	32.21	2656	8238	2.9	1191.3	1191.3	1192.1	0.9
	32.27	2746	8258	2.9	1192.3	1192.3	1193.0	0.8
	32.34	2815	8106	2.9	1193.6	1193.6	1194.2	0.6
	32.42	2822	8629	2.7	1194.9	1194.9	1195.6	0.7
	32.50	2820	9290	2.5	1196.0	1196.0	1196.8	0.8
	32.57	2857	9593	2.5	1197.2	1197.2	1198.0	0.8
	32.63	2919	10258	2.3	1198.3	1198.3	1199.1	0.8
	32.68	2969	10738	2.2	1199.2	1199.2	1200.2	0.9
	32.75	2978	10611	2.2	1200.4	1200.4	1201.3	1.0
	32.82	2934	9803	2.4	1201.6	1201.6	1202.5	0.9
	32.89	2887	8955	2.6	1202.7	1202.7	1203.6	0.8
	32.97	2792	7851	3.0	1203.9	1203.9	1204.6	0.6
	33.05	2713	7111	3.3	1205.1	1205.1	1205.6	0.5
	33.12	2566	5741	4.1	1206.1	1206.1	1206.5	0.4
	33.18	2429	5337	4.4	1207.2	1207.2	1207.6	0.5
	33.26	2257	5135	4.6	1208.5	1208.5	1209.1	0.7
	33.34	2197	5226	4.5	1210.0	1210.0	1210.8	0.8
	33.42	2251	5621	4.2	1211.3	1211.3	1212.1	0.8
	33.49	2378	5700	4.1	1212.5	1212.5	1213.3	0.7
	33.58	2553	5799	4.1	1214.0	1214.0	1214.6	0.7
	33.67	2744	6357	5.4	1215.7	1215.7	1216.4	0.7
	33.72	2858	7392	4.7	1216.8	1216.8	1217.7	0.8
	33.78	2937	7388	4.7	1217.9	1217.9	1218.7	0.8
	33.85	2956	7646	4.5	1219.3	1219.3	1220.1	0.8
	33.93	3045	7823	4.4	1220.6	1220.6	1221.4	0.8

[1]Miles above confluence with Gila River

TABLE 7-4

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, ARIZONA AND INCORPORATED AREAS

FLOODWAY DATA

CENTENNIAL WASH

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SECOND)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
Centennial Wash (Cont'd)								
	34.02	3127	8074	4.3	1221.9	1221.9	1222.7	0.8
	34.10	3172	8148	4.2	1223.2	1223.2	1223.9	0.7
	34.16	3514	8756	3.9	1224.3	1224.3	1224.9	0.6
	34.22	3847	9055	3.8	1225.3	1225.3	1225.8	0.5
	34.29	4300	9745	3.5	1226.1	1226.1	1226.8	0.7
	34.36	4551	9936	3.5	1226.7	1226.7	1227.7	1.0
	34.42	4680	10444	3.3	1227.7	1227.7	1228.5	0.9
	34.48	4592	10227	3.4	1228.7	1228.7	1229.4	0.7
	34.55	4368	9800	3.5	1229.8	1229.8	1230.4	0.6
	34.61	4083	9582	3.6	1230.8	1230.8	1231.4	0.6
	34.69	3846	8985	3.8	1232.2	1232.2	1233.0	0.8
	34.73	3836	9233	3.7	1233.0	1233.0	1233.8	0.8
	34.79	3776	9827	3.5	1234.1	1234.1	1235.0	0.9
	34.86	3766	9881	3.5	1235.2	1235.2	1236.1	0.9
	34.92	3722	10429	3.3	1236.3	1236.3	1237.1	0.8
	34.98	3671	10713	3.2	1237.2	1237.2	1238.0	0.8
	35.04	3544	10613	3.2	1238.2	1238.2	1238.9	0.8
	35.10	3419	10735	3.2	1239.2	1239.2	1240.0	0.8
	35.18	3240	10327	3.3	1240.4	1240.4	1241.3	0.9
	35.26	3152	10839	3.2	1241.8	1241.8	1242.8	1.0
	35.34	3096	11305	3.0	1243.0	1243.0	1243.9	0.9
	35.41	3030	11523	3.0	1244.2	1244.2	1245.0	0.8
	35.47	2914	11472	3.0	1245.0	1245.0	1245.7	0.7
	35.53	2720	11165	3.1	1245.8	1245.8	1246.5	0.7
	35.59	2531	9974	3.4	1246.6	1246.6	1247.2	0.6

[1]Miles above confluence with Gila River

TABLE 7-4

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, ARIZONA AND INCORPORATED AREAS

FLOODWAY DATA

CENTENNIAL WASH

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SECOND)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
Centennial Wash (Cont'd)								
	35.64	2391	9397	3.7	1247.6	1247.6	1248.2	0.6
	35.72	2184	9343	3.7	1249.0	1249.0	1249.8	0.7
	35.80	2138	9524	3.6	1250.4	1250.4	1251.1	0.7
	35.89	2085	9825	3.5	1251.7	1251.7	1252.4	0.7
	35.95	2064	10124	3.4	1252.5	1252.5	1253.3	0.8
	36.02	2022	10300	3.3	1253.6	1253.6	1254.5	0.8
	36.10	1984	9980	3.4	1254.7	1254.7	1255.4	0.7
	36.17	1931	9500	3.6	1255.8	1255.8	1256.3	0.5
	36.25	1875	9098	3.8	1256.7	1256.7	1257.4	0.7
	36.30	1830	9003	3.8	1257.4	1257.4	1258.1	0.7
	36.36	1762	8574	4.0	1258.2	1258.2	1258.9	0.7
	36.41	1779	9233	3.7	1258.9	1258.9	1259.7	0.8
	36.48	1735	9922	3.5	1259.8	1259.8	1260.7	0.9
	36.55	1729	9442	3.6	1260.7	1260.7	1261.6	0.9
	36.63	1730	9436	3.6	1262.0	1262.0	1262.7	0.8
	36.70	1757	9806	3.5	1263.1	1263.1	1263.9	0.8
	36.78	1798	9754	3.5	1263.9	1263.9	1264.7	0.8
	36.83	1806	9715	3.5	1264.4	1264.4	1265.2	0.8
	36.88	1796	9650	3.6	1265.0	1265.0	1265.8	0.8
	36.93	1796	9566	3.6	1265.7	1265.7	1266.4	0.7
	37.01	1727	8673	4.0	1266.7	1266.7	1267.3	0.6
	37.08	1566	8054	4.3	1267.8	1267.8	1268.3	0.5
	37.15	1463	7898	4.4	1268.8	1268.8	1269.4	0.6
	37.22	1518	8578	4.0	1269.7	1269.7	1270.5	0.8
	37.28	1558	8810	3.9	1270.4	1270.4	1271.2	0.7

[1]Miles above confluence with Gila River

TABLE 7-4

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, ARIZONA AND INCORPORATED AREAS

FLOODWAY DATA

CENTENNIAL WASH

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SECOND)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
Centennial Wash (Cont'd)								
	37.35	1519	8550	4.0	1271.3	1271.3	1271.9	0.7
	37.42	1479	8441	4.1	1272.1	1272.1	1272.8	0.7
	37.48	1414	7969	4.3	1272.9	1272.9	1273.6	0.7
	37.54	1393	8003	4.3	1273.8	1273.8	1274.6	0.8
	37.62	1389	8222	4.2	1275.0	1275.0	1275.8	0.8
	37.68	1396	8159	4.2	1275.8	1275.8	1276.6	0.8
	37.74	1432	8549	4.0	1276.5	1276.5	1277.4	0.9
	37.80	1472	8501	4.0	1277.2	1277.2	1278.1	0.9
	37.85	1535	8656	4.0	1278.0	1278.0	1278.9	0.9
	37.93	1607	8051	4.3	1279.1	1279.1	1280.0	0.8
	38.01	1666	7964	4.3	1280.4	1280.4	1281.2	0.8
	38.08	1757	7682	4.5	1281.5	1281.5	1282.2	0.7
	38.14	1832	7827	4.4	1282.4	1282.4	1282.9	0.5
	38.22	1953	8149	4.2	1283.7	1283.7	1284.0	0.3
	38.28	2029	8716	3.9	1285.0	1285.0	1285.3	0.4
	38.35	2079	9706	3.5	1286.2	1286.2	1286.7	0.5
	38.45	2115	8583	4.0	1287.6	1287.6	1288.1	0.4
	38.55	2154	8318	4.1	1289.3	1289.3	1289.6	0.4
	38.63	2152	8883	3.9	1290.8	1290.8	1291.3	0.5
	38.70	2159	9583	3.6	1292.0	1292.0	1292.6	0.6
	38.78	2180	10610	3.2	1293.2	1293.2	1294.0	0.8
	38.85	2162	10490	3.3	1294.4	1294.4	1295.3	0.9
	38.91	2153	10672	3.2	1295.5	1295.5	1296.4	0.9
	38.96	2153	11150	3.1	1296.4	1296.4	1297.3	0.9
	39.02	2151	11233	3.1	1297.4	1297.4	1298.3	1.0

[1]Miles above confluence with Gila River

TABLE 7-4

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, ARIZONA AND INCORPORATED AREAS

FLOODWAY DATA

CENTENNIAL WASH

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SECOND)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
Centennial Wash (Cont'd)								
	39.09	2050	10672	3.2	1298.4	1298.4	1299.4	1.0
	39.17	1929	9810	3.5	1299.4	1299.4	1300.3	0.9
	39.25	1826	9641	3.6	1300.7	1300.7	1301.5	0.8
	39.32	1801	9355	3.7	1301.7	1301.7	1302.5	0.8
	39.40	1654	7740	4.4	1303.0	1303.0	1303.5	0.5
	39.47	1617	8315	4.1	1304.5	1304.5	1305.2	0.7
	39.56	1621	8748	3.9	1305.9	1305.9	1306.8	0.9
	39.64	1680	9178	3.7	1307.3	1307.3	1308.2	0.9
	39.71	1733	9412	3.7	1308.5	1308.5	1309.4	0.9
	39.79	1821	8700	4.0	1309.7	1309.7	1310.5	0.9
	39.87	1916	8789	3.9	1311.0	1311.0	1311.8	0.8
	39.95	2015	9161	3.8	1312.3	1312.3	1313.0	0.7
	40.02	2061	9381	3.7	1313.5	1313.5	1314.3	0.7
	40.10	2101	9902	3.5	1314.7	1314.7	1315.5	0.8
	40.19	2029	9904	3.5	1316.2	1316.2	1316.8	0.7
	40.34	2017	6523	5.3	1319.7	1319.7	1319.8	0.1
	40.50	1940	8299	4.1	1322.7	1322.7	1323.0	0.3
	40.65	2010	8717	3.9	1324.5	1324.5	1324.9	0.5

[1]Miles above confluence with Gila River

TABLE 7-4

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, ARIZONA AND INCORPORATED AREAS

FLOODWAY DATA

CENTENNIAL WASH

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SECOND)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
Centennial Wash RR Spill								
	0.05	924	5200	2.7	842.4 [2]	842.1	842.8	0.7
	0.11	842	4381	2.3	843.4 [3]	842.2	843.0	0.8
	0.16	1011	4886	1.6	844.5 [4]	842.3	843.1	0.8
	0.21	990	4321	1.8	845.5 [5]	842.4	843.2	0.8
	0.26	945	3659	2.1	846.3 [6]	842.5	843.2	0.8
	0.30	1037	3177	2.4	846.9 [7]	842.7	843.4	0.7
	0.36	1205	2670	2.6	847.7 [8]	843.1	843.7	0.6
	0.42	1166	2204	3.2	848.6 [9]	844.0	844.4	0.3
	0.46	1007	2125	3.2	849.8 [10]	845.0	845.0	0.0
	0.50	564	1781	3.6	851.3 [11]	845.6	845.6	0.0
	0.56	344	3567	3.8	852.0 [12]	847.7	847.7	0.0
	0.60	351	2004	2.5	852.0 [12]	850.0	850.0	0.0
	0.623	468	3145	1.6	852.0 [12]	850.6	850.6	0.0

[1]Miles above confluence with Centennial Wash

[2]Regulatory (FEET NAVD) taken from "DS Trestles 2-3" reach, RS 0.07

[3]Regulatory (FEET NAVD) taken from "DS Trestles 2-3" reach, RS 0.15

[4]Regulatory (FEET NAVD) taken from "DS Trestles 2-3" reach, RS 0.22

[5]Regulatory (FEET NAVD) taken from "DS Trestles 2-3" reach, RS 0.29

[6]Regulatory (FEET NAVD) taken from "DS Trestles 2-3" reach, RS 0.37

[7]Regulatory (FEET NAVD) taken from "DS Trestles 2-3" reach, RS 0.45

[8]Regulatory (FEET NAVD) taken from "DS Trestles 2-3" reach, RS 0.52

[9]Regulatory (FEET NAVD) taken from "DS Trestles 2-3" reach, RS 0.60

[10]Regulatory (FEET NAVD) taken from "DS Trestles 2-3" reach, RS 0.67

[11]Regulatory (FEET NAVD) taken from "DS Trestles 2-3" reach, RS 0.75

[12]Regulatory (FEET NAVD) taken from flat WSEL mapping (see TSDN Section 6.7.1.4)

TABLE 7-4

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, ARIZONA AND INCORPORATED AREAS

FLOODWAY DATA

Centennial Wash RR Spill

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SECOND)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
Centennial Wash RR Spill (Cont'd)								
	0.625	674	3036	1.3	852.0 [2]	850.9	850.9	0.0
	0.628	656	2166	1.8	852.0 [2]	851.2	851.4	0.2
	0.69	447	2185	1.7	852.0 [2]	851.7	852.2	0.5
	0.76	408	1591	2.4	852.7	852.7	853.4	0.7
	0.84	429	1918	2.0	853.3	853.3	854.1	0.8
	0.90	431	2286	1.7	853.5	853.5	854.3	0.8
	0.97	540	2940	3.4	853.7	853.7	854.5	0.9
	1.02	670	3569	2.8	854.1	854.1	855.0	0.9
	1.07	675	3324	3.0	854.5	854.5	855.3	0.8
	1.14	691	3342	3.0	855.3	855.3	855.9	0.6
	1.22	706	3650	2.7	855.8	855.8	856.4	0.6
	1.28	713	3864	2.6	856.0	856.0	856.7	0.7
	1.33	833	4433	2.3	856.2	856.2	857.0	0.8
	1.40	827	5115	4.4	856.6	856.6	857.2	0.7
	1.46	988	6059	3.7	857.0	857.0	857.8	0.8
	1.52	1117	6850	3.3	857.3	857.3	858.1	0.8
	1.60	1296	8111	2.8	857.6	857.6	858.4	0.9
	1.67	1612	9843	2.3	857.7	857.7	858.6	0.9
	1.75	2146	12265	1.8	857.9	857.9	858.8	0.9

[1]Miles above confluence with Centennial Wash

[2]Regulatory (FEET NAVD) taken from flat WSEL mapping (see TSDN Section 6.7.1.4)

TABLE 7-4

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, ARIZONA AND INCORPORATED AREAS

FLOODWAY DATA

Centennial Wash RR Spill

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SECOND)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
Centennial Field								
	0.07	5184	15455	2.0	842.3	842.3	843.0	0.7
	0.15	5413	17016	2.5	843.4	843.4	843.6	0.2
	0.22	5262	17180	2.8	844.5	844.5	844.6	0.1
	0.29	5089	16934	2.4	845.5	845.5	845.5	0.0
	0.37	5304	16398	2.3	846.3	846.3	846.3	0.0
	0.45	5601	16353	2.1	846.9	846.9	846.9	0.0
	0.52	5688	14676	2.3	847.7	847.7	847.7	0.0
	0.60	4749	14049	2.4	848.6	848.6	848.6	0.0
	0.67	2890	16034	2.9	849.8	849.8	849.8	0.0
	0.75	1610	20097	3.5	851.3	851.3	851.3	0.0
	0.82	707	19347	0.6	852.7	852.7	852.7	0.0

[1]Miles above confluence with Centennial Wash

TABLE 7-4

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, ARIZONA AND INCORPORATED AREAS

FLOODWAY DATA

Centennial Field

Appendix A: References

A.1 Data Collection Summary

Centennial Wash Floodplain Delineation Study: Gila River to La Paz County
FCD 2012C004
Data Collection Inventory

ID	Relevant to Project	Document	Description	Author	Format	Date Received	Date of Document	Received From	Filename	Folder
1		Arlington Valley Solar Energy Project CLOMR Application	Technical data notebook	Arcadis, AVSE for FCDMC and FEMA	pdf		Apr. 2011	Arcadis	AVSE - FCDMC TDN 06122012, AVSE - FEMA TDN 06272012, AVSE II - FCDMC TDN FEMA Submittal 20110609	P:\FCDM001015 Centennial Wash\Data\ARCADIS
2		AVSE Drainage Report	Stormwater routing and management report	Arcadis for AVSE	pdf		Feb. 2011	Arcadis	AVSE Drainage Report February 2011 (R1) FINAL	P:\FCDM001015 Centennial Wash\Data\ARCADIS\Response Package 5
3		Response to comments	Letter with comment responses to FEMA	Arcadis for FEMA	pdf, doc		Aug. 2012	Arcadis	AVSE FEMA CLOMR RTC 201208014, AVSE FEMA CLOMR RTC 201208014 w attachements	P:\FCDM001015 Centennial Wash\Data\ARCADIS\Response Package 5
4		Maps and HEC-RAS models	Maps of model areas and HEC-RAS model files	Arcadis	pdf, zip		Aug. 2012	Arcadis	HECRAS East Channel.zip, HECRAS Winters Wash.zip, WM03 - Winters Wash.zip, WM04 - East Channel.zip, WM-01 Centennial Wash.pdf, WM-02 West Channel.pdf, WM03 - Winters Wash.pdf, WM04 - East Channel.pdf	P:\FCDM001015 Centennial Wash\Data\ARCADIS\Response Package 5
5		Mesquite Solar Technical Data Notebook, CLOMR	Technical data notebook, CLOMR, and model and survey files	Burns and McDonell Engineering Company for SEP II, LLC	pdf, HEC-RAS, HEC-1, dwg		Mar. 2011	Burns and McDonnell	FEMA issued CLOMR, MS TDN CLOMR vol 1a, MS TDN CLOMR vol 1b, MS TDN CLOMR vol 2, Appendix G - Data Disc	P:\FCDM001015 Centennial Wash\Data\BurnsMcDonald\Mesquite Solar\CLOMR
6		MT-1 Mesquite Solar Energy Project	MT-1 form with attachments and CAD drawing of legal description	Burns and McDonnell for FEMA	pdf, dwg		May. 2012	Burns and McDonnell	MT-1, Attachment #9 - Digital Files\Legal Desc rev1	P:\FCDM001015 Centennial Wash\Data\BurnsMcDonald\Mesquite Solar\CLOMR-F
7		Mesquite Solar Technical Data Notebook, LOMR	Technical Data notebook with model and survey data and maps	Burns and McDonnell for SEP II, LLC	pdf, HEC-RAS, HEC-1, dwg		May. 2012	Burns and McDonnell	MS TDN LOMR vol 1a, MS TDN LOMR vol 1b, MS TDN LOMR vol 2, B. Maps\B.1 Maps (N and E Perim Channels - As-Builts), B. Maps\B.2 Maps (Block 1), B. Maps\B.2 Maps (Block 2), B. Maps\B.2 Maps (Blocks 3 and 6), B. Maps\B.2 Maps (Remaining Blocks), B. Maps\B.2 Maps (W Perim Channel), Appendix G - Data Disc	P:\FCDM001015 Centennial Wash\Data\BurnsMcDonald\Mesquite Solar\LOMR
8		Mesquite Solar Drainage Report Vol. 1 and 2	Drainage report for Mesquite Solar project, volumes 1, 2, plans, and model data	Burns and McDonnell for Sempra Generation	pdf, HEC-RAS, HEC-1		Dec. 2010	Burns and McDonnell	Mesquite Solar Final Drainage Report Volume 1, Mesquite Solar Final Drainage Report Volume 2, Precise Plans, HEC-1 and HEC-RAS Models	P:\FCDM001015 Centennial Wash\Data\BurnsMcDonald\Mesquite Solar\SUP
9		Data DVD Centennial Wash FDS	Digital files- survey points, elevations, orthophotos	Data from FCDMC GIS database, various authors	dwg, shp, sid, xls	5/2/2012		FCDMC	DataDVD_05022012_CentennialWashFDS	P:\FCDM001015 Centennial Wash\Data\FCDMC
10		Data DVD Topographic GIS Data and Aerials	Digital files - aerial photos (2010), Centennial Wash shapefiles, etc.	Data from FCDMC GIS database, various authors	shp, sid	5/2/2012		FCDMC	DataDVD_05022012_TopographicGISData&Aerials	P:\FCDM001015 Centennial Wash\Data\FCDMC
11		Data DVD Orthophotography 2012	Aerial photos (2011)	Data from FCDMC GIS database, various authors	shp, sid	8/16/2012		FCDMC	DataDVD_08162012_OrthoTilesFY11-12	P:\FCDM001015 Centennial Wash\Data\FCDMC
12		Infill topography data delivered via WEST ftp	Infill topography digital files	FCDMC	dwg, shp, txt			FCDMC	InFillTopography_DataDeliveredviaWESTftp	P:\FCDM001015 Centennial Wash\Data\FCDMC
13		Survey report manual for Dec. 2011 Centennial Mapping Contract	Survey results	A Team Professional Associates	pdf		Jan. 2012	FCDMC	A333_910_SurveyReportManualforDecember_2011_CentennialMappingSituatedinorNearSections_19_20_29_30_32_T1N_R8W_etc	P:\FCDM001015 Centennial Wash\Data\FCDMC\Mapping Certification Statements
14		Survey Report: Centennial Wash	Survey report with maps and photos	Wilson & Company, Inc. for FCDMC	pdf		Feb. 2012	FCDMC	A333_911SurveyReport_CentennialWashPhotControl	P:\FCDM001015 Centennial Wash\Data\FCDMC\Mapping Certification Statements
15		Survey Report: Palo Verde ADMP	Survey report with maps and photos	Wilson & Company, Inc. for FCDMC	pdf		Jun. 2008	FCDMC	A335_901PaloVerdeADMPMappingSuveyReport2008_Book_1_of_3_Updated2009.pdf	P:\FCDM001015 Centennial Wash\Data\FCDMC\Mapping Certification Statements
16		Survey Report: Gillespie Infill	Survey report with point data	FCDMC	pdf		Jul. 2012	FCDMC	Gillespie infill-final	P:\FCDM001015 Centennial Wash\Data\FCDMC\Mapping Certification Statements
17		Survey Report: Gillespie ADMP	Survey report with map	David Evans and Associates for FCDMC	pdf		Oct. 2008	FCDMC	SANB2_DEA_SVYREPORT	P:\FCDM001015 Centennial Wash\Data\FCDMC\Mapping Certification Statements
18		Survey Report: Portion of Centennial Wash	Survey report with point data	FCDMC	pdf		Jul. 2012	FCDMC	Witt Survey Report-final	P:\FCDM001015 Centennial Wash\Data\FCDMC\Mapping Certification Statements
19		Flood Control Flooding Photos 1970s - 1990s	Flooding photos for Salt River, Cave Creek Wash at Peoria, Unidentified Maricopa County Locations, Santa Rosa Wash, Wickenburg, Wendon, Centennial Wash, and Narrows Dam	FCDMC	pdf			FCDMC	007_193_FloodControlFloodingPhotos1970s_1990sandUndatedSaltRiverWendonCaveCreekWashatPeoriaUniden	P:\FCDM001015 Centennial Wash\Data\FCDMC\ReferenceData
20		Arizona Stream Channels Roughness Coefficients	Roughness Coefficients for Stream Channels in Arizona	Aldridge and Garrett, with Arizona Highway Department	pdf		Feb. 1978	FCDMC	102_901RoughnessCoefficientsforStreamChannelsinArizona	P:\FCDM001015 Centennial Wash\Data\FCDMC\ReferenceData
21		Centennial Wash Hydrologic Analysis	Hydrologic Analysis of the Centennial Wash in Maricopa County, Arizona with HEC-1 model data and workmaps	Cella Barr Associates for FEMA	pdf, HEC-1		Jan. 1989	FCDMC	A333_902HydrologicAnalysis_of_the_CentennialWash_in_MaricopaCountyArizona, P:\FCDM001015 Centennial Wash\Data\FCDMC\ReferenceData\LowerCentennialEffectiveModels\CBA, P:\FCDM001015 Centennial Wash\Data\FCDMC\ReferenceData\workmaps\Centennial Wash F.I.S. Re-Study, P:\FCDM001015 Centennial Wash\Data\FCDMC\ReferenceData\CENTENNIAL_FIS_Report_Models	P:\FCDM001015 Centennial Wash\Data\FCDMC\ReferenceData
22		Hydrology Report: Centennial Wash Watershed	Hydrology report with updated 100-yr peak flows	RBF Consulting for CV Harquahala LLC	pdf		Apr. 2011	FCDMC	Centennial CLOMR 12-09-0043R DRAFT, Centennial CLOMR - Final Discharges	P:\FCDM001015 Centennial Wash\Data\FCDMC\ReferenceData
23		Trestle #2 Bridge Survey	Survey points at Trestle #2	FCDMC	pts		Aug. 2012	FCDMC	Trestle #2 Cloud_8-9-12	P:\FCDM001015 Centennial Wash\Data\FCDMC\RR_Bridge_Survey

ID	Relevant to Project	Document	Description	Author	Format	Date Received	Date of Document	Received From	Filename	Folder
24		Maricopa County LOMR	Map revision for panels 1450, 1475, 1950; 1950, 2425, 2450;	FEMA	pdf		Aug. 2006	FEMA	06-09-B579P-040037, 06-09-B715P-040037	P:\FCDM001015 Centennial Wash\Data\FEMA
25		FEMA Maps and profiles	Map of panel locations and reach flood profiles	FEMA	pdf		Aug. 2006	FEMA	FEMA map 1, FEMA map 2, profiles, profiles_northBranch, profiles_upper	P:\FCDM001015 Centennial Wash\Data\FEMA
26		FIRM panels	Panels 1133, 1134, 1137, 1139, 1141, 1450, 1725, 1750, 1425, 1450, 1475, 1500, 1505, 1900, 1925, 1950, 2425, 2450, 2455, 2465, and 2470	FEMA	png		Sep. 2005	FEMA	04012C1133C, 04012C1134C, 04012C1137C, 04012C1139C, 04012C1141C, 04012C1450C, 04012C1725C, 04012C1750C, 04013C1425G, 04013C1450G, 04013C1475G, 04013C1500F, 04013C1505H, 04013C1900G, 04013C1925G, 04013C1950G, 04013C2425G, 04013C2450G, 04013C2455G, 04013C2465G, 04013C2470H	P:\FCDM001015 Centennial Wash\Data\FEMA
27		USGS Daily Flows at SPRR on Centennial Wash	Daily flows for entire period of record, beginning 8/28/1978 and ending 10/16/2012	USGS	txt		Oct. 2012	USGS	09517490 Centennial Wash at SPRR Daily	P:\FCDM001015 Centennial Wash\Data\USGSGage
28		USGS 15-min Flows at SPRR on Centennial Wash	15-minute flows for the August 23 storm event	USGS	txt		Oct. 2013	USGS	15-minute data for the August 23 storm event	P:\FCDM001015 Centennial Wash\Data\USGSGage\09517490 Centennial Wash at SPRR

Appendix A: References

A.2 Referenced Documents

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Appendix B: General Documentation and Correspondence

B.1 General Project Documentation and Correspondence

Date: August 3, 2012

A meeting was held on Wednesday, August 1, 2012 at 10:00 AM MST with the following attendees:

Flood Control District of Maricopa County (District)

1. Jeff Shelton
2. Amir Motamedi

WEST Consultants (WEST)

1. Brian Wahlin
2. Chuck Davis

This meeting was the kickoff meeting for the Floodplain Delineation Study (FDS) for Centennial Wash in support of FEMA flood map revisions along the length of the watercourse from the La Paz County border to the confluence of Centennial with the Gila River.

The meeting followed the agenda prepared by WEST prior to the meeting, including the discussion items described below.

Project Description – Major Tasks

Public Involvement, Task 2 of the Scope of Work – Jeff has already drafted the text of this for the legal advertisement of the study. The right-of-entry letter for the study is being developed by the District internally (primarily Jeff and Gant Wegner). Finally, Jeff will be developing the mailing list for the right-of-entry letter concurrently during the development of the legal advertisement.

Jeff may send us the final versions of the advertisement, letter, and/or mailing list developed by the District for comment by WEST. Jeff will try to finalize these three products in the first month or so of the project (possibly by the end of August).

Data Collection, Task 3 of the Scope of Work – To begin this conversation, WEST had a few questions regarding the DTM and other topography data that has been provided to WEST by the District at this point. First, WEST inquired if the various data sources provided by the District should be edge-matched carefully, or if we should generally trust that these data sources line up well and check only for large discrepancies across the topography boundaries. Jeff said that Joe Wagner's group has checked this well and everything looks good across the topo boundaries; WEST should only roughly check the edge-matching with a cursory review. Basically, if WEST's notes anything odd during cross section development or mapping, WEST will forward these concerns to Jeff, but there should not be significant issues with edge-matching for the various topographic datasets.

WEST also brought up the 150' "gap" in topography data between the more recently collected topography data provided to the District by Wilson & Company and the Gillespie topography near the confluence of Centennial and the Gila River. Jeff pointed out that he does not think

WEST has been provided all of the data available from the District at this time to represent this area. There are 7 topographic data sources that have been provided at this time: (1) W holdings, (2) Palo Verde topo, (3) Gillespie topo, (4) Salt/Gila river master plan topo, (5) Countywide 10' contour mapping topo, (6) Luke Wash & Arlington topo, and (7) Saddleback FRS mapping topo (as a note, the seventh topo source provided by the District is only available in the western portion of the watershed, far away from the Centennial/Gila confluence which is the focus of this discussion). Jeff thinks that the infill topography that the District performed would actually cover this 150' gap between the Wilson & Company topo and the Gillespie topo, but he is not sure. WEST will check if they have accessed all of the available topo on the DVD's provided by the District to ensure that WEST has not missed any extra delivered topo that would cover this gap. Jeff will provide the letter reports for each of the topo sources listed above, and he will send these via the District's ETF service (similar to an FTP site). Jeff will also provide the DTM for the small area of topography near the Centennial/Gila confluence.

The next portion of the discussion of data collection focused on the surveys of the bridge trestles for the Union Pacific Railroad (UPRR) Bridge crossing the Centennial Wash near the downstream end of the study reach. These bridge trestle surveys were performed by the District using their new 3D survey scanner technology, and the District is still trying to figure out the best way to deliver the data. The output of these surveys is 3D data clouds that are very large and require enormous electronic storage capacity. Jeff will invite John Stock to the next monthly meeting for Centennial to discuss these data more thoroughly. Jeff also mentioned that this is a new technology for the survey group at the District and that we have time to figure out how to best utilize this data for Centennial, so Jeff may provide us a few different data deliverables for the trestles to determine the best format to utilize this type of survey in HEC-RAS. Jeff mentioned possibly providing the data in Excel or text format with X,Y,Z information, or providing figures with measurements and distances noted on the figures. Chuck mentioned that WEST has some software capabilities to view some of these point clouds and create our own figures and measurements if the District could thin the data cloud enough for WEST to be able to process the data. Jeff will provide an initial attempt of data delivery for these data soon. WEST will also check in our records for the as-builts for this bridge, as WEST completed a study in this area some time ago. Finally, Jeff has heard that there are no plans to update the UPRR bridge at this time; however, Jeff will forward his contact for the UPRR to WEST for WEST to contact them to verify this is the case. Jeff has also requested as-builts of the UPRR bridge and trestles from the UPRR and is waiting for their response.

The next portion of the discussion of data collection focused on the solar project facilities being constructed in the watershed. Jeff provided a map to WEST of the three primary sites in some form of construction or planning at this time in the watershed: Mesquite Phase I, Arlington Valley Solar Energy (AVSE) Phase I, and AVSE Phase II. These are each discussed individually below.

1) Mesquite Phase I
    a. Drainage plans completed by Burns & McDonald

b. Nathan Thompson is the engineer who worked on the project, Chuck knows him and will request data from him
c. There is a rock-lined channel around the property, we need to acquire as-builts for this feature and any other drainage feature we can from Burns & McDonald.
d. LOMRs and CLOMRs have been done for various portions of this project.
e. This project will be disturbing some amount of land near or within the floodplain.

2) AVSE Phase I
   a. Drainage plans completed by ARCADIS
   b. Jeff cannot remember the name of the engineer who worked on this project for ARCADIS, but he will look back in his notes and find this to send to WEST soon.
   c. A CLOMR was submitted on 5/17/2012 for AVSE Phase I (Jeff cannot remember if this was submitted to FEMA or to FCDMC, but he will check).
   d. A LOMR is expected to be submitted by 2015 for AVSE Phase I.
   e. Phase I used the flows from the Palo Verde study.
3) AVSE Phase II
   a. Drainage plans completed by ARCADIS
   b. Jeff cannot remember the name of the engineer who worked on this project for ARCADIS, but he will look back in his notes and find this to send to WEST soon.
   c. A CLOMR has been completed for AVSE Phase II (Jeff cannot remember if this was submitted to FEMA or to FCDMC, but he will check).
   d. A LOMR is expected to be submitted by winter 2013 for AVSE Phase II.
   e. This site was already under construction as of 5/17/2012.
   f. Phase II used the flows from the old Centennial Wash study.

WEST will contact ARCADIS and Burns & McDonald to see if they will provide the necessary information directly to WEST. If WEST needs Jeff's support to acquire data from either firm, we will let him know. Jeff will check at the District to see what information has been submitted by either firm for Mesquite and AVSE Phases I and II to the District.

Jeff also pointed out that the timing of our study versus their future CLOMRs or LOMRs might be important. If one of those sites completed a CLOMR, then WEST and the District complete the Centennial FDS study before they construct, they might have to redo their analysis for the CLOMR or final LOMR. On the other hand, if they are able to submit their LOMR quickly and go to construction well before we finish the Centennial FDS study, we may need to obtain as-builts or complete additional survey of the affected areas. This is something to keep in mind moving forward.

The next portion of the discussion of data collection focused on the irrigation districts. WEST will contact the irrigation districts in the area (primarily the Harquahala Irrigation District, and possibly Arlington Canal Owners). In regards to the north/south drainage channel that flows towards Centennial in the widest part of the floodplain, Amir and Jeff both brought up the point that there were federal "no trespassing" signs on the channel and the downstream (i.e., to the east of the channel) berm indicating a pipe was underground at this location. This pipe collects the flow from an open-channel canal that ends at the Encanto Boulevard alignment and takes it

underground for a long distance. Also, WEST will check if the districts maintain any digital data outlining ag coverages (e.g., GIS shapefiles of cultivated areas) in the study watershed. Jeff will send WEST the contact information for his contact at the Harquahala Irrigation District.

The next portion of the discussion of data collection was brought up by Amir regarding W Holdings. Amir mentioned that Jerry Witt (the District's primary contact at W Holdings) might know of any additional plans for new construction in the study area due to his large landholder presence along Centennial Wash. Jeff will provide WEST with Jerry's contact information, and WEST will check with Jerry for any information that W Holdings might have regarding upcoming projects in the area. Also, WEST will check if W Holdings maintains any digital data outlining ag coverages (e.g., GIS shapefiles of cultivated areas) in the study watershed.

Other possible data sources for this project include (i) the EPNG study that WEST completed for the Centennial Wash crossing (WEST will provide this to the District) and (ii) contacting MCDOT for any possible planned alignments that may cross Centennial Wash. WEST will contact MCDOT for this purpose.

Floodplain/Floodway Delineation, Task 7 of the Scope of Work – To begin this conversation, Jeff brought up the farmer dikes near the downstream end of the study reach. Jeff and WEST agreed that we should not bother running any "without levees" scenarios until we run the model as it is with the current topography to see if this is necessary first. A "without levees" scenario likely will not be needed for several of the dikes that are visible in the aerials. If we decide to pursue any "without levees" scenarios, these will require a detailed discussion with Jeff.

For the upstream tie-in, Jeff wants to tie-in with the updated Zone AE at the La Paz/Maricopa county boundary as the effective study has done. For any topography needed upstream of the county line to finalize this model, WEST can utilize the HEC-2 model cross sections upstream of the La Paz County line for this purpose.

In regards to the Manning's *n* field reconnaissance site visits, WEST requested that these be held the week of August 20. After checking Jeff's calendar at the end of the meeting, it was determined that August 21 would be the best date for this initial site visit.

WEST will go through the initial steps of a FEMA request to see if FEMA provides any additional information that WEST has not received from the District, especially in regards to the Zone A floodplains.

In regards to the confluence of Centennial Wash with the Gila, Jeff and Cathy Regester (the PM for the Gila FDS) have not determined whose going to take the lead on coordinating tie-in issues, but they have discussed the importance of keeping the lines of communication open for this reason. Amir pointed out that if the Centennial study would be considering coincident peaks, then the final results of the Gila FDS would affect our downstream boundary condition. However, if the Centennial study will not consider coincident peaks with the Gila, the tie-in

issues will likely be more straightforward. Brian asked if the District might want to package the two studies together into a single PMR, but Amir said that the District would likely want to get Centennial in more quickly to get the PMR grant process started (he said that FEMA will not give a PMR until studies are in the queue, so the District cannot get a PMR grant by telling FEMA that the District will have studies ready for FEMA at a given time; the study actually has to be submitted first before the PMR grant process begins). Brian also pointed out that the timing of the Gila study might be important for this discussion as well. For example, if Cathy and the selected consultant for that study focus further upstream in their study reach towards the beginning of the project, and WEST focuses on the lower portion of the Centennial study reach last (as has been previously discussed for this project), then the delay in the start date for the Gila FDS might not be a problem and the tie-in areas might be completed about the same time. Jeff said that he would check with Cathy to see if she had a game plan in mind at this time regarding how her study might proceed.

Project Coordination

Project Communication – Brian wanted to let Jeff know that Brian and Chuck will both be available regularly for this project, and Jeff should feel free to contact either Brian or Chuck at any time with questions or concerns he might have.

Project Schedule – After looking over the preliminary draft schedule WEST provided to Jeff, he requested that more detail be added to the schedule, primarily by increasing the number of draft submittals of deliverables and draft reviews of those submittal prior to the final deliverables and final reviews. Additionally, he requested that WEST add more review time for the Manning's roughness report as well. WEST will make these changes and return them to Jeff soon.

Other Items

MT-2 Forms – Jeff pointed out that we will need to fill out some (if not all) of the MT-2 forms for this study to submit the study to the FEMA's PMR queue. Jeff will check with Kathryn Gross regarding which MT-2 forms will likely be required.

Modeling Standards – Brian asked if Jeff would like to use the most recently approved manuals from the District for modeling questions, or the most recently released draft manuals available on the website, or the most recent versions of the draft manuals we will be able to receive from Tom Loomis or others. Jeff indicated that he would like for WEST to use the most recent version of the draft manuals we could obtain for this study.

Action items deriving from this meeting:

1. *Jeff and Gant Wegner to work towards finalization of the legal advertisement, right-of-entry letter, and mailing list by August 31. Jeff may forward some of these materials to WEST for comment and review before finalization.*
2. *Chuck to check the data delivered by the District again for the 150' "gap" in topography that appears to exist between the Gillespie mapping and the W Holdings mapping.* ***Update: WEST sent a technical memo regarding this subject to Jeff via email on Aug 7.***
3. *Jeff to provide the letter reports for each of the topo sources provided by the District to WEST via the District's ETF service (similar to an FTP site).*
4. *Jeff to provide the final DTM for the small area of topography collected by the District near the confluence of Centennial Wash and the Gila River.*
5. *Jeff to invite John Stock to the next monthly meeting to discuss the bridge trestle surveys.*
6. *Jeff to provide WEST a "first attempt" data deliverable for the survey of one UPRR bridge trestle to work towards determining the best format to utilize all of this data in HEC-RAS.* ***Update: this was delivered by Jeff via email on August 6.***
7. *Jeff to forward his UPRR contact's information to WEST so WEST can verify there are no plans to update the bridge. WEST to check our records for the bridge as-builts.*
8. *Jeff to send the contact information of the engineer at ARCADIS who worked on the AVSE drainage plans to WEST. WEST to contact ARCADIS for more information.*
9. *Chuck to request drainage plans for the Mesquite solar site from Nathan Thompson, the engineer at Burns & McDonald who worked on the Mesquite project.* ***Update: WEST requested and received this data from Nathan on August 2 from Nathan.***
10. *Jeff to check with Floodplain Management Services for studies that have been submitted by either ARCADIS or Burns & McDonald for the AVSE or Mesquite projects for District review.*
11. *WEST to contact the irrigation districts (primarily the Harquahala Irrigation District, possibly Arlington Canal Owners) for information regarding their activities in the floodplain. Also, WEST to check if any districts maintain digital data outlining ag coverages in the study area. Jeff to send WEST the information for his contacts at Harquahala Irrigation District and Arlington Canal Owners.*
12. *Jeff to provide WEST with Jerry Witt's contact information (W Holdings). WEST to contact Jerry for information he might have regarding upcoming projects in the area. Also, WEST will check if they maintain digital data outlining ag coverages in the area.*
13. *WEST to contact MCDOT for any possible planned alignments that may cross Centennial.*
14. *WEST to schedule the first Manning's n field reconnaissance site visit for August 21 and invite Jeff to this site visit.* ***Update: this has now been moved to August 23.***
15. *WEST to perform a FEMA request for the study reach to see if FEMA provides any additional information that WEST has not received from the District.*
16. *WEST to update the MS Project Schedule and provide the updated schedule to Jeff.* ***Update: WEST provided this via email on Aug 7.***
17. *WEST to provide projected billings to Jeff.* ***Update: WEST provided this via email Aug 7.***
18. *Jeff to check with Kathryn Gross regarding which MT-2 forms will likely be required.*

19. *WEST to provide Melissa with a short description of the work being performed for the APS transmission line scour assessment for the planned line crossing Centennial Wash.* ***Update: Brian provided this via email on August 3.***

MEETING MINUTES

Date & Time: Monday, 17 September 2012 at 11:30 a.m. (MST)

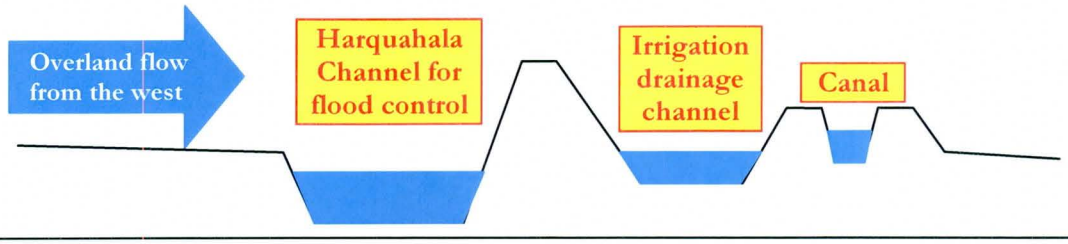
Location: Phone Call, WEST Consultants (WEST), Harquahala Valley Irrigation District (HVID)

Subject: **Phone call with the Rick Warren (HVID) and Chuck Davis (WEST) Centennial Wash Floodplain Delineation Study: Gila River to La Paz County**

Notes from the discussion regarding any concerns HVID might have regarding the upcoming Centennial Wash Floodplain Delineation Study:

- Construction began on most of the features of the HVID in 1985, and construction of the system was completed in 1986. The Bureau of Reclamation built HVID.
- Franzoy Corey Engineering (since bought out by Stantec) was the engineering firm responsible for the design of the HVID system.
- Flooding issues are most problematic in the south end of the valley, specifically in the southwest corner of the valley. The northern portion of the valley (i.e., the area of the currently mapped overbank flowpath as described by FEMA) has not had flooding issues in some time.
- Rick was familiar with the flood control channel that Chuck described running north-south parallel to the Harquahala Valley Road alignment approximately 1/2 mile to the west of Harquahala Valley Road. This channel feature (referred to as the Harquahala Channel henceforth) runs from the Bethany Home Road alignment at the northern end to approximately 0.6 miles south of the Buckeye Road alignment (0.4 miles north of the Lower Buckeye Road alignment) at the southern end. This feature was designed originally strictly as a flood control feature. Rick said that the record drawings are on file with HVID, and that WEST can copy those on a large flatbed scanner, or Rick can make copies of these sheets to ledger-size paper if that would work for WEST. Chuck will check with the project manager for the Flood Control District of Maricopa County, Jeff Shelton, to see if he has a preference regarding these scans. A schematic of this channel in relation to other HVID features is shown below for reference.

Harquahala Channel west of Harquahala Valley Road, looking to the north (flows in the channel are from the north to the south)



- As can be seen from the schematic shown above, the bottom of the Harquahala Channel is lower than the adjacent ground and other HVID features. Additionally, the embankment immediately east of the channel is the highest point along the schematic cross section of these features. Chuck asked Rick if any infrastructure was associated with the Harquahala Channel or the downstream embankment. Rick said that there was not (i.e., no pipelines or other infrastructure are housed in the embankment). In fact, Rick said that the only infrastructure features associated with the Harquahala Channel are the culverts under Van Buren Road at the channel's crossing of that roadway alignment. Rick said those three culvert barrels are each 6 feet in diameter.
- In regards to the schematic shown above and the discussion in the previous point, what would be the associated "downstream natural ground elevation" adjacent to the Harquahala Channel? With FEMA's current guidelines, the water surface elevation in the Harquahala Channel would have to be compared to the elevation of the natural ground adjacent to the embankment downstream to determine if a with/without embankment analysis would be required for the FEMA mapping of the overbank flow split. Would the bottom of the irrigation drainage channel be the "downstream natural ground elevation" adjacent to the Harquahala Channel, or would this be the elevation downstream of the canal further to the east?
- HVID maintains 32,537 acres for possible irrigation. Rick's best guess at the actively farmed fields at any given time is about 27,000 acres (83% of the total available acreage).
- HVID does not maintain any spatial data regarding the currently farmed crops in the area.
- October 2 would work for Rick as a possible date to have a site visit to look at the flow split area. Chuck will send a meeting invite to several parties (Rick, WEST personnel, Flood Control District of Maricopa County personnel) regarding this site visit for additional coordination. Rick's email address is rwarren@hughes.net.

MEETING MINUTES

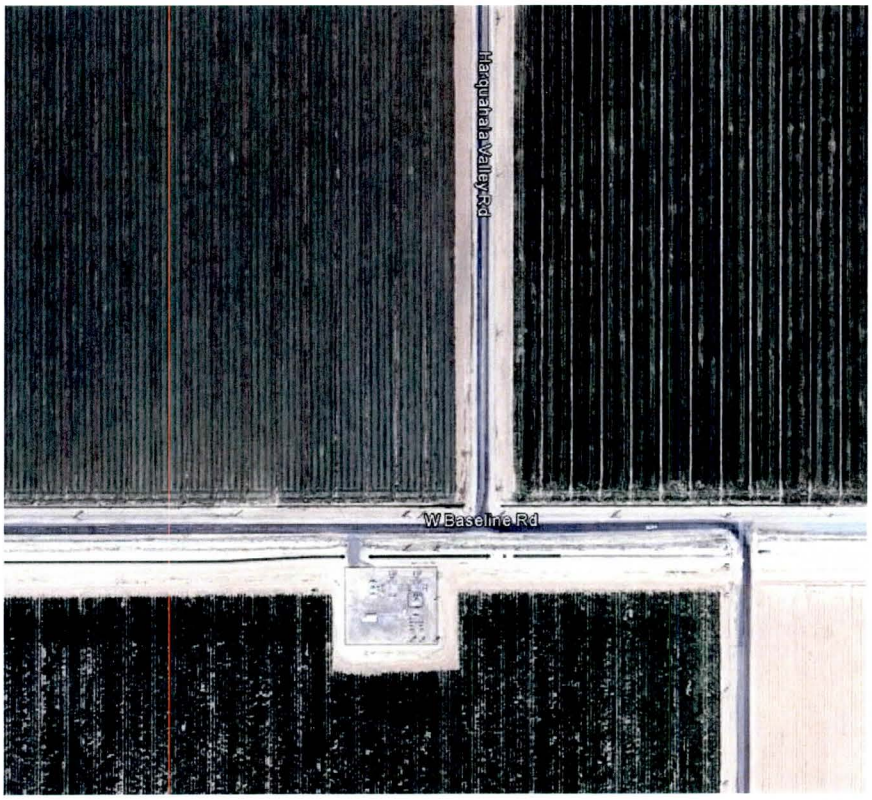
Date & Time: Monday, 17 September 2012 at 4:30 p.m. (MST)

Location: Phone Call, WEST Consultants (WEST), Witt Holdings (WH)

Subject: **Phone call with the Jerry Witt (WH) and Chuck Davis (WEST)**
Centennial Wash Floodplain Delineation Study: Gila River to La Paz County

Notes from the discussion regarding any concerns WH might have regarding the upcoming Centennial Wash Floodplain Delineation Study:

- WH is concerned about flooding occurring near the intersection of Baseline Road and Harquahala Valley Road. The Saddle Mountain Substation is just west of this intersection on the south side of Baseline Road (see figure below), and APS owns and operates this facility. Jerry indicated that the culvert built under the access road to this site is undersized. When even small runoff events occur in the tributaries entering Centennial from the south, flows in this channel will overwhelm the culvert and flow to the south and over Baseline Road to the north. Jerry stated that this occurs at flows much lower than the 100-year flow amount, and Chuck verified that this area is completely outside of the floodplain for the main branch of Centennial Wash, as well as outside any of the tributaries mapped by FEMA or FCDMC.



- Jerry also said that there are some tailwater ponds about 2 miles east of the Saddle Mountain Substation just south of Baseline Road that also have some flooding issues during very high-frequency, low-return interval storm events. Chuck verified that these ponds are also outside of the main Centennial Wash floodplain, as well as outside any of the tributaries mapped by FEMA or FCDMC.

- Similarly to Rick Warren (Harquahala Valley Irrigation District), Jerry said that the primary flooding issues are associated with the southwest portion of the valley. Also similarly to Rick, Jerry feels that the flooding impacts estimated in the northern part of the valley (as reflected by the FEMA floodplain mapping) is excessive. Jerry does not remember ever seeing water in the flood control channel running north-south parallel to the Harquahala Valley Road alignment approximately 1/2 mile to the west of Harquahala Valley Road. This channel feature (referred to as the Harquahala Channel) runs from the Bethany Home Road alignment at the northern end to approximately 0.6 miles south of the Buckeye Road alignment (0.4 miles north of the Lower Buckeye Road alignment) at the southern end.

- Steve Melton is a farmer whose family has been farming in the Harquahala Valley for many years. The Meltons are now tenant farmers for WH. Jerry said to obtain more detailed anecdotal information regarding flooding in the valley, WEST should talk to the Meltons. However, they will primarily be most knowledgeable about high-frequency, low-return interval type hydrologic events, because these are the floods that they are most familiar with and cause the most regular damage to crops. They will not be as concerned with flood sizes that they have not seen in the valley such as the 100-year storm.

Date: September 24, 2012

A meeting was held on Thursday, September 20, 2012 at 9:00 AM MST with the following attendees:

Flood Control District of Maricopa County (District)

1. Jeff Shelton
2. John Stock
3. John Ashley

WEST Consultants (WEST)

1. Brian Wahlin
2. Chuck Davis

This meeting was a monthly coordination meeting for the Floodplain Delineation Study (FDS) for Centennial Wash in support of FEMA flood map revisions along the length of the watercourse from the La Paz County border to the confluence of Centennial with the Gila River.

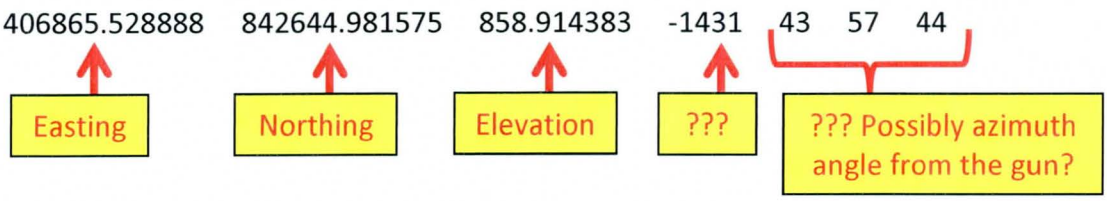
The meeting followed the agenda prepared by WEST prior to the meeting, including the discussion items described below.

Discussion of train trestle surveys

John Stock and John Ashley (both in the District's survey group) were present to discuss the survey deliverables for the laser scan 3D point cloud surveys completed for all four railroad trestle crossings that were constructed by the railroad to pass Centennial Wash flows. Several items relating to these surveys were discussed during this portion of the meeting.

First, WEST reported that they were able to process the original 5-million point data deliverable for Trestle 2. Images from the visualization software WEST used (ESRI's ArcGIS Desktop software suite, including the individual software packages ArcScene and ArcGlobe) are shown below. Although WEST is able to process this data, the size of the dataset is pushing the visual processing capabilities of WEST's machine to view this dataset and collect measurements for entry into HEC-RAS in a time- and cost-effective manner.

WEST had a number of questions about the original survey deliverables. First and foremost, WEST wanted to know if survey codes were available with the final 3D data clouds from the laser-scan survey, and John Ashley said they were not available. John Ashley and John Stock both said that they did not know exactly what the numbers to the right of the Easting, Northing, and Elevation columns in the text files of the data deliverable provided, but the last three columns appeared to be azimuth angles from the gun. An example line of text from this data deliverable is shown below for further clarification.



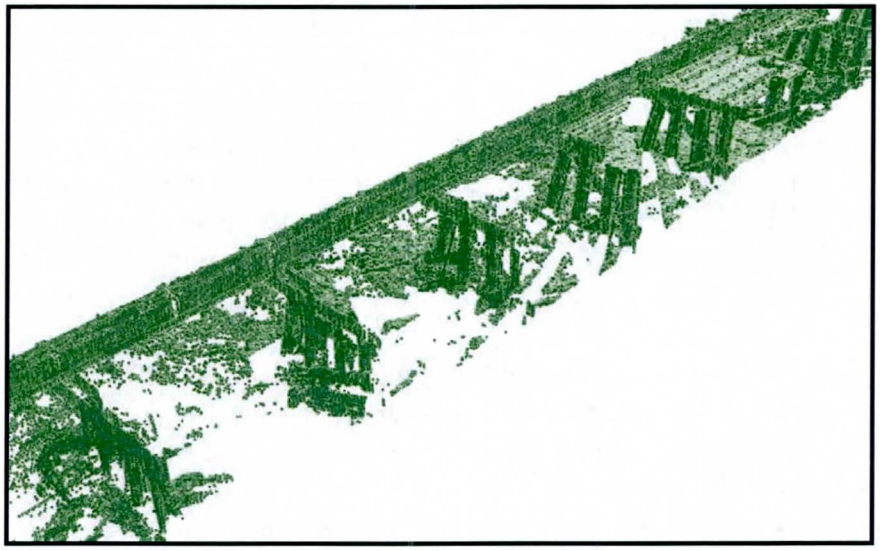


Figure 1. Lookdown View of Trestle #2 from ArcGIS software

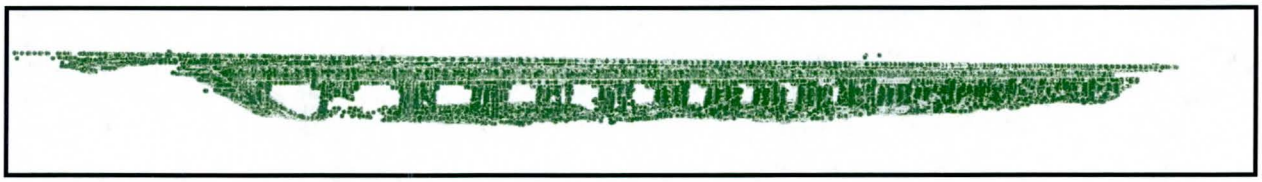


Figure 2. View of Trestle #2 from ArcGIS software

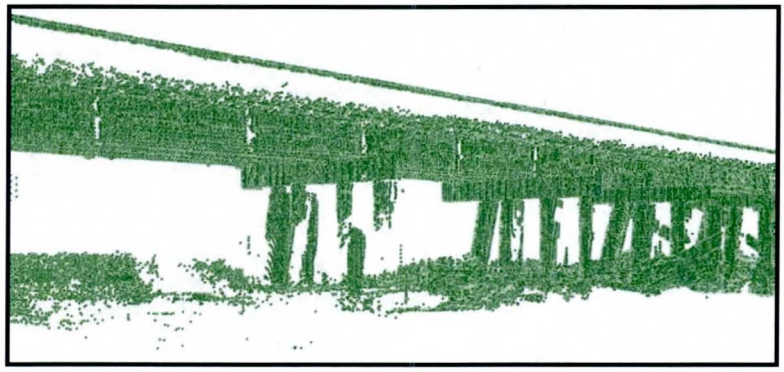


Figure 3. Detailed View of Trestle #2 from ArcGIS software

The deliverable that was provided to WEST previously that included survey codes (file titled "TRESSEL 2_7-23-12.txt") was a 57-point simplification of the bridge survey with all data taken from the 5-milion point 3D data cloud developed from the laser-scan survey. John Stock referred to this deliverable as a "virtual RTK survey" where RTK stands for real time kinematic. John referred to this as a virtual RTK because the 57 points were collected based on John Ashley's extraction of these 57 points from the 3D data cloud in the office instead of going into the field to collect the RTK points manually using GPS-based survey equipment which would be a physical RTK survey. It was decided that the District will create these virtual RTK survey deliverables for all four trestles surveyed using the laser scanner and deliver them to WEST. In fact, John Ashley thought he might have already completed this task for all four bridge trestles.

The District uses a software package developed by Leica Geosystems to process the data from the 3D laser scanner survey equipment. Leica has a freeware version of the software that can process the 3D data clouds, and this package is called TruView. John Ashley recommended that WEST download this freeware to utilize along with the virtual RTK deliverables to develop the necessary input data for the HEC-RAS bridge geometry editor. From John's understanding, however, this freeware package will not report actual elevations for a particular point in the dataset; this software will only allow for distance measurements of the dataset (width, height, etc.). In addition to horizontal measurements, this software will allow the point data to be displayed along with the photos captured by the instrument as opposed to only seeing the 3D point cloud without any referenced imagery. John Ashley said that this may solve WEST's data processing issues. By combining the functionality of the TruView freeware for distance measurements with the virtual RTK datasets to reference a few crucial elevations, WEST may be able to arrive at all of the data needed to enter into the HEC-RAS bridge geometry data editor without having to utilize the bulky, inefficient data visualization software that WEST is currently using to obtain these measurements.

As another option, Jeff Shelton recommended possibly having the District's survey team thin the 3D data cloud to improve WEST's visualization and measurement capabilities with their current visualization software (i.e., ArcGlobe and ArcScene). This could be done by randomly removing every other point (reducing the dataset to about 2.5 million points), or 4 of every 5 data points (reducing the dataset to about 1 million points), or whatever resolution would allow WEST's software to handle the datasets successfully. WEST indicated that we are only having slight difficulties handling 5 million points; therefore, WEST feels that a dataset of about 2.5 million points would be well within the processing capabilities of our current hardware to allow the visualization software WEST is currently using to be much more dynamic and efficient in viewing and measuring the dimensions of these bridge trestle 3D data clouds. John Stock took this conversation one step further by recommending removing data until you begin to lose resolution in the image of the structure itself. This would be an iterative process used to thin the dataset until the survey team at the District felt that certain features were no longer being represented accurately (e.g., top of rail, corner of a trestle cap immediately under the bridge deck, etc.). Another possible thinning methodology that John Ashley mentioned was developing a TIN surface for the ground points (i.e., not including the bridge structure) based on the data representing the ground surface in the 3D point cloud, then extruding the final

points used to develop the TIN surface and delivering those points as the final dataset. Even with a dense TIN, the number of points that are retained when developing the TIN and subsequently extruded from the final TIN surface would be far less than the number of raw points captured by the 3D laser scanner. John Stock's primary concern with this methodology was the fact that no breaklines would be used to develop the TIN; therefore, the creation of TIN triangles across a break in slope may create an erroneous surface from which erroneous point elevations would then be extruded. Jeff will continue to work with the District's survey team towards the best "thinned" survey product to possibly deliver to WEST.

John Stock also indicated that WEST was always more than welcome to go the District's offices to speak with himself or John Ashley about this data product. Additionally, the District's computers could be used by WEST to view/extract data if needed for the final HEC-RAS modeling efforts. John Stock asked that WEST coordinate any meeting to this end directly with him, always copying Jeff on those emails.

Finally, WEST asked if each of the four trestle's 3D data clouds from the laser scanner were approximately the same size (i.e., 5 million points). John Ashley said they would each be approximately the same size.

In conclusion, the recommended method to view these data would be to use the 50- to 100-point virtual RTK survey datasets provided by the District in association with the TruView freeware to create the final bridge geometry files for HEC-RAS. If this is not enough detail, WEST can continue to process the full 3D data clouds using the ArcGIS software suite, and the District will work to provide somewhat "thinned" datasets for WEST to use with this process if necessary. As a last resort, WEST can always go to the District's office to view the datasets on the survey team's computers.

John Stock also offered to perform additional survey along the top of the train track if needed to provide an exact slope of the train track. John's plan would be to collect a few points leading away from a trestle, and then project the slope of those points to see if that slope connected with the bridge deck elevation of the nearest trestle. If they did (as John expected they likely would due to the mild, consistent slopes in the area), then the survey would be completed and the projected slope could be assumed to persist the entire length of the railroad embankment between the two corresponding trestles. If the projected slope did not connect with the bridge deck elevation of the nearest trestle, then John's team could go back to the field to collect the breaks in elevation along the embankment slope until the embankment was fully characterized. WEST, Jeff Shelton, and John Stock all felt that this may be more than required because the aerial mapping of the embankments between the train trestles is likely very accurate due to the typically good response of railroad embankments to photogrammetric analysis during topo development. This item will be considered again in the future if the embankment seems odd in the final surface product.

Development of final surface to use in modeling and mapping

WEST provided Jeff and the District with a technical memorandum outlining the development of the final surface that will be used in modeling and mapping for this project based on the topographic datasets provided previously by the District. This technical memorandum was titled "Final Topographic Surface Technical Memorandum" and was dated September 20, 2012. Jeff will pass this technical memorandum along to John Stock and Joe Wagner for their review and input. After resolving initial issues with the topographic data, WEST feels confident with the final product that was developed and will be used for the remainder of this project.

Data Collection

Status of discussions with stakeholders – At this point, WEST has been able to contact the Harquahala Valley Irrigation District and Jerry Witt regarding their issues and concerns with the project as well as any available data they may have regarding flooding issues in the area. WEST provided detailed call logs describing these conversations to Jeff.

A site visit has been set up with Rick Warren of the Harquahala Valley Irrigation District for October 2. WEST will continue to coordinate with Rick and Jeff in regards to this site visit.

WEST has not been able to contact the Arlington Irrigation District at this time. WEST will continue to try to get in touch with Gary Gable of the Arlington Irrigation District.

Status of field reconnaissance summaries – WEST provided Jeff with a site visit trip report, primarily made up of the field photograph documentation log. Jeff will review this report and provide comments to WEST if desired.

Manning's roughness assessment

WEST provided Jeff and the District with a Manning's roughness assignment report. WEST also showed Jeff the shapefile that supported the spatial definition of Manning's roughness areas on the laptop that WEST brought to the meeting. This shapefile only listed the names of the land use types; the shapefile did not include the corresponding Manning's roughness coefficient assigned to each land use type. Jeff requested that WEST resend the shapefile once the Manning's roughness coefficients had been assigned to each polygon in the shapefile.

Project schedule

Based on the schedule proposed by WEST previously to the District, we currently appear to be on track to progress slightly ahead of schedule moving forward. This may change depending on the use of FLO-2D for the analysis of the flow split area. WEST will work towards a preliminary flow split analysis using lateral structures in HEC-RAS and preliminary cross section alignments for the next monthly meeting on October 18.

Action items deriving from this meeting:

1. *WEST to investigate the TruView software we can download in our office to view the data deliverable files.* ***Update: WEST has downloaded this software. It has been installed successfully on a local machine in our office. WEST is ready for the District to deliver a trestle survey dataset we can view in TruView.***
2. *District survey team to develop the 50- to 100-point "virtual RTK" survey datasets for the other three bridge trestles (if the District has not already completed this task as John Ashley thought he might have done this previously) and provide these data to WEST.*
3. *District survey team and Jeff to explore possible "thinned" data deliverables for the 3D point clouds to provide to WEST to improve efficiency of WEST's visualization software.*
4. *Jeff to pass along the "Final Topographic Surface Technical Memorandum" to John Stock and Joe Wagner for their review and input.*
5. *WEST to continue to coordinate with Rick and Jeff in regards to the Harquahala Valley Irrigation District site visit on October 2.* ***Update: This site visit has been planned. WEST will pick Jeff up at the District offices at 7:30 AM on Tuesday, October 2.***
6. *WEST to continue to try to contact Gary Gable of the Arlington Irrigation District.*
7. *Jeff to review the site visit trip report and provide comments to WEST if desired.*
8. *WEST to resend the Manning's roughness assignment shapefile once the Manning's roughness coefficients have been assigned to each polygon in the shapefile.* ***Update: WEST provided this shapefile to Jeff via the District's EFTP service on September 21.***
9. *Jeff to review the Manning's roughness assignment report and provide comments to WEST if desired.*
10. *WEST to provide electronic versions of the phone call logs, site visit trip report, and the Manning's roughness assignment report to Jeff.* ***Update: WEST provided these files in MS Word format to Jeff via the District's EFTP service on September 21.***
11. *WEST to work towards a preliminary flow split analysis using lateral structures in HEC-RAS and preliminary cross section alignments for the next monthly meeting on October 18.*

Action items continuing from the kick-off meeting:

1. *Jeff and Gant Wegner to work towards finalization of the legal advertisement, right-of-entry letter, and mailing list by August 31. Jeff may forward some of these materials to WEST for comment and review before finalization.* ***Update: This was completed and Jeff provided the final right-of-entry letter and mailing list used to send the letters via email on September 20.***
2. *Jeff to provide the letter reports for each of the topo sources provided by the District to WEST via the District's ETF service (similar to an FTP site).* ***Update: Jeff provided these letter reports for each topo source provided by the District via the District's ETF service on August 7.***
3. *Jeff to provide the final DTM for the small area of topography collected by the District near the confluence of Centennial Wash and the Gila River.* ***Update: Joe Wagner provided this DTM to WEST via WEST's ftp site on August 9.***
4. *Jeff to forward his UPRR contact's information to WEST so WEST can verify there are no plans to update the bridge. WEST to check our records for the bridge as-builts.* ***Update: WEST checked their records, and WEST does not have these as-builts. Jeff contacted the UPRR directly for this task, and he has not gotten any response at this time.***
5. *Jeff to send the contact information of the engineer at ARCADIS who worked on the AVSE drainage plans to WEST. WEST to contact ARCADIS for more information.* ***Update: WEST received this data from Corey Zorn at ARCADIS via WEST's ftp site on September 4.***
6. *Jeff to check with Floodplain Management Services for studies that have been submitted by either ARCADIS or Burns & McDonald for the AVSE or Mesquite projects for District review.* ***Update: Jeff forwarded the Mesquite Solar LOMR from Kenneth de Roulhac at the District on September 18.***
7. *WEST to contact MCDOT for any possible planned alignments that may cross Centennial.* ***Update: WEST still to contact MCDOT.***
8. *WEST to perform a FEMA request for the study reach to see if FEMA provides any additional information that WEST has not received from the District.* ***Update: WEST received a response from FEMA via email on September 19 stating that there was only HEC-2 data available for the main stem of Centennial Wash in microfiche format. No other data (digital or otherwise) was available for Centennial Wash or any of the tributaries to Centennial Wash. Therefore, WEST did not proceed with receiving any data from FEMA.***
9. *Jeff to check with Kathryn Gross regarding which MT-2 forms will likely be required.* ***Update: Jeff sent an email to WEST on August 7 stating that Kathryn informed him to "Prepare to fill out all the MT-2 forms so we can send the study to the LOMC Clearinghouse."***

Date: October 4, 2012

A site visit was held on Tuesday, October 2, 2012 with the following attendees:

Flood Control District of Maricopa County (District)

1. Jeff Shelton

WEST Consultants (WEST)

1. Bert Clemmens
2. Chuck Davis

Harquahala Valley Irrigation District (HVID)

1. Rick Warren

Arlington Canal Company (ACC)

1. Gary Gable
2. Carter Gable
3. Bill Rousell

This meeting was a site visit for the Floodplain Delineation Study (FDS) for Centennial Wash in support of FEMA flood map revisions along the length of the watercourse from the La Paz County border to the confluence of Centennial with the Gila River.

The meetings with the local irrigation providers during these two site visits included the discussion items described below.

Meeting with HVID

Bert asked if HVID owned all of their facilities. Rick said that the USBOR transferred ownership to HVID in 1998 for all of the facilities not on BLM lands. Any HVID facilities that fall on the BLM lands are still owned by BLM.

Jeff asked about maintenance practices for the facilities. Rick stated that all maintenance was done on an as-needed basis, including cleaning out or rebuilding the irrigation ditches when necessary. No records are kept of this maintenance

In regards to the flood control feature that runs parallel to Harquahala Valley Road one-half mile west of the roadway alignment, water that is flowing down the flood control ditch can back up at the culverts under Van Buren, cross over the road, and run down Van Buren to the west at this location. These culverts were originally put in by MCDOT for a school on the west side of the flood control ditch ditch. However, the school is no longer there, and MCDOT could take out the culverts at the Van Buren crossing to alleviate flooding issues associated with this hydraulic structure in Rick's opinion.

Jeff mentioned that Art Martori had contacted the District in regards to some flooding on his property recently. Rick said that he knows the Martori farms, and their primary holdings are in

the southwest portion of Harquahala Valley. That is the area that would have been flooded recently according to Rick.

Rick's primary flooding concern is not related to Centennial Wash. Bill O'Brien was a Harquahala Valley rancher who built a dike in the 1970s (see Figure 1). It worked until 1988, then it failed and now there is a developed neighborhood downstream of the dike that is flooded on occasion. This neighborhood is near the southern end of the Westside canal. Greg Jones of FCDMC came out to look at the O'Brien dike with Rick on October 1, 2012.

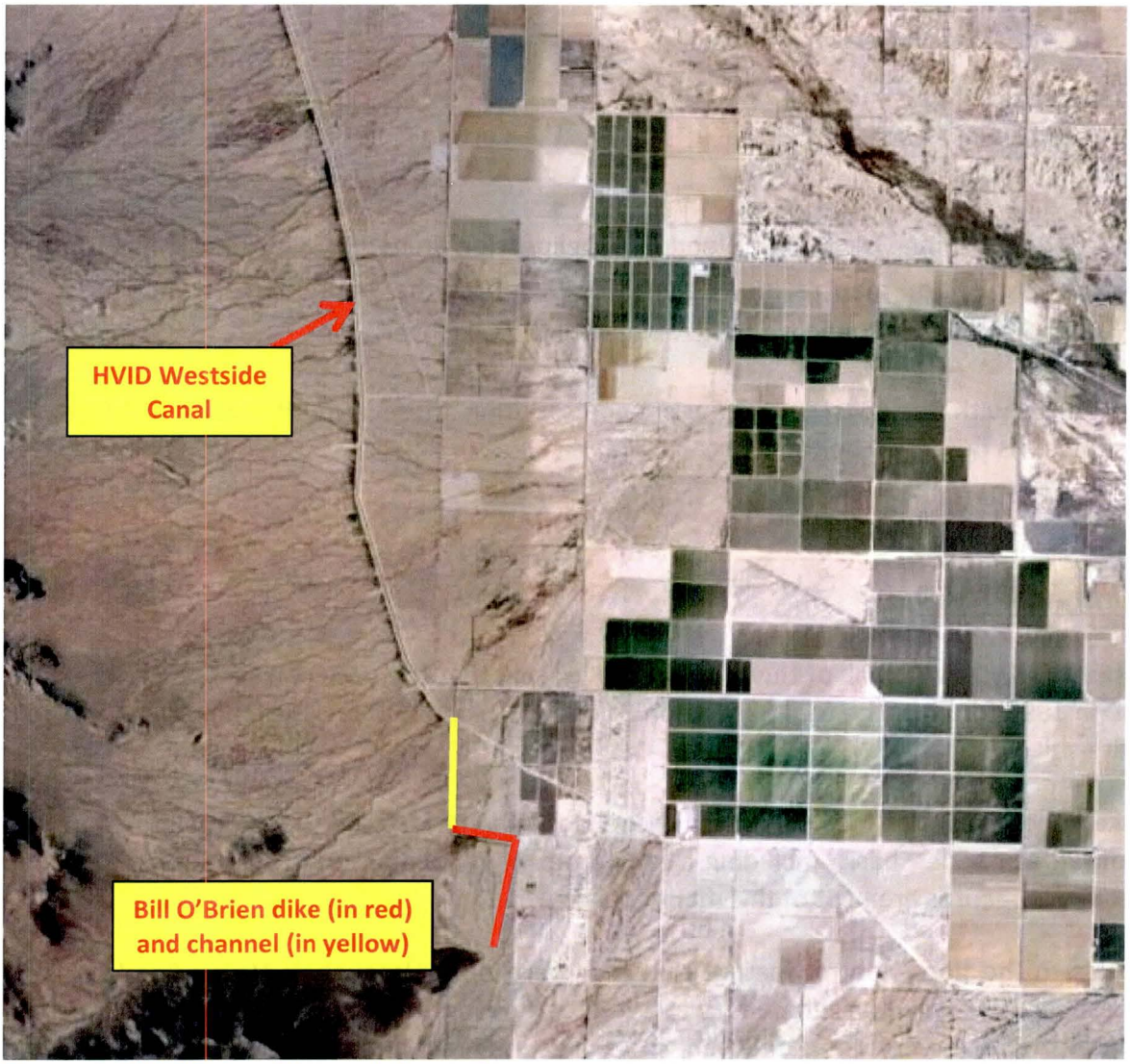


Figure 1. Bill O'Brien dike and channel

Bert asked if there were any delivery issues with the canal itself. Rick said that there were a few problems originally associated with cascade blocks that were included in the canal. Rick has removed all cascade blocks from the HVID canal system.

Jeff asked about the large stock tank near the flow split just west of the HVID Westside canal. Rick referred to this stock tank as Allison Tank; he said it is not used anymore. The Allison Tank was originally designed to catch tailwater off the BJ Ranch.

Rick referred to a farm or an area near the BJ Ranch that he called '75E' about 11 miles west of Harquahala Valley Rd. (the Arlington Canal Company folks referred to 75E as well). Rick referred to either a person or a place named Riddler that had a recharge facility that took CAP water and put it into the ground with 30-inch-diameter wells that go into 150 feet into the ground.

Rick said that the Centennial Levee (which runs from Centennial Wash to I-10 north of Westside Canal) has helped the HVID facilities managements considerably.

Rick has seen large flows in Centennial Wash enter the flood control channel as high as the Indian School Road alignment. In regards to construction of the HVID system, Rick said that CAP water was first delivered into the HVID system in May of 1985, and the flood control channel was completed in November of 1986.

Meeting with ACC

The Gables (Gary and his father, Carter) farm about 2600 acres above Gillespie dam and about 1000 acres below the dam. As far as Gary knows, Arlington Canal Co. irrigates about 3800 cultivated acres.

Centennial Wash is a problem for Arlington. Centennial flows can wash out the Arlington Canal. He also said that the flooding is at its worst when Centennial and the two smaller tributaries just downstream of Centennial all flow at the same time (see Figure 2). All three of these can do damage to the Arlington Canal.

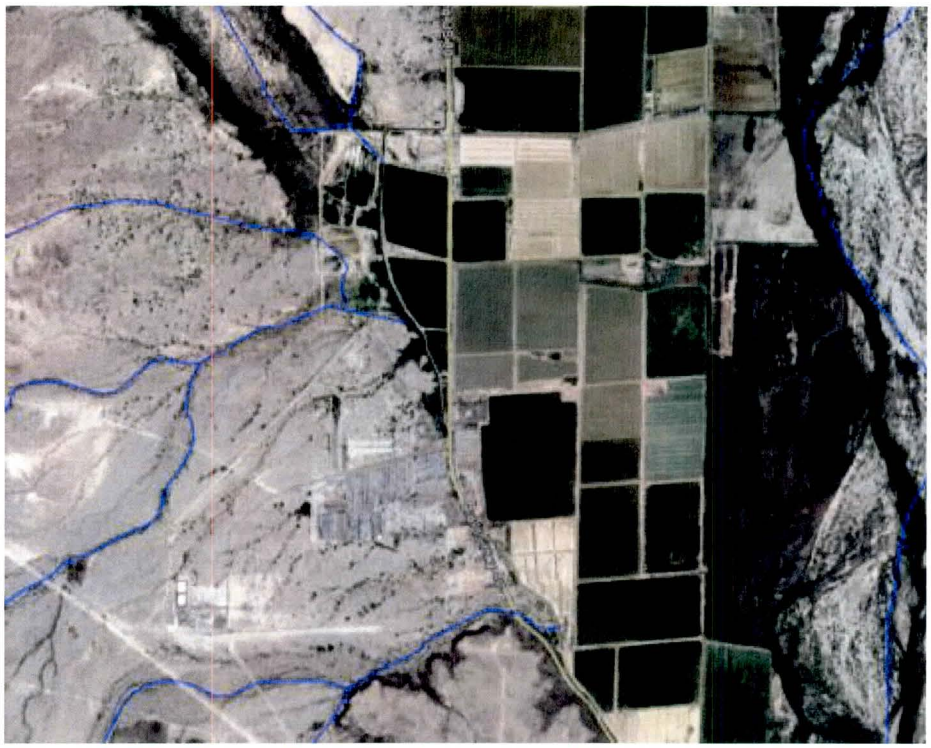


Figure 2. Gila River tributaries that can wash out parts of the Arlington Canal

The Arlington Canal siphons below Luke Wash. Gary said it is not economically feasible to siphon the canal below Centennial Wash.

US Hwy 80 is a dam for Centennial Wash backing water up onto Gary's farm.

Low flow will move down the Arlington Canal in its entirety. Arlington Canal Company is considering increasing the capacity of the canal to increase the stormwater flows that can be transferred in the canal. When asked what the capacity of the canal is, Mr. Gable said he did not know. No as-built plans are available for the canal.

When asked about the flow direction of Centennial Wash in the area, Gary said that that depended on the time period you were discussing. If discussing the historic flow path, the water would flow as shown in Figure 3 below. Since the construction of the AZ Game and Fish ponds (see Figure 4), water has been obstructed from following the historic flow path. Gary would like to be able to channelize the system somewhat to allow the water to follow the recommended flow path shown in Figure 5. Unfortunately, at this time, flood waters from Centennial Wash break out across several farms in the Arlington Canal Company lands and do not flow back into the Gila River until much further to the south, as shown in Figure 6. Gary acknowledged that he was only discussing the lower flows in Centennial (not near the 100-year flow as defined by FEMA).

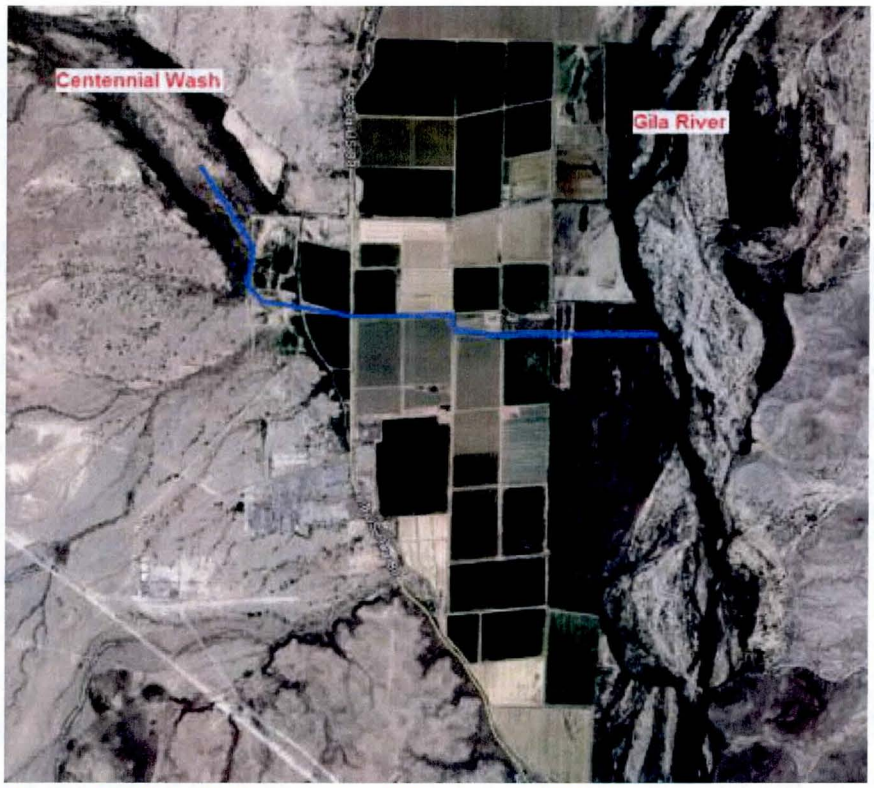


Figure 3. Historic flow path of Centennial Wash

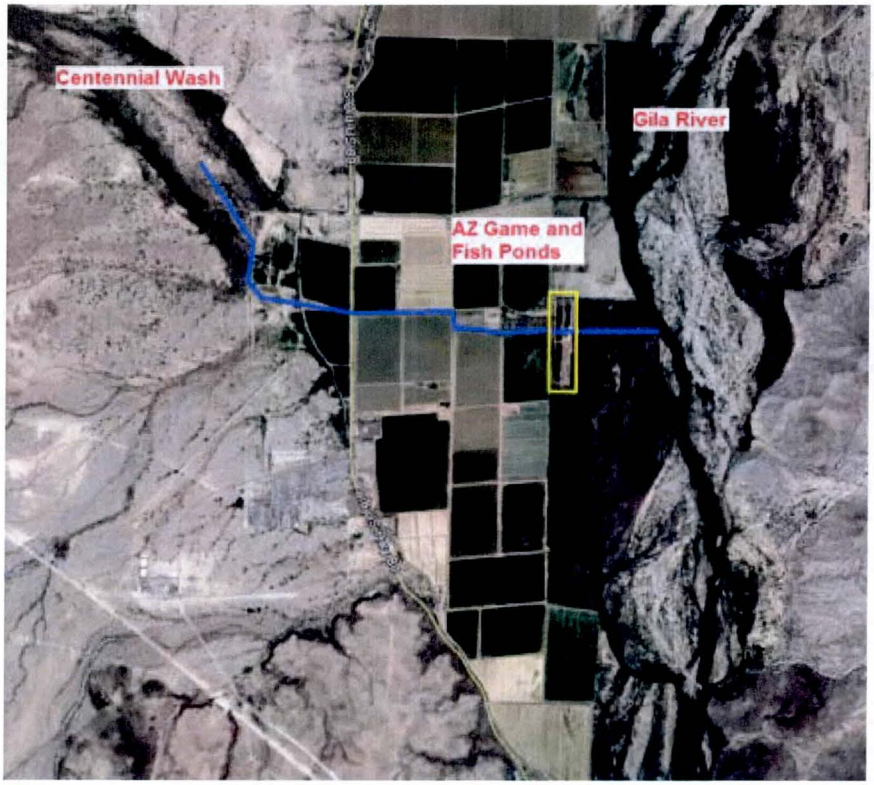


Figure 4. AZ Game and Fish ponds blocking the historic flow path of Centennial Wash

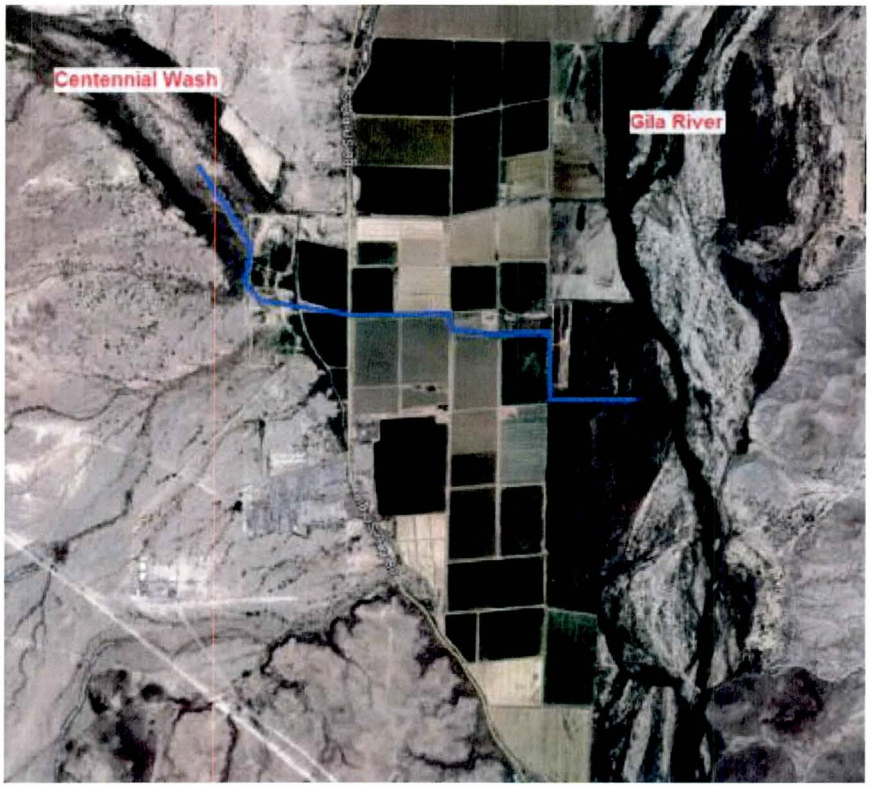


Figure 5. Recommended flow path of Centennial Wash around AZ Game & Fish ponds

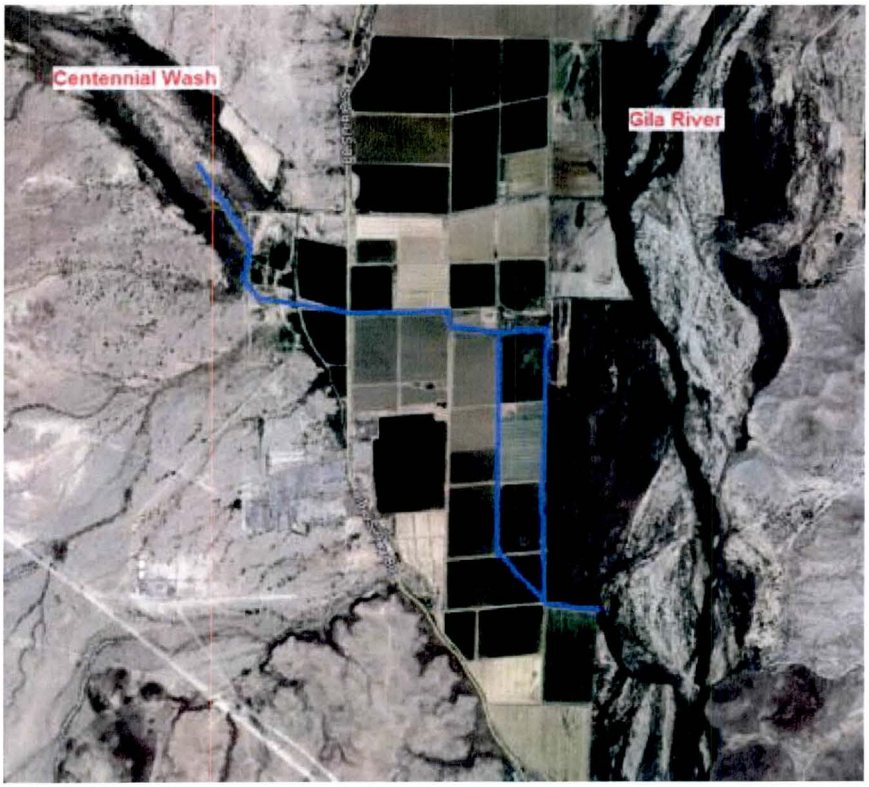


Figure 6. Current observed flow path of Centennial Wash around AZ Game & Fish ponds

According to Gary and Carter, they had not seen high flows like the 1950's and 1960's in Centennial Wash since the construction of some of the dams and other drainage features in the 1980's (for example, Saddleback FRS and Harquahala FRS).

The main canal was cleaned well 5 years ago and it needs to be cleaned again.

Carter mentioned that subsidence has occurred west of Harquahala Valley.

Gary mentioned that a house fire burned a home just west of Old US Hwy 80 near the intersection of Desert Rose Road. When the person wanted to rebuild in the same location, they found out they were in a floodplain (see Figure 7). Mr. Gable said he had never seen flows from Centennial or the Gila reach those houses.

Figure 7. Houses in the floodplain just west of Old US Hwy 80 near the intersection of Desert Rose Road

Carter and Gary both said that significant vegetation along the north side of the Arlington Canal shows how much flows from Centennial and the other Gila River tributaries backs up against the canal. However, they both said that this vegetation helps to protect the Arlington Canal by

"metering" the flow into the canal and not allowing the storm water to rip out the embankment entirely.

Gary mentioned that a recent hydrologic event on Sept. 11, 2012, caused damage to the canal.

The Arlington Canal was built in 1885.

Resource Land Holdings is a large hedge fund that has bought much of the land in the Arlington Valley near the Gila River.

According to Gary, the low flow channel of the Gila River near Palo Verde Road used to pass 150,000 cfs easily. Now 50,000 cfs in the Gila will flood the farms north of the canal at the Palo Verde Road alignment. According to Gary, 80,000 cfs would "wipe Arlington off the map."

Date: October 24, 2012

A meeting was held on Thursday, October 18, 2012 at 9:00 AM MST with the following attendees:

Flood Control District of Maricopa County (District)

1. Jeff Shelton

WEST Consultants (WEST)

1. Brian Wahlin
2. Chuck Davis
3. Bert Clemmens

This meeting was a monthly coordination meeting for the Floodplain Delineation Study (FDS) for Centennial Wash in support of FEMA flood map revisions along the length of the watercourse from the La Paz County border to the confluence of Centennial with the Gila River.

The meeting followed the agenda prepared by WEST prior to the meeting, including the discussion items described below.

Discussion of cross section alignments for HEC-RAS

WEST showed Jeff the preliminary draft cross section alignments for the HEC-RAS model of Centennial Wash. This preliminary draft deliverable was developed by first re-populating the original FEMA lettered cross sections and then adding additional cross sections with cross section spacing on the order of 400 feet or less. As Jeff put it, this seemed crowded when viewing the cross section alignments overlaying the aerial photography. WEST will submit the preliminary draft cross section alignments to Jeff; Jeff will review the layout of the cross sections in a general manner with comments by Friday, October 26. Both WEST and Jeff will continue to consider possibly thinning the cross sections for the final model with cross section spacing on the order of 600 to 800 feet. WEST felt confident that this spacing will still support valid hydraulic modeling results for steady-state computations due to the highly subcritical nature of the flow from early model results. WEST will also investigate cross section spacing needed for unsteady flow modeling (an option that was discussed later in this meeting).

Discussion of preliminary RAS Mapper results

Based on early results of preliminary draft modeling efforts for this study, WEST feels that the size of the input files (TINs and DEMs on the order of several gigabytes in size) and the size of the output files will render RAS Mapper more problematic than useful for this study. Therefore, WEST recommended abandoning further pursuit of the use of RAS Mapper as a review tool for this study. Jeff agreed with this conclusion.

Discussion of preliminary calibration results

Based on the measurements collected in the field on August 23, 2012, WEST attempted an early model calibration. However, WEST quickly realized that the hydrograph at the railroad bridge from the District gage could not be utilized directly to extract a flow rate for the time we were in the field collecting samples. Without a more thorough understanding of the attenuation effects of the hydrograph as the storm wave flowed downstream from the location of measurements to the railroad bridge, and without a better understanding of possible tributary flows contributing to Centennial Wash between the location of measurements and the District gage at the railroad bridge, WEST could not arrive at a known flow rate to match with the measured water surface elevation readings to be able to calibrate the Manning's values. Jeff would like to return to this exercise further along in the modeling process possibly, but he understood that this reading may not allow for a full calibration of our modeling results due to the limited understanding of unsteady hydrograph attenuation and tributary inflows.

In lieu of a calibration, WEST discussed at a minimum comparing the Manning's values from this study with Manning's values assigned to the effective model to determine the agreement between these two modeling studies. Jeff had previously suggested this in his comments on the Manning's roughness report as well. A preliminary comparison of Manning's roughness values in the right overbank reach of the model that WEST developed compared to the right overbank effective model showed general agreement, with WEST's reach-averaged Manning's n value (0.054) being slightly higher than the reach-averaged Manning's n from the effective model for this reach (0.04). WEST will further refine this comparison for the right overbank reach (which represents primarily agricultural land in the Harquahala Valley) and will conduct a similar comparison for an undeveloped portion of the Centennial Wash reach with WEST's proposed roughness values and the effective model values (likely the reach in the remote region downstream of Harquahala Valley Irrigation District (HVID) but upstream of the railroad bridge).

Discussion of required updates to the surface used to cut cross sections and perform mapping tasks

During the initial split flow analysis (discussed below), WEST determined that the extent of some of the effective cross sections did not fully contain the water surface elevation at all locations. In some locations, the extension of the cross sections necessary to contain the flow may go beyond the current extents of the TIN WEST developed originally based on the boundaries of the proposed work map panels. Therefore, WEST will need to extend the boundaries of this TIN in order to accomplish this task. WEST is already in the process of working on this. WEST will inform Jeff as to the status of this process moving forward.

Discussion of the data collection log

WEST developed an Excel spreadsheet detailing the data collected so far in the project from the District and other agencies. This spreadsheet will be sent to Jeff electronically following this meeting.

Jeff inquired if WEST had contacted MCDOT about possible planned alignments through the study area that might be constructed before the completion of this FDS study. WEST has not made this contact at this time. Jeff suggested that in 6-9 months, WEST should contact the engineers working on both the Mesquite Solar Facility (Burns & McDonald is the consulting firm working on this site) and the Arlington Valley Solar Facilities Sites 1 and 2 (ARCADIS is the consulting firm working on these sites) to include the most final data available in the modeling for the Centennial FDS. At that time, Jeff would like WEST to ask MCDOT if they have any projects planned in the study area with imminent construction plans.

Discussion of Jeff's comments on the Manning's roughness assessment

As mentioned previously, WEST will continue to refine the comparison of Manning's roughness values between the proposed Manning's coverages with the cross section alignments for the right overbank reach (which represents primarily agricultural land in the Harquahala Valley) as compared to the effective Manning's values for this reach and will conduct a similar comparison for an undeveloped portion of the Centennial Wash reach with WEST's proposed roughness values and the effective model values (likely the reach in the remote region downstream of Harquahala Valley Irrigation District but upstream of the railroad bridge). This task will be progressing immediately by WEST.

In regards to the comments provided previously to WEST by Jeff, WEST had only one major question regarding the agricultural fields that Jeff had defined as possibly being active in his review. In his comments, Jeff indicated that from the 2011 aerial photographs to the 2012 aerial photographs (both years' photographs were captured in September of the given year), some of the fields defined as "fallow" appeared to be active in the next calendar year. After discussion of this observation, the project team decided that all of these fields should be defined as "active" instead of "fallow," the logic being that an active field that becomes fallow from one year to the next or a fallow field that becomes active from one year to the next should be considered active on an annual average basis for Manning's values. Once again, this would provide a slightly more conservative estimate of water surface elevations as well.

Another point of discussion during this meeting was which seasonal vegetation density should be used to assign roughness values for the model. After consulting with Bert Clemmens regarding growth cycles of plants compared to the dates of the aerial photographs provided by the District (September of 2011 and 2012 for the two sets of aerial photos available from the District at this time), Bert suggested that the growth stage (and therefore the corresponding

roughness values) of the plants primarily grown in the HVID irrigated acreage would not vary significantly. Also, an analysis of the peak flows at the UPRR bridge gage maintained by the District and USGS revealed that the peak flow ever recorded at this gage was a September storm (associated with summer monsoonal hydrologic events), and two of the top four peak events ever recorded at this gage occurred in September. The other two peak flows of the top four recorded at this gage over the entirety of the gage record were winter storms that likely reflect significantly different hydrologic events leading to these peak flows (i.e., lower-intensity, longer-duration winter rain storms that tend to precipitate significantly larger volumes of water over longer periods of time compared to the flashier summer monsoonal hydrologic events). Based on this discussion, the project team in attendance decided to utilize the "worst-case" scenario of roughness values for the peak vegetation density during the summer months as the final Manning's assignments for the modeling effort. Additionally, this provides a more conservative estimate of water surface elevations for the floodplain delineation study than the estimate of Manning's roughness associated with a less-dense winter crop rotation.

Discussion of bridge survey

Jeff met with the District survey team again (John Stock and John Ashley) and found out that viewing the data through the Leica software previously obtained by WEST requires additional licensing for the District which is cost-prohibitive. Therefore, Jeff and the District survey team will supply WEST with the previously discussed 50-100 point survey (termed a virtual RTK survey in the meeting minutes from the September monthly meeting) and a thinned (~1,000,000-point) trestle survey dataset for each of the 4 trestle surveys for WEST to process internally. WEST will be able to handle these datasets easily. Again, WEST would be able to go to the District's offices to view the full datasets on the survey teams' computers if needed to obtain greater detail in the bridge measurements.

Discussion of flow split analysis

WEST completed an initial flow split analysis for the primary flow split area for Centennial Wash (just east of the HVID's West Canal). Our findings were summarized in the technical memo provided to Jeff during the meeting. In summary, the flow split appears to be taking a significant amount of flow from the main branch of Centennial Wash and dumping it into the historic alignment of Tiger Wash (which the updated topo actually shows to be lower in elevation than the riverbed of Centennial Wash). Based on this analysis, WEST needs to continue to refine the flow split analysis in steady-state mode. Jeff, Brian, and Chuck discussed possibly utilizing the unsteady flow component of HEC-RAS to arrive at a better estimate of this flow split. WEST will outline a plan moving forward for developing an unsteady flow model using the hydrographs presented in the Cella Barr study and scaled to peak flows developed by RBF in their analysis for the CLOMR.

Project schedule and billings

Jeff and Brian were not sure if this was a lump-sum contract or a time and materials contract; Jeff will look into which type of contract was utilized in the end.

Jeff inquired if WEST is behind schedule because we are not meeting our projected billings or if WEST is just working efficiently at this point compared to the project billings. Brian and Chuck both felt that the schedule was not an issue, but WEST is just working efficiently at this point. Jeff inquired if WEST would be able to make up some ground on the billings in October and November, and WEST felt confident that they would be able to do that.

Action items deriving from this meeting:

1. *WEST to submit the preliminary draft cross section alignments to Jeff. WEST to consider possibly thinning the cross sections for the final model with cross section spacing on the order of 600'-800', with special thought given to cross section spacing for unsteady flow modeling analysis.* ***Update: WEST provided the preliminary draft cross section alignments to Jeff via email on October 19. WEST will continue to consider cross section spacing for steady and unsteady flow modeling analysis.***
2. *Jeff to review generally the layout of the cross sections with comments by Friday, October 26. Jeff to consider possibly thinning the cross sections for the final model with cross section spacing on the order of 600 to 800 feet.*
3. *WEST to abandon the calibration based on the measurement obtained in the field for now. Jeff would like to return to this exercise further along in the modeling process possibly, considering that the collected measurements may not allow for a full calibration of our modeling results due to the limited understanding of unsteady hydrograph attenuation and tributary inflows.*
4. *WEST to further refine the comparison of Manning's roughness values between the proposed Manning's coverages with the cross section alignments for the right overbank reach (which represents primarily agricultural land in the Harquahala Valley) as compared to the effective Manning's values for this reach, and will conduct a similar comparison for an undeveloped portion of the Centennial Wash reach with WEST's proposed roughness values and the effective model values (likely the reach in the remote region downstream of HVID acreage but upstream of the railroad bridge).*
5. *WEST to extend the boundaries of the developed TIN to contain flow extents in all cross sections and inform Jeff as to the status of this process moving forward.*
6. *WEST to send the data collection log spreadsheet to Jeff electronically.*
7. *IN 6 to 9 months, WEST to contact the engineers working on both the Mesquite Solar Facility and the Arlington Valley Solar Facilities Sites 1 and 2 to include the most final data available in the modeling for the Centennial FDS. At that time, WEST will also contact MCDOT to ask if they have any construction plans in the FDS study area.*

8. *WEST to continue addressing Jeff's comments on the Manning's roughness report and shapefile as per the comments included in the minutes above.* ***Update: WEST forwarded an updated report and shapefile to Jeff via email on 10/24/2012.***
9. *Jeff to provide the virtual RTK 50-100 point survey files and the one million point data deliverables for each of the four railroad trestles when available from the District's survey team.*
10. *WEST to continue to refine the flow split analysis in steady-state mode.*
11. *WEST to outline a plan moving forward for developing an unsteady flow model using the hydrographs presented in the Cella Barr study and scaled to peak flows developed by RBF in their analysis for the CLOMR.*
12. *Jeff to determine if the contract was in finality a lump-sum contract or a time and materials contract.*
13. *WEST to make up some ground on the billings compared to the project billings in October and November.*
14. *Jeff to forward WEST the linework for the historic Tiger Wash alignment.*
15. *WEST to work with Jeff to see if Jeff can utilize WEST's ftp site one more time before utilizing the District's EFTP for the remainder of the project.*

Action items continuing from the last monthly meeting:

1. *WEST to continue to coordinate with Rick and Jeff in regards to the Harquahala Valley Irrigation District site visit on October 2.* ***Update: This site visit was completed on Tuesday, October 2.***
2. *WEST to continue to try to contact Gary Gable of the Arlington Irrigation District.* ***Update: This contact was made during the site visit that was completed on Tuesday, October 2.***
3. *Jeff to review the site visit trip report and provide comments to WEST if desired.* ***Update: Comments were provided to WEST by Jeff. WEST is working to incorporate these comments.***
4. *WEST to contact MCDOT for any possible planned alignments that may cross Centennial.* ***Update: WEST still to contact MCDOT.***

Date: November 21, 2012

A meeting was held on Friday, November 16, 2012 at 9:00 AM MST with the following attendees:

Flood Control District of Maricopa County (District)

1. Jeff Shelton

WEST Consultants (WEST)

1. Brian Wahlin
2. Chuck Davis

This meeting was a monthly coordination meeting for the Floodplain Delineation Study (FDS) for Centennial Wash in support of FEMA flood map revisions along the length of the watercourse from the La Paz County border to the confluence of Centennial with the Gila River.

The meeting followed the agenda prepared by WEST prior to the meeting, including the discussion items described below.

Discussion of updated billing projections for the project

Jeff requested that WEST update our projected billings memorandum with the following items: (1) graphs of the originally proposed projected billings (one graph for the incremental projected monthly billings and one graph for the cumulative projected monthly billings); (2) updated projected billings in tabular format with the August, September, and October actual billings, then updated projected billings moving forward showing where we will regain our current difference in projected versus actual billings to this point; and (3) graphs of the updated proposed project billings (one graph for the updated incremental projected monthly billings and one graph for the updated cumulative projected monthly billings). After reviewing the past billing trends and taking into account upcoming tasks in regards to budgeting, WEST updated the projected billings memorandum with this information and provided it to Jeff via email on November 14. Jeff said he had not reviewed this document yet, but he would review this document and get back to WEST with any comments if needed. During this coordination meeting, Jeff noticed that a link to a reference in the Word document was erroneous. WEST will correct this and deliver an updated version to Jeff right away.

Discussion of flow split analysis

WEST built on the initial flow split analysis for the primary flow split area for Centennial Wash (just east of the HVID's West Canal) that was completed initially ahead of the October monthly meeting. In summary, the more in-depth analysis agreed with the previous initial analysis in its results: the flow split still appears to be taking a significant amount of flow from the main

branch of Centennial Wash and dumping it into the historic alignment of Tiger Wash (which the updated topo actually shows to be lower in elevation than the riverbed of Centennial Wash). WEST's continued refinement of the flow split analysis in steady-state mode included the following analyses:

1) Improve the representation of the lateral structures in the model by ensuring that the lateral structures correctly capture the hydraulics of water spilling from one reach into the other. This was done by verifying the lateral weir structure lengths and weir coefficients. Additionally, the number of lateral weir structures utilized in the model and the level of detail included in the definition of the weir geometry were subjected to sensitivity testing. The final results still ranged from a maximum breakout flow between 8,000 and 12,000 cfs.

2) Analyze the capacity of the main channel of Centennial Wash to determine what flow in the main channel would cause breakout flow to enter the overflow channel (i.e., the historic Tiger Wash alignment). This analysis showed that, due to the flat topography in the study area and the lack of clearly defined high ground between the two channels, flows well below the peak flow of 34,347 cfs (as per the RBF CLOMR study) could still introduce significant amounts of flow into the breakout channel. From previous discussions between WEST and the District, it had been proposed to possibly analyze the flow split area using unsteady flow modeling to determine the volume of water that might leave the main stem during a flood event if the main channel contained completely the flows below some flow value near the peak (e.g., if the main channel could contain flows up to 32,000 cfs, then only that portion of the hydrograph above 32,000 would be available to leave the main channel). It was discussed that this unsteady flow analysis could possibly result in a peak flow in the breakout channel far less than a similar split flow analysis using steady-state flow modeling, which does not take into account the unsteady nature of storm events and the possible limitations in peak flow in the breakout channel due to volume constraints of the hydrograph. However, flows below 20,000 cfs were still shown to send significant amounts of flow into the breakout channel. From the unsteady flow hydrograph technical memorandum submitted to the District by WEST on November 5, the amount of time for which the flood hydrograph exceeds 20,000 cfs is a large percentage of the total time of the storm hydrograph. From this preliminary capacity analysis of the main branch of Centennial Wash and discussion between WEST and the District, it was determined that the possibility of an unsteady model significantly reducing the breakout flow was likely low, since there would likely be ample time for the amount of water leaving the main branch of Centennial Wash and entering the breakout channel to create an almost steady-state condition in the breakout channel that would be limited by head differential between the two channels and not limited by the volume of water available in the unsteady hydrograph. In other words, this preliminary unsteady modeling task supported the use of steady-state hydraulic modeling to analyze the flow splits. Therefore, the District and WEST decided to forgo unsteady HEC-RAS modeling for the flow split area at this time.

3) Analyze the capacity of the HVID flood control drainage feature that runs north-south parallel to Harquahala Valley Road. This analysis showed that the capacity of the channel ranges from approximately 500 cfs near the northern end of the channel feature to on the order of 3,000 cfs near the downstream end of this channel feature. It was estimated that an overall average "capacity" of this feature would be between 1,000 and 2,000 cfs. This analysis agreed conceptually with the as-built plans for this channel, which shows that the channel increases in size (bottom width and flow depth) from upstream to downstream. The District and WEST discussed this analysis in detail at the meeting. Three things of specific note came from this discussion. First, this analysis still does not include the 3-barrel culvert in the north-south drainage feature at Centennial Road. Including this hydraulic structure directly in the model could further reduce the capacity of this drainage feature for purposes of overall channel capacity. Second, the water surface elevation in the channel within the north-south drainage feature compared to the natural ground downstream of the embankment along the east bank of the north-south drainage feature was well over one foot at some locations. Therefore, for purposes of a FEMA assessment, this feature would be considered a non-certified embankment that cannot be relied upon for flood control purposes and must be removed for modeling purposes. Third, it appears that breakout could occur at multiple locations along the length of the north-south drainage feature, as flows below the minimum flow leaving the main branch of Centennial Wash as identified in the split flow analysis above would overwhelm the north-south drainage feature's downstream embankment at several locations.

With this more detailed analysis in mind, the District and WEST began discussing the best methodology moving forward to analyze the area of the flow split for modeling and mapping purposes. The discussion concluded that a two-dimensional assessment of flooding conditions in this area—specifically, the use of FLO-2D—would be the best approach for quantifying flooding issues in the vicinity of the flow split for a number of reasons:

1) Due to the facts that (1) the thalweg of the breakout channel is lower than the Centennial Wash thalweg in the vicinity of the flow split and (2) there is little high ground dividing these two channels in an area of very flat topography, the resulting hydraulics of the flow split area are two-dimensional in nature. Utilizing a two-dimensional model will better quantify the flow split and provide certainty in the current steady-state analysis of flow split using steady-state HEC-RAS for the main flow split area.

2) The spatial distribution of flows entering the north-south drainage feature of the HVID system varies throughout its length, and there is also variation in the possible breakout of flows from this channel into the agricultural fields downstream. Quantifying the flow that may leave the overbank flow split area and re-enter Centennial Wash through the north-south drainage feature will be crucial to accurately assessing the realistic extents of flooding in this area.

3) The minimum breakout flow from Centennial Wash into the breakout channel estimated to this point is 8,000 cfs. The maximum capacity of the north-south drainage feature is approximately 3,000 cfs. Even though the analysis to this point has been preliminary, the large disparity of flows from these analyses lead the project team to anticipate that flow will break out of the north-south drainage feature and continue to flow downstream through a highly two-dimensional system of agricultural fields where, once again, realistically assessing flooding extents could be crucial.

4) Floodplain storage that occurs in very wide, flat cross sections is lost in a one-dimensional assessment of flooding extents. Two-dimensional analysis helps to account for attenuation of flooding that can occur due to floodplain storage, even in a steady-state analysis.

Regarding the application of FLO-2D to the flow spit area, WEST and the District discussed possibilities for applying FLO-2D to this specific system. First, a computational domain that includes the primary flow split area, the entire main channel of Centennial Wash and the overflow flooding area, and the confluence of these two flow paths downstream would be approximately 46 square miles. If we only include the primary flow split area, the overflow flooding area, and the confluence of the two flow paths (i.e., do not include the main branch of Centennial Wash in the portion of the reach that is not influenced by the flooding extents of the overflow channel below the main flow split and above the confluence), the total area of the computational domain would be approximately 32 square miles. With very little urban development in the project study area, a highly detailed grid resolution may not be warranted to assess flooding extents and model the hydraulics of the system. A grid size of 50 feet was discussed as reasonable, which would result in approximately 510,000 grid elements for the 46-square-mile study area or approximately 350,000 grid elements for the 32-square-mile study area. If the District would like to use a finer resolution grid, a grid size of 25 feet would result in approximately 2,000,000 grid elements for the 46-square-mile study area or approximately 1,400,000 grid elements for the 32-square-mile study area. Finally, a grid size of 35 feet would result in approximately 1,000,000 grid elements for the 46-square-mile study area or approximately 730,000 grid elements for the 32-square-mile study area.

Regardless of the final grid size, it was recommended to model the north-south drainage feature of the HVID system as a one-dimensional channel feature in FLO-2D. We also discussed whether a FLO-2D model should be used as a stand-alone model to support FEMA mapping, or if the model should be used to calibrate an HEC-RAS steady-state model. This will continue to be discussed by the project team. WEST will provide a separate technical memorandum to Jeff summarizing this conversation to facilitate his discussion of these topics internally with District staff.

Discussion of cross section alignments for HEC-RAS

WEST had no questions regarding Jeff's comments on the cross section alignments. WEST will provide Jeff with a response to comments package on the cross section alignments as early as next week.

At one point, Jeff had recommended considering a coarser cross section spacing for the HEC-RAS model than 400 feet, the original spacing submitted to the District. WEST performed a sensitivity analysis to determine an optimum spacing for this project. The results of this sensitivity analysis are shown below. To summarize this analysis, an 800-foot cross section spacing introduced significantly more warnings regarding hydraulic computations in HEC-RAS having difficulty converging on an acceptable answer due to excessive cross section spacing. Therefore, WEST recommended to remain with the 400-foot cross section spacing as originally proposed. The District concurred with this recommendation, with the additional recommendation to correct areas that appear to be too "bunched up" near sharp turns or hydraulic structures using the 400-foot spacing. WEST said that they would thin the cross sections where needed while maintaining 400-foot cross section spacing throughout most of the model.

		Errors				
Location	**Spacing**	**Energy**	**Velocity**	**Conveyance**	**Total**	**Percent Increase**
Below Bridge	**400'**	16	1	12	**29**	52%
	800'	37	0	7	**44**	
Lower Reach	**400'**	22	1	1	**24**	75%
	800'	39	1	2	**42**	
Middle Reach	**400'**	60	11	7	**78**	-12%
	800'	49	10	10	**69**	
Upper Reach	**400'**	65	2	12	**79**	-22%
	800'	51	2	9	**62**	

Discussion of Bridge cross section alignments and calibration efforts

WEST performed an initial analysis of flow through the bridge structure using a method recommended originally by the District. This analysis showed approximately 53% of the flow going through the main opening of the bridge trestles at Centennial Wash, 29% going through trestle #2, 15% going through trestle #3, and 3% going through trestle #4 (which is an opening for the Winters Wash). Trestle #1 was analyzed using the direct step backwater calculation method using an actual bridge opening, while trestles #2, #3, and #4 were analyzed as weir flow over a lateral structure, and flow not going through the bridge opening would first be available to flow through trestle #2, then #3, then #4 in that order. There were significant issues with this analysis from a hydraulic modeling perspective, including boundary condition effects and the applicability of assumptions inherent in weir flow over a lateral structure. However, this was a good starting point for the further analysis of the hydraulics through this complex bridge structure. Another possible modeling method would be to model trestle #1 as one bridge, and trestles #2, #3, and #4 as bridge structure separate from trestle #1. A third option was to model trestles #1 and #4 as bridge structures with a direct step backwater computation and trestles #2 and #3 as lateral structures. A final option was to model all four trestles as a single bridge structure. WEST will continue to assess which method would be the best representation of hydraulics through this highly complex bridge structure.

Discussion of roughness comparison to effective model

WEST compared the Manning's values from this study with Manning's values assigned to the effective model to determine the agreement between these two modeling studies. A preliminary comparison of Manning's roughness values in the right overbank reach of the model that WEST developed compared to the right overbank effective model showed general agreement, with WEST's reach-averaged Manning's *n*-value (0.054) being slightly higher than the reach-averaged Manning's *n*-value from the effective model for this reach (0.04). This comparison (which was presented previously to the District) represented the right overbank reach which is made up primarily of agricultural land in the Harquahala Valley. Similarly, WEST conducted a similar comparison for an undeveloped portion of the Centennial Wash reach between the confluence of the overbank flow path with the main branch of Centennial Wash and the Union Pacific Railroad Bridge. This comparison showed that WEST's reach-averaged Manning's *n*-value (0.046) to once again be slightly higher than the reach-averaged Manning's *n*-value from the effective model for this undeveloped reach (0.04), but these values were closer than the comparison of the agricultural portion of the study watershed. Both comparisons for the updated model Manning's roughness values compared to the effective modeling study show good general agreement, with slightly conservative estimates of roughness for the current study based on more detailed assessment of roughness areas in the project area.

Discussion of required updates to the surface used to cut cross sections and perform mapping tasks

The extents of the surfaces used to support modeling and mapping tasks for this project have been updated slightly based on initial determination that effective cross section extents may not contain flows in all locations (even with lower flow values) due to the improved accuracy of the topography data used for this study. This surface extension did not require additional topography to be delivered from the District (WEST already had the additional topography extents needed to include in the final surface), and this task has been completed internally by WEST. WEST can deliver the final surface to the District at their request when desired.

Discussion of bridge survey

Jeff delivered two products for each bridge trestle at this monthly coordination meeting:

1) A 50-100 point "virtual RTK" of the bridge developed from the scan data. This was developed by the District's internal survey team. Using the scan data in a virtual environment, they "collected" points at primary locations along the trestle bridges (such as "Natural Ground," "Bridge Chord at Pillars," or "Railroad") just as they would in a field-based traditional survey method with the total station survey equipment. However, these are just thinned points from an electronic data cloud.
2) A thinned trestle survey dataset for each of the 4 trestle surveys that were originally about 5,000,000 points each. These thinned data edited out points that were within 0.1 feet of each other, and these data were delivered for WEST to process internally for measurements of the bridge opening to enter into HEC-RAS. The approximate number of points for each thinned survey is below.
    a. Trestle 1 ~217,000 points
    b. Trestle 2 ~560,000 points
    c. Trestle 3 ~606,000 points
    d. Trestle 4 ~269,000 points

WEST will begin to process these data to extract the necessary information to enter into the HEC-RAS model for the railroad bridge when needed.

Action items deriving from this meeting:

1. *WEST to provide an updated projected schedule and billings technical memorandum to Jeff correcting the erroneous page references.* ***Update: This was delivered by WEST via email on November 19.***
2. *WEST to provide Jeff with a technical memorandum discussing the status of the split flow analysis and the discussion supporting the use of FLO-2D to model the split flow area due to the complexity of the steady-state split flow analysis to this point.*
3. *WEST to respond to Jeff's comments on the cross section alignments by technical memorandum. WEST to thin any cross sections that seem too "bunched up" in the final 400-foot cross section spacing file before submitting to Jeff.*
4. *WEST to utilize the delivered trestle scan data to extract bridge survey information in support of entering bridge data into the HEC-RAS model.*
5. *WEST to further refine the bridge opening modeling effort by testing several of the options discussed during the meeting to determine which best represents the hydraulics through this structure. This analysis will be supplemented with the additional information from the trestle scans delivered by the District at this meeting.*

Action items continuing from the last monthly meeting:

1. *WEST to send the data collection log spreadsheet to Jeff electronically.* ***Update: WEST is currently working to provide this document to Jeff.***
2. *Jeff to review the site visit trip report and provide comments to WEST if desired.* ***Update: Comments were provided to WEST by Jeff. WEST is working to incorporate these comments.***

Date: December 28, 2012

A meeting was held on Thursday, December 20, 2012 at 9:00 AM MST with the following attendees:

Flood Control District of Maricopa County (District)

1. Jeff Shelton

WEST Consultants (WEST)

1. Brian Wahlin
2. Chuck Davis

This meeting was a monthly coordination meeting for the Floodplain Delineation Study (FDS) for Centennial Wash in support of FEMA flood map revisions along the length of the watercourse from the La Paz County border to the confluence of Centennial with the Gila River.

The meeting followed the agenda prepared by WEST prior to the meeting, including the discussion items described below.

Discussion of updated billing projections for the project

The District requested that WEST update our projected billings memorandum one final time for delivery to the District by Monday, December 24, 2012. The District will need to hold WEST to those projected billings from that point forward for the remainder of the project.

Discussion of the draft HEC-RAS deliverables

WEST explained in detail the draft HEC-RAS deliverable that was made to District staff via email and ftp delivery on Monday, December 17, 2012. More information on these deliverables can be found in the email sent to Jeff Shelton on that date.

The District requested that WEST send the final Manning's n shapefile used for developing the HEC-RAS model deliverables be resent to him to aid in his review to ensure that he has the most recent version of that deliverable.

Discussion of the Narrows Dam in the CBA HEC-1 model

The District suggested removing Narrows Dam from the Cella Barr HEC-1 model for Centennial Wash so the hydrologic model used to develop an unsteady hydrograph for use in the FLO-2D modeling tasks does not include retention from this dam (which is no longer in existence) in the hydrologic routing

computations. Jeff Shelton offered to complete this analysis if WEST would send their corrected version of the electronic HEC-1 input file to him.

Discussion of the FLO-2D modeling tasks

The District and WEST discussed the optional FLO-2D modeling task for the flow split area, which was approved by the District via letter on December 12, 2012. This discussion touched on several different components of the modeling effort that will begin shortly.

First, the District wanted to verify that WEST was using the most recently approved version of the FLO-2D model for this effort to ensure that the hydraulic analysis in FLO-2D and any subsequent mapping based on this analysis would not be disallowed by FEMA due to model versioning issues. WEST verified that they would be using FLO-2D v2009.06 which was listed as an approved model on FEMA's list of approved hydraulic models online when retrieved online on December 19, 2012 (http://www.fema.gov/national-flood-insurance-program-flood-hazard-mapping/numerical-models-meeting-minimum-requirement-0).

Second, the District and WEST discussed the options for hydrology to be used in the FLO-2D modeling effort. WEST could use one of two types of hydrographs for use in the FLO-2D model of the flow split: (1) a fully unsteady hydrograph based on the shape of the hydrographs from the Cella Barr HEC-1 model with the maximum ordinate scaled to the lower peak flow in the more recent return-interval analysis completed by RBF, or (2) a constant-inflow hydrograph with the peak flow value from the RBF analysis entered for every hydrograph ordinate. The second option would allow for a "quasi-steady" hydraulic analysis by running a constant-inflow hydrograph into the model until a near equilibrium state is reached in the model grid, thereby arriving at a nearly steady-state solution. This type of analysis would be more congruent with the steady-state approach used in the one-dimensional HEC-RAS model than the fully unsteady flow hydrograph.

Another reason to use the "quasi-steady" hydraulic analysis methodology listed above as opposed to the fully unsteady hydrograph is the issue of timing for the inflow of the additional flow derived from the original HEC-1 modeling study and the RBF return interval analysis. This is problematic using the fully unsteady flow modeling approach. This flow change occurs at Baseline Road, just upstream of the downstream end of the FLO-2D model identified for this task. Therefore, a hydrograph with a peak flow equal to the peak flow near the upstream end of the model as defined by RBF will need to be entered at the upstream end of the FLO-2D grid and another hydrograph with a peak flow equal to the difference in the peak flow at Baseline Road and the peak flow near the upstream end of the model as defined by RBF (i.e., 4,205 cfs) will need to be entered into the model somewhere near the downstream end of the model. In order to ensure the timing of these two hydrographs is correct to allow the peaks to combine before reaching the downstream end of the FLO-2D grid, WEST would need to undertake a significant effort of model runs to optimize the timing of the inflow hydrograph near the

downstream end of the model. The District and WEST both felt that this level of effort would not be beneficial or necessary. To avoid this issue, the District recommended possibly entering a constant-inflow hydrograph near the downstream end of the model of 4,205 cfs (38,552 cfs at Baseline Road minus 34,347 cfs at the upstream end of the model). This constant-inflow hydrograph would allow the timing of the additional flow required to reach the peak flow below Baseline Road to be ignored, as the constant-inflow "flow change" hydrograph would correspond to the peak of the flood wave that was routed from the upstream end of the model grid no matter when that attenuated hydrograph peak arrived near the downstream end.

Additionally, the District surmised that part of the reason that the flow change was defined at this location may be related to the outfall channel of the Saddleback FRS, the downstream end of which is located very near the intersection of Centennial Wash and Baseline Road. The District recommended entering the constant-inflow hydrograph near the end of the Saddleback FRS outfall channel. As WEST is working on the Saddleback FRS hydrology currently, WEST offered to look into their documentation received from the District to determine the approximate 100-year flow from the Saddleback FRS outfall channel.

In the end, it was determined that WEST would use an unsteady flow hydrograph created by scaling the ordinates of the Cella Barr HEC-1 hydrographs to the new peak flows from the RBF study for use in the FLO-2D model near the upstream end, and a constant-inflow hydrograph would be used near the downstream end to support the flow change location defined at Baseline Road in the RBF study. In the future, the constant-inflow hydrograph approach can be used near the upstream end of the model as well if it is deemed necessary to investigate this method.

The third task that WEST discussed with the District in regards to the FLO-2D modeling was in regards to Manning's roughness for the FLO-2D model. The District and WEST agreed that the base Manning's n shapefile for the Manning's n assignment used in HEC-RAS should be used for the horizontal assignment of roughness areas for the FLO-2D model as well; however, the values themselves should be increased by some consistent percentage to utilize Manning's n values slightly higher than typical one-dimensional modeling Manning's n values as per the recommendation of the FLO-2D modeling guidelines. WEST will work on this analysis and provide the results to Jeff Shelton for review at a later date.

The fourth task that WEST discussed with the District in regards to the FLO-2D modeling was the number of grid elements over which to subdivide the inflow hydrograph. The peak flow value at the upstream end of the model is 34,347 cfs. Typical practice recommends that FLO-2D models not enter any hydrograph onto the grid for which the ratio of the flow in a given element to the surface area of that element is more than 1. This helps to reduce numerical stability issues due to a wave face being too steep as it leaves a given cell. In the specific example of the Centennial FLO-2D model, the grid size is 40 feet x 40 feet (corresponding to a single element surface area of 1,600 square feet). Therefore, the ratio of the peak flow to the surface area of a single grid element is 21.5. WEST recommended spreading the inflow hydrograph over 22 or more grid cells to alleviate the numerical stability issues this problem

can cause. The District recommended spreading the inflow over a larger distance, possibly 40 grid elements. From back-of-the-envelope calculations, 40 grid elements accounted for approximately half of the width of the Centennial Wash floodplain, and WEST and the District decided to use this number of grid elements for the development of the inflowing hydrograph.

The final task that WEST discussed with the District in regards to the FLO-2D modeling was the development of Area Reduction Factors (ARFs) and Width Reduction Factors (WRFs) for the FLO-2D grid elements. It was determined by the project team that WEST will create polygon shapefiles for the buildings in the study area to use as ARFs. WRFs may or may not be defined, as neither WEST nor the District felt that walls or other linear features reducing flow widths for grid elements would be prevalent in the study watershed. WEST will provide the ARF shapefile to Jeff Shelton when available, and WEST will report to the District if they feel that WRF definition and incorporation into the FLO-2D model will be warranted.

Discussion of the bridge calibration effort

WEST explained to the District the current status of the bridge modeling effort using a combination lateral structures and bridge structures in the HEC-RAS geometry to represent flow through the UPRR Bridge. The District was generally pleased with the approach, but the District felt that the lateral structures used to model bridge trestles #2 and #3 should use box culverts instead of ground points alone to represent the piers and the bridge deck. WEST will make these changes and provide the results to the District.

Additionally, it is obvious in the current bridge geometry that the railroad rails themselves are included in the elevation data representing the bridge deck geometry over the bridge openings, but the height of the rail was not included when the elevation data was extracted from the final DTM along the top of the railroad embankment between the bridge openings. Therefore, the District mentioned possibly adding the average thickness of the railroad rails from the trestle scans to the portions of the bridge geometry between the bridge openings (i.e., the portion of the bridge deck geometry obtained from the DTM data) if an average value can be determined easily.

In regards to the "without levee" type of condition, the District and WEST discussed possibly considering two more primary additions to the bridge calibration model, including (1) adding lateral structures between the primary flow path and the middle overbank flow path and between the middle overbank flow path and the far left overbank flow path, and (2) keeping the lateral structures in the geometry in the left overbank of the primary flow path upstream of the bridge but dropping the lateral structure elevations to the ground for one plan to consider a "no levee" scenario. WEST will look into both of these options moving forward.

After reaching a final model best describing the hydraulics through the bridge structure, WEST will include that plan into the overall model titled "Baseline to Gila" that was submitted to the

District as part of the draft HEC-RAS deliverables as opposed to including only a short stretch of the Centennial Wash reach upstream and downstream of the bridge for this calibration model.

Discussion of railroad trestle scan survey tools created by WEST

WEST created a simple Excel macro-based tool to aid in the visualization of the trestle scan data for incorporation into the HEC-RAS modeling. One problem that was persistent with the trestle scan data before developing these tools was the problem of trying to measure pier width after zooming in on the three-dimensional trestle scan data cloud and losing perspective due to the conflicting visualization of near points and background points. Therefore, these tools were developed to define a rectilinear, six-sided volume to filter points inside this volume. Conceptually, the trestle data scan could then be limited to a 1' tall strip of points surrounding only the piers in the trestle (each trestle included 19 trestle groups of 5-6 piers per trestle group). This allowed for much better visualization of trestle scan data both from an oblique angle and in plan view.

Discussion of the development of elevation reference marks (ERMs)

WEST and the District discussed the possibility of beginning the development of the ERM dataset for the workmaps for Centennial. WEST felt that the down time during FLO-2D model development and the District's review of the draft HEC-RAS submittal would allow WEST's GIS staff to begin this process of ERM development if the District was ready to proceed with this process. The District indicated they agreed with this course of action, and Jeff will plan to provide WEST with the necessary data to begin ERM development in the next few weeks.

Action items deriving from this meeting:

1. *WEST to provide an updated projected billings memorandum by Monday, December 24, 2012.* ***Update: This was delivered by WEST via email on December 24.***
2. *WEST to send the final Manning's n shapefile used for developing the HEC-RAS model deliverables to the District.*
3. *WEST to send the corrected version of the electronic HEC-1 input file from the Cella Barr study to Jeff Shelton, and Jeff to investigate the removal of the Narrows Dam from this model and subsequent impacts on the final hydrographs.* ***Update: WEST forwarded the***

corrected Cella Barr HEC-1 model to Jeff via email on December 21, and Jeff forwarded the conclusions of his investigation back to WEST on December 28.

4. *WEST to develop inputs for the FLO-2D model, including the hydrographs scaled from the Cella Barr HEC-1 model, updated Manning's n values, and ARF/WRF development.*
5. *WEST to investigate the use of Saddleback FRS 100-year outflow data return interval analysis in the FLO-2D modeling task for comparison to the flow change determined by the RBF study at Baseline Road of 4,205 cfs.*
6. *WEST to model bridge trestles #2 and #3 using box culverts instead of ground points alone to represent the piers and the bridge deck in the lateral structure.*
7. *WEST to investigate adding the average thickness of the railroad rails from the trestle scans to the portions of the bridge geometry between the bridge openings (i.e., the portion of the bridge deck geometry obtained from the DTM data) if an average value can be determined easily.*
8. *WEST to investigate (1) adding lateral structures between the primary flow path and the middle overbank flow path and between the middle overbank flow path and the far left overbank flow path downstream of the bridge, and (2) keeping the lateral structures in the geometry in the left overbank of the primary flow path upstream of the bridge but dropping the lateral structure elevations to the ground for one plan to consider a "no levee" scenario.*
9. *WEST to include the final bridge hydraulics plan into the overall model titled "Baseline to Gila."*
10. *Jeff to provide WEST with the necessary points for ERM development, and WEST to begin developing the ERM dataset for this study's workmaps.*

Date: January 25, 2013

A meeting was held on Thursday, January 17, 2013 at 9:00 AM MST with the following attendees:

Flood Control District of Maricopa County (District)

1. Jeff Shelton

WEST Consultants (WEST)

1. Brian Wahlin
2. Chuck Davis
3. Bert Clemmens

This meeting was a monthly coordination meeting for the Floodplain Delineation Study (FDS) for Centennial Wash in support of FEMA flood map revisions along the length of the watercourse from the La Paz County border to the confluence of Centennial with the Gila River.

The meeting followed the agenda prepared by WEST prior to the meeting, including the discussion items described below.

Discussion of the draft HEC-RAS deliverables

The District indicated that comments on the draft HEC-RAS deliverables would be provided by January 25 as indicated in the schedule. WEST and the District will coordinate at that time to possibly have an intermediate meeting to discuss these comments if needed.

Discussion of the hydrology for the FLO-2D model

Bert Clemmens joined the meeting to discuss the use of the results from Cella Barr HEC-1 model in the FLO-2D modeling task for the flow split. As discussed previously between WEST and the District, the hydrograph at the upper end of the flow split FLO-2D model from the Cella Barr HEC-1 model would be scaled linearly such that the peak flow from the scaled hydrograph would match the peak flow from the RBF CLOMR that reduced peak flows in the study reach. Bert mentioned that by reducing the volume of the hydrograph based on linearly scaling every hydrograph ordinate, we are effectively ascribing all of the error in the Cella Barr HEC-1 model to volumetric parameters in the model (infiltration, rainfall, etc.) and not ascribing any error to the timing parameters in the model (time of concentration, routing parameters, etc.). By stretching the scaled hydrograph to include more volume, we would be ascribing model error to both volume and timing while still basing the hydrograph shape on the modeling results. Bert said that he would look into some options to do this, and we will forward those findings to Jeff for his review and further discussion.

Discussion of ARF/WRF FLO-2D modeling parameters

WEST presented the initial Area Reduction Factors (ARFs) shapefile outlining buildings in the floodplain to Jeff during the meeting. WEST said they would forward this deliverable to Jeff after some additional internal QA/QC. Additionally, the team discussed the development of Width Reduction Factors (WRFs) shapefiles outlining walls and other linear obstruction features to input to the FLO-2D model. Jeff requested that WRFs be digitized when they were identified by WEST during investigation of aerial photographs, and further field verification can be conducted if needed to verify whether or not the identified "walls" should be represented in the model.

Discussion of the incorporation of the RBF flow change location at Baseline Road compared to the FLO-2D modeling effort

At the December monthly coordination meeting, the project team discussed possibly introducing a flow change onto the FLO-2D modeling grid to account for the flow change defined by RFB occurring at Baseline Road. In the figures below, the red outline shows the boundary of the FLO-2D grid. It can be seen from these figures that approximately 0.9 square miles of the total 46 square mile area of the FLO-2D grid is below Baseline Road. It was discussed that the flow change locations typically identified in hydrologic studies are not precise locations but generally characterizations of a reach within which a flow change occurs. Additionally, the inclusion of a flow change from a steady-flow return-interval analysis into the unsteady FLO-2D model is difficult because approximating a hydrograph shape for the flow change occurring near Baseline Road is not straightforward. For example, a hydrograph defined near the downstream end of the grid with a similar shape as the hydrograph defined near the upstream end of the FLO-2D model may create a situation in which the timing of the peaks of these two hydrographs do not coincide, thereby not creating the effect of an "increased flow" at the downstream end of the model. Based on these discussions—primarily the fact that this flow change could easily be ascribed to the reach entirely below our FLO-2D model if the application of the flow change were applied slightly downstream of Baseline Road—it was decided to not include the flow change in the FLO-2D modeling effort.

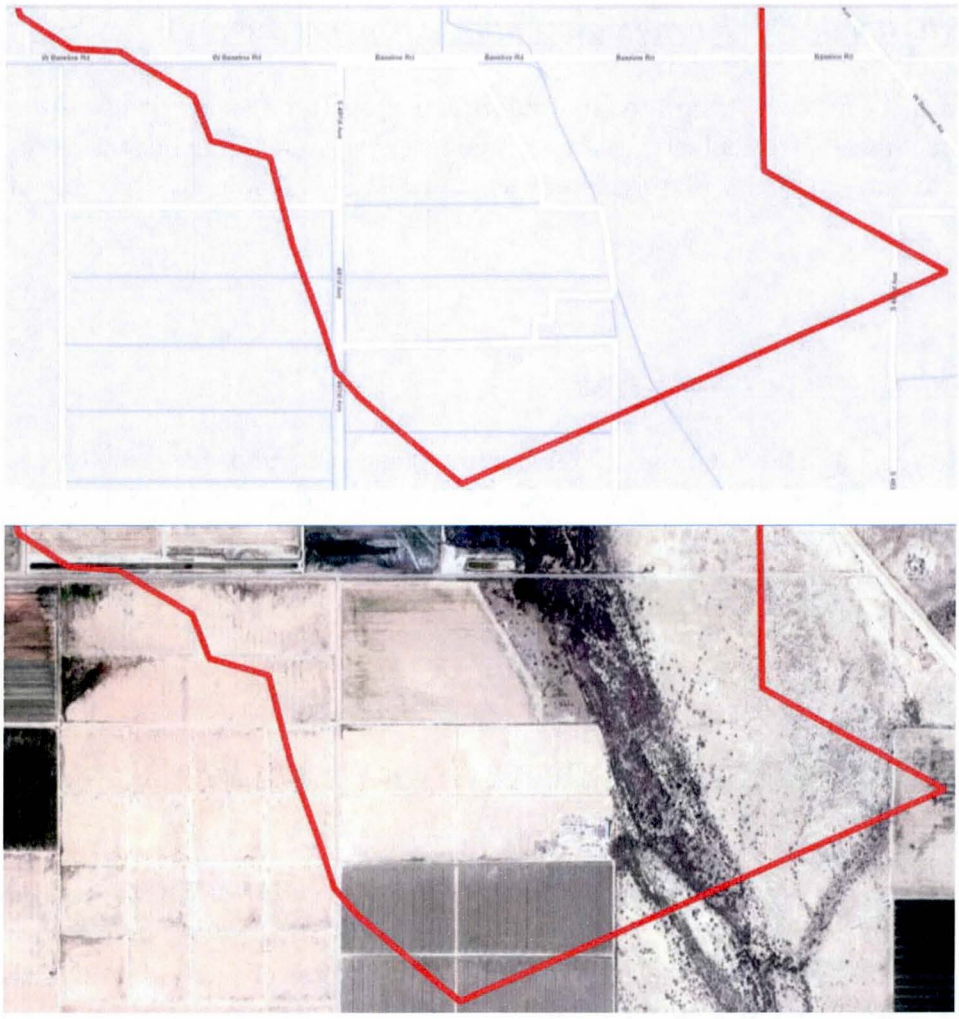


Figure. 0.9-square mile are of the FLO-2D grid below Baseline Road

Discussion of the current status of the FLO-2D modeling effort

WEST reported that the grid elevations and Manning's values had been populated, and early model debugging had begun. WEST will provide incremental updates to the District as the modeling progresses.

Discussion of the HVID north-south drainage channel structure survey

WEST reported that David Evans and Associates had been deployed to begin working on the structure survey for the three-barrel culvert structure under Van Buren Road for the HVID north-south drainage channel. Results of this survey work will be available by the end of January if not before.

Discussion of the bridge structure modeling

WEST reported that Trestles 2 and 3 were now modeled with culverts as opposed to the lateral structures with ground points used to define the piers. WEST is currently working on adding the railroad track depth on the top of the bridge embankment for the final HEC-RAS geometry. WEST will wait to receive the District's comments on the draft HEC-RAS deliverables before providing an updated version of the bridge model to the District for review.

Discussion of the development of the elevation reference marks (ERMs) dataset for workmap development

WEST had two questions in regards to the development of the ERM dataset for the Centennial work maps. First, WEST asked if recent FCD mapping points should take precedence over GDACS points of similar quality. Jeff said that he would typically prefer GDACS points due to the level of documentation associated with these points. Second, WEST asked if Jeff wanted WEST to contact ADOT for more information on survey monuments available in the 'ADOT' shapefile provided by the District for panels that did not include any other possible ERM points (either GDACS or NGS). Jeff said WEST should proceed with contacting ADOT for these points.

In addition, Jeff mentioned that the size of a 1" = 400' scale study sheet might warrant 2 to 3 ERM's per panel. WEST will refine our ERM development to include more ERM points per panel.

Action items deriving from this meeting:

1. *WEST to send the final Manning's n shapefile used for developing the HEC-RAS model deliverables and FLO-2D model to the District.* ***Update: This was delivered to Jeff Shelton via email on January 23.***
2. *Bert to investigate altering the inflow hydrographs for the FLO-2D model by stretching the hydrograph shown in the Cella Barr HEC-1 modeling output and scaling the hydrograph to match the peak flows in the RBF CLOMR. This would act to ascribe some portion of the error in the Cella Barr HEC-1 model to timing parameters and some portion of the error to volume parameters as opposed to ascribing all of the error in the Cella Barr study to volumetric parameters.*
3. *WEST to forward initial ARF shapefile outlining buildings in the study area to Jeff.*
4. *WEST to continue investigating the need for WRF's in the study area for the FLO-2D models.*
5. *WEST to coordinate with Jeff on FLO-2D modeling updates as they occur.*
6. *WEST to provide the District with the results of the culvert survey upon receipt from DEA.*
7. *WEST to investigate adding the average thickness of the railroad rails from the trestle scans to the portions of the bridge geometry between the bridge openings (i.e., the portion of the bridge deck geometry obtained from the DTM data) if an average value can be determined easily.*
8. *WEST to investigate (1) adding lateral structures between the primary flow path and the middle overbank flow path and between the middle overbank flow path and the far left overbank flow path downstream of the bridge, and (2) keeping the lateral structures in the geometry in the left overbank of the primary flow path upstream of the bridge but dropping the lateral structure elevations to the ground for one plan to consider a "no levee" scenario.*
9. *WEST to include the final bridge hydraulics plan in the overall model titled "Baseline to Gila."*
10. *WEST to contact ADOT for continued ERM development using ADOT survey points.*
11. *WEST to include 2 to 3 ERM points per map sheet.*
12. *WEST to coordinate with Jeff for a possible meeting to deliver the District's comments on the draft HEC-RAS deliverables after January 25.*

Date: February 13, 2013

A meeting was held on Thursday, February 7, 2013 at 9:00 AM MST with the following attendees:

Flood Control District of Maricopa County (District)

1. Jeff Shelton

WEST Consultants (WEST)

1. Brian Wahlin
2. Chuck Davis

This meeting was an intermediate coordination meeting between regularly monthly coordination meetings to discuss early FLO-2D modeling results and draft HEC-RAS deliverable comments for the Floodplain Delineation Study (FDS) for Centennial Wash in support of FEMA flood map revisions along the length of the watercourse from the La Paz County border to the confluence of Centennial with the Gila River.

The meeting followed the agenda prepared by WEST prior to the meeting, including the discussion items described below.

Discussion of the draft HEC-RAS deliverables

WEST acknowledged receipt of the HEC-RAS comments provided by Jeff Shelton on Friday, January 25. WEST had begun preliminary response to these comments, and the comments were clear. WEST will as Jeff questions as they arise regarding these comments.

Discussion of the hydrology for the FLO-2D model

Based on previous discussion of possible edits to the original proposed hydrograph development for the FLO-2D model (i.e., the Cella Barr HEC-1 hydrographs scaled linear on an ordinate-by-ordinate basis based on the ratio of the updated peak flow of 34,347 cfs to the original 52,200 cfs), Jeff inquired if WEST would like to use an alternate hydrograph shape for FLO-2D. WEST indicated they had done further research into a methodology to develop an altered hydrograph shape, and that they would refine this methodology and forward a technical memorandum to Jeff outlining the procedure.

Jeff and WEST discussed the quasi-steady approach (i.e., entering a constant-inflow hydrograph of 34,347 cfs onto the FLO-2D grid and run the model until no more change is occurring on the grid). This seems as if it would introduce an excessive volume of water onto the grid, especially in the flow split area, causing excessively large inundation areas. This methodology will not be utilized for the modeling.

Discussion of stock tanks and other pits in the FLO-2D modeling grid

WEST will be "filling" the stock tanks and other pits in the FLO-2D modeling grid to the surrounding ground elevations, as these areas of significant ponding create model stability issues and significantly slow down the model run time. By "filling" these pits to ground elevations of the surrounding ground, we avoid the numerical issues, but we artificially decrease the volume available for flood routing on the grid. However, this volume is insignificant in the context of the overall volume of water in the inflowing hydrograph. Therefore, Jeff approved this plan moving forward.

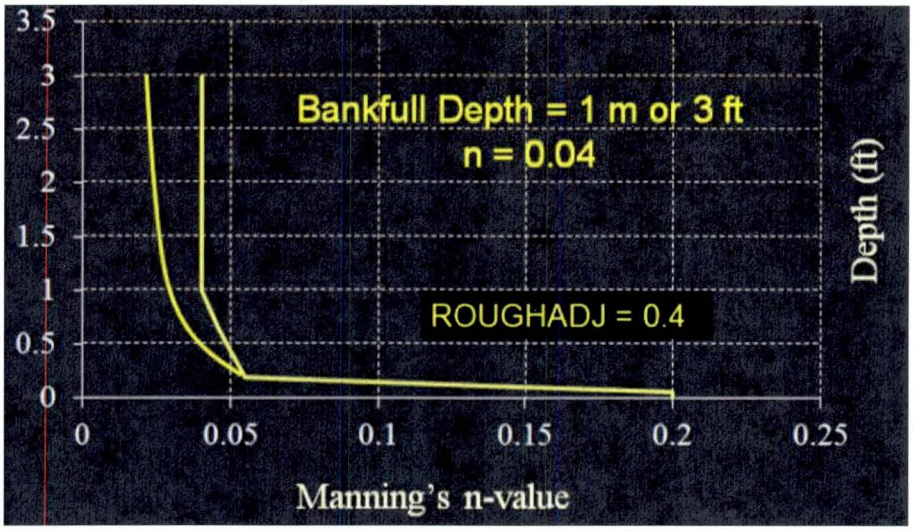
Discussion of the Manning's roughness values used in FLO-2D

Roughness values were set in the HEC-RAS model based on land use using a shapefile differentiating various land use areas and assigning horizontally-varying n-values in the HEC-RAS cross sections based on this shapefile. WEST recommended using roughness values 50% higher than those values used for the HEC-RAS model in the FLO-2D modeling effort. This is to account for the lack of a Boussinesq eddy viscosity term in FLO-2D, a numerical approximation of momentum transfer loss due to turbulence. Early model results with a Manning's roughness value 50% greater than the roughness values used in the spatial extent of roughness values for the HEC-RAS, however, indicated that inundation areas were far beyond what was predicted in HEC-RAS. Therefore, the original Manning's n values used for HEC-RAS modeling were applied to the FLO-2D model, which led to results more comparable to HEC-RAS. Also, WEST noted that the use of the HEC-RAS Manning's n values did not create unreasonably high Manning's n corrections using the Courant adjustment from FLO-2D.

Other questions that resulted from this discussion included "what depth does the shallow n-value turn off?" Jimmy has hardcoded 3 depths into FLO-2D that control this parameter; each of these are discussed below.

1) 0.2 feet and below – the SHALLOWN value specified in the CONT.DAT file is used for these depths.
2) 0.2 feet to 0.5 feet – the Manning's n values between these flow depths range from the SHALLOWN value at 0.2 feet to the maximum of either 50% of the SHALLOWN value or the user-specified Manning's n value at a given cell at 0.5 feet. The transition between n values is linear from 0.2 to 0.5 feet.
3) 0.5 feet to 3.0 feet – the Manning's n values between these flow depths range from the maximum of either 50% of the SHALLOWN value or the user-specified Manning's n value at a given cell at 0.5 feet to the user-specified Manning's n value at a given cell at 3.0 feet and above. The transition between n values is curvilinear from 0.5 to 3.0 feet following an exponential curve as shown in the figure below (taken directly from the FLO-2D documentation). The curve is an exponential relationship between depth and Manning's value, decreasing from the maximum of 50% of the SHALLOWN value or the

user-specified Manning's n value at a given cell at 0.5 feet to the user-specified Manning's n value at a given cell at 3.0 feet and above. Obviously, if the user user-specified Manning's n value is selected at a depth of 0.5 feet when compared to 50% of the SHALLOWN parameter, then the user-specified Manning's n value is used for every flow depth above 0.5 feet.



WEST is using a SHALLOWN parameter of 0.2 currently in the model.

Discussion of the FLO-2D model results compared to the RAS results

Jeff requested that WEST compare flow depths from the FLO-2D model to the RAS results, particularly near the inflow and outflow portions of the grid, but also reporting in the middle of the RAS model reach, and another near the HVID north-south drainage channel.

Action items deriving from this meeting:

1. *WEST to forward initial ARF shapefile outlining buildings in the study area to Jeff.*
2. *WEST to continue investigating the need for WRF's in the study area for the FLO-2D models.*
3. *WEST to coordinate with Jeff on FLO-2D modeling updates as they occur.*
4. *WEST to work towards the development of a hydraulic structure rating curve for the Van Buren culverts in the north-south HVID drainage channel.*
5. *WEST to compare flow depths from the FLO-2D model to the RAS results, particularly near the inflow and outflow portions of the grid, but also reporting in the middle of the RAS model reach, and another near the HVID north-south drainage channel.*

Date: March 1, 2013

A meeting was held on Thursday, February 21, 2013 at 9:00 AM MST with the following attendees:

Flood Control District of Maricopa County (District)

1. Jeff Shelton

WEST Consultants (WEST)

1. Brian Wahlin
2. Chuck Davis

This meeting was a monthly coordination meeting for the Floodplain Delineation Study (FDS) for Centennial Wash in support of FEMA flood map revisions along the length of the watercourse from the La Paz County border to the confluence of Centennial with the Gila River.

The meeting followed the agenda prepared by WEST prior to the meeting, including the discussion items described below.

Discussion of the draft HEC-RAS deliverables

WEST had one question regarding the RAS comments and the overbank reach stationing for the 'Fields' and 'Overbank' reaches near the UPRR Bridge in the lateral structures and weir plan. Jeff indicated that for the stationing of the overbank flow paths, WEST should be using the junction lengths to create a starting station, not the total lengths of the river centerlines. The river centerlines in RAS have to be drawn a long distance parallel to the cross section to tie back into the junction with the main branch of Centennial Wash. Therefore, the distance along this line is not representative of what the river station of these reaches should be.

This conversation brought up another question—should WEST be snapping the endpoint of our new river centerline to the endpoint of the currently effective Centennial Wash river line at the confluence with the Gila River? Jeff will talk to Cathy about this question and about the status of the river centerline realignment for the Gila River FDS.

Discussion of the hydrology for the FLO-2D model

WEST presented Jeff with a technical memorandum describing a possible alternate hydrograph shape that assigned some of the error in the Cella Barr model to volume and some of the error to timing by scaling the maximum flow to the updated maximum flow and then stretching the hydrograph out in time to get closer to the original volume estimated by Cella Barr (as opposed to linearly scaling every ordinate of the hydrograph and only assigning error from the Cella Barr model to volumetric hydrologic modeling parameters). Jeff will review this document.

Discussion of expanding the FLO-2D modeling grid boundary

In our early model runs, WEST had seen some flow contacting the boundary of the grid. The model boundary was expanded to avoid this issue.

Discussion of Jim O'Brien's comments on the early model run

Jim O'Brien's comments on the early iteration of the model are provided below in blue text. WEST's responses are provided in red text.

1. Volume conservation is observed.
   WEST Response: None required.
2. Maximum velocities in VELTIMEFP.OUT are reasonable. This would mean that the spatially variable n-values are ok.
   WEST Response: None required.
3. Output is generated every 1.0 hours. An output interval of 0.25 hours would add more detail.
   WEST Response: Output interval was decreased.
4. Computer runtime is 64 hours. We should try to reduce this. The Pro model would probably cut this runtime in half or more.
   WEST Response: Considering converting the model to the PRO version, then converting back to the FEMA-approved version (2009.06) prior to the final runs.
5. The limiting Froude number in CONT.DAT may be a little low. A FROUDL = 0.8 or slightly higher may reduce the n-value variation at runtime and increase the model speed. Review the ROUGH.OUT file and make any revisions to the FPLAIN.RGH n-value as necessary. Delete FPLAIN.DAT, rename FPLAIN.RGH to FPLAIN.DAT and reset FROUDL to 0.8. After the next simulation, ROUGH.OUT should be almost empty.
   WEST Response: FROUDL increased to 0.85.
6. Increase the Courant number to 0.65 or 0.7 to speed the model up while observing if an maximum velocities in VELTIMEFP.OUT indicate numerical surging.
   WEST Response: Courant number increased to 0.7.
7. Using Maxplot or Mapper, the final flow velocity plot at the end of hour 87, indicates that there are a lot of grid elements with high velocities. The peak discharge may have moved off the grid system but there is still a lot of volume moving around at hour 87. This may be ok.
   WEST Response: None required.
8. It is important to note that there may be flow contacting the grid system boundary on the east side. If in reality this flow can physically leave the grid system, then outflow nodes at this location (and maybe a few others) may be necessary. Otherwise, the flow may be artificially confined and could increase flow depths downstream.
   WEST Response: Model grid expanded to address this issue.

9. Adding the channel component will help confine the flow and would probably reduce the run times. It will also speed up the floodwave movement over the grid system.

   WEST Response: Based on conversation with the FCDMC, the main channel of Centennial was not identified as a 1D channel element in FLO-2D due to the exceedingly wide and shallow nature of the river. The 2D routing grid elements sufficiently account for water moving in this system as the thalweg is not significantly lower than surrounding grade in most locations.

10. Simulating infiltration would reduce the flood volume and speed up the model also.

    WEST Response: This will be a hydraulics-only model. Infiltration will not be used in this model.

These comments led Jeff to state that he's fine with WEST using the PRO model if we would like to take that on and then convert back to 2009.06 at the end of the model development phase.

Discussion of the north-south HVID drainage channel and model stability

The 1-D channel in the FLO-2D model representing the north-south flood control drainage feature has been problematic to get working properly. Significant model debugging is ongoing for this channel. This has slowed down model run times and causes fatal terminations of the model. WEST will inform Jeff when resolution of this issue has been obtained.

Discussion of FLO-2D modeling schedule

Due to the nature of the FLO-2D modeling task, WEST will coordinate more regular coordination meetings with District staff (once every two weeks as was done on Feb. 7) to continue working on the FLO-2D model. WEST will not be providing a formal "draft submittal" for the FLO-2D model as these intermediate coordination meetings with the District will suffice for over-the-shoulder reviews of the FLO-2D modeling effort.

Action items deriving from this meeting:

1. *WEST to update the river stationing for the "overbank" and "fields" reaches in the RAS model around the UPRR bridge.*
2. *Jeff will talk to Cathy about the downstream river line alignment for Centennial (should the updated river centerline snap to the effective river centerline at the confluence with the Gila River?) and also about the status of the river centerline realignment for the Gila River FDS.*
3. *WEST to continue to coordinate intermediate coordination meetings with District staff once every two weeks for over-the-shoulder FLO-2D model reviews.*

Date: March 15, 2013

A meeting was held on Monday, March 11, 2013 at 11:00 AM MST with the following attendees:

Flood Control District of Maricopa County (District)

1. Jeff Shelton

WEST Consultants (WEST)

1. Brian Wahlin
2. Chuck Davis

This meeting was an intermediate coordination meeting between regularly monthly coordination meetings to discuss early FLO-2D modeling results and draft HEC-RAS deliverable comments for the Floodplain Delineation Study (FDS) for Centennial Wash in support of FEMA flood map revisions along the length of the watercourse from the La Paz County border to the confluence of Centennial with the Gila River.

The meeting followed the agenda prepared by WEST prior to the meeting, including the discussion items described below.

Discussion of the hydrology for the FLO-2D model

Jeff and Amir discussed the possible alteration of the Cella Barr HEC-1 hydrograph that was scaled to the new peak flows using a linear scaling factor applied to each hydrograph ordinate. WEST proposed possibly stretching the hydrograph and increasing the total hydrograph volume by multiplying each ordinates' time component by a scaling factor in order to ascribe some of the error in the Cella Barr output to volumetric parameters in the hydrology model (i.e., scaling the peak flow to the updated peak flow estimate from RBF) and some of the error in the Cella Barr output to the timing parameters in the hydrology model (i.e., stretching the hydrograph under the assumption that time of concentrations and other timing parameters in the model were incorrect). The final decision from the District was to use the originally proposed methodology of linearly scaling each hydrograph ordinate from the original Cella Barr output hydrograph to match the peak flow to the updated peak flow from the return interval analysis completed by RBF.

Discussion of the status of the FLO-2D model

WEST provided a brief review of the general FLO-2D model development to this point using the following bullet items:

Iteration 1) Build channel in FLO-2D
Iteration 2) Cross section interpolation issues in FLO-2D causing model to crash
Iteration 3) Clip model grid for channel debugging
Iteration 4) Volume conservation issue, altering downstream end of 1-D channel to transition more smoothly from channel to floodplain
Iteration 5) Volume conservation issue, altering floodplain surrounding downstream end of 1-D channel to transition more smoothly from channel to floodplain

At this time, WEST was under the impression that the channel boundary condition in the model was not allowing flow to interact with the 2-D grid immediately downstream of the channel; there only appeared to be interaction of flow from the 1-D channel to the 2-D grid in the lateral direction (i.e., over the right and left bank stations) of the downstream-most cross section in the channel. Later conversations with Jim O'Brien determined that this in fact was the case.

Jeff recommended possibly decreasing the height of the channel bank to allow the banks to transition back to approximately the elevation of the grid. He said that his early model tweaking to this effect provided positive results. WEST will review his model and create similar changes based on this proposed methodology.

Action items deriving from this meeting:

1. *WEST to review Jeff's model edits for the 1-D channel in FLO-2D and to create similar changes based on this proposed methodology.*

Date: April 5, 2013

A meeting was held on Thursday, March 28, 2013 at 9:00 AM MST with the following attendees:

Flood Control District of Maricopa County (District)

1. Jeff Shelton

WEST Consultants (WEST)

1. Brian Wahlin
2. Chuck Davis

This meeting was a monthly coordination meeting for the Floodplain Delineation Study (FDS) for Centennial Wash in support of FEMA flood map revisions along the length of the watercourse from the La Paz County border to the confluence of Centennial with the Gila River.

The meeting followed the agenda prepared by WEST prior to the meeting, including the discussion items described below.

Discussion of the draft HEC-RAS deliverables

WEST had one question regarding the agricultural berms and the berms around the stock tanks in the HEC-RAS models. One of Jeff's draft HEC-RAS model comments poses the question "will these wash away during flooding?" WEST stated that these are being modeled currently with ineffective flow areas behind the embankments, but the water surface elevation computed in the model will be mapped on both sides of these embankments. Jeff said that this seems reasonable, and he will revisit this comment after the next HEC-RAS submittal.

WEST also asked about the reach length comments that Jeff made throughout the "Canal to Baseline" model. WEST brought up the point that changing individual cross sections would then not match our GIS linework for overbank flow path lengths. Therefore, to address these many comments systemically throughout the model, WEST proposed straightening the overbank flow path lines significantly to parallel the main channel reach length throughout this model. Jeff agreed that this would resolve the comments he had made.

Finally, WEST spoke with Jeff about empirical coefficients for both the bridge pier losses for the bridge trestles and the weir coefficients for the lateral weirs used to represent trestles 2 and 3 in the model. Jeff had commented that the bridge pier loss coefficients should reflect "square-nosed" piers instead of "piers with semi-circular ends." WEST pointed out that several of the trestle piers actually used round timbers instead of square railroad ties for piers, while some of the piers were square railroad ties as Jeff assumed. Therefore, some averaged value between the loss coefficients for circular and square-nosed piers would be most accurate. However, as this is an empirical loss coefficient subjectively chosen by the modeler, WEST will choose a value most appropriate for each pier and then provide more detail on the reasoning behind the selection in the TSDN documentation.

In regards to the weir coefficient for the lateral structures used to represent trestles 2 and 3 in the bridge, Jeff commented that WEST's selected values were too low compared to recommended values in the "Handbook of Hydraulics" which recommends values of 2.5 to 3.0. However, WEST contested that these coefficients were developed based on experimentation for broad-crested weirs with no obstructions whatsoever in a laboratory flume. Other coefficient approximation techniques (such as the De-Marchi equation) have been developed to estimate losses when the "weir" being represented is actually a bridge or other physical structure that could have debris, guardrails, or other impediments to flow. These would cause significantly higher losses than the laboratory experiments used to define the ranges of coefficients for lateral weir coefficients, and a lower weir coefficient is justifiable in these cases. WEST will include some of the calculation techniques (such as the De-Marchi equation) in the TSDN to justify the use of the final weir coefficients in this model. WEST will also include the computation Brian mentioned that was used by WEST previously for the District on the Jackrabbit Wash delineation for these structures; this computation is based only on Froude number.

Discussion of FLO-2D modeling tasks

WEST reported that the 1-D channel is now working successfully in the overall model. The channel has been successfully implemented back into the full model. Additionally, the hydraulic structure has been added to the model using the information from the DEA survey of the Van Buren Street culverts, and ARFs/WRFs were assigned for buildings throughout the model grid. WEST will deliver the final version of the model to Jeff by Wednesday, April 3 for a formal draft submittal of the FLO-2D model.

In regards to mapping the FLO-2D model results, Jeff recommended possibly using Zone AO's in the overbank area along with Zone AH's in the deeper areas of backwater ponding throughout the FLO-2D grid. Jeff will begin discussing with Amir whether or not two FLO-2D models should be maintained moving forward, a "with embankment" and "without embankment" model for the flood control berm on the downstream side of the HVID flood control channel. He said that he would discuss with Amir the likelihood of an additional optional task or possibly a change order for the first optional task to maintain this second model and take it to a final deliverable stage.

Finally, WEST and the District discussed possibly mapping everything now in HEC-RAS since FLO-2D is still showing similar flooding extents in the overbanks. Jeff will bring this up to Amir as well.

For a calibration effort, WEST needs to compare the results at the downstream end of the FLO-2D model with the results from the RAS model. This comparison should include water surface elevations and the discharge hydrograph in FLO-2D (to evaluate attenuation across the grid).

This comparison will help the project team to evaluate our use of the same Manning's values as inputs to both the 1D and 2D models.

Discussion of project schedule

After making the draft FLO-2D deliverable to Jeff on April 3, the District will complete a draft FLO-2D review in two weeks (by April 17). At that time, WEST will address the District's FLO-2D comments and submit the final RAS model for the downstream reach (from Baseline to the Gila River) and the far upstream reach (from the La Paz County boundary to the HVID westside canal). Jeff can begin reviewing these final models at that time for two weeks, ending on May 1. When WEST receives the final RAS model comments from Jeff on April 1 and addresses those, final mapping can commence for the far upstream and downstream reaches using HEC-RAS. WEST will then resubmit the FLO-2D model to Jeff on May 1 for finalization of the FLO-2D model and of the HEC-RAS model between the HVID westside canal and Baseline Road.

Action items deriving from this meeting:

1. *WEST to straighten the overbank flow path lines significantly to parallel the main channel centerline throughout the "Canal to Baseline" model before the next submittal.*
2. *WEST to provide more detail on the reasoning behind the selection of empirical coefficients for the bridge pier losses and for the lateral structure weir coefficients in the TSDN documentation. WEST to also include the computation Brian mentioned that was used by WEST previously for the District on the Jackrabbit Wash delineation for the computation of weir coefficient for trestles 2 and 3.*
3. *WEST will deliver the final version of the model to Jeff by Wednesday, April 3 for a formal draft submittal of the FLO-2D model.* ***Update: This model was provided to Jeff by WEST on April 4.***
4. *Jeff to discuss with Amir the mapping downstream of the HVID flood control embankment, and whether any of the various options for mapping in this area would necessitate a possible additional optional task or change order for the first optional task to maintain a "without embankment" FLO-2D and take it to a final deliverable stage along with the "with embankment" FLO-2D model.*
5. *WEST to compare the results at the downstream end of the FLO-2D model with the depths in the RAS model (for both stage and flow).*

Date: April 30, 2013

A meeting was held on Monday, April 22, 2013 at 10:30 AM MST with the following attendees:

Flood Control District of Maricopa County (District)

1. Jeff Shelton
2. Amir Motamedi
3. Richard Harris

WEST Consultants (WEST)

1. Brian Wahlin
2. Chuck Davis

This meeting was a monthly coordination meeting for the Floodplain Delineation Study (FDS) for Centennial Wash in support of FEMA flood map revisions along the length of the watercourse from the La Paz County border to the confluence of Centennial with the Gila River.

The meeting followed the agenda prepared by WEST prior to the meeting, including the discussion items described below.

Discussion of the near-final HEC-RAS deliverables for the reaches from Baseline Rd to the Gila River and from the La Paz County boundary to the HVID canal

WEST provided "near-final" deliverables for the HEC-RAS models for the reaches from Baseline Rd to the Gila River and from the La Paz County boundary to the HVID canal at this meeting. This included the model files themselves, the HEC-RAS report (*.rep) files, and draft HIS deliverables for cross sections (FPXFCD.shp) and the baseline (FPBLN.shp).

The reason that these were "near-final" is the District was still in internal discussions to finalize the tie-in location for Centennial with the Gila River and to finalize the floodway approach. During this meeting, it was determined that Jeff would get together with Cathy Regester to coordinate on the Gila tie-in shortly following this meeting. Also, Jeff would finish the review of the "near-final" HEC-RAS models provided during this meeting to allow WEST to begin mapping by May 3. Also, Amir pointed out the fact that the original suggested mapping approach around the UPRR bridge (i.e., to use the highest water surface elevation from the three reaches defining flow through the bridge and projecting that highest water surface elevation across all three reaches) was likely too conservative given the significant differences in water surface elevations (on the order of 2 to 3 feet for some cross sections) among the three reaches. Therefore, WEST will look into doing some type of "with embankment" and "without embankment" analysis for this area for the base floodplain mapping. After the primary portion of this meeting with Jeff and Amir, Richard Harris joined the conversation to discuss the methodology used by URS to map the floodplain for the Waterman Wash study which had broken BFE's due to worst-case scenario mapping for with and without embankment analyses. Richard recommended running four possible scenarios. The scenarios are listed below.

1) With both embankments along the main channel upstream & downstream of the bridge
2) Without both embankments along the main channel upstream & downstream of the bridge
3) Without upstream embankment along the main channel, but with the downstream embankment
4) Without downstream embankment along the main channel, but with the upstream embankment

During this discussion with Richard, Jeff and WEST decided to only analyze scenarios 1 and 2 above as the "with embankments upstream and downstream" scenario would likely be the worst case for the flooding depths in the channel, and the "without embankments upstream and downstream" scenario would likely be the worst case for the flooding depths in the overbanks. WEST will complete this analysis. Since we currently have the "with both embankment" scenario model, Jeff recommended possibly saving an intermediate geometry while creating the "without embankment" condition after we remove one of the embankments; this way we can analyze either scenario 3 or 4 fairly easily.

In regards to the floodway analysis for the models, Amir and Jeff had some suggestions regarding the approach. WEST suggested that a floodway technically should contain all the flow in the system. However, the effective study did not follow this; the floodway analysis in the main channel was based on the reduced flow in the main branch of Centennial Wash after the flow split. Amir and Jeff agreed that due to this precedence being set, and due to the likely arbitrariness of defining a floodway in a highly distributary flow area such as the left overbank flowpath, the District would rather perform a floodway analysis in this area with only the flow in the main channel after the flow split, similarly to the methodology completed for the effective study.

Discussion of FLO-2D modeling tasks

From the previous monthly coordination meeting, WEST provided some preliminary calibration information between the "with embankment" FLO-2D model and the HEC-RAS model. This generally showed good agreement between the two model results, even with the significant peak flow attenuation in the unsteady FLO-2D model. WEST compared these results by extracting FLO-2D results along the longitudinal profile of the hydraulic baseline from HEC-RAS (i.e., a single point compared to the cross section results in HEC-RAS) and by extracting the results along every HEC-RAS cross section from the FLO-2D results grid. Both methods of extraction showed generally good agreement between the two sets of results.

Before finalizing the FLO-2D tasks, Jeff provided some comments from the District's internal FLO-2D mapping experts on methodologies used previously in the District to map FLO-2D results. Kathryn Gross provided the following comments to Jeff from the Rio Verde study.

1) The Rio Verde study used 0.1' as the minimum mapping depth for floodplain inundation extents. They did this because they felt this methodology was most analogous to RAS extending the water surface elevation to the ground surface at all cross sections.
2) Regarding mapping accuracy standards, Cathy pointed out that the grid elevations have to be within half the contour interval of the mapping that was used to develop the FLO-2D grid at "all points" along the boundary of the grid. A map audit must be completed to check this requirement.
3) Cathy mentioned that we will likely need to get FEMA Region IX's approval for the chosen FLO-2D mapping technique before proceeding to a final mapping state.

Amir and Jeff discussed some other input from other FLO-2D experts at the District. They indicated that other studies at the District are using 0.3 feet and 0.5 feet are being used for minimum depth to map from FLO-2D results on various studies. Jeff mentioned that FEMA's Appendix C may have additional guidance on this topic since it has been updated recently. WEST will investigate this possibility. Jeff also mentioned at some point we may need to decide that if less than a certain amount of flow is going in a certain direction, then we may want to draw a limit of study line and not follow that flow path for mapping purposes. However, Amir also pointed out that for a single flooding source where everything should be rejoining downstream, this may not occur in our system.

In regards to the levee-like embankments, Amir mentioned that we may need both "with embankment" and "without embankment" FLO-2D models for the HVID north-south drainage canal, but Amir also mentioned that the Rio Verde study removed large stock tanks from the "without embankment" analysis as well. Jeff and WEST agreed that this study would require a "without embankment" FLO-2D model that removed the embankment along the east bank of the HVID north-south drainage canal and removed the large stock tanks in the model domain. Jeff and Amir asked WEST to determine if the current hours for mapping HEC-RAS results in the left overbank area contained enough funds to cover the "without embankment" FLO-2D model. If the number of hours are equivalent, Jeff can authorize moving money from the overbank HEC-RAS mapping task into the new "without embankment" FLO-2D modeling task. However, if the number of hours for the "without embankment" FLO-2D task exceed the currently authorized overbank HEC-RAS modeling/mapping budget, then the District can look into authorizing some of the funds from the additional optional HEC-RAS tasks that have not been authorized to date to cover these additional funding requirements. WEST will investigate the original budget and scope to aid the District in making this decision.

Regarding the final mapping of the FLO-2D model results, the project team began discussing possible FEMA floodplain zones to use for this mapping. Zone AOs and AHs have a limit of a maximum of 3 feet of flooding depth. For those ponded areas behind roadways in the model domain, a Zone AE with a single water surface elevation may be most appropriate. Everywhere else with shallow flooding, Zone AOs are likely the most appropriate. The only place that does not hold true is the area of the left overbank flowpath near the confluence with the main branch of Centennial Wash where flooding depths are much deeper than three feet; in this area, Zone AEs will be used with BFEs for the FLO-2D results.

If we decide to continue with the "without embankment" FLO-2D model, then we should map the worst case of both models at all locations (i.e., the worst-case flooding depth in each grid cell).

Upon completion of preliminary mapping results from FLO-2D, Jeff wants to have a meeting with W Holdings and Bob Bezek (FEMA Region IX) at the same time regarding model results and mapping approach as per Kathryn Gross's suggestion.

In regards to informing the HEC-RAS model with the results from the FLO-2D model, the project team decided that WEST should start with the water surface elevations computed in FLO-2D, then back out a discharge and see if it remains similar to the FLO-2D flows at a given location. This is preferable to using the flows from the FLO-2D results then backing out a final water surface elevation in HEC-RAS since the calibration to water surface elevation is more important from a mapping perspective.

Discussion of project schedule

The project team determined that the project schedule may also need to be considered and possibly changed given the addition of a second FLO-2D model that should be taken to a final documentation level for the modeling effort. WEST will investigate the need for a lengthened project schedule and report back to the District on their findings while reviewing the original schedule, the updated modeling requirements, and the scope as part of the task for reviewing the budget for possible authorization of additional funds for the "without embankment" FLO-2D model (as discussed above in these minutes).

Action items deriving from this meeting:

1. *Jeff would get together with Cathy Regester to coordinate on the Gila tie-in shortly following this meeting.* ***Update: this was done by Jeff with a report made to the project team at the May monthly coordination meeting.***
2. *Jeff would finish the review of the "near-final" HEC-RAS models provided during this meeting to allow WEST to begin mapping by May 3.* ***Update: this was done by Jeff via email on May 7.***
3. *The current HEC-RAS model around the UPRR bridge is the "with embankments upstream and downstream" along the main channel. WEST will build the "without embankments upstream and downstream" scenario model, and during this process will develop either the "without upstream embankment along the main channel, but with the downstream embankment" model or the "without downstream embankment along the main channel, but with the upstream embankment" model.*

4. *WEST to begin the Centennial floodway analysis with only the flow in the main channel in the flow split area.*
5. *WEST to investigate FEMA's Appendix C for additional guidance regarding the depth of flooding from a two-dimensional modeling study to include in the mapping of floodplain hazard areas.*
6. *WEST to determine if the current hours for HEC-RAS modeling and mapping in the left overbank area contained enough funds to cover the "without embankment" FLO-2D model and report back to the District on these findings.*

Date: June 6, 2013

A meeting was held on Wednesday, May 8, 2013 at 2:00 PM MST with the following attendees:

Flood Control District of Maricopa County (District)

1. Jeff Shelton

WEST Consultants (WEST)

1. Brian Wahlin
2. Chuck Davis

This meeting was a monthly coordination meeting for the Floodplain Delineation Study (FDS) for Centennial Wash in support of FEMA flood map revisions along the length of the watercourse from the La Paz County border to the confluence of Centennial with the Gila River.

The meeting followed the agenda prepared by WEST prior to the meeting, including the discussion items described below.

Discussion of the near-final HEC-RAS deliverables for the reaches from Baseline Rd to the Gila River and from the La Paz County boundary to the HVID canal

WEST provided "near-final" deliverables for the HEC-RAS models for the reaches from Baseline Rd to the Gila River and from the La Paz County boundary to the HVID canal at the April monthly coordination meeting. Jeff had some final comments on these documents, and WEST responded to each of these during this coordination meeting.

To respond to Jeff's first comment regarding Gila River tie-in location, WEST added four cross sections downstream of the downstream-most cross section in our original model to extend the model approximately 2,000 feet. Regarding the actual hydraulic baseline of the Gila River, WEST and Jeff decided to tie into the currently effective hydraulic baseline for this study as opposed to the updated hydraulic baseline being created by Cathy Regester's study currently. Jeff asked that WEST show the calculation from the updated downstream-most cross section in the model to the new baseline on the work maps so a future review could easily make this conversion if needed. However, nothing else (cross sections, baselines, etc.) will reference the new Gila River baseline being created by Cathy's study.

Regarding the downstream-most flow change location defined as being "at the Gila River" in the RBF CLOMR used to update the hydrology for the study reach, the project team decided to add this flow change location into the model at the intersection of Centennial Wash with Old US Highway 80. This methodology is consistent with the RBF CLOMR analysis of the old gage because the old gage was at located at this roadway crossing.

Regarding the ineffective flow areas that Jeff wanted to see changed, WEST agreed that the IFA's in these cross sections would have been better placed where Jeff recommended. These changes will be made in the model.

For additional items related to the RAS modeling effort, WEST will continue to work on the with- and without-embankment RAS modeling near the bridge. Jeff will provide the floodway data table from the Waterman Wash FDS to assist in this process. Finally, WEST will deliver a technical memo describing the "inform RAS with FLO-2D results" on May 21.

For the floodway analysis, if the effective stations create a surcharge greater than 0.6 or 0.8 feet, we'll plan to leave the floodway stations equivalent to the effective floodway stations. If it's 0.2 feet on average, we need to improve the floodway stations by squeezing them in closer to the thalweg.

Discussion of FLO-2D modeling tasks

From the previous monthly coordination meeting, WEST was tasked with investigating the original budget and scope to help the District in making the decision regarding whether optional funding would be required to complete the "without embankment" FLO-2D model to 100% completion (including documentation) along with the base conditions "with embankment" FLO-2D model. WEST felt that they would have enough dollars available in the current budget to complete this task, but the schedule may be pushed out slightly due to this issue. Jeff said that, even if the funding amount turned out to be the same, he would need additional documentation to finalize the administrative component of the schedule adjustment. Jeff requested a document from WEST with the following components to support a schedule and possibly a funding change to the current contract:

1) discussion of the difficulty associated with merging two FLO-2D model results together and how this is outside of the current expected effort within the current contract and scope of work;
2) discussion of the added requirement to fully documentation two FLO-2D models;
3) discussion of the difficulties in informing the main stem HEC-RAS model with results from the FLO-2D model;
4) consideration of what budget may be remaining from the 9 miles of Centennial Left Overbank that we will not be mapping in RAS due to the FLO-2D model for the overbank area; and
5) discussion of the difficulties in mapping the floodway in the vicinity of the flow split area and how this would fall outside of the current expected effort within the current contract and scope of work.

This cost estimate will be completed by Friday, May 10, which will be delivered to Jeff on Monday, May 13. Jeff asked that this cost estimate include a discussion of the required

adjustment to the schedule associated with the change in the FLO-2D modeling tasks described above.

Amir mentioned possibly throwing a new rainfall value into the Cella Barr HEC-1 model. WEST reported a maximum flow in the left overbank of 14,000 cfs from the without embankment FLO-2D model. WEST has looked into the HEC-1 model in the flow split area briefly, and WEST will forward this documentation on the HEC-1 subbasins "cut off" by the Centennial floodplain to Jeff. Jeff will also look at the Cella-Barr model, and he will perform the additional hydrologic modeling task if required.

Regarding the mapping of the FLO-2D results, Jeff reported at this meeting the results of a conversation he had with FMS. Jeff's first questions from the FMS group (from Mandar) were as follows:

1) Do you have buyoff from FEMA yet on the methodology used to inform RAS flows based on the FLO-2D model?
2) Do you have buyoff from FEMA yet on the methodology used to complete the floodway near the bridge?

Jeff asked WEST if there was anything else WEST felt the District needed to bring up to FEMA now. WEST said not that they were aware of.

The second result of Jeff's conversation with FMS was that FMS wants products similar to the Rio Verde study. This would include gridded boundaries for Zone AO, similar to Rio Verde, as opposed to fully smoothed boundaries along the edges of the floodplain. In regards to this, at any point along the boundary of the floodplain as mapped with a gridded boundary, the water surface elevation must be +/-0.5 feet compared to the actual ground elevation along the boundary (not the FLO-2D grid element elevation) with some confidence interval to pass FEMA map audit standards.

Jeff spoke with FMS about "dry islands" in the middle of the grid. FMS had concern that there would be islands left in the middle of the grid where there shouldn't be. If the island is a foot higher than the water surface elevations, we might be able to map a dry island if it's large enough. There will also be a minimum area criteria in addition to a depth criteria. Jeff will look up the minimum area for a dry island according to FEMA. Should we also consider a minimum dimension (i.e., minimum length in the northing or easting direction)? The project team initially discussed during this meeting having a minimum dimension of at least 3 or 4 elements. However, since there hopefully will be so few "dry islands," the project team felt that maybe we can deal with each on a case-by-case basis and not have to specify this minimum dimension now. The minimum area suggested by FMS and later confirmed by Jeff was 10 elements (about 0.367 acres).

FMS agreed that Zone AO's were the most viable floodplain hazard designation available for mapping the FLO-2D results in the overbank area. We will have to map different AO depths:

Zone AO1 (from 0.1' depth to 1.5' depth), Zone AO2 (from 1.5' depth to 2.5' depth), and Zone AO3 (from 2.5' depth to 3.0' depth). FMS indicated that pits should be mapped with Zone AEs and a constant ponding elevation. The FLO-2D results in the overbank flowpath immediately before it confluences back with the main stem of Centennial Wash (modeled with RAS) should be mapped using a Zone AE designation with sloping BFE's. This area will need a flood profile as well.

FMS initially indicated that the minimum mapping depth could be 0.5' or below, but they may prefer something less like 0.3' or 0.1'. Jeff later made the decision to map everything of 0.1' to 1.5' as AO1.

Jeff asked WEST to research whether or not Zone AOs require flood profiles, but the project team felt confident during this meeting that Zone AOs do not require flood profiles. WEST will continue to research this topic.

Action items deriving from this meeting:

1. *WEST to continue working on the with- and without-embankment RAS modeling near the bridge.*
2. *Jeff to provide the floodway data table from the Waterman Wash FDS.* ***Update: This was provided to WEST by Jeff via email on May 14.***
3. *WEST to deliver a write-up describing the "inform RAS with FLO-2D results" on May 21.* ***Update: This was provided to Jeff by WEST via email on May 31.***
4. *WEST to continue working on the RAS floodway analysis.*
5. *WEST to complete the cost estimate and schedule adjustment memo and provide this document to the District by Friday, May 10, or Monday, May 13.* ***Update: This was provided to Jeff by WEST via email on May 10.***
6. *WEST to forward preliminary documentation on the HEC-1 subbasins "cut off" by the Centennial floodplain to Jeff.* ***Update: This was provided to Jeff by WEST via email on June 5.***
7. *Jeff to investigate the Cella-Barr model and possibly perform the additional hydrologic modeling task with NOAA-14 rainfall if deemed necessary.*
8. *WEST to research whether or not Zone AOs require flood profiles.*
9. *WEST to continue working towards finalization of FLO-2D models and develop preliminary mapping products based on the guidance provided herein.*

Date: July 18, 2013

A meeting was held on Thursday, June 20, 2013 at 9:30 AM MST with the following attendees:

Flood Control District of Maricopa County (District)

1. Jeff Shelton

WEST Consultants (WEST)

1. Brian Wahlin
2. Chuck Davis

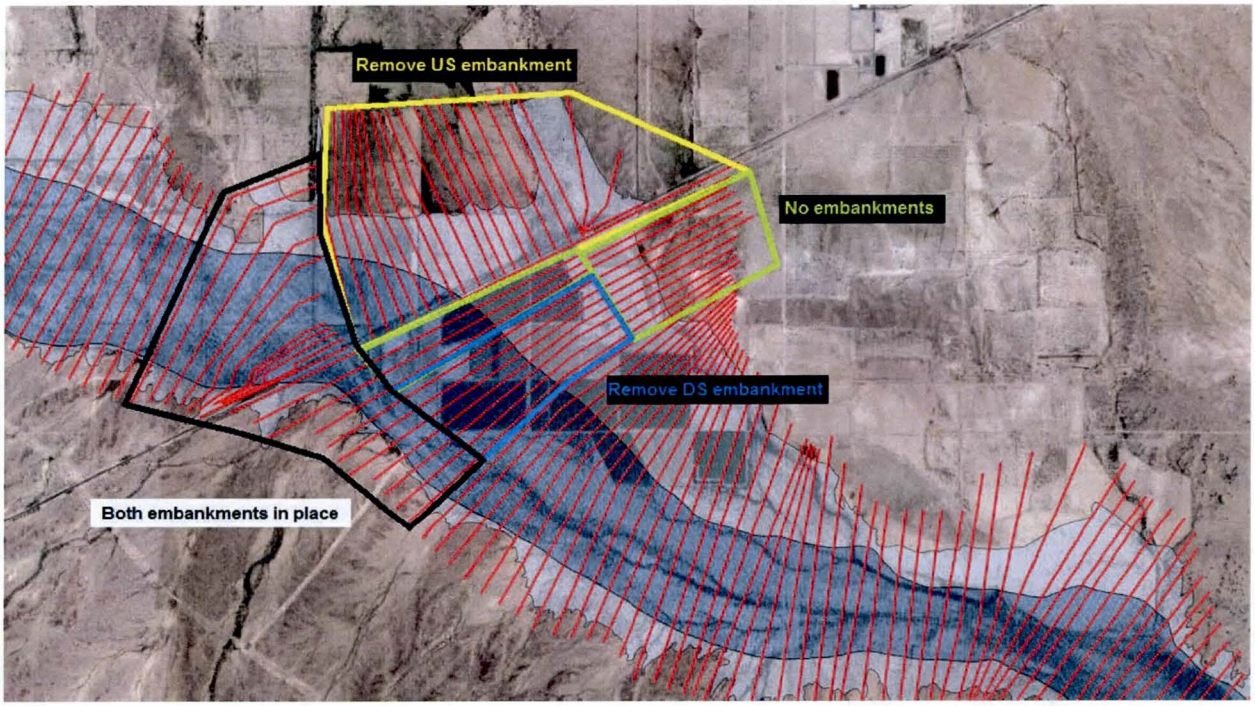
This meeting was a monthly coordination meeting for the Floodplain Delineation Study (FDS) for Centennial Wash in support of FEMA flood map revisions along the length of the watercourse from the La Paz County border to the confluence of Centennial with the Gila River.

The meeting followed the agenda prepared by WEST prior to the meeting, including the discussion items described below.

Discussion of the with- and without-embankment HEC-RAS models near the SPRR bridge

Based on modeling results presented by WEST, the project team decided to use the two primary models representing the embankments around the bridge instead of all four models. The two primary models to be used will include (1) the model with both the upstream and downstream embankments in place and (2) the without either the upstream or downstream embankments in place. The other two models developed for the study consist of a model with the upstream embankment but without the downstream embankment, and a model with the downstream embankment but without the upstream embankment.

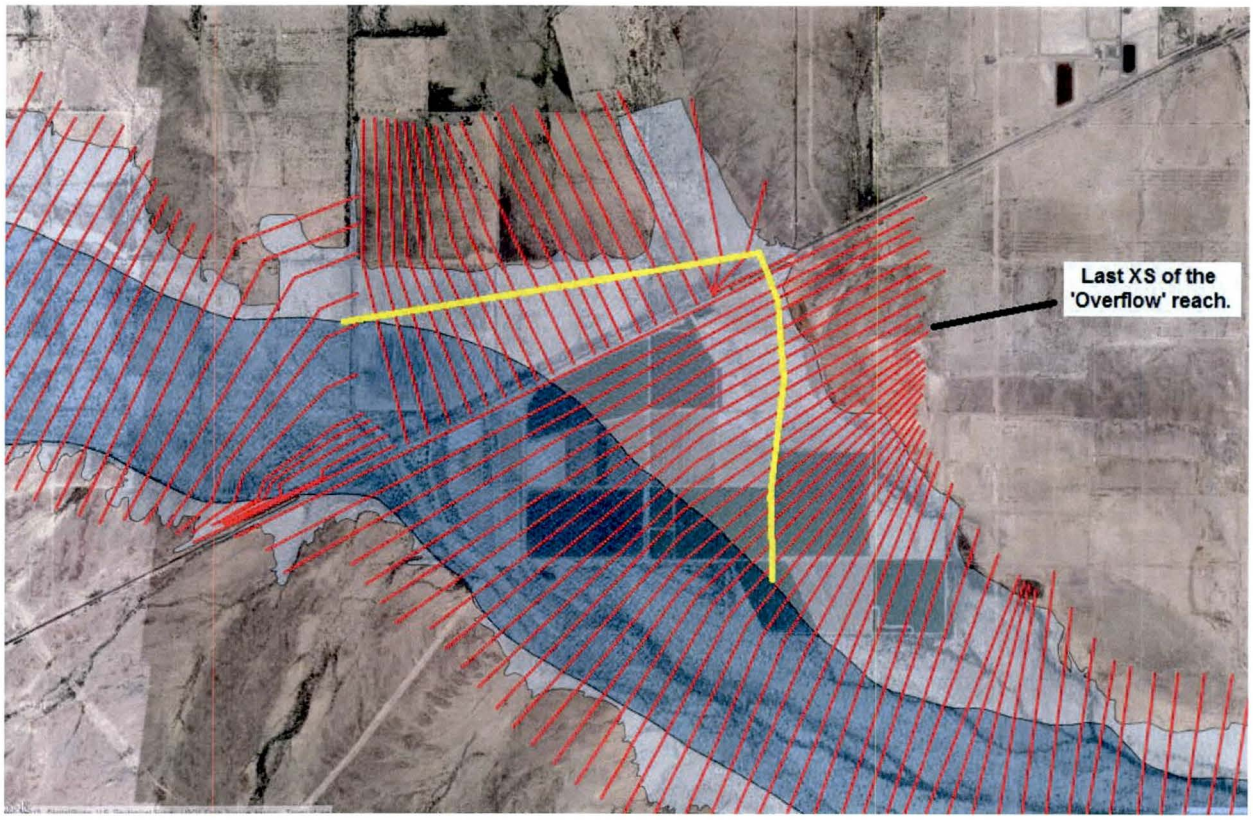
The figure below shows which model is the worst-case scenario (i.e., has the highest WSEL) for each cross section around the bridge. In the left overbank (i.e., those reaches that are not the main channel of Centennial Wash), one of the models including the removal of an embankment (removing the upstream embankment, the downstream embankment, or both) is the worst-case scenario for every cross section. However, the difference in these models is minimal; the model with the removal of both embankments is never lower than approximately 0.2' below the worst-case scenario WSEL of another model at any given cross section. Therefore, the project team decided to only use the two primary models as discussed above. Additionally, it was decided that only the two primary models would be included in the TSDN. This is defensible (as opposed to documenting all four models in the TSDN) because of the simplicity of documentation and user update down the road.



Discussion of the floodway

For the majority of the study reach, WEST will attempt to utilize the effective floodway boundaries as closely as possible. If these create a situation with an average surcharge << 0.6 feet, then WEST will squeeze the effective floodway boundaries to reach ~0.6 feet on average for surcharges throughout the study reach (similar to the effective study average surcharge).

For the area around the SPRR bridge, we will use a wide floodway including all four trestle openings and then narrow the floodway back to the approximate extents effective floodway as quickly as possible downstream of the bridge. This was done for two reasons. First, this is best from a regulatory perspective; no fill should be able to be placed within any of the four trestle openings for this bridge. Second, this is the most straightforward way to complete a floodway analysis given the complex bridge modeling approach utilized for this study. A schematic representation of the proposed floodway near the bridge is provided below; this figure was used during the meeting for discussion purposes.



Action items deriving from this meeting:

1. *WEST to utilize only the two models with embankments and without all embankments for the final mapping and TSDN effort.*
2. *WEST to complete the floodway analysis shortly and deliver this to Jeff.* ***Update: This was delivered to Jeff by WEST.***

Date: July 18, 2013

A meeting was held on Monday, July 15, 2013 at 10:00 AM MST with the following attendees:

Flood Control District of Maricopa County (District)

1. Jeff Shelton

WEST Consultants (WEST)

1. Brian Wahlin
2. Chuck Davis

This meeting was a monthly coordination meeting for the Floodplain Delineation Study (FDS) for Centennial Wash in support of FEMA flood map revisions along the length of the watercourse from the La Paz County border to the confluence of Centennial with the Gila River.

The meeting followed the agenda prepared by WEST prior to the meeting, including the discussion items described below.

Discussion of the draft work map sheets

WEST provided draft work map sheets at this meeting for review and discussion of work map deliverables. The following comments/questions were developed regarding the work maps during this meeting:

1) There needs to be a jurisdictional boundary added to Panel 1 differentiating La Paz County from Maricopa County.
2) 5' BFE's look good. WEST had printed example work maps with 1' BFE's that looked too busy, and WEST had also printed example work maps with no BFE's which did not provide enough detail. Jeff recommended sticking with the 5' BFE spacing for the final work maps.
3) WEST needs to increase the text size on the cross section labels. Different options regarding this increased text size discussed at the meeting are provided below:
   a. WEST could possibly create two columns with a wider label instead of just scaling the size of the entire hexagonal label up.
   b. WEST should have a white background in the hexagonal cross section labels, if the label is outside of the floodplain. If the label is inside the floodplain, at the minimum, have the hexagonal cross section label with a clear background (i.e., don't have the white background like those labels outside of the floodplain), but try to move all labels outside of the floodplain with a leader if possible.
4) In the title block, WEST needs to add a colon after 'Study' in the title of the project, i.e., "...Study: Gila..."
5) WEST needs to put 2' contour intervals on the maps instead of the 5' contour intervals shown currently. Instead of using topo lines developed from our final TIN,

WEST should use the topo lines received directly from the FCDMC, even though that doesn't cover the entire TIN area created for the modeling/mapping efforts.

6) Spline the floodplain boundaries to create smoother linework. Jeff said this was eventually up to WEST on how much we wanted to try to spline these boundaries. If we were sacrificing accuracy for splining, we should definitely go with the more accurate approach.
7) Jeff likes the tick mark labels WEST came up with, but he thinks there are too many on the maps. We need to thin out the tick mark labels (maybe every other one in the northing and easting compared to the current spacing we have).
8) WEST asked Jeff how he wanted to label roadways that don't appear to be a road of any kind (dirt or otherwise) on the aerials. Jeff indicated that if you don't see it on the aerial but it still shows up in the stnetres.shp provided by the District, WEST should put the word '[alignment]' in brackets beside the road name. For example, "Centennial Road [alignment]" over a portion of that roadway that does not appear on the underlying aerials.
9) Jeff didn't like the linework to distinguish the effective floodplain boundary. Thoughts on this discussion were provided below:
    a. Jeff recommended using a light gray, thicker line for the effective floodplain boundary.
    b. To differentiate between the effective Zone A and effective Zone AE boundary, Jeff suggested using the same gray and the same line weight as the effective floodplain but using a dashed line type.
10) For the triangular "wedge" near the La Paz County border that WEST has currently mapped as effective data, the project team decided that WEST would use the effective cross sections in their entirety for a few cross sections to get upstream of the county boundary, then map the water surface elevations from these old cross sections on the new topography downstream of the county boundary.
11) WEST needs to begin working on the tie-ins for the existing Zone A areas.
12) For the annotated FIRMs, Jeff thinks WEST will be using the new ones that become effective on Oct 16. Jeff will provide these to WEST shortly.

Discussion of HEC-RAS/FLO-2D mapping boundary

WEST proposed transition from the HEC-RAS mapping near the flow split into the FLO-2D mapping along the north/south embankment running to the north of the large stock tank near the flow split area. This is good in some ways, such as the mapping boundary occurring along a physical feature that is a major component of the amount of flow leaving the main branch at this location (i.e., the embankment north of the stock tank) and capturing more of the flow split area as modeled using the two-dimensional model (especially given the fact that this area is the exact reason the two-dimensional modeling task was implemented in the first place). However, this approach has drawbacks as well. First and foremost, this approach would create problems with the reporting of HEC-RAS cross sections that are intersected by the north-south divide

created long the stock tank embankment. Also, the tie-in is not good just north of this embankment; in other words, a discontinuity in the floodplain limits as modeled using these two approaches would create a large, immediate decrease in the floodplain limit as mapped using RAS (up to the location of transition) and the narrower floodplain as mapped using FLO-2D downstream of the transition.

The second option is to go downstream of the stock tank and make the mapping transition occur along a single HEC-RAS cross section. This has the distinct advantage of simplifying the mapping process by having all HEC-RAS cross section widths match in the modeling and the mapping, and the transition between the two model results becomes much smoother (i.e., the mapped floodplain widths are much more similar at this location than upstream near the stock tank embankment). Unfortunately, this approach does not utilize the FLO-2D results for mapping the flow split around the stock tank, which was the primary reason the FLO-2D model was developed in the first place. However, the flow changes from the FLO-2D model were still utilized to inform the HEC-RAS flow change locations/values; therefore, the information from the FLO-2D model would still be used in this approach.

The project team decided to utilize the second option and map the transition between the HEC-RAS model and the FLO-2D model at a distinct, individual HEC-RAS cross section downstream of the stock tank.

Discussion of FLO-2D Zone AE areas and flood profiles

Flood profiles have to be developed for results from the FLO-2D model designated as Zone AE area with sloping water surface elevations (i.e., Zone AE areas with a single ponded water surface elevation will not need a flood profile defined). Tasks for this flood profile task include the following:

1) Thalweg line will be needed for the FLO-2D Zone AE areas with sloping water surface elevations. This will include primarily the HVID north-south drainage channel and the area near the confluence of the overbank flow path with the main branch of Centennial Wash.
2) For each thalweg line drawn, WEST will need to develop river mile stationing and add that to the work maps.
3) WEST will need to extract the thalweg line elevations from the DTM.
4) WEST will need to smooth the flood profile results from FLO-2D in between the BFEs.

Discussion of miscellaneous items and schedule

WEST needs to begin filling out MT-2 forms. The project team decided that all of the MT-2 forms should be completed for this project.

The remaining schedule for the project was outlined during the meeting. This schedule is shown below:

1. AO mapping meeting between Jeff and FMS – 7/24
2. Jeff to provide final AO linework back to WEST – 7/31
3. Draft workmaps for HEC-RAS and possibly a few FLO-2D panels delivered to Jeff – 8/7
4. Remainder of FLO-2D workmaps delivered to Jeff - 8/21
5. Jeff to provide WEST with comments on the HEC-RAS work maps – 8/21
6. Jeff to provide WEST with comments on the remainder of the work maps – 9/16
7. WEST to provide Jeff with the Draft TSDN – 9/16
8. Annotated FIRMS/final workmaps delivered to Jeff by WEST – 9/30
9. Turn the entire package into FEMA 10/31

Action items deriving from this meeting:

1. *WEST to work on initial work map comments, including the following:*
    a. *Add jurisdictional boundaries to Panel 1.*
    b. *Add 5' BFE's to all panels.*
    c. *Increase the text size on the cross section labels.*
    d. *In the title block, add a colon after 'Study' for the project title ("...Study: Gila...").*
    e. *Add 2' contour intervals to the work maps instead of the 5' contour intervals.*
    f. *Spline the floodplain boundaries to create smoother linework if possible.*
    g. *Thin out the tick mark labels WEST developed originally.*
    h. *Label roadways that don't appear to be a road of any kind (dirt or otherwise) on the aerials by putting the word '[alignment]' in brackets beside the road name.*
    i. *Use a light gray, thicker line for the effective floodplain boundary.*
    j. *Differentiate between the effective Zone A and effective Zone AE boundaryby using the same gray and the same line weight as the effective floodplain but using a dashed line type.*
    k. *Use the effective cross sections in their entirety for a few cross sections upstream of the current triangular wedge of effective floodplain to get upstream of the county boundary, then map the water surface elevations from these old cross sections on the new topography downstream of the county boundary.*
    l. *Begin working on the tie-ins for the existing Zone A areas.*
    m. *Use the recently updated DFIRM panels that become effective on Oct 16 to create the annotated FIRM panels, not the old FIRMs.*

2. *WEST to update the mapping of the transition between the HEC-RAS model and the FLO-2D model at a distinct, individual HEC-RAS cross section downstream of the stock tank.*
3. *WEST to develop flood profiles for results from the FLO-2D model designated as Zone AE area with sloping water surface elevations (i.e., Zone AE areas with a single ponded water surface elevation will not need a flood profile defined).*
4. *WEST to begin filling out MT-2 forms.*
5. *Jeff to provide the updated DFIRM panels to WEST to use in the development of annotated FIRMs.* ***Update: This was provided to WEST by Jeff via disc on July 17.***

Date: August 9, 2013

A meeting was held on Thursday, August 8, 2013 at 11:00 AM MST with the following attendees:

Flood Control District of Maricopa County (District)

1. Jeff Shelton
2. Aisha Alexander

WEST Consultants (WEST)

1. Chuck Davis

This meeting was a monthly coordination meeting for the Floodplain Delineation Study (FDS) for Centennial Wash in support of FEMA flood map revisions along the length of the watercourse from the La Paz County border to the confluence of Centennial with the Gila River.

The meeting followed the agenda prepared by WEST prior to the meeting, including the discussion items described below.

Discussion of the public meeting materials

Aisha, the PIO for the Centennial Wash FDS, informed WEST of the schedule of required deliverables for PIO materials. By Monday, August 12, WEST needs to provide Aisha with text for the brochure, a picture of the wash from the field in JPEG format for the brochure's front cover (minimum 300 DPI), and a very minimally detailed study area location map similar to the example Aisha brought for the Scatter Wash public meeting brochure in JPEG format (also minimum 300 DPI). All other materials, including draft newspaper advertisement text and draft exhibit board graphics, will all be due in early September.

Regarding Google earth deliverables for the final flood hazard boundaries to be used during the public meeting, neither Jeff nor Aisha thought it was necessary for this project. This was for two reasons. First, the parcels in the study area are very large, not small, individual homes like a more urban study. Large, agricultural parcels can be seen on a large map much more easily than small parcels that need a greater level of detail at a higher zoom. Second, the likely location for the public meeting (main conference room at FCDMC) will likely not have computers to run Google Earth. Therefore, the two laptops that WEST will provide for the meeting will be the only two computers in the room with Google Earth functionality which may not be widely useful for the public.

Discussion of the work map deliverables

WEST provided draft work map sheets for Panels 27 through 49 (from approximately Baseline Road downstream to the Gila River confluence) at this meeting for the District to begin review. The following items were delivered with these work maps:

1) Hard copy of Panels 27 through 49
2) Electronic copies of Panels 27 through 49 in both PDF and PNG formats (not georeferenced at this time)
3) Final HEC-RAS models
4) GIS files showing cross section alignments, final flood lines for the revised floodplain and floodway, etc.

Chuck will develop a README file for the deliverable CD and provide it to Jeff by tomorrow, August 9.

WEST had several questions regarding the work maps. The first regarded the final naming convention for reaches in the models. The final agreed upon names are provided below.

1) Model 1 – La Paz County to HVID Westside Canal
    a. River – Centennial Wash
    b. Reach – To La Paz
2) Model 2 – HVID Westside Canal to Baseline Road
    a. River – Centennial Wash
    b. Reach – Harquahala Valley
3) Model 3 – Baseline Road to Gila River (geometry with embankment)
    a. Main branch above railroad
        i. River – Centennial Wash
        ii. Reach – Above Railroad
    b. Main branch below railroad
        i. River – Centennial Wash
        ii. Reach – Below Railroad
    c. First breakout channel, formerly "overflow"
        i. River – Centennial RR spill
        ii. Reach – Trestles 2 to 4
    d. Second breakout channel, formerly "fields"
        i. River – Centennial Fields
        ii. Reach – DS Trestles 2 and 3
4) Model 3 – Baseline Road to Gila River (geometry with embankment)
    a. Main branch above railroad
        i. River – Centennial Wash
        ii. Reach – Above Railroad
    b. Main branch through Trestle 1
        i. River – Centennial Wash

ii. Reach – Trestle 1

c. Main branch below railroad
    i. River – Centennial Wash
    ii. Reach – Below Railroad
d. First breakout channel, formerly "overflow"
    i. River – Centennial RR spill
    ii. Reach – Trestles 2 to 4
e. Second breakout channel, formerly "fields"
    i. River – Centennial Fields
    ii. Reach – DS Trestles 2 and 3

The second question was about rounding in GIS compared to HEC-RAS. WEST was noticing that the rounding of WSEL's to the tenths, when the hundredths digit was 5, was rounding down at times instead of rounding up. Jeff found the answer to this issue. ESRI uses "banker's rounding" in the ArcGIS suite. If the tenth digit is even and the hundredth is 5, the digit will round down. For example 0.45 rounds down to 0.4. If the tenth is odd and the hundredth is 5, the digit will round up. For example 0.75 rounds up to 0.8. Jeff said that this, on average, will create a rounded dataset with an average closer to the average of the original dataset than traditional rounding where every 5 digit is rounded up. However, the District says that FEMA and the District historically have rounded using traditional methods, i.e. 5 hundredths always rounds up to the greater tenth. They requested that WEST take all of the WSEL's to the hundredths, round using the traditional method in excel, and then use this hard rounding to the tenth to label our cross section WSEL's on the work maps. WEST will correct this on all of the final work maps.

WEST asked whether the District wanted the titles of the tributary names from the Centennial Wash Zone A FDS, i.e., the unnamed tributaries entering Centennial Wash, called out on WEST's work maps. The District indicated that they would. Jeff will leave a CD at the front desk at FCDMC to pick up with all of the reports from the Centennial Wash Zone A FDS, and WEST can go through and extract each of the tributary names from the report. WEST will then place these names on our work maps using text boxes. No hydraulic baselines need to be shown for these tributaries.

Jeff pointed out that the final flood lines developed by WEST may not have been as smoothed as needed because of a limitation in their HIS system to only allow a certain number of vertices in the floodplain boundary line work in between cross sections. Jeff will check with Kathryn Gross regarding this requirement and get back to WEST.

Discussion of final FLO-2D mapping

WEST asked Jeff some questions regarding his final FLO-2D line work comments. Jeff answered these questions, and the FLO-2D line work will be considered final ahead of the draft FLO-2D work map submittal on August 21.

In regards to the remainder of the FLO-2D mapping items, WEST and the District decided on naming conventions for the two largest FLO-2D Zone AE areas. For the left overbank Zone AE, the District and WEST agreed to use the effective reach name for the hydraulic baseline tying into Centennial Wash with a few minor edits. For the HVID drainage channel Zone AE, the District and WEST agreed to use the name from the HVID plan set (something like "HVID Drainage Channel" or similar). Jeff mentioned that WEST will have to develop river mile ticks for these two Zone AE's along the hydraulic baselines for the work maps, and that WEST will eventually have to develop profiles for these two reaches. These profiles should be in DXF or DWG format.

We also need to begin doing an edge matching check of the FLO-2D results in the Zone AE area near the Centennial Wash confluence. We need to export the boundary grid final WSEL from the final combined Max WSEL model results grid (by either rasterizing the results along the border, or creating a 3D line along the absolute outer edge populated with the values from the raster) and then subtract the underlying topography data (either by subtracting the base topo DEM at a 5' interval from boundary results grid at a 40' interval or by extracting a profile from the underlying topo DEM or TIN and comparing that to the profile from the 3D line developed above). This difference should be less than a half-foot everywhere. WEST needs to propose and complete a methodology to do this in the Zone AE area near the confluence with Centennial Wash. Jeff thinks we won't have to perform a similar check for the Zone AO boundaries since those are merely specifying a ground elevation plus a flooding depth, not specifying a final WSEL associated with flood hazards. WEST should look into this though.

Action items deriving from this meeting:

1. *By Monday, August 12, WEST to provide Aisha with text for the brochure, a picture of the wash from the field in JPEG format for the brochure's front cover (minimum 300 DPI), and a very minimally detailed study area location map similar to the example Aisha brought for the Scatter Wash public meeting brochure in JPEG format (also minimum 300 DPI).*
2. *Chuck will develop a README file for the deliverable CD and provide it to Jeff by tomorrow, August 9.*
3. *WEST to update the RAS model reach names as specified above.*
4. *WEST to round all WSEL's to the tenth using traditional methods by rounding results with 5 in the hundredths digit up to the nearest tenth for final WSEL reporting.*

5. *WEST to title the Centennial Wash Zone A tributaries using the final report from this study.*
6. *Jeff to inquire with Kathryn Gross about possible limitations to the number of vertices in flood line work in between cross sections for the District's HIS system.*
7. *WEST to develop hydraulic baselines and flood profiles for the two largest FLO-2D Zone AE's.*
8. *WEST to calculated ponded Zone AE flooding elevations for all other FLO-2D Zone AE's.*
9. *WEST to recommend and complete an edge-matching check for the border of the FLO-2D results compared to the underlying topography for the Zone AE in the left overbank near the confluence with the main branch of Centennial Wash.*

Date: October 26, 2013

A meeting was held on Tuesday, September 24, 2013 at 11:00 AM MST with the following attendees:

Flood Control District of Maricopa County (District)

1. Jeff Shelton

WEST Consultants (WEST)

1. Brian Wahlin
2. Chuck Davis

This meeting was an intermediate coordination meeting between regularly monthly coordination meetings to discuss finalization of the AVSE Phase II site inclusion into the HEC-RAS model for the Floodplain Delineation Study (FDS) for Centennial Wash in support of FEMA flood map revisions along the length of the watercourse from the La Paz County border to the confluence of Centennial with the Gila River.

The meeting followed the agenda prepared by WEST prior to the meeting, including the discussion items described below.

Discussion of incorporation of the as-built data for the AVSE Phase II project into the final HEC-RAS model

WEST discussed the process that WEST is currently using to georeference the work maps provided to WEST in PDF format and then use those plans to update the HEC-RAS model. WEST is still waiting on the possibility of receiving the electronic topography data from the client to cut cross sections directly from the electronic data. WEST proposed October 4 as the last possible date for which receiving electronic topography data for the AVSE Phase II site would be usable. Jeff concurred with this date.

WEST asked if the accuracy of our georeferencing process would be a problem for the District's accuracy standards, especially compared to the accuracy of the other topographic datasets used in this study. Jeff assured WEST that this would not be a problem if accurately documented in the report.

WEST also indicated that they did not believe the AVSE portion of the project would be ready for District review before the final package was due on October 31. Jeff said that he understood and that he would not request this prior to the final submittal date.

Discussion of miscellaneous items

Jeff told WEST not to worry about including the updated Gila hydraulic baseline from Cathy Regester's study on our work maps. That project is currently on hold for review of Manning's roughness coefficients. Therefore, Jeff does not want to include any of that study on our work maps.

After October 31, Jeff will send Bob Bezek (from FEMA Region 9) the PDF of the final TSDN and the FLO-2D work maps to communicate to him the mapping methodology used for this study. Hopefully this will allow us to address big-picture concerns regarding the results before receiving comments back from FEMA.

Jeff would like to see the final FEMA map audit spreadsheet we developed during this meeting for the "Centennial Left Overbank" Zone AE area from the FLO-2D results. Assuming an accuracy standard of +/- one-half of the contour interval, we meet mapping accuracy standards at a 90% pass rate. Is this the correct limit? WEST will investigate. Based on WEST's experience, the accuracy requirement is +/- 1 foot for detailed studies, but there are three risk classes each with its own percent passing requirement: (1) Risk Class A, high population and/or high anticipated growth = 95%; (2) Risk Class B, medium population and/or modest anticipated growth = 90%, and (3) Risk Class C, sparse population, small/no anticipated growth = 85%.

Action items deriving from this meeting:

1. *WEST to continue to georeference the work maps provided to WEST in PDF format and then use those plans to update the HEC-RAS model in the vicinity of the AVSE Phase II Site.*
2. *WEST to report the results of the final map audit spreadsheet the project team developed during this meeting for the "Centennial Left Overbank" Zone AE area from the FLO-2D results.*

Date: October 26, 2013

A meeting was held on Thursday, October 3, 2013 at 3:00 PM MST with the following attendees:

Flood Control District of Maricopa County (District)

1. Jeff Shelton

WEST Consultants (WEST)

1. Chuck Davis
2. Brian Wahlin

This meeting was a monthly coordination meeting for the Floodplain Delineation Study (FDS) for Centennial Wash in support of FEMA flood map revisions along the length of the watercourse from the La Paz County border to the confluence of Centennial with the Gila River.

The meeting followed the agenda prepared by WEST prior to the meeting, including the discussion items described below.

AVSE as-built plans and incorporation of these plans into the HEC-RAS model

WEST mentioned that the preliminary mapping was showing water surface elevations overtopping more of the site than originally expected. Also, WEST mentioned that the lack of digital topography data and low-resolution as-built images that WEST georeferenced to perform this work was making the mapping difficult. Part of the reason the mapping of the AVSE Phase II site was overtopping the project features was the differences in topography between the effective study and the updated mapping collected by the FCDMC. Jeff found that the Cella Barr ERM's were consistently 0.5 to 0.7 feet lower than what MCDOT has recorded for the elevations these points. In addition to this consistent downward shift in the ERM data, the error in 4' topography (the contour interval of the effective topography) is up to +/- 2 feet. This could have caused an even greater downward shift in the effective study topography relative to the updated topography. These two things in concert were likely the cause of the significant difference in these two datasets.

Due to the last-minute nature of incorporating the as-built data into the model with georeferenced as-built plans form the PDF plan set (as opposed to digital topography data), Jeff would like WEST to talk about the incorporation of the AVSE topography into the HEC-RAS model as an area of less accuracy than other parts of the model in the report.

Also, in the mapping process, the water surface elevations in the final RAS model are slightly lower than some of the embankments near the outer edge of the site. However, the water surface elevation was higher than the ground surface of the detention basins on the other side of the embankments. Therefore, Jeff instructed WEST to map conservatively as if the embankments were not there.

Remaining project schedule

Based on previous scheduling conversations, WEST will deliver annotated FIRMS and final workmaps to Jeff by 9/30. Jeff and WEST discussed that Jeff will return his comments on the TSDN to WEST by 10/15, and WEST will give final work maps and annotated FIRMs to Jeff by 10/15 as well. In the end, WEST will submit the final package to the District by 10/31.

Final billings

WEST asked Jeff how the final billings should be conducted. Jeff asked WEST to refrain from billing the entire amount by October 31 and keep some of the budget available for future FEMA comments.

Action items deriving from this meeting:

1. *WEST to talk about the incorporation of the AVSE topography into the HEC-RAS model as an area of less accuracy than other parts of the model in the report.*
2. *WEST to map conservatively in the area of the AVSE Phase II site as if the embankments were not there.*
3. *Jeff will return his comments on the TSDN to WEST by 10/15.*
4. *WEST to give final work maps and annotated FIRMs to Jeff by 10/15.*
5. *WEST will submit the final FDS package to the District by 10/31.*
6. *WEST to refrain from billing the entire amount by October 31 and keep some of the budget available for future FEMA comments.*

Date: October 29, 2013

A meeting was held on Friday, October 11, 2013 at 1:00 PM MST with the following attendees:

Flood Control District of Maricopa County (District)

1. Jeff Shelton
2. Mandar Nangare

WEST Consultants (WEST)

1. Brian Wahlin
2. Chuck Davis

ARCADIS

1. Corey Zorn
2. Isaac Thomas

This meeting was an intermediate coordination meeting between regularly monthly coordination meetings to discuss finalization of the AVSE Phase II site inclusion into the HEC-RAS model for the Floodplain Delineation Study (FDS) for Centennial Wash in support of FEMA flood map revisions along the length of the watercourse from the La Paz County border to the confluence of Centennial with the Gila River.

The meeting followed the agenda prepared by Jeff Shelton prior to the meeting, including the discussion items described below.

Preliminary Results from including AVSEII as-built plans into Centennial Wash FDS study

Jeff and WEST presented the results of the Centennial study after including the AVSE as-builts into our final model. This shows flooding depths of up to ~1 foot on the AVSE site (above the berms of the channels and detention basins along the edge of the site) at some places. The area of inundation covers many of the solar panels on the site, but none of the buildings.

WEST and the District found significant differences between the effective four-foot topography and the two-foot topography used in the new study. This is mainly attributed to the +/- two foot of error assumed for the effective topography (4-foot contour interval data). Error on the order of +/- half of the contour interval is a typical assumption for topography data.

ARCADIS showed no inundation on the site from their CLOMR study, which is based on the effective topography, but Corey indicated that ARCADIS had noticed topography differences in the main channel and had warned LS Power (owners and operators of the AVSE Phase II facility) that there was a risk that an updated topography study could alter the inundation limits on their site, even after construction. Corey indicated that LS Power had agreed to that risk if the District would provide the necessary permits based on a more simplified hydraulic analysis because the cost of a full restudy was cost-prohibitive for LS Power.

Mandar mentioned his desire not to have LS Power complete all of the District's and FEMA's requirements for a CLOMR/LOMR and then immediately map them back into the floodplain. He mentioned considering not utilizing the new WEST linework from the study presented at this meeting but utilizing the ARCADIS LOMR linework in this area instead. One problem with this approach that Jeff pointed out is tie-in with the updated study would be difficult due to differing WSEL's. ARCADIS indicated that they were not concerned with this issue, and they did not feel their client would be either. Previous discussions between ARCADIS and LS Power regarding the possible risk associated with the approach taken previously for the CLOMR study included a discussion with LS Power about the results of this possibility. They indicated that as long as they complied with the District, what happened in the future was likely not problematic. Therefore, WEST and the District will proceed to map the results as they are shown currently based on incorporating the as-built data into the HEC-RAS model.

In fact, ARCADIS mentioned that the site was designed to have up to six inches of water without any problems at all. If needed, LS Power could avoid costly flood insurance by elevating the electrical equipment for the panels by putting the panel control boards up higher on the post, or by putting the entire post/panel assembly on an elevated metal box. Finally, the nature of solar panels not being "inhabitable buildings" may mean that there is no flood insurance requirement regardless of flood inundation extent. Corey will inquire with his client about this flood insurance requirement.

Finalization of the LOMR process for LS Power and ARCADIS

Based on the conversation during the first portion of the meeting, the District began to outline the best course of action moving forward for ARCADIS to complete the LOMR for LS Power. First and foremost, it was decided that ARCADIS should continue to update the effective model. In other words, ARCADIS should not be required to take WEST's updated model and verify the incorporation of the as-built information into the model. Since the WEST model will not be effective for some time (as the PMR process tends to take a significantly greater amount of time than the LOMR process to update the effective information), there is no reason for ARCADIS to provide their LOMR updates based on that model.

Regarding the timing of the submittals for ARCADIS and WEST, Jeff mentioned the idea of intentionally holding WEST's submittal until well after the ARCADIS submittal to not cause confusion with FEMA. ARCADIS will be submitting their LOMR to the District on November 1 or shortly thereafter. The District then has a 90-day review window to comment on this submittal before it is sent to FEMA. WEST will be turning in their final product on October 31. The District will have approximately a 2-week window of review for this submittal at which time Tim Phillips will sign this study (making it "enforceable" for the District from a regulatory perspective) and send it to FEMA as a PMR. Jeff mentioned holding the WEST package until after the ARCADIS package goes to FEMA. However, the project team discussed that due to the significant differences between the PMR process and the LOMR process, a lagged delivery likely

would not provide much benefit to FEMA or to the District in terms of reduced confusion of submittals. Therefore, all of the submittals will proceed based on the previously planned schedules.

Action items deriving from this meeting:

1. *WEST to move forward with the incorporation of the AVSE Phase II data into the final model as planned, with mapping continuing as planned as well.*
2. *ARCADIS to complete their LOMR based on the effective model as originally planned.*
3. *Corey to inquire whether or not LS Power actually pays flood insurance.*

Appendix B: General Documentation and Correspondence

B.2 Contract Documents

CONTRACT FCD 2012C004

CENTENNIAL WASH FLOODPLAIN DELINEATION STUDY: GILA RIVER TO LA PAZ COUNTY

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CONTRACT FCD 2012C004
CENTENNIAL WASH FLOODPLAIN DELINEATION STUDY:
GILA RIVER TO LA PAZ COUNTY

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Pursuant to the provisions of the Arizona Revised Statutes §48-3603, the Board of Directors of the Flood Control District of Maricopa County has the authority to enter into contracts.

The **Flood Control District of Maricopa County**, Arizona, hereinafter called "District", is desirous of having certain professional services performed in connection with **Contract FCD 2012C004, Centennial Wash Floodplain Delineation Study: Gila River to La Paz County,** hereinafter called the "Project" and as more fully described in Exhibit A, Scope of Work, and in accordance with Exhibit B, Fee Proposal, attached; and **WEST Consultants, Inc.**, hereinafter called "Consultant", with its principal offices located at **8950 S. 52nd Street, Suite 210, Tempe, Arizona 85284-1043**, is desirous of performing said services;

THEREFORE, the parties hereto mutually agree as follows:

SECTION I—SERVICES OF THE CONSULTANT

The Consultant, under the general supervision of the District Engineering Division Manager, shall prepare studies, reports, surveys, plans, drawings, specifications, and cost estimates as are necessary for the Project according to the directions and designated standards of the District, and in accordance with Exhibit A, Scope of Work. It is understood and agreed that the District's authorized representative shall be the Engineering Division Manager or his duly authorized representative, hereinafter called the "Agent". For purposes of this contract, the Agent's duly authorized representative shall be the Project Manager and he/she shall be the sole contact for administering this contract.

The Consultant shall meet periodically with the Agent so as to keep the District informed of the progress of the work in accordance with the schedule defined in Exhibit A, Scope of Work.

The Consultant shall promptly advise the Agent of any factors which develop during the Project that would likely result in construction or design costs in excess of budgetary constraints.

SECTION II—PERIOD OF SERVICE

The Consultant shall complete all work including optional tasks within seven hundred ninety (790) calendar days from the Notice to Proceed (NTP). The Consultant shall have the final study results ready for submittal to FEMA within four hundred twenty five (425) calendar days from the Notice to Proceed (NTP).

Should extension of this contract period be necessary, and any such extension(s) continue the date of contract performance for a time period of more than one (1) year from the original date of contract expiration, adjustment(s) of the Consultant's fee(s) may be made, upon agreement by both the District and the Consultant. Any such fee adjustment shall only apply to the extended contract time period.

SECTION III—PAYMENTS TO THE CONSULTANT

The Consultant shall be paid for work under this contract a **lump sum fee of $** [redacted] **plus a fee not-to-exceed** [redacted] **for optional tasks** as identified below and in accordance with the Scope of Work. A written authorization from the Agent will be required prior to initiating any optional task.

OPTIONAL TASK NUMBER	DESCRIPTION	TOTAL
2.0	Public Involvement	$ [redacted]
5.0	Field Survey	$
7.0	Floodplain/Floodway Delineation	$
9.0	FEMA Submittal	$
	Direct and Outside Expenses	$

The total contract amount will not exceed [redacted] plus any adjustments that have been approved in writing in accordance with the Maricopa County Procurement Code.

The District shall pay the Consultant upon completion of the work as accepted by the District, except that progress payments may be made as billed by the Consultant based on approved monthly progress reports subject to the limitations set forth in Exhibit A, Scope of Work.

With each request for payment, the Contractor shall complete and provide the "Maricopa County Small Business Enterprise Program Participation Reporting Form" which is included with this contract document.

SECTION IV—THE DISTRICT'S RESPONSIBILITIES

The District shall furnish the Consultant, at no cost to the Consultant, the following information or services for this Project:

A. One copy of on-hand maps, records, survey ties, benchmarks, or other data pertinent to the Project. This does not, however, relieve the Consultant of the responsibility of searching records for additional information, for requesting specific information, or for verification of that information provided. The District does not warrant the accuracy or comprehensiveness of any such information.

B. All available information and data relative to policies, standards, criteria, and studies, etc. impacting the Project as identified by the Consultant.

C. Available staff for consultation with the Consultant during the performance of studies and plan development in order to identify the problems, needs, and other functional aspects of the Project.

D. Prompt examination of documents submitted by the Consultant and rendering of decisions pertaining thereto in order to avoid unreasonable delay in the progress of the work by the Consultant. The District will keep the Consultant advised concerning the progress of the District's review of work.

SECTION V—AMENDMENTS

This contract may be amended by mutual agreement of the District and the Consultant.

Any alteration in the Scope of Work that will result in a substantial change in the nature of the Project so as to materially increase or decrease the contract fee will require negotiation of an amendment to the contract to be executed by the District and the Consultant. No work shall commence on the change until the contract amendment has been approved by the District and the Agent has notified the Consultant to proceed. It is distinctly understood and agreed that no claim for extra work performed or materials furnished by the Consultant will be allowed by the District except as provided herein, nor shall the Consultant do any work or furnish any materials not covered by this agreement unless such work is first authorized in writing by the District in accordance with the Maricopa County Procurement Code. Any such work or materials furnished by the Consultant without such written authorization first being given shall be at Consultant's own risk, cost, and expense. The Consultant hereby agrees to make no claim for such work or materials furnished without such written authorization.

SECTION VI—RECORDS

Records of the Consultant's expenses pertaining to this contract and records of accounts between the District and the Consultant shall be kept on a generally recognized accounting basis and shall be available upon request to the District or its authorized representative for audit during normal business hours.

All Consultant and District procurement records shall be retained for a period of one (1) year and disposed of in accordance with the records retention guidelines and schedules approved by the State of Arizona Department of Library, Archives, and Public Records unless applicable Federal regulations require a longer period of retention.

SECTION VII—PROJECT COMPLETION

If, during the course of this contract, situations arise which prevent completion within the allotted time, the Agent may grant an extension.

SECTION VIII—TERMINATION

The District may terminate this contract at any time upon reimbursement to the Consultant of expenses that include reasonable charges for time and material for the percentage of work satisfactorily completed and provided to the District.

The District reserves the right to postpone, terminate, or abandon this contract for the Consultant's failure to complete the Project on time or failure to comply with the provisions of the contract. The District also reserves the right to terminate any or all parts of this contract for its own convenience as the District may determine at it's sole discretion.

The District hereby gives notice that pursuant to A.R.S. § 38-511 "A" this contract may be canceled without penalty or further obligation within three (3) years after execution if any person significantly involved in initiating, negotiating, securing, drafting, or creating a contract on behalf of the District is, at any time while the contract or any extension of the contract is in effect, an employee or agent of any other party to the contract in any capacity or a consultant to any other party of the contract with respect to the subject matter of the contract. Cancellation under this section shall be effective when written notice from the District Chief Engineer and General Manager is received by all of the parties to the contract. In addition, the District may recoup any fee or commission paid or due to any person significantly involved

in initiating, negotiating, securing, drafting, or creating the contract on behalf of the District from any other party to the contract arising as a result of the contract.

The Consultant may terminate this contract in the event of nonpayment of fees as specified in SECTION III, PAYMENTS TO THE CONSULTANT.

SECTION IX—OWNERSHIP OF DOCUMENTS

A. All original documents including, but not limited to studies, reports, tracings, drawings, physical and computer models, estimates, field notes, investigations, design analysis, calculations, computer software, and specifications, prepared in the performance of this contract are to be and remain the property of the District and are to be delivered to the Agent before final payment is made to the Consultant. The District will not reuse, alter or modify these documents without noting such modifications, alterations, or intent of their reuse, and will hold the Consultant harmless from any claims arising from such reuse, modifications, or alterations of the documents. The Consultant may retain reproducible copies of all such documents delivered to the District.

B. If the Consultant retains reproducible copies of all such documents delivered to the District, the Consultant may not use those documents in regard to current or future claims or litigation against the District brought by another party or parties unless the documents are independently produced in accordance with a court order or procedural rules and notice of such production is given to the District immediately and prior to their production.

C. Copies retained by the Consultant, sub-consultant(s), or any related entities are governed by Arizona Law regarding the use of public records and may not be used for commercial purpose without additional written permission from the District and the payment of all applicable fees.

D. The District reserves the right to reuse the documents as it sees fit.

SECTION X—COMPLIANCE WITH LAWS

The Consultant is required to comply with all Federal, State, and local laws, local ordinances and regulations. The Consultant's signature on this contract certifies compliance with the provisions of the I-9 requirements of the Immigration Reform and Control Act of 1986 for all personnel that the Consultant and any subconsultants employ to complete any Project. It is understood that the District shall conduct itself in accordance with the provisions of the Maricopa County Procurement Code.

The consultant warrants that it is in compliance with A.R.S. §41-4401 and further acknowledges:

(1) That the consultant and its sub-consultants, if any, warrant their compliance with all federal immigration laws and regulations that relate to their employees and their compliance with A.R.S. §23-214, subsection A; *After December 31, 2007, every employer, after hiring an employee, shall verify the employment eligibility of the employee through the e-verify program and shall keep a record of the verification for the duration of the employee's employment or at least three years, whichever is longer.*

(2) That a breach of a warranty under subsection 1 above, shall be deemed a material breach of the contract that is subject to penalties up to and including termination of the contracts;

(3) That the contracting government entity retains the legal right to inspect the papers of any consultant or sub-consultant employee who works on the contract to ensure that the consultant or sub-consultant is complying with the warranty provided under subsection 1 above and that the consultant agrees to make all papers and employment records of said employee(s) available during normal working hours in order to facilitate such an inspection.

(4) That nothing herein shall make any consultant or sub-consultant an agent or employee of the contracting government entity.

Verification regarding compliance with A.R.S. §35-391.06 and §35-393.06 Business Relations with Sudan and Iran:

(1) By entering into the Contract, the Contractor certifies it does not have scrutinized business operations in Sudan or Iran. The contractor shall obtain statements from its subcontractors certifying compliance and shall furnish the statements to the Procurement Officer upon request. These warranties shall remain in effect through the term of the Contract.

(2) The District may request verification of compliance for any contractor or subcontractor performing work under the Contract. Should the District suspect or find that the Contractor or any of its subcontractors are not in compliance, the District may pursue any and all remedies allowed by law, including, but not limited to: suspension of work, termination of the Contract for default, and suspension and/or debarment of the Contractor. All costs necessary to verify compliance are the responsibility of the Contractor.

SECTION XI—GENERAL CONSIDERATIONS

A. The Consultant shall furnish to the District for approval, the names of its key employees, and of its subconsultants and their key employees, to be used on this Project prior to beginning the work under this contract. Any subsequent changes are subject to the written approval of the District.

B. The Consultant shall perform, with its own firm, work amounting to fifty percent (50%) or more of the total amount of the contract value. Any deviation may be approved, in writing, at the discretion of the Agent.

C. The failure of either party to enforce any of the provisions of this contract or to require performance of the other party of any of the provisions hereof shall not be construed to be a waiver of such provisions, nor shall it affect the validity of this contract or any part thereof, or the right of either party to thereafter enforce each and every provision.

D. The Consultant shall be responsible for the cost of any additional design, field layout, testing, construction and supervision necessary to correct those errors or omissions attributable to the Consultant, and for any damage incurred by the District as a result of additional construction costs caused by such consultant errors or omissions.

E. The fact that the District has accepted or approved the Consultant's work shall in no way relieve the Consultant's responsibility.

F. It is mutually understood and agreed that this contract shall be governed by the laws of the State of Arizona, both as to interpretation and performance. Any action at law, suit in equity, or judicial

proceeding for the enforcement of this contract, or any provision thereof, shall be instituted only in the courts of the State of Arizona.

G. When this contract requires the Consultant to study specific geographic areas of Maricopa County (including but not limited to floodplain delineations, watercourse master plans, area drainage master studies, or any other site specific assignment) the Consultant agrees during the term of this contract and any extensions thereof that Consultant will not perform similar services for any clients other than the District within that specific geographic area without the written authorization and approval of the Chief Engineer and General Manager of the District.

H. The Consultant shall incorporate stormwater quality best management practices (BMPs) in the design of the project and comply with the Maricopa County Stormwater Quality Management and Discharge Control Regulation, the Maricopa County Drainage Policies and Standards, and the Maricopa County Drainage Regulations, using guidance from the Maricopa County Drainage Design Manual, Vol. III, Erosion Control

I. The Consultant agrees that it, its principals, employees, sub-consultants, agents and assigns, shall not accept employment as consultants, expert witnesses or otherwise in any pending or contemplated litigation against the District during the term of this contract and any extensions thereof without the written authorization and approval of the Chief Engineer and General Manager of the District.

J. The Consultant agrees that it, its principals, employees, sub-consultants, agents and assigns, shall not accept employment as consultants, expert witnesses or otherwise in any future litigation against the District in regard to the subject matter of this contract without the written authorization and approval of the Chief Engineer and General Manager of the District.

K. It is understood that the District shall have the right to seek and obtain in any court of competent jurisdiction an injunction to restrain a violation or alleged violation by the Consultant, its principals, employees, sub-consultants, agents or assigns, of the provisions of G., I., and J. of this section or of the provisions of B. of Section IX, and the right of action for full damages at law, in addition to any other remedies provided by this contract. In no case shall a waiver by the District of the right to seek relief under this provision constitute a waiver of any other or further violation.

SECTION XII—SUCCESSORS AND ASSIGNS

This contract shall not be assigned by either party without prior written approval of the other except that the Consultant may use in the performance of this contract without prior approval of the District, personnel or services of its related entities and affiliated companies as if they were an integral part of the Consultant; and it shall extend to and be binding upon the heirs, executors, administrators, successors and assigns of the parties hereto.

SECTION XIII—NO KICK-BACK CERTIFICATION

The Consultant warrants that no person has been employed or retained to solicit or secure this contract upon any agreement or understanding for a commission, percentage, brokerage, or contingent fee; and that no member of the Board of Directors or any employee of the District has any interest, financially or otherwise, in the Consultant's firm.

For breach or violation of this warranty, the District shall have the right to annul this contract without liability, or at its discretion, to deduct from the contract price or consideration, the full amount of such commission, percentage, brokerage, or contingent fee.

SECTION XIV - INFLUENCE

As prescribed in MC1-1202 of the Maricopa County Procurement Code, any effort to influence an employee or agent to breach the Maricopa County Ethical Code of Conduct or any ethical conduct, may be grounds for Disbarment or Suspension under MC1-902.

An attempt to influence includes, but is not limited to:

1. A Person offering or providing a gratuity, gift, tip, present, donation, money, entertainment or educational passes or tickets, or any type valuable contribution or subsidy;
2. That is offered or given with the intent to influence a decision, obtain a contract, garner favorable treatment, or gain favorable consideration of any kind.

If a Person attempts to influence any employee or agent of Maricopa County, the Chief Procurement Officer, or his designee, reserves the right to seek any remedy provided by the Maricopa County Procurement Code, any remedy in equity or in the law, or any remedy provided by this contract

SECTION XV—ANTI-DISCRIMINATION PROVISION

The Consultant agrees not to discriminate against any employee or applicant for employment because of race, religion, gender, age, disability, or national origin, and further agrees not to engage in any unlawful employment practices. The Consultant further agrees to insert the foregoing provisions in all subcontracts hereunder.

ARTICLE XVI – SMALL BUSINESS ENTERPRISE (SBE) PROGRAM

The Maricopa County Small Business Enterprise (SBE) Program is incorporated by reference. It is Maricopa County's policy to provide small businesses the opportunity to participate in the District's solicitation process and to be considered to fulfill the requirement for various commodities and services. No specific SBE participation percentage goal or dollar amount has been established for this contract.

SECTION XVII—INDEMNIFICATION

To the fullest extent permitted by law, the Consultant shall defend, indemnify, and hold harmless the Flood Control District of Maricopa County, Maricopa County, and their agents, representatives, officers, directors, officials, and employees from and against all claims, damages, losses, and expenses including, but not limited to, attorney fees, court costs, expert witness fees, and the cost of appellate proceedings, relating to, arising out of, or alleged to have resulted from the negligent acts, errors, omissions or mistakes relating to the performance of this Contract. The Consultant's duty to defend, indemnify, and hold harmless the Flood Control District of Maricopa County, Maricopa County, and their agents, representatives, officers, directors, officials, and employees shall arise in connection with any claim, damage, loss or expense that is attributable to bodily injury, sickness, disease, death, or injury to, impairment, or destruction of property, including loss of use resulting there from, caused by any negligent acts, errors, omissions, or mistakes in the performance of this Contract including any person for whose negligent acts, errors, omissions, or mistakes the Consultant may be legally liable.

The amount and type of insurance coverage requirements set forth herein will in no way be construed as limiting the scope of the indemnity in this paragraph.

The scope of this indemnification does not extend to the sole negligence of the Flood Control District of Maricopa County.

SECTION XVIII—INSURANCE REQUIREMENTS

The Consultant, at the Consultant's own expense, shall purchase and maintain the herein stipulated minimum insurance from a company or companies duly licensed by the State of Arizona and possessing a current A.M. Best, Inc. rating of A7. In lieu of State of Arizona licensing, the stipulated insurance may be purchased from a company or companies, which are authorized to do business in the State of Arizona, provided that said insurance companies meet the approval of the Flood Control District of Maricopa County. The form of any insurance policies and forms must be acceptable to the Flood Control District of Maricopa County.

All insurance required herein shall be maintained in full force and effect until all work or service required to be performed under the terms of the Contract is satisfactorily completed and formally accepted. Failure to do so may, at the sole discretion of the Flood Control District of Maricopa County, constitute a material breach of this Contract.

The Consultant's insurance shall be primary insurance as respects the Flood Control District of Maricopa County and Maricopa County, and any insurance or self-insurance maintained by the Flood Control District of Maricopa County or Maricopa County shall not contribute to it.

Any failure to comply with the claim reporting provisions of the insurance policies or any breach of an insurance policy warranty shall not affect the Flood Control District of Maricopa County's right to coverage afforded under the insurance policies.

The insurance policies may provide coverage that contains deductibles or self-insured retentions. Such deductible and/or self-insured retentions shall not be applicable with respect to the coverage provided to the Flood Control District of Maricopa County under such policies. The Consultant shall be solely responsible for the deductible and/or self-insured retention and the Flood Control District of Maricopa County, at its option, may require the Consultant to secure payment of such deductibles or self-insured retentions by a surety bond or an irrevocable and unconditional letter of credit.

The Flood Control District of Maricopa County reserves the right to request and to receive, within ten (10) working days, certified copies of any or all of the herein required insurance policies and/or endorsements. The Flood Control District of Maricopa County shall not be obligated, however, to review such policies and/or endorsements or to advise the Consultant of any deficiencies in such policies and endorsements, and such receipt shall not relieve the Consultant from, or be deemed a waiver of the Flood Control District of Maricopa County's right to insist on strict fulfillment of the Consultant's obligations under this Contract.

The insurance policies required by this Contract, except Workers' Compensation and Errors and Omissions, shall name the Flood Control District of Maricopa County, Maricopa County, and their agents, representatives, officers, directors, officials, and employees as Additional Insureds.

The policies required hereunder, except Workers' Compensation and Errors and Omissions, shall contain a waiver of transfer of rights of recovery (subrogation) against the Flood Control District of Maricopa County, Maricopa County and their agents, representatives, officers, directors, officials, and employees for any claims arising out of the Consultant's work or service.

REQUIRED INSURANCE COVERAGES

Commercial General Liability
Commercial General Liability insurance and, when necessary, Commercial Umbrella insurance with a limit of not less than $2,000,000 for each occurrence, $2,000,000 Products/Completed Operations Aggregate, and $4,000,000 General Aggregate Limit. The policy shall include coverage for bodily injury, broad form property damage, personal injury, products, and completed operations and blanket contractual coverage, and shall not contain any provision that would serve to limit third party action over claims. There shall be no endorsement or modification of the CGL limiting the scope of coverage for liability arising from explosion, collapse, or underground property damage.

Automobile Liability
Commercial/Business Automobile Liability insurance and, if necessary, Commercial Umbrella insurance with a combined single limit for bodily injury and property damage of not less than $2,000,000 each occurrence with respect to any of the Consultant's owned, hired, and non-owned vehicles assigned to or used in performance of the Consultant's work or services under this Contract.

Workers' Compensation
Workers' Compensation insurance to cover obligations imposed by federal and state statutes having jurisdiction of the Consultant's employees engaged in the performance of the work or services under this Contract; and Employer's Liability insurance of not less than $1,000,000 for each accident, $1,000,000 disease for each employee, and $1,000,000 disease policy limit. The Consultant waives all rights against the Flood Control District of Maricopa County, Maricopa County, and their agents, officers, directors, and employees for recovery of damages to the extent these damages are covered by the Workers' Compensation and Employer's Liability or commercial umbrella liability insurance obtained by the Consultant pursuant to this contract.

Errors and Omissions Insurance
Errors and Omissions insurance and, when necessary, Commercial Umbrella insurance, which will insure and provide coverage for errors or omissions of the Consultant, with limits of no less than $1,000,000 for each claim.

Certificates of Insurance
Prior to commencing work or services under this Contract, the Consultant shall furnish the Flood Control District of Maricopa County with Certificates of Insurance in a form acceptable to the Flood Control District of Maricopa County, or formal endorsements as required by the Contract in the form provided by the Flood Control District of Maricopa County, issued by the Consultant's insurer(s), as evidence that policies providing the required coverage's, conditions, and limits required by this Contract are in full force and effect. **Such certificates shall identify this contract number and contract title.**

In the event any insurance policy(ies) required by this Contract is(are) written on a "claims made" basis, coverage shall extend for two (2) years past completion and acceptance of the Consultant's work or services and as evidenced by annual Certificates of Insurance.

If a policy does expire during the life of the Contract, a renewal certificate must be sent to the Flood Control District of Maricopa County fifteen (15) days prior to the expiration date.

Cancellation and Expiration Notice
Insurance required herein shall not expire, be canceled, or materially changed without thirty (30) days prior written notice to the Flood Control District of Maricopa County.

SIGNATURE PAGE

IN WITNESS WHEREOF, the parties herein have executed this contract.

WEST CONSULTANTS, INC.

Principal (Signature)

Jeffrey B. Bradley

Printed Name

President

Title

6/8/2012

Date

33-0303017

Federal Tax Identification Number

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

RECOMMENDED BY:

6/20/12

Timothy S. Phillips, P.E. Date
Chief Engineer and General Manager

ACCEPTED AND APPROVED:

AUG 0 6 2012

Chairman, Board of Directors Date

ATTEST:

AUG 0 6 2012

Clerk of the Board 07251 2 Date

LEGAL REVIEW

Approved as to form and within the powers and authority granted under the laws of the State of Arizona to the Flood Control District of Maricopa County.

6/18/12

Flood Control District General Counsel Date

CONTRACT FCD 2012C004

CENTENNIAL WASH FLOODPLAIN DELINEATION: GILA RIVER TO LA PAZ COUNTY

ATTACHMENTS

Certificate of Performance

Certificate of Insurance

Maricopa County Small Business Enterprise Program Participation Reporting Form

Attachment 1

Certificate of Performance and Payment of All Claims

CONSULTANT CONTRACT

_____ hereby certifies to the Flood Control District of Maricopa County
(Name of Signer)
(District) that all lawful claims for labor, rental of equipment, material used, and any other claims by **WEST Consultants, Inc.,** or subcontractors in connection with the Project described in District contract **FCD 2012C004** for **Centennial Wash Floodplain Delineation Study: Gila River to La Paz County** have been paid.

WEST Consultants, Inc., understands that with receipt of payment for previously invoiced amounts plus any retained monies, that this is a settlement of all claims of every nature and kind against the District arising out of the performance of the District's contract **FCD 2012C004**, relating to the material, equipment, and work covered in and required by the contract.

The undersigned hereby certifies that to his/her knowledge, no contractual disputes exist in regard to this contract and that he/she has no knowledge of any pending or potential claims in regard to this contract.

Upon submission of this document and a separate invoice for any retained funds to the District, invoice processing will be completed within forty-five (45) calendar days.

State of Arizona)
)§
County of Maricopa)

Signed this _____ day of _____, 201__.

_____
Signature

_____
Title

SUBSCRIBED AND SWORN TO before me this _____ day of _____, 201__.

_____
Notary Public

My Commission Expires:_____

Attachment 2

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CERTIFICATE OF INSURANCE

CONTRACT FCD 2012C004 PROJECT TITLE: Centennial Wash FDS: Gila River to La Paz County

NAME AND ADDRESS OF INSURANCE AGENCY:	*COMPANIES AFFORDING COVERAGES:		
	Company Letter	A	
	Company Letter	B	
	Company Letter	C	
NAME AND ADDRESS OF INSURED:	Company Letter	D	
	Company Letter	E	
	Company Letter	F	

This certificate of insurance certifies that policies of insurance listed below have been issued to the insured named above and are in full force at this time.

*CO. LTR.	TYPE OF INSURANCE	POLICY NUMBER	EFFECTIVE DATE (MM/DD/YY)	EXPIRATION DATE (MM/DD/YY)	LIMITS	
	GENERAL LIABILITY: ☒ COMMERCIAL GENERAL LIABILITY ☐: Claims Made ☐: Occur ☒: PREMISES OPERATIONS ☒: BLANKET CONTRACTURAL ☒: BROAD FORM PROPERTY DAMAGE ☒: PERSONAL INJURY ☒: PRODUCTS AND COMPLETED OPERATIONS HAZARD ☒: XCU Hazards ☒: INDEPENDENT CONTRACTORS				GENERAL AGGREGATE PRODUCTS/COMPLETED OPERATIONS AGGREGATE EACH OCCURRENCE	$4,000,000 $2,000,000 $2,000,000
	AUTOMOBILE LIABILITY: ☒: ANY AUTO ☒: ALL OWNED AND NON-OWNED AUTOS				Combined Single Limit Bodily Injury Property Damage Per person/Per accident	$2,000,000 $2,000,000 $2,000,000 $2,000,000
	☐: **EXCESS LIABILITY** ☐: Umbrella Form ☐: Other than Umbrella Form				Each occurrence Aggregate	$ $
	☒: **WORKERS' COMPENSATION AND EMPLOYERS' LIABILITY**				STATUTORY LIMITS AND EMPLOYER'S LIABILITY: EACH ACCIDENT DISEASE: EACH EMPLOYEE DISEASE: POLICY LIMIT	 $1,000,000 $1,000,000 $1,000,000
	☒: **PROFESSIONAL LIABILITY**				Each Claim Aggregate	$1,000.000 $1,000,000
	☒: **OTHER:**	Except for Workers' Compensation and Professional Liability Insurance, the Flood Control District of Maricopa County, Maricopa County, and their agents, representatives, officers, Directors, Officials, and employees are named as Additional Insured's.				

Except for Workers' Compensation and Professional Liability Insurance, the Flood Control District of Maricopa County (District), Maricopa County, and, their agents, representatives, officers, Directors, Officials, and employees are named as Additional Insured's on those types of policies described herein which are required to be furnished by this contract entered into between the insured and the District. To the extent provided in this Contract, insured shall hold harmless the District from liability arising out of any services provided or duty performed by insured as required by statute, law, purchase order or otherwise required, with the exception of liability for loss or damage resulting from the sole negligence of the District, its agents, employees, or indemnities. It is agreed that any insurance available to the named insured shall be primary of other sources that may be available. It is further agreed that no policy shall expire, be cancelled, or materially changed to affect the coverage available to the District without thirty (30) days written notice to the District. **THIS CERTIFICATE IS NOT VALID UNLESS COUNTERSIGNED BY AN AUTHORIZED REPRESENTATIVE OF THE INSURANCE COMPANY.**

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY 2801 WEST DURANGO STREET PHOENIX, ARIZONA 85009	DATE ISSUED: _____ _____ AUTHORIZED REPRESENTATIVE

Maricopa County Small Business Enterprise Program
Participation Reporting Form

This form is to be submitted with each pay application or invoice. Any pay application or invoice without this form attached is subject to rejection as not being a completed pay application or invoice pursuant to the terms of the contract.

Name of Prime Consultant/Contractor

Contract No.

Contact Person

Project No.

Street Address

$ Amount of this Pay Application/Invoice

City, State ZIP

Complete below with information on the SBE firms utilized as subconsultants/subcontractors for this pay application/invoice. If work was self-performed and your firm, as the prime, is an SBE firm pursuant to A.R.S. § 41-1001, et seq., then you may list your firm as the SBE firm.

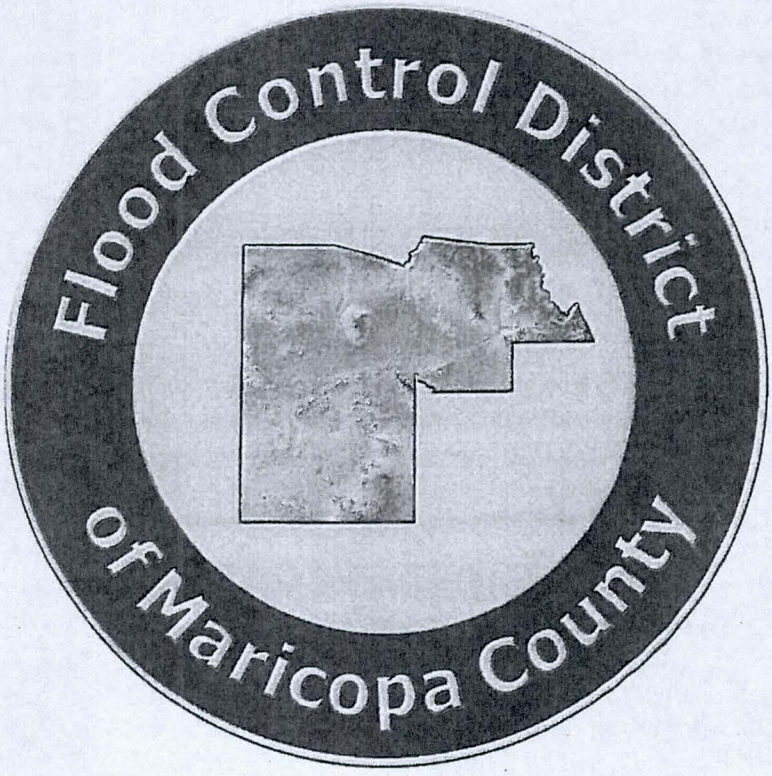
SBE Firm Name	SBE Firm Address	Type of Work Performed	$ Pd to SBE this App/Inv
			$
			$
			$
			$
			$
			$
			$
			$
			$
			$

☐ **A mark in this box certifies that no SBE firms were utilized as the prime, subconsultant or subcontractor with respect to this pay application/invoice.**

Date: _____

Signature

EXHIBIT A



SCOPE OF WORK

CONTRACT FCD 2012C004

Centennial Wash Floodplain Delineation Study:
Gila River to La Paz County

EXHIBIT A

SCOPE OF WORK

This is a re-study of the effective Special Flood Hazard Area, SFHA, for Centennial Wash in western Maricopa County from its confluence with the Gila River to the boundary between La Paz and Maricopa counties. The effective SFHA was delineated in 1989 by Cella Barr and Associates. They mapped the same reach of the wash with a 100-year peak discharge producing a Zone AE floodplain and floodway. The 100-year discharge was the only return interval calculated. This re-study is being performed because the hydrology has been updated due to the inclusion of 20 additional years of gage record. A private citizen submitted a CLOMR to FEMA with updated hydrology, case number 12-09-0043R.

The 1-percent-annual-chance flood will be re-delineated. This will include 40 linear miles of Centennial Wash and approximately 13 linear miles Centennial Wash Left Overbank. Since the 1-perecent-annual-chance flood discharge decreased, several tributaries may need to be extended to tie-in to the new floodplain.

The CONSULTANT will develop hydraulic models using the latest version of HEC-RAS with geo-referenced cross-sections. A two dimensional model may be used to analyze the area north of Centennial Road and west of Harquahala Valley Road and other locations in the system as deemed appropriate based on discussion between the CONSULTANT and the DISTRICT. The CONSULTANT must use sound engineering judgment in the development of the models. The CONSULTANT must analyze the results of the models carefully and make refinements to the input parameters in order to obtain the most realistic results.

All work must meet the requirements of the DISTRICT's Consultant Guidelines most current edition. All work must also meet the latest versions of the Arizona Department of Water Resources (ADWR) Standards and the Federal Emergency Management Agency (FEMA) Guidelines and Specifications for floodplain delineations. Prior to the finalization of this contract, FEMA and the DISTRICT must review and accept the results of this study, and all items called for in this Scope of Work must be delivered to the DISTRICT.

All work including optional tasks must be completed within seven hundred ninety (790) calendar days from the Notice to Proceed (NTP). The CONSULTANT shall have the final study results ready for submittal to FEMA within four hundred twenty-five (425) calendar days from the Notice to Proceed (NTP).

TASK 1 - COORDINATION

1.1 Within fourteen (14) days of the NTP the CONSULTANT will submit a project schedule to the DISTRICT's Project Manager showing coordination meetings and completion dates for each task identified in the Scope of Work (SOW). The CONSULTANT will update this project schedule when appropriate.

1.2 The CONSULTANT will submit an estimate of the monthly billing within fourteen (14) days of the NTP. Thereafter, this estimate will be updated and submitted to the DISTRICT's Project Manager as necessary.

1.3 The CONSULTANT will participate in regular coordination meetings (at least monthly) with the DISTRICT's Project Manager and in milestone coordination meetings in the development of the hydrologic and hydraulic analyses. The CONSULTANT is responsible for the minutes of any

meetings. Coordination and milestone meetings should be combined whenever possible. Draft meeting minutes must be prepared and delivered to the DISTRICT within 7 working days of all meetings.

1.4 The CONSULTANT will submit monthly progress reports with monthly invoices. The report shall be brief and should be no longer than two (2) typed pages. Earned Value reporting is recommended to track progress throughout the project. At a minimum, the monthly progress report shall contain the following:

1.4.1 A short description of the work accomplished by task during the reporting month.
1.4.2 Percent (%) completed for the month and percent (%) cumulative completed for each task.
1.4.3 A brief description of the work to be accomplished in the following month.
1.4.4 A description of any problems encountered.

1.5 Performance Evaluations will be performed by both the DISTRICT and the CONSULTANT at the completion of the project.

TASK 2 - PUBLIC INVOLVEMENT

2.1 The DISTRICT has prepared a set of guidelines for CONSULTANTS to follow when conducting public involvement and public information activities for the DISTRICT. A copy of these guidelines is available from the DISTRICT Public Information Office and shall be used by the CONSULTANT if or when preparing public information related materials.

2.2 The DISTRICT will be responsible for placing the legal advertising at the beginning of the study. The advertisement will be run in a widely circulated newspaper. A display advertisement will also be published twice in a local newspaper that serves the area being studied (if such newspaper exists), with approximately one (1) week between runs. The DISTRICT also will be responsible for placing any legal advertisements for public open house meetings.

2.3 The DISTRICT Public Information Officer will create a critical path calendar for planning one public open house meeting. A critical path calendar will be developed by the DISTRICT Public Information Officer for the second (OPTIONAL) public open house meeting if this meeting is deemed necessary by the DISTRICT and the CONSULTANT.

2.4 The DISTRICT will generate mailing lists of the residents and property owners located within the study area boundary and which have properties that will be affected by the study results once the results become available.

2.5 The CONSULTANT shall plan and conduct public involvement and prepare information as required in the following public involvement activities and in accordance with the DISTRICT Public Involvement and Information Guidelines.

2.5.1 The CONSULTANT shall provide the preliminary language for inclusion in the two mailings that will be developed by the DISTRICT. The first mailing will be a letter to notify property owners within the study area of the Intent of Study and will include text for the right-of-entry for survey notice. The second mailing will be a tri-fold brochure to notify affected property owners of the study results and provide an invitation to the open house meetings.

2.5.2 The DISTRICT will prepare (design) two mailings to include the text of the two mailings described in task 2.5.1. The Intent of Study letter will be mailed out after the Notice to

Proceed of the study has been sent to the CONSULTANT. The Notification of Study Results brochure will be mailed out after the DISTRICT has approved draft floodplains. The DISTRICT will be responsible for printing and mailing the letter and brochure.

2.5.3 The CONSULTANT shall also be responsible for providing images (PDF) of the study area for the DISTRICT to post to the Centennial Wash Floodplain Delineation Study project page within the Projects and Structures section of the DISTRICT Web site.

2.5.4 The CONSULTANT shall be responsible for producing approximately four (4) study area display images for the public open house meetings. The DISTRICT will use these images to design and print exhibits for display at the public open house meetings.

2.5.5 The CONSULTANT shall provide simple snack refreshments at the open house meetings.

2.6 The DISTRICT will develop PDFs of the Notification of Study Results brochure for placement on the DISTRICT website project page.

2.7 For the open house meetings, the DISTRICT will secure the public meeting venue and certificate(s) of insurance. Mostly likely, the open house will be held at the DISTRICT office or within the Phoenix Metro area based upon needs and available accommodations.

2.8 The DISTRICT will be responsible for designing, printing and mounting the open house meeting exhibit displays and providing sign-in sheets, comment sheets, name tags, and other supplies and any additional handouts regarding the study at the meetings.

2.9 The DISTRICT shall conduct one open house public meeting at a location, likely at the DISTRICT office or within the Phoenix Metro area based upon needs and available accommodations. The purpose of this meeting will be to inform the public about the study results. At least two (2) representatives from the CONSULTANT will attend the meeting. This meeting will occur prior to submitting the study results to FEMA.

2.10 **Second Public Meeting (OPTIONAL):** The DISTRICT may plan and conduct a second open house public meeting. At least two (2) representatives from the CONSULTANT will attend the meeting. This meeting will also occur prior to submitting the study results to FEMA. **This optional task is not authorized with the Notice to Proceed; it may be authorized in writing by the DISTRICT based upon specific need and amount as determined by the DISTRICT during the contract period.**

TASK 3 - DATA COLLECTION

3.1 The CONSULTANT will collect and review pertinent data from the DISTRICT and other outside sources. Data to be collected will include previous flood hazard reports for the study area, existing topographic mapping, historical flooding information, relevant roadway crossing infrastructure information, FEMA Flood Hazard Boundary Maps, FEMA Letters of Map Amendment/Revision, USGS quad maps, and other pertinent information. Prior to any public presentation or meeting to discuss preliminary study results, the CONSULTANT will obtain the most current aerial photography from the DISTRICT to use as background for the project study sheets.

3.2 The CONSULTANT will coordinate with officials from the DISTRICT to contact the Harquahala Valley Irrigation District, local cities, La Paz County, county and state transportation departments, CAP, APS, State Trust Land, the Union Pacific Railroad, El Paso Natural Gas Company, consulting firms, and FEMA in order to identify local flooding problems and obtain information

on current and planned public works projects, channel modifications, development, and corporate limits.

3.3 A data collection summary will be submitted to the DISTRICT for information purposes. A preliminary draft is due within sixty (60) days of the NTP. The final will be included in Appendix A of the Technical Data Notebook (TDN).

TASK 4 - TOPOGRAPHIC MAPPING

4.1 Topographic mapping, with 2-foot and 10-foot contour intervals, will be provided by the DISTRICT. This mapping is in the Arizona State Plane Coordinate System Central Zone, 1983 North American Datum (NAD) International Feet, horizontally; and the North American Vertical Datum 1988 (NAVD 88), vertically.

TASK 5 - FIELD SURVEY

5.1 DISTRICT Field Survey: The DISTRICT will survey the Union Pacific Railroad trestles. Individual culverts less than 30 inches in diameter may be disregarded unless they have been constructed in such a way as to significantly affect project hydrology and/or hydraulics. All collected survey information should be reduced and compiled into 11"x 17" (maximum size) sketches for inclusion in the TDN. The information presented in the sketches should be in a format appropriate for use in future HEC-RAS models. The DISTRICT will require structure sketches to better define survey points in both plan and profile. The survey should meet the DISTRICT's Chief Surveyor's criteria for accuracy. The basis of all survey work shall be the MCDOT'S GDACS network, unless otherwise approved by the DISTRICT.

5.2 **Additional Field Survey (OPTIONAL):** As needed, additional field surveys and measurements of bridges, culverts, and hydraulic structures are to be obtained by the CONSULTANT when as-built plans are not available. Field surveys may be needed for up to three drainage channels within the study area. GDACS control will be the basis of field survey, unless otherwise approved by the DISTRICT. This information should be reduced and compiled into an 11"x 17" (maximum size) sketch format approved by the DISTRICT, for inclusion in the TDN. The survey should meet the DISTRICT's Chief Surveyor's criteria for accuracy. The information presented in the sketch should be in a format appropriate for use in future HEC-RAS models. **This optional task is not authorized with the Notice to Proceed; it may be authorized in writing by the DISTRICT based upon specific need as determined by the DISTRICT during the contract period.**

5.3 Copies of the sealed survey field notes and office calculations must be included in the Technical Data Notebook.

TASK 6 - Hydrology

An efficient approach appropriate for the delineation of the Zone AE floodplains and floodways shall be used to develop the regulatory discharges for this study.

This study will use the approved CLOMR with case number 12-09-0043R as a basis for floodplain modeling. This CLOMR used gage data to calculate the 100-year regulatory discharge for Centennial Wash at the confluence with the Gila River. FEMA updated the Summary of Discharge Table all the way to Centennial Road/Courthouse Road (was Gin Road in 2005 FIS). FEMA's discharges will be used in this study.

TASK 7 - FLOODPLAIN/FLOODWAY DELINEATION

7.1 Floodplain/Floodway delineations will be conducted using methodology as outlined by FEMA. The CONSULTANT will prepare the study using the guidelines established in FEMA's most current Guidelines and Specifications for Flood Hazard Mapping Partners and Arizona Department of Water Resources Technical Data Notebook guidelines.

The CONSULTANT must obtain DISTRICT approval at each of the following steps:

7.1.1 Draft field reconnaissance section of the TDN and estimation of Manning's "n" values.
7.1.2 Proposed study reaches.
7.1.3 Methodology to be used for split-flow analyses.
7.1.4 Proposed location and alignment of the cross sections with draft floodplain delineations.
7.1.5 Floodplain and Draft Floodway delineations.
7.1.6 Final hydraulics section of the TDN.

7.2 The mapping scale shall be approved by the DISTRICT. The hydraulic modeling and delineation work maps shall be in the North American Vertical Datum of 1988 (NAVD 88). The delineations shall be based upon the final results of the hydraulic study as directed by the DISTRICT.

7.3 The CONSULTANT will delineate 49 linear miles of Detailed Zone AE floodplain and floodway boundaries based upon the final results of the hydraulic study. Before HEC-RAS model building may commence the CONSULTANT must receive written agreement from the DISTRICT regarding final study reach selection. At a minimum, an Existing Conditions Model will be developed.

7.4 Hydraulics Manning's "n" Field Reconnaissance

7.4.1 The CONSULTANT will conduct a field reconnaissance of the study area. This may include but is not limited to observation of channel and floodplain conditions for estimating Manning's "n" values; photographic documentation of floodplain characteristics; determination of channel bank characteristics; observation of possible overflow areas; observation of levees or other flood control structures; and measurement of bridge dimensions. The DISTRICT will be given notice and invited to this field trip.

7.4.2 Manning's "n" values are to be determined using the methodology in the USGS report, *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, 2006.* If approved by the DISTRICT, another report entitled *Estimated Manning's Roughness Coefficients for Stream Channels and Floodplains in Maricopa County, 1991*, may be substituted. Copies of these reports are available through the DISTRICT. Manning's Roughness Coefficients may be divided into typical coverage areas within the project area, rather than by watercourse cross section. It is anticipated that between 6 and 10 typical reach or area types will be identified during the field reconnaissance. Other Manning's roughness references are allowed upon approval by the DISTRICT.

7.4.3 The reconnaissance data will present the determination of channel and over bank "n" values using captioned color photographs or color photocopies for each identified reach or area type in the project area. The extents of the typical reach or area types shall be displayed on an aerial photo exhibit. The n-value section will also discuss floodplain conditions affecting the delineation, describe structures and obstructions, and provide color photos or photocopies of

major hydraulic structures. Photo locations for channels, structures, and "n" value determinations will be displayed on reduced scale mapping and included in the TDN.

7.5 The CONSULTANT will make several different HEC-RAS models. The first model (base model) will consist of the main 40 miles of the Centennial Wash channel without considering any flow splits or embankments. The second HEC-RAS model will include the flow split located near the upstream end of the study reach modeled. This model will include modeling the Left Overbank of Centennial Wash as well as the large drainage channel that runs north and south that conveys water from the Left Overbank of Centennial Wash back to the main Centennial Wash channel. The additional length for this second model is approximately 9 miles. A HEC-RAS model that includes the small embankment near the flow split will be developed. If the north-south drainage channel cannot convey all the flows adequately, additional modeling will be needed as described in Optional Task 7.13. There are many farmers' levees along Centennial Wash. Up to four of these embankments will be considered in the modeling efforts in addition to the one near the flow split.

7.6 All Zone A tributaries to Centennial Wash will be tied into the new Centennial Wash floodplain.

7.7 The CONSULTANT will analyze split flow locations using the lateral structure option in HEC-RAS. The CONSULTANT will select the proper alignment, elevation, and discharge coefficients to assign to the lateral structures to best represent the flow splits.

7.8 **Two Dimensional Analyses of Split Flow (OPTIONAL):** If it is determined that the lateral structure option will not properly describe the split flow conditions, the CONSULTANT shall model the area where Centennial Wash and Centennial Wash Left Overbank flood with a two-dimensional model to determine overland flow depths, discharges and extent of inundation for floodplain mapping purposes. There will be no hydrologic modeling involved. **This optional task is not authorized with the Notice to Proceed; it may be authorized in writing by the DISTRICT based upon specific need and amount as determined by the DISTRICT during the contract period.**

7.9 **Two Dimensional Analyses of the Centennial Wash/Gila River Confluence (OPTIONAL):** The CONSULTANT shall model the area of the confluence between Centennial Wash and the Gila River to with a two-dimensional model to determine flow paths, overland flow depths, discharges, and extent of inundation for floodplain mapping purposes. There will be no hydrologic modeling involved. **This optional task is not authorized with the Notice to Proceed; it may be authorized in writing by the DISTRICT based upon specific need and amount as determined by the DISTRICT during the contract period.**

7.10 Cross Sections

7.10.1 The location and alignment of cross sections and channel centerlines will be submitted for the DISTRICT's review and approval. An attempt will be made to duplicate as many cross sections from the effective FEMA model as is reasonably possible for hydraulic modeling. Cross section spacing will be no greater than approximately every five hundred (500) feet, unless geographic or structural constraints dictate otherwise, and will extend the full width of the area inundated by 100-year floodwaters. Cross section placement locations shall be selected with respect to existing structures such as roads, railways, drainage features and confluences. Cross section spacing should be done in such a way as to minimize computational head loss and where natural grade breaks occur as defined by hydraulic baseline profiles. Cross section stationing will be from left to right looking downstream with the hydraulic baseline at station 10,000. Identification of cross sections will be in river

miles, increasing upstream. The stationing will tie into the specified river mile of the effective FEMA study. The cross sections may need to be reoriented or altered after running the HEC-RAS model to ensure that they are perpendicular to flow per FEMA criteria. Cross sections developed by the HEC-RAS interpolation feature are not to be used. The CONSULTANT must coordinate the methodology for generating the cross section geometric data.

7.10.2 The HEC-RAS output for the TDN shall include fully labeled cross section plots with Flow Distribution locations set at a minimum of 2 for Left Overbank, Channel, and Right Overbank. Hard copies of the summary tables will be printed. The full output report and cross section plots can be provided in PDF format for the TDN.

7.11 Bridges and culverts must be modeled according to HEC-RAS modeling requirements for the selected routine. The hydraulic effects of bridges and culverts shall be incorporated into assessing the floodplain around such structures, especially in areas where ponding will occur. Minor conveyance structures such as small culverts (i.e., less than 30 inches in diameter), or, structures considered likely to become clogged during the 100-year peak discharge shall not be included in the hydraulic analyses.

7.12 For Floodway encroachment modeling, the CONSULTANT shall use either HEC-RAS Method 4 (equal conveyance) or Method 5 (water surface and energy) as appropriate, then incorporate modifications and refinements using HEC-RAS Method 1 (manual method). The final HEC-RAS files shall contain the Method 1 information, and shall not contain the Method 4 or Method 5 information.

7.13 The main project description box of the HEC-RAS models should include the following:

- Project Name and FCD Contract Number
- Consultant(s) Name, phone number, address, website address, and Job Number
- Study Purpose
- File Name and latest run date/final date if completed
- Vertical Datum of the model, base map date, and base map contractor information
- Any notable features that are considered unique or unusual to the hydraulic modeling
- HEC-RAS program version.
- Source of Hydrology
- Wash Names
- Subsequent update information, if any.

In addition, minor descriptions should be added to the model for hydraulic sections located above and below drainage structures, at highways and railway crossings, at canals, and at confluences. Model descriptions should be added at culverts and lateral structures, and at any other feature judged pertinent to the modeling or identification of location.

7.14 **Additional HEC-RAS Modeling (OPTIONAL):** Additional HEC-RAS modeling may need to be performed in order to delineate up to 15 miles of incidental floodplain/floodway boundaries. The TDN will include full documentation for revisions to the FIS, accordingly. **This optional task is not authorized with the Notice to Proceed; it may be authorized in writing by the DISTRICT based upon specific need as determined by the DISTRICT during the contract period.**

7.15 The CONSULTANT will provide work maps using the DISTRICT's most recent aerial (contour) mapping. Photographic background in lieu of contour mapping may be acceptable at the DISTRICT's discretion. The work map drawings will be 22" X 34" in size. The work map scale will be 1 inch = 400 feet. A cover sheet will be part of the work-study drawings and shall include the project title, contract number, source and date of topographic mapping, and a location map showing geographic range covered by each specific mapping sheet. Each drawing will include the watercourse names and existing floodplain boundaries, proposed floodplain and floodway boundaries, a north arrow, map scale, section lines and corners, current streets and highway names, subdivision boundary names, Horizontal and Vertical Datum references (State Plane Coordinate System, NAD 83, and NAVD 88), any of the MCDOT's GDAC's and any other monument control as directed by the DISTRICT monument labels located within individual sheet boundaries, major drainage features, corporate boundaries, hydraulic cross section lines, sheet index map, peak discharges, and relative Township and Range.

7.16 Flood Zones must be determined according to FEMA criteria and be clearly labeled on the final drawings.

7.17 The findings of the floodplain delineation study will be presented in Section 5 of the Technical Data Notebook and will be prepared in accordance with ADWR State Standards Attachment 1-97 (SSA 1-97) or newer.

7.18 The CONSULTANT shall prepare submittals for DISTRICT review and comment. The number of submittals and format shall be agreed upon by both parties during the development of the project schedule. These submittals shall include all the material and background information necessary for the DISTRICT to review the draft floodplains. Intermediate floodplains may be submitted to the DISTRICT using HEC-RASMapper. The pre-final submittal will be in the DISTRICT's HIS format. All draft floodplains and workmaps will be geo-rectified.

7.19 The CONSULTANT shall fill out all the forms required by FEMA for the submittal of a Floodplain Delineation Study.

TASK 8 - DIGITAL DATA

Digital data shall be delivered in accordance with the Data Delivery Modified Shape File Specifications Version 1.2. Preliminary floodplains must be delivered to the DISTRICT at the time the study TDN is mailed to FEMA for review. This preliminary data will be included on the pending floodplain layer in the DISTRICT's database. All of the final digital data will be delivered to the DISTRICT when the TDN has been accepted by FEMA or as directed by the District. The themes listed below could be developed by the CONSULTANT for a Floodplain Delineation Study. Only those themes for which there is new data need to be delivered to the DISTRICT. If the CONSULTANT has data that does not fit one of the themes listed, the DISTRICT's Project Manager shall be contacted to determine the appropriate theme for that data.

- NDXPRJ: Map Sheet Index
- PRJ: Project Boundary
- CARTO: (Cartographic Features) (separate submittals for Mapping and Flood Delineation)
- CORNERS: (if any)
- CTRL: (Miscellaneous Control Survey Points)
- LNDUSECUR and LNDUSEFUT: (Current and future Land Use, if not provided by the DISTRICT)
- STRCT: (Structure)
- DQ: Data Quality

- PRJDAT: Project Identification
- FPCTLFCD: (FCD Reference Marks)
- FPSRFFCD: Water Surface Elevation / Base Flood Elevation
- FPXFCD: Cross Sections
- FPZNFCD: Floodplain Zones
- FPBLN: Hydraulic Baseline / Thalweg
- CNL: (Canal System, if any)
- RR: (Railroad System, if any)
- STRTDTL: (Street Detail)
- ELV: (Elevation (Land))
- SOIL: (Soil Type Area, if not provided by FCD)
- DRNBSN: Drainage Basins (Watersheds)
- CULVERTS: (if any)
- DRNPTHLN: Drainage Flowpaths (Time-of-Concentration, Routing)
- LAKE: (if any)
- RIVER: (if any)

TASK 9 - DELIVERABLES

9.1 The CONSULTANT will review existing elevation certificates in context with the new hydraulic information obtained through Task 7 of this study, and provide an inventory of those parcels that are in the new floodway or floodplain and those which are not. The CONSULTANT will also inventory all insurable structures in the new floodway/floodplain and indicate if they are also in the effective floodway/floodplain. This data will be delivered in a point file format.

9.2 **FEMA Submittal:** The CONSULTANT will submit the following items to the DISTRICT for review by FEMA and any other appropriate governmental agency within four hundred twenty-five (425) calendar days from the Notice to Proceed (NTP).

All of the following products are considered deliverables for the FEMA submittal:

9.2.1 Two (2) complete sets of blackline paper topographic base maps with the floodplain delineations shown. All drawings will be signed and sealed by persons of appropriate professional registration(s). Each registrant will provide a specific statement as to what service they performed.

9.2.2 Two (2) complete copies of the Technical Data Notebook, including completed FEMA forms, and annotated Flood Insurance Rate Maps showing the proposed delineation. The following items shall be included on disk: HEC-RAS input/output files, a .PDF version of the entire TDN, .PDF's of the workmaps at 22" x 34", and geo-rectified workmaps with world files. GIS or CAD representations of floodplains, cross sections and base flood elevations should be included for FEMA's use.

9.2.3 One (1) separate data disk(s) containing all data relevant to this study.

9.3 **FEMA Submittal (Optional):** This task will consist of post-submittal responses to FEMA comments and providing Final Deliverable material to FEMA and the District. All activities during this task will occur after submittal of the study materials to FEMA. **This optional task is not authorized with the Notice to Proceed; it may be authorized in writing by the DISTRICT based upon specific need as determined by the DISTRICT during the contract period.**

Appendix B: General Documentation and Correspondence

B.3 Public Notification

Flood Control District
of Maricopa County

Board of Directors
Fulton Brock, District 1
Don Stapley, District 2
Andrew Kunasek, District 3
Max Wilson, District 4
Mary Rose Wilcox, District 5

www.fcd.maricopa.gov

2801 West Durango Street
Phoenix, Arizona 85009
Phone: 602-506-1501
Fax: 602-506-4601
TT: 602-505-5897

September 18, 2012

Re: APN: 50622073, Owner: ESPINOZA JORGE A REYES

Dear Property Owner:

For more than 50 years, the Flood Control District of Maricopa County (District) has provided regional flood control services to County residents to reduce their risks of injury, death, and property damage from flooding. In continuing that effort the District has contracted with WEST Consultants, Inc. to perform a detailed Zone AE floodplain delineation study of the Centennial Wash between the Gila River and the La Paz County boundary in western Maricopa County.

Based on County records, if you have received this mailer, your property is either located in or near the existing Centennial Wash floodplain.

This study will examine and evaluate the flood hazard areas along this section of Centennial Wash to revise the detailed floodplain limits. These limits will then be used by the Federal Emergency Management Agency (FEMA) to determine flood insurance rates.

This letter is intended to inform you of the start of this study. It may be necessary for a survey team to briefly enter or cross the land portion of your property to perform surveying and reconnaissance activities in support of the study. This activity should not result in any inconvenience to you and will not damage your property. If you have any objection to the entry onto your property, please notify Jeff Shelton at the contact information listed below. Otherwise, it will be assumed that you consent to the entry onto your property. This letter is also intended to give you an opportunity to participate in the study by informing the District of local flooding problems in the area.

If you wish to get floodplain information for your parcel(s), report flooding issues, or have any general questions regarding the study, please contact Jeff Shelton at the contact information below.

Jeff Shelton, P.E., Senior Civil Engineer
Flood Control District of Maricopa County
2801 W. Durango Street
Phoenix, Arizona 85009

Direct: (602) 506-4486
Main: (602) 506-1501
jefferyshelton@mail.maricopa.gov

APN	OwnerName	OwnerAddre	OwnerAdd_1	OwnerCity	OwnerState	OwnerZip	PropertyAd	PropertySu	PropertyCi	PropertyZi	TaxOwner	TaxAddress	TaxAddre_1	TaxAddre_2	TaxAddre_	TaxCity	TaxState	TaxZip
40153003	411TH & ELLIOT 320 AZ LLC	2657 WINDMILL PKWY STE 393		HENDERSON	NV	89074					411TH & ELLIOT 320 AZ LLC	2657 WINDMILL PKWY STE 393				HENDERSON	NV	89074-3384
50614022A	515TH 20 AC LLC	6241 E YUCCA ST		SCOTTSDALE	AZ	85254					515TH 20 AC LLC	6241 E YUCCA ST				SCOTTSDALE	AZ	85254
50622084B	55500 W EARLL LLC	4188 N 298TH LN		BUCKEYE	AZ	85396					55500 W EARLL LLC	4188 N 298TH LN				BUCKEYE	AZ	85396-3136
50630018B	ACCOMAZZO JACQUELYNN C TR	3825 S 99TH AVE		TOLLESON	AZ	85353	2530 N 491ST AVE			85354	ACCOMAZZO JACQUELYNN C TR	3825 S 99TH AVE				TOLLESON	AZ	85353-9382
50659001	ACOSTA JOSE A	51539 W VAN BUREN		TONAPAH	AZ	85354	51539 W VAN BUREN AVE			85354	ACOSTA JOSE A	51539 W VAN BUREN ST				TONOPAH	AZ	85354-7154
50614019D	ADAMCZYK ANDRZEJ/ANNA ENGELMAN	14847 W DESERT HILLS DR		SURPRISE	AZ	85379					ADAMCZYK ANDRZEJ/ANNA ENGELMAN	14847 W DESERT HILLS DR				SURPRISE	AZ	85379-5258
40159008X	AHNELL FAMILY 2012 TR/ESPINOZA MARTIN M ETAL	821 VIA ALEGRE		FALLBROOK	CA	92028					AHNELL KARL I/LINDA K/ESPINOZA MARTIN M	821 VIA ALEGRE				FALLBROOK	CA	92028-1746
50659007	AIRTH PROPERTIES LTD PARTNERSHIP	32132 VIA BUENA		SAN JUAN CAPISTRANO	CA	92675					AIRTH PROPERTIES LIMITED PARTNERSHIP	C/O S. JEAN AIRTH	32132 VIA BUENA			SAN JUAN CAPO	CA	92675-3825
50659006	AIRTH PROPERTIES LTD PARTNERSHIP	32132 VIA BUENA		SAN JUAN CAPISTRANO	CA	92675					AIRTH PROPERTIES LIMITED PARTNERSHIP	C/O S. JEAN AIRTH	32132 VIA BUENA			SAN JUAN CAPO	CA	92675-3825
40145006	AIRTH S JEAN TR	32132 VIA BUENA		SAN JUAN CAPISTRANO	CA	92675					AIRTH S JEAN TR	32132 VIA BUENA				SAN JUAN CAPO	CA	92675-3825
40152043	AKERS CAROL	184 NEWELL ST		WEST WARWICK	RI	02893					AKERS CAROL	184 NEWELL ST				WEST WARWICK	RI	02893-1847
50632005	AKKURT ALEXANDER	3126 N GRANITE REEF RD		SCOTTSDALE	AZ	85251					AKKURT ALEXANDER	3126 N GRANITE REEF RD				SCOTTSDALE	AZ	85251-7310
50632006	AKKURT ALEXANDER	3126 N GRANITE REEF RD		SCOTTSDALE	AZ	85251					ISKENDER ALEX	3126 N GRANITE REEF RD				SCOTTSDALE	AZ	85251-7310
50660014	AKKURT DAVID/GEORGE	3126 N GRANITE REEF RD		SCOTTSDALE	AZ	85251					AKKURT GEORGE/DAVID	3126 N GRANITE REEF RD				SCOTTSDALE	AZ	85251-7310
50660013	AKKURT DAVID/GEORGE	3126 N GRANITE REEF RD		SCOTTSDALE	AZ	85251					AKKURT GEORGE/DAVID	3126 N GRANITE REEF RD				SCOTTSDALE	AZ	85251-7310
50659017	AKKURT GEORGE/DAVID	3126 N GRANITE REEF RD		SCOTTSDALE	AZ	85251					AKKURT GEORGE/DAVID	3126 N GRANITE REEF RD				SCOTTSDALE	AZ	85251-7310
50614016K	ALCORTA GLADIS A/FORNES EDWARD	PO BOX 5456		PEORIA	AZ	85385					ALCORTA GLADIS A/FORNES EDWARD	PO BOX 5456				PEORIA	AZ	85385-5456
40146020B	ALKASS ASTER/SAMI	6350 N KILPATRICK AVE		CHICAGO	IL	60646					ALKASS ASTER/SAMI	6350 N KILPATRICK AVE				CHICAGO	IL	60646-4428
50659042	AMELI MANSOOR	PO BOX 12644		TEMPE	AZ	85284					AMELI MANSOOR	PO BOX 12644				TEMPE	AZ	85284-0045
50659043	AMELI MANSOOR	PO BOX 12644		TEMPE	AZ	85284					UNKNOWN	301 WEST JEFFERSON ST				PHOENIX	AZ	85003
50624006D	ANAND PRITI	2765 W DEL RIO PL		CHANDLER	AZ	85224					ANAND PRITI	2765 W DEL RIO PL				CHANDLER	AZ	85224-7328
50622156C	ANDERSON BRUCE	141 W MAIN		MISSOULA	MT	59802					ANDERSON BRUCE	141 W MAIN				MISSOULA	MT	59802-4311
50622156D	ANDERSON BRUCE	141 W MAIN		MISSOULA	MT	59802					ANDERSON BRUCE	141 W MAIN				MISSOULA	MT	59802-4311
50659045	ANITA KERMAN	333 E 79TH ST APT 12X		NEW YORK	NY	10021					ANITA KERMAN	42 GEDNEY PARK DR				WHITE PLAINS	NY	10605-3533
50632013	ARANKI TAREK/OLIVIA	6600 A WILLOW DR		TEMPE	AZ	85283					ARANKI TAREK/OLIVIA	6600 A WILLOW DR				TEMPE	AZ	85283
50632019	ARANKI TAREK/OLIVIA	6600 A WILLOW DR		TEMPE	AZ	85283					ARANKI TAREK/OLIVIA	6600 S WILLOW DR				TEMPE	AZ	85283-4169
50632017	ARANKI TAREK/OLIVIA	6600 A WILLOW DR		TEMPE	AZ	85283					ARANKI TAREK/OLIVIA	6600 S WILLOW DR				TEMPE	AZ	85283-4169
40158034	ARIZONA STATE LAND DEPT	3300 N CENTRAL AVE NO 1800		PHOENIX	AZ	85012					ARIZONA STATE LAND DEPT	1616 W ADAMS ST				PHOENIX	AZ	85007-2614
40158011	ARIZONA STOCK FARMS INC	37 W SIERRA VISTA DR		PHOENIX	AZ	85013					ARIZONA STOCK FARMS INC	QUICK GLENN E	37 W SIERRA VISTA DR			PHOENIX	AZ	85013-1200
40158020	ARIZONA STOCK FARMS INC	37 W SIERRA VISTA DR		PHOENIX	AZ	85013					ARIZONA STOCK FARMS INC	QUICK GLENN E	37 W SIERRA VISTA DR			PHOENIX	AZ	85013-1200
40158022B	ARIZONA STOCK FARMS INC	37 W SIERRA VISTA DR		PHOENIX	AZ	85013					ARIZONA STOCK FARMS INC	QUICK GLENN E	37 W SIERRA VISTA DR			PHOENIX	AZ	85013-1200
40158016	ARIZONA STOCK FARMS INC	37 W SIERRA VISTA DR		PHOENIX	AZ	85013					ARIZONA STOCK FARMS INC	QUICK GLENN E	37 W SIERRA VISTA DR			PHOENIX	AZ	85013-1200
50624930	ARIZONA TELEPHONE CO	525 JUNCTION RD		MADISON	WI	53717	51707 W WASHINGTON ST			85354	ARIZONA TELEPHONE COMPANY	ATTN: PROPERTY TAXES	525 JUNCTION RD			MADISON	WI	53717-2152
50624011Z	ARIZONA TELEPHONE COMPANY	PO BOX 32396		KNOXVILLE	TN	37930-2396					ARIZONA TELEPHONE COMPANY	525 JUNCTION RD				MADISON	WI	53717-2152
40158006B	ARLINGTON CANAL CO	PO BOX 488		BUCKEYE	AZ	85326					ARLINGTON CANAL CO	PO BOX 488				BUCKEYE	AZ	85326-0037
40158031D	ARLINGTON LAND LLC	25550 W HWY 85		BUCKEYE	AZ	85326	20505 S OLD HIGHWAY 80			85322	ARLINGTON LAND LLC	25550 W US HIGHWAY 85				BUCKEYE	AZ	85326-5216
40145007	ARLINGTON VALLEY SOLAR ENERGY II LLC	TWO TOWER CENTER 11TH FLR		EAST BRUNSWICK	NJ	08816					SCOTT HERBERT Z	2320 FRENCH ST				SANTA ANA	CA	92706-2038
40146009	ARLINGTON VALLEY SOLAR ENERGY LLC	TWO TOWER CENTER 11TH FLOOR		EAST BRUNSWICK	NJ	08816	13224 S 383RD AVE			85354	ARLINGTON VALLEY SOLAR HOLDINGS LLC	TWO TOWER CENTER 11TH FLOOR				EAST BRUNSWICK	NJ	8816
40146008	ARLINGTON VALLEY SOLAR ENERGY LLC	TWO TOWER CENTER 11TH FLOOR		EAST BRUNSWICK	NJ	08816					ARLINGTON VALLEY SOLAR HOLDINGS LLC	TWO TOWER CENTER 11TH FLOOR				EAST BRUNSWICK	NJ	8816
50622111	ARMBRUSTER MICHAEL L/CONNIE S	13727 W MONTEBELLO AVE		LITCHFIELD PARK	AZ	85340					ARMBRUSTER MICHAEL L/CONNIE S	3072 PIXLEY CIR NW				UNIONTOWN	OH	44685-6809
50659047	ASADOLLAHI HEDIEH NAJAFI	19744 E REINS RD		QUEEN CREEK	AZ	85142					DESERT JEWELL LLC	PO BOX 23881				TEMPE	AZ	85285-3881
50659044	ASADOLLAHI HEDIEH NAJAFI	19744 E REINS RD		QUEEN CREEK	AZ	85142					DESERT JEWELL LLC	PO BOX 23881				TEMPE	AZ	85285-3881
40149004D	AT & AL LLC	5278 W MURIEL DR		GLENDALE	AZ	85308					AT & AL LLC	5278 W MURIEL DR				GLENDALE	AZ	85308-5353
50620024B	AVERY MICHAEL W	1718 E CAMPBELL	, #38	PHOENIX	AZ	85016					AVERY MICHAEL W	PO BOX 16935				PHOENIX	AZ	85011-6935
40155012B	AZOO LLC	150-16 27TH AVE		FLUSHING	NY	11354					AZOO LLC	150-16 27TH AVE				FLUSHING	NY	11354-1541
50622041	AZOO LLC	150-16 27TH AVE		FLUSHING	NY	11354					AZOO LLC	150-16 27TH AVE				FLUSHING	NY	11354-1541
50659048	BAKKOM IRMA C	N703 MARINE DR		CEDAR GROVE	WI	53013					BAKKOM IRMA C	DAVID BAKKOM	N703 MARINE DR			CEDAR GROVE	WI	53013-1442
50659023	BAKKOM IRMA C	N703 MARINE DR		CEDAR GROVE	WI	53013					BAKKOM IRMA	C/O DAVID BAKKOM	N703 MARINE DR			CEDAR GROVE	WI	53013-1442
50659020	BAKKOM IRMA C	N703 MARINE DR		CEDAR GROVE	WI	53013					BAKKOM IRMA	C/O DAVID BAKKOM	N703 MARINE DR			CEDAR GROVE	WI	53013-1442
50659063	BAKKOM PLAZA PROPERTY HOLDINGS LLC	4449 N 59TH DR		PHOENIX	AZ	85033					BAKKOM PLAZA PROPERTY HOLDINGS LLC	6528 N 171ST LN				WADDELL	AZ	85355-9892
50623019C	BARNES EUELL L (CUSTODIAN)	PO BOX 489		QUEEN CREEK	AZ	85242					BARNES EUELL L (CUSTODIAN)	PO BOX 489				QUEEN CREEK	AZ	85242-1809
50623022	BARNES HARQUAHALA FARMS LLC	PO BOX 489		QUEEN CREEK	AZ	85142					BARNES HARQUAHALA FARMS LLC	PO BOX 489				QUEEN CREEK	AZ	85142-1809
50623019B	BARNES HARQUAHALA FARMS LLC	PO BOX 489		QUEEN CREEK	AZ	85142					BARNES HARQUAHALA FARMS LLC	PO BOX 489				QUEEN CREEK	AZ	85142-1809
40150005K	BARRICK PROPERTIES LC	4336 E BECK LN		PHOENIX	AZ	85032					BARRICK PROPERTIES LC	4336 E BECK LN				PHOENIX	AZ	85032-4129
40150004A	BARRICK PROPERTIES LC	4336 E BECK LN		PHOENIX	AZ	85032					BARRICK PROPERTIES LC	4336 E BECK LN				PHOENIX	AZ	85032-4129
50621008K	BARRON JAMES MELVIN	P O BOX 610		BUCKEYE	AZ	85326					BARRON JAMES MELVIN	PO BOX 610				BUCKEYE	AZ	85326-0045
50621008A	BARRON JOHN L/THOMAS L/MEL/CHUCK ETAL	PO BOX 428		ST DAVID	AZ	85630					BAKER LUCILLE BARRON	PO BOX 428				SAINT DAVID	AZ	85630-0428
40152025	BASS TODD A/LEAH J	2665 W MEADOWRIDGE DR		WEST JORDON	UT	84008					BASS TODD A/LEAH J	2665 W MEADOWRIDGE DR				WEST JORDON	UT	84008-8550
50632002	BAUTISTA ELIAS	STAR RT 1 BOX 435		BUCKEYE	AZ	85326					BAUTISTA ELIAS	3832 FOX SPARROW TR NW				ALBUQUERQUE	NM	87120-5004
50660011	BAUTISTA JOSE M & LUPE L	1000 18TH ST		PARKER	AZ	85344					BAUTISTA JOSE M & LUPE L	1000 18TH ST				PARKER	AZ	85344-6414
50632001	BAUTISTA SALVADOR	8130 W INDIAN SCHOOL		PHOENIX	AZ	85033					BAUTISTA VANESSA	3832 FOX SPARROW TR NW				ALBUQUERQUE	NM	87120-5004
50622086	BAYVIEW FINANCIAL PROPERTY TRUST	2665 S BAYSHORE DR 301		MIAMI	FL	33133					JOSEPH MARRONE	PO BOX 8427				TUCSON	AZ	85738-0427
40152013E	BC GALLOWAY HOLDINGS LLC	911 HILDEBRAND LN STE 203		BAINBRIDGE ISLAND	WA	98110					BC GALLOWAY HOLDING LLC	403 MADISON AVE NORTH STE 230				BAINBRIDGE ISLAND	WA	98110
50622021	BEASLEY RANDY/ALAN/ROBERT/RODRIGUEZ TAMMY	4593 N F ST		SAN BERNARDINO	CA	92407					BEASLEY RANDY/ALAN/ROBERT/RODRIGUEZ TAMM	4593 NF ST				SAN BERNARDINO	CA	92407
50660010	BEETER & ASSOCIATES LLC	PO BOX 1639		APACHE JUNCTION	AZ	85208					BEETER & ASSOCIATES LLC	PO BOX 697				TONOPAH	AZ	85354-0697
50660018	BEETER & ASSOCIATES LLC	PO BOX 1639		APACHE JUNCTION	AZ	85208					BEETER & ASSOCIATES LLC	PO BOX 697				TONOPAH	AZ	85354-0697
50660024	BEETER & ASSOCIATES LLC	PO BOX 1639		APACHE JUNCTION	AZ	85208					BEETER & ASSOCIATES LLC	PO BOX 697				TONOPAH	AZ	85354-0697
50660023	BEETER & ASSOCIATES LLC	PO BOX 1639		APACHE JUNCTION	AZ	85208					BEETER & ASSOCIATES LLC	PO BOX 697				TONOPAH	AZ	85354-0697
50622051G	BELLO MARTA I	4435 N 78TH ST APT 291A		SCOTTSDALE	AZ	85251					BELLO MARTA I	4435 N 78TH ST APT 291A				SCOTTSDALE	AZ	85251-2538
50622065A	BELTRAN LEONIDES	3301 N 64TH DR		PHOENIX	AZ	85033					BELTRAN LEONIDES	3301 N 64TH DR				PHOENIX	AZ	85033-5212
40152034	BEST CHOICE EQUESTRIAN ESTATES LLC	2487 S GILBERT RD	, STE 106 418	GILBERT	AZ	85296	46112 W CARVER RD			85354	BEST CHOICE EQUESTRIAN ESTATES LLC	2487 S GILBERT RD	STE 106 418			GILBERT	AZ	85296
40150014C	BEST CHOICE PROPERTIES-1120 ACRES LLC	2487 S GILBERT STE 106-418		GILBERT	AZ	85296					BEST CHOICE PROPERTIES-1120 ACRES L	2487 S GILBERT STE 106-418				GILBERT	AZ	85296-2824
50624005E	BGBBJB REVOCABLE TRUST	5421 W WILLOW AVE		GLENDALE	AZ	85304					BGBBJB REVOCABLE TRUST	5421 W WILLOW AVE				GLENDALE	AZ	85304-1370
50629047	BIG SKY LAND INVESTMENTS LLC	1920 E MARYLAND AVE NO 32		PHOENIX	AZ	85016					BIG SKY LAND INVESTMENTS LLC	1920 E MARYLAND AVE UNIT 32				PHOENIX	AZ	85016-1455
50629027D	BISON INVESTMENTS PROPERTIES I	10397 E WOOD DR		SCOTTSDALE	AZ	85260					BISON INVESTMENTS PROPERTIES I	10397 E WOOD DR				SCOTTSDALE	AZ	85260-7277
50629027G	BISON INVESTMENTS PROPERTIES LLC	10397 E WOOD DR		SCOTTSDALE	AZ	85260					BISON INVESTMENTS PROPERTIES LLC	10397 E WOOD DR				SCOTTSDALE	AZ	85260-7277
40149010	BLALOCK LEON F/JOAN	991 ELK VALLEY RD		CRESCENT CITY	CA	95531					BLALOCK LEON F/JOAN	991 ELK VALLEY RD				CRESCENT CITY	CA	95531-9343
40149011D	BLALOCK LEON F/JOAN	991 ELK VALLEY RD		CRESCENT CITY	CA	95531					BLALOCK LEON F/JOAN	991 ELK VALLEY RD				CRESCENT CITY	CA	95531-9343
50624945	BLANCHETTE CHARLES T TR/BLANCHETTE DENISE TR	2549 W ROSE LN # A214		PHOENIX	AZ	85017					BLANCHETTE CHARLES T TR/BLANCHETTE DENIS	2549 W ROSE LN # A214				PHOENIX	AZ	85017-2378
50624946	BLANCHETTE CHARLES T TR/BLANCHETTE DENISE TR	2549 W ROSE LN # A214		PHOENIX	AZ	85017					BLANCHETTE CHARLES T TR/BLANCHETTE DENIS	2549 W ROSE LN # A214				PHOENIX	AZ	85017-2378
50624947	BLANCHETTE CHARLES T TR/BLANCHETTE DENISE TR	2549 W ROSE LN # A214		PHOENIX	AZ	85017					BLANCHETTE CHARLES T TR/BLANCHETTE DENIS	2549 W ROSE LN # A214				PHOENIX	AZ	85017-2378
50624944	BLANCHETTE CHARLES T TR/BLANCHETTE DENISE TR	2549 W ROSE LN # A214		PHOENIX	AZ	85017					BLANCHETTE CHARLES T TR/BLANCHETTE DENIS	2549 W ROSE LN # A214				PHOENIX	AZ	85017-2378
50624943	BLANCHETTE CHARLES T TR/BLANCHETTE DENISE TR	2549 W ROSE LN # A214		PHOENIX	AZ	85017					BLANCHETTE CHARLES T TR/BLANCHETTE DENIS	2549 W ROSE LN # A214				PHOENIX	AZ	85017-2378
50622047E	BOLLE KLAUS	PO BOX 772		TONOPAH	AZ	85354					BOLLE KLAUS	PO BOX 772				TONOPAH	AZ	85354-0772
50659002	BONILLA MIGUEL A	STAR RT BOX 346A		BUCKEYE	AZ	85326					BONILLA MIGUEL A	305 W BRINKER DR				AVONDALE	AZ	85323-1866
50624008C	BORBON JIMMY FRANK	PO BOX 7515		SURPRISE	AZ	85374					BORBON JIMMY F	4650 E SANDRA TERR				PHOENIX	AZ	85032-3438
50622084F	BORSETH KELLY G/LINDA R	3399 E KIMBALL RD		GILBERT	AZ	85297					BORSETH KELLY G/LINDA R	3399 E KIMBALL RD				GILBERT	AZ	85297-3025
50614016N	BOYS SERRON L/LORETTA IC/CANDICE E	7341 S 253RD AVE		BUCKEYE	AZ	85326					BOYS SERREN L/ LORETTA IC/CANDICE E	11602 W TONTO ST				AVONDALE	AZ	85323-9133
40149021	BRADBURN GARY ALAN/RUSTER MICHAEL	1817 OAKLWAN DR		PRESCOTT	AZ	86305					RUSTER MICHAEL/BRADBURN GARY ALAN	1817 OAKLAWN DR				PRESCOTT	AZ	86305-1158
50622047D	BRANDT ARTHUR/JULIE/QUON DAVID/ANA	708 COLLIER DR		SAN LEANDRO	CA	94577					BRANDT ARTHUR/JULIE/QUON DAVID/ANA	708 COLLIER DR				SAN LEANDRO	CA	94577-3816
40150005G	BREZIN RONALD S/THERESE	252 WHISPERWOOD CT		SAYLORSBURG	PA	18353					BREZIN RONALD S/THERESE	RR4 BOX 2902 WHISPERWOOD CT				SAYLORSBURG	PA	18353-9005
50628034A	BROKEN ARROW RANCH LLC	PO BOX 238		PORTALES	NM	88130					BROKEN ARROW RANCH LLC	PO BOX 238				PORTALES	NM	88130-0238
40158022A	BRONCO ENTERPRISES LTD	PO BOX 68		ARLINGTON	AZ	85322	18301 S OLD US HIGHWAY 80				STEWART GLEN/FAY	PO BOX 68				ARLINGTON	AZ	85322-0068
50624937	BROWN KATHY K TR	16805 S GREENFIELD RD		HIGLEY	AZ	85236					BROWN KATHY K TR	16805 S GREENFIELD RD				HIGLEY	AZ	85295-1914
50622019K	BUONINCONTRO DIANA	23937 N 73RD LN		PEORIA	AZ	85383					BUONINCONTRO DIANA	6526 WEST ORAIBI DR				GLEDALE	AZ	85308-7045

50622019F	BUONINCONTRO MARK T/PINCUS STEVE	6526 W ORAIBI DR		GLENDALE	AZ	85308				BUONINCONTRO MARK T/PINCUS STEVE	17505 N 79TH AVE STE 214			GLENDALE	AZ	85308-8728
50624009R	BURTON CHARLES A	22 N 226TH LN		BUCKEYE	AZ	85326				BURTON CHARLES A	22 N 226TH LN			BUCKEYE	AZ	85326-7863
50622051E	BYRNE ELIZABETH	6225 E MONTGOMERY RD		CAVE CREEK	AZ	85331				BYRNE ELIZABETH	6225 E MONTGOMERY RD			CAVE CREEK	AZ	85331-3079
50622060	BYUN CHONG D/PAIK YONG JUP	4013 CALLE SONORA DESTE NO 2C		LAGUNA WOODS	CA	92637				BYUN CHONG D/PAIK YONG JUP	4013 CALLE SONORA DESTE NO 2C			LAGUNA WOODS	CA	92637-3232
50659057	CALLAHAN ANNA J & KATHRYN C CALLAGHAN	4605 W 99TH ST		OAK LAWN	IL	60453				CALLAHAN ANNA J/KATHRYN C CALLAGHAN	C/O PAUL SULLIVAN	12354 GLENCOE ST		THORNTON	CO	80241-3200
50659050	CALLAHAN ANNA J & KATHRYN C CALLAGHAN	4605 W 99TH ST		OAK LAWN	IL	60453				CALLAHAN ANNA J/KATHRYN C CALLAGHAN	C/O PAUL SULLIVAN	12354 GLENCOE ST		THORNTON	CO	80241-3200
50622093A	CANYON STATE HOLDINGS LLC	8912 E PINNACLE PEAK STE 440		SCOTTSDALE	AZ	85255				CANYON STATE HOLDINGS LLC	8912 E PINNACLE PEAK STE 440			SCOTTSDALE	AZ	85255-3659
50622044A	CAPRITTA DALE A	13052 N 55TH AVE		GLENDALE	AZ	85304	2259 N 517TH AVE	TONOPAH	85354	CAPRITTA DALE A	13052 N 55TH AVE			GLENDALE	AZ	85304-1351
50629042	CARRANZA YOLANDA H	15633 FACTORY ST		SURPRISE	AZ	85374				CARRANZA YOLANDA H	15633 N FACTORY ST			SURPRISE	AZ	85374-4116
40153007B	CENTENNIAL 36 LLC	7836 W CARIBBEAN LN		PEORIA	AZ	85381				CENTENNIAL 36 LLC	7836 W CARIBBEAN LN			PEORIA	AZ	85381-3441
50660001	CERDA JOSE L	1600 PALM AVE 98		SAN DIEGO	CA	92154				CERDA JOSE M	1600 PALM AVENUE SPACE 98			SAN DIEGO	CA	92154-1025
50629057	CERDA JOSE LUIS	17447 N AVE OF THE ARTS NO 2004		SURPRISE	AZ	85374				CERDA JOSE LUIS	15281 W TASHA DR			SURPRISE	AZ	85374-1449
50660002	CERDA JOSE LUIS/SOCORRO	15281 W TASHA DR		SURPRISE	AZ	85374				CERDA JOSE LUIS/SOCORRO	15281 W TASHA DR			SURPRISE	AZ	85374-1449
50629062	CERMAK STEVEN A/CAROL S	2258 W 105TH ST		BLOOMINGTON	MN	55431				CERMAK STEVEN A/CAROL S	2258 W 105TH ST			BLOOMINGTON	MN	55431-3409
50629061	CERMAK STEVEN A/CAROL S	2258 W 10TH ST		BLOOMINGTON	MN	55431				CERMAK STEVEN A/CAROL S	2258 W 10STH ST			BLOOMINGTON	MN	55431-3409
50660009D	CHAN CHIN HSIU	3510 E HAMPTON AVE NO 31		MESA	AZ	85204				CHAN CHIN HSIU	3510 E HAMPTON AVE NO 31			MESA	AZ	85204-6433
50660009C	CHAN PATTY	3510 E HAMPTON NO 31		MESA	AZ	85204				CHAN PATTY	3510 E HAMPTON NO 31			MESA	AZ	85204
40149007B	CHARRON RICHARD E TR	9447 W MCRAE WY		PEORIA	AZ	85382				CHARRON RICHARD E TR	9447 W MCRAE WAY			PEORIA	AZ	85382-3625
50660025	CHAVEZ MICHELE N	33450 N SYMER DR		CAVE CREEK	AZ	85331				CHAVEZ MICHELE N	33450 N SYMER DR			CAVE CREEK	AZ	85331-5042
50623033M	CHIANG HSUEH HO/MYONG SOOK	1936 E TONTO DR		CHANDLER	AZ	85249				CHIANG HSUEH HO/MYONG SOOK	1936 E TONTO DR			CHANDLER	AZ	85249-3376
50624004	CHIARAMONTE JOSEPH/TERESA MARIA TR	7032 E PRESIDO RD		SCOTTSDALE	AZ	85254				CHIARAMONTE JOSEPH/TERESA MARIA TR	CHIARAMONTE FAMILY LIVING TRUST	7032 E PRESIDO RD		SCOTTSDALE	AZ	85254-4030
50624003A	CHIARAMONTE JOSEPH/TERESA MARIA TR	7032 E PRESIDO RD		SCOTTSDALE	AZ	85254				CHIARAMONTE JOSEPH/TERESA MARIA TR	CHIARAMONTE FAMILY LIVING TRUST	7032 E PRESIDO RD		SCOTTSDALE	AZ	85254-4030
50622084D	CHIN HOWARD	13717 BANNON DR		CERRITOS	CA	90703				CHIN HOWARD	13717 BANNON DR			CERRITOS	CA	90703-2336
50623033N	CK DEVELOPMENT INC	2052 E SANOQUE BLVD		GILBERT	AZ	85298				CK DEVELOPMENT INC	2052 E SANOQUE BLVD			GILBERT	AZ	85298-6106
50628044	CLARK BROS INC LEASE # 01-2325	3480 G S RICHARD BLD #101		CARSON CITY	AZ	85012				SOUTHWESTERN AGRICULTURAL SERVICES INC	3480 G S RICHARD BLD #101			CARSON CITY	NV	89703-8442
50659049	CLASSI PHILIP/DIANE	3115 BELTAGH AVE		WANTAGH	NY	11793				CLASSI PHILIP/DIANE	3115 BELTAGH AVE			WANTAGH	NY	11793-2560
40150005H	CLIFFORD SEAN MICHAEL/THERESA ANN	2447 S AVOCA CR		MESA	AZ	85208				CLIFFORD SEAN MICHAEL/THERESA ANN	2447 S AVOCA CIR			MESA	AZ	85209-4984
50622134	COHENZADEH DAVOOD/SIMA L	1507 BERKELY ST NO 4		SANTA MONICA	CA	90404				COHENZADEH DAVOOD/SIMA L	1507 BERKELEY ST APT 4			SANTA MONICA	CA	90404-3228
40152013H	COLLEY MARILYN D	6240 S 17TH ST		PHOENIX	AZ	85042				COLLEY MARILYN D	6240 S 17TH ST			PHOENIX	AZ	85042-4509
50622106	CONTRERAS RALPH	6442 IRA AVE		BELL GARDENS	CA	90201				CONTRERAS RALPH	6442 IRA AVE			BELL GARDENS	CA	90201-1727
50622105	CONTRERAS RALPH	6442 IRA AVE		BELL GARDENS	CA	90201-1727				CONTRERAS RALPH	6442 IRA AVE			BELL GARDENS	CA	90201-1727
50630014	COURTHOUSE AG HOLDINGS LLC	7332 E BUTHERUS DR		SCOTTSDALE	AZ	85260				COURTHOUSE AG HOLDINGS LLC	7332 E BUTHERUS DR			SCOTTSDALE	AZ	85260-2426
40149011E	COWLEY FAMILY FOUNDATION	1242 E JACKSON ST		PHOENIX	AZ	85034				COWLEY FAMILY FOUNDATION	1242 E JACKSON ST			PHOENIX	AZ	85034-2342
40149007A	COWLEY FAMILY FOUNDATION	1242 E JACKSON ST		PHOENIX	AZ	85034				COWLEY FAMILY FOUNDATION	1242 E JACKSON ST			PHOENIX	AZ	85034-2342
40149011F	COWLEY FAMILY FOUNDATION	1242 E JACKSON ST		PHOENIX	AZ	85034				COWLEY FAMILY FOUNDATION	1242 E JACKSON ST			PHOENIX	AZ	85034-2342
506220358	CP CP LLC	1028 E FREMONT ST		LAS VEGAS	NV	89101				CP CP LLC	1028 E FREMONT ST			LAS VEGAS	NV	89101-5404
50629034	CROSBY WILLIE JR/WILLIAMS LOGAN F	2280 E VALLEY PKWY NO 13		ESCONDIDO	CA	92027	51427 W TONTO ST			CROSBY WILLIAM	51427 W TONTO			TONOPAH	AZ	85354-7243
506140178	CUCCIARDO ROBERT M	905 MISTY L N		SPRING BRANCH	TX	78070				CUCCIARDO ROBERT M	905 MISTY LN			SPRING BRANCH	TX	78070-5779
50624009U	CURRIE RITA L TRUST	13283 N 153RD LN		SURPRISE	AZ	85379				CURRIE RITA L TRUST	13283 N 153RD LN			SURPRISE	AZ	85379-9148
50624009V	CURRIE RITA L TRUST	13283 N 153RD LN		SURPRISE	AZ	85379				RITA L CURRIE TRUST	CURRIE RITA L TR	13283 N 153RD LN		SURPRISE	AZ	85374-9148
50624009W	CURRIE RITA L TRUST	13283 N 153RD LN		SURPRISE	AZ	85379				RITA L CURRIE TRUST	CURRIE RITA L TR	13283 N 153RD LN		SURPRISE	AZ	85374-9148
40150004E	DAFFERN WILLIAM CHESTER/JUANITA ROIENE	PO BOX 282		ARLINGTON	AZ	85322				DAFFERN WILLIAM CHESTER/JUANITA ROIENE	PO BOX 946			SUNRAY	TX	79086-0946
40149038	DALIN ENTERPRISES INC	25614 N DANNY LN		RIO VERDE	AZ	85263				DALIN ENTERPRISES INC	25614 N DANNY LN			RIO VERDE	AZ	85263-7140
50629009B	DANGELO 237 LLC	6241 E YUCCA		SCOTTSDALE	AZ	85254				DANGELO 237 LLC	6241 E YUCCA			SCOTTSDALE	AZ	85254-5448
50629009A	DANGELO 237 LLC	6241 E YUCCA		SCOTTSDALE	AZ	85254				DANGELO 237 LLC	6241 E YUCCA			SCOTTSDALE	AZ	85254-5448
50624009T	DARLAND JACQUELINE M	4044 W GLENN DR		PHOENIX	AZ	85051				DARLAND JACQUELINE M	4044 W GLENN DR			PHOENIX	AZ	85051-8111
50629027E	DAVIS DEVELOPMENT GROUP OF OHIO LLC	3466 MANCHESTER RD		AKRON	OH	44319				DAVIS DEVELOPMENT GROUP OF OHIO LLC	3466 MANCHESTER RD			AKRON	OH	44319-1436
50629027F	DAVIS DEVELOPMENT GROUP OF OHIO LLC	3466 MANCHESTER RD		AKRON	OH	44319				DAVIS DEVELOPMENT GROUP OF OHIO LLC	3466 MANCHESTER RD			AKRON	OH	44319-1436
40144026	DB FARMS LE # 23-113755-01	65 N POTTEBAUM		CASA GRANDE	AZ	85222				ARIZONA STATE LAND DEPARTMENT CONTO	65 N POTTEBAUM			CASA GRANDE	AZ	85222-5326
50622070	DE LA VARA DANIEL ALEJANDRO	7213 S 39TH DR		PHOENIX	AZ	85041				FIRST AMERICAN TITLE INS CO TR 8504	16212 S AVENUE A1/2			SOMERTON	AZ	85350-7614
50629016A	DE YOUNG HARQUAHALA LLC	37 SANDPIPER STRAND		CORONADO	CA	92118				DE YOUNG HARQUAHALA LLC	37 SANDPIPER STRAND			CORONADO	CA	92118-3211
50624001	DECENDENTS TRUST OF THE ENG FAMILY TRUST/ETAL	P O BOX 298		BUCKEYE	AZ	85326				DECENDENTS TRUST OF THE ENG FAMILY TRUST	P O BOX 298			BUCKEYE	AZ	85326-0024
50629050	DEGIORGI BRUNO	9050 E MCDOWELL RD		MESA	AZ	85207				DEGIORGI BRUNO	9050 E MCDOWELL RD			MESA	AZ	85207-1514
50629054	DEGIORGI BRUNO R	9050 E MCDOWELL RD		MESA	AZ	85207				DEGIORGI BRUNO R	9050 E MCDOWELL RD			MESA	AZ	85207-1514
50623044D	DEL REAL TERESA/AGUILA JAVIER J	10720 W INDIAN SCHOOL RD STE 19	, PMB 128	PHOENIX	AZ	85037				DEL REAL TERESA/AGUILA JAVIER J	10720 W INDIAN SCHOOL RD STE 19	PMB 128		PHOENIX	AZ	85037
50623044F	DEL REAL TERESA/AGUILA JAVIER J	10720 W INDIAN SCHOOL RD STE 19	, PMB 128	PHOENIX	AZ	85037				DEL REAL TERESA/AGUILA JAVIER J	10720 W INDIAN SCHOOL RD STE 19	PMB 128		PHOENIX	AZ	85037
50632008	DELGADO JUAN/MARIA J	275 W EUCLID AVE		PHOENIX	AZ	85041				DELGADO JUAN/MARIA J	275 W EUCLID AVE			PHOENIX	AZ	85041-8434
40150007A	DENMAN MICHAEL KEVIN/MICHELL GLORIA	14566 W COLUMBUS AVE		GOODYEAR	AZ	85338				DENMAN MICHAEL KEVIN/MICHELL GLORIA	14566 W COLUMBUS AVE			GOODYEAR	AZ	85338-8235
40149032N	DEPAULIS RICHARD F	6804 E 2ND ST UNIT 15		SCOTTSDALE	AZ	85251				DEPAULIS RICHARD F	4942 E EVANS DR			SCOTTSDALE	AZ	85254
50623024	DESERT BLOOM PROPERTIES LLC	PO BOX 5159		REXBURG	ID	83440				DESERT BLOOM PROPERTIES LLC	PO BOX 5159			REXBURG	ID	83440
50623025	DESERT BLOOM PROPERTIES LLC	PO BOX 5159		REXBURG	ID	83440				DESERT BLOOM PROPERTIES LLC	PO BOX 5159			REXBURG	ID	83440
40150011	DIAZ MARIA ELENA	21018 W NARRAMORE		BUCKEYE	AZ	85236				DIAZ MARIA ELENA	21018 W NARRAMORE			BUCKEYE	AZ	85236-4582
40149018D	DILLWORTH RICHARD S	71 E BEDELL ST		FREEPORT	NY	11520				DILLWORTH RICHARD S	71 E BEDELL ST			FREEPORT	NY	11520-5722
50660003	DINIUS BARBARA	PO BOX 1572		SNOWFLAKE	AZ	85937				JANDA LAND HOLDINGS LLC	PO BOX 9794			PHOENIX	AZ	85068-9794
50629039	DOBKIENICZ JERZY/LUCYNA	1 PINE HILL CT		DAYTON	NJ	08810				DOBKIENICZ JERZY/LUCYNA	1 PINE HILL CT			DAYTON	NJ	08810-1631
50629040	DOBKIENICZ JERZY/LUCYNA	1 PINE HILL CT		DAYTON	NJ	08810				DOBKIENICZ JERZY/LUCYNA	1 PINE HILL CT			DAYTON	NJ	08810-1631
50629041	DOBKIEWICZ JERZY/LUCYNA	1 PINE HILL CT		DAYTON	NJ	08810				DOBKIEWICZ JERZY/LUCYNA	1 PINE HILL CT			DAYTON	NJ	08810-1631
40150004D	DOOEN SEAN MICHAEL	PO BOX 12036		FLAGSTAFF	AZ	86011				C/O SEAN MICHAEL DOOEN	7030 N 15TH ST			PHOENIX	AZ	85020-5414
50622078E	DOOLEY ALAN SR/TRACY TR	3870 W DUBLIN		CHANDLER	AZ	85226				DOOLEY ALAN SR/TRACY TR	3870 W DUBLIN			CHANDLER	AZ	85226-2282
40152026	DRY FLY GIANTS LLC	20101 E SILVER CREEK LN		QUEEN CREEK	AZ	85142				DRY FLY GIANTS LLC	20101 E SILVER CREEK LN			QUEEN CREEK	AZ	85142-6285
50622040	DUONG HUE T TR/DUONG LINDA GIAU TR/MONICA N	22447 S 197TH CIR		QUEEN CREEK	AZ	85242				DUONG HUE T TR/DUONG LINDA GIAU TR/MONIC	22447 S 197TH CIR			QUEEN CREEK	AZ	85242-7598
50622047A	DURAN FRANK M/SHIRLEY A	13616 W LAREATA AVE		GOODYEAR	AZ	85338				DURAN FRANK M/SHIRLEY A	13616 W LAREATA AVE			GOODYEAR	AZ	85338-2247
50629038	DURLEJ CATHY	7234 CESTRUM RD		LAS VEGAS	NV	89113				BUTLER KENNETH W	7234 CESTRUM RD			LAS VEGAS	NV	89113-3218
50623045	EAGLE BUTTE LLC (LEASE # 01-1739)	3825 S 99TH AVE		TOLLESON	AZ	85353-9382				EAGLE BUTTE LLC (LEASE # 01-1739)	3825 S 99TH AVE			TOLLESON	AZ	85353-9382
50622056	EAGLE RANCH HOLDINGS LLC	3454 E FRUITVALE AVE		GILBERT	AZ	85297				EAGLE RANCH HOLDINGS LLC	3454 E FRUITVALE AVE			GILBERT	AZ	85297-3006
40152038	EARL PATRICIA L	2900 THOMAS AVE S #2304		MINNEAPOLIS	MN	55416				KIELEY PATRICIA L	19103 E POCO RIO DR			RIO VERDE	AZ	85263-7274
40150026	EARL PATRICIA L ETAL	19103 E POCO RIO DR		RIO VERDE	AZ	85263				KIELEY PATRICIA L	19103 E POCO RIO DR			RIO VERDE	AZ	85263-7274
50623023H	EHRFURTH TRUST/NOWAK RUSSELL J	20419 W MONARCH CT		BUCKEYE	AZ	85396				EHRFURTH TRUST/NOWAK RUSSELL J	EHRFURTH LEONARD A/DEBORAH V TR	20419 W MONARCH CT		BUCKEYE	AZ	85396-7652
506200198	EICH DENNIS & EICH GENE	181 RED TOP DR		LIBERTYVILLE	IL	60048				EICH DENNIS & EICH GENE	181 RED TOP DR			LIBERTYVILLE	IL	60048-5267
40149032J	EKPO HELEN/ANIEKAN	7126 W CAMINO DE ORO		PEORIA	AZ	85212				EKPO HELEN/ANIEKAN	7126 W CAMINO DE ORO			PEORIA	AZ	85212-3264
40149032G	EKPOH UDOH/EMEM U	8951 W CHARLESTON AVE		PEORIA	AZ	85382				EKPOH UDOH/EMEM U	8951 W CHARLESTON AVE			PEORIA	AZ	85382-8105
50622047C	EKPOH UDOH/EMEM U	8951 W CHARLESTON AVE		PEORIA	AZ	85382				EKPOH UDOH/EMEM U	8951 W CHARLESTON AVE			PEORIA	AZ	85382-8105
50622043B	ELIZEE FRANCOISE/PATRICIA	1643 BRICKELL AVE NO 2201		MIAMI	FL	33129				ELIZEE FRANCOISE/PATRICIA	1643 BRICKELL AVE NO 2201			MIAMI	FL	33129-1258
40149004C	EMAD INVESTMENT LLC	5635 W ALAMEDA RD		GLENDALE	AZ	85310				EMAD INVESTMENT LLC	5635 W ALAMEDA RD			GLENDALE	AZ	85310-3612
50624002	ENG LARRY & JERFEE ANN ETAL	PO BOX 296		BUCKEYE	AZ	85326				ENG ENTERPRISES	PO BOX 298			BUCKEYE	AZ	85326-0024
50624934	ENGLUND FAMILY TRUST	PO BOX 250		CASHION	AZ	85329	51929 W VAN BUREN ST		85354	ENGLUND FAMILY TRUST	PO BOX 250			CASHION	AZ	85329-0250
50624931	ENGLUND FAMILY TRUST	PO BOX 250		CASHION	AZ	85329				ENGLUND FAMILY TRUST	PO BOX 250			CASHION	AZ	85329-0250
50624932	ENGLUND FAMILY TRUST	PO BOX 250		CASHION	AZ	85329				ENGLUND FAMILY TRUST	PO BOX 250			CASHION	AZ	85329-0250
50624933	ENGLUND FAMILY TRUST	PO BOX 250		CASHION	AZ	85329				ENGLUND FAMILY TRUST	PO BOX 250			CASHION	AZ	85329-0250
50629021C	ENRIQUEZ FRANCISCO/LAURA	315 S 515TH AVE		TONOPAH	AZ	85354	315 S 515TH AVE		85354	ENRIQUEZ FRANCISCO/LAURA	315 S 515TH AVE			TONOPAH	AZ	85354-7105
50622097	ENTRIALGO ESTHER	157 E COUNTY RD 430 S		FRANKFORT	IN	46041				ENTRIALGO ESTHER	157 E COUNTY RD 430 S			FRANKFORT	IN	46041-3370
50622024F	ERAZO EDWIN R/ELVA	6710 W ROMA AVE		PHOENIX	AZ	85033				ERAZO EDWIN R/ELVA	6710 W ROMA AVE			PHOENIX	AZ	85033-2622
50623005D	ERICKSON INVESTMENT LP	3616 E TREMAINE CT		GILBERT	AZ	85234				ERICKSON INVESTMENT LP	3616 E TREMAINE CT			GILBERT	AZ	85234-3104
50622059D	ERNEST MICHAEL A/ROSAMELIA	PO BOX 602		TONOPAH	AZ	85354-0602				ERNEST MICHAEL A/ROSAMELIA	PO BOX 602			TONOPAH	AZ	85354-0602
50622059E	ERNEST MICHAEL A/ROSAMELIA	PO BOX 602		TONOPAH	AZ	85354-0602				ERNEST MICHAEL A/ROSAMELIA	PO BOX 602			TONOPAH	AZ	85354-0602
50622073	ESPINOZA JORGE A REYES	111 N GILBERT RD NO 2053		MESA	AZ	85203				ESPINOZA JORGE A REYES	111 N GILBERT RD NO 2053			MESA	AZ	85203-0942

50614020B	FACKINER DENNIS J	23132 W YAVAPAI ST	BUCKEYE	AZ	85326	51008 W COURT HOUSE RD	TONOPAH	85354	FACKINER DENNIS J	23132 W YAVAPAI ST			BUCKEYE	AZ	85326
50614020E	FACKINER STACY L	PO BOX 51	TONOPAH	AZ	85354				FACKINER STACY L	PO BOX 51			TONOPAH	AZ	85354-0051
50614020C	FACKINER STACY L	PO BOX 51	TONOPAH	AZ	85354				FACKINER STACY L	PO BOX 51			TONOPAH	AZ	85354-0051
50614020D	FACKINER STACY L	PO BOX 51	TONOPAH	AZ	85354				FACKINER STACY L	PO BOX 51			TONOPAH	AZ	85354-0051
50629055	FEDIUK SBIGNIEW A/MARIA	3205 N MANSFIELD DR	LITCHFIELD PARK	AZ	85340				FEDIUK SBIGNIEW A/MARIA	3205 N MANSFIELD DR			LITCHFIELD PARK	AZ	85340
50623003	FERGUSON GRANDCHILDREN LLC	PO BOX 519	REXBURG	ID	83440				FERGUSON GRANDCHILDREN LLC	PO BOX 519			REXBURG	ID	83440-0519
50623002	FERGUSON GRANDCHILDREN LLC	PO BOX 519	REXBURG	ID	83440				FERGUSON GRANDCHILDREN LLC	PO BOX 519			REXBURG	ID	83440-0519
50622055M	FIL ALEXANDER Y/JENNIFER L TR	2432 W PEORIA AVE STE 1083	PHOENIX	AZ	85029				FIL ALEXANDER Y/JENNIFER L TR	2432 W PEORIA AVE STE 1083			PHOENIX	AZ	85029-4731
50622047G	FIL ALEXANDER Y/JENNIFER TR	2432 W PEORIA AVE STE 1083	PHOENIX	AZ	85029				FIL ALEXANDER Y/JENNIFER TR	908 W WALTAN LN			PHOENIX	AZ	85023-4463
40159008T	FINCHUM KEN III/MELANIE	16601 W OLD HWY 80	ARLINGTON	AZ	85322				FINCHUM KEN III/MELANIE	16601 W OLD HIGHWAY 80			ARLINGTON	AZ	85322
40159008N	FINCHUM KENNETH E III/MELANIE M	15905 S OLD US HWY 80	ARLINGTON	AZ	85322				FINCHUM KENNETH E III/MELANIE M	15905 S OLD US HIGHWAY 80			ARLINGTON	AZ	85322-8200
40159008L	FINCHUM MELANIE MAY/WORKMAN DIANNA LYNN	18601 S OLD US HWY 80	ARLINGTON	AZ	85322				FINCHUM MELANIE MAY/WORKMAN DIANNA LYNN	15905 S OLD US HIGHWAY 80			ARLINGTON	AZ	85322-8200
50614016Y	FINTO JOHN/MARY A	13267 W BOCA RATON RD	SURPRISE	AZ	85374				FINTO JOHN/MARY A	13267 W BOCA RATON RD			SURPRISE	AZ	85374-6434
50614016X	FINTO JOHN/MARY A	13267 W BOCA RATON RD	SURPRISE	AZ	85374				FINTO JOHN/MARY A	13267 W BOCA RATON RD			SURPRISE	AZ	85374-6434
50622046	FIRST AMERICAN TITLE INS CO TR 8504	7201 E CAMELBACK RD NO 305	SCOTTSDALE	AZ	85251				FIRST AMERICAN TITLE INS CO TR 8504	C/O NORANDA PROPERTIES INC	7201 E CAMELBACK RD #305		SCOTTSDALE	AZ	85251-3336
50622019J	FIRST ELECTRONICS INC	15403 E REDROCK DR	FOUNTAIN HILLS	AZ	85268				FIRST ELECTRONICS INC	15403 E REDROCK DR			FOUNTAIN HILLS	AZ	85268
50629035B	FISERV ISS AND CO FBO JOSEPH A DINUZZO JR IRA	7611 S ORANGE BLOSSOM TRL	ORLANDO	FL	32809				FISERV ISS AND CO	FBO JOSEPH A DINUZZO JR	3301 W FOLGERS RD		PHOENIX	AZ	85027-7009
50622019L	FONG KAREN	1161 HILLCREST BLVD	MILLBRAE	CA	94030				FONG KAREN	1161 HILLCREST BLVD			MILLBRAE	CA	94030-2234
40149032M	FORESIGHT PROPERTIES INC	6241 E YUCCA ST	SCOTTSDALE	AZ	85254				FORESIGHT PROPERTIES INC	6241 E YUCCA			SCOTTSDALE	AZ	85254-5448
50622064	FORSTER JOHN D/NANCY J	1221 N KENNETH PL	CHANDLER	AZ	85226				FORSTER JOHN D/NANCY J	33611 N 140TH PL			SCOTTSDALE	AZ	85262-5928
50614016W	FORTUNA FRANKLIN L/EDITHANN V	14730 W BLACK GOLD CT	SUN CITY WEST	AZ	85375				FORTUNA FRANKLIN L/EDITHANN V	14730 W BLACK GOLD CT			SUN CITY WEST	AZ	85375-2789
50614016U	FORTUNA FRANKLIN L/EDITHANN V	14730 W BLACK GOLD CT	SUN CITY WEST	AZ	85375				FORTUNA FRANKLIN L/EDITHANN V	14730 W BLACK GOLD CT			SUN CITY WEST	AZ	85375-2789
50614016V	FORTUNA FRANKLIN L/EDITHANN V	14730 W BLACK GOLD CT	SUN CITY WEST	AZ	85375				FORTUNA FRANKLIN L/EDITHANN V	14730 W BLACK GOLD CT			SUN CITY WEST	AZ	85375-2789
50629016H	FRANCIS BRYAN G	11627 E BELLFLOWER DR	CHANDLER	AZ	85249				FRANCIS BRYAN G	11627 E BELLFLOWER DR			CHANDLER	AZ	85249-4526
40150027	FRANCIS JOHN STEPHEN SCHUYLER/ETAL	5632 N 46TH DR	GLENDALE	AZ	85301				FRANCIS JOHN STEPHEN SCHUYLER/ETAL	5632 N 46TH DR			GLENDALE	AZ	85301-6216
50622015K	FRANKEL GREG L/DOUGLAS J	5331 E VALLEY VISTA RD	PHOENIX	AZ	85018				FRANKEL GREG L/DOUGLAS J	5331 E VALLE VISTA RD			PHOENIX	AZ	85018-1933
50622015J	FRANKEL GREG L/DOUGLAS J	5331 E VALLEY VISTA RD	PHOENIX	AZ	85018				FRANKEL GREG L/DOUGLAS J	5331 E VALLE VISTA RD			PHOENIX	AZ	85018-1933
40152013J	FREEMAN CAROLYN J	6240 S 17TH ST	PHOENIX	AZ	85042				FREEMAN CAROLYN J	6240 S 17TH ST			PHOENIX	AZ	85042-4509
40149036	FUENTES ALEXANDER JR/BESSIE J	PO BOX 867	TONOPAH	AZ	85354-0867				SECURITY TITLE AGENCY	TRUST DEPT	3636 N CENTRAL AVE 3RD FL		PHOENIX	AZ	85012-1930
40159005	GABLE GARY P/WARREN T/KREAGER CRAIG	PO BOX 10 15005 S OLD US 80	ARLINGTON	AZ	85322	20847 S 100TH DR		85322	GABLE GARY P/WARREN T/KREAGER CRAIG	PO BOX 10 15005 S OLD US 80			ARLINGTON	AZ	85322-0010
50629016G	GAFFNEY TIMOTHY J	16107 E EMERALD DR UNIT 112	FOUNTAIN HILLS	AZ	85268				GAFFNEY TIMOTHY J/RAFAELA		16107 E EMERALD DR APT 112		FOUNTAIN HILLS	AZ	85268
50622045	GALINDO ADALBERTO M/ANDREA	3608 W MARYLAND AVE	PHOENIX	AZ	85019				GALINDO ADALBERT M/ANDREA	3608 W MARYLAND AVE			PHOENIX	AZ	85019-1537
50622082	GALINDO ANDRES R/LOPEZ MARIA T	7207 S 3RD AVE	PHOENIX	AZ	85041				GALINDO ANDRES R/LOPEZ MARIA T	7207 S 3RD AVE			PHOENIX	AZ	85041-7137
50622059C	GALINDO VANESSA MARIE	5405 AHSBOURNE LN	INDIANAPOLIS	IN	46226				GALINDO VANESSA MARIE	5405 AHSBOURNE LN			INDIANAPOLIS	IN	46226-3232
50632014	GALLEGOS GILBERT & FRANCES	867 NAVAJO BLVD	HOLBROOK	AZ	86025				GALLEGOS GILBERT & FRANCES	867 NAVAJO BLVD			HOLBROOK	AZ	86025-2646
40149039	GANDARA JUAN J/IMELDA/SEFERINO	2027 N 48TH LN	PHOENIX	AZ	85035				GANDARA JUAN J/IMELDA/SEFERINO	2027 N 48TH LN			PHOENIX	AZ	85035-4021
50622044C	GARCIA KENDALL BIANCA	16801 N 94TH ST 1042	SCOTTSDALE	AZ	85260				GARCIA KENDALL BIANCA	16801 N 94TH ST 1042			SCOTTSDALE	AZ	85260-1511
50624005D	GARCIA LUIS/OLIVAS MANUEL/ERNESTINA	7151 W INDIAN SCHOOL NO 2019	PHOENIX	AZ	85033				LARSEN ELAINE	CONTO	P O BOX 5607		MOHAVE VALLEY	AZ	86446-5607
50622053B	GARCIA MANUEL	2523 S 7TH AVE	PHOENIX	AZ	85007				GARCIA MANUEL		2523 S 7TH AVE		PHOENIX	AZ	85007-4501
50629015B	GARFINKLE FAMILY TRUST	1205 VIA GABARDA	LAFAYETTE	CA	94549	51401 W VAN BUREN ST			GARFINKLE FAMILY TRUST		1205 VIA GABARDA		LAFAYETTE	CA	94549-6250
50629015A	GARFINKLE GARY S/MARIA J TR	1205 VIA GABARDA	LAFAYETTE	CA	94549				GARFINKLE GARY S/MARIA J TR		1205 VIA GABARDA		LAFAYETTE	CA	94549-6250
50629015C	GARFINKLE GARY S/MARIA J TR	1205 VIA GABARDA	LAFAYETTE	CA	94549				GARFINKLE GARY S/MARIA J TR		1205 VIA GABARDA		LAFAYETTE	CA	94549-6250
50622051H	GARGANO MARIAN	34068 N 60TH PL	SCOTTSDALE	AZ	85262				GARGANO MARIAN		34068 N 60TH PL		SCOTTSDALE	AZ	85262-6302
50621010C	GARMO FAMILY LIMITED PARTNERSHIP	23300 TELEGRAPH RD	SOUTHFIELD	MI	48034				GARMO FAMILY LIMITED PARTNERSHIP		23300 TELEGRAPH RD		SOUTHFIELD	MI	48034-4120
50621010D	GARMO FAMILY LIMITED PARTNERSHIP	23300 TELEGRAPH RD	SOUTHFIELD	MI	48034				GARMO FAMILY LIMITED PARTNERSHIP		23300 TELEGRAPH RD		SOUTHFIELD	MI	48034-4120
50622007	GASTON DAISY N TR/BILLY C	1616 W BECK LN	PHOENIX	AZ	85023				GASTON DAISY N TR/BILLY C		1616 W BECK LN		PHOENIX	AZ	85023-3457
50622006	GASTON DAISY N TR/BILLY C	1616 W BECK LN	PHOENIX	AZ	85023				GASTON DAISY N TR/BILLY C		1616 W BECK LN		PHOENIX	AZ	85023-3457
50624942	GEBRAN RESOURCES LLC	3238 N SCOTTSDALE RD	SCOTTSDALE	AZ	85251				GEBRAN RESOURCES LLC		3238 N SCOTTSDALE RD		SCOTTSDALE	AZ	85251-6408
50624941	GEBRAN RESOURCES LLC	3238 N SCOTTSDALE RD	SCOTTSDALE	AZ	85251				GEBRAN RESOURCES LLC		3238 N SCOTTSDALE RD		SCOTTSDALE	AZ	85251-6408
50632016	GEERS PATRICK G	2675 DOVE DR	FLORISSANT	MO	63031				GEERS PATRICK G		2675 DOVE DR		FLORISSANT	MO	63031-3703
50622089B	GEISNER HENRY L/JANENE K H	10308 W MOUNTAIN VIEW RD	SUN CITY	AZ	85351				GEISNER HENRY L/JANENE K H		10308 W MOUNTAIN VIEW RD		SUN CITY	AZ	85351-4716
40149011C	GENTEMAN EDITH MAE	38238 N 20TH ST	PHOENIX	AZ	85086				TATTIE LAND LP	CONTO	38238 N 20TH ST		PHOENIX	AZ	85086-8814
50629027A	GEORGETOWN HOLDINGS LLC	1121 W WARNER RD STE 109	TEMPE	AZ	85284				GEORGETOWN HOLDINGS LLC		1121 W WARNER RD STE 109		TEMPE	AZ	85284-2819
50628042	GKP-94 FARM LLC LEASE NO 01-34994	PO BOX 668	BUCKEYE	AZ	85326	50602 W BASELINE RD		85354	W HARQUAHALA LLC		1121 W WARNER RD STE 109		TEMPE	AZ	85284-2819
50658275	GKP-94 FARM LLC LEASE NO 01-34994	PO BOX 668	BUCKEYE	AZ	85326	48710 W BASELINE RD		85354	W HARQUAHALA LLC		1121 W WARNER RD STE 109		TEMPE	AZ	85284-2819
50629026B	GLADDEN SHARON	25914 W BASELINE RD	BUCKEYE	AZ	85326				GLADDEN SHARON		2440 N 123RD AVE		AVONDALE	AZ	85323-5597
50614050	GLASS RICHARD P/BARBARA L	PO BOX 50581	PHOENIX	AZ	85076				GLASS RICHARD/BARBARA		4606 SW 84TH DR		GAINESVILLE	FL	32608-4109
50614053	GLASS RICHARD P/BARBARA L	PO BOX 50581	PHOENIX	AZ	85076				GLASS RICHARD P/BARBARA L		4606 SW 84TH DR		GAINESVILLE	FL	32608-4109
50614051	GLASS RICHARD P/BARBARA L	PO BOX 50581	PHOENIX	AZ	85076				GLASS RICHARD P/BARBARA L		4606 SW 84TH DR		GAINESVILLE	FL	32608-4109
50614052	GLASS RICHARD P/BARBARA L	PO BOX 50581	PHOENIX	AZ	85076				GLASS RICHARD P/BARBARA L		4606 SW 84TH DR		GAINESVILLE	FL	32608-4109
40152039	GLASS RICHARD/BARBARA	4606 SW 64TH DR	GAINESVILLE	FL	32608	46032 W NARRAMORE RD		85354	GLASS RICHARD/BARBARA		4606 SW 84TH DR		GAINESVILLE	FL	32608-4109
50614054	GLASS RICHARD/BARBARA	P O BOX 50581	PHOENIX	AZ	85076				GLASS RICHARD/BARBARA		4606 SW 84TH DR		GAINESVILLE	FL	32608-4109
40149040	GLOBAL ACQUISITIONS GROUP LLC	3260 S HOLLY CT	CHANDLER	AZ	85248				TRANSNATION TITLE INS CO TR 7334	CONTO	3260 S HOLLY CT		CHANDLER	AZ	85248-3659
40149006	GO GETTER PROPERTIES LLC	1423 S HIGLEY RD STE 127	MESA	AZ	85206				GO GETTER PROPERTIES LLC		C/O RICHARD E DURFEE JR	1024 N CONSTELLATION WAY	GILBERT	AZ	85234-3902
50622083	GOLAY WALTER ANTHONY	860 N MCQUEEN RD UNIT 1184	CHANDLER	AZ	85225				GOLAY WALTER ANTHONY		860 N MCQUEEN RD UNIT 1184		CHANDLER	AZ	85225-8105
50659046	GOLDSTEIN BARRY	5 RICES LANE	WESTPORT	CT	06880-1922				GOLDSTEIN BARRY		5 RICES LN		WESTPORT	CT	06880-1923
50659052	GOLDSTEIN MARILYN	205 3RD AVE APT 14E	NEW YORK	NY	10003				GOLDSTEIN MARILYN		205 3RD AVE APT 14E		NEW YORK	NY	10003-2550
50659051	GOLDSTEIN MARILYN	205 3RD AVE APT 14E	NEW YORK	NY	10003				GOLDSTEIN MARILYN		205 3RD AVE APT 14E		NEW YORK	NY	10003-2550
50660031	GONDO ENTERPRISES LLC	PO BOX 33248	PHOENIX	AZ	85067				GONDO ENTERPRISES LLC		PO BOX 33248		PHOENIX	AZ	85067-3248
50624006C	GONZALES HECTOR/VASQUEZ FRANCISCO/ETAL	PO BOX 5607	MOHAVE VALLEY	AZ	86446				GONZALES HECTOR/VASQUEZ FRANCISCO/ETAL		PO BOX 5607		MOHAVE VALLEY	AZ	86446-5607
50622067	GONZALES SALVADOR F	5150 W MCDOWELL RD	PHOENIX	AZ	85035				BAYVIEW FINANCIAL PROPERTY TRUST		GONZALES SALVADOR F	CONTO	5150 W MCDOWELL RD	PHOENIX	AZ	85035-3862
40155014	GOODGAME JACQULYNN TR	10509 W PALMERAS DR	SUN CITY	AZ	85373				GOODGAME JACQULYNN TR		10509 W PALMERAS DR			SUN CITY	AZ	85373-1939
50629052	GORAYSKI ROMAN/URSULA	2132 GREENWICK RD	EL CAJON	CA	92019				GORAYSKI ROMAN/URSULA		2132 GREENWICK RD			EL CAJON	CA	92019-4114
50624936	GORMAN REVOCABLE TRUST	4028 N RAINIER	MESA	AZ	85215				GORMAN REVOCABLE TRUST		4028 N RAINIER			MESA	AZ	85215-0818
40150002B	GRAHAM DANNY A	419 RELMELLAN CT	WAKE FOREST	NC	27587				GRAHAM DANNY A		419 RELMELLAN CT			WAKE FOREST	NC	27587
50622043H	GRAN VIA PROPERTIES LLC	8776 E SHEA BLVD B3A-317	SCOTTSDALE	AZ	85260				GRAN VIA PROPERTIES LLC		8776 E SHEA BLVD B3A-317			SCOTTSDALE	AZ	85260-6629
50659019	GREEN JAMES H	5201 E FANFOL	PARADISE VALLEY	AZ	85253				GREEN JAMES H		5201 E FANFOL DR			PARADISE VLY	AZ	85253-1623
50659018	GREEN KAREN M TR	5201 E FANFOL	PARADISE VALLEY	AZ	85253				GREEN KAREN M TR		5201 E FANFOL DR			PARADISE VLY	AZ	85253-1623
50614016M	GREGORY ROBERT D TR	1225 KORONA LN	CONCORD	CA	94521				GREGORY ROBERT D TR		3023 E FRISS DR			PHOENIX	AZ	85032-5698
50614016B	GREGORY ROBERT D TR	1225 KORONA LN	CONCORD	CA	94521				GREGORY ROBERT D TR		3023 E FRISS DR			PHOENIX	AZ	85032-5698
50629049	GROSS MARCUS/DOWNES LEANNE/OPAL L	17736 E BROOKS FARM RD	GILBERT	AZ	85297	1016 S 507TH AVE		85354	GROSS MARCUS/DOWNES LEANNE/OPAL L		17736 E BROOKS FARMS RD			GILBERT	AZ	85297-8938
50622051F	GUARDADO ANTONIO/ROSALBA	1162 N HUDSON PL	CHANDLER	AZ	85225				GUARDADO ANTONIO/ROSALBA		4851 S STONECREEK BLVD			GILBERT	AZ	85296-6891
50628006F	GYP HARQUAHALA HOLDINGS LLC	3165 E MILL ROCK DR STE 450	HOLLIDAY	UT	84121				GYP HARQUAHALA HOLDINGS LLC		3165 E MILL ROCK DR	STE 450		HOLLIDAY	UT	84121
50628006E	GYP HARQUAHALA HOLDINGS LLC	3165 E MILL ROCK DR STE 450	HOLLIDAY	UT	84121				GYP HARQUAHALA HOLDINGS LLC		PRONAIA CAPITAL	3165 E MILL ROCK DR STE 450		HOLLIDAY	UT	84121
40145005	HAINES MADGE MOLINE	421 W 9TH #A	CASA GRANDE	AZ	85222				DYNEGY INC - ARLINGTON VALLEY LLC		C/O LS POWER DEVELOPMENT LLC	TWO TOWER CENTER 11TH FL		EAST BRUNSWICK	NJ	8816
50622112C	HANINI ENTERPRISE LLC	45 ACADEMY ST STE 205	NEWARK	NJ	07102				HANINI ENTERPRISE LLC		45 ACADEMY ST STE 205			NEWARK	NJ	07102-2900
50622112B	HANINI ENTERPRISE LLC	45 ACADEMY ST STE 205	NEWARK	NJ	07102				HANINI ENTERPRISE LLC		45 ACADEMY ST STE 205			NEWARK	NJ	07102-2900
40152036A	HAPOGIAN RAFI/ARAXIE N	9015 E PARADISE DR	SCOTTSDALE	AZ	85260				HAPOGIAN RAFI/ARAXIE N		9015 E PARADISE DR			SCOTTSDALE	AZ	85260-6888
40152036C	HAPOGIAN RAFI/ARAXIE N	9015 E PARADISE DR	SCOTTSDALE	AZ	85260				HAPOGIAN RAFI/ARAXIE N		9015 E PARADISE DR			SCOTTSDALE	AZ	85260-6888
40152036B	HAPOGIAN RAFI/ARAXIE N	9015 E PARADISE DR	SCOTTSDALE	AZ	85260				HAPOGIAN RAFI/ARAXIE N		9015 E PARADISE DR			SCOTTSDALE	AZ	85260-6888
40145008	HARDISON & HARDISON DESERT RANCHES LLC	PO BOX 135	ARLINGTON	AZ	85322				DYNEGY INC - ARLINGTON VALLEY LLC		C/O LS POWER DEVELOPMENT LLC	TWO TOWER CENTER 11TH FL		EAST BRUNSWICK	NJ	8816
50660028	HARQUAHALA FIRE DISTRICT	STAR RT 2	BUCKEYE	AZ	85326	1043 N 192ND AVE		85354	HARQUAHALA FIRE DISTRICT		HC 2			BUCKEYE	AZ	85326
50623001	HARQUAHALA INVESTMENT CO	6201 WINTHROP DR	RALEIGH	NC	27612				HARQUAHALA INVESTMENT CO		6201 WINTHROP DR			RALEIGH	NC	27612-2145
50622018A	HARQUAHALA PROPERTY HOLDINGS LLC	4449 N 59TH DR	PHOENIX	AZ	85033				HARQUAHALA PROPERTY HOLDINGS LLC		6528 N 171ST LN			WADDELL	AZ	85355-9892
50624011Q	HARQUAHALA VALLEY COMMUNITY BENEFITS FOUNDATI	402 S HARQUAHALA VALLEY RD	TONOPAH	AZ	85354	402 S HARQUAHALA VALLEY RD	TONOPAH	85354	HARQUAHALA VALLEY COMMUNITY BENEFITS FOU		402 S HARQUAHALA VALLEY RD			TONOPAH	AZ	85354-7106
50623035A	HARQUAHALA VALLEY FARMS LLC	PO BOX 519	REXBURG	ID	83440	4043 N 503RD AVE		85354	HARQUAHALA VALLEY FARMS LLC		PO BOX 519			REXBURG	ID	83440-0519

50623036B	HARQUAHALA VALLEY FARMS LLC	PO BOX 519	REXBURG	ID	83440				HARQUAHALA VALLEY FARMS LLC	PO BOX 519			REXBURG	ID	83440-0519
50623036C	HARQUAHALA VALLEY FARMS LLC	PO BOX 519	REXBURG	ID	83440				HARQUAHALA VALLEY FARMS LLC	PO BOX 519			REXBURG	ID	83440-0519
50623012D	HARQUAHALA VALLEY FARMS LLC	PO BOX 519	REXBURG	ID	83440				HARQUAHALA VALLEY FARMS LLC	PO BOX 519			REXBURG	ID	83440-0519
50660004	HARQUAHALA VALLEY IRRIGATION DISTRICT	STAR RT 2 BOX 397	BUCKEYE	AZ	85326	402 S 515TH AVE		85354	HARQUAHALA VALLEY IRRIGATION DISTRICT	HC 2 BOX 397			BUCKEYE	AZ	85326
50629020	HARQUHALA GIN LLC	3636 S 7TH ST	PHOENIX	AZ	85040	383 S 515TH AVE		85354	HARQUHALA GIN LLC	3636 S 7TH ST			PHOENIX	AZ	85040-1131
50629021A	HARQUHALA GIN LLC	3636 S 7TH ST	PHOENIX	AZ	85040				HARQUHALA GIN LLC	3636 S 7TH ST			PHOENIX	AZ	85040-1131
50629021B	HARQUHALA GIN LLC	3636 S 7TH ST	PHOENIX	AZ	85040				HARQUHALA GIN LLC	3636 S 7TH ST			PHOENIX	AZ	85040-1131
50623039	HARQVAL 320	5650 BAYSIDE DR	ORLANDO	FL	32819				HARQUAL 320	C/O KIANG SUE	5650 BAYSIDE DR		ORLANDO	FL	32819-4045
40149032H	HARRIET KANDY ROHDE MARITAL TRUST/ETAL	PO BOX 1354	CHICAGO	IL	60690				HARRIET KANDY ROHDE MARITAL TRUST/ETAL	C/O NORTHERN TRUST NA	2398 E CAMELBACK RD STE 400		PHOENIX	AZ	85016-9011
40152023	HARRINGTON SCOTT T	860 S GENEVIEVE	EAGAR	AZ	85925				HARRINGTON SCOTT T	860 S GENEVIEVE			EAGAR	AZ	85925-9773
40152045	HARRIS DONALD J/SHELLY C	PO BOX 364	TONOPAH	AZ	85354				HARRIS DONALD J/SHELLY C	PO BOX 364			TONOPAH	AZ	85354-0364
40152044	HARRIS DONALD J/SHELLY C	PO BOX 364	TONOPAH	AZ	85354				HARRIS DONALD J/SHELLY C	PO BOX 364			TONOPAH	AZ	85354-0364
40150008B	HEESCH RICHARD/REA/NELSON RICHARD/LANA/COOK T	8767 E VIA DEL ARBOR	SCOTTSDALE	AZ	85258				ACKERMAN LEE/RUSCHE EDMUND/ELLEN ETAL	8767 E VIA DEL ARBOR			SCOTTSDALE	AZ	85258-3529
50629051	HELSPER JOSEPH/KRYSTYNA	253 ASH STREET	WOODDALE	IL	60191				HELSPER JOSEPH/KRYSTYNA	253 ASH AVE			WOOD DALE	IL	60191-1662
50622058B	HENDERSON MARK F/JUDITH L	P O BOX 685	TONOPAH	AZ	85354				HENDERSON JUDITH L	P O BOX 685			TONOPAH	AZ	85354-0685
50629016F	HENG PETER/PHALLY	5067 VINCENT AVE NO 2	LOS ANGELES	CA	90041				HENG PETER/PHALLY	5067 VINCENT AVE NO 2			LOS ANGELES	CA	90041-2253
50629016E	HENG VICTOR V	5067 VINCENT AVE UNIT 2	LOS ANGELES	CA	90041				HENG VICTORY V	5067 VINCENT AVE UNIT 2			LOS ANGELES	CA	90041-2253
50622138	HENSLEE MARK R/SUSAN K	1729 W WIKIEUP LN	PHOENIX	AZ	85027				HENSLEE MARK R/SUSAN K	1729 W WICKIEUP LN			PHOENIX	AZ	85027-4527
50623044H	HERNANDEZ GUSTAVO A	6432 W KEIM DR	GLENDALE	AZ	85301				HERNANDEZ GUSTAVO A	6432 W KEIM DR			GLENDALE	AZ	85301-5038
50659062	HERNANDEZ JUAN/ARTEMISA	21989 W HADLEY ST	BUCKEYE	AZ	85326				HERNANDEZ ARTEMISA	6750 W WINDSOR AVE			PHOENIX	AZ	85035-1427
50622088	HERNANDEZ MARIO J/MONTES MARTHA V	4130 N 10TH PL	PHOENIX	AZ	85014				HERNANDEZ MARIO J/MONTES MARTHA V	4130 N 10TH PL			PHOENIX	AZ	85014-4820
40159010E	HERNANDEZ THOMAS	PO BOX 14	ARLINGTON	AZ	85322				HERNANDEZ THOMAS	PO BOX 14			ARLINGTON	AZ	85322-0014
50614017A	HERZBERGER MICHAEL/ANGEL	3456 WHITE EAGLE DR	NAPERVILLE	IL	60564				HERZBERGER MICHAEL/ANGEL	3456 WHITE EAGLE DR			NAPERVILLE	IL	60564-4621
50622075B	HEWITT HOLDINGS LLC	17708 W DESERT VIEW LN	GOODYEAR	AZ	85338				HEWITT HOLDINGS LLC	17708 W DESERT VIEW LN			GOODYEAR	AZ	85338-5353
50622156E	HEWITT RICHARD/SUSAN	17708 W DESERT VIEW LN	GOODYEAR	AZ	85338				HEWITT RICHARD/SUSAN	17708 W DESERT VIEW LN			GOODYEAR	AZ	85338-5353
50614019G	HEWITT RICHARD/SUSAN	17708 W DESERT VIEW LN	GOODYEAR	AZ	85338				HEWITT RICHARD/SUSAN	17708 W DESERT VIEW LN			GOODYEAR	AZ	85338-5353
50623010A	HILL SANDRA JEAN/ETAL	21351 N BLACK BEAR LODGE DR	SURPRISE	AZ	85387				HILL SANDRA JEAN/ETAL	21351 N BLACK BEAR LODGE DR			SURPRISE	AZ	85387-8203
50623010B	HILL SANDRA JEAN/ETAL	21351 N BLACK BEAR LODGE DR	SURPRISE	AZ	85387				HILL SANDRA JEAN/ETAL	21351 N BLACK BEAR LODGE DR			SURPRISE	AZ	85387-8203
50623010C	HILL SANDRA JEAN/ETAL	21351 N BLACK BEAR LODGE DR	SURPRISE	AZ	85387				FIGUEROA SANDRA JEAN/ETAL	O NEILL BOB	P O BOX 17463		FOUNTAIN HILLS	AZ	85269
50624007C	HOKANSON DAVID J/KELLI L	19402 W TAYLOR ST	BUCKEYE	AZ	85326				HOKANSON DAVID J/KELLI L	19402 W TAYLOR ST			BUCKEYE	AZ	85326-8509
50624007F	HUGHES DAVID	2735 E SOUTH MOUNTAIN AVE	PHOENIX	AZ	85042				HUGHES DAVID	2735 E SOUTH MOUNTAIN AVE			PHOENIX	AZ	85042-8221
40149044	HUSAYNO TARIQ/AHLAM	10731 E SUNNYSIDE DR	SCOTTSDALE	AZ	85259				HUSAYNO TARIQ/AHLAM	10731 E SUNNYSIDE DR			SCOTTSDALE	AZ	85259-2913
50622090	HYDE WILLIAM D/DEBRA A	231 SPRUCE ST	ELYRIA	OH	44035				BAYVIEW FINANCIAL PROPERTY TRUST CONTO	231 SPRUCE ST			ELYRIA	OH	44035-3244
50622055G	IBARRA FRANCISCO APOLINAR/NANCI	7023 W PIERCE ST	PHOENIX	AZ	85043				IBARRA FRANCISCO APOLINAR/NANCI	7023 W PIERCE ST			PHOENIX	AZ	85043-2424
50624009B	IRIARTE ANGELICA/CORRALES GERARDO/IRIARTE CON	5624 W MYRTLE	GLENDALE	AZ	85301				IRIARTE ANGELICA/CONRADO	5624 W MYRTLE			GLENDALE	AZ	85301-1927
40152016L	ISELI ANDRE W/GAIL A	14917 SE 142ND	CLACKAMAS	OR	97015				ISELI ANDRE W/GAIL A	14917 SE 142ND AVE			CLACKAMAS	OR	97015-7374
40159003	JAGOW FAMILY LLC	12911 N E 185TH ST	BATTLEGROUND	WA	98604	33205 W DESERT ROSE RD		85322	JAGOW FAMILY LLC	12911 N E 185TH ST			BATTLEGROUND	WA	98604-4151
40149004B	JAHANSOUZ HOSSAIN/ALANI LAMAN	2116 DEEP MEADOW LN	LANSDALE	PA	19446				JAHANSOUZ HOSSAIN/ALANI LAMAN	6809 SHADOW CREEK CT	MARI VISTA		FORT WORTH	TX	76132
50624009D	JANDA LAND HOLDING LLC	101 E MOON VALLEY DR	PHOENIX	AZ	85022				JANDA LAND HOLDING LLC	PO BOX 9794			PHOENIX	AZ	85068-9794
50622024G	JANDA LAND HOLDINGS LLC	101 E MOON VALLEY DR	PHOENIX	AZ	85022				JANDA LAND HOLDINGS LLC	101 E MOON VALLEY DR			PHOENIX	AZ	85022-4249
50660012	JANDA LAND HOLDINGS LLC	101 E MOON VALLEY DR	PHOENIX	AZ	85022				JANDA LAND HOLDINGS LLC	PO BOX 9794			PHOENIX	AZ	85068-9794
50622020	JENKINS WILLIAM T/RACHEL ANN TR	6601 E DESERT COVE	SCOTTSDALE	AZ	85251				JENKINS WILLIAM T/RACHEL ANN TR	6601 E DESERT COVE AVE			SCOTTSDALE	AZ	85254-5049
50660009E	JLK RE INVESTMENT CORPORATION	6730 E MCDOWELL RD NO 136	SCOTTSDALE	AZ	85257				JLK REAL ESTATE INVESTMENT CORP	6730 E MCDOWELL RD #136			SCOTTSDALE	AZ	85257-3135
40150005L	JOHNSON SHIRLEY MARGOT	PO BOX 244	TONOPAH	AZ	85354	7859 S 498TH AVE	TONOPAH	85354	JOHNSON SHIRLEY MARGOT	PO BOX 244			TONOPAH	AZ	85354-0244
50629044	JOSEF AND JANINA OKOLITA REVOCABLE TRUST	10744 W TONOPAH DR	SUN CITY	AZ	85373				JOSEF AND JANINA OKOLITA REVOCABLE TRUST	10744 W TONOPAH DR			SUN CITY	AZ	85373-3306
50629045	JOSEF AND JANINA OKOLITA REVOCABLE TRUST	10744 W TONOPAH DR	SUN CITY	AZ	85373				JOSEF AND JANINA OKOLITA REVOCABLE TRUST	10744 W TONOPAH DR			SUN CITY	AZ	85373-3306
50629015D	JRS NEVITT FARMS LLC	1121 W RANCH RD	TEMPE	AZ	85284				JRS NEVITT FARMS LLC	1121 W RANCH RD			TEMPE	AZ	85284-2001
40149032F	JUNG CHING YEE/HA ANN NGAN	15724 VASSAR AVE	SAN LORENZO	CA	74580				JUNG CHING YEE/HA ANN NGAN	15724 VASSAR AVE			SAN LORENZO	CA	74580-1059
50614016D	KACIUBA JESSIE B	1933 YORKTOWNE BLVD	TOMS RIVER	NJ	08753	7 S 523RD AVE	TONOPAH	85354	KACIUBA JESSIE B	1933 YORKTOWNE BLVD			TOMS RIVER	NJ	08753-1511
40150007G	KALLA SUBHI M TR	7820 N 47TH PL	PARADISE VALLEY	AZ	85253				KALLA SUBHI M TR	7820 N 47TH PL			PARADISE VALLEY	AZ	85253
50629023C	KAWELA ONE LLC	38082 SNICKERVILLE TPK	PURCELLVILLE	VA	20132				KAWELA ONE LLC	C/O BRADLEY J BOLAND	38082 SNICKERVILLE TPK		PURCELLVILLE	VA	20132-5006
50629023D	KAWELA ONE LLC	38082 SNICKERVILLE TPK	PURCELLVILLE	VA	20132				KAWELA ONE LLC	C/O BRADLEY J BOLAND	38082 SNICKERVILLE TPK		PURCELLVILLE	VA	20132-5006
50660026	KEIM RAYMOND E SR/KAY D	P O BOX 5663	SALTON CITY	CA	92275				KEIM RAYMOND E SR/KAY D	PO BOX 5663			SALTON CITY	CA	92275-5663
40152041	KELLER JENNIE E/SEAGER DUSTIN R	5094 PERSILLE DR	TAYLORSVILLE	UT	84118				KELLER JENNIE E/SEAGER DUSTIN R	5094 PERSILLE DR			TAYLORSVILLE	UT	84118-2930
40152040	KELLER JENNIE E/SEAGER DUSTIN R	5094 PERSILLE DR	TAYLORSVILLE	UT	84118				KELLER JENNIE E/SEAGER DUSTIN R	5094 PERSILLE DR			TAYLORSVILLE	UT	84118-2930
50622018F	KEN K HARADA AND TOBY N HARADA FAMILY TRUST	25498 FRAN LOU DR	MORENO VALLEY	CA	92557				HARADA KEN K/TOBY N TR	PO BOX 10037			MORENO	CA	92552-0037
50622039	KHAN MONAIR/BEBE S	87 TENNYSON DR	NANUET	NY	10954				KHAN MONAIR/BEBE S	87 TENNYSON DR			NANUET	NY	10954-1039
50622121	KHAN MONAIR/BEBE S	87 TENNYSON	NAMUET	NY	10904				KHAN MONAIR/BEBE S	87 TENNYSON DR			NANUET	NY	10954-1039
50622104	KIEU THI CHAU TRUST	7746 W PORT AU PRINCE LN	PEORIA	AZ	85381				KIEU THI CHAU TRUST	7746 W PORT AU PRINCE LN			PEORIA	AZ	85381
506240095	KIM JAEKWON/JUNG K CHUNG TR	5260 W MELINDA LN	GLENDALE	AZ	85308				KIM JAEKWON/JUNG K CHUNG TR	5260 W MELINDA LN			GLENDALE	AZ	85308-9304
50621023A	KIM SU POK/KYONG HWA TR	32020 N 20TH DR	PHOENIX	AZ	85085				KIM SU POK/KYONG HWA TR	32020 N 20TH DR			PHOENIX	AZ	85085-7082
50621009	KIM SU POK/KYONG HWA TR	32020 N 20TH DR	PHOENIX	AZ	85085				KIM SU POK/KYONG HWA TR	32020 N 20TH DR			PHOENIX	AZ	85085-7082
50622019M	KIM SUE	17505 N 79TH AVE STE 214	GLENDALE	AZ	85308				KIM SUE	17505 N 79TH AVE STE 214			GLENDALE	AZ	85308-8728
40152016R	KINGSBY ROBERT III	7235 W PERSHING AVE	PEORIA	AZ	85381				KINGSBY ROBERT III	7235 W PERSHING AVE			PEORIA	AZ	85381-6018
50622075A	KIRK LINDA S	PO BOX 9	TONOPAH	AZ	85354				KIRK LINDA S	PO BOX 9			TONOPAH	AZ	85354-0009
50622094	KLEWIN MARK ANDREW/TERI LEE	4330 N RAINER CIR	MESA	AZ	85215				BAYVIEW FINANCIAL PROPERTY TRUST CONTO	4330 N RANIER CIR			MESA	AZ	85215-0845
50660032	KNAUSS HARRIETT	8021 N 15TH AVE	PHOENIX	AZ	85021				CHAVEZ HARRIETT	8021 N 15TH AVE			PHOENIX	AZ	85021-5401
40150002A	KOBIE JEFFREY LELAND	1274 E COMMERCE AVE	GILBERT	AZ	85234				KOBIE JEFFREY LELAND	1274 E COMMERCE AVE			GILBERT	AZ	85234-4730
40152027	KOCZWARA RYSZARDCECYLIA	8924 E APACHE TRL	MESA	AZ	85207				KOCZWARA RYSZARDCECYLIA	8924 E MAIN ST			MESA	AZ	85207-8704
50659021	KOHN DAVID R	7150 SW 3RD AVE	PORTLAND	OR	97219				KOHN DAVID R	7150 SW 3RD AVE			PORTLAND	OR	97219
50622038	KOLONIA LLC	5025 N CENTRAL AVE NO 611	PHOENIX	AZ	85012				KOLONIA LLC	5025 N CENTRAL AVE PMB 611			PHOENIX	AZ	85012-1520
50622130	KOTSIOPOULOS DIMOSTIENIS/THEOFANIA	46 FOREST AVE	EVERETT	WA	02149				KOTSIOPOULOS DIMOSTIENIS/THEOFANIA	46 FOREST AVE			EVERETT	MA	02149-2604
50622109A	KRETSEDEMAS NICHOLAS G	PO BOX 1984	CHANDLER	AZ	85225				KRETSEDEMAS NICHOLAS G	640 E PALOMINO WAY			QUEEN CREEK	AZ	85143
50622095	KRETSEDEMAS NICHOLAS G/MARIVIC M	P O BOX 1984	CHANDLER	AZ	85225				KRETSEDEMAS NICHOLAS G/MARIVIC M	PO BOX 1984			CHANDLER	AZ	85244-1984
50659041	KRIEGER REGAN CATHERINE	1415 BROADWAY ST UNIT 14	HAMMOND	WI	54015				KRIEGER REGAN CATHERINE	951 170TH ST			HAMMOND	WI	54015
50622011	KROEPEL EDITH E TR	3646 N 52ND PL	PHOENIX	AZ	85018				KROEPEL EDITH E TR	3646 N 52ND PL			PHOENIX	AZ	85018-6149
50621012	KROEPEL EDITH E TR	3646 N 52ND PL	PHOENIX	AZ	85018				KROEPEL EDITH E TR	3646 N 52ND PL			PHOENIX	AZ	85018-6149
50629043	KRUTUL DOROTA	235 E 2ND ST NO C4	BROOKLYN	NY	11218				KRUTUL DOROTA	235 E 2ND ST APT C4			BROOKLYN	NY	11218-2320
50629035A	KUBINEC JOHN C/TANYA	9005 BLAZING STAR RD SE	ALBUQUERQUE	NM	87116				KUBINEC JOHN C/TANYA	503 STRIKE EAGLE DR			ROBINS AFB	GA	31098
40149005F	L & K PROPERTY INVESTMENT FAMILY LLLP	P O BOX 1084	BUCKEYE	AZ	85362				L & K PROPERTY INVESTMENT FAMILY LLLP	P O BOX 1084			BUCKEYE	AZ	85362-0081
40146019A	LA MARCHE BARBARA/KENNETH	474 NEZ PEARCE PL	LA CONNOR	WA	98257				LA MARCHE BARBARA/KENNETH	474 NEZ PEARCE PL			LA CONNOR	WA	98257-9550
40146025	LA MARCHE BARBARA/KENNETH	474 NEZ PEARCE PL	LA CONNOR	WA	98257				LA MARCHE BARBARA/KENNETH	474 NEZ PEARCE PL			LA CONNOR	WA	98257-9550
40146024	LA MARCHE BARBARA/KENNETH	474 NEZ PEARCE PL	LA CONNOR	WA	98257				LA MARCHE BARBARA/KENNETH	474 NEZ PEARCE PL			LA CONNOR	WA	98257-9550
50629056	LAGUNA CHRISTOPHER J/MARIOLA	1370 E THACKER ST	SCHAUMBERG	IL	60173				LAGUNA CHRISTOPHER J/MARIOLA	1370 E THACKER ST			SCHAUMBURG	IL	60173-6591
50629036	LAGUNA CHRISTOPHER/BOSZKO ROBERT J/VOLA B	1370 E THACKER ST	SCHAUMBURG	IL	60173				LAGUNA CHRISTOPHER/BOSZKO ROBERT J/VOLA	1370 E THACKER ST			SCHAUMBURG	IL	60173-6591
50622055D	LAGUNA CHRISTOPHER/CHRISTOPHER J	1370 E THACKER ST	SCHAUMBURG	IL	60173				LAGUNA CHRISTOPHER/CHRISTOPHER J	1370 E THACKER ST			SCHAUMBURG	IL	60173-6591
40155007E	LAND HOLDINGS LLC	69 E COLUMBUS AVE	PHOENIX	AZ	85012				LAND HOLDINGS LLC	7650 S MCCLINTOCK DR STE 103			TEMPE	AZ	85284-1673
50624012G	LANDON RICHARD A/SANDY M	3303 E 200 NORTH	RIGBY	ID	83442				LANDON RICHARD A/SANDY M	3303 E 200 N			RIGBY	ID	83442-5618
50623044B	LANDUST PROPERTIES LLC	5555 N 7TH ST STE 134-143	PHOENIX	AZ	85014				LANDUST PROPERTIES LLC	5555 N 7TH ST STE 134-143			PHOENIX	AZ	85014-2554
40152020	LANEY JAMES R	3310 THOMAS BUTLER RD	TALLAHASSEE	FL	32308				LANEY JAMES R	3310 THOMAS BUTLER RD			TALLAHASSEE	FL	32308-4510
50629025B	LANGLEY PALOVERDE FIELD LLC/ET AL	2738 E GUADALUPE RD	GILBERT	AZ	85234				LANGLEY PALOVERDE FIELD LLC/ET AL	2738 E GUADALUPE RD			GILBERT	AZ	85234-5100
50629026A	LANGLEY PALOVERDE FIELD LLC/ET AL	2738 E GUADALUPE RD	GILBERT	AZ	85234				LANGLEY PALOVERDE FIELD LLC/ET AL	2738 E GUADALUPE RD			GILBERT	AZ	85234-5100
50629025A	LANGLEY PALOVERDE FIELD LLC/ET AL	2738 E GUADALUPE RD	GILBERT	AZ	85234				LANGLEY PALOVERDE FIELD LLC/ET AL	2738 E GUADALUPE RD			GILBERT	AZ	85234-5100
40144004	LAUTERBACH VIRGINIA C/EDWARD G TR	1500 E EVERGREEN TERRACE	GLENVIEW	IL	60025				LAUTERBACH VIRGINIA C/EDWARD G TR	331 COLLEGE ST APT D4			MACON	GA	31201-7261
40146019C	LAZAR ASHOR/DYANA	513 S LOUIS	MT PROSPECT	IL	60056				LAZAR ASHOR/DYANA	513 S LOUIS ST			MT PROSPECT	IL	60056-3936
40152016T	LAZAR ODISHO/JOSAPHIN/JOSEF/A/RASHO VIRGINIA	5016 W CULVER ST	SKOKIE	IL	60077				LAZAR ODISHO/JOSAPHIN/JOSEF/A/RASHO VIRG	5016 W CULVER ST			SKOKIE	IL	60077-1004

50622055F	LEAL GREGORIO BARBOZA/BARBOZA OLIVIA	7115 W PIONEER ST		PHOENIX	AZ	85043					LEAL GREGORIO BARBOZA/BARBOZA OLIVIA	7115 W PIONEER ST				PHOENIX	AZ	85043-7209
50622055H	LEAL GREGORIO BARBOZA/BARBOZA OLIVIA	7115 W PIONEER ST		PHOENIX	AZ	85043					LEAL GREGORIO BARBOZA/BARBOZA OLIVIA	7115 W PIONEER ST				PHOENIX	AZ	85043-7209
50622015A	LEE JUYUN/SILVERMAN ELIZABETH	1702 W MOODY TRL		PHOENIX	AZ	85041					LEE JUYUN/SILVERMAN ELIZABETH	1702 W MOODY TRL				PHOENIX	AZ	85041-9128
50623033P	LEE KWANG W	15403 E REDROCK DR		FOUNTAIN HILLS	AZ	85286					LEE KWANG W	15403 E REDROCK DR				FOUNTAIN HILLS	AZ	85286
50622051B	LEE SEE/KO WONKI	10618 TRUSSELL ST		LAS VEGAS	NV	89141					LEE SEE/KO WONKI	10618 TRUSSELL ST				LAS VEGAS	NV	89141-4263
50622051C	LEE SEE/KO WONKI	10618 TRUSSELL ST		LAS VEGAS	NV	89141					LEE SEE/KO WONKI	10618 TRUSSELL ST				LAS VEGAS	NV	89141-4263
50622019G	LEE SIMON/FONG JANLEY	76 BAY CT		S SAN FRANCISCO	CA	94080					LEE SIMON/FONG JANLEY	76 BAY CT				S SAN FRANCISCO	CA	94080
40146020A	LEE SUNG HWAN/SUNG AH TR	7123 W VILLA CHULA		GLENDALE	AZ	85310					LEE SUNG HWAN/SUNG AH TR	7123 W VILLA CHULA				GLENDALE	AZ	85310-5884
50622024E	LEON GERTRUDE	4622 W PALMAIRE		GLENDALE	AZ	85301					LEON GERTRUDE	4622 W PALMAIRE				GLENDALE	AZ	85301-2819
50622024H	LEON GERTRUDE R	4622 W PALMAIRE		GLENDALE	AZ	85301					LEON GERTRUDE R	4622 W PALMAIRE				GLENDALE	AZ	85301-2819
50629037	LEVAN BRIAN/LESLIE	3115 N 188TH AVE		LITCHFIELD PARK	AZ	85340					LEVAN BRIAN/LESLIE	3115 N 188TH AVE				LITCHFIELD PARK	AZ	85340
40145012A	LEVEL 3 COMMUNICATIONS LLC	14023 DENVER WEST PKWY		GOLDEN	CO	80401-3107					LEVEL 3 COMMUNICATIONS LLC	1025 ELDORADO BLVD				BROOMFIELD	CO	80021-8254
50622098F	LEWIS PATRICK D	P O BOX 71		TONOPAH	AZ	85354					LEWIS PATRICK D	P O BOX 71				TONOPAH	AZ	85354-0071
50625008B	LF-1 LLC	1180 N MOUNTAIN SPRINGS PA		SPRINGVILLE	UT	84663					EAGLETAIL 640 LLC	4616 E FIGHTER ACES DR				MESA	AZ	85215-2502
50625007B	LF-1 LLC	1180 N MOUNTAIN SPRINGS PA		SPRINGVILLE	UT	84663					EAGLETAIL 640 LLC	4616 E FIGHTER ACES DR				MESA	AZ	85215-2502
50625008A	LF-1 LLC	1180 N MOUNTAIN SPRINGS PA		SPRINGVILLE	UT	84663					EAGLETAIL 640 LLC	4616 E FIGHTER ACES DR				MESA	AZ	85215-2502
50623008	LILLE INVESTMENTS LLC	10500 N 52ND ST		PARADISE VALLEY	AZ	85253					LILLE INVESTMENTS LLC	10500 N 52ND ST				PARADISE VALLEY	AZ	85253
40152013D	LITTLETON CHARLEY GLENN	575 CLIFF LN		FALL BRANCH	TN	37656					LITTLETON CHARLEY GLENN	575 CLIFF LN				FALL BRANCH	TN	37656-3410
40152016Q	LITTLETON JAMES T/DANNY/TRACY/ETAL	589 CLIFF LN		FALL BRANCH	TN	37656					LITTLETON JAMES T/DANNY/TRACY/ETAL	589 CLIFF LN				FALL BRANCH	TN	37656-3410
50629065	LOGAN FLORENCE/WILLIAMS CROSBY MARJORIE	330 E 26TH ST NO 5F		NEW YORK	NY	10010					LOGAN FLORENCE/WILLIAMS CROSBY MARJORIE	51427 W TONTO ST				TONOPAH	AZ	85354-7243
50629064	LOGAN THEADORA CYNTHIA	200 COZINE AVE 9J		BROOKLYN	NY	11207					LOGAN THEADORA CYNTHIA	200 COZINE AVE APT 9 J				BROOKLYN	NY	11207-8809
50622015D	LONG CELENE RITA OCONNOR	2358 AKOKI ST		LIHUE	MI	96766					LONG CELENE RITA OCONNOR	2358 AKOKI ST				LIHUE	MI	96766-8809
40152021	LOWERRE EDWIN W/ARMBRUSTER CINDY J	44810 N SAGUARO BLOSSOM LN		MORRISTOWN	AZ	85342					LOWERRE EDWIN W/ARMBRUSTER CINDY J	44810 SAGUARO BLOSSOM LN				MORRISTOWN	AZ	85342-9890
40152022	LOWERRE EDWIN W/ARMBRUSTER CINDY J	44810 N SAGUARO BLOSSOM LN		MORRISTOWN	AZ	85342					LOWERRE EDWIN W/ARMBRUSTER CINDY J	44810 SAGUARO BLOSSOM LN				MORRISTOWN	AZ	85342-9890
50624940	LUCIANO LORRAINE	4153 W PARKVIEW LN		GLENDALE	AZ	85310					LUCIANO LORRAINE	4153 W PARKVIEW LN				GLENDALE	AZ	85310-3220
50659022	LUNA ANTONIO JR	PO BOX 37		TONOPAH	AZ	85354	51633 W VAN BUREN ST		TONOPAH	85354	LUNA ANTONIO JR	PO BOX 37				TONOPAH	AZ	85354-0037
50659055	LUNA ANTONIO JR	PO BOX 37		TONOPAH	AZ	85354					MERABAN MERDAD/NAJAFI HENGAMEH CONTO	PO BOX 37				TONOPAH	AZ	85354-0037
50659056	LUNA ANTONIO JR	PO BOX 37		TONOPAH	AZ	85354					MERABAN MERDAD/NAJAFI HENGAMEH CONTO	PO BOX 37				TONOPAH	AZ	85354-0037
50622139	LUNA MELBA	1316 N DEPOT RD		EDINBURG	TX	78541					LUNA MELBA	1316 N DEPOT RD				EDINBURG	TX	78541-9468
50620012	LYKES NORMAN R & TIMOTHY ETAL CO-TR	17326 21ST AVE SW		BURIEN	WA	98166					LYKES NORMAN R & TIMOTHY ETAL CO-TR	17326 21ST AVE SW				BURIEN	WA	98166-3262
50622155	MACDONALD PAMELA	PO BOX 235		HEREFORD	AZ	85615					BAYVIEW FINANCIAL PROPERTY TRUST CONTO	PO BOX 294131				KERRVILLE	TX	78029
50622154	MACDONALD PAMELA L	637 W PANTERA AVE		MESA	AZ	85210					MACDONALD PAMELA	PO BOX 294131				KERRVILLE	TX	78029
50624006A	MAGO NARESH	5867 S BRITTANY LN		TEMPE	AZ	85283					ANAND PRITI	2765 W DEL RIO PL				CHANDLER	AZ	85224-7328
50622055A	MAIN CHARLES	51727 W CENTENNIAL RD	, PMB 430	TONAPAH	AZ	85354	51707 W MCDOWELL RD			85354	MAIN CHARLES	51727 W CENTENNIAL RD	PMB 430			TONAPAH	AZ	85354
40152016W	MAJED MAHMOUD/YASSER H/MICHELLE A	6807 E BROADWAY		MESA	AZ	85208					MAJED MAHMOUD/YASSER H/MICHELLE A	6807 E BROADWAY				MESA	AZ	85208-1913
40155009B	MALAD INC	1955 N VAL VISTA DR STE 110		MESA	AZ	85213					MALAD INC	MALAD INC	1955 N VAL VISTA DR STE 110			MESA	AZ	85213-3218
40155009A	MALAD INC	1955 N VAL VISTA DR STE 110		MESA	AZ	85213					MALAD INC	MALAD INC	1955 N VAL VISTA DR STE 110			MESA	AZ	85213-3218
50622102	MALONEY LISA M	3001 WAGONER RD		PHOENIX	AZ	85053					MALONEY LISA M	3001 WAGONER RD				PHOENIX	AZ	85053
50622085A	MANNG BRIAN C/ANNY	2426 W SHANNON ST		CHANDLER	AZ	85224					MANNG BRIAN C/ANNY	2426 W SHANNON ST				CHANDLER	AZ	85224-3473
50624003D	MARKS BENITA TR/GOULD JEFFREY S TR	9494 E REDFIELD RD #1001		SCOTTSDALE	AZ	85260					MARKS BENITA TR/GOULD JEFFREY S TR	10 GRACE CT				LONG BRANCH	NJ	07740-5960
50622098E	MARLIN LAWRENCE J/ANITA L	8912 E PINNACLE PEAK	, STE 440	SCOTTSDALE	AZ	85255					MARLIN LAWRENCE J/ANITA L	8912 E PINNACLE PEAK	STE 440			SCOTTSDALE	AZ	85255
50622051D	MARQUEZ JOSEPH M	645 SANTO ORO AVE		LA PUENTE	CA	91744					MARQUEZ JOSEPH M	645 SANTO ORO AVE				LA PUENTE	CA	91744-3915
50623023J	MARSHALL CHRYSTAL	PO BOX 374		TONOPAH	AZ	85354					MARSHALL CHRYSTAL	PO BOX 374				TONOPAH	AZ	85354-0374
40146026	MARTINEZ RAYMOND JR	PO BOX 5700		PHOENIX	AZ	85010-5700					MARTINEZ RAYMOND JR	3242 E GRANADA RD				PHOENIX	AZ	85008-3830
50660005	MARTORI BROS DIST	7332 E BUTHERUS DR		SCOTTSDALE	AZ	85260					MARTORI BROS DIST	7332 E BUTHERUS DR				SCOTTSDALE	AZ	85260-2426
50623042	MARTORI BROTHERS DISTRIBUTORS	7332 E BUTHERUS DR		SCOTTSDALE	AZ	85260					MARTORI BROTHERS DISTRIBUTORS	7332 E BUTHERUS DR				SCOTTSDALE	AZ	85260-2426
50622114	MASTOPEITRO KURT I/HOLLANDER BRENDA L	4336 E ENCANTO BLVD		MESA	AZ	85205					BAYVIEW FINANCIAL PROPERTY TRUST CONTO	4336 E ENCANTO ST				MESA	AZ	85205-5116
50629016K	MC REVOCABLE TRUST	10115 E BELL RD #107-410		SCOTTSDALE	AZ	85260					MC REVOCABLE TRUST	10115 E BELL RD #107-410				SCOTTSDALE	AZ	85260-2189
40150007H	MCCAULEY BOKE E	PO BOX 55943		PHOENIX	AZ	85078					MCCAULEY BOKE E	PO BOX 55943				PHOENIX	AZ	85078-5943
40146018B	MCMURTRY FAMILY PROPERTIES LLC	20340 W ROUTE 102		WILMINGTON	IL	60481					MCMURTRY FAMILY PROPERTIES LLC	C/O MCMURTRY DAVID	26338 S MCKINLEY WOODS RD			CHANNAHON	IL	60410
50660029	MCNAMARA JESSE	214 N B ST		LOMPOC	CA	93436	1106 S 515TH AVE			85354	COMPASS POINT WEST LAND INVESTMENTS LLC	5044 E DUANE LN				CAVE CREEK	AZ	85331-2311
50660006	MENDOZA ANTONIO & RAMONA G	HG-02 BOX 402		BUCKEYE	AZ	85326	51554 W LINCOLN ST		TONOPAH	85354	MENDOZA ANTONIO & RAMONA G	51554 W LINCOLN ST				TONOPAH	AZ	85354-7108
50622117	MENDOZA FRANCISCO G/CARMEN S	1105 N DYSART RD LOT 30		AVONDALE	AZ	85323					BAYVIEW FINANCIAL PROPERTY TRUST CONTO	1742 W MARICOPA ST				PHOENIX	AZ	85007-3537
50624939	MICHAEL SANHARIB/MONA	304 S DOHENY DR 5		BEVERLY HILLS	CA	90211					MICHAEL SANHARIB/MONA	304 S DOHENY DR 5				BEVERLY HILLS	CA	90211-3549
40149043	MILLER LES/PHYLLIS	18604 W SWEET ACACIA DR		GOODYEAR	AZ	85338					MILLER LES/PHYLLIS	18604 W SWEET ACACIA DR				GOODYEAR	AZ	85338-5603
50659010	MILLETTE CAROL A/JAMES H	51523 W VAN BUREN ST PO BOX 992		TONOPAH	AZ	85354					MILLETTE CAROL A/JAMES H	PO BOX 992				TONOPAH	AZ	85354-0902
50659003	MILLETTE JAMES H/CAROL A	PO BOX 992		TONOPAH	AZ	85354	51523 W VAN BUREN ST		TONOPAH	85354	MILLETTE JAMES H/CAROL A	PO BOX 992				TONOPAH	AZ	85354-0902
50614017C	MJDD HOLDINGS LLC	PO BOX 13096		GLENDALE	AZ	85318					MJDD HOLDINGS LLC	PO BOX 13096				GLENDALE	AZ	85318
50659024	MOATAMER MANUCHEHR	PO BOX 11530		SANTA ANA	CA	92711					MOATAMER MANUCHEHR	PO BOX 11530				SANTA ANA	CA	92711-1530
40158006C	MOERMAN PATSY J/MORGAN CAROL M TR/MOERMAN E/P	529 B WALKERTOWN-GUTHRIE RD		WINSTON-SALEM	NC	27101					MOERMAN PATSY J/MORGAN CAROL M TR/M	529 B WALKERTOWN-GUTHRIE RD				WINSTON-SALEM	NC	27101-6310
40158006D	MOERMAN PATSY J/MORGAN CAROL M TR/MOERMAN E/P	529 B WALKERTOWN-GUTHRIE RD		WINSTON-SALEM	NC	27101					MOERMAN PATSY J/MORGAN CAROL M TR/M	527 WALKERTOWN GUTHRIE RD				WINSTON SALEM	NC	27101
40159008E	MONIZ DAVID	2067 NAVARRO AVE		PASADENA	CA	91103					RICHARDSON KEVIN B/JUDY A	34401 W DESERT ROSE RD				ARLINGTON	AZ	85322-8215
50622059A	MONTES ANDRES G/GUADALUPE Y	14810 N 74TH LN		PEORIA	AZ	85381					MONTES ANDRES G/GUADALUPE Y	14810 N 74TH LN				PEORIA	AZ	85381-4469
50620015	MUVDI JUNE M ETAL	3915 W DEVON		CHICAGO	IL	60645					MUVDI JUNE M ETAL	C/O LUNDSBERG PARTNERSHIP	1202 ALLANSON RD			MUNDELEIN	IL	60060-3808
50620014A	MUVDI JUNE M ETAL	3915 W DEVON		CHICAGO	IL	60645					MUVDI JUNE M ETAL	C/O LUNDSBERG PARTNERSHIP	1202 ALLANSON RD			MUNDELEIN	IL	60060-3808
40152036E	N/A	N/A	N/A	N/A	NA	N/A					PRINGLE DANIEL T/ELIZABETH A	3287 E TREMAINE AVE				GILBERT	AZ	85234-5276
50622044E	NAQVI ALI T/ATIA J/KAZMI SYED Z/MEENA H	18709 E SEAGULL DR		QUEEN CREEK	AZ	85142					NAQVI ALI T/ATIA J/KAZMI SYED Z/MEENA H	18709 E SEAGULL DR				QUEEN CREEK	AZ	85142-5144
50622044D	NAQVI ATHAR H/SOBIA YASMEEN	19755 S 190TH ST		QUEEN CREEK	AZ	85242					NAQVI ATHAR H/SOBIA YASMEEN	19755 S 190TH ST				QUEEN CREEK	AZ	85242-6897
40150004F	NARRAMORE 435 T LLC	2230 N UNIVERSITY PKWY	, UNIT 2C	PROVO	UT	84604					NARRAMORE 435 T LLC	2230 N UNIVERSITY PKWY	UNIT 2C			PROVO	UT	84604
40150005M	NARRAMORE 435 T LLC	2230 N UNIVERSITY PKWY	, UNIT 2C	PROVO	UT	84604					NARRAMORE 435 T LLC	2230 N UNIVERSITY PKWY UNIT 2C				PROVO	UT	84604-6708
40150005J	NARRAMORE 435 T LLC	2230 N UNIVERSITY PKWY	, UNIT 2C	PROVO	UT	84604					NARRAMORE 435 T LLC	2230 N UNIVERSITY PKWY UNIT 2C				PROVO	UT	84604-6708
50660016	NASLONSKI PAWEL/KATARZYNA	5702 N LAGUNA		LITCHFIELD PARK	AZ	85340					NASLONSKI PAWEL/KATARZYNA	5702 N LAGUNA				LITCHFIELD PARK	AZ	85340
50614016T	NAVA RAUL CABALLERO	6441 W MC DOWELL RD 1062		PHOENIX	AZ	85035					NAVA RAUL CABALLERO	4629 W GRANADA RD				PHOENIX	AZ	85035-4104
50629046	NAVARREZ PAUL/LETICIA	441 W WINDSOR		GLENDALE	CA	91204					NAVARREZ PAUL/LETICIA	441 W WINDSOR RD				GLENDALE	CA	91204-4249
50624007B	NAVARRO JOHNNY/DANIEL/RICHARD/EDWARD/ETAL	3730 W MONTE VISTA		PHOENIX	AZ	85009					NAVARRO JOHNNY/DANIEL/RICHARD/EDWARD/ETA	2605 W SONORAN BLVD 134				PHOENIX	AZ	85085-5205
40146020C	NEIRA YOLANDA	403 TERRACE AVE		GARDEN CITY	NY	11530					NEIRA YOLANDA	403 TERRACE AVE				GARDEN CITY	NY	11530-5425
50622156B	NELSON REVOCABLE TRUST	14910 S 43RD AVE		LAVEEN	AZ	85339					NELSON REVOCABLE TRUST	NELSON HAROLD W/CRYSTAL A TR	14910 S 43RD AVE			LAVEEN	AZ	85339-3262
40152032	NELSON SHAWN A	300 E MAPLE ST		REDOAK	IA	85354	10424 S 465TH AVE			85354	NELSON SHAWN A	300 E MAPLE ST				REDOAK	IA	85354-1526
40153006A	NEW CENTURY	4625 COOPERS HAWK RD		KLAMATH FALLS	OR	97601					NEW CENTURY	4625 COOPERS HAWK RD				KLAMATH FALLS	OR	97601-8664
50630017D	NEW HARQUAHALA GENERATING COMPANY LLC	2530 N 491ST AVE		TONOPAH	AZ	85354					NEW HARQUAHALA GENERATING COMPANY LLC	2530 N 491ST AVE				TONOPAH	AZ	85354-7123
50632010	NEWNAM JAMES ALAN/DARLINE IRENE TR	4540 N 18TH DR		PHOENIX	AZ	85015					NEWNAM JAMES ALAN/DARLINE IRENE TR	4540 N 18TH DR				PHOENIX	AZ	85015-3841
50632009	NEWNAM JAMES ALAN/DARLINE IRENE TR	4540 N 18TH DR		PHOENIX	AZ	85015					NEWNAM JAMES ALAN/DARLINE IRENE TR	4540 N 18TH DR				PHOENIX	AZ	85015-3841
50622123	NGUYEN LY D/LINH TUYET	407 BRIDALWOOD DR		MANDEVILLE	LA	70448					NGUYEN LY D/LINH TUYET	407 BRIDALWOOD DR				MANDEVILLE	LA	70448-6308
50659036	NIROUMAND AMENEH	7201 FOSTER ST		MORTON GROVE	IL	60053					NIROUMAND AMENEH	7201 FOSTER ST				MORTON GROVE	IL	60053-1104
50659037	NIROUMAND AMENEH	7201 FOSTER ST		MORTON GROVE	IL	60053					NIROUMAND AMENEH	7201 FOSTER ST				MORTON GROVE	IL	60053-1104
50622072G	NOEL SAM/CAROLINE	12967 W HIGHLAND AVE		LITCHFIELD PARK	AZ	85340					NOEL SAM/CAROLINE	12967 W HIGHLAND AVE				LITCHFIELD PARK	AZ	85340
40152015A	NUCICO ANICETO/MARIA CARLOTTA	7529 W MACKENZIE DR		PHOENIX	AZ	85033					NUCICO ANICETO/MARIA CARLOTTA	7350 W MONTECITO AVE				PHOENIX	AZ	85033-2526
40149032Q	NUNEZ JUAN J/ELVIRA	34033 W ENCINAS LN		TONOPAH	AZ	85354					NUNEZ JUAN J/ELVIRA	12362 W JOBLANCA RD				AVONDALE	AZ	85323
50629068	O & E FARMS LEASE # 01-100563	PO BOX 430		BUCKEYE	AZ	85326					ARIZONA STATE OF	O & E FARMS LEASE # 01-100563 CONTO	PO BOX 430			BUCKEYE	AZ	85326-0033
50622043J	OCONNOR DOUGLAS/BARBARA	2842 E LINDA CT		GILBERT	AZ	85296					OCONNOR DOUGLAS/BARBARA	2842 E LINDA CT				GILBERT	AZ	85296-6399
50622043G	OCONNOR DOUGLAS/BARBARA	2842 E LINDA CT		GILBERT	AZ	85296					OCONNOR DOUGLAS/BARBARA	2842 E LINDA CT				GILBERT	AZ	85296-6399
50622084G	ODISHO DANIEL/BASIMA	9606 KEELER AVE		SKOKIE	IL	60076					ODISHO DANIEL/BASIMA	9606 KEELER AVE				SKOKIE	IL	60076-1128
50622018D	OGSBURY INVESTMENTS LLC	PO BOX 275		COTTAGE GROVE	OR	97424					OGSBURY INVESTMENTS LLC	PO BOX 275				COTTAGE GROVE	OR	97424-0010
50622015F	OGSBURY INVESTMENTS LLC	PO BOX 275		COTTAGE GROVE	OR	97424					OGSBURY INVESTMENTS LLC	PO BOX 275				COTTAGE GROVE	OR	97424-0010
50623023E	OGSLAND LLC	PO BOX 32697		PHOENIX	AZ	85064					OGSLAND LLC	7047 E EARLL DR UNIT 1006				SCOTTSDALE	AZ	85251-6529
50623023F	OGSLAND LLC	PO BOX 32697		PHOENIX	AZ	85064					OGSBURY EARL G JR & MARGARET E	7047 E EARLL DR UNIT 1006				SCOTTSDALE	AZ	85251-6529

50623023C	OGSLAND LLC	PO BOX 32697	PHOENIX	AZ	85064			OGSLAND LLC	7047 E EARLL DR 1006			SCOTTSDALE	AZ	85251-6529
50624951	OKOLITA JOHN/HELEN	9205 N ASHLAND	NILES	IL	60714			OKOLITA JOHN/HELEN	9205 N ASHLAND			NILES	IL	60714-1305
50625005B	OLDHAM ENTERPRISES LLC	1180 N MOUNTAIN SPRINGS PA	SPRINGVILLE	UT	84663			EAGLETAIL 640 LLC	4616 E FIGHTER ACES DR			MESA	AZ	85215-2502
50622110	OLMSTED DAVID M	PO BOX 10633	SCOTTSDALE	AZ	85271			OLMSTED DAVID M	PO BOX 10633			SCOTTSDALE	AZ	85271-0633
50624009Q	ORLANDO RONALD T	850 E MONROE UNIT 20	BUCKEYE	AZ	85326			ORLANDO RONALD T	850 E MONROE UNIT 20			BUCKEYE	AZ	85326-2910
50622112A	OSBORNE CELIA GUADALUPE	3218 E BELL RD BOX 202	PHOENIX	AZ	85032			OSBORNE CELIA GUADALUPE	3218 E BELL RD BOX 202			PHOENIX	AZ	85032-2727
50632015	OSTROW VICTOR TR	4840 E CAIDA DEL SOL DR	PARADISE VALLEY	AZ	85253			OSTROW VICTOR TR	4840 E CAIDA DEL SOL DR			PARADISE VALLEY	AZ	85253-2013
50632018	OSTROW VICTOR TR	4840 E CAIDA DEL SOL DR	PARADISE VALLEY	AZ	85253			OSTROW VICTOR TR	4840 E CAIDA DEL SOL DR			PARADISE VALLEY	AZ	85253-2013
40158014	PACIFIC CAPITAL BANK	PO BOX 60704	SANTA BARBARA	CA	93160	18300 S OLD		85322 IL LEONI INC	718 E SIERRA VISTA DR			PHOENIX	AZ	85014-1220
50622068	PALO CRISTI INVESTMENTS INC ETAL	3801 E INDIAN SCHOOL RD	PHOENIX	AZ	85018			PALO CRISTI INVESTMENTS INC ETAL	3801 E INDIAN SCHOOL RD			PHOENIX	AZ	85018-5234
50622131	PANICKER PROPERTY INVESTMENTS L L C	78-18 264TH ST	FLORAL PARK	NY	11004			PANICKER PROPERTY INVESTMENTS L L C	78-18 264TH ST			FLORAL PARK	NY	11004-1308
50622132	PANICKER PROPERTY INVESTMENTS L L C	78-18 264TH ST	FLORAL PARK	NY	11004			PANICKER PROPERTY INVESTMENTS L L C	C/O PANICKER SHIRLEY P/PHILIP O	7818 264TH ST		FLORAL PARK	NY	11004-1308
50624012E	PASSMORE STEPHEN R/ELIZABETH R	2148 N 180 W	PLEASANT GROVE	UT	84062			PASSMORE STEPHEN R/ELIZABETH R	2148 N 180 W			PLEASANT GRV	UT	84062-9089
50622080	PASTORE ORLANDO/NINETTE/SERPE DOMENICO/RUTH	12547 S ARCHER AVE	LEMONT	IL	60439-9350			PASTORE ORLANDO/NINETTE/SERPE DOMENICO/R	12547 ARCHER AVE			LEMONT	IL	60439-6730
50622142	PATEL SUNILKUMAR N/PRITI S	225 BURNS RD	ELYRIA	OH	44035			PATEL SUNILKUMAR N & PRITI S	1124 W BARROW DR			CHANDLER	AZ	85224-2335
50622141	PATEL SUNILKUMAR N/PRITI S	225 BURNS RD	ELYRIA	OH	44035			PATEL SUNILKUMAR N/PRITI S	1124 W BARROW DR			CHANDLER	AZ	85224-2335
50622085B	PAWAR BALWINDER SINGH/GURDEV KAUR	8234 W CAMINO DE ORO	PEORIA	AZ	85383			PAWAR BALWINDER SINGH/GURDEV KAUR	8234 W CAMINO DE ORO			PEORIA	AZ	85383-5604
40152024	PAXTON WESTLEY A/KIMBERLY K	1068 SCENIC BLVD	CHESAPEAKE	VA	23328			PAXTON WESTLEY A/KIMBERLY K	1068 SCENIC BLVD			CHESAPEAKE	VA	23328-7323
50621010A	PEACEFUL HAPPY LAND GROUP FOUR LLC	11224 N 33RD ST	PHOENIX	AZ	85028			PEACEFUL HAPPY LAND GROUP FOUR LLC	11224 N 33RD ST			PHOENIX	AZ	85028-2723
40149001F	PHAM HONG THU/HOANG TRONG	3333 N GARDEN LN	AVONDALE	AZ	85323			PHAM HONG THU/HOANG TRONG	3333 N GARDEN LN			AVONDALE	AZ	85323-3813
40149008E	PHAM HONG THU/HOANG TRONG	3333 N GARDEN LN	AVONDALE	AZ	85323			PHAM HONG THU/HOANG TRONG	3333 N GARDEN LN			AVONDALE	AZ	85323-3813
40149001G	PHAM HONG THU/HOANG TRONG	3333 N GARDEN LN	AVONDALE	AZ	85323			PHAM HONG THU/HOANG TRONG	3333 N GARDEN LN			AVONDALE	AZ	85323-3813
50659053	PHILLIPS BRYAN KELVIN/STEFANIE PANNELL	8264 GREENVIEW DR	JONESBORO	GA	30235			PHILLIPS BRYAN KELVIN/STEFANIE PANNELL	8264 GREENVIEW DR			JONESBORO	GA	30235-4182
50659060	PHILLIPS BRYAN KELVIN/STEFANIE PANNELL	8264 GREENVIEW DR	JONESBORO	GA	30235			PHILLIPS BRYAN KELVIN/STEFANIE PANNELL	8264 GREENVIEW DR			JONESBORO	GA	30236-4182
50659054	PHILLIPS BRYAN KELVIN/STEFANIE PANNELL	8264 GREENVIEW DR	JONESBORO	GA	30235			PHILLIPS BRYAN KELVIN/STEFANIE PANNELL	8264 GREENVIEW DR			JONESBORO	GA	30236-4182
50622018G	PHILLIPS PAUL JOSEPH TR	4635 W PORT AU PRINCE LN	GLENDALE	AZ	85306			PHILLIPS PAUL JOSEPH TR	4635 W PORT AU PRINCE LN			GLENDALE	AZ	85306-3631
50622140	PHOENIX HOUSING SOLUTIONS II LLC	23233 N PIMA RD 113-240	SCOTTSDALE	AZ	85255			PHOENIX HOUSING SOLUTIONS II LLC	23233 N PIMA RD # 113-240			SCOTTSDALE	AZ	85255-8388
50660007	PIOVANO JILL A TR	6225 E MONTGOMERY RD	CAVE CREEK	AZ	85331			PIOVANO JILL A TR	6225 E MONTGOMERY RD			CAVE CREEK	AZ	85331-3079
50660008	PIOVANO JILL A TR	6225 E MONTGOMERY RD	CAVE CREEK	AZ	85331			PIOVANO JILL A TR	6225 E MONTGOMERY RD			CAVE CREEK	AZ	85331-3079
50621008L	PISSIOS RONDA R	1705 PAVILION WAY STE 501	PARK RIDGE	IL	60068			PISSIOS RONDA R	1705 PAVILION WAY STE 501			PARK RIDGE	IL	60068-1119
50623033L	PITTS MYONG C	5266 W ANGELA DR	GLENDALE	AZ	85308			PITTS MYONG C	5266 W ANGELA DR			GLENDALE	AZ	85308-5344
40149030	PLANCK JERE W/MARY CHRISTINE TR	5420 E EXETER BLVD	PHOENIX	AZ	85018			PLANCK JERE W/MARY CHRISTINE TR	5420 E EXETER BLVD			PHOENIX	AZ	85018-3105
50614016Q	PLATA MAURA I/PLATA ERNESTO	3050 N 83RD LN	PHOENIX	AZ	85037			PLATA MAURA I/PLATA ERNESTO	3050 N 83RD LN			PHOENIX	AZ	85037-3353
50614016S	PLATA MAURA I/PLATA ERNESTO	3050 N 83RD LN	PHOENIX	AZ	85037			PLATA MAURA I/PLATA ERNESTO	3050 N 83RD LN			PHOENIX	AZ	85037-3353
50614016R	PLATA MAURA I/PLATA ERNESTO	3050 N 83RD LN	PHOENIX	AZ	85037			PLATA MAURA I/PLATA ERNESTO	3050 N 83RD LN			PHOENIX	AZ	85037-3353
50614016P	PLATA MAURA I/PLATA ERNESTO	3050 N 83RD LN	PHOENIX	AZ	85037			PLATA MAURA I/PLATA ERNESTO	3050 N 83RD LN			PHOENIX	AZ	85037-3353
40144005	POCHELSKI LENORE/LUCILLE B/LOUISE	1718 N BROADWAY	MELROSE PARK	IL	60160			POCHELSKI LENORE/LUCILLE B/LOUISE	4 CHICHESTER ON ASBURY			ROLLING MEADOWS	IL	60008
50660015	POZEFSKY DANIEL W/FEELEY COLLEEN A	27306 N 59TH DR	PHOENIX	AZ	85085			POZEFSKY DANIEL W/FEELEY COLLEEN A	27306 N 59TH DR			PHOENIX	AZ	85085-6524
40152037	POZEFSKY DANIEL W/FEELEY COLLEEN R	27306 N 59TH DR	PHOENIX	AZ	85085			POZEFSKY DANIEL W/FEELEY COLLEEN R	27306 N 59TH DR			PHOENIX	AZ	85085-6524
40152047	PROPER THERON A/LORNA A	3634 N 423RD AVE	TONOPAH	AZ	85354			PROPER THERON A/LORNA A	3634 N 423RD AVE			TONOPAH	AZ	85354-8392
50628007A	PSC-94 SITE L.L.C.	PO BOX 668	BUCKEYE	AZ	85326			PSC-94 SITE L.L.C.	PO BOX 668			BUCKEYE	AZ	85326-0049
50628027B	PSC-94 SITE L.L.C.	PO BOX 668	BUCKEYE	AZ	85326			SCP 94 FARM LLC	C/O TG LAND & INVESTMENT LLC	P O BOX 668		BUCKEYE	AZ	85326-0049
50660019	QUALEX CONSTRUCTION INC	PO BOX 1639	APACHE JUNCTION	AZ	85217			QUALEX CONSTRUCTION INC	PO BOX 697			TONOPAH	AZ	85354-0697
50660022	QUALEX CONSTRUCTION INC	PO BOX 1639	APACHE JUNCTION	AZ	85217			QUALEX CONSTRUCTION INC	PO BOX 697			TONOPAH	AZ	85354-0697
40152019	QUINONES RUBEN C/CAROL/DELGADO MARTIN	1101 N 27TH LN	PHOENIX	AZ	85009			BAYVIEW FINANCIAL PROPERTY TRUST CONTO	1101 N 27TH LN			PHOENIX	AZ	85009-3946
50622042	QUINONEZ JAIMA A/CAMACHO GUILLERMINA	7585 WEST COLTER STREET	GLENDALE	AZ	85303			QUINONEZ JAIME A/CAMACHO GUILLERMINA	7585 WEST COLTER STREET			GLENDALE	AZ	85303-6603
50660020	R R & R R EVANS CO	P O BOX 5840	MESA	AZ	85201			BROWN EVANS DISTRIBUTING CO	PO BOX 5840			MESA	AZ	85211-5840
50614019C	RADZIETA JAN	25709 W WILLIAMS CT	BUCKEYE	AZ	85326			RADZIETA JAN	25709 W WILLIAMS CT			BUCKEYE	AZ	85326-2982
50614019B	RADZIETA JAN	25709 W WILLIAMS CT	BUCKEYE	AZ	85326			RADZIETA JAN	25709 W WILLIAMS CT			BUCKEYE	AZ	85326-2982
40149009	RAMADA SAFARI INC	1 SYLVAN WAY	, PO BOX 641 PARSIPPANY	NJ	07054			RENAISSANCE HOTEL OPERATING CO	CTF DEVELOPMENT INC	1300 CONNETICUT AVE NW STE 901		WASHINGTON	DC	20036-1752
50622043C	RANDHAWA ARVINDER	2727 E BEAUTIFUL LN	PHOENIX	AZ	85042			RANDHAWA ARVINDER	2727 E BEAUTIFUL LN			PHOENIX	AZ	85042-7074
50659061	RANJBAR SIMIN	4472 W WALTON WY	CHANDLER	AZ	85226			RANJBAR SIMIN	4472 W WALTON WY			CHANDLER	AZ	85226-6206
40152033	RASCON HECTOR/VICTORIA P	5327 N TORNO CT	LITCHFIELD PARK	AZ	85340			RASCON HECTOR/VICTORIA P	5327 N TORNO CT			LITCHFIELD PARK	AZ	85340
50622071	RASOOLY MICHAEL M/ZIBA	3583 MAIN ST	OAKLEY	CA	94561			RASOOLY MICHAEL M	3583 MAIN ST			OAKLEY	CA	94561-3174
50622062	RASOOLY MICHAEL M/ZIBA F	3583 MAIN ST	OAKLEY	CA	94561			RASOOLY MICHAEL M/ZIBA F	3583 MAIN ST			OAKLEY	CA	94561-3174
50622101B	RAWAY JAMES J/GAIL	12107 S 208TH AVE	BUCKEYE	AZ	85326			RAWAY JAMES J/GAIL	12107 S 208TH AVE			BUCKEYE	AZ	85326-1933
40152016N	REID RHONDA R/JAMES F SR	1230 E DESERT COVE AVE	PHOENIX	AZ	85020			REID RHONDA R/JAMES F SR	1230 E DESERT COVE AVE			PHOENIX	AZ	85020-1108
50622069	REILLY ELLEN J	7175 E YANCEY LANE	FLAGSTAFF	AZ	86004			REILLY ELLEN J	13080W PALO VERDE DR			CHANDLER	AZ	85224
50622113	REUMAN ROBERT W TR	7738 N 12TH ST APT 2	PHOENIX	AZ	85020			REUMAN ROBERT W TR	4209 N 84TH ST			OMAHA	NE	68134-4215
50622135	REUMAN ROBERT W TR	7738 N 12TH ST APT 2	PHOENIX	AZ	85020			REUMAN ROBERT W TR	4209 N 84TH ST			OMAHA	NE	68134-4215
50659004A	REYNA LEONARDO C	PO BOX 81	TONOPAH	AZ	85354	226 N 515TH AVE		85354 REYNA LEONARDO C	PO BOX 827			TONOPAH	AZ	85354-0827
40155018	RHIND RALPH TR	2054 MANHATTAN AVE	HERMOSA BEACH	CA	90254			RHIND RALPH TR	2054 MANHATTAN AVE			HERMOSA BEACH	CA	90254-2862
50624011T	RICH ROSE DEVELOPMENT LLC	12658 N 150TH LN	SURPRISE	AZ	85379			RICHROSE DEVELOPMENT LLC	PO BOX 23693			TEMPE	AZ	85285-3693
40159008S	RICHARDSON HUGH W/CHERYLE A	2650 W. UNION HILLS DR. LOT 106	PHOENIX	AZ	85027-5013	18813 S OLD HIGHWAY 80		85322 RICHARDSON HUGH W/CHERYLE A	18813 S OLD US HIGHWAY 80			ARLINGTON	AZ	85322-8206
40159007C	RICHARDSON KEVIN B	STAR RT 3 BOX 138	ARLINGTON	AZ	85322	34401 W DESERT ROSE RD		RICHARDSON KEVIN B	34401 W DESRT ROSE RD			ARLINGTON	AZ	85322-8215
40159006	RICHARDSON KEVIN B	STAR RT 3 BOX 138	ARLINGTON	AZ	85322			RICHARDSON KEVIN B	34401 W DESERT ROSE RD			ARLINGTON	AZ	85322-8215
40159007B	RICHARDSON KEVIN B/JUDY A	34401 W DESERT ROSE RD	ARLINGTON	AZ	85322			RICHARDSON KEVIN B/JUDY A	34401 W DESERT ROSE RD			ARLINGTON	AZ	85322-8215
40159008W	RICHARDSON SAM K JR	34401 W DESERT ROSE RD	ARLINGTON	AZ	85322			RICHARDSON SAM K JR	34401 W DESERT ROSE RD			ARLINGTON	AZ	85322-8215
40150006A	ROBERT L AND JACKLYNE M TAIGEN REV TRUST	PO BOX 147	COOLIN	ID	83821			BLUE NANCY	1911 EL FREDA RD			TEMPE	AZ	85284-8012
50622065B	RODENBACH ROBERT H	7559 E NESTLING WY	SCOTTSDALE	AZ	85255			RODENBACH ROBERT H	7559 E NESTLING WY			SCOTTSDALE	AZ	85255-4642
50622072B	ROLAND GERALD/SALLY	11558 W APACHE ST	AVONDALE	AZ	85323			ROLAND GERALD/SALLY	11558 W APACHE ST			AVONDALE	AZ	85323-6209
50660009A	ROSE ACCEPTANCE INC	241 E SAGINAW - PO BOX 980	EAST LANSING	MI	48826			CASTELLANO DIEGO/ MARIA	8043 E JUANITA AVE			MESA	AZ	85208-4341
50660009B	ROSE ACCEPTANCE INC	241 E SAGINAW - PO BOX 980	EAST LANSING	MI	48826			CASTELLANO DIEGO/ MARIA	8043 E JUANITA AVE			MESA	AZ	85208-4341
50622084H	RUETHER FAMILY TRUST	16316 E CRYSTAL RIDGE DR	FOUNTAIN HILLS	AZ	85268			RUETHER FAMILY TRUST	16316 E CRYSTAL RIDGE DR			FOUNTAIN HILLS	AZ	85268
40150007D	RUIZ BRENDA	6518 S 71ST DR	LAVEEN	AZ	85339			RUIZ BRENDA	6518 S 71ST DR			LAVEEN	AZ	85339-5018
50623044M	RUIZ EDUARDO OCTAVIO	2226 S 85TH DR	TOLLESON	AZ	85353			RUIZ EDUARDO OCTAVIO	2226 S 85TH DR			TOLLESON	AZ	85353-8723
50623044J	RUIZ EDUARDO OCTAVIO	2226 S 85TH DR	TOLLESON	AZ	85353			RUIZ EDUARDO OCTAVIO	2226 S 85TH DR			TOLLESON	AZ	85353-8723
50623044L	RUIZ PABLO	6322 W KEIM DR	GLENDALE	AZ	85301			RUIZ PABLO	6322 W KEIM DR			GLENDALE	AZ	85301-5026
50623044K	RUIZ PABLO	6322 W KEIM DR	GLENDALE	AZ	85301			RUIZ PABLO	6322 W KEIM DR			GLENDALE	AZ	85301-5026
50622061	SAAVEDRA ALICIA	6703 W WILSHIRE AVE	PHOENIX	AZ	85035			SAAVEDRA ALICIA	6703 W WILSHIRE DR			PHOENIX	AZ	85035-1413
40149005E	SADDLEBACK CATTLE CO LP	PO BOX 1084	BUCKEYE	AZ	85326			SADDLEBACK CATTLE CO LP	PO BOX 150			BUCKEYE	AZ	85322-0150
50622015E	SALIBA K M/MCKEEVER J M/J J ETAL	7038 W STOCKMAN RD	GLENDALE	AZ	85308			SALIBA K M/MCKEEVER J M/J J ETAL	7038 W STOCKMAN RD			GLENDALE	AZ	85308-8050
40149004A	SALIH RAAD M	2316 E ALLEY ST	PHOENIX	AZ	85042			SALIH RAAD M	2316 E ALLEN ST			PHOENIX	AZ	85042-8105
50622017	SALM FRANK/GAIL M TR	22818 N 49TH ST	PHOENIX	AZ	85054			SALM FRANK/GAIL M TR	22818 N 49TH ST			PHOENIX	AZ	85054-6131
50622016	SALM FRANK/GAIL M TR	22818 N 49TH ST	PHOENIX	AZ	85054			SALM FRANK/GAIL M TR	22818 N 49TH ST			PHOENIX	AZ	85054-6131
50659059	SALVATORE GATTO PARTN LP/VICTOR BADA PARTN LP	PO BOX 33248	PHOENIX	AZ	85067			SALVATORE GATTO PARTN LP/VICTOR BADA PAR	PO BOX 33248			PHOENIX	AZ	85067-3248
50659058	SALVATORE GATTO PARTN LP/VICTOR BADA PARTN LP	PO BOX 33248	PHOENIX	AZ	85067			SALVATORE GATTO PARTN LP/VICTOR BADA PAR	PO BOX 33248			PHOENIX	AZ	85067-3248
50623023D	SALVATORE GATTO PARTNERS LP	PO BOX 33184	PHOENIX	AZ	85067			SALVATORE GATTO PARTNERS LP	PO BOX 33184			PHOENIX	AZ	85067-3184
50623043	SALVINI JOHN M	P O BOX 579	SELAH	WA	98942			SALVINI JOHN M	P O BOX 579			SELAH	WA	98942-0579
50623028B	SALVINI JOHN M	P O BOX 579	SELAH	WA	98942			SALVINI JOHN M	P O BOX 579			SELAH	WA	98942-0579
50629031C	SANBORN GREG/PHOEBE	145 OLD N GROTON RD	RUMNEY	NH	03266			SANBORN GREG/PHOEBE	145 OLD N GROTON RD			RUMNEY	NH	03266-3323
50622055C	SANCHEZ DAVID G	3020 S 68TH DR	PHOENIX	AZ	85043			SANCHEZ DAVID G	3020 S 68TH DR			PHOENIX	AZ	85043-6700
50622055B	SANCHEZ DAVID G	3020 S 68TH DR	PHOENIX	AZ	85043	51723 W MCDOWELL RD		85354 SANCHEZ DAVID G	51723 W MCDOWELL RD			TONOPAH	AZ	85354
40158031G	SANDERS RICHARD M TR	PO BOX 19	PALO VERDE	AZ	85343			SANDERS RICHARD M TR	PO BOX 19			PALO VERDE	AZ	85343-0019
40158031E	SANDERS RICHARD M TR	PO BOX 19	PALO VERDE	AZ	85343			SANDERS RICHARD M TR	PO BOX 19			PALO VERDE	AZ	85343-0019
40159009A	SANDERS RICHARD M/DEBRA J TR	P O BOX 19	PALO VERDE	AZ	85343			SANDERS RICHARD M/DEBRA J TR	PO BOX 19			PALO VERDE	AZ	85343-0019

40159010A	SANDERS RICHARD M/DEBRA J TR	P O BOX 19	PALO VERDE	AZ	85343			SANDERS RICHARD M/DEBRA J TR	PO BOX 19				PALO VERDE	AZ	85343-0019
50629063	SANSEVIERI ANTHONY/TAMMY A	51328 W BUCKEYE RD	TONOPAH	AZ	85354	51328 W BUCKEYE RD	85354	SANSEVIERI ANTHONY JR/TAMMY A	PO BOX 693				TONOPAH	AZ	85354-0693
50622074	SAWAGED FUAD D/ABEER N	1501 W WINDROSE DR	PHOENIX	AZ	85029			SAWAGED FUAD D/ABEER N	1501 W WINDROSE DR				PHOENIX	AZ	85029-2806
50622089A	SAYEGH ROGER/NANCY	124 FALMOUTH RD	SCARSDALE	NY	10583			SAYEGH ROGER/NANCY	124 FALMOUTH RD				SCARSDALE	NY	10583-4752
50622078A	SAYEGH SUSAN	27 PARK TERRACE	SOUTH CONGERS	NY	10920			SAYEGH SUSAN	27 PARK TERRACE				SOUTH CONGERS	NY	10920-2625
50622081	SCALZO ANTHONY/JOSEPHINE TR	717 N EIGHT AVE	ADDISON	IL	60101			SCALZO ANTHONY/JOSEPHINE TR	717 N 8TH AVE				ADDISON	IL	60101-2085
50622076	SCALZO ANTHONY/JOSEPHINE TR	717 N EIGHT AVE	ADDISON	IL	60101			SCALZO ANTHONY/JOSEPHINE TR	717 N 8TH AVE				ADDISON	IL	60101-2085
50622015G	SCHAER FAMILY TRUST	24592 VIA RAZA	LAKE FOREST	CA	92630			SCHAER FAMILY TRUST	24592 VIA RAZA				LAKE FOREST	CA	92630-2039
50624016	SCHOOL DIST 201 /BUCKEYE UNION H S/	902 EASON AVE	BUCKEYE	AZ	85326			SCHOOL DIST 201 /BUCKEYE UNION H S/	902 E EASON AVE				BUCKEYE	AZ	85326-2602
50624015	SCHOOL DIST 47 ARLINGTON SCHOOL	STAR RT BOX 125	ARLINGTON	AZ	85322	52340 W VAN BUREN ST	85354	SCHOOL DIST 47 ARLINGTON SCHOOL	PO BOX 125				ARLINGTON	AZ	85322-0125
50622122	SCHRODER SCOTT/BARBARA	30251 W LOWER RIVER RD	BUCKEYE	AZ	85326			SCHRODER SCOTT/BARBARA	30251 W LOWER RIVER RD				BUCKEYE	AZ	85326-5423
50624009X	SCOTT RUSSELL L	904 S ANNE AVE	TONOPAH	AZ	85354	904 S ANNE AVE		SCOTT RUSSELL L	904 S ANNE AVE				TONOPAH	AZ	85354-7335
50620023A	SEVEN LAKES COMPANY INC	P O BOX 190	TONOPAH	AZ	85354			SEVEN LAKES COMPANY INC	PO BOX 190				TONOPAH	AZ	85354-0190
40153006B	SHABAN AHMAD M/IBTISSAM D	19402 N 15TH AVE	PHOENIX	AZ	85027			SHABAN AHMAD	19402 N 15TH AVE				PHOENIX	AZ	85027-4608
40155004A	SHAWVER PATRICIA E	PO BOX 5	AVONDALE	AZ	85323			SHAWVER PATRICIA E	PO BOX 5				AVONDALE	AZ	85323-0011
40153005	SHAWYER COREY L	12 DUTCHTOWN RD	HOUTZDALE	PA	16651			SHAWVER COREY L	12 DUTCHTOWN RD				HOUTZDALE	PA	16651-9225
40150003	SHETH ASHVIN/PRAGNA	2310 E MINTON ST	MESA	AZ	85213			SHETH ASHVIN/PRAGNA	2310 E MINTON ST				MESA	AZ	85213-1428
50614025	SHIN GLEN Y/SO YOUNG H	8227 W BEAUBIEN DR	PEORIA	AZ	85382			SHIN GLEN Y/SO YOUNG H	8227 W BEAUBIEN DR				PEORIA	AZ	85382-3469
50622100	SHINDO INVESTMENTS LLC	3850 E BARBARITA AVE	GILBERT	AZ	85234			SHINDO INVESTMENTS LLC	3850 E BARBARITA AVE				GILBERT	AZ	85234-3259
50622096F	SHOSHANI LINA	7918 MORNING QUEEN DR	LAS VEGAS	NV	89178			SHOSHANI LINA	7918 MORNING QUEEN DR				LAS VEGAS	NV	89178-8272
50622096C	SHOSHANI LINA/VALIA/RAUA	7918 MORNING QUEEN DR	LAS VEGAS	NV	89179			FIRST AMERICAN TITLE INS CO TR 8504	SHOSHANI LINA/VALIA/RAUA	CONTO	7918 MORNING QUEEN DR		LAS VEGAS	NV	89179-8272
50622096G	SHOSHANI RAUA	7918 MORNING QUEEN DR	LAS VEGAS	NV	89178			SHOSHANI RAUA	7918 MORNING QUEEN DR				LAS VEGAS	NV	89178-8272
50622096D	SHOSHANI VALIA	7918 MORNING QUEEN DR	LAS VEGAS	NV	89178			SHOSHANI VALIA	7918 MORNING QUEEN DR				LAS VEGAS	NV	89178-8272
50628035C	SIKON CHESTER	5649 W HAZLEWOOD	PHOENIX	AZ	85031			SIKON CHESTER	5649 W HAZELWOOD ST				PHOENIX	AZ	85031-1626
50614019E	SILESIA TRUST	14562 W SHAW BUTTE DR	SURPRISE	AZ	85379			SILESIA TRUST	SILESIA LLC TR		14562 W SHAW BUTTE DR		SURPRISE	AZ	85379-4460
40152011	SILVER JACK/ROXIE TR/BURACK TR/SJB INVESMENTS	8096 N 85TH WAY STE 102	SCOTTSDALE	AZ	85258			SILVER JACK/ROXIE TR/BURACK TR/SJB INVES	SJB INVESTMENTS		7505 E MAIN ST STE 600		SCOTTSDALE	AZ	85251-4560
40146019B	SIMPSON J ERNESTINE	3831 N BAYOU LN	BOISE	ID	83702			SIMPSON J ERNESTINE	3831 N BAYOU LN				BOISE	ID	83702-3023
40149019	SIMPSON VICTOR A	2730 W MONTE AVE	MESA	AZ	85202			SIMPSON VICTOR A	2730 W MONTE AVE				MESA	AZ	85202-6919
40152013G	SIMS CARWELL/CATHERINE	62040 S 17TH ST	PHOENIX	AZ	85040			SIMS CARWELL/CATHERINE	6240 S 17TH ST				PHOENIX	AZ	85040-4509
50622120	SINGH BIKHRAM/BIBI BANOO TR	933 E MARCO POLO RD	PHOENIX	AZ	85024			SINGH BIKHRAM/BIBI BANOO TR	933 E MARCO POLO RD				PHOENIX	AZ	85024-1128
50622053A	SINGH JESSICA TR	51827 W ENCANTO BLVD	TONOPAH	AZ	85354			SINGH JESSICA TR	51827 W ENCANTO BLVD				TONOPAH	AZ	85354
50622055I	SINGH REVOCABLE TRUST	10842 N 127TH PL	SCOTTSDALE	AZ	85259			SINGH REVOCABLE TRUST	SINGH JESSICA TRUSTEE		10842 N 127TH PL		SCOTTSDALE	AZ	85259-3844
50622024B	SLIFF JAMES B/GREGSON T/SWENSON L ETAL	854 BARD	HERMOSA BEACH	CA	90254			SLIFF JIM	854 BARD ST				HERMOSA BEACH	CA	90254-4232
50622157	SLPR LLC	4800 N SCOTTSDALE RD NO 6000	SCOTTSDALE	AZ	85251			SLPR LLC	4800 N SCOTTSDALE RD NO 6000				SCOTTSDALE	AZ	85251-7616
40152013K	SMITH EL RAY	6240 S 17TH ST	PHOENIX	AZ	85042			SMITH EL RAY	5408 S 18TH AVE				PHOENIX	AZ	85041-3810
50622043D	SMITH GRADY	20908 W WATKINS ST	BUCKEYE	AZ	85326			SMITH GRADY	P O BOX 641				TONOPAH	AZ	85354-0641
50623005B	SMITH NATHAN/MIKE	4200 149TH AVE SE	SAWYER	ND	58781			SMITH NATHAN/MIKE	4200 149TH AVE SE				SAWYER	ND	58781-9101
40145003	SMITH NATHAN/NESHEM ROGER	4200 149TH AVE SE	SAWYER	ND	58781			SMITH NATHAN/NESHEM ROGER	4200 149TH AVE SE				SAWYER	ND	58781-9101
50614022B	SMK LAND HOLDINGS LLC	1920 E MARYLAND 32	PHOENIX	AZ	85016			SMK LAND HOLDINGS LLC	SHARON CONTORNO3		1920 E MARYLAND 32		PHOENIX	AZ	85016-1455
50660017	SMK LAND HOLDINGS LLC	1920 E MARYLAND AVE STE 32	PHOENIX	AZ	85016			SMK LAND HOLDINGS LLC`	1920 E MARYLAND AVE STE 32				PHOENIX	AZ	85016-1455
50622116	SORENSEN STERLING C	1511 N SUNSET DR	TEMPE	AZ	85281			SORENSEN STERLING C	1511 N SUNSET DR				TEMPE	AZ	85281-1533
50622115	SORENSEN STERLING C	1511 N SUNSET DR	TEMPE	AZ	85281			SORENSEN STERLING C	1511 N SUNSET DR				TEMPE	AZ	85281-1533
40149012B	SOUTH 40 TURNING POINTE LLC	3411 N 5TH AVE	PHOENIX	AZ	85013			SOUTH 40 TURNING POINTE LLC	201 E GLENN DR				PHOENIX	AZ	85020-4829
50620016	SOUTHWESTERN AGRICULTURAL SERVICES INC	3480 GS RICHARDS BLVD STE 101	CARSON CITY	NV	89703			SOUTHWESTERN AGRICULTURAL SERVICES INC	3480 GS RICHARDS BLVD STE 101				CARSON CITY	NV	89703-8442
50620013A	SOUTHWESTERN AGRICULTURAL SERVICES INC	3480 GS RICHARDS BLVD STE 101	CARSON CITY	NV	89703			SOUTHWESTERN AGRICULTURAL SERVICES INC	3480 GS RICHARDS BLVD STE 101				CARSON CITY	NV	89703-8442
50624012F	SRP TRUST	2148 N 180 W	PLEASANT GROVE	UT	84062			PASSMORE STEPHEN R/ELIZABETH R	2148 N 180 W				PLEASANT GRV	UT	84062-9089
50624010B	ST HENRY ROMAN CATHOLIC PARISH BUCKEYE	400 E MONROE	PHOENIX	AZ	85004			ST HENRY ROMAN CATHOLIC PARISH BUCKEYE	400 E MONROE				PHOENIX	AZ	85004-2336
40152016P	STAECK ANN	2401 SOUTH 226TH DRIVE	BUCKEYE	AZ	85326			STAECK ANN	2401 S 226TH DR				BUCKEYE	AZ	85326-3915
50622022	STANFORD MARY	7321 N 16TH ST	PHOENIX	AZ	85020			STANFORD MARY	7321 N 16TH ST				PHOENIX	AZ	85020-5224
50629053	STOYANOV KRYSTYNA E/VALERY M/KONRAD	4017 N 11TH ST	PHOENIX	AZ	85014			STOYANOV KRYSTYNA E/VALERY M/KONRAD	4017 N 11TH ST				PHOENIX	AZ	85014-4804
50660021	STRANDER PETROLEUM INC	30151-A W OLD US HIGHWAY 80	PALO VERDE	AZ	85343			STRANDER PETROLEUM INC	30151-A W OLD US HIGHWAY 80				PALO VERDE	AZ	85343
50622019C	SU EDWIN K	1421 DE FALCO WAY	SAN JOSE	CA	95131			SU EDWIN K	1421 DE FALCO WY				SAN JOSE	CA	95131-3237
40152016E	SURDAKOWSKI FRANCIS P/LINDA M	14619 N 14TH DR	PHOENIX	AZ	85010			SURDAKOWSKI FRANCIS P/LINDA M	14619 N 14TH DR				PHOENIX	AZ	85010-5194
50622072E	SURVIVORS TRUST UNDER NUMEH FAM TRUST/ETAL	24138 W TONTO ST	BUCKEYE	AZ	85326			NUMEH BUTROS/ROSE TR	20978 W WHITE ROCK RD				BUCKEYE	AZ	85396-1594
50614021	SUTHERLAND BARRY K/SHARON LEE TR	PO BOX 1562	GILBERT	AZ	85299	51106 W COURT HOUSE RD	85354	SUTHERLAND BARRY K/SHARON LEE TR	PO BOX 1562				GILBERT	AZ	85299-1562
50622049	SUTHERLAND BARRY K/SHARON LEE TR	PO BOX 1562	GILBERT	AZ	85299			SUTHERLAND BARRY K/SHARON LEE TR	PO BOX 1562				GILBERT	AZ	85299-1562
50614018	SUTHERLAND BARRY K/SHARON LEE TR	PO BOX 1562	GILBERT	AZ	85299			SUTHERLAND BARRY K/SHARON LEE TR	PO BOX 1562				GILBERT	AZ	85299-1562
50622048	SUTHERLAND BARRY K/SHARON LEE TR	PO BOX 1562	GILBERT	AZ	85299			SUTHERLAND BARRY K/SHARON LEE TR	PO BOX 1562				GILBERT	AZ	85299-1562
50623041	SUTHERLAND FAMILY REVOCABLE LIVING TRUST	PO BOX 1562	GILBERT	AZ	85299			SUTHERLAND FAMILY REVOCABLE LIVING TRUST	PO BOX 1562				GILBERT	AZ	85299-1562
40158005	SUTTER RICK/KAREN TR	PO BOX 1198	BUCKEYE	AZ	85326	18023 S 347TH AVE	85322	SUTTER RICK/KAREN TR	PO BOX 1198				BUCKEYE	AZ	85326-0088
50660030	SZUL IRENA	PO BOX 1693	LITCHFIELD PARK	AZ	85340			SZUL IRENA	2822 N MEVINA AVE				CHICAGO	IL	60634
50660027	SZUL IRENA	PO BOX 1693	LITCHFIELD PARK	AZ	85340			SZUL IRENA	2822 N MEVINA AVE				CHICAGO	IL	60634
50624948	SZUSTAK SOPHIE	12629 W APODACA DR	LITCHFIELD PARK	AZ	85340			SZUSTAK SOPHIE	12629 W APODACA DR				LITCHFIELD PARK	AZ	85340
50624950	SZUSTAK SOPHIE	12629 W APODACA DR	LITCHFIELD PARK	AZ	85340			SZUSTAK SOPHIE	12629 W APODACA DR				LITCHFIELD PARK	AZ	85340
40155017	TALEBI KAM/SARA R	18734 MELROSE CHASE	EDEN PRAIRIE	MN	55347			TALEBI KAM/SARA R	18734 MELROSE CHASE				EDEN PRAIRIE	MN	55347-3479
40149042	TAPIA TRINIDAD/JOSEFINA L	4026 W BLUEFIELD AVE	GLENDALE	AZ	85308-1813			SECURITY TITLE AGENCY INC TR 7334	TAPIA TRINIDAD/JOSEFINA L	CONTO	4026 W BLUEFIELD AVE		GLENDALE	AZ	85308-1813
40152015B	TATTIE LAND LP	20107 W MEDLOCK	LITCHFIELD PARK	AZ	85340			TATTIE LAND LP	20011 W MINNEZONA AVE				LITCHFIELD PARK	AZ	85340
50620024A	TFP ENTERPRISES LLC	19820 W PINNACLE PEAK RD	SURPRISE	AZ	85387			TFP ENTERPRISES LLC	19820 W PINNACLE PEAK RD				SURPRISE	AZ	85387-9775
50622058A	TFP ENTERPRISES LLC	19820 W PINNACLE PEAK RD	SURPRISE	AZ	85387			TFP ENTERPRISES LLC	19820 W PINNACLE PEAK RD				SURPRISE	AZ	85387-9775
50620018B	THOMAS ALLEN R/BARBARA BANDFIELD	5301 E ARCADIA LN	PHOENIX	AZ	85018			THOMAS ALLEN R	5301 E ARCADIA LN				PHOENIX	AZ	85018-3004
50622103	THOMAS HARRY W	P O BOX 683	TONOPAH	AZ	85354			THOMAS HARRY W	PO BOX 683				TONOPAH	AZ	85354-0683
50624012D	THOMPKINS LOIS/BIRD CLIFFORD/MCDONALD DEBRA	PO BOX 785	CAMP VERDE	AZ	86322			THOMPKINS LOIS/BIRD CLIFFORD/MCDONALD DE	PO BOX 785				CAMP VERDE	AZ	86322-0785
50624012B	THOMPKINS LOIS/BIRD CLIFFORD/MCDONALD DEBRA	PO BOX 785	CAMP VERDE	AZ	86322			THOMPKINS LOIS/BIRD CLIFFORD/MCDONALD DE	PO BOX 785				CAMP VERDE	AZ	86322-0785
50622101A	THOMPSON ALAN LEE SR	PO BOX 1	TONOPAH	AZ	85354			THOMPSON ALAN LEE SR	PO BOX 1				TONOPAH	AZ	85354-0001
40150007E	THORESON JIM	PO BOX 74	TONOPAH	AZ	85354			THORESON JIM	PO BOX 74				TONOPAH	AZ	85354-0074
40152016X	THORNTON AND THORNTON DEF BEN PEN PL & RET TR	40472 N SPUR CROSS RD	CAVE CREEK	AZ	85331			THORNTON PATRICK M TR	40472 N SPUR CROSS RD				CAVE CREEK	AZ	85331-8123
50622107	THORNTON PATRICK M TR	23200 N PIMA RD STE 200	SCOTTSDALE	AZ	85255			THORNTON PATRICK M TR	23200 N PIMA RD STE 200				SCOTTSDALE	AZ	85255-4388
50629016L	THORNTON PATRICK M TR	40472 N SPUR CROSS RD	CAVE CREEK	AZ	85331			THORNTON PATRICK M TR	40472 N SPUR CROSS RD				CAVE CREEK	AZ	85331-8123
50622108	THORNTON PATRICK M TR	23200 N PIMA RD STE 200	SCOTTSDALE	AZ	85255			THORNTON PATRICK M TR	23200 N PIMA RD STE 200				SCOTTSDALE	AZ	85255-4388
50620021F	TODD RONALD G	5325 E PERSHING AVE	SCOTTSDALE	AZ	85254			TODD RONALD G	5325 E PERSHING AVE				SCOTTSDALE	AZ	85254-3627
40150014B	TONOPAH/GILABEND 1100/657 LLC	3001 W INDIAN SCHOOL RD 140	PHOENIX	AZ	85016			VERMA AA AMERICAN DA 423/DOBBINS 1100 LL	3001 W INDIAN SCHOOL RD STE 140				PHOENIX	AZ	85017-4142
50628045	TORREY PINES DEV LLC/ETAL LEASE #01-1826	1121 W WARNER RD STE 109	TEMPE	AZ	85284			ARIZONA STATE LAND DEPT	TORREY PINES DEV LLC/ETAL LEASE #01CONTO		1121 W WARNER RD STE 109		TEMPE	AZ	85284-2819
40149041	TOWNSEND SAMUEL B	141 CHEVY CHASE DR	SAN ANTONIO	TX	78209			TOWNSEND SAMUEL B	141 CHEVY CHASE DR				SAN ANTONIO	TX	78209-4242
40149032P	TRAN HUNG TAN/DIANA THI/DANG HANNAH/ETAL	2525 104TH AVE	AVONDALE	AZ	85392			TRAN HUNG TAN/DIANA THI/DANG HANNAH/ETAL	2525 104TH AVE				AVONDALE	AZ	85392-4603
50622109B	TRAN VIET/THU TRANG	3514 W YUCCA ST	PHOENIX	AZ	85029			TRAN VIET/THU TRANG	3514 W YUCCA ST				PHOENIX	AZ	85029-3162
50622072D	TRAYERS FAMILY TRUST/ETAL	7705 E GREENWAY RD STE 110	SCOTTSDALE	AZ	85260			TRAYERS FAMILY TRUST/ETAL	SCOTTSDALE MORTGAGE AND INVESTMENT INC		7705 E GREENWAY RD STE 110		SCOTTSDALE	AZ	85260-1716
50614019F	TRIDANE ABDESSAMAD/NAJAFI HEDIEH	19744 E REINS RD	QUEEN CREEK	AZ	85242			TRIDANE ABDESSAMAD/NAJAFI HEDIEH	19744 E REINS RD				QUEEN CREEK	AZ	85242
40152036D	TROMMLER SAMUEL D/REBECCA B	13825 N 56TH PL	SCOTTSDALE	AZ	85254			TROMMLER SAMUEL D/REBECCA B	13825 N 56TH PL				SCOTTSDALE	AZ	85254-3011
40149032D	TUSCANY FOREVER LLC SERIES D	487 KIOLSTAD DR	PLACENTIA	CA	92870			TUSCANY FOREVER LLC SERIES D	487 KIOLSTAD DR				PLACENTIA	CA	92870-1509
40150009	TUZIM JOHN/MARIA	15760 W 132ND ST	LEMONT	IL	60439			TUZIM JOHN/MARIA	15760 132ND ST				LEMONT	IL	60439-6475
50622043F	TYCO INVESTORS LLC	1242 E JACKSON ST	PHOENIX	AZ	85034			COWLEY DIXON	2840 N WHITING CIR				MESA	AZ	85213
50624005C	UHM LLC	PO BOX 225	AVONDALE	AZ	85323			UHM LLC	PO BOX 225				AVONDALE	AZ	85323-0080
50614023	UNITED MIDWEST SAVINGS BANK	101 S MAIN ST	, PO BOX 159 DEGRAFF	OH	43318			TRAN LIA/NGUYEN LY	13658 W CARIBEAN LN				SURPIRSE	AZ	85379-5576
50620021J	UNITED STATES OF AMERICA	P O BOX 13468	PHOENIX	AZ	85002			UNITED STATES OF AMERICA	PO BOX 13468				PHOENIX	AZ	85002-3468
50624009Y	VACLAVINEK PETR/SOKALSKI ROMAN	6291 FALCON CHASE DR	WESTERVILLE	OH	43082			VACLAVINEK PETR/SOKALSKI ROMAN	6291 FALCON CHASE DR				WESTERVILLE	OH	43082-8937
50632003	VALLEY NATL BANK OF AZ TR THE	2602 W LAWRENCE RD	PHOENIX	AZ	85017			VALLEY NATL BANK OF AZ TR THE	2602 W LAWRENCE RD				PHOENIX	AZ	85017-1319

50632004	VALLEY NATL BK OF AZ TR THE	2602 W LAWRENCE RD		PHOENIX	AZ	85017				WEBB PAUL	21895 SW HEDGES DR			TUALATIN	OR	97062-8927
40149033	VAN DEN HEUVEL ANTHONY P/MARIA E TR	11823 N ABBEY LN		FOUNTAIN HILLS	AZ	85268	13822 S 421ST AVE	85354	VAN DEN HEUVEL ANTHONY P/MARIA E TR	11823 N ABBEY LN				FOUNTAIN HLS	AZ	85268-4501
40149035	VAN DEN HEUVEL ANTHONY P/MARIA E TR	11823 N ABBEY LN		FOUNTAIN HILLS	AZ	85268			VAN DEN HEUVEL ANTHONY P/MARIA E TR	11823 N ABBEY LN				FOUNTAIN HLS	AZ	85268-4501
40149034	VAN DEN HEUVEL ANTHONY P/MARIA E TR	11823 N ABBEY LN		FOUNTAIN HILLS	AZ	85268			VAN DEN HEUVEL ANTHONY P/MARIA E TR	11823 N ABBEY LN				FOUNTAIN HLS	AZ	85268-4501
50629048	VAN GALDER SUSAN C	18393 RACCOON TRL		GRASS VALLEY	CA	95945	50723 W TONTO ST	85354	VAN GALDER SUSAN C	C/O DENEEN ASSOCIATES	337 17TH ST STE 208			OAKLAND	CA	94612
50622057	VANDEVEER INVESTMENT PROPERTIES LLC	287 PARRACK RD		MACKS CREEK	MO	65786			VANDEVEER INVESTMENT PROPERTIES LLC	287 PARRACK RD				MACKS CREEK	MO	65786-8109
50622050	VANDEVEER INVESTMENT PROPERTIES LLC	287 PARRACK RD		MACKS CREEK	MO	65786			VANDEVEER INVESTMENT PROPERTIES LLC	10553 W FLOWER ST				AVONDALE	AZ	85392-4405
50622054	VANN JOHN L JR/DORIS	PO BOX 173		LOLO	MT	59847-0173			VANN JOHN L JR/DORIS	15810 N NICKLAUS LANE				SUN CITY	AZ	85351-1764
50622043A	VEGA GUILLERMO	7546 W ORANGEWOOD AVE		GLENDALE	AZ	85303			VEGA GUILLERMO	7546 W ORANGEWOOD AVE				GLENDALE	AZ	85303-1528
50622055L	VENEZIA RICHARD J	16021 N 174TH LN		SURPRISE	AZ	85388			VENEZIA RICHARD/CAROL TR	20521 N 93RD AVE				PEORIA	AZ	85382
50622047F	VENEZIA RICHARD J	16021 N 174TH LN		SURPRISE	AZ	85388			VENEZIA RICHARD/CAROL TR	20521 N 93RD AVE				PEORIA	AZ	85382
50624009N	VENEZIA RICHARD J/CAROL D/ZELLERS ANA	903 W GROVE ST		LITCHFIELD PARK	AZ	85340			VENEZIA RICHARD J/CAROL D/ZELLERS ANA	C/O ZELLERS ANA	5550 N 12TH ST UNIT 18			PHOENIX	AZ	85014
50622051A	VENEZIA RICHARD/FIL A/J TR	16021 N 174TH LN		SURPRISE	AZ	85388			VENEZIA RICHARD/CAROL TR/FIL A/J TR	20521 N 93RD AVE				PEORIA	AZ	85382
40150006B	VERDUGO DIEGO RAMON	3977 S NEWPORT ST		CHANDLER	AZ	85286			DELUNA SALVADOR/VERDUGO DIEGO RAMON	1604 ENGLISH OAK ST				LAS VEGAS	NV	89117-1380
50621011A	VERMA AA AMERICAN GW 571/CAMELBACK 157 LLC	3001 W INDIAN SCHOOL RD STE 140		PHOENIX	AZ	85017			VERMA AA AMERICAN GW 571/CAMELBACK 157 L	3001 W INDIAN SCHOOL RD STE 140				PHOENIX	AZ	85017-4142
50623026	VERMA MD A 523/THOMAS 320 LLC	3001 W INDIAN SCHOOL RD STE 140		PHOENIX	AZ	85017			VERMA MD A 523/THOMAS 320 LLC	3001 W INDIAN SCHOOL RD STE 140				PHOENIX	AZ	85017-4142
50623027	VERMA MD A 523/THOMAS 320 LLC	3001 W INDIAN SCHOOL RD STE 140		PHOENIX	AZ	85017			VERMA MD A 523/THOMAS 320 LLC	3001 W INDIAN SCHOOL RD STE 140				PHOENIX	AZ	85017-4142
40150010B	VERMA MD TD 435/NARRAMORE 240 LLC	3001 W INDIAN SCHOOL RD STE 140		PHOENIX	AZ	85017			VERMA MD TD 435/NARRAMORE 240 LLC	3001 W INDIAN SCHOOL RD STE 140				PHOENIX	AZ	85017-4142
40150010A	VERMA MD TD 435/NARRAMORE 240 LLC	3001 W INDIAN SCHOOL RD STE 140		PHOENIX	AZ	85017			VERMA MD TD 435/NARRAMORE 240 LLC	3001 W INDIAN SCHOOL RD STE 140				PHOENIX	AZ	85017-4142
40150008A	VERMA MD TD 435/NARRAMORE 240 LLC	3001 W INDIAN SCHOOL RD STE 140		PHOENIX	AZ	85017			VERMA MD TD 435/NARRAMORE 240 LLC	3001 W INDIAN SCHOOL RD STE 140				PHOENIX	AZ	85017-4142
50622052	VERMA/KATARIA 1G0 519/ENCANTO 40 LLC	3001 W INDIAN SCHOOL RD NO 140		PHOENIX	AZ	85017			VERMA/KATARIA 1G0 519/ENCANTO 40 LLC	3001 W INDIAN SCHOOL RD NO 140				PHOENIX	AZ	85017-4142
40149032E	VERMA/KATARIA 1GM 427/RAY 5 LLC	3001 W INDIAN SCHOOL RD NO 140		PHOENIX	AZ	85017			VERMA/KATARIA 1GM 427/RAY 5 LLC	3001 W INDIAN SCHOOL RD NO 140				PHOENIX	AZ	85017-4142
50622018B	VERMA/KATARIA 1JJ 537/CENTENNIAL 20 LLC	3001 W INDIAN SCHOOL RD NO 140		PHOENIX	AZ	85017			VERMA/KATARIA 1JJ 537/CENTENNIAL 20 LLC	3001 W INDIAN SCHOOL RD NO 140				PHOENIX	AZ	85017-4142
50622133	VERMA/KATARIA 1JM 555/CAMELBACK 40 LLC	3001 W INDIAN SCHOOL RD NO 140		PHOENIX	AZ	85017			VERMA/KATARIA 1JM 555/CAMELBACK 40 LLC	3001 W INDIAN SCHOOL RD NO 140				PHOENIX	AZ	85017-4142
40149037B	VERMA/KATARIA 1JO 415/RAY 52 LLC	3001 W INDIAN SCHOOL RD NO 140		PHOENIX	AZ	85017			VERMA/KATARIA 1JO 415/RAY 52 LLC	3001 W INDIAN SCHOOL RD NO 140				PHOENIX	AZ	85017-4142
50620023B	VIDLER WATER CO INC	3480 GS RICHARDS BLVD STE 101		CARSON CITY	NV	89703			VIDLER WATER CO INC	3480 GS RICHARDS BLVD STE 101				CARSON CITY	NV	89703-8442
50620017A	VIDLER WATER CO INC	3480 GS RICHARDS BLVD STE 101		CARSON CITY	NV	89703			SOUTHWESTERN AGRICULTURAL SERVICES INC	3480 GS RICHARDS BLVD STE 101				CARSON CITY	NV	89703-8442
50622010B	VINCENT CHARLES T/MINEAR DEANNA L	4202 W TIERRA BUENA LN		PHOENIX	AZ	85053			VINCENT CHARLES T/MINEAR DEANNA L	4202 W TIERRA BUENA LN				PHOENIX	AZ	85053-3769
50622087	W P INVESTMENTS LLC	3003 N CENTRAL AVE NO 103-232		PHOENIX	AZ	85012			W P INVESTMENTS LLC	1928 E HIGHLAND AVE STE F104-504				PHOENIX	AZ	85016-0651
50614015	WALTER JOHN J	7914 E SOFTWIND DR		SCOTTSDALE	AZ	85255			WALTER JOHN J	7914 E SOFTWIND DR				SCOTTSDALE	AZ	85255-3464
50622091	WALTER STEFAN/GERDA TR/WALTER JOHN J	7914 E SOFTWIND DR		SCOTTSDALE	AZ	85255			WALTER STEFAN/GERDA TR/WALTER JOHN J	7914 E SOFTWIND DR				SCOTTSDALE	AZ	85255-3464
50620011A	WASHINGTON LETTUCE AND VEGETABLE COMPANY	3724 78TH AVE E		FIFE	WA	98424			WASHINGTON LETTUCE AND VEGETABLE COMPANY	13225 FARM TO MARKET RD				MT VERNON	WA	98273-8706
50632020B	WATER UTILITIES OF GREATER TONOPAH INC	21410 N 19TH AVE STE 201		PHOENIX	AZ	85027			WATER UTILITIES OF GREATER TONOPAH INC	21410 N 19TH AVE STE 201				PHOENIX	AZ	85027-2758
50632012D	WATER UTILITIES OF GREATER TONOPAH INC	21410 N 19TH AVE STE 201		PHOENIX	AZ	85027			WATER UTILITY OF GREATER TONOPAH	C/O GLOBAL WATER RESOURCES	21410 N 19TH AVE STE 201			PHOENIX	AZ	85027-2758
50624949	WAXMANSKY JULIE	11241 S WORTH		WORTH	IL	60482			WAXMANSKY JULIE	11241 S WORTH				WORTH	IL	60482-1820
50632011	WENNBERG RICHARD D/MICHELLE R	22027 W WATKINS ST		BUCKEYE	AZ	85326			WENNBERG RICHARD D/MICHELLE R	22027 W WATKINS ST				BUCKEYE	AZ	85326-3953
50632020A	WENNBERG RICHARD D/MICHELLE R	22027 W WATKINS ST		BUCKEYE	AZ	85326			WENNBERG RICHARD D/MICHELLE R	22027 W WATKINS ST				BUCKEYE	AZ	85326-3953
50632012C	WENNBERG RICHARD D/MICHELLE R	22027 W WATKINS ST		BUCKEYE	AZ	85326			WENNBERG RICHARD D/MICHELLE R	22027 W WATKINS ST				BUCKEYE	AZ	85326-3953
50622002	WESTWARD MOVEMENT/ETAL	1132 E SESAME ST		TEMPE	AZ	85283			WESTWARD MOVEMENT LLC/ETAL	C/O BENSON MARC	1132 E SESAME ST			TEMPE	AZ	85283-3025
40152042	WESTWOOD JOHN M/CAROL S TR/JACK	4730 W MCNEIL ST		LAVEEN	AZ	85339			WESTWOOD JOHN M/CAROL S TR/JACK	4730 W MCNEIL ST				LAVEEN	AZ	85339-9643
40152046	WESTWOOD JOHN M/CAROL S TR/JACK M	4730 W MCNEIL ST		LAVEEN	AZ	85339			WESTWOOD JOHN M/CAROL S TR/JACK M	4730 W MCNEIL ST				LAVEEN	AZ	85339-9643
40153007A	WESTWOOD LEGACY TRUST	4730 W MCNEIL ST		LAVEEN	AZ	85339			WESTWOOD LEGACY TRUST	4730 W MCNEIL ST				LAVEEN	AZ	85339-9643
50623009	WHOOLEY JEREMIAH A TR	PO BOX 14407		SCOTTSDALE	AZ	85267			WHOOLEY JEREMIAH A TR	PO BOX 14407				SCOTTSDALE	AZ	85267-4407
50623007B	WHOOLEY JEREMIAH A TR	PO BOX 14407		SCOTTSDALE	AZ	85267			WHOOLEY JEREMIAH A TR	PO BOX 14407				SCOTTSDALE	AZ	85267-4407
50622118	WILCOX DAVID W/MARY A	RD 3	, BOX 147	TITUSVILLE	PA	16354			WILCOX DAVID W/MARY A	201 OLD ROUTE 8				TITUSVILLE	PA	16354-7555
50622037	WOOD ALBERT E & MAREA E	1906 N 115TH AVE		AVONDALE	AZ	85323			MAREA E WOOD	C/O BRUCE WOOD	14300 SEVEN MILE POST RD			ATHENS	AL	35611-7667
50632007	WOODMAN FAMILY TRUST	9525 E PALOMINO PL		SUN LAKES	AZ	85248	210 S 515TH AVE	85354	WOODMAN FAMILY TRUST	KARL AND ELEANOR WOODMAN TRUSTEES	9525 E PALOMINO PL			SUN LAKES	AZ	85248-6526
40159008C	WORKMAN DIANNA LYNN	16601 W OLD US HWY 80		ARLINGTON	AZ	85322			WORKMAN DIANNA LYNN	16601 W OLD HIGHWAY 80				ARLINGTON	AZ	85322
40159008D	WORKMAN DIANNA LYNN	16601 W OLD US HWY 80		ARLINGTON	AZ	85322			WORKMAN DIANNA LYNN	16601 S OLD US HIGHWAY 80				ARLINGTON	AZ	85322-8216
40159008U	WORKMAN TERRY/DIANNA	16601 W OLD HWY 80		ARLINGTON	AZ	85322	16601 S OLD HIGHWAY 80		WORKMAN TERRY/DIANNA	16601 W OLD HIGHWAY 80				ARLINGTON	AZ	85322
50614024	WP INVESTMENTS LLC	3003 N CENTRAL AVE 103 232		PHOENIX	AZ	85012			WP INVESTMENTS LLC	1928 E HIGHLAND AVE STE F104-504				PHOENIX	AZ	85016-0651
50622066	WSR DEVELOPMENT 1 LLC	7914 E SOFTWIND DR		SCOTTSDALE	AZ	85255			WSR DEVELOPMENT 1 LLC	7914 E SOFTWIND DR				SCOTTSDALE	AZ	85255-3464
50624938	WYORAL JAMES J/CELINE B	5205 FIORE TERRACE APT B301		SAN DIEGO	CA	92122			WYORAL JAMES J/CELINE B	5205 FIORE TERRACE APT B301				SAN DIEGO	CA	92122-5676
50624003C	YAKOO JALAL	17051 N 45TH ST		PHOENIX	AZ	85032			YAKOO JALAL	17051 N 45TH ST				PHOENIX	AZ	85032-9309
50622096A	YAKOO JALAL	17051 N 45TH ST		PHOENIX	AZ	85032			YAKOO JALAL	17051 N 45TH ST				PHOENIX	AZ	85032-9309
50622099	YAKOO KHIBEIR	1600 W 12TH ST NO 721		YUMA	AZ	85364			YAKOO KHIBEIR	1600 W 12TH ST NO 721				YUMA	AZ	85364-9000
50622072F	YANDELL PEGGY	17649 W EAGLE DR		GOODYEAR	AZ	85338			YANDELL PEGGY	17649 W EAGLE DR				GOODYEAR	AZ	85338-5431
50623020A	YANKEE POINT LLC	38082 SNICKERSVILLE TURNPIKE		PURCELVILLE	VA	20132	3921 N 515TH AVE	85354	YANKEE POINT LLC	BRADLEY BOLAND	38082 SNICKERSVILLE TURNPIKE			PURCELVILLE	VA	20132-5006
50623021	YANKEE POINT LLC	38082 SNICKERSVILLE TURNPIKE		PURCELVILLE	VA	20132			YANKEE POINT LLC	BRADLEY BOLAND	38082 SNICKERSVILLE TURNPIKE			PURCELVILLE	VA	20132-5006
50622079	YI CHONG KU/YONG	730 W HANCOCK AVE		GILBERT	AZ	85233			YI CHONG KU/YONG	730 W HANCOCK AVE				GILBERT	AZ	85233-1408
50629060	YOUNG TED W	407 ANN MARIE AVE		IRON RIDGE	WI	53035			YOUNG TED W	711 OLD SETTLEMENT DR				WATERTOWN	WI	53098
50629059	YOUNG TED W	407 ANN MARIE AVE		IRON RIDGE	WI	53035			YOUNG TED W	711 OLD SETTLEMENT DR				WATERTOWN	WI	56098
50629058	YOUNG TED W	407 ANN MARIE AVE		IRON RIDGE	WI	53035			YOUNG TED W	711 OLD SETTLEMENT DR				WATERTOWN	WI	53098
40153008	ZABROCKI STEVE J	5704 N 11TH AVE		PHOENIX	AZ	85013			ZABROCKI STEVE J	5704 N 11TH AVE				PHOENIX	AZ	85013-1609
50659064	ZAHEDI SHAHLLA	4472 W WALTON WY		CHANDLER	AZ	85226			ZAHEDI SHAHLLA	4472 W WALTON WY				CHANDLER	AZ	85226-6206
50622018E	ZALKOW LAND LLC	14809 N 73RD ST STE 102		SCOTTSDALE	AZ	85260			ZALKOW LAND LLC	14809 N 73RD ST STE 102				SCOTTSDALE	AZ	85260
50622084C	ZARA ADAM E/SABRINA M	16224 N 72ND LN		PEORIA	AZ	85382			ZARA ADAM E/SABRINA M	16224 N 72ND LN				PEORIA	AZ	85382-4940
50614016A	ZEDAN MARIA	15039 W CHARTER OAK RD		SURPRISE	AZ	85379			ZEDAN MARIA	15039 W CHARTER OAK RD				SURPRISE	AZ	85379-5921
50622063	ZOLNIERCZYK MICHAEL/HELEN	8108 E BUENA TERRA WY		SCOTTSDALE	AZ	85250			ZOLNIERCZYK MICHAEL/HELEN	8108 E BUENA TERRA WY				SCOTTSDALE	AZ	85250-6608
50622019E	ZPACK INVESTMENTS LLC	3731 W CHARLOTTE DR		GLENDALE	AZ	85310			ZPACK INVESTMENTS LLC	3731 W CHARLOTTE DR				GLENDALE	AZ	85310-3334

You Are Invited to an Open House

Representatives from the District and the consultant team members will explain the preliminary details and results of this re-delineation study and show how your property may be affected by the study. Please bring this brochure to the open house. Your property's Assessor's Tax Parcel Number (APN) is printed on the address label and the APN can help reference your property on study maps.

Public Open House

Thursday, October 3, 2013
5:00–6:30PM
Flood Control District of Maricopa County
New River Conference Room
2801 West Durango Street
Phoenix, Arizona 85009

Contact

Jeffery Shelton, P.E.
Civil Engineer
Flood Control District of Maricopa County
602-506-4486
jefferyshelton@mail.maricopa.gov

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

October 2013

Centennial Wash Physical Map Revision

Open House Announcement

www.fcd.maricopa.gov

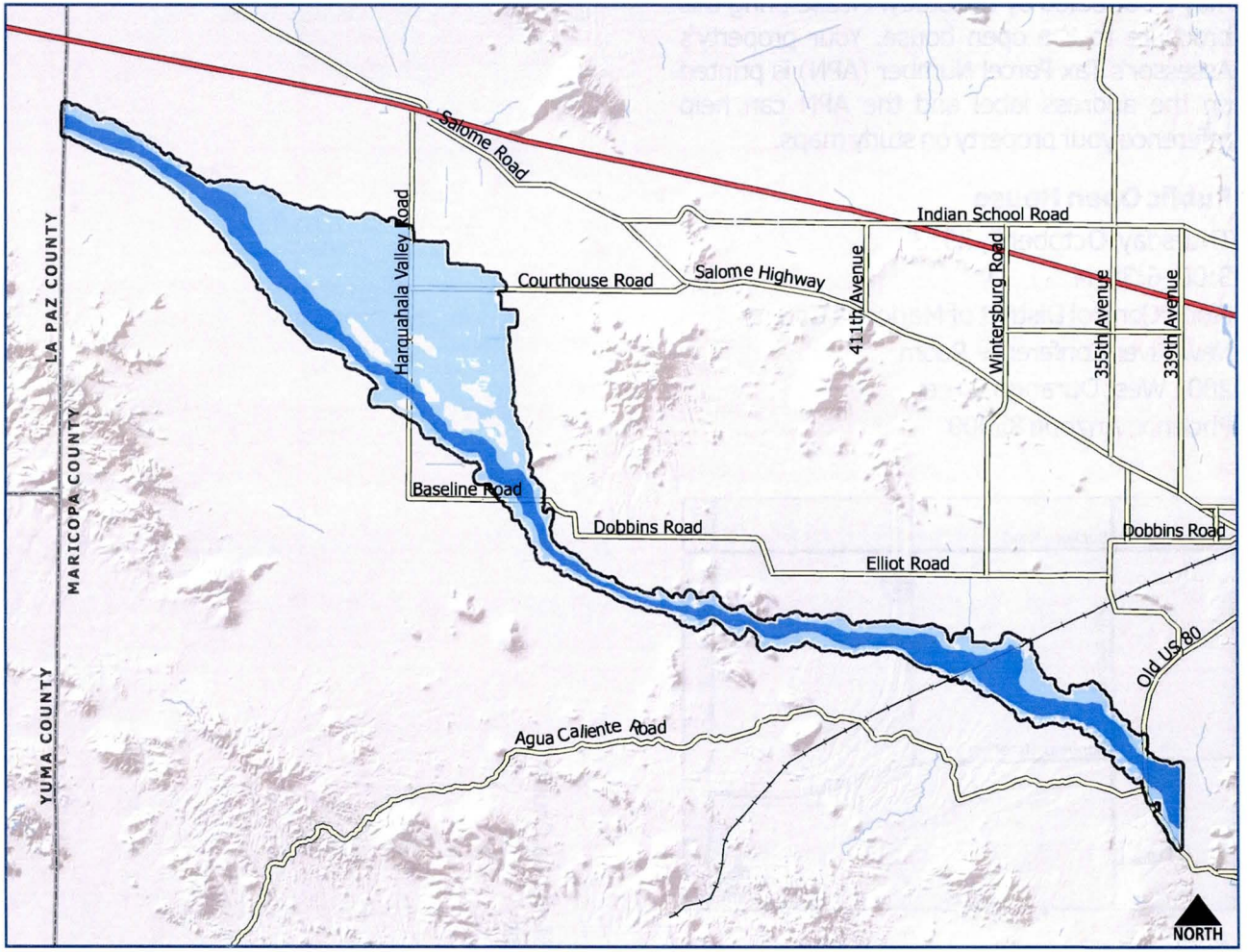
Centennial Wash Physical Map Revision

Project Overview

The Flood Control District of Maricopa County (District) invites you to an open house to view the preliminary study results of detailed re-delineations of floodplains and floodways along Centennial Wash. The Centennial Wash study area is from the La Paz County and Maricopa County border at the upstream end to the confluence with the Gila River at the downstream end. The study proposes to revise the base flood elevations and floodplain/ floodway boundaries for areas of currently regulated floodplains. The changes in base flood elevations are based on revised estimates of hydrology (i.e., flow rates) in the wash and more detailed topography (i.e., land elevations). The base flood elevations represent a flood that has a one-percent chance of occurring in any given year, referred to commonly as the "100-year flood."

About Floodplain/ Floodway Delineation

The District manages the floodplains for unincorporated Maricopa County and 13 municipalities. The District conducts floodplain and floodway delineation studies to identify areas that are subject to flood inundation by a 100-year flood. The resulting floodplain maps are used for floodplain management purposes and are submitted to the Federal Emergency Management Agency for revisions to Flood Insurance Rate Maps (FIRMs). Once the FIRMs are finalized, affected property owners typically see changes in their flood insurance rates.



Map not to scale.

Project Area Boundary

Floodplain

Floodway

APN	PropertyFullStreetAddress	PropertyCity	PropertyZipCode	OwnerName	OwnerAddressLine1	OwnerAddressLine2	OwnerCity	OwnerState	OwnerZipCode	OwnerCountry	TaxOwnerName	TaxOwnerAddressLine1	TaxOwnerAddressLine2	TaxOwnerAddressLine3	TaxOwnerAddressLine4	TaxOwnerCity	TaxOwnerState	TaxOwnerZipCode
40146009	13224 S 383RD AVE		85354	ARLINGTON VALLEY SOLAR ENERGY LLC	TWO TOWER CENTER 11TH FLOOR		EAST BRUNSWICK	NJ	8816		ARLINGTON VALLEY SOLAR HOLDINGS LL CONTO	TWO TOWER CENTER 11TH FLOOR				EAST BRUNSWICK	NJ	8816
40146005	39029 W NARRAMORE RD		85354	LSP ARLINGTON VALLEY LLC	5400 WESTHEIMER CT		HOUSTON	TX	77056		DYNEGY INC - ARLINGTON VALLEY LLC	PO BOX 26				ARLINGTON	AZ	85322
40146012A	1003 N SARIVAL AVE			ARLINGTON VALLEY LLC	1850 N CENTRAL AVE SUITE 1100		PHOENIX	AZ	85004		ARLINGTON VALLEY LLC	PO BOX 26				ARLINGTON	AZ	85322
40149033	13822 S 421ST AVE		85354	VAN DEN HEUVEL EXEMPT TRUST	11823 N ABBEY LN		FOUNTAIN HILLS	AZ	85268	USA	VAN DEN HEUVEL ANTHONY P TR	11823 N ABBEY LN				FOUNTAIN HILLS	AZ	85268
40152034	46112 W CARVER RD		85354	BEST CHOICE EQUESTRIAN ESTATES LLC	2487 S GILBERT RD	STE 106 418	GILBERT	AZ	85296		BEST CHOICE EQUESTRIAN ESTATES LLC	2487 S GILBERT RD	STE 106 418			GILBERT	AZ	85296
40150005L	7859 S 498TH AVE	TONOPAH	85354	JOHNSON SHIRLEY MARGOT	PO BOX 244		TONOPAH	AZ	85354		JOHNSON SHIRLEY MARGOT	PO BOX 244				TONOPAH	AZ	85354-0244
40145008				MCWIGGINS MARY F	PO BOX 135		ARLINGTON	AZ	85322	USA	DYNEGY INC - ARLINGTON VALLEY LLC	PO BOX 26				ARLINGTON	AZ	85322
40144026				DB FARMS LE # 23-113755-01	65 N POTTEBAUM		CASA GRANDE	AZ	85222		ARIZONA STATE LAND DEPARTMENT CONTO	65 N POTTEBAUM				CASA GRANDE	AZ	85222-5326
40144027				D B FARMS LE # 01-1577	20340 W RT 102		WILMINGTON	IL	60481		ARIZONA STATE LAND DEPARTMENT CONTO	20340 W RT 102				WILMINGTON	IL	60481-8200
40145013				D B FARMS LE # 01-1577	20340 W RT 102		WILMINGTON	IL	60481		ARIZONA STATE LAND DEPARTMENT CONTO	20340 W RT 102				WILMINGTON	IL	60481-8200
40145014				D B FARMS LE # 01-1577	20340 W RT 102		WILMINGTON	IL	60481		ARIZONA STATE LAND DEPARTMENT CONTO	20340 W RT 102				WILMINGTON	IL	60481-8200
40145015				D B FARMS LE # 01-1577	20340 W RT 102		WILMINGTON	IL	60481		ARIZONA STATE LAND DEPARTMENT CONTO	20340 W RT 102				WILMINGTON	IL	60481-8200
40145016				D B FARMS LE # 01-1577	20340 W RT 102		WILMINGTON	IL	60481		ARIZONA STATE LAND DEPARTMENT CONTO	20340 W RT 102				WILMINGTON	IL	60481-8200
40152032	10424 S 465TH AVE		85354	NELSON SHAWN A	300 E MAPLE ST		REDOAK	IA	85354		NELSON SHAWN A	300 E MAPLE ST				REDOAK	IA	85354-1526
40152039	46032 W NARRAMORE RD		85354	GLASS RICHARD/BARBARA	4606 SW 64TH DR		GAINESVILLE	FL	32608		GLASS RICHARD/BARBARA	PO BOX 50581				PHOENIX	AZ	85076-0581
40155006	48210 W DOBBINS RD		85354	CV HARQUAHALA LLC	3549 153RD AVE SE		CASSELTON	ND	58012	USA	CV HARQUAHALA LLC	CLUB VISTA FINANCIAL SERVICES LLC	3549 153RD AVE SE			CASSELTON	ND	58012-9700
40144001				LSP ARLINGTON VALLEY LLC	5400 WESTHEIMER CT		HOUSTON	TX	77056		DYNEGY INC - ARLINGTON VALLEY LLC	PO BOX 26				ARLINGTON	AZ	85322
40144003				DUKE ENERGY MARICOPA LLC	5400 WESTHEIMER CT PO BOX 1642		HOUSTON	TX	77251		DYNEGY INC - ARLINGTON VALLEY LLC	PO BOX 26				ARLINGTON	AZ	85322
40144004				LAUTERBACH VIRGINIA C/EDWARD G TR	1500 E EVERGREEN TERRACE		GLENVIEW	IL	60025		LAUTERBACH VIRGINIA C/EDWARD G TR	331 COLLEGE ST APT D4				MACON	GA	31201-7261
40144005				POCHELSKI LENORE/LUCILLE B/LOUISE	1718 N BROADWAY		MELROSE PARK	IL	60160		POCHELSKI LENORE/LUCILLE B/LOUISE	4 CHICHESTER ON ASBURY				ROLLING MEADOWS	IL	60008
40144013				ARLINGTON VALLEY LLC	1850 N CENTRAL AVE SUITE 1100		PHOENIX	AZ	85004		ARLINGTON VALLEY LLC	PO BOX 26				ARLINGTON	AZ	85322
40144014				ARLINGTON VALLEY LLC	1850 N CENTRAL AVE SUITE 1100		PHOENIX	AZ	85004		ARLINGTON VALLEY LLC	PO BOX 26				ARLINGTON	AZ	85322
40144015				LSP ARLINGTON VALLEY LLC	5400 WESTHEIMER CT		HOUSTON	TX	77056		DYNEGY INC - ARLINGTON VALLEY LLC	PO BOX 26				ARLINGTON	AZ	85322
40144016				LSP ARLINGTON VALLEY LLC	5400 WESTHEIMER CT		HOUSTON	TX	77056		DYNEGY INC - ARLINGTON VALLEY LLC	PO BOX 26				ARLINGTON	AZ	85322
40144017				ARLINGTON VALLEY LLC	1850 N CENTRAL AVE SUITE 1100		PHOENIX	AZ	85004		ARLINGTON VALLEY LLC	PO BOX 26				ARLINGTON	AZ	85322
40144024				SOUTHERN PACIFIC TRANS CO	1400 DOUGLAS ST STOP 1640		OMAHA	NE	68179		SOUTHERN PACIFIC TRANS CO	1400 DOUGLAS ST STOP 1640				OMAHA	NE	68179-1001
40144970				SOUTHERN PACIFIC TRANS CO	1400 DOUGLAS ST STOP 1640		OMAHA	NE	68179		SOUTHERN PACIFIC TRANS CO	ONE MAKET PLAZA				SAN FRANCISCO	CA	94105-1101
40145001				DUKE ENERGY MARICOPA LLC	2828 N MONROE ST		DECATUR	IL	62526		DYNEGY INC - ARLINGTON VALLEY LLC	PO BOX 26				ARLINGTON	AZ	85322
40145002				ARLINGTON VALLEY LLC	1850 N CENTRAL AVE SUITE 1100		PHOENIX	AZ	85004		ARLINGTON VALLEY LLC	PO BOX 26				ARLINGTON	AZ	85322
40145003				SMITH NATHAN/NESHEM ROGER	4200 149TH AVE SE		SAWYER	ND	58781		SMITH NATHAN/NESHEM ROGER	4200 149TH AVE SE				SAWYER	ND	58781-9101
40145004				ARLINGTON VALLEY LLC	1850 N CENTRAL AVE SUITE 1100		PHOENIX	AZ	85004		ARLINGTON VALLEY LLC	PO BOX 26				ARLINGTON	AZ	85322
40145005				HAINES MADGE MOLINE	421 W 9TH #A		CASA GRANDE	AZ	85222		DYNEGY INC - ARLINGTON VALLEY LLC	PO BOX 26				ARLINGTON	AZ	85322
40145006				AIRTH S JEAN TR	32132 VIA BUENA		SAN JUAN CAPISTRANO	CA	92675		AIRTH S JEAN TR	32132 VIA BUENA				SAN JUAN CAPO	CA	92675-3825
40145007				ARLINGTON VALLEY SOLAR ENERGY II LLC	TWO TOWER CENTER 11TH FLR		EAST BRUNSWICK	NJ	8816	USA	ARLINGTON VALLEY SOLAR ENERGY II LLC	TWO TOWER CENTER 11TH FLR				EAST BRUNSWICK	NJ	8816
40145010				DUKE ENERGY MARICOPA LLC	5400 WESTHEIMER CT PO BOX 1642		HOUSTON	TX	77251		DYNEGY INC - ARLINGTON VALLEY LLC	PO BOX 26				ARLINGTON	AZ	85322
40145011				DUKE ENERGY MARICOPA LLC	5400 WESTHEIMER CT PO BOX 1642		HOUSTON	TX	77251		DYNEGY INC - ARLINGTON VALLEY LLC	PO BOX 26				ARLINGTON	AZ	85322
40145012A				LEVEL 3 COMMUNICATIONS LLC	1025 ELDORADO BLVD		BROOMFIELD	CO	80021	USA	LEVEL 3 COMMUNICATIONS LLC	1025 ELDORADO BLVD				BROOMFIELD	CO	80021
40145970				SOUTHERN PACIFIC CO /OPERATIVE/	1400 DOUGLAS ST STOP 1640		OMAHA	NE	68179		SOUTHERN PACIFIC CO /OPERATIVE/	9830 N 32ND ST STE B-106				PHOENIX	AZ	85028
40146004				LSP ARLINGTON VALLEY LLC	5400 WESTHEIMER CT		HOUSTON	TX	77056		DYNEGY INC - ARLINGTON VALLEY LLC	PO BOX 26				ARLINGTON	AZ	85322
40146008				ARLINGTON VALLEY SOLAR ENERGY LLC	TWO TOWER CENTER 11TH FLOOR		EAST BRUNSWICK	NJ	8816		ARLINGTON VALLEY SOLAR HOLDINGS LL CONTO	TWO TOWER CENTER 11TH FLOOR				EAST BRUNSWICK	NJ	8816
40146010				DUKE ENERGY MARICOPA LLC	5400 WESTHEIMER CT		HOUSTON	TX	77056		DYNEGY INC - ARLINGTON VALLEY LLC	PO BOX 26				ARLINGTON	AZ	85322
40146011				ARLINGTON VALLEY LLC	1850 N CENTRAL AVE SUITE 1100		PHOENIX	AZ	85004		ARLINGTON VALLEY LLC	PO BOX 26				ARLINGTON	AZ	85322
40146012B				ARLINGTON VALLEY LLC	1850 N CENTRAL AVE SUITE 1100		PHOENIX	AZ	85004		ARLINGTON VALLEY LLC	PO BOX 26				ARLINGTON	AZ	85322
40146013				ARLINGTON VALLEY LLC	1850 N CENTRAL AVE SUITE 1100		PHOENIX	AZ	85004		ARLINGTON VALLEY LLC	PO BOX 26				ARLINGTON	AZ	85322
40146014				DUKE ENERGY MARICOPA LLC	5400 WESTHEIMER CT PO BOX 1642		HOUSTON	TX	77251		DYNEGY INC - ARLINGTON VALLEY LLC	PO BOX 26				ARLINGTON	AZ	85322
40146015				DUKE ENERGY MARICOPA LLC	5400 WESTHEIMER CT PO BOX 1642		HOUSTON	TX	77251		DYNEGY INC - ARLINGTON VALLEY LLC	PO BOX 26				ARLINGTON	AZ	85322
40146016				DUKE ENERGY MARICOPA LLC	5400 WESTHEIMER CT PO BOX 1642		HOUSTON	TX	77251		DYNEGY INC - ARLINGTON VALLEY LLC	PO BOX 26				ARLINGTON	AZ	85322
40146018C				SEP II	101 ASH ST		SAN DIEGO	CA	92101-3017		SEP II	101 ASH ST				SAN DIEGO	CA	92101-3017
40146019A				LA MARCHE BARBARA/KENNETH	474 NEZ PEARCE PL		LA CONNOR	WA	98257		LA MARCHE BARBARA/KENNETH	474 NEZ PEARCE PL				LA CONNOR	WA	98257-9550
40146019B				SIMPSON J ERNESTINE	3831 N BAYOU LN		BOISE	ID	83702		SIMPSON J ERNESTINE	3831 N BAYOU LN				BOISE	ID	83702-3023
40146019C				LAZAR ASHOR/DYANA	513 S LOUIS		MT PROSPECT	IL	60056		LAZAR ASHOR/DYANA	513 S LOUIS ST				MT PROSPECT	IL	60056-3936
40146020A				LEE SUNG HWAN/SUNG AH TR	7123 W VILLA CHULA		GLENDALE	AZ	85310		LEE SUNG HWAN/SUNG AH TR	7123 W VILLA CHULA				GLENDALE	AZ	85310-5884
40146020B				ALKASS ASTER/SAMI	6350 N KILPATRICK AVE		CHICAGO	IL	60646		ALKASS ASTER/SAMI	6350 N KILPATRICK AVE				CHICAGO	IL	60646-4428
40146020C				NEIRA YOLANDA	403 TERRACE AVE		GARDEN CITY	NY	11530		NEIRA YOLANDA	403 TERRACE AVE				GARDEN CITY	NY	11530-5425
40146024				LA MARCHE BARBARA/KENNETH	474 NEZ PEARCE PL		LA CONNOR	WA	98257		LA MARCHE BARBARA/KENNETH	474 NEZ PEARCE PL				LA CONNOR	WA	98257-9550
40146025				LA MARCHE BARBARA/KENNETH	474 NEZ PEARCE PL		LA CONNOR	WA	98257		LA MARCHE BARBARA/KENNETH	474 NEZ PEARCE PL				LA CONNOR	WA	98257-9550
40146026				MARTINEZ RAYMOND JR	PO BOX 5700		PHOENIX	AZ	85010-5700		MARTINEZ RAYMOND JR	3242 E GRANADA RD				PHOENIX	AZ	85008-3830
40146970				SOUTHERN PACIFIC CO /OPERATIVE/	1400 DOUGLAS ST STOP 1640		OMAHA	NE	68179		SOUTHERN PACIFIC CO /OPERATIVE/	9830 N 32ND ST STE B-106				PHOENIX	AZ	85028
40146971				SOUTHERN PACIFIC CO /OPERATIVE/	1400 DOUGLAS ST STOP 1640		OMAHA	NE	68179		SOUTHERN PACIFIC CO /OPERATIVE/	9830 N 32ND ST STE B-106				PHOENIX	AZ	85028
40146972				SOUTHERN PACIFIC CO /OPERATIVE/	1400 DOUGLAS ST STOP 1640		OMAHA	NE	68179		SOUTHERN PACIFIC CO /OPERATIVE/	9830 N 32ND ST STE B-106				PHOENIX	AZ	85028
40145009				DUKE ENERGY MARICOPA LLC	5400 WESTHEIMER CT PO BOX 1642		HOUSTON	TX	77251		DYNEGY INC - ARLINGTON VALLEY LLC	PO BOX 26				ARLINGTON	AZ	85322
40145012C				DUKE ENERGY MARICOPA LLC	5400 WESTHEIMER CT PO BOX 1642		HOUSTON	TX	77251		DUKE ENERGY MARICOPA LLC	PO BOX 26				ARLINGTON	AZ	85322
40145012D				DUKE ENERGY MARICOPA LLC	5400 WESTHEIMER CT PO BOX 1642		HOUSTON	TX	77251		DUKE ENERGY MARICOPA LLC	PO BOX 26				ARLINGTON	AZ	85322
40146018B				MCMURTRY FAMILY PROPERTIES LLC	20340 W ROUTE 102		WILMINGTON	IL	60481		MCMURTRY FAMILY PROPERTIES LLC	C/O MCMURTRY DAVID	26338 S MCKINLEY WOODS RD			CHANNAHON	IL	60410
40150005M				NARRAMORE 435 T LLC	2230 N UNIVERSITY PKWY	UNIT 2C	PROVO	UT	84604		NARRAMORE 435 T LLC	2230 N UNIVERSITY PKWY UNIT 2C				PROVO	UT	84604-6708
40150004E				DAFFERN WILLIAM CHESTER/JUANITA ROIENE	PO BOX 282		ARLINGTON	AZ	85322		DAFFERN WILLIAM CHESTER/JUANITA ROIENE	PO BOX 946				SUNRAY	TX	79086-0946
40155028				CV HARQUAHALA LLC	3549 153RD AVE SE		CASSELTON	ND	58012	USA	CV HARQUAHALA LLC	CLUB VISTA FINANCIAL SERVICES LLC	3549 153RD AVE SE			CASSELTON	ND	58012-9700
40155029				CV HARQUAHALA LLC	3549 153RD AVE SE		CASSELTON	ND	58012	USA	CV HARQUAHALA LLC	CLUB VISTA FINANCIAL SERVICES LLC	3549 153RD AVE SE			CASSELTON	ND	58012-9700
40155032A				CV HARQUAHALA LLC	3549 153RD AVE SE		CASSELTON	ND	58012	USA	CV HARQUAHALA LLC	CLUB VISTA FINANCIAL SERVICES LLC	3549 153RD AVE SE			CASSELTON	ND	58012-9700
40149032D				TUSCANY FOREVER LLC SERIES D	487 KIOLSTAD DR		PLACENTIA	CA	92870		TUSCANY FOREVER LLC SERIES D	487 KIOLSTAD DR				PLACENTIA	CA	92870-1509
40149032E				VERMA/KATARIA 1GM 427/RAY 5 LLC	3001 W INDIAN SCHOOL RD NO 140		PHOENIX	AZ	85017		VERMA/KATARIA 1GM 427/RAY 5 LLC	3001 W INDIAN SCHOOL RD NO 140				PHOENIX	AZ	85017-4142
40149032F				JUNG CHING YEE/HA ANN NGAN	15724 VASSAR AVE		SAN LORENZO	CA	74580		JUNG CHING YEE/HA ANN NGAN	15724 VASSAR AVE				SAN LORENZO	CA	74580-1059
40149032G				EKPOH UDOH/EMEM U	8951 W CHARLESTON AVE		PEORIA	AZ	85382		EKPOH UDOH/EMEM U	8951 W CHARLESTON AVE				PEORIA	AZ	85382-8105
40149032H				HARRIET KANDY ROHDE MARITAL TRUST/ETAL	2398 E CAMELBACK RD STE 400		PHOENIX	AZ	85016		HARRIET KANDY ROHDE MARITAL TRUST/ETAL	C/O NORTHERN TRUST NA	PO BOX 1354			CHICAGO	IL	60690-1354
40149032J				EKPO HELEN/ANIEKAN	7126 W CAMINO DE ORO		PEORIA	AZ	85212		EKPO HELEN/ANIEKAN	7126 W CAMINO DE ORO				PEORIA	AZ	85212-3264
40149032M				FORESIGHT PROPERTIES INC	6241 E YUCCA ST		SCOTTSDALE	AZ	85254	USA	FORESIGHT PROPERTIES INC	6241 E YUCCA				SCOTTSDALE	AZ	85254-5448
40149032N				DEPAULIS RICHARD F	6804 E 2ND ST UNIT 15		SCOTTSDALE	AZ	85251		DEPAULIS RICHARD F	4942 E EVANS DR				SCOTTSDALE	AZ	85254-2852
40149032P				TRAN HUNG TAN/DIANA THI/DANG HANNAH/ETAL	2525 104TH AVE		AVONDALE	AZ	85392		TRAN HUNG TAN/DIANA THI/DANG HANNAH/ETAL	2525 104TH AVE				AVONDALE	AZ	85392-4603
40149032Q				FORESIGHT PROPERTIES INC	6241 E YUCCA ST		SCOTTSDALE	AZ	85254	USA	FORESIGHT PROPERTIES INC	6241 E YUCCA ST				SCOTTSDALE	AZ	85254
40149034				VAN DEN HEUVEL EXEMPT TRUST	11823 N ABBEY LN		FOUNTAIN HILLS	AZ	85268	USA	VAN DEN HEUVEL ANTHONY P TR	11823 N ABBEY LN				FOUNTAIN HILLS	AZ	85268
40149035				VAN DEN HEUVEL EXEMPT TRUST	11823 N ABBEY LN		FOUNTAIN HILLS	AZ	85268	USA	VAN DEN HEUVEL ANTHONY P TR	11823 N ABBEY LN				FOUNTAIN HILLS	AZ	85268
40149036				FUENTES ALEXANDER JR/BESSIE J	PO BOX 867		TONOPAH	AZ	85354-0867	USA	GHD REAL ESTATE HOLDINGS LLC	C/O GHD LAND ACQUISITION LLC	BTC LAND FINANCE LLC	430 MAIN ST		WILLIAMTOWN	MA	1267
40149037B				VERMA/KATARIA 1JO 415/RAY 52 LLC	3001 W INDIAN SCHOOL RD NO 140		PHOENIX	AZ	85017		VERMA/KATARIA 1JO 415/RAY 52 LLC	3001 W INDIAN SCHOOL RD NO 140				PHOENIX	AZ	85017-4142
40149038				DALIN ENTERPRISES INC	25614 N DANNY LN		RIO VERDE	AZ	85263		DALIN ENTERPRISES INC	25614 N DANNY LN				RIO VERDE	AZ	85263-7140
40149039				GANDARA JUAN J/IMELDA/SEFERINO	2027 N 48TH LN		PHOENIX	AZ	85035		GANDARA JUAN J/IMELDA/SEFERINO	2027 N 48TH LN				PHOENIX	AZ	85035-4021
40149040				GLOBAL ACQUISITIONS GROUP LLC	3260 S HOLLY CT		CHANDLER	AZ	85248		GLOBAL ACQUISITIONS GROUP LLC	C/O COOLEY AARON	5241 S COTTON DR			CHANDLER	AZ	85248
40149041				TOWNSEND SAMUEL B	141 CHEVY CHASE DR		SAN ANTONIO	TX	78209		TOWNSEND SAMUEL B	141 CHEVY CHASE DR				SAN ANTONIO	TX	78209-4242
40149042				TAPIA TRINIDAD/JOSEFINA L	4026 W BLUEFIELD AVE		GLENDALE	AZ	85308-1813		TAPIA TRINIDAD/JOSEFINA L CONTO	4026 W BLUEFIELD AVE				GLENDALE	AZ	85308-1813
40149043				MILLER LES/PHYLLIS	18604 W SWEET ACACIA DR		GOODYEAR	AZ	85338		MILLER LES/PHYLLIS	18604 W SWEET ACACIA DR				GOODYEAR	AZ	85338-5603
40149044				HUSAYNO TARIQ/AHLAM	10731 E SUNNYSIDE DR		SCOTTSDALE	AZ	85259		HUSAYNO TARIQ/AHLAM	10731 E SUNNYSIDE DR				SCOTTSDALE	AZ	85259-2913
40150026				EARL PATRICIA L ETAL	19103 E POCO RIO DR		RIO VERDE	AZ	85263		KIELEY PATRICIA L	19103 E POCO RIO DR				RIO VERDE	AZ	85263-7274
40150027				FRANCIS JOHN STEPHEN SCHUYLER/ETAL	5632 N 46TH DR		GLENDALE	AZ	85301		FRANCIS JOHN STEPHEN SCHUYLER/ETAL	5632 N 46TH DR				GLENDALE	AZ	85301-6216
40152019				QUINONES RUBEN C/CAROL/DELGADO MARTIN	1101 N 27TH LN		PHOENIX	AZ	85009		BAYVIEW FINANCIAL PROPERTY TRUST CONTO	1101 N 27TH LN				PHOENIX	AZ	85009-3946
40152020				LANEY JAMES R	3310 THOMAS BUTLER RD		TALLAHASSEE	FL	32308		LANEY JAMES R	3310 THOMAS BUTLER RD				TALLAHASSEE	FL	32308-4510
40152021				LOWERRE EDWIN W/ARMBRUSTER CINDY J	44810 N SAGUARO BLOSSOM LN		MORRISTOWN	AZ	85342		LOWERRE EDWIN W/ARMBRUSTER CINDY J	44810 SAGUARO BLOSSOM LN				MORRISTOWN	AZ	85342-9890
40152022				LOWERRE EDWIN W/ARMBRUSTER CINDY J	44810 N SAGUARO BLOSSOM LN		MORRISTOWN	AZ	85342		LOWERRE EDWIN W/ARMBRUSTER CINDY J	44810 SAGUARO BLOSSOM LN				MORRISTOWN	AZ	85342-9890
40152023				HARRINGTON SCOTT T	860 S GENEVIEVE		EAGAR	AZ	85925		HARRINGTON SCOTT T	860 S GENEVIEVE				EAGAR	AZ	85925-9773
40152024				PAXTON WESTLEY A/KIMBERLY K	1068 SCENIC BLVD		CHESAPEAKE	VA	23328		PAXTON WESTLEY A/KIMBERLY K	C/O PAXTON CONSTRUCTION CORP	PO BOX 16245			CHESAPEAKE	VA	23328-6245
40152025				BASS TODD A/LEAH J	2665 W MEADOWRIDGE DR		WEST JORDON	UT	84008		BASS TODD A/LEAH J	2665 W MEADOWRIDGE DR				WEST JORDON	UT	84008-8550
40152026				DRY FLY GIANTS LLC	20101 E SILVER CREEK LN		QUEEN CREEK	AZ	85142		DRY FLY GIANTS LLC	20101 E SILVER CREEK LN				QUEEN CREEK	AZ	85142-6285
40152027				KOCZWARA RYSZARDCECYLIA	8924 E APACHE TRL		MESA	AZ	85207		KOCZWARA RYSZARDCECYLIA	8924 E MAIN ST				MESA	AZ	85207-8704
40152033				RASCON HECTOR/VICTORIA P	5327 N TORNO CT		LITCHFIELD PARK	AZ	85340		RASCON HECTOR/VICTORIA P	5327 N TORNO CT				LITCHFIELD PARK	AZ	85340
40152036A				HAPOGIAN RAFI/ARAXIE N	9015 E PARADISE DR		SCOTTSDALE	AZ	85260		HAPOGIAN RAFI/ARAXIE N	9015 E PARADISE DR				SCOTTSDALE	AZ	85260-6888
40152036B				HAPOGIAN RAFI/ARAXIE N	9015 E PARADISE DR		SCOTTSDALE	AZ	85260		HAPOGIAN RAFI/ARAXIE N	9015 E PARADISE DR				SCOTTSDALE	AZ	85260-6888
40152036C				HAPOGIAN RAFI/ARAXIE N	9015 E PARADISE DR		SCOTTSDALE	AZ	85260		HAPOGIAN RAFI/ARAXIE N	9015 E PARADISE DR				SCOTTSDALE	AZ	85260-6888
40152036D				TROMMLER SAMUEL D/REBECCA B	13825 N 56TH PL		SCOTTSDALE	AZ	85254		TROMMLER SAMUEL D/REBECCA B	13825 N 56TH PL				SCOTTSDALE	AZ	85254-3011
40152037				POZEFSKY DANIEL W/FEELEY COLLEEN R	27306 N 59TH DR		PHOENIX	AZ	85085		POZEFSKY DANIEL W/FEELEY COLLEEN R	27306 N 59TH DR				PHOENIX	AZ	85085-6524
40152038				EARL PATRICIA L	2900 THOMAS AVE S #2304		MINNEAPOLIS	MN	55416		KIELEY PATRICIA L	19103 E POCO RIO DR				RIO VERDE	AZ	85263-7274
40152040				KELLER JENNIE E/SEAGER DUSTIN R	5094 PERSILLE DR		TAYLORSVILLE	UT	84118		KELLER JENNIE E/SEAGER DUSTIN R	5094 PERSILLE DR				TAYLORSVILLE	UT	84118-2930
40152041				KELLER JENNIE E/SEAGER DUSTIN R	5094 PERSILLE DR		TAYLORSVILLE	UT	84118		KELLER JENNIE E/SEAGER DUSTIN R	5094 PERSILLE DR				TAYLORSVILLE	UT	84118-2930

40152042	WESTWOOD JOHN M/CAROL S TR/JACK	4730 W MCNEIL ST		LAVEEN	AZ	85339	WESTWOOD JOHN M/CAROL S TR/JACK	4730 W MCNEIL ST						LAVEEN	AZ	85339-9643		
40152043	AKERS CAROL	184 NEWELL ST		WEST WARWICK	RI	2893	AKERS CAROL	184 NEWELL ST						WEST WARWICK	RI	02893-1847		
40152044	HARRIS DONALD J/SHELLY C	PO BOX 364		TONOPAH	AZ	85354	HARRIS DONALD J/SHELLY C	PO BOX 364						TONOPAH	AZ	85354-0364		
40152045	HARRIS DONALD J/SHELLY C	PO BOX 364		TONOPAH	AZ	85354	HARRIS DONALD J/SHELLY C	PO BOX 364						TONOPAH	AZ	85354-0364		
40152046	WESTWOOD JOHN M/CAROL S TR/JACK M	4730 W MCNEIL ST		LAVEEN	AZ	85339	WESTWOOD JOHN M/CAROL S TR/JACK M	4730 W MCNEIL ST						LAVEEN	AZ	85339-9643		
40152047	PROPER THERON A/LORNA A	3634 N 423RD AVE		TONOPAH	AZ	85354	PROPER THERON A/LORNA A	3634 N 423RD AVE						TONOPAH	AZ	85354-8392		
40148015B	SEP II LLC	101 ASH ST		SAN DIEGO	CA	92101	SEP II LLC	101 ASH ST						SAN DIEGO	CA	92101-3017		
40149001F	PHAM HONG THU/HOANG TRONG	3333 N GARDEN LN		AVONDALE	AZ	85323	PHAM HONG THU/HOANG TRONG	3333 N GARDEN LN						AVONDALE	AZ	85323-3813		
40149001G	PHAM HONG THU/HOANG TRONG	3333 N GARDEN LN		AVONDALE	AZ	85323	PHAM HONG THU/HOANG TRONG	3333 N GARDEN LN						AVONDALE	AZ	85323-3813		
40149004A	SALIH RAAD M	2316 E ALLEY ST		PHOENIX	AZ	85042	SALIH RAAD M	2316 E ALLEN ST						PHOENIX	AZ	85042-8105		
40149004B	JAHANSOUZ HOSSAIN/ALANI LAMAN	2116 DEEP MEADOW LN		LANSDALE	PA	19446	JAHANSOUZ HOSSAIN/ALANI LAMAN	6809 SHADOW CREEK CT	MARI VISTA					FORT WORTH	TX	76132-4522		
40149004C	EMAD INVESTMENT LLC	5635 W ALAMEDA RD		GLENDALE	AZ	85310 USA	EMAD INVESTMENT LLC	5635 W ALAMEDA RD						GLENDALE	AZ	85310-3612		
40149004D	AT & AL LLC	5278 W MURIEL DR		GLENDALE	AZ	85308	AT & AL LLC	5278 W MURIEL DR						GLENDALE	AZ	85308-5353		
40149005E	SADDLEBACK CATTLE CO LP	PO BOX 1084		BUCKEYE	AZ	85326	SADDLEBACK CATTLE CO LP	PO BOX 150						BUCKEYE	AZ	85322-0150		
40149005F	L & K PROPERTY INVESTMENT FAMILY LLLP	11225 S 193RD DR		BUCKEYE	AZ	85362 USA	L & K PROPERTY INVESTMENT FAMILY LLLP	P O BOX 1084						BUCKEYE	AZ	85362-0081		
40149006	GO GETTER PROPERTIES LLC	1423 S HIGLEY RD STE 127		MESA	AZ	85206	GO GETTER PROPERTIES LLC	C/O RICHARD E DURFEE JR	1024 N CONSTELLATION WAY					GILBERT	AZ	85234-3902		
40149007A	COWLEY FAMILY FOUNDATION	1242 E JACKSON ST		PHOENIX	AZ	85034	COWLEY FAMILY FOUNDATION	1242 E JACKSON ST						PHOENIX	AZ	85034-2342		
40149007B	CHARRON RICHARD E TR	9447 W MCRAE WY		PEORIA	AZ	85382	CHARRON RICHARD E TR	9447 W MCRAE WAY						PEORIA	AZ	85382-3625		
40149008E	PHAM HONG THU/HOANG TRONG	3333 N GARDEN LN		AVONDALE	AZ	85323	PHAM HONG THU/HOANG TRONG	3333 N GARDEN LN						AVONDALE	AZ	85323-3813		
40149009	RAMADA SAFARI INC	1 SYLVAN WAY	PO BOX 641	PARSIPPANY	NJ	7054	RAMADA SAFARI INC	C/O CTF DEVELOPMENT INC	1300 CONNETICUT AVE NW UNIT 901					WASHINGTON	DC	20036		
40149010	BLALOCK LEON F/JOAN	991 ELK VALLEY RD		CRESCENT CITY	CA	95531	BLALOCK LEON F/JOAN	991 ELK VALLEY RD						CRESCENT CITY	CA	95531-9343		
4014911C	GENTEMAN EDITH MAE	38238 N 20TH ST		PHOENIX	AZ	85086	GENTEMAN EDITH MAE	38238 N 20TH ST						PHOENIX	AZ	85086-8814		
40149011D	BLALOCK LEON F/JOAN	991 ELK VALLEY RD		CRESCENT CITY	CA	95531	BLALOCK LEON F/JOAN	991 ELK VALLEY RD						CRESCENT CITY	CA	95531-9343		
40149011E	COWLEY FAMILY FOUNDATION	1242 E JACKSON ST		PHOENIX	AZ	85034	COWLEY FAMILY FOUNDATION	1242 E JACKSON ST						PHOENIX	AZ	85034-2342		
40149011F	COWLEY FAMILY FOUNDATION	1242 E JACKSON ST		PHOENIX	AZ	85034	COWLEY FAMILY FOUNDATION	1242 E JACKSON ST						PHOENIX	AZ	85034-2342		
40149012B	SOUTH 40 TURNING POINTE LLC	3411 N 5TH AVE		PHOENIX	AZ	85013	SOUTH 40 TURNING POINTE LLC	201 E GLENN DR						PHOENIX	AZ	85020-4829		
40149017E	EL PASO NATURAL GAS CO	P O BOX 1492		EL PASO	TX	79948	EL PASO NATURAL GAS CO	PO BOX 1492						EL PASO	TX	79978-0001		
40149017X	SEP II	101 ASH ST		SAN DIEGO	CA	92101-3017	SEP II	101 ASH ST						SAN DIEGO	CA	92101-3017		
40149018D	DILLWORTH RICHARD S	71 E BEDELL ST		FREEPORT	NY	11520	DILLWORTH RICHARD S	71 E BEDELL ST						FREEPORT	NY	11520-5722		
40149019	SIMPSON VICTOR A	2730 W MONTE AVE		MESA	AZ	85202	SIMPSON VICTOR A	2730 W MONTE AVE						MESA	AZ	85202-6919		
40149021	BRADBURN GARY ALAN/RUSTER MICHAEL	1817 OAKLWAN DR		PRESCOTT	AZ	86305	RUSTER MICHAEL/BRADBURN GARY ALAN	1817 OAKLAWN DR						PRESCOTT	AZ	86305-1158		
40149030	PLANCK JERE W/MARY CHRISTINE TR	5420 E EXETER BLVD		PHOENIX	AZ	85018	PLANCK JERE W/MARY CHRISTINE TR	5420 E EXETER BLVD						PHOENIX	AZ	85018-3105		
40150002A	KOBIE JEFFREY LELAND	1274 E COMMERCE AVE		GILBERT	AZ	85234	KOBIE JEFFREY LELAND	1274 E COMMERCE AVE						GILBERT	AZ	85234-4730		
40150002B	GRAHAM DANNY A	419 RELMELLAN CT		WAKE FOREST	NC	27587	GRAHAM DANNY A	419 RELMELLAN CT						WAKE FOREST	NC		27587	
40150003	SHETH ASHVIN/PRAGNA	2310 E MINTON ST		MESA	AZ	85213	SHETH ASHVIN/PRAGNA	2310 E MINTON ST						MESA	AZ	85213-1428		
40150004A	BARRICK PROPERTIES LC	4336 E BECK LN		PHOENIX	AZ	85032	BARRICK PROPERTIES LC	4336 E BECK LN						PHOENIX	AZ	85032-7621		
40150004D	DOOEN SEAN MICHAEL	PO BOX 12036		FLAGSTAFF	AZ	86011	SEAN MICHAEL DOOEN	P O BOX 397						YARNELL	AZ	85362-0397		
40150004F	NARRAMORE 435 T LLC	2230 N UNIVERSITY PKWY	UNIT 2C	PROVO	UT	84604	NARRAMORE 435 T LLC	2230 N UNIVERSITY PKWY	UNIT 2C					PROVO	UT		84604	
40150005G	BREZIN RONALD S/THERESE	RR4 BOX 2902 WHISPERWOOD CT		SAYLORSBURG	PA	18353	BREZIN RONALD S/THERESE	252 WHISPERWOOD CT						SAYLORSBURG	PA	18353-8590		
40150005H	CLIFFORD SEAN MICHAEL/THERESA ANN	2447 S AVOCA CR		MESA	AZ	85208	CLIFFORD SEAN MICHAEL/THERESA ANN	2447 S AVOCA CIR						MESA	AZ	85209-4984		
40150005J	NARRAMORE 435 T LLC	2230 N UNIVERSITY PKWY	UNIT 2C	PROVO	UT	84604	NARRAMORE 435 T LLC	2230 N UNIVERSITY PKWY UNIT 2C						PROVO	UT	84604-6708		
40150005K	BARRICK PROPERTIES LC	4336 E BECK LN		PHOENIX	AZ	85032	BARRICK PROPERTIES LC	4336 E BECK LN						PHOENIX	AZ	85032-7621		
40150006A	TAIGEN FAMILY LLC	PO BOX 147		COOLIN	ID	83821 USA	TAIGEN FAMILY LLC	PO BOX 147						COOLIN	ID	83821-0147		
40150006B	VERDUGO DIEGO RAMON	3977 S NEWPORT ST		CHANDLER	AZ	85286	VERDUGO DIEGO RAMON	3977 S NEWPORT ST						CHANDLER	AZ	85286-2594		
40150007A	DENMAN MICHAEL KEVIN/MICHELL GLORIA	14566 W COLUMBUS AVE		GOODYEAR	AZ	85338	DENMAN MICHAEL KEVIN/MICHELL GLORIA	14566 W COLUMBUS AVE						GOODYEAR	AZ	85338-8235		
40150007D	RUIZ BRENDA	6518 S 71ST DR		LAVEEN	AZ	85339	RUIZ BRENDA	6518 S 71ST DR						LAVEEN	AZ	85339-5018		
40150007E	THORESON JIM	PO BOX 74		TONOPAH	AZ	85354	THORESON JIM	PO BOX 74						TONOPAH	AZ	85354-0074		
40150007G	KALLA SUBHI M TR	7820 N 47TH PL		PARADISE VALLEY	AZ	85253	KALLA SUBHI M TR	7820 N 47TH PL						PARADISE VALLEY	AZ		85253	
40150007H	MCCAULEY BOKE E	PO BOX 55943		PHOENIX	AZ	85078	MCCAULEY BOKE E	PO BOX 55943						PHOENIX	AZ	85078-5943		
40150008A	VERMA MD TD 435/NARRAMORE 240 LLC	3001 W INDIAN SCHOOL RD STE 140		PHOENIX	AZ	85017	VERMA MD TD 435/NARRAMORE 240 LLC	3001 W INDIAN SCHOOL RD STE 140						PHOENIX	AZ	85017-4142		
40150008B	HEESCH RICHARD/REA/NELSON RICHARD/LANA	8767 E VIA DEL ARBOR		PHOENIX	AZ	85258	HEESCH RICHARD/REA/NELSON RICHARD/LANA	8767 E VIA DEL ARBOR						SCOTTSDALE	AZ		85258	
40150009	TUZIM JOHN/MARIA	15760 W 132ND ST		LEMONT	IL	60439	TUZIM JOHN/MARIA	15760 132ND ST						LEMONT	IL	60439-6475		
40150010A	VERMA MD TD 435/NARRAMORE 240 LLC	3001 W INDIAN SCHOOL RD STE 140		PHOENIX	AZ	85017	VERMA MD TD 435/NARRAMORE 240 LLC	3001 W INDIAN SCHOOL RD STE 140						PHOENIX	AZ	85017-4142		
40150010B	VERMA MD TD 435/NARRAMORE 240 LLC	3001 W INDIAN SCHOOL RD STE 140		PHOENIX	AZ	85017	VERMA MD TD 435/NARRAMORE 240 LLC	3001 W INDIAN SCHOOL RD STE 140						PHOENIX	AZ	85017-4142		
40150011	DIAZ MARIA ELENA	21018 W NARRAMORE		BUCKEYE	AZ	85236	DIAZ MARIA ELENA	21018 W NARRAMORE						BUCKEYE	AZ	85236-4582		
40150014B	TONOPAH/GILABEND 1100/657 LLC	3001 W INDIAN SCHOOL RD 140		PHOENIX	AZ	85016 USA	TONOPAH/GILABEND 1100/657 LLC	3001 W INDIAN SCHOOL RD 140						PHOENIX	AZ	85016-4142		
40150014C	BEST CHOICE PROPERTIES-1120 ACRES LLC	2487 S GILBERT STE 106-418		GILBERT	AZ	85296	BEST CHOICE PROPERTIES-1120 ACRES L	2487 S GILBERT STE 106-418						GILBERT	AZ	85296-2824		
40152011	SILVER JACK/ROXIE TR/BURACK TR/SJB INVESMENTS	7505 E MAIN ST STE 600		SCOTTSDALE	AZ	85251-4560	SILVER JACK/ROXIE TR/BURACK TR/SJB INVES	SJB INVESTMENTS	8096 N 85TH WAY STE 102					SCOTTSDALE	AZ	85258-4322		
40152013D	LITTLETON CHARLEY GLENN	575 CLIFF LN		FALL BRANCH	TN	37656	LITTLETON CHARLEY GLENN	575 CLIFF LN						FALL BRANCH	TN	37656-3410		
40152013E	BC GALLOWAY HOLDINGS LLC	911 HILDEBRAND LN STE 203		BAINBRIDGE ISLAND	WA	98110	BC GALLOWAY HOLDING LLC	403 MADISON AVE NORTH STE 230						BAINBRIDGE ISLAND	WA		98110	
40152013G	SIMS CARWELL/CATHERINE	62040 S 17TH ST		PHOENIX	AZ	85040	SIMS CARWELL/CATHERINE	6240 S 17TH ST						PHOENIX	AZ	85040-4509		
40152013H	COLLEY MARILYN D	6240 S 17TH ST		PHOENIX	AZ	85042	COLLEY MARILYN D	6240 S 17TH ST						PHOENIX	AZ	85042-4509		
40152013J	FREEMAN CAROLYN J	6240 S 17TH ST		PHOENIX	AZ	85042	FREEMAN CAROLYN J	6240 S 17TH ST						PHOENIX	AZ	85042-4509		
40152013K	SMITH EL RAY	6240 S 17TH ST		PHOENIX	AZ	85042	SMITH EL RAY	5408 S 18TH AVE						PHOENIX	AZ	85041-3810		
40152015A	NUCICO ANICETO/MARIA CARLOTTA	7529 W MACKENZIE DR		PHOENIX	AZ	85033	NUCICO ANICETO/MARIA CARLOTTA	7350 W MONTECITO AVE						PHOENIX	AZ	85033-2526		
40152015B	TATTIE LAND LP	20107 W MEDLOCK		LITCHFIELD PARK	AZ	85340 USA	TATTIE LAND LP	893 W PALO BREA DR						LITCHFIELD PARK	AZ		85340	
40152016E	SURDAKOWSKI FRANCIS P/LINDA M	14619 N 14TH DR		PHOENIX	AZ	85010	SURDAKOWSKI FRANCIS P/LINDA M	14619 N 14TH DR						PHOENIX	AZ	85010-5194		
40152016L	ISELI ANDRE W/GAIL A	14917 SE 142ND		CLACKAMAS	OR	97015	ISELI ANDRE W/GAIL A	14917 SE 142ND AVE						CLACKAMAS	OR	97015-7374		
40152016N	REID RHONDA R/JAMES F SR	1230 E DESERT COVE AVE		PHOENIX	AZ	85020	REID RHONDA R/JAMES F SR	1230 E DESERT COVE AVE						PHOENIX	AZ	85020-1108		
40152016P	STAECK ANN	2401 SOUTH 226TH DRIVE		BUCKEYE	AZ	85326	STAECK ANN	2401 S 226TH DR						BUCKEYE	AZ	85326-3915		
40152016Q	LITTLETON JAMES T/DANNY/TRACY/ETAL	589 CLIFF LN		FALL BRANCH	TN	37656	LITTLETON JAMES T/DANNY/TRACY/ETAL	589 CLIFF LN						FALL BRANCH	TN	37656-3410		
40152016R	KINGSBY ROBERT III	7235 W PERSHING AVE		PEORIA	AZ	85381	KINGSBY ROBERT III	7235 W PERSHING AVE						PEORIA	AZ	85381-6018		
40152016W	MAJED MAHMOUD/YASSER H/MICHELLE A	6807 E BROADWAY		MESA	AZ	85208	MAJED MAHMOUD/YASSER H/MICHELLE A	6807 E BROADWAY						MESA	AZ	85208-1913		
40152016X	THORNTON AND THORNTON DEF BEN PEN PL & RET TR	40472 N SPUR CROSS RD		CAVE CREEK	AZ	85331	THORNTON PATRICK M TR	40472 N SPUR CROSS RD						CAVE CREEK	AZ	85331-8123		
40153003	VERMA 467THNARRAMORE 320 LLC	3001 W INDIAN SCHOOL RD SUITE 140		PHOENIX	AZ	85017 USA	VERMA 467THNARRAMORE 320 LLC	3001 W INDIAN SCHOOL RD SUITE 140						PHOENIX	AZ		85017	
40153005	SHAWYER COREY L	12 DUTCHTOWN RD		HOUTZDALE	PA	16651	SHAWVER COREY L	12 DUTCHTOWN RD						HOUTZDALE	PA	16651-9225		
40153006A	NEW CENTURY	4625 COOPERS HAWK RD		KLAMATH FALLS	OR	97601	NEW CENTURY	4625 COOPERS HAWK RD						KLAMATH FALLS	OR	97601-8664		
40153006B	SHABAN AHMAD M/IBTISSAM D	19402 N 15TH AVE		PHOENIX	AZ	85027	SHABAN AHMAD	19402 N 15TH AVE						PHOENIX	AZ	85027-4608		
40153007A	WESTWOOD LEGACY TRUST	4730 W MCNEIL ST		LAVEEN	AZ	85339	WESTWOOD LEGACY TRUST	4730 W MCNEIL ST						LAVEEN	AZ	85339-9643		
40153008	ZABROCKI STEVE J	5704 N 11TH AVE		PHOENIX	AZ	85013	ZABROCKI STEVE J	5704 N 11TH AVE						PHOENIX	AZ	85013-1609		
40155002	CV HARQUAHALA LLC	3549 153RD AVE SE		CASSELTON	ND	58012 USA	CV HARQUAHALA LLC	CLUB VISTA FINANCIAL SERVICES LLC	3549 153RD AVE SE					CASSELTON	ND	58012-9700		
40155004A	SHAWVER PATRICIA E	PO BOX 5		AVONDALE	AZ	85323	SHAWVER PATRICIA E	PO BOX 5						AVONDALE	AZ	85323-0011		
40155004B	CV HARQUAHALA LLC	3549 153RD AVE SE		CASSELTON	ND	58012 USA	CV HARQUAHALA LLC	CLUB VISTA FINANCIAL SERVICES LLC	3549 153RD AVE SE					CASSELTON	ND	58012-9700		
40155007B	CV HARQUAHALA LLC	3549 153RD AVE SE		CASSELTON	ND	58012 USA	CV HARQUAHALA LLC	CLUB VISTA FINANCIAL SERVICES LLC	3549 153RD AVE SE					CASSELTON	ND	58012-9700		
40155007E	LAND HOLDINGS LLC	69 E COLUMBUS AVE		PHOENIX	AZ	85012	LAND HOLDINGS LLC	7650 S MCCLINTOCK DR STE 103						TEMPE	AZ	85284-1673		
40155007F	CV HARQUAHALA LLC	3549 153RD AVE SE		CASSELTON	ND	58012 USA	CV HARQUAHALA LLC	CLUB VISTA FINANCIAL SERVICES LLC	3549 153RD AVE SE					CASSELTON	ND	58012-9700		
40155007G	CV HARQUAHALA LLC	3549 153RD AVE SE		CASSELTON	ND	58012 USA	CV HARQUAHALA LLC	CLUB VISTA FINANCIAL SERVICES LLC	3549 153RD AVE SE					CASSELTON	ND	58012-9700		
40155008	CV HARQUAHALA LLC	3549 153RD AVE SE		CASSELTON	ND	58012 USA	CV HARQUAHALA LLC	CLUB VISTA FINANCIAL SERVICES LLC	3549 153RD AVE SE					CASSELTON	ND	58012-9700		
40155009A	MALAD INC	1955 N VAL VISTA DR STE 110		MESA	AZ	85213	MALAD INC	MALAD INC	1955 N VAL VISTA DR STE 110					MESA	AZ	85213-3218		
40155009B	MALAD INC	1955 N VAL VISTA DR STE 110		MESA	AZ	85213	MALAD INC	MALAD INC	1955 N VAL VISTA DR STE 110					MESA	AZ	85213-3218		
40155010	CV HARQUAHALA LLC	3549 153RD AVE SE		CASSELTON	ND	58012 USA	CV HARQUAHALA LLC	CLUB VISTA FINANCIAL SERVICES LLC	3549 153RD AVE SE					CASSELTON	ND	58012-9700		
40155012B	AZOO LLC	150-16 27TH AVE		FLUSHING	NY	11354	AZOO LLC	150-16 27TH AVE						FLUSHING	NY	11354-1541		
40155014	GOODGAME JACQULYNN TR	10509 W PALMERAS DR		SUN CITY	AZ	85373	GOODGAME JACQULYNN TR	10509 W PALMERAS DR						SUN CITY	AZ	85373-1939		
40155017	TALEBI KAM/SARA R	18734 MELROSE CHASE		EDEN PRAIRIE	MN	55347	TALEBI KAM/SARA R	18734 MELROSE CHASE						EDEN PRAIRIE	MN	55347-3479		
40155018	RHIND RALPH TR	2054 MANHATTAN AVE		HERMOSA BEACH	CA	90254	RHIND RALPH TR	2054 MANHATTAN AVE						HERMOSA BEACH	CA	90254-2862		
40155026	CV HARQUAHALA LLC	3549 153RD AVE SE		CASSELTON	ND	58012 USA	CV HARQUAHALA LLC	CLUB VISTA FINANCIAL SERVICES LLC	3549 153RD AVE SE					CASSELTON	ND	58012-9700		
40155027	CV HARQUAHALA LLC	3549 153RD AVE SE		CASSELTON	ND	58012 USA	CV HARQUAHALA LLC	CLUB VISTA FINANCIAL SERVICES LLC	3549 153RD AVE SE					CASSELTON	ND	58012-9700		
40155030	CV HARQUAHALA LLC	3549 153RD AVE SE		CASSELTON	ND	58012 USA	CV HARQUAHALA LLC	CLUB VISTA FINANCIAL SERVICES LLC	3549 153RD AVE SE					CASSELTON	ND	58012-9700		
40155031C	CV HARQUAHALA LLC	3549 153RD AVE SE		CASSELTON	ND	58012 USA	CV HARQUAHALA LLC	CLUB VISTA FINANCIAL SERVICES LLC	3549 153RD AVE SE					CASSELTON	ND	58012-9700		
40155031D	CV HARQUAHALA LLC	3549 153RD AVE SE		CASSELTON	ND	58012 USA	CV HARQUAHALA LLC	CLUB VISTA FINANCIAL SERVICES LLC	3549 153RD AVE SE					CASSELTON	ND	58012-9700		
40155032B	CV HARQUAHALA LLC	3549 153RD AVE SE		CASSELTON	ND	58012 USA	CV HARQUAHALA LLC	CLUB VISTA FINANCIAL SERVICES LLC	3549 153RD AVE SE					CASSELTON	ND	58012-9700		
40152036E							PRINGLE DANIEL T/ELIZABETH A	3287 E TREMAINE AVE						GILBERT	AZ	85234-5276		
40152016T	LAZAR JOSAPHIN/RASHO VIRGINIA/FOOD AB I	847 DIGHTON LN		SCHAUMBURG	IL	60173 USA	LAZAR ODISHO/JOSAPHIN/JOSEF/A/RASHO VIRG	5016 W CULVER ST						SKOKIE	IL	60077-1004		
40159003	33205 W DESERT ROSE RD			85322 JAGOW FAMILY LLC	12911 N E 185TH ST		BATTLEGROUND	WA	98604	JAGOW FAMILY LLC	12911 N E 185TH ST			BATTLEGROUND	WA	98604-4151		
40159008E	18601 S OLD US HIGHWAY 80	ARLINGTON		85332 MONIZ DAVID	2067 NAVARRO AVE		PASADENA	CA	91103	MONIZ DAVID	2067 NAVARRO AVE			PASADENA	CA	91103-1555		
40158014	18300 S OLD US HIGHWAY 80	ARLINGTON		85322 JUBILEE FRIENDS ENTERPRISES LLC	921 W MAIN ST		AVONDALE	AZ	85323 USA	PACIFIC CAPITAL BANK	PO BOX 60704			SANTA BARBARA	CA	93160-0704		
40158005	18023 S 347TH AVE			85322 SUTTER RICK/KAREN TR	PO BOX 1198		BUCKEYE	AZ	85326	SUTTER RICK/KAREN TR	PO BOX 1198			BUCKEYE	AZ	85326-0088		
40159005	20847 S 100TH DR	ARLINGTON		85322 GABLE GARY P/WARREN T/KREAGER CRAIG	PO BOX 10 15005 S OLD US 80		ARLINGTON	AZ	85322	GABLE GARY P/WARREN T/KREAGER CRAIG	PO BOX 10 15005 S OLD US 80			ARLINGTON	AZ	85322-0010		
40158031D	20505 S OLD HIGHWAY 80			85322 MEOJ LLC	22237 E WATKINS ST		BUCKEYE	AZ	85326 USA	ARLINGTON LAND LLC	25550 W US HIGHWAY 85			BUCKEYE	AZ	85326-5216		
40159008S	18813 S OLD HIGHWAY 80			85322 RICHARDSON HUGH W/CHERYLE A	2650 W. UNION HILLS DR. LOT 106		PHOENIX	AZ	85027-5013	RICHARDSON HUGH W/CHERYLE A	18813 S OLD US HIGHWAY 80			ARLINGTON	AZ	85322-8206		
40158022A	18301 S OLD US HIGHWAY 80			BRONCO ENTERPRISES LTD	PO BOX 68		ARLINGTON	AZ	85322	BRONCO ENTERPRISES LTD	PO BOX 68			ARLINGTON	AZ	85322-0068		

40159007C	34401 W DESERT ROSE RD			RICHARDSON KEVIN B		STAR RT 3 BOX 138		ARLINGTON	AZ	85322	RICHARDSON KEVIN B	34401 W DESRT ROSE RD				ARLINGTON	AZ	85322-8215	
40159008U	16601 S OLD HIGHWAY 80			WORKMAN TERRY/DIANNA		16601 W OLD HWY 80		ARLINGTON	AZ	85322	WORKMAN TERRY/DIANNA	16601 W OLD HIGHWAY 80				ARLINGTON	AZ		85322
40158006B				ARLINGTON CANAL CO		PO BOX 488		BUCKEYE	AZ	85326	ARLINGTON CANAL CO	PO BOX 488				BUCKEYE	AZ	85326-0037	
40159007B				RICHARDSON KEVIN B/JUDY A		34401 W DESERT ROSE RD		ARLINGTON	AZ	85322	RICHARDSON KEVIN B/JUDY A	34401 W DESERT ROSE RD				ARLINGTON	AZ	85322-8215	
40159009A				SANDERS FAMILY FARMS LP		9728 S BRUNER RD		BUCKEYE	AZ	85326 USA	SANDERS RICHARD M/DEBRA J TR	PO BOX 19				PALO VERDE	AZ	85343-0019	
40159008C				WORKMAN DIANNA LYNN		16601 W OLD US HWY 80		ARLINGTON	AZ	85322	WORKMAN DIANNA LYNN	16601 W OLD HIGHWAY 80				ARLINGTON	AZ		85322
40159010E				HERNANDEZ THOMAS		PO BOX 14		ARLINGTON	AZ	85322	HERNANDEZ THOMAS	PO BOX 14				ARLINGTON	AZ	85322-0014	
40158034				ARIZONA STATE LAND DEPT		3300 N CENTRAL AVE NO 1800		PHOENIX	AZ	85012	ARIZONA STATE LAND DEPT	1616 W ADAMS ST				PHOENIX	AZ	85007-2614	
40158011				ARIZONA STOCK FARMS INC		37 W SIERRA VISTA DR		PHOENIX	AZ	85013	ARIZONA STOCK FARMS INC	QUICK GLENN E	37 W SIERRA VISTA DR			PHOENIX	AZ	85013-1200	
40158015				SADDLE BACK CATTLE CO/L&K PROPERTY INV FAM		PO BOX 150		ARLINGTON	AZ	85322	SADDLE BACK CATTLE CO/L&K PROPERTY INV F	PO BOX 150				ARLINGTON	AZ	85322-0150	
40158016				ARIZONA STOCK FARMS INC		37 W SIERRA VISTA DR		PHOENIX	AZ	85013	ARIZONA STOCK FARMS INC	QUICK GLENN E	37 W SIERRA VISTA DR			PHOENIX	AZ	85013-1200	
40158017				SADDLE BACK CATTLE CO/L&K PROPERTY INV FAM		PO BOX 150		ARLINGTON	AZ	85322	SADDLE BACK CATTLE CO/L&K PROPERTY INV F	PO BOX 150				ARLINGTON	AZ	85322-0150	
40158018				SADDLE BACK CATTLE CO/L&K PROPERTY INV FAM		PO BOX 150		ARLINGTON	AZ	85322	SADDLE BACK CATTLE CO/L&K PROPERTY INV F	PO BOX 150				ARLINGTON	AZ	85322-0150	
40158019				SADDLE BACK CATTLE CO/L&K PROPERTY INV FAM		PO BOX 150		ARLINGTON	AZ	85322	SADDLE BACK CATTLE CO/L&K PROPERTY INV F	PO BOX 150				ARLINGTON	AZ	85322-0150	
40158020				ARIZONA STOCK FARMS INC		37 W SIERRA VISTA DR		PHOENIX	AZ	85013	ARIZONA STOCK FARMS INC	QUICK GLENN E	37 W SIERRA VISTA DR			PHOENIX	AZ	85013-1200	
40158021				SADDLE BACK CATTLE CO/L&K PROPERTY INV FAM		PO BOX 150		ARLINGTON	AZ	85322	SADDLE BACK CATTLE CO/L&K PROPERTY INV F	PO BOX 150				ARLINGTON	AZ	85322-0150	
40158022B				ARIZONA STOCK FARMS INC		37 W SIERRA VISTA DR		PHOENIX	AZ	85013	ARIZONA STOCK FARMS INC	QUICK GLENN E	37 W SIERRA VISTA DR			PHOENIX	AZ	85013-1200	
40158031E				SANDERS FAMILY FARMS LP		9728 S BRUNER RD		BUCKEYE	AZ	85326 USA	SANDERS RICHARD M TR	PO BOX 19				PALO VERDE	AZ	85343-0019	
40158031G				SANDERS FAMILY FARMS LP		9728 S BRUNER RD		BUCKEYE	AZ	85326 USA	SANDERS RICHARD M TR	PO BOX 19				PALO VERDE	AZ	85343-0019	
40159006				RICHARDSON KEVIN B		STAR RT 3 BOX 138		ARLINGTON	AZ	85322	RICHARDSON KEVIN B	34401 W DESERT ROSE RD				ARLINGTON	AZ	85322-8215	
40159008D				WORKMAN DIANNA LYNN		16601 W OLD US HWY 80		ARLINGTON	AZ	85322	WORKMAN DIANNA LYNN	16601 S OLD US HIGHWAY 80				ARLINGTON	AZ	85322-8216	
40159008L				FINCHUM MELANIE MAY/WORKMAN DIANNA LYNN		18601 S OLD US HWY 80		ARLINGTON	AZ	85322	FINCHUM MELANIE MAY/WORKMAN DIANNA LYNN	15905 S OLD US HIGHWAY 80				ARLINGTON	AZ	85322-8200	
40159008N				FINCHUM KENNETH E III/MELANIE M		15905 S OLD US HWY 80		ARLINGTON	AZ	85322	FINCHUM KENNETH E III/MELANIE M	15905 S OLD US HIGHWAY 80				ARLINGTON	AZ	85322-8200	
40159008T				FINCHUM KEN III/MELANIE		16601 W OLD HWY 80		ARLINGTON	AZ	85322	FINCHUM KEN III/MELANIE	16601 W OLD HIGHWAY 80				ARLINGTON	AZ		85322
40159008W				RICHARDSON SAM K JR		34401 W DESERT ROSE RD		ARLINGTON	AZ	85322	RICHARDSON SAM K JR	34401 W DESERT ROSE RD				ARLINGTON	AZ	85322-8215	
40159008X				AHNELL FAMILY 2012 TR/ESPINOZA MARTIN M ETAL		821 VIA ALEGRE		FALLBROOK	CA	92028	AHNELL FAMILY 2012 TR/ESPINOZA MARTIN M	KARL I AND LINDA K AHNELL	821 VIA ALEGRE			FALLBROOK	CA	92028-1746	
40159010A				SANDERS FAMILY FARMS LP		9728 S BRUNER RD		BUCKEYE	AZ	85326 USA	SANDERS RICHARD M/DEBRA J TR	PO BOX 19				PALO VERDE	AZ	85343-0019	
40158006C				MOERMAN PATSY J/MORGAN CAROL M TR/MOERMAN E/P		529 B WALKERTOWN-GUTHRIE RD		WINSTON-SALEM	NC	27101	MOERMAN PATSY J/MORGAN CAROL M TR/M	529 B WALKERTOWN-GUTHRIE RD				WINSTON-SALEM	NC	27101-6310	
40158006D				MOERMAN PATSY J/MORGAN CAROL M TR/MOERMAN E/P		529 B WALKERTOWN-GUTHRIE RD		WINSTON-SALEM	NC	27101	MOERMAN PATSY J/MORGAN CAROL M TR/M	527 WALKERTOWN GUTHRIE RD				WINSTON SALEM	NC	27101-6310	
40149017L				SEP II LLC		101 ASH ST HQ08B		SAN DIEGO	CA	92101	SEP II LLC	101 ASH ST HQ08B				SAN DIEGO	CA	92101-3017	
40149017M				SEP II LLC		101 ASH ST HQ08B		SAN DIEGO	CA	92101	SEP II LLC	101 ASH ST HQ08B				SAN DIEGO	CA	92101-3017	
40153007C				SPRAKER LARISSA R		5311 N 8TH AVE		PHOENIX	AZ	85013 USA									
40153007D				K.MARYN LLC		5639 E MORNING VISTA LN		CAVE CREEK	AZ	85331 USA									
50614020D				FACKINER STACY L		PO BOX 51		TONOPAH	AZ	85354	FACKINER STACY L	PO BOX 51							
50614016D	7 S 523RD AVE	TONOPAH	85354	KACIUBA JESSIE B		1933 YORKTOWNE BLVD		TOMS RIVER	NJ	8753	KACIUBA JESSIE B	1933 YORKTOWNE BLVD				TONOPAH	AZ	85354-0051	
50614020B	51008 W COURT HOUSE RD	TONOPAH	85354	FACKINER DENNIS J		23132 W YAVAPAI ST		BUCKEYE	AZ	85326	FACKINER DENNIS J	23132 W YAVAPAI ST				TOMS RIVER	NJ	08753-1511	
50614021	51106 W COURT HOUSE RD		85354	SUTHERLAND BARRY K/SHARON LEE TR		PO BOX 1562		GILBERT	AZ	85299	SUTHERLAND BARRY K/SHARON LEE TR	PO BOX 1562				BUCKEYE	AZ	85326-6185	
50614015				WALTER JOHN J		7914 E SOFTWIND DR		SCOTTSDALE	AZ	85255	WALTER JOHN J	7914 E SOFTWIND DR				GILBERT	AZ	85299-1562	
50614016A				ZEDAN MARIA		15039 W CHARTER OAK RD		SURPRISE	AZ	85379	ZEDAN MARIA	15039 W CHARTER OAK RD				SCOTTSDALE	AZ	85255-3464	
50614016B				GREGORY ROBERT D TR		1225 KORONA LN		CONCORD	CA	94521	GREGORY ROBERT D TR	3023 E FRISS DR				SURPRISE	AZ	85379-5921	
50614016K				ALCORTA GLADIS A/FORNES EDWARD		PO BOX 5456		PEORIA	AZ	85385	ALCORTA GLADIS A/FORNES EDWARD	PO BOX 5456				PHOENIX	AZ	85032-5698	
50614016M				GREGORY ROBERT D TR		1225 KORONA LN		CONCORD	CA	94521	GREGORY ROBERT D TR	3023 E FRISS DR				PEORIA	AZ	85385-5456	
50614016N				BOYS SERRON L/LORETTA IC/CANDICE E		11602 W TONTO ST		AVONDALE	AZ	85323	BOYS SERRON L/LORETTA IC/CANDICE E	7341 S 253RD AVE				PHOENIX	AZ	85032-5698	
50614016P				PLATA MAURA I/PLATA ERNESTO		3050 N 83RD LN		PHOENIX	AZ	85037	PLATA MAURA I/PLATA ERNESTO	3050 N 83RD LN				BUCKEYE	AZ	85326-1380	
50614016Q				PLATA MAURA I/PLATA ERNESTO		3050 N 83RD LN		PHOENIX	AZ	85037	PLATA MAURA I/PLATA ERNESTO	3050 N 83RD LN				PHOENIX	AZ	85037-3353	
50614016R				PLATA MAURA I/PLATA ERNESTO		3050 N 83RD LN		PHOENIX	AZ	85037	PLATA MAURA I/PLATA ERNESTO	3050 N 83RD LN				PHOENIX	AZ	85037-3353	
50614016S				PLATA MAURA I/PLATA ERNESTO		3050 N 83RD LN		PHOENIX	AZ	85037	PLATA MAURA I/PLATA ERNESTO	3050 N 83RD LN				PHOENIX	AZ	85037-3353	
50614016T				NAVA RAUL CABALLERO		6441 W MC DOWELL RD 1062		PHOENIX	AZ	85035	NAVA RAUL CABALLERO	4629 W GRANADA RD				PHOENIX	AZ	85035-4104	
50614016U				FORTUNA FRANKLIN L/EDITHANN V		14730 W BLACK GOLD CT		SUN CITY WEST	AZ	85375	FORTUNA FRANKLIN L/EDITHANN V	14730 W BLACK GOLD CT				SUN CITY WEST	AZ	85375-2789	
50614016V				FORTUNA FRANKLIN L/EDITHANN V		14730 W BLACK GOLD CT		SUN CITY WEST	AZ	85375	FORTUNA FRANKLIN L/EDITHANN V	14730 W BLACK GOLD CT				SUN CITY WEST	AZ	85375-2789	
50614016W				FORTUNA FRANKLIN L/EDITHANN V		14730 W BLACK GOLD CT		SUN CITY WEST	AZ	85375	FORTUNA FRANKLIN L/EDITHANN V	14730 W BLACK GOLD CT				SURPRISE	AZ	85374-6434	
50614016X				FINTO JOHN/MARY A		13267 W BOCA RATON RD		SURPRISE	AZ	85374	FINTO JOHN/MARY A	13267 W BOCA RATON RD				SURPRISE	AZ	85374-6434	
50614016Y				FINTO JOHN/MARY A		13267 W BOCA RATON RD		SURPRISE	AZ	85374	FINTO JOHN/MARY A	13267 W BOCA RATON RD				SURPRISE	AZ	85374-6434	
50614018				SUTHERLAND BARRY K/SHARON LEE TR		PO BOX 1562		GILBERT	AZ	85299	SUTHERLAND BARRY K/SHARON LEE TR	PO BOX 1562				GILBERT	AZ	85299-1562	
50614019B				RADZIETA JAN		25709 W WILLIAMS CT		BUCKEYE	AZ	85326	RADZIETA JAN	25709 W WILLIAMS CT				BUCKEYE	AZ	85326-2982	
50614019C				RADZIETA JAN		25709 W WILLIAMS CT		BUCKEYE	AZ	85326	RADZIETA JAN	25709 W WILLIAMS CT				BUCKEYE	AZ	85326-2982	
50614019D				ADAMCZYK ANDRZEJ/ANNA ENGELMAN		14847 W DESERT HILLS DR		SURPRISE	AZ	85379	ADAMCZYK ANDRZEJ/ANNA ENGELMAN	14847 W DESERT HILLS DR				SURPRISE	AZ	85379-5258	
50614019E				SILESIA TRUST		14562 W SHAW BUTTE DR		SURPRISE	AZ	85379	SILESIA TRUST	SILESIA LLC TR	14562 W SHAW BUTTE DR			SURPRISE	AZ	85379-4460	
50614019F				TRIDANE ABDESSAMAD/NAJAFI HEDIEH		19744 E REINS RD		QUEEN CREEK	AZ	85242	TRIDANE ABDESSAMAD/NAJAFI HEDIEH	19744 E REINS RD				QUEEN CREEK	AZ	85242-8675	
50614019G				HEWITT RICHARD/SUSAN		17708 W DESERT VIEW LN		GOODYEAR	AZ	85338	HEWITT RICHARD/SUSAN	17708 W DESERT VIEW LN				GOODYEAR	AZ	85338-5353	
50614020C				FACKINER STACY L		PO BOX 51		TONOPAH	AZ	85354	FACKINER STACY L	PO BOX 51				TONOPAH	AZ	85354-0051	
50614020E				FACKINER STACY L		PO BOX 51		TONOPAH	AZ	85354	FACKINER STACY L	PO BOX 51				TONOPAH	AZ	85354-0051	
50614022A				515TH 20 AC LLC		3040 N 44TH ST STE 3		PHOENIX	AZ	85018	515TH 20 AC LLC	6241 E YUCCA ST				SCOTTSDALE	AZ	85254-5448	
50614022B				SMK LAND HOLDINGS LLC		1920 E MARYLAND 32		PHOENIX	AZ	85016	SMK LAND HOLDINGS LLC	SHARON CONTORNO3	1920 E MARYLAND 32			PHOENIX	AZ	85016-1455	
50614023				TRANGSONS LLC		9899 S LA ROSA DR		TEMPE	AZ	85284 USA	TRANGSONS LLC	9899 S LA ROSA DR				TEMPE	AZ		85284
50614024				WP INVESTMENTS LLC		3003 N CENTRAL AVE 103 232		PHOENIX	AZ	85012	WP INVESTMENTS LLC	1928 E HIGHLAND AVE STE F104-504				PHOENIX	AZ	85016-0651	
50614025				SHIN GLEN Y/SO YOUNG H		8227 W BEAUBIEN DR		PEORIA	AZ	85382	SHIN GLEN Y/SO YOUNG H	8227 W BEAUBIEN DR				PEORIA	AZ	85382-3469	
50614050				GLASS RICHARD P/BARBARA L		4606 SW 84TH DR		GAINESVILLE	FL	32608	GLASS RICHARD/BARBARA	PO BOX 50581				PHOENIX	AZ	85076-0581	
50614051				GLASS RICHARD P/BARBARA L		4606 SW 84TH DR		GAINESVILLE	FL	32608	GLASS RICHARD P/BARBARA L	PO BOX 50581				PHOENIX	AZ	85076-0581	
50614052				GLASS RICHARD P/BARBARA L		4606 SW 84TH DR		GAINESVILLE	FL	32608	GLASS RICHARD P/BARBARA L	PO BOX 50581				PHOENIX	AZ	85076-0581	
50614053				GLASS RICHARD P/BARBARA L		4606 SW 84TH DR		GAINESVILLE	FL	32608	GLASS RICHARD P/BARBARA L	PO BOX 50581				PHOENIX	AZ	85076-0581	
50614054				GLASS RICHARD/BARBARA		PO BOX 50581		PHOENIX	AZ	85076 USA	GLASS RICHARD/BARBARA	PO BOX 50581				PHOENIX	AZ	85076-0581	
50614017A				HERZBERGER MICHAEL/ANGEL		3456 WHITE EAGLE DR		NAPERVILLE	IL	60564	HERZBERGER MICHAEL/ANGEL	3456 WHITE EAGLE DR				NAPERVILLE	IL	60564-4621	
50614017B				CUCCIARDO ROBERT M		905 MISTY L N		SPRING BRANCH	TX	78070	CUCCIARDO ROBERT M	221 W MONTGOMERY ST				SPARTA	WI	54656-1100	
50614017C				MJDD HOLDINGS LLC		PO BOX 13096		GLENDALE	AZ	85318	MJDD HOLDINGS LLC	C/O DAVID C ALEXANDER III	16520 E LASER DR UNIT 5			FOUNTAIN HILLS	AZ		85268
50623020A	3921 N 515TH AVE		85354	YANKEE POINT LLC		38082 SNICKERSVILLE TURNPIKE		PURCELVILLE	VA	20132	YANKEE POINT LLC	BRADLEY BOLAND	38082 SNICKERSVILLE TURNPIKE			PURCELVILLE	VA	20132-5006	
50622044A	2259 N 517TH AVE	TONOPAH	85354	CAPRITTA DALE A		13052 N 55TH AVE		GLENDALE	AZ	85304	CAPRITTA DALE A	11843 N 51ST DR				GLENDALE	AZ	85304-1970	
50622055A	51737 W CENTENNIAL RD	TONOPAH	85354	MAIN CHARLES		51727 W CENTENNIAL RD	PMB 430	TONAPAH	AZ	85354	MAIN CHARLES	PO BOX 400				TONOPAH	AZ	85354-0400	
50622055B	51723 W MCDOWELL RD		85354	CRUZ GERARDO/ANGELINA		51723 W MCDOWELL RD		TONOPAH	AZ	85354 USA	SANCHEZ DAVID G	C/O GERARDO/ANGELINA CRUZ	51723 W MCDOWELL RD			TONOPAH	AZ		85354
50620021G				FLOOD CONTROL DISTRICT OF MARICOPA COUNTY		2801W DURANGO ST		PHOENIX	AZ	85009 USA	MARICOPA COUNTY TREASURER'S OFFICE	2801 W JEFFERSON				PHOENIX	AZ		85009
50620021H				FLOOD CONTROL DISTRICT OF MARICOPA COUNTY		2801W DURANGO ST		PHOENIX	AZ	85009 USA	MARICOPA COUNTY TREASURER'S OFFICE	2801 W JEFFERSON				PHOENIX	AZ		85009
50620021J				UNITED STATES OF AMERICA		P O BOX 13468		PHOENIX	AZ	85002	UNITED STATES OF AMERICA	PO BOX 13468				PHOENIX	AZ	85002-3468	
50620026				FLOOD CONTROL DISTRICT OF MARICOPA COUNTY		2801W DURANGO ST		PHOENIX	AZ	85009 USA	MARICOPA COUNTY FLOOD CONTROL DISTRICT	2801 W DURANGO ST				PHOENIX	AZ	85009-6356	
50623035A	4043 N 503RD AVE		85354	HARQUAHALA VALLEY FARMS LLC		PO BOX 519		REXBURG	ID	83440	HARQUAHALA VALLEY FARMS LLC	PO BOX 519				REXBURG	ID	83440-0519	
50622039				KHAN MONAIR/BEBE S		87 TENNYSON DR		NANUET	NY	10954	KHAN MONAIR/BEBE S	87 TENNYSON DR				NANUET	NY	10954-1039	
50622040				DUONG HUE T TR/DUONG LINDA GIAU TR/MONICA N		22447 S 197TH CIR		QUEEN CREEK	AZ	85242	DUONG HUE T TR/DUONG LINDA GIAU TR/MONIC	22447 S 197TH CIR				QUEEN CREEK	AZ	85242-7598	
50622041				AZOO LLC		150-16 27TH AVE		FLUSHING	NY	11354	AZOO LLC	150-16 27TH AVE				FLUSHING	NY	11354-1541	
50620011A				WASHINGTON LETTUCE AND VEGETABLE COMPANY		3724 78TH AVE E		FIFE	WA	98424	WASHINGTON LETTUCE AND VEGETABLE COMPANY	13225 FARM TO MARKET RD				MT VERNON	WA	98273-8706	
50620012				LYKES NORMAN R & TIMOTHY ETAL CO-TR		17326 21ST AVE SW		BURIEN	WA	98166	LYKES NORMAN R & TIMOTHY ETAL CO-TR	17326 21ST AVE SW				BURIEN	WA	98166-3262	
50620013A				SOUTHWESTERN AGRICULTURAL SERVICES INC		3480 GS RICHARDS BLVD STE 101		CARSON CITY	NV	89703	SOUTHWESTERN AGRICULTURAL SERVICES INC	3480 GS RICHARDS BLVD STE 101				CARSON CITY	NV	89703-8442	
50620015				MUVDI JUNE M ETAL		3915 W DEVON		CHICAGO	IL	60645	MUVDI JUNE M ETAL	C/O LUNDSBERG PARTNERSHIP	1202 ALLANSON RD			MUNDELEIN	IL	60060-3808	
50620016				SOUTHWESTERN AGRICULTURAL SERVICES INC		3480 GS RICHARDS BLVD STE 101		CARSON CITY	NV	89703	SOUTHWESTERN AGRICULTURAL SERVICES INC	3480 GS RICHARDS BLVD STE 101				CARSON CITY	NV	89703-8442	
50620017A				VIDLER WATER CO INC		3480 GS RICHARDS BLVD STE 101		CARSON CITY	NV	89703	SOUTHWESTERN AGRICULTURAL SERVICES INC	3480 GS RICHARDS BLVD STE 101				CARSON CITY	NV	89703-8442	
50620018B				THOMAS ALLEN R/BARBARA BANDFIELD		5301 E ARCADIA LN		PHOENIX	AZ	85018	THOMAS ALLEN R	5301 E ARCADIA LN				PHOENIX	AZ	85018-3004	
50620021F				TODD RONALD G		5325 E PERSHING AVE		SCOTTSDALE	AZ	85254	TODD RONALD G	5325 E PERSHING AVE				SCOTTSDALE	AZ	85254-3627	
50620023A				SEVEN LAKES COMPANY INC		P O BOX 190		TONOPAH	AZ	85354	SEVEN LAKES COMPANY INC	PO BOX 190				TONOPAH	AZ	85354-0190	
50620023B				VIDLER WATER CO INC		3480 GS RICHARDS BLVD STE 101		CARSON CITY	NV	89703	VIDLER WATER CO INC	3480 GS RICHARDS BLVD STE 101				CARSON CITY	NV	89703-8442	
50620024A				TFP ENTERPRISES LLC		19820 W PINNACLE PEAK RD		SURPRISE	AZ	85387	TFP ENTERPRISES LLC	19820 W PINNACLE PEAK RD				SURPRISE	AZ	85387-9775	
50620024B				AVERY MICHAEL W		1718 E CAMPBELL	#38	PHOENIX	AZ	85016	AVERY MICHAEL W	PO BOX 16935				PHOENIX	AZ	85011-6935	
50621008A				BARRON JOHN L/THOMAS L/MEL/CHUCK ETAL		PO BOX 428		ST DAVID	AZ	85630	BAKER LUCILLE BARRON	PO BOX 428				SAINT DAVID	AZ	85630-0428	
50621008K				BARRON JAMES MELVIN		P O BOX 610		BUCKEYE	AZ	85326	BARRON JAMES MELVIN	PO BOX 610				BUCKEYE	AZ	85326-0045	
50621008L				PISSIOS RONDA R		1705 PAVILION WAY STE 501		PARK RIDGE	IL	60068	PISSIOS RONDA R	1705 PAVILION WAY STE 501				PARK RIDGE	IL	60068-1119	
50621009				VERMA 579/THOMAS 320 LLC		3001 W INDIAN SCHOOL RD - 140		PHOENIX	AZ	85017 USA	KIM SU POK/KYONG HWA TR	C/O KIM KYONG	29440 N 22ND AVE			PHOENIX	AZ		85085
50621010A				PEACEFUL HAPPY LAND GROUP FOUR LLC		11224 N 33RD ST		PHOENIX	AZ	85028	PEACEFUL HAPPY LAND GROUP FOUR LLC	11224 N 33RD ST				PHOENIX	AZ	85028-2723	
50621010C				GARMO FAMILY LIMITED PARTNERSHIP		23300 TELEGRAPH RD		SOUTHFIELD	MI	48034	GARMO FAMILY LIMITED PARTNERSHIP	23300 TELEGRAPH RD				SOUTHFIELD	MI	48034-4120	
50621010D				GARMO FAMILY LIMITED PARTNERSHIP		23300 TELEGRAPH RD		SOUTHFIELD	MI	48034	GARMO FAMILY LIMITED PARTNERSHIP	23300 TELEGRAPH RD				SOUTHFIELD	MI	48034-4120	
50621011A				VERMA AA AMERICAN GW 571/CAMELBACK 157 LLC		3001 W INDIAN SCHOOL RD STE 140		PHOENIX	AZ	85017	VERMA AA AMERICAN GW 571/CAMELBACK 157 L	3001 W INDIAN SCHOOL RD STE 140				PHOENIX	AZ	85017-4142	
50621012				KROEPEL EDITH E TR		3646 N 52ND PL		PHOENIX	AZ	85018	KROEPEL EDITH E TR	3646 N 52ND PL				PHOENIX	AZ	85018-6149	
50621023A				VERMA 579/THOMAS 320 LLC		3001 W INDIAN SCHOOL RD - 140		PHOENIX	AZ	85017 USA	KIM SU POK/KYONG HWA TR	C/O KIM KYONG	29440 N 22ND AVE			PHOENIX	AZ		85085
50622002				WESTWARD MOVEMENT/ETAL		1132 E SESAME ST		TEMPE	AZ	85283	WESTWARD MOVEMENT LLC/ETAL	C/O BENSON MARC	1132 E SESAME ST			TEMPE	AZ	85283-3025	
50622003A				MILLER ADAM/LORI		6501 E GREENWAY PKWY STE 103-291		SCOTTSDALE	AZ	85254	MILLER ADAM/LORI	6110 E HUNTRESS DR				PARADISE VALLEY	AZ		85253

50622003B		MILLER ADAM/LORI	6501 E GREENWAY PKWY STE 103-291	SCOTTSDALE	AZ	85254	MILLER ADAM/LORI	6110 E HUNTRESS DR		PARADISE VALLEY	AZ	85253			
50622003C		MILLER ADAM/LORI	6501 E GREENWAY PKWY STE 103-291	SCOTTSDALE	AZ	85254	MILLER ADAM/LORI	6110 E HUNTRESS DR		PARADISE VALLEY	AZ	85253			
50622003D		MILLER ADAM/LORI	6501 E GREENWAY PKWY STE 103-291	SCOTTSDALE	AZ	85254	MILLER ADAM/LORI	6110 E HUNTRESS DR		PARADISE VALLEY	AZ	85253			
50622003E		MILLER ADAM/LORI	6501 E GREENWAY PKWY STE 103-291	SCOTTSDALE	AZ	85254	MILLER ADAM/LORI	6110 E HUNTRESS DR		PARADISE VALLEY	AZ	85253			
50622003F		MILLER ADAM/LORI	6501 E GREENWAY PKWY STE 103-291	SCOTTSDALE	AZ	85254	MILLER ADAM/LORI	6110 E HUNTRESS DR		PARADISE VALLEY	AZ	85253			
50622006		GASTON DAISY N TR/BILLY C	1616 W BECK LN	PHOENIX	AZ	85023	GASTON DAISY N TR/BILLY C	1616 W BECK LN		PHOENIX	AZ	85023-3457			
50622007		GASTON DAISY N TR/BILLY C	1616 W BECK LN	PHOENIX	AZ	85023	GASTON DAISY N TR/BILLY C	1616 W BECK LN		PHOENIX	AZ	85023-3457			
50622010B		VINCENT CHARLES T/MINEAR DEANNA L	4202 W TIERRA BUENA LN	PHOENIX	AZ	85053	VINCENT CHARLES T/MINEAR DEANNA L	4202 W TIERRA BUENA LN		PHOENIX	AZ	85053-3769			
50622011		KROEPEL EDITH E TR	3646 N 52ND PL	PHOENIX	AZ	85018	KROEPEL EDITH E TR	3646 N 52ND PL		PHOENIX	AZ	85018-6149			
50622015A		LEE JUYUN/SILVERMAN ELIZABETH	1702 W MOODY TRL	PHOENIX	AZ	85041	LEE JUYUN/SILVERMAN ELIZABETH	1702 W MOODY TRL		PHOENIX	AZ	85041-9128			
50622015D		LONG CELENE RITA OCONNOR	2358 AKOKI ST	LIHUE	MI	96766	LONG CELENE RITA OCONNOR	2358 AKOKI ST		LIHUE	MI	96766-8809			
50622015E		SALIBA K M/MCKEEVER J M/J J ETAL	7038 W STOCKMAN RD	GLENDALE	AZ	85308	SALIBA K M/MCKEEVER J M/J J ETAL	7038 W STOCKMAN RD		GLENDALE	AZ	85308-8050			
50622015F		OGSBURY INVESTMENTS LLC	PO BOX 275	COTTAGE GROVE	OR	97424	OGSBURY INVESTMENTS LLC	PO BOX 275		COTTAGE GROVE	OR	97424-0010			
50622015G		SCHAER FAMILY TRUST	24592 VIA RAZA	LAKE FOREST	CA	92630	SCHAER FAMILY TRUST	24592 VIA RAZA		LAKE FOREST	CA	92630-2039			
50622015J		FRANKEL GREG L/DOUGLAS J	5331 E VALLEY VISTA RD	PHOENIX	AZ	85018	FRANKEL GREG L/DOUGLAS J	5331 E VALLE VISTA RD		PHOENIX	AZ	85018-1933			
50622015K		FRANKEL GREG L/DOUGLAS J	5331 E VALLEY VISTA RD	PHOENIX	AZ	85018	FRANKEL GREG L/DOUGLAS J	5331 E VALLE VISTA RD		PHOENIX	AZ	85018-1933			
50622016		SALM FRANK/GAIL M TR	22818 N 49TH ST	PHOENIX	AZ	85054	SALM FRANK/GAIL M TR	22818 N 49TH ST		PHOENIX	AZ	85054-6131			
50622017		SALM FRANK/GAIL M TR	22818 N 49TH ST	PHOENIX	AZ	85054	SALM FRANK/GAIL M TR	22818 N 49TH ST		PHOENIX	AZ	85054-6131			
50622018A		HARQUAHALA PROPERTY HOLDINGS LLC	4449 N 59TH DR	PHOENIX	AZ	85033	HARQUAHALA PROPERTY HOLDINGS LLC	6528 N 171ST LN		WADDELL	AZ	85355-9892			
50622018B		VERMA/KATARIA 1JJ 537/CENTENNIAL 20 LLC	3001 W INDIAN SCHOOL RD NO 140	PHOENIX	AZ	85017	VERMA/KATARIA 1JJ 537/CENTENNIAL 20 LLC	3001 W INDIAN SCHOOL RD NO 140		PHOENIX	AZ	85017-4142			
50622018D		OGSBURY INVESTMENTS LLC	PO BOX 275	COTTAGE GROVE	OR	97424	OGSBURY INVESTMENTS LLC	PO BOX 275		COTTAGE GROVE	OR	97424-0010			
50622018E		ZALKOW LAND LLC	14809 N 73RD ST STE 102	SCOTTSDALE	AZ	85260	ZALKOW LAND LLC	14809 N 73RD ST STE 102		SCOTTSDALE	AZ	85260-3104			
50622018F		KEN K HARADA AND TOBY N HARADA FAMILY TRUST	25498 FRAN LOU DR	MORENO VALLEY	CA	92557	KEN K HARADA AND TOBY N HARADA FAMILY TR	KEN HARADA TRUSTEE	25498 FRAN LOU DR	MORENO VALLEY	CA	92557-5213			
50622018G		PHILLIPS PAUL JOSEPH TR	4635 W PORT AU PRINCE LN	GLENDALE	AZ	85306	PHILLIPS PAUL JOSEPH TR	4635 W PORT AU PRINCE LN		GLENDALE	AZ	85306-3631			
50622019C		SU EDWIN K	1421 DE FALCO WAY	SAN JOSE	CA	95131	SU EDWIN K	1421 DE FALCO WY		SAN JOSE	CA	95131-3237			
50622019E		ZPACK INVESTMENTS LLC	3731 W CHARLOTTE DR	GLENDALE	AZ	85310	ZPACK INVESTMENTS LLC	3731 W CHARLOTTE DR		GLENDALE	AZ	85310-3334			
50622019F		BUONINCONTRO MARK T/PINCUS STEVE	6526 W ORAIBI DR	GLENDALE	AZ	85308	BUONINCONTRO MARK T/PINCUS STEVE	C/O BUONINCONTRO MARK	7252 W MARIPOSA GRANDE LN	PEORIA	AZ	85383			
50622019G		LEE SIMON/FONG JANLEY	76 BAY CT	S SAN FRANCISCO	CA	94080	LEE SIMON/FONG JANLEY	76 BAY CT		S SAN FRANCISCO	CA	94080			
50622019J		FIRST ELECTRONICS INC	15403 E REDROCK DR	FOUNTAIN HILLS	AZ	85268	FIRST ELECTRONICS INC	15403 E REDROCK DR		FOUNTAIN HILLS	AZ	85268			
50622019K		BUONINCONTRO DIANA	23937 N 73RD LN	PEORIA	AZ	85383	BUONINCONTRO DIANA	6526 WEST ORAIBI DR		GLEDALE	AZ	85308-7045			
50622019L		FONG KAREN	1161 HILLCREST BLVD	MILLBRAE	CA	94030	FONG KAREN	1161 HILLCREST BLVD		MILLBRAE	CA	94030-2234			
50622019M		KIM SUE	17505 N 79TH AVE STE 214	GLENDALE	AZ	85308	KIM SUE	17505 N 79TH AVE STE 214		GLENDALE	AZ	85308-8728			
50622020		JENKINS WILLIAM T/RACHEL ANN TR	6601 E DESERT COVE	SCOTTSDALE	AZ	85251	JENKINS WILLIAM T/RACHEL ANN TR	6601 E DESERT COVE AVE		SCOTTSDALE	AZ	85254-5049			
50622021		BEASLEY RANDY/ALAN/ROBERT/RODRIGUEZ TAMMY	4593 N ""F"" ST	SAN BERNARDINO	CA	92407	BEASLEY RANDY/ALAN/ROBERT/RODRIGUEZ TAMM	4593 N F ST		SAN BERNARDINO	CA	92407			
50622022		STANFORD MARY	7321 N 58TH ST	PHOENIX	AZ	85020	STANFORD MARY	837 AVALON RD		LAWRENCE	KS	66044			
50622024B		SLIFF JAMES B/GREGSON T/SWENSON L ETAL	854 BARD	HERMOSA BEACH	CA	90254	SLIFF JIM	854 BARD ST		HERMOSA BEACH	CA	90254-4232			
50622024E		LEON GERTRUDE	4622 W PALMAIRE	GLENDALE	AZ	85301	LEON GERTRUDE	4622 W PALMAIRE		GLENDALE	AZ	85301-2819			
50622024F		ERAZO EDWIN R/ELVA	6710 W ROMA AVE	PHOENIX	AZ	85033	ERAZO EDWIN R/ELVA	6710 W ROMA AVE		PHOENIX	AZ	85033-2622			
50622024G		JANDA LAND HOLDINGS LLC	101 E MOON VALLEY DR	PHOENIX	AZ	85022	JANDA LAND HOLDINGS LLC	101 E MOON VALLEY DR		PHOENIX	AZ	85022-4249			
50622024H		LEON GERTRUDE R	4622 W PALMAIRE	GLENDALE	AZ	85301	LEON GERTRUDE R	4622 W PALMAIRE		GLENDALE	AZ	85301-2819			
50622027		ALLEGHENY ENERGY SUPPLY COMPANY LLC	800 CABIN HILL DR	GREENSBURG	PA	15601	ALLEGHNEY ENERGY SUPPLY CO LLC	ATTN: TAX DEPT. RICH DVORSKY	800 CABIN HILL DR	GREENSBURG	PA	15601-1650			
50622032		ALLEGHENY ENERGY SUPPLY COMPANY LLC	800 CABIN HILL DR	GREENSBURG	PA	15601	ALLEGHNEY ENERGY SUPPLY CO LLC	ATTN: TAX DEPT. RICH DVORSKY	800 CABIN HILL DR	GREENSBURG	PA	15601-1650			
50622035B		CP CP LLC	1028 E FREMONT ST	LAS VEGAS	NV	89101	CP CP LLC	1028 E FREMONT ST		LAS VEGAS	NV	89101-5404			
50622037		WOOD ALBERT E & MAREA E	1906 N 115TH AVE	AVONDALE	AZ	85323	MAREA E WOOD	C/O BRUCE WOOD	14300 SEVEN MILE POST RD	ATHENS	AL	35611-7667			
50622038		KOLONIA LLC	5025 N CENTRAL AVE NO 611	PHOENIX	AZ	85012 USA	KOLONIA LLC	5025 N CENTRAL AVE PMB 611		PHOENIX	AZ	85012-1520			
50620014A		MUVDI JUNE M ETAL	3915 W DEVON	CHICAGO	IL	60645	MUVDI JUNE M ETAL	C/O LUNDSBERG PARTNERSHIP	1202 ALLANSON RD	MUNDELEIN	IL	60060-3808			
506200198		EICH DENNIS & EICH GENE	181 RED TOP DR	LIBERTYVILLE	IL	60048	EICH DENNIS & EICH GENE	181 RED TOP DR		LIBERTYVILLE	IL	60048-5267			
50624009X	904 S ANNE AVE	SCOTT RUSSELL L	904 S ANNE AVE	TONOPAH	AZ	85354	SCOTT RUSSELL L	904 S ANNE AVE		TONOPAH	AZ	85354-7335			
506221124		OSBORNE CELIA GUADALUPE	3218 E BELL RD BOX 202	PHOENIX	AZ	85032	OSBORNE CELIA GUADALUPE	3218 E BELL RD BOX 202		PHOENIX	AZ	85032-2727			
50629020	383 S 515TH AVE	85354 HARQUHALA GIN LLC	3636 S 7TH ST	PHOENIX	AZ	85040	HARQUHALA GIN LLC	3636 S 7TH ST		PHOENIX	AZ	85040-1131			
50629021C	315 S 515TH AVE	85354 ENRIQUEZ FRANCISCO/LAURA	315 S 515TH AVE	TONOPAH	AZ	85354	ENRIQUEZ FRANCISCO/LAURA	315 S 515TH AVE		TONOPAH	AZ	85354-7105			
50624011Q	402 S HARQUAHALA VALLEY RD TONOPAH	85354 HARQUAHALA VALLEY COMMUNITY BENEFITS FOUNDATI	402 S HARQUAHALA VALLEY RD	TONOPAH	AZ	85354	HARQUAHALA VALLEY COMMUNITY BENEFITS FOU	402 S HARQUAHALA VALLEY RD		TONOPAH	AZ	85354-7106			
50624015	52340 W VAN BUREN ST	85354 SCHOOL DIST 47 ARLINGTON SCHOOL	STAR RT BOX 125	ARLINGTON	AZ	85322	SCHOOL DIST 47 ARLINGTON SCHOOL	PO BOX 125		ARLINGTON	AZ	85322-0125			
50624010B		ST HENRY ROMAN CATHOLIC PARISH BUCKEYE	400 E MONROE	PHOENIX	AZ	85004	ST HENRY ROMAN CATHOLIC PARISH BUCKEYE	400 E MONROE		PHOENIX	AZ	85004-2336			
50629063	51328 W BUCKEYE RD	85354 BANK OF AMERICA NA	2380 PERFORMANCE DR TX 984-0407	RICHARDSON	TX	75082 USA	BANK OF AMERICA NA	2380 PERFORMANCE DR TX 984-0407		RICHARDSON	TX	75082			
50622053B		INTERNATIONAL TRADE COMMODITIES LLC	2837 N 73RD DR	PHOENIX	AZ	85035 USA	GARCIA MANUEL	2523 S 7TH AVE		PHOENIX	AZ	85007-4501			
50623023H		EHRFURTH TRUST	20419 W MONARCH CT	BUCKEYE	AZ	85396 USA	EHRFURTH TRUST/NOWAK RUSSELL J	EHRFURTH LEONARD A/DEBORAH V TR	20419 W MONARCH CT	BUCKEYE	AZ	85396-7652			
50629034	51427 W TONTO ST	CROSBY WILLIE JR/WILLIAMS LOGAN F	2280 E VALLEY PKWY NO 13	ESCONDIDO	CA	92027	CROSBY WILLIAM	51427 W TONTO		TONOPAH	AZ	85354-7243			
50629048	50723 W TONTO ST	85354 VAN GALDER SUSAN C	18393 RACCOON TRL	GRASS VALLEY	CA	95945	VAN GALDER SUSAN C	C/O DENEEN ASSOCIATES	337 17TH ST STE 208	OAKLAND	CA	94612			
50629049	1016 S 507TH AVE	85354 GROSS MARCUS/DOWNES LEANNE/OPAL L	17736 E BROOKS FARM RD	GILBERT	AZ	85297	GROSS MARCUS/DOWNES LEANNE/OPAL L	17736 E BROOKS FARMS RD		GILBERT	AZ	85297-8938			
50624022	120 N 517TH AVE	85354 LONGO MICHAEL A/MARY KAY	PO BOX 760	SCOTTSDALE	AZ	85252-0760	LONGO MICHAEL A/MARY KAY	PO BOX 760		SCOTTSDALE	AZ	85252-0760			
50628003	3920 S 515TH AVE	85354 CV HARQUAHALA LLC	3549 153RD AVE SE	CASSELTON	ND	58012 USA	CV HARQUAHALA LLC	CLUB VISTA FINANCIAL SERVICES LLC	3549 153RD AVE SE	CASSELTON	ND	58012-9700			
50628024A	50102 W BROADWAY RD	85354 CV HARQUAHALA LLC	3549 153RD AVE SE	CASSELTON	ND	58012 USA	CV HARQUAHALA LLC	CLUB VISTA FINANCIAL SERVICES LLC	3549 153RD AVE SE	CASSELTON	ND	58012-9700			
506290068	49111 W VAN BUREN ST	85354 CV HARQUAHALA LLC	3549 153RD AVE SE	CASSELTON	ND	58012 USA	CV HARQUAHALA LLC	CLUB VISTA FINANCIAL SERVICES LLC	3549 153RD AVE SE	CASSELTON	ND	58012-9700			
5062205SC		SANCHEZ DAVID G	3020 S 68TH DR	PHOENIX	AZ	85043	SANCHEZ DAVID G	3020 S 68TH DR		PHOENIX	AZ	85043-6700			
50622058B		HENDERSON MARK F/JUDITH L	P O BOX 685	TONOPAH	AZ	85354	HENDERSON MARK F/JUDITH L	P O BOX 685		TONOPAH	AZ	85354-0685			
50622156E		HEWITT RICHARD/SUSAN	17708 W DESERT VIEW LN	GOODYEAR	AZ	85338	HEWITT RICHARD/SUSAN	17708 W DESERT VIEW LN		GOODYEAR	AZ	85338-5353			
50624947		NAVARRETE SALVADOR	PO BOX 688	TONOPAH	AZ	85354 USA	BLANCHETTE CHARLES T TR/BLANCHETTE DENIS	C/O BLANCHETTE DENISE	917 W COUNTRY LN	PAYSON	AZ	85541			
50623021		YANKEE POINT LLC	38082 SNICKERSVILLE TURNPIKE	PURCELVILLE	VA	20132	YANKEE POINT LLC	BRADLEY BOLAND	38082 SNICKERSVILLE TURNPIKE	PURCELVILLE	VA	20132-5006			
50623037A		W HARQUAHALA LLC	1121 W WARNER RD STE 109	TEMPE	AZ	85284 USA	W HARQUAHALA LLC	1121 W WARNER RD STE 109		TEMPE	AZ	85284-2819			
50623038A		W HARQUAHALA LLC	1121 W WARNER RD STE 109	TEMPE	AZ	85284 USA	W HARQUAHALA LLC	1121 W WARNER RD STE 109		TEMPE	AZ	85284-2819			
50629023E	912 N 491ST AVE	85354 CV HARQUAHALA LLC	3549 153RD AVE SE	CASSELTON	ND	58012 USA	CV HARQUAHALA LLC	CLUB VISTA FINANCIAL SERVICES LLC	3549 153RD AVE SE	CASSELTON	ND	58012-9700			
50628042	50602 W BASELINE RD	85354 TORREY PINES DEV LLC/ETAL LEASE # 01-34994	1121 W WARNER RD STE 109	TEMPE	AZ	85284 USA	ARIZONA STATE LAND DEPT	TORREY PINES DEV LLC/ETAL LEASE # 0CONTO	1121 W WARNER RD STE 109	TEMPE	AZ	85284			
50623045		EAGLE BUTTE LLC (LEASE # 01-1739)	3825 S 99TH AVE	TOLLESON	AZ	85353-9382	EAGLE BUTTE LLC (LEASE # 01-1739)	3825 S 99TH AVE		TOLLESON	AZ	85353-9382			
50624016		SCHOOL DIST 201 /BUCKEYE UNION H S/	902 EASON AVE	BUCKEYE	AZ	85326	SCHOOL DIST 201 /BUCKEYE UNION H S/	902 E EASON AVE		BUCKEYE	AZ	85326-2602			
50624017		FLOOD CONTROL DISTRICT OF MARICOPA COUNTY	2801W DURANGO ST	PHOENIX	AZ	85009 USA	FLOOD CONTROL DIST OF MARICOPA COUNTY	3325 W DURANGO ST		PHOENIX	AZ	85009-6214			
50624018		FLOOD CONTROL DISTRICT OF MARICOPA COUNTY	2801W DURANGO ST	PHOENIX	AZ	85009 USA	FLOOD CONTROL DIST OF MARICOPA COUNTY	3325 W DURANGO ST		PHOENIX	AZ	85009-6214			
50624019		FLOOD CONTROL DISTRICT OF MARICOPA COUNTY	2801W DURANGO ST	PHOENIX	AZ	85009 USA	FLOOD CONTROL DIST OF MARICOPA COUNTY	3325 W DURANGO ST		PHOENIX	AZ	85009-6214			
50624020		FLOOD CONTROL DISTRICT OF MARICOPA COUNTY	2801W DURANGO ST	PHOENIX	AZ	85009 USA	FLOOD CONTROL DIST OF MARICOPA COUNTY	3325 W DURANGO ST		PHOENIX	AZ	85009-6214			
50624021		FLOOD CONTROL DISTRICT OF MARICOPA COUNTY	2801W DURANGO ST	PHOENIX	AZ	85009 USA	FLOOD CONTROL DIST OF MARICOPA COUNTY	3325 W DURANGO ST		PHOENIX	AZ	85009-6214			
50624930	51707 W WASHINGTON ST	85354 ARIZONA TELEPHONE CO	525 JUNCTION RD	MADISON	WI	53717	ARIZONA TELEPHONE COMPANY	ATTN: PROPERTY TAXES	525 JUNCTION RD	MADISON	WI	53717-2152			
50624934	51929 W VAN BUREN ST	85354 ENGLUND FAMILY TRUST	PO BOX 250	CASHION	AZ	85329	ENGLUND FAMILY TRUST	PO BOX 250		CASHION	AZ	85329-0250			
50628002	5439 S 523RD AVE	85354 CV HARQUAHALA LLC	3549 153RD AVE SE	CASSELTON	ND	58012 USA	CV HARQUAHALA LLC	CLUB VISTA FINANCIAL SERVICES LLC	3549 153RD AVE SE	CASSELTON	ND	58012-9700			
50628004	3604 S 515TH AVE	85354 CV HARQUAHALA LLC	3549 153RD AVE SE	CASSELTON	ND	58012 USA	CV HARQUAHALA LLC	CLUB VISTA FINANCIAL SERVICES LLC	3549 153RD AVE SE	CASSELTON	ND	58012-9700			
50628005A	2439 S 515TH AVE	85354 CV HARQUAHALA LLC	3549 153RD AVE SE	CASSELTON	ND	58012 USA	CV HARQUAHALA LLC	CLUB VISTA FINANCIAL SERVICES LLC	3549 153RD AVE SE	CASSELTON	ND	58012-9700			
50628024B	3220 515TH AVE	85354 CV HARQUAHALA LLC	3549 153RD AVE SE	CASSELTON	ND	58012 USA	CV HARQUAHALA LLC	CLUB VISTA FINANCIAL SERVICES LLC	3549 153RD AVE SE	CASSELTON	ND	58012-9700			
50628039	51105 W ELWOOD ST	85354 EL PASO NATURAL GAS CO	P O BOX 1492	EL PASO	TX	79948	EL PASO NATURAL GAS CO	PO BOX 1492		EL PASO	TX	79978-0001			
506290158	51401 W VAN BUREN ST	GARFINKLE FAMILY TRUST	1205 VIA GABARDA	LAFAYETTE	CA	94549	GARFINKLE FAMILY TRUST	1205 VIA GABARDA		LAFAYETTE	CA	94549-6250			
50629024A	803 S 499TH AVE	85354 CV HARQUAHALA LLC	3549 153RD AVE SE	CASSELTON	ND	58012 USA	CV HARQUAHALA LLC	CLUB VISTA FINANCIAL SERVICES LLC	3549 153RD AVE SE	CASSELTON	ND	58012-9700			
50622042		QUINONEZ JAIMA A/CAMACHO GUILLERMINA	7585 WEST COLTER STREET	GLENDALE	AZ	85303	QUINONEZ JAIME A/CAMACHO GUILLERMINA	7585 WEST COLTER STREET		GLENDALE	AZ	85303-6603			
50622043A		VEGA GUILLERMO	7546 W ORANGEWOOD AVE	GLENDALE	AZ	85303	VEGA GUILLERMO	7546 W ORANGEWOOD AVE		GLENDALE	AZ	85303-1528			
50622043B		ELIZEE FRANCOISE/PATRICIA	1643 BRICKELL AVE NO 2201	MIAMI	FL	33129	ELIZEE FRANCOISE/PATRICIA	1643 BRICKELL AVE NO 2201		MIAMI	FL	33129-1258			
50622043C		RANDHAWA ARVINDER	2727 E BEAUTIFUL LN	PHOENIX	AZ	85042	RANDHAWA ARVINDER	2727 E BEAUTIFUL LN		PHOENIX	AZ	85042-7074			
50622043D		SMITH GRADY	20908 W WATKINS ST	BUCKEYE	AZ	85326	SMITH GRADY	P O BOX 641		TONOPAH	AZ	85354-0641			
50622043F		TYCO INVESTORS LLC	1242 E JACKSON ST	PHOENIX	AZ	85034 USA	TYCO INVESTORS LLC	1242 E JACKSON ST		PHOENIX	AZ	85034-2342			
50622043G		OCONNOR DOUGLAS/BARBARA	2842 E LINDA CT	GILBERT	AZ	85296	OCONNOR DOUGLAS/BARBARA	2842 E LINDA CT		GILBERT	AZ	85296-6399			
50622043H		GRAN VIA PROPERTIES LLC	8776 E SHEA BLVD B3A-317	SCOTTSDALE	AZ	85260	GRAN VIA PROPERTIES LLC	8776 E SHEA BLVD B3A-317		SCOTTSDALE	AZ	85260-6629			
50622043J		OCONNOR DOUGLAS/BARBARA	2842 E LINDA CT	GILBERT	AZ	85296	OCONNOR DOUGLAS/BARBARA	2842 E LINDA CT		GILBERT	AZ	85296-6399			
50622044C		GARCIA KENDALL BIANCA	16801 N 94TH ST 1042	SCOTTSDALE	AZ	85260	GARCIA KENDALL BIANCA	16801 N 94TH ST 1042		SCOTTSDALE	AZ	85260-1511			
50622044D		NAQVI ATHAR H/SOBIA YASMEEN	19755 S 190TH ST	QUEEN CREEK	AZ	85242	NAQVI ATHAR H/SOBIA YASMEEN	19755 S 190TH ST		QUEEN CREEK	AZ	85242-6897			
50622044E		NAQVI ALI T/ATIA J/KAZMI SYED Z/MEENA H	18709 E SEAGULL DR	QUEEN CREEK	AZ	85142	NAQVI ALI T/ATIA J/KAZMI SYED Z/MEENA H	18709 E SEAGULL DR		QUEEN CREEK	AZ	85142-5144			
50622045		GALINDO ADALBERTO M/ANDREA	3608 W MARYLAND AVE	PHOENIX	AZ	85019	GALINDO ADALBERT M/ANDREA	3611 W MARYLAND AVE		PHOENIX	AZ	85019-1536			
50622046		FIRST AMERICAN TITLE INS CO TR 8504	7201 E CAMELBACK RD NO 305	SCOTTSDALE	AZ	85251	FIRST AMERICAN TITLE INS CO TR 8504	C/O NORANDA PROPERTIES INC	7201 E CAMELBACK RD #305	SCOTTSDALE	AZ	85251-3336			
50622047A		DURAN FRANK M/SHIRLEY A	13616 W LAREATA AVE	GOODYEAR	AZ	85338	DURAN FRANK M/SHIRLEY A	13616 W LAREATA AVE		GOODYEAR	AZ	85338-2247			
50622047C		EKPOH UDOH/EMEM U	8951 W CHARLESTON AVE	PEORIA	AZ	85382	EKPOH UDOH/EMEM U	8951 W CHARLESTON AVE		PEORIA	AZ	85382-8105			
50622047D		BRANDT ARTHUR/JULIE/QUON DAVID/ANA	708 COLLIER DR	SAN LEANDRO	CA	94577	BRANDT ARTHUR/JULIE/QUON DAVID/ANA	708 COLLIER DR		SAN LEANDRO	CA	94577-3816			
50622047E		BOLLE KLAUS	PO BOX 772	TONOPAH	AZ	85354	BOLLE KLAUS	PO BOX 772		TONOPAH	AZ	85354-0772			
50622047F		RICHARD VENEZIA FAMILY TRUST	16021 N 174TH LN	SURPRISE	AZ	85388 USA	VENEZIA RICHARD/CAROL TR	16021 N 174TH LN		SURPIRSE	AZ	85388-0268			
50622047G		FIL ALEXANDER Y/JENNIFER TR	2432 W PEORIA AVE STE 1083	PHOENIX	AZ	85029	FIL ALEXANDER Y/JENNIFER TR	908 W WALTAN LN		PHOENIX	AZ	85023-4463			
50622048		SUTHERLAND BARRY K/SHARON LEE TR	PO BOX 1562	GILBERT	AZ	85299	SUTHERLAND BARRY K/SHARON LEE TR	PO BOX 1562		GILBERT	AZ	85299-1562			
50622049		SUTHERLAND BARRY K/SHARON LEE TR	PO BOX 1562	GILBERT	AZ	85299	SUTHERLAND BARRY K/SHARON LEE TR	PO BOX 1562		GILBERT	AZ	85299-1562			

50622050	VANDEVEER INVESTMENT PROPERTIES LLC	287 PARRACK RD	MACKS CREEK	MO	65786	VANDEVEER INVESTMENT PROPERTIES LLC	10553 W FLOWER ST			AVONDALE	AZ	85392-4405			
50622051A	VENEZIA RICHARD/FIL A/J TR	16021 N 174TH LN	SURPRISE	AZ	85388	VENEZIA RICHARD/CAROL TR/FIL A/J TR	16021 N 174TH LN			SURPRISE	AZ	85388-0268			
50622051B	LEE SEE/KO WONKI	10618 TRUSSELL ST	LAS VEGAS	NV	89141	LEE SEE/KO WONKI	10618 TRUSSELL ST			LAS VEGAS	NV	89141-4263			
50622051C	LEE SEE/KO WONKI	10618 TRUSSELL ST	LAS VEGAS	NV	89141	LEE SEE/KO WONKI	10618 TRUSSELL ST			LAS VEGAS	NV	89141-4263			
50622051D	MARQUEZ JOSEPH M	645 SANTO ORO AVE	LA PUENTE	CA	91744	MARQUEZ JOSEPH M	645 SANTO ORO AVE			LA PUENTE	CA	91744-3915			
50622051E	BYRNE ELIZABETH	6225 E MONTGOMERY RD	CAVE CREEK	AZ	85331	BYRNE ELIZABETH	6225 E MONTGOMERY RD			CAVE CREEK	AZ	85331-3079			
50622051F	GUARDADO ANTONIO/ROSALBA	1162 N HUDSON PL	CHANDLER	AZ	85225	GUARDADO ANTONIO/ROSALBA	1429 E THORNTON AVE LOT			GILBERT	AZ		85297		
50622051G	MCFADDEN BRETT	2229 W NORTHERN AVE	PHOENIX	AZ	85021 USA	MCFADDEN BRETT	2229 W NORTHERN AVE			PHOENIX	AZ	85021-4958			
50622051H	GARGANO MARIAN	34068 N 60TH PL	SCOTTSDALE	AZ	85262	GARGANO MARIAN	34068 N 60TH PL			SCOTTSDALE	AZ	85262-6302			
50622052	VERMA/KATARIA 1G0 519/ENCANTO 40 LLC	3001 W INDIAN SCHOOL RD NO 140	PHOENIX	AZ	85017	VERMA/KATARIA 1G0 519/ENCANTO 40 LLC	3001 W INDIAN SCHOOL RD NO 140			PHOENIX	AZ	85017-4142			
50622053A	SINGH JESSICA TR	51827 W ENCANTO BLVD	TONOPAH	AZ	85354	SINGH JESSICA TR	51827 W ENCANTO BLVD			TONOPAH	AZ		85354		
50622054	VANN JOHN L JR/DORIS	PO BOX 173	LOLO	MT	59847-0173	VANN JOHN L JR/DORIS	15810 N NICKLAUS LANE			SUN CITY	AZ	85351-1764			
50622055D	LAGUNA CHRISTOPHER/CHRISTOPHER J	1370 E THACKER ST	SCHAUMBURG	IL	60173	LAGUNA CHRISTOPHER/CHRISTOPHER J	1370 E THACKER ST			SCHAUMBURG	IL	60173-6591			
50622055F	LEAL GREGORIO BARBOZA/BARBOZA OLIVIA	7115 W PIONEER ST	PHOENIX	AZ	85043	LEAL GREGORIO BARBOZA/BARBOZA OLIVIA	7115 W PIONEER ST			PHOENIX	AZ	85043-7209			
50622055G	IBARRA FRANCISCO APOLINAR/NANCI	7023 W PIERCE ST	PHOENIX	AZ	85043	IBARRA FRANCISCO APOLINAR/NANCI	7023 W PIERCE ST			PHOENIX	AZ	85043-2424			
50622055H	LEAL GREGORIO BARBOZA/BARBOZA OLIVIA	7115 W PIONEER ST	PHOENIX	AZ	85043	LEAL GREGORIO BARBOZA/BARBOZA OLIVIA	7115 W PIONEER ST			PHOENIX	AZ	85043-7209			
50622055J	SINGH REVOCABLE TRUST	10842 N 127TH PL	SCOTTSDALE	AZ	85259	SINGH REVOCABLE TRUST	C/O SINGH JESSICA	16810 AVE OF FOUNTAINS STE 108		FOUNTAIN HILLS	AZ		85268		
50622055L	RICHARD VENEZIA FAMILY TRUST	16021 N 174TH LN	SURPRISE	AZ	85388 USA	VENEZIA RICHARD/CAROL TR	16021 N 174TH LN			SURPRISE	AZ	85388-0268			
50622055M	FIL ALEXANDER Y/JENNIFER L TR	2432 W PEORIA AVE STE 1083	PHOENIX	AZ	85029	FIL ALEXANDER Y/JENNIFER L TR	2432 W PEORIA AVE STE 1083			PHOENIX	AZ	85029-4731			
50622056	EAGLE RANCH HOLDINGS LLC	3454 E FRUITVALE AVE	GILBERT	AZ	85297	EAGLE RANCH HOLDINGS LLC	3454 E FRUITVALE AVE			GILBERT	AZ	85297-3006			
50622057	VANDEVEER INVESTMENT PROPERTIES LLC	287 PARRACK RD	MACKS CREEK	MO	65786	VANDEVEER INVESTMENT PROPERTIES LLC	287 PARRACK RD			MACKS CREEK	MO	65786-8109			
50622058A	TFP ENTERPRISES LLC	19820 W PINNACLE PEAK RD	SURPRISE	AZ	85387	TFP ENTERPRISES LLC	19820 W PINNACLE PEAK RD			SURPRISE	AZ	85387-9775			
50622059A	MONTES ANDRES G/GUADALUPE Y	14810 N 74TH LN	PEORIA	AZ	85381	MONTES ANDRES G/GUADALUPE Y	14810 N 74TH LN			PEORIA	AZ	85381-4469			
50622059C	GALINDO VANESSA MARIE	5405 AHSBOURNE LN	INDIANAPOLIS	IN	46226	GALINDO VANESSA MARIE	504 E RANDY ST			AVONDALE	AZ		85323		
50622059D	ERNEST MICHAEL A/ROSAMELIA	PO BOX 602	TONOPAH	AZ	85354-0602	ERNEST MICHAEL A/ROSAMELIA	PO BOX 602			TONOPAH	AZ	85354-0602			
50622059E	ERNEST MICHAEL A/ROSAMELIA	PO BOX 602	TONOPAH	AZ	85354-0602	ERNEST MICHAEL A/ROSAMELIA	PO BOX 602			TONOPAH	AZ	85354-0602			
50622060	BYUN CHONG D/PAIK YONG JUP	4013 CALLE SONORA DESTE NO 2C	LAGUNA WOODS	CA	92637	BYUN CHONG D/PAIK YONG JUP	4013 CALLE SONORA DESTE NO 2C			LAGUNA WOODS	CA	92637-3232			
50622061	SAAVEDRA ALICIA	6703 W WILSHIRE AVE	PHOENIX	AZ	85035	SAAVEDRA ALICIA	6703 W WILSHIRE DR			PHOENIX	AZ	85035-1413			
50622062	ARMSTRONG CAROLINE A	PO BOX 539	MENTONE	CA	92359	ARMSTRONG CAROLINE A	PO BOX 539			MENTONE	CA	92359-0539			
50622063	ZOLNIERCZYK MICHAEL/HELEN	8108 E BUENA TERRA WY	SCOTTSDALE	AZ	85250	ZOLNIERCZYK MICHAEL/HELEN	8108 E BUENA TERRA WY			SCOTTSDALE	AZ	85250-6608			
50622064	FORSTER JOHN D/NANCY J	1221 N KENNETH PL	CHANDLER	AZ	85226	FORSTER JOHN D/NANCY J	33611 N 140TH PL			SCOTTSDALE	AZ	85262-5928			
50622065A	FELIX CLAUDIA B	3301 N 64TH DR	PHOENIX	AZ	85033 USA	FELIX CLAUDIA B	3301 N 64TH DR			PHOENIX	AZ	85033-5212			
50622065B	RODENBACH ROBERT H	7559 E NESTLING WY	SCOTTSDALE	AZ	85255	RODENBACH ROBERT H	7559 E NESTLING WY			SCOTTSDALE	AZ	85255-4642			
50622066	WSR DEVELOPMENT 1 LLC	7914 E SOFTWIND DR	SCOTTSDALE	AZ	85255	WSR DEVELOPMENT 1 LLC	7914 E SOFTWIND DR			SCOTTSDALE	AZ	85255-3464			
50622067	GONZALES SALVADOR F	5150 W MCDOWELL RD	PHOENIX	AZ	85035	BAYVIEW FINANCIAL PROPERTY TRUST	GONZALES SALVADOR F CONTO	5150 W MCDOWELL RD		PHOENIX	AZ	85035-3862			
50622068	PALO CRISTI INVESTMENTS INC	7802 E GRAY RD SUITE 150	PHOENIX	AZ	85260 USA	PALO CRISTI INVESTMENTS INC ETAL	6750 E CAMELBACK RD STE 101			SCOTTSDALE	AZ	85251-2020			
50622069	REILLY ELLEN J	7175 E YANCEY LANE	FLAGSTAFF	AZ	86004	REILLY ELLEN J	13080W PALO VERDE DR			CHANDLER	AZ		85224		
50622070	DE LA VARA DANIEL ALEJANDRO	7213 S 39TH DR	PHOENIX	AZ	85041	DE LA VARA DANIEL ALEJANDRO	7213 S 39TH DR			PHOENIX	AZ	85041-6074			
50622071	RASOOLY MICHAEL M/ZIBA	3583 MAIN ST	OAKLEY	CA	94561	RASOOLY MICHAEL M	3583 MAIN ST			OAKLEY	CA	94561-3174			
50622072B	ROLAND GERALD/SALLY	11558 W APACHE ST	AVONDALE	AZ	85323	ROLAND GERALD/SALLY	11558 W APACHE ST			AVONDALE	AZ	85323-6209			
50622072D	TRAYERS FAMILY TRUST/ETAL	7705 E GREENWAY RD STE 110	SCOTTSDALE	AZ	85260	TRAYERS FAMILY TRUST/ETAL	SCOTTSDALE MORTGAGE AND INVESTMENT INC	7705 E GREENWAY RD STE 110		SCOTTSDALE	AZ	85260-1716			
50622072E	SURVIVORS TRUST UNDER NIJMEH FAM TRUST/ETAL	24138 W TONTO ST	BUCKEYE	AZ	85326 USA	SURVIVORS TRUST UNDER NIJMEH FAM TRUST/E	ROSE NIJMEH TRUSTEE	24138 W TONTO ST		BUCKEYE	AZ	85326-1867			
50622072F	YANDELL PEGGY	17649 W EAGLE DR	GOODYEAR	AZ	85338	YANDELL PEGGY	17649 W EAGLE DR			GOODYEAR	AZ	85338-5431			
50622072G	NOEL SAM/CAROLINE	12967 W HIGHLAND AVE	LITCHFIELD PARK	AZ	85340	NOEL SAM/CAROLINE	12967 W HIGHLAND AVE			LITCHFIELD PARK	AZ		85340		
50622073	ESPINOZA JORGE A REYES	111 N GILBERT RD NO 2053	MESA	AZ	85203	ESPINOZA JORGE A REYES	112 BRECKENRIDGE AVE			PORT CHESTER	NY	10573-2904			
50622074	SAWAGED FUAD D/ABEER N	1501 W WINDROSE DR	PHOENIX	AZ	85029	SAWAGED FUAD D/ABEER N	1501 W WINDROSE DR			PHOENIX	AZ	85029-2806			
50622075A	KIRK LINDA S	PO BOX 9	TONOPAH	AZ	85354	KIRK LINDA S	PO BOX 9			TONOPAH	AZ	85354-0009			
50622075B	HEWITT HOLDINGS LLC	17708 W DESERT VIEW LN	GOODYEAR	AZ	85338	HEWITT HOLDINGS LLC	17708 W DESERT VIEW LN			GOODYEAR	AZ	85338-5353			
50622076	SCALZO ANTHONY/JOSEPHINE TR	717 N EIGHT AVE	ADDISON	IL	60101	SCALZO ANTHONY/JOSEPHINE TR	717 N 8TH AVE			ADDISON	IL	60101-2085			
50622078A	SAYEGH SUSAN	27 PARK TERRACE	SOUTH CONGERS	NY	10920	SAYEGH SUSAN	27 PARK TERRACE			SOUTH CONGERS	NY	10920-2625			
50622078E	DOOLEY ALAN SR/TRACY TR	3870 W DUBLIN	CHANDLER	AZ	85226	DOOLEY ALAN SR/TRACY TR	3870 W DUBLIN			CHANDLER	AZ	85226-2282			
50622079	YI CHONG KU/YONG	730 W HANCOCK AVE	GILBERT	AZ	85233	YI CHONG KU/YONG	730 W HANCOCK AVE			GILBERT	AZ	85233-1408			
50622080	PASTORE ORLANDO/NINETTE/SERPE DOMENICO/RUTH	12547 S ARCHER AVE	LEMONT	IL	60439-9350	PASTORE ORLANDO/NINETTE/SERPE DOMENICO/R	12547 ARCHER AVE			LEMONT	IL	60439-6730			
50622081	SCALZO ANTHONY/JOSEPHINE TR	717 N EIGHT AVE	ADDISON	IL	60101	SCALZO ANTHONY/JOSEPHINE TR	717 N 8TH AVE			ADDISON	IL	60101-2085			
50622082	GALINDO ANDRES R/LOPEZ MARIA T	7207 S 3RD AVE	PHOENIX	AZ	85041	GALINDO ANDRES R/LOPEZ MARIA T	7207 S 3RD AVE			PHOENIX	AZ	85041-7137			
50622083	GOLAY WALTER ANTHONY	860 N MCQUEEN RD UNIT 1184	CHANDLER	AZ	85225	GOLAY WALTER ANTHONY	17586 N CARMEN AVE			MARICOPA	AZ		85139		
50622084B	55500 W EARLL LLC	4188 N 298TH LN	BUCKEYE	AZ	85396	55500 W EARLL LLC	4188 N 298TH LN			BUCKEYE	AZ	85396-3136			
50622084C	ZARA ADAM E/SABRINA M	16224 N 72ND LN	PEORIA	AZ	85382	ZARA ADAM E/SABRINA M	16224 N 72ND LN			PEORIA	AZ	85382-4940			
50622084D	CHIN HOWARD	13717 BANNON DR	CERRITOS	CA	90703	CHIN HOWARD	13717 BANNON DR			CERRITOS	CA	90703-2336			
50622084F	BORSETH KELLY G/LINDA R	3399 E KIMBALL RD	GILBERT	AZ	85297	BORSETH KELLY G/LINDA R	3399 E KIMBALL RD			GILBERT	AZ	85297-3025			
50622084G	ODISHO DANIEL/BASIMA	9606 KEELER AVE	SKOKIE	IL	60076	ODISHO DANIEL/BASIMA	9606 KEELER AVE			SKOKIE	IL	60076-1128			
50622084H	RUETHER FAMILY TRUST	16316 E CRYSTAL RIDGE DR	FOUNTAIN HILLS	AZ	85268	RUETHER FAMILY TRUST	16316 E CRYSTAL RIDGE DR			FOUNTAIN HILLS	AZ		85268		
50622085A	MANNG BRIAN C/ANNY	2426 W SHANNON ST	CHANDLER	AZ	85224	MANNG BRIAN C/ANNY	2426 W SHANNON ST			CHANDLER	AZ	85224-3473			
50622085B	PAWAR BALWINDER SINGH/GURDEV KAUR	8234 W CAMINO DE ORO	PEORIA	AZ	85383	PAWAR BALWINDER SINGH/GURDEV KAUR	8234 W CAMINO DE ORO			PEORIA	AZ	85383-5604			
50622086	BAYVIEW FINANCIAL PROPERTY TRUST	2665 S BAYSHORE DR 301	MIAMI	FL	33133	JOSEPH MARRONE	PO BOX 8427			TUCSON	AZ	85738-0427			
50622088	HERNANDEZ MARIO J/MONTES MARTHA V	4130 N 10TH PL	PHOENIX	AZ	85014	HERNANDEZ MARIO J/MONTES MARTHA V	4130 N 10TH PL			PHOENIX	AZ	85014-4820			
50622089A	SAYEGH ROGER/NANCY	124 FALMOUTH RD	SCARSDALE	NY	10583	SAYEGH ROGER/NANCY	124 FALMOUTH RD			SCARSDALE	NY	10583-4752			
50622089B	GEISNER HENRY L/JANENE K H	10308 W MOUNTAIN VIEW RD	SUN CITY	AZ	85351	GEISNER HENRY L/JANENE K H	10308 W MOUNTAIN VIEW RD			SUN CITY	AZ	85351-4716			
50622090	HYDE WILLIAM D/DEBRA A	231 SPRUCE ST	ELYRIA	OH	44035 USA	HYDE WILLIAM D/DEBRA A	231 SPRUCE ST			ELYRIA	OH		44035		
50622091	WALTER STEFAN/GERDA TR/WALTER JOHN J	7914 E SOFTWIND DR	SCOTTSDALE	AZ	85255	WALTER STEFAN/GERDA TR/WALTER JOHN J	7914 E SOFTWIND DR			SCOTTSDALE	AZ	85255-3464			
50622093A	CANYON STATE HOLDINGS LLC	8912 E PINNACLE PEAK STE 440	SCOTTSDALE	AZ	85255 USA	CANYON STATE HOLDINGS LLC	8912 E PINNACLE PEAK STE 440			SCOTTSDALE	AZ	85255-3659			
50622094	KLEWIN MARK ANDREW/TERI LEE	4330 N RAINER CIR	MESA	AZ	85215	BAYVIEW FINANCIAL PROPERTY TRUST CONTO	4330 N RANIER CIR			MESA	AZ	85215-0845			
50622095	KRETSEDEMAS NICHOLAS G/MARIVIC M	P O BOX 1984	CHANDLER	AZ	85225	KRETSEDEMAS NICHOLAS G/MARIVIC M	PO BOX 1984			CHANDLER	AZ	85244-1984			
50622096A	YAKOO JALAL	17051 N 45TH ST	PHOENIX	AZ	85032	YAKOO JALAL	17051 N 45TH ST			PHOENIX	AZ	85032-9309			
50622096C	SHOSHANI LINA/VALIA/RAUA	7918 MORNING QUEEN DR	LAS VEGAS	NV	89179	FIRST AMERICAN TITLE INS CO TR 8504	SHOSHANI LINA/VALIA/RAUA CONTO	7918 MORNING QUEEN DR		LAS VEGAS	NV	89179-8272			
50622096D	SHOSHANI VALIA	7918 MORNING QUEEN DR	LAS VEGAS	NV	89178	SHOSHANI VALIA	3701 OVERLAND AVE UNIT H			LOS ANGELES	CA		90034		
50622096F	SHOSHANI LINA	7918 MORNING QUEEN DR	LAS VEGAS	NV	89178	SHOSHANI LINA	3701 OVERLAND AVE UNIT H			LOS ANGELES	CA		90034		
50622096G	SHOSHANI RAUA	7918 MORNING QUEEN DR	LAS VEGAS	NV	89178	SHOSHANI RAUA	3701 OVERLAND AVE UNIT H			LOS ANGELS	CA		90034		
50622097	ENTRIALGO ESTHER	157 E COUNTY RD 430 S	FRANKFORT	IN	46041	ENTRIALGO ESTHER	157 E COUNTY RD 430 S			FRANKFORT	IN	46041-3370			
50622098E	MARLIN LAWRENCE J/ANITA L	8912 E PINNACLE PEAK STE 440	SCOTTSDALE	AZ	85255	MARLIN LAWRENCE J/ANITA L	8912 E PINNACLE PEAK	STE 440		SCOTTSDALE	AZ		85255		
50622098F	LEWIS PATRICK D	P O BOX 71	TONOPAH	AZ	85354	LEWIS PATRICK D	P O BOX 71			TONOPAH	AZ	85354-0071			
50622099	YAKOO KHIBEIR	1600 W 12TH ST NO 721	YUMA	AZ	85364	YAKOO KHIBEIR	1600 W 12TH ST NO 721			YUMA	AZ	85364-9000			
50622100	SHINDO INVESTMENTS LLC	3850 E BARBARITA AVE	GILBERT	AZ	85234	SHINDO INVESTMENTS LLC	3850 E BARBARITA AVE			GILBERT	AZ	85234-3259			
50622101B	RAWAY JAMES J/GAIL	12107 S 208TH AVE	BUCKEYE	AZ	85326	RAWAY JAMES J/GAIL	198 S 230TH LN			BUCKEYE	AZ	85326-6260			
50622102	MALONEY LISA M	3001 WAGONER RD	PHOENIX	AZ	85053	MALONEY LISA M	3001 WAGONER RD			PHOENIX	AZ	85053-1119			
50622103	THOMAS HARRY W	P O BOX 683	TONOPAH	AZ	85354	THOMAS HARRY W	PO BOX 683			TONOPAH	AZ	85354-0683			
50622104	KIEU THI CHAU TRUST	7746 W PORT AU PRINCE LN	PEORIA	AZ	85381	KIEU THI CHAU TRUST	7746 W PORT AU PRINCE LN			PEORIA	AZ	85381-3417			
50622105	CONTRERAS RALPH	6442 IRA AVE	BELL GARDENS	CA	90201-1727	CONTRERAS RALPH	6442 IRA AVE			BELL GARDENS	CA	90201-1727			
50622106	CONTRERAS RALPH	6442 IRA AVE	BELL GARDENS	CA	90201	CONTRERAS RALPH	6442 IRA AVE			BELL GARDENS	CA	90201-1727			
50622108	THORNTON PATRICK M TR	23200 N PIMA RD STE 200	SCOTTSDALE	AZ	85255	THORNTON PATRICK M TR	23200 N PIMA RD STE 200			SCOTTSDALE	AZ	85255-4388			
50622109A	KRETSEDEMAS NICHOLAS G	PO BOX 1984	CHANDLER	AZ	85225	KRETSEDEMAS NICHOLAS G	PO BOX 1984			CHANDLER	AZ	85244-1984			
50622109B	TRAN VIET/THU TRANG	3514 W YUCCA ST	PHOENIX	AZ	85029	TRAN VIET/THU TRANG	3514 W YUCCA ST			PHOENIX	AZ	85029-3162			
50622110	OLMSTED DAVID M	PO BOX 10633	SCOTTSDALE	AZ	85271	OLMSTED DAVID M	PO BOX 10633			SCOTTSDALE	AZ	85271-0633			
50622111	ARMBRUSTER MICHAEL L/CONNIE S	13727 W MONTEBELLO AVE	LITCHFIELD PARK	AZ	85340	ARMBRUSTER MICHAEL L/CONNIE S	3072 PIXLEY CIR NW			UNIONTOWN	OH	44685-6809			
50622112B	HANINI ENTERPRISE LLC	45 ACADEMY ST STE 205	NEWARK	NJ	7102	HANINI ENTERPRISE LLC	45 ACADEMY ST STE 205			NEWARK	NJ	07102-2900			
50622112C	HANINI ENTERPRISE LLC	45 ACADEMY ST STE 205	NEWARK	NJ	7102	HANINI ENTERPRISE LLC	45 ACADEMY ST STE 205			NEWARK	NJ	07102-2900			
50622113	REUMAN ROBERT W TR	7738 N 12TH ST APT 2	PHOENIX	AZ	85020	REUMAN ROBERT W TR	4209 N 84TH ST			OMAHA	NE	68134-4215			
50622114	MASTOPEITRO KURT I/HOLLANDER BRENDA L	4336 E ENCANTO BLVD	MESA	AZ	85205	BAYVIEW FINANCIAL PROPERTY TRUST CONTO	4336 E ENCANTO ST			MESA	AZ	85205-5116			
50622115	SORENSEN STERLING C	1511 N SUNSET DR	TEMPE	AZ	85281	SORENSEN STERLING C	1511 N SUNSET DR			TEMPE	AZ	85281-1533			
50622116	SORENSEN STERLING C	1511 N SUNSET DR	TEMPE	AZ	85281	SORENSEN STERLING C	1511 N SUNSET DR			TEMPE	AZ	85281-1533			
50622117	MENDOZA FRANCISCO G/CARMEN S	1742 W MARICOPA	PHOENIX	AZ	85007	MENDOZA FRANCISCO G/CARMEN S	1105 N DYSART RD LOT 30			AVONDALE	AZ	85323-1708			
50622118	WILCOX DAVID W/MARY A	RD 3	BOX 147	TITUSVILLE	PA	16354	WILCOX DAVID W/MARY A	201 OLD ROUTE 8			TITUSVILLE	PA	16354-7555		
50622120	SINGH BIKHRAM/BIBI BANOO TR	933 E MARCO POLO RD	PHOENIX	AZ	85024	SINGH BIKHRAM/BIBI BANOO TR	933 E MARCO POLO RD			PHOENIX	AZ	85024-1128			
50622121	KHAN MONAIR/BEBE S	87 TENNYSON	NAMUET	NY	10904	KHAN MONAIR/BEBE S	87 TENNYSON DR			NANUET	NY	10954-1039			
50622122	SCHRODER SCOTT B/BARBARA L TR	30251 W LOWER RIVER	BUCKEYE	AZ	85326 USA	SCHRODER SCOTT B/BARBARA L TR	30251 W LOWER RIVER			BUCKEYE	AZ		85326		
50622123	NGUYEN LY D/LINH TUYET	407 BRIDALWOOD DR	MANDEVILLE	LA	70448	NGUYEN LY D/LINH TUYET	407 BRIDALWOOD DR			MANDEVILLE	LA	70448-6308			
50622130	KOTSIOPOULOS DIMOSTIENIS/THEOFANIA	46 FOREST AVE	EVERETT	WA	2149	KOTSIOPOULOS DIMOSTIENIS/THEOFANIA	46 FOREST AVE			EVERETT	MA	02149-2604			
50622131	PANICKER PROPERTY INVESTMENTS L L C	78-18 264TH ST	FLORAL PARK	NY	11004	PANICKER PROPERTY INVESTMENTS L L C	78-18 264TH ST			FLORAL PARK	NY	11004-1308			
50622132	PANICKER PROPERTY INVESTMENTS L L C	78-18 264TH ST	FLORAL PARK	NY	11004	PANICKER PROPERTY INVESTMENTS L L C	C/O PANICKER SHIRLEY P/PHILIP O	7818 264TH ST		FLORAL PARK	NY	11004-1308			
50622133	VERMA/KATARIA 1JM 555/CAMELBACK 40 LLC	3001 W INDIAN SCHOOL RD NO 140	PHOENIX	AZ	85017	VERMA/KATARIA 1JM 555/CAMELBACK 40 LLC	3001 W INDIAN SCHOOL RD NO 140			PHOENIX	AZ	85017-4142			
50622134	COHENZADEH DAVOOD/SIMA L	1507 BERKELY ST NO 4	SANTA MONICA	CA	90404	COHENZADEH DAVOOD/SIMA L	1507 BERKELEY ST APT 4			SANTA MONICA	CA	90404-3228			

50622135	REUMAN ROBERT W TR	7738 N 12TH ST APT 2		PHOENIX	AZ	85020	REUMAN ROBERT W TR	4209 N 84TH ST		OMAHA	NE	68134-4215	
50622138	HENSLEE MARK R/SUSAN K	1729 W WIKIEUP LN		PHOENIX	AZ	85027	HENSLEE MARK R/SUSAN K	1729 W WICKIEUP LN		PHOENIX	AZ	85027-4527	
50622139	LUNA MELBA	1316 N DEPOT RD		EDINBURG	TX	78541	LUNA MELBA	1316 N DEPOT RD		EDINBURG	TX	78541-9468	
50622140	PHOENIX HOUSING SOLUTIONS II LLC	23233 N PIMA RD 113-240		SCOTTSDALE	AZ	85255	PHOENIX HOUSING SOLUTIONS II LLC	23233 N PIMA RD # 113-240		SCOTTSDALE	AZ	85255-8388	
50622141	PATEL SUNILKUMAR N/PRITI S	225 BURNS RD		ELYRIA	OH	44035	PATEL SUNILKUMAR N/PRITI S	1124 W BARROW DR		CHANDLER	AZ	85224-2335	
50622142	PATEL SUNILKUMAR N/PRITI S	225 BURNS RD		ELYRIA	OH	44035	PATEL SUNILKUMAR N & PRITI S	1124 W BARROW DR		CHANDLER	AZ	85224-2335	
50622155	MACDONALD PAMELA	PO BOX 235		HEREFORD	AZ	85615	MACDONALD PAMELA	PO BOX 235		HEREFORD	AZ	85615-0235	
50622156B	NELSON REVOCABLE TRUST	14910 S 43RD AVE		LAVEEN	AZ	85339	NELSON REVOCABLE TRUST	NELSON HAROLD W/CRYSTAL A TR	14910 S 43RD AVE	LAVEEN	AZ	85339-3262	
50622156C	ANDERSON BRUCE	141 W MAIN		MISSOULA	MT	59802	ANDERSON BRUCE	141 W MAIN		MISSOULA	MT	59802-4311	
50622156D	ANDERSON BRUCE	141 W MAIN		MISSOULA	MT	59802	ANDERSON BRUCE	141 W MAIN		MISSOULA	MT	59802-4311	
50622157	SLPR LLC	4800 N SCOTTSDALE RD NO 6000		SCOTTSDALE	AZ	85251	SLPR LLC	4800 N SCOTTSDALE RD NO 6000		SCOTTSDALE	AZ	85251-7616	
50623001	HARQUAHALA INVESTMENT CO	6201 WINTHROP DR		RALEIGH	NC	27612	HARQUAHALA INVESTMENT CO	6201 WINTHROP DR		RALEIGH	NC	27612-2145	
50623002	FERGUSON GRANDCHILDREN LLC	PO BOX 519		REXBURG	ID	83440	FERGUSON GRANDCHILDREN LLC	PO BOX 519		REXBURG	ID	83440-0519	
50623003	FERGUSON GRANDCHILDREN LLC	PO BOX 519		REXBURG	ID	83440	FERGUSON GRANDCHILDREN LLC	PO BOX 519		REXBURG	ID	83440-0519	
50623005B	SMITH NATHAN/MIKE	4200 149TH AVE SE		SAWYER	ND	58781	SMITH NATHAN/MIKE	4200 149TH AVE SE		SAWYER	ND	58781-9101	
50623005D	ERICKSON INVESTMENT LP	3616 E TREMAINE CT		GILBERT	AZ	85234	ERICKSON INVESTMENT LP	3616 E TREMAINE CT		GILBERT	AZ	85234-3104	
50623007B	SOUTH CENTRAL HOLDINGS LLC	6929 N HAYDEN RD SUITE C4-335		SCOTTSDALE	AZ	85250 USA	SOUTH CENTRAL HOLDINGS LLC	6929 N HAYDEN RD STE C4-335		SCOTTSDALE	AZ		85250
50623008	LILLE INVESTMENTS LLC	10500 N 52ND ST		PARADISE VALLEY	AZ	85253	LILLE INVESTMENTS LLC	10500 N 52ND ST		PARADISE VALLEY	AZ		85253
50623009	SOUTH CENTRAL HOLDINGS LLC	6929 N HAYDEN RD SUITE C4-335		SCOTTSDALE	AZ	85250 USA	SOUTH CENTRAL HOLDINGS LLC	6929 N HAYDEN RD STE C4-335		SCOTTSDALE	AZ		85250
50623010A	HILL SANDRA JEAN/ETAL	21351 N BLACK BEAR LODGE DR		SURPRISE	AZ	85387	HILL SANDRA JEAN/ETAL	21351 N BLACK BEAR LODGE DR		SURPRISE	AZ	85387-8203	
50623010B	HILL SANDRA JEAN/ETAL	21351 N BLACK BEAR LODGE DR		SURPRISE	AZ	85387	HILL SANDRA JEAN/ETAL	21351 N BLACK BEAR LODGE DR		SURPRISE	AZ	85387-8203	
50623010C	HILL SANDRA JEAN/ETAL	21351 N BLACK BEAR LODGE DR		SURPRISE	AZ	85387	HILL SANDRA JEAN/ETAL	21351 N BLACK BEAR LODGE DR		SURPRISE	AZ	85387-8203	
50623012D	HARQUAHALA VALLEY FARMS LLC	PO BOX 519		REXBURG	ID	83440	HARQUAHALA VALLEY FARMS LLC	PO BOX 519		REXBURG	ID	83440-0519	
50623019B	BARNES HARQUAHALA FARMS LLC	PO BOX 489		QUEEN CREEK	AZ	85142	BARNES HARQUAHALA FARMS LLC	PO BOX 489		QUEEN CREEK	AZ	85142-1809	
50623019C	BARNES EUELL L (CUSTODIAN)	PO BOX 489		QUEEN CREEK	AZ	85242	BARNES EUELL L (CUSTODIAN)	PO BOX 489		QUEEN CREEK	AZ	85242-1809	
50623022	BARNES HARQUAHALA FARMS LLC	PO BOX 489		QUEEN CREEK	AZ	85142	BARNES HARQUAHALA FARMS LLC	PO BOX 489		QUEEN CREEK	AZ	85142-1809	
50623023C	OGSLAND LLC	PO BOX 32697		PHOENIX	AZ	85064	OGSLAND LLC	PO BOX 32697		PHOENIX	AZ	85064-2697	
50623023D	SALVATORE GATTO PARTNERS LP	PO BOX 33184		PHOENIX	AZ	85067	SALVATORE GATTO PARTNERS LP	PO BOX 33184		PHOENIX	AZ	85067-3184	
50623023E	OGSLAND LLC	PO BOX 32697		PHOENIX	AZ	85064	OGSLAND LLC	PO BOX 32697		PHOENIX	AZ	85064-2697	
50623023F	OGSLAND LLC	PO BOX 32697		PHOENIX	AZ	85064	OGSLAND LLC	PO BOX 32697		PHOENIX	AZ	85064-2697	
50623023J	MARSHALL CHRYSTAL	PO BOX 374		TONOPAH	AZ	85354	MARSHALL CHRYSTAL	PO BOX 374		TONOPAH	AZ	85354-0374	
50623024	DESERT BLOOM PROPERTIES LLC	PO BOX 5159		REXBURG	ID	83440	DESERT BLOOM PROPERTIES LLC	PO BOX 5159		REXBURG	ID		83440
50623025	DESERT BLOOM PROPERTIES LLC	PO BOX 5159		REXBURG	ID	83440	DESERT BLOOM PROPERTIES LLC	PO BOX 5159		REXBURG	ID		83440
50623026	VERMA MD A 523/THOMAS 320 LLC	3001 W INDIAN SCHOOL RD STE 140		PHOENIX	AZ	85017	VERMA MD A 523/THOMAS 320 LLC	3001 W INDIAN SCHOOL RD STE 140		PHOENIX	AZ	85017-4142	
50623027	VERMA MD A 523/THOMAS 320 LLC	3001 W INDIAN SCHOOL RD STE 140		PHOENIX	AZ	85017	VERMA MD A 523/THOMAS 320 LLC	3001 W INDIAN SCHOOL RD STE 140		PHOENIX	AZ	85017-4142	
50623028B	SALVINI JOHN M	P O BOX 579		SELAH	WA	98942	SALVINI JOHN M	P O BOX 579		SELAH	WA	98942-0579	
50623033L	PITTS MYONG C	5266 W ANGELA DR		GLENDALE	AZ	85308	PITTS MYONG C	5266 W ANGELA DR		GLENDALE	AZ	85308-5344	
50623033M	CHIANG HSUEH HO/MYONG SOOK	1936 E TONTO DR		CHANDLER	AZ	85249	CHIANG HSUEH HO/MYONG SOOK	1936 E TONTO DR		CHANDLER	AZ	85249-3376	
50623033N	CK DEVELOPMENT INC	2052 E SANOQUE BLVD		GILBERT	AZ	85298	CK DEVELOPMENT INC	5515 S ROANOKE ST		GILBERT	AZ	85298-3425	
50623033P	LEE KWANG W	15403 E REDROCK DR		FOUNTAIN HILLS	AZ	85286	LEE KWANG W	15403 E REDROCK DR		FOUNTAIN HILLS	AZ		85286
50623036B	HARQUAHALA VALLEY FARMS LLC	PO BOX 519		REXBURG	ID	83440	HARQUAHALA VALLEY FARMS LLC	PO BOX 519		REXBURG	ID	83440-0519	
50623036C	HARQUAHALA VALLEY FARMS LLC	PO BOX 519		REXBURG	ID	83440	HARQUAHALA VALLEY FARMS LLC	PO BOX 519		REXBURG	ID	83440-0519	
50623039	HARQVAL 320	5650 BAYSIDE DR		ORLANDO	FL	32819	HARQUAL 320	C/O KIANG SUE	5650 BAYSIDE DR	ORLANDO	FL	32819-4045	
50623041	SUTHERLAND FAMILY REVOCABLE LIVING TRUST	PO BOX 1562		GILBERT	AZ	85299	SUTHERLAND FAMILY REVOCABLE LIVING TRUST	PO BOX 1562		GILBERT	AZ	85299-1562	
50623042	MARTORI BROTHERS DISTRIBUTORS	7332 E BUTHERUS DR		SCOTTSDALE	AZ	85260	MARTORI BROTHERS DISTRIBUTORS	7332 E BUTHERUS DR		SCOTTSDALE	AZ	85260-2426	
50623043	SALVINI JOHN M	P O BOX 579		SELAH	WA	98942	SALVINI JOHN M	P O BOX 579		SELAH	WA	98942-0579	
50623044B	LANDUST PROPERTIES LLC	5555 N 7TH ST STE 134-143		PHOENIX	AZ	85014	LANDUST PROPERTIES LLC	1928 E HIGHLAND AVE STE F104-504		PHOENIX	AZ	85016-0651	
50623044D	DEL REAL TERESA/AGUILA JAVIER J	10720 W INDIAN SCHOOL RD STE 19	PMB 128	PHOENIX	AZ	85037	DEL REAL TERESA/AGUILA JAVIER J	10720 W INDIAN SCHOOL RD STE 19	PMB 128	PHOENIX	AZ		85037
50623044F	DEL REAL TERESA/AGUILA JAVIER J	10720 W INDIAN SCHOOL RD STE 19	PMB 128	PHOENIX	AZ	85037	DEL REAL TERESA/AGUILA JAVIER J	10720 W INDIAN SCHOOL RD STE 19	PMB 128	PHOENIX	AZ		85037
50623044J	RUIZ EDUARDO OCTAVIO	2226 S 85TH DR		TOLLESON	AZ	85353	RUIZ EDUARDO OCTAVIO	8245 N 27TH AVE UNIT 1002		PHOENIX	AZ		85051
50624001	DECENDENTS TRUST OF THE ENG FAMILY TRUST/ETAL	P O BOX 298		BUCKEYE	AZ	85326	DECENDENTS TRUST OF THE ENG FAMILY TRUST	P O BOX 298		BUCKEYE	AZ	85326-0024	
50624002	ENG LARRY & JERFEE ANN ETAL	PO BOX 296		BUCKEYE	AZ	85326	ENG ENTERPRISES	PO BOX 298		BUCKEYE	AZ	85326-0024	
50624003A	CHIARAMONTE JOSEPH/TERESA MARIA TR	7032 E PRESIDO RD		SCOTTSDALE	AZ	85254	CHIARAMONTE JOSEPH/TERESA MARIA TR	CHIARAMONTE FAMILY LIVING TRUST	7032 E PRESIDO RD	SCOTTSDALE	AZ	85254-4030	
50624003C	YAKOO JALAL	17051 N 45TH ST		PHOENIX	AZ	85032	YAKOO JALAL	17051 N 45TH ST		PHOENIX	AZ	85032-9309	
50624003D	MARKS BENITA TR/GOULD JEFFREY S TR	9494 E REDFIELD RD #1001		SCOTTSDALE	AZ	85260	MARKS BENITA TR/GOULD JEFFREY S TR	10 GRACE CT		LONG BRANCH	NJ	07740-5960	
50624004	CHIARAMONTE JOSEPH/TERESA MARIA TR	7032 E PRESIDO RD		SCOTTSDALE	AZ	85254	CHIARAMONTE JOSEPH/TERESA MARIA TR	CHIARAMONTE FAMILY LIVING TRUST	7032 E PRESIDO RD	SCOTTSDALE	AZ	85254-4030	
50624005C	UHM LLC	PO BOX 225		AVONDALE	AZ	85323	UHM LLC	PO BOX 225		AVONDALE	AZ	85323-0080	
50624005D	GARCIA LUIS/OLIVAS MANUEL/ERNESTINA	7151 W INDIAN SCHOOL NO 2019		PHOENIX	AZ	85033	LARSEN ELAINE CONTO	P O BOX 5607		MOHAVE VALLEY	AZ	86446-5607	
50624005E	BGBBJB REVOCABLE TRUST	5421 W WILLOW AVE		GLENDALE	AZ	85304	BGBBJB REVOCABLE TRUST	5421 W WILLOW AVE		GLENDALE	AZ	85304-1370	
50624005F	LONGO MICHAEL/MARY KAY	PO BOX 760		SCOTTSDALE	AZ	85252	LONGO MICHAEL/MARY KAY	PO BOX 760		SCOTTSDALE	AZ	85252-0760	
50624006A	MAGO NARESH	5867 S BRITTANY LN		TEMPE	AZ	85283	MAGO NARESH	5867 S BRITTANY LN		TEMPE	AZ	85283-2782	
50624006B	LONGO MICHAEL A/MARY KAY	PO BOX 760		SCOTTSDALE	AZ	85252-0760	LONGO MICHAEL A/MARY KAY	PO BOX 760		SCOTTSDALE	AZ	85252-0760	
50624006C	GONZALES HECTOR/VASQUEZ FRANCISCO/ETAL	PO BOX 5607		MOHAVE VALLEY	AZ	86446	GONZALES HECTOR/VASQUEZ FRANCISCO/ETAL	PO BOX 5607		MOHAVE VALLEY	AZ	86446-5607	
50624006D	ANAND PRITI	2765 W DEL RIO PL		CHANDLER	AZ	85224	ANAND PRITI	2765 W DEL RIO PL		CHANDLER	AZ	85224-7328	
50624006E	LONGO MICHAEL/MARY KAY	PO BOX 760		SCOTTSDALE	AZ	85252	LONGO MICHAEL/ MARY KAY	PO BOX 760		SCOTTSDALE	AZ	85252-0760	
50624007B	NAVARRO JOHNNY/DANIEL/RICHARD/EDWARD/ETAL	3730 W MONTE VISTA		PHOENIX	AZ	85009	NAVARRO JOHNNY/DANIEL/RICHARD/EDWARD/ETA	2605 W SONORAN BLVD 134		PHOENIX	AZ	85085-5226	
50624007C	HOKANSON DAVID J/KELLI L	19402 W TAYLOR ST		BUCKEYE	AZ	85326	HOKANSON DAVID J/KELLI L	19402 W TAYLOR ST		BUCKEYE	AZ	85326-8509	
50624007E	LONGO MICHAEL/MARY KAY	PO BOX 760		SCOTTSDALE	AZ	85252	LONGO MICHAEL/MARY KAY	PO BOX 760		SCOTTSDALE	AZ	85252-0760	
50624007F	HUGHES DAVID	2735 E SOUTH MOUNTAIN AVE		PHOENIX	AZ	85042	HUGHES DAVID	2735 E SOUTH MOUNTAIN AVE		PHOENIX	AZ	85042-8221	
50624008A	LONGO MICHAEL A/MARY KAY	PO BOX 760		SCOTTSDALE	AZ	85252-0760	LONGO MICHAEL A/MARY KAY	PO BOX 760		SCOTTSDALE	AZ	85252-0760	
50624008C	BORBON JIMMY FRANK	PO BOX 7515		SURPRISE	AZ	85374	BORBON JIMMY F	4650 E SANDRA TERR		PHOENIX	AZ	85032-3438	
50624008D	LONGO MICHAEL A/MARY KAY	PO BOX 760		SCOTTSDALE	AZ	85252-0760	LONGO MICHAEL A/MARY KAY	PO BOX 760		SCOTTSDALE	AZ	85252-0760	
50624008E	LONGO MICHAEL/MARY KAY	PO BOX 760		SCOTTSDALE	AZ	85252	LONGO MICHAEL/MARY KAY	PO BOX 760		SCOTTSDALE	AZ	85252-0760	
50624009B	IRIARTE ANGELICA/CORRALES GERARDO/IRIARTE CON	5624 W MYRTLE		GLENDALE	AZ	85301	IRIARTE ANGELICA/CONRADO	5624 W MYRTLE		GLENDALE	AZ	85301-1927	
50624009D	JANDA LAND HOLDING LLC	PO BOX 9794		PHOENIX	AZ	85068-9794	JANDA LAND HOLDING LLC	101 E MOON VALLEY DR		PHOENIX	AZ	85022-4249	
50624009N	ZELLERS ANA/VENEZIA CAROL D	20521 N 93RD AVE		PEORIA	AZ	85382 USA	VENEZIA RICHARD J/CAROL D/ZELLERS ANA	20521 N 93RD AVE		PEORIA	AZ	85382-5256	
50624009Q	ORLANDO RONALD T	850 E MONROE UNIT 20		BUCKEYE	AZ	85326	ORLANDO RONALD T	850 E MONROE UNIT 20		BUCKEYE	AZ	85326-2910	
50624009R	BURTON CHARLES A	22 N 226TH LN		BUCKEYE	AZ	85326	EAGLE EYE INVESTMENTS LLC	BURTON CHARLES A	22 N 226TH LN	BUCKEYE	AZ	85326-7863	
50624009S	KIM JAEKWON/JUNG K CHUNG TR	5260 W MELINDA LN		GLENDALE	AZ	85308	KIM JAEKWON/JUNG K CHUNG TR	5260 W MELINDA LN		GLENDALE	AZ	85308-9304	
50624009T	DARLAND JACQUELINE M	4044 W GLENN DR		PHOENIX	AZ	85051	DARLAND JACQUELINE M	4044 W GLENN DR		PHOENIX	AZ	85051-8111	
50624009U	CURRIE RITA L TRUST	13283 N 153RD LN		SURPRISE	AZ	85379	CURRIE RITA L TRUST	2344 HERNANDO RD		SACRAMENTO	CA	95825-0213	
50624009V	CURRIE RITA L TRUST	13283 N 153RD LN		SURPRISE	AZ	85379	RITA L CURRIE TRUST	CURRIE RITA L TR	2344 HERNANDO RD	SACRAMENTO	CA	95825-0213	
50624009W	CURRIE RITA L TRUST	13283 N 153RD LN		SURPRISE	AZ	85379	RITA L CURRIE TRUST	CURRIE RITA L TR	2344 HERNANDO RD	SACRAMENTO	CA	95825-0213	
50624009Y	VACLAVINEK PETR/SOKALSKI ROMAN	6291 FALCON CHASE DR		WESTERVILLE	OH	43082	VACLAVINEK PETR/SOKALSKI ROMAN	6291 FALCON CHASE DR		WESTERVILLE	OH	43082-8937	
50624011T	RICH ROSE DEVELOPMENT LLC	12658 N 150TH LN		SURPRISE	AZ	85379	RICHROSE DEVELOPMENT LLC	C/O MARVIN ROBBY RICHARDS	315 W PINTURA CIR	LITCHFIELD PARK	AZ		85340
50624011Z	ARIZONA TELEPHONE COMPANY	PO BOX 32396		KNOXVILLE	TN	37930-2396	ARIZONA TELEPHONE COMPANY	525 JUNCTION RD		MADISON	WI	53717-2152	
50624012B	THOMPKINS LOIS/BIRD CLIFFORD/MCDONALD DEBRA	PO BOX 785		CAMP VERDE	AZ	86322	THOMPKINS LOIS/BIRD CLIFFORD/MCDONALD DE	PO BOX 785		CAMP VERDE	AZ	86322-0785	
50624012D	THOMPKINS LOIS/BIRD CLIFFORD/MCDONALD DEBRA	PO BOX 785		CAMP VERDE	AZ	86322	THOMPKINS LOIS/BIRD CLIFFORD/MCDONALD DE	PO BOX 785		CAMP VERDE	AZ	86322-0785	
50624012E	PASSMORE STEPHEN R/ELIZABETH R	2148 N 180 W		PLEASANT GROVE	UT	84062	PASSMORE STEPHEN R/ELIZABETH R	2148 N 180 W		PLEASANT GRV	UT	84062-9089	
50624012F	SRP TRUST	2148 N 180 W		PLEASANT GROVE	UT	84062 USA	SRP TRUST	PASSMORE STEPHEN R TRUSTEE	2148 N 180 W	PLEASANT GROVE	UT		84062
50624012G	LANDON RICHARD A/SANDY M	3303 E 200 NORTH		RIGBY	ID	83442	LANDON RICHARD A/SANDY M	3303 E 200 N		RIGBY	ID	83442-5618	
50624931	ENGLUND FAMILY TRUST	PO BOX 250		CASHION	AZ	85329	ENGLUND FAMILY TRUST	PO BOX 250		CASHION	AZ	85329-0250	
50624932	ENGLUND FAMILY TRUST	PO BOX 250		CASHION	AZ	85329	ENGLUND FAMILY TRUST	PO BOX 250		CASHION	AZ	85329-0250	
50624933	ENGLUND FAMILY TRUST	PO BOX 250		CASHION	AZ	85329	ENGLUND FAMILY TRUST	PO BOX 250		CASHION	AZ	85329-0250	
50624935	LONGO MICHAEL/MARY KAY	PO BOX 760		SCOTTSDALE	AZ	85252	LONGO MICHAEL/MARY KAY	PO BOX 760		SCOTTSDALE	AZ	85252-0760	
50624936	GORMAN REVOCABLE TRUST	4028 N RAINIER		MESA	AZ	85215	GORMAN REVOCABLE TRUST	4028 N RAINIER		MESA	AZ	85215-0818	
50624937	BROWN KATHY K TR	16805 S GREENFIELD RD		HIGLEY	AZ	85236	BROWN KATHY K TR	16805 S GREENFIELD RD		HIGLEY	AZ	85295-1914	
50624938	WYORAL JAMES J/CELINE B	5205 FIORE TERRACE APT B301		SAN DIEGO	CA	92122	WYORAL JAMES J/CELINE B	30410 CALLE LA REINA		BONSALL	CA		92003
50624939	MICHAEL SANHARIB/MONA	304 S DOHENY DR S		BEVERLY HILLS	CA	90211	MICHAEL SANHARIB/MONA	304 S DOHENY DR S		BEVERLY HILLS	CA	90211-3549	
50624940	LUCIANO LORRAINE	4153 W PARKVIEW LN		GLENDALE	AZ	85310	LUCIANO LORRAINE	4153 W PARKVIEW LN		GLENDALE	AZ	85310-3220	
50624941	GEBRAN RESOURCES LLC	3238 N SCOTTSDALE RD		SCOTTSDALE	AZ	85251	GEBRAN RESOURCES LLC	3238 N SCOTTSDALE RD		SCOTTSDALE	AZ	85251-6408	
50624942	GEBRAN RESOURCES LLC	3238 N SCOTTSDALE RD		SCOTTSDALE	AZ	85251	GEBRAN RESOURCES LLC	3238 N SCOTTSDALE RD		SCOTTSDALE	AZ	85251-6408	
50624943	BLANCHETTE CHARLES T TR/BLANCHETTE DENISE TR	2549 W ROSE LN # A214		PHOENIX	AZ	85017	BLANCHETTE CHARLES T TR/BLANCHETTE DENIS	C/O BLANCHETTE DENISE	917 W COUNTRY LN	PAYSON	AZ		85541
50624944	BLANCHETTE CHARLES T TR/BLANCHETTE DENISE TR	2549 W ROSE LN # A214		PHOENIX	AZ	85017	BLANCHETTE CHARLES T TR/BLANCHETTE DENIS	C/O BLANCHETTE DENISE	917 W COUNTRY LN	PAYSON	AZ		85541
50624945	BLANCHETTE CHARLES T TR/BLANCHETTE DENISE TR	2549 W ROSE LN # A214		PHOENIX	AZ	85017	BLANCHETTE CHARLES T TR/BLANCHETTE DENIS	C/O BLANCHETTE DENISE	917 W COUNTRY LN	PAYSON	AZ		85541
50624946	BLANCHETTE CHARLES T TR/BLANCHETTE DENISE TR	2549 W ROSE LN # A214		PHOENIX	AZ	85017	BLANCHETTE CHARLES T TR/BLANCHETTE DENIS	C/O BLANCHETTE DENISE	917 W COUNTRY LN	PAYSON	AZ		85541
50624948	SZUSTAK SOPHIE	12629 W APODACA DR		LITCHFIELD PARK	AZ	85340 USA	SZUSTAK SOPHIE	12629 W APODACA DR		LITCHFIELD PARK	AZ		85340
50624949	WAXMANSKY JULIE	11241 S WORTH		WORTH	IL	60482	WAXMANSKY JULIE	11241 S WORTH		WORTH	IL	60482-1820	
50624950	SZUSTAK SOPHIE	12629 W APODACA DR		LITCHFIELD PARK	AZ	85340 USA	SZUSTAK SOPHIE	12629 W APODACA DR		LITCHFIELD PARK	AZ		85340
50624951	OKOLITA JOHN/HELEN	9205 N ASHLAND		NILES	IL	60714	OKOLITA JOHN/HELEN	9205 N ASHLAND		NILES	IL	60714-1305	
506250018	ALLEGHENY ENERGY SUPPLY COMPANY LLC	800 CABIN HILL DR		GREENSBURG	PA	15601	ALLEGHENY ENERGY SUPPLY CO LLC	ATTN TAX DEPT RICH DVORSKY	800 CABIN HILL DR	GREENSBURG	PA	15601-1650	

50625001C		ALLEGHENY ENERGY SUPPLY COMPANY LLC	800 CABIN HILL DR	GREENSBURG	PA	15601	ALLEGHENY ENERGY SUPPLY CO LLC	ATTN TAX DEPT RICH DVORSKY	800 CABIN HILL DR			GREENSBURG	PA	15601-1650	
50625005B		OLDHAM ENTERPRISES LLC	1180 N MOUNTAIN SPRINGS PA	SPRINGVILLE	UT	84663	OLDHAM ENTERPRISES LLC	1180 N MOUNTAIN SPRINGS PA				SPRINGVILLE	UT	84663-3007	
50625007B		LF-1 LLC	1180 N MOUNTAIN SPRINGS PA	SPRINGVILLE	UT	84663	LF-1 LLC	1180 N MOUNTAIN SPRINGS PA				SPRINGVILLE	UT	84663-3007	
50625008A		LF-1 LLC	1180 N MOUNTAIN SPRINGS PA	SPRINGVILLE	UT	84663	LF-1 LLC	1180 N MOUNTAIN SPRINGS PA				SPRINGVILLE	UT	84663-3007	
50625008B		LF-1 LLC	1180 N MOUNTAIN SPRINGS PA	SPRINGVILLE	UT	84663	LF-1 LLC	1180 N MOUNTAIN SPRINGS PA				SPRINGVILLE	UT	84663-3007	
50622154		MACDONALD PAMELA L	PO BOX 294131	KERRVILLE	TX	78029 USA	MACDONALD PAMELA	PO BOX 294131				KERRVILLE	TX	78029-4131	
50625009A	55402 W VAN BUREN ST	85354 ALLEGHENY ENERGY SUPPLY COMPANY LLC	800 CABIN HILL DR	GREENSBURG	PA	15601	ALLEGHENY ENERGY SUPPLY CO LLC	ATTN TAX DEPT RICH DVORSKY	800 CABIN HILL DR			GREENSBURG	PA	15601-1650	
50628021	6004 S 49STH AVE	85354 CV HARQUAHALA LLC	3549 153RD AVE SE	CASSELTON	ND	58012 USA	CV HARQUAHALA LLC	CLUB VISTA FINANCIAL SERVICES LLC	3549 153RD AVE SE			CASSELTON	ND	58012-9700	
50628030	49448 W BASELINE RD	85354 CV HARQUAHALA LLC	3549 153RD AVE SE	CASSELTON	ND	58012 USA	CV HARQUAHALA LLC	CLUB VISTA FINANCIAL SERVICES LLC	3549 153RD AVE SE			CASSELTON	ND	58012-9700	
50622087		W P INVESTMENTS LLC	3003 N CENTRAL AVE NO 103-232	PHOENIX	AZ	85012	W P INVESTMENTS LLC	1928 E HIGHLAND AVE STE F104-504				PHOENIX	AZ	85016-0651	
50622101A		THOMPSON ALAN LEE SR	PO BOX 1	TONOPAH	AZ	85354	THOMPSON ALAN LEE SR	PO BOX 1				TONOPAH	AZ	85354-0001	
50622107		THORNTON PATRICK M TR	23200 N PIMA RD STE 200	SCOTTSDALE	AZ	85255	THORNTON PATRICK M TR	23200 N PIMA RD STE 200				SCOTTSDALE	AZ	85255-4388	
50623044H		HERNANDEZ GUSTAVO A	6432 W KEIM DR	GLENDALE	AZ	85301	HERNANDEZ GUSTAVO A	6432 W KEIM DR				GLENDALE	AZ	85301-5038	
50623044K		RUIZ PABLO	6322 W KEIM DR	GLENDALE	AZ	85301	RUIZ PABLO	6322 W KEIM DR				GLENDALE	AZ	85301-5026	
50623044L		RUIZ PABLO	6322 W KEIM DR	GLENDALE	AZ	85301	RUIZ PABLO	6322 W KEIM DR				GLENDALE	AZ	85301-5026	
50623044M		RUIZ EDUARDO OCTAVIO	2226 S 85TH DR	TOLLESON	AZ	85353	RUIZ EDUARDO OCTAVIO	8245 N 27TH AVE UNIT 1002				PHOENIX	AZ	85051	
50629011		SCOTTSDALE CITY OF	7447 E INDIAN SCHOOL RD STE 205	SCOTTSDALE	AZ	85251	CITY OF SCOTTSDALE	ASSET MANAGEMENT	7447 E INDIAN SCHOOL RD STE 205			SCOTTSDALE	AZ	85251-3915	
50629031C		SANBORN GREG/PHOEBE	145 OLD N GROTON RD	RUMNEY	NH	3266	SANBORN GREG/PHOEBE	145 OLD N GROTON RD				RUMNEY	NH	03266-3323	
50632008		WOODMAN FAMILY TRUST	9525 E PALOMINO PL	SUN LAKES	AZ	85248 USA	APPLE WOOD FUNDING	275 W EUCLID AVE				PHOENIX	AZ	85041-8434	
50629021B		HARQUHALA GIN LLC	3636 S 7TH ST	PHOENIX	AZ	85040	HARQUHALA GIN LLC	3636 S 7TH ST				PHOENIX	AZ	85040-1131	
50629031F		SCOTTSDALE CITY OF	7447 E INDIAN SCHOOL RD STE 205	SCOTTSDALE	AZ	85251	CITY OF SCOTTSDALE	ASSET MANAGEMENT	7447 E INDIAN SCHOOL RD STE 205			SCOTTSDALE	AZ	85251-3915	
50629023C		KAWELA ONE LLC	38082 SNICKERVILLE TPK	PURCELLVILLE	VA	20132	KAWELA ONE LLC	C/O BRADLEY J BOLAND	38082 SNICKERVILLE TPK			PURCELLVILLE	VA	20132-5006	
50632007	210 S 515TH AVE	85354 WOODMAN FAMILY TRUST	9525 E PALOMINO PL	SUN LAKES	AZ	85248 USA	WOODMAN FAMILY TRUST	KARL AND ELEANOR WOODMAN TRUSTEES	9525 E PALOMINO PL			SUN LAKES	AZ	85248-6526	
50632001		BAUTISTA SALVADOR	8130 W INDIAN SCHOOL	PHOENIX	AZ	85033	BAUTISTA VANESSA	3832 FOX SPARROW TR NW				ALBUQUERQUE	NM	87120-5004	
50632002		BAUTISTA ELIAS	STAR RT 1 BOX 435	BUCKEYE	AZ	85326	BAUTISTA ELIAS	3832 FOX SPARROW TR NW				ALBUQUERQUE	NM	87120-5004	
50632003		VALLEY NATL BANK OF AZ TR THE	2602 W LAWRENCE RD	PHOENIX	AZ	85017	VALLEY NATL BANK OF AZ TR THE	2602 W LAWRENCE RD				PHOENIX	AZ	85017-1319	
50632004		VALLEY NATL BK OF AZ TR THE	2602 W LAWRENCE RD	PHOENIX	AZ	85017	VALLEY NAT'L BANK OF AZ TR THE	2602 W LAWRENCE RD				PHOENIX	AZ	85017-1319	
50632005		AKKURT ALEXANDER	3126 N GRANITE REEF RD	SCOTTSDALE	AZ	85251	AKKURT ALEXANDER	3126 N GRANITE REEF RD				SCOTTSDALE	AZ	85251-7310	
50632006		AKKURT ALEXANDER	3126 N GRANITE REEF RD	SCOTTSDALE	AZ	85251	ISKENDER ALEX	3126 N GRANITE REEF RD				SCOTTSDALE	AZ	85251-7310	
50632009		NEWNAM JAMES ALAN/DARLINE IRENE TR	4540 N 18TH DR	PHOENIX	AZ	85015	NEWNAM JAMES ALAN/DARLINE IRENE TR	4540 N 18TH DR				PHOENIX	AZ	85015-3841	
50632010		NEWNAM JAMES ALAN/DARLINE IRENE TR	4540 N 18TH DR	PHOENIX	AZ	85015	NEWNAM JAMES ALAN/DARLINE IRENE TR	4540 N 18TH DR				PHOENIX	AZ	85015-3841	
50632011		WENNBERG RICHARD D/MICHELLE R	22027 W WATKINS ST	BUCKEYE	AZ	85326	WENNBERG RICHARD D/MICHELLE R	22027 W WATKINS ST				BUCKEYE	AZ	85326-3953	
50632012C		WENNBERG RICHARD D/MICHELLE R	22027 W WATKINS ST	BUCKEYE	AZ	85326	WENNBERG RICHARD D/MICHELLE R	22027 W WATKINS ST				BUCKEYE	AZ	85326-3953	
50632012D		WATER UTILITIES OF GREATER TONOPAH INC	21410 N 19TH AVE STE 201	PHOENIX	AZ	85027	WATER UTILITY OF GREATER TONOPAH	C/O GLOBAL WATER RESOURCES	21410 N 19TH AVE STE 201			PHOENIX	AZ	85027-2758	
50629015A		GARFINKLE GARY S/MARIA J TR	1205 VIA GABARDA	LAFAYETTE	CA	94549	GARFINKLE GARY S/MARIA J TR	1205 VIA GABARDA				LAFAYETTE	CA	94549-6250	
50628028		SCOTTSDALE CITY OF	7447 E INDIAN SCHOOL RD STE 205	SCOTTSDALE	AZ	85251	CITY OF SCOTTSDALE	ASSET MANAGEMENT	7447 E INDIAN SCHOOL RD STE 205			SCOTTSDALE	AZ	85251-3915	
50628029		SCOTTSDALE CITY OF	7447 E INDIAN SCHOOL RD STE 205	SCOTTSDALE	AZ	85251	CITY OF SCOTTSDALE	ASSET MANAGEMENT	7447 E INDIAN SCHOOL RD STE 205			SCOTTSDALE	AZ	85251-3915	
50628033		SCOTTSDALE CITY OF	7447 E INDIAN SCHOOL RD STE 205	SCOTTSDALE	AZ	85251	CITY OF SCOTTSDALE	ASSET MANAGEMENT	7447 E INDIAN SCHOOL RD STE 205			SCOTTSDALE	AZ	85251-3915	
50628041		FLOOD CONTROL DISTRICT OF MARICOPA COUNTY	2801W DURANGO ST	PHOENIX	AZ	85009 USA	MARICOPA COUNTY FLOOD CONTROL	2801 W DURANGO ST				PHOENIX	AZ	85009-6356	
50628044		TORREY PINES DEV LLC/ETAL LEASE #01-2325	1121 W WARNER RD STE 109	TEMPE	AZ	85284 USA	ARIZONA STATE LAND DEPT	TORREY PINES DEV LLC/ETAL LEASE	1121 W WARNER RD UNIT 109			TEMPE	AZ	85284	
50628045		TORREY PINES DEV LLC/ETAL LEASE #01-1826	1121 W WARNER RD STE 109	TEMPE	AZ	85284	ARIZONA STATE LAND DEPT	TORREY PINES DEV LLC/ETAL LEASE #01CONTO	1121 W WARNER RD STE 109			TEMPE	AZ	85284-2819	
50629010		SCOTTSDALE CITY OF	7447 E INDIAN SCHOOL RD STE 205	SCOTTSDALE	AZ	85251	CITY OF SCOTTSDALE	ASSET MANAGEMENT	7447 E INDIAN SCHOOL RD STE 205			SCOTTSDALE	AZ	85251-3915	
50629012B		SCOTTSDALE CITY OF	7447 E INDIAN SCHOOL RD STE 205	SCOTTSDALE	AZ	85251	CITY OF SCOTTSDALE	ASSET MANAGEMENT	7447 E INDIAN SCHOOL RD STE 205			SCOTTSDALE	AZ	85251-3915	
50629013B		SCOTTSDALE CITY OF	7447 E INDIAN SCHOOL RD STE 205	SCOTTSDALE	AZ	85251	CITY OF SCOTTSDALE	ASSET MANAGEMENT	7447 E INDIAN SCHOOL RD STE 205			SCOTTSDALE	AZ	85251-3915	
50629018C		SCOTTSDALE CITY OF	7447 E INDIAN SCHOOL NO 205	SCOTTSDALE	AZ	85251	CITY OF SCOTTSDALE	C/O ASSET MANAGEMENT	7447 E INDIAN SCHOOL STE 205			SCOTTSDALE	AZ	85251-3915	
50629018D		SCOTTSDALE CITY OF	7447 E INDIAN SCHOOL RD STE 205	SCOTTSDALE	AZ	85251	CITY OF SCOTTSDALE	ASSET MANAGEMENT	7447 E INDIAN SCHOOL RD STE 205			SCOTTSDALE	AZ	85251-3915	
50629068		O & E FARMS LEASE # 01-100563	PO BOX 430	BUCKEYE	AZ	85326	ARIZONA STATE OF	O & E FARMS LEASE # 01-100563 CONTO	PO BOX 430			BUCKEYE	AZ	85326-0033	
50629035A		KUBINEC JOHN C/TANYA	5114 GRIMM DR	ALEXANDRIA	VA	22304	KUBINEC JOHN C/TANYA	9005 BLAZING STAR RD SE				ALBUQUERQUE	NM	87116-3019	
50629035B		FISERV ISS AND CO FBO JOSEPH A DINUZZO JR IRA	7611 S ORANGE BLOSSOM TRL	ORLANDO	FL	32809	FISERV ISS AND CO	FBO JOSEPH A DINUZZO JR	3301 W FOLGERS RD			PHOENIX	AZ	85027-7009	
50629036		LAGUNA CHRISTOPHER/BOSZKO ROBERT J/VOLA B	1370 E THACKER ST	SCHAUMBURG	IL	60173	LAGUNA CHRISTOPHER/BOSZKO ROBERT J/VOLA	1370 E THACKER ST				SCHAUMBURG	IL	60173-6591	
50629037		LEVAN BRIAN/LESLIE	3115 N 188TH AVE	LITCHFIELD PARK	AZ	85340	LEVAN BRIAN/LESLIE	3115 N 188TH AVE				LITCHFIELD PARK	AZ	85340	
50629038		DURLEJ CATHY	7234 CESTRUM RD	LAS VEGAS	NV	89113	DURLEJ CATHY	7234 CESTRUM RD				LAS VEGAS	NV	89113-3218	
50629039		DOBKIENICZ JERZY/LUCYNA	1 PINE HILL CT	DAYTON	NJ	8810	DOBKIENICZ JERZY/LUCYNA	1 PINE HILL CT				DAYTON	NJ	08810-1631	
50629040		DOBKIENICZ JERZY/LUCYNA	1 PINE HILL CT	DAYTON	NJ	8810	DOBKIENICZ JERZY/LUCYNA	1 PINE HILL CT				DAYTON	NJ	08810-1631	
50629041		DOBKIEWICZ JERZY/LUCYNA	1 PINE HILL CT	DAYTON	NJ	8810	DOBKIEWICZ JERZY/LUCYNA	1 PINE HILL CT				DAYTON	NJ	08810-1631	
50629042		CARRANZA YOLANDA H	15633 FACTORY ST	SURPRISE	AZ	85374	CARRANZA YOLANDA H	15633 N FACTORY ST				SURPRISE	AZ	85374-4116	
50629043		KRUTUL DOROTA	235 E 2ND ST NO C4	BROOKLYN	NY	11218	KRUTUL DOROTA	235 E 2ND ST APT C4				BROOKLYN	NY	11218-2320	
50629044		JOSEF AND JANINA OKOLITA REVOCABLE TRUST	10744 W TONOPAH DR	SUN CITY	AZ	85373	JOSEF AND JANINA OKOLITA REVOCABLE TRUST	12566 W GLENROSA DR				LITCHFIELD PARK	AZ	85340	
50629045		JOSEF AND JANINA OKOLITA REVOCABLE TRUST	10744 W TONOPAH DR	SUN CITY	AZ	85373	JOSEF AND JANINA OKOLITA REVOCABLE TRUST	10744 W TONOPAH DR				SUN CITY	AZ	85373-3306	
50629046		NAVARREZ PAUL/LETICIA	441 W WINDSOR	GLENDALE	CA	91204	NAVARREZ PAUL/LETICIA	441 W WINDSOR RD				GLENDALE	CA	91204-4249	
50629047		BIG SKY LAND INVESTMENTS LLC	1920 E MARYLAND AVE NO 32	PHOENIX	AZ	85016	BIG SKY LAND INVESTMENTS LLC	1920 E MARYLAND AVE UNIT 32				PHOENIX	AZ	85016-1455	
50629050		DEGIORGI BRUNO	9050 E MCDOWELL RD	MESA	AZ	85207	DEGIORGI BRUNO	9050 E MCDOWELL RD				MESA	AZ	85207-1514	
50629051		HELSPER JOSEPH/KRYSTYNA	253 ASH STREET	WOODDALE	IL	60191	HELSPER JOSEPH/KRYSTYNA	253 ASH AVE				WOOD DALE	IL	60191-1662	
50629052		GORAYSKI ROMAN/URSULA	2132 GREENWICK RD	EL CAJON	CA	92019	GORAYSKI ROMAN/URSULA	2132 GREENWICK RD				EL CAJON	CA	92019-4114	
50629053		STOYANOV KRYSTYNA E/VALERY M/KONRAD	4017 N 11TH ST	PHOENIX	AZ	85014	STOYANOV KRYSTYNA E/VALERY M/KONRAD	4017 N 11TH ST				PHOENIX	AZ	85014-4804	
50629054		DEGIORGI BRUNO R	9050 E MCDOWELL RD	MESA	AZ	85207	DEGIORGI BRUNO R	9050 E MCDOWELL RD				MESA	AZ	85207-1514	
50629055		FEDIUK SBIGNIEW A/MARIA	3205 N MANSFIELD DR	LITCHFIELD PARK	AZ	85340	FEDIUK SBIGNIEW A/MARIA	3205 N MANSFIELD DR				LITCHFIELD PARK	AZ	85340	
50629056		LAGUNA CHRISTOPHER J/MARIOLA	1370 E THACKER ST	SCHAUMBERG	IL	60173	LAGUNA CHRISTOPHER J/MARIOLA	1370 E THACKER ST				SCHAUMBURG	IL	60173-6591	
50629057		CERDA JOSE LUIS	17447 N AVE OF THE ARTS NO 2004	SURPRISE	AZ	85374	CERDA JOSE LUIS	15281 W TASHA DR				SURPRISE	AZ	85374-1449	
50629058		YOUNG TED W	407 ANN MARIE AVE	IRON RIDGE	WI	53035	YOUNG TED W	711 OLD SETTLEMENT DR				WATERTOWN	WI	53098-1148	
50629059		YOUNG TED W	407 ANN MARIE AVE	IRON RIDGE	WI	53035	YOUNG TED W	711 OLD SETTLEMENT DR				WATERTOWN	WI	53098-1148	
50629060		YOUNG TED W	407 ANN MARIE AVE	IRON RIDGE	WI	53035	YOUNG TED W	711 OLD SETTLEMENT DR				WATERTOWN	WI	53098-1148	
50629061		AWF LLC	PO BOX 52991	MESA	AZ	85208	AWF LLC	PO BOX 52991				MESA	AZ	85208	
50629062		AWF LLC	PO BOX 52991	MESA	AZ	85208	AWF LLC	PO BOX 52991				MESA	AZ	85208	
50629064		LOGAN THEADORA CYNTHIA	200 COZINE AVE 9J	BROOKLYN	NY	11207	LOGAN THEADORA CYNTHIA	200 COZINE AVE APT 9 J				BROOKLYN	NY	11207-8809	
50629065		LOGAN FLORENCE/WILLIAMS CROSBY MARJORIE	330 E 26TH ST NO 5F	NEW YORK	NY	10010	LOGAN FLORENCE/WILLIAMS CROSBY MARJORIE	51427 W TONTO ST				TONOPAH	AZ	85354-7243	
50629069		GLENROCK FARMS LLC	1000 OLD QUARRY RD	SAN JOSE	CA	95123	GLENROCK FARMS LLC	1000 OLD QUARRY RD				SAN JOSE	CA	95123-2454	
50629070		GLENROCK FARMS LLC	1000 OLD QUARRY RD	SAN JOSE	CA	95123	GLENROCK FARMS LLC	1000 OLD QUARRY RD				SAN JOSE	CA	95123-2454	
50629071		GLENROCK FARMS LLC	1000 OLD QUARRY RD	SAN JOSE	CA	95123	GLENROCK FARMS LLC	1000 OLD QUARRY RD				SAN JOSE	CA	95123-2454	
50629072		GLENROCK FARMS LLC	1000 OLD QUARRY RD	SAN JOSE	CA	95123	GLENROCK FARMS LLC	1000 OLD QUARRY RD				SAN JOSE	CA	95123-2454	
50629073		GLENROCK FARMS LLC	1000 OLD QUARRY RD	SAN JOSE	CA	95123	GLENROCK FARMS LLC	1000 OLD QUARRY RD				SAN JOSE	CA	95123-2454	
50629074		GLENROCK FARMS LLC	1000 OLD QUARRY RD	SAN JOSE	CA	95123	GLENROCK FARMS LLC	1000 OLD QUARRY RD				SAN JOSE	CA	95123-2454	
50629075		GLENROCK FARMS LLC	1000 OLD QUARRY RD	SAN JOSE	CA	95123	GLENROCK FARMS LLC	1000 OLD QUARRY RD				SAN JOSE	CA	95123-2454	
50629076		GLENROCK FARMS LLC	1000 OLD QUARRY RD	SAN JOSE	CA	95123	GLENROCK FARMS LLC	1000 OLD QUARRY RD				SAN JOSE	CA	95123-2454	
50629077		GLENROCK FARMS LLC	1000 OLD QUARRY RD	SAN JOSE	CA	95123	GLENROCK FARMS LLC	1000 OLD QUARRY RD				SAN JOSE	CA	95123-2454	
50629078		GLENROCK FARMS LLC	1000 OLD QUARRY RD	SAN JOSE	CA	95123	GLENROCK FARMS LLC	1000 OLD QUARRY RD				SAN JOSE	CA	95123-2454	
50629079		GLENROCK FARMS LLC	1000 OLD QUARRY RD	SAN JOSE	CA	95123	GLENROCK FARMS LLC	1000 OLD QUARRY RD				SAN JOSE	CA	95123-2454	
50629080		GLENROCK FARMS LLC	1000 OLD QUARRY RD	SAN JOSE	CA	95123	GLENROCK FARMS LLC	1000 OLD QUARRY RD				SAN JOSE	CA	95123-2454	
50629081		GLENROCK FARMS LLC	1000 OLD QUARRY RD	SAN JOSE	CA	95123	GLENROCK FARMS LLC	1000 OLD QUARRY RD				SAN JOSE	CA	95123-2454	
50629082		GLENROCK FARMS LLC	1000 OLD QUARRY RD	SAN JOSE	CA	95123	GLENROCK FARMS LLC	1000 OLD QUARRY RD				SAN JOSE	CA	95123-2454	
50629083		GLENROCK FARMS LLC	1000 OLD QUARRY RD	SAN JOSE	CA	95123	GLENROCK FARMS LLC	1000 OLD QUARRY RD				SAN JOSE	CA	95123-2454	
50629084		GLENROCK FARMS LLC	1000 OLD QUARRY RD	SAN JOSE	CA	95123	GLENROCK FARMS LLC	1000 OLD QUARRY RD				SAN JOSE	CA	95123-2454	
50629085		GLENROCK FARMS LLC	1000 OLD QUARRY RD	SAN JOSE	CA	95123	GLENROCK FARMS LLC	1000 OLD QUARRY RD				SAN JOSE	CA	95123-2454	
50632013		ARANKI TAREK/OLIVIA	6600 A WILLOW DR	TEMPE	AZ	85283	ARANKI TAREK/OLIVIA	6600 A WILLOW DR				TEMPE	AZ	85283	
50632014		GALLEGOS GILBERT & FRANCES	867 NAVAJO BLVD	HOLBROOK	AZ	86025	GALLEGOS GILBERT & FRANCES	867 NAVAJO BLVD				HOLBROOK	AZ	86025-2646	
50632015		MICHAELS TRUST	4840 E CAIDA DEL SOL DR	PARADISE VALLEY	AZ	85253 USA	OSTROW VICTOR TR	4840 E CAIDA DEL SOL DR				PARADISE VALLEY	AZ	85253-2013	
50632016		GEERS PATRICK G	2675 DOVE DR	FLORISSANT	MO	63031	GEERS PATRICK G	2675 DOVE DR				FLORISSANT	MO	63031-3703	
50632017		ARANKI TAREK/OLIVIA	6600 A WILLOW DR	TEMPE	AZ	85283	ARANKI TAREK/OLIVIA	6600 S WILLOW DR				TEMPE	AZ	85283-4169	
50632018		MICHAELS TRUST	4840 E CAIDA DEL SOL DR	PARADISE VALLEY	AZ	85253 USA	OSTROW VICTOR TR	4840 E CAIDA DEL SOL DR				PARADISE VALLEY	AZ	85253-2013	
50632019		ARANKI TAREK/OLIVIA	6600 A WILLOW DR	TEMPE	AZ	85283	ARANKI TAREK/OLIVIA	6600 S WILLOW DR				TEMPE	AZ	85283-4169	
50632020A		WENNBERG RICHARD D/MICHELLE R	22027 W WATKINS ST	BUCKEYE	AZ	85326	WENNBERG RICHARD D/MICHELLE R	22027 W WATKINS ST				BUCKEYE	AZ	85326-3953	
50632020B		WATER UTILITIES OF GREATER TONOPAH INC	21410 N 19TH AVE STE 201	PHOENIX	AZ	85027	WATER UTILITIES OF GREATER TONOPAH INC	21410 N 19TH AVE STE 201				PHOENIX	AZ	85027-2758	
50628005B		CV HARQUAHALA LLC	3549 153RD AVE SE	CASSELTON	ND	58012 USA	CV HARQUAHALA LLC	CLUB VISTA FINANCIAL SERVICES LLC	3549 153RD AVE SE			CASSELTON	ND	58012-9700	
50628006E		GYP HARQUAHALA HOLDINGS LLC	3165 E MILL ROCK DR STE 450	HOLLIDAY	UT	84121	GYP HARQUAHALA HOLDINGS LLC	1250 E 200 S STE 2D				LEHI	UT	84043-1483	
50628006F		GYP HARQUAHALA HOLDINGS LLC	3165 E MILL ROCK DR STE 450	HOLLIDAY	UT	84121	GYP HARQUAHALA HOLDINGS LLC	1250 E 200 S STE 2D				LEHI	UT	84043-1483	
50628007A		PSC-94 SITE L.L.C.	PO BOX 668	BUCKEYE	AZ	85326	PSC-94 SITE L.L.C.	PO BOX 668				BUCKEYE	AZ	85326-0049	
50628007B		CV HARQUAHALA LLC	3549 153RD AVE SE	CASSELTON	ND	58012 USA	CV HARQUAHALA LLC	CLUB VISTA FINANCIAL SERVICES LLC	3549 153RD AVE SE			CASSELTON	ND	58012-9700	
50628011		CV HARQUAHALA LLC	3549 153RD AVE SE	CASSELTON	ND	58012 USA	CV HARQUAHALA LLC	CLUB VISTA FINANCIAL SERVICES LLC	3549 153RD AVE SE			CASSELTON	ND	58012-9700	
50628015		CV HARQUAHALA LLC	3549 153RD AVE SE	CASSELTON	ND	58012 USA	CV HARQUAHALA LLC	CLUB VISTA FINANCIAL SERVICES LLC	3549 153RD AVE SE			CASSELTON	ND	58012-9700	
50628022		CV HARQUAHALA LLC	3549 153RD AVE SE	CASSELTON	ND	58012 USA	CV HARQUAHALA LLC	CLUB VISTA FINANCIAL SERVICES LLC	3549 153RD AVE SE			CASSELTON	ND	58012-9700	
50628023C		CV HARQUAHALA LLC	3549 153RD AVE SE	CASSELTON	ND	58012 USA	CV HARQUAHALA LLC	CLUB VISTA FINANCIAL SERVICES LLC	3549 153RD AVE SE			CASSELTON	ND	58012-9700	

50628025A			CV HARQUAHALA LLC	3549 153RD AVE SE	CASSELTON	ND	58012	USA	CV HARQUAHALA LLC	CLUB VISTA FINANCIAL SERVICES LLC	3549 153RD AVE SE			CASSELTON	ND	58012-9700		
50628026A			CV HARQUAHALA LLC	3549 153RD AVE SE	CASSELTON	ND	58012	USA	CV HARQUAHALA LLC	CLUB VISTA FINANCIAL SERVICES LLC	3549 153RD AVE SE			CASSELTON	ND	58012-9700		
50628027A			CV HARQUAHALA LLC	3549 153RD AVE SE	CASSELTON	ND	58012	USA	CV HARQUAHALA LLC	CLUB VISTA FINANCIAL SERVICES LLC	3549 153RD AVE SE			CASSELTON	ND	58012-9700		
50628027B			PSC-94 SITE L.L.C.	PO BOX 668	BUCKEYE	AZ	85326		SCP 94 FARM LLC	C/O TG LAND & INVESTMENT LLC	P O BOX 668			BUCKEYE	AZ	85326-0049		
50628031A			CV HARQUAHALA LLC	3549 153RD AVE SE	CASSELTON	ND	58012	USA	CV HARQUAHALA LLC	CLUB VISTA FINANCIAL SERVICES LLC	3549 153RD AVE SE			CASSELTON	ND	58012-9700		
50628031B			CV HARQUAHALA LLC	3549 153RD AVE SE	CASSELTON	ND	58012	USA	CV HARQUAHALA LLC	CLUB VISTA FINANCIAL SERVICES LLC	3549 153RD AVE SE			CASSELTON	ND	58012-9700		
50628031C			CV HARQUAHALA LLC	3549 153RD AVE SE	CASSELTON	ND	58012	USA	CV HARQUAHALA LLC	CLUB VISTA FINANCIAL SERVICES LLC	3549 153RD AVE SE			CASSELTON	ND	58012-9700		
50628031D			CV HARQUAHALA LLC	3549 153RD AVE SE	CASSELTON	ND	58012	USA	CV HARQUAHALA LLC	CLUB VISTA FINANCIAL SERVICES LLC	3549 153RD AVE SE			CASSELTON	ND	58012-9700		
50628032A			CV HARQUAHALA LLC	3549 153RD AVE SE	CASSELTON	ND	58012	USA	CV HARQUAHALA LLC	CLUB VISTA FINANCIAL SERVICES LLC	3549 153RD AVE SE			CASSELTON	ND	58012-9700		
50628032B			CV HARQUAHALA LLC	3549 153RD AVE SE	CASSELTON	ND	58012	USA	CV HARQUAHALA LLC	CLUB VISTA FINANCIAL SERVICES LLC	3549 153RD AVE SE			CASSELTON	ND	58012-9700		
50628034A			BROKEN ARROW RANCH LLC	PO BOX 238	PORTALES	NM	88130		BROKEN ARROW RANCH LLC	PO BOX 238				PORTALES	NM	88130-0238		
50628034B			CV HARQUAHALA LLC	3549 153RD AVE SE	CASSELTON	ND	58012	USA	CV HARQUAHALA LLC	CLUB VISTA FINANCIAL SERVICES LLC	3549 153RD AVE SE			CASSELTON	ND	58012-9700		
50628035C			SIKON CHESTER	5649 W HAZLEWOOD	PHOENIX	AZ	85031		SIKON CHESTER	5649 W HAZELWOOD ST				PHOENIX	AZ	85031-1626		
50628036			CV HARQUAHALA LLC	3549 153RD AVE SE	CASSELTON	ND	58012	USA	CV HARQUAHALA LLC	CLUB VISTA FINANCIAL SERVICES LLC	3549 153RD AVE SE			CASSELTON	ND	58012-9700		
50628037			EL PASO NATURAL GAS CO	P O BOX 1492	EL PASO	TX	79948		EL PASO NATURAL GAS CO	PO BOX 1492				EL PASO	TX	79978-0001		
50628038			EL PASO NATURAL GAS CO	P O BOX 1492	EL PASO	TX	79948		EL PASO NATURAL GAS CO	PO BOX 1492				EL PASO	TX	79978-0001		
50628040			EL PASO NATURAL GAS CO	P O BOX 1492	EL PASO	TX	79948		EL PASO NATURAL GAS CO	PO BOX 1492				EL PASO	TX	79978-0001		
50629004			CV HARQUAHALA LLC	3549 153RD AVE SE	CASSELTON	ND	58012	USA	CV HARQUAHALA LLC	CLUB VISTA FINANCIAL SERVICES LLC	3549 153RD AVE SE			CASSELTON	ND	58012-9700		
50629005			CV HARQUAHALA LLC	3549 153RD AVE SE	CASSELTON	ND	58012	USA	CV HARQUAHALA LLC	CLUB VISTA FINANCIAL SERVICES LLC	3549 153RD AVE SE			CASSELTON	ND	58012-9700		
50629009A			DANGELO 237 LLC	6241 E YUCCA	SCOTTSDALE	AZ	85254		DANGELO 237 LLC	6241 E YUCCA				SCOTTSDALE	AZ	85254-5448		
50629009B			DANGELO 237 LLC	6241 E YUCCA	SCOTTSDALE	AZ	85254		DANGELO 237 LLC	6241 E YUCCA				SCOTTSDALE	AZ	85254-5448		
50629012A			W HARQUAHALA LLC	1121 W WARNER RD STE 109	TEMPE	AZ	85284	USA	W HARQUAHALA LLC	1121 W WARNER RD STE 109				TEMPE	AZ	85284-2819		
50629013A			CV HARQUAHALA LLC	3549 153RD AVE SE	CASSELTON	ND	58012	USA	CV HARQUAHALA LLC	CLUB VISTA FINANCIAL SERVICES LLC	3549 153RD AVE SE			CASSELTON	ND	58012-9700		
50629015C			GARFINKLE GARY S/MARIA J TR	1205 VIA GABARDA	LAFAYETTE	CA	94549		GARFINKLE GARY S/MARIA J TR	1205 VIA GABARDA				LAFAYETTE	CA	94549-6250		
50629015D			JRS NEVITT FARMS LLC	1121 W RANCH RD	TEMPE	AZ	85284		JRS NEVITT FARMS LLC	1121 W RANCH RD				TEMPE	AZ	85284-2001		
50629016A			DE YOUNG HARQUAHALA LLC	37 SANDPIPER STRAND	CORONADO	CA	92118		DE YOUNG HARQUAHALA LLC	37 SANDPIPER STRAND				CORONADO	CA	92118-3211		
50629016E			HENG VICTOR V	5067 VINCENT AVE UNIT 2	LOS ANGELES	CA	90041		HENG VICTORY V	4563 RAINIER DR				CYPRESS	CA		90630	
50629016F			HENG PETER/PHALLY	5067 VINCENT AVE NO 2	LOS ANGELES	CA	90041		HENG PETER/PHALLY	14421 MOCCASIN ST				LA PUENTE	CA	91744-3429		
50629016G			TIMOTHY J GAFFNEY AND RAFAELA GAFFNEY TRUST	16107 E EMERALD DR UNIT 112	FOUNTAIN HILLS	AZ	85268	USA	TIMOTHY J GAFFNEY AND RAFAELA GAFFNEY TR	16107 E EMERALD DR UNIT 112				FOUNTAIN HILLS	AZ		85268	
50629016H			FRANCIS BRYAN G	11627 E BELLFLOWER DR	CHANDLER	AZ	85249		FRANCIS BRYAN G	11627 E BELLFLOWER DR				CHANDLER	AZ	85249-4526		
50629016K			MC REVOCABLE TRUST	10115 E BELL RD #107-410	SCOTTSDALE	AZ	85260		MC REVOCABLE TRUST	10115 E BELL RD #107-410				SCOTTSDALE	AZ	85260-2189		
50629016L			THORNTON PATRICK M TR	40472 N SPUR CROSS RD	CAVE CREEK	AZ	85331		THORNTON PATRICK M TR	40472 N SPUR CROSS RD				CAVE CREEK	AZ	85331-8123		
50629017			CV HARQUAHALA LLC	3549 153RD AVE SE	CASSELTON	ND	58012	USA	CV HARQUAHALA LLC	CLUB VISTA FINANCIAL SERVICES LLC	3549 153RD AVE SE			CASSELTON	ND	58012-9700		
50629018B			CV HARQUAHALA LLC	3549 153RD AVE SE	CASSELTON	ND	58012	USA	CV HARQUAHALA LLC	CLUB VISTA FINANCIAL SERVICES LLC	3549 153RD AVE SE			CASSELTON	ND	58012-9700		
50629019			CV HARQUAHALA LLC	3549 153RD AVE SE	CASSELTON	ND	58012	USA	CV HARQUAHALA LLC	CLUB VISTA FINANCIAL SERVICES LLC	3549 153RD AVE SE			CASSELTON	ND	58012-9700		
50629021A			HARQUHALA GIN LLC	3636 S 7TH ST	PHOENIX	AZ	85040		HARQUHALA GIN LLC	3636 S 7TH ST				PHOENIX	AZ	85040-1131		
50629023D			KAWELA ONE LLC	38082 SNICKERVILLE TPK	PURCELLVILLE	VA	20132		KAWELA ONE LLC	C/O BRADLEY J BOLAND	38082 SNICKERVILLE TPK			PURCELLVILLE	VA	20132-5006		
50629024B			CV HARQUAHALA LLC	3549 153RD AVE SE	CASSELTON	ND	58012	USA	CV HARQUAHALA LLC	CLUB VISTA FINANCIAL SERVICES LLC	3549 153RD AVE SE			CASSELTON	ND	58012-9700		
50629025A			LANGLEY PALOVERDE FIELD LLC/ET AL	2738 E GUADALUPE RD	GILBERT	AZ	85234		LANGLEY PALOVERDE FIELD LLC/ET AL	2738 E GUADALUPE RD				GILBERT	AZ	85234-5100		
50629025B			LANGLEY PALOVERDE FIELD LLC/ET AL	2738 E GUADALUPE RD	GILBERT	AZ	85234		LANGLEY PALOVERDE FIELD LLC/ET AL	2738 E GUADALUPE RD				GILBERT	AZ	85234-5100		
50629026A			LANGLEY PALOVERDE FIELD LLC/ET AL	2738 E GUADALUPE RD	GILBERT	AZ	85234		LANGLEY PALOVERDE FIELD LLC/ET AL	2738 E GUADALUPE RD				GILBERT	AZ	85234-5100		
50629026B			GLADDEN SHARON	25914 W BASELINE RD	BUCKEYE	AZ	85326		GLADDEN SHARON	2440 N 123RD AVE				AVONDALE	AZ	85323-5597		
50629027A			GEORGETOWN HOLDINGS LLC	1121 W WARNER RD STE 109	TEMPE	AZ	85284		GEORGETOWN HOLDINGS LLC	1121 W WARNER RD STE 109				TEMPE	AZ	85284-2819		
50629027D			BISON INVESTMENTS PROPERTIES I	10397 E WOOD DR	SCOTTSDALE	AZ	85260		BISON INVESTMENTS PROPERTIES I	10397 E WOOD DR				SCOTTSDALE	AZ	85260-7277		
50629027G			BISON INVESTMENTS PROPERTIES LLC	10397 E WOOD DR	SCOTTSDALE	AZ	85260		BISON INVESTMENTS PROPERTIES LLC	10397 E WOOD DR				SCOTTSDALE	AZ	85260-7277		
50629029			CV HARQUAHALA LLC	3549 153RD AVE SE	CASSELTON	ND	58012	USA	CV HARQUAHALA LLC	CLUB VISTA FINANCIAL SERVICES LLC	3549 153RD AVE SE			CASSELTON	ND	58012-9700		
50629030			CV HARQUAHALA LLC	3549 153RD AVE SE	CASSELTON	ND	58012	USA	CV HARQUAHALA LLC	CLUB VISTA FINANCIAL SERVICES LLC	3549 153RD AVE SE			CASSELTON	ND	58012-9700		
50629031D			CV HARQUAHALA LLC	3549 153RD AVE SE	CASSELTON	ND	58012	USA	CV HARQUAHALA LLC	CLUB VISTA FINANCIAL SERVICES LLC	3549 153RD AVE SE			CASSELTON	ND	58012-9700		
50629031E			W HARQUAHALA LLC	1121 W WARNER RD STE 109	TEMPE	AZ	85284	USA	W HARQUAHALA LLC	1121 W WARNER RD STE 109				TEMPE	AZ	85284-2819		
50629031G			W HARQUAHALA LLC	1121 W WARNER RD STE 109	TEMPE	AZ	85284	USA	W HARQUAHALA LLC	1121 W WARNER RD STE 109				TEMPE	AZ	85284-2819		
50629032			CV HARQUAHALA LLC	3549 153RD AVE SE	CASSELTON	ND	58012	USA	CV HARQUAHALA LLC	CLUB VISTA FINANCIAL SERVICES LLC	3549 153RD AVE SE			CASSELTON	ND	58012-9700		
50629033			W HARQUAHALA LLC	1121 W WARNER RD STE 109	TEMPE	AZ	85284	USA	W HARQUAHALA LLC	1121 W WARNER RD STE 109				TEMPE	AZ	85284-2819		
50630014			COURTHOUSE AG HOLDINGS LLC	7332 E BUTHERUS DR	SCOTTSDALE	AZ	85260		COURTHOUSE AG HOLDINGS LLC	7332 E BUTHERUS DR				SCOTTSDALE	AZ	85260-2426		
50630017D			NEW HARQUAHALA GENERATING COMPANY LLC	2530 N 491ST AVE	TONOPAH	AZ	85354		NEW HARQUAHALA GENERATING COMPANY LLC	2530 N 491ST AVE				TONOPAH	AZ	85354-7123		
50630018B	2530 N 491ST AVE		ACCOMAZZO JACQUELYNN C TR	3825 S 99TH AVE	TOLLESON	AZ	85353		ACCOMAZZO JACQUELYNN C TR	3825 S 99TH AVE				TOLLESON	AZ	85353-9382		
50629027E			CARL DAVIS TRUST	1650 W MARKET ST STE 32	AKRON	OH	44313	USA	DAVIS DEVELOPMENT GROUP OF OHIO LLC	3466 MANCHESTER RD				AKRON	OH	44319-1436		
50629027F			CARL DAVIS TRUST	1650 W MARKET ST STE 32	AKRON	OH	44313	USA	DAVIS DEVELOPMENT GROUP OF OHIO LLC	3466 MANCHESTER RD				AKRON	OH	44319-1436		
50660006	51554 W LINCOLN ST	TONOPAH	MENDOZA ANTONIO & RAMONA G	HG-02 BOX 402	BUCKEYE	AZ	85326		MENDOZA ANTONIO & RAMONA G	51554 W LINCOLN ST				TONOPAH	AZ	85354-7108		
50659001	51539 W VAN BUREN AVE		ACOSTA JOSE A	51539 W VAN BUREN	TONAPAH	AZ	85354		ACOSTA JOSE A	51539 W VAN BUREN ST				TONOPAH	AZ	85354-7154		
50659003	51523 W VAN BUREN ST	TONOPAH	MILLETTE JAMES H/CAROL A	PO BOX 992	TONOPAH	AZ	85354		MILLETTE JAMES H/CAROL A	PO BOX 992				TONOPAH	AZ	85354-0902		
50659022	51633 W VAN BUREN ST	TONOPAH	LUNA ANTONIO JR	PO BOX 37	TONOPAH	AZ	85354		LUNA ANTONIO JR	PO BOX 37				TONOPAH	AZ	85354-0037		
50660028	1043 N 192ND AVE		HARQUAHALA FIRE DISTRICT	STAR RT 2	BUCKEYE	AZ	85326		HARQUAHALA FIRE DISTRICT	HC 2				BUCKEYE	AZ		85326	
50659004A	226 N 515TH AVE		REYNA LEONARDO C	PO BOX 81	TONOPAH	AZ	85354		REYNA LEONARDO C	PO BOX 827				TONOPAH	AZ	85354-0827		
50660004	402 S 515TH AVE		HARQUAHALA VALLEY IRRIGATION DISTRICT	STAR RT 2 BOX 397	BUCKEYE	AZ	85326		HARQUAHALA VALLEY IRRIGATION DISTRICT	HC 2 BOX 397				BUCKEYE	AZ		85326	
50659014	51601 W ASHTON ST		SHERRY NADINE KLINGER LIVING TR	15332 ANTIOCH ST NO 446	PACIFIC PALISADES	CA	90272		SHERRY NADINE KLINGER LIVING TR	15332 ANTIOCH ST NO 446				PACIFIC PALISADES	CA		90272	
50660029	1106 S 515TH AVE		MCNAMARA JESSE	214 N B ST	LOMPOC	CA	93436		MCNAMARA JESSE	214 N B ST				LOMPOC	CA	93436-6125		
50658002			CV HARQUAHALA LLC	3549 153RD AVE SE	CASSELTON	ND	58012	USA	CV HARQUAHALA LLC	CLUB VISTA FINANCIAL SERVICES LLC	3549 153RD AVE SE			CASSELTON	ND	58012-9700		
50658004			CV HARQUAHALA LLC	3549 153RD AVE SE	CASSELTON	ND	58012	USA	CV HARQUAHALA LLC	CLUB VISTA FINANCIAL SERVICES LLC	3549 153RD AVE SE			CASSELTON	ND	58012-9700		
50658275	48710 W BASELINE RD		TORREY PINES DEV LLC/ETAL LEASE # 01-34994	1121 W WARNER RD STE 109	TEMPE	AZ	85284	USA	ARIZONA STATE LAND DEPT	TORREY PINES DEV LLC/ETAL LEASE # 0CONTO	1121 W WARNER RD STE 109			TEMPE	AZ		85284	
50658003			CV HARQUAHALA LLC	3549 153RD AVE SE	CASSELTON	ND	58012	USA	CV HARQUAHALA LLC	CLUB VISTA FINANCIAL SERVICES LLC	3549 153RD AVE SE			CASSELTON	ND	58012-9700		
50660021			STRANDER PETROLEUM INC	30151-A W OLD US HIGHWAY 80	PALO VERDE	AZ	85343		STRANDER PETROLEUM INC	PO BOX 1				ARLINGTON	AZ	85322-0001		
50660027			SZUL IRENA	PO BOX 1693	LITCHFIELD PARK	AZ	85340		SZUL IRENA	2822 N MEVINA AVE				CHICAGO	IL	60634-5003		
50659002			BONILLA MIGUEL A	STAR RT BOX 346A	BUCKEYE	AZ	85326		BONILLA MIGUEL A	305 W BRINKER DR				AVONDALE	AZ	85323-1866		
50659006			AIRTH PROPERTIES LTD PARTNERSHIP	32132 VIA BUENA	SAN JUAN CAPISTRANO	CA	92675		AIRTH PROPERTIES LIMITED PARTNERSHIP	C/O S. JEAN AIRTH	32132 VIA BUENA			SAN JUAN CAPO	CA	92675-3825		
50659007			AIRTH PROPERTIES LTD PARTNERSHIP	32132 VIA BUENA	SAN JUAN CAPISTRANO	CA	92675		AIRTH PROPERTIES LIMITED PARTNERSHIP	C/O S. JEAN AIRTH	32132 VIA BUENA			SAN JUAN CAPO	CA	92675-3825		
50659008			SHERRY NADINE KLINGER LIVING TR	15332 ANTIOCH ST NO 446	PACIFIC PALISADES	CA	90272		SHERRY NADINE KLINGER LIVING TR	15332 ANTIOCH ST NO 446				PACIFIC PALISADES	CA		90272	
50659009			SHERRY NADINE KLINGER LIVING TR	15332 ANTIOCH ST NO 446	PACIFIC PALISADES	CA	90272		SHERRY NADINE KLINGER LIVING TR	15332 ANTIOCH ST NO 446				PACIFIC PALISADES	CA		90272	
50659010			MILLETTE CAROL A/JAMES H	51523 W VAN BUREN ST PO BOX 992	TONOPAH	AZ	85354		MILLETTE CAROL A/JAMES H	PO BOX 992				TONOPAH	AZ	85354-0902		
50659015			SHERRY NADINE KLINGER LIVING TR	15332 ANTIOCH ST NO 446	PACIFIC PALISADES	CA	90272		SHERRY NADINE KLINGER LIVING TR	15332 ANTIOCH ST NO 446				PACIFIC PALISADES	CA		90272	
50659016			SHERRY NADINE KLINGER LIVING TR	15332 ANTIOCH ST NO 446	PACIFIC PALISADES	CA	90272		SHERRY NADINE KLINGER LIVING TR	15332 ANTIOCH ST NO 446				PACIFIC PALISADES	CA		90272	
50659017			AKKURT GEORGE/DAVID	3126 N GRANITE REEF RD	SCOTTSDALE	AZ	85251		AKKURT GEORGE/DAVID	3126 N GRANITE REEF RD				SCOTTSDALE	AZ	85251-7310		
50659018			GREEN KAREN M TR	5201 E FANFOL	PARADISE VALLEY	AZ	85253		GREEN KAREN M TR	5201 E FANFOL DR				PARADISE VLY	AZ	85253-1623		
50659019			GREEN JAMES H	5201 E FANFOL	PARADISE VALLEY	AZ	85253		GREEN JAMES H	5201 E FANFOL DR				PARADISE VLY	AZ	85253-1623		
50659020			BAKKOM IRMA C	N703 MARINE DR	CEDAR GROVE	WI	53013		BAKKOM IRMA	C/O DAVID BAKKOM	N703 MARINE DR			CEDAR GROVE	WI	53013-1442		
50659021			KOHN DAVID R	7150 SW 3RD AVE	PORTLAND	OR	97219		KOHN DAVID R	7150 SW 3RD AVE				PORTLAND	OR	97219-2276		
50659023			BAKKOM IRMA C	N703 MARINE DR	CEDAR GROVE	WI	53013		BAKKOM IRMA	C/O DAVID BAKKOM	N703 MARINE DR			CEDAR GROVE	WI	53013-1442		
50659024			MOATAMER MANUCHEHR	PO BOX 11530	SANTA ANA	CA	92711		MOATAMER MANUCHEHR	PO BOX 11530				SANTA ANA	CA	92711-1530		
50659025			WHOLE LIFE FOUNDATION	P O BOX 13207	PHOENIX	AZ	85002		WHOLE LIFE FOUNDATION	PO BOX 13207				PHOENIX	AZ	85002-3207		
50659026			WHOLE LIFE FOUNDATION	P O BOX 13207	PHOENIX	AZ	85002		WHOLE LIFE FOUNDATION	PO BOX 13207				PHOENIX	AZ	85002-3207		
50659027			WHOLE LIFE FOUNDATION	P O BOX 13207	PHOENIX	AZ	85002		WHOLE LIFE FOUNDATION	PO BOX 13207				PHOENIX	AZ	85002-3207		
50659028			WHOLE LIFE FOUNDATION	P O BOX 13207	PHOENIX	AZ	85002		WHOLE LIFE FOUNDATION	PO BOX 13207				PHOENIX	AZ	85002-3207		
50659029			WHOLE LIFE FOUNDATION	P O BOX 13207	PHOENIX	AZ	85002		WHOLE LIFE FOUNDATION	PO BOX 13207				PHOENIX	AZ	85002-3207		
50659030			WHOLE LIFE FOUNDATION	P O BOX 13207	PHOENIX	AZ	85002		WHOLE LIFE FOUNDATION	PO BOX 13207				PHOENIX	AZ	85002-3207		
50659031			WHOLE LIFE FOUNDATION	P O BOX 13207	PHOENIX	AZ	85002		WHOLE LIFE FOUNDATION	PO BOX 13207				PHOENIX	AZ	85002-3207		
50659032			WHOLE LIFE FOUNDATION	P O BOX 13207	PHOENIX	AZ	85002		WHOLE LIFE FOUNDATION	PO BOX 13207				PHOENIX	AZ	85002-3207		
50659033			WHOLE LIFE FOUNDATION	P O BOX 13207	PHOENIX	AZ	85002		WHOLE LIFE FOUNDATION	PO BOX 13207				PHOENIX	AZ	85002-3207		
50659034			WHOLE LIFE FOUNDATION	P O BOX 13207	PHOENIX	AZ	85002		WHOLE LIFE FOUNDATION	PO BOX 13207				PHOENIX	AZ	85002-3207		
50659035			WHOLE LIFE FOUNDATION	P O BOX 13207	PHOENIX	AZ	85002		WHOLE LIFE FOUNDATION	PO BOX 13207				PHOENIX	AZ	85002-3207		
50659036			NIROUMAND AMENEH	7201 FOSTER ST	MORTON GROVE	IL	60053		NIROUMAND AMENEH	7201 FOSTER ST				MORTON GROVE	IL	60053-1104		
50659037			NIROUMAND AMENEH	7201 FOSTER ST	MORTON GROVE	IL	60053		NIROUMAND AMENEH	7201 FOSTER ST				MORTON GROVE	IL	60053-1104		
50659038			WHOLE LIFE FOUNDATION	P O BOX 13207	PHOENIX	AZ	85002		WHOLE LIFE FOUNDATION	PO BOX 13207				PHOENIX	AZ	85002-3207		
50659039			WHOLE LIFE FOUNDATION	P O BOX 13207	PHOENIX	AZ	85002		WHOLE LIFE FOUNDATION	PO BOX 13207				PHOENIX	AZ	85002-3207		
50659040			WHOLE LIFE FOUNDATION	P O BOX 13207	PHOENIX	AZ	85002		WHOLE LIFE FOUNDATION	P O BOX 13207				PHOENIX	AZ	85002-3207		
50659041			KRIEGER REGAN CATHERINE	951 170TH ST	HAMMOND	WI	54015	USA	KRIEGER REGAN CATHERINE	814 E WISCONSIN AVE				PEWAUKEE	WI		53072	
50659042			AMELI MANSOOR	PO BOX 12644	TEMPE	AZ	85284		AMELI MANSOOR	PO BOX 12644				TEMPE	AZ	85284-0045		
50659043			AMELI MANSOOR	PO BOX 12644	TEMPE	AZ	85284		UNKNOWN	301 WEST JEFFERSON ST				PHOENIX	AZ		85003	
50659044			MERABAN MERDAD/NAJAFI HENGAMEH	PO BOX 23881	TEMPE	AZ	85285	USA	MERABAN MERDAD/NAJAFI HENGAMEH	PO BOX 23881				TEMPE	AZ		85285	
50659045			ANITA KERMAN	333 E 79TH ST APT 12X	NEW YORK	NY	10021		ANITA KERMAN	42 GEDNEY PARK DR				WHITE PLAINS	NY	10605-3533		
50659046			GOLDSTEIN BARRY	5 RICES LANE	WESTPORT	CT	06880-1922		GOLDSTEIN BARRY	5 RICES LN				WESTPORT	CT	06880-1923		
50659047			MERABAN MERDAD/NAJAFI HENGAMEH	PO BOX 23881	TEMPE	AZ	85285	USA	MERABAN MERDAD/NAJAFI HENGAMEH	PO BOX 23881				TEMPE	AZ		85285	
50659048			BAKKOM IRMA C	N703 MARINE DR	CEDAR GROVE	WI	53013		BAKKOM IRMA C	DAVID BAKKOM	N703 MARINE DR			CEDAR GROVE	WI	53013-1442		

50659049	CLASSI PHILIP/DIANE	3115 BELTAGH AVE	WANTAGH	NY	11793	CLASSI PHILIP/DIANE	3115 BELTAGH AVE		WANTAGH	NY	11793-2560
50659050	CALLAHAN ANNA J & KATHRYN C CALLAGHAN	4605 W 99TH ST	OAK LAWN	IL	60453	CALLAHAN ANNA J/KATHRYN C CALLAGHAN	C/O PAUL SULLIVAN	12354 GLENCOE ST	THORNTON	CO	80241-3200
50659051	GOLDSTEIN MARILYN	205 3RD AVE APT 14E	NEW YORK	NY	10003	GOLDSTEIN MARILYN	205 3RD AVE APT 14E		NEW YORK	NY	10003-2550
50659052	GOLDSTEIN MARILYN	205 3RD AVE APT 14E	NEW YORK	NY	10003	GOLDSTEIN MARILYN	205 3RD AVE APT 14E		NEW YORK	NY	10003-2550
50659053	PHILLIPS BRYAN KELVIN/STEFANIE PANNELL	8264 GREENVIEW DR	JONESBORO	GA	30235	PHILLIPS BRYAN KELVIN/STEFANIE PANNELL	8264 GREENVIEW DR		JONESBORO	GA	30235-4182
50659054	PHILLIPS BRYAN KELVIN/STEFANIE PANNELL	8264 GREENVIEW DR	JONESBORO	GA	30235	PHILLIPS BRYAN KELVIN/STEFANIE PANNELL	8264 GREENVIEW DR		JONESBORO	GA	30236-4182
50659055	LUNA ANTONIO JR	PO BOX 37	TONOPAH	AZ	85354	MERABAN MERDAD/NAJAFI HENGAMEH CONTO	PO BOX 37		TONOPAH	AZ	85354-0037
50659056	LUNA ANTONIO JR	PO BOX 37	TONOPAH	AZ	85354	LUNA ANTONIO JR	PO BOX 37		TONOPAH	AZ	85354
50659057	CALLAHAN ANNA J & KATHRYN C CALLAGHAN	4605 W 99TH ST	OAK LAWN	IL	60453	CALLAHAN ANNA J/KATHRYN C CALLAGHAN	C/O PAUL SULLIVAN	12354 GLENCOE ST	THORNTON	CO	80241-3200
50659058	SALVATORE GATTO PARTN LP/VICTOR BADA PARTN LP	PO BOX 33248	PHOENIX	AZ	85067	SALVATORE GATTO PARTN LP/VICTOR BADA PAR	PO BOX 33248		PHOENIX	AZ	85067-3248
50659059	SALVATORE GATTO PARTN LP/VICTOR BADA PARTN LP	PO BOX 33248	PHOENIX	AZ	85067	SALVATORE GATTO PARTN LP/VICTOR BADA PAR	PO BOX 33248		PHOENIX	AZ	85067-3248
50659060	PHILLIPS BRYAN KELVIN/STEFANIE PANNELL	8264 GREENVIEW DR	JONESBORO	GA	30235	PHILLIPS BRYAN KELVIN/STEFANIE PANNELL	8264 GREENVIEW DR		JONESBORO	GA	30236-4182
50659061	RANJBAR SIMIN	4472 W WALTON WY	CHANDLER	AZ	85226	RANJBAR SIMIN	4472 W WALTON WY		CHANDLER	AZ	85226-6206
50659062	HERNANDEZ JUAN/ARTEMISA	6750 W WINDSOR	PHOENIX	AZ	85035 USA	HERNANDEZ ARTEMISA	6750 W WINDSOR AVE		PHOENIX	AZ	85035-1427
50659063	BAKKOM PLAZA PROPERTY HOLDINGS LLC	4449 N 59TH DR	PHOENIX	AZ	85033	BAKKOM PLAZA PROPERTY HOLDINGS LLC	6528 N 171ST LN		WADDELL	AZ	85355-9892
50659064	ZAHEDI SHAHLLA	4472 W WALTON WY	CHANDLER	AZ	85226	ZAHEDI SHAHLLA	4472 W WALTON WY		CHANDLER	AZ	85226-6206
50660001	CERDA JOE	5994 VISTA SANTA CATARINA	SAN DIEGO	CA	92154 USA	CERDA JOE	5994 VISTA SANTA CATARINA		SAN DIEGO	CA	92154
50660002	CERDA JOSE LUIS/SOCORRO	15281 W TASHA DR	SURPRISE	AZ	85374	CERDA JOSE LUIS/SOCORRO	15281 W TASHA DR		SURPRISE	AZ	85374-1449
50660003	DINIUS BARBARA	PO BOX 1572	SNOWFLAKE	AZ	85937	JANDA LAND HOLDINGS LLC	101 E MOON VALLEY DR		PHOENIX	AZ	85022-4249
50660005	MARTORI BROS DIST	7332 E BUTHERUS DR	SCOTTSDALE	AZ	85260	MARTORI BROS DIST	7332 E BUTHERUS DR		SCOTTSDALE	AZ	85260-2426
50660007	PIOVANO JILL A TR	6225 E MONTGOMERY RD	CAVE CREEK	AZ	85331	PIOVANO JILL A TR	6225 E MONTGOMERY RD		CAVE CREEK	AZ	85331-3079
50660008	PIOVANO JILL A TR	6225 E MONTGOMERY RD	CAVE CREEK	AZ	85331	PIOVANO JILL A TR	6225 E MONTGOMERY RD		CAVE CREEK	AZ	85331-3079
50660009A	LAND4LESS.US LLC	18521 E QUEEN CREEK RD SE 105-502	QUEEN CREEK	AZ	85142 USA	ROSE ACCEPTANCE INC	241 E SAGINAW - PO BOX 980		EAST LANSING	MI	48826-0980
50660009B	LAND4LESS.US LLC	18521 E QUEEN CREEK RD SE 105-502	QUEEN CREEK	AZ	85142 USA	ROSE ACCEPTANCE INC	241 E SAGINAW - PO BOX 980		EAST LANSING	MI	48826-0980
50660009C	CHAN PATTY	3510 E HAMPTON NO 31	MESA	AZ	85204	CHAN PATTY	3510 E HAMPTON NO 31		MESA	AZ	85204-6433
50660009E	JLK RE INVESTMENT CORPORATION	6730 E MCDOWELL RD NO 116	SCOTTSDALE	AZ	85257	JLK REAL ESTATE INVESTMENT CORP	6730 E MCDOWELL RD #136		SCOTTSDALE	AZ	85257-3135
50660010	BEETER & ASSOCIATES LLC	PO BOX 1639	APACHE JUNCTION	AZ	85208	BEETER & ASSOCIATES LLC	PO BOX 697		TONOPAH	AZ	85354-0697
50660011	BAUTISTA JOSE M & LUPE L	1000 18TH ST	PARKER	AZ	85344	BAUTISTA JOSE M & LUPE L	1000 W 18TH ST		PARKER	AZ	85344
50660013	AKKURT DAVID/GEORGE	3126 N GRANITE REEF RD	SCOTTSDALE	AZ	85251	AKKURT GEORGE/DAVID	3126 N GRANITE REEF RD		SCOTTSDALE	AZ	85251-7310
50660014	AKKURT DAVID/GEORGE	3126 N GRANITE REEF RD	SCOTTSDALE	AZ	85251	AKKURT GEORGE/DAVID	3126 N GRANITE REEF RD		SCOTTSDALE	AZ	85251-7310
50660015	POZEFSKY DANIEL W/FEELEY COLLEEN A	27306 N 59TH DR	PHOENIX	AZ	85085	POZEFSKY DANIEL W/FEELEY COLLEEN A	27306 N 59TH DR		PHOENIX	AZ	85085-6524
50660016	NASLONSKI PAWEL/KATARZYNA	5702 N LAGUNA	LITCHFIELD PARK	AZ	85340	NASLONSKI PAWEL/KATARZYNA	5702 N LAGUNA		LITCHFIELD PARK	AZ	85340
50660017	SMK LAND HOLDINGS LLC	1920 E MARYLAND AVE STE 32	PHOENIX	AZ	85016	SMK LAND HOLDINGS LLC	1920 E MARYLAND AVE STE 32		PHOENIX	AZ	85016-1455
50660018	BEETER & ASSOCIATES LLC	PO BOX 1639	APACHE JUNCTION	AZ	85208	BEETER & ASSOCIATES LLC	PO BOX 697		TONOPAH	AZ	85354-0697
50660019	QUALEX CONSTRUCTION INC	PO BOX 1639	APACHE JUNCTION	AZ	85217	QUALEX CONSTRUCTION INC	PO BOX 697		TONOPAH	AZ	85354-0697
50660020	R R & R R EVANS CO	P O BOX 5840	MESA	AZ	85201	BROWN EVANS DISTRIBUTING CO	PO BOX 5840		MESA	AZ	85211-5840
50660022	QUALEX CONSTRUCTION INC	PO BOX 1639	APACHE JUNCTION	AZ	85217	QUALEX CONSTRUCTION INC	PO BOX 697		TONOPAH	AZ	85354-0697
50660023	BEETER & ASSOCIATES LLC	PO BOX 1639	APACHE JUNCTION	AZ	85208	BEETER & ASSOCIATES LLC	PO BOX 697		TONOPAH	AZ	85354-0697
50660024	BEETER & ASSOCIATES LLC	PO BOX 1639	APACHE JUNCTION	AZ	85208	BEETER & ASSOCIATES LLC	PO BOX 697		TONOPAH	AZ	85354-0697
50660025	CHAVEZ MICHELE N	33450 N SYMER DR	CAVE CREEK	AZ	85331	CHAVEZ MICHELE N	33450 N SYMER DR		CAVE CREEK	AZ	85331-5042
50660026	KEIM RAYMOND E SR/KAY D	P O BOX 5663	SALTON CITY	CA	92275	KEIM RAYMOND E SR/KAY D	PO BOX 5663		SALTON CITY	CA	92275-5663
50660030	SZUL IRENA	PO BOX 1693	LITCHFIELD PARK	AZ	85340	SZUL IRENA	2822 N MEVINA AVE		CHICAGO	IL	60634-5003
50660031	GONDO ENTERPRISES LLC	PO BOX 33248	PHOENIX	AZ	85067	GONDO ENTERPRISES LLC	PO BOX 33248		PHOENIX	AZ	85067-3248
50660032	KNAUSS HARRIETT	8021 N 15TH AVE	PHOENIX	AZ	85021	CHAVEZ HARRIETT	8021 N 15TH AVE		PHOENIX	AZ	85021-5401
50660012	JANDA LAND HOLDINGS LLC	PO BOX 9794	PHOENIX	AZ	85068	JANDA LAND HOLDINGS LLC	101E MOON VALLEY DR		PHOENIX	AZ	85022-4249
50660009D	CHAN CHIN HSIU	3510 E HAMPTON AVE NO 31	MESA	AZ	85204	CHAN CHIN HSIU	3510 E HAMPTON AVE NO 31		MESA	AZ	85204-6433

AFFIDAVIT OF PUBLICATION
CENTENNIAL WASH FDS

01

Arizona Business Gazette
The business resource

PO BOX 194
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ANNOUNCEMENT OF INTENT TO RE-DELINEATE THE FLOOD PLAIN ON CENTENNIAL WASH WITHIN UNINCORPORATED MARICOPA COUNTY, ARIZONA

The Flood Control District of Maricopa County (District), under authority of the National Flood Insurance Act of 1968 (PL-90-448), as amended, the Flood Disaster Protection Act of 1973 (PL93-234), and Arizona Revised Statutes Title 48, is funding a detailed study of the Centennial Wash floodplain in western Maricopa County sduth of I-10 and the Palo Verde Nuclear Generating Station, and north of Gila Bend and the Gila Bend Mountains.

The District has contracted with WEST Consultants, Inc. to provide detailed floodplain delineation of 49 linear miles of Centennial Wash. The results will be used by Maricopa County to regulate development within the respective floodplain. The study will be sent to the Federal Emergency Management Agency (FEMA) in order to update the effective Flood Insurance Rate Maps (FIRMs), which are used to determine federal flood insurance rates.

This announcement is intended to inform all interested persons and communities of the study's beginning, and to provide concerned citizens with an opportunity to bring any relevant technical information and/or flooding history to the attention of the District. This information will be considered during the study. Your comments should be addressed to Mr. Jeff Shelton, Senior Civil Engineer at the Flood Control District of Maricopa County, 2801 West Durango Street, Phoenix, AZ 85009, (602) 506-4486, email: jefferyshelton@mail.maricopa.gov.

Published September 20, 2012

STATE OF ARIZONA
COUNTY OF MARICOPA } SS.

Manny Vargas, being first duly sworn, upon oath deposes and says: That he is the Legal Ad Rep of the Arizona Business Gazette, a newspaper of general circulation in the county of Maricopa, State of Arizona, published weekly at Phoenix, Arizona, and that the copy hereto attached is a true copy of the advertisement published in the said paper on the dates indicated.

9/20/2012

Sworn to before me this
20TH day of
SEPTEMBER 2012

OPHELIA SHEPPARD
Notary Public - Arizona
Maricopa County
My Comm. Expires Aug 3, 2014

Notary Public

Appendix B: General Documentation and Correspondence

B.4 FEMA Correspondence

Appendix C: Survey Field Notes

C.1 Digital Projection Information

Appendix C: Survey Field Notes

C.2 Survey Field Notes For Aerial Mapping Control

SURVEY REPORT: GILLESPIE INFILL

During the course of edge matching several mapping products in the Centennial Wash –Arlington area it was discovered that existing mapping did not properly overlap between projects leaving a small area with no recent mapping product. This occurred in Township 2 South, Range 5 West of the Gila and Salt River Meridian. The affected projécts were Luke Wash, Gillespie , and Palo Verde ADMP/ADMS. It was decided to perform the surveys on the ground with Real Time Kinematic (RTK) and RTK continuous survey methods utilizing all-terrain vehicles and 4WD trucks as well as walking to several positions inaccessible by vehicle. . The work commenced and was completed on April 5th 2012. The equipment was a Trimble 5800 and R8 rover with AZGPS virtual base station. All observations were in the Arizona State Plane System Central Zone NAD 1983 (1992) epoch and NAVD 1988 vertically and geoid '09. This is the same datum as the surrounding mapping projects are on. Points were collected, analyzed and delivered to the Cadd Administrator for inclusion into the exiting mapping digital terrain model. Expected observation precisions are plus or minus a 0.10 from control.

Submitted:

John R. Stock RLS, CFM
Chief Surveyor
Flood Control District of Maricopa County

Expires 6/30/2013

Meta Data:
Vertical Datum: NAVD 88
Coordinate System: US State Plane 1983
Zone: Arizona Central 0202
Datum: NAD 1983 (NSRS 2007)
Geoid Model: Geoid 09 AZ

Point #	Northing	Easting	Elevation	Description
100	831206	430565.4	790.02	NG
101	830894.9	430581.1	788.41	NG
102	830501.1	430600.9	789.1	NG
103	830087.9	430621.2	789.74	NG
104	829684.8	430641.1	789.33	NG
105	829274.3	430657.5	788.59	NG
106	828855	430661.2	786.42	NG
107	828475.4	430663.3	783.53	NG
108	828057.5	430665.3	781.82	NG
109	827606.4	430667.6	781.71	NG
110	827219	430669.7	778.07	NG
111	826781.4	430672.8	777.63	NG
112	826344.2	430676.5	780.78	NG
113	825952.3	430678.6	780.71	NG
114	825705.3	430682.2	777.39	NG
115	827049.4	430586.1	776.53	NG
116	827084.1	430409.7	776.96	NG
117	827138.9	430178.2	777.49	NG
118	827156	430006.5	777.99	NG
119	827199	429808.5	778.76	NG
120	827235.4	429626.5	779.09	NG
121	827264.4	429442.3	779.32	NG
122	827332.1	429374.8	781.68	NG
123	827388.4	429420.9	779.57	NG
124	827336.2	429636.7	779.42	NG
125	827282.5	429823.4	778.99	NG
126	827227.6	430014.8	778.44	NG
127	827178.8	430175.2	777.64	NG
128	827124.2	430363.8	777.26	NG
129	827175.2	430097	777.79	NG
130	827214.4	429943.2	778.25	NG
131	827263.4	429749.5	778.85	NG
132	827308.1	429562.2	779.35	NG
133	827339.7	429430.6	779.18	NG
134	827213.7	429410.5	776.58	NG

135	827151.1	429422.4	781	NG
136	827112.7	429565.6	779.4	NG
137	827099	429735.2	778.62	NG
138	827086.5	429901	777.56	NG
139	827073.3	430068.3	776.99	NG
140	827054.8	430276.6	776.71	NG
141	827043.5	430435.1	776.21	NG
142	827117.8	429981.2	776.86	NG
143	827133.9	429871.2	777.12	NG
144	827158.4	429708.2	777.4	NG
145	827222.1	429482.9	778.62	NG
146	827194.7	429446.4	775.95	NG
147	827172.9	429531.5	775.78	NG
148	827166.1	429614.6	777.57	NG
149	827080.6	429533.4	780.03	NG
150	827066.9	429688.9	779.7	NG
151	827056.7	429857	779.21	NG
152	827037.1	430089.4	778.61	NG
153	827026.8	430221.3	778.45	NG
154	827013.8	430422.1	778.03	NG
155	827145.2	430436.5	777.54	NG
156	827185.5	430292.6	777.75	NG
157	827222.7	430161.7	777.89	NG
158	827272.8	429986.6	778.15	NG
159	827331	429787.8	778.36	NG
160	827391.5	429566	778.89	NG
161	827423.5	429417.2	779.16	NG
162	827226.1	429373.5	775.79	NG
163	827166.9	429353.9	781.22	NG
164	827290.7	429302.8	781.88	NG
165	827459.3	429289.8	783.34	NG
166	827624.1	429276.8	781.68	NG
167	827820.6	429262.3	780.74	NG
168	828035	429257.6	780.45	NG
169	828243.8	429272.9	781.92	NG
170	828501.6	429288	783.59	NG
171	828891.9	429310.6	784.67	NG
172	829164.1	429330.4	788.16	NG

173	829506.9	429352.8	789.15	NG
174	827946.1	429308.7	780.95	NG
175	827568.8	429346.4	782.22	NG
176	827418.5	429363.9	782.16	NG
500	829388.9	429264.8	789.81	NG
501	829527	429254.6	788.05	NG
502	829471.7	429194.5	785	NG
503	829506.2	429088.9	788.53	NG
504	829590.8	429028.9	789.04	NG
505	829581.8	428823.9	790.25	NG
506	829602.7	428636.8	786.56	NG
507	829588.9	428384.6	785.57	NG
508	829594.2	428226.1	786.66	NG
509	829610.9	428051.6	786.78	NG
510	829663.2	428019.4	786.77	NG
511	829648.7	428258.6	786.72	NG
512	829647.1	428478.5	784.23	NG
513	829731.6	428607.7	794.6	NG
514	829659.6	428703.6	791.93	NG
515	829520.2	428865.7	790.45	NG
516	829359.2	429004	789.32	NG
517	829258.3	429178.3	789.45	NG
518	829142.6	429260.4	789.19	NG
519	829108.9	429216.7	783.72	NG
520	828932.3	429208.3	782.68	NG
521	828742.4	429183.9	782.33	NG
522	828561.5	429177.3	782.29	NG
523	828384.7	429157.3	782.06	NG
524	828172.3	429114.7	781.65	NG
525	828023.8	429001.9	782.27	NG
526	827995.1	428863.9	782.36	NG
527	827745.6	428770.9	782.19	NG
528	827691.9	428652	783.1	NG
529	827699.8	428407.2	783.68	NG
530	827716.7	428251.4	783.59	NG
531	827634.5	428375.2	783.82	NG
532	827638.9	428718.3	782.87	NG
533	827614	429053.6	782.11	NG

534	827425.6	429151.9	781.62	NG
535	827157.7	429203.6	781.71	NG
536	826893.6	429244.6	781.7	NG
537	826287.5	429470.1	782.18	NG
538	825981.1	429507.6	782.11	NG
539	825945.5	429263	783.07	NG
540	825956.1	429065	783.91	NG
541	825960.2	428884.7	784.59	NG
542	825981.6	428605	785.3	NG
543	825936.2	428585.5	785.05	NG
544	825810.6	428717.8	787.75	NG
545	825924.7	428809.6	784.8	NG
546	825886.1	428935.9	784.35	NG
547	825825.6	429076.8	784.65	NG
548	825728.8	429194	786.89	NG
549	825633.5	429281.9	789.54	NG
550	825665.9	429421.6	788.98	NG
551	825665.2	429523.7	788.13	NG
552	825660	429647.5	785.7	NG
553	825694.3	429749.3	784.34	NG
554	825815.6	429681.3	782.82	NG
555	825923.6	429429.8	781.23	NG

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
FCD 2007C045
GILLESPIE ADMP MAPPING
PHASE 1
DAVID EVANS AND ASSOCIATES, INC.
SURVEY REPORT
EXECUTIVE SUMMARY

Scope of work. This survey is to provide Global Positioning System (GPS) Base Station data for photogrammetric control, of approximately three hundred twenty square miles of floodplain mapping and survey data of the profiles for the Gila Bend Canal, Interstate 8, Old US 80, SR 85, Maricopa Road, Butterfield Trail, Patterson Road and Woods Road within the Gillespie Area Drainage Master Plan Project for the Flood Control District of Maricopa County. Also included is survey data for associated drainage structures, bridges, Gillespie Dam, and the Bullard Wash Overchute within Phase I of the project. See the attached Figure A – Map of Project Area for the project limits and Phase I and Phase II limits. The ground control should be sufficient to allow an aerial survey contractor to compile topographic mapping on a 2-foot contour interval and at a scale of 1 inch equals 200 feet. The ground control shall meet or exceed the requirements as specified in FEMA Guidelines and Specifications for Flood Hazard Mapping Partners, Volume 1 : Flood Studies and Mapping, February, 2002.

Control datum GPS control is based upon published National Geodetic Survey (NGS) values. Horizontal control was based upon Maricopa County GDACS stations, which are published NGS B- order (1:1,000,000) control stations in a NAD 83 (1992.0 epoch) reference frame. Vertical control was based upon the same Maricopa County GDACS B-order stations, which have published NGS third-order, class II ellipsoid heights. The Maricopa County GDACS stations are either set in bedrock, or are stainless steel rods driven to refusal.

Field survey data was collected using both Leica and Trimble equipment and processed with Leica Geomatics Office (LGO) and Trimble Geomatics Office (TGO) software. GPS techniques, utilizing the hybrid geoid model developed for the GDACS project, were employed to estimate NAVD 88 orthometric heights, when using TGO. When using LGO the orthometric heights were derived by applying Geoid 03 to the ellipsoid heights. This method was employed to eliminate blunders in entering the data into the Leica equipment. A spreadsheet showing the NGS control points in the project area and the A-Team project panel points projected to both of the above height definitions shows an average difference of 0.006 feet vertically and a standard deviation of 0.059 feet vertically. This result was also confirmed by collecting adjacent points with both systems along the Gila Bend Canal. A copy of the spreadsheet is included in Section F on CD-ROM.

TABLE OF CONTENTS

Section A - Narrative

Section B - Published NGS control stations for GPS Base Stations

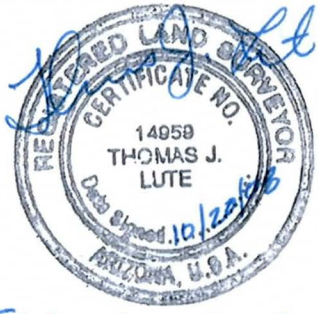
Section C - DEA Project Control Points

Section D - GPS Observations for GPS Base Stations (in digital format on CD)

Section E - Field notes and Photos of Structures (in digital format on CD)

Section F - Coordinate list of all survey data (in ASCII format on CD)

Section G - Drawing of Roadway, Canal and Bridge profile data (in pdf format on CD)



EXPIRES 6/30/2009

NARRATIVE

Procedures

Global Positioning System (GPS) Base Stations

GPS Base Stations were established at 3CG2, 3CK2, 3FHI, 3HH1, 4AE1, E 360, and H395 all of which are NGS B Order Geodetic Control points. A GPS Base Station was also established at A 469 which is an NGS A Order Geodetic Control point. These stations were selected to limit the baseline distance between the base stations and the airborne receiver to a maximum of eight (8) miles. Fixed height tripods were used on all base stations to eliminate antenna height measurement blunders. Leica 1200 or Trimble 4700 receivers were used at all base stations.

Copies of all Station Data sheets are included in Section B. A copy of all GPS observations and station log sheets are included in Section D on CD-ROM.

Field Surveys of Structures

Survey data was collected using RTK GPS or terrestrial total station procedures. Base stations for RTK were set on NGS B Order Geodetic Control points, project control panels established by A Team or control points established by DEA using static GPS procedures. Control points established by DEA were derived using two independent vectors from occupations of 6 to 10 minutes or more, as dictated by the distance from the existing control points. Data for the Gillespie Dam and the Gillespie Bridge was collected using a Leica 1200 total station.

Bridge profiles on Bullard Road, Estrella Parkway, Cotton Lane, Tuthill Road and SR 85 were collected using the Titan mobile laser scanner. Base stations for the post processed kinematic GPS for the Titan scanner were set on NGS B Order Geodetic Control points, project control panels established by A Team or control points established by DEA using static GPS procedures. Additional bridge details and cross-sections were collected using RTK GPS, terrestrial total station or measuring down from the bridge deck, as field conditions dictated.

All control points established by DEA are listed in the FCD's HIS spreadsheet format in Section C.
Survey data is included in Section F on CD-ROM.

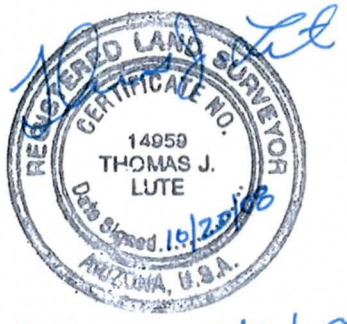
Profiles

Profiles for Interstate 8 (19.0 miles total, 9.5 miles each direction), Old US 80 (31.2 miles), SR 85 (52.8 miles total, some divided highway), Maricopa Road (16.3 miles), Butterfield Trail (3.5 miles), Patterson Road (3.5 miles) and Woods Road (1.3 miles) were collected using the Titan mobile laser scanner. Base stations for the post processed kinematic GPS for

the Titan scanner were set on NGS B Order Geodetic Control points, project control panels established by A Team or control points established by DEA using static GPS procedures. Cross-sections of the pavement were collected, using RTK GPS procedures, every three miles, as a check for the scanned profile data. A spreadsheet showing the differences between the scanned profile data and the RTK check shots is included on CD-ROM in Section F.

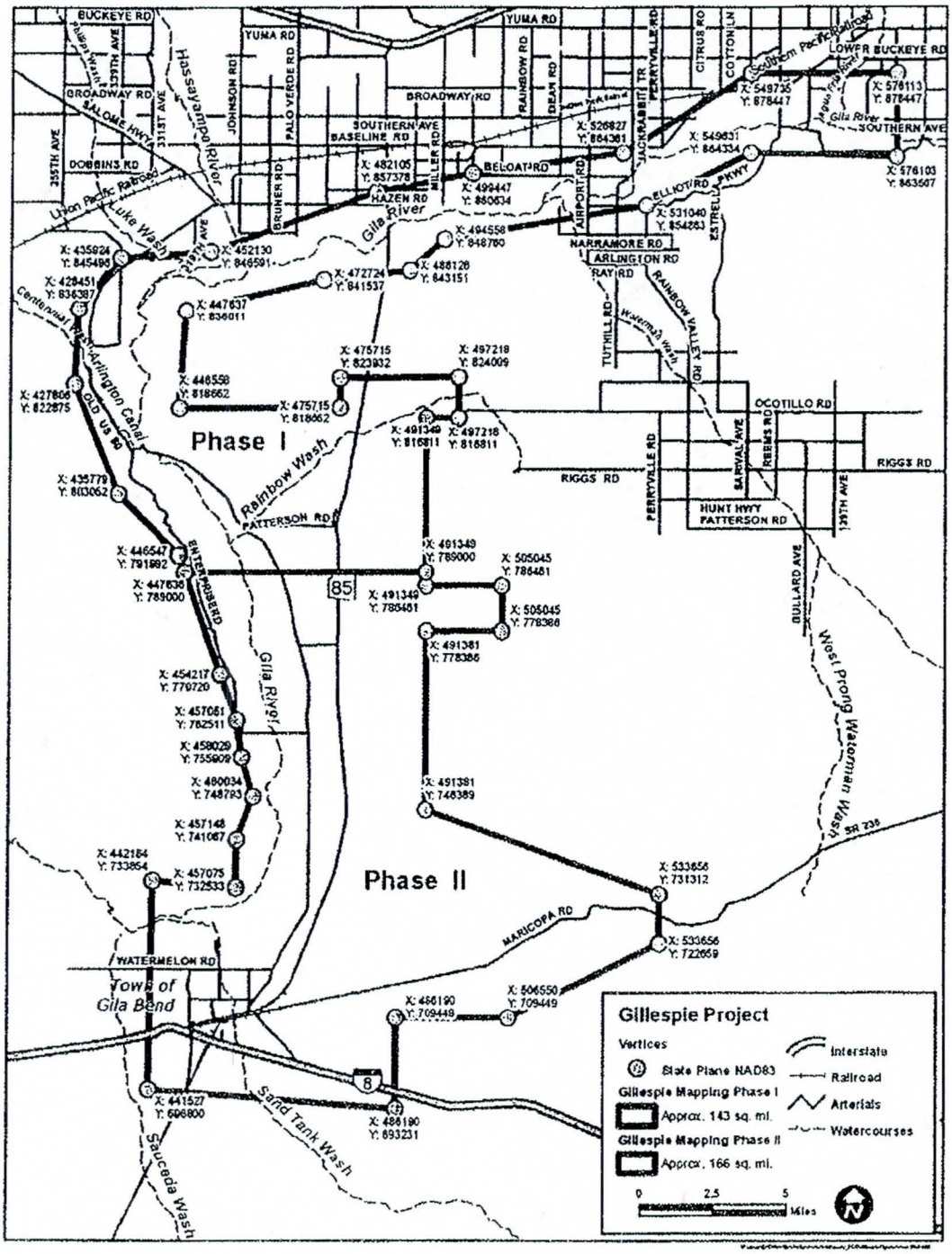
Profiles for the Gila Bend Canal were collected using continuous kinematic GPS procedures with all terrain vehicles. Check points were established every three miles and compared with the profile data. A spreadsheet showing the differences between the continuous kinematic GPS data and the RTK check shots is included on CD-ROM in Section F.

Profile data is also shown in a pdf drawing on CD-ROM in Section G.



EXPIRES 6/30/09

Figure A –Map of Project Area



SURVEY REPORT: A PORTION OF CENTENNIAL WASH, MARICOPA COUNTY, ARIZONA

The work product is located in Townships 1 South, 1 North and 2 North and in Ranges 8 and 9 West of the Gila and Salt River Meridian. The aerial mapping product from Vertical Mapping Resources was delivered with permission from W Holdings to the Flood Control District for review, checking, comment, and use. From January 9th to the 30th, 2012 field work was conducted by FCD employees to check the digital terrain model for compliance with FCD and FEMA standards for mapping. Trimble 5800 and R8 systems were utilized and where possible AZGPS internet connection. All data was collected on the State Plane coordinate system of 1983 1992 epoch and the vertical datum was NAVD 1988. Points were selected at random throughout the project and were not photo identified or paneled targets. The RMSE of the 39 submitted points tested was 0.50 ft., acceptable for 2 foot contour interval floodplain mapping.

John R. Stock RLS, CFM
Chief Surveyor
Flood Control District of Maricopa County

Expires 6/30/2013

Meta Data:
Vertical Datum: NAVD 88
Coordinate System: US State Plane 1983
Zone: Arizona Central 0202
Datum: NAD 1983 (NSRS 2007)
Geoid Model: Geoid 09 AZ

Maricopa County

Flood Control Surface Check Report

Report Created: 2/27/2012 Time: 1:53pm

Project Units	**Imperial**	**TOL1=**	**0.6**
DTM Name	**centennial wash**	**TOL2=**	**0.1**

POINT	X	Y	Field Z	DTM Z	Z Diff	ABS Value	
2031	303865.22	899027.67	1181.1	1181.05	0.05	0.05	0.0025
2033	304071.86	899023.61	1181.21	1181.12	0.09	0.09	0.0081
2034	304173.86	899021.14	1181.33	1181	0.33	0.33	0.[illegible]9
5007	306972.97	902314.18	1181.91	1180.08	1.83	1.83	
5008	309841.58	902078.44	1172.18	1172.52	-0.34	0.34	0.1156
5009	312616.36	901548.45	1162.61	1162.03	0.58	0.58	0.3364
5010	315101.62	901491.51	1156.01	1156.36	-0.35	0.35	0.1225
5011	317186.21	903745.98	1153.48	1153.57	-0.09	0.09	0.0081
5012	315254.85	904160.27	1159.48	1159.39	0.09	0.09	0.0081
5013	317291.99	905591.81	1155.28	1155.51	-0.23	0.23	0.0529
5014	316599.47	907802.09	1159.86	1160.82	-0.96	0.96	0.9216
5015	318179.45	908172.2	1155.37	1157.22	-1.85	1.85	
5016	313030.14	910159.73	1172.31	1172.82	-0.51	0.51	0.2601
5017	312140.73	906315.71	1172.01	1172.06	-0.05	0.05	0.0025
5018	309327.51	906049.9	1180.22	1180.15	0.07	0.07	0.0049
5019	308825.95	908329.33	1183.5	1184.25	-0.75	0.75	0.5625
5025	320412.41	905050.58	1145.01	1146.66	-1.65	1.65	
5026	322952.4	904981.23	1139.78	1139.62	0.16	0.16	0.0[illegible]6
5027	325407.61	902730.06	1131.73	1131.16	0.57	0.57	0.[illegible]9

5028	322871.1	901340.95	1133.39	1134.89	-1.5	1.5	2.25
5029	320388.26	899869.82	1139.27	1139.79	-0.52	0.52	0.2704
5032	328120.04	896153.45	1112.39	1114.05	-1.66	1.66	
5033	326850.7	893381.26	1113.85	1114.1	-0.25	0.25	0.0625
5034	330065.31	893455.89	1108.79	1107.36	1.43	1.43	
5035	325445.19	893449.13	1117.19	1117.14	0.05	0.05	0.0025
5038	330077.95	890788.79	1104.36	1103.81	0.55	0.55	0.3025
5040	328072.79	885539.98	1102.65	1103.19	-0.54	0.54	0.2916
5042	329337.93	882250.22	1094.63	1094.63	0	0	0
5043	327538.45	881579.31	1095.97	1096.46	-0.49	0.49	0.2401
5044	325787.74	881610.36	1101.27	1100.79	0.48	0.48	0.2304
5046	325324.11	886841.22	1107.09	1107.5	-0.41	0.41	0.1681
5047	322554.79	888142.3	1116.13	1116.91	-0.78	0.78	0.6084
5048	318938.72	889707.22	1129.04	1129.08	-0.04	0.04	0.0016
6000	325435.71	896095.8	1120.32	1119.68	0.64	0.64	0.4096
6002	318812.11	893677.67	1135.46	1135.44	0.02	0.02	0.0004
6004	317405.4	896257.42	1142.42	1143.21	-0.79	0.79	0.6241
6005	318626.18	896241.86	1139.64	1139.88	-0.24	0.24	0.0576
6006	317122.84	899037.48	1147.61	1147.65	-0.04	0.04	0.0016
6007	315090.42	898812.78	1152.1	1152.93	-0.83	0.83	0.6889
6008	311655.26	898852.19	1161.67	1160.88	0.79	0.79	0.6241
6009	309654.85	899509.85	1168.86	1169.27	-0.41	0.41	0.1681
6010	304392.16	899656.98	1182.93	1181.09	1.84	1.84	
6022	313331.14	893875.38	1150.76	1151.35	-0.59	0.59	0.3481
6023	313627.92	898859.69	1156.17	1157	-0.83	0.83	0.6889

			10.9047
Total Points Outside	**391**	**RMSE=.503**	

Appendix C: Survey Field Notes

C.3 Survey Field Notes For Hydrologic Modeling

Appendix C: Survey Field Notes

C.4 Survey Field Notes For Hydraulic Modeling

SURVEY REPORT: LOWER CENTENNIAL WASH WATERSHED,
UNION PACIFIC RAILROAD TRESTLES

Jeff Shelton, PE of the Flood Delineations Branch, Flood Control District of Maricopa County requested that District surveyors field survey four railroad trestles in the vicinity of the Centennial Wash crossing in the Lower Centennial Wash Watershed. The work was performed on 6-26 to 7-2, 2012 in Sections 27 and 28, Township 1 South, Range 6 West Gila and Salt River Meridian, Maricopa County, Arizona. Each of the four trestles and immediate surrounding areas was scanned using a Leica C10 stationary scanner. The control was set by a Trimble 5800/ R8 Rover connected to the AZGPS virtual network. Trimble Business Center software reduced the raw field data on the control points and Leica Cyclone software processed the scan data. Control results were provided in an excel format spread sheet. Registered and decimated point clouds were digitally provided through the internet via FTP sites. Field accuracy of control was +- 0.10 on the control points. Precision of the scanned points is +- 3 mm at the 95% confidence level.

The control used for the work is a portion of the Maricopa County Geodetic Densification and Cadastral Survey System (GDACS) control network. Observations were conducted on the NAVD 88 vertical datum. All coordinate data is displayed in NAD 1983/92 State Plane Coordinates, Arizona Central Zone.

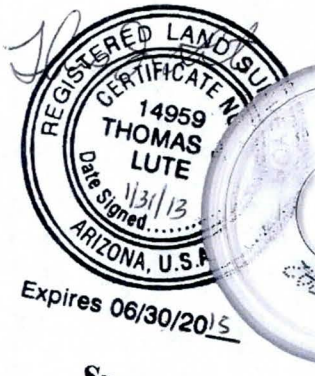
The survey was conducted under my direct supervision and the information herein is true and correct to the best of my knowledge and belief.

REGISTERED LAND SURVEYOR
CERTIFICATE NO.
25087
JOHN R. STOCK
Date Signed 10/14/13
ARIZONA U.S.A.

Expires 6-30-2016

John R. Stock, RLS, #25087 CFM#US-04-01065

Contract FCD 2012C004
Centennial Wash Floodplain Delineation Study
Gila River to La Paz County

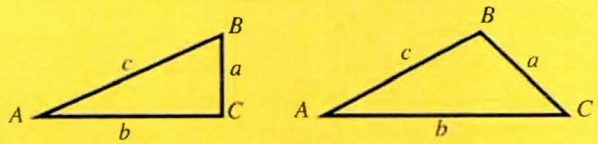


Expires 06/30/2015

David Evans
and
Associates, Inc.

Survey Data – Van Buren Culverts
1/31/2013
WSTC0000-0012

FORMULAE FOR SOLVING RIGHT TRIANGLES



$$\text{Sin } A = \frac{a}{c} = \text{Cos } B \qquad \text{Cot } A = \frac{b}{a} = \text{Tan } B$$

$$\text{Cos } A = \frac{b}{c} = \text{Sin } B \qquad \text{Sec } A = \frac{c}{b} = \text{Cosec } B$$

$$\text{Tan } A = \frac{a}{b} = \text{Cot } B \qquad \text{Cosec } A = \frac{c}{a} = \text{Sec } B$$

Given	Required	Solution
A, c	B, a, b	$B = 90° - A, a = c \sin A, b = c \cos A.$
A, b	B, a, c	$B = 90° - A, a = b \tan A, c = \frac{b}{\cos A}.$
A, a	B, b, c	$B = 90° - A, b = a \cot A, c = \frac{a}{\sin A}.$
a, c	A, B, b	$\sin A = \frac{a}{c} = \cos B, b = \sqrt{(c+a)(c-a)}$
a, b	A, B, c	$\tan A = \frac{a}{b} = \cot B, c = \sqrt{a^2 + b^2}$

FORMULAE FOR SOLVING OBLIQUE TRIANGLES

Given	Required	Solution
A, a, b	B, c	$\sin B = \frac{b \sin A}{a}, c = \frac{a \sin C}{\sin A}$
A, B, a	b	$b = \frac{a \sin B}{\sin A}$
a, b, C	A, c	$A + B = 180° - C, c = \frac{a \sin C}{\sin A}$
a, b, c	Area	side $\frac{a+b+c}{2}$, area $= \sqrt{s(s-a)(s-b)(s-c)}$
A, b, c	Area	area $= \frac{bc \sin A}{2}$
A, B, C, a	Area	area $= \frac{a^2 \sin B \sin C}{2 \sin A}$

MADE IN CHINA

≡ CENTENNIAL WASH ≡

FCD 2012 C 004

1/24/13

D. LUTE
R. HUNT

Cloudy, raining

DEA JOB NO. WSTC0000-0012

GPS FILE: CENTWASH

BASE @ 4BR1

HT = 2.000 m

SS ROD w/ PUNCH, NO CAP, IN A MARICOPA CO. GEODETIC CONTROL MON CASE

PT #	CODE	DESC
~~100~~	199	NGS 4CS1
100	199	14431

RH

6 90

6 92

SS RCDR W/ PUNCH, NO CAP, IN MCGC MON CASE

NOTE: NO SHOT - RADIO INITIALIZATION SPOTTY

BCPH 0.90 FT DOWN W/ SCREWED + NE CORNER — S.10, TIN, RSN

NOTE: INITIALIZATION CONTINUES TO GAIN LOCK & LOSE LOCK REPEATEDLY.

GO BACK TO PREV - ALL GOOD THERE & INS ALL FIXED

BACK @ THE SEL. COR — & THE SAME PROBLEM PERSISTS.

✓ TRY THE OTHER RECEIVER ANTENNA

@ HARQ. & VAN BUREN W/ PUCEM

PT #	COD	DESC			PA
101	199	14433			6.90
102	199	NGS 4CS1			6.60
5000 -	221	℄ RUNWAY			
5012	221	VAN BUREN)			
5013 -	223	EP	NORTH SIDE		
5025	223	"	"	"	
5026 -	223	EP	SOUTH SIDE		
5038	223	"	"	"	
5039 -	270	G/S	"	"	
5048	270	"			
5049 -	271	TOP			
5064	271	TOP			
5065 -	272	TOE			
5072	272	TOE			
5073 -	271	TOP			
5076	271	TOP			
5077	272	TOE			
5089	"	"			

@ VAN BUREN & 523RD AVE.

MCHD BCHH @ NW CORNER
S10, T1N, R9W
SEE PREV PAGE FOR DESC.
APPROX 4 mi WEST
OF HARQ VALLEY RD ON
CENTENNIAL.

STILL BY PROVIDA INITIALIZATION GAIN/LOSS

300' EAST OF CHANNEL

300' WEST OF CHANNEL

300' EAST OF CHANNEL

300' WEST OF CHANNEL

WEST SIDE CHANNEL, SO. OF V/B

5090	271	TOP	
5095	271	TOP	
5096	272	TOE	
5103	272	TOE	
5104	459	TOP OF PIPE	
5105	459	"	"
5106	459	"	"
5107	270	G/S	& CHANNEL
5111	270	"	" "
5112	270	G/S	
5121	270	G/S	
5122	270	G/S	
5129	270	G/S	
5130	272	TOE	
5133	272	TOE	
5134	271	TOP	ACCESS RD - E
5137	271	TOP	
5138	271	TOP	ACCESS RD - W
5151	271	TOP	
5152	271	TOP	OTHER SIDE *
5153	272	TOE	
5160	272	TOE	
5161	270	G/S	& CHANNEL
5164	270	G/S	"

SOUTH SIDE - WEST PIPE
" " MIDDLE "
" " EAST "

SO. SIDE OF ROADWAY
LAST SO. SIDE GROUND SHOT
NO. SIDE OF ROADWAY

TAKE TOP SHOTS AROUND
TO TAKE WEST SIDE OF
CMPs.

NORTH SIDE

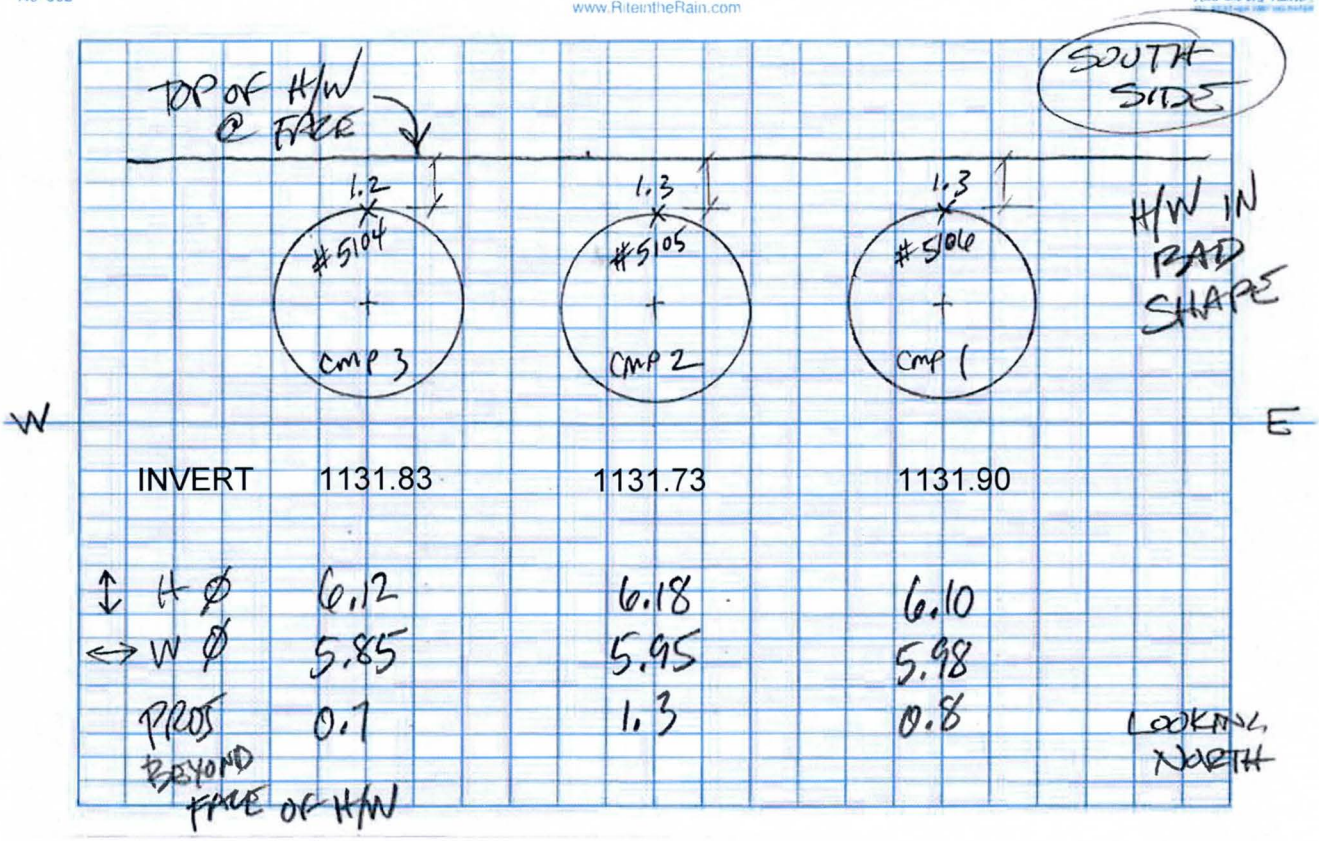
5165 –	466	LOCK OF	RIPRAP
5176	466	"	"
5177	459	TOP	PIPE
5178	459	"	"
5179	459	"	"
5180 –	270	G/S	

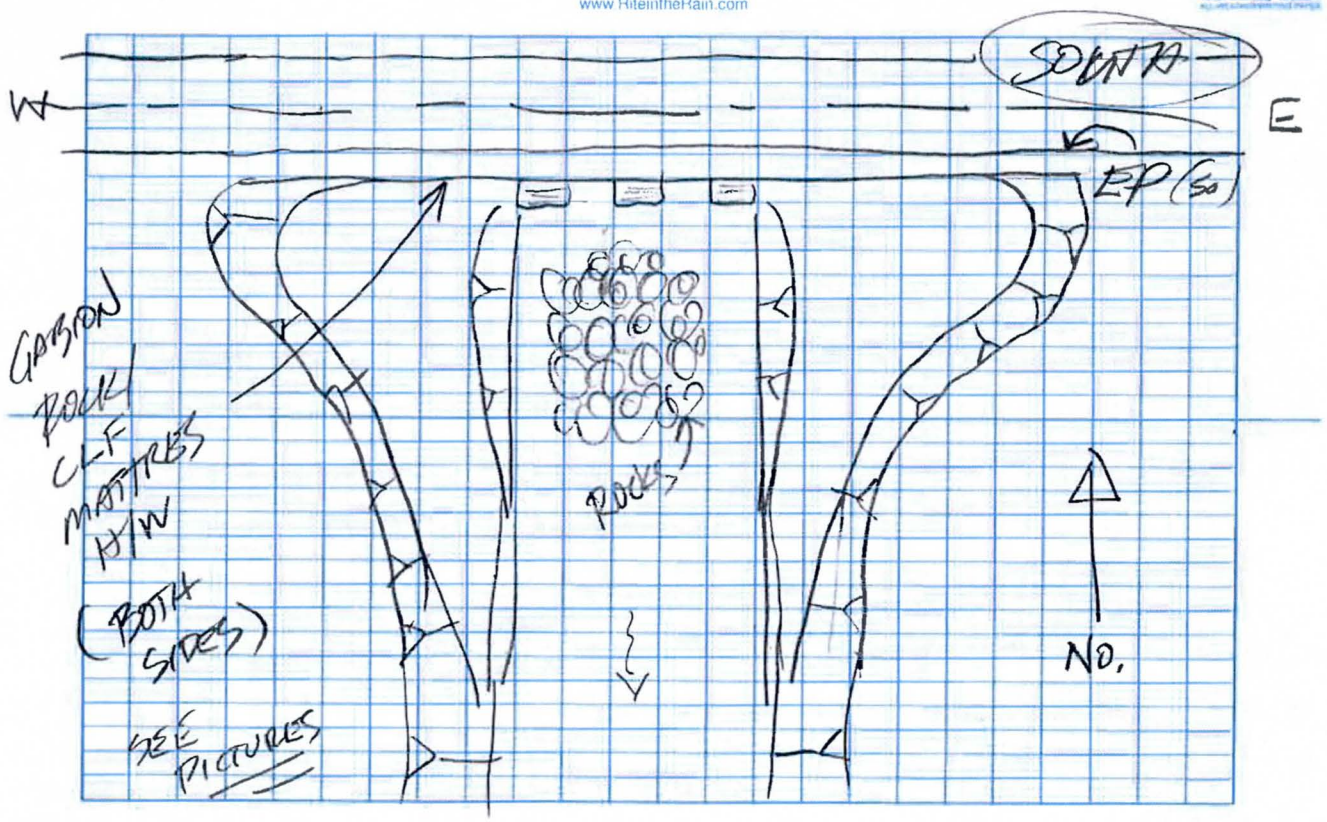
GABION
HEADWALL COMPRISED OF PLOCKS ROCK HELD IN PLACE BY STEEL POSTS & CHAIN LINK FENCE – SEE PHOTOS.

IN GENERAL – ROCK GABION WALLS ARE IN DISREPAIR.

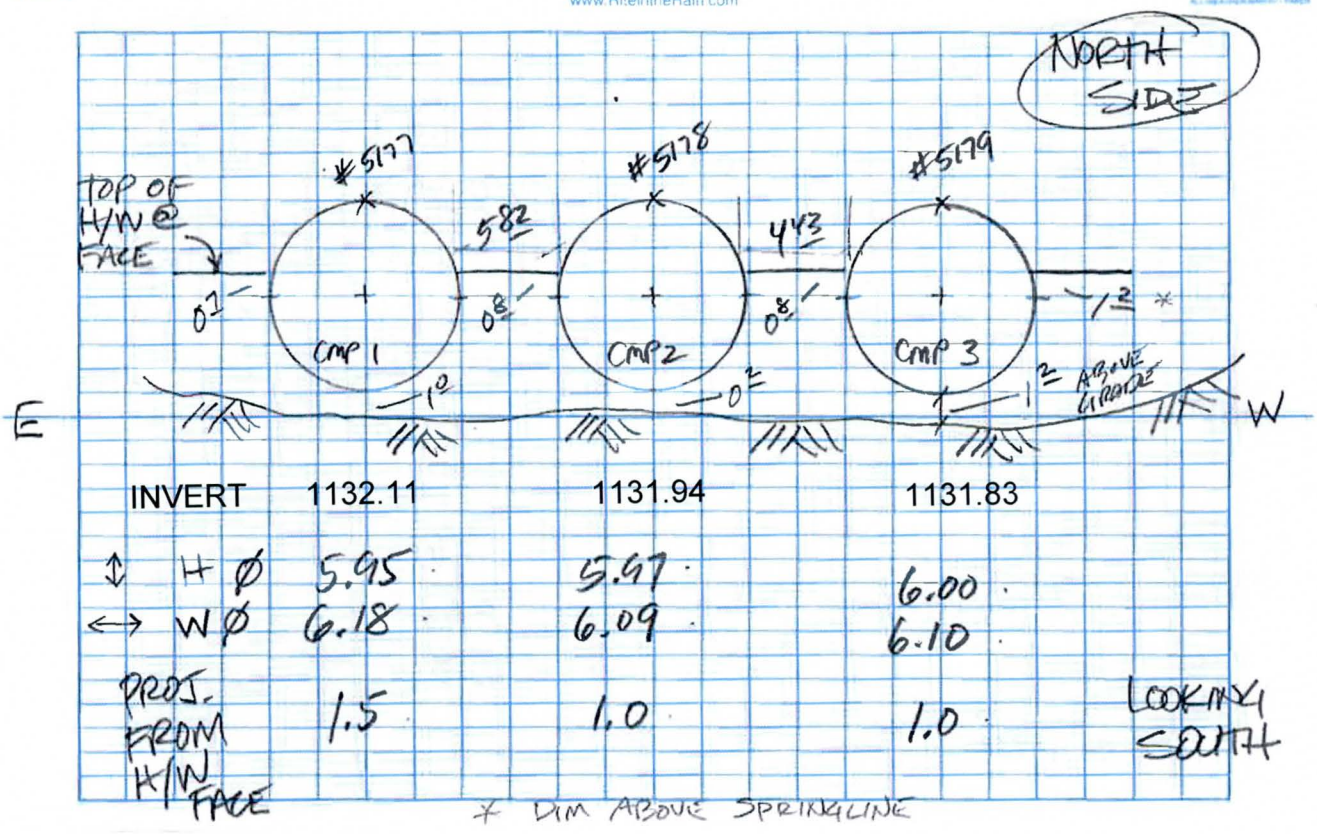
BANK PROTECTION (CONC & ROCK)
CONNECT PACK TO #5165

EAST CMP
MIDDLE CMP
WEST CMP
} NORTH SIDE

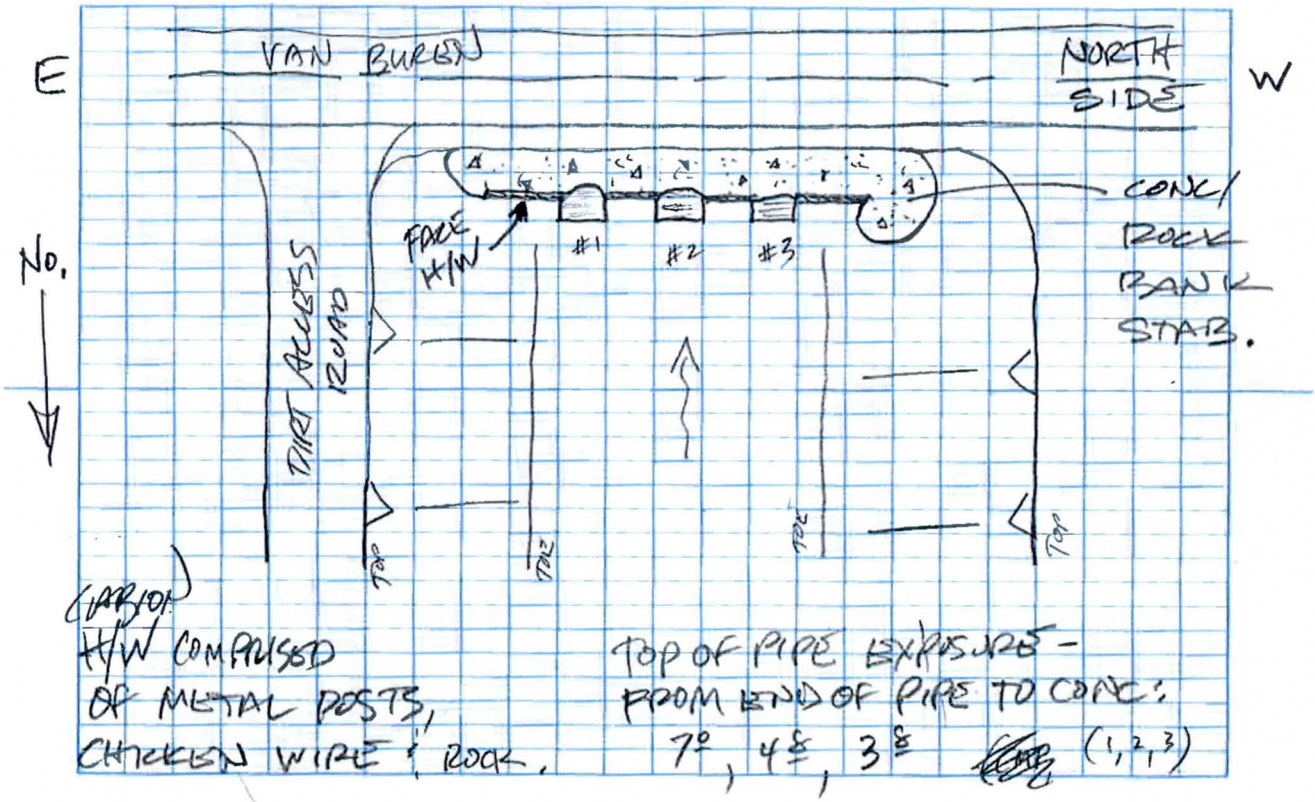

TOP OF H/W @ FACE
SOUTH SIDE
1.2
#5104
+
CMP 3
1.3
#5105
+
CMP 2
1.3
#5106
+
CMP 1
H/W IN BAD SHAPE
W
E
INVERT 1131.83 1131.73 1131.90
↕ H Ø 6.12 6.18 6.10
↔ W Ø 5.85 5.95 5.98
PROS 0.7 1.3 0.8
BEYOND FACE OF H/W
LOOKING NORTH


SOUTH
W
E
EP (So)
GABION
ROCK
CLF
MATTRESS
H/W
(BOTH SIDES)
ROCK
NO.
SEE PICTURES

No 302
J L DARLING CORP TACOMA, WA 98424-1017
www.RiteintheRain.com



No 302
J L DARLING CORP TACOMA, WA 98424-1017
www.RiteintheRain.com



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5004	893578.1	317536.4	1140.225	221
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5007	893580.1	317381.8	1140.421	221
5008	893580.7	317332.1	1140.834	221
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5119	893469.1	317572.4	1139.664	270
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5155	893626.3	317446.7	1133.792	272
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5161	893698.5	317431	1133.195	270
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5163	893655.8	317432.1	1133.242	270
5164	893635.1	317432.5	1133.227	270
5165	893616.1	317393.2	1139.805	466
5166	893623.7	317399.4	1135.656	466
5167	893620.7	317405.4	1135.2	466
5168	893619.7	317419.4	1133.19	466
5169	893617.3	317418.8	1136.413	466
5170	893615	317422.1	1137.906	466
5171	893618.1	317425.2	1135.415	466
5172	893617.5	317429.5	1135.673	466
5173	893613.9	317432.7	1137.843	466
5174	893617.4	317435.6	1135.356	466
5175	893617.4	317441.3	1135.102	466
5176	893608	317446.5	1139.509	466
5177	893619.1	317444.5	1138.062	459
5178	893618.6	317432.6	1137.909	459
5179	893618.9	317422.1	1137.834	459
5180	893695.7	317372.7	1140.949	270
5181	893645.6	317372.9	1141.131	270
5182	893647.3	317317.4	1141.649	270
5183	893705.8	317313.4	1141.311	270

5184	893703.5	317261.7	1141.464	270
5185	893650.8	317261.7	1141.405	270
5186	893706.6	317211.3	1141.384	270
5187	893655.6	317206.5	1141.469	270
5188	893652.8	317150.9	1141.577	270
5189	893705.6	317153.1	1141.27	270
5190	893699.5	317114.6	1141.673	270
5191	893649.5	317114.2	1142.123	270
14431	893561.3	320164.1	1131.27	150
14433	893618.3	314881.2	1146.736	150

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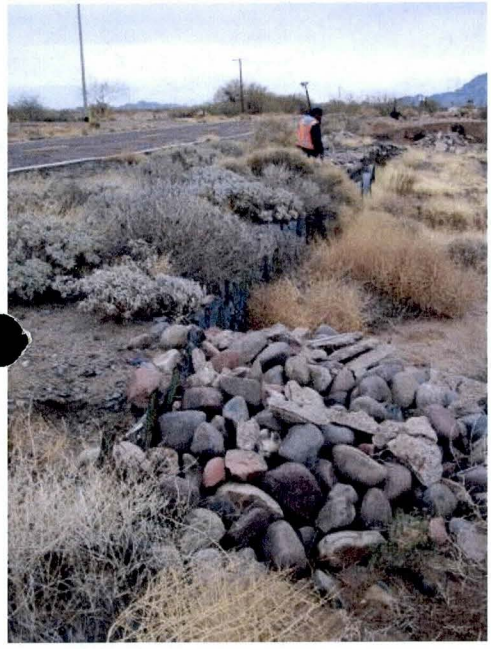

ELEVATION REFERENCE MARKS FOR DFIRM DEVELOPMENT
TECHNICAL MEMORANDUM

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
CENTENNIAL WASH FLOODPLAIN DELINEATION STUDY

Date: October 7, 2013

To: Jeff Shelton, P.E., FCDMC

Cc: Amir Motamedi, FCDMC

From: Brian Wahlin, Project Manager – WEST Consultants, Inc.
Chuck Davis – WEST Consultants, Inc.
Suzie Monk – WEST Consultants, Inc.

INTRODUCTION

The purpose of this Technical Memorandum is to identify appropriate data points to use as Elevation Reference Marks (ERMs) as required by the Flood Control District of Maricopa County (District) for work map development and by the Federal Emergency Management Agency (FEMA) for Flood Insurance Rate Map (FIRM) development. These data will be displayed on the work maps developed by WEST Consultants, Inc. (WEST) for the Centennial Wash Floodplain Delineation Study (FDS): Gila River to La Paz County, Contract FCD 2012C004. The final deliverable accompanying this memorandum is an ArcGIS shapefile depicting ERMs throughout the study reach of the Centennial Wash hydraulic model. This hydraulic model and all accompanying supporting documentation is supporting pending FEMA flood map revisions of the floodplain and floodway delineations for Centennial Wash.

The following sections of this technical memorandum provide detailed information regarding (1) guidance provided by the District to WEST regarding the selection of ERMs from the District's survey records and (2) the explanation and reasoning for WEST's selection of the individual ERMs for the Centennial Wash FDS represented in the attached ArcGIS shape file.

DISTRICT GUIDANCE REGARDING THE BASIS FOR SELECTING ERMS

The District provided WEST with six ArcGIS shape files representing elevation points that could be used for ERMs in this study. These shape files are described briefly below:

1) National Geodetic Survey (NGS) monuments, maintained by the National Oceanic and Atmospheric Administration (NOAA), in the vicinity of the study reach. NGS monuments were contained in one shapefile: SurveyPoint_NGS.

2) Geodetic Densification and Cadastral Survey (GDACS) project monuments demarcating section and quarter section corners and other monuments, maintained by the Maricopa County Department of Transportation (MCDOT), in the vicinity of the study reach. These were divided into three shapefiles denoted with the following titles:

    a. SurveyPointCorner_MCDOT

    b. SurveyPointCornerRecord_MCDOT

    c. SurveyPointMisc_MCDOT

3) Aerial control points for various topographic datasets collected by the District. A single shapefile (titled SurveyPointFCDMapping) was delivered including control points for the following topographic datasets:

    a. Luke Wash & Arlington Mapping collected in 2005

    b. Palo Verde Mapping collected in 2007

    c. Saddleback FRS Mapping collected in 1996

    d. Salt/Gila River Master Plan Mapping collected in 1991 and 1993

4) Project monuments maintained by the Arizona Department of Transportation (ADOT). ADOT monuments were contained in one shapefile: SurveyPointCorner_ADOT.

It should be noted that the GDACS dataset is comprised of data including NGS monuments. The GDACS data is prioritized in the following order at all section and quarter section corners: (a) NGS published vertical monuments; (b) NGS published horizontal monuments of A or B order stability only; and (c) MCDOT surveyed section or quarter section corners. Therefore, GDACS monuments can be coincident with NGS monuments.

Based on guidance from the District, there are several criteria for selecting ERMs from these six datasets. First, there should be approximately two ERM's per map panel if possible, and the highest quality monument available in a panel should be selected as one of the two ERM's per map panel. If only one monument or no monuments are available on a panel, that panel will not be required to show two ERM's.

Second, the quality of the monuments to be used as ERMs should be ranked in the following order: (a) NGS approved monuments, then (b) GDACS approved monuments, then (c) aerial control points used to develop topographic datasets used in the development of the final surface used for creating hydraulic models and delineating floodplain/floodway boundaries for the Centennial Wash FDS, and finally (d) ADOT project monuments with acceptable vertical accuracy. Throughout the investigation and identification of ERMs for this project, it was determined that no individual work map sheets contain aerial control points that would not be superseded by possible ERMs from either NGS or GDACS; therefore, aerial control points were not used as ERMs for any work map sheet in this study. ADOT project monuments do exist on

work map sheets that do not have NGS, GDACS, or aerial control points. However, none of the ADOT project monuments met the District's definition of acceptable vertical accuracy. Therefore, ADOT project monuments were not used as ERMs for any work map sheet in this study.

Third, for any of these monument types, the ERMs should represent monuments that have been recorded in recent surveys as being easily identifiable, if possible. Additionally, if possible, the ERM monuments should be brass caps in concrete, not rebar or other survey markers that were found in place or put in place to represent section or quarter section corners.

Finally, the District indicated that as much backup documentation as is available should be included in the ArcGIS shape file developed as the final ERM deliverable to provide to the District that is attached to this technical memorandum. For example, supporting documentation for NGS and GDACS monuments are available online; the URLs to these websites providing supporting documentation for a specific site should be included in the attribute table of the shape file for that location. This data tagging will provide metadata for the ERM points built directly into the shape file that can eventually be delivered to FEMA in support of map changes for Centennial Wash.

SELECTION OF ERM POINTS FOR THE CENTENNIAL WASH FDS STUDY

The draft work map panel layout WEST provided previously to the District has been edited slightly; the originally estimated 50 map panels have been reduced to 49 panels for the final work map panel layout. These 49 panels were used for the determination of two ERMs per map panel. Of the 49 panels, 43 contained two viable ERMs. Two panels contained only one viable ERM each, and four contained no viable ERMs at all. This draft layout is shown in Figure 1 below.

The numbering of the panels in Figure 1 follows an alphanumeric scheme consisting of lettered rows and numbered columns. Therefore, the panel falling in row J and column 11 has a map panel descriptor of 'J11' as shown in Figure 1. The final panel numbering sequence will follow this same numbering order, increasing first along rows then moving to the next row. In other words, Panel 'A1' as shown in Figure 1 will be sheet 1 of 49 in the work map set; Panel 'A2' will be sheet 2 of 49; Panel 'B1' will be sheet 3 of 49; etc.

Based on the different sources provided by the District available for the selection of elevation monument data and the priority given to certain survey monument data sources over others, the selection of the ERM points was divided into sections based on the source of the ERM itself. Three of the six shapefiles provided by the District as mentioned above were used in the final ERM dataset development; each of these three datasets will be discussed individually below.

ERMs from the shapefile titled 'SurveyPoint_NGS'

As mentioned above, this dataset was given the highest priority over the other possible survey monuments that could act as ERMs. WEST identified ERMs from this shapefile for nine of the forty-nine panels shown in Figure 1 below, and ten of the eighty-eight ERMs shown in Figure 2 were selected from this shapefile. Monuments from this shapefile make up both of the reference marks in one of those nine panels. Table 1 below has ten rows presenting the information for the ten NGS monuments used as reference marks.

Table 1. NGS points used as ERM monuments

Panel Number	Selected ERM 'ObjectID' from the NGS point shapefile	Selected ERM 'PID' from the NGS point shapefile	Selected ERM 'Name' from the NGS point shapefile	Stability	Elevation (M NAVD88)	Elevation (FT NAVD88)	URL (beginning with "http://www.ngs.noaa.gov/cgi-bin/ds_mark.prl?PidBox=")
B2	2171	AJ3574	4DT2	B	384.34	1260.96	AJ3574
D4	2161	AJ3568	4CS1	B	364.29	1195.18	AJ3568
D7	2160	AJ3567	4CQ1	B	339.76	1114.70	AJ3567
F5	2150	AJ3564	4BR1	B	342	1122.05	AJ3564
J8	1787	AJ3956	3BP2	A	308.85	1013.29	AJ3956
J11	1786	AJ3954	3BN2	A	282.31	926.21	AJ3954
L16	1794	AJ3811	3CK2	A	245.83	806.50	AJ3811
L16	17982	DV1236	Z475	A	241.697	792.97	DV1236
N16	10877	DV0793	N 13	C	240.026	787.49	DV0793
N17	16218	DV0794	V 360	C	238.299	781.82	DV0794

ERMs from the shapefile titled 'SurveyPointCorner_MCDOT'

WEST identified ERMs from this shapefile for eight of the forty-nine panels shown in Figure 1 below, and fifteen ERMs of the eighty-eight total ERMs shown in Figure 2 were identified from this shapefile within these eight panels. Monuments from this shapefile make up both of the reference marks in seven of those eight panels. All of the monuments are brass- or aluminum-capped disk monuments. The highest quality GDACS monuments were used whenever possible while considering the spacing between the two points for each panel. Two high quality monuments located very close together were not chosen if there was another monument of acceptable quality further away within the panel. A table of these points with their corresponding identification data is provided in Table 2 below.

Table 2. GDACS corner points used as ERM monuments

Panel Number	Selected ERM Survey Point Monument Number	Selected ERM Survey Point Monument Name	Description	Elevation (FT NAVD88)	URL*
C7	5699	31882-1	FD 3 1/2" BC FL STAMPED "T2N 25 30 R9W R8W 36 31 2001 LS 19354" NOTE-LOCATED ON WEST SIDE OF BOTTOM OF WASH	1121.805	5699
C7	2160	31900-1M	FD 1/2" RB W/O ID 1.2' DN NOTE- REFURBISHED RB W/ 2" MC AL CAP STAMPED "T2N R8W S19 S20 S30 S29 RLS 36563 2005"	1143.676	2160
D7	2023	31864-Z1	SET 5/8" RB W/ 2" MARICOPA COUNTY AL CAP FL STAMPED "T2N R8W 1/4 S31 S32 RLS 36563 2005"	1124.428	2023
J13	2000	31360-1M	FD 1/2" RB W/ 3" MC BC STAMPED T1S R6W S18 S17 S19 S20 RLS 36563 2004	885.346	2000
J13	2144	31363-1M	FD 1/2" RB W/ 2" MC AL CAP STAMPED "T1S R7W R6W 1/4 S13 S18 RLS 36563 2004"	911.229	2144
K13	2562	31340-1	FD 2" IP 0.2' DN W/ 2 1/2" GLO BC STAMPED "T1S R6W S19 S20 S30 S29 1914" NOTE- UNDER N-S FENCE LINE - FNC ENDS 2.5' TO THE NORTH - CAP FITS APS TIES 1980	864.477	2562
K13	2390	31342-1M	SET 9/16" SSTL ROD W/3" MC BC STAMPED "T1S R7W R6W S24 S19 S25 S30 RLS 36563 2004"	875.303	2390
K14	12148	31336-1	FD 2" IP 1' UP W/ 2 1/2" GLO BC STAMPED "T1S R6W S21 S22 S28 S27 1914"	853.012	12148
K14	2141	31339-1M	FD 1"IP 0.4'DN W/ NO ID NOTE- IP HAS 1/2" RB IN TOP/BENT/LOCATE BASE ORIGIN - REPLACED IP W/5/8"RB W/2" MC AL CAP STAMPED "T1S R6W S20 1/4 S29 RLS 36563 2004"	864.963	2141
K15	2565	31348-1M	FD 2" IP 1.6' DN W/ NO ID NOTE- NO CONC IN IP, SURFACED 2" PIPE W/ 5/8" RB W/ 2" MC AL CAP STAMPED "T1S R6W 1/4 S23 S24 RLS 36563 2004"	863.802	2565
K15	2830	31327-1M	FD 1/2" RB W/O ID FL NOTE- RB SITS AT INTERSEC OF NORTH SOUTH & EAST FNC LINES, REFURBISHED 1/2"RB W/2" MC AL CAP STAMPED "T1S R6W 1/4 S27 S26 RLS 36563 2004"	839.304	2830
L14	12238	31298-1	FD 3" IP 0.8' UP W/ 3 1/2" GLO BC STAMPED "T1S S32 S33 R6W S5 S4 T2S 1914"	874.704	12238
L14	2833	31319-1	FD 1" IP 1' UP W/ 2 1/2" GLO BC STAMPED "S29 1/4 S32 1914"	866.031	2833
L15	4651	31313-1M	FD 1/2" RB W/ 2" MC AL CAP STAMPED "T1S R6W S27 S26 S34 S35 RLS 36563 2004"	827.249	4651
L15	6665	31294-1	FD 3" IP 0.5' UP W/ 3 1/2" GLO BC STAMPED "T1S S34 S35 R6W S3 S2 T2S 1914"	822.157	6665

Each URL begins with* **http://www.fcd.maricopa.gov/maps/gismaps/apps/gdacs/application/reportsurvey.cfm?gdacsplsspts=

ERMs from the shapefile titled 'SurveyPointMisc_MCDOT'

This dataset resulted in the largest number of ERMs for the Centennial Wash FDS Study Area. WEST identified ERMs from this shapefile for thirty-five of the forty-nine panels shown in Figure 1 below, and sixty-three ERMs of the eighty-eight total ERMs shown in Figure 2 were identified from this shapefile within these thirty-five panels. Monuments from this shapefile make up both of the reference marks in twenty-eight of those thirty-five panels. Most of these monuments are brass or aluminum caps mounted in dirt but several are pipe filled with concrete or rebar with or without a plastic cap. A table of these points with their corresponding identification data is provided in Table 3 below.

Table 3. GDACS miscellaneous points used as ERM monuments

Panel Number	Selected ERM Survey Point Monument Number	Selected ERM Survey Point Monument Name	Description	Elevation (FT NAVD88)	URL*
A1	15220	74691-1	FD 2" IP 0.9' UP W/ 2 1/2" GLO BC STAMPED "T2N R10W S6 S5 S7 S8 1914"	1309.86	15220
A1	15223	74692-R2	FD 1 1/4" PIPE 0.5' UP W/ 3" MC HWY DEPT BC STAMPED "RP SEC COR 40 W"	1305.153	15223
B4	14559	27070-1	FD 2" IP 0.9' UP W/ 2 1/2" GLO BC STAMPED "T2N R9W S17 S18 S19 S20 1914"	1214.395	14559
B5	14555	27065-1	FD 1" IP 1.55' UP W/ 2 1/2" GLO BC STAMPED "1/4 S15 S22 1914" NOTE- IP IS ENCASED IN A CONC BLOCK	1176.526	14555
B5	14558	27068-1	FD 2" IP 0.3' UP W/ 2 1/2" GLO BC STAMPED "T2N R9W S16 S17 S20 S21 1914"	1197.503	14558
C3	14981	74834-1	FD 2" IP 0.7' UP W/ 2 1/2" GLO BC STAMPED "T2N R10W S27 S26 S34 S35 1914" NOTE: LEANING TO W; +/-15' W OF BARBED-WIRE FENCE; +/-30' W OF CL OF DIRT RD +/-15' WIDE	1256.648	14981
C3	14985	74837-1	FD 1" IP 0.8' UP W/ 2 1/2" GLO BC STAMPED "S25 1/4 S36 1914" NOTE: NEAR A PROPERTY CORNER PVC POLE	1211.969	14985
C4	14570	27090-1	FD 2" IP 0.6' DN W/ 2 1/2" GLO BC STAMPED "T2N R9W S19 S20 S29 S30 1914"	1197.893	14570
C4	14587	27112-1	FD 3" IP 0.45' DN W/ 3 1/2" GLO BC STAMPED "T2N R10W S25 S36 R9W S30 S31 1914"	1203.745	14587
C5	14566	27085-1	FD 1" IP 0.45' DN W/ 2 1/2" GLO BC STAMPED "1/4 S22 S27 1914"	1160.061	14566
C5	14583	27108-1	FD 2" IP 0.15' UP W/ 2 1/2" GLO BC STAMPED "T2N R9W S28 S29 S32 S33 1914"	1177.004	14583
C6	14578	27102-T1	FD CHIS X ON NW COR CONC WELL PAD	1133.237	14578
C6	14564	27082-1	FD 1/2" ROUND STL METAL ROD 0.45' DN W/ NO ID	1148.379	14564
D3	14957	74820-1	FD 1" IP 1.4' UP W/ 2 1/2" GLO BC STAMPED "S3 1/4 S2 1914" NOTE: +/-100' SW OF POWER LINE	1273.607	14957
D3	14977	74830-1	FD 1" IP 1.1' UP W/ 2 1/2" GLO BC STAMPED "S34 1/4 S35 1914" NOTE: E SIDE OF TRUCK TRAIL & NEXT TO A PROPERTY CORNER PVC PIPE	1260.128	14977

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Table 3. GDACS miscellaneous points used as ERM monuments (cont'd)

Panel Number	Selected ERM Survey Point Monument Number	Selected ERM Survey Point Monument Name	Description	Elevation (FT NAVD88)	URL*
D4	14423	27134-1	FD 1/2" RB W/ 1" PLAS CAP FL STAMPED "DON MILLER LS #15336"	1176.719	14423
D5	14591	27116-1	FD 1/2" RB W/ 1" PLAS CAP FL STAMPED "RLS 26404" NOTE-FD RB SET AT BASE OF TELEPHONE POLE FNC COR	1156.291	14591
D5	14425	27136-1	FD 1/2" RB W/ 1" PLAS CAP 0.4' UP STAMPED "MILLER LS #15336"	1150.791	14425
D6	14595	27122-1	FD 4" MC ENG DEPT BC IN HH 0.85' DN NO STAMPING	1120.285	14595
D6	14597	27124-1	FD 4" MC ENG DEPT BC IN HH 0.75' DN NO STAMPING	1138.519	14597
E4	14455	27170-1	FD 3" MARICOPA COUNTY DEPT OF TRANSPORTATION BC FL STAMPED "T1N R9W S7 S8 S17 S18"	1171.752	14455
E4	14439	27152-1	FD 3" IP 0.77' UP W/ 3 1/2" GLO BC STAMPED "T1N R9W S6 S7 R10W S1 S12 1914 1998"	1196.644	14439
E5	14433	27146-1	FD 3" MARICOPA COUNTY HIGHWAY DEPT BC IN HH 0.55' DN NO STAMPING	1146.736	14433
E5	14435	27148-1	FD 2" IP 0.63' UP W/ 2 1/2" GLO BC STAMPED "T1N R9W S4 S5 S8 S9 1914"	1158.495	14435
E6	14431	27144-1	FD 2 1/2" MARICOPA COUNTY HIGHWAY DEPT BC IN HH 1' DN NO STAMPING	1131.27	14431
E6	14451	27164-1	FD 2 1/2" GLO BC IN HH 0.65' DN STAMPED "T1N R9W S10 S11 S14 S15"	1123.687	14451
E7	14901	74872-1	FD 1/2" RB W/ 2 1/2" A.C. IN HH 0.1' DN STAMPED "T1N R8W S6 1/4 S7 2007 RLS 33861" NOTE: N EDGE OF DIRT RD	1106.219	14901
E7	14894	74864-1	FD 2" IP 0.2' DN W/ 2 1/2" GLO BC STAMPED "T1N R8W S7 S8 S18 S17 19__" NOTE: MONUMENT BENT TO N; SHOT TAKEN AT S SIDE .45' DN FROM TOP EDGE OF CAP	1102.412	14894
F5	14469	27187-1	FD 3" MARICOPA COUNTY DEPT OF TRANSPORTATION BC IN HH 0.5' DN STAMPED "T1N R9W 1/4 S16 S21 LS 26411"	1133.499	14469
F6	14466	27184-1	FD 4" MARICOPA COUNTY ENGINEERING DEPT BC IN HH 0.34' DN NO STAMPING	1109.579	14466
F6	14460	27178-1	FD 1/2" RB W/ 2 1/2" AL CAP 0.36' DN STAMPED "T1N R9W 1/4 COR S13 S14 RLS 23371"	1101.36	14460

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Table 3. GDACS miscellaneous points used as ERM monuments (cont'd)

Panel Number	Selected ERM Survey Point Monument Number	Selected ERM Survey Point Monument Name	Description	Elevation (FT NAVD88)	URL*
F7	14462	27180-1	FD 3" IP 0.8' DN W/ 3 1/2" GLO BC STAMPED "T1N R9W S13 S24 R8W S18 S19 1914"	1095.014	14462
F7	14889	74856-1	FD 1" IP 0.3' UP W/ 2 1/2" GLO BC STAMPED "1/4 S19 S20 1914" NOTE: MONUMENT MISALIGNED; N OF GATEPOST AT S-END OF N-S GATE; AT E-END OF E-W GATE	1089.146	14889
G6	14494	27224-1	FD 4" MARICOPA COUNTY ENGINEERING DEPT BC IN HH 0.6' DN NO STAMPING	1115.367	14494
G6	14480	27201-1	FD 1/2" RB W/ 2 1/2" AL CAP 0.1' DN STAMPED "T1N R9W 1/4 COR S24 S25 RLS 23371"	1092.14	14480
G7	14492	27220-1	FD 2 1/2" IP 0.4' DN W/ 3" GLO BC STAMPED "T1N R8W S30 S31 R9W S25 S36 1914"	1080.813	14492
G7	14888	74854-1	FD 2" IP 0.5' UP W/ 2 1/2" GLO BC STAMPED "T1N R8W S19 S20 S30 S29 1914" NOTE: .5' E OF FENCE CORNER IRON POST 4.5" IN DIAMETER	1072.451	14888
H7	14676	75004-1	FD 1/2" RB W/ 1" PLAS CAP 0.35' DN STAMPED "RLS 33861" NOTE: +/- 13 FT S OF CL OF DOBBINS RD AND W OF 507TH AVE	1081.592	14676
H7	15760	74926-1	FD 1/2" RB W/ 1" PLAS CAP 0.65' DN STAMPED "RLS 33861" NOTE: +/- 20 FT S OF CL OF BASELINE RD AND +/- 8 FT W OF CL OF 491ST AVE	1059.092	15760
H8	15758	74923-1	FD 2" IP 1.2' UP W/ 2 1/2" GLO BC STAMPED "T1N R8W S32 S33 C C S5 S4 1914" NOTE: POINT LIES +/- 10.6 FT W OF BARBED-WIRE FENCE	1062.224	15758
H8	15759	74924-1	FD 3" IP 0.3' UP W/ 3 1/2" GLO BC STAMPED "S C T1N R8W S32 S33 1914" NOTE: PIPE BROKEN 1.0' BELOW GROUND SURFACE; POINT LIES +/- 19 FT S OF CL OF BASELINE RD	1059.767	15759
I7	15748	74910-1	FD 2" IP 1.6' UP W/ 2 1/2" GLO BC STAMPED "T1S R8W S7 S8 S18 S17 1914" NOTE: POINT LIES +/- 0.5 FT S OF BARBED-WIRE FENCE	1075.339	15748
I7	14634	74958-1	FD 2" IP 0.7' UP W/ 2 1/2" GLO BC STAMPED "T1S R9W S18 S17 S19 S20 1914" NOTE: +/- 15.5 FT N OF CL OF DIRT ROAD	1113.656	14634

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Table 3. GDACS miscellaneous points used as ERM monuments (cont'd)

Panel Number	Selected ERM Survey Point Monument Number	Selected ERM Survey Point Monument Name	Description	Elevation (FT NAVD88)	URL*
I8	15746	74908-W1	FD 2" IP FL W/ 2 1/2" GLO BC STAMPED "WC T1S R8W S8 S9 S17 S16 1914" NOTE: POINT LIES +/- 0.6 FT S OF E-W BARBED-WIRE FENCE	1044.446	15746
I8	15755	74917-1	FD 2" IP 1.1' UP W/ 2 1/2" GLO BC STAMPED "T1S R8W S5 S4 S8 S9 1914" NOTE: POINT LIES +/- 19 FT S OF CL OF DOBBINS RD.	1056.631	15755
J8	15739	74902-1	FD 1/2" RB W/ 1" PLAS CAP 0.1' DN STAMPED "SPRINGER RLS 34399" NOTE: POINT LIES +/- 9 FT S OF CL DIRT RD	1023.438	15739
J9	15740	74903-1	FD 1" IP 0.1' UP W/ 1" PLAS CAP STAMPED "LOFTIS 26404" NOTE: POINT LIES +/- 5.4 FT W OF BARBED-WIRE FENCE	1001.986	15740
J9	15741	74904-1	FD 5/8" RB W/ NO ID 0.35' UP NOTE: +/- 25 FT S AND +/- 25 FT E OF WOOD POWER POLE E OF ROAD	986.124	15741
J10	14913	75719-1	FD 2" IP 0.6' UP W/ 2 1/2" GLO BC STAMPED "T1S R7W S18 S17 S19 S20 1914" NOTE: S SLOPE OF HILL +/- 400' NW OF EXISTING HOUSE	980.753	14913
J10	14914	75720-1	FD 3" IP W/ NO ID 1.4' DN NOTE: PIPE CONCRETE-FILLED; TOP DEGRADED; N SIDE OF DIRT RD INTERSECTIONS	958.563	14914
J11	14934	75734-1	FD 1" IP 1' UP W/ 2 1/2" GLO BC STAMPED "1/4 S17 S18 1914"	1166.142	14934
J12	14909	75715-1	FD 2" IP 0.8' UP W/ 2 1/2" GLO BC STAMPED "T1S R7W S14 S13 S23 S24 1914" NOTE: BC ROTATED; .2' N OF 1' DIAMETER WOOD FENCE POST	906.559	14909
J12	14946	75743-1	FD 1" IP 1.2' UP W/ 2 1/2" GLO BC STAMPED "1/4 S17 S16 1914"	920.647	14946
K11	14904	75711-1	FD 2" IP 0.9' UP W/ 2 1/2" GLO BC STAMPED "T1S R7W S20 S21 S29 S28 1914" NOTE: E SLOPE OF LOW RISE	939.338	14904
K11	14906	75712-T2	FD 1/2" RB W/ 1 1/2" A.C. FL NO STAMPING NOTE: SSE CORNER OF DIRT RD T-INTERSECTION +/-40' S OF CL OF E-W DIRT RD +/-10' WIDE	922.155	14906
K12	14908	75714-1	FD 2" IP FL W/ 2 1/2" GLO BC STAMPED "T1S R7W S23 S24 S26 S25 1914" NOTE: .6' S OF CONCRETE POST LABELED "EPNG"; +/- 140' S OF NW-SE DIRT RD	887.618	14908

Each URL begins with* **http://www.fcd.maricopa.gov/maps/gismaps/apps/gdacs/application/reportsurvey.cfm?gdacsmiscpts=

Table 3. GDACS miscellaneous points used as ERM monuments (cont'd)

Panel Number	Selected ERM Survey Point Monument Number	Selected ERM Survey Point Monument Name	Description	Elevation (FT NAVD88)	URL*
K12	14907	75713-1	FD 2" IP 1' DN W/ 2 1/2" GLO BC STAMPED "T1S R7W S22 S23 S27 S26 1914" NOTE: S OF OLD FENCE WOOD POST; +/-18' W OF CL OF DIRT RD	902.076	14907
M16	15655	75568-1	FD 2 1/2" STEEL PIPE 0.1' UP W/ 3 1/4" BLM BC STAMPED "1/4 S1 1955" NOTE: IN OLD TREE FARM	796.389	15655
M16	15654	75567-1	FD 2 1/2" STEEL PIPE 0.7' UP W/ 3 1/4" BLM BC STAMPED "1/4 S12 1955" NOTE: PIPE LEANING; SHOT AT SE EDGE OF CAP AT HEEL OF THE LETTER E	802.353	15654
M17	15643	75550-1	FD 5/8" RB W/ 3 1/4" A.C. 0.2' DN STAMPED "36562" NOTE: +/- 5' N OF CL OF DESERT ROSE RD	780.563	15643
M17	15632	75535-1	FD 1/2" RB W/ NO ID 0.2' DN NOTE: AT CL OF E-W DIRT RD NEAR W SIDE ALIGNMENT OF N-S DIRT RD	770.062	15632
N16	15628	75527-1	FD 2 1/2" STEEL PIPE 0.7' UP W/ 3 1/4" BLM BC STAMPED "R6W R5W S13 S18 S19 1955" NOTE: +/-45' S OF PROPERTY FENCE	833.252	15628
N17	15623	75520-1	FD 2 1/2" STEEL PIPE 0.6' UP W/ 3 1/4" BLM BC STAMPED "BLM T2S R5W S16 S15 S21 S22 1958" NOTE: +/- 750' W OF DIRT RD AT E EDGE OF HEAVY VEGETATION	763.429	15623

Each URL begins with* **http://www.fcd.maricopa.gov/maps/gismaps/apps/gdacs/application/reportsurvey.cfm?gdacsmiscpts=

SUMMARY OF THE FINAL ERM MONUMENTS

WEST identified two monuments for forty-three of forty-nine panels as shown in Figure 2. Two panels contain only one monument identified by WEST, and four panels contain no monuments. Therefore, for forty-nine panels, we have eighty-eight (88) ERMs in the final ERM dataset. In thirty-six of the panels, both monuments are from the same source, but there are thirteen panels where the sources are not the same or fewer than two ERMs were available per panel. In Figure 1, panels shown with striped colors correspond to the panels that have either two ERM monuments from different sources or only one ERM monument. The solid yellow panels contained no acceptable ERM monuments in terms of accuracy. The monuments selected were chosen based on the source of the monument information and quality of the monument while considering the spatial locations of the available monuments within the panel as well (i.e., WEST attempted to choose points on opposite sides of the panel when possible).

Of all of the panels, only Panels J8, J11, and L16 include a monument or monuments of the highest quality as defined by the District, NGS monuments with an 'A' stability rating. Four 'A' rated NGS monuments were identified for these three panels. Six more panels include an NGS monument with a stability rating of 'B' (four panels, one ERM per panel) or 'C' (two panels, one ERM per panel). Therefore, ten ERM monuments of the total eighty-eight were selected from the NGS dataset for nine separate panels. Monuments from this shapefile make up both of the reference marks in one of those nine panels.

GDACS monuments make up the remainder of ERMs chosen for this study outside of the NGS points. ERMs were selected from GDACS points for forty-three of the forty-nine panels shown in Figure 1 below. ERMs taken from the GDACS datasets make up both of the reference marks in thirty-five of those forty-three panels.

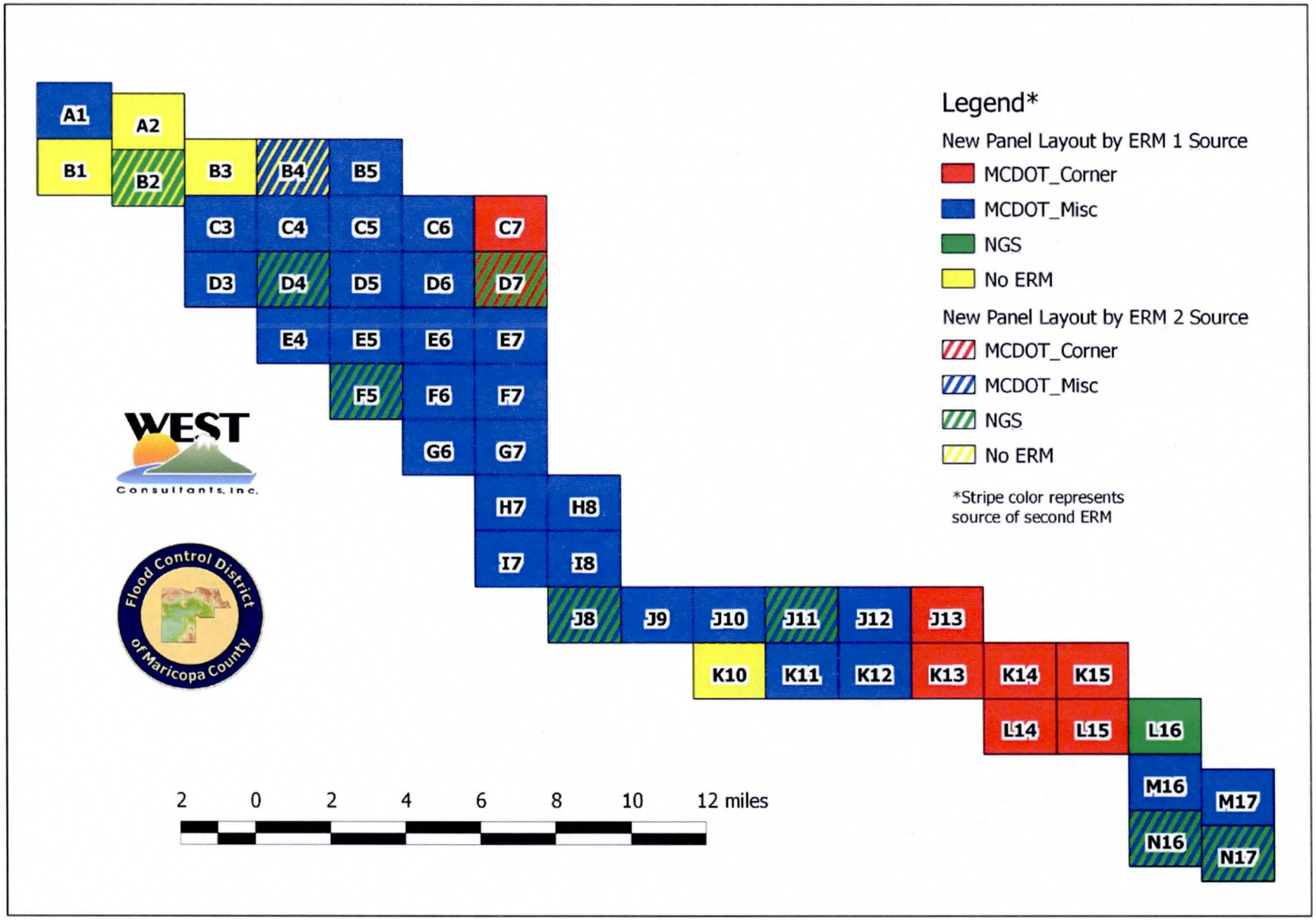

Figure 1. Draft Panel Layout from WEST and the Final Source of the ERM Points for Each Panel

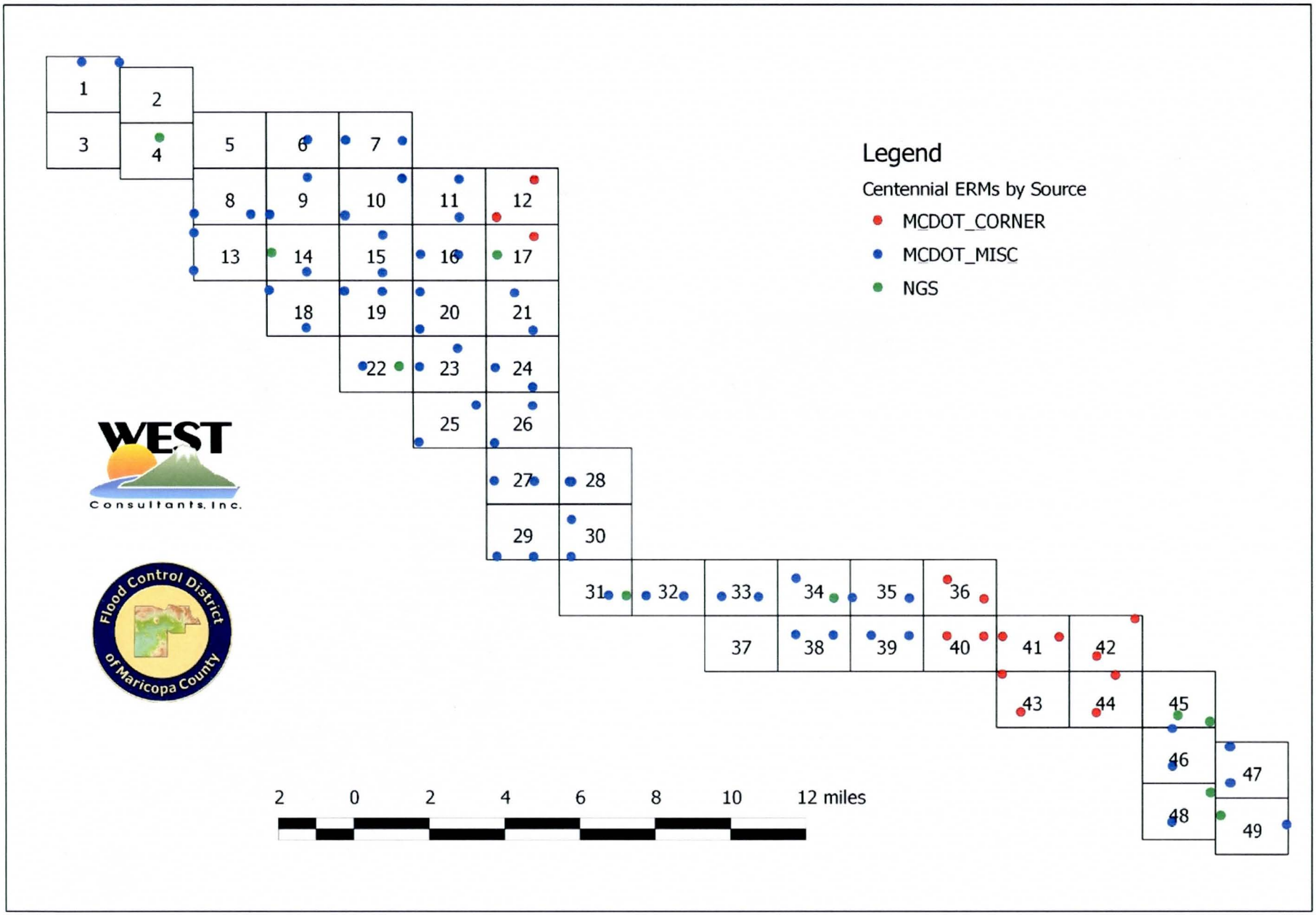

Figure 2. Draft Panel Layout from WEST and the Final locations of the ERM Points for Each Panel

Appendix D: Hydrologic Analysis Supporting Documentation

D.1 Precipitation Data

Appendix D: Hydrologic Analysis Supporting Documentation

D.2 Physical Parameter Calculations

Appendix D: Hydrologic Analysis Supporting Documentation

D.3 Hydrograph Routing Data

Appendix D: Hydrologic Analysis Supporting Documentation

D.4 Reservoir Routing Data

Appendix D: Hydrologic Analysis Supporting Documentation

D.5 Flow Splits and Diversions Data

Appendix D: Hydrologic Analysis Supporting Documentation

D.6 Hydrologic Calculations

HYDROLOGY REPORT
CENTENNIAL WASH WATERSHED

JN 45104562

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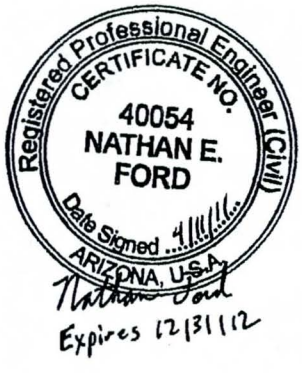
April 8, 2011



Section 4: Hydrology

4.1 Method Description

The Flood Insurance Study (FIS) of the Centennial Wash in Maricopa County was completed in January 1989 by Cella Barr Associates for the Federal Emergency Management Agency (FEMA). Peak flows for the 100-year storm were computed at specific locations along the Centennial Wash. Peak flows were computed using the U.S. Army Corps of Engineers Flood Hydrograph Package HEC-1 with Soil Conservation Service (SCS) Curve Number.

The purpose of the hydrologic analysis is to provide updated peak flow data for the floodplain delineation of Centennial Wash. The updated peak flow data was estimated by statistical methods. The United States Geological Survey (USGS) PeakFQ computer program was used to compute the statistical results following procedures outlined in Water Resources Council Bulletin 17B. Comparisons to the USGS Regional Regression Equations were also performed.

4.2 Parameter Estimation

Statistical analyses of USGS and Flood Control District of Maricopa County (FCDMC) gage flow data was performed for two locations on Centennial Wash near the project site. The gages analyzed were Centennial Wash at Southern Pacific Railroad Bridge near Arlington, AZ (USGS 09517490 and FCDMC 5103) and Centennial Wash near Arlington (USGS 09517500). Refer to Figure 1 which shows the locations of these gages in the Centennial Wash watershed.

The statistical analyses were performed using PeakFQ with the weighted skew of the station and generalized skew. The statistical analyses were performed using two different generalized skew coefficients. The first generalized skew coefficient was obtained from Bulletin 17B. The generalized skew used for the calculations was -0.054 or -0.058 and the generalized skew MSE was 0.303 for all scenarios. The second generalized skew coefficient was set to zero and used a MSE of 0.31 from Water Supply Paper 2433. Annual peak flow data were obtained from the *Statistical Summaries of Streamflow Data and Characteristics of Drainage Basins for Selected Streamflow-Gaging Stations in Arizona Through Water Year 1996* (Water Resources Investigations Report 98-4225), David Creighton's Cella Barr Report Review Comments, USGS website, and FCDMC website. The complete data sets and PeakFQ output are found in the appendix.

Centennial Wash at Southern Pacific Railroad Bridge near Arlington, AZ (USGS 09517490 and FCD 5103)

This gage is located in the Centennial Wash on the downstream side of the Southern Pacific Railroad Bridge in Section 28 of Township 1 South Range 6

West. The drainage area at this location is approximately 1,817 square miles. The USGS operated a gage at this location from May 15, 1980 to September 30, 1985. This gage was discontinued and reestablished February 15, 1990. The FCDMC installed a gage at this location on February 9, 1990. Both the USGS and FCDMC gage flow data were analyzed. The flow data differs between the two sources. Refer to Figure 2 which shows a comparison between the two data sets.

Centennial Wash near Arlington, AZ (USGS 09517500)

This gage was located in the Centennial Wash on the upstream side of the former U.S. Highway 80 near the confluence of the Gila River in Section 7 of Township 2 South Range 5 West. The drainage area at this location is approximately 1,870 square miles. The USGS operated this gage from January 1961 to September 1979. The data from this gage has a peak stream flow qualification code of six, which means discharge is affected by regulation or diversion. The flow is regulated by several small retention dams in the upper end of basin. This gage data was used because the same remark was included on FCD 5103 so the watershed characteristics are the same for the two gages.

Data Analyses

The data were analyzed in several different ways to evaluate the impact on the 100-year peak flow.

Scenario 1 used the data from the FCDMC website for FCD 5103. This included 21 annual peak flow values from February 9, 1990 through September 30, 2010. Four of the annual peak flow values were zero because no flow events were measured during the respective water year. If a date was not given for the zero flow event, the date was assumed to be the given water year.

Scenario 2 used data from the USGS website for USGS 09517490. This included 23 annual peak flow values. The data were from water years 1981-1984 and 1990-2009. There were flow values for each year during this period.

Scenario 3 includes the same data as Scenario 2 plus additional flow data from David Creighton's review of the gage data in his review comments of the Cella Barr HEC-1 model. These included water year 1980. This scenario includes a total of 24 annual peak flow values.

Scenario 4 used data from the USGS website for USGS 09517500. This included 19 annual peak flow values. The data were from water years 1961-1979. Three of the annual peak flow values were zero because no flow events were recorded during some water years.

Scenario 5 is the combination of data from Scenario 3 and 4. This scenario analyzes data from two different gage locations. However, according to the existing effective FIS prepared by Cella Barr in 1989 the 100-year peak discharge is the same at these two locations. When these data are combined, they include 43 annual peak flow values with three years having a zero flow value.

Scenario 6 is the combination of data from Scenario 1 and Scenario 4. When these data are combined, they include 40 annual peak flow values with seven years having a zero flow value.

Scenario 7 is the combination of data from Scenario 6 plus data from water years 1980-1984 from USGS 09517490 as reported in David Creighton's Review Comments. When these data are combined, they include 45 annual peak flow values with seven years of zero flow values.

Scenario 8 is the combination of data from Scenario 3 and 4 and is similar to Scenario 5. This scenario analyzes data from two different gage locations. The gage data at the railroad tracks was adjusted using the drainage area ratio (Equation 2) from the USGS Water-Supply Paper 2433. When these data are combined, they include 43 annual peak flow values with three years having a zero flow value.

Scenario 9 is the combination of data from Scenario 1 and Scenario 4 and is similar to Scenario 6. The gage data at the railroad tracks was adjusted using the drainage area ratio (Equation 2) from the USGS Water-Supply Paper 2433. When these data are combined, they include 40 annual peak flow values with seven years having a zero flow value.

Scenario 10 is the combination of data from Scenario 6 plus data from water years 1980-1984 from USGS 09517490 as reported in David Creighton's Review Comments. This scenario is similar to Scenario 7. The gage data at the railroad tracks was adjusted using the drainage area ratio (Equation 2) from the USGS Water-Supply Paper 2433. When these data are combined, they include 45 annual peak flow values with seven years of zero flow values.

The results of these ten scenarios are shown in Table 1.

Table 1 100-Year Peak Flow Comparison Between PeakFQ and FIS

Scenario	Generalized Skew from Bulletin 17B MSE = 0.303			Generalized Skew = 0 MSE = 0.31			FIS 100-Year Peak Flow (cfs)	Drainage Area at Gage Location
	PeakFQ 100-Year Peak Flow (cfs)	68-Pct Lower Limit	68-Pct Upper Limit	PeakFQ 100-Year Peak Flow (cfs)	68-Pct Lower Limit	68-Pct Upper Limit		
1	28,320	20,950	39,820	29,180	21,550	41,110	67,300	1,817
2	29,440	21,970	40,950	30,260	22,550	42,160	67,300	1,817
3	28,610	21,470	39,520	29,380	22,010	40,660	67,300	1,817
4	39,880	30,830	53,510	40,940	31,600	55,030	67,300	1,870
5	39,400	31,640	50,010	40,210	32,270	51,090	67,300	Varies
6	34,000	27,540	42,780	34,720	28,100	43,730	67,300	Varies
7	43,470	34,830	55,310	44,400	35,550	56,540	67,300	Varies
8	39,420	31,680	50,020	40,300	32,360	51,190	67,300	1,870
9	34,040	27,590	42,820	34,840	28,200	43,870	67,300	1,870
10	43,570	34,930	55,410	44,590	35,710	56,760	67,300	1,870

4.3 Problems Encountered During the Study

No problems were encountered.

4.4 Calibration

The PeakFQ results were compared to the USGS regional regression equations. Two USGS regional regression equations were compared. The first is the regional regression equation for Region 2 developed by R. H. Roeske and published September 1978 in *Methods for Estimating the Magnitude and Frequency of Floods in Arizona*. This equation was superseded by the USGS Water Supply Paper 2433 Region 13 regional regression equation developed by Blakemore Thomas, H.W. Hjalmarson, and S.D. Waltemeyer. A comparison between these regional regression equations and the FIS peak flowrate are shown in Table 2.

Region 2 $Q_{100} = 1{,}100A^{0.499}$

Region 13 $Q_{100} = 10^{(5.52 - 2.42AREA-0.12)}$

Table 2 100-Year Peak Flow Comparison Between Equations and FIS

Location Along Centennial Wash	Area (Mi^2)	Roeske Region 2 100-Year (cfs)	Roeske Region 2 Standard Error of Estimate %	Thomas Region 13 100-Year (cfs)	Thomas Region 13 Standard Error of Estimate %	FIS (cfs)
At Centennial Levee Reach 2	1109.7	36,387	83	29,974	48	52,300
Near Baseline Road	1398.1	40,833	83	32,009	48	58,100
At Railroad Bridge near Arlington	1824.5	46,634	83	34,449	48	67,300
At Confluence with Gila River	1870.3	47,215	83	34,681	48	67,300

4.5 Final Results

The results of the PeakFQ analysis and Regression Equations are lower than the FIS flows. According to the USGS Water Supply Paper 2433 weighted estimates provide the best estimate of flood frequency at gaged sites and help reduce the time sampling error of non-representative flood data due to a limited length of record. The weighting procedure uses both the gage analysis and regional regression results as shown in the following equation:

$$Q_{T(W)} = (Q_{T(s)}N + Q_{T(r)}E) / (N+ E)$$

$Q_{T(W)}$ = weighted discharge (cfs), per T-year recurrence interval
$Q_{T(s)}$ = station value of discharge (cfs), for T-year recurrence interval
$Q_{T(r)}$ = regression value of discharge (cfs), for T-year recurrence interval
N = number of years of station data used to compute $Q_{T(s)}$
E = equivalent years of record for $Q_{T(r)}$

Scenario 10 provides the most years of flow data so it was used for the weighted estimate. The peak flow using the generalized skew set to zero and a MSE = 0.31 was used for the weighted average. The current regional regression equation developed by Thomas et. al. was also used to calculate the weighted estimate. There were 45 years of records for the gage analysis and 16.1 years of records for the USGS Regional Regression Equations. The 100-year peak flow at the confluence of the Gila River using the weighted average is 41,979 cfs.

According to the USGS Water Supply Paper 2433 locations near gages sites on the same stream can be estimated using a ratio of drainage for the ungaged and gage location according to the following equation:

$$Q_{T(U)} = Q_{T(g)}(A_U/A_g)^X$$

$Q_{T(U)}$ = peak discharge (cfs), at ungaged site for T-year recurrence interval
$Q_{T(g)}$ = weighted peak discharge (cfs), at gaged site for T-year recurrence interval
A_U = drainage area, in square miles at ungaged site
A_g = drainage area, in square miles at gaged site
X = exponent for each flood region

Table 3 Weighted 100-Year Peak Flow

Location Along Centennial Wash	Area (Mi^2)	Weighted 100-Year (cfs)	FIS (cfs)
At Centennial Levee Reach 2	1109.7	32,335	52,300
Near Baseline Road	1398.1	36,295	58,100
At Railroad Bridge near Arlington	1824.5	41,462	67,300
At Confluence with Gila River	1870.3	41,979	67,300

The USGS regional regression equations for Arizona are currently being updated by the USGS. FCDMC staff recommended using the statistical results instead of the weighted results combining with the USGS regional regression equations because the results of the statistical analysis more closely match the preliminary analysis performed by the USGS for the Centennial Wash watershed.

Table 4 Recommended 100-Year Peak Flow

Location Along Centennial Wash	Area (Mi^2)	100-Year (cfs)	FIS (cfs)
At Centennial Levee Reach 2	1109.7	34,347	52,300
Near Baseline Road	1398.1	38,552	58,100
At Railroad Bridge near Arlington	1824.5	44,041	67,300
At Confluence with Gila River	1870.3	44,590	67,300

References

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Mason, Robert R. Jr., King, Jeffrey N, and Thomas, Wilbert O. Jr. (1999). "National Flood-Frequency Program – Methods for Estimating Flood Magnitude and Frequency in Rural Areas In Arizona" U.S. Geological Survey Fact Sheet 111-98.

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Pope G.L., Rigas P.D., and Smith C. F. (1998), "Statistical Summaries of Streamflow Data and Characteristics of Drainage Basins for Selected Streamflow-Gaging Stations in Arizona Through Water Year 1996" U.S. Geological Survey Water Resources Investigations Report 98-4225.

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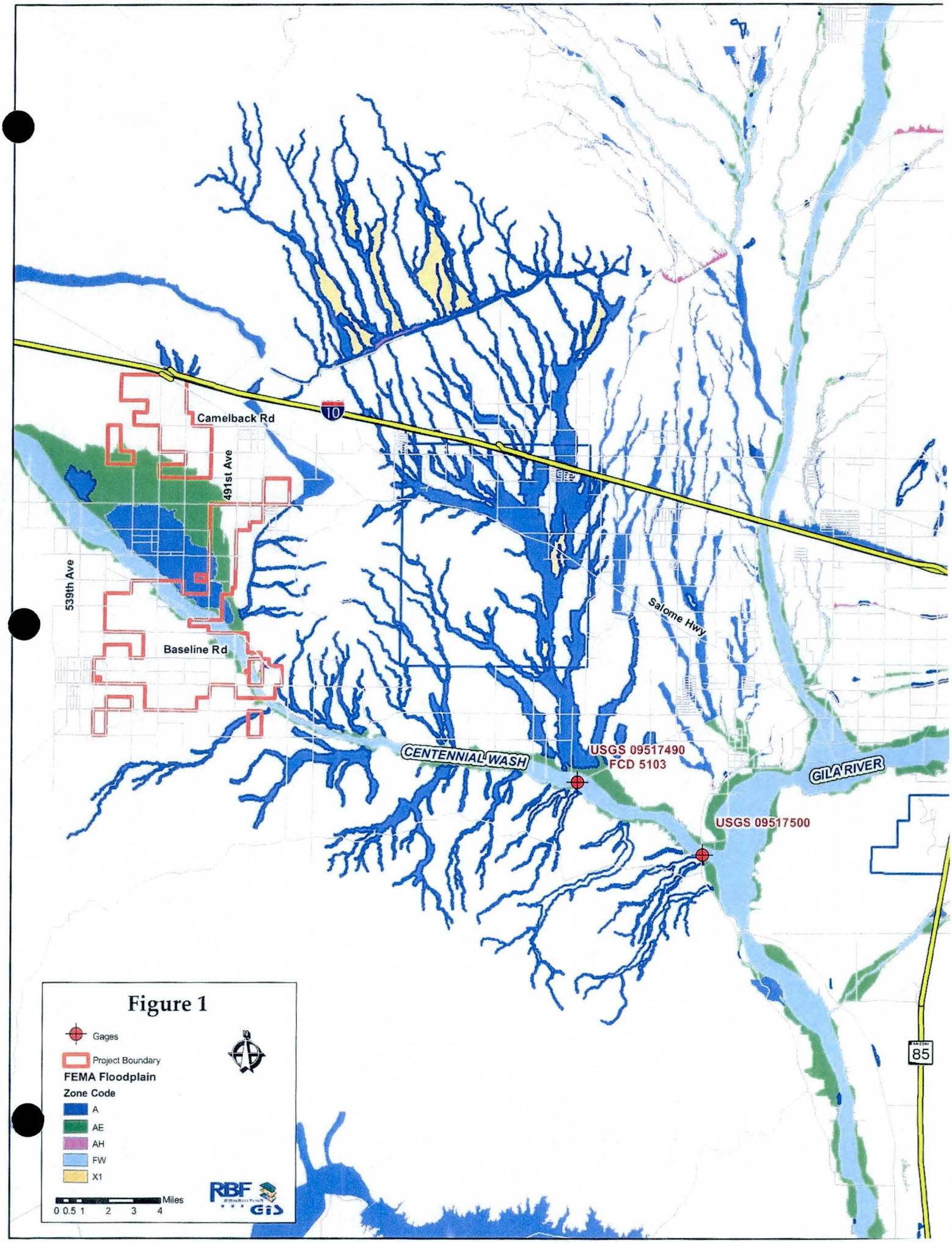
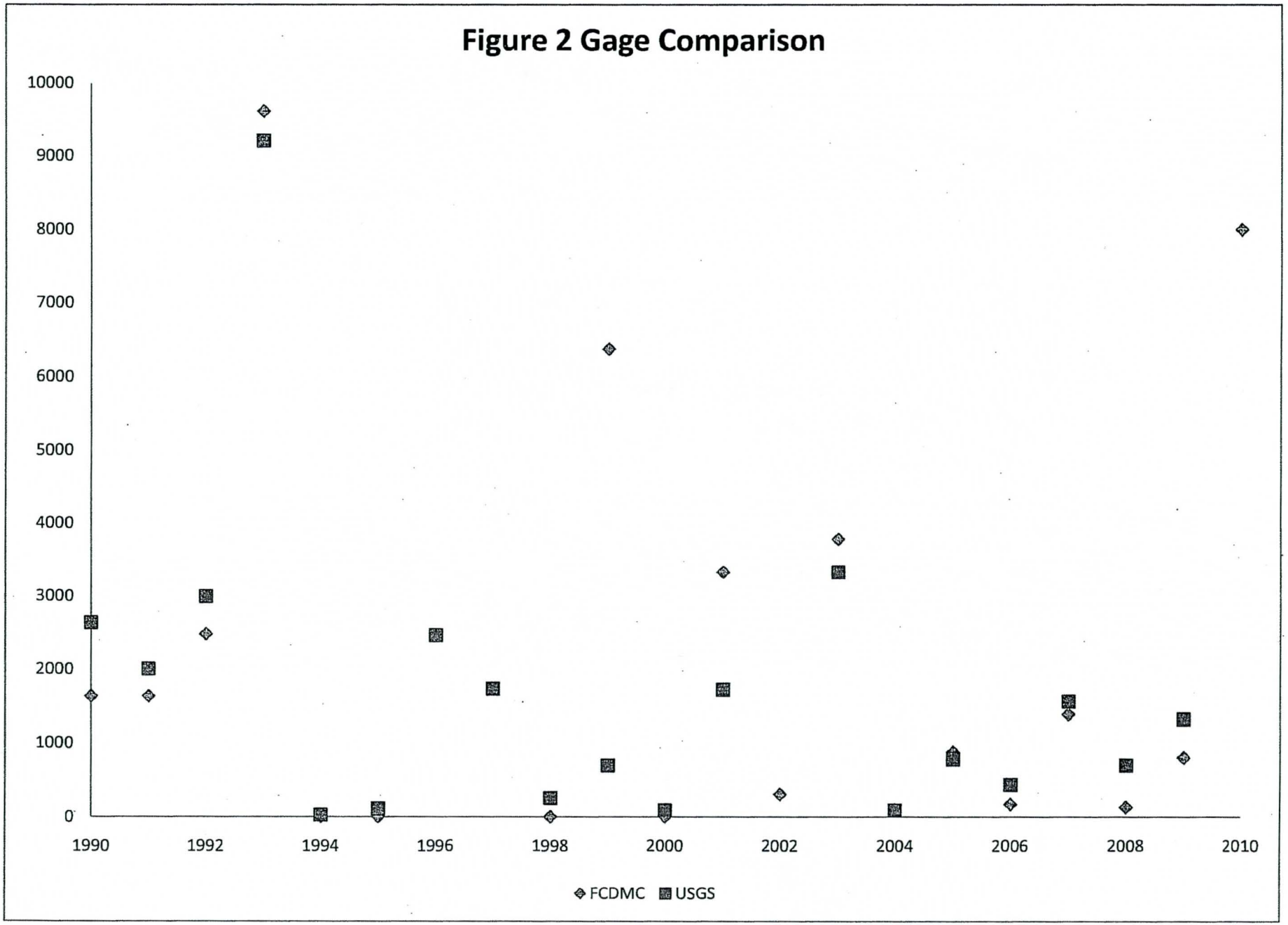

Camelback Rd
10
491st Ave
539th Ave
Baseline Rd
Salome Hwy
CENTENNIAL WASH
USGS 09517490
FCD 5103
GILA RIVER
USGS 09517500
85
Figure 1
Gages
Project Boundary
FEMA Floodplain
Zone Code
A
AE
AH
FW
X1
Miles
0 0.5 1 2 3 4
RBF
GIS

Figure 2 Gage Comparison



CENTENNIAL WASH FLOODPLAIN DELINEATION STUDY
GILA RIVER TO LA PAZ COUNTY

CONTRACT FCD 2012C004

DRAFT HYDROGRAPHS TECHNICAL MEMORANDUM

Date: November 5, 2012

To: Jeff Shelton, Project Manager – FCDMC

From: Brian Wahlin, Project Manager – WEST Consultants, Inc.
Chuck Davis – WEST Consultants, Inc.
Suzie Monk – WEST Consultants, Inc.

The purpose of this technical memorandum is to outline the development of hydrographs for several locations along Centennial Wash using the updated 1-percent annual chance discharge developed by RBF Consulting in 2011 (RBF Consulting, 2011). These hydrographs will be used in an unsteady HEC-RAS model.

The hydrographs were determined for four locations along Centennial Wash, shown below in Figure 1. The hydrograph distribution was determined by an existing HEC-1 model developed by Cella Barr (Cella Barr Associates, 1988) for the effective model. These hydrograph was scaled to reflect the updated peak flow using linear scaling at each location.

The steps utilized to determine the hydrographs are outlined below:

1) Run HEC-1 model developed by Cella Barr to obtain hydrograph distributions.
2) Determine which concentration points from the HEC-1 model coincide with the locations from the FIS and RBF report where peak flows are reported.
3) Scale hydrographs to reflect the updated peak flows.

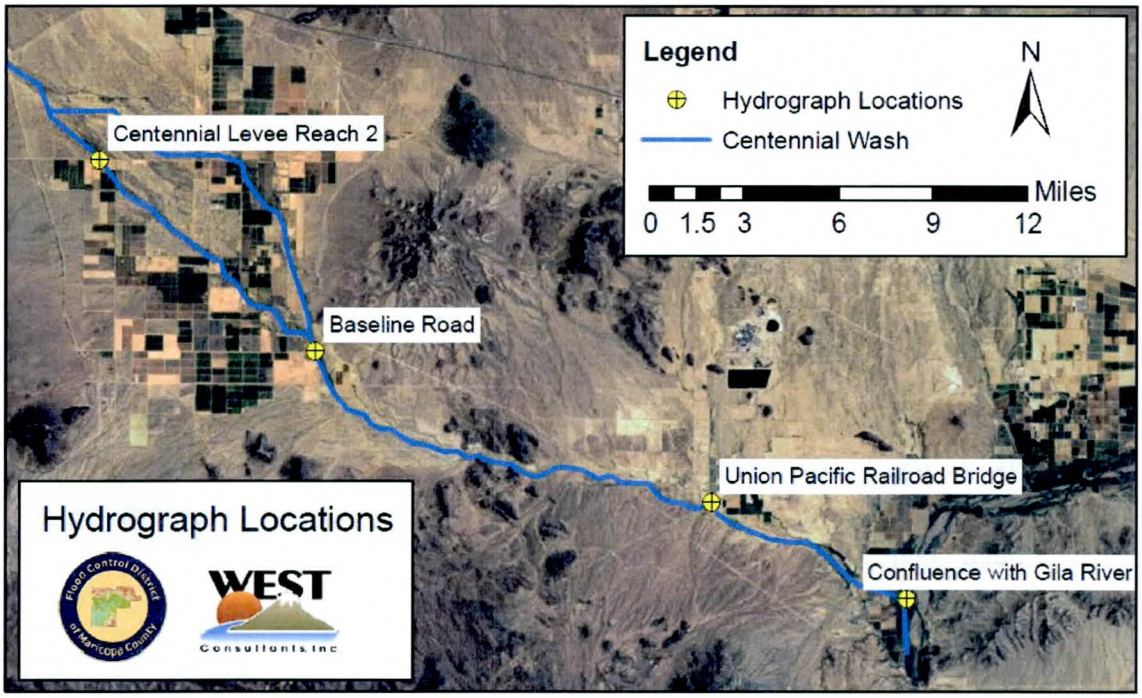


Figure 1. Hydrograph locations along Centennial Wash

Task 1: Run HEC-1 model developed by Cella Barr to obtain hydrograph distributions.

The purpose of this task was to obtain hydrographs along Centennial Wash from the HEC-1 model that was developed by Cella Barr. Peak flows and other output from the HEC-1 model were presented in the report by Cella Barr, but the hydrographs were not. The HEC-1 model data file was run in order to obtain these hydrographs. Some minor corrections had to be made to the original data file to get the model to run. The errors could have been due to an older version of HEC-1 used for this project compared to the version of HEC-1 used herein to rerun the model (although this does not seem to be an issue as the flows regenerated in the HEC-1 model herein were identical to the original modeling results), or the errors could have been due to transcription errors if the data file was transcribed directly from hard copies of the appendix of the report by Cella Barr. Because some values were changed in the electronic HEC-1 input file provided to WEST, the output file was compared to the output presented in the Cella Barr report to ensure that the results were the same. By the end of this task, hydrographs at each subbasin, concentration point, and routed reach along Centennial Wash were obtained.

Task 2: Determine which concentration points from the HEC-1 model coincide with the locations from the FIS and RBF report where peak flows are reported.

The purpose of this step was to determine which hydrographs from the HEC-1 model corresponded to the reported peak values in the Cella Barr hydrology report and FIS. After comparing the values in the Cella Barr HEC-1 model results, the Cella Barr hydrology report, and the FIS, it looked like the most reliable parameter to be compared between the three sources was the basin area. So the basin area was used to determine which concentration point in the HEC-1 model corresponded to locations reported in the FIS. Looking primarily at cumulative basin areas and verifying the location was correct by comparing the peak flows reported in the Cella Barr report with the peak flows from the HEC-1 model output, it was found that the Centennial Levee Reach 2 from the Cella Barr report corresponded to concentration point 19 routed through reach 14 (HEC-1 station 14) in the HEC-1 model, the Gin Road site reported in the FIS, and the Centennial Road/Courthouse Road site in the hydrology report by RBF. The site at Baseline Road corresponded to concentration point 22 routed through reach 17 (HEC-1 station 17). The railroad bridge site corresponded to concentration point 25 routed through reach 20 (HEC-1 station 20). The confluence with the Gila River location corresponded to concentration point 26 (HEC-1 station 26). A schematic of the basin logic used in the HEC-1 model is shown in Figure 2. These four locations corresponded directly to locations for which peak flows were reported in the RBF report. A comparison of the basin areas and 100-year peak flows are shown below in Table 1.

Table 1. 1-percent annual chance flows at each location

		Peak 100-yr Flow			
Location	Area (mi^2)	HEC-1 Model (cfs)	FIS (cfs)	RBF (cfs)	Reduction in Peak Flow (%)
Centennial Road / Courthouse Road	1110	52,156	52,200	34,347	34.2
Near Baseline Road	1398	58,075	58,100	38,552	33.6
Union Pacific Railroad Bridge	1825	67,246	67,300	44,041	34.6
Confluence with Gila River	1870	67,281	67,300	44,590	33.7

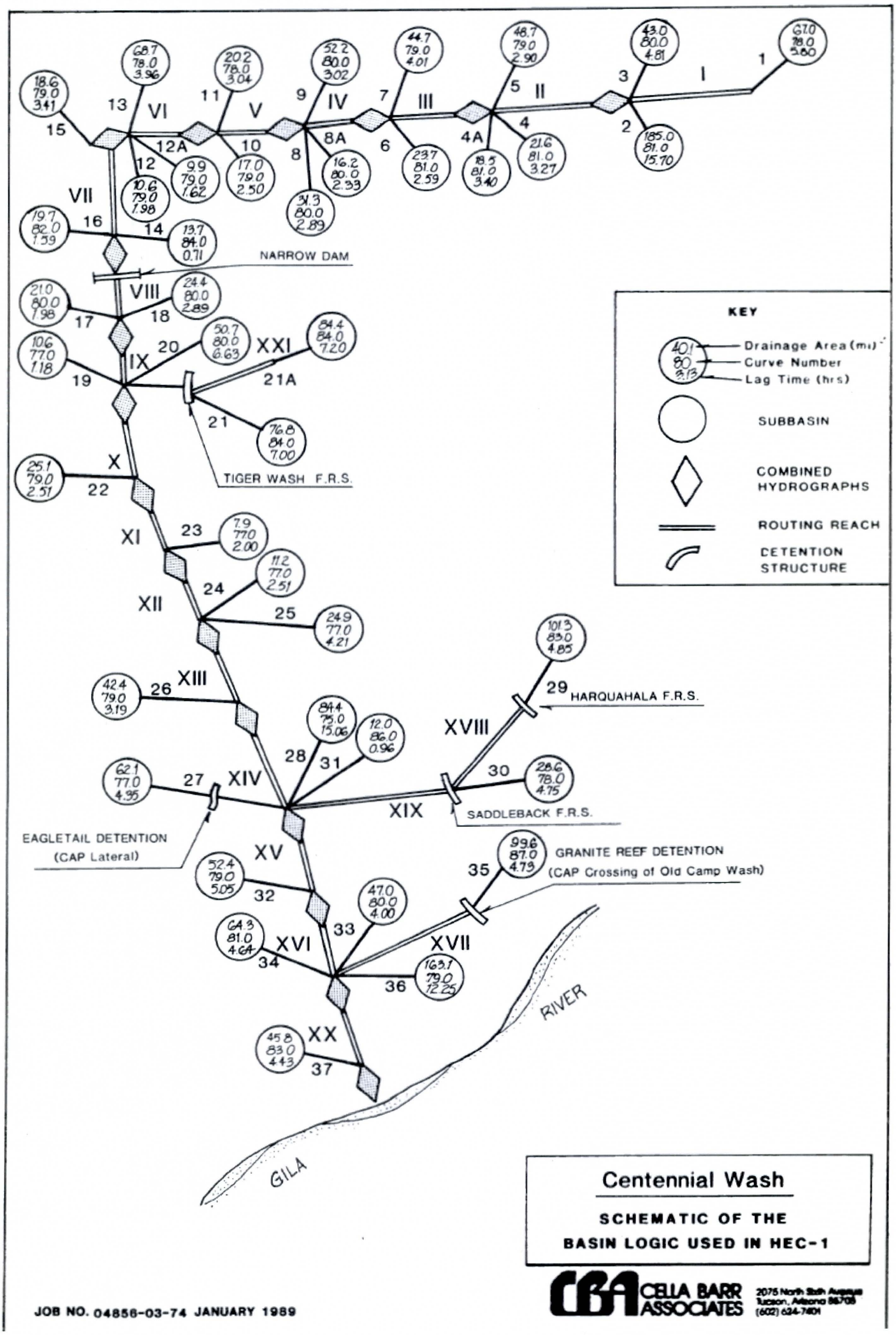


Figure 2. HEC-1 schematic

Task 3: Scale hydrographs to reflect the updated peak flows.

The purpose of this task was to extract the hydrographs from the locations in the HEC-1 model determined in Task 2 and scale the hydrographs to reflect the new peak flow values. The original hydrographs from the HEC-1 model from the stations found in Task 2 were then linearly scaled to the new peak flow developed by RBF. The scaling factor was a ratio between the HEC-1 model peak flow and the RBF-reported peak flow, both of which are presented in Table 1. The original and scaled hydrographs are presented in Figures 3 through 6.

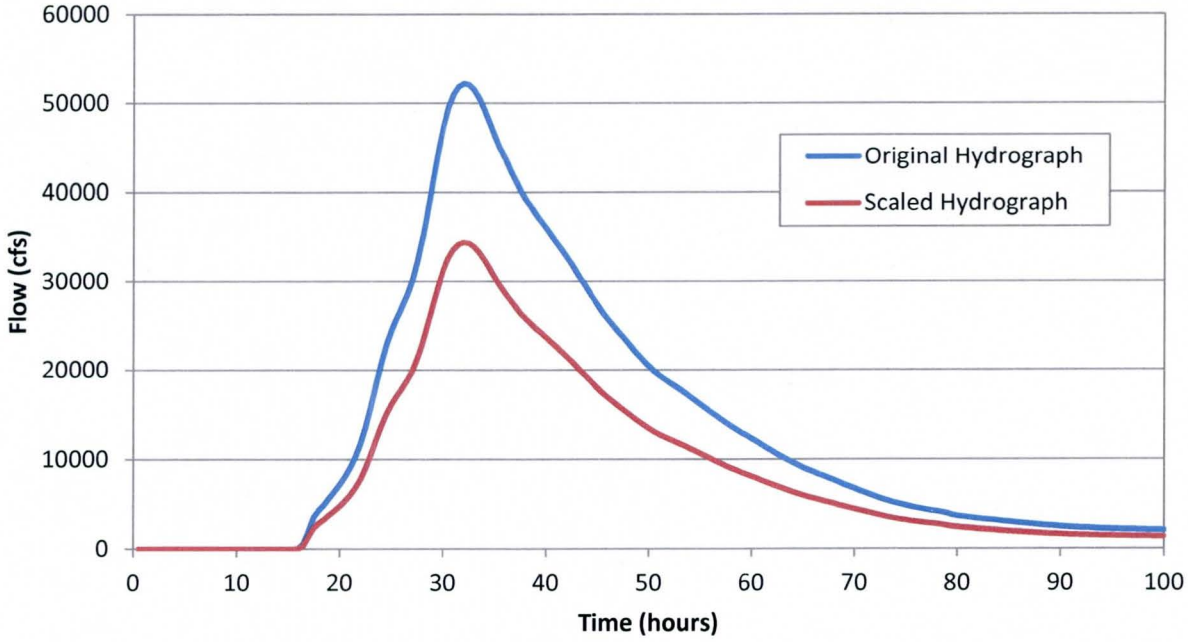


Figure 3. Original and scaled hydrographs at Centennial Levee Reach 2

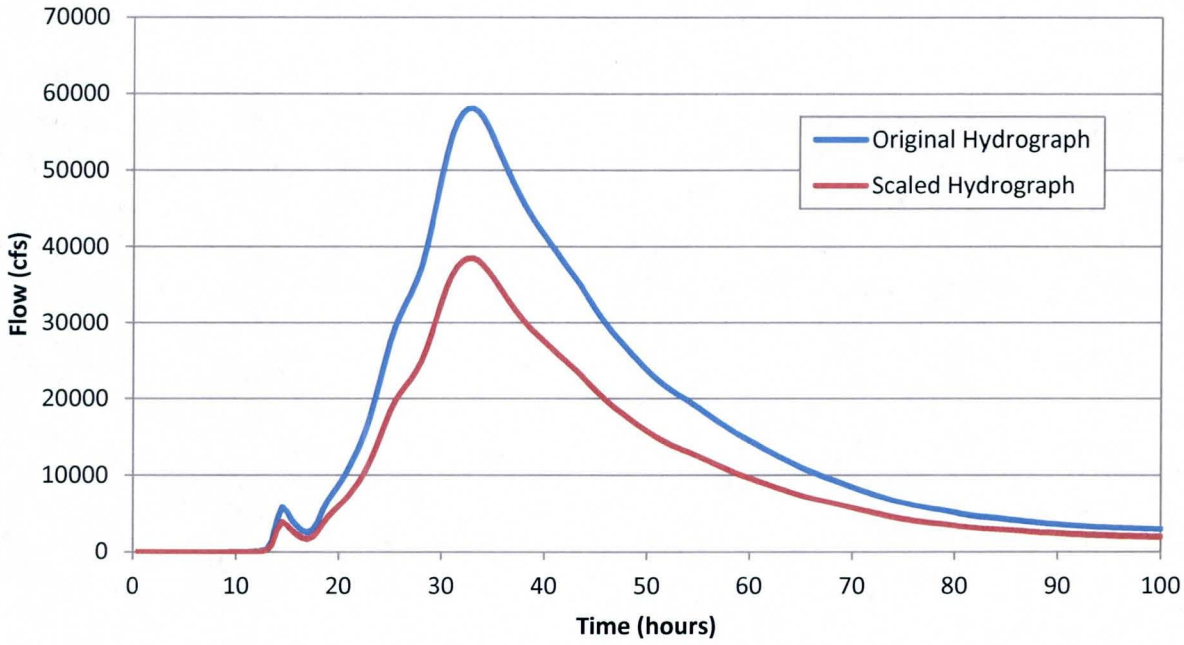


Figure 4. Original and scaled hydrographs at Baseline Road

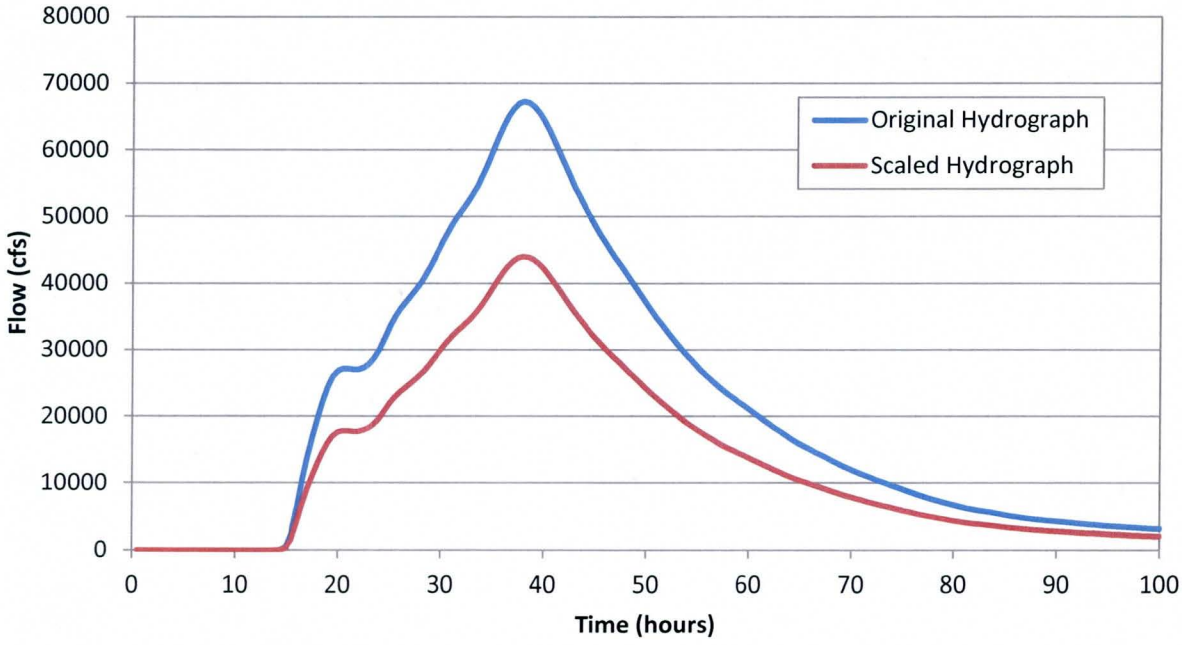


Figure 5. Original and scaled hydrographs at the Union Pacific Railroad Bridge

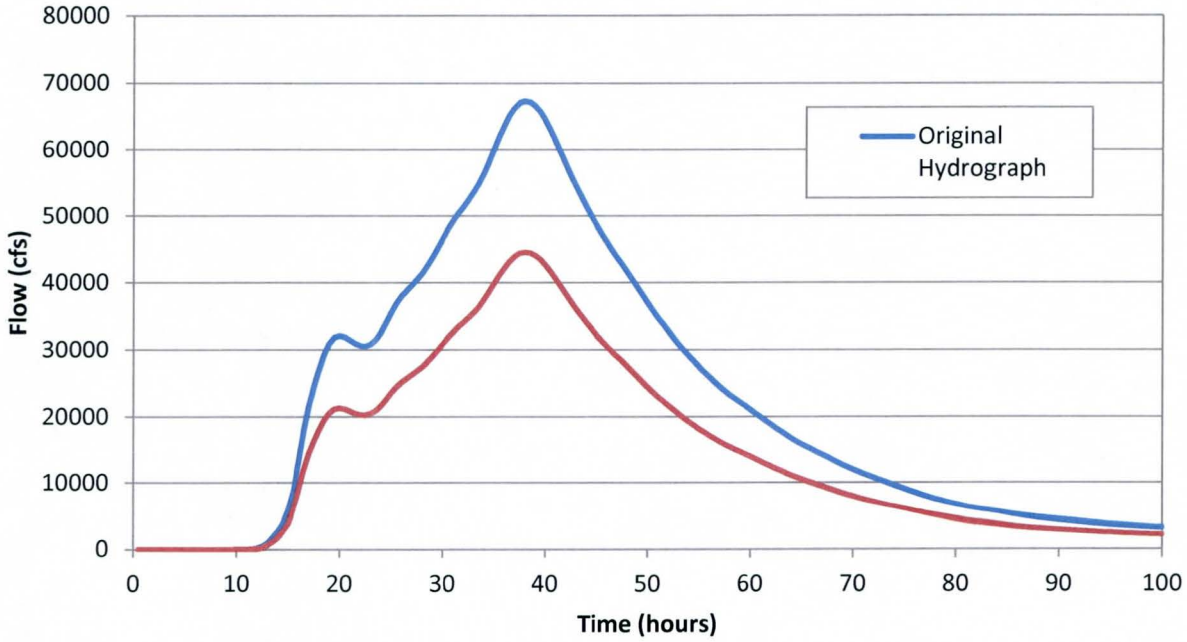


Figure 6. Original and scaled hydrographs at the confluence with the Gila River

CENTENNIAL WASH FLOODPLAIN DELINEATION STUDY
GILA RIVER TO LA PAZ COUNTY

CONTRACT FCD 2012C004

MODIFICATION OF INFLOW HYDROGRAPH FOR CENTENNIAL WASH REACH 2 TECHNICAL MEMORANDUM

Date: February 27, 2013

To: Jeff Shelton, Project Manager – FCDMC

From: Brian Wahlin, Project Manager – WEST Consultants, Inc.
Chuck Davis – WEST Consultants, Inc.
Suzie Monk – WEST Consultants, Inc.

The purpose of this technical memorandum is to outline the development of hydrographs for several locations along Centennial Wash using the updated 1-percent annual chance discharge developed by RBF Consulting in 2011 (RBF Consulting, 2011). These hydrographs will be used in a FLO-2D model.

The hydrographs developed by Cella Barr (Cella Barr Associates, 1988) show peak discharges that exceed the 1-percent annual chance discharge developed by RBF Consulting (RBF Consulting, 2011). The initial approach simply scaled the hydrographs, linearly (see Draft Hydrographs Technical Memorandum, November 5, 2012). This technical memorandum takes a more careful look at the potential errors from the Cella Barr (CB) Report and provides an alternate approach.

Creighton (1988) examined the CB (1988) report and noted a number of deficiencies (Creighton, 1988). A wide variety of errors were noted. These mainly fall into two categories. First, the report did not consider channel infiltration, which can be substantial in these washes. Second, the lag time values developed were much too low, partially because of Manning n values that were too small. Thus there are errors in both the volume and the timing of flows.

If all the errors in the CB hydrograph were from incorrect volumes resulting from not considering channel infiltration, then the scaling of the CB discharges might be appropriate (as was done in the November 5, 2012 Memorandum). If one assumes error in the CB discharges are the result of errors in tag times, then the peak of the hydrograph can be reduced by stretching the time. For example, if one assume that the volume is correct, then to reduce the discharge one can simply increase the time duration. For example assume a discharge of 100 cfs for a one-hour

duration. If the 1-percent discharge from is only 50 cfs, one would get the same volume by using 50 cfs for 2 hours.

Here, we assume that there are errors in both the volume and the timing. We can compute a new hydrograph with a two-step process. First we scale the discharges by multiplying each discharge by the ratio of the CB peak discharge and the 1-percent. For this example, the CB peak discharge was 52,930 cfs and the 1-percent annual chance discharge was 34,347 cfs. The scaling factor was thus 0.65. This would scale the volume by 65%. If we assume that ½ the error is from volume, we would want to adjust the volume so it is reduced to 82.5%, or half way between 100% and 65%. To provide this volume as still match the 1-percent hydrograph, we simply divide the time by 0.825. This will increase the duration of the hydrograph, and simulate a change in lag times. The resulting hydrographs are shown in Figure 1.

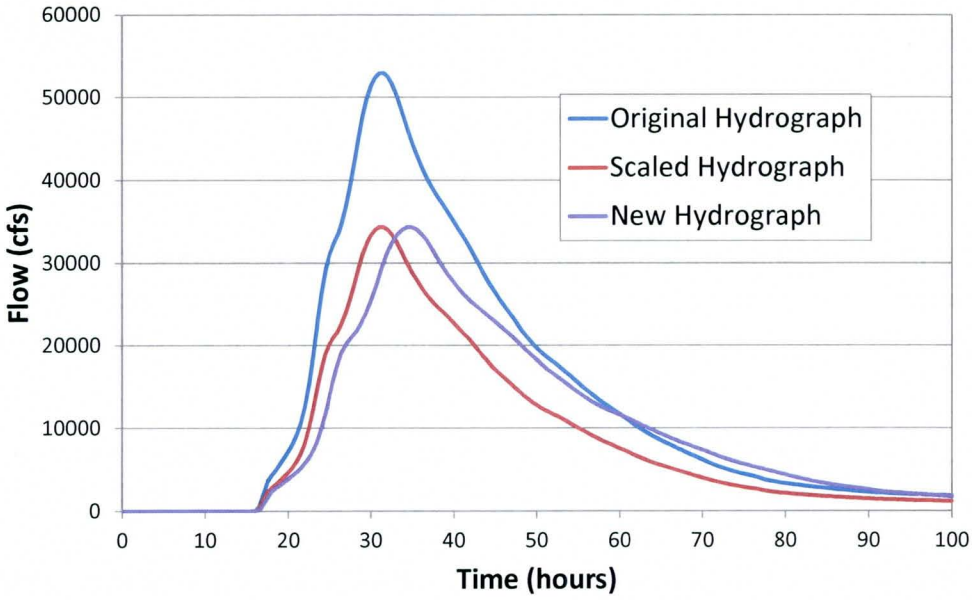


Figure 1. Adjusted hydrographs for Centennial Wash Reach 2, based on scaling both the peak and extending the duration

References

Cella Barr Associates. (1988). *Hydrologic Analysis of the Centennial Wash in Maricopa County, Arizona.* Prepared for the Federal Emergency Management Agency.

Creighton, J. D. (1988). *Review of CBA September 22, 1988, draft of Centennial Wash Study (FEMA Flood Insurance Re-Study).* Department of Water Resources.

Creighton, J. D. (1989). *Review of Second CBA Centennial Wash Report (January 6, 1989).* Department of Water Resources.

RBF Consulting. (2011). *Hydrology Report: Centennial Wash Watershed.* Prepared for CV Harquahala LLC.

Appendix E: Hydraulic Analysis Supporting Documentation

E.1 Roughness Coefficient Estimation

Centennial Wash Floodplain Delineation Study: Gila River to La Paz County

SELECTION OF MANNING'S ROUGHNESS COEFFICIENTS

Contract FCD 2012C004

FINAL REPORT

WEST Consultants, Inc.
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October 2012

Methodology

To select the Manning's roughness coefficient for the Centennial Wash Floodplain Delineation Study, the components of Manning's *n*-values were estimated, as outlined in "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" by Phillips and Tadayon (2006). That report was prepared in association with the Flood Control District of Maricopa County (FCDMC). The components of the *n*-value per Phillips and Tadayon (2006) are as follows:

n_0 = base value for a straight uniform channel,
n_1 = value for degree of irregularity,
n_2 = value for variation in channel cross section,
n_3 = value for the effect of obstructions,
n_4 = value for the amount of vegetation, and
m = value for the degree of meandering.

The total *n*-value is the sum of these components:

$$n = (n_0 + n_1 + n_2 + n_3 + n_4)\, m$$

The *n*-value components for the Centennial Wash were estimated by first categorizing geographic regions along Centennial Wash based on visual changes in vegetation density from aerial photographs, classifying various geographic regions based on similarity, then assigning a Manning's *n*-value to all of the identified geographic regions given a certain classification based on the calculation from Phillips and Tadayon (2006) shown above. Assignment of a total Manning's *n*-value for each specific Centennial Wash classification was completed by estimating the components of the *n*-value including the expected base value, degree of irregularity, variation in channel cross section, effect of obstructions, amount of vegetation, and degree of meandering for each individual classification. The following sections will discuss the resulting estimated n_0, n_1, n_2, n_3, n_4, and m values for each roughness classification in Centennial Wash.

Another report used significantly to assign Manning's *n*-values for this study was "Estimated Manning's Roughness Coefficients for Stream Channels and Flood Plains in Maricopa County, Arizona" by Thomsen and Hjalmarson (1991). That report was also prepared in association with FCDMC. Aerial and ground photographs in Thomsen and Hjalmarson (1991) that appeared similar to each Centennial Wash category were identified. The composite *n*-values assigned to the Thomsen and Hjalmarson (1991) regions were then tabulated and compared to the calculation from Phillips and Tadayon (2006) for the corresponding Centennial wash roughness classification for verification.

An older *n*-value report was also available that provided *n*-values for Arizona titled USGS Open-File Report 73-3 "Roughness Coefficients for Stream Channels in Arizona"

by Aldridge and Garrett (1973). This report contains only ground photographs of various streams throughout Arizona. The ground photographs in Aldridge and Garrett's (1973) report were examined and matched to the ground photographs taken during the field trips. If the Manning's *n*-values reported by Aldridge and Garrett (1973) were similar to the values reported by Thomsen and Hjalmarson (1991), then this acted as independent verification that the estimated Manning's *n*-values were appropriate for Centennial Wash.

Existing Hydraulic Model

The existing Flood Insurance Study (FIS) is based on a floodplain delineation completed by Cella-Barr in 1989. The hydraulics for that FIS study were modeled in HEC-2. The average depths of flooding discussed below were taken from the effective Cella-Barr FIS hydraulic model.

Roughness Classifications

In examining the aerial photographs of Centennial Wash, ten (10) major roughness classifications were identified: Open Water, Unvegetated Channel, Sparse Vegetation, Tall Sparse Vegetation, Tall Medium Vegetation, Tall Dense Vegetation, Extremely Dense Vegetation, Agricultural—Cultivated Fields, Agricultural—Fallow Fields, and Canal Embankment.

The depth of flow was also considered when selecting the *n*-values. This categorization was made because of the following observation from Thomsen and Hjalmarson (1991):

> *Depth of flow must be considered in the selection of n values. The effects of roughness elements on and near the channel bottom tend to diminish as the depth of flow increases. The effect of vegetation on n values depends greatly on the depth of flow and to some extent on the flexibility of the vegetation. If the flow is of sufficient depth to submerge and (or) flatten the vegetation, n values will be lowered.*

The flow depths were estimated for this report based on average values from the effective Cella-Barr FIS hydraulic model calculated to be approximately 2.5 feet in the overbanks and 5 feet in the channel. Although HEC-RAS permits the use of variation of *n*-value with discharge or with flow depth, this option was not utilized for this study as only the 1% annual chance flood event (commonly referred to as the 100-year flow) will be considered for floodplain delineation as per the direction of the Flood Control District of Maricopa County.

The determination of whether a particular area was in the channel or overbanks was made primarily on the basis of visual examination of the aerial photographs and topography. Note that this channel/overbank determination for the purposes of *n*-value selection does not necessarily match the channel bank stations that will be utilized for the final Centennial HEC-RAS model. For the purpose of assignment of *n*-values, the definition of channel and overbank areas was assigned more generally to capture whether a certain

roughness classification occurred primarily within the deeper portion of the flow area near the channel thalweg (considered a channel area) or occurred primarily within the shallower portions of the flow areas away from the channel thalweg where the frequency of inundation would be lower (considered an overbank area). Based on this definition, the distinction between the channel and overbank was generally made at a location of marked change in vegetation density. The topography was also used as a guideline in setting the line between the channel and overbanks when a clear break in elevation was visible in the topography dropping towards the river bottom. In conclusion, the roughness classifications considered to be in the channel include Open Water, Unvegetated Channel, Tall Dense Vegetation, and Extremely Dense Vegetation. The roughness classifications considered to be in the overbanks include Sparse Vegetation, Tall Sparse Vegetation, Tall Medium Vegetation, Agricultural—Cultivated Fields, Agricultural—Fallow Fields, and Canal Embankment. The flow depths mentioned above taken from the Cella-Barr model (5 feet in the channel and 2.5 feet in the overbanks) were assigned to their corresponding roughness classifications for the assignment of roughness parameters.

It should be noted that the 2.5-foot depth in the overbanks and the 5-foot depth in the channel are averages; there is great variability throughout the effective model calculations from these average values. For example, the channel downstream of the railroad, which appears to be contained for some distance on the left bank by a levee-like embankment from the effective Cella-Barr hydraulic model, is much deeper than the average value (on the order of 8-10 feet deep) for the 100-year flood. However, for the purposes of broad Manning's *n*-value assignments, these local anomalies in flooding depth were not considered in the analysis. Furthermore, for floods smaller than the 100-year, the depths would be lower. This study will only be assessing the 100-year flood event; therefore, the Manning's *n*-value assignments were only considered to reflect the roughness during 100-year flood conditions. These roughness values may not be entirely applicable to lower-frequency or higher-frequency flooding events.

It should also be noted that in the channel and the overbanks, the 100-year depths are fairly shallow compared to the height of vegetation. It would be expected that depths of flow of about 2.5 feet in the overbanks would not be deep enough to flatten the vegetation and significantly decrease the *n*-values due to vegetation flattening. In the channel, a flow depth of 5 feet is on the shallow end of the range of depths reported in Thomsen and Hjalmarson (1991) for visually similar sites. Thus, it was assumed that the variation of depth in the channel would also not have a significant impact on the overall *n*-value in regards to vegetation flattening or other significant vegetation impacts.

Table 1 lists the *n*-value categories, their Manning's *n*-value, and the percent fraction of each category in or near the current FEMA floodplain. This gives an indication of the relative importance of each category. Table 1 is a summary of the *n*-value calculations that are described in more detail later in the report.

Table 1. Summary of the Manning's *n* categories identified for Centennial Wash

Category Name	Classification Type (Channel or Overbank)	Manning's *n*-value	Area (acres)	Percent
Open Water	Channel	0.018	30	0.06%
Unvegetated Channel	Channel	0.025	99	0.21%
Sparse Vegetation	Overbank	0.035	8,824	18.42%
Tall Sparse Vegetation	Overbank	0.040	15,444	32.23%
Tall Medium Vegetation	Overbank	0.062	6,807	14.21%
Tall Dense Vegetation	Channel	0.111	4,691	9.79%
Extremely Dense Vegetation	Channel	0.200	835	1.74%
Agricultural—Cultivated Fields	Overbank	0.060	8,732	18.22%
Agricultural—Fallow Fields	Overbank	0.030	2,421	5.05%
Canal Embankment	Overbank	0.016	30	0.06%

The *n*-values were assigned to the cross-sections by first dividing the entire study reach into polygons corresponding to each of the categories, a process completed in GIS. The intersection of each cross-section with the various polygons in different categories determined the assignment of the *n*-values in each cross-section. This corresponds to the feature in HEC-RAS using "variation in *n*-value by horizontal station" rather than an assignment of one *n*-value each for the left bank, main channel, and right bank.

Bed and Bank Grain Size

During the site visits that WEST took for this project, the channel bed material was visually assessed for approximate size at two representative locations near the Southern Pacific Railroad Bridge: one for bed material in a non-armored portion of the bed (Figure 1) and one for bed material in an armored portion of the bed (Figure 2). From visual observations of the sand in the channel bed during the site visit and from the pictures below compared to representative samples of known grain size, the bed material could be classified as "firm earth" based on the definitions found in Table 2 of Phillips and Tadayon (2006). This classification could possibly be considered "coarse sand" based on the same table in Phillips and Tadayon (2006), but the base *n*-values are very similar for these two classifications, so it was not deemed necessary to make this distinction.

Table 2 in Phillips and Tadayon (2006) also provides base n_0-values as a function of the bed material classifications discussed above. A base Manning's n_0-value for "firm earth" can range from 0.025-0.032, and a base Manning's n_0-value for "coarse sand" can range from 0.026-0.035. Based on the general assessment that most conditions in the reach are not armored, and given the fact that Manning's roughness compositing techniques such as Phillips and Tadayon (2006) can lead to conservatively high estimates of Manning's roughness for certain conditions, WEST chose to use 0.025 at the low end of these ranges as the base Manning's n_0-value for this study in both the channel and overbank areas.

Figure 1. Representative bed material in a non-armored portion of the bed near the Southern Pacific Railroad Bridge

Figure 2. Representative bed material in an armored portion of the bed near the Southern Pacific Railroad Bridge

Open Water (n = 0.018)

This roughness classification is found intermittently along the entire reach of Centennial Wash but comprises only a small amount of the total area. The primary type of Open Water areas are tailwater ponds used to store return irrigation water near irrigated fields for water reuse. An aerial photograph of one of these areas is shown in Figure 3.

Manning's n-values for open water areas are very low, similar to those of very smooth channels. According to Arcement and Schneider (1989), a smooth channel would have a base n-value of 0.011. Most of these open water areas will have areas of grass or sand along the edges. Sand with a median diameter of 0.8 mm has a base n-value of 0.025 (Arcement and Schneider, 1989). Taking an average of these two values provides us with an n-value of 0.018 which can be assigned to the Open Water areas along Centennial Wash.

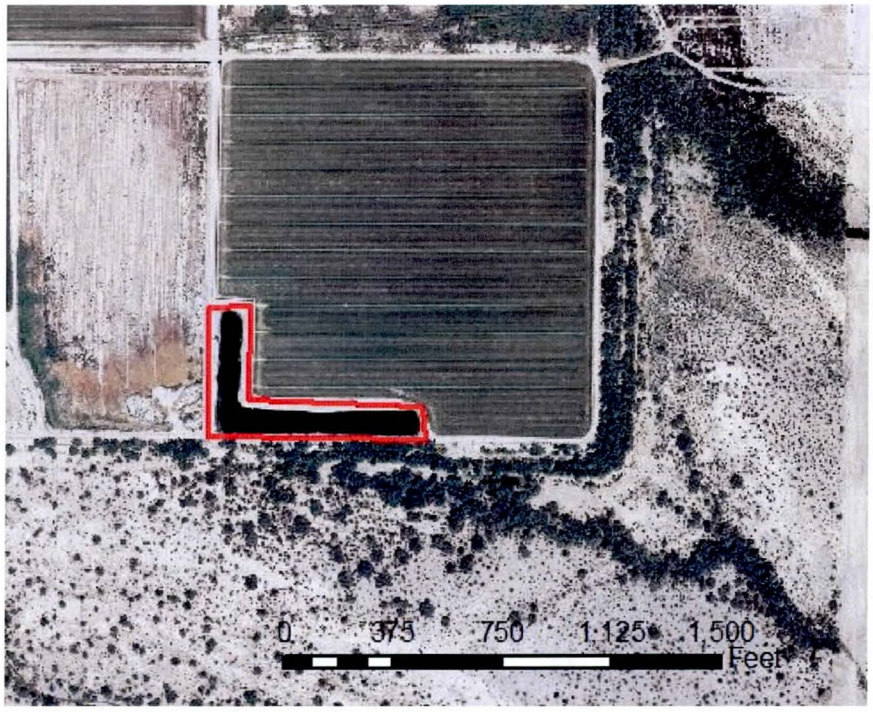

Figure 3. Aerial photograph of Open Water area

Unvegetated Channel (n = 0.025)

The roughness classification of Unvegetated Channel consists of areas of the main channel of Centennial Wash that have very little or no vegetation. Typically, these areas are smooth and are composed almost completely of sand. An aerial photograph of the Unvegetated Channel designation is shown in Figure 4 while a ground photograph is shown in Figure 5. Thomsen and Hjalmarson (1991) use an n-value of 0.025 to describe the sandy channel, which is due entirely to a base n_0-value of 0.025 with no corresponding n_1, n_2, n_3, n_4, or m factors. The location that Thomsen and Hjalmarson (1991) used is actually within the study reach, and their calculation of Manning's

roughness for this roughness classification is directly applicable to this study. Therefore, the Thomsen and Hjalmarson (1991) calculations were applied to the Phillips and Tadayon (2006) equation, and those results are shown in Table 2.

Table 2. Calculation of Manning's *n* for Unvegetated Channel

Location	Selected – Unvegetated Channel
Notes	-
n_0 (base)	0.025
Flood	100-year
n_1 (irregularity)	-
n_2 (cross section variation.)	-
n_3 (obstructions)	-
n_4 (vegetation)	-
m (meandering)	1.0
Average Depth	5 feet
Total n	0.025

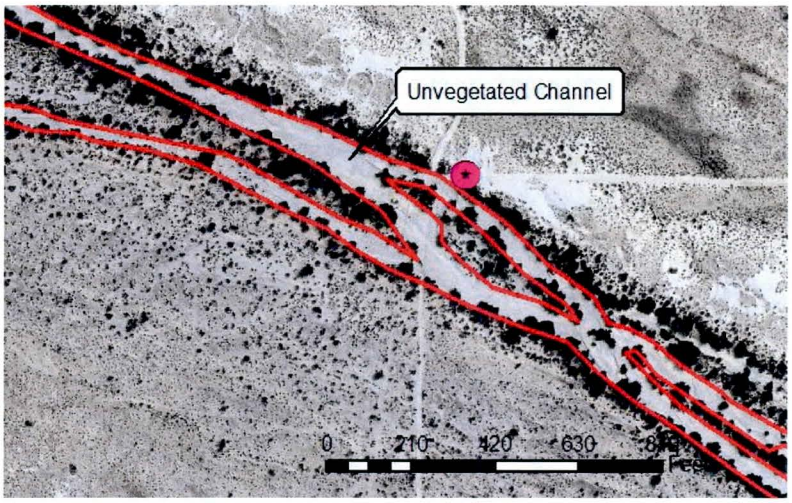

Figure 4. Aerial photograph of Unvegetated Channel (pink dot is Waypoint 070)

Figure 5. Ground photograph of Unvegetated Channel area (from Waypoint 007)

Sparse Vegetation (n = 0.035)

In the Sparse Vegetation roughness classification, there are scattered low-growing brush and weeds on the bed and banks. These areas are present along the entire study reach. An aerial photo of a Sparse Vegetation area is shown in Figure 6 and a ground photo is shown in Figure 7.

The Thomsen and Hjalmarson (1991) examples chosen for comparison with the Phillips and Tadayon (2006) calculations were the Hassayampa River at the CAP canal and the Waterman Wash above Rainbow Valley.

Along the left bank of the Hassayampa River at the CAP canal, the area is sparsely vegetated with small shrubs and bushes. Thomsen and Hjalmarson (1991) assign an n_3 (vegetation) value of 0.007, which appears possibly slightly high based on the photographs in the report. Thomsen and Hjalmarson (1991) give this area an overall n-value of 0.032 for a depth corresponding to the 100-year flood.

An even sparser and flatter area is shown for Waterman Wash above Rainbow Valley in Thomsen and Hjalmarson (1991). This area is given an overall n-value of 0.030 for a depth corresponding to the 100-year flood.

The aerial photograph in Figure 6 shows a sample of the Sparse Vegetation roughness classification herein. This area looks similar to the aerial and ground photographs of the overbank of the Hassayampa River at the CAP canal provided in Figure 15C of Thomsen and Hjalmarson (1991). Since the Hassayampa River at the CAP canal's n_1 (irregularity) factor was set at 0.003, the n_1 for this category was set equal to 0.003 as well. The vegetation factor was set slightly lower than the Thomsen and Hjalmarson (1991) vegetation factor of 0.007 recommended for the Hassayampa at the CAP canal since the vegetation seemed slightly less dense for the Centennial Wash study reach. The n_0-value was increased beyond the Hassayampa River at the CAP canal example from Thomsen and Hjalmarson (1991). The base n_0-value from Thomsen and Hjalmarson (1991) was 0.022, which is representative of a D_{50} of 0.5 mm. It was believed that a D_{50} of 0.8 mm was more representative of the overbanks, and the base n_0 herein was set equal to 0.025. This is in line with the recommendations of Phillips and Tadayon (2006) as well as discussed above. The cross section variation coefficient (n_2) was set equal to zero for this classification, as the overbank floodplain width does not vary significantly from one cross section to the next in regards to available area for flooding. Finally, the obstructions coefficient was set equal to 0.002 to account for minor debris buildup on the bushes during a high flow event. Table 3 below shows the final calculation of Manning's roughness for Sparse Vegetation of 0.035 based on Phillips and Tadayon (2006).

Table 3. Calculation of Manning's *n* for Sparse Vegetation

Location	Selected – Sparse Vegetation
Notes	-
n_0 (base)	0.025
Flood	
n_1 (irregularity)	0.003
n_2 (cross section variation.)	-
n_3 (obstructions)	0.002
n_4 (vegetation)	0.005
m (meandering)	1.0
Average Depth	2.5 feet
Total n	0.035

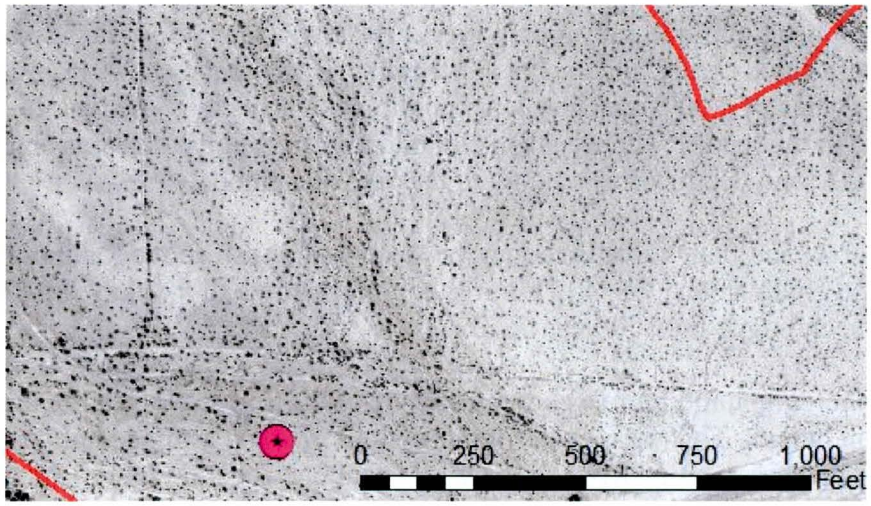

Figure 6. Aerial photograph of Sparse Vegetation area (Waypoint 069 is shown as a pink dot). Boundary of Sparse Vegetation areas are shown in red.

Figure 7. Ground photograph of Overbank Sparse Vegetation (near Waypoint 069)

Tall Sparse Vegetation (n = 0.040)

In these areas, trees and tall shrubs are sparsely scattered along the channel and floodplain. Small bushes are also scattered along the ground. These tall trees are not likely to be overtopped by the 100-year flood. The shrubs might be pushed down by the 100-year flood, but it should not be enough to significantly lower the overall *n*-value. As a rough rule-of-thumb, the vegetation was considered sparse if there were no salt cedar trees present from the aerial photographs in these areas. An aerial photo of a Tall Sparse Vegetation area is shown in Figure 8 and a ground photo is shown in Figure 9.

The most comparable example from Thomsen and Hjalmarson (1991) for the Tall Sparse Vegetation areas in terms of vegetation was found in the right overbank of the Agua Fria River below U.S. Highway 74. The n_3 (vegetation) value for this example from Thomsen and Hjalmarson (1991) was set to be 0.015, and the overall *n*-value for the example was estimated to be 0.045.

A summary of Manning's *n*-value calculations for the Tall Sparse Vegetation areas as calculated by the Phillips and Tadayon (2006) computation herein is shown in Table 4. The base n_0 herein was set equal to 0.025, in line with the recommendations of Phillips and Tadayon (2006). The degree of irregularity coefficient (n_1) was set to a value representing minor irregularity from one cross section to the next with slightly scoured or eroded side slopes, 0.003. The cross section variation coefficient (n_2) was set equal to zero for this site, as the overbank floodplain width does not vary significantly from one cross section to the next in regards to available area for flooding. The obstructions coefficient (n_3) was set equal to 0.002 to account for minor debris buildup on the bushes during a high flow event. Finally, the vegetation coefficient (n_4) was set to reflect the high end of the "small" range of vegetation as defined in Table 3 of Phillips and Tadayon (2006) with a value of 0.010.

Table 4. Calculation of Manning's *n* for Tall Sparse Vegetation

Location	Selected –Tall Sparse Vegetation
Notes	Vegetation is slightly lighter than Thomsen and Hjalmarson (1991) example
n_0 (base)	0.025
Flood	100-year
n_1 (irregularity)	0.003
n_2 (cross section variation.)	-
n_3 (obstructions)	0.002
n_4 (vegetation)	0.010
m (meandering)	1.0
Average Depth	2.5 feet
Total *n*	0.040

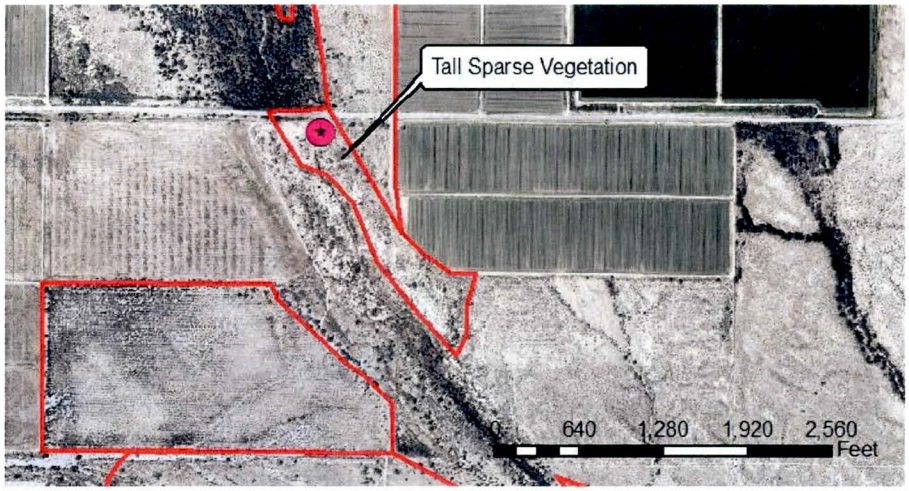

Figure 8. Aerial photograph of Tall Sparse Vegetation area (Waypoint 016 is shown as a pink dot). Boundary of Tall Sparse Vegetation areas are shown in red.

Figure 9. Ground photograph of Tall Sparse Vegetation (near Waypoint 016)

Tall Medium Vegetation (n = 0.062)

This designation is reserved for areas that have a medium density of tall trees and shrubs. As a rough rule-of-thumb, vegetation was considered to be medium density if there were 200 bushes or tree stems in a 100-foot by 100-foot area. Salt cedar trees are the primary trees utilized for these rule-of-thumb counts because they are by far the most prevalent vegetation and the only vegetation present in many areas in the study reach, but vegetation other than salt cedars were found in portions of this classification as well.

The area used for comparison from Thomsen and Hjalmarson (1991) was Centennial Wash below Southern Pacific Railroad, specifically the area between the channel and left overbank just upstream of the bridge.

An aerial photograph of an area with Tall Medium Vegetation is shown in Figure 10. A ground photograph of a Tall Medium Vegetation area can be seen in Figure 11. This photograph looks very similar to the ground photograph shown in Thomsen and Hjalmarson (1991) for Centennial Wash below Southern Pacific Railroad, with the addition of grasses growing below the salt cedars and other tall vegetation. Thomsen and Hjalmarson (1991) use a value of 0.060 for the overall n-value to describe the roughness of the area that is designated as Tall Medium Vegetation in this report.

A summary of Manning's n-value calculations for the Tall Sparse Vegetation areas as calculated by the Phillips and Tadayon (2006) computation herein is shown in Table 5. The base n_0 herein was set equal to 0.025, in line with the recommendations of Phillips and Tadayon (2006). The degree of irregularity coefficient (n_1) was set to a value representing moderate irregularity from one cross section to the next with moderately eroded side slopes, 0.006. The cross section variation coefficient (n_2) was set equal to zero for this site, as the overbank floodplain width does not vary significantly from one cross section to the next in regards to available area for flooding. The obstructions coefficient (n_3) was set equal to 0.006 to account for minor debris buildup on the bushes during a high flow event. Finally, the vegetation coefficient (n_4) was set to reflect the high end of the "medium" range of vegetation as defined in Table 3 of Phillips and Tadayon (2006) with a value of 0.025.

Table 5. Calculation of Manning's *n* for Tall Medium Vegetation

Location	Selected –Tall Medium Vegetation
Notes	Vegetation is slightly denser than Thomsen and Hjalmarson (1991) example
n_0 (base)	0.025
Flood	100-year
n_1 (irregularity)	0.006
n_2 (cross section variation.)	-
n_3 (obstructions)	0.006
n_4 (vegetation)	0.025
m (meandering)	1.0
Average Depth	2.5 feet
Total n	0.062

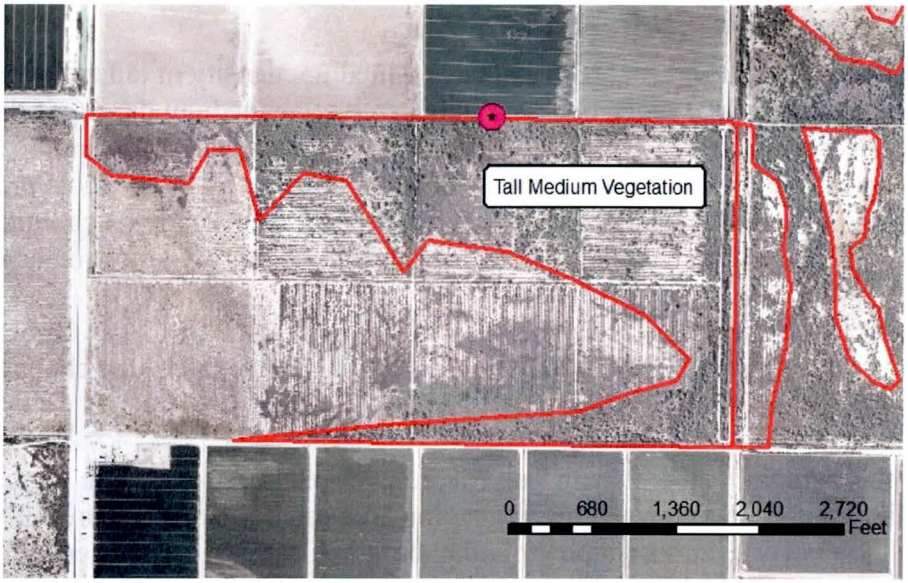

Figure 10. Aerial photograph of Tall Medium Vegetation area (Waypoint 022 is shown as a pink dot). Boundary of Tall Medium Vegetation areas are shown in red.

Figure 11. Ground photograph of Tall Medium Vegetation area (at Waypoint 022)

Tall Dense Vegetation (n = 0.111)

The Tall Dense Vegetation designation corresponds to areas that have a very dense vegetation coverage composed of tall trees and shrubs. As a rough rule-of-thumb, the vegetation was considered dense if there were 400 bushes or tree stems in a 100-foot by 100-foot area. Salt cedar trees are the primary trees utilized for these rule-of-thumb counts because they are by far the most prevalent vegetation and the only vegetation present in many areas in the study reach, but vegetation other than salt cedars were found in portions of this roughness classification as well. Average vegetation height for the Tall Dense Vegetation as defined herein is approximately 10 ft.

The comparison sites from Thomsen and Hjalmarson (1991) were the Gila River above Gillespie Dam, the Hassayampa River above the highway rest stop near Wickenburg, and Centennial Wash below Southern Pacific Railroad.

For the Gila River example from Thomsen and Hjalmarson (1991), a very densely vegetated area is shown that is assigned an overall n-value of 0.15 for the 100-year flood. The amount of vegetation in this example is denser than what is considered Tall Dense Vegetation in this report, but Thomsen and Hjalmarson (1991) only account for the vegetation component of their calculation (n_3) for this vegetation type which could possibly slightly underestimate roughness.

On the Hassayampa River example, Thomsen and Hjalmarson (1991) show aerial photographs of an area that is very similar to what is called Tall Dense Vegetation in this report (see Figure 12 and Figure 13 below). This area is located between the road and the main channel on the left overbank and is given an overall n-value of 0.125.

Another example of Tall Dense Vegetation can be found on Centennial Wash in Thomsen and Hjalmarson (1991). The right overbank is composed of fairly dense vegetation, and Thomsen and Hjalmarson (1991) assign this area an overall n-value of 0.100.

A summary of Manning's n-value calculations for the Tall Dense Vegetation areas as calculated by the Phillips and Tadayon (2006) computation herein is shown in Table 6. The most important individual component of roughness for this calculation was the vegetation coefficient (n_4), which was set to reflect the higher end of the "very large" range of vegetation as defined in Table 3 of Phillips and Tadayon (2006) with a value of 0.080 for the Tall Dense Vegetation. An overall n-value of 0.111 was computed (see Table 6).

Table 6. Calculation of Manning's *n* for Tall Dense Vegetation

Location	Selected –Tall Dense Vegetation
Notes	Vegetation is slightly denser than Thomsen and Hjalmarson (1991) example
n_0 (base)	0.025
Flood	100-year
n_1 (irregularity)	0.006
n_2 (cross section variation.)	-
n_3 (obstructions)	-
n_4 (vegetation)	0.080
m (meandering)	1.0
Average Depth	5 feet
Total n	0.111

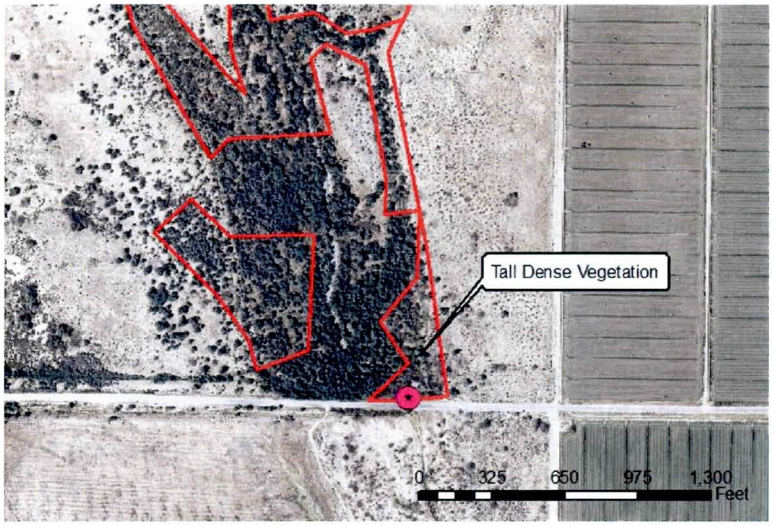

Figure 12. Aerial photograph of Tall Dense Vegetation area (Waypoint 017 is shown as a pink dot). Boundary of Tall Dense Vegetation areas are shown in red.

Figure 13. Ground photograph of Tall Dense Vegetation, and the vegetation in the background is the vegetation classified as Tall Dense Vegetation (at Waypoint 017)

Extremely Dense Vegetation (n = 0.200)

There are several areas on Centennial Wash that have been classified as Extremely Dense Vegetation. Most of these are in the mid to upper portions of the study reach, although there are areas exhibiting this type of vegetation near the confluence with the Gila River as well. The average vegetation height in these areas was approximately 18 feet. An aerial photograph of an area with Extremely Dense Vegetation is shown in Figure 14 and a ground photograph is shown in Figure 15.

Two comparison areas were found in Thomsen and Hjalmarson (1991): The Gila River above Gillespie Dam and the Gila River above Bullard Avenue near Avondale. For the Gila River above Gillespie Dam, Thomsen and Hjalmarson (1991) show an aerial photograph of an area with very dense vegetation. For the Gila River above Bullard Avenue, Thomsen and Hjalmarson (1991) show some ground photographs of an area on the Gila River with vegetation that is very dense and about 15 feet high. This area also appears to be very similar to the area shown in Figure 14 for an Extremely Dense Vegetation classification on Centennial Wash for this project.

In both of the examples in Thomsen and Hjalmarson (1991), the overall *n*-value was set at 0.15 for higher depths during the 100-year flood (around 13-15 feet) and 0.20 for lower depths during the 10-year flood (around 7 feet). Most of the areas in Centennial Wash where Extremely Dense Vegetation is present are found nearer to the main channel, but the flooding depths on average are around 5 feet in the channel, which is more comparable to the depths determined by Thomsen and Hjalmarson (1991) for their 10-year flood with a corresponding roughness value of 0.20.

A summary of Manning's *n*-value calculations for the Extremely Dense Vegetation areas as calculated by the Phillips and Tadayon (2006) computation herein is shown in Table 7. The most important individual component of roughness for this calculation was the vegetation coefficient (n_4), which was set to reflect the high end of the "extremely large" range of vegetation as defined in Table 3 of Phillips and Tadayon (2006) with a value of 0.170 for the Extremely Dense Vegetation. An overall *n*-value of 0.200 was computed (see Table 7).

Table 7. Calculation of Manning's *n* for Extremely Dense Vegetation

Location	Selected –Extremely Dense Vegetation
Notes	-
n_0 (base)	0.025
Flood	100-year
n_1 (irregularity)	0.005
n_2 (cross section variation.)	-
n_3 (obstructions)	-
n_4 (vegetation)	0.170
m (meandering)	1.0
Average Depth	5 feet
Total n	0.200

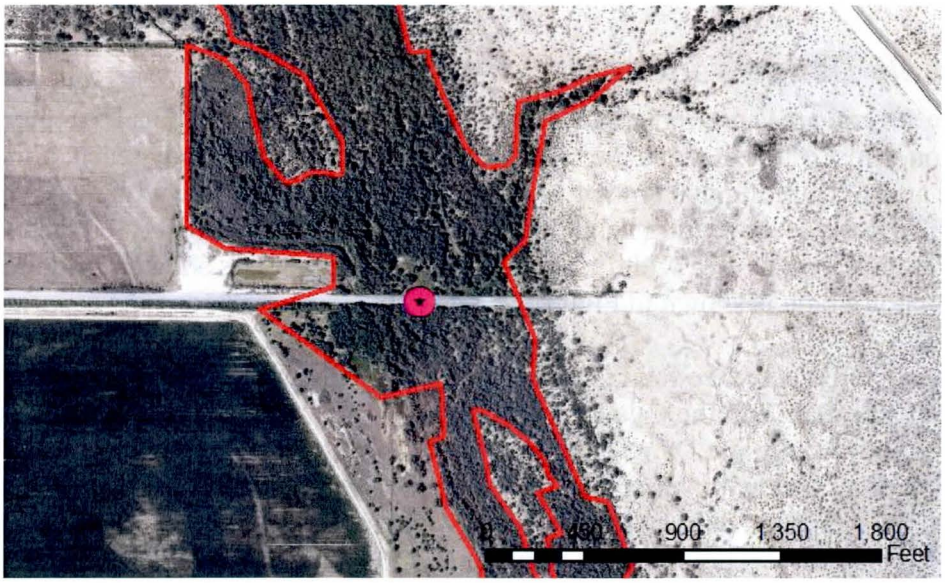

Figure 14. Aerial photograph of Extremely Dense Vegetation (Waypoint 015 is shown as a pink dot). Boundary of Extremely Dense Vegetation areas shown in red.

Figure 15. Ground photograph of Extremely Dense Vegetation (near Waypoint 015)

Agriculture—Cultivated Fields (n = 0.06)

Some of the areas on the banks of Centennial Wash are actively cultivated agricultural fields. Based on interviews with Mr. Rick Warren of the Harquahala Valley Irrigation District, approximately 83% of the 32,537 acres that are available to be irrigated in the Harquahala Valley Irrigation District lands are actively being farmed at any given time. An aerial photograph of actively cultivated agricultural fields in the study reach is shown in Figure 16 and a ground photograph is shown in Figure 17. Some fields were observed during Centennial Wash site visits and the crops in these fields were identified as corn and cotton. These fields are mainly located in the Harquahala Valley near the upper portion of the reach and in lower reach near the Gila River confluence of Centennial Wash. Some of these fields are surrounded by farmer's levees and dikes that have been built to protect the fields from flooding.

Phillips and Tadayon (2006) do not address agricultural fields in their reports in great detail. However, they do have a table for approximate roughness coefficients for cultivated areas that are based on the table found in Chow's (1959) *Open-Channel Hydraulics* book with additions based on their own work and work found in Thomsen and Hjalmarson (1991). The values applicable to the Centennial Wash study taken from the final table in Phillips and Tadayon (2006) dealing with agricultural roughness values is shown in Table 8 below. Phillips and Tadayon (2006) state that "Mature cotton plants are comparable to dense brush in the summer, and defoliated cotton is comparable to medium to dense brush in the winter."

Table 8. Manning's roughness coefficients for cultivated agricultural areas (from Phillips and Tadayon (2006))

Cultivated Area	Manning's *n*-value		
	Minimum	Normal	Maximum
No crop	0.020	0.030	0.040
Mature row crops, such as small vegetables	0.025	0.035	0.045
Mature field crops	0.030	0.040	0.050
Medium to dense shrub, in winter	0.045	0.070	0.110
Medium to dense shrub, in summer	0.070	0.100	0.160

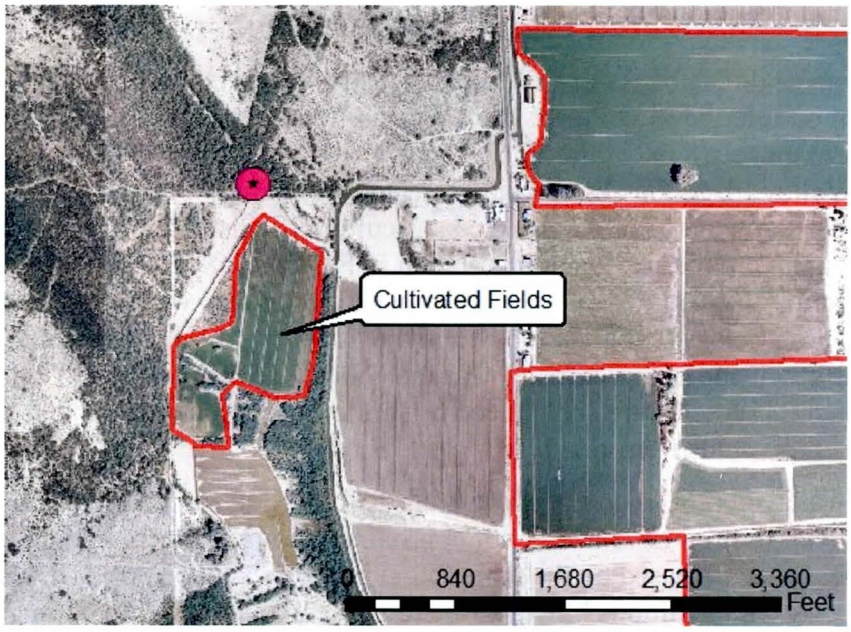

Figure 16. Aerial photograph of Cultivated Fields area (located south of Waypoint 001, shown by the pink dot). Boundary of Cultivated Fields areas are shown in red.

Figure 17. Ground photograph of Cultivated Fields (located south of Waypoint 001)

The types of crops that are typical of the study area were investigated. Mr. Rick Warren of the Harquahala Valley Irrigation District was contacted; he indicated that the main crops in the area are alfalfa, cotton, corn, grains (wheat or barley), and melons (cantaloupe and watermelon). Based on this information, Table 9 was prepared showing some possible crops of the region as well as their growing seasons.

Table 9. Crops in the study area and their seasons

Crop	Planted	Harvested	Source
Cotton	April	November	USDA (1997)
Corn	April	October	USDA (1997)
Watermelon, 1st crop	December	Feb - Apr	Planting Date: U of A, Tucson (1998). Time to harvest: 70-130 days per U of A, Tucson (1998)
Watermelon, 2nd crop	April	Jun - Aug	
Alfalfa	Perennial		USDA (1997)
Grains	December	May - Jun	USDA (1997)

An examination of the flow record indicates the months of the year when large floods are likely, which could indicate what types of crops are most likely to be present during the seasons when flooding is most likely. Of the 25 yearly peaks recorded at the USGS stream gage on Centennial Wash at the Southern Pacific Railroad Bridge, 60% of the yearly peaks occur in July and August, and 100% of the peaks occur between July and February. This is not helpful in narrowing the crops to utilize for this analysis, however, because virtually every crop in the table except for the two grains are capable of being fully mature in the July through February time frame. In the interest of brevity, the examination of *n*-values was restricted to alfalfa and cotton for the summer growing, as these appeared to be the most widespread crops grown in the area and the summer seasons would provide a conservative estimate of roughness for this study.

The study "Friction Factors for Vegetated Waterways of Small Slopes" (USDA, 1977) summarizes experiments performed to determine the Manning's *n*-value of various crops at different depths. The USDA report shows results of experiments with cotton, but not with alfalfa. However, the report does have results for lovegrass. Lovegrass appears to be similar to alfalfa in height and may also be similar in terms of hydraulic resistance.

According to the USDA report (USDA, 1977) lovegrass stems averaged 12 inches tall with some stems 32 inches long. There was also considerable crabgrass in the channel for the lovegrass experiment, which averaged 22 inches in length and went as high as 50 inches. The experiments tended to use depths that were fairly shallow. For lovegrass, the report gives a Manning's *n*-value of 0.077 for the highest two flow depths of 2.25 and 2.47 feet (actually hydraulic radius values in the USDA report but equated to flow depths herein).

According to the USDA report (USDA 1977), Manning's *n*-values for a particular crop are best correlated to the product of the velocity and the hydraulic radius. For an estimated velocity of perhaps 2 to 3 feet per second and an estimated average depth of perhaps 2 to 3 feet, the possible product of hydraulic radius and velocity ranges from about 4 to 9 ft^2/s. Per the chart in the USDA publication (Figure 52 in USDA (1977)), for average channel conditions, the Manning's *n*-value for this span of hydraulic radius and velocity products would be about 0.05 to 0.07.

For cotton, the highest hydraulic radius shown in the USDA report was only 1.53 feet, and the Manning's *n*-value reported for this height was 0.099. The average height of the cotton plants was about 21 inches, with the tallest plants averaging 27 inches. The 1.53-foot flow depth is quite low, and lack of experiments with higher flow depths limits the applicability of this reported *n*-value. However, this 0.099 *n*-value matches well with Chow's (1959) *n*-value of 0.10, which is given as the maximum Manning's *n*-value for dense field crops (including cotton) when the depth of flow is less than the height of the vegetation.

Based on the information outlined above from Phillips and Tadayon (2006) and the USDA (1977) report, an overall *n*-value of 0.06 was selected for the Cultivated Fields areas as an approximate average to capture the range of roughness associated with crops grown in the area taken from the Phillips and Tadayon (2006) table and in the USDA (1977) experimental values.

Agriculture—Fallow Fields (n = 0.030)

Some of the areas on the banks of Centennial Wash are agricultural fields that lie in fallow. Based on interviews with Mr. Rick Warren of the Harquahala Valley Irrigation District, approximately 17% of the 32,537 acres that are available to be irrigated in the Harquahala Valley Irrigation District lands are lying fallow at any given time. As discussed in the previous section, Phillips and Tadayon (2006) do not address agricultural fields in their reports in much detail, but approximate roughness coefficients can be estimated for fallow fields herein based on the values reported by Phillips and Tadayon (2006) and reproduced in Table 8 above. Some of the fallow fields on the banks of Centennial Wash are shown in Figure 18 and Figure 19. Using the Manning's roughness coefficients table for cultivated agricultural areas from Phillips and Tadayon (2006) (partially reproduced in Table 8 of this report), "no crop" is assigned a Manning's *n*-value of 0.030. This value was selected for Fallow Fields herein.

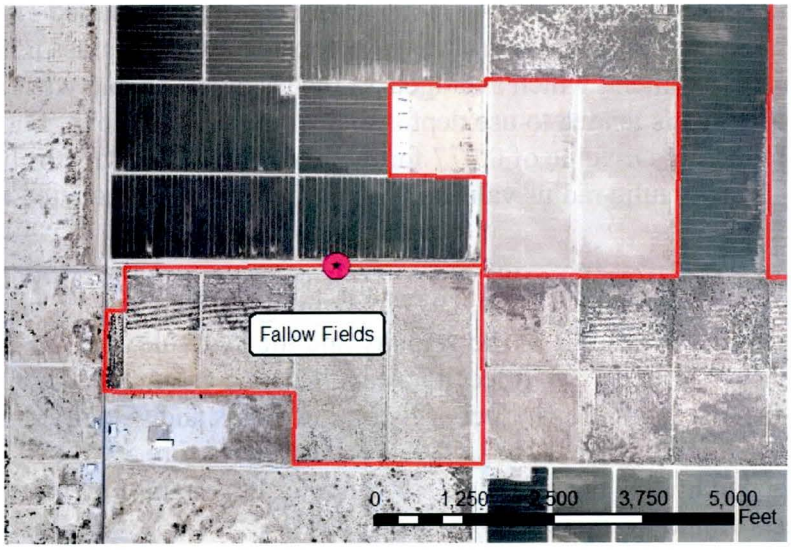

Figure 18. Aerial photograph of Fallow Fields area (located south of Waypoint 021, shown by the pink dot). Boundary of Fallow Fields areas are shown in red.

Figure 19. Ground photograph of Fallow Fields (located south of Waypoint 021)

Canal Embankment (n = 0.016)

This roughness classification is found only in small areas in the upper and lower reaches of Centennial Wash. An aerial photograph of one of these areas can be seen in Figure 20.

A base Manning's *n*-value of 0.012-0.018 is typically assigned for straight, smooth concrete channels (Arcement and Schneider, 1989). Since water will flow perpendicular to the direction of the canal in this case, a value on the upper end of this range, 0.016, was selected to represent the Canal areas.

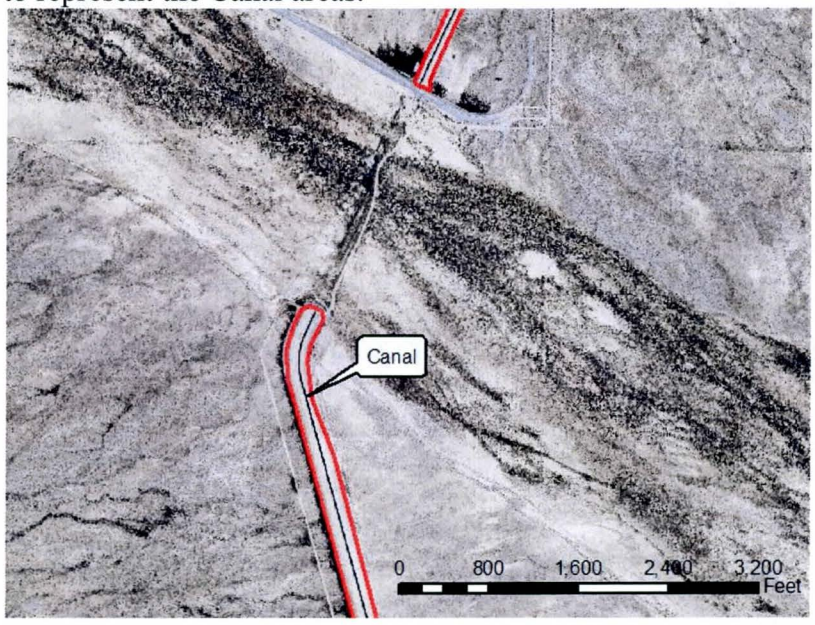

Figure 20. Aerial photograph of Canal area

Thomsen and Hjalmarson Example in the Project Reach

Thomsen and Hjalmarson (1991) analyzed one location that is within the project reach titled "Centennial Wash below Southern Pacific Railroad." Their specific classification of roughness at this site has been summarized below for additional reference. It should be noted that the calculation for composite Manning's *n*-values in Thomsen and Hjalmarson (1991) is slightly different (less complex with fewer contributing sub-components) than the calculation for composite Manning's *n*-values in Phillips and Tadayon (2006).

Centennial Wash below Southern Pacific Railroad

For a cross section taken below the railroad bridge, the roughness categorization across that width from WEST has six different roughness classifications for *n*-value assignments that were described above (Sparse, Tall Sparse, Tall Medium, Tall Dense, Agriculture—Cultivated Field, and Unvegetated Channel). In comparison, Thomsen and Hjalmarson (1991) broke this section into four *n*-value classification areas, and the calculations of composite roughness for these four areas based on the simplified calculation presented in Thomsen and Hjalmarson (1991) are summarized in Table 10.

Table 10. Manning's *n*-values for Centennial Wash below Southern Pacific Railroad reported by Thomsen and Hjalmarson (1991)

Location	Fallow Cropland, far left overbank	Medium vegetation, left overbank	Channel	Dense vegetation, right overbank
Description	T&H Figure 25, p. 86	T&H Figure 25, p. 86	T&H Figure 25, p. 86	T&H Figure 25, p. 86
Notes	-	n_b of 0.025 is for D_{50} = 0.8mm.	n_b of 0.025 is for D_{50} = 0.8mm.	n_b of 0.025 is for D_{50} = 0.8mm.
Flood	100-year	100-year	100-year	100-year
n_b (base)	0.025	0.025	0.025	0.025
n_1 (irreg.)	-	0.005	-	0.010
n_2 (obstruct.)	-	-	-	-
n_3 (veg.)	-	0.030	-	0.065
Depth Range	2-4 feet	2-4 feet	4-7 feet	2-4 feet
Average Depth	3 feet	3 feet	5 feet	3 feet
Total *n*	0.025	0.060	0.025	0.100

As can be seen, the Manning's *n*-values for roughness classifications defined as being in or near the channel in this report are similar to Thomsen and Hjalmarson (1991) Manning's *n*-values calculated in the channel. Similarly, the range of Manning's *n*-values for roughness classifications defined as being in the overbanks in this report agree with the range of Thomsen and Hjalmarson (1991) Manning's *n*-values calculated in the overbanks. The only difference is that the overbank Manning's *n*-values can be much higher in this report than what is shown in Thomsen and Hjalmarson (1991), but that difference is primarily due to the fact that the cross section analyzed in Thomsen and Hjalmarson (1991) for Centennial Wash does not include the much denser vegetation stands that are found in other portions of the Centennial Wash reach.

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FIELD RECONNAISSANCE REPORT

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
CENTENNIAL WASH FLOODPLAIN DELINEATION STUDY:
GILA RIVER TO LA PAZ COUNTY

Date: September 2012

To: Jeff Shelton, P.E., FCDMC

Cc: Amir Motamedi, FCDMC

From: Brian Wahlin, Ph.D., P.E., WEST Consultants, Inc.
Chuck Davis, CFM, WEST Consultants, Inc.

INTRODUCTION

The purpose of this Field Reconnaissance Report is to describe the site visits completed by WEST Consultants, Inc., (WEST) and the Flood Control District of Maricopa County (FCDMC) to Centennial Wash for determination of Manning's *n*-value assignments on August 23, 2012, and again on September 5, 2012. This work was performed under Contract Number FCD 2012C004. Jeff Shelton, Chuck Davis, and Suzie Monk performed the site visit on August 23; Chuck Davis and Suzie Monk performed the site visit on September 5.

As per the proposal submitted for this contract, this site visit was to "include but is not limited to observation of channel and floodplain conditions for estimating Manning's "n" values; photographic documentation of floodplain characteristics; determination of channel bank characteristics; observation of possible overflow areas; observation of levees or other flood control structures; and measurement of bridge dimensions." This report will present photos and preliminary observations from this field reconnaissance. The majority of the preliminary observations are made directly in the captions of the field photos (presented in the appendices to this report) based on noted observations while on the site visits.

Table 1 provides the waypoint numbers, field photo numbers, and a brief description of the site for each field photo and/or waypoint that was assigned to the site on the first day of the field reconnaissance (August 23). Figure 1 and Figure 2 both show general locations of the study reach with the waypoints noted from Day 1 of the of field reconnaissance to show the relative location of sites visited along Centennial Wash to one another. These waypoint numbers are also referenced in several of the photo captions in Appendix A to this memorandum (field photos from Day 1 of the field reconnaissance). It should be noted that these waypoints were collected using a handheld GPS device with an accuracy on the order of a few feet in the horizontal (i.e., not survey grade equipment). These locations as they relate to Manning's *n*-value assignments or floodplain delineation considerations will be discussed in greater detail in the final report.

Table 1. Waypoint numbers, photo numbers, and site descriptions as provided in the field for Day 1 of the Field Reconnaissance held on August 23, 2012

Waypoint	Picture	Description
067	458-461 (A-4-7)	North bank of Centennial
068	462-466 (A-8-13) Jeff 15	North bank
069		Road just north marks difference between east-west and north-south flow
070	474-478 (A-18-22)	Site 2

Figure 1. Relative location of GPS waypoints along Centennial Wash for Day 1 of the Field Reconnaissance held on August 23, 2012

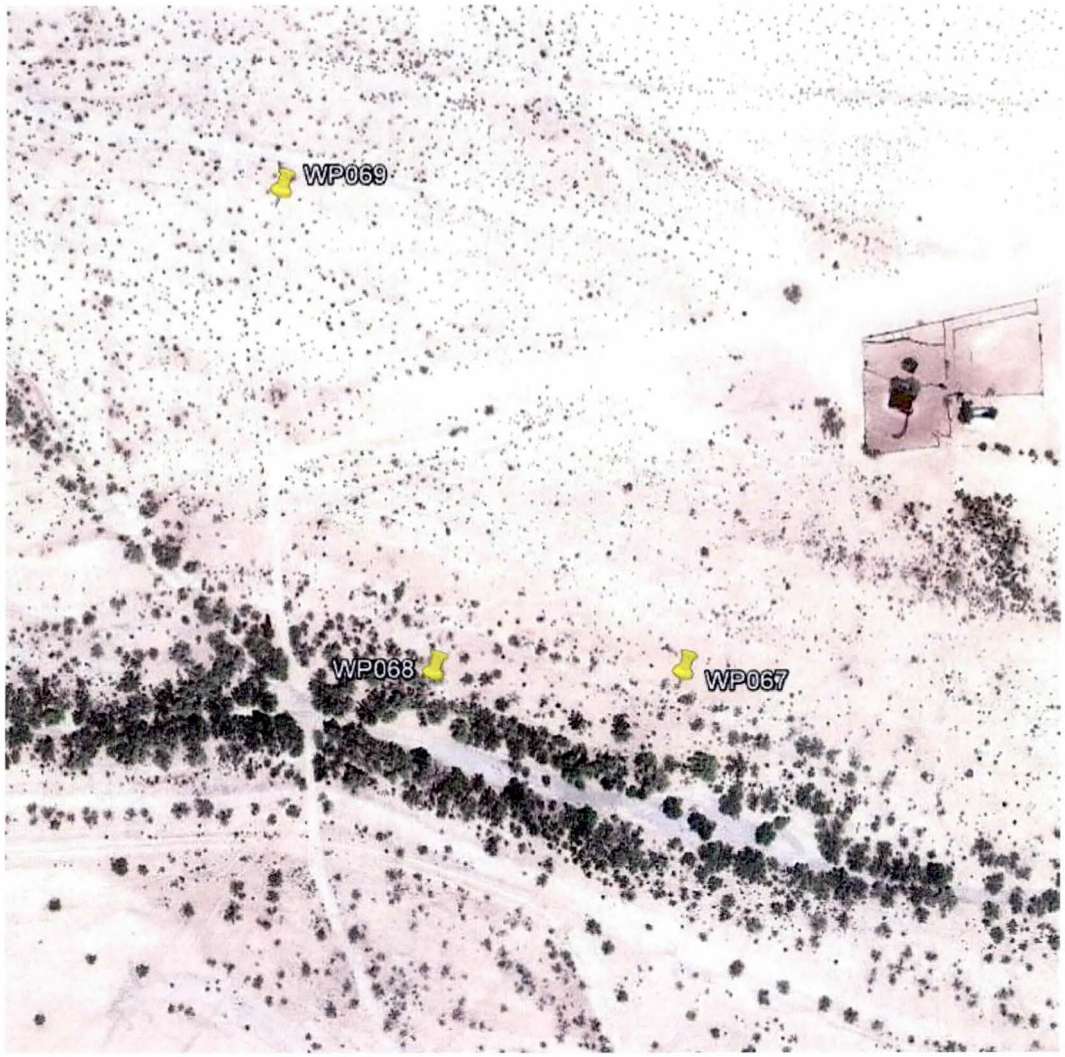


Figure 2. Locations of waypoints near Site 1 for Day 1 of the Field Reconnaissance held on August 23, 2012

Centennial Wash was flowing during Day 1 of the field reconnaissance on August 23, 2012. Due to this fact, WEST and FCDMC staff were able to collect readings that could possibly be used for model calibration in the future. At waypoint 68 there was an approximately 2.7 foot difference from the water surface to the debris line on a bush approximately 89 feet away from the edge of the water. The flow in the main channel was estimated to be 2.5-3 feet deep, 70-100 feet wide, with a flow velocity between 2-3 ft/s. These estimates lead us to a best guess of flow between 500 and 1000 cfs. This data was collected at approximately 9:30 AM that day (for future correlation with gage flow values). Jeff Shelton also noted that the road just north of waypoint 69 (see Figure 2) appeared to mark the difference between east-west and north-south flow as indicated by the debris buildup on small bushes in this area. The road appeared to be approximately 150 yards away from Centennial Wash. If this was the maximum flooding extent for the peak flow in Centennial Wash reached that morning, this location could be used as a model calibration point in the future.

Table 2 provides the waypoint numbers, field photo numbers, and a brief description of the site for each field photo and/or waypoint that was assigned to the site on the second day of the field reconnaissance (September 5). Figure 3 and Figure 4 both show general locations of the study reach with the waypoints noted from Day 2 of the of field reconnaissance to show the relative location of sites visited along Centennial Wash to one another. These waypoint numbers are also referenced in several of the photo captions in Appendix B to this memorandum (field photos from Day 2 of the field reconnaissance). It should be noted that these waypoints were collected using a handheld GPS device with an accuracy on the order of a few feet in the horizontal (i.e., not survey grade equipment). These locations as they relate to Manning's *n*-value assignments or floodplain delineation considerations will be discussed in greater detail in the final report.

Table 2. Waypoint numbers, photo numbers, and site descriptions as provided in the field for Day 2 of the Field Reconnaissance held on September 5, 2012

Waypoint	Appendix B Photo Number	Description
	1	Ag field (possibly corn?) just south of Arlington Irrigation District canal and levee
WPT001	2-6	Famer's dike; ~15 ft above field
WPT002	7-	Densest vegetation; average height ~18 ft
WPT003		AVSE II entrance
WPT004	8-13	Trestle Bridge (looking at the bridge from downstream); 1 ft diameter piers, 19 across; counting from left bank: 1-8 circular wood, 9 square wood, 10-14 steel I beams, 15 square, 16-19 circular; 20-25 foot levee on left bank downstream
	14, 20	Substrate barely downstream of bridge
	15, 17-19	Larger substrate further downstream of bridge
WPT005	16	Even further downstream of bridge
WPT006	21-23	Downstream of bridge; right bank; dense vegetation; average height ~10 ft
	24, 26-28, 30	Vegetation upstream of bridge
	25-26	Bank stabilization blocks upstream of bridge
WPT007	29	Secondary flow path upstream of bridge, left of main channel
	31-32	Substrate upstream of bridge
WPT008	33-36	Trestle span, east of main bridge; 19 piers: ½ circle, ½ square, 1 ft diameter
WPT009	37-40	Trestle span east of main bridge, circular; 19 (?) piers
WPT010	41-42	Trestle span east of main bridge; 19 piers; 44 from downstream, 45 from upstream
WPT011	46	Trestle span furthest east of main bridge; 2 piers
	44-46	Harquahala drainage channel (possibly for flood control), grass-lined; facing North; top width of 65 ft, bottom width of 30 ft
	50	Harquahala drainage channel; facing South
	48-53	Lined canal just east of Harquahala drainage channel; half of

Waypoint	Appendix B Photo Number	Description
		water goes into tank and half goes into smaller canal?; 51 facing South, 56 facing North on embankment
	57	Drainage channel continues straight north past where the road turns east; facing North
WPT012	55-56	Upper end of Harquahala drainage channel
WPT013	57-60	Flow along the road, irrigation return?; 60 N-facing, 61 E-facing, 62 SE-facing, 63 N-facing
WPT014	61-63	E of Lower Buckeye; 10-12 ft high with very high grasses (~5 ft), less dense than upstream, berm along Lower Buckeye (standing water)
	67	Inundation area to SE of Lower Buckeye
WPT015	65-68	East of 491 and Baseline; standing water upstream (north of the road, pic 71)
	69-71	Right overbank directly west of main channel near 491 and Baseline (WPT015); 72-73 looking North, 74 looking South
WPT016	72-74	Downstream of road, low-flow channel (75)
WPT017	75-76	Upstream channel North of road, standing water, end of vegetation
WPT018	80	Southwest-facing
WPT019	78-79	Canal just North of road pushes Centennial east (field to South
WPT020	80	Retention basin just East of road (not pictured), dead trees West of road
	81-82	View from Southern Ave just west of WPT 19 and 20 (85 looking N, 86 looking S); 2x2 salt cedar (unwalkably dense) in 10'x10' area = 80-90% canopy cover (medium density = 2 salt cedar, low vegetation = 0 salt cedar)
WPT021	83-84	Fallow fields south of Van Buren (87), fields north of Van Buren (88)
WPT022	85-87	Medium vegetation with low bushes/grass (field in aerials); raised road; false front next to road with long grass (89), shorter grass further from road (90-91)
WPT023	88-89	Vegetated area E of Van Buren, 2 plants per 10'x10' area
WPT024	94	Triple barrel 72" diameter culvert (4.5' between); Harquahala drainage channel and Van Buren; view from upstream; 30' bottom width, 90' top width
	95	Left bank downstream of culvert
	92-93	Looking downstream from culvert
	94-95	Buckeye and Harquahala drainage channel; low-flow crossing; 98 upstream, 99 downstream

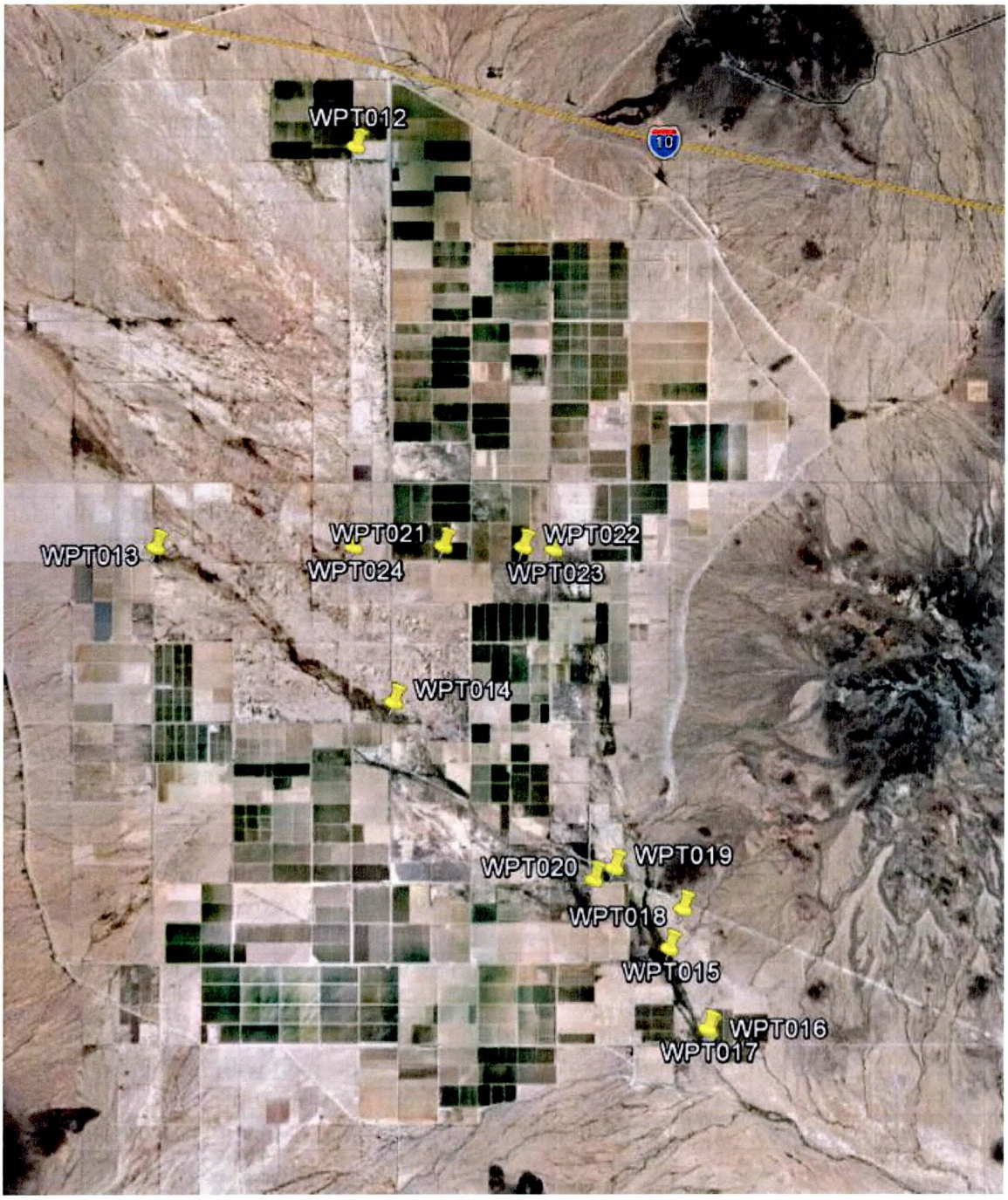


Figure 3. Locations of GPS waypoints 12 through 24 along Centennial Wash for Day 2 of the Field Reconnaissance held on September 5, 2012

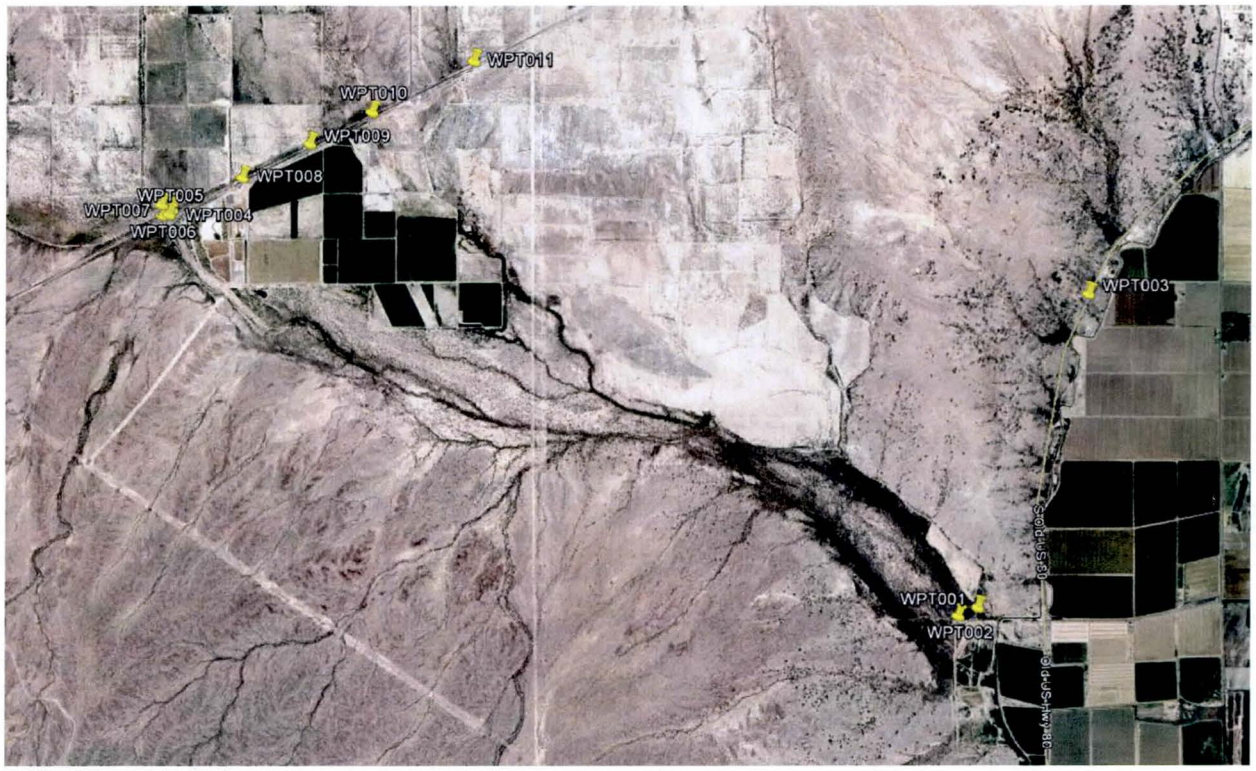


Figure 4. Locations of GPS waypoints 1 through 11 along Centennial Wash for Day 2 of the Field Reconnaissance held on September 5, 2012

Table 3 provides the waypoint numbers, field photo numbers, and a brief description of the site for each field photo and/or waypoint that was assigned to the site on the third day of the field reconnaissance (October 2). Figure 5 shows general locations of the study reach with the waypoints noted from Day 3 of the of field reconnaissance to show the relative location of sites visited along Centennial Wash to one another. These waypoint numbers are also referenced in several of the photo captions in Appendix C to this memorandum (field photos from Day 3 of the field reconnaissance). It should be noted that these waypoints were collected using a handheld GPS device with an accuracy on the order of a few feet in the horizontal (i.e., not survey grade equipment). These locations as they relate to Manning's *n*-value assignments or floodplain delineation considerations will be discussed in greater detail in the final report. The purpose of Day 3 of the field reconnaissance was to evaluate the primary flow split for Centennial Wash so that it could be modeled more effectively.

Table 3. Waypoint numbers, photo numbers, and site description as provided in the field for Day 3 of the Field Reconnaissance held on October 2, 2012

Waypoint	Appendix C Photo Number	Description
001	1-4	Near the Allison stock tank
002	5-7	Near the southern flow path of the primary flow split for Centennial Wash

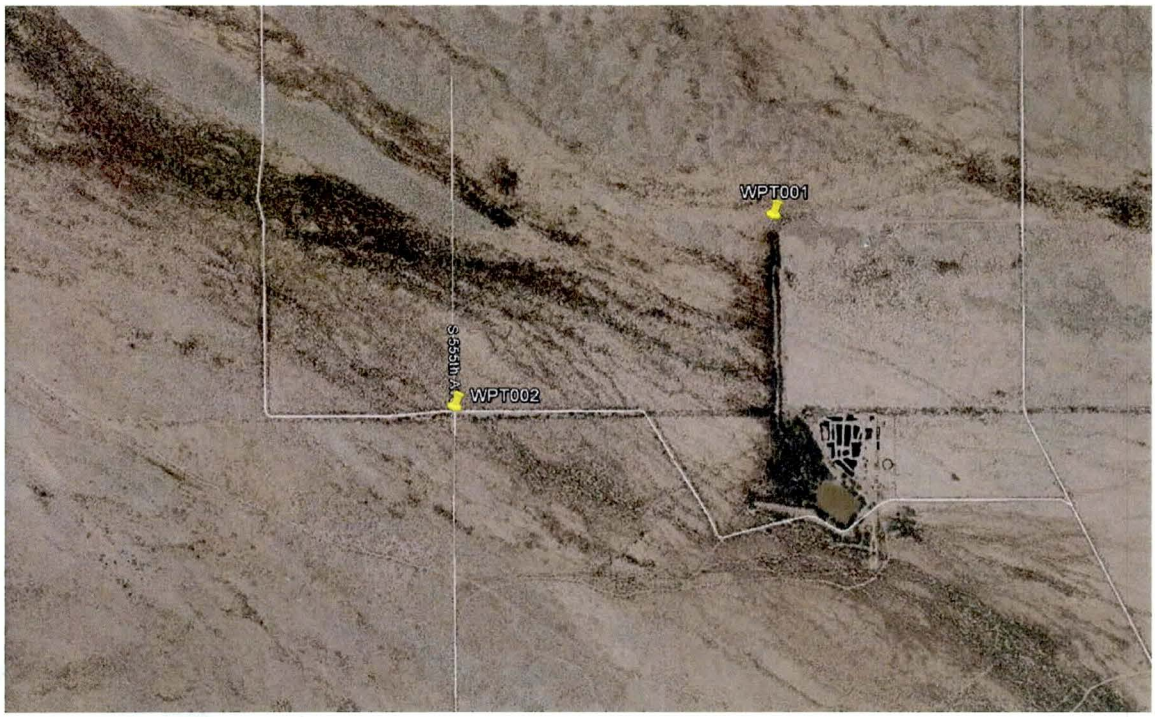


Figure 5. Locations of GPS Waypoints 1 and 2 along Centennial Wash for Day 3 of the Field Reconnaissance held on October 2, 2012

Appendix A: Pictures from Day 1 of the Manning's *n*-value Field Reconnaissance (August 23, 2012)

Photo A-1 – Evidence of sheet flow.

Photo A-2 – Height of vegetation in the left overbank (white square is 1.5 ft square).

Photo A-3 – Height of vegetation in the left overbank (white square is 1.5 ft square).

Photo A-4 – Height of vegetation in the left overbank (white square is 1.5 ft square).

Photo A-5 – Side channel just north of the main channel (in distance).

Photo A-6 – Height of vegetation along banks of stream channel.

Photo A-7 – Side channel north of the main channel.

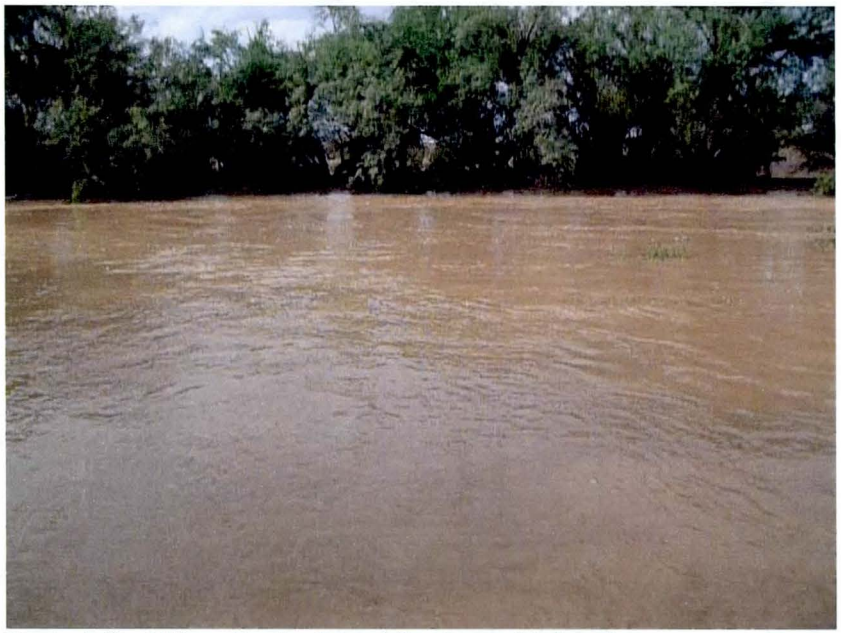


Photo A-8 – Video of main channel flowing at this location (P1030462.MOV).

Photo A-9 – Vegetation in the north floodplain.

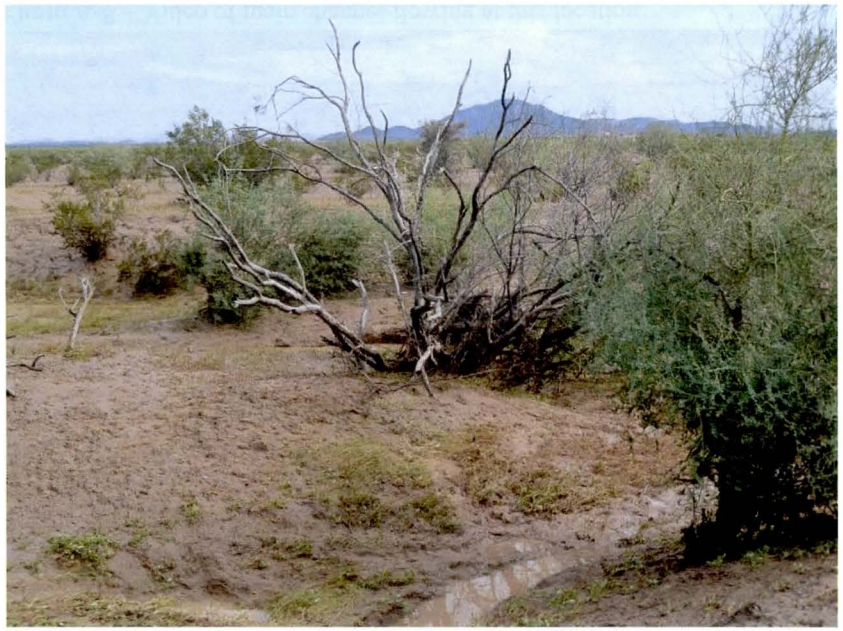


Photo A-10 – Debris collected on vegetation (on right-most bush).

Photo A-11 – Debris collected on vegetation.

Photo A-12 – Debris collected on vegetation. Northern side channel in background.

Photo A-13 – Vegetation in north floodplain.

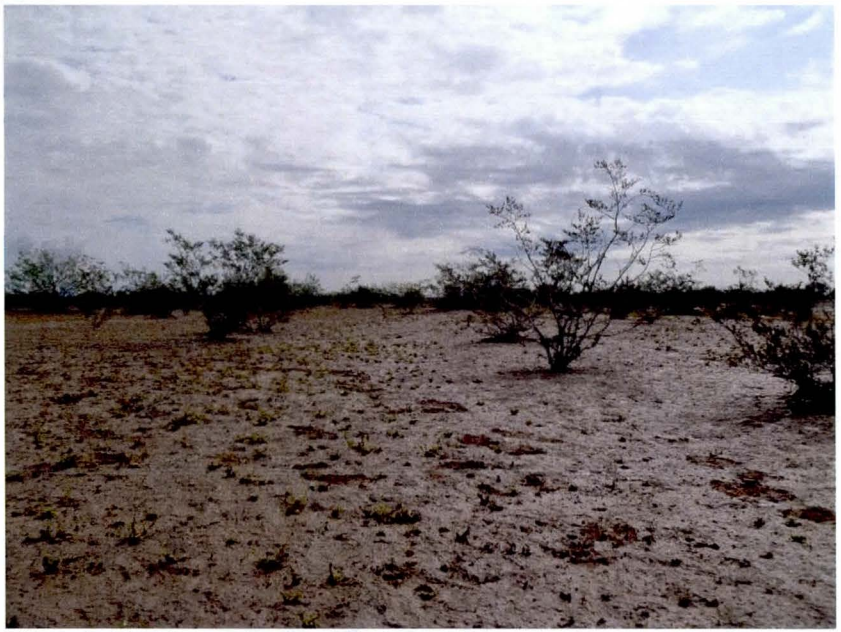


Photo A-14 – Vegetation in north floodplain.

Photo A-15 – Vegetation in north floodplain.

Photo A-16 – Vegetation in north floodplain.

Photo A-17 – Vegetation in north floodplain.

Photo A-18 – Erosion at second site.

Photo A-19 – Main channel, looking upstream.

Photo A-20 – Main channel, looking upstream.

Photo A-21 – Main channel, looking upstream.

Photo A-22 – Main channel, looking downstream.

Appendix B: Pictures from Day 2 of the Manning's *n*-value Field Reconnaissance (September 5, 2012)

Photo B-1 – Field south of canal and levee, possibly corn

Photo B-2 – Facing north on farmer's dike (Waypoint 1)

Photo B-3 – Facing west on farmer's dike (Waypoint 1)

Photo B-4 – Facing south on farmer's dike (Waypoint 1)

Photo B-5 – Facing southeast on farmer's dike (Waypoint 1)

Photo B-6 – Facing northeast on farmer's dike (Waypoint 1)

Photo B-7 – Area with densest vegetation. Square is 1.5'x1.5'. Average vegetation height is approximately 18 ft (Waypoint 2)

Photo B-8 – Primary trestle bridge, looking from downstream left bank (Waypoint 4)

Photo B-9 – Primary trestle bridge, looking from downstream left bank (Waypoint 4)

Photo B-10 – Primary trestle bridge, looking from downstream left bank (Waypoint 4)

Photo B-11 – Primary trestle bridge, looking from downstream main channel (Waypoint 4)

Photo B-12 – Primary trestle bridge, looking from downstream main channel (Waypoint 4)

Photo B-13 – Primary trestle bridge, looking from downstream main channel (Waypoint 4)

Photo B-14 – Surface substrate barely downstream of trestle bridge (Waypoint 4)

Photo B-15 – Surface substrate further downstream of trestle bridge (Waypoint 4)

Photo B-16 – Substrate furthest downstream of trestle bridge (Waypoint 5)

Photo B-17 – Substrate downstream of trestle bridge (corresponds to Photo B-18) (Waypoint 4)

Photo B-18 – Substrate downstream of trestle bridge (corresponds to Photo B-18) (Waypoint 4)

Photo B-19 – Substrate downstream of trestle bridge (corresponds to Photo B-18) (Waypoint 4)

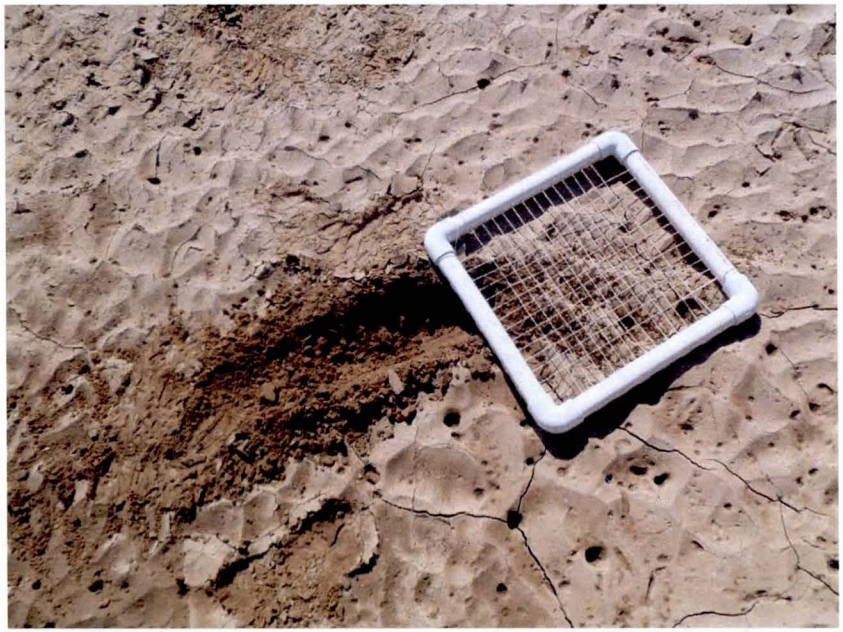


Photo B-20 – Substrate barely downstream of trestle bridge (corresponds to Photo B-17) (Waypoint 4)

Photo B-21 – Right bank downstream of primary trestle bridge. Dense vegetation with an average height of around 10 feet (Waypoint 6)

Photo B-22 – Dense vegetation downstream of primary trestle bridge on right bank (Waypoint 6)

Photo B-23 – Dense vegetation downstream of primary trestle bridge on right bank (Waypoint 6)

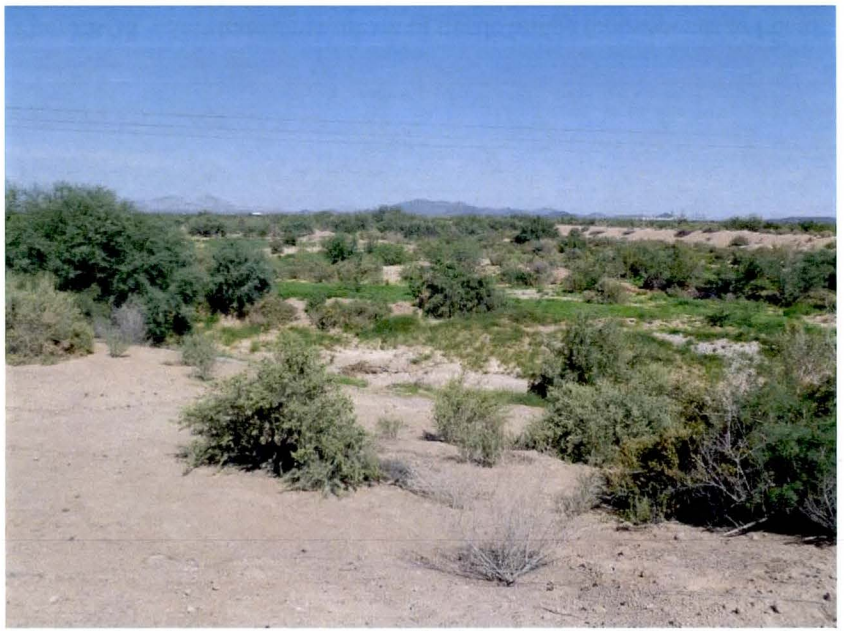


Photo B-24 – Vegetation upstream of bridge on right bank, looking upstream

Photo B-25 – Main channel upstream of bridge with bank stabilization blocks on left bank

Photo B-26 – Vegetation upstream of bridge, looking upstream from main channel

Photo B-27 – Vegetation upstream of trestle bridge

Photo B-28 – Vegetation upstream of trestle bridge

Photo B-29 – Secondary flow path upstream of trestle bridge, left of main channel (Waypoint 7)

Photo B-30 – Vegetation on banks of main channel, viewed from upstream of trestle bridge (Waypoint 7)

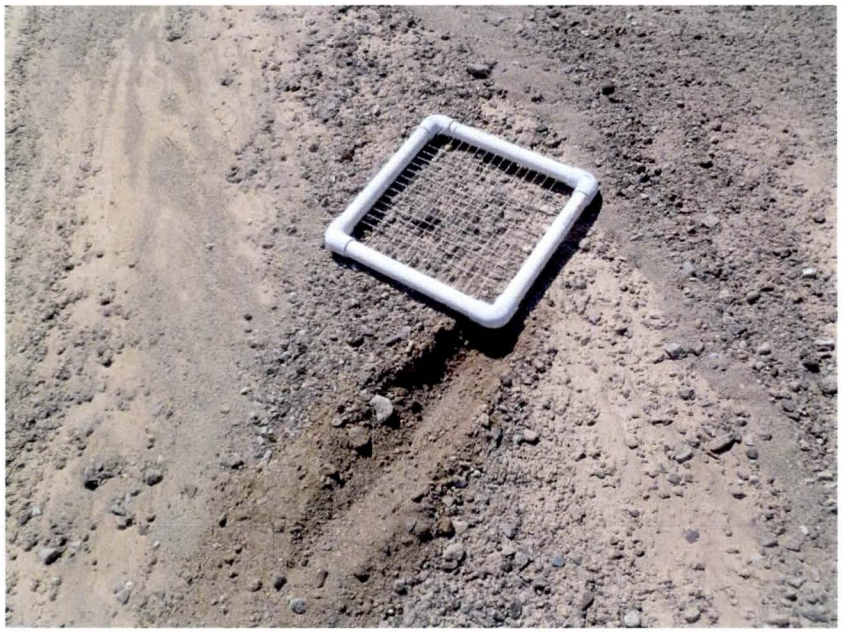


Photo B-31 – Substrate upstream of primary trestle bridge (Waypoint 7)

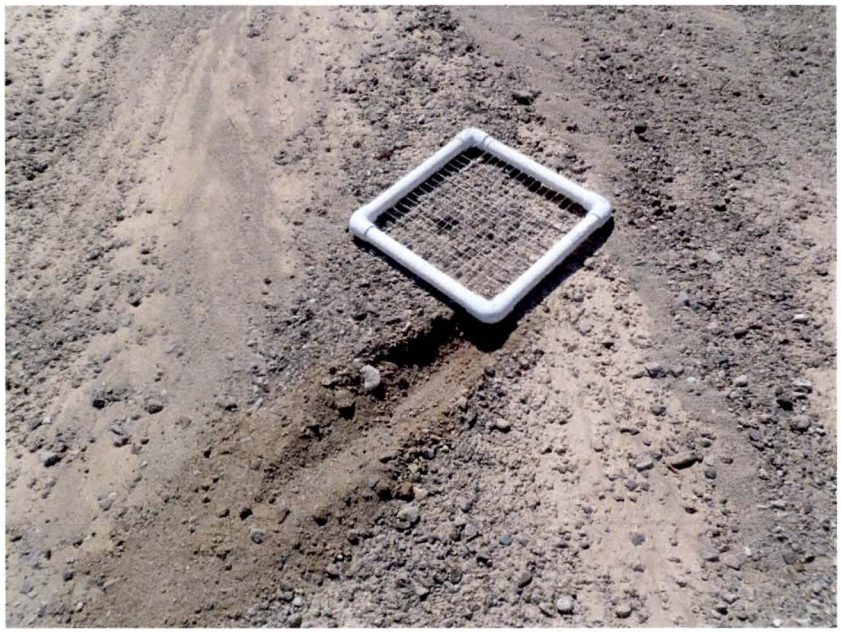


Photo B-32 – Substrate upstream of primary trestle bridge (Waypoint 7)

Photo B-33 – First trestle span east of primary trestle bridge (Waypoint 8)

Photo B-34 – First trestle span east of primary trestle bridge (Waypoint 8)

Photo B-35 – First trestle span east of primary trestle bridge (Waypoint 8)

Photo B-36 – First trestle span east of primary trestle bridge (Waypoint 8)

Photo B-37 – Second trestle span east of primary trestle bridge (Waypoint 9)

Photo B-38 – Second trestle span east of primary trestle bridge (Waypoint 9)

Photo B-39 – Second trestle span east of primary trestle bridge (Waypoint 9)

Photo B-40 – Second trestle span east of primary trestle bridge (Waypoint 9)

Photo B-41 – Third trestle span east of primary trestle bridge, viewed from downstream (Waypoint 10)

Photo B-42 – Third trestle span east of primary trestle bridge, viewed from upstream (Waypoint 10)

Photo B-43 – Fourth trestle span east of primary trestle bridge (Waypoint 11)

Photo B-44 – Harquahala drainage channel, facing north from Centennial Road just west of Indian School Road

Photo B-45 – Harquahala drainage channel, facing north from Centennial Road just west of Indian School Road

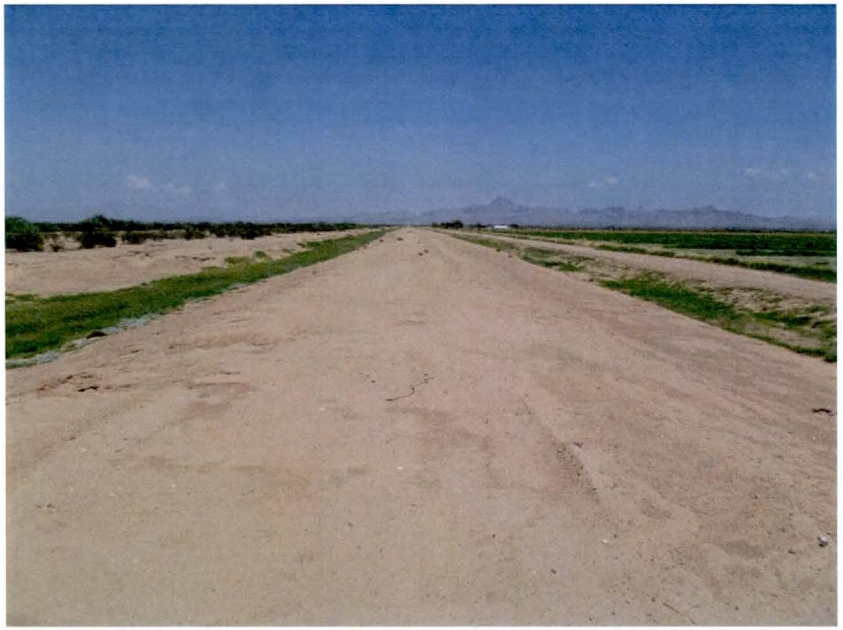


Photo B-46 – Embankment on left bank of Harquahala drainage channel, facing north

Photo B-47 – Harquahala drainage channel, facing South from Centennial Road just west of Indian School Road

Photo B-48 – Lined canal just east of Harquahala drainage channel, facing south

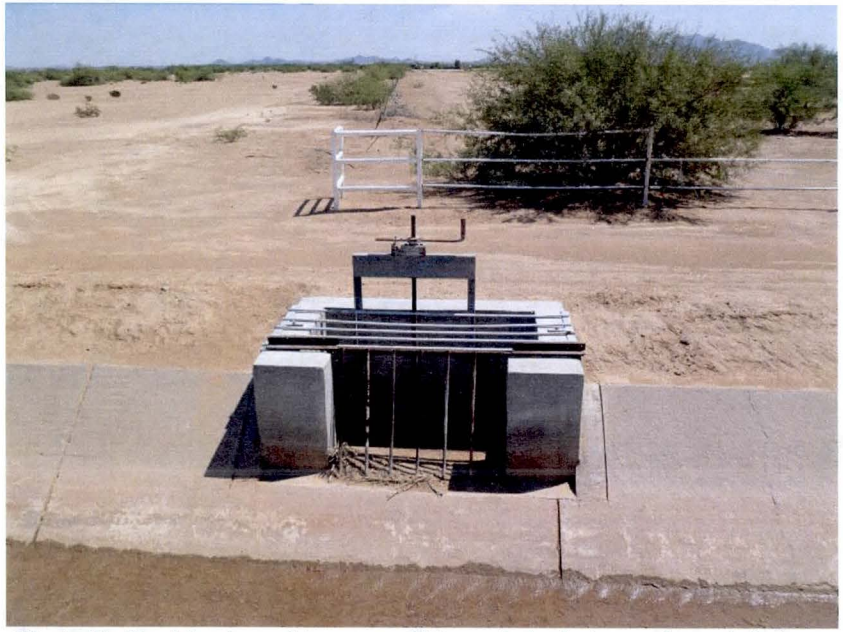


Photo B-49 – Lined canal just east of Harquahala drainage channel, facing east

Photo B-50 – Lined canal just east of Harquahala drainage channel, facing south

Photo B-51 – Lined canal just east of Harquahala drainage channel, facing north

Photo B-52 – Lined canal just east of Harquahala drainage channel, facing north

Photo B-53 – Harquahala drainage channel embankment near lined canal

Photo B-54 – Harquahala drainage channel embankment where Indian School Road splits from channel

Photo B-55 – Upper end of Harquahala drainage channel, facing south (Waypoint 12)

Photo B-56 – Upper end of Harquahala drainage channel (Waypoint 12)

Photo B-57 – Flow along 539th Ave, facing north on Van Buren Street (Waypoint 13)

Photo B-58 – Flow along 539th Ave, facing east on Van Buren Street (Waypoint 13)

Photo B-59 – Flow along 539th Ave, facing southeast on Van Buren Street (Waypoint 13)

Photo B-60 – Flow Flow along 539th Ave, facing north on Van Buren Street (Waypoint 13)

Photo B-61 – Vegetation east of Lower Buckeye, 10-12 feet high with 5-ft tall grasses (Waypoint 14)

Photo B-62 – Vegetation east of Lower Buckeye, 10-12 feet high with 5-ft tall grasses (Waypoint 14)

Photo B-63 – Vegetation east of Lower Buckeye, 10-12 feet high with 5-ft tall grasses (Waypoint 14)

Photo B-64 – Inundation area to southeast of Lower Buckeye (Waypoint 14)

Photo B-65 – Vegetation east of 491 Ave and Baseline, facing west (Waypoint 15)

Photo B-66 – Vegetation east of 491 Ave and Baseline, facing south (Waypoint 15)

Photo B-67 – Vegetation east of 491 Ave and Baseline, facing east (Waypoint 15)

Photo B-68 – Vegetation east of 491 Ave and Baseline, standing water upstream, facing north (Waypoint 15)

Photo B-69 – Right overbank directly west of main channel near 491 Ave and Baseline, facing north (West of waypoint 15)

Photo B-70 – Right overbank directly west of main channel near 491 Ave and Baseline, facing north (West of waypoint 15)

Photo B-71 – Right overbank directly west of main channel near 491 Ave and Baseline, facing south (West of waypoint 15)

Photo B-72 – Low-flow channel downstream of Dobbins Road, facing south (Waypoint 16)

Photo B-73 – Vegetation downstream of road, facing south (Waypoint 16)

Photo B-74 – Vegetation downstream of Dobbins Road (Waypoint 16)

Photo B-75 – Vegetation upstream (north) of Dobbins Road, facing north. Standing water, end of denser vegetation (Waypoint 17)

Photo B-76 – Vegetation upstream of Dobbins Road, facing north. Standing water, end of denser vegetation (Waypoint 17)

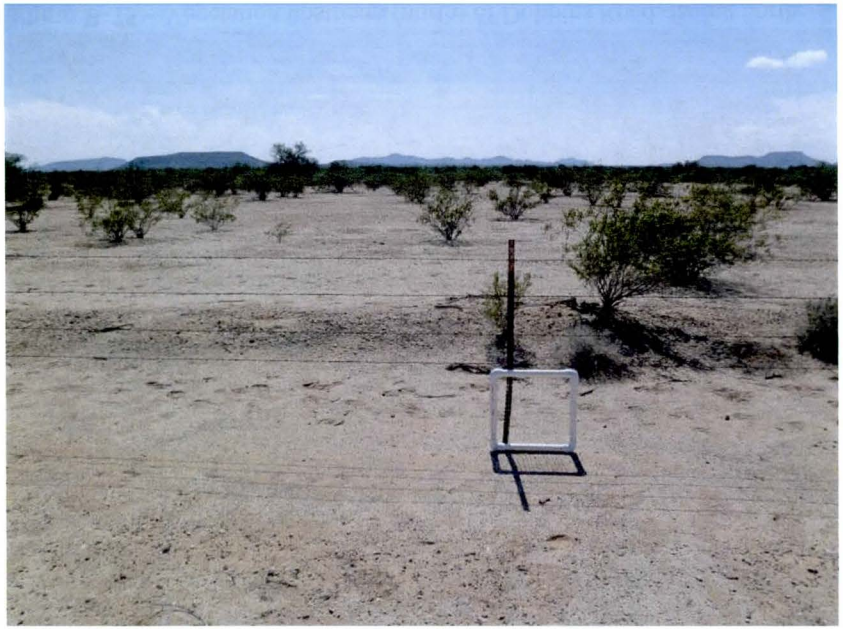


Photo B-77 – Sparse vegetation, facing southwest (Waypoint 18)

Photo B-78 – Canal just north of road may direct Centennial flow away from field to south of Southern Ave (Waypoint 19)

Photo B-79 – Field left of road and canal right of Southern Ave (Waypoint 19)

Photo B-80 – Vegetation west of road (Waypoint 20)

Photo B-81 – Vegetation viewed from Southern Ave (West of waypoints 19 and 20)

Photo B-82 – Vegetation viewed from Southern Ave (West of waypoints 19 and 20)

Photo B-83 – Fallow field south of Van Buren (Waypoint 21)

Photo B-84 – Growing fields north of Van Buren (Waypoint 21)

Photo B-85 – Dense vegetation right next to Van Buren Road, facing south (Waypoint 22)

Photo B-86 – Representative vegetation further away from Van Buren Road, facing south. Look like fields on the aerial maps (Waypoint 22)

Photo B-87 – Representative vegetation further away from Van Buren Road, facing south. Look like fields on the aerial maps (Waypoint 22)

Photo B-88 – Vegetated area east of Van Buren, facing south, two plants per 100 ft^2 (Waypoint 23)

Photo B-89 – Vegetated area east of Van Buren, facing south, two plants per 100 ft^2 (Waypoint 23)

Photo B-90 – Triple barrel 72" diameter culvert under Van Buren for the Harquahala drainage channel, viewed from upstream (Waypoint 24)

Photo B-91 – Left bank downstream of culvert crossing, viewed from road (Waypoint 24)

Photo B-92 – Riprap in main channel downstream of culvert crossing (Waypoint 24)

Photo B-93 – Riprap in main channel downstream of culvert crossing (Waypoint 24)

Photo B-94 – Low flow crossing on Buckeye for Harquahala drainage channel, looking upstream

Photo B-95 – Low flow crossing on Buckeye for Harquahala drainage channel, looking downstream

Appendix C: Pictures from Day 3 of the Detailed Field Reconnaissance
(October 2, 2012)

Photo C-1 – Looking West-Northwest from Waypoint 1 near Allison stock tank

Photo C-2 – Looking West-Northwest from Waypoint 1 near Allison stock tank

Photo C-3 – Looking South from Waypoint 1 near Allison stock tank

Photo C-4 – Looking South from Waypoint 1 near Allison stock tank

Photo C-5 – Looking west from Waypoint 2 at the southern flow path of the primary flow split for Centennial Wash

Photo C-6 – Looking west from Waypoint 2 at the southern flow path of the primary flow split for Centennial Wash

Photo C-7 – Old survey marker near Waypoint 2

Appendix E: Hydraulic Analysis Supporting Documentation

E.2 Cross Section Plots

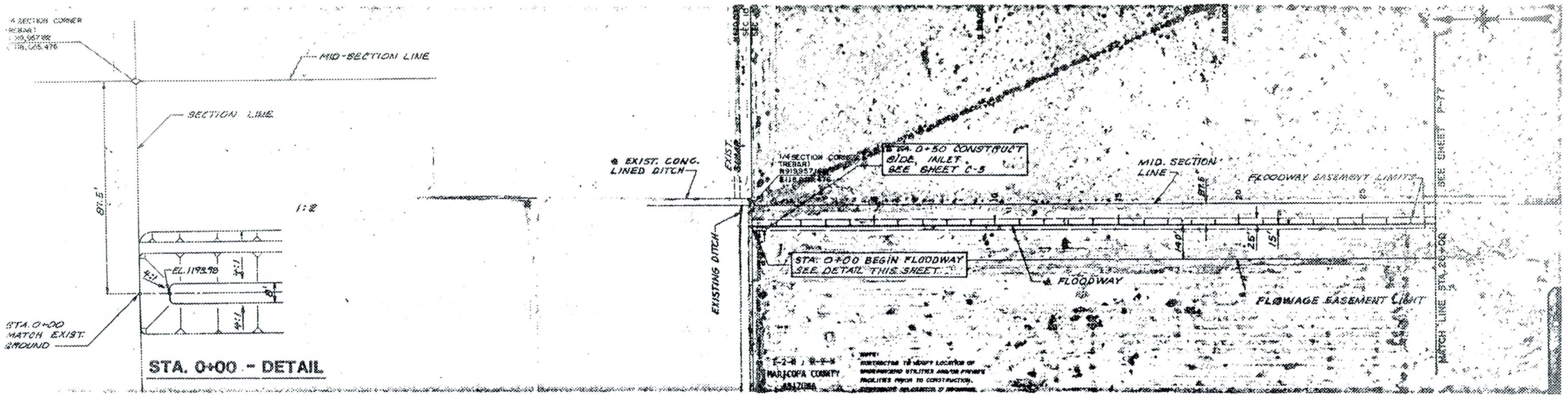
Appendix E: Hydraulic Analysis Supporting Documentation

E.3 Expansion and Contraction Coefficients

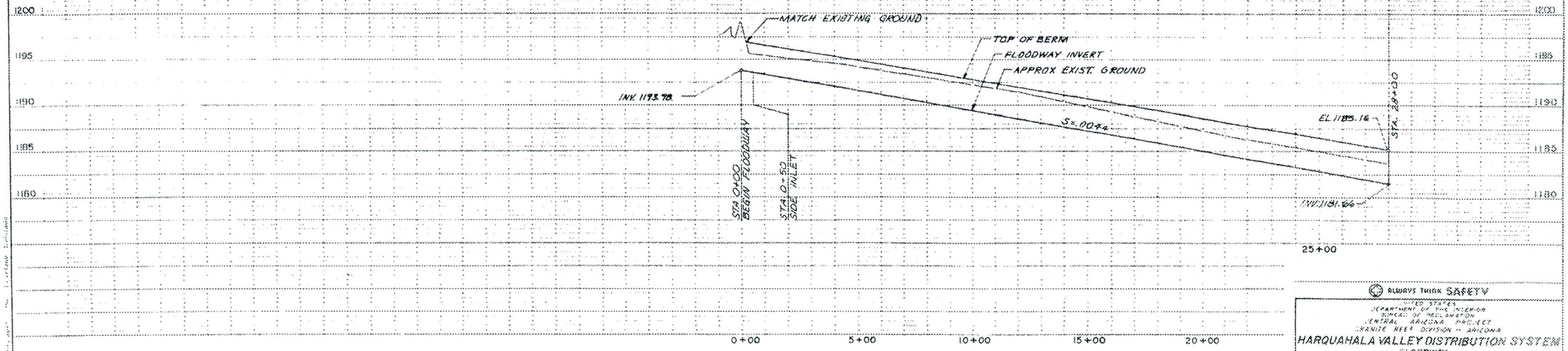
Appendix E: Hydraulic Analysis Supporting Documentation

E.4 Analysis of Structures

NOTE:
FOR GEOLOGICAL EXPLANATION AND NOTES, SEE SHEET X-1



ARIZONA STATE PLANE COORDINATES, CENTRAL ZONE
NOTE: COORDINATES ARE COMPUTED FROM UNADJUSTED GROUND DISTANCES



ALWAYS THINK SAFETY

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
CENTRAL ARIZONA PROJECT
GRANITE REEF DIVISION - ARIZONA

HARQUAHALA VALLEY DISTRIBUTION SYSTEM

FLOODWAY

PLAN AND PROFILE
STA. 0+00 TO STA. 25+00

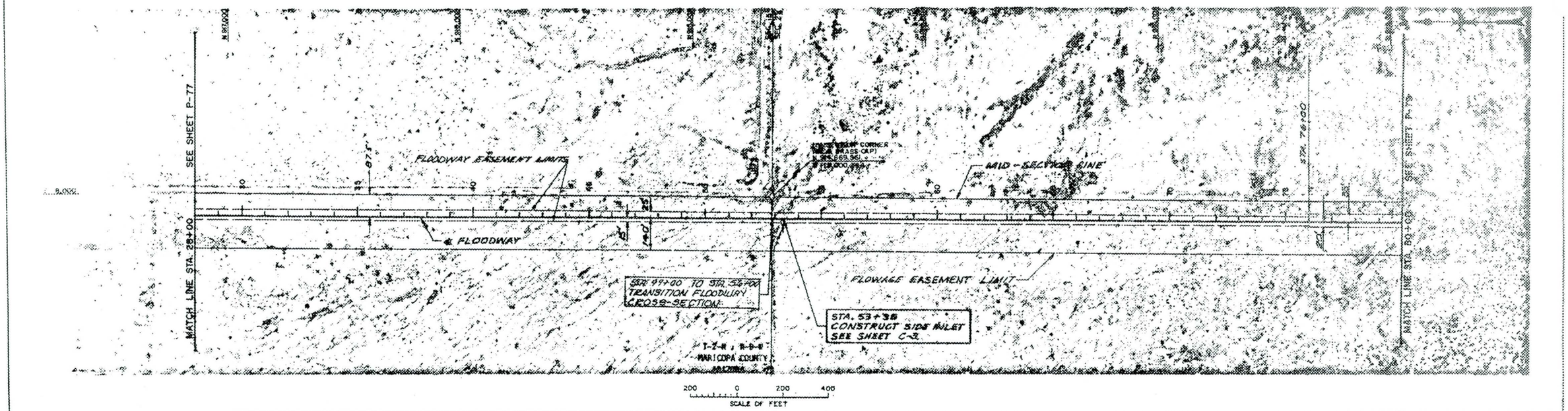
263-1100

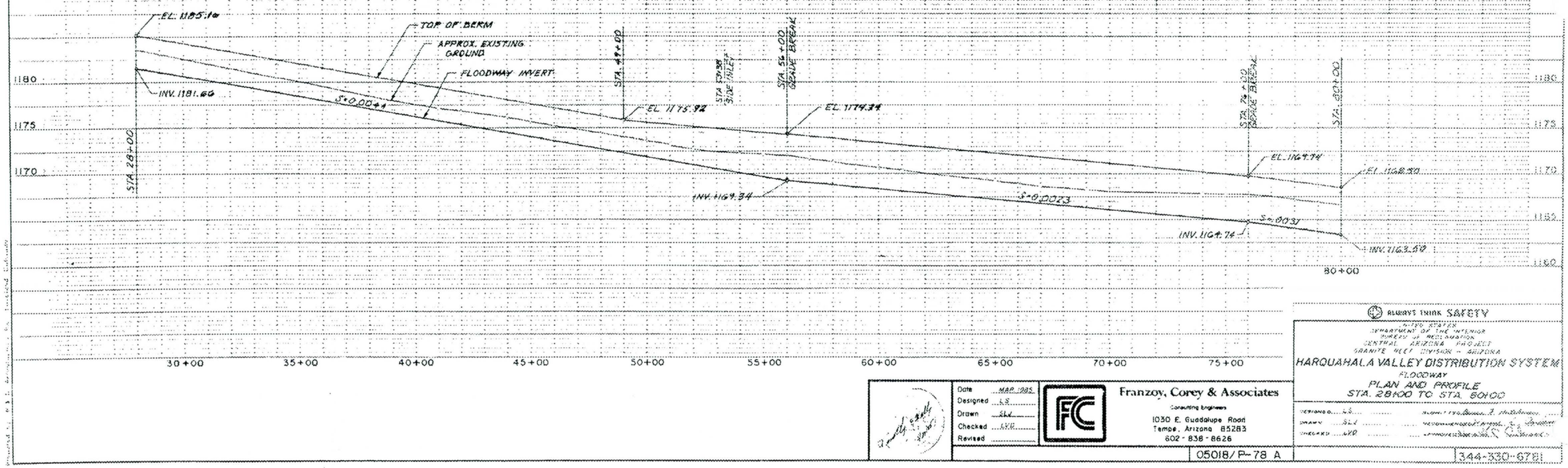
Date FEB. 1985
Designed L.S.
Drawn S.L.J.
Checked L.V.D.
Revised

Franzoy, Corey & Associates
Consulting Engineers
1030 E. Guadalupe Road
Tempe, Arizona 85283
602-838-8626

05018/P-77 A

344-330-6780





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PLAN AND PROFILE
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Date	MAR 1985
Designed	LS
Drawn	SLV
Checked	LVD
Revised	

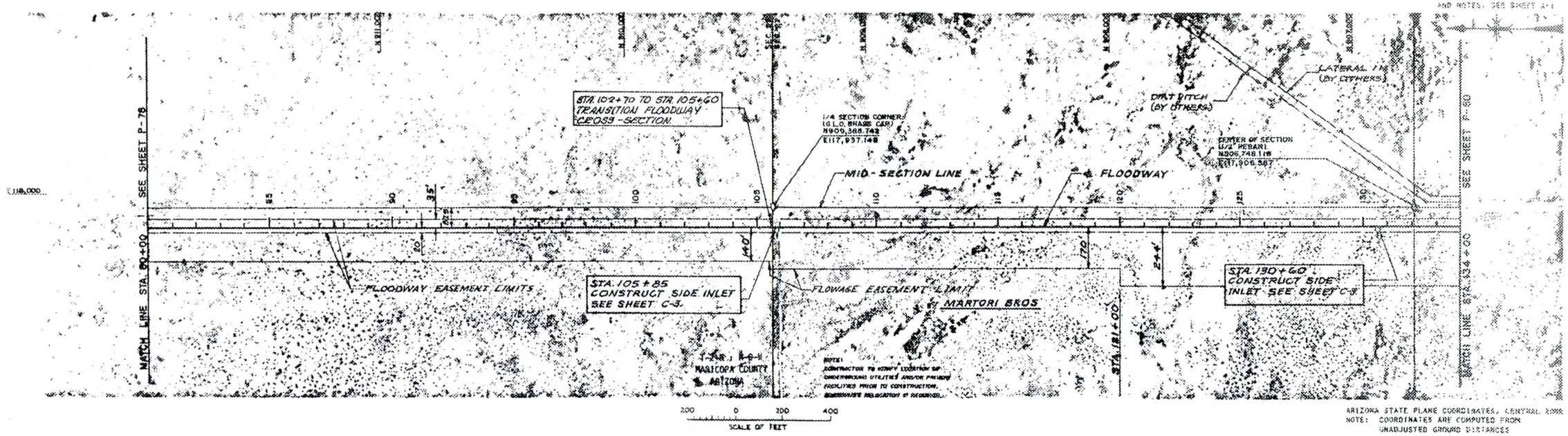
Franzoy, Corey & Associates
Consulting Engineers
1030 E. Guadalupe Road
Tempe, Arizona 85283
602 - 838 - 8626

DESIGNED LS — RECOMMENDED FOR APPROVAL
DRAWN SLV — SUPERINTENDENT
CHECKED LVD — CHIEF, DESIGN DIVISION

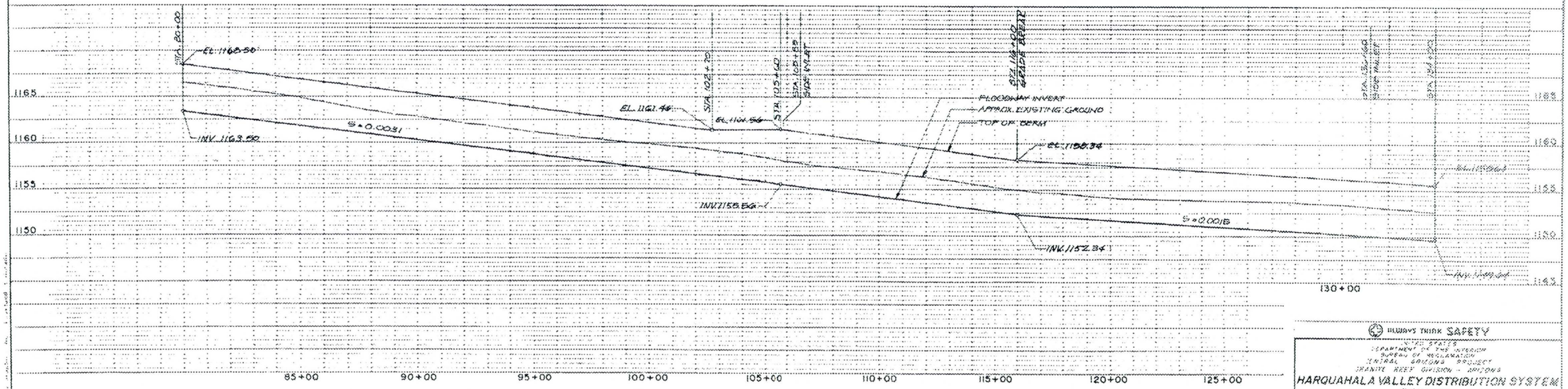
05018/P-78 A

344-330-6781

NOTE:
FOR GEOLOGICAL EXPLANATION AND NOTES, SEE SHEET A-1



ARIZONA STATE PLANE COORDINATES, CENTRAL ZONE
NOTE: COORDINATES ARE COMPUTED FROM UNADJUSTED GROUND DISTANCES



263-1100

Date MAR. 1985
Designed L.S.
Drawn S.L.J.
Checked L.V.R.
Revised

Franzoy, Corey & Associates
Consulting Engineers
1030 E. Guadalupe Road
Tempe, Arizona 85283
602-838-8626

05018/P-79 A

344-330-6782

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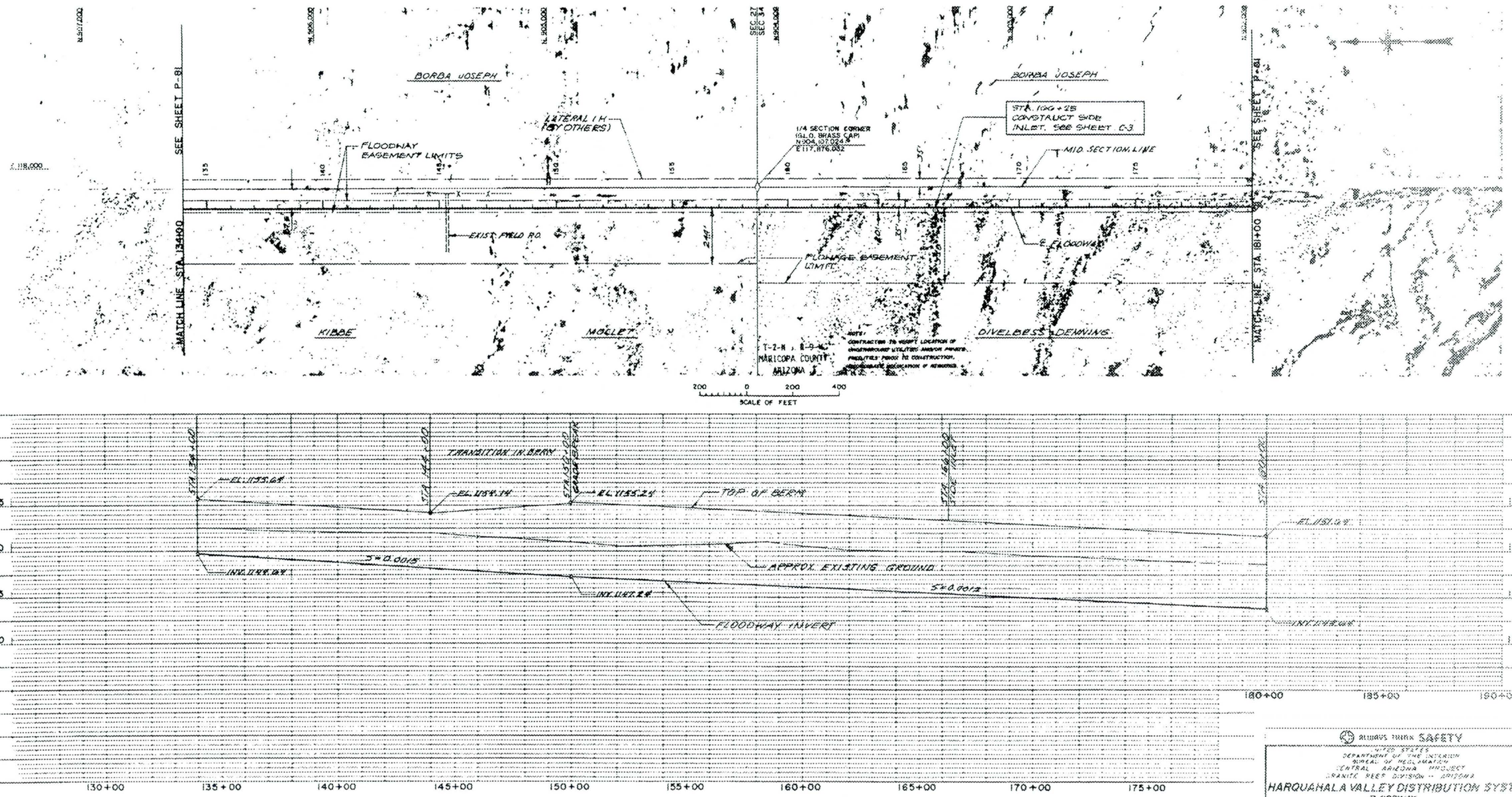
BUREAU OF RECLAMATION
CENTRAL ARIZONA PROJECT
PHOENIX AREA OFFICE - ARIZONA

HARQUAHALA VALLEY DISTRIBUTION SYSTEM

FLOODWAY

PLAN AND PROFILE
STA. 80+00 TO STA. 134+00

DESIGNED L.S. RECOMMENDED
DRAWN S.L.J.
CHECKED L.V.R. APPROVED



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BUREAU OF RECLAMATION
CENTRAL ARIZONA PROJECT
GRANITE REEF DIVISION - ARIZONA

HARQUAHALA VALLEY DISTRIBUTION SYSTEM

FLOODWAY

PLAN AND PROFILE
STA. 134+00 TO STA. 180+00

DESIGNED LS
DRAWN SLV/RDA
CHECKED LVD

Date MAR 1985
Designed LS
Drawn SLV/RDA
Checked LVD
Revised

Franzoy, Corey & Associates
Consulting Engineers
1030 E Guadalupe Road
Tempe, Arizona 85283
602-838-8626

05018/P-80 A

344-330-6783

263-1100

NOTE:
FOR GEOLOGICAL EXPLORATION AND NOTES, SEE SHEET A-17

1"=8,000

SEE SHEET P-80

MATCH LINE STA. 180+00

LATERAL 1H (BY OTHERS)

CENTER OF SECTION (REBAR)
N 901,467.233
E 117,845.873

MID-SECTION LINE

EXIST. CONC. DITCH

FLOODWAY

1/4 CORNER (REBAR)
N 898,827.251
E 117,865.764

FLOODWAY EASEMENT LIMITS

SEE SHEET P-82

MATCH LINE STA. 228+00

STA. 187+35
CONSTRUCT SIDE INLET
SEE SHEET C-23

STA. 195+40 CONSTRUCT SIDE INLET
SEE SHEET C-23

FLOWAGE EASEMENT LIMIT

COURTHOUSE RD.

STA 211+23
CONSTRUCT ROAD CROSSING
SEE SHEET C-24

T 7 S, R 9 W
MARICOPA COUNTY
ARIZONA

T 6 S, R 9 W
MARICOPA COUNTY
ARIZONA

NOTE:
CONTRACTOR TO VERIFY LOCATION OF GOVERNING UTILITIES AND/OR FACILITIES PRIOR TO CONSTRUCTION.

100 0 200 400
SCALE OF FEET

ARIZONA STATE PLANE COORDINATES, CENTRAL ZONE
NOTE: COORDINATES ARE COMPUTED FROM UNADJUSTED GROUND DISTANCES

STA. 180+00
EL. 1151.64
STA. 185+00 GRADE BREAK
STA. 187+35 SIDE INLET
STA. 191+10 SIDE INLET
STA. 211+23 GRADE BREAK
STA. 211+23 ROAD CROSSING
APPROX. EXIST. GROUND
TOP OF BERM
EL. 1147.48
EL. 1144.34
S=0.0012
S=0.0014
S=0.0018
INV. 1143.64
INV. 1143.04
FLOODWAY INVERT
INV. 1138.84

1150
1145
1140

180+00 185+00 190+00 195+00 200+00 205+00 210+00 215+00 220+00 225+00

263-1100

Date MAR 1984
Designed LS
Drawn SL/RGA
Checked LYD
Revised

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Consulting Engineers
1030 E. Guadalupe Road
Tempe, Arizona 85283
602-838-8626

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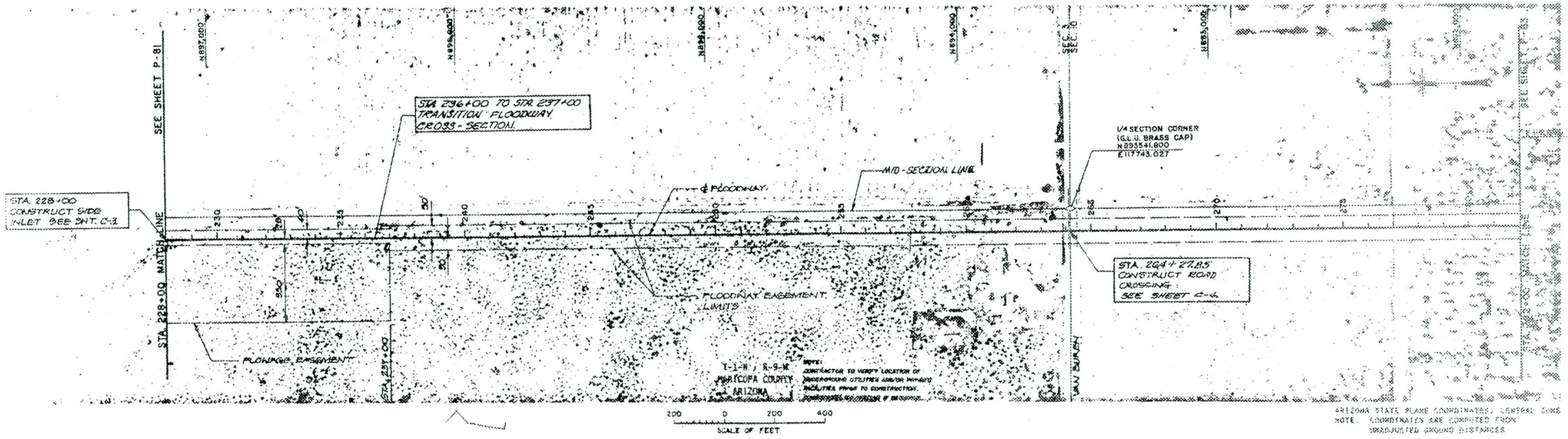
CENTRAL ARIZONA PROJECT
MARIE REEF DIVISION - ARIZONA

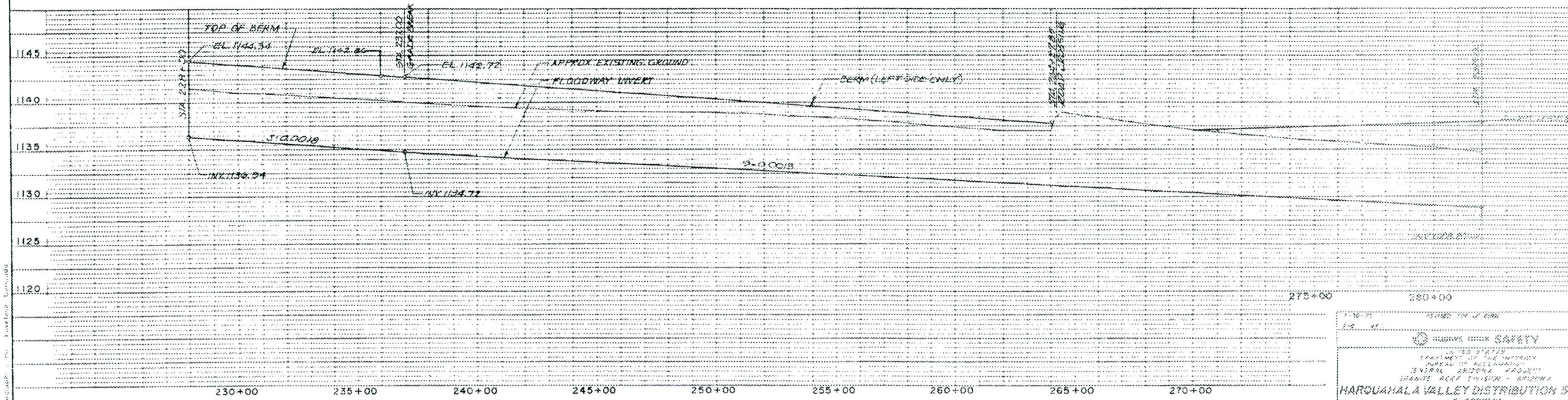
HARQUAHALA VALLEY DISTRIBUTION SYSTEM
FLOODWAY
PLAN AND PROFILE
STA. 180+00 TO STA. 228+00

DESIGNED LS
DRAWN SL/RGA
CHECKED LYD

344-330-6784

SEE SHEET C-1 FOR GEOLOGICAL EXPLANATION AND NOTES. SEE SHEET C-11





Plotted by: M.S.U. Associate Inc. Everyone Computer

J263-1100

Date	MAR. 1985
Designed	NVM
Drawn	DEJ/JRA
Checked	HDB
Revised	

Franzoy, Corey & Associates
Consulting Engineers
1030 E. Guadalupe Road
Tempe, Arizona 85283
602-838-8626

05018 / P-82 A

344-330-6795

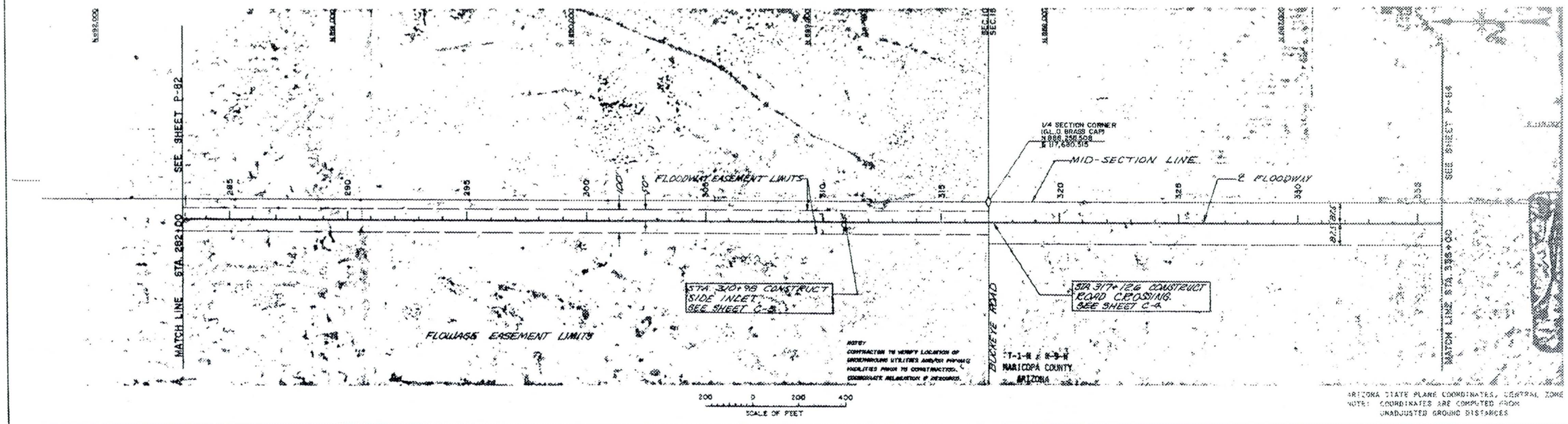
REVISED TO AS BUILT
APPROVED FOR CONSTRUCTION
SAFETY

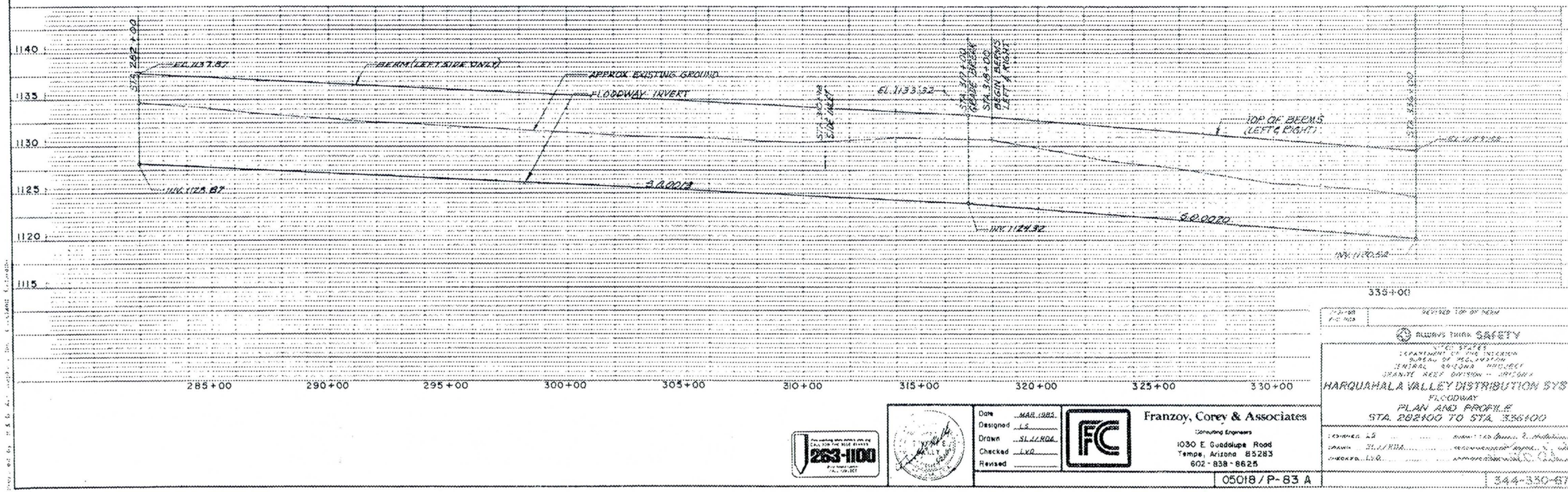
CENTRAL ARIZONA PROJECT
GRANITE REEF DIVERSION - ARIZONA

HARQUAHALA VALLEY DISTRIBUTION SYSTEM
FLOODWAY
PLAN AND PROFILE
STA. 228+00 TO STA. 282+00

DESIGNED NVM
DRAWN DEJ/JRA
CHECKED HDB

FOR GEOLOGICAL EXPLANATION AND NOTES, SEE SHEET P-1





P-83	REVISED TOP OF BERM
P-82	

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
CENTRAL ARIZONA PROJECT
GRANITE REEF DIVISION — ARIZONA

HARQUAHALA VALLEY DISTRIBUTION SYSTEM

FLOODWAY

PLAN AND PROFILE

STA. 282+00 TO STA. 336+00

DESIGNED	LS
DRAWN	SL/JJ/RDA
CHECKED	LVD

Franzoy, Corey & Associates
Consulting Engineers
1030 E. Guadalupe Road
Tempe, Arizona 85283
602-838-8625

Date	MAR 1985
Designed	LS
Drawn	SL/JJ/RDA
Checked	LVD
Revised	

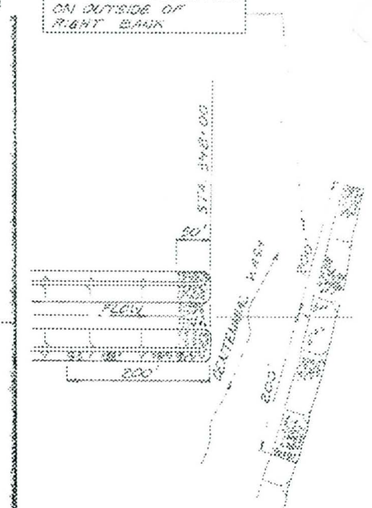
05018 / P-83 A

344-330-6786

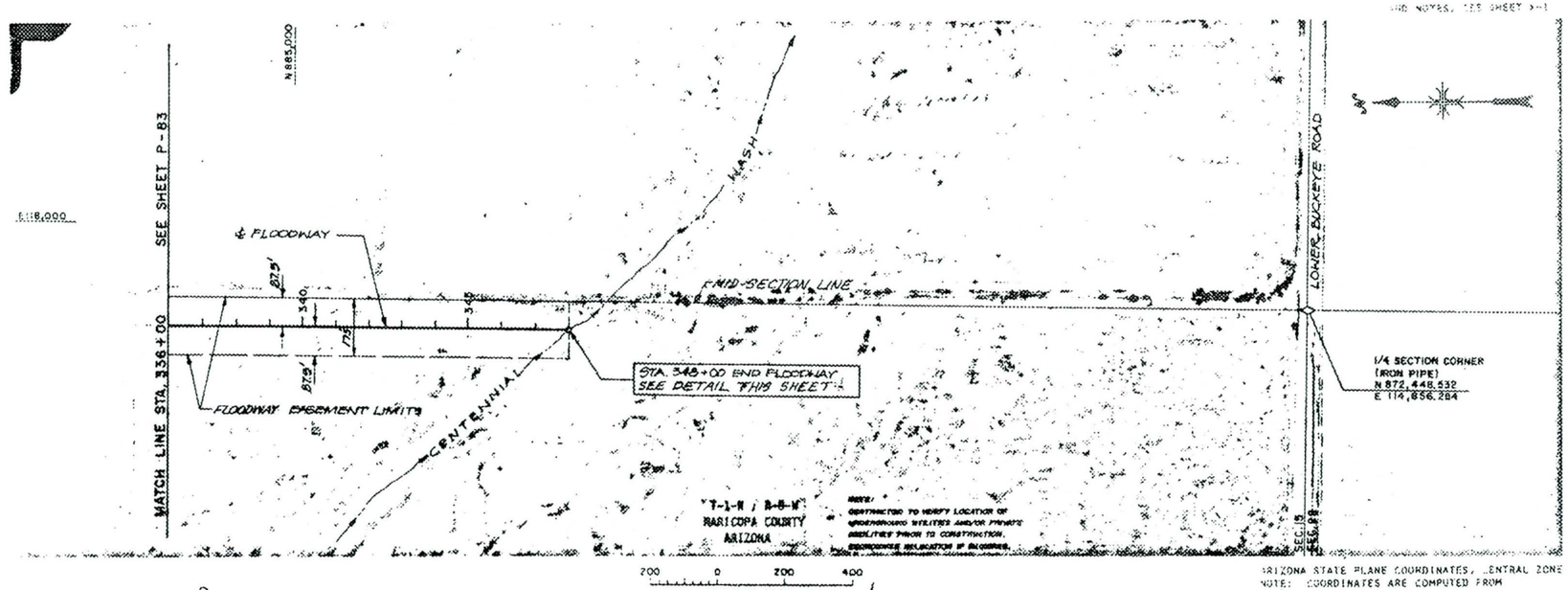
263-1100
CALL FOR THE BLUE STAKES
48 HOURS BEFORE YOU DIG
ALL CALLS

NOTE:
FOR SEQUENTIAL EXPLANATION
AND NOTES, SEE SHEET 2-1

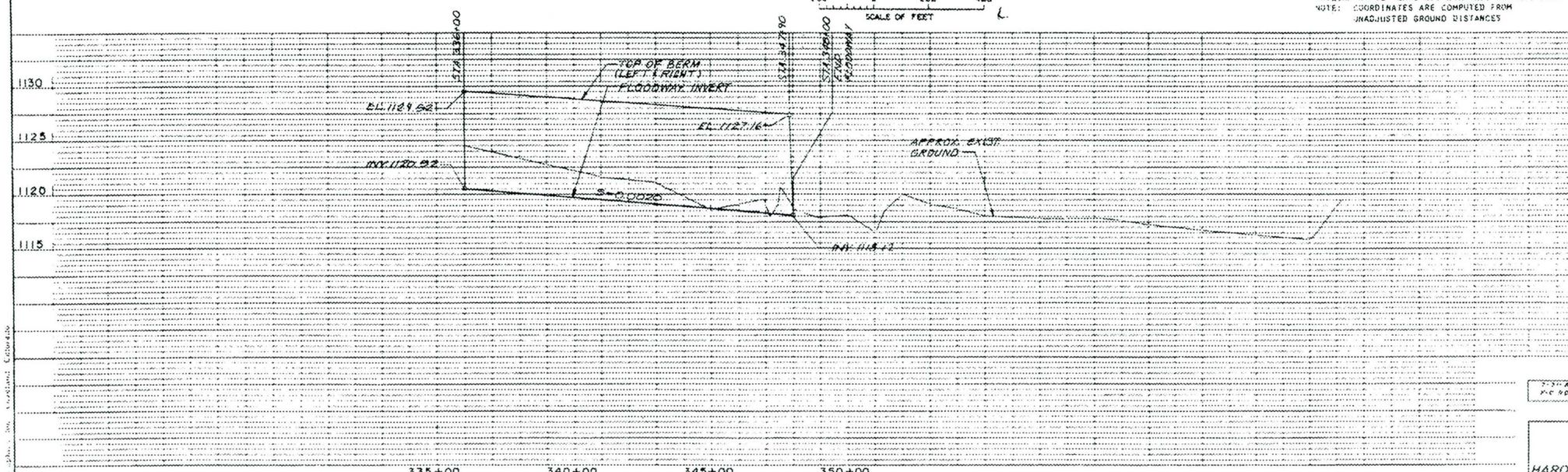
GRADE & PLACE
RIP RAP PROTECTION
ON OUTSIDE OF
RIGHT BANK



OUTLET DETAIL



ARIZONA STATE PLANE COORDINATES, CENTRAL ZONE
NOTE: COORDINATES ARE COMPUTED FROM
UNADJUSTED GROUND DISTANCES



Prepared for: U.S. Army Corps of Engineers, Los Angeles, California

J263-1100

Date	MAR. 1965
Designed	LS
Drawn	DEJ/JRA
Checked	HDB
Revised	

Franzoy, Corey & Associates
Consulting Engineers
1030 E. Guadalupe Road
Tempe, Arizona 85283
602-838-8626

05018/P-84A

T-1-N
R-6-W

RECORD TOP OF BANK

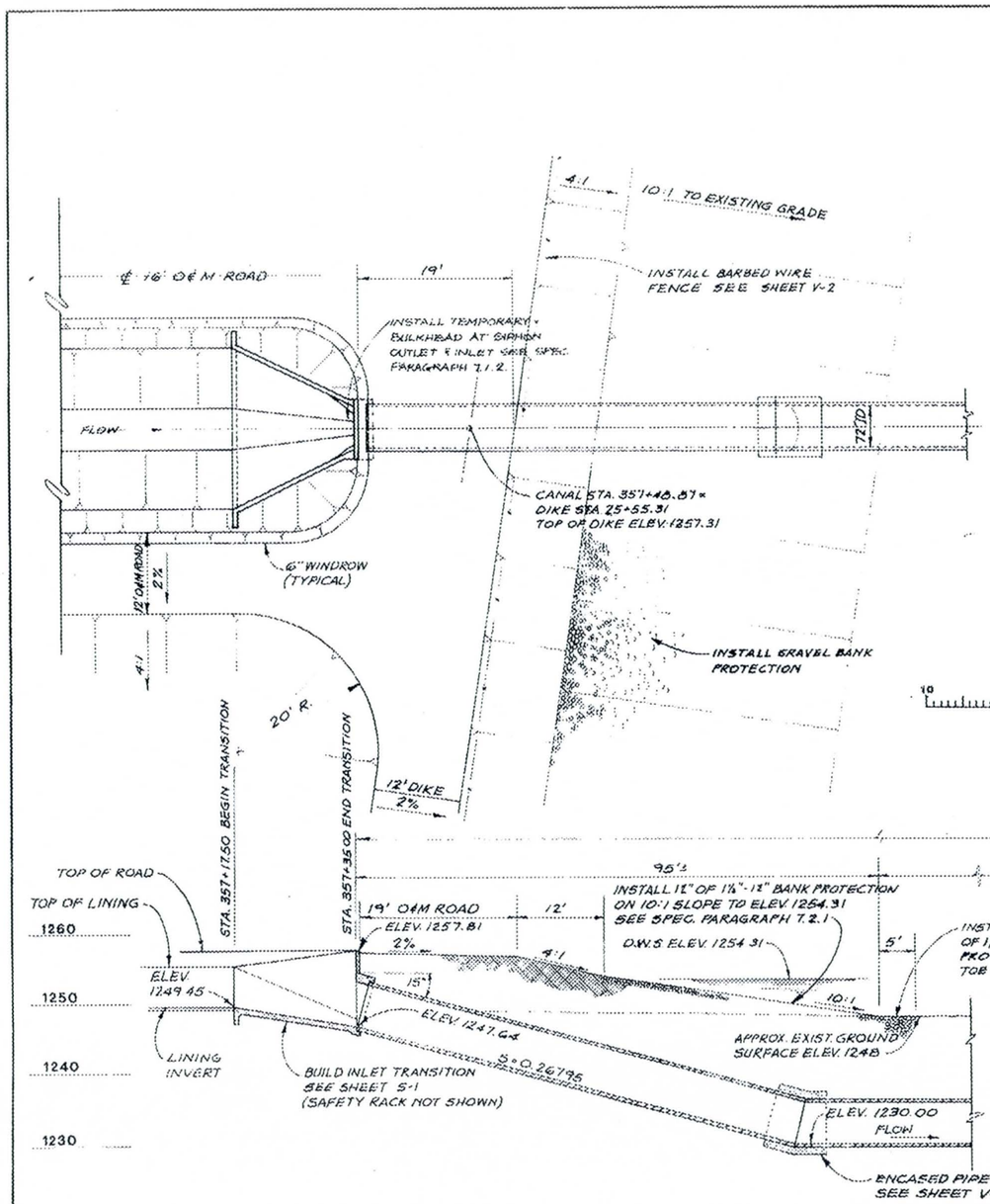
PLEASE THINK SAFETY

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
CENTRAL ARIZONA PROJECT
GRANITE REEF DIVERSION - ARIZONA

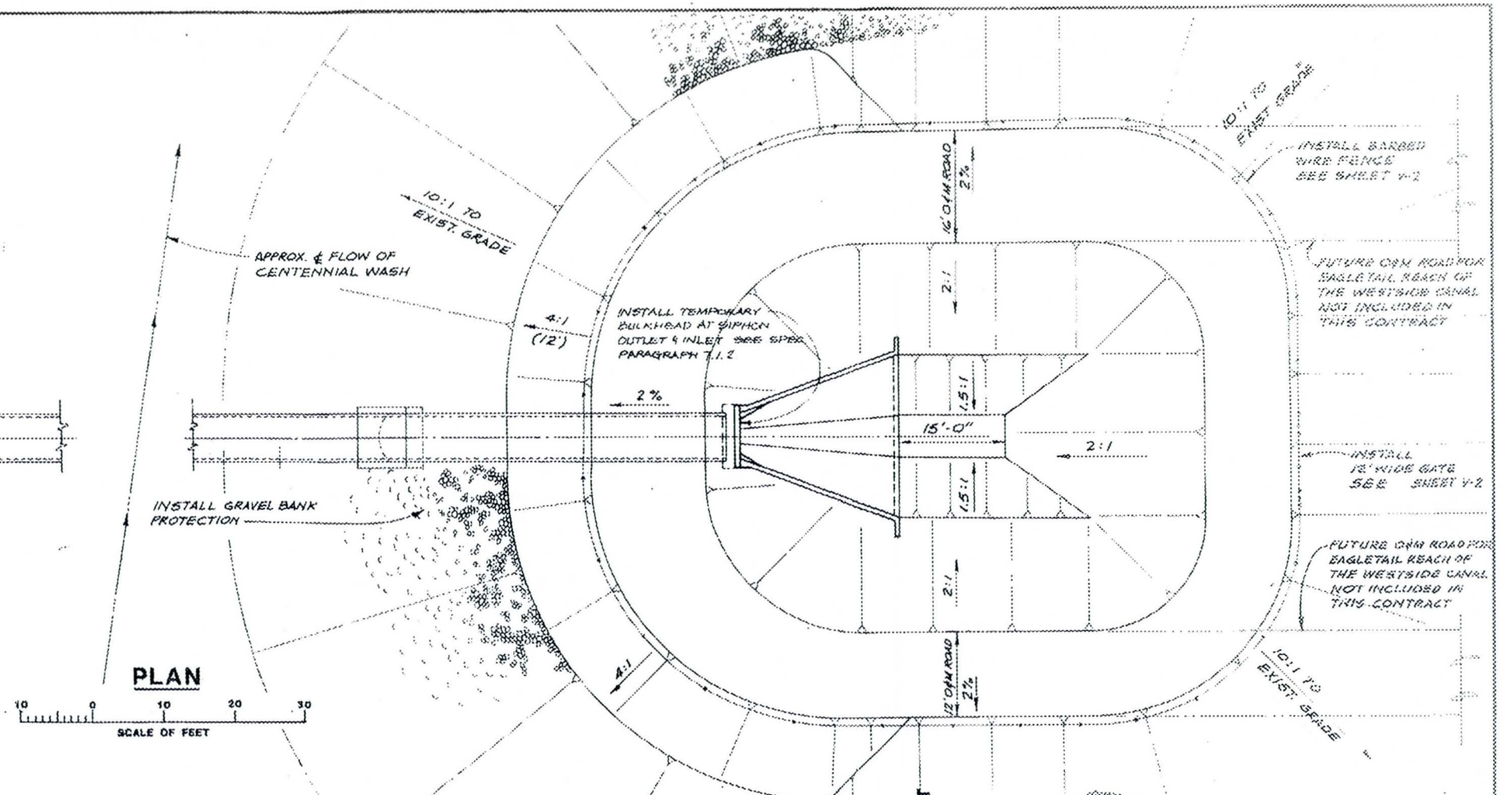
HARQUAHALA VALLEY DISTRIBUTION SYSTEM
FLOODWAY
PLAN AND PROFILE
STA 336+00 TO STA 348+00

DESIGNED L.S.
DRAWN DEJ
CHECKED HDB

344-330-6780



LONGITUDINAL SECTION



PLAN

10 0 10 20 30
SCALE OF FEET

ALWAYS THINK SAFETY

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
CENTRAL ARIZONA PROJECT
GRANITE REEF DIVISION - ARIZONA

HARQUAHALA VALLEY DISTRIBUTION SYSTEM

WESTSIDE CANAL / CENTENNIAL REACH

SIPHON AT CENTENNIAL WASH
PLAN AND SECTION

DESIGNED RPM/HVM
DRAWN SSO
CHECKED RPM/RVD
SUBMITTED
RECOMMENDED
APPROVED

344-330-4476

Date APR. 1984
Designed RPM/HVM
Drawn SSO
Checked RPM/RVD
Revised

Franzoy, Corey & Associates
Consulting Engineers
1030 E. Guadalupe Road
Tempe, Arizona 85283
602-838-8626

05012 / C-4

Appendix E: Hydraulic Analysis Supporting Documentation

E.5 Hydraulic Calculations

Model: BaselineRdtoGila_LS.prj

Plan Title: Final_100-year_Encroachments

Short Identifier: Final_100-ye

Geometry: CW_BaselineRdtoGila_finLatStr

Flow file: 100-yr_HardCodeQs_withEmbankment

Profile: 100-year

Base Conditions (i.e., Floodplain), Standard Table 1 from HEC-RAS

Plan Description: This plan represents the existing conditions geometry as derived from the final topography. The flows calculated from the "Final-100yr-Optimize" plan (i.e., *.p01) in this model were hardcoded into the flow file of the plan herein to set the flows around the Union Pacific R.R. Bridge, and this plan is used for calculating floodway encroachment stations in the model for the main stem of Centennial Wash near the bridge (see TSDN for additional explanation).

HEC-RAS Plan: Final_100-ye Profile: 100-year

River	Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Centennial Wash	Above Railroad	22.8	100-year	38552.00	1052.51	1062.32	1058.81	1062.42	0.001877	1.84	17023.85	4605.23	0.12
Centennial Wash	Above Railroad	22.73	100-year	38552.00	1050.55	1061.84	1058.94	1061.92	0.000880	1.17	19124.26	4428.94	0.07
Centennial Wash	Above Railroad	22.66	100-year	38552.00	1051.79	1061.60	1057.68	1061.70	0.000538	0.72	19634.44	5089.41	0.04
Centennial Wash	Above Railroad	22.58	100-year	38552.00	1051.08	1061.36	1055.72	1061.43	0.000686	1.19	20906.46	4426.89	0.07
Centennial Wash	Above Railroad	22.5	100-year	38552.00	1050.55	1061.02	1055.58	1061.08	0.001099	1.10	21795.26	5102.24	0.06
Centennial Wash	Above Railroad	22.42	100-year	38552.00	1048.26	1060.39	1054.95	1060.46	0.002199	1.62	18442.17	4393.58	0.09
Centennial Wash	Above Railroad	22.35	100-year	38552.00	1050.00	1059.70	1055.03	1059.79	0.001656	1.43	17828.84	4176.19	0.09
Centennial Wash	Above Railroad	22.27	100-year	38552.00	1048.92	1059.15	1053.97	1059.23	0.001290	1.41	17971.96	3927.78	0.08
Centennial Wash	Above Railroad	22.2	100-year	38552.00	1047.26	1058.79	1052.84	1058.86	0.000634	1.19	19621.44	4019.09	0.07
Centennial Wash	Above Railroad	22.12	100-year	38552.00	1046.85	1057.96	1052.33	1058.39	0.002222	1.86	11083.32	4113.98	0.10
Centennial Wash	Above Railroad	22.04	100-year	38552.00	1046.06	1056.88	1051.16	1057.39	0.002020	1.52	11035.13	3611.58	0.09
Centennial Wash	Above Railroad	21.97	100-year	38552.00	1044.89	1056.10	1051.01	1056.46	0.003284	2.15	10505.96	3040.26	0.12
Centennial Wash	Above Railroad	21.89	100-year	38552.00	1043.36	1054.82	1049.63	1054.99	0.003671	2.47	12848.01	2866.73	0.14
Centennial Wash	Above Railroad	21.82	100-year	38552.00	1041.49	1053.50	1049.21	1053.73	0.002566	1.65	11181.81	2810.20	0.10
Centennial Wash	Above Railroad	21.74	100-year	38552.00	1040.89	1052.69	1048.16	1052.89	0.001651	2.06	11779.12	2792.58	0.12
Centennial Wash	Above Railroad	21.66	100-year	38552.00	1039.31	1052.25	1048.15	1052.37	0.000943	1.60	14999.65	3528.83	0.10
Centennial Wash	Above Railroad	21.58	100-year	38552.00	1038.44	1051.81	1046.86	1051.92	0.001164	1.97	15334.88	2980.01	0.12
Centennial Wash	Above Railroad	21.51	100-year	38552.00	1037.93	1051.23	1046.56	1051.41	0.001513	1.95	12558.92	2565.16	0.11
Centennial Wash	Above Railroad	21.44	100-year	38552.00	1038.05	1050.33	1045.70	1050.56	0.003143	1.97	12067.88	2222.42	0.11
Centennial Wash	Above Railroad	21.36	100-year	38552.00	1037.87	1048.80	1044.67	1048.99	0.004412	2.28	11702.51	2348.54	0.13
Centennial Wash	Above Railroad	21.28	100-year	38552.00	1037.95	1047.40	1044.94	1047.71	0.002064	1.37	10965.38	2594.09	0.08
Centennial Wash	Above Railroad	21.2	100-year	38552.00	1037.51	1046.88	1043.79	1047.09	0.001069	4.44	10529.68	2521.49	0.30
Centennial Wash	Above Railroad	21.12	100-year	38552.00	1035.71	1046.36	1043.02	1046.63	0.001150	3.59	9376.69	1859.20	0.22
Centennial Wash	Above Railroad	21.04	100-year	38552.00	1033.62	1045.93	1042.05	1046.18	0.001103	3.58	9728.05	1765.84	0.20
Centennial Wash	Above Railroad	20.97	100-year	38552.00	1032.88	1045.38	1041.16	1045.61	0.001537	4.52	10235.71	1833.24	0.24
Centennial Wash	Above Railroad	20.89	100-year	38552.00	1030.55	1044.70	1040.21	1044.90	0.001531	2.76	11023.87	1985.43	0.14
Centennial Wash	Above Railroad	20.81	100-year	38552.00	1029.17	1043.81	1039.26	1044.13	0.001999	2.18	9492.87	2263.13	0.11
Centennial Wash	Above Railroad	20.74	100-year	38552.00	1028.09	1042.52	1038.47	1043.02	0.003905	2.80	7378.01	2430.88	0.15
Centennial Wash	Above Railroad	20.66	100-year	38552.00	1026.95	1040.63	1037.59	1041.27	0.004756	3.89	6563.70	1928.40	0.22
Centennial Wash	Above Railroad	20.58	100-year	38552.00	1023.96	1038.89	1035.93	1039.34	0.004332	3.73	7602.71	1646.62	0.22
Centennial Wash	Above Railroad	20.51	100-year	38552.00	1023.45	1037.55	1034.48	1037.84	0.002984	2.80	9122.63	1934.14	0.16
Centennial Wash	Above Railroad	20.49	100-year	38552.00	1023.22	1037.15	1034.03	1037.45	0.002952	2.92	9010.09	1752.25	0.17
Centennial Wash	Above Railroad	20.43	100-year	38552.00	1022.48	1036.28	1033.25	1036.60	0.003124	2.29	8965.79	1892.90	0.13
Centennial Wash	Above Railroad	20.36	100-year	38552.00	1021.12	1034.87	1031.80	1035.22	0.003780	2.30	8943.96	1757.69	0.12
Centennial Wash	Above Railroad	20.29	100-year	38552.00	1021.36	1033.62	1030.48	1033.91	0.003548	2.35	9419.28	2297.85	0.14
Centennial Wash	Above Railroad	20.22	100-year	38552.00	1020.04	1032.41	1029.56	1032.71	0.003593	3.56	8877.57	1973.47	0.20
Centennial Wash	Above Railroad	20.15	100-year	38552.00	1019.30	1030.91	1028.93	1031.27	0.004336	5.42	8186.78	2304.40	0.32
Centennial Wash	Above Railroad	20.07	100-year	38552.00	1017.63	1029.42	1026.98	1029.75	0.003369	3.37	8592.77	2129.11	0.20
Centennial Wash	Above Railroad	20.01	100-year	38552.00	1016.98	1028.45	1026.10	1028.77	0.003463	3.42	8602.01	2010.00	0.20
Centennial Wash	Above Railroad	19.96	100-year	38552.00	1015.52	1027.61	1025.08	1027.92	0.003132	3.49	8854.92	1986.27	0.20
Centennial Wash	Above Railroad	19.92	100-year	38552.00	1014.73	1026.84	1024.13	1027.12	0.002953	3.15	9112.43	2119.67	0.18
Centennial Wash	Above Railroad	19.84	100-year	38552.00	1012.72	1025.61	1022.60	1025.91	0.003194	3.35	8885.92	2019.21	0.19
Centennial Wash	Above Railroad	19.75	100-year	38552.00	1010.63	1024.10	1021.21	1024.48	0.004116	4.07	7928.36	1682.64	0.22
Centennial Wash	Above Railroad	19.67	100-year	38552.00	1010.19	1022.72	1019.78	1023.09	0.003494	3.90	8089.03	1734.95	0.21
Centennial Wash	Above Railroad	19.6	100-year	38552.00	1009.20	1021.70	1019.40	1022.17	0.002516	6.64	7348.35	1573.29	0.37
Centennial Wash	Above Railroad	19.53	100-year	38552.00	1008.01	1020.32	1018.62	1021.19	0.002952	9.50	5806.93	1126.73	0.52
Centennial Wash	Above Railroad	19.45	100-year	38552.00	1007.05	1019.55	1016.67	1020.18	0.001879	7.55	6623.01	1106.68	0.41
Centennial Wash	Above Railroad	19.37	100-year	38552.00	1004.48	1018.59	1014.76	1019.11	0.003461	3.96	6964.31	1235.81	0.21
Centennial Wash	Above Railroad	19.31	100-year	38552.00	1003.48	1017.50	1014.15	1018.02	0.003611	4.03	6952.57	1116.59	0.21
Centennial Wash	Above Railroad	19.27	100-year	38552.00	1002.78	1016.74	1013.79	1017.32	0.003696	4.08	6463.20	1015.89	0.21
Centennial Wash	Above Railroad	19.22	100-year	38552.00	1002.15	1015.82	1012.89	1016.42	0.003576	4.69	6338.87	1228.47	0.27
Centennial Wash	Above Railroad	19.14	100-year	38552.00	1000.95	1014.46	1012.32	1015.21	0.002627	9.05	6120.69	1041.97	0.53
Centennial Wash	Above Railroad	19.07	100-year	38552.00	1000.35	1013.53	1011.22	1014.21	0.002270	9.00	6893.69	1393.36	0.50
Centennial Wash	Above Railroad	18.99	100-year	38552.00	998.81	1012.60	1009.06	1013.12	0.003020	4.14	6955.53	1043.57	0.23
Centennial Wash	Above Railroad	18.91	100-year	38552.00	997.92	1011.73	1007.84	1012.09	0.001960	5.41	8104.57	1317.77	0.27
Centennial Wash	Above Railroad	18.84	100-year	38552.00	996.46	1010.63	1007.60	1011.25	0.004099	5.74	6143.29	1132.66	0.31
Centennial Wash	Above Railroad	18.76	100-year	38552.00	996.13	1009.31	1007.32	1010.13	0.002017	9.11	6273.78	1063.27	0.49
Centennial Wash	Above Railroad	18.69	100-year	38552.00	994.59	1008.82	1005.58	1009.27	0.001911	5.87	7322.80	1221.42	0.34
Centennial Wash	Above Railroad	18.61	100-year	38552.00	994.12	1007.75	1004.13	1008.25	0.003613	4.65	7068.47	1091.13	0.27
Centennial Wash	Above Railroad	18.59	100-year	38552.00	993.18	1007.42	1003.91	1007.93	0.003698	4.76	6969.04	1123.02	0.28
Centennial Wash	Above Railroad	18.53	100-year	38552.00	991.98	1006.00	1003.35	1006.65	0.004731	5.44	6262.93	1185.14	0.31
Centennial Wash	Above Railroad	18.46	100-year	38552.00	991.96	1003.67	1002.96	1004.99	0.003471	10.38	5129.47	1170.98	0.64
Centennial Wash	Above Railroad	18.38	100-year	38552.00	990.93	1002.66	1001.20	1003.68	0.002624	9.50	5594.43	1181.25	0.56
Centennial Wash	Above Railroad	18.3	100-year	38552.00	990.06	1001.51	1000.20	1002.61	0.002607	10.45	5709.34	1219.70	0.59
Centennial Wash	Above Railroad	18.25	100-year	38552.00	988.71	1001.12	998.20	1001.69	0.003505	5.26	6564.58	1341.35	0.29
Centennial Wash	Above Railroad	18.22	100-year	38552.00	988.43	1000.33	997.68	1001.04	0.005055	5.67	5879.49	1306.44	0.33
Centennial Wash	Above Railroad	18.15	100-year	38552.00	987.64	997.78	996.95	999.13	0.004185	11.26	4897.01	1103.26	0.70
Centennial Wash	Above Railroad	18.07	100-year	38552.00	986.05	996.64	995.09	997.45	0.003449	8.51	5690.95	1337.47	0.54
Centennial Wash	Above Railroad	18	100-year	38552.00	984.00	995.52	993.89	996.22	0.002575	8.42	6217.07	1243.78	0.51
Centennial Wash	Above Railroad	17.92	100-year	38552.00	984.05	994.54	992.65	995.23	0.002494	7.65	6177.28	1366.49	0.46
Centennial Wash	Above Railroad	17.85	100-year	38552.00	981.68	993.45	991.24	994.02	0.004164	5.47	6400.54	1306.45	0.32
Centennial Wash	Above Railroad	17.8	100-year	38552.00	981.01	991.91	991.02	993.03	0.003293	10.37	5457.70	1182.90	0.63
Centennial Wash	Above Railroad	17.76	100-year	38552.00	980.79	991.29	990.18	992.34	0.002763	9.90	5551.23	1222.43	0.60
Centennial Wash	Above Railroad	17.7	100-year	38552.00	979.70	990.57	988.98	991.45	0.002962	9.25	5806.18	1127.24	0.54
Centennial Wash	Above Railroad	17.62	100-year	38552.00	979.15	988.38	987.91	989.98	0.004118	12.13	4509.43	1185.70	0.77
Centennial Wash	Above Railroad	17.55	100-year	38552.00	977.72	987.05	986.32	988.35	0.003610	10.58	4911.08	1244.26	0.67
Centennial Wash	Above Railroad	17.47	100-year	38552.00	976.40	985.91	985.04	987.06	0.002715	9.96	5435.14	1273.47	0.62
Centennial Wash	Above Railroad	17.4	100-year	38552.00	974.90	984.08	984.01	985.69	0.004086	12.63	4786.01	1180.63	0.81
Centennial Wash	Above Railroad	17.33	100-year	38552.00	973.59	983.31	981.93	984.10	0.003175	8.05	5691.66	1206.65	0.53
Centennial Wash	Above Railroad	17.25	100-year	38552.00	972.68	981.67	980.13	982.38	0.006258	5.69	5827.09	1360.60	0.39
Centennial Wash	Above Railroad	17.17	100-year	38552.00	971.26	979.49	978.78	980.43	0.003235	9.88	5663.92	1994.48	0.68
Centennial Wash	Above Railroad	17.09	100-year	38552.00	969.09	977.63	977.49	978.92	0.004215	13.95	5381.75	1901.22	0.92
Centennial Wash	Above Railroad	17.02	100-year	38552.00	967.88	976.48	975.72	977.30	0.003245	10.61	5867.84	1653.51	0.69
Centennial Wash	Above Railroad	16.94	100-year	38552.00	967.21	975.21	974.25	975.93	0.003390	8.78	6015.05	1604.93	0.63
Centennial Wash	Above Railroad	16.87	100-year	38552.00	964.35	974.20	972.31	974.86	0.002243	3.45	6331.32	1575.87	0.21
Centennial Wash	Above Railroad	16.79	100-year	38552.00	964.22	973.33	971.57	973.97	0.002600	9.18	6746.59	1732.08	0.61
Centennial Wash	Above Railroad	16.71	100-year	38552.00	962.92	972.31	970.61	973.02	0.002443	11.72	6962.51	1872.28	0.72

HEC-RAS Plan: Final_100-ye Profile: 100-year (Continued)

River	Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Centennial Wash	Above Railroad	16.64	100-year	38552.00	961.95	971.20	969.54	971.86	0.003744	9.18	6308.13	1924.79	0.60
Centennial Wash	Above Railroad	16.55	100-year	38552.00	960.35	969.84	968.18	970.41	0.003164	7.42	6564.44	2018.30	0.48
Centennial Wash	Above Railroad	16.47	100-year	38552.00	959.27	968.38	966.88	968.88	0.004143	3.39	7651.21	2314.85	0.21
Centennial Wash	Above Railroad	16.43	100-year	38552.00	958.50	967.35	965.73	967.77	0.004381	3.29	8194.63	2442.03	0.22
Centennial Wash	Above Railroad	16.38	100-year	38552.00	957.50	966.27	964.85	966.72	0.002932	2.61	8541.95	3547.23	0.18
Centennial Wash	Above Railroad	16.32	100-year	38552.00	956.65	965.13	963.57	965.62	0.004068	3.01	7268.61	3633.04	0.21
Centennial Wash	Above Railroad	16.25	100-year	38552.00	954.03	963.85	962.10	964.26	0.002642	5.68	7617.74	2411.80	0.37
Centennial Wash	Above Railroad	16.17	100-year	38552.00	953.25	961.68	961.65	962.72	0.005299	13.55	6638.32	2146.48	0.91
Centennial Wash	Above Railroad	16.08	100-year	38552.00	951.81	960.15	959.00	960.70	0.002643	9.39	7663.94	3277.66	0.63
Centennial Wash	Above Railroad	15.99	100-year	38552.00	951.18	958.94	957.39	959.42	0.003131	7.49	8333.22	3253.06	0.53
Centennial Wash	Above Railroad	15.89	100-year	38552.00	948.73	957.74	956.45	958.23	0.002858	7.30	7637.12	3744.36	0.54
Centennial Wash	Above Railroad	15.84	100-year	38552.00	948.30	957.22	955.21	957.56	0.002292	6.12	9850.39	3807.50	0.42
Centennial Wash	Above Railroad	15.79	100-year	38552.00	947.64	956.67	954.19	956.93	0.002526	3.61	9424.98	3335.07	0.23
Centennial Wash	Above Railroad	15.71	100-year	38552.00	945.56	955.17	954.21	955.84	0.003080	10.39	7456.20	3169.71	0.70
Centennial Wash	Above Railroad	15.63	100-year	38552.00	944.38	954.05	951.94	954.49	0.003222	5.38	7294.17	3382.58	0.34
Centennial Wash	Above Railroad	15.56	100-year	38552.00	943.88	952.35	950.57	952.88	0.003869	6.00	6709.97	2289.80	0.39
Centennial Wash	Above Railroad	15.49	100-year	38552.00	943.25	950.58	949.19	951.19	0.002864	9.37	6643.07	1883.90	0.67
Centennial Wash	Above Railroad	15.41	100-year	38552.00	941.99	949.81	947.82	950.20	0.001875	7.78	8600.47	1810.21	0.58
Centennial Wash	Above Railroad	15.34	100-year	38552.00	941.71	948.91	947.17	949.37	0.002195	8.41	7887.62	1674.14	0.64
Centennial Wash	Above Railroad	15.29	100-year	38552.00	940.65	948.35	946.54	948.84	0.002203	9.26	8018.15	1681.76	0.66
Centennial Wash	Above Railroad	15.24	100-year	38552.00	940.73	947.79	946.06	948.30	0.002360	9.61	7983.16	1687.04	0.67
Centennial Wash	Above Railroad	15.18	100-year	38552.00	940.01	947.11	945.11	947.52	0.002341	8.62	8325.92	1766.26	0.61
Centennial Wash	Above Railroad	15.1	100-year	38552.00	938.82	946.14	944.35	946.56	0.002474	8.55	8424.54	1870.49	0.63
Centennial Wash	Above Railroad	15.02	100-year	38552.00	938.09	945.08	943.46	945.53	0.002750	9.30	8370.56	2132.56	0.67
Centennial Wash	Above Railroad	14.93	100-year	38552.00	936.77	944.07	942.37	944.48	0.002697	8.17	8219.38	2380.97	0.60
Centennial Wash	Above Railroad	14.85	100-year	38552.00	935.62	943.19	941.02	943.48	0.002275	3.01	9101.55	2678.39	0.21
Centennial Wash	Above Railroad	14.8	100-year	38552.00	933.39	942.53	940.86	942.89	0.001894	8.33	9252.13	2563.55	0.56
Centennial Wash	Above Railroad	14.75	100-year	38552.00	933.73	942.21	940.05	942.48	0.001391	7.56	10477.22	2659.81	0.50
Centennial Wash	Above Railroad	14.7	100-year	38552.00	933.74	941.91	938.64	942.08	0.001130	1.58	11660.79	3134.94	0.11
Centennial Wash	Above Railroad	14.62	100-year	38552.00	931.84	941.47	937.48	941.60	0.001060	1.56	14358.20	3213.70	0.10
Centennial Wash	Above Railroad	14.55	100-year	38552.00	930.92	940.90	936.46	941.07	0.001264	1.79	11722.51	2786.08	0.12
Centennial Wash	Above Railroad	14.49	100-year	38552.00	929.24	940.38	935.78	940.58	0.001782	2.55	10833.67	1513.75	0.16
Centennial Wash	Above Railroad	14.44	100-year	38552.00	928.35	939.74	935.29	940.00	0.002247	3.50	9398.38	1280.44	0.21
Centennial Wash	Above Railroad	14.39	100-year	38552.00	927.60	938.72	934.94	939.11	0.004097	3.69	7711.19	1100.28	0.21
Centennial Wash	Above Railroad	14.32	100-year	38552.00	927.44	937.06	933.49	937.47	0.003635	3.06	7604.23	1112.48	0.20
Centennial Wash	Above Railroad	14.24	100-year	38552.00	926.53	935.34	932.33	935.77	0.004518	3.64	7460.05	1220.74	0.25
Centennial Wash	Above Railroad	14.17	100-year	38552.00	926.28	933.81	930.97	934.22	0.003248	2.57	7716.16	1311.16	0.19
Centennial Wash	Above Railroad	14.09	100-year	38552.00	926.09	932.65	929.93	933.04	0.002740	2.09	8173.54	1498.95	0.16
Centennial Wash	Above Railroad	14.01	100-year	38552.00	925.23	931.33	929.45	931.75	0.003940	2.80	7717.94	1784.21	0.25
Centennial Wash	Above Railroad	13.93	100-year	38552.00	924.68	929.96	928.32	930.29	0.003467	2.45	8597.63	2616.02	0.23
Centennial Wash	Above Railroad	13.85	100-year	38552.00	923.82	928.51	926.93	928.84	0.004324	4.97	8446.85	2451.46	0.52
Centennial Wash	Above Railroad	13.77	100-year	38552.00	923.40	927.64	925.85	927.79	0.001752	1.08	12409.94	3877.94	0.12
Centennial Wash	Above Railroad	13.69	100-year	38552.00	923.61	927.00	924.76	927.17	0.001458	1.54	12839.86	3433.15	0.16
Centennial Wash	Above Railroad	13.61	100-year	38552.00	920.85	926.38	923.76	926.54	0.001846	1.74	12449.40	2971.29	0.15
Centennial Wash	Above Railroad	13.57	100-year	38552.00	918.22	926.05	923.25	926.19	0.001901	2.06	13043.47	2936.72	0.16
Centennial Wash	Above Railroad	13.53	100-year	38552.00	917.65	925.73	922.84	925.86	0.002083	2.20	13156.67	3046.42	0.17
Centennial Wash	Above Railroad	13.46	100-year	38552.00	916.27	924.94	922.12	925.07	0.002466	2.20	13783.73	3341.41	0.17
Centennial Wash	Above Railroad	13.38	100-year	38552.00	916.46	924.13	921.16	924.26	0.002085	2.23	14084.00	3215.85	0.17
Centennial Wash	Above Railroad	13.3	100-year	38552.00	914.59	923.38	920.59	923.50	0.001946	2.57	14467.95	3589.91	0.19
Centennial Wash	Above Railroad	13.25	100-year	38552.00	912.38	922.91	920.23	923.03	0.001959	2.63	15011.74	3959.27	0.19
Centennial Wash	Above Railroad	13.21	100-year	38552.00	910.63	922.50	919.79	922.60	0.002081	2.83	15099.97	4204.54	0.19
Centennial Wash	Above Railroad	13.15	100-year	38552.00	909.07	921.83	919.19	921.95	0.002092	3.12	14661.23	4231.48	0.22
Centennial Wash	Above Railroad	13.08	100-year	38552.00	909.37	920.78	918.39	920.94	0.003261	3.69	12797.13	4172.29	0.26
Centennial Wash	Above Railroad	13	100-year	38552.00	909.15	919.50	917.19	919.66	0.003102	3.28	12522.35	4117.04	0.23
Centennial Wash	Above Railroad	12.92	100-year	38552.00	905.52	918.35	915.99	918.50	0.002642	2.75	12847.52	4104.77	0.20
Centennial Wash	Above Railroad	12.85	100-year	38552.00	904.11	917.49	915.23	917.65	0.002402	3.54	12596.51	3888.17	0.25
Centennial Wash	Above Railroad	12.77	100-year	38552.00	904.07	916.62	914.29	916.78	0.002161	3.46	12169.92	3863.65	0.25
Centennial Wash	Above Railroad	12.69	100-year	38552.00	902.82	915.49	913.57	915.77	0.002321	2.11	9616.94	2863.82	0.15
Centennial Wash	Above Railroad	12.60	100-year	38552.00	900.68	914.45	912.69	914.78	0.002726	2.23	8988.30	2820.93	0.17
Centennial Wash	Above Railroad	12.52	100-year	38552.00	900.86	913.70	911.66	913.88	0.001731	1.93	11486.64	3579.02	0.13
Centennial Wash	Above Railroad	12.48	100-year	38552.00	899.96	913.22	910.86	913.44	0.001768	1.86	10620.14	2915.60	0.13
Centennial Wash	Above Railroad	12.43	100-year	38552.00	900.29	912.70	910.24	912.95	0.002188	2.37	9918.72	2943.82	0.15
Centennial Wash	Above Railroad	12.36	100-year	38552.00	897.83	911.81	909.36	912.08	0.002856	3.61	9568.98	3022.69	0.22
Centennial Wash	Above Railroad	12.28	100-year	38552.00	897.70	910.72	908.48	910.95	0.002640	3.27	10397.21	3394.21	0.21
Centennial Wash	Above Railroad	12.21	100-year	38552.00	898.49	909.68	908.03	909.94	0.002663	2.78	10004.87	3208.93	0.19
Centennial Wash	Above Railroad	12.13	100-year	38552.00	896.05	908.60	906.85	908.85	0.002903	2.92	9935.05	3222.47	0.18
Centennial Wash	Above Railroad	12.07	100-year	38552.00	894.40	907.71	905.74	907.93	0.002448	2.91	10359.15	3564.27	0.17
Centennial Wash	Above Railroad	12.03	100-year	38552.00	893.69	907.25	905.12	907.44	0.001992	2.55	11114.91	3478.20	0.16
Centennial Wash	Above Railroad	11.97	100-year	38552.00	892.93	906.73	904.45	906.91	0.002217	2.47	11450.90	3814.26	0.15
Centennial Wash	Above Railroad	11.9	100-year	38552.00	892.66	905.69	903.86	905.90	0.002895	4.89	10638.53	4222.01	0.31
Centennial Wash	Above Railroad	11.82	100-year	38552.00	891.21	904.56	903.18	904.76	0.003010	4.56	11006.82	4534.78	0.31
Centennial Wash	Above Railroad	11.74	100-year	38552.00	890.26	903.34	902.04	903.53	0.003151	4.45	11335.66	4682.07	0.32
Centennial Wash	Above Railroad	11.67	100-year	38552.00	890.08	902.18	900.68	902.36	0.002579	4.21	11731.78	4597.74	0.29
Centennial Wash	Above Railroad	11.61	100-year	38552.00	888.53	901.40	899.95	901.60	0.002531	4.40	11901.41	4512.61	0.29
Centennial Wash	Above Railroad	11.56	100-year	38552.00	888.02	900.69	899.18	900.90	0.002651	3.91	11582.11	4552.95	0.28
Centennial Wash	Above Railroad	11.5	100-year	38552.00	887.99	899.85	898.46	900.06	0.002624	4.29	11368.31	4151.60	0.28
Centennial Wash	Above Railroad	11.44	100-year	38552.00	886.53	899.12	897.59	899.32	0.002297	3.52	11527.85	3854.70	0.26
Centennial Wash	Above Railroad	11.36	100-year	38552.00	885.88	898.33	896.68	898.52	0.001939	3.56	11805.77	3852.21	0.24
Centennial Wash	Above Railroad	11.29	100-year	38552.00	885.71	897.63	895.98	897.81	0.001937	3.77	11816.64	3787.30	0.25
Centennial Wash	Above Railroad	11.22	100-year	38552.00	884.50	896.75	895.31	896.99	0.002729	4.76	10555.07	3383.18	0.30
Centennial Wash	Above Railroad	11.14	100-year	38552.00	884.18	895.76	894.17	895.95	0.002708	4.33	11553.27	3730.10	0.30
Centennial Wash	Above Railroad	11.08	100-year	38552.00	883.96	894.80	893.49	895.03	0.002338	6.42	11620.96	3527.18	0.40
Centennial Wash	Above Railroad	10.99	100-year	38552.00	882.62	893.85	892.46	894.06	0.002033	5.70	11690.42	3412.49	0.37
Centennial Wash	Above Railroad	10.92	100-year	38552.00	882.76	893.12	891.93	893.37	0.002244	6.82	11681.83	3787.35	0.43
Centennial Wash	Above Railroad	10.84	100-year	38552.00	881.55	891.92	890.89	892.23	0.003131	7.40	10169.71	3489.99	0.49
Centennial Wash	Above Railroad	10.77	100-year	38552.00	880.87	891.07	889.82	891.32	0.002241	6.43	11205.99	3593.96	0.42
Centennial Wash	Above Railroad	10.7	100-year	38552.00	880.59	890.06	888.95	890.40	0.002837	7.67	9658.88	3400.63	0.50

HEC-RAS Plan: Final_100-ye Profile: 100-year (Continued)

River	Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Centennial Wash	Above Railroad	10.63	100-year	38552.00	880.66	889.24	887.68	889.53	0.002126	6.32	9909.34	3478.31	0.44
Centennial Wash	Above Railroad	10.57	100-year	38552.00	879.25	888.50	887.18	888.79	0.002113	5.86	9982.53	3292.46	0.39
Centennial Wash	Above Railroad	10.49	100-year	38552.00	878.49	887.81	886.34	888.05	0.001739	5.83	11004.67	3732.66	0.41
Centennial Wash	Above Railroad	10.41	100-year	38552.00	876.42	887.06	885.87	887.34	0.001843	6.53	10712.79	3845.88	0.43
Centennial Wash	Above Railroad	10.34	100-year	38552.00	875.52	886.35	885.20	886.62	0.001694	6.37	10498.94	3673.71	0.42
Centennial Wash	Above Railroad	10.25	100-year	38552.00	875.06	885.32	884.33	885.65	0.002389	6.58	9037.57	3484.25	0.47
Centennial Wash	Above Railroad	10.17	100-year	38552.00	873.75	884.46	883.15	884.74	0.002103	5.49	9662.55	3518.02	0.40
Centennial Wash	Above Railroad	10.1	100-year	38552.00	873.73	883.60	882.29	883.87	0.002194	4.93	9434.48	3404.22	0.38
Centennial Wash	Above Railroad	10.02	100-year	38552.00	873.93	882.67	881.55	882.97	0.002288	5.76	9132.53	3331.21	0.46
Centennial Wash	Above Railroad	9.95	100-year	38552.00	873.84	881.81	880.62	882.08	0.002115	5.65	9580.67	3636.88	0.44
Centennial Wash	Above Railroad	9.89	100-year	38552.00	873.38	881.12	879.83	881.38	0.002144	4.84	9612.04	3684.75	0.40
Centennial Wash	Above Railroad	9.84	100-year	38552.00	872.88	880.48	879.36	880.77	0.002401	6.04	9382.89	3804.12	0.48
Centennial Wash	Above Railroad	9.78	100-year	38552.00	872.64	879.58	878.56	879.91	0.002870	6.28	8930.78	3572.14	0.50
Centennial Wash	Above Railroad	9.72	100-year	38552.00	873.21	878.82	877.05	879.06	0.001760	3.73	10441.45	3425.73	0.35
Centennial Wash	Above Railroad	9.65	100-year	38552.00	872.95	877.96	876.41	878.19	0.002231	4.18	10132.60	3541.47	0.39
Centennial Wash	Above Railroad	9.57	100-year	38552.00	871.61	876.82	875.27	877.04	0.002316	3.18	10327.96	3770.54	0.36
Centennial Wash	Above Railroad	9.5	100-year	38552.00	869.40	875.86	874.25	876.06	0.002030	3.64	10800.72	3881.39	0.39
Centennial Wash	Above Railroad	9.45	100-year	38552.00	871.82	875.24	873.60	875.42	0.001922	2.58	11382.34	4014.84	0.33
Centennial Wash	Above Railroad	9.4	100-year	38552.00	871.45	874.34	873.17	874.58	0.003110	2.36	10038.98	4318.88	0.40
Centennial Wash	Above Railroad	9.34	100-year	38552.00	870.57	873.28	871.91	873.49	0.002739	2.83	10718.06	4484.14	0.42
Centennial Wash	Above Railroad	9.27	100-year	38552.00	868.75	872.14	871.00	872.35	0.002848	2.32	10722.16	4953.10	0.40
Centennial Wash	Above Railroad	9.19	100-year	38552.00	867.26	871.22	870.26	871.41	0.002749	3.57	11042.28	5419.25	0.44
Centennial Wash	Above Railroad	9.11	100-year	38552.00	864.59	870.43	869.07	870.57	0.001823	3.24	12652.22	5484.76	0.33
Centennial Wash	Above Railroad	9.04	100-year	38552.00	864.70	869.64	868.13	869.78	0.001666	3.36	13101.43	5634.51	0.36
Centennial Wash	Above Railroad	8.96	100-year	38552.00	863.50	869.00	867.37	869.12	0.001411	3.50	14200.61	5771.86	0.35
Centennial Wash	Above Railroad	8.89	100-year	38552.00	863.49	868.41	866.77	868.51	0.001453	3.29	14951.21	5770.46	0.34
Centennial Wash	Above Railroad	8.81	100-year	38552.00	862.44	867.76	865.90	867.86	0.001602	3.77	15667.32	5655.46	0.37
Centennial Wash	Above Railroad	8.73	100-year	38552.00	861.62	867.03	865.06	867.14	0.001941	3.69	14786.74	5349.38	0.36
Centennial Wash	Above Railroad	8.66	100-year	38552.00	861.38	866.22	864.57	866.37	0.002227	3.57	12411.07	4711.42	0.41
Centennial Wash	Above Railroad	8.58	100-year	38552.00	860.46	865.32	863.70	865.50	0.002299	3.96	11250.54	4146.93	0.39
Centennial Wash	Above Railroad	8.51	100-year	38552.00	859.60	864.58	862.74	864.74	0.001894	0.96	12239.34	4162.61	0.12
Centennial Wash	Above Railroad	8.43	100-year	38552.00	859.20	863.89	861.99	864.04	0.001776	1.20	12451.33	3710.13	0.12
Centennial Wash	Above Railroad	8.36	100-year	38552.00	859.60	863.35	861.11	863.47	0.001249	0.89	14092.13	3886.15	0.10
Centennial Wash	Above Railroad	8.28	100-year	44041.00	858.45	862.71	860.51	862.87	0.001623	1.06	14088.30	6236.20	0.11
Centennial Wash	Above Railroad	8.26		Lat Struct									
Centennial Wash	Above Railroad	8.21	100-year	43984.11	857.80	861.83	859.59	861.99	0.002314	1.02	13654.01	6281.33	0.13
Centennial Wash	Above Railroad	8.18		Lat Struct									
Centennial Wash	Above Railroad	8.13	100-year	43937.20	857.26	860.95	858.41	861.08	0.001607	0.76	15152.13	5490.81	0.12
Centennial Wash	Above Railroad	8.11		Lat Struct									
Centennial Wash	Above Railroad	8.05	100-year	41196.93	856.76	860.43	857.45	860.50	0.000783	0.62	19532.88	4793.89	0.07
Centennial Wash	Above Railroad	8.03		Lat Struct									
Centennial Wash	Above Railroad	7.98	100-year	38956.64	855.36	860.24	856.67	860.30	0.000670	0.67	19381.96	4054.55	0.07
Centennial Wash	Above Railroad	7.96		Lat Struct									
Centennial Wash	Above Railroad	7.90	100-year	36846.35	854.64	859.91	855.96	859.98	0.000939	0.99	17347.79	3504.94	0.09
Centennial Wash	Above Railroad	7.88		Lat Struct									
Centennial Wash	Above Railroad	7.83	100-year	27494.91	854.76	859.62	855.10	859.67	0.000532	2.11	14700.04	3021.56	0.21
Centennial Wash	Above Railroad	7.82		Lat Struct									
Centennial Wash	Above Railroad	7.81	100-year	27413.40	852.60	859.56	854.73	859.61	0.000468	2.16	15231.95	3069.93	0.20
Centennial Wash	Above Railroad	7.8		Lat Struct									
Centennial Wash	Above Railroad	7.75	100-year	26934.63	851.07	859.48	854.07	859.53	0.000363	1.14	16580.65	3065.61	0.10
Centennial Wash	Above Railroad	7.71		Lat Struct									
Centennial Wash	Above Railroad	7.62	100-year	25941.96	846.99	859.44	852.32	859.49	0.000108	0.56	20058.32	3088.19	0.03
Centennial Wash	Above Railroad	7.52		Lat Struct									
Centennial Wash	Above Railroad	7.39	100-year	23788.00	842.47	859.28	853.23	859.36	0.000348	3.09	19716.66	3661.03	0.14
Centennial Wash	Above Railroad	7.37		Bridge									
Centennial Wash	Above Railroad	7.35	100-year	23788.00	842.94	856.69	853.51	856.87	0.001038	4.72	12019.53	2624.67	0.25
Centennial Wash	Above Railroad	7.3		Lat Struct									
Centennial Wash	Above Railroad	7.27	100-year	23788.00	841.63	856.23	851.94	856.49	0.000741	5.13	10067.89	2290.21	0.27
Centennial Wash	Above Railroad	7.25		Lat Struct									
Centennial Wash	Above Railroad	7.19	100-year	23788.00	840.51	855.82	852.27	856.04	0.001637	4.92	8134.34	1536.62	0.28
Centennial Wash	Above Railroad	7.15		Lat Struct									
Centennial Wash	Above Railroad	7.12	100-year	23788.00	839.66	855.12	851.71	855.48	0.001107	5.72	6128.76	1283.96	0.32
Centennial Wash	Above Railroad	7.05		Lat Struct									
Centennial Wash	Above Railroad	7.04	100-year	23788.00	838.64	854.46	851.60	854.92	0.001729	6.43	4960.32	1237.20	0.35
Centennial Wash	Above Railroad	7.0		Lat Struct									
Centennial Wash	Above Railroad	6.97	100-year	23788.00	837.74	853.52	850.49	854.12	0.002150	6.76	4569.83	1051.60	0.42
Centennial Wash	Above Railroad	6.95		Lat Struct									
Centennial Wash	Above Railroad	6.89	100-year	23788.00	837.75	852.62	850.03	853.18	0.002483	6.56	4775.03	1275.17	0.42
Centennial Wash	Above Railroad	6.85		Lat Struct									
Centennial Wash	Above Railroad	6.81	100-year	23788.00	836.98	851.17	849.65	851.99	0.003472	8.39	3841.07	1211.37	0.48
Centennial Wash	Above Railroad	6.8		Lat Struct									
Centennial Wash	Above Railroad	6.74	100-year	23083.40	837.04	849.69	848.71	850.45	0.004222	8.04	3723.54	1112.06	0.52
Centennial Wash	Above Railroad	6.7		Lat Struct									
Centennial Wash	Above Railroad	6.67	100-year	21355.27	835.10	848.39	846.64	848.88	0.003245	6.49	4062.76	1192.87	0.44
Centennial Wash	Above Railroad	6.6		Lat Struct									
Centennial Wash	Above Railroad	6.59	100-year	21225.80	833.26	845.38	845.38	846.54	0.012107	9.70	3104.46	1285.77	0.67
Centennial Wash	Below Railroad	6.51	100-year	44041.00	831.17	841.86	839.59	841.92	0.001057	2.46	21558.39	7885.94	0.20
Centennial Wash	Below Railroad	6.36	100-year	44041.00	826.48	840.83	838.72	840.91	0.001549	2.16	19941.21	7666.26	0.13
Centennial Wash	Below Railroad	6.27	100-year	44041.00	826.30	839.92	837.70	840.00	0.001995	2.21	19387.51	7996.02	0.14
Centennial Wash	Below Railroad	6.2	100-year	44041.00	824.27	839.14	837.02	839.21	0.001961	2.09	20413.55	7715.57	0.14
Centennial Wash	Below Railroad	6.13	100-year	44041.00	826.35	838.16	836.53	838.26	0.003984	2.63	16897.45	7399.27	0.20
Centennial Wash	Below Railroad	6.06	100-year	44041.00	825.42	837.17	835.09	837.27	0.002376	2.35	17866.83	7168.60	0.16
Centennial Wash	Below Railroad	5.98	100-year	44041.00	824.54	836.34	834.27	836.46	0.002229	2.00	16315.75	7206.48	0.15
Centennial Wash	Below Railroad	5.91	100-year	44041.00	823.50	835.67	833.45	835.78	0.001674	1.85	17459.94	7208.44	0.13
Centennial Wash	Below Railroad	5.83	100-year	44041.00	821.32	834.94	832.79	835.07	0.002625	2.29	15834.58	6910.15	0.16
Centennial Wash	Below Railroad	5.74	100-year	44041.00	820.76	834.13	831.37	834.25	0.001752	2.24	16291.71	6450.55	0.14
Centennial Wash	Below Railroad	5.65	100-year	44041.00	820.73	833.25	831.35	833.42	0.002184	2.65	14172.81	6108.98	0.18

HEC-RAS Plan: Final_100-ye Profile: 100-year (Continued)

River	Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Centennial Wash	Below Railroad	5.57	100-year	44041.00	819.82	832.40	830.58	832.52	0.002014	2.17	16836.33	6208.10	0.14
Centennial Wash	Below Railroad	5.5	100-year	44041.00	818.99	831.66	829.65	831.76	0.002091	2.26	17749.35	6620.64	0.15
Centennial Wash	Below Railroad	5.42	100-year	44041.00	818.99	830.86	828.72	830.95	0.002209	1.96	17632.09	6939.28	0.15
Centennial Wash	Below Railroad	5.33	100-year	44041.00	817.00	829.92	827.81	830.01	0.002093	2.13	18747.49	6687.81	0.15
Centennial Wash	Below Railroad	5.27	100-year	44041.00	815.10	829.11	827.04	829.22	0.002624	2.12	16571.66	6171.92	0.16
Centennial Wash	Below Railroad	5.19	100-year	44041.00	813.79	828.02	825.59	828.14	0.002888	2.48	15879.41	5658.88	0.17
Centennial Wash	Below Railroad	5.13	100-year	44041.00	812.66	827.12	824.55	827.22	0.002526	2.11	17567.50	5451.96	0.16
Centennial Wash	Below Railroad	5.06	100-year	44041.00	811.04	825.92	824.16	826.08	0.003491	3.06	14265.83	4933.85	0.19
Centennial Wash	Below Railroad	4.99	100-year	44041.00	809.79	825.23	822.71	825.32	0.001774	2.39	17531.53	5454.86	0.14
Centennial Wash	Below Railroad	4.91	100-year	44041.00	810.09	824.53	822.27	824.64	0.002231	2.40	16325.48	5513.58	0.15
Centennial Wash	Below Railroad	4.83	100-year	44041.00	809.38	823.73	820.89	823.84	0.001909	1.90	17235.20	5474.47	0.14
Centennial Wash	Below Railroad	4.75	100-year	44041.00	808.83	823.04	820.41	823.13	0.001781	1.94	18592.30	5668.86	0.16
Centennial Wash	Below Railroad	4.68	100-year	44041.00	808.47	822.32	819.43	822.43	0.001670	1.83	17679.12	4632.55	0.13
Centennial Wash	Below Railroad	4.6	100-year	44041.00	808.44	821.53	818.32	821.67	0.001977	2.12	16189.41	4245.60	0.16
Centennial Wash	Below Railroad	4.54	100-year	44041.00	807.65	820.91	816.77	821.03	0.001717	2.15	17193.76	3908.44	0.14
Centennial Wash	Below Railroad	4.46	100-year	44041.00	806.90	820.25	816.69	820.41	0.001531	1.99	15219.52	3618.43	0.13
Centennial Wash	Below Railroad	4.37	100-year	44041.00	806.08	819.35	816.27	819.58	0.002045	2.31	12325.09	3413.75	0.15
Centennial Wash	Below Railroad	4.3	100-year	44041.00	805.79	818.52	815.67	818.73	0.002173	2.36	12768.97	3709.81	0.15
Centennial Wash	Below Railroad	4.22	100-year	44041.00	805.57	817.83	814.97	817.97	0.001518	1.98	15148.22	4148.50	0.13
Centennial Wash	Below Railroad	4.14	100-year	44041.00	805.54	817.21	813.57	817.35	0.001458	2.10	16010.76	3887.80	0.13
Centennial Wash	Below Railroad	4.07	100-year	44041.00	805.44	816.75	812.76	816.86	0.001148	1.91	16229.23	3658.03	0.11
Centennial Wash	Below Railroad	3.98	100-year	44041.00	804.97	816.15	811.89	816.26	0.001509	2.27	17236.96	4035.32	0.13
Centennial Wash	Below Railroad	3.9	100-year	44041.00	804.88	815.40	811.29	815.52	0.001964	2.52	16509.25	4673.31	0.15
Centennial Wash	Below Railroad	3.84	100-year	44041.00	803.45	814.27	811.26	814.43	0.003983	2.91	13728.72	5213.12	0.20
Centennial Wash	Below Railroad	3.77	100-year	44041.00	803.59	812.83	810.40	813.05	0.002730	1.69	14236.92	5528.27	0.13
Centennial Wash	Below Railroad	3.71	100-year	44041.00	803.96	811.94	809.43	812.17	0.003141	1.27	13858.68	5645.02	0.10
Centennial Wash	Below Railroad	3.66	100-year	44041.00	804.60	810.89	808.54	811.16	0.003268	1.20	13541.66	5186.27	0.10
Centennial Wash	Below Railroad	3.6	100-year	44041.00	804.68	810.16	807.90	810.36	0.002290	0.98	15525.77	5736.33	0.08
Centennial Wash	Below Railroad	3.53	100-year	44041.00	802.03	809.38	806.73	809.54	0.001635	0.87	16360.87	4878.34	0.07
Centennial Wash	Below Railroad	3.45	100-year	44041.00	801.11	808.95	805.61	809.05	0.000893	2.26	19482.04	4941.98	0.17
Centennial Wash	Below Railroad	3.38	100-year	44041.00	800.46	808.67	804.83	808.75	0.000616	1.91	23426.84	5273.67	0.14
Centennial Wash	Below Railroad	3.32	100-year	44041.00	801.07	808.50	804.35	808.57	0.000631	1.96	23564.75	5391.23	0.14
Centennial Wash	Below Railroad	3.27	100-year	44041.00	799.62	808.28	803.70	808.35	0.000753	2.25	24764.36	4633.68	0.16
Centennial Wash	Below Railroad	3.21	100-year	44041.00	798.94	807.92	803.48	808.00	0.001748	3.38	20193.94	3779.83	0.24
Centennial Wash	Below Railroad	3.16	100-year	44041.00	800.11	807.37	802.88	807.47	0.001887	3.26	18517.86	3243.03	0.24
Centennial Wash	Below Railroad	3.08	100-year	44041.00	798.98	806.71	802.15	806.79	0.001446	2.94	19783.91	3752.06	0.21
Centennial Wash	Below Railroad	3	100-year	44041.00	799.55	805.82	801.19	805.91	0.002831	4.03	18861.13	3665.15	0.30
Centennial Wash	Below Railroad	2.9	100-year	44041.00	798.21	804.85	800.49	804.94	0.002086	3.49	19068.16	3789.73	0.26
Centennial Wash	Below Railroad	2.81	100-year	44041.00	797.15	803.95	799.64	804.03	0.001963	1.94	19838.51	3657.81	0.14
Centennial Wash	Below Railroad	2.73	100-year	44041.00	794.98	802.87	798.81	802.96	0.002340	1.55	19155.95	3622.15	0.11
Centennial Wash	Below Railroad	2.66	100-year	44041.00	795.08	801.76	798.17	801.85	0.002343	1.24	18276.25	4126.43	0.09
Centennial Wash	Below Railroad	2.58	100-year	44041.00	793.83	800.69	797.27	800.78	0.002475	1.29	19679.85	4110.33	0.09
Centennial Wash	Below Railroad	2.51	100-year	44041.00	792.21	799.50	796.17	799.61	0.003425	1.65	17495.17	3632.06	0.12
Centennial Wash	Below Railroad	2.43	100-year	44041.00	791.28	798.37	794.93	798.49	0.002829	1.38	17075.43	3530.17	0.10
Centennial Wash	Below Railroad	2.38	100-year	44041.00	790.12	797.65	794.05	797.76	0.002487	1.31	17946.70	3703.55	0.09
Centennial Wash	Below Railroad	2.33	100-year	44041.00	789.28	797.09	793.53	797.18	0.001941	1.15	19151.08	4008.63	0.08
Centennial Wash	Below Railroad	2.27	100-year	44041.00	788.22	796.62	792.68	796.71	0.001254	0.96	20465.91	3949.95	0.06
Centennial Wash	Below Railroad	2.2	100-year	44041.00	788.04	796.05	791.93	796.15	0.001579	1.06	19246.14	3378.76	0.07
Centennial Wash	Below Railroad	2.12	100-year	44041.00	786.25	795.28	791.32	795.40	0.002117	1.45	17955.62	4145.43	0.10
Centennial Wash	Below Railroad	2.04	100-year	44041.00	785.44	794.13	790.32	794.25	0.003884	3.20	16979.86	4383.92	0.22
Centennial Wash	Below Railroad	1.96	100-year	44041.00	785.24	792.13	789.61	792.36	0.005666	5.09	13105.84	4298.22	0.40
Centennial Wash	Below Railroad	1.9	100-year	44041.00	785.62	790.88	788.42	791.22	0.002676	5.58	12318.77	4555.31	0.45
Centennial Wash	Below Railroad	1.84	100-year	44041.00	782.68	790.13	787.12	790.35	0.002050	3.65	13856.27	4755.93	0.27
Centennial Wash	Below Railroad	1.77	100-year	44041.00	781.21	789.12	786.60	789.41	0.003099	3.46	11218.66	3181.99	0.26
Centennial Wash	Below Railroad	1.71	100-year	44041.00	781.76	788.31	785.82	788.60	0.002880	4.07	10986.32	3405.03	0.31
Centennial Wash	Below Railroad	1.66	100-year	44041.00	781.42	787.46	785.20	787.73	0.002810	4.50	10729.38	2960.80	0.36
Centennial Wash	Below Railroad	1.61	100-year	44041.00	775.54	787.02	784.56	787.23	0.001312	4.27	13219.36	3629.82	0.32
Centennial Wash	Below Railroad	1.56	100-year	44041.00	776.99	786.48	783.70	786.78	0.002223	4.70	10524.78	3681.14	0.33
Centennial Wash	Below Railroad	1.5	100-year	44041.00	777.65	785.87	782.87	786.10	0.002482	4.07	11607.99	4222.25	0.29
Centennial Wash	Below Railroad	1.44	100-year	44041.00	777.43	785.13	782.39	785.36	0.002733	3.99	11464.36	3317.95	0.30
Centennial Wash	Below Railroad	1.38	100-year	44041.00	777.29	784.06	781.89	784.32	0.003790	4.31	10765.30	2962.42	0.35
Centennial Wash	Below Railroad	1.31	100-year	44590.00	774.92	782.61	780.60	782.88	0.004083	4.37	11003.22	3467.64	0.36
Centennial Wash	Below Railroad	1.25	100-year	44590.00	774.05	780.69	779.10	781.18	0.007401	5.72	8262.18	3232.50	0.48
Centennial Wash	Below Railroad	1.18	100-year	44590.00	773.35	778.22	776.83	778.42	0.004700	3.90	12871.27	4565.92	0.37
Centennial Wash	Below Railroad	1.11	100-year	44590.00	772.89	776.92	774.93	777.02	0.002479	2.61	17136.59	6115.87	0.26
Centennial Wash	Below Railroad	1.04	100-year	44590.00	770.18	776.00	773.96	776.09	0.001867	2.72	18506.37	5976.57	0.24
Centennial Wash	Below Railroad	0.96	100-year	44590.00	769.47	775.17	773.03	775.27	0.001852	2.79	18145.62	5506.79	0.24
Centennial Wash	Below Railroad	0.88	100-year	44590.00	769.50	774.18	772.21	774.29	0.002184	2.96	17278.93	5422.05	0.26
Centennial Wash	Below Railroad	0.8	100-year	44590.00	767.83	772.90	771.52	773.06	0.003549	3.53	14647.76	5498.57	0.33
Centennial Wash	Below Railroad	0.73	100-year	44590.00	767.70	771.74	769.99	771.85	0.002672	2.93	17244.12	7044.35	0.27
Centennial Wash	Below Railroad	0.66	100-year	44590.00	767.15	769.97	769.02	770.11	0.005843	3.26	14832.20	8383.56	0.39
Centennial Wash	Below Railroad	0.6	100-year	44590.00	766.38	767.99	766.23	768.15	0.004564	1.46	14495.64	8351.17	0.28
Centennial Wash	Below Railroad	0.53	100-year	44590.00	765.12	766.84	765.25	766.91	0.002180	1.04	21624.16	10894.75	0.20
Centennial Wash	Below Railroad	0.46	100-year	44590.00	765.07	765.99	764.46	766.06	0.002384	0.65	20552.63	11104.93	0.18
Centennial Wash	Below Railroad	0.39	100-year	44590.00	764.67	765.32	763.49	765.38	0.001647	0.59	23228.41	11398.88	0.16
Centennial Wash	Below Railroad	0.34	100-year	44590.00	764.26	764.92	762.63	764.97	0.001002	0.39	26155.79	10956.97	0.12
Centennial Field	DS Trestles 2-3	0.82	100-year	1.00	847.36	851.78	847.43	851.78	0.000000	0.00	2581.44	5037.95	0.00
Centennial Field	DS Trestles 2-3	0.75	100-year	17286.91	845.09	850.60	848.54	850.76	0.004791	2.61	5614.97	5397.92	0.23
Centennial Field	DS Trestles 2-3	0.7		Lat Struct									
Centennial Field	DS Trestles 2-3	0.67	100-year	15629.44	845.43	849.11	847.79	849.20	0.004335	1.97	6526.93	5654.76	0.20
Centennial Field	DS Trestles 2-3	0.65		Lat Struct									
Centennial Field	DS Trestles 2-3	0.6	100-year	15375.72	845.63	847.93	846.96	848.01	0.002883	1.08	7585.49	5553.00	0.16
Centennial Field	DS Trestles 2-3	0.55		Lat Struct									
Centennial Field	DS Trestles 2-3	0.52	100-year	15375.72	844.52	846.86	845.97	846.93	0.002804	0.94	7994.10	5431.78	0.13
Centennial Field	DS Trestles 2-3	0.5		Lat Struct									
Centennial Field	DS Trestles 2-3	0.45	100-year	15251.60	839.08	846.07	845.09	846.12	0.001972	1.81	8808.96	5467.68	0.14
Centennial Field	DS Trestles 2-3	0.4		Lat Struct									

HEC-RAS Plan: Final_100-ye Profile: 100-year (Continued)

River	Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Centennial Field	DS Trestles 2-3	0.37	100-year	15251.60	838.20	845.38	844.08	845.44	0.002182	1.78	8000.76	5184.26	0.14
Centennial Field	DS Trestles 2-3	0.35		Lat Struct									
Centennial Field	DS Trestles 2-3	0.29	100-year	15251.60	841.56	844.67	843.32	844.73	0.002047	0.75	8107.80	4946.46	0.11
Centennial Field	DS Trestles 2-3	0.25		Lat Struct									
Centennial Field	DS Trestles 2-3	0.22	100-year	15956.21	829.98	843.69	843.32	843.92	0.002655	6.23	6740.48	4959.88	0.45
Centennial Field	DS Trestles 2-3	0.2		Lat Struct									
Centennial Field	DS Trestles 2-3	0.15	100-year	16255.98	831.99	842.67	842.38	842.89	0.002397	5.74	7147.26	5213.14	0.43
Centennial Field	DS Trestles 2-3	0.1		Lat Struct									
Centennial Field	DS Trestles 2-3	0.07	100-year	13259.42	834.58	842.23	840.39	842.26	0.000700	2.27	9767.67	5049.08	0.20
Cent W RR Spill	Trestles 2 to 4	1.75	100-year	1.00	848.16	857.63	848.34	857.63	0.000000	0.00	11365.08	3277.61	0.00
Cent W RR Spill	Trestles 2 to 4	1.7		Lat Struct									
Cent W RR Spill	Trestles 2 to 4	1.67	100-year	20253.99	848.13	857.53	854.15	857.59	0.000497	1.16	11196.04	3131.20	0.07
Cent W RR Spill	Trestles 2 to 4	1.65		Lat Struct									
Cent W RR Spill	Trestles 2 to 4	1.6	100-year	20253.99	849.31	857.37	854.04	857.44	0.000616	1.25	10462.40	2992.54	0.08
Cent W RR Spill	Trestles 2 to 4	1.55		Lat Struct									
Cent W RR Spill	Trestles 2 to 4	1.52	100-year	20253.99	848.47	857.14	854.12	857.22	0.001028	1.60	8923.69	2861.21	0.11
Cent W RR Spill	Trestles 2 to 4	1.5		Lat Struct									
Cent W RR Spill	Trestles 2 to 4	1.46	100-year	20253.99	846.70	856.81	853.87	856.91	0.001282	1.85	8232.10	2715.71	0.12
Cent W RR Spill	Trestles 2 to 4	1.45		Lat Struct									
Cent W RR Spill	Trestles 2 to 4	1.4	100-year	20253.99	847.90	856.26	853.63	856.48	0.001784	2.07	5625.34	2588.60	0.14
Cent W RR Spill	Trestles 2 to 4	1.35		Lat Struct									
Cent W RR Spill	Trestles 2 to 4	1.33	100-year	8431.54	850.14	855.97	852.74	856.00	0.000566	1.53	5789.64	2418.16	0.13
Cent W RR Spill	Trestles 2 to 4	1.3		Lat Struct									
Cent W RR Spill	Trestles 2 to 4	1.28	100-year	8431.54	848.16	855.74	852.91	855.79	0.000722	1.17	4661.15	2073.51	0.09
Cent W RR Spill	Trestles 2 to 4	1.25		Lat Struct									
Cent W RR Spill	Trestles 2 to 4	1.22	100-year	8431.54	847.86	855.50	852.91	855.56	0.000808	1.19	4734.26	1668.36	0.09
Cent W RR Spill	Trestles 2 to 4	1.15		Lat Struct									
Cent W RR Spill	Trestles 2 to 4	1.14	100-year	8431.54	847.38	854.95	852.67	855.05	0.002028	1.87	3498.31	1442.53	0.14
Cent W RR Spill	Trestles 2 to 4	1.1		Lat Struct									
Cent W RR Spill	Trestles 2 to 4	1.07	100-year	8431.54	846.31	854.10	852.08	854.21	0.002116	2.07	3293.81	1255.08	0.15
Cent W RR Spill	Trestles 2 to 4	1.05		Lat Struct									
Cent W RR Spill	Trestles 2 to 4	1.02	100-year	8431.54	845.73	853.69	851.32	853.77	0.001310	1.68	3780.49	1302.29	0.12
Cent W RR Spill	Trestles 2 to 4	1		Lat Struct									
Cent W RR Spill	Trestles 2 to 4	0.97	100-year	8431.54	846.36	853.28	850.90	853.39	0.001406	1.56	3447.42	1060.54	0.12
Cent W RR Spill	Trestles 2 to 4	0.95		Lat Struct									
Cent W RR Spill	Trestles 2 to 4	0.9	100-year	2968.09	845.84	853.07	850.09	853.09	0.000268	0.69	3134.38	1172.44	0.05
Cent W RR Spill	Trestles 2 to 4	0.85		Lat Struct									
Cent W RR Spill	Trestles 2 to 4	0.84	100-year	2968.09	847.02	852.93	850.68	852.96	0.000701	0.98	2225.63	964.53	0.08
Cent W RR Spill	Trestles 2 to 4	0.8		Lat Struct									
Cent W RR Spill	Trestles 2 to 4	0.76	100-year	2968.09	846.00	852.28	850.86	852.34	0.005343	2.85	1754.51	1039.66	0.23
Cent W RR Spill	Trestles 2 to 4	0.7		Lat Struct									
Cent W RR Spill	Trestles 2 to 4	0.69	100-year	2968.09	844.60	851.25	848.58	851.27	0.001558	1.60	2964.60	1344.48	0.12
Cent W RR Spill	Trestles 2 to 4	0.65		Lat Struct									
Cent W RR Spill	Trestles 2 to 4	0.628	100-year	2968.09	845.22	850.63	848.35	850.64	0.002261	1.19	2862.51	1397.79	0.13
Cent W RR Spill	Trestles 2 to 4	0.625	100-year	2968.09	844.79	850.23	847.23	850.24	0.000605	0.86	4239.07	1574.54	0.07
Cent W RR Spill	Trestles 2 to 4	0.623	100-year	2968.09	844.61	849.94	846.49	849.97	0.001479	1.47	2092.66	1443.48	0.12
Cent W RR Spill	Trestles 2 to 4	0.6	100-year	2968.09	844.06	849.47	846.34	849.55	0.004152	2.36	1296.49	1451.31	0.20
Cent W RR Spill	Trestles 2 to 4	0.58		Bridge									
Cent W RR Spill	Trestles 2 to 4	0.56	100-year	2968.09	844.45	847.48	846.18	847.65	0.016504	3.26	904.87	2434.15	0.36
Cent W RR Spill	Trestles 2 to 4	0.5	100-year	2968.09	843.26	845.27	844.59	845.46	0.004311	3.65	871.38	1362.27	0.48
Cent W RR Spill	Trestles 2 to 4	0.46	100-year	4625.56	842.68	844.61	843.82	844.74	0.002966	2.94	1628.79	1163.23	0.39
Cent W RR Spill	Trestles 2 to 4	0.42	100-year	4879.27	842.13	843.68	843.23	843.86	0.005833	3.56	1426.16	1083.99	0.53
Cent W RR Spill	Trestles 2 to 4	0.36	100-year	4879.27	841.28	842.68	841.98	842.78	0.002356	1.88	2041.90	1430.95	0.32
Cent W RR Spill	Trestles 2 to 4	0.3	100-year	5003.39	839.48	842.37	840.86	842.42	0.000766	1.90	2963.82	1550.77	0.21
Cent W RR Spill	Trestles 2 to 4	0.26	100-year	5003.39	838.96	842.27	840.24	842.30	0.000371	1.48	3741.21	1544.51	0.15
Cent W RR Spill	Trestles 2 to 4	0.21	100-year	5003.39	838.29	842.22	839.46	842.23	0.000159	1.10	4706.65	1457.58	0.10
Cent W RR Spill	Trestles 2 to 4	0.16	100-year	5003.39	837.97	842.19	839.02	842.20	0.000115	1.01	5095.47	1338.20	0.09
Cent W RR Spill	Trestles 2 to 4	0.11	100-year	6431.74	837.14	842.14	838.72	842.16	0.000179	1.39	5180.78	1735.36	0.11
Cent W RR Spill	Trestles 2 to 4	0.05	100-year	9557.78	836.49	842.09	838.43	842.12	0.000184	1.52	8038.29	2529.78	0.12

Model: BaselineRdtoGila_LS.prj

Plan Title: Final_100-year_Encroachments

Short Identifier: Final_100-ye

Geometry: CW_BaselineRdtoGila_finLatStr

Flow file: 100-yr_HardCodeQs_withEmbankment

Profile: Encroach

Encroached Conditions (i.e., Floodway), Encroachment Table 3 from HEC-RAS (i.e., FEMA"S Floodway Data Table)

Plan Description: This plan represents the existing conditions geometry as derived from the final topography. The flows calculated from the "Final-100yr-Optimize" plan (i.e., *.p01) in this model were hardcoded into the flow file of the plan herein to set the flows around the Union Pacific R.R. Bridge, and this plan is used for calculating floodway encroachment stations in the model for the main stem of Centennial Wash near the bridge (see TSDN for additional explanation).

HEC-RAS Plan: Final_100-ye Profile: Encroach

River	Reach	River Sta	Profile	Top Wdth Act	Area	Vel Total	W.S. Elev	Base WS	Prof Delta WS
				(ft)	(sq ft)	(ft/s)	(ft)	(ft)	(ft)
Centennial Wash	Above Railroad	22.8	Encroach	2845.61	17116.41	2.37	1063.08	1062.32	0.76
Centennial Wash	Above Railroad	22.73	Encroach	2822.10	18803.69	2.17	1062.68	1061.84	0.84
Centennial Wash	Above Railroad	22.66	Encroach	2798.36	19179.79	2.05	1062.48	1061.60	0.87
Centennial Wash	Above Railroad	22.58	Encroach	2749.06	20557.04	1.91	1062.26	1061.36	0.90
Centennial Wash	Above Railroad	22.5	Encroach	2613.31	19993.84	2.08	1061.88	1061.02	0.86
Centennial Wash	Above Railroad	22.42	Encroach	2395.98	18874.50	2.27	1061.15	1060.39	0.76
Centennial Wash	Above Railroad	22.35	Encroach	2222.10	16878.06	2.32	1060.46	1059.70	0.76
Centennial Wash	Above Railroad	22.27	Encroach	2084.66	17180.62	2.27	1060.01	1059.15	0.86
Centennial Wash	Above Railroad	22.2	Encroach	2135.78	18523.56	2.26	1059.61	1058.79	0.82
Centennial Wash	Above Railroad	22.12	Encroach	1216.77	19894.51	3.27	1058.80	1057.96	0.84
Centennial Wash	Above Railroad	22.04	Encroach	1102.99	17636.61	3.74	1057.70	1056.88	0.82
Centennial Wash	Above Railroad	21.97	Encroach	1070.09	15140.67	3.83	1056.99	1056.10	0.89
Centennial Wash	Above Railroad	21.89	Encroach	1561.30	12412.31	3.48	1055.64	1054.82	0.82
Centennial Wash	Above Railroad	21.82	Encroach	1407.38	11068.69	3.65	1054.17	1053.50	0.68
Centennial Wash	Above Railroad	21.74	Encroach	1405.68	11365.05	3.39	1053.49	1052.69	0.79
Centennial Wash	Above Railroad	21.66	Encroach	1456.72	11433.37	3.37	1053.01	1052.25	0.77
Centennial Wash	Above Railroad	21.58	Encroach	1464.47	11820.71	3.26	1052.51	1051.81	0.70
Centennial Wash	Above Railroad	21.51	Encroach	1441.50	11941.71	3.23	1051.94	1051.23	0.71
Centennial Wash	Above Railroad	21.44	Encroach	1402.95	11968.05	3.22	1051.18	1050.33	0.85
Centennial Wash	Above Railroad	21.36	Encroach	1344.04	10204.29	3.78	1049.59	1048.80	0.80
Centennial Wash	Above Railroad	21.28	Encroach	1332.54	8440.63	4.57	1047.56	1047.40	0.16
Centennial Wash	Above Railroad	21.2	Encroach	1337.45	8622.12	4.47	1047.16	1046.88	0.28
Centennial Wash	Above Railroad	21.12	Encroach	1292.87	8747.39	4.41	1046.73	1046.36	0.37
Centennial Wash	Above Railroad	21.04	Encroach	1299.48	9409.87	4.10	1046.36	1045.93	0.43
Centennial Wash	Above Railroad	20.97	Encroach	1256.23	9886.60	3.90	1045.91	1045.38	0.53
Centennial Wash	Above Railroad	20.89	Encroach	1170.45	9845.83	3.92	1045.28	1044.70	0.57
Centennial Wash	Above Railroad	20.81	Encroach	1013.51	8781.96	4.39	1044.41	1043.81	0.59
Centennial Wash	Above Railroad	20.74	Encroach	777.73	7314.39	5.96	1042.85	1042.52	0.33
Centennial Wash	Above Railroad	20.66	Encroach	887.64	6991.92	5.76	1041.06	1040.63	0.43
Centennial Wash	Above Railroad	20.58	Encroach	1039.61	7355.15	5.24	1039.52	1038.89	0.64
Centennial Wash	Above Railroad	20.51	Encroach	1136.18	7843.54	4.92	1038.10	1037.55	0.55
Centennial Wash	Above Railroad	20.49	Encroach	1229.85	8440.37	4.57	1037.73	1037.15	0.58
Centennial Wash	Above Railroad	20.43	Encroach	1211.79	8481.96	4.55	1036.90	1036.28	0.62
Centennial Wash	Above Railroad	20.36	Encroach	1243.51	8581.75	4.49	1035.63	1034.87	0.76
Centennial Wash	Above Railroad	20.29	Encroach	1350.19	9115.37	4.23	1034.49	1033.62	0.87
Centennial Wash	Above Railroad	20.22	Encroach	1211.31	8455.79	4.56	1033.35	1032.41	0.94
Centennial Wash	Above Railroad	20.15	Encroach	1104.05	7297.87	5.28	1031.79	1030.91	0.88
Centennial Wash	Above Railroad	20.07	Encroach	1196.77	7911.70	4.87	1030.34	1029.42	0.92
Centennial Wash	Above Railroad	20.01	Encroach	1253.30	7784.62	4.95	1029.40	1028.45	0.94
Centennial Wash	Above Railroad	19.96	Encroach	1290.75	8222.10	4.69	1028.59	1027.61	0.97
Centennial Wash	Above Railroad	19.92	Encroach	1286.63	8355.29	4.61	1027.84	1026.84	1.00
Centennial Wash	Above Railroad	19.84	Encroach	1166.93	7540.55	5.11	1026.32	1025.61	0.71
Centennial Wash	Above Railroad	19.75	Encroach	1118.88	7282.90	5.29	1024.55	1024.10	0.45
Centennial Wash	Above Railroad	19.67	Encroach	972.67	6692.11	5.76	1023.02	1022.72	0.31
Centennial Wash	Above Railroad	19.6	Encroach	932.84	6654.09	5.79	1022.13	1021.70	0.43
Centennial Wash	Above Railroad	19.53	Encroach	779.20	5688.49	6.78	1020.95	1020.32	0.63
Centennial Wash	Above Railroad	19.45	Encroach	756.34	6428.08	6.00	1020.27	1019.55	0.72
Centennial Wash	Above Railroad	19.37	Encroach	763.00	6629.71	5.82	1019.35	1018.59	0.76
Centennial Wash	Above Railroad	19.31	Encroach	765.63	6259.75	6.16	1018.17	1017.50	0.67
Centennial Wash	Above Railroad	19.27	Encroach	783.67	5983.70	6.44	1017.38	1016.74	0.64
Centennial Wash	Above Railroad	19.22	Encroach	792.01	6072.48	6.35	1016.50	1015.82	0.67
Centennial Wash	Above Railroad	19.14	Encroach	755.92	5912.65	6.52	1015.27	1014.46	0.82
Centennial Wash	Above Railroad	19.07	Encroach	731.50	5930.15	6.50	1014.32	1013.53	0.79
Centennial Wash	Above Railroad	18.99	Encroach	707.91	5954.83	6.47	1013.25	1012.60	0.64
Centennial Wash	Above Railroad	18.91	Encroach	749.93	6671.92	5.78	1012.15	1011.73	0.42
Centennial Wash	Above Railroad	18.84	Encroach	783.29	5794.10	6.65	1010.98	1010.63	0.35
Centennial Wash	Above Railroad	18.76	Encroach	809.07	6278.89	6.14	1009.97	1009.31	0.66
Centennial Wash	Above Railroad	18.69	Encroach	811.80	6737.38	5.72	1009.45	1008.82	0.63
Centennial Wash	Above Railroad	18.61	Encroach	797.43	6570.05	5.87	1008.29	1007.75	0.55
Centennial Wash	Above Railroad	18.59	Encroach	797.50	6414.96	6.01	1007.93	1007.42	0.51
Centennial Wash	Above Railroad	18.53	Encroach	764.27	5629.47	6.85	1006.35	1006.00	0.35
Centennial Wash	Above Railroad	18.46	Encroach	731.45	4823.11	7.99	1004.39	1003.67	0.72
Centennial Wash	Above Railroad	18.38	Encroach	707.22	5227.58	7.37	1003.58	1002.66	0.91
Centennial Wash	Above Railroad	18.3	Encroach	660.13	5207.55	7.40	1002.48	1001.51	0.97
Centennial Wash	Above Railroad	18.25	Encroach	652.92	5376.41	7.17	1001.87	1001.12	0.75
Centennial Wash	Above Railroad	18.22	Encroach	645.92	4950.64	7.79	1000.86	1000.33	0.53

HEC-RAS Plan: Final_100-ye Profile: Encroach (Continued)

River	Reach	River Sta	Profile	Top Wdth Act	Area	Vel Total	W.S. Elev	Base WS	Prof Delta WS
				(ft)	(sq ft)	(ft/s)	(ft)	(ft)	(ft)
Centennial Wash	Above Railroad	18.15	Encroach	689.21	4618.88	8.35	998.44	997.78	0.65
Centennial Wash	Above Railroad	18.07	Encroach	723.85	4989.61	7.73	997.33	996.64	0.68
Centennial Wash	Above Railroad	18	Encroach	771.87	5371.58	7.18	996.25	995.52	0.73
Centennial Wash	Above Railroad	17.92	Encroach	783.76	5458.60	7.06	995.36	994.54	0.82
Centennial Wash	Above Railroad	17.85	Encroach	804.37	5287.13	7.29	994.05	993.45	0.61
Centennial Wash	Above Railroad	17.8	Encroach	771.98	4620.26	8.34	992.33	991.91	0.42
Centennial Wash	Above Railroad	17.76	Encroach	745.03	4497.25	8.57	991.39	991.29	0.11
Centennial Wash	Above Railroad	17.7	Encroach	766.79	5021.67	7.68	990.71	990.57	0.14
Centennial Wash	Above Railroad	17.62	Encroach	776.36	4333.55	8.90	988.78	988.38	0.40
Centennial Wash	Above Railroad	17.55	Encroach	728.67	4484.37	8.60	987.56	987.05	0.51
Centennial Wash	Above Railroad	17.47	Encroach	685.91	4660.33	8.27	986.46	985.91	0.55
Centennial Wash	Above Railroad	17.4	Encroach	700.43	4053.73	9.51	984.54	984.08	0.46
Centennial Wash	Above Railroad	17.33	Encroach	808.66	5100.31	7.56	983.87	983.31	0.56
Centennial Wash	Above Railroad	17.25	Encroach	924.24	4927.69	7.82	981.88	981.67	0.21
Centennial Wash	Above Railroad	17.17	Encroach	1127.01	5268.37	7.32	979.71	979.49	0.22
Centennial Wash	Above Railroad	17.09	Encroach	1202.48	5853.85	6.59	978.62	977.63	0.99
Centennial Wash	Above Railroad	17.02	Encroach	1242.94	5596.96	6.89	977.39	976.48	0.91
Centennial Wash	Above Railroad	16.94	Encroach	1144.11	4986.49	7.73	975.65	975.21	0.43
Centennial Wash	Above Railroad	16.87	Encroach	1051.46	6471.61	5.96	974.92	974.20	0.72
Centennial Wash	Above Railroad	16.79	Encroach	1002.69	6185.29	6.23	974.12	973.33	0.78
Centennial Wash	Above Railroad	16.71	Encroach	886.98	6021.06	6.40	973.09	972.31	0.78
Centennial Wash	Above Railroad	16.64	Encroach	834.12	5198.04	7.42	971.88	971.20	0.68
Centennial Wash	Above Railroad	16.55	Encroach	958.18	5808.62	6.64	970.56	969.84	0.72
Centennial Wash	Above Railroad	16.47	Encroach	1110.24	6413.26	6.01	968.83	968.38	0.45
Centennial Wash	Above Railroad	16.43	Encroach	1255.11	7192.11	5.36	967.88	967.35	0.52
Centennial Wash	Above Railroad	16.38	Encroach	1395.07	7323.32	5.26	966.71	966.27	0.44
Centennial Wash	Above Railroad	16.32	Encroach	1374.45	7117.00	5.42	965.78	965.13	0.64
Centennial Wash	Above Railroad	16.25	Encroach	1182.01	6334.74	6.09	964.43	963.85	0.58
Centennial Wash	Above Railroad	16.17	Encroach	1127.87	5048.42	7.64	962.02	961.68	0.33
Centennial Wash	Above Railroad	16.08	Encroach	1401.41	6427.60	6.00	960.38	960.15	0.23
Centennial Wash	Above Railroad	15.99	Encroach	1638.67	7812.24	4.93	959.24	958.94	0.30
Centennial Wash	Above Railroad	15.89	Encroach	1831.18	8305.63	4.64	958.37	957.74	0.63
Centennial Wash	Above Railroad	15.84	Encroach	1848.22	9345.45	4.13	957.95	957.22	0.73
Centennial Wash	Above Railroad	15.79	Encroach	1760.22	8853.98	4.35	957.51	956.67	0.84
Centennial Wash	Above Railroad	15.71	Encroach	1570.69	6016.41	6.41	955.39	955.17	0.22
Centennial Wash	Above Railroad	15.63	Encroach	1423.84	6964.80	5.54	954.25	954.05	0.20
Centennial Wash	Above Railroad	15.56	Encroach	1382.41	6837.33	5.64	952.66	952.35	0.30
Centennial Wash	Above Railroad	15.49	Encroach	1403.47	7283.34	5.29	951.34	950.58	0.77
Centennial Wash	Above Railroad	15.41	Encroach	1385.32	7269.04	5.30	950.42	949.81	0.62
Centennial Wash	Above Railroad	15.34	Encroach	1391.12	7164.45	5.38	949.49	948.91	0.58
Centennial Wash	Above Railroad	15.29	Encroach	1382.71	7232.65	5.33	948.88	948.35	0.53
Centennial Wash	Above Railroad	15.24	Encroach	1388.98	7114.38	5.42	948.28	947.79	0.49
Centennial Wash	Above Railroad	15.18	Encroach	1454.46	7468.51	5.16	947.55	947.11	0.44
Centennial Wash	Above Railroad	15.1	Encroach	1538.00	7750.54	4.97	946.52	946.14	0.38
Centennial Wash	Above Railroad	15.02	Encroach	1527.98	7573.69	5.09	945.37	945.08	0.30
Centennial Wash	Above Railroad	14.93	Encroach	1654.12	8139.70	4.74	944.43	944.07	0.37
Centennial Wash	Above Railroad	14.85	Encroach	1796.11	9354.94	4.12	943.71	943.19	0.51
Centennial Wash	Above Railroad	14.8	Encroach	1859.02	10178.51	3.79	943.25	942.53	0.73
Centennial Wash	Above Railroad	14.75	Encroach	1853.69	10954.49	3.52	943.01	942.21	0.80
Centennial Wash	Above Railroad	14.7	Encroach	1827.19	11834.03	3.26	942.78	941.91	0.87
Centennial Wash	Above Railroad	14.62	Encroach	1680.28	12242.61	3.15	942.30	941.47	0.83
Centennial Wash	Above Railroad	14.55	Encroach	1404.28	10981.38	3.51	941.66	940.90	0.76
Centennial Wash	Above Railroad	14.49	Encroach	1211.22	9759.89	3.95	941.06	940.38	0.67
Centennial Wash	Above Railroad	14.44	Encroach	1090.44	8770.71	4.40	940.32	939.74	0.58
Centennial Wash	Above Railroad	14.39	Encroach	972.86	7594.56	5.08	939.29	938.72	0.58
Centennial Wash	Above Railroad	14.32	Encroach	955.47	7352.72	5.24	937.63	937.06	0.57
Centennial Wash	Above Railroad	14.24	Encroach	1047.40	7049.09	5.47	935.80	935.34	0.47
Centennial Wash	Above Railroad	14.17	Encroach	1168.32	7429.81	5.19	934.17	933.81	0.36
Centennial Wash	Above Railroad	14.09	Encroach	1279.88	7919.20	4.87	933.04	932.65	0.39
Centennial Wash	Above Railroad	14.01	Encroach	1424.76	7033.99	5.48	931.69	931.33	0.36
Centennial Wash	Above Railroad	13.93	Encroach	1820.54	7734.65	4.98	930.25	929.96	0.29
Centennial Wash	Above Railroad	13.85	Encroach	2232.89	9418.64	4.09	929.13	928.51	0.61
Centennial Wash	Above Railroad	13.77	Encroach	2237.09	9830.16	3.92	928.22	927.64	0.58
Centennial Wash	Above Railroad	13.69	Encroach	2276.88	10950.79	3.52	927.58	927.00	0.58
Centennial Wash	Above Railroad	13.61	Encroach	2280.00	12172.46	3.17	927.05	926.38	0.68
Centennial Wash	Above Railroad	13.57	Encroach	2293.88	12450.70	3.10	926.77	926.05	0.72

HEC-RAS Plan: Final_100-ye Profile: Encroach (Continued)

River	Reach	River Sta	Profile	Top Wdth Act	Area	Vel Total	W.S. Elev	Base WS	Prof Delta WS
				(ft)	(sq ft)	(ft/s)	(ft)	(ft)	(ft)
Centennial Wash	Above Railroad	13.53	Encroach	2310.11	12745.60	3.02	926.49	925.73	0.77
Centennial Wash	Above Railroad	13.46	Encroach	2305.33	12863.24	3.00	925.79	924.94	0.85
Centennial Wash	Above Railroad	13.38	Encroach	2259.95	12844.19	3.00	924.99	924.13	0.86
Centennial Wash	Above Railroad	13.3	Encroach	2371.48	13126.10	2.94	924.20	923.38	0.82
Centennial Wash	Above Railroad	13.25	Encroach	2645.85	13963.31	2.76	923.73	922.91	0.82
Centennial Wash	Above Railroad	13.21	Encroach	2780.29	14246.67	2.71	923.35	922.50	0.85
Centennial Wash	Above Railroad	13.15	Encroach	2671.94	13253.03	2.91	922.72	921.83	0.89
Centennial Wash	Above Railroad	13.08	Encroach	2539.78	11833.46	3.26	921.68	920.78	0.90
Centennial Wash	Above Railroad	13	Encroach	2455.81	11120.72	3.47	920.40	919.50	0.90
Centennial Wash	Above Railroad	12.92	Encroach	2557.34	11465.86	3.36	919.22	918.35	0.87
Centennial Wash	Above Railroad	12.85	Encroach	2492.30	11294.57	3.41	918.25	917.49	0.76
Centennial Wash	Above Railroad	12.77	Encroach	1858.52	9967.66	3.87	917.22	916.62	0.60
Centennial Wash	Above Railroad	12.69	Encroach	1623.19	8385.92	4.60	916.08	915.49	0.59
Centennial Wash	Above Railroad	12.60	Encroach	1513.92	7972.01	4.84	915.16	914.45	0.71
Centennial Wash	Above Railroad	12.52	Encroach	1462.12	8026.93	4.80	914.30	913.70	0.60
Centennial Wash	Above Railroad	12.48	Encroach	1418.09	8024.11	4.80	913.78	913.22	0.55
Centennial Wash	Above Railroad	12.43	Encroach	1399.26	8333.86	4.63	913.25	912.70	0.54
Centennial Wash	Above Railroad	12.36	Encroach	1373.06	8269.13	4.66	912.42	911.81	0.60
Centennial Wash	Above Railroad	12.28	Encroach	1388.46	8153.97	4.73	911.40	910.72	0.68
Centennial Wash	Above Railroad	12.21	Encroach	1397.54	7718.91	4.99	910.41	909.68	0.73
Centennial Wash	Above Railroad	12.13	Encroach	1458.23	7831.26	4.92	909.39	908.60	0.79
Centennial Wash	Above Railroad	12.07	Encroach	1610.27	8341.94	4.62	908.60	907.71	0.90
Centennial Wash	Above Railroad	12.03	Encroach	1759.34	9268.66	4.16	908.23	907.25	0.98
Centennial Wash	Above Railroad	11.97	Encroach	1836.46	9344.27	4.13	907.72	906.73	0.99
Centennial Wash	Above Railroad	11.9	Encroach	1900.76	8971.93	4.30	906.67	905.69	0.98
Centennial Wash	Above Railroad	11.82	Encroach	1860.15	8493.20	4.54	905.44	904.56	0.88
Centennial Wash	Above Railroad	11.74	Encroach	1904.07	8663.50	4.45	904.18	903.34	0.83
Centennial Wash	Above Railroad	11.67	Encroach	1945.46	8994.42	4.29	903.02	902.18	0.85
Centennial Wash	Above Railroad	11.61	Encroach	1984.62	8928.09	4.32	902.22	901.40	0.82
Centennial Wash	Above Railroad	11.56	Encroach	2013.50	8592.43	4.49	901.42	900.69	0.73
Centennial Wash	Above Railroad	11.5	Encroach	2006.32	8633.67	4.47	900.52	899.85	0.67
Centennial Wash	Above Railroad	11.44	Encroach	2021.32	8640.76	4.46	899.70	899.12	0.58
Centennial Wash	Above Railroad	11.36	Encroach	2093.85	9002.80	4.28	898.82	898.33	0.48
Centennial Wash	Above Railroad	11.29	Encroach	2279.13	9374.58	4.11	898.03	897.63	0.41
Centennial Wash	Above Railroad	11.22	Encroach	2479.17	10036.71	3.84	897.24	896.75	0.49
Centennial Wash	Above Railroad	11.14	Encroach	2518.73	10771.41	3.58	896.36	895.76	0.60
Centennial Wash	Above Railroad	11.08	Encroach	2499.91	11035.04	3.49	895.57	894.80	0.77
Centennial Wash	Above Railroad	10.99	Encroach	2165.47	10158.22	3.80	894.65	893.85	0.80
Centennial Wash	Above Railroad	10.92	Encroach	1999.47	9372.38	4.11	893.85	893.12	0.73
Centennial Wash	Above Railroad	10.84	Encroach	1929.06	8402.65	4.59	892.59	891.92	0.66
Centennial Wash	Above Railroad	10.77	Encroach	1985.67	8695.05	4.43	891.60	891.07	0.53
Centennial Wash	Above Railroad	10.7	Encroach	2000.52	8469.15	4.55	890.60	890.06	0.54
Centennial Wash	Above Railroad	10.63	Encroach	1927.11	8682.34	4.44	889.77	889.24	0.54
Centennial Wash	Above Railroad	10.57	Encroach	1902.58	8649.06	4.46	889.04	888.50	0.54
Centennial Wash	Above Railroad	10.49	Encroach	1916.56	9000.24	4.28	888.37	887.81	0.56
Centennial Wash	Above Railroad	10.41	Encroach	1912.15	8715.65	4.42	887.67	887.06	0.61
Centennial Wash	Above Railroad	10.34	Encroach	1904.46	8438.29	4.57	886.95	886.35	0.61
Centennial Wash	Above Railroad	10.25	Encroach	1866.37	7609.11	5.07	885.96	885.32	0.63
Centennial Wash	Above Railroad	10.17	Encroach	1856.23	8052.21	4.79	885.12	884.46	0.65
Centennial Wash	Above Railroad	10.1	Encroach	1893.48	7811.17	4.94	884.22	883.60	0.63
Centennial Wash	Above Railroad	10.02	Encroach	1932.05	7868.73	4.90	883.34	882.67	0.67
Centennial Wash	Above Railroad	9.95	Encroach	1949.23	8165.00	4.72	882.54	881.81	0.73
Centennial Wash	Above Railroad	9.89	Encroach	1931.18	8123.56	4.75	881.88	881.12	0.76
Centennial Wash	Above Railroad	9.84	Encroach	1899.32	7726.32	4.99	881.24	880.48	0.76
Centennial Wash	Above Railroad	9.78	Encroach	1897.12	7316.05	5.27	880.33	879.58	0.75
Centennial Wash	Above Railroad	9.72	Encroach	1793.00	8113.61	4.75	879.51	878.82	0.68
Centennial Wash	Above Railroad	9.65	Encroach	2092.34	8414.98	4.58	878.58	877.96	0.63
Centennial Wash	Above Railroad	9.57	Encroach	2325.48	8549.48	4.51	877.34	876.82	0.52
Centennial Wash	Above Railroad	9.5	Encroach	2532.60	8986.54	4.29	876.23	875.86	0.37
Centennial Wash	Above Railroad	9.45	Encroach	2837.96	9460.43	4.08	875.46	875.24	0.22
Centennial Wash	Above Railroad	9.4	Encroach	3272.70	8925.79	4.32	874.40	874.34	0.06
Centennial Wash	Above Railroad	9.34	Encroach	3703.25	10406.89	3.70	873.33	873.28	0.05
Centennial Wash	Above Railroad	9.27	Encroach	4091.43	10883.67	3.54	872.31	872.14	0.16
Centennial Wash	Above Railroad	9.19	Encroach	4303.15	11210.66	3.44	871.53	871.22	0.31
Centennial Wash	Above Railroad	9.11	Encroach	4473.70	11712.11	3.29	870.76	870.43	0.33
Centennial Wash	Above Railroad	9.04	Encroach	4619.46	12860.04	3.00	870.02	869.64	0.38

HEC-RAS Plan: Final_100-ye Profile: Encroach (Continued)

River	Reach	River Sta	Profile	Top Wdth Act	Area	Vel Total	W.S. Elev	Base WS	Prof Delta WS
				(ft)	(sq ft)	(ft/s)	(ft)	(ft)	(ft)
Centennial Wash	Above Railroad	8.96	Encroach	4697.37	14148.84	2.72	869.47	869.00	0.47
Centennial Wash	Above Railroad	8.89	Encroach	4496.64	13909.74	2.77	868.90	868.41	0.50
Centennial Wash	Above Railroad	8.81	Encroach	4235.19	13346.08	2.89	868.19	867.76	0.43
Centennial Wash	Above Railroad	8.73	Encroach	4005.69	12969.19	2.97	867.41	867.03	0.38
Centennial Wash	Above Railroad	8.66	Encroach	3686.13	12219.72	3.15	866.68	866.22	0.47
Centennial Wash	Above Railroad	8.58	Encroach	3228.96	11795.22	3.27	865.96	865.32	0.64
Centennial Wash	Above Railroad	8.51	Encroach	3116.85	11731.50	3.29	865.23	864.58	0.65
Centennial Wash	Above Railroad	8.43	Encroach	2975.19	11175.57	3.45	864.43	863.89	0.54
Centennial Wash	Above Railroad	8.36	Encroach	3102.20	12248.10	3.15	863.79	863.35	0.44
Centennial Wash	Above Railroad	8.28	Encroach	3095.41	12540.45	3.51	862.98	862.71	0.27
Centennial Wash	Above Railroad	8.26		Lat Struct					
Centennial Wash	Above Railroad	8.21	Encroach	3399.82	14314.23	3.07	862.10	861.83	0.28
Centennial Wash	Above Railroad	8.18		Lat Struct					
Centennial Wash	Above Railroad	8.13	Encroach	3752.60	17123.68	2.57	861.47	860.95	0.52
Centennial Wash	Above Railroad	8.11		Lat Struct					
Centennial Wash	Above Railroad	8.05	Encroach	4041.32	19736.54	2.09	861.07	860.43	0.63
Centennial Wash	Above Railroad	8.03		Lat Struct					
Centennial Wash	Above Railroad	7.98	Encroach	4059.16	22829.58	1.71	860.94	860.24	0.70
Centennial Wash	Above Railroad	7.96		Lat Struct					
Centennial Wash	Above Railroad	7.90	Encroach	3401.14	20060.85	1.84	860.73	859.91	0.82
Centennial Wash	Above Railroad	7.88		Lat Struct					
Centennial Wash	Above Railroad	7.83	Encroach	2553.34	17671.26	1.61	860.55	859.62	0.93
Centennial Wash	Above Railroad	7.82		Lat Struct					
Centennial Wash	Above Railroad	7.81	Encroach	2529.46	18379.17	1.55	860.52	859.56	0.95
Centennial Wash	Above Railroad	7.8		Lat Struct					
Centennial Wash	Above Railroad	7.75	Encroach	2555.54	18240.35	1.48	860.47	859.48	0.98
Centennial Wash	Above Railroad	7.71		Lat Struct					
Centennial Wash	Above Railroad	7.62	Encroach	2149.28	19516.21	1.33	860.43	859.44	0.99
Centennial Wash	Above Railroad	7.52		Lat Struct					
Centennial Wash	Above Railroad	7.39	Encroach	549.60	5025.37	4.73	859.73	859.28	0.45
Centennial Wash	Above Railroad	7.37 BR U	Encroach	549.60	2687.22	8.04	859.73	859.28	0.45
Centennial Wash	Above Railroad	7.37 BR D	Encroach	536.02	2571.46	8.39	859.73	859.17	0.56
Centennial Wash	Above Railroad	7.35	Encroach	534.33	4317.90	5.51	857.68	856.69	0.99
Centennial Wash	Above Railroad	7.3		Lat Struct					
Centennial Wash	Above Railroad	7.27	Encroach	601.23	5266.12	4.52	857.17	856.23	0.94
Centennial Wash	Above Railroad	7.25		Lat Struct					
Centennial Wash	Above Railroad	7.19	Encroach	540.99	4603.61	5.17	856.39	855.82	0.57
Centennial Wash	Above Railroad	7.15		Lat Struct					
Centennial Wash	Above Railroad	7.12	Encroach	589.09	4683.28	5.08	855.67	855.12	0.55
Centennial Wash	Above Railroad	7.05		Lat Struct					
Centennial Wash	Above Railroad	7.04	Encroach	534.45	4198.82	5.67	854.91	854.46	0.46
Centennial Wash	Above Railroad	7.0		Lat Struct					
Centennial Wash	Above Railroad	6.97	Encroach	657.58	4351.52	5.47	854.18	853.52	0.66
Centennial Wash	Above Railroad	6.95		Lat Struct					
Centennial Wash	Above Railroad	6.89	Encroach	716.96	4645.73	5.12	853.49	852.62	0.87
Centennial Wash	Above Railroad	6.85		Lat Struct					
Centennial Wash	Above Railroad	6.81	Encroach	512.03	2922.25	8.14	851.76	851.17	0.59
Centennial Wash	Above Railroad	6.8		Lat Struct					
Centennial Wash	Above Railroad	6.74	Encroach	571.59	3111.38	7.42	850.31	849.69	0.62
Centennial Wash	Above Railroad	6.7		Lat Struct					
Centennial Wash	Above Railroad	6.67	Encroach	599.41	3778.51	5.65	849.36	848.39	0.97
Centennial Wash	Above Railroad	6.6		Lat Struct					
Centennial Wash	Above Railroad	6.59	Encroach	557.36	2219.13	9.56	845.94	845.38	0.55
Centennial Wash	Below Railroad	6.51	Encroach	6171.17	23546.17	2.20	842.60	841.86	0.74
Centennial Wash	Below Railroad	6.36	Encroach	5879.15	21610.57	2.43	841.59	840.83	0.76
Centennial Wash	Below Railroad	6.27	Encroach	5635.61	20469.69	2.60	840.72	839.92	0.80
Centennial Wash	Below Railroad	6.2	Encroach	5296.25	19760.12	2.46	839.96	839.14	0.82
Centennial Wash	Below Railroad	6.13	Encroach	4721.79	16378.00	2.99	838.98	838.16	0.83
Centennial Wash	Below Railroad	6.06	Encroach	4305.88	15065.74	3.01	837.81	837.17	0.64
Centennial Wash	Below Railroad	5.98	Encroach	3747.91	14423.38	3.08	836.90	836.34	0.56
Centennial Wash	Below Railroad	5.91	Encroach	3446.49	14858.23	2.96	836.30	835.67	0.63
Centennial Wash	Below Railroad	5.83	Encroach	3104.17	13859.35	3.18	835.67	834.94	0.73
Centennial Wash	Below Railroad	5.74	Encroach	2464.87	13996.90	3.18	834.95	834.13	0.82
Centennial Wash	Below Railroad	5.65	Encroach	2838.62	13682.63	3.22	834.16	833.25	0.91
Centennial Wash	Below Railroad	5.57	Encroach	2777.51	12967.00	3.40	833.30	832.40	0.91
Centennial Wash	Below Railroad	5.5	Encroach	2752.12	13194.38	3.34	832.53	831.66	0.87

HEC-RAS Plan: Final_100-ye Profile: Encroach (Continued)

River	Reach	River Sta	Profile	Top Wdth Act	Area	Vel Total	W.S. Elev	Base WS	Prof Delta WS
				(ft)	(sq ft)	(ft/s)	(ft)	(ft)	(ft)
Centennial Wash	Below Railroad	5.42	Encroach	2704.76	12822.13	3.43	831.66	830.86	0.81
Centennial Wash	Below Railroad	5.33	Encroach	2735.00	13368.89	3.29	830.65	829.92	0.72
Centennial Wash	Below Railroad	5.27	Encroach	2692.90	12987.05	3.39	829.84	829.11	0.73
Centennial Wash	Below Railroad	5.19	Encroach	2672.82	13382.54	3.29	828.93	828.02	0.91
Centennial Wash	Below Railroad	5.13	Encroach	2671.89	11994.87	3.67	827.99	827.12	0.87
Centennial Wash	Below Railroad	5.06	Encroach	2665.72	11080.12	3.97	826.79	825.92	0.86
Centennial Wash	Below Railroad	4.99	Encroach	2770.29	13145.60	3.35	826.15	825.23	0.92
Centennial Wash	Below Railroad	4.91	Encroach	2770.10	12390.10	3.55	825.44	824.53	0.91
Centennial Wash	Below Railroad	4.83	Encroach	2795.65	13776.54	3.20	824.70	823.73	0.97
Centennial Wash	Below Railroad	4.75	Encroach	2618.36	12410.36	3.55	823.93	823.04	0.90
Centennial Wash	Below Railroad	4.68	Encroach	2592.20	14428.10	3.05	823.18	822.32	0.86
Centennial Wash	Below Railroad	4.6	Encroach	2439.05	12523.92	3.52	822.27	821.53	0.74
Centennial Wash	Below Railroad	4.54	Encroach	2294.64	12990.33	3.39	821.52	820.91	0.60
Centennial Wash	Below Railroad	4.46	Encroach	2108.59	13879.29	3.17	820.86	820.25	0.61
Centennial Wash	Below Railroad	4.37	Encroach	2041.02	11447.38	3.85	819.98	819.35	0.63
Centennial Wash	Below Railroad	4.3	Encroach	1981.15	11544.63	3.81	819.25	818.52	0.73
Centennial Wash	Below Railroad	4.22	Encroach	1884.02	11736.71	3.75	818.51	817.83	0.68
Centennial Wash	Below Railroad	4.14	Encroach	1940.25	13338.93	3.30	817.80	817.21	0.59
Centennial Wash	Below Railroad	4.07	Encroach	2018.22	14150.73	3.11	817.30	816.75	0.55
Centennial Wash	Below Railroad	3.98	Encroach	2138.32	15187.90	2.90	816.65	816.15	0.50
Centennial Wash	Below Railroad	3.9	Encroach	2211.55	15023.79	2.93	815.85	815.40	0.45
Centennial Wash	Below Railroad	3.84	Encroach	2363.91	12763.27	3.45	814.71	814.27	0.45
Centennial Wash	Below Railroad	3.77	Encroach	2608.32	13517.10	3.26	813.32	812.83	0.49
Centennial Wash	Below Railroad	3.71	Encroach	2732.72	13456.10	3.27	812.50	811.94	0.57
Centennial Wash	Below Railroad	3.66	Encroach	2854.14	13637.52	3.23	811.59	810.89	0.70
Centennial Wash	Below Railroad	3.6	Encroach	2872.56	14619.75	3.01	810.94	810.16	0.79
Centennial Wash	Below Railroad	3.53	Encroach	2958.46	16590.45	2.65	810.29	809.38	0.91
Centennial Wash	Below Railroad	3.45	Encroach	3239.19	19617.16	2.25	809.92	808.95	0.97
Centennial Wash	Below Railroad	3.38	Encroach	3361.99	22156.13	1.99	809.64	808.67	0.96
Centennial Wash	Below Railroad	3.32	Encroach	3270.54	22533.38	1.95	809.45	808.50	0.95
Centennial Wash	Below Railroad	3.27	Encroach	3071.61	22760.62	1.93	809.19	808.28	0.90
Centennial Wash	Below Railroad	3.21	Encroach	2772.63	20197.09	2.18	808.79	807.92	0.87
Centennial Wash	Below Railroad	3.16	Encroach	2553.12	18909.64	2.33	808.29	807.37	0.92
Centennial Wash	Below Railroad	3.08	Encroach	2506.28	19020.13	2.32	807.64	806.71	0.93
Centennial Wash	Below Railroad	3	Encroach	2491.46	19106.22	2.31	806.77	805.82	0.94
Centennial Wash	Below Railroad	2.9	Encroach	2558.30	18716.89	2.35	805.72	804.85	0.88
Centennial Wash	Below Railroad	2.81	Encroach	2637.36	18955.80	2.32	804.76	803.95	0.81
Centennial Wash	Below Railroad	2.73	Encroach	2725.96	18798.17	2.34	803.67	802.87	0.80
Centennial Wash	Below Railroad	2.66	Encroach	2828.43	18610.72	2.37	802.63	801.76	0.88
Centennial Wash	Below Railroad	2.58	Encroach	2893.02	18397.27	2.39	801.55	800.69	0.86
Centennial Wash	Below Railroad	2.51	Encroach	2882.72	16880.46	2.61	800.18	799.50	0.69
Centennial Wash	Below Railroad	2.43	Encroach	2833.22	17609.00	2.50	799.17	798.37	0.80
Centennial Wash	Below Railroad	2.38	Encroach	2790.16	18298.02	2.41	798.60	797.65	0.95
Centennial Wash	Below Railroad	2.33	Encroach	2736.75	17960.01	2.45	798.02	797.09	0.93
Centennial Wash	Below Railroad	2.27	Encroach	2686.14	18649.85	2.36	797.48	796.62	0.85
Centennial Wash	Below Railroad	2.2	Encroach	2602.10	18738.21	2.35	796.88	796.05	0.83
Centennial Wash	Below Railroad	2.12	Encroach	2341.13	16611.14	2.65	796.07	795.28	0.79
Centennial Wash	Below Railroad	2.04	Encroach	2158.78	15078.41	2.92	794.88	794.13	0.74
Centennial Wash	Below Railroad	1.96	Encroach	1864.50	10542.53	4.18	792.68	792.13	0.55
Centennial Wash	Below Railroad	1.9	Encroach	1870.04	9944.97	4.43	791.45	790.88	0.56
Centennial Wash	Below Railroad	1.84	Encroach	1902.29	11659.31	3.78	790.76	790.13	0.63
Centennial Wash	Below Railroad	1.77	Encroach	1791.65	10765.52	4.09	789.75	789.12	0.64
Centennial Wash	Below Railroad	1.71	Encroach	1854.31	10761.25	4.09	789.02	788.31	0.71
Centennial Wash	Below Railroad	1.66	Encroach	1831.50	10418.88	4.23	788.38	787.46	0.92
Centennial Wash	Below Railroad	1.61	Encroach	1680.19	10420.02	4.23	787.97	787.02	0.94
Centennial Wash	Below Railroad	1.56	Encroach	1191.96	9831.72	5.27	787.36	786.48	0.88
Centennial Wash	Below Railroad	1.5	Encroach	1400.69	10225.60	4.61	786.70	785.87	0.83
Centennial Wash	Below Railroad	1.44	Encroach	1644.36	10508.79	4.30	785.94	785.13	0.81
Centennial Wash	Below Railroad	1.38	Encroach	1679.42	9782.80	4.74	784.84	784.06	0.78
Centennial Wash	Below Railroad	1.31	Encroach	1616.85	8415.94	5.58	782.96	782.61	0.35
Centennial Wash	Below Railroad	1.25	Encroach	1689.34	7985.97	5.65	780.97	780.69	0.28
Centennial Wash	Below Railroad	1.18	Encroach	2779.67	11720.63	3.80	779.18	778.22	0.95
Centennial Wash	Below Railroad	1.11	Encroach	3353.50	12854.52	3.53	777.85	776.92	0.94
Centennial Wash	Below Railroad	1.04	Encroach	3345.78	14222.76	3.14	776.73	776.00	0.73
Centennial Wash	Below Railroad	0.96	Encroach	3551.11	14499.20	3.08	775.77	775.17	0.60
Centennial Wash	Below Railroad	0.88	Encroach	3728.01	14683.27	3.04	774.68	774.18	0.50

HEC-RAS Plan: Final_100-ye Profile: Encroach (Continued)

River	Reach	River Sta	Profile	Top Wdth Act	Area	Vel Total	W.S. Elev	Base WS	Prof Delta WS
				(ft)	(sq ft)	(ft/s)	(ft)	(ft)	(ft)
Centennial Wash	Below Railroad	0.8	Encroach	3853.35	13250.86	3.45	773.36	772.90	0.46
Centennial Wash	Below Railroad	0.73	Encroach	4137.02	15312.07	2.92	772.27	771.74	0.53
Centennial Wash	Below Railroad	0.66	Encroach	6022.06	15305.76	2.94	770.91	769.97	0.94
Centennial Wash	Below Railroad	0.6	Encroach	7803.22	14311.49	3.12	768.98	767.99	1.00
Centennial Wash	Below Railroad	0.53	Encroach	8354.70	19563.92	2.28	767.44	766.84	0.60
Centennial Wash	Below Railroad	0.46	Encroach	8512.44	19015.06	2.34	766.46	765.99	0.48
Centennial Wash	Below Railroad	0.39	Encroach	8426.10	22335.11	2.00	765.79	765.32	0.47
Centennial Wash	Below Railroad	0.34	Encroach	7960.29	24638.32	1.81	765.39	764.92	0.47
Centennial Field	DS Trestles 2-3	0.82	Encroach	707.17	14735.17	0.00	851.78	851.78	0.00
Centennial Field	DS Trestles 2-3	0.75	Encroach	1569.87	16328.73	3.08	850.60	850.60	0.00
Centennial Field	DS Trestles 2-3	0.7		Lat Struct					
Centennial Field	DS Trestles 2-3	0.67	Encroach	2878.95	12398.06	2.39	849.11	849.11	0.00
Centennial Field	DS Trestles 2-3	0.65		Lat Struct					
Centennial Field	DS Trestles 2-3	0.6	Encroach	4618.10	10123.11	2.03	847.93	847.93	0.00
Centennial Field	DS Trestles 2-3	0.55		Lat Struct					
Centennial Field	DS Trestles 2-3	0.52	Encroach	5431.78	10172.09	1.92	846.86	846.86	0.00
Centennial Field	DS Trestles 2-3	0.5		Lat Struct					
Centennial Field	DS Trestles 2-3	0.45	Encroach	5467.68	11564.03	1.73	846.07	846.07	0.00
Centennial Field	DS Trestles 2-3	0.4		Lat Struct					
Centennial Field	DS Trestles 2-3	0.37	Encroach	5184.26	11801.04	1.91	845.38	845.38	0.00
Centennial Field	DS Trestles 2-3	0.35		Lat Struct					
Centennial Field	DS Trestles 2-3	0.29	Encroach	4946.41	12638.93	1.88	844.67	844.67	0.00
Centennial Field	DS Trestles 2-3	0.25		Lat Struct					
Centennial Field	DS Trestles 2-3	0.22	Encroach	4960.49	12849.02	2.36	843.70	843.69	0.00
Centennial Field	DS Trestles 2-3	0.2		Lat Struct					
Centennial Field	DS Trestles 2-3	0.15	Encroach	5273.65	14379.03	1.73	843.11	842.67	0.43
Centennial Field	DS Trestles 2-3	0.1		Lat Struct					
Centennial Field	DS Trestles 2-3	0.07	Encroach	5151.32	15090.32	1.00	842.91	842.23	0.68
Cent W RR Spill	Trestles 2 to 4	1.75	Encroach	2145.97	11251.17	0.00	858.30	857.63	0.66
Cent W RR Spill	Trestles 2 to 4	1.7		Lat Struct					
Cent W RR Spill	Trestles 2 to 4	1.67	Encroach	1612.13	9130.30	2.22	858.17	857.53	0.64
Cent W RR Spill	Trestles 2 to 4	1.65		Lat Struct					
Cent W RR Spill	Trestles 2 to 4	1.6	Encroach	1296.43	7534.72	2.69	857.98	857.37	0.60
Cent W RR Spill	Trestles 2 to 4	1.55		Lat Struct					
Cent W RR Spill	Trestles 2 to 4	1.52	Encroach	1116.86	6346.48	3.19	857.69	857.14	0.55
Cent W RR Spill	Trestles 2 to 4	1.5		Lat Struct					
Cent W RR Spill	Trestles 2 to 4	1.46	Encroach	982.28	5601.04	3.62	857.30	856.81	0.50
Cent W RR Spill	Trestles 2 to 4	1.45		Lat Struct					
Cent W RR Spill	Trestles 2 to 4	1.4	Encroach	824.50	4707.97	4.30	856.74	856.26	0.48
Cent W RR Spill	Trestles 2 to 4	1.35		Lat Struct					
Cent W RR Spill	Trestles 2 to 4	1.33	Encroach	828.48	4000.84	2.11	856.46	855.97	0.49
Cent W RR Spill	Trestles 2 to 4	1.3		Lat Struct					
Cent W RR Spill	Trestles 2 to 4	1.28	Encroach	709.91	3500.58	2.41	856.19	855.74	0.46
Cent W RR Spill	Trestles 2 to 4	1.25		Lat Struct					
Cent W RR Spill	Trestles 2 to 4	1.22	Encroach	701.13	3291.20	2.56	855.88	855.50	0.38
Cent W RR Spill	Trestles 2 to 4	1.15		Lat Struct					
Cent W RR Spill	Trestles 2 to 4	1.14	Encroach	687.74	2980.98	2.83	855.35	854.95	0.40
Cent W RR Spill	Trestles 2 to 4	1.1		Lat Struct					
Cent W RR Spill	Trestles 2 to 4	1.07	Encroach	672.46	2942.75	2.87	854.74	854.10	0.64
Cent W RR Spill	Trestles 2 to 4	1.05		Lat Struct					
Cent W RR Spill	Trestles 2 to 4	1.02	Encroach	666.96	3175.73	2.65	854.41	853.69	0.72
Cent W RR Spill	Trestles 2 to 4	1		Lat Struct					
Cent W RR Spill	Trestles 2 to 4	0.97	Encroach	536.21	2619.65	3.22	853.92	853.28	0.64
Cent W RR Spill	Trestles 2 to 4	0.95		Lat Struct					
Cent W RR Spill	Trestles 2 to 4	0.9	Encroach	428.00	2021.79	1.47	853.66	853.07	0.59
Cent W RR Spill	Trestles 2 to 4	0.85		Lat Struct					
Cent W RR Spill	Trestles 2 to 4	0.84	Encroach	426.33	1660.01	1.79	853.46	852.93	0.53
Cent W RR Spill	Trestles 2 to 4	0.8		Lat Struct					
Cent W RR Spill	Trestles 2 to 4	0.76	Encroach	405.00	1340.52	2.21	852.76	852.28	0.48
Cent W RR Spill	Trestles 2 to 4	0.7		Lat Struct					
Cent W RR Spill	Trestles 2 to 4	0.69	Encroach	444.43	1929.03	1.54	851.66	851.25	0.41
Cent W RR Spill	Trestles 2 to 4	0.65		Lat Struct					
Cent W RR Spill	Trestles 2 to 4	0.628	Encroach	653.44	1772.61	1.67	850.78	850.63	0.16
Cent W RR Spill	Trestles 2 to 4	0.625	Encroach	671.96	2610.80	1.14	850.25	850.23	0.02
Cent W RR Spill	Trestles 2 to 4	0.623	Encroach	465.70	2755.15	1.42	849.94	849.94	0.00
Cent W RR Spill	Trestles 2 to 4	0.6	Encroach	344.50	1661.74	2.29	849.47	849.47	0.00

HEC-RAS Plan: Final_100-ye Profile: Encroach (Continued)

River	Reach	River Sta	Profile	Top Wdth Act	Area	Vel Total	W.S. Elev	Base WS	Prof Delta WS
				(ft)	(sq ft)	(ft/s)	(ft)	(ft)	(ft)
Cent W RR Spill	Trestles 2 to 4	0.58 BR U	Encroach	285.37	1160.59	2.56	849.17	849.17	0.00
Cent W RR Spill	Trestles 2 to 4	0.58 BR D	Encroach	296.61	1207.91	2.46	848.94	848.94	0.00
Cent W RR Spill	Trestles 2 to 4	0.56	Encroach	344.00	3158.22	3.28	847.48	847.48	0.00
Cent W RR Spill	Trestles 2 to 4	0.5	Encroach	547.85	1493.34	3.41	845.27	845.27	0.00
Cent W RR Spill	Trestles 2 to 4	0.46	Encroach	992.13	1706.84	2.85	844.60	844.61	-0.01
Cent W RR Spill	Trestles 2 to 4	0.42	Encroach	1124.06	1705.10	2.86	843.93	843.68	0.25
Cent W RR Spill	Trestles 2 to 4	0.36	Encroach	1190.48	2202.59	2.22	843.32	842.68	0.63
Cent W RR Spill	Trestles 2 to 4	0.3	Encroach	1034.15	2891.57	1.73	843.10	842.37	0.73
Cent W RR Spill	Trestles 2 to 4	0.26	Encroach	944.35	3457.54	1.45	843.03	842.27	0.76
Cent W RR Spill	Trestles 2 to 4	0.21	Encroach	985.78	4153.22	1.20	842.98	842.22	0.77
Cent W RR Spill	Trestles 2 to 4	0.16	Encroach	1009.89	4744.13	1.05	842.96	842.19	0.77
Cent W RR Spill	Trestles 2 to 4	0.11	Encroach	841.60	4322.98	1.49	842.90	842.14	0.76
Cent W RR Spill	Trestles 2 to 4	0.05	Encroach	923.94	5214.60	1.83	842.83	842.09	0.73

Model: BaselineRdtoGila_LS.prj

Plan Title: Final_100-year_Encroachments_noEmb

Short Identifier: FinEncr_noEmbank

Geometry: CW_BLtoGila_LatStr_UpperJunction_NoDSemb

Flow file: 100-yr_USJunction_HardCodeQs_noEmb

Profile: 100-year

Base Conditions (i.e., Floodplain), Standard Table 1 from HEC-RAS

Plan Description: This plan represents a "without embankment" geometry with farmers levees near the Union Pacific R.R. Bridge removed from the geometry entirely. The flows calculated from the "Final 100yr No Embank Optimize" plan (i.e., *.p06) in this model were hardcoded into the flow file of the plan herein to set the flows around the Union Pacific R.R. Bridge, and this plan is used for calculating floodway encroachment stations in the model for the overflow channels near the bridge (see TSDN for additional explanation).

HEC-RAS Plan: FinEncr_noEmbank Profile: 100-year

River	Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Centennial Wash	Above Railroad	22.8	100-year	38552.00	1052.51	1062.32	1058.81	1062.42	0.001877	1.84	17023.85	4605.23	0.12
Centennial Wash	Above Railroad	22.73	100-year	38552.00	1050.55	1061.84	1058.94	1061.92	0.000880	1.17	19124.26	4428.94	0.07
Centennial Wash	Above Railroad	22.66	100-year	38552.00	1051.79	1061.60	1057.68	1061.70	0.000538	0.72	19634.44	5089.41	0.04
Centennial Wash	Above Railroad	22.58	100-year	38552.00	1051.08	1061.36	1055.72	1061.43	0.000686	1.19	20906.46	4426.89	0.07
Centennial Wash	Above Railroad	22.5	100-year	38552.00	1050.55	1061.02	1055.58	1061.08	0.001099	1.10	21795.26	5102.24	0.06
Centennial Wash	Above Railroad	22.42	100-year	38552.00	1048.26	1060.39	1054.95	1060.46	0.002199	1.62	18442.17	4393.58	0.09
Centennial Wash	Above Railroad	22.35	100-year	38552.00	1050.00	1059.70	1055.03	1059.79	0.001656	1.43	17828.84	4176.19	0.09
Centennial Wash	Above Railroad	22.27	100-year	38552.00	1048.92	1059.15	1053.97	1059.23	0.001290	1.41	17971.96	3927.78	0.08
Centennial Wash	Above Railroad	22.2	100-year	38552.00	1047.26	1058.79	1052.84	1058.86	0.000634	1.19	19621.44	4019.09	0.07
Centennial Wash	Above Railroad	22.12	100-year	38552.00	1046.85	1057.96	1052.33	1058.39	0.002222	1.86	11083.32	4113.98	0.10
Centennial Wash	Above Railroad	22.04	100-year	38552.00	1046.06	1056.88	1051.16	1057.39	0.002020	1.52	11035.13	3611.58	0.09
Centennial Wash	Above Railroad	21.97	100-year	38552.00	1044.89	1056.10	1051.01	1056.46	0.003284	2.15	10505.96	3040.26	0.12
Centennial Wash	Above Railroad	21.89	100-year	38552.00	1043.36	1054.82	1049.63	1054.99	0.003671	2.47	12848.01	2866.73	0.14
Centennial Wash	Above Railroad	21.82	100-year	38552.00	1041.49	1053.50	1049.21	1053.73	0.002566	1.65	11181.81	2810.20	0.10
Centennial Wash	Above Railroad	21.74	100-year	38552.00	1040.89	1052.69	1048.16	1052.89	0.001651	2.06	11779.12	2792.58	0.12
Centennial Wash	Above Railroad	21.66	100-year	38552.00	1039.31	1052.25	1048.15	1052.37	0.000943	1.60	14999.65	3528.83	0.10
Centennial Wash	Above Railroad	21.58	100-year	38552.00	1038.44	1051.81	1046.86	1051.92	0.001164	1.97	15334.88	2980.01	0.12
Centennial Wash	Above Railroad	21.51	100-year	38552.00	1037.93	1051.23	1046.56	1051.41	0.001513	1.95	12558.92	2565.16	0.11
Centennial Wash	Above Railroad	21.44	100-year	38552.00	1038.05	1050.33	1045.70	1050.56	0.003143	1.97	12067.88	2222.42	0.11
Centennial Wash	Above Railroad	21.36	100-year	38552.00	1037.87	1048.80	1044.67	1048.99	0.004412	2.28	11702.51	2348.54	0.13
Centennial Wash	Above Railroad	21.28	100-year	38552.00	1037.95	1047.40	1044.94	1047.71	0.002064	1.37	10965.38	2594.09	0.08
Centennial Wash	Above Railroad	21.2	100-year	38552.00	1037.51	1046.88	1043.79	1047.09	0.001069	4.44	10529.68	2521.49	0.30
Centennial Wash	Above Railroad	21.12	100-year	38552.00	1035.71	1046.36	1043.02	1046.63	0.001150	3.59	9376.69	1859.20	0.22
Centennial Wash	Above Railroad	21.04	100-year	38552.00	1033.62	1045.93	1042.05	1046.18	0.001103	3.58	9728.05	1765.84	0.20
Centennial Wash	Above Railroad	20.97	100-year	38552.00	1032.88	1045.38	1041.16	1045.61	0.001537	4.52	10235.71	1833.24	0.24
Centennial Wash	Above Railroad	20.89	100-year	38552.00	1030.55	1044.70	1040.21	1044.90	0.001531	2.76	11023.87	1985.43	0.14
Centennial Wash	Above Railroad	20.81	100-year	38552.00	1029.17	1043.81	1039.26	1044.13	0.001999	2.18	9492.87	2263.13	0.11
Centennial Wash	Above Railroad	20.74	100-year	38552.00	1028.09	1042.52	1038.47	1043.02	0.003905	2.80	7378.01	2430.88	0.15
Centennial Wash	Above Railroad	20.66	100-year	38552.00	1026.95	1040.63	1037.59	1041.27	0.004756	3.89	6563.70	1928.40	0.22
Centennial Wash	Above Railroad	20.58	100-year	38552.00	1023.96	1038.89	1035.93	1039.34	0.004332	3.73	7602.71	1646.62	0.22
Centennial Wash	Above Railroad	20.51	100-year	38552.00	1023.45	1037.55	1034.48	1037.84	0.002984	2.80	9122.63	1934.14	0.16
Centennial Wash	Above Railroad	20.49	100-year	38552.00	1023.22	1037.15	1034.03	1037.45	0.002952	2.92	9010.09	1752.25	0.17
Centennial Wash	Above Railroad	20.43	100-year	38552.00	1022.48	1036.28	1033.25	1036.60	0.003124	2.29	8965.79	1892.90	0.13
Centennial Wash	Above Railroad	20.36	100-year	38552.00	1021.12	1034.87	1031.80	1035.22	0.003780	2.30	8943.96	1757.69	0.12
Centennial Wash	Above Railroad	20.29	100-year	38552.00	1021.36	1033.62	1030.48	1033.91	0.003548	2.35	9419.28	2297.85	0.14
Centennial Wash	Above Railroad	20.22	100-year	38552.00	1020.04	1032.41	1029.56	1032.71	0.003593	3.56	8877.57	1973.47	0.20
Centennial Wash	Above Railroad	20.15	100-year	38552.00	1019.30	1030.91	1028.93	1031.27	0.004336	5.42	8186.78	2304.40	0.32
Centennial Wash	Above Railroad	20.07	100-year	38552.00	1017.63	1029.42	1026.98	1029.75	0.003369	3.37	8592.77	2129.11	0.20
Centennial Wash	Above Railroad	20.01	100-year	38552.00	1016.98	1028.45	1026.10	1028.77	0.003463	3.42	8602.01	2010.00	0.20
Centennial Wash	Above Railroad	19.96	100-year	38552.00	1015.52	1027.61	1025.08	1027.92	0.003132	3.49	8854.92	1986.27	0.20
Centennial Wash	Above Railroad	19.92	100-year	38552.00	1014.73	1026.84	1024.13	1027.12	0.002953	3.15	9112.43	2119.67	0.18
Centennial Wash	Above Railroad	19.84	100-year	38552.00	1012.72	1025.61	1022.60	1025.91	0.003194	3.35	8885.92	2019.21	0.19
Centennial Wash	Above Railroad	19.75	100-year	38552.00	1010.63	1024.10	1021.21	1024.48	0.004116	4.07	7928.36	1682.64	0.22
Centennial Wash	Above Railroad	19.67	100-year	38552.00	1010.19	1022.72	1019.78	1023.09	0.003494	3.90	8089.03	1734.95	0.21
Centennial Wash	Above Railroad	19.6	100-year	38552.00	1009.20	1021.70	1019.40	1022.17	0.002516	6.64	7348.35	1573.29	0.37
Centennial Wash	Above Railroad	19.53	100-year	38552.00	1008.01	1020.32	1018.62	1021.19	0.002952	9.50	5806.93	1126.73	0.52
Centennial Wash	Above Railroad	19.45	100-year	38552.00	1007.05	1019.55	1016.67	1020.18	0.001879	7.55	6623.01	1106.68	0.41
Centennial Wash	Above Railroad	19.37	100-year	38552.00	1004.48	1018.59	1014.76	1019.11	0.003461	3.96	6964.31	1235.81	0.21
Centennial Wash	Above Railroad	19.31	100-year	38552.00	1003.48	1017.50	1014.15	1018.02	0.003611	4.03	6952.57	1116.59	0.21
Centennial Wash	Above Railroad	19.27	100-year	38552.00	1002.78	1016.74	1013.79	1017.32	0.003696	4.08	6463.20	1015.89	0.21
Centennial Wash	Above Railroad	19.22	100-year	38552.00	1002.15	1015.82	1012.89	1016.42	0.003576	4.69	6338.87	1228.47	0.27
Centennial Wash	Above Railroad	19.14	100-year	38552.00	1000.95	1014.46	1012.32	1015.21	0.002627	9.05	6120.69	1041.97	0.53
Centennial Wash	Above Railroad	19.07	100-year	38552.00	1000.35	1013.53	1011.22	1014.21	0.002270	9.00	6893.69	1393.36	0.50
Centennial Wash	Above Railroad	18.99	100-year	38552.00	998.81	1012.60	1009.06	1013.12	0.003020	4.14	6955.53	1043.57	0.23
Centennial Wash	Above Railroad	18.91	100-year	38552.00	997.92	1011.73	1007.84	1012.09	0.001960	5.41	8104.57	1317.77	0.27
Centennial Wash	Above Railroad	18.84	100-year	38552.00	996.46	1010.63	1007.60	1011.25	0.004099	5.74	6143.29	1132.66	0.31
Centennial Wash	Above Railroad	18.76	100-year	38552.00	996.13	1009.31	1007.32	1010.13	0.002017	9.11	6273.78	1063.27	0.49
Centennial Wash	Above Railroad	18.69	100-year	38552.00	994.59	1008.82	1005.58	1009.27	0.001911	5.87	7322.80	1221.42	0.34
Centennial Wash	Above Railroad	18.61	100-year	38552.00	994.12	1007.75	1004.13	1008.25	0.003613	4.65	7068.47	1091.13	0.27
Centennial Wash	Above Railroad	18.59	100-year	38552.00	993.18	1007.42	1003.91	1007.93	0.003698	4.76	6969.04	1123.02	0.28
Centennial Wash	Above Railroad	18.53	100-year	38552.00	991.98	1006.00	1003.35	1006.65	0.004731	5.44	6262.93	1185.14	0.31
Centennial Wash	Above Railroad	18.46	100-year	38552.00	991.96	1003.67	1002.96	1004.99	0.003471	10.38	5129.47	1170.98	0.64
Centennial Wash	Above Railroad	18.38	100-year	38552.00	990.93	1002.66	1001.20	1003.68	0.002624	9.50	5594.43	1181.25	0.56
Centennial Wash	Above Railroad	18.3	100-year	38552.00	990.06	1001.51	1000.20	1002.61	0.002607	10.45	5709.34	1219.70	0.59
Centennial Wash	Above Railroad	18.25	100-year	38552.00	988.71	1001.12	998.20	1001.69	0.003505	5.26	6564.58	1341.35	0.29
Centennial Wash	Above Railroad	18.22	100-year	38552.00	988.43	1000.33	997.68	1001.04	0.005055	5.67	5879.49	1306.44	0.33
Centennial Wash	Above Railroad	18.15	100-year	38552.00	987.64	997.78	996.95	999.13	0.004185	11.26	4897.01	1103.26	0.70
Centennial Wash	Above Railroad	18.07	100-year	38552.00	986.05	996.64	995.09	997.45	0.003449	8.51	5690.95	1337.47	0.54
Centennial Wash	Above Railroad	18	100-year	38552.00	984.00	995.52	993.89	996.22	0.002575	8.42	6217.07	1243.78	0.51
Centennial Wash	Above Railroad	17.92	100-year	38552.00	984.05	994.54	992.65	995.23	0.002494	7.65	6177.28	1366.49	0.46
Centennial Wash	Above Railroad	17.85	100-year	38552.00	981.68	993.45	991.24	994.02	0.004164	5.47	6400.54	1306.45	0.32
Centennial Wash	Above Railroad	17.8	100-year	38552.00	981.01	991.91	991.02	993.03	0.003293	10.37	5457.70	1182.90	0.63
Centennial Wash	Above Railroad	17.76	100-year	38552.00	980.79	991.29	990.18	992.34	0.002763	9.90	5551.23	1222.43	0.60
Centennial Wash	Above Railroad	17.7	100-year	38552.00	979.70	990.57	988.98	991.45	0.002962	9.25	5806.18	1127.24	0.54
Centennial Wash	Above Railroad	17.62	100-year	38552.00	979.15	988.38	987.91	989.98	0.004118	12.13	4509.43	1185.70	0.77
Centennial Wash	Above Railroad	17.55	100-year	38552.00	977.72	987.05	986.32	988.35	0.003610	10.58	4911.08	1244.26	0.67
Centennial Wash	Above Railroad	17.47	100-year	38552.00	976.40	985.91	985.04	987.06	0.002715	9.96	5435.14	1273.47	0.62
Centennial Wash	Above Railroad	17.4	100-year	38552.00	974.90	984.08	984.01	985.69	0.004086	12.63	4786.01	1180.63	0.81
Centennial Wash	Above Railroad	17.33	100-year	38552.00	973.59	983.31	981.93	984.10	0.003175	8.05	5691.66	1206.65	0.53
Centennial Wash	Above Railroad	17.25	100-year	38552.00	972.68	981.67	980.13	982.38	0.006258	5.69	5827.09	1360.60	0.39
Centennial Wash	Above Railroad	17.17	100-year	38552.00	971.26	979.49	978.78	980.43	0.003235	9.88	5663.92	1994.48	0.68
Centennial Wash	Above Railroad	17.09	100-year	38552.00	969.09	977.63	977.49	978.92	0.004215	13.95	5381.75	1901.22	0.92
Centennial Wash	Above Railroad	17.02	100-year	38552.00	967.88	976.48	975.72	977.30	0.003245	10.61	5867.84	1653.51	0.69
Centennial Wash	Above Railroad	16.94	100-year	38552.00	967.21	975.21	974.25	975.93	0.003390	8.78	6015.05	1604.93	0.63
Centennial Wash	Above Railroad	16.87	100-year	38552.00	964.35	974.20	972.31	974.86	0.002243	3.45	6331.32	1575.87	0.21
Centennial Wash	Above Railroad	16.79	100-year	38552.00	964.22	973.33	971.57	973.97	0.002600	9.18	6746.59	1732.08	0.61
Centennial Wash	Above Railroad	16.71	100-year	38552.00	962.92	972.31	970.61	973.02	0.002443	11.72	6962.51	1872.28	0.72

HEC-RAS Plan: FinEncr_noEmbank Profile: 100-year (Continued)

River	Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Centennial Wash	Above Railroad	16.64	100-year	38552.00	961.95	971.20	969.54	971.86	0.003744	9.18	6308.13	1924.79	0.60
Centennial Wash	Above Railroad	16.55	100-year	38552.00	960.35	969.84	968.18	970.41	0.003164	7.42	6564.44	2018.30	0.48
Centennial Wash	Above Railroad	16.47	100-year	38552.00	959.27	968.38	966.88	968.88	0.004143	3.39	7651.21	2314.85	0.21
Centennial Wash	Above Railroad	16.43	100-year	38552.00	958.50	967.35	965.73	967.77	0.004381	3.29	8194.63	2442.03	0.22
Centennial Wash	Above Railroad	16.38	100-year	38552.00	957.50	966.27	964.85	966.72	0.002932	2.61	8541.95	3547.23	0.18
Centennial Wash	Above Railroad	16.32	100-year	38552.00	956.65	965.13	963.57	965.62	0.004068	3.01	7268.61	3633.04	0.21
Centennial Wash	Above Railroad	16.25	100-year	38552.00	954.03	963.85	962.10	964.26	0.002642	5.68	7617.74	2411.80	0.37
Centennial Wash	Above Railroad	16.17	100-year	38552.00	953.25	961.68	961.65	962.72	0.005299	13.55	6638.32	2146.48	0.91
Centennial Wash	Above Railroad	16.08	100-year	38552.00	951.81	960.15	959.00	960.70	0.002643	9.39	7663.94	3277.66	0.63
Centennial Wash	Above Railroad	15.99	100-year	38552.00	951.18	958.94	957.39	959.42	0.003131	7.49	8333.22	3253.06	0.53
Centennial Wash	Above Railroad	15.89	100-year	38552.00	948.73	957.74	956.45	958.23	0.002858	7.30	7637.12	3744.36	0.54
Centennial Wash	Above Railroad	15.84	100-year	38552.00	948.30	957.22	955.21	957.56	0.002292	6.12	9850.39	3807.50	0.42
Centennial Wash	Above Railroad	15.79	100-year	38552.00	947.64	956.67	954.19	956.93	0.002526	3.61	9424.98	3335.07	0.23
Centennial Wash	Above Railroad	15.71	100-year	38552.00	945.56	955.17	954.21	955.84	0.003080	10.39	7456.20	3169.71	0.70
Centennial Wash	Above Railroad	15.63	100-year	38552.00	944.38	954.05	951.94	954.49	0.003222	5.38	7294.17	3382.58	0.34
Centennial Wash	Above Railroad	15.56	100-year	38552.00	943.88	952.35	950.57	952.88	0.003869	6.00	6709.97	2289.80	0.39
Centennial Wash	Above Railroad	15.49	100-year	38552.00	943.25	950.58	949.19	951.19	0.002864	9.37	6643.07	1883.90	0.67
Centennial Wash	Above Railroad	15.41	100-year	38552.00	941.99	949.81	947.82	950.20	0.001875	7.78	8600.47	1810.21	0.58
Centennial Wash	Above Railroad	15.34	100-year	38552.00	941.71	948.91	947.17	949.37	0.002195	8.41	7887.62	1674.14	0.64
Centennial Wash	Above Railroad	15.29	100-year	38552.00	940.65	948.35	946.54	948.84	0.002203	9.26	8018.15	1681.76	0.66
Centennial Wash	Above Railroad	15.24	100-year	38552.00	940.73	947.79	946.06	948.30	0.002360	9.61	7983.16	1687.04	0.67
Centennial Wash	Above Railroad	15.18	100-year	38552.00	940.01	947.11	945.11	947.52	0.002341	8.62	8325.92	1766.26	0.61
Centennial Wash	Above Railroad	15.1	100-year	38552.00	938.82	946.14	944.35	946.56	0.002474	8.55	8424.54	1870.49	0.63
Centennial Wash	Above Railroad	15.02	100-year	38552.00	938.09	945.08	943.46	945.53	0.002750	9.30	8370.56	2132.56	0.67
Centennial Wash	Above Railroad	14.93	100-year	38552.00	936.77	944.07	942.37	944.48	0.002697	8.17	8219.38	2380.97	0.60
Centennial Wash	Above Railroad	14.85	100-year	38552.00	935.62	943.19	941.02	943.48	0.002275	3.01	9101.55	2678.39	0.21
Centennial Wash	Above Railroad	14.8	100-year	38552.00	933.39	942.53	940.86	942.89	0.001894	8.33	9252.13	2563.55	0.56
Centennial Wash	Above Railroad	14.75	100-year	38552.00	933.73	942.21	940.05	942.48	0.001391	7.56	10477.22	2659.81	0.50
Centennial Wash	Above Railroad	14.7	100-year	38552.00	933.74	941.91	938.64	942.08	0.001130	1.58	11660.79	3134.94	0.11
Centennial Wash	Above Railroad	14.62	100-year	38552.00	931.84	941.47	937.48	941.60	0.001060	1.56	14358.20	3213.70	0.10
Centennial Wash	Above Railroad	14.55	100-year	38552.00	930.92	940.90	936.46	941.07	0.001264	1.79	11722.51	2786.08	0.12
Centennial Wash	Above Railroad	14.49	100-year	38552.00	929.24	940.38	935.78	940.58	0.001782	2.55	10833.67	1513.75	0.16
Centennial Wash	Above Railroad	14.44	100-year	38552.00	928.35	939.74	935.29	940.00	0.002247	3.50	9398.38	1280.44	0.21
Centennial Wash	Above Railroad	14.39	100-year	38552.00	927.60	938.72	934.94	939.11	0.004097	3.69	7711.19	1100.28	0.21
Centennial Wash	Above Railroad	14.32	100-year	38552.00	927.44	937.06	933.49	937.47	0.003635	3.06	7604.23	1112.48	0.20
Centennial Wash	Above Railroad	14.24	100-year	38552.00	926.53	935.34	932.33	935.77	0.004518	3.64	7460.05	1220.74	0.25
Centennial Wash	Above Railroad	14.17	100-year	38552.00	926.28	933.81	930.97	934.22	0.003248	2.57	7716.16	1311.16	0.19
Centennial Wash	Above Railroad	14.09	100-year	38552.00	926.09	932.65	929.93	933.04	0.002740	2.09	8173.54	1498.95	0.16
Centennial Wash	Above Railroad	14.01	100-year	38552.00	925.23	931.33	929.45	931.75	0.003940	2.80	7717.94	1784.21	0.25
Centennial Wash	Above Railroad	13.93	100-year	38552.00	924.68	929.96	928.32	930.29	0.003467	2.45	8597.63	2616.02	0.23
Centennial Wash	Above Railroad	13.85	100-year	38552.00	923.82	928.51	926.93	928.84	0.004324	4.97	8446.85	2451.46	0.52
Centennial Wash	Above Railroad	13.77	100-year	38552.00	923.40	927.64	925.85	927.79	0.001752	1.08	12409.94	3877.94	0.12
Centennial Wash	Above Railroad	13.69	100-year	38552.00	923.61	927.00	924.76	927.17	0.001458	1.54	12839.86	3433.15	0.16
Centennial Wash	Above Railroad	13.61	100-year	38552.00	920.85	926.38	923.76	926.54	0.001846	1.74	12449.40	2971.29	0.15
Centennial Wash	Above Railroad	13.57	100-year	38552.00	918.22	926.05	923.25	926.19	0.001901	2.06	13043.47	2936.72	0.16
Centennial Wash	Above Railroad	13.53	100-year	38552.00	917.65	925.73	922.84	925.86	0.002083	2.20	13156.67	3046.42	0.17
Centennial Wash	Above Railroad	13.46	100-year	38552.00	916.27	924.94	922.12	925.07	0.002466	2.20	13783.73	3341.41	0.17
Centennial Wash	Above Railroad	13.38	100-year	38552.00	916.46	924.13	921.16	924.26	0.002085	2.23	14084.00	3215.85	0.17
Centennial Wash	Above Railroad	13.3	100-year	38552.00	914.59	923.38	920.59	923.50	0.001946	2.57	14467.95	3589.91	0.19
Centennial Wash	Above Railroad	13.25	100-year	38552.00	912.38	922.91	920.23	923.03	0.001959	2.63	15011.74	3959.27	0.19
Centennial Wash	Above Railroad	13.21	100-year	38552.00	910.63	922.50	919.79	922.60	0.002081	2.83	15099.97	4204.54	0.19
Centennial Wash	Above Railroad	13.15	100-year	38552.00	909.07	921.83	919.19	921.95	0.002092	3.12	14661.23	4231.48	0.22
Centennial Wash	Above Railroad	13.08	100-year	38552.00	909.37	920.78	918.39	920.94	0.003261	3.69	12797.13	4172.29	0.26
Centennial Wash	Above Railroad	13	100-year	38552.00	909.15	919.50	917.19	919.66	0.003102	3.28	12522.35	4117.04	0.23
Centennial Wash	Above Railroad	12.92	100-year	38552.00	905.52	918.35	915.99	918.50	0.002642	2.75	12847.52	4104.77	0.20
Centennial Wash	Above Railroad	12.85	100-year	38552.00	904.11	917.49	915.23	917.65	0.002402	3.54	12596.51	3888.17	0.25
Centennial Wash	Above Railroad	12.77	100-year	38552.00	904.07	916.62	914.29	916.78	0.002161	3.46	12169.92	3863.65	0.25
Centennial Wash	Above Railroad	12.69	100-year	38552.00	902.82	915.49	913.57	915.77	0.002321	2.11	9616.94	2863.82	0.15
Centennial Wash	Above Railroad	12.60	100-year	38552.00	900.68	914.45	912.69	914.78	0.002726	2.23	8988.30	2820.93	0.17
Centennial Wash	Above Railroad	12.52	100-year	38552.00	900.86	913.70	911.66	913.88	0.001731	1.93	11486.64	3579.02	0.13
Centennial Wash	Above Railroad	12.48	100-year	38552.00	899.96	913.22	910.86	913.44	0.001768	1.86	10620.14	2915.60	0.13
Centennial Wash	Above Railroad	12.43	100-year	38552.00	900.29	912.70	910.24	912.95	0.002188	2.37	9918.72	2943.82	0.15
Centennial Wash	Above Railroad	12.36	100-year	38552.00	897.83	911.81	909.36	912.08	0.002856	3.61	9568.98	3022.69	0.22
Centennial Wash	Above Railroad	12.28	100-year	38552.00	897.70	910.72	908.48	910.95	0.002640	3.27	10397.21	3394.21	0.21
Centennial Wash	Above Railroad	12.21	100-year	38552.00	898.49	909.68	908.03	909.94	0.002663	2.78	10004.87	3208.93	0.19
Centennial Wash	Above Railroad	12.13	100-year	38552.00	896.05	908.60	906.85	908.85	0.002903	2.92	9935.05	3222.47	0.18
Centennial Wash	Above Railroad	12.07	100-year	38552.00	894.40	907.71	905.74	907.93	0.002448	2.91	10359.15	3564.27	0.17
Centennial Wash	Above Railroad	12.03	100-year	38552.00	893.69	907.25	905.12	907.44	0.001992	2.55	11114.91	3478.20	0.16
Centennial Wash	Above Railroad	11.97	100-year	38552.00	892.93	906.73	904.45	906.91	0.002217	2.47	11450.90	3814.26	0.15
Centennial Wash	Above Railroad	11.9	100-year	38552.00	892.66	905.69	903.86	905.90	0.002895	4.89	10638.53	4222.01	0.31
Centennial Wash	Above Railroad	11.82	100-year	38552.00	891.21	904.56	903.18	904.76	0.003010	4.56	11006.82	4534.78	0.31
Centennial Wash	Above Railroad	11.74	100-year	38552.00	890.26	903.34	902.04	903.53	0.003151	4.45	11335.66	4682.07	0.32
Centennial Wash	Above Railroad	11.67	100-year	38552.00	890.08	902.18	900.68	902.36	0.002579	4.21	11731.78	4597.74	0.29
Centennial Wash	Above Railroad	11.61	100-year	38552.00	888.53	901.40	899.95	901.60	0.002531	4.40	11901.41	4512.61	0.29
Centennial Wash	Above Railroad	11.56	100-year	38552.00	888.02	900.69	899.18	900.90	0.002651	3.91	11582.11	4552.95	0.28
Centennial Wash	Above Railroad	11.5	100-year	38552.00	887.99	899.85	898.46	900.06	0.002624	4.29	11368.31	4151.60	0.28
Centennial Wash	Above Railroad	11.44	100-year	38552.00	886.53	899.12	897.59	899.32	0.002297	3.52	11527.85	3854.70	0.26
Centennial Wash	Above Railroad	11.36	100-year	38552.00	885.88	898.33	896.68	898.52	0.001939	3.56	11805.77	3852.21	0.24
Centennial Wash	Above Railroad	11.29	100-year	38552.00	885.71	897.63	895.98	897.81	0.001937	3.77	11816.64	3787.30	0.25
Centennial Wash	Above Railroad	11.22	100-year	38552.00	884.50	896.75	895.31	896.99	0.002729	4.76	10555.07	3383.18	0.30
Centennial Wash	Above Railroad	11.14	100-year	38552.00	884.18	895.76	894.17	895.95	0.002708	4.33	11553.27	3730.10	0.30
Centennial Wash	Above Railroad	11.08	100-year	38552.00	883.96	894.80	893.49	895.03	0.002338	6.42	11620.96	3527.18	0.40
Centennial Wash	Above Railroad	10.99	100-year	38552.00	882.62	893.85	892.46	894.06	0.002033	5.70	11690.42	3412.49	0.37
Centennial Wash	Above Railroad	10.92	100-year	38552.00	882.76	893.12	891.93	893.37	0.002244	6.82	11681.83	3787.35	0.43
Centennial Wash	Above Railroad	10.84	100-year	38552.00	881.55	891.92	890.89	892.23	0.003131	7.40	10169.71	3489.99	0.49
Centennial Wash	Above Railroad	10.77	100-year	38552.00	880.87	891.07	889.82	891.32	0.002241	6.43	11205.99	3593.96	0.42
Centennial Wash	Above Railroad	10.7	100-year	38552.00	880.59	890.06	888.95	890.40	0.002837	7.67	9658.88	3400.63	0.50

HEC-RAS Plan: FinEncr_noEmbank Profile: 100-year (Continued)

River	Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Centennial Wash	Above Railroad	10.63	100-year	38552.00	880.66	889.24	887.68	889.53	0.002126	6.32	9909.34	3478.31	0.44
Centennial Wash	Above Railroad	10.57	100-year	38552.00	879.25	888.50	887.18	888.79	0.002113	5.86	9982.53	3292.46	0.39
Centennial Wash	Above Railroad	10.49	100-year	38552.00	878.49	887.81	886.34	888.05	0.001739	5.83	11004.67	3732.66	0.41
Centennial Wash	Above Railroad	10.41	100-year	38552.00	876.42	887.06	885.87	887.34	0.001843	6.53	10712.79	3845.88	0.43
Centennial Wash	Above Railroad	10.34	100-year	38552.00	875.52	886.35	885.20	886.62	0.001694	6.37	10498.94	3673.71	0.42
Centennial Wash	Above Railroad	10.25	100-year	38552.00	875.06	885.32	884.33	885.65	0.002389	6.58	9037.57	3484.25	0.47
Centennial Wash	Above Railroad	10.17	100-year	38552.00	873.75	884.46	883.15	884.74	0.002103	5.49	9662.55	3518.02	0.40
Centennial Wash	Above Railroad	10.1	100-year	38552.00	873.73	883.60	882.29	883.87	0.002194	4.93	9434.48	3404.22	0.38
Centennial Wash	Above Railroad	10.02	100-year	38552.00	873.93	882.67	881.55	882.97	0.002288	5.76	9132.53	3331.21	0.46
Centennial Wash	Above Railroad	9.95	100-year	38552.00	873.84	881.81	880.62	882.08	0.002115	5.65	9580.67	3636.88	0.44
Centennial Wash	Above Railroad	9.89	100-year	38552.00	873.38	881.12	879.83	881.38	0.002144	4.84	9612.04	3684.75	0.40
Centennial Wash	Above Railroad	9.84	100-year	38552.00	872.88	880.48	879.36	880.77	0.002401	6.04	9382.89	3804.12	0.48
Centennial Wash	Above Railroad	9.78	100-year	38552.00	872.64	879.58	878.56	879.91	0.002870	6.28	8930.78	3572.14	0.50
Centennial Wash	Above Railroad	9.72	100-year	38552.00	873.21	878.82	877.05	879.06	0.001760	3.73	10441.45	3425.73	0.35
Centennial Wash	Above Railroad	9.65	100-year	38552.00	872.95	877.96	876.41	878.19	0.002231	4.18	10132.60	3541.47	0.39
Centennial Wash	Above Railroad	9.57	100-year	38552.00	871.61	876.82	875.27	877.04	0.002316	3.18	10327.96	3770.54	0.36
Centennial Wash	Above Railroad	9.5	100-year	38552.00	869.40	875.86	874.25	876.06	0.002030	3.64	10800.72	3881.39	0.39
Centennial Wash	Above Railroad	9.45	100-year	38552.00	871.82	875.24	873.60	875.42	0.001922	2.58	11382.34	4014.84	0.33
Centennial Wash	Above Railroad	9.4	100-year	38552.00	871.45	874.34	873.17	874.58	0.003110	2.36	10038.98	4318.88	0.40
Centennial Wash	Above Railroad	9.34	100-year	38552.00	870.57	873.28	871.91	873.49	0.002739	2.83	10718.06	4484.14	0.42
Centennial Wash	Above Railroad	9.27	100-year	38552.00	868.75	872.14	871.00	872.35	0.002848	2.32	10722.16	4953.10	0.40
Centennial Wash	Above Railroad	9.19	100-year	38552.00	867.26	871.22	870.26	871.41	0.002749	3.57	11042.28	5419.25	0.44
Centennial Wash	Above Railroad	9.11	100-year	38552.00	864.59	870.43	869.07	870.57	0.001823	3.24	12652.22	5484.76	0.33
Centennial Wash	Above Railroad	9.04	100-year	38552.00	864.70	869.64	868.13	869.78	0.001666	3.36	13101.09	5634.50	0.36
Centennial Wash	Above Railroad	8.96	100-year	38552.00	863.50	869.00	867.37	869.12	0.001410	3.50	14200.96	5771.87	0.35
Centennial Wash	Above Railroad	8.89	100-year	38552.00	863.49	868.41	866.77	868.51	0.001453	3.29	14951.56	5770.48	0.34
Centennial Wash	Above Railroad	8.81	100-year	38552.00	862.44	867.76	865.90	867.86	0.001602	3.77	15667.66	5655.47	0.37
Centennial Wash	Above Railroad	8.73	100-year	38552.00	861.62	867.03	865.06	867.14	0.001941	3.69	14787.04	5349.39	0.36
Centennial Wash	Above Railroad	8.66	100-year	38552.00	861.38	866.22	864.57	866.37	0.002226	3.57	12411.83	4711.79	0.41
Centennial Wash	Above Railroad	8.58	100-year	38552.00	860.46	865.32	863.70	865.50	0.002298	3.96	11252.97	4146.96	0.39
Centennial Wash	Above Railroad	8.51	100-year	38552.00	859.60	864.58	862.74	864.74	0.001891	0.96	12245.50	4163.13	0.12
Centennial Wash	Above Railroad	8.43	100-year	38552.00	859.20	863.89	861.99	864.04	0.001770	1.20	12463.63	3710.21	0.12
Centennial Wash	Above Railroad	8.36	100-year	38552.00	859.60	863.36	861.11	863.48	0.001242	0.89	14114.66	3886.45	0.10
Centennial Wash	Above Railroad	8.28	100-year	44041.00	858.45	862.72	860.51	862.88	0.001608	1.06	14128.61	6240.58	0.11
Centennial Wash	Above Railroad	8.21	100-year	44041.00	857.80	861.85	859.59	862.01	0.002278	1.02	13737.44	6310.35	0.13
Centennial Wash	Above Railroad	8.13	100-year	44041.00	857.26	860.99	858.42	861.12	0.001562	0.76	15312.98	5493.09	0.12
Centennial Wash	Above Railroad	8.05	100-year	44041.00	856.76	860.44	857.52	860.52	0.000892	0.66	19554.06	4794.15	0.08
Centennial Wash	Above Railroad	7.98	100-year	44041.00	855.36	860.19	856.81	860.28	0.000884	0.76	19194.22	4053.91	0.08
Centennial Wash	Above Railroad	7.90	100-year	44041.00	854.64	859.69	856.19	859.80	0.001541	1.22	16581.60	3474.57	0.11
Centennial Wash	Above Railroad	7.83	100-year	44041.00	854.76	858.87	855.73	859.05	0.002097	3.58	12815.50	2801.53	0.40
Centennial Wash	Above Railroad	7.81	100-year	44041.00	852.60	858.61	855.36	858.79	0.002045	3.83	12854.75	2796.01	0.41
Centennial Wash	Above Railroad	7.75	100-year	44041.00	851.07	858.18	854.95	858.38	0.002109	2.33	12705.84	2829.99	0.24
Centennial Wash	Trestle 1	7.62	100-year	19559.51	846.99	857.92	851.76	857.96	0.000119	0.51	15560.01	2839.23	0.04
Centennial Wash	Trestle 1	7.39	100-year	19559.51	842.47	856.59	852.33	857.50	0.002701	7.56	2690.91	3068.87	0.38
Centennial Wash	Trestle 1	7.37		Bridge									
Centennial Wash	Trestle 1	7.35	100-year	19559.51	842.94	853.95	853.09	854.61	0.004160	7.76	5703.33	2021.41	0.48
Centennial Wash	Trestle 1	7.3		Lat Struct									
Centennial Wash	Trestle 1	7.27	100-year	16503.23	841.63	852.92	850.54	853.46	0.001768	6.48	4478.88	1256.54	0.41
Centennial Wash	Trestle 1	7.25		Lat Struct									
Centennial Wash	Trestle 1	7.19	100-year	13473.51	840.51	851.96	850.35	852.63	0.002433	7.12	3233.71	1025.92	0.49
Centennial Wash	Trestle 1	7.15		Lat Struct									
Centennial Wash	Trestle 1	7.12	100-year	11394.48	839.66	851.19	847.87	851.69	0.002030	5.87	2355.87	742.99	0.41
Centennial Wash	Trestle 1	7.05		Lat Struct									
Centennial Wash	Trestle 1	7.04	100-year	8929.83	838.64	850.38	847.21	850.80	0.002326	5.44	1998.97	586.39	0.37
Centennial Wash	Trestle 1	7.0		Lat Struct									
Centennial Wash	Trestle 1	6.97	100-year	7596.35	837.74	849.53	845.73	849.88	0.002056	4.76	1639.94	456.74	0.40
Centennial Wash	Trestle 1	6.95		Lat Struct									
Centennial Wash	Trestle 1	6.89	100-year	7204.75	837.75	848.60	845.65	848.91	0.002891	4.55	1662.67	540.19	0.41
Centennial Wash	Trestle 1	6.85		Lat Struct									
Centennial Wash	Trestle 1	6.81	100-year	6291.68	836.98	847.22	844.88	847.68	0.003312	5.60	1215.85	339.21	0.41
Centennial Wash	Trestle 1	6.8		Lat Struct									
Centennial Wash	Trestle 1	6.74	100-year	5090.90	837.04	845.83	843.95	846.27	0.003953	5.41	970.36	316.27	0.49
Centennial Wash	Trestle 1	6.7		Lat Struct									
Centennial Wash	Trestle 1	6.67	100-year	3450.86	835.10	844.75	842.89	844.93	0.002455	3.42	1109.35	633.09	0.33
Centennial Wash	Trestle 1	6.6		Lat Struct									
Centennial Wash	Trestle 1	6.59	100-year	3024.96	833.26	841.58	841.48	842.76	0.022439	8.96	358.52	153.85	0.79
Centennial Wash	Below Railroad	6.51	100-year	44041.00	831.17	841.86	839.59	841.92	0.001057	2.46	21558.39	7885.94	0.20
Centennial Wash	Below Railroad	6.36	100-year	44041.00	826.48	840.83	838.72	840.91	0.001549	2.16	19941.21	7666.26	0.13
Centennial Wash	Below Railroad	6.27	100-year	44041.00	826.30	839.92	837.70	840.00	0.001995	2.21	19387.51	7996.02	0.14
Centennial Wash	Below Railroad	6.2	100-year	44041.00	824.27	839.14	837.02	839.21	0.001961	2.09	20413.55	7715.57	0.14
Centennial Wash	Below Railroad	6.13	100-year	44041.00	826.35	838.16	836.53	838.26	0.003984	2.63	16897.45	7399.27	0.20
Centennial Wash	Below Railroad	6.06	100-year	44041.00	825.42	837.17	835.09	837.27	0.002376	2.35	17866.83	7168.60	0.16
Centennial Wash	Below Railroad	5.98	100-year	44041.00	824.54	836.34	834.27	836.46	0.002229	2.00	16315.75	7206.48	0.15
Centennial Wash	Below Railroad	5.91	100-year	44041.00	823.50	835.67	833.45	835.78	0.001674	1.85	17459.94	7208.44	0.13
Centennial Wash	Below Railroad	5.83	100-year	44041.00	821.32	834.94	832.79	835.07	0.002625	2.29	15834.58	6910.15	0.16
Centennial Wash	Below Railroad	5.74	100-year	44041.00	820.76	834.13	831.37	834.25	0.001752	2.24	16291.71	6450.55	0.14
Centennial Wash	Below Railroad	5.65	100-year	44041.00	820.73	833.25	831.35	833.42	0.002184	2.65	14172.81	6108.98	0.18
Centennial Wash	Below Railroad	5.57	100-year	44041.00	819.82	832.40	830.58	832.52	0.002014	2.17	16836.33	6208.10	0.14
Centennial Wash	Below Railroad	5.5	100-year	44041.00	818.99	831.66	829.65	831.76	0.002091	2.26	17749.35	6620.64	0.15
Centennial Wash	Below Railroad	5.42	100-year	44041.00	818.99	830.86	828.72	830.95	0.002209	1.96	17632.09	6939.28	0.15
Centennial Wash	Below Railroad	5.33	100-year	44041.00	817.00	829.92	827.81	830.01	0.002093	2.13	18747.49	6687.81	0.15
Centennial Wash	Below Railroad	5.27	100-year	44041.00	815.10	829.11	827.04	829.22	0.002624	2.12	16571.66	6171.92	0.16
Centennial Wash	Below Railroad	5.19	100-year	44041.00	813.79	828.02	825.59	828.14	0.002888	2.48	15879.41	5658.88	0.17
Centennial Wash	Below Railroad	5.13	100-year	44041.00	812.66	827.12	824.55	827.22	0.002526	2.11	17567.50	5451.96	0.16
Centennial Wash	Below Railroad	5.06	100-year	44041.00	811.04	825.92	824.16	826.08	0.003491	3.06	14265.83	4933.85	0.19
Centennial Wash	Below Railroad	4.99	100-year	44041.00	809.79	825.23	822.71	825.32	0.001774	2.39	17531.53	5454.86	0.14
Centennial Wash	Below Railroad	4.91	100-year	44041.00	810.09	824.53	822.27	824.64	0.002231	2.40	16325.48	5513.58	0.15

HEC-RAS Plan: FinEncr_noEmbank Profile: 100-year (Continued)

River	Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Centennial Wash	Below Railroad	4.83	100-year	44041.00	809.38	823.73	820.89	823.84	0.001909	1.90	17235.20	5474.47	0.14
Centennial Wash	Below Railroad	4.75	100-year	44041.00	808.83	823.04	820.41	823.13	0.001781	1.94	18592.30	5668.86	0.16
Centennial Wash	Below Railroad	4.68	100-year	44041.00	808.47	822.32	819.43	822.43	0.001670	1.83	17679.12	4632.55	0.13
Centennial Wash	Below Railroad	4.6	100-year	44041.00	808.44	821.53	818.32	821.67	0.001977	2.12	16189.41	4245.60	0.16
Centennial Wash	Below Railroad	4.54	100-year	44041.00	807.65	820.91	816.77	821.03	0.001717	2.15	17193.76	3908.44	0.14
Centennial Wash	Below Railroad	4.46	100-year	44041.00	806.90	820.25	816.69	820.41	0.001531	1.99	15219.52	3618.43	0.13
Centennial Wash	Below Railroad	4.37	100-year	44041.00	806.08	819.35	816.27	819.58	0.002045	2.31	12325.09	3413.75	0.15
Centennial Wash	Below Railroad	4.3	100-year	44041.00	805.79	818.52	815.67	818.73	0.002173	2.36	12768.97	3709.81	0.15
Centennial Wash	Below Railroad	4.22	100-year	44041.00	805.57	817.83	814.97	817.97	0.001518	1.98	15148.22	4148.50	0.13
Centennial Wash	Below Railroad	4.14	100-year	44041.00	805.54	817.21	813.57	817.35	0.001458	2.10	16010.76	3887.80	0.13
Centennial Wash	Below Railroad	4.07	100-year	44041.00	805.44	816.75	812.76	816.86	0.001148	1.91	16229.23	3658.03	0.11
Centennial Wash	Below Railroad	3.98	100-year	44041.00	804.97	816.15	811.89	816.26	0.001509	2.27	17236.96	4035.32	0.13
Centennial Wash	Below Railroad	3.9	100-year	44041.00	804.88	815.40	811.29	815.52	0.001964	2.52	16509.25	4673.31	0.15
Centennial Wash	Below Railroad	3.84	100-year	44041.00	803.45	814.27	811.26	814.43	0.003983	2.91	13728.72	5213.12	0.20
Centennial Wash	Below Railroad	3.77	100-year	44041.00	803.59	812.83	810.40	813.05	0.002730	1.69	14236.92	5528.27	0.13
Centennial Wash	Below Railroad	3.71	100-year	44041.00	803.96	811.94	809.43	812.17	0.003141	1.27	13858.68	5645.02	0.10
Centennial Wash	Below Railroad	3.66	100-year	44041.00	804.60	810.89	808.54	811.16	0.003268	1.20	13541.66	5186.27	0.10
Centennial Wash	Below Railroad	3.6	100-year	44041.00	804.68	810.16	807.90	810.36	0.002290	0.98	15525.77	5736.33	0.08
Centennial Wash	Below Railroad	3.53	100-year	44041.00	802.03	809.38	806.73	809.54	0.001635	0.87	16360.87	4878.34	0.07
Centennial Wash	Below Railroad	3.45	100-year	44041.00	801.11	808.95	805.61	809.05	0.000893	2.26	19482.04	4941.98	0.17
Centennial Wash	Below Railroad	3.38	100-year	44041.00	800.46	808.67	804.83	808.75	0.000616	1.91	23426.84	5273.67	0.14
Centennial Wash	Below Railroad	3.32	100-year	44041.00	801.07	808.50	804.35	808.57	0.000631	1.96	23564.75	5391.23	0.14
Centennial Wash	Below Railroad	3.27	100-year	44041.00	799.62	808.28	803.70	808.35	0.000753	2.25	24764.36	4633.68	0.16
Centennial Wash	Below Railroad	3.21	100-year	44041.00	798.94	807.92	803.48	808.00	0.001748	3.38	20193.94	3779.83	0.24
Centennial Wash	Below Railroad	3.16	100-year	44041.00	800.11	807.37	802.88	807.47	0.001887	3.26	18517.86	3243.03	0.24
Centennial Wash	Below Railroad	3.08	100-year	44041.00	798.98	806.71	802.15	806.79	0.001446	2.94	19783.91	3752.06	0.21
Centennial Wash	Below Railroad	3	100-year	44041.00	799.55	805.82	801.19	805.91	0.002831	4.03	18861.13	3665.15	0.30
Centennial Wash	Below Railroad	2.9	100-year	44041.00	798.21	804.85	800.49	804.94	0.002086	3.49	19068.16	3789.73	0.26
Centennial Wash	Below Railroad	2.81	100-year	44041.00	797.15	803.95	799.64	804.03	0.001963	1.94	19838.51	3657.81	0.14
Centennial Wash	Below Railroad	2.73	100-year	44041.00	794.98	802.87	798.81	802.96	0.002340	1.55	19155.95	3622.15	0.11
Centennial Wash	Below Railroad	2.66	100-year	44041.00	795.08	801.76	798.17	801.85	0.002343	1.24	18276.25	4126.43	0.09
Centennial Wash	Below Railroad	2.58	100-year	44041.00	793.83	800.69	797.27	800.78	0.002475	1.29	19679.85	4110.33	0.09
Centennial Wash	Below Railroad	2.51	100-year	44041.00	792.21	799.50	796.17	799.61	0.003425	1.65	17495.17	3632.06	0.12
Centennial Wash	Below Railroad	2.43	100-year	44041.00	791.28	798.37	794.93	798.49	0.002829	1.38	17075.43	3530.17	0.10
Centennial Wash	Below Railroad	2.38	100-year	44041.00	790.12	797.65	794.05	797.76	0.002487	1.31	17946.70	3703.55	0.09
Centennial Wash	Below Railroad	2.33	100-year	44041.00	789.28	797.09	793.53	797.18	0.001941	1.15	19151.08	4008.63	0.08
Centennial Wash	Below Railroad	2.27	100-year	44041.00	788.22	796.62	792.68	796.71	0.001254	0.96	20465.91	3949.95	0.06
Centennial Wash	Below Railroad	2.2	100-year	44041.00	788.04	796.05	791.93	796.15	0.001579	1.06	19246.14	3378.76	0.07
Centennial Wash	Below Railroad	2.12	100-year	44041.00	786.25	795.28	791.32	795.40	0.002117	1.45	17955.62	4145.43	0.10
Centennial Wash	Below Railroad	2.04	100-year	44041.00	785.44	794.13	790.32	794.25	0.003884	3.20	16979.86	4383.92	0.22
Centennial Wash	Below Railroad	1.96	100-year	44041.00	785.24	792.13	789.61	792.36	0.005666	5.09	13105.84	4298.22	0.40
Centennial Wash	Below Railroad	1.9	100-year	44041.00	785.62	790.88	788.42	791.22	0.002676	5.58	12318.77	4555.31	0.45
Centennial Wash	Below Railroad	1.84	100-year	44041.00	782.68	790.13	787.12	790.35	0.002050	3.65	13856.27	4755.93	0.27
Centennial Wash	Below Railroad	1.77	100-year	44041.00	781.21	789.12	786.60	789.41	0.003099	3.46	11218.66	3181.99	0.26
Centennial Wash	Below Railroad	1.71	100-year	44041.00	781.76	788.31	785.82	788.60	0.002880	4.07	10986.32	3405.03	0.31
Centennial Wash	Below Railroad	1.66	100-year	44041.00	781.42	787.46	785.20	787.73	0.002810	4.50	10729.38	2960.80	0.36
Centennial Wash	Below Railroad	1.61	100-year	44041.00	775.54	787.02	784.56	787.23	0.001312	4.27	13219.36	3629.82	0.32
Centennial Wash	Below Railroad	1.56	100-year	44041.00	776.99	786.48	783.70	786.78	0.002223	4.70	10524.78	3681.14	0.33
Centennial Wash	Below Railroad	1.5	100-year	44041.00	777.65	785.87	782.87	786.10	0.002482	4.07	11607.99	4222.25	0.29
Centennial Wash	Below Railroad	1.44	100-year	44041.00	777.43	785.13	782.39	785.36	0.002733	3.99	11464.36	3317.95	0.30
Centennial Wash	Below Railroad	1.38	100-year	44041.00	777.29	784.06	781.89	784.32	0.003790	4.31	10765.30	2962.42	0.35
Centennial Wash	Below Railroad	1.31	100-year	44590.00	774.92	782.61	780.60	782.88	0.004083	4.37	11003.22	3467.64	0.36
Centennial Wash	Below Railroad	1.25	100-year	44590.00	774.05	780.69	779.10	781.18	0.007401	5.72	8262.18	3232.50	0.48
Centennial Wash	Below Railroad	1.18	100-year	44590.00	773.35	778.22	776.83	778.42	0.004700	3.90	12871.27	4565.92	0.37
Centennial Wash	Below Railroad	1.11	100-year	44590.00	772.89	776.92	774.93	777.02	0.002479	2.61	17136.59	6115.87	0.26
Centennial Wash	Below Railroad	1.04	100-year	44590.00	770.18	776.00	773.96	776.09	0.001867	2.72	18506.37	5976.57	0.24
Centennial Wash	Below Railroad	0.96	100-year	44590.00	769.47	775.17	773.03	775.27	0.001852	2.79	18145.62	5506.79	0.24
Centennial Wash	Below Railroad	0.88	100-year	44590.00	769.50	774.18	772.21	774.29	0.002184	2.96	17278.93	5422.05	0.26
Centennial Wash	Below Railroad	0.8	100-year	44590.00	767.83	772.90	771.52	773.06	0.003549	3.53	14647.76	5498.57	0.33
Centennial Wash	Below Railroad	0.73	100-year	44590.00	767.70	771.74	769.99	771.85	0.002672	2.93	17244.12	7044.35	0.27
Centennial Wash	Below Railroad	0.66	100-year	44590.00	767.15	769.97	769.02	770.11	0.005843	3.26	14832.20	8383.56	0.39
Centennial Wash	Below Railroad	0.6	100-year	44590.00	766.38	767.99	766.23	768.15	0.004564	1.46	14495.64	8351.17	0.28
Centennial Wash	Below Railroad	0.53	100-year	44590.00	765.12	766.84	765.25	766.91	0.002180	1.04	21624.16	10894.75	0.20
Centennial Wash	Below Railroad	0.46	100-year	44590.00	765.07	765.99	764.46	766.06	0.002384	0.65	20552.63	11104.93	0.18
Centennial Wash	Below Railroad	0.39	100-year	44590.00	764.67	765.32	763.49	765.38	0.001647	0.59	23228.41	11398.88	0.16
Centennial Wash	Below Railroad	0.34	100-year	44590.00	764.26	764.92	762.63	764.97	0.001002	0.39	26155.79	10956.97	0.12
Centennial Field	DS Trestles 2-3	0.82	100-year	2000.00	847.36	852.68	848.63	852.69	0.000284	0.62	3223.46	5091.68	0.05
Centennial Field	DS Trestles 2-3	0.75	100-year	23749.58	845.09	851.28	848.91	851.50	0.004964	2.92	6722.89	5483.09	0.24
Centennial Field	DS Trestles 2-3	0.7		Lat Struct									
Centennial Field	DS Trestles 2-3	0.67	100-year	24207.68	845.43	849.75	848.12	849.89	0.004504	2.30	8375.00	5687.08	0.22
Centennial Field	DS Trestles 2-3	0.65		Lat Struct									
Centennial Field	DS Trestles 2-3	0.6	100-year	25603.27	845.63	848.63	847.30	848.73	0.002668	1.34	10855.88	5695.03	0.16
Centennial Field	DS Trestles 2-3	0.55		Lat Struct									
Centennial Field	DS Trestles 2-3	0.52	100-year	28062.82	844.52	847.67	846.33	847.76	0.002442	1.14	12496.83	5688.16	0.13
Centennial Field	DS Trestles 2-3	0.5		Lat Struct									
Centennial Field	DS Trestles 2-3	0.45	100-year	28872.54	839.08	846.93	845.44	847.01	0.001905	1.89	13596.43	5600.90	0.14
Centennial Field	DS Trestles 2-3	0.4		Lat Struct									
Centennial Field	DS Trestles 2-3	0.37	100-year	29264.14	838.20	846.26	844.83	846.35	0.002152	1.87	12595.82	5303.82	0.14
Centennial Field	DS Trestles 2-3	0.35		Lat Struct									
Centennial Field	DS Trestles 2-3	0.29	100-year	30177.21	841.56	845.53	844.07	845.62	0.002166	0.91	12397.47	5088.54	0.12
Centennial Field	DS Trestles 2-3	0.25		Lat Struct									
Centennial Field	DS Trestles 2-3	0.22	100-year	31292.10	829.98	844.54	843.92	844.76	0.002873	6.87	11037.06	5260.96	0.48
Centennial Field	DS Trestles 2-3	0.2		Lat Struct									
Centennial Field	DS Trestles 2-3	0.15	100-year	30638.01	831.99	843.43	842.85	843.65	0.002536	6.42	11173.05	5411.80	0.45
Centennial Field	DS Trestles 2-3	0.1		Lat Struct									
Centennial Field	DS Trestles 2-3	0.07	100-year	27019.62	834.58	842.32	841.10	842.44	0.002605	4.43	10224.28	5072.70	0.39
Cent W RR Spill	Trestles 2 to 4	1.75	100-year	22481.49	848.16	857.90	854.42	857.96	0.000545	1.21	12248.89	3282.00	0.08

HEC-RAS Plan: FinEncr_noEmbank Profile: 100-year (Continued)

River	Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Cent W RR Spill	Trestles 2 to 4	1.7		Lat Struct									
Cent W RR Spill	Trestles 2 to 4	1.67	100-year	22481.49	848.13	857.73	854.26	857.79	0.000513	1.20	11815.68	3133.22	0.08
Cent W RR Spill	Trestles 2 to 4	1.65		Lat Struct									
Cent W RR Spill	Trestles 2 to 4	1.6	100-year	22481.49	849.31	857.57	854.17	857.63	0.000634	1.29	11038.52	2994.84	0.08
Cent W RR Spill	Trestles 2 to 4	1.55		Lat Struct									
Cent W RR Spill	Trestles 2 to 4	1.52	100-year	22481.49	848.47	857.32	854.25	857.41	0.001040	1.64	9457.95	2863.69	0.11
Cent W RR Spill	Trestles 2 to 4	1.5		Lat Struct									
Cent W RR Spill	Trestles 2 to 4	1.46	100-year	22481.49	846.70	856.99	854.01	857.10	0.001295	1.89	8727.75	2723.90	0.12
Cent W RR Spill	Trestles 2 to 4	1.45		Lat Struct									
Cent W RR Spill	Trestles 2 to 4	1.4	100-year	22481.49	847.90	856.55	853.79	856.68	0.001752	2.11	7892.91	2601.58	0.14
Cent W RR Spill	Trestles 2 to 4	1.35		Lat Struct									
Cent W RR Spill	Trestles 2 to 4	1.33	100-year	10013.43	850.14	856.20	852.90	856.24	0.000592	1.61	6341.74	2422.96	0.13
Cent W RR Spill	Trestles 2 to 4	1.3		Lat Struct									
Cent W RR Spill	Trestles 2 to 4	1.28	100-year	10013.43	848.16	856.03	853.13	856.07	0.000454	0.96	6446.07	2144.46	0.07
Cent W RR Spill	Trestles 2 to 4	1.25		Lat Struct									
Cent W RR Spill	Trestles 2 to 4	1.22	100-year	10013.43	847.86	855.82	853.07	855.88	0.000819	1.24	5275.31	1728.71	0.09
Cent W RR Spill	Trestles 2 to 4	1.15		Lat Struct									
Cent W RR Spill	Trestles 2 to 4	1.14	100-year	10013.43	847.38	855.28	852.94	855.39	0.001887	1.88	3972.46	1477.63	0.14
Cent W RR Spill	Trestles 2 to 4	1.1		Lat Struct									
Cent W RR Spill	Trestles 2 to 4	1.07	100-year	10013.43	846.31	854.48	852.31	854.59	0.002041	2.11	3783.04	1368.68	0.15
Cent W RR Spill	Trestles 2 to 4	1.05		Lat Struct									
Cent W RR Spill	Trestles 2 to 4	1.02	100-year	10013.43	845.73	854.08	851.54	854.17	0.001278	1.72	4303.67	1389.71	0.12
Cent W RR Spill	Trestles 2 to 4	1		Lat Struct									
Cent W RR Spill	Trestles 2 to 4	0.97	100-year	10013.43	846.36	853.67	851.12	853.79	0.001410	1.64	3866.40	1111.25	0.12
Cent W RR Spill	Trestles 2 to 4	0.95		Lat Struct									
Cent W RR Spill	Trestles 2 to 4	0.9	100-year	3788.18	845.84	853.46	850.26	853.48	0.000288	0.75	3607.29	1242.53	0.05
Cent W RR Spill	Trestles 2 to 4	0.85		Lat Struct									
Cent W RR Spill	Trestles 2 to 4	0.84	100-year	3788.18	847.02	853.31	850.86	853.34	0.000708	1.04	2608.97	1027.32	0.08
Cent W RR Spill	Trestles 2 to 4	0.8		Lat Struct									
Cent W RR Spill	Trestles 2 to 4	0.76	100-year	3788.18	846.00	852.69	851.00	852.75	0.004593	2.79	2188.91	1072.52	0.21
Cent W RR Spill	Trestles 2 to 4	0.7		Lat Struct									
Cent W RR Spill	Trestles 2 to 4	0.69	100-year	3788.18	844.60	851.73	848.76	851.75	0.001496	1.66	3633.89	1406.81	0.12
Cent W RR Spill	Trestles 2 to 4	0.65		Lat Struct									
Cent W RR Spill	Trestles 2 to 4	0.628	100-year	3788.18	845.22	851.19	848.52	851.21	0.001737	1.19	3674.18	1487.11	0.12
Cent W RR Spill	Trestles 2 to 4	0.625	100-year	3788.18	844.79	850.85	847.40	850.86	0.000534	0.89	5130.54	1746.19	0.07
Cent W RR Spill	Trestles 2 to 4	0.623	100-year	3788.18	844.61	850.55	846.70	850.59	0.001587	1.65	2377.18	1484.84	0.12
Cent W RR Spill	Trestles 2 to 4	0.6	100-year	3788.18	844.06	850.02	846.64	850.13	0.004486	2.65	1489.80	1489.94	0.21
Cent W RR Spill	Trestles 2 to 4	0.58		Bridge									
Cent W RR Spill	Trestles 2 to 4	0.56	100-year	3788.18	844.45	847.73	846.41	847.96	0.019771	3.80	992.36	2489.56	0.40
Cent W RR Spill	Trestles 2 to 4	0.5	100-year	3788.18	843.26	845.60	844.77	845.81	0.003842	3.85	1057.06	1464.34	0.46
Cent W RR Spill	Trestles 2 to 4	0.46	100-year	6359.80	842.68	844.97	844.04	845.13	0.002942	3.32	1987.90	1325.67	0.40
Cent W RR Spill	Trestles 2 to 4	0.42	100-year	7043.25	842.13	844.03	843.47	844.27	0.005578	4.05	1818.17	1158.93	0.54
Cent W RR Spill	Trestles 2 to 4	0.36	100-year	7048.36	841.28	843.07	842.21	843.19	0.002362	2.31	2607.69	1501.18	0.34
Cent W RR Spill	Trestles 2 to 4	0.3	100-year	7572.11	839.48	842.65	841.27	842.73	0.001185	2.53	3398.43	1637.03	0.27
Cent W RR Spill	Trestles 2 to 4	0.26	100-year	7572.11	838.96	842.47	840.52	842.52	0.000666	2.06	4047.24	1567.22	0.20
Cent W RR Spill	Trestles 2 to 4	0.21	100-year	7572.11	838.29	842.37	839.71	842.40	0.000316	1.59	4925.12	1476.85	0.14
Cent W RR Spill	Trestles 2 to 4	0.16	100-year	7658.00	837.97	842.30	839.28	842.34	0.000245	1.50	5250.84	1350.06	0.13
Cent W RR Spill	Trestles 2 to 4	0.11	100-year	9952.13	837.14	842.19	839.09	842.25	0.000410	2.12	5275.63	1760.15	0.17
Cent W RR Spill	Trestles 2 to 4	0.05	100-year	13996.42	836.49	842.09	838.82	842.15	0.000394	2.23	8041.99	2530.02	0.17

Model: BaselineRdtoGila_LS.prj

Plan Title: Final_100-year_Encroachments_noEmb

Short Identifier: FinEncr_noEmbank

Geometry: CW_BLtoGila_LatStr_UpperJunction_NoDSemb

Flow file: 100-yr_USJunction_HardCodeQs_noEmb

Profile: Encroach

Encroached Conditions (i.e., Floodway), Encroachment Table 3 from HEC-RAS (i.e., FEMA"S Floodway Data Table)

Plan Description: This plan represents a "without embankment" geometry with farmers levees near the Union Pacific R.R. Bridge removed from the geometry entirely. The flows calculated from the "Final 100yr No Embank Optimize" plan (i.e., *.p06) in this model were hardcoded into the flow file of the plan herein to set the flows around the Union Pacific R.R. Bridge, and this plan is used for calculating floodway encroachment stations in the model for the overflow channels near the bridge (see TSDN for additional explanation).

HEC-RAS Plan: FinEncr_noEmbank Profile: Encroach

River	Reach	River Sta	Profile	Top Wdth Act	Area	Vel Total	W.S. Elev	Base WS	Prof Delta WS
				(ft)	(sq ft)	(ft/s)	(ft)	(ft)	(ft)
Centennial Wash	Above Railroad	22.8	Encroach	2845.61	17116.41	2.37	1063.08	1062.32	0.76
Centennial Wash	Above Railroad	22.73	Encroach	2822.10	18803.69	2.17	1062.68	1061.84	0.84
Centennial Wash	Above Railroad	22.66	Encroach	2798.36	19179.79	2.05	1062.48	1061.60	0.87
Centennial Wash	Above Railroad	22.58	Encroach	2749.06	20557.04	1.91	1062.26	1061.36	0.90
Centennial Wash	Above Railroad	22.5	Encroach	2613.31	19993.84	2.08	1061.88	1061.02	0.86
Centennial Wash	Above Railroad	22.42	Encroach	2395.98	18874.50	2.27	1061.15	1060.39	0.76
Centennial Wash	Above Railroad	22.35	Encroach	2222.10	16878.06	2.32	1060.46	1059.70	0.76
Centennial Wash	Above Railroad	22.27	Encroach	2084.66	17180.62	2.27	1060.01	1059.15	0.86
Centennial Wash	Above Railroad	22.2	Encroach	2135.78	18523.56	2.26	1059.61	1058.79	0.82
Centennial Wash	Above Railroad	22.12	Encroach	1216.77	19894.51	3.27	1058.80	1057.96	0.84
Centennial Wash	Above Railroad	22.04	Encroach	1102.99	17636.61	3.74	1057.70	1056.88	0.82
Centennial Wash	Above Railroad	21.97	Encroach	1070.09	15140.67	3.83	1056.99	1056.10	0.89
Centennial Wash	Above Railroad	21.89	Encroach	1561.30	12412.31	3.48	1055.64	1054.82	0.82
Centennial Wash	Above Railroad	21.82	Encroach	1407.38	11068.69	3.65	1054.17	1053.50	0.68
Centennial Wash	Above Railroad	21.74	Encroach	1405.68	11365.05	3.39	1053.49	1052.69	0.79
Centennial Wash	Above Railroad	21.66	Encroach	1456.72	11433.37	3.37	1053.01	1052.25	0.77
Centennial Wash	Above Railroad	21.58	Encroach	1464.47	11820.71	3.26	1052.51	1051.81	0.70
Centennial Wash	Above Railroad	21.51	Encroach	1441.50	11941.71	3.23	1051.94	1051.23	0.71
Centennial Wash	Above Railroad	21.44	Encroach	1402.95	11968.05	3.22	1051.18	1050.33	0.85
Centennial Wash	Above Railroad	21.36	Encroach	1344.04	10204.29	3.78	1049.59	1048.80	0.80
Centennial Wash	Above Railroad	21.28	Encroach	1332.54	8440.63	4.57	1047.56	1047.40	0.16
Centennial Wash	Above Railroad	21.2	Encroach	1337.45	8622.12	4.47	1047.16	1046.88	0.28
Centennial Wash	Above Railroad	21.12	Encroach	1292.87	8747.39	4.41	1046.73	1046.36	0.37
Centennial Wash	Above Railroad	21.04	Encroach	1299.48	9409.87	4.10	1046.36	1045.93	0.43
Centennial Wash	Above Railroad	20.97	Encroach	1256.23	9886.60	3.90	1045.91	1045.38	0.53
Centennial Wash	Above Railroad	20.89	Encroach	1170.45	9845.83	3.92	1045.28	1044.70	0.57
Centennial Wash	Above Railroad	20.81	Encroach	1013.51	8781.96	4.39	1044.41	1043.81	0.59
Centennial Wash	Above Railroad	20.74	Encroach	777.73	7314.39	5.96	1042.85	1042.52	0.33
Centennial Wash	Above Railroad	20.66	Encroach	887.64	6991.92	5.76	1041.06	1040.63	0.43
Centennial Wash	Above Railroad	20.58	Encroach	1039.61	7355.15	5.24	1039.52	1038.89	0.64
Centennial Wash	Above Railroad	20.51	Encroach	1136.18	7843.54	4.92	1038.10	1037.55	0.55
Centennial Wash	Above Railroad	20.49	Encroach	1229.85	8440.37	4.57	1037.73	1037.15	0.58
Centennial Wash	Above Railroad	20.43	Encroach	1211.79	8481.96	4.55	1036.90	1036.28	0.62
Centennial Wash	Above Railroad	20.36	Encroach	1243.51	8581.75	4.49	1035.63	1034.87	0.76
Centennial Wash	Above Railroad	20.29	Encroach	1350.19	9115.37	4.23	1034.49	1033.62	0.87
Centennial Wash	Above Railroad	20.22	Encroach	1211.31	8455.79	4.56	1033.35	1032.41	0.94
Centennial Wash	Above Railroad	20.15	Encroach	1104.05	7297.87	5.28	1031.79	1030.91	0.88
Centennial Wash	Above Railroad	20.07	Encroach	1196.77	7911.70	4.87	1030.34	1029.42	0.92
Centennial Wash	Above Railroad	20.01	Encroach	1253.30	7784.62	4.95	1029.40	1028.45	0.94
Centennial Wash	Above Railroad	19.96	Encroach	1290.75	8222.10	4.69	1028.59	1027.61	0.97
Centennial Wash	Above Railroad	19.92	Encroach	1286.63	8355.29	4.61	1027.84	1026.84	1.00
Centennial Wash	Above Railroad	19.84	Encroach	1166.93	7540.55	5.11	1026.32	1025.61	0.71
Centennial Wash	Above Railroad	19.75	Encroach	1118.88	7282.90	5.29	1024.55	1024.10	0.45
Centennial Wash	Above Railroad	19.67	Encroach	972.67	6692.11	5.76	1023.02	1022.72	0.31
Centennial Wash	Above Railroad	19.6	Encroach	932.84	6654.09	5.79	1022.13	1021.70	0.43
Centennial Wash	Above Railroad	19.53	Encroach	779.20	5688.49	6.78	1020.95	1020.32	0.63
Centennial Wash	Above Railroad	19.45	Encroach	756.34	6428.08	6.00	1020.27	1019.55	0.72
Centennial Wash	Above Railroad	19.37	Encroach	763.00	6629.71	5.82	1019.35	1018.59	0.76
Centennial Wash	Above Railroad	19.31	Encroach	765.63	6259.75	6.16	1018.17	1017.50	0.67
Centennial Wash	Above Railroad	19.27	Encroach	783.67	5983.70	6.44	1017.38	1016.74	0.64
Centennial Wash	Above Railroad	19.22	Encroach	792.01	6072.48	6.35	1016.50	1015.82	0.67
Centennial Wash	Above Railroad	19.14	Encroach	755.92	5912.65	6.52	1015.27	1014.46	0.82
Centennial Wash	Above Railroad	19.07	Encroach	731.50	5930.15	6.50	1014.32	1013.53	0.79
Centennial Wash	Above Railroad	18.99	Encroach	707.91	5954.83	6.47	1013.25	1012.60	0.64
Centennial Wash	Above Railroad	18.91	Encroach	749.93	6671.92	5.78	1012.15	1011.73	0.42
Centennial Wash	Above Railroad	18.84	Encroach	783.29	5794.10	6.65	1010.98	1010.63	0.35
Centennial Wash	Above Railroad	18.76	Encroach	809.07	6278.89	6.14	1009.97	1009.31	0.66
Centennial Wash	Above Railroad	18.69	Encroach	811.80	6737.38	5.72	1009.45	1008.82	0.63
Centennial Wash	Above Railroad	18.61	Encroach	797.43	6570.05	5.87	1008.29	1007.75	0.55
Centennial Wash	Above Railroad	18.59	Encroach	797.50	6414.96	6.01	1007.93	1007.42	0.51
Centennial Wash	Above Railroad	18.53	Encroach	764.27	5629.47	6.85	1006.35	1006.00	0.35
Centennial Wash	Above Railroad	18.46	Encroach	731.45	4823.11	7.99	1004.39	1003.67	0.72
Centennial Wash	Above Railroad	18.38	Encroach	707.22	5227.58	7.37	1003.58	1002.66	0.91
Centennial Wash	Above Railroad	18.3	Encroach	660.13	5207.55	7.40	1002.48	1001.51	0.97
Centennial Wash	Above Railroad	18.25	Encroach	652.92	5376.41	7.17	1001.87	1001.12	0.75
Centennial Wash	Above Railroad	18.22	Encroach	645.92	4950.64	7.79	1000.86	1000.33	0.53

HEC-RAS Plan: FinEncr_noEmbank Profile: Encroach (Continued)

River	Reach	River Sta	Profile	Top Wdth Act	Area	Vel Total	W.S. Elev	Base WS	Prof Delta WS
				(ft)	(sq ft)	(ft/s)	(ft)	(ft)	(ft)
Centennial Wash	Above Railroad	18.15	Encroach	689.21	4618.88	8.35	998.44	997.78	0.65
Centennial Wash	Above Railroad	18.07	Encroach	723.85	4989.61	7.73	997.33	996.64	0.68
Centennial Wash	Above Railroad	18	Encroach	771.87	5371.58	7.18	996.25	995.52	0.73
Centennial Wash	Above Railroad	17.92	Encroach	783.76	5458.60	7.06	995.36	994.54	0.82
Centennial Wash	Above Railroad	17.85	Encroach	804.37	5287.13	7.29	994.05	993.45	0.61
Centennial Wash	Above Railroad	17.8	Encroach	771.98	4620.26	8.34	992.33	991.91	0.42
Centennial Wash	Above Railroad	17.76	Encroach	745.03	4497.25	8.57	991.39	991.29	0.11
Centennial Wash	Above Railroad	17.7	Encroach	766.79	5021.67	7.68	990.71	990.57	0.14
Centennial Wash	Above Railroad	17.62	Encroach	776.36	4333.55	8.90	988.78	988.38	0.40
Centennial Wash	Above Railroad	17.55	Encroach	728.67	4484.37	8.60	987.56	987.05	0.51
Centennial Wash	Above Railroad	17.47	Encroach	685.91	4660.33	8.27	986.46	985.91	0.55
Centennial Wash	Above Railroad	17.4	Encroach	700.43	4053.73	9.51	984.54	984.08	0.46
Centennial Wash	Above Railroad	17.33	Encroach	808.66	5100.31	7.56	983.87	983.31	0.56
Centennial Wash	Above Railroad	17.25	Encroach	924.24	4927.69	7.82	981.88	981.67	0.21
Centennial Wash	Above Railroad	17.17	Encroach	1127.01	5268.37	7.32	979.71	979.49	0.22
Centennial Wash	Above Railroad	17.09	Encroach	1202.48	5853.85	6.59	978.62	977.63	0.99
Centennial Wash	Above Railroad	17.02	Encroach	1242.94	5596.96	6.89	977.39	976.48	0.91
Centennial Wash	Above Railroad	16.94	Encroach	1144.11	4986.49	7.73	975.65	975.21	0.43
Centennial Wash	Above Railroad	16.87	Encroach	1051.46	6471.61	5.96	974.92	974.20	0.72
Centennial Wash	Above Railroad	16.79	Encroach	1002.69	6185.29	6.23	974.12	973.33	0.78
Centennial Wash	Above Railroad	16.71	Encroach	886.98	6021.06	6.40	973.09	972.31	0.78
Centennial Wash	Above Railroad	16.64	Encroach	834.12	5198.04	7.42	971.88	971.20	0.68
Centennial Wash	Above Railroad	16.55	Encroach	958.18	5808.62	6.64	970.56	969.84	0.72
Centennial Wash	Above Railroad	16.47	Encroach	1110.24	6413.26	6.01	968.83	968.38	0.45
Centennial Wash	Above Railroad	16.43	Encroach	1255.11	7192.11	5.36	967.88	967.35	0.52
Centennial Wash	Above Railroad	16.38	Encroach	1395.07	7323.32	5.26	966.71	966.27	0.44
Centennial Wash	Above Railroad	16.32	Encroach	1374.45	7117.00	5.42	965.78	965.13	0.64
Centennial Wash	Above Railroad	16.25	Encroach	1182.01	6334.74	6.09	964.43	963.85	0.58
Centennial Wash	Above Railroad	16.17	Encroach	1127.87	5048.42	7.64	962.02	961.68	0.33
Centennial Wash	Above Railroad	16.08	Encroach	1401.41	6427.60	6.00	960.38	960.15	0.23
Centennial Wash	Above Railroad	15.99	Encroach	1638.67	7812.24	4.93	959.24	958.94	0.30
Centennial Wash	Above Railroad	15.89	Encroach	1831.18	8305.63	4.64	958.37	957.74	0.63
Centennial Wash	Above Railroad	15.84	Encroach	1848.22	9345.45	4.13	957.95	957.22	0.73
Centennial Wash	Above Railroad	15.79	Encroach	1760.22	8853.98	4.35	957.51	956.67	0.84
Centennial Wash	Above Railroad	15.71	Encroach	1570.69	6016.41	6.41	955.39	955.17	0.22
Centennial Wash	Above Railroad	15.63	Encroach	1423.84	6964.80	5.54	954.25	954.05	0.20
Centennial Wash	Above Railroad	15.56	Encroach	1382.41	6837.33	5.64	952.66	952.35	0.30
Centennial Wash	Above Railroad	15.49	Encroach	1403.47	7283.34	5.29	951.34	950.58	0.77
Centennial Wash	Above Railroad	15.41	Encroach	1385.32	7269.04	5.30	950.42	949.81	0.62
Centennial Wash	Above Railroad	15.34	Encroach	1391.12	7164.45	5.38	949.49	948.91	0.58
Centennial Wash	Above Railroad	15.29	Encroach	1382.71	7232.65	5.33	948.88	948.35	0.53
Centennial Wash	Above Railroad	15.24	Encroach	1388.98	7114.38	5.42	948.28	947.79	0.49
Centennial Wash	Above Railroad	15.18	Encroach	1454.46	7468.51	5.16	947.55	947.11	0.44
Centennial Wash	Above Railroad	15.1	Encroach	1538.00	7750.54	4.97	946.52	946.14	0.38
Centennial Wash	Above Railroad	15.02	Encroach	1527.98	7573.69	5.09	945.37	945.08	0.30
Centennial Wash	Above Railroad	14.93	Encroach	1654.12	8139.70	4.74	944.43	944.07	0.37
Centennial Wash	Above Railroad	14.85	Encroach	1796.11	9354.94	4.12	943.71	943.19	0.51
Centennial Wash	Above Railroad	14.8	Encroach	1859.02	10178.51	3.79	943.25	942.53	0.73
Centennial Wash	Above Railroad	14.75	Encroach	1853.69	10954.49	3.52	943.01	942.21	0.80
Centennial Wash	Above Railroad	14.7	Encroach	1827.19	11834.03	3.26	942.78	941.91	0.87
Centennial Wash	Above Railroad	14.62	Encroach	1680.28	12242.61	3.15	942.30	941.47	0.83
Centennial Wash	Above Railroad	14.55	Encroach	1404.28	10981.38	3.51	941.66	940.90	0.76
Centennial Wash	Above Railroad	14.49	Encroach	1211.22	9759.89	3.95	941.06	940.38	0.67
Centennial Wash	Above Railroad	14.44	Encroach	1090.44	8770.71	4.40	940.32	939.74	0.58
Centennial Wash	Above Railroad	14.39	Encroach	972.86	7594.56	5.08	939.29	938.72	0.58
Centennial Wash	Above Railroad	14.32	Encroach	955.47	7352.72	5.24	937.63	937.06	0.57
Centennial Wash	Above Railroad	14.24	Encroach	1047.40	7049.09	5.47	935.80	935.34	0.47
Centennial Wash	Above Railroad	14.17	Encroach	1168.32	7429.81	5.19	934.17	933.81	0.36
Centennial Wash	Above Railroad	14.09	Encroach	1279.88	7919.20	4.87	933.04	932.65	0.39
Centennial Wash	Above Railroad	14.01	Encroach	1424.76	7033.99	5.48	931.69	931.33	0.36
Centennial Wash	Above Railroad	13.93	Encroach	1820.54	7734.65	4.98	930.25	929.96	0.29
Centennial Wash	Above Railroad	13.85	Encroach	2232.89	9418.64	4.09	929.13	928.51	0.61
Centennial Wash	Above Railroad	13.77	Encroach	2237.09	9830.16	3.92	928.22	927.64	0.58
Centennial Wash	Above Railroad	13.69	Encroach	2276.88	10950.79	3.52	927.58	927.00	0.58
Centennial Wash	Above Railroad	13.61	Encroach	2280.00	12172.46	3.17	927.05	926.38	0.68
Centennial Wash	Above Railroad	13.57	Encroach	2293.88	12450.70	3.10	926.77	926.05	0.72

HEC-RAS Plan: FinEncr_noEmbank Profile: Encroach (Continued)

River	Reach	River Sta	Profile	Top Wdth Act	Area	Vel Total	W.S. Elev	Base WS	Prof Delta WS
				(ft)	(sq ft)	(ft/s)	(ft)	(ft)	(ft)
Centennial Wash	Above Railroad	13.53	Encroach	2310.11	12745.60	3.02	926.49	925.73	0.77
Centennial Wash	Above Railroad	13.46	Encroach	2305.33	12863.24	3.00	925.79	924.94	0.85
Centennial Wash	Above Railroad	13.38	Encroach	2259.95	12844.19	3.00	924.99	924.13	0.86
Centennial Wash	Above Railroad	13.3	Encroach	2371.48	13126.10	2.94	924.20	923.38	0.82
Centennial Wash	Above Railroad	13.25	Encroach	2645.85	13963.31	2.76	923.73	922.91	0.82
Centennial Wash	Above Railroad	13.21	Encroach	2780.29	14246.67	2.71	923.35	922.50	0.85
Centennial Wash	Above Railroad	13.15	Encroach	2671.94	13253.03	2.91	922.72	921.83	0.89
Centennial Wash	Above Railroad	13.08	Encroach	2539.78	11833.46	3.26	921.68	920.78	0.90
Centennial Wash	Above Railroad	13	Encroach	2455.81	11120.72	3.47	920.40	919.50	0.90
Centennial Wash	Above Railroad	12.92	Encroach	2557.34	11465.86	3.36	919.22	918.35	0.87
Centennial Wash	Above Railroad	12.85	Encroach	2492.30	11294.57	3.41	918.25	917.49	0.76
Centennial Wash	Above Railroad	12.77	Encroach	1858.52	9967.66	3.87	917.22	916.62	0.60
Centennial Wash	Above Railroad	12.69	Encroach	1623.19	8385.92	4.60	916.08	915.49	0.59
Centennial Wash	Above Railroad	12.60	Encroach	1513.92	7972.01	4.84	915.16	914.45	0.71
Centennial Wash	Above Railroad	12.52	Encroach	1462.12	8026.93	4.80	914.30	913.70	0.60
Centennial Wash	Above Railroad	12.48	Encroach	1418.09	8024.11	4.80	913.78	913.22	0.55
Centennial Wash	Above Railroad	12.43	Encroach	1399.26	8333.86	4.63	913.25	912.70	0.54
Centennial Wash	Above Railroad	12.36	Encroach	1373.06	8269.13	4.66	912.42	911.81	0.60
Centennial Wash	Above Railroad	12.28	Encroach	1388.46	8153.97	4.73	911.40	910.72	0.68
Centennial Wash	Above Railroad	12.21	Encroach	1397.54	7718.91	4.99	910.41	909.68	0.73
Centennial Wash	Above Railroad	12.13	Encroach	1458.23	7831.26	4.92	909.39	908.60	0.79
Centennial Wash	Above Railroad	12.07	Encroach	1610.27	8341.94	4.62	908.60	907.71	0.90
Centennial Wash	Above Railroad	12.03	Encroach	1759.34	9268.66	4.16	908.23	907.25	0.98
Centennial Wash	Above Railroad	11.97	Encroach	1836.46	9344.27	4.13	907.72	906.73	0.99
Centennial Wash	Above Railroad	11.9	Encroach	1900.76	8971.93	4.30	906.67	905.69	0.98
Centennial Wash	Above Railroad	11.82	Encroach	1860.15	8493.20	4.54	905.44	904.56	0.88
Centennial Wash	Above Railroad	11.74	Encroach	1904.07	8663.50	4.45	904.18	903.34	0.83
Centennial Wash	Above Railroad	11.67	Encroach	1945.46	8994.42	4.29	903.02	902.18	0.85
Centennial Wash	Above Railroad	11.61	Encroach	1984.62	8928.09	4.32	902.22	901.40	0.82
Centennial Wash	Above Railroad	11.56	Encroach	2013.50	8592.43	4.49	901.42	900.69	0.73
Centennial Wash	Above Railroad	11.5	Encroach	2006.32	8633.67	4.47	900.52	899.85	0.67
Centennial Wash	Above Railroad	11.44	Encroach	2021.32	8640.76	4.46	899.70	899.12	0.58
Centennial Wash	Above Railroad	11.36	Encroach	2093.85	9002.80	4.28	898.82	898.33	0.48
Centennial Wash	Above Railroad	11.29	Encroach	2279.13	9374.58	4.11	898.03	897.63	0.41
Centennial Wash	Above Railroad	11.22	Encroach	2479.17	10036.71	3.84	897.24	896.75	0.49
Centennial Wash	Above Railroad	11.14	Encroach	2518.73	10771.41	3.58	896.36	895.76	0.60
Centennial Wash	Above Railroad	11.08	Encroach	2499.91	11035.04	3.49	895.57	894.80	0.77
Centennial Wash	Above Railroad	10.99	Encroach	2165.47	10158.22	3.80	894.65	893.85	0.80
Centennial Wash	Above Railroad	10.92	Encroach	1999.47	9372.38	4.11	893.85	893.12	0.73
Centennial Wash	Above Railroad	10.84	Encroach	1929.06	8402.65	4.59	892.59	891.92	0.66
Centennial Wash	Above Railroad	10.77	Encroach	1985.67	8695.05	4.43	891.60	891.07	0.53
Centennial Wash	Above Railroad	10.7	Encroach	2000.52	8469.15	4.55	890.60	890.06	0.54
Centennial Wash	Above Railroad	10.63	Encroach	1927.11	8682.34	4.44	889.77	889.24	0.54
Centennial Wash	Above Railroad	10.57	Encroach	1902.58	8649.06	4.46	889.04	888.50	0.54
Centennial Wash	Above Railroad	10.49	Encroach	1916.56	9000.24	4.28	888.37	887.81	0.56
Centennial Wash	Above Railroad	10.41	Encroach	1912.15	8715.65	4.42	887.67	887.06	0.61
Centennial Wash	Above Railroad	10.34	Encroach	1904.46	8438.29	4.57	886.95	886.35	0.61
Centennial Wash	Above Railroad	10.25	Encroach	1866.37	7609.11	5.07	885.96	885.32	0.63
Centennial Wash	Above Railroad	10.17	Encroach	1856.23	8052.21	4.79	885.12	884.46	0.65
Centennial Wash	Above Railroad	10.1	Encroach	1893.48	7811.17	4.94	884.22	883.60	0.63
Centennial Wash	Above Railroad	10.02	Encroach	1932.05	7868.73	4.90	883.34	882.67	0.67
Centennial Wash	Above Railroad	9.95	Encroach	1949.23	8165.00	4.72	882.54	881.81	0.73
Centennial Wash	Above Railroad	9.89	Encroach	1931.18	8123.56	4.75	881.88	881.12	0.76
Centennial Wash	Above Railroad	9.84	Encroach	1899.32	7726.32	4.99	881.24	880.48	0.76
Centennial Wash	Above Railroad	9.78	Encroach	1897.12	7316.05	5.27	880.33	879.58	0.75
Centennial Wash	Above Railroad	9.72	Encroach	1793.00	8113.61	4.75	879.51	878.82	0.68
Centennial Wash	Above Railroad	9.65	Encroach	2092.34	8414.98	4.58	878.58	877.96	0.63
Centennial Wash	Above Railroad	9.57	Encroach	2325.48	8549.48	4.51	877.34	876.82	0.52
Centennial Wash	Above Railroad	9.5	Encroach	2532.60	8986.54	4.29	876.23	875.86	0.37
Centennial Wash	Above Railroad	9.45	Encroach	2837.96	9460.43	4.08	875.46	875.24	0.22
Centennial Wash	Above Railroad	9.4	Encroach	3272.70	8925.79	4.32	874.40	874.34	0.06
Centennial Wash	Above Railroad	9.34	Encroach	3703.25	10406.89	3.70	873.33	873.28	0.05
Centennial Wash	Above Railroad	9.27	Encroach	4091.43	10883.67	3.54	872.31	872.14	0.16
Centennial Wash	Above Railroad	9.19	Encroach	4303.15	11210.66	3.44	871.53	871.22	0.31
Centennial Wash	Above Railroad	9.11	Encroach	4473.70	11712.11	3.29	870.76	870.43	0.33
Centennial Wash	Above Railroad	9.04	Encroach	4619.46	12859.75	3.00	870.02	869.64	0.38

HEC-RAS Plan: FinEncr_noEmbank Profile: Encroach (Continued)

River	Reach	River Sta	Profile	Top Wdth Act	Area	Vel Total	W.S. Elev	Base WS	Prof Delta WS
				(ft)	(sq ft)	(ft/s)	(ft)	(ft)	(ft)
Centennial Wash	Above Railroad	8.96	Encroach	4697.37	14148.26	2.72	869.47	869.00	0.47
Centennial Wash	Above Railroad	8.89	Encroach	4496.64	13908.91	2.77	868.90	868.41	0.50
Centennial Wash	Above Railroad	8.81	Encroach	4235.19	13344.27	2.89	868.19	867.76	0.42
Centennial Wash	Above Railroad	8.73	Encroach	4005.69	12964.80	2.97	867.41	867.03	0.38
Centennial Wash	Above Railroad	8.66	Encroach	3686.11	12212.52	3.16	866.68	866.22	0.46
Centennial Wash	Above Railroad	8.58	Encroach	3228.92	11781.23	3.27	865.96	865.32	0.64
Centennial Wash	Above Railroad	8.51	Encroach	3116.77	11703.53	3.29	865.22	864.58	0.64
Centennial Wash	Above Railroad	8.43	Encroach	2975.05	11114.01	3.47	864.41	863.89	0.52
Centennial Wash	Above Railroad	8.36	Encroach	3101.80	12128.06	3.18	863.76	863.36	0.40
Centennial Wash	Above Railroad	8.28	Encroach	3094.67	12278.43	3.59	862.90	862.72	0.17
Centennial Wash	Above Railroad	8.21	Encroach	3398.35	13617.77	3.23	861.90	861.85	0.05
Centennial Wash	Above Railroad	8.13	Encroach	3743.02	15698.14	2.81	861.09	860.99	0.10
Centennial Wash	Above Railroad	8.05	Encroach	4035.83	17266.18	2.55	860.46	860.44	0.02
Centennial Wash	Above Railroad	7.98	Encroach	3942.43	19810.28	2.29	860.20	860.19	0.00
Centennial Wash	Above Railroad	7.90	Encroach	3371.85	16554.50	2.66	859.69	859.69	0.01
Centennial Wash	Above Railroad	7.83	Encroach	2496.88	13055.62	3.43	858.88	858.87	0.01
Centennial Wash	Above Railroad	7.81	Encroach	2470.92	13108.15	3.42	858.62	858.61	0.01
Centennial Wash	Above Railroad	7.75	Encroach	2554.36	12419.25	3.55	858.19	858.18	0.01
Centennial Wash	Trestle 1	7.62	Encroach	2148.78	14119.26	1.39	857.92	857.92	0.00
Centennial Wash	Trestle 1	7.39	Encroach	291.50	3301.74	7.27	856.59	856.59	0.00
Centennial Wash	Trestle 1	7.37 BR U	Encroach		2200.52	8.89	855.09	855.09	0.00
Centennial Wash	Trestle 1	7.37 BR D	Encroach	276.62	1895.10	10.32	854.05	853.95	0.11
Centennial Wash	Trestle 1	7.35	Encroach	537.62	2556.28	7.65	854.05	853.95	0.11
Centennial Wash	Trestle 1	7.3		Lat Struct					
Centennial Wash	Trestle 1	7.27	Encroach	604.99	3124.82	5.28	852.97	852.92	0.05
Centennial Wash	Trestle 1	7.25		Lat Struct					
Centennial Wash	Trestle 1	7.19	Encroach	563.28	2542.42	5.30	851.94	851.96	-0.02
Centennial Wash	Trestle 1	7.15		Lat Struct					
Centennial Wash	Trestle 1	7.12	Encroach	608.20	2307.51	4.94	851.19	851.19	0.00
Centennial Wash	Trestle 1	7.05		Lat Struct					
Centennial Wash	Trestle 1	7.04	Encroach	521.97	1975.93	4.52	850.38	850.38	0.00
Centennial Wash	Trestle 1	7.0		Lat Struct					
Centennial Wash	Trestle 1	6.97	Encroach	456.68	1639.89	4.63	849.53	849.53	0.00
Centennial Wash	Trestle 1	6.95		Lat Struct					
Centennial Wash	Trestle 1	6.89	Encroach	534.37	1662.04	4.33	848.60	848.60	0.00
Centennial Wash	Trestle 1	6.85		Lat Struct					
Centennial Wash	Trestle 1	6.81	Encroach	339.14	1215.12	5.18	847.22	847.22	0.00
Centennial Wash	Trestle 1	6.8		Lat Struct					
Centennial Wash	Trestle 1	6.74	Encroach	304.02	965.14	5.27	845.81	845.83	-0.01
Centennial Wash	Trestle 1	6.7		Lat Struct					
Centennial Wash	Trestle 1	6.67	Encroach	578.23	1017.91	3.39	844.62	844.75	-0.14
Centennial Wash	Trestle 1	6.6		Lat Struct					
Centennial Wash	Trestle 1	6.59	Encroach	379.27	681.55	4.44	842.88	841.58	1.30
Centennial Wash	Below Railroad	6.51	Encroach	6171.17	23546.17	2.20	842.60	841.86	0.74
Centennial Wash	Below Railroad	6.36	Encroach	5879.15	21610.57	2.43	841.59	840.83	0.76
Centennial Wash	Below Railroad	6.27	Encroach	5635.61	20469.69	2.60	840.72	839.92	0.80
Centennial Wash	Below Railroad	6.2	Encroach	5296.25	19760.12	2.46	839.96	839.14	0.82
Centennial Wash	Below Railroad	6.13	Encroach	4721.79	16378.00	2.99	838.98	838.16	0.83
Centennial Wash	Below Railroad	6.06	Encroach	4305.88	15065.74	3.01	837.81	837.17	0.64
Centennial Wash	Below Railroad	5.98	Encroach	3747.91	14423.38	3.08	836.90	836.34	0.56
Centennial Wash	Below Railroad	5.91	Encroach	3446.49	14858.23	2.96	836.30	835.67	0.63
Centennial Wash	Below Railroad	5.83	Encroach	3104.17	13859.35	3.18	835.67	834.94	0.73
Centennial Wash	Below Railroad	5.74	Encroach	2464.87	13996.90	3.18	834.95	834.13	0.82
Centennial Wash	Below Railroad	5.65	Encroach	2838.62	13682.63	3.22	834.16	833.25	0.91
Centennial Wash	Below Railroad	5.57	Encroach	2777.51	12967.00	3.40	833.30	832.40	0.91
Centennial Wash	Below Railroad	5.5	Encroach	2752.12	13194.38	3.34	832.53	831.66	0.87
Centennial Wash	Below Railroad	5.42	Encroach	2704.76	12822.13	3.43	831.66	830.86	0.81
Centennial Wash	Below Railroad	5.33	Encroach	2735.00	13368.89	3.29	830.65	829.92	0.72
Centennial Wash	Below Railroad	5.27	Encroach	2692.90	12987.05	3.39	829.84	829.11	0.73
Centennial Wash	Below Railroad	5.19	Encroach	2672.82	13382.54	3.29	828.93	828.02	0.91
Centennial Wash	Below Railroad	5.13	Encroach	2671.89	11994.87	3.67	827.99	827.12	0.87
Centennial Wash	Below Railroad	5.06	Encroach	2665.72	11080.12	3.97	826.79	825.92	0.86
Centennial Wash	Below Railroad	4.99	Encroach	2770.29	13145.60	3.35	826.15	825.23	0.92
Centennial Wash	Below Railroad	4.91	Encroach	2770.10	12390.10	3.55	825.44	824.53	0.91
Centennial Wash	Below Railroad	4.83	Encroach	2795.65	13776.54	3.20	824.70	823.73	0.97
Centennial Wash	Below Railroad	4.75	Encroach	2618.36	12410.36	3.55	823.93	823.04	0.90

HEC-RAS Plan: FinEncr_noEmbank Profile: Encroach (Continued)

River	Reach	River Sta	Profile	Top Wdth Act	Area	Vel Total	W.S. Elev	Base WS	Prof Delta WS
				(ft)	(sq ft)	(ft/s)	(ft)	(ft)	(ft)
Centennial Wash	Below Railroad	4.68	Encroach	2592.20	14428.10	3.05	823.18	822.32	0.86
Centennial Wash	Below Railroad	4.6	Encroach	2439.05	12523.92	3.52	822.27	821.53	0.74
Centennial Wash	Below Railroad	4.54	Encroach	2294.64	12990.33	3.39	821.52	820.91	0.60
Centennial Wash	Below Railroad	4.46	Encroach	2108.59	13879.29	3.17	820.86	820.25	0.61
Centennial Wash	Below Railroad	4.37	Encroach	2041.02	11447.38	3.85	819.98	819.35	0.63
Centennial Wash	Below Railroad	4.3	Encroach	1981.15	11544.63	3.81	819.25	818.52	0.73
Centennial Wash	Below Railroad	4.22	Encroach	1884.02	11736.71	3.75	818.51	817.83	0.68
Centennial Wash	Below Railroad	4.14	Encroach	1940.25	13338.93	3.30	817.80	817.21	0.59
Centennial Wash	Below Railroad	4.07	Encroach	2018.22	14150.73	3.11	817.30	816.75	0.55
Centennial Wash	Below Railroad	3.98	Encroach	2138.32	15187.90	2.90	816.65	816.15	0.50
Centennial Wash	Below Railroad	3.9	Encroach	2211.55	15023.79	2.93	815.85	815.40	0.45
Centennial Wash	Below Railroad	3.84	Encroach	2363.91	12763.27	3.45	814.71	814.27	0.45
Centennial Wash	Below Railroad	3.77	Encroach	2608.32	13517.10	3.26	813.32	812.83	0.49
Centennial Wash	Below Railroad	3.71	Encroach	2732.72	13456.10	3.27	812.50	811.94	0.57
Centennial Wash	Below Railroad	3.66	Encroach	2854.14	13637.52	3.23	811.59	810.89	0.70
Centennial Wash	Below Railroad	3.6	Encroach	2872.56	14619.75	3.01	810.94	810.16	0.79
Centennial Wash	Below Railroad	3.53	Encroach	2958.46	16590.45	2.65	810.29	809.38	0.91
Centennial Wash	Below Railroad	3.45	Encroach	3239.19	19617.16	2.25	809.92	808.95	0.97
Centennial Wash	Below Railroad	3.38	Encroach	3361.99	22156.13	1.99	809.64	808.67	0.96
Centennial Wash	Below Railroad	3.32	Encroach	3270.54	22533.38	1.95	809.45	808.50	0.95
Centennial Wash	Below Railroad	3.27	Encroach	3071.61	22760.62	1.93	809.19	808.28	0.90
Centennial Wash	Below Railroad	3.21	Encroach	2772.63	20197.09	2.18	808.79	807.92	0.87
Centennial Wash	Below Railroad	3.16	Encroach	2553.12	18909.64	2.33	808.29	807.37	0.92
Centennial Wash	Below Railroad	3.08	Encroach	2506.28	19020.13	2.32	807.64	806.71	0.93
Centennial Wash	Below Railroad	3	Encroach	2491.46	19106.22	2.31	806.77	805.82	0.94
Centennial Wash	Below Railroad	2.9	Encroach	2558.30	18716.89	2.35	805.72	804.85	0.88
Centennial Wash	Below Railroad	2.81	Encroach	2637.36	18955.80	2.32	804.76	803.95	0.81
Centennial Wash	Below Railroad	2.73	Encroach	2725.96	18798.17	2.34	803.67	802.87	0.80
Centennial Wash	Below Railroad	2.66	Encroach	2828.43	18610.72	2.37	802.63	801.76	0.88
Centennial Wash	Below Railroad	2.58	Encroach	2893.02	18397.27	2.39	801.55	800.69	0.86
Centennial Wash	Below Railroad	2.51	Encroach	2882.72	16880.46	2.61	800.18	799.50	0.69
Centennial Wash	Below Railroad	2.43	Encroach	2833.22	17609.00	2.50	799.17	798.37	0.80
Centennial Wash	Below Railroad	2.38	Encroach	2790.16	18298.02	2.41	798.60	797.65	0.95
Centennial Wash	Below Railroad	2.33	Encroach	2736.75	17960.01	2.45	798.02	797.09	0.93
Centennial Wash	Below Railroad	2.27	Encroach	2686.14	18649.85	2.36	797.48	796.62	0.85
Centennial Wash	Below Railroad	2.2	Encroach	2602.10	18738.21	2.35	796.88	796.05	0.83
Centennial Wash	Below Railroad	2.12	Encroach	2341.13	16611.14	2.65	796.07	795.28	0.79
Centennial Wash	Below Railroad	2.04	Encroach	2158.78	15078.41	2.92	794.88	794.13	0.74
Centennial Wash	Below Railroad	1.96	Encroach	1864.50	10542.53	4.18	792.68	792.13	0.55
Centennial Wash	Below Railroad	1.9	Encroach	1870.04	9944.97	4.43	791.45	790.88	0.56
Centennial Wash	Below Railroad	1.84	Encroach	1902.29	11659.31	3.78	790.76	790.13	0.63
Centennial Wash	Below Railroad	1.77	Encroach	1791.65	10765.52	4.09	789.75	789.12	0.64
Centennial Wash	Below Railroad	1.71	Encroach	1854.31	10761.25	4.09	789.02	788.31	0.71
Centennial Wash	Below Railroad	1.66	Encroach	1831.50	10418.88	4.23	788.38	787.46	0.92
Centennial Wash	Below Railroad	1.61	Encroach	1680.19	10420.02	4.23	787.97	787.02	0.94
Centennial Wash	Below Railroad	1.56	Encroach	1191.96	9831.72	5.27	787.36	786.48	0.88
Centennial Wash	Below Railroad	1.5	Encroach	1400.69	10225.60	4.61	786.70	785.87	0.83
Centennial Wash	Below Railroad	1.44	Encroach	1644.36	10508.79	4.30	785.94	785.13	0.81
Centennial Wash	Below Railroad	1.38	Encroach	1679.42	9782.80	4.74	784.84	784.06	0.78
Centennial Wash	Below Railroad	1.31	Encroach	1616.85	8415.94	5.58	782.96	782.61	0.35
Centennial Wash	Below Railroad	1.25	Encroach	1689.34	7985.97	5.65	780.97	780.69	0.28
Centennial Wash	Below Railroad	1.18	Encroach	2779.67	11720.63	3.80	779.18	778.22	0.95
Centennial Wash	Below Railroad	1.11	Encroach	3353.50	12854.52	3.53	777.85	776.92	0.94
Centennial Wash	Below Railroad	1.04	Encroach	3345.78	14222.76	3.14	776.73	776.00	0.73
Centennial Wash	Below Railroad	0.96	Encroach	3551.11	14499.20	3.08	775.77	775.17	0.60
Centennial Wash	Below Railroad	0.88	Encroach	3728.01	14683.27	3.04	774.68	774.18	0.50
Centennial Wash	Below Railroad	0.8	Encroach	3853.35	13250.86	3.45	773.36	772.90	0.46
Centennial Wash	Below Railroad	0.73	Encroach	4137.02	15312.07	2.92	772.27	771.74	0.53
Centennial Wash	Below Railroad	0.66	Encroach	6022.06	15305.76	2.94	770.91	769.97	0.94
Centennial Wash	Below Railroad	0.6	Encroach	7803.22	14311.49	3.12	768.98	767.99	1.00
Centennial Wash	Below Railroad	0.53	Encroach	8354.70	19563.92	2.28	767.44	766.84	0.60
Centennial Wash	Below Railroad	0.46	Encroach	8512.44	19015.06	2.34	766.46	765.99	0.48
Centennial Wash	Below Railroad	0.39	Encroach	8426.10	22335.11	2.00	765.79	765.32	0.47
Centennial Wash	Below Railroad	0.34	Encroach	7960.29	24638.32	1.81	765.39	764.92	0.47
Centennial Field	DS Trestles 2-3	0.82	Encroach	707.20	19347.36	0.62	852.68	852.68	0.00
Centennial Field	DS Trestles 2-3	0.75	Encroach	1609.75	20097.22	3.53	851.28	851.28	0.00

HEC-RAS Plan: FinEncr_noEmbank Profile: Encroach (Continued)

River	Reach	River Sta	Profile	Top Wdth Act	Area	Vel Total	W.S. Elev	Base WS	Prof Delta WS
				(ft)	(sq ft)	(ft/s)	(ft)	(ft)	(ft)
Centennial Field	DS Trestles 2-3	0.7		Lat Struct					
Centennial Field	DS Trestles 2-3	0.67	Encroach	2889.63	16034.49	2.89	849.75	849.75	0.00
Centennial Field	DS Trestles 2-3	0.65		Lat Struct					
Centennial Field	DS Trestles 2-3	0.6	Encroach	4748.97	14048.68	2.36	848.63	848.63	0.00
Centennial Field	DS Trestles 2-3	0.55		Lat Struct					
Centennial Field	DS Trestles 2-3	0.52	Encroach	5688.17	14675.51	2.25	847.67	847.67	0.00
Centennial Field	DS Trestles 2-3	0.5		Lat Struct					
Centennial Field	DS Trestles 2-3	0.45	Encroach	5600.92	16352.53	2.12	846.93	846.93	0.00
Centennial Field	DS Trestles 2-3	0.4		Lat Struct					
Centennial Field	DS Trestles 2-3	0.37	Encroach	5303.88	16398.05	2.32	846.26	846.26	0.00
Centennial Field	DS Trestles 2-3	0.35		Lat Struct					
Centennial Field	DS Trestles 2-3	0.29	Encroach	5089.22	16934.17	2.43	845.53	845.53	0.00
Centennial Field	DS Trestles 2-3	0.25		Lat Struct					
Centennial Field	DS Trestles 2-3	0.22	Encroach	5261.72	17179.58	2.82	844.55	844.54	0.01
Centennial Field	DS Trestles 2-3	0.2		Lat Struct					
Centennial Field	DS Trestles 2-3	0.15	Encroach	5412.85	17015.84	2.54	843.59	843.43	0.16
Centennial Field	DS Trestles 2-3	0.1		Lat Struct					
Centennial Field	DS Trestles 2-3	0.07	Encroach	5184.48	15455.14	1.98	842.98	842.32	0.66
Cent W RR Spill	Trestles 2 to 4	1.75	Encroach	2145.97	12265.08	1.83	858.77	857.90	0.87
Cent W RR Spill	Trestles 2 to 4	1.7		Lat Struct					
Cent W RR Spill	Trestles 2 to 4	1.67	Encroach	1612.13	9842.70	2.28	858.62	857.73	0.88
Cent W RR Spill	Trestles 2 to 4	1.65		Lat Struct					
Cent W RR Spill	Trestles 2 to 4	1.6	Encroach	1296.43	8110.93	2.77	858.42	857.57	0.85
Cent W RR Spill	Trestles 2 to 4	1.55		Lat Struct					
Cent W RR Spill	Trestles 2 to 4	1.52	Encroach	1116.86	6849.97	3.28	858.14	857.32	0.82
Cent W RR Spill	Trestles 2 to 4	1.5		Lat Struct					
Cent W RR Spill	Trestles 2 to 4	1.46	Encroach	988.38	6058.78	3.71	857.77	856.99	0.78
Cent W RR Spill	Trestles 2 to 4	1.45		Lat Struct					
Cent W RR Spill	Trestles 2 to 4	1.4	Encroach	827.28	5114.97	4.40	857.24	856.55	0.69
Cent W RR Spill	Trestles 2 to 4	1.35		Lat Struct					
Cent W RR Spill	Trestles 2 to 4	1.33	Encroach	832.57	4433.25	2.26	856.98	856.20	0.78
Cent W RR Spill	Trestles 2 to 4	1.3		Lat Struct					
Cent W RR Spill	Trestles 2 to 4	1.28	Encroach	713.00	3864.26	2.59	856.70	856.03	0.68
Cent W RR Spill	Trestles 2 to 4	1.25		Lat Struct					
Cent W RR Spill	Trestles 2 to 4	1.22	Encroach	705.83	3649.78	2.74	856.39	855.82	0.57
Cent W RR Spill	Trestles 2 to 4	1.15		Lat Struct					
Cent W RR Spill	Trestles 2 to 4	1.14	Encroach	690.55	3341.79	3.00	855.87	855.28	0.59
Cent W RR Spill	Trestles 2 to 4	1.1		Lat Struct					
Cent W RR Spill	Trestles 2 to 4	1.07	Encroach	675.42	3323.70	3.01	855.31	854.48	0.82
Cent W RR Spill	Trestles 2 to 4	1.05		Lat Struct					
Cent W RR Spill	Trestles 2 to 4	1.02	Encroach	669.73	3569.38	2.81	855.00	854.08	0.92
Cent W RR Spill	Trestles 2 to 4	1		Lat Struct					
Cent W RR Spill	Trestles 2 to 4	0.97	Encroach	540.09	2940.29	3.41	854.52	853.67	0.85
Cent W RR Spill	Trestles 2 to 4	0.95		Lat Struct					
Cent W RR Spill	Trestles 2 to 4	0.9	Encroach	430.84	2285.66	1.66	854.28	853.46	0.81
Cent W RR Spill	Trestles 2 to 4	0.85		Lat Struct					
Cent W RR Spill	Trestles 2 to 4	0.84	Encroach	429.43	1918.34	1.97	854.06	853.31	0.75
Cent W RR Spill	Trestles 2 to 4	0.8		Lat Struct					
Cent W RR Spill	Trestles 2 to 4	0.76	Encroach	407.94	1591.41	2.38	853.37	852.69	0.69
Cent W RR Spill	Trestles 2 to 4	0.7		Lat Struct					
Cent W RR Spill	Trestles 2 to 4	0.69	Encroach	447.19	2184.59	1.73	852.23	851.73	0.50
Cent W RR Spill	Trestles 2 to 4	0.65		Lat Struct					
Cent W RR Spill	Trestles 2 to 4	0.628	Encroach	656.00	2165.59	1.75	851.38	851.19	0.19
Cent W RR Spill	Trestles 2 to 4	0.625	Encroach	674.41	3035.56	1.25	850.88	850.85	0.03
Cent W RR Spill	Trestles 2 to 4	0.623	Encroach	468.04	3144.97	1.59	850.55	850.55	0.00
Cent W RR Spill	Trestles 2 to 4	0.6	Encroach	351.06	2004.28	2.54	850.02	850.02	0.00
Cent W RR Spill	Trestles 2 to 4	0.58 BR U	Encroach	296.47	1311.84	2.89	849.69	849.69	0.00
Cent W RR Spill	Trestles 2 to 4	0.58 BR D	Encroach	296.59	1352.21	2.80	849.42	849.42	0.00
Cent W RR Spill	Trestles 2 to 4	0.56	Encroach	344.00	3567.37	3.82	847.73	847.73	0.00
Cent W RR Spill	Trestles 2 to 4	0.5	Encroach	564.40	1781.45	3.58	845.60	845.60	0.00
Cent W RR Spill	Trestles 2 to 4	0.46	Encroach	1007.15	2124.62	3.15	845.00	844.97	0.03
Cent W RR Spill	Trestles 2 to 4	0.42	Encroach	1165.58	2203.89	3.20	844.36	844.03	0.33
Cent W RR Spill	Trestles 2 to 4	0.36	Encroach	1204.91	2670.01	2.64	843.71	843.07	0.64
Cent W RR Spill	Trestles 2 to 4	0.3	Encroach	1036.77	3176.79	2.38	843.38	842.65	0.73
Cent W RR Spill	Trestles 2 to 4	0.26	Encroach	945.46	3658.65	2.07	843.24	842.47	0.78
Cent W RR Spill	Trestles 2 to 4	0.21	Encroach	989.59	4320.93	1.75	843.15	842.37	0.79

HEC-RAS Plan: FinEncr_noEmbank Profile: Encroach (Continued)

River	Reach	River Sta	Profile	Top Wdth Act	Area	Vel Total	W.S. Elev	Base WS	Prof Delta WS
				(ft)	(sq ft)	(ft/s)	(ft)	(ft)	(ft)
Cent W RR Spill	Trestles 2 to 4	0.16	Encroach	1010.84	4886.33	1.57	843.10	842.30	0.80
Cent W RR Spill	Trestles 2 to 4	0.11	Encroach	841.60	4380.82	2.27	842.97	842.19	0.78
Cent W RR Spill	Trestles 2 to 4	0.05	Encroach	923.94	5199.82	2.69	842.81	842.09	0.72

Model: CW_CanaltoBaseline.prj

Plan Title: FLO2D_flow_changes_encroach_final

Short Identifier: FLO2DQs-Encroach

Geometry: HVIDCanaltoBaselineRd

Flow file: Cent Rd-FLO2D Qs-Final w/ Encroach

Profile: 100-year

Base Conditions (i.e., Floodplain), Standard Table 1 from HEC-RAS

Plan Description: This model represents Centennial Wash from the HVID Westside Canal upstream to Baseline Road downstream. Downstream boundary condition set based on results from the upstream-most cross section of the model titled "BaselineRdtoGila_LS" using plan *.p08. The downstream cross section in this model's geometry file, RS 22.8, is coincident with the upstream cross section in the "BaselineRdtoGila_LS.prj" model.

HEC-RAS Plan: FLO2DQs-Encroach River: Centennial Wash Reach: HarquahalaValley Profile: 100-year

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
HarquahalaValley	35.89	100-year	34347.00	1246.61	1251.67	1249.55	1251.82	0.003038	3.05	11424.86	3582.30	0.27
HarquahalaValley	35.8	100-year	34347.00	1245.80	1250.35	1248.50	1250.52	0.002678	3.25	10457.63	3493.59	0.30
HarquahalaValley	35.72	100-year	34347.00	1244.21	1249.03	1247.28	1249.20	0.003117	3.01	10672.14	3662.42	0.28
HarquahalaValley	35.64	100-year	34347.00	1242.98	1247.64	1246.01	1247.83	0.003698	2.82	10449.23	4058.46	0.27
HarquahalaValley	35.59	100-year	34347.00	1241.98	1246.62	1244.99	1246.79	0.003146	2.86	10712.50	4125.52	0.27
HarquahalaValley	35.53	100-year	34347.00	1241.25	1245.83	1244.12	1245.97	0.002593	2.42	12115.93	4333.19	0.22
HarquahalaValley	35.47	100-year	34347.00	1240.25	1244.97	1243.29	1245.12	0.002700	2.36	12260.10	4753.35	0.22
HarquahalaValley	35.41	100-year	34347.00	1239.39	1244.16	1242.51	1244.30	0.002735	2.48	12348.44	4954.19	0.24
HarquahalaValley	35.34	100-year	34347.00	1238.50	1243.04	1241.56	1243.18	0.002744	2.54	12221.46	5643.51	0.25
HarquahalaValley	35.26	100-year	34347.00	1237.17	1241.82	1240.48	1241.98	0.003198	2.53	11837.51	5653.15	0.25
HarquahalaValley	35.18	100-year	34347.00	1236.20	1240.40	1239.20	1240.56	0.003438	2.62	11576.91	6164.73	0.27
HarquahalaValley	35.1	100-year	34347.00	1234.79	1239.17	1238.05	1239.32	0.003031	2.50	12404.99	6439.72	0.26
HarquahalaValley	35.04	100-year	34347.00	1234.49	1238.15	1237.11	1238.29	0.002856	2.72	12365.94	6687.75	0.29
HarquahalaValley	34.98	100-year	34347.00	1233.68	1237.23	1236.31	1237.37	0.002857	3.00	12476.75	6957.93	0.34
HarquahalaValley	34.92	100-year	34347.00	1233.28	1236.27	1235.45	1236.42	0.003043	3.22	12235.60	7179.84	0.38
HarquahalaValley	34.86	100-year	34347.00	1232.43	1235.18	1234.50	1235.35	0.003668	3.30	11579.83	7303.22	0.42
HarquahalaValley	34.79	100-year	34347.00	1231.35	1234.09	1233.29	1234.23	0.003204	3.23	12320.48	7504.99	0.41
HarquahalaValley	34.73	100-year	34347.00	1230.55	1232.99	1232.31	1233.14	0.003686	3.48	11629.19	7595.44	0.47
HarquahalaValley	34.69	100-year	34347.00	1229.83	1232.22	1231.51	1232.36	0.003617	3.37	11594.54	7525.73	0.46
HarquahalaValley	34.61	100-year	34347.00	1227.88	1230.79	1230.05	1230.93	0.003207	3.36	12159.31	7579.51	0.44
HarquahalaValley	34.55	100-year	34347.00	1226.80	1229.77	1229.05	1229.90	0.003153	3.26	12179.36	7960.26	0.44
HarquahalaValley	34.48	100-year	34347.00	1226.05	1228.66	1227.90	1228.78	0.002913	2.96	12407.46	8028.47	0.42
HarquahalaValley	34.42	100-year	34347.00	1225.27	1227.66	1226.91	1227.78	0.002908	2.59	12425.49	8286.21	0.41
HarquahalaValley	34.36	100-year	34347.00	1224.74	1226.72	1225.99	1226.84	0.003049	2.46	12240.71	8358.55	0.41
HarquahalaValley	34.29	100-year	34347.00	1222.86	1226.09	1224.96	1226.16	0.001379	1.92	16189.37	9218.74	0.29
HarquahalaValley	34.22	100-year	34347.00	1221.89	1225.27	1224.47	1225.42	0.003000	3.03	11473.36	9702.98	0.44
HarquahalaValley	34.16	100-year	34347.00	1221.71	1224.31	1223.46	1224.47	0.002914	3.08	10868.90	9779.17	0.43
HarquahalaValley	34.1	100-year	34347.00	1220.22	1223.20	1222.40	1223.40	0.003205	3.40	9585.79	9813.34	0.46
HarquahalaValley	34.02	100-year	34347.00	1219.32	1221.94	1221.23	1222.14	0.002986	3.39	9851.21	9969.95	0.45
HarquahalaValley	33.93	100-year	34347.00	1218.18	1220.61	1219.95	1220.81	0.003174	3.43	9881.38	10297.59	0.46
HarquahalaValley	33.85	100-year	34347.00	1216.92	1219.26	1218.60	1219.44	0.003167	3.34	10266.93	10321.30	0.46
HarquahalaValley	33.78	100-year	34347.00	1215.71	1217.87	1217.26	1218.06	0.003613	3.35	10063.56	10483.57	0.48
HarquahalaValley	33.72	100-year	34347.00	1214.76	1216.84	1216.14	1217.01	0.003277	3.33	10560.74	10411.26	0.46
HarquahalaValley	33.67	100-year	34347.00	1213.76	1215.71	1215.18	1215.93	0.004652	3.85	9439.13	10343.85	0.55
HarquahalaValley	33.58	100-year	23512.00	1212.08	1213.95	1213.35	1214.10	0.003214	3.30	7818.92	9538.45	0.46
HarquahalaValley	33.49	100-year	23512.00	1210.48	1212.54	1211.94	1212.70	0.002971	3.23	7804.36	8479.26	0.44
HarquahalaValley	33.42	100-year	23512.00	1209.23	1211.29	1210.69	1211.44	0.003164	3.50	7756.14	8697.97	0.46
HarquahalaValley	33.34	100-year	23512.00	1208.01	1209.98	1209.43	1210.13	0.003508	3.54	7688.67	8558.38	0.48
HarquahalaValley	33.26	100-year	23512.00	1206.21	1208.49	1207.94	1208.64	0.003375	3.65	7778.24	9507.39	0.48
HarquahalaValley	33.18	100-year	23512.00	1204.65	1207.16	1206.57	1207.31	0.003188	3.70	7877.09	8802.81	0.47
HarquahalaValley	33.12	100-year	23512.00	1203.63	1206.12	1205.56	1206.28	0.003189	3.81	7778.67	7824.69	0.47
HarquahalaValley	33.05	100-year	23512.00	1202.47	1205.06	1204.20	1205.17	0.002506	2.92	9102.03	9346.04	0.34
HarquahalaValley	32.97	100-year	23512.00	1200.71	1203.93	1202.99	1204.03	0.003061	2.85	9702.93	10157.80	0.33
HarquahalaValley	32.89	100-year	23512.00	1199.90	1202.73	1201.65	1202.82	0.002942	2.03	10356.15	10682.77	0.23
HarquahalaValley	32.82	100-year	23512.00	1198.58	1201.58	1200.42	1201.65	0.002800	1.38	11807.98	11832.88	0.15
HarquahalaValley	32.75	100-year	23512.00	1197.28	1200.36	1199.19	1200.47	0.003564	1.20	11288.68	5471.75	0.13
HarquahalaValley	32.68	100-year	23512.00	1195.93	1199.23	1197.99	1199.33	0.003200	1.27	11380.62	5499.37	0.13
HarquahalaValley	32.63	100-year	23512.00	1194.89	1198.25	1196.89	1198.36	0.003790	1.58	11063.73	5579.20	0.16
HarquahalaValley	32.57	100-year	23512.00	1194.03	1197.22	1195.81	1197.32	0.003142	1.57	10619.43	5490.47	0.16
HarquahalaValley	32.5	100-year	23512.00	1192.93	1196.04	1194.75	1196.13	0.002794	1.73	10837.53	5696.17	0.18
HarquahalaValley	32.42	100-year	23512.00	1191.73	1194.89	1193.68	1194.99	0.002914	1.86	10005.85	5406.77	0.20
HarquahalaValley	32.34	100-year	23512.00	1190.38	1193.60	1192.50	1193.71	0.003456	2.21	9414.64	5335.54	0.23
HarquahalaValley	32.27	100-year	23512.00	1188.97	1192.30	1191.12	1192.40	0.003276	2.49	9388.95	5578.60	0.26
HarquahalaValley	32.21	100-year	23512.00	1188.03	1191.25	1190.09	1191.35	0.003151	2.32	9481.27	5700.28	0.24
HarquahalaValley	32.15	100-year	23512.00	1186.84	1190.39	1189.22	1190.49	0.002727	2.24	9998.22	5846.38	0.23
HarquahalaValley	32.1	100-year	20282.00	1182.90	1189.69	1188.41	1189.76	0.002664	2.08	9587.37	5937.23	0.21
HarquahalaValley	32.05	100-year	20282.00	1182.25	1188.78	1187.58	1188.87	0.003563	2.00	9001.87	5376.38	0.22
HarquahalaValley	31.97	100-year	20282.00	1181.36	1187.27	1186.38	1187.38	0.003535	2.77	7903.24	5353.47	0.30
HarquahalaValley	31.9	100-year	20282.00	1180.36	1185.76	1185.10	1185.92	0.004076	3.52	6864.21	5360.96	0.42
HarquahalaValley	31.82	100-year	20282.00	1179.36	1184.07	1183.68	1184.29	0.004088	4.18	6185.29	5378.48	0.52
HarquahalaValley	31.77	100-year	20282.00	1178.81	1182.97	1182.56	1183.18	0.003465	4.23	6200.74	5290.48	0.53
HarquahalaValley	31.71	100-year	20282.00	1179.79	1182.05	1181.66	1182.25	0.003093	4.10	6361.36	5528.01	0.54
HarquahalaValley	31.63	100-year	20282.00	1177.61	1180.95	1180.37	1181.09	0.002616	3.37	7191.25	5651.26	0.43
HarquahalaValley	31.55	100-year	20282.00	1177.05	1179.90	1179.20	1180.01	0.002239	2.44	8031.60	5817.95	0.33
HarquahalaValley	31.47	100-year	20282.00	1176.71	1178.97	1178.22	1179.07	0.002208	1.78	8857.98	6536.27	0.24
HarquahalaValley	31.39	100-year	20282.00	1175.56	1177.80	1177.16	1177.92	0.003265	1.83	8138.27	6281.89	0.25
HarquahalaValley	31.31	100-year	20282.00	1174.82	1176.65	1175.93	1176.76	0.002444	1.67	8886.63	6440.27	0.23
HarquahalaValley	31.22	100-year	20282.00	1173.38	1175.46	1174.65	1175.56	0.002412	1.93	8915.29	6580.72	0.25
HarquahalaValley	31.13	100-year	20282.00	1172.07	1174.26	1173.36	1174.35	0.003119	2.47	8558.79	6394.71	0.32
HarquahalaValley	31.05	100-year	20282.00	1170.76	1172.86	1171.83	1172.93	0.002971	2.47	9817.76	6458.89	0.33
HarquahalaValley	30.97	100-year	20282.00	1169.35	1171.60	1170.53	1171.67	0.003252	1.95	9595.12	6229.65	0.26
HarquahalaValley	30.91	100-year	20282.00	1168.41	1170.67	1169.62	1170.74	0.002854	1.71	9863.87	6085.30	0.23
HarquahalaValley	30.85	100-year	20282.00	1167.39	1169.70	1168.65	1169.77	0.003066	1.54	9811.23	6069.06	0.21
HarquahalaValley	30.79	100-year	20282.00	1166.44	1168.69	1167.76	1168.77	0.003336	1.66	9413.10	6068.88	0.24
HarquahalaValley	30.71	100-year	20282.00	1164.65	1167.40	1166.38	1167.47	0.003068	1.47	9857.75	6239.51	0.20
HarquahalaValley	30.64	100-year	20282.00	1161.61	1166.14	1165.19	1166.21	0.003146	1.65	9878.97	6340.40	0.21
HarquahalaValley	30.56	100-year	20282.00	1160.90	1164.85	1164.02	1164.93	0.003185	1.68	9466.71	6303.87	0.21
HarquahalaValley	30.5	100-year	20282.00	1159.84	1163.93	1163.10	1164.01	0.003016	1.67	9412.27	6268.14	0.21
HarquahalaValley	30.45	100-year	20282.00	1159.48	1162.98	1162.05	1163.06	0.003433	2.02	9230.89	5994.51	0.24

HEC-RAS Plan: FLO2DQs-Encroach River: Centennial Wash Reach: HarquahalaValley Profile: 100-year (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
HarquahalaValley	30.4	100-year	20282.00	1158.93	1162.13	1161.14	1162.20	0.003072	2.03	9346.69	6085.32	0.25
HarquahalaValley	30.32	100-year	20282.00	1157.49	1160.67	1159.85	1160.77	0.004356	2.37	8258.48	5656.75	0.28
HarquahalaValley	30.25	100-year	17111.00	1156.22	1159.14	1158.31	1159.23	0.003517	2.46	7377.03	5115.36	0.30
HarquahalaValley	30.17	100-year	17111.00	1155.03	1157.79	1156.86	1157.88	0.003255	2.61	7430.27	4884.16	0.30
HarquahalaValley	30.1	100-year	17111.00	1153.50	1156.48	1155.36	1156.57	0.003128	2.71	7447.25	4572.27	0.30
HarquahalaValley	30.03	100-year	17111.00	1152.23	1155.38	1154.30	1155.48	0.003310	2.90	7145.65	4448.46	0.31
HarquahalaValley	29.95	100-year	17111.00	1150.63	1153.79	1152.68	1153.91	0.003550	3.23	6733.72	4539.94	0.35
HarquahalaValley	29.87	100-year	17111.00	1149.20	1152.43	1151.30	1152.55	0.003372	3.08	6481.62	3448.10	0.33
HarquahalaValley	29.8	100-year	17111.00	1147.92	1151.15	1149.87	1151.26	0.003166	3.05	6488.04	3649.04	0.32
HarquahalaValley	29.72	100-year	17111.00	1146.61	1149.93	1148.66	1150.05	0.002997	2.93	6298.99	3752.16	0.30
HarquahalaValley	29.65	100-year	17111.00	1144.89	1148.73	1147.31	1148.85	0.003033	3.00	6160.14	2728.57	0.30
HarquahalaValley	29.59	100-year	17111.00	1143.84	1147.83	1146.30	1147.95	0.002975	3.03	6136.82	2624.50	0.30
HarquahalaValley	29.54	100-year	17111.00	1142.63	1147.02	1145.38	1147.14	0.002803	2.92	6295.66	2521.89	0.28
HarquahalaValley	29.48	100-year	17111.00	1142.06	1146.22	1144.56	1146.34	0.002970	2.86	6432.44	2816.41	0.28
HarquahalaValley	29.42	100-year	17111.00	1140.89	1145.13	1143.67	1145.24	0.003646	2.89	6292.11	2873.79	0.29
HarquahalaValley	29.34	100-year	17111.00	1140.06	1143.81	1142.19	1143.93	0.002719	2.92	6357.22	2512.64	0.29
HarquahalaValley	29.26	100-year	17111.00	1138.45	1142.26	1140.83	1142.38	0.005325	2.68	6296.94	3114.40	0.27
HarquahalaValley	29.18	100-year	17111.00	1136.29	1141.06	1139.27	1141.14	0.001856	2.16	7846.32	3200.60	0.21
HarquahalaValley	29.13	100-year	17111.00	1135.53	1140.49	1138.30	1140.57	0.001940	1.89	8224.83	3068.62	0.18
HarquahalaValley	29.08	100-year	17111.00	1135.09	1139.88	1137.68	1139.98	0.002670	1.86	7909.36	2925.45	0.17
HarquahalaValley	29.03	100-year	16051.00	1134.70	1139.18	1137.04	1139.31	0.002712	1.75	7392.19	2856.12	0.16
HarquahalaValley	28.95	100-year	16051.00	1133.20	1138.00	1135.75	1138.09	0.003166	2.34	6584.93	2418.63	0.21
HarquahalaValley	28.88	100-year	16051.00	1132.09	1136.79	1134.63	1136.89	0.002929	2.39	6515.03	2668.35	0.21
HarquahalaValley	28.8	100-year	16051.00	1130.94	1135.71	1133.53	1135.79	0.002287	1.99	7395.56	2656.95	0.18
HarquahalaValley	28.72	100-year	16051.00	1129.96	1134.73	1132.08	1134.80	0.002644	2.03	7818.69	2692.87	0.18
HarquahalaValley	28.64	100-year	16051.00	1128.69	1133.47	1131.02	1133.56	0.003278	2.40	6759.44	2323.78	0.22
HarquahalaValley	28.59	100-year	16051.00	1127.52	1132.49	1130.15	1132.58	0.003487	2.39	6812.38	2548.15	0.22
HarquahalaValley	28.54	100-year	16051.00	1126.94	1131.67	1129.39	1131.75	0.003043	2.26	7061.32	2659.57	0.20
HarquahalaValley	28.47	100-year	16051.00	1125.61	1130.84	1128.21	1130.91	0.001761	2.04	8019.57	2964.08	0.18
HarquahalaValley	28.4	100-year	16051.00	1125.03	1130.07	1127.58	1130.14	0.002761	1.92	8167.38	3055.23	0.17
HarquahalaValley	28.32	100-year	16051.00	1123.67	1129.30	1126.33	1129.35	0.001323	1.84	9049.84	3215.00	0.16
HarquahalaValley	28.25	100-year	16051.00	1122.98	1128.87	1125.56	1128.91	0.001015	1.67	9895.09	3793.95	0.14
HarquahalaValley	28.16	100-year	16051.00	1122.11	1128.36	1124.46	1128.40	0.001189	1.55	9680.93	5739.74	0.12
HarquahalaValley	28.07	100-year	22085.00	1121.63	1126.91	1125.20	1127.12	0.006690	3.59	5995.09	6308.56	0.30
HarquahalaValley	27.99	100-year	22085.00	1120.70	1124.54	1123.60	1124.69	0.005231	2.66	7403.92	5245.77	0.28
HarquahalaValley	27.94	100-year	22085.00	1120.09	1123.54	1122.27	1123.65	0.002889	1.94	8942.03	5641.63	0.20
HarquahalaValley	27.89	100-year	22085.00	1118.84	1122.73	1121.27	1122.84	0.003246	1.83	9342.64	5104.48	0.18
HarquahalaValley	27.84	100-year	22085.00	1117.39	1121.85	1120.12	1121.94	0.003138	1.99	9663.12	5776.48	0.19
HarquahalaValley	27.76	100-year	22085.00	1115.55	1120.20	1118.44	1120.32	0.004985	2.60	8116.13	5284.72	0.24
HarquahalaValley	27.68	100-year	22085.00	1114.05	1118.83	1117.02	1118.94	0.002470	2.69	8536.18	5705.99	0.25
HarquahalaValley	27.61	100-year	22085.00	1112.92	1118.03	1115.54	1118.10	0.001695	2.23	10351.67	5894.06	0.19
HarquahalaValley	27.56	100-year	22085.00	1112.41	1117.41	1114.58	1117.48	0.003219	2.05	10462.14	6286.58	0.17
HarquahalaValley	27.5	100-year	22085.00	1111.30	1116.45	1113.94	1116.55	0.003153	2.56	8788.24	5722.08	0.22
HarquahalaValley	27.44	100-year	22085.00	1110.12	1115.45	1113.15	1115.57	0.003402	2.85	8188.17	5730.02	0.25
HarquahalaValley	27.37	100-year	22085.00	1108.81	1113.61	1111.86	1113.78	0.005778	3.47	6769.13	4482.17	0.31
HarquahalaValley	27.29	100-year	22085.00	1106.08	1111.73	1109.84	1111.89	0.004315	3.24	7071.85	3352.19	0.29
HarquahalaValley	27.22	100-year	22085.00	1102.27	1110.50	1108.44	1110.64	0.002521	2.51	8076.57	3178.64	0.23
HarquahalaValley	27.15	100-year	22085.00	1102.10	1109.52	1107.65	1109.65	0.002614	3.32	8235.38	3507.75	0.28
HarquahalaValley	27.08	100-year	22085.00	1101.78	1108.70	1106.32	1108.84	0.001792	3.02	7759.97	3146.47	0.27
HarquahalaValley	27.02	100-year	22085.00	1099.22	1108.18	1105.71	1108.29	0.001973	2.78	8397.73	3405.56	0.24
HarquahalaValley	26.97	100-year	22085.00	1099.16	1107.53	1105.27	1107.67	0.002802	3.15	7647.71	3459.34	0.28
HarquahalaValley	26.91	100-year	22085.00	1100.82	1106.75	1104.72	1106.88	0.002211	3.15	8325.88	3270.92	0.29
HarquahalaValley	26.86	100-year	22085.00	1098.25	1106.20	1104.07	1106.30	0.002363	2.77	9092.93	3053.65	0.24
HarquahalaValley	26.8	100-year	22085.00	1096.14	1105.57	1103.29	1105.66	0.001473	2.28	10055.26	3099.08	0.18
HarquahalaValley	26.73	100-year	22085.00	1097.30	1104.95	1101.77	1105.02	0.001854	2.37	11317.50	3457.19	0.18
HarquahalaValley	26.65	100-year	22085.00	1097.57	1104.18	1100.97	1104.23	0.002188	2.05	11617.92	3654.30	0.16
HarquahalaValley	26.59	100-year	22085.00	1095.78	1103.35	1100.05	1103.41	0.002509	1.97	11333.61	3773.45	0.15
HarquahalaValley	26.51	100-year	22085.00	1094.55	1102.15	1099.07	1102.23	0.002886	1.90	10474.12	3471.72	0.15
HarquahalaValley	26.43	100-year	22085.00	1093.25	1101.15	1098.26	1101.23	0.002066	1.88	10035.65	2928.81	0.14
HarquahalaValley	26.34	100-year	22085.00	1092.45	1100.29	1097.50	1100.37	0.001885	1.23	10287.58	3294.72	0.09
HarquahalaValley	26.26	100-year	22085.00	1091.70	1099.40	1096.86	1099.48	0.002284	1.33	9987.22	3842.38	0.09
HarquahalaValley	26.19	100-year	22085.00	1090.26	1098.57	1095.82	1098.64	0.001887	1.04	10956.61	3793.50	0.08
HarquahalaValley	26.12	100-year	21677.00	1088.75	1097.83	1094.87	1097.91	0.001848	1.12	11062.09	4477.73	0.08
HarquahalaValley	26.04	100-year	21677.00	1088.77	1097.21	1094.20	1097.29	0.001463	0.98	10677.56	3310.47	0.07
HarquahalaValley	25.97	100-year	21677.00	1089.19	1096.54	1093.59	1096.61	0.002325	1.62	10692.54	3539.76	0.11
HarquahalaValley	25.89	100-year	21677.00	1087.38	1095.51	1092.82	1095.58	0.002869	2.01	10313.13	3450.07	0.14
HarquahalaValley	25.81	100-year	21677.00	1086.92	1094.16	1092.47	1094.29	0.003590	2.91	7684.69	3214.63	0.21
HarquahalaValley	25.73	100-year	21677.00	1087.11	1092.92	1090.94	1093.07	0.002492	3.46	7247.99	3177.02	0.27
HarquahalaValley	25.66	100-year	21677.00	1086.13	1092.01	1090.06	1092.14	0.002256	3.12	7490.44	2475.25	0.26
HarquahalaValley	25.58	100-year	21677.00	1083.72	1091.01	1088.91	1091.16	0.002494	3.29	7766.91	2621.50	0.26
HarquahalaValley	25.51	100-year	21677.00	1082.88	1090.01	1087.75	1090.14	0.002326	3.37	7815.71	2721.51	0.27
HarquahalaValley	25.43	100-year	21677.00	1083.01	1089.38	1086.88	1089.46	0.001251	2.12	9519.21	3624.72	0.16
HarquahalaValley	25.36	100-year	21677.00	1081.92	1088.82	1085.96	1088.88	0.001726	2.30	11369.76	3557.94	0.17
HarquahalaValley	25.31	100-year	21677.00	1080.99	1088.41	1085.16	1088.46	0.001680	2.33	12448.33	4047.59	0.17
HarquahalaValley	25.26	100-year	21677.00	1079.90	1088.01	1084.74	1088.06	0.001667	2.35	13233.25	4493.96	0.17
HarquahalaValley	25.21	100-year	21677.00	1079.56	1087.48	1084.35	1087.52	0.002110	1.69	13235.59	4292.39	0.12
HarquahalaValley	25.14	100-year	21677.00	1078.10	1086.78	1083.37	1086.82	0.001977	1.42	14424.26	4274.60	0.10
HarquahalaValley	25.06	100-year	21677.00	1076.98	1085.99	1082.43	1086.03	0.002819	1.76	13639.81	4305.48	0.12
HarquahalaValley	24.99	100-year	21677.00	1077.28	1084.90	1081.67	1084.94	0.002697	1.80	14045.81	4675.14	0.12

HEC-RAS Plan: FLO2DQs-Encroach River: Centennial Wash Reach: HarquahalaValley Profile: 100-year (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
HarquahalaValley	24.92	100-year	21677.00	1076.40	1083.89	1080.57	1083.94	0.002385	1.71	13525.90	4762.84	0.12
HarquahalaValley	24.86	100-year	21677.00	1075.21	1083.28	1080.00	1083.33	0.002414	1.80	12855.62	4883.23	0.12
HarquahalaValley	24.8	100-year	21677.00	1074.83	1082.59	1079.59	1082.65	0.002825	1.96	11739.40	4840.60	0.14
HarquahalaValley	24.71	100-year	21677.00	1073.31	1081.66	1078.24	1081.72	0.001832	1.86	11607.01	5042.68	0.13
HarquahalaValley	24.64	100-year	21677.00	1073.49	1081.09	1077.88	1081.14	0.001226	1.50	12509.89	5268.57	0.10
HarquahalaValley	24.56	100-year	21677.00	1071.74	1080.53	1076.96	1080.58	0.001483	2.27	12441.62	5105.51	0.15
HarquahalaValley	24.5	100-year	21677.00	1072.17	1079.79	1076.65	1079.88	0.002763	2.69	10568.76	7129.11	0.18
HarquahalaValley	24.42	100-year	21677.00	1068.86	1078.87	1075.13	1078.96	0.001967	2.74	10636.90	6961.91	0.19
HarquahalaValley	24.35	100-year	21677.00	1067.86	1078.11	1074.99	1078.20	0.001751	2.60	10932.67	7312.23	0.19
HarquahalaValley	24.28	100-year	21677.00	1067.76	1077.49	1074.66	1077.57	0.001893	2.42	11370.33	7876.43	0.18
HarquahalaValley	24.2	100-year	21677.00	1068.03	1076.69	1074.00	1076.77	0.002068	2.05	10746.89	8157.82	0.15
HarquahalaValley	24.13	100-year	21677.00	1067.33	1075.97	1072.19	1076.06	0.001687	1.63	10107.96	8374.04	0.12
HarquahalaValley	24.05	100-year	21677.00	1067.12	1075.11	1071.52	1075.21	0.002850	2.21	8681.66	8743.61	0.16
HarquahalaValley	23.99	100-year	21677.00	1066.57	1073.59	1070.62	1073.79	0.009110	3.62	5968.85	8020.83	0.28
HarquahalaValley	23.94	100-year	21677.00	1066.16	1072.54	1068.39	1072.66	0.002264	1.39	11166.41	7995.03	0.11
HarquahalaValley	23.89	100-year	21677.00	1065.38	1072.03	1069.26	1072.09	0.001965	1.12	12097.78	7606.91	0.09
HarquahalaValley	23.8	100-year	21677.00	1064.37	1070.59	1067.56	1070.70	0.006065	1.88	9413.45	6261.03	0.15
HarquahalaValley	23.73	100-year	21677.00	1062.31	1069.09	1066.99	1069.21	0.003006	3.15	7984.89	5543.61	0.27
HarquahalaValley	23.66	100-year	21677.00	1061.87	1068.31	1065.69	1068.42	0.001571	2.96	9068.59	5461.78	0.23
HarquahalaValley	23.59	100-year	21677.00	1061.89	1067.76	1065.64	1067.89	0.001535	3.18	8700.79	5835.50	0.26
HarquahalaValley	23.52	100-year	21677.00	1061.50	1067.17	1065.31	1067.33	0.001659	3.54	7897.28	5876.15	0.29
HarquahalaValley	23.43	100-year	21677.00	1060.92	1066.45	1064.61	1066.59	0.001552	3.49	8381.73	5381.84	0.29
HarquahalaValley	23.36	100-year	21677.00	1060.46	1066.02	1064.21	1066.12	0.001151	3.06	10066.11	6099.82	0.25
HarquahalaValley	23.32	100-year	21677.00	1060.08	1065.77	1063.68	1065.86	0.001054	2.97	10101.19	6298.54	0.24
HarquahalaValley	23.27	100-year	21677.00	1059.74	1065.55	1063.17	1065.63	0.000842	2.83	11098.11	6245.86	0.22
HarquahalaValley	23.2	100-year	38552.00	1058.59	1065.16	1062.09	1065.23	0.001111	2.99	21314.55	5909.38	0.23
HarquahalaValley	23.11	100-year	38552.00	1057.63	1064.70	1060.93	1064.75	0.001079	1.49	22166.11	5641.32	0.11
HarquahalaValley	23.03	100-year	38552.00	1055.64	1064.20	1060.14	1064.26	0.001214	1.58	20821.59	5440.81	0.10
HarquahalaValley	22.98	100-year	38552.00	1055.54	1063.81	1060.19	1063.87	0.001538	1.88	18849.33	4902.23	0.12
HarquahalaValley	22.9	100-year	38552.00	1053.82	1063.17	1059.36	1063.23	0.001565	2.00	18976.83	4865.05	0.13
HarquahalaValley	22.8	100-year	38552.00	1052.51	1062.32	1058.81	1062.42	0.001882	1.84	17008.51	4604.63	0.12

Model: CW_CanaltoBaseline.prj

Plan Title: FLO2D_flow_changes_encroach_final

Short Identifier: FLO2DQs-Encroach

Geometry: HVIDCanaltoBaselineRd

Flow file: Cent Rd-FLO2D Qs-Final w/ Encroach

Profile: Encroach

Encroached Conditions (i.e., Floodway), Encroachment Table 3 from HEC-RAS (i.e., FEMA"S Floodway Data Table)

Plan Description: This model represents Centennial Wash from the HVID Westside Canal upstream to Baseline Road downstream. Downstream boundary condition set based on results from the upstream-most cross section of the model titled "BaselineRdtoGila_LS" using plan *.p08. The downstream cross section in this model's geometry file, RS 22.8, is coincident with the upstream cross section in the "BaselineRdtoGila_LS.prj" model.

HEC-RAS Plan: FLO2DQs-Encroach River: Centennial Wash Reach: HarquahalaValley Profile: Encroach

Reach	River Sta	Profile	Top Wdth Act	Area	Vel Total	W.S. Elev	Base WS	Prof Delta WS
			(ft)	(sq ft)	(ft/s)	(ft)	(ft)	(ft)
HarquahalaValley	35.89	Encroach	2084.58	9825.03	3.50	1252.40	1251.67	0.72
HarquahalaValley	35.8	Encroach	2137.78	9523.89	3.61	1251.09	1250.35	0.73
HarquahalaValley	35.72	Encroach	2183.88	9342.53	3.68	1249.75	1249.03	0.72
HarquahalaValley	35.64	Encroach	2390.96	9396.68	3.66	1248.24	1247.64	0.60
HarquahalaValley	35.59	Encroach	2531.48	9974.42	3.44	1247.21	1246.62	0.59
HarquahalaValley	35.53	Encroach	2720.14	11165.34	3.08	1246.48	1245.83	0.65
HarquahalaValley	35.47	Encroach	2914.20	11471.90	2.99	1245.71	1244.97	0.74
HarquahalaValley	35.41	Encroach	3029.91	11523.28	2.98	1244.97	1244.16	0.81
HarquahalaValley	35.34	Encroach	3095.56	11304.72	3.04	1243.94	1243.04	0.91
HarquahalaValley	35.26	Encroach	3151.97	10838.69	3.17	1242.76	1241.82	0.95
HarquahalaValley	35.18	Encroach	3240.26	10326.68	3.33	1241.30	1240.40	0.91
HarquahalaValley	35.1	Encroach	3419.30	10734.61	3.20	1239.97	1239.17	0.80
HarquahalaValley	35.04	Encroach	3544.22	10612.72	3.24	1238.93	1238.15	0.78
HarquahalaValley	34.98	Encroach	3670.89	10712.59	3.21	1238.04	1237.23	0.81
HarquahalaValley	34.92	Encroach	3721.66	10428.73	3.29	1237.11	1236.27	0.84
HarquahalaValley	34.86	Encroach	3766.08	9881.15	3.48	1236.08	1235.18	0.90
HarquahalaValley	34.79	Encroach	3775.60	9827.43	3.50	1234.97	1234.09	0.88
HarquahalaValley	34.73	Encroach	3835.51	9233.49	3.72	1233.78	1232.99	0.80
HarquahalaValley	34.69	Encroach	3846.18	8985.17	3.82	1232.96	1232.22	0.75
HarquahalaValley	34.61	Encroach	4082.62	9582.19	3.58	1231.42	1230.79	0.63
HarquahalaValley	34.55	Encroach	4367.65	9800.40	3.50	1230.38	1229.77	0.61
HarquahalaValley	34.48	Encroach	4591.84	10227.31	3.36	1229.36	1228.66	0.70
HarquahalaValley	34.42	Encroach	4679.89	10443.90	3.29	1228.51	1227.66	0.85
HarquahalaValley	34.36	Encroach	4551.42	9935.71	3.46	1227.70	1226.72	0.98
HarquahalaValley	34.29	Encroach	4299.81	9745.32	3.52	1226.82	1226.09	0.73
HarquahalaValley	34.22	Encroach	3846.79	9055.15	3.79	1225.80	1225.27	0.53
HarquahalaValley	34.16	Encroach	3513.82	8756.45	3.92	1224.92	1224.31	0.61
HarquahalaValley	34.1	Encroach	3172.14	8148.32	4.22	1223.89	1223.20	0.69
HarquahalaValley	34.02	Encroach	3127.14	8074.10	4.25	1222.70	1221.94	0.76
HarquahalaValley	33.93	Encroach	3044.52	7823.38	4.39	1221.39	1220.61	0.79
HarquahalaValley	33.85	Encroach	2956.14	7646.32	4.49	1220.06	1219.26	0.80
HarquahalaValley	33.78	Encroach	2936.59	7387.70	4.65	1218.69	1217.87	0.82
HarquahalaValley	33.72	Encroach	2857.81	7391.63	4.65	1217.65	1216.84	0.81
HarquahalaValley	33.67	Encroach	2743.58	6357.45	5.40	1216.37	1215.71	0.66
HarquahalaValley	33.58	Encroach	2553.00	5798.94	4.05	1214.62	1213.95	0.67
HarquahalaValley	33.49	Encroach	2377.55	5700.30	4.12	1213.26	1212.54	0.71
HarquahalaValley	33.42	Encroach	2251.48	5621.13	4.18	1212.05	1211.29	0.77
HarquahalaValley	33.34	Encroach	2196.81	5226.27	4.50	1210.75	1209.98	0.77
HarquahalaValley	33.26	Encroach	2257.20	5134.52	4.58	1209.14	1208.49	0.66
HarquahalaValley	33.18	Encroach	2428.85	5336.97	4.41	1207.63	1207.16	0.47
HarquahalaValley	33.12	Encroach	2566.31	5740.72	4.10	1206.54	1206.12	0.43
HarquahalaValley	33.05	Encroach	2713.10	7110.92	3.31	1205.56	1205.06	0.49
HarquahalaValley	32.97	Encroach	2791.64	7851.21	2.99	1204.55	1203.93	0.62
HarquahalaValley	32.89	Encroach	2887.14	8955.48	2.63	1203.56	1202.73	0.83
HarquahalaValley	32.82	Encroach	2934.22	9803.35	2.40	1202.51	1201.58	0.93
HarquahalaValley	32.75	Encroach	2978.10	10611.44	2.22	1201.32	1200.36	0.96
HarquahalaValley	32.68	Encroach	2968.99	10738.23	2.19	1200.16	1199.23	0.94
HarquahalaValley	32.63	Encroach	2919.25	10257.78	2.29	1199.08	1198.25	0.83
HarquahalaValley	32.57	Encroach	2857.38	9593.13	2.45	1197.99	1197.22	0.77
HarquahalaValley	32.5	Encroach	2819.72	9290.35	2.53	1196.80	1196.04	0.76
HarquahalaValley	32.42	Encroach	2822.44	8629.24	2.72	1195.59	1194.89	0.69
HarquahalaValley	32.34	Encroach	2815.25	8106.35	2.90	1194.23	1193.60	0.63
HarquahalaValley	32.27	Encroach	2746.43	8258.03	2.85	1193.04	1192.30	0.75
HarquahalaValley	32.21	Encroach	2656.36	8237.62	2.85	1192.14	1191.25	0.89
HarquahalaValley	32.15	Encroach	2606.94	8366.56	2.81	1191.39	1190.39	1.00
HarquahalaValley	32.1	Encroach	2533.06	7864.61	2.58	1190.69	1189.69	1.00
HarquahalaValley	32.05	Encroach	2410.58	7020.27	2.89	1189.65	1188.78	0.87
HarquahalaValley	31.97	Encroach	2338.44	5906.29	3.43	1187.79	1187.27	0.52
HarquahalaValley	31.9	Encroach	2291.03	4995.48	4.06	1186.05	1185.76	0.29

HEC-RAS Plan: FLO2DQs-Encroach River: Centennial Wash Reach: HarquahalaValley Profile: Encroach (Continued)

Reach	River Sta	Profile	Top Wdth Act	Area	Vel Total	W.S. Elev	Base WS	Prof Delta WS
			(ft)	(sq ft)	(ft/s)	(ft)	(ft)	(ft)
HarquahalaValley	31.82	Encroach	2302.59	4635.27	4.38	1184.27	1184.07	0.20
HarquahalaValley	31.77	Encroach	2379.82	4744.97	4.27	1183.20	1182.97	0.23
HarquahalaValley	31.71	Encroach	2511.54	4902.48	4.14	1182.35	1182.05	0.30
HarquahalaValley	31.63	Encroach	2639.57	6140.57	3.30	1181.53	1180.95	0.58
HarquahalaValley	31.55	Encroach	2765.26	6623.24	3.06	1180.72	1179.90	0.82
HarquahalaValley	31.47	Encroach	2894.00	6991.87	2.90	1179.84	1178.97	0.86
HarquahalaValley	31.39	Encroach	2974.01	6769.79	3.00	1178.64	1177.80	0.84
HarquahalaValley	31.31	Encroach	3013.20	7030.53	2.88	1177.44	1176.65	0.79
HarquahalaValley	31.22	Encroach	3001.02	7040.62	2.88	1176.06	1175.46	0.60
HarquahalaValley	31.13	Encroach	3021.72	7381.97	2.75	1174.81	1174.26	0.55
HarquahalaValley	31.05	Encroach	3037.14	8099.94	2.50	1173.64	1172.86	0.77
HarquahalaValley	30.97	Encroach	3076.38	8714.23	2.33	1172.51	1171.60	0.91
HarquahalaValley	30.91	Encroach	3124.85	8676.01	2.34	1171.56	1170.67	0.89
HarquahalaValley	30.85	Encroach	3174.27	8389.44	2.42	1170.51	1169.70	0.81
HarquahalaValley	30.79	Encroach	3234.89	7957.70	2.55	1169.43	1168.69	0.74
HarquahalaValley	30.71	Encroach	3294.21	8132.22	2.49	1168.01	1167.40	0.61
HarquahalaValley	30.64	Encroach	3309.23	8156.21	2.49	1166.63	1166.14	0.49
HarquahalaValley	30.56	Encroach	3160.86	7900.36	2.57	1165.34	1164.85	0.50
HarquahalaValley	30.5	Encroach	2995.46	7891.36	2.57	1164.49	1163.93	0.56
HarquahalaValley	30.45	Encroach	2835.73	7803.28	2.60	1163.62	1162.98	0.64
HarquahalaValley	30.4	Encroach	2736.36	7575.66	2.68	1162.82	1162.13	0.69
HarquahalaValley	30.32	Encroach	2526.23	6253.42	3.24	1161.26	1160.67	0.59
HarquahalaValley	30.25	Encroach	2297.55	5861.16	2.92	1159.73	1159.14	0.59
HarquahalaValley	30.17	Encroach	1979.66	5724.86	2.99	1158.48	1157.79	0.69
HarquahalaValley	30.1	Encroach	1643.74	5427.24	3.15	1157.24	1156.48	0.77
HarquahalaValley	30.03	Encroach	1456.10	4861.56	3.52	1156.14	1155.38	0.77
HarquahalaValley	29.95	Encroach	1363.90	4556.47	3.76	1154.60	1153.79	0.82
HarquahalaValley	29.87	Encroach	1310.46	4582.87	3.73	1153.26	1152.43	0.83
HarquahalaValley	29.8	Encroach	1304.42	4715.35	3.63	1151.95	1151.15	0.80
HarquahalaValley	29.72	Encroach	1313.24	4644.17	3.68	1150.61	1149.93	0.68
HarquahalaValley	29.65	Encroach	1342.39	4900.84	3.49	1149.28	1148.73	0.55
HarquahalaValley	29.59	Encroach	1354.48	5018.18	3.41	1148.32	1147.83	0.50
HarquahalaValley	29.54	Encroach	1394.67	5317.41	3.22	1147.51	1147.02	0.49
HarquahalaValley	29.48	Encroach	1437.85	5336.88	3.21	1146.69	1146.22	0.47
HarquahalaValley	29.42	Encroach	1487.93	5250.10	3.26	1145.53	1145.13	0.41
HarquahalaValley	29.34	Encroach	1554.49	5747.21	2.98	1144.29	1143.81	0.48
HarquahalaValley	29.26	Encroach	1593.74	5984.99	2.86	1143.03	1142.26	0.77
HarquahalaValley	29.18	Encroach	1598.33	6673.47	2.56	1141.98	1141.06	0.91
HarquahalaValley	29.13	Encroach	1607.87	7168.07	2.39	1141.36	1140.49	0.86
HarquahalaValley	29.08	Encroach	1583.81	6977.71	2.45	1140.61	1139.88	0.72
HarquahalaValley	29.03	Encroach	1541.09	6699.93	2.40	1139.74	1139.18	0.55
HarquahalaValley	28.95	Encroach	1518.65	6183.24	2.60	1138.46	1138.00	0.47
HarquahalaValley	28.88	Encroach	1535.38	5988.64	2.68	1137.31	1136.79	0.52
HarquahalaValley	28.8	Encroach	1567.25	6338.82	2.53	1136.16	1135.71	0.45
HarquahalaValley	28.72	Encroach	1585.56	7023.05	2.29	1135.02	1134.73	0.29
HarquahalaValley	28.64	Encroach	1625.53	6575.47	2.44	1133.73	1133.47	0.26
HarquahalaValley	28.59	Encroach	1663.59	6591.24	2.44	1132.84	1132.49	0.35
HarquahalaValley	28.54	Encroach	1657.57	6809.95	2.36	1132.11	1131.67	0.45
HarquahalaValley	28.47	Encroach	1695.50	7591.31	2.11	1131.41	1130.84	0.57
HarquahalaValley	28.4	Encroach	1721.22	7722.61	2.08	1130.72	1130.07	0.65
HarquahalaValley	28.32	Encroach	1811.35	8442.94	1.90	1129.97	1129.30	0.67
HarquahalaValley	28.25	Encroach	1850.74	9341.37	1.72	1129.56	1128.87	0.69
HarquahalaValley	28.16	Encroach	1452.39	10376.22	1.81	1129.05	1128.36	0.69
HarquahalaValley	28.07	Encroach	1017.45	8299.17	4.72	1127.30	1126.91	0.39
HarquahalaValley	27.99	Encroach	2328.33	7641.66	2.89	1125.37	1124.54	0.84
HarquahalaValley	27.94	Encroach	2355.30	8070.67	2.74	1124.49	1123.54	0.95
HarquahalaValley	27.89	Encroach	2367.67	8576.71	2.57	1123.51	1122.73	0.78
HarquahalaValley	27.84	Encroach	2343.86	8310.28	2.66	1122.40	1121.85	0.55
HarquahalaValley	27.76	Encroach	2287.12	7448.27	2.97	1120.51	1120.20	0.31

HEC-RAS Plan: FLO2DQs-Encroach River: Centennial Wash Reach: HarquahalaValley Profile: Encroach (Continued)

Reach	River Sta	Profile	Top Wdth Act	Area	Vel Total	W.S. Elev	Base WS	Prof Delta WS
			(ft)	(sq ft)	(ft/s)	(ft)	(ft)	(ft)
HarquahalaValley	27.68	Encroach	2104.58	7866.58	2.81	1119.26	1118.83	0.43
HarquahalaValley	27.61	Encroach	1985.77	9028.11	2.45	1118.46	1118.03	0.43
HarquahalaValley	27.56	Encroach	1961.35	9186.23	2.40	1117.74	1117.41	0.34
HarquahalaValley	27.5	Encroach	1919.93	8143.40	2.71	1116.72	1116.45	0.26
HarquahalaValley	27.44	Encroach	1907.41	7255.61	3.04	1115.68	1115.45	0.22
HarquahalaValley	27.37	Encroach	1849.19	5948.69	3.71	1113.77	1113.61	0.17
HarquahalaValley	27.29	Encroach	1792.57	6959.96	3.17	1112.18	1111.73	0.44
HarquahalaValley	27.22	Encroach	1785.60	6923.09	3.19	1110.88	1110.50	0.38
HarquahalaValley	27.15	Encroach	1852.45	7094.73	3.11	1109.70	1109.52	0.18
HarquahalaValley	27.08	Encroach	2022.53	7750.96	2.85	1108.97	1108.70	0.26
HarquahalaValley	27.02	Encroach	2063.17	8400.21	2.63	1108.53	1108.18	0.35
HarquahalaValley	26.97	Encroach	1900.51	7914.49	2.79	1108.04	1107.53	0.52
HarquahalaValley	26.91	Encroach	1765.14	7597.43	2.91	1107.48	1106.75	0.73
HarquahalaValley	26.86	Encroach	1624.43	7800.58	2.83	1107.04	1106.20	0.84
HarquahalaValley	26.8	Encroach	1784.12	8798.98	2.51	1106.45	1105.57	0.88
HarquahalaValley	26.73	Encroach	1942.23	9685.57	2.28	1105.86	1104.95	0.91
HarquahalaValley	26.65	Encroach	2027.83	9316.74	2.37	1105.09	1104.18	0.91
HarquahalaValley	26.59	Encroach	2053.40	9614.15	2.30	1104.16	1103.35	0.80
HarquahalaValley	26.51	Encroach	2001.63	9099.91	2.43	1102.78	1102.15	0.63
HarquahalaValley	26.43	Encroach	1919.79	9101.42	2.43	1101.65	1101.15	0.49
HarquahalaValley	26.34	Encroach	1858.73	8665.86	2.55	1100.77	1100.29	0.48
HarquahalaValley	26.26	Encroach	1815.72	8255.35	2.68	1099.96	1099.40	0.56
HarquahalaValley	26.19	Encroach	1804.53	8822.04	2.50	1099.17	1098.57	0.60
HarquahalaValley	26.12	Encroach	1803.21	9487.03	2.28	1098.50	1097.83	0.67
HarquahalaValley	26.04	Encroach	1776.84	9709.00	2.23	1098.00	1097.21	0.78
HarquahalaValley	25.97	Encroach	1692.55	9114.04	2.38	1097.37	1096.54	0.84
HarquahalaValley	25.89	Encroach	1544.38	8162.02	2.66	1096.26	1095.51	0.75
HarquahalaValley	25.81	Encroach	1392.19	6089.57	3.56	1094.76	1094.16	0.60
HarquahalaValley	25.73	Encroach	1274.72	5354.64	4.05	1093.38	1092.92	0.46
HarquahalaValley	25.66	Encroach	1385.75	5830.56	3.72	1092.30	1092.01	0.29
HarquahalaValley	25.58	Encroach	1657.13	6997.02	3.10	1091.31	1091.01	0.30
HarquahalaValley	25.51	Encroach	1937.53	7967.34	2.72	1090.50	1090.01	0.49
HarquahalaValley	25.43	Encroach	2024.74	9076.21	2.39	1090.03	1089.38	0.65
HarquahalaValley	25.36	Encroach	2087.86	9976.00	2.17	1089.60	1088.82	0.78
HarquahalaValley	25.31	Encroach	2130.67	11043.94	1.96	1089.26	1088.41	0.85
HarquahalaValley	25.26	Encroach	2225.97	11396.95	1.90	1088.89	1088.01	0.88
HarquahalaValley	25.21	Encroach	2436.24	11966.78	1.81	1088.33	1087.48	0.86
HarquahalaValley	25.14	Encroach	2699.09	12643.76	1.71	1087.51	1086.78	0.73
HarquahalaValley	25.06	Encroach	2856.95	13037.41	1.66	1086.65	1085.99	0.67
HarquahalaValley	24.99	Encroach	2989.08	13140.77	1.65	1085.62	1084.90	0.72
HarquahalaValley	24.92	Encroach	2998.55	12520.99	1.73	1084.60	1083.89	0.70
HarquahalaValley	24.86	Encroach	2970.99	12008.61	1.81	1083.98	1083.28	0.70
HarquahalaValley	24.8	Encroach	2890.49	11864.12	1.83	1083.37	1082.59	0.77
HarquahalaValley	24.71	Encroach	2657.97	12074.15	1.80	1082.54	1081.66	0.88
HarquahalaValley	24.64	Encroach	2465.47	11836.27	1.83	1081.94	1081.09	0.85
HarquahalaValley	24.56	Encroach	2335.25	10483.63	2.07	1081.25	1080.53	0.73
HarquahalaValley	24.5	Encroach	2284.85	9260.77	2.34	1080.40	1079.79	0.61
HarquahalaValley	24.42	Encroach	2301.46	9829.59	2.21	1079.50	1078.87	0.63
HarquahalaValley	24.35	Encroach	2395.86	10674.04	2.03	1078.84	1078.11	0.73
HarquahalaValley	24.28	Encroach	2460.39	11300.10	1.92	1078.35	1077.49	0.86
HarquahalaValley	24.2	Encroach	2247.19	9966.00	2.18	1077.57	1076.69	0.88
HarquahalaValley	24.13	Encroach	1783.49	8696.58	2.50	1076.54	1075.97	0.57
HarquahalaValley	24.05	Encroach	1932.81	8741.03	2.51	1075.57	1075.11	0.46
HarquahalaValley	23.99	Encroach	1815.64	7440.60	2.96	1074.53	1073.59	0.94
HarquahalaValley	23.94	Encroach	1844.52	8302.26	2.73	1073.43	1072.54	0.89
HarquahalaValley	23.89	Encroach	2279.19	9850.01	2.20	1072.66	1072.03	0.63
HarquahalaValley	23.8	Encroach	2396.92	8775.64	2.47	1070.68	1070.59	0.09
HarquahalaValley	23.73	Encroach	2509.79	7718.52	2.81	1069.17	1069.09	0.08
HarquahalaValley	23.66	Encroach	2536.39	8840.23	2.45	1068.42	1068.31	0.12

HEC-RAS Plan: FLO2DQs-Encroach River: Centennial Wash Reach: HarquahalaValley Profile: Encroach (Continued)

Reach	River Sta	Profile	Top Wdth Act	Area	Vel Total	W.S. Elev	Base WS	Prof Delta WS
			(ft)	(sq ft)	(ft/s)	(ft)	(ft)	(ft)
HarquahalaValley	23.59	Encroach	2512.96	8183.34	2.65	1067.91	1067.76	0.15
HarquahalaValley	23.52	Encroach	2588.22	8143.89	2.66	1067.43	1067.17	0.26
HarquahalaValley	23.43	Encroach	2744.80	8695.20	2.49	1066.90	1066.45	0.46
HarquahalaValley	23.36	Encroach	2858.04	9649.49	2.25	1066.58	1066.02	0.57
HarquahalaValley	23.32	Encroach	2915.06	10829.67	2.00	1066.43	1065.77	0.66
HarquahalaValley	23.27	Encroach	3078.26	12236.04	1.77	1066.30	1065.55	0.75
HarquahalaValley	23.2	Encroach	3278.21	15909.79	2.42	1065.95	1065.16	0.79
HarquahalaValley	23.11	Encroach	3385.30	19004.01	2.03	1065.50	1064.70	0.80
HarquahalaValley	23.03	Encroach	3246.84	18268.59	2.11	1065.00	1064.20	0.80
HarquahalaValley	22.98	Encroach	3031.90	16475.98	2.34	1064.58	1063.81	0.78
HarquahalaValley	22.9	Encroach	2879.35	16033.74	2.40	1063.90	1063.17	0.73
HarquahalaValley	22.8	Encroach	2845.61	17250.50	2.35	1063.13	1062.32	0.81

Model: LaPaztoHVIDCanal.prj

Plan Title: 100-year Encroachments

Short Identifier: 100yrEncr

Geometry: LaPaztoHVIDCanal_wEffectiveXS

Flow file: Centennial Road Encroach

Profile: 100-year

Base Conditions (i.e., Floodplain), Standard Table 1 from HEC-RAS

Plan Description: This model represents Centennial Wash from the La Paz County/Maricopa County border upstream to the HVID Westside Canal downstream. Majority of the model geometry is based on topographic data provided by the FCDMC in 2012 in NAVD 88 datum. Upstream three cross sections (RS 40.34, 40.5, and 40.65), along with the right portion of RS 40.19 were obtained directly from the effective model, not from the final topography developed for this study. All items are identical to the effective model for these upper 3 cross sections, including STA/ELEV, Manning's n, reach lengths, bank stations, etc. Downstream boundary condition set based on results from the upstream-most cross section of the model titled "CW_CanaltoBaselineRd" using plan *.p07. The downstream cross section in this model's geometry file, RS 35.89, is coincident with the upstream cross section in the "CW_CanaltoBaselineRd" model.

HEC-RAS Plan: 100yrEncr River: Centennial Wash Reach: To La Paz Profile: 100-year

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
To La Paz	40.65	100-year	34347.00	1317.94	1324.45	1322.45	1324.61	0.001978	3.57	10940.72	3422.68	0.30
To La Paz	40.5	100-year	34347.00	1316.94	1322.72	1320.81	1322.88	0.002255	3.66	10698.34	3568.14	0.32
To La Paz	40.34	100-year	34347.00	1315.54	1319.74	1318.78	1320.08	0.005692	5.29	7591.25	3091.78	0.49
To La Paz	40.19	100-year	34347.00	1310.63	1316.18	1314.16	1316.38	0.003711	2.25	10504.61	3285.23	0.19
To La Paz	40.1	100-year	34347.00	1309.15	1314.70	1312.90	1314.85	0.002911	1.88	11866.33	4065.34	0.16
To La Paz	40.02	100-year	34347.00	1308.43	1313.53	1311.91	1313.71	0.002710	1.84	11372.18	3922.96	0.16
To La Paz	39.95	100-year	34347.00	1307.08	1312.33	1310.72	1312.53	0.003203	2.02	10853.18	3714.70	0.18
To La Paz	39.87	100-year	34347.00	1305.64	1311.04	1309.43	1311.25	0.003567	2.07	10336.58	3670.34	0.18
To La Paz	39.79	100-year	34347.00	1304.59	1309.65	1308.00	1309.84	0.003451	2.13	10512.30	3742.45	0.18
To La Paz	39.71	100-year	34347.00	1302.56	1308.47	1306.39	1308.62	0.002602	1.99	11885.60	3909.22	0.16
To La Paz	39.64	100-year	34347.00	1301.11	1307.27	1305.38	1307.44	0.003285	2.38	11106.57	3706.55	0.19
To La Paz	39.56	100-year	34347.00	1299.85	1305.91	1303.96	1306.07	0.003223	2.65	11067.79	3712.84	0.21
To La Paz	39.47	100-year	34347.00	1298.52	1304.52	1302.57	1304.68	0.003415	2.95	10582.90	3512.19	0.23
To La Paz	39.4	100-year	34347.00	1297.19	1303.02	1301.32	1303.23	0.004071	2.92	9558.46	3197.48	0.24
To La Paz	39.32	100-year	34347.00	1295.53	1301.74	1299.66	1301.90	0.002446	3.14	10524.77	3226.90	0.25
To La Paz	39.25	100-year	34347.00	1294.43	1300.69	1298.58	1300.86	0.003095	2.23	11285.03	3646.47	0.18
To La Paz	39.17	100-year	34347.00	1294.10	1299.44	1297.48	1299.64	0.002800	1.94	11179.84	3677.94	0.16
To La Paz	39.09	100-year	34347.00	1292.95	1298.40	1296.16	1298.54	0.002543	2.20	12128.42	4037.69	0.18
To La Paz	39.02	100-year	34347.00	1292.04	1297.37	1295.19	1297.51	0.003077	2.02	12737.82	4141.35	0.17
To La Paz	38.96	100-year	34347.00	1291.22	1296.38	1294.19	1296.50	0.003279	2.11	13071.05	4318.86	0.18
To La Paz	38.91	100-year	34347.00	1290.48	1295.50	1293.46	1295.63	0.003598	2.22	12511.59	4187.75	0.19
To La Paz	38.85	100-year	34347.00	1289.20	1294.43	1292.47	1294.58	0.003586	2.13	12286.55	4186.02	0.18
To La Paz	38.78	100-year	34347.00	1287.95	1293.19	1291.02	1293.33	0.002649	1.85	12854.22	4138.27	0.16
To La Paz	38.7	100-year	34347.00	1285.27	1292.01	1290.15	1292.18	0.003012	1.93	11740.51	4021.24	0.17
To La Paz	38.63	100-year	34347.00	1285.64	1290.80	1289.21	1290.99	0.002937	1.81	10841.68	3810.29	0.16
To La Paz	38.55	100-year	34347.00	1283.53	1289.26	1287.96	1289.49	0.003336	1.85	10188.30	3736.73	0.17
To La Paz	38.45	100-year	34347.00	1282.83	1287.63	1286.24	1287.85	0.003563	2.51	9766.95	3464.92	0.23
To La Paz	38.35	100-year	34347.00	1280.77	1286.19	1284.20	1286.35	0.002616	2.49	11171.53	3501.22	0.20
To La Paz	38.28	100-year	34347.00	1279.82	1284.96	1283.09	1285.14	0.003512	3.16	10086.27	3359.29	0.26
To La Paz	38.22	100-year	34347.00	1278.20	1283.71	1282.01	1283.92	0.003436	3.55	9323.55	3251.52	0.31
To La Paz	38.14	100-year	34347.00	1277.02	1282.40	1281.06	1282.67	0.002788	4.71	8829.82	3239.99	0.41
To La Paz	38.08	100-year	34347.00	1275.98	1281.46	1280.12	1281.71	0.002996	4.42	8658.10	3381.42	0.39
To La Paz	38.01	100-year	34347.00	1274.81	1280.41	1278.78	1280.62	0.002623	3.78	9355.68	3222.78	0.32
To La Paz	37.93	100-year	34347.00	1273.44	1279.13	1277.32	1279.38	0.003625	3.14	9224.24	3009.51	0.26
To La Paz	37.85	100-year	34347.00	1271.85	1277.96	1275.69	1278.18	0.002380	3.13	9515.40	2538.41	0.25
To La Paz	37.8	100-year	34347.00	1271.15	1277.24	1274.87	1277.45	0.002382	3.02	9957.98	2891.09	0.23
To La Paz	37.74	100-year	34347.00	1269.57	1276.54	1274.14	1276.74	0.002264	2.77	10148.01	2770.58	0.21
To La Paz	37.68	100-year	34347.00	1269.26	1275.77	1273.44	1276.01	0.002583	2.82	9466.47	2604.04	0.21
To La Paz	37.62	100-year	34347.00	1268.35	1275.02	1272.62	1275.27	0.002602	2.53	9831.41	2892.17	0.19
To La Paz	37.54	100-year	34347.00	1267.07	1273.84	1271.50	1274.12	0.003282	2.60	9058.62	2471.61	0.19
To La Paz	37.48	100-year	34347.00	1266.21	1272.90	1270.56	1273.15	0.002954	2.82	9331.37	2580.35	0.21
To La Paz	37.42	100-year	34347.00	1265.66	1272.11	1269.66	1272.33	0.002231	2.90	9715.58	2599.71	0.22
To La Paz	37.35	100-year	34347.00	1264.71	1271.25	1268.94	1271.48	0.002508	2.64	9764.51	2664.77	0.20
To La Paz	37.28	100-year	34347.00	1264.04	1270.42	1267.96	1270.63	0.002190	3.24	9665.08	2629.32	0.25
To La Paz	37.22	100-year	34347.00	1263.65	1269.69	1267.32	1269.90	0.002240	3.07	9600.41	2620.65	0.24
To La Paz	37.15	100-year	34347.00	1261.91	1268.79	1266.55	1269.01	0.002620	2.67	9943.33	2823.76	0.21
To La Paz	37.08	100-year	34347.00	1260.60	1267.76	1265.58	1268.01	0.002747	3.24	9144.89	2909.74	0.25
To La Paz	37.01	100-year	34347.00	1260.42	1266.70	1264.63	1266.91	0.002675	3.06	9848.49	3058.25	0.24
To La Paz	36.93	100-year	34347.00	1259.74	1265.67	1263.32	1265.86	0.002256	2.74	10343.41	2892.41	0.22
To La Paz	36.88	100-year	34347.00	1258.57	1265.01	1262.65	1265.18	0.002264	2.66	10615.61	2997.77	0.21
To La Paz	36.83	100-year	34347.00	1258.38	1264.44	1262.05	1264.60	0.002131	2.93	10851.00	2901.71	0.23
To La Paz	36.78	100-year	34347.00	1257.35	1263.93	1261.55	1264.09	0.002059	2.92	10596.29	3027.64	0.23
To La Paz	36.7	100-year	34347.00	1255.63	1263.12	1260.68	1263.26	0.002074	2.91	11452.36	3196.19	0.23
To La Paz	36.63	100-year	34347.00	1255.85	1261.97	1259.64	1262.20	0.003381	3.09	9770.57	2968.72	0.24
To La Paz	36.55	100-year	34347.00	1254.36	1260.72	1258.47	1260.95	0.002752	2.64	9995.60	3083.14	0.21
To La Paz	36.48	100-year	34347.00	1253.67	1259.81	1257.39	1260.00	0.001906	2.18	10926.40	2652.54	0.17
To La Paz	36.41	100-year	34347.00	1252.66	1258.92	1256.89	1259.16	0.002488	1.95	10260.21	2945.07	0.15
To La Paz	36.36	100-year	34347.00	1252.21	1258.19	1256.38	1258.47	0.002788	2.03	9579.19	3291.51	0.16
To La Paz	36.3	100-year	34347.00	1251.58	1257.35	1255.40	1257.58	0.002418	2.22	9936.96	3332.97	0.18
To La Paz	36.25	100-year	34347.00	1250.97	1256.70	1254.66	1256.91	0.002377	2.54	10100.37	3414.56	0.21
To La Paz	36.17	100-year	34347.00	1250.56	1255.79	1253.49	1255.98	0.002237	2.14	11156.31	3405.15	0.17
To La Paz	36.1	100-year	34347.00	1249.32	1254.72	1252.47	1254.98	0.002683	2.88	9048.98	3134.04	0.23
To La Paz	36.02	100-year	34347.00	1248.10	1253.64	1251.25	1253.83	0.002689	2.22	11005.18	2964.91	0.18
To La Paz	35.95	100-year	34347.00	1247.29	1252.53	1250.28	1252.68	0.002570	2.23	11767.60	3459.47	0.19
To La Paz	35.89	100-year	34347.00	1246.61	1251.67	1249.55	1251.81	0.003051	3.05	11409.99	3579.65	0.27

Model: LaPaztoHVIDCanal.prj

Plan Title: 100-year Encroachments

Short Identifier: 100yrEncr

Geometry: LaPaztoHVIDCanal_wEffectiveXS

Flow file: Centennial Road Encroach

Profile: Floodway

Encroached Conditions (i.e., Floodway), Encroachment Table 3 from HEC-RAS (i.e., FEMA"S Floodway Data Table)

Plan Description: This model represents Centennial Wash from the La Paz County/Maricopa County border upstream to the HVID Westside Canal downstream. Majority of the model geometry is based on topographic data provided by the FCDMC in 2012 in NAVD 88 datum. Upstream three cross sections (RS 40.34, 40.5, and 40.65), along with the right portion of RS 40.19 were obtained directly from the effective model, not from the final topography developed for this study. All items are identical to the effective model for these upper 3 cross sections, including STA/ELEV, Manning's n, reach lengths, bank stations, etc. Downstream boundary condition set based on results from the upstream-most cross section of the model titled "CW_CanaltoBaselineRd" using plan *.p07. The downstream cross section in this model's geometry file, RS 35.89, is coincident with the upstream cross section in the "CW_CanaltoBaselineRd" model.

HEC-RAS Plan: 100yrEncr River: Centennial Wash Reach: To La Paz Profile: Floodway

Reach	River Sta	Profile	Top Wdth Act	Area	Vel Total	W.S. Elev	Base WS	Prof Delta WS
			(ft)	(sq ft)	(ft/s)	(ft)	(ft)	(ft)
To La Paz	40.65	Floodway	2010.00	8716.51	3.94	1324.94	1324.45	0.49
To La Paz	40.5	Floodway	1939.67	8298.81	4.14	1323.02	1322.72	0.30
To La Paz	40.34	Floodway	2017.00	6522.75	5.27	1319.83	1319.74	0.09
To La Paz	40.19	Floodway	2029.34	9904.40	3.47	1316.84	1316.18	0.66
To La Paz	40.1	Floodway	2100.76	9901.94	3.47	1315.54	1314.70	0.84
To La Paz	40.02	Floodway	2061.03	9381.00	3.66	1314.27	1313.53	0.74
To La Paz	39.95	Floodway	2014.70	9160.53	3.75	1313.02	1312.33	0.69
To La Paz	39.87	Floodway	1916.29	8788.84	3.91	1311.81	1311.04	0.77
To La Paz	39.79	Floodway	1821.19	8700.36	3.95	1310.52	1309.65	0.87
To La Paz	39.71	Floodway	1733.02	9411.76	3.65	1309.38	1308.47	0.90
To La Paz	39.64	Floodway	1680.25	9178.02	3.74	1308.21	1307.27	0.94
To La Paz	39.56	Floodway	1620.75	8748.07	3.93	1306.78	1305.91	0.86
To La Paz	39.47	Floodway	1617.15	8314.83	4.13	1305.16	1304.52	0.65
To La Paz	39.4	Floodway	1654.35	7739.68	4.44	1303.53	1303.02	0.51
To La Paz	39.32	Floodway	1800.78	9355.34	3.67	1302.52	1301.74	0.79
To La Paz	39.25	Floodway	1825.90	9641.22	3.56	1301.52	1300.69	0.83
To La Paz	39.17	Floodway	1928.65	9809.99	3.50	1300.30	1299.44	0.85
To La Paz	39.09	Floodway	2049.90	10672.26	3.22	1299.36	1298.40	0.96
To La Paz	39.02	Floodway	2151.16	11233.37	3.06	1298.34	1297.37	0.97
To La Paz	38.96	Floodway	2152.86	11150.22	3.08	1297.32	1296.38	0.94
To La Paz	38.91	Floodway	2153.30	10672.43	3.22	1296.41	1295.50	0.91
To La Paz	38.85	Floodway	2162.28	10489.73	3.27	1295.29	1294.43	0.86
To La Paz	38.78	Floodway	2179.65	10609.91	3.24	1293.97	1293.19	0.78
To La Paz	38.7	Floodway	2159.36	9582.71	3.58	1292.60	1292.01	0.59
To La Paz	38.63	Floodway	2151.61	8883.11	3.87	1291.27	1290.80	0.47
To La Paz	38.55	Floodway	2154.06	8317.70	4.13	1289.63	1289.26	0.37
To La Paz	38.45	Floodway	2115.27	8582.79	4.00	1288.07	1287.63	0.44
To La Paz	38.35	Floodway	2079.22	9706.27	3.54	1286.67	1286.19	0.48
To La Paz	38.28	Floodway	2029.10	8716.08	3.94	1285.32	1284.96	0.36
To La Paz	38.22	Floodway	1952.86	8149.09	4.21	1284.01	1283.71	0.30
To La Paz	38.14	Floodway	1832.47	7826.80	4.39	1282.93	1282.40	0.53
To La Paz	38.08	Floodway	1757.30	7682.13	4.47	1282.15	1281.46	0.69
To La Paz	38.01	Floodway	1666.02	7963.71	4.31	1281.22	1280.41	0.81
To La Paz	37.93	Floodway	1606.61	8051.33	4.27	1279.96	1279.13	0.83
To La Paz	37.85	Floodway	1535.29	8656.35	3.97	1278.86	1277.96	0.91
To La Paz	37.8	Floodway	1471.64	8500.53	4.04	1278.14	1277.24	0.90
To La Paz	37.74	Floodway	1432.30	8549.00	4.02	1277.39	1276.54	0.85
To La Paz	37.68	Floodway	1396.33	8159.37	4.21	1276.58	1275.77	0.81
To La Paz	37.62	Floodway	1389.14	8222.14	4.18	1275.79	1275.02	0.77
To La Paz	37.54	Floodway	1392.63	8003.09	4.29	1274.58	1273.84	0.75
To La Paz	37.48	Floodway	1414.30	7969.44	4.31	1273.59	1272.90	0.69
To La Paz	37.42	Floodway	1479.15	8440.52	4.07	1272.79	1272.11	0.69
To La Paz	37.35	Floodway	1518.87	8549.97	4.02	1271.92	1271.25	0.67
To La Paz	37.28	Floodway	1557.76	8810.47	3.90	1271.17	1270.42	0.74
To La Paz	37.22	Floodway	1517.73	8577.91	4.00	1270.47	1269.69	0.78
To La Paz	37.15	Floodway	1462.85	7897.63	4.35	1269.39	1268.79	0.60
To La Paz	37.08	Floodway	1566.04	8053.81	4.26	1268.31	1267.76	0.54
To La Paz	37.01	Floodway	1726.81	8673.31	3.96	1267.31	1266.70	0.61
To La Paz	36.93	Floodway	1796.34	9565.69	3.59	1266.38	1265.67	0.71
To La Paz	36.88	Floodway	1795.74	9649.51	3.56	1265.76	1265.01	0.76
To La Paz	36.83	Floodway	1805.85	9715.03	3.54	1265.22	1264.44	0.78
To La Paz	36.78	Floodway	1797.83	9753.82	3.52	1264.73	1263.93	0.80
To La Paz	36.7	Floodway	1757.05	9805.58	3.50	1263.88	1263.12	0.76
To La Paz	36.63	Floodway	1729.74	9436.01	3.64	1262.74	1261.97	0.77
To La Paz	36.55	Floodway	1729.39	9441.55	3.64	1261.61	1260.72	0.89
To La Paz	36.48	Floodway	1735.28	9922.48	3.46	1260.70	1259.81	0.89

HEC-RAS Plan: 100yrEncr River: Centennial Wash Reach: To La Paz Profile: Floodway (Continued)

Reach	River Sta	Profile	Top Wdth Act	Area	Vel Total	W.S. Elev	Base WS	Prof Delta WS
			(ft)	(sq ft)	(ft/s)	(ft)	(ft)	(ft)
To La Paz	36.41	Floodway	1778.50	9232.67	3.72	1259.73	1258.92	0.82
To La Paz	36.36	Floodway	1762.35	8574.18	4.01	1258.92	1258.19	0.74
To La Paz	36.3	Floodway	1830.24	9003.05	3.82	1258.06	1257.35	0.71
To La Paz	36.25	Floodway	1874.65	9098.38	3.78	1257.39	1256.70	0.69
To La Paz	36.17	Floodway	1930.75	9499.59	3.62	1256.28	1255.79	0.49
To La Paz	36.1	Floodway	1983.58	9980.46	3.44	1255.39	1254.72	0.67
To La Paz	36.02	Floodway	2021.99	10299.90	3.33	1254.47	1253.64	0.83
To La Paz	35.95	Floodway	2064.42	10124.13	3.39	1253.31	1252.53	0.78
To La Paz	35.89	Floodway	2084.58	9833.18	3.49	1252.40	1251.67	0.73

CENTENNIAL WASH FLOODPLAIN DELINEATION STUDY
GILA RIVER TO LA PAZ COUNTY

CONTRACT FCD 2012C004

FINAL TOPOGRAPHIC SURFACE TECHNICAL MEMORANDUM

Date: September 20, 2012

To: Jeff Shelton, Project Manager – FCDMC

From: Brian Wahlin, Project Manager – WEST Consultants, Inc.
Chuck Davis – WEST Consultants, Inc.

The purpose of this technical memorandum is to outline the development of the final topographic surface to be used in HEC-RAS model development and floodplain/floodway mapping for the Centennial Wash Floodplain Delineation Study (FDS) from Gila River to the La Paz County boundary. This surface was developed based on topographic data sources delivered previously by the Flood Control District of Maricopa County (FCDMC) to WEST Consultants, Inc., (WEST).

The processing steps utilized to develop the final surface are outlined below:

1) The clip boundary provided by WEST to the FCDMC that was used by FCDMC to clip the topographic data delivered for this project was used as the boundary of the TIN. That clip data boundary is described as "CentenialWashPanelsExtended4800" in the legend of Figure 1 below.

2) The projection was defined originally in all surface files (i.e., TINs, raster datasets, topography lines, etc.) to be NAD_1983_HARN_StatePlane_Arizona_Central_FIPS_0202_Feet_Intl as per the FCDMC standards.

3) The topography delivered to WEST by the FCDMC was ranked in order of importance based on the date of topography collection. The final ranking utilized by WEST is provided below. The boundaries for each of these topographic data sources can be seen in Figure 1 below.
    a. Combined DTM breakline and mass point shapefiles (from 2011??)
    b. Infill topography breakline and mass point shapefiles (from 2011??)
    c. Gillespie mapping *.lf and *.pf files (from 2008), each beginning with '1290'
    d. Palo Verde mapping *.lf and *.pf files (from 2007), each beginning with '1013'
    e. Luke Wash and Arlington mapping *.lf and *.pf files (from 2005), each beginning with '1258'
    f. Countywide 10' contour mapping line shapefile (from 2000) titled "elvln-1208.shp"

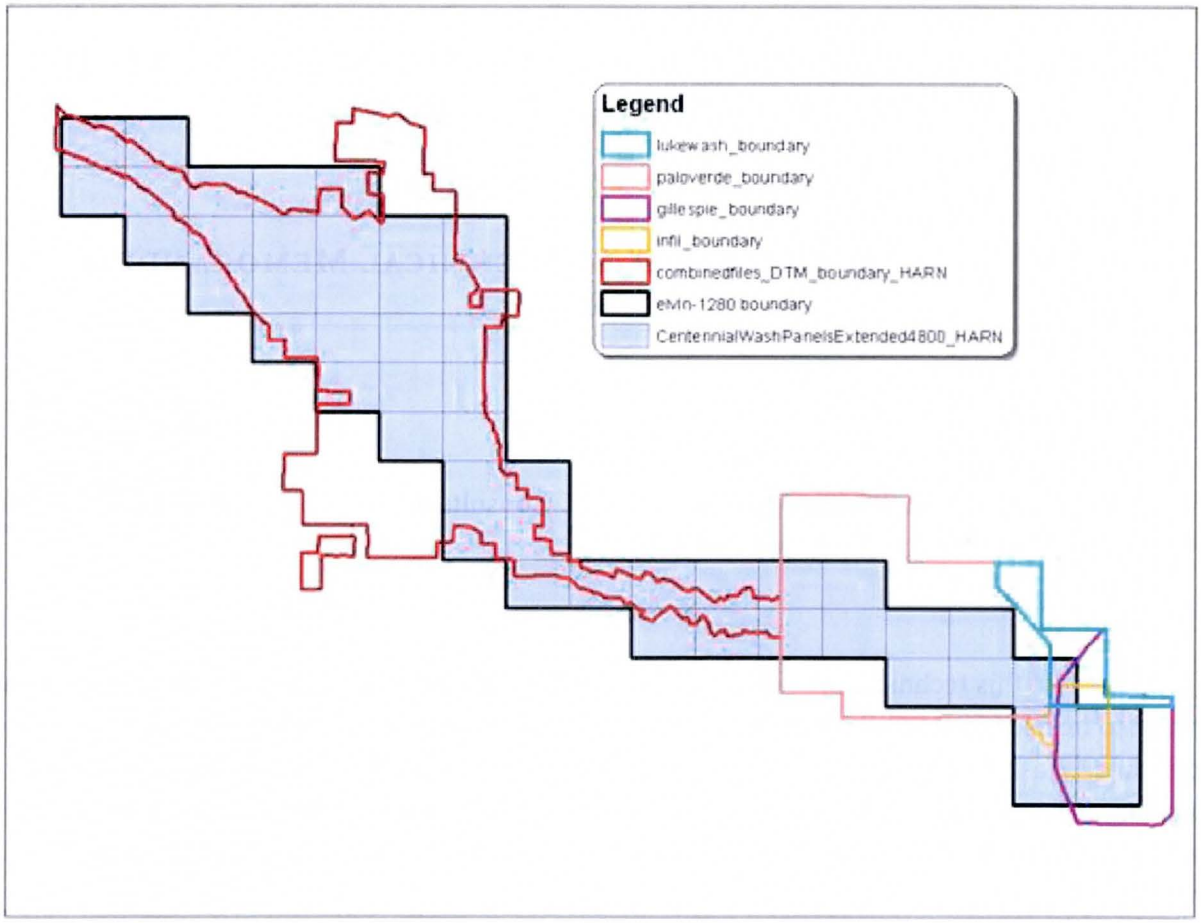


Figure 1. Source data boundaries

4) Each boundary polygon shown in Figure 1 above was developed by generating a TIN of the points and lines for a particular dataset. Using the Delineate TIN Data Area tool in ArcToolbox, the TIN was reduced to only the area covered by the input data to eliminate erroneous extrapolated areas. The resulting TIN was converted into a grid which was reclassed to a single value raster. This raster was converted to a polygon feature class. The polygon was displayed with the input data and edited to remove any extrapolated areas not removed by the Delineate TIN Data Area tool. The results for each dataset are shown in Figure 1 above.

5) WEST ignored all of the Salt/Gila River Master Plan topography from the early 1990's (beginning with '1030') and the Saddleback FRS mapping from 1996 (beginning with '1016') for the creation of this surface.

6) After ranking each topographic dataset based on the date of data collection and developing the bounding polygon for each dataset, WEST clipped and erased data from areas of data overlap such that only the newest data was used in any given area to develop the final topographic surface. For example, for the area shown in Figure 1 above where the infill topography overlaps the Gillespie mapping, the Luke Wash and Arlington mapping, and the 10' Countywide contour

interval mapping, only the data for the highest rank dataset (i.e., the infill topography dataset) was used to develop the final surface.

7) Further editing was required on the source data for the Combined DTM topography data source. Figure 2 below shows a boundary line in the breakline data that is coded with -9999 values that prevents a correct interpolation of the data into a surface. These -9999 codes appeared to be some type of boundary delineation, possibly used in photogrammetric data deliverable processing. These features were detected and removed through an iterative TIN building process until a realistic surface was achieved.

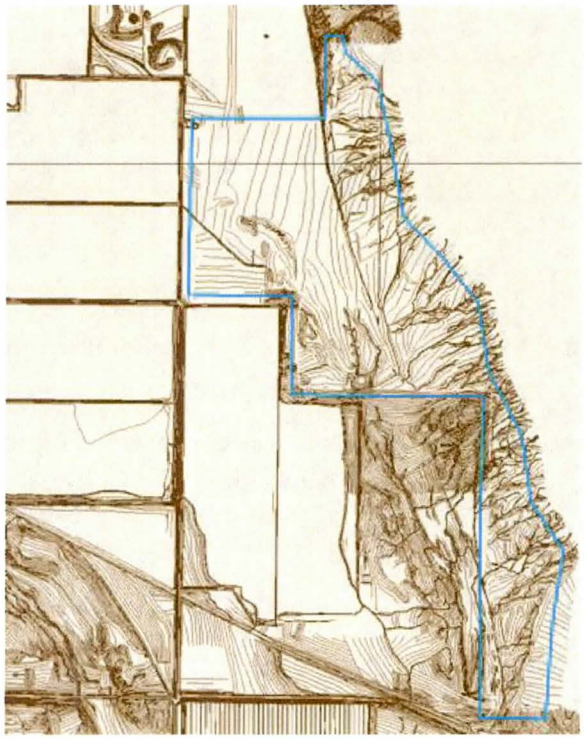


Figure 2. Lines to be removed from the breakline dataset for the Combined DTM topographic data source

8) After the data pre-processing listed above, WEST created a TIN for the data with the final identified data based on relative importance at all locations in the study area. Figure 3 below shows the resulting surface after cleaning up the data. An ArcGIS 10 TIN was generated from the input elevation data and breaklines. A pre-10 version of the TIN was saved for use in earlier versions of ArcGIS if needed. The TIN was converted to a grid with a 5-foot cell for use in hydraulic models and for floodplain processing and mapping. A 10' contour interval line shapefile was developed from the TIN as well.

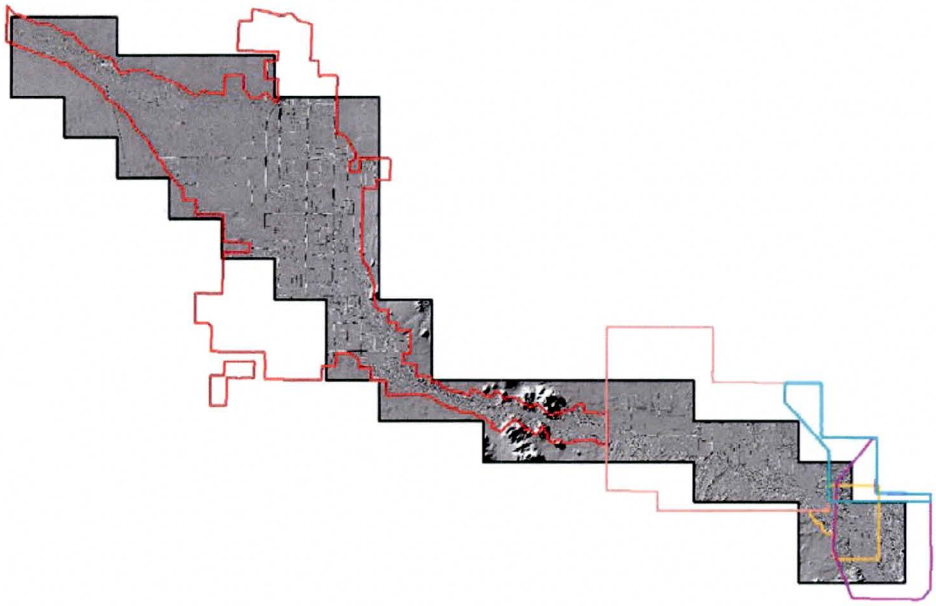


Figure 3. Resulting final surface (hillshade model)

9) A partial TIN developed from the final TIN surface is shown in Figure 4 below. The partial TIN was created to show an example of the possible tiles that may be required to be utilized to cut and map this model due to the expansive sizes of these topographic datasets.

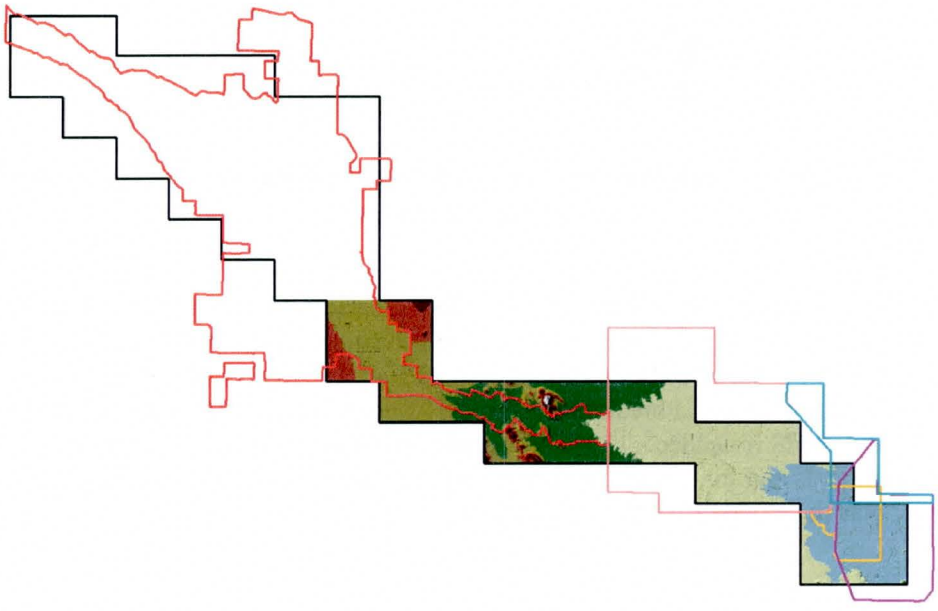


Figure 4. Partial TIN developed from the final surface TIN

CENTENNIAL WASH FLOODPLAIN DELINEATION STUDY
GILA RIVER TO LA PAZ COUNTY

CONTRACT FCD 2012C004

DRAFT BRIDGE CROSS SECTIONS TECHNICAL MEMORANDUM

Date: October 31, 2012

To: Jeff Shelton, Project Manager – FCDMC

From: Brian Wahlin, Project Manager – WEST Consultants, Inc.
Chuck Davis – WEST Consultants, Inc.
Suzie Monk – WEST Consultants, Inc.

The purpose of this technical memorandum is to show the changes made to the cross sections near the Union Pacific Railroad Bridge (UPRR) on Centennial Wash and explain why the changes were made. The existing FEMA cross sections near the UPRR do not represent the flow through the trestle bridges and across the railroad embankment accurately. A picture of the existing FEMA cross sections with problem areas is shown in Figure 1. The bridge is shown in red. Cross section P is the one that arrows 1-3 are pointing at and arrow 4 is pointing at cross section O. At areas 1 and 3, the cross section is oriented in such a way that flow is represented as going over the railroad bridge at an angle. At high flows, it is expected that flow will cross perpendicular to the direction of the railroad, rather than at an angle. Arrow 2 shows where the main trestle bridge is located, but there are three more openings along the railroad bridge to the east of the main bridge. The cross sections cannot represent these other bridge openings as they are right now. Arrow 4 shows where cross section O crosses the embankment, which is also an inaccurate representation of flow.

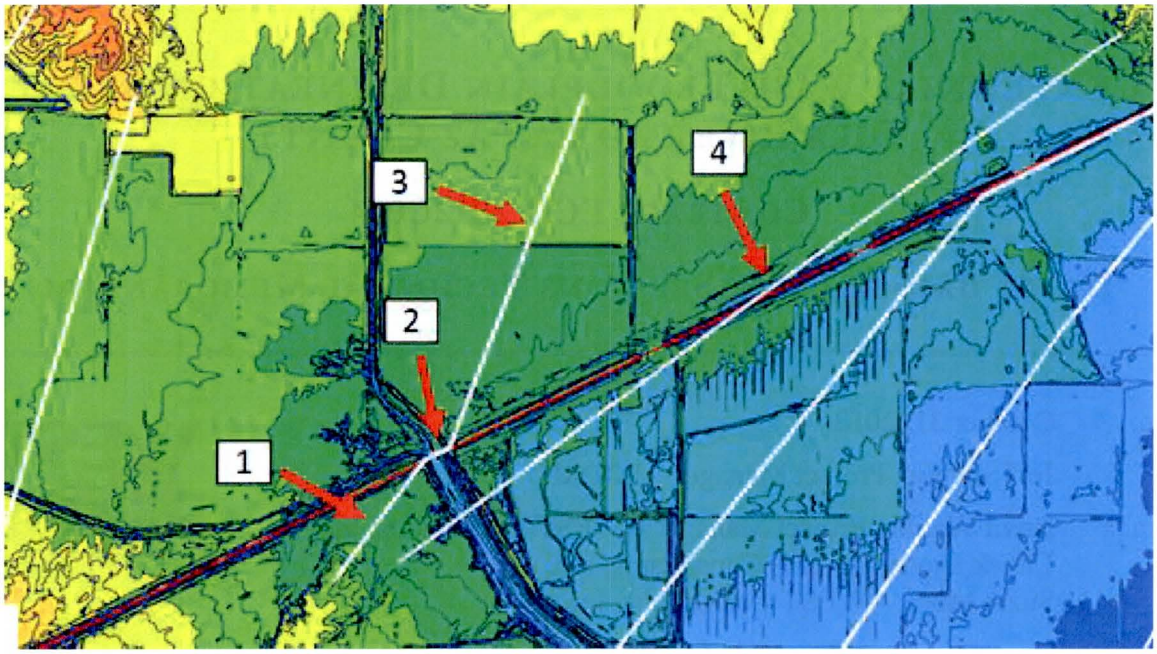


Figure 1. Issues with the effective cross sections

New cross sections were drawn in the area around the bridge in order to more accurately represent flow during large events. A picture of the new cross sections is shown below in Figure 2. The cross sections were revised to address the issues with the FEMA cross sections mentioned above. The left-most arrow in the picture shows the approximate center of mass during large events. The blue line is the main channel. The middle arrow shows the location of the main trestle bridge. The third arrow shows the direction of flow in the left overbank as it goes through the other trestle bridges or over the railroad bridge. The approximate locations of the bridges are shown by black stars. It is believed that most flow will go through the main bridge as the upstream topography hinders water from spreading out that much in the left overbank. The first cross section upstream of the bridge captures the main channel only just upstream of the bridge. The second, third, and fourth cross sections upstream bend to capture the main channel.

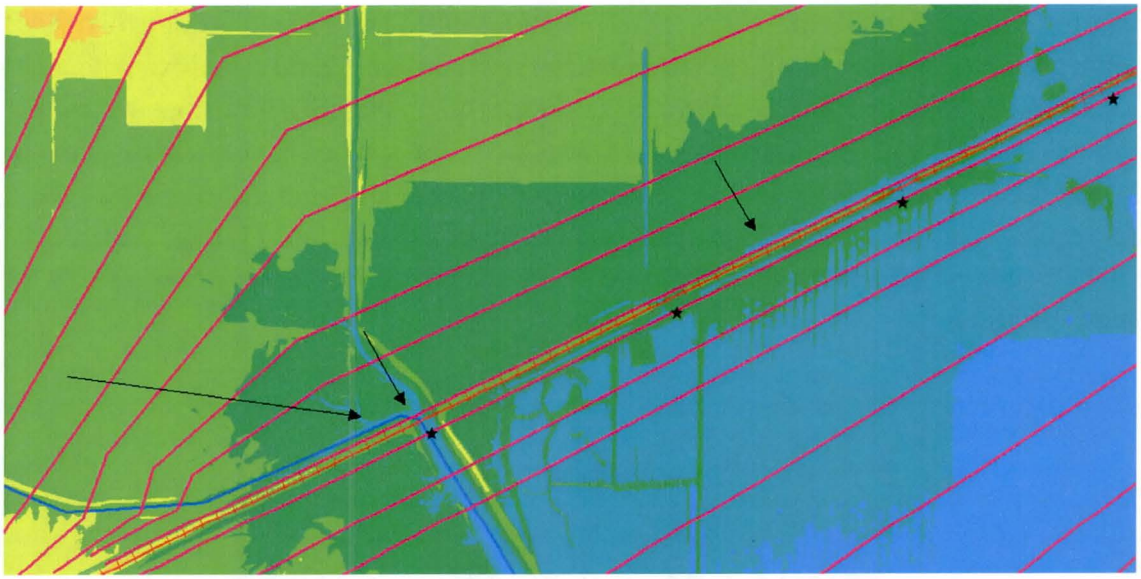


Figure 2. New cross sections

All of the new cross sections around the bridge as well as the FEMA cross sections are shown in Figure 3. FEMA cross sections are shown with purple dotted lines and new cross sections are shown in fuchsia. The location of the railroad is shown in red and the main channel is shown in blue.

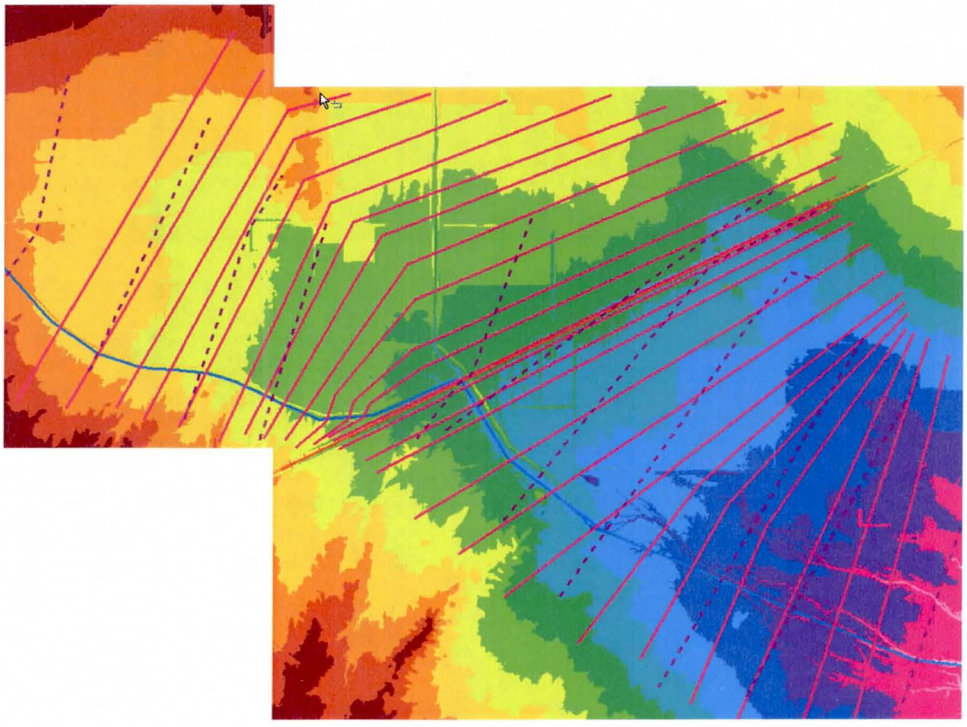


Figure 3. New cross sections with effective cross sections

In order to compare flood depths between the old and updated cross sections, the ground surface elevation should be compared rather than equating cross sections directly. For example, FEMA cross section Q (the dotted cross section near the center of the picture below) may be compared to the new cross section highlighted in blue. These two cross sections have similar elevations along the length of the cross section. It may be necessary in some locations to compare the FEMA depths to the cross section upstream or downstream, though, specifically at the ends where the cross section elevations differ more. More discussion will be necessary on how to compare specific flood depths as the work progresses.

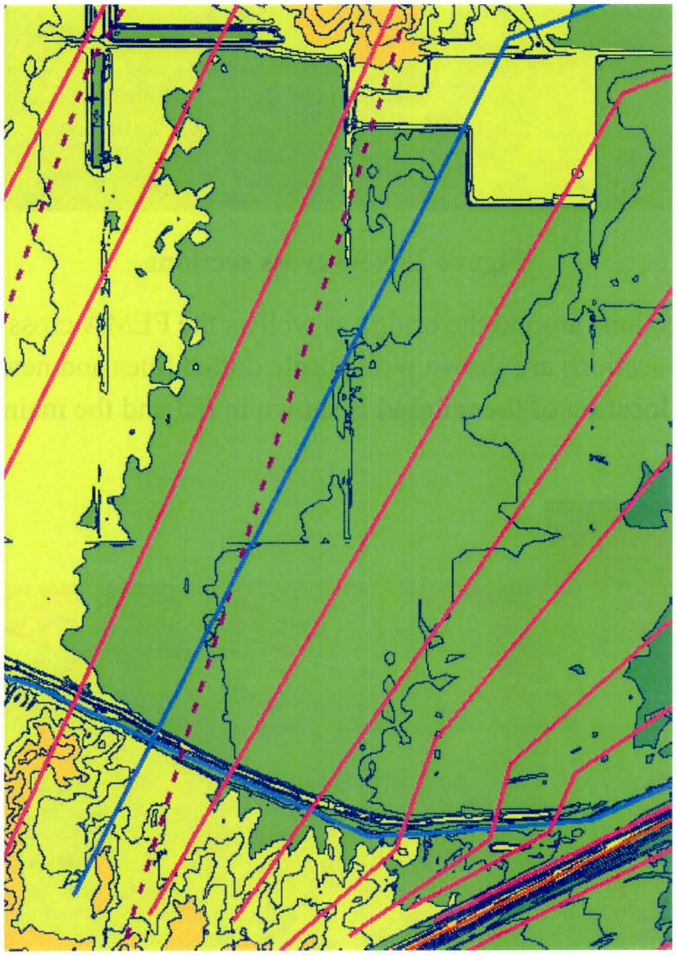


Figure 4. Effective cross section Q

CENTENNIAL WASH FLOODPLAIN DELINEATION STUDY
GILA RIVER TO LA PAZ COUNTY

CONTRACT FCD 2012C004

DRAFT FLO-2D FLOW SPLIT ANALYSIS TECHNICAL MEMORANDUM

Date: November 29, 2012

To: Jeff Shelton, Project Manager – District

From: Brian Wahlin, Project Manager – WEST Consultants, Inc.
Chuck Davis – WEST Consultants, Inc.
Suzie Monk – WEST Consultants, Inc.

The purpose of this technical memorandum is to describe the issues associated with the flow split area of the Centennial Wash that seem to necessitate the use of a more detailed, two-dimensional analysis of the hydraulics of the system utilizing FLO-2D. This technical memorandum will not discuss in great detail the one-dimensional flow split analysis to this point using HEC-RAS that supports the conclusion that a two-dimensional modeling effort is warranted for this study; this technical memorandum assumes that the one-dimensional flow split analysis is insufficient to capture the complex hydraulics of the Centennial Wash flow split. For additional documentation regarding the one-dimensional analysis to date supporting the conclusion to utilize a two-dimensional analysis as opposed to a one-dimensional analysis of the flow split area, refer to the technical memorandum developed by WEST for the District dated November 29, 2012, titled "Draft Flow Split Analysis Update Technical Memorandum."

Reasons for the improved analysis of Centennial Wash flooding using two-dimensional modeling

Again, assuming that the one-dimensional approach to assessing the flow split area is insufficient to fully capture the hydraulics of the system, the District and WEST began discussing the best methodology moving forward to analyze the area of the flow split for modeling and mapping purposes using FLO-2D. A number of reasons support this conclusion.

First, due to the facts that (1) the thalweg of the breakout channel is lower than the Centennial Wash thalweg in the vicinity of the flow split and (2) there is little high ground dividing these two channels in an area of very flat topography, the resulting hydraulics of the flow split area are two-dimensional in nature. Utilizing a two-dimensional model will better quantify the flow split

and provide certainty in the current steady-state analysis of flow split using steady-state HEC-RAS for the main flow split area.

Second, the spatial distribution of flows entering the north-south drainage feature (designed and built for flood control purposes) of the HVID system varies throughout the length of the drainage feature, and there is also variation in the possible breakout of flows from this channel into the agricultural fields downstream (i.e., to the east). Quantifying the flow that may leave the overbank flow split area and re-enter Centennial Wash through the north-south drainage feature will be crucial to accurately assessing the realistic extents of flooding in this area.

Third, the minimum breakout flow from Centennial Wash into the breakout channel estimated to date using the one-dimensional flow split analysis in HEC-RAS is 8,000 cfs. The maximum capacity of the north-south drainage feature is approximately 3,000 cfs. Even though the one-dimensional analysis to this point has been preliminary, the large disparity of flows from these analyses lead the project team to anticipate that flow will break out of the north-south drainage feature and continue to flow downstream through a highly two-dimensional system of agricultural fields where, once again, realistically assessing flooding extents will be much improved using a two-dimensional model.

Finally, floodplain storage that occurs in very wide, flat cross sections is lost in a one-dimensional assessment of flooding extents. Two-dimensional analysis helps to account for attenuation of flooding downstream that can occur due to floodplain storage, even in a steady-state analysis.

Discussion of practical application considerations for the use of FLO-2D in Centennial Wash

Regarding the application of FLO-2D to the flow spit area, WEST and the District discussed possibilities for applying FLO-2D to Centennial Wash. First, a computational domain that includes the primary flow split area, the entire main channel of Centennial Wash and the overflow flooding area, and the confluence of these two flow paths downstream would be approximately 46 square miles. If we only include the primary flow split area, the overflow flooding area, and the confluence of the two flow paths (i.e., do not include the main branch of Centennial Wash in the portion of the reach that is not influenced by the flooding extents of the overflow channel below the main flow split and above the confluence), the total area of the computational domain would be approximately 38 square miles. The 38-square-mile study area was determined by assessing the amount of overtopping in the left overbank for the main flow path of Centennial Wash below the flow split area using the entire flow available in Centennial Wash from the RBF report (i.e., no flow leaves the main branch and enters the overbank flow path). In Figure 1 below, green cross sections indicate that the cross section contains flow with the current alignment. Blue cross sections indicate that the cross section would contain flow based on the current computed water surface elevation if the cross section were extended to the

left and ended before reaching the right extent of the corresponding left overbank flowpath cross section. Yellow cross sections indicate that the cross section would contain flow based on the current computed water surface elevation if the cross section were extended to the left and overlapped the right extent of the corresponding left overbank flowpath cross section, but high ground in the right portion of the area defined using the cross sections of the left overbank flowpath would contain flow in the main channel of Centennial before reaching the defined thalweg of the left overbank flowpath. Finally, red cross sections indicate that the cross section would not contain flow based on the current computed water surface elevation until reaching the high ground on the north side of the left overbank flowpath as it is currently defined. This last situation for the red cross sections would indicate that flow could still entirely interact between the main branch of Centennial Wash and the left overbank flow path at these locations.

Further interpreting Figure 1 below, the original, western Zone A defined just downstream of the primary flow split of Centennial Wash does not appear to be high ground that will fully separate the flows of Centennial Wash and the left overbank flow path until these flows converge downstream of the agricultural area. Instead, it appears that there will be interaction of the two flowpaths between the western, smaller Zone A and the eastern, larger Zone A (which would be consistent with the original hydraulic modeling analysis completed for this project that mapped the area in between these two Zone A areas as detailed Zone AE with BFE's). Therefore, the FLO-2D modeling should contain this area as well.

To utilize the smaller area for our computational domain in FLO-2D shown in Figure 1, the District and WEST discussed placing a series of outflow nodes along the FLO-2D grid where flow would enter the main branch of Centennial Wash, then a series of inflow hydrographs where flow would reenter the FLO-2D computational domain from the main branch of Centennial Wash. Due to possibility of flood peak attenuation in the downstream direction due to floodplain storage in FLO-2D (even in a steady-state type of analysis), timing is important in two-dimensional modeling. Removing this flow from the grid at one location would mean would have to enter the exact same hydrograph into the FLO-2D model at the downstream location as-is (direct translation) or route these flows using unsteady-state HEC-RAS to account for the timing of flows along Centennial Wash. Direct translation from the upstream portion of the computational domain of FLO-2D to the lower portion of the computational domain would reduce the ability of FLO-2D to consider attenuation in the hydraulic calculations. Utilizing unsteady-state HEC-RAS to route the flood wave downstream one-dimensionally would create the need to build and debug and unsteady-state HEC-RAS model while building and debugging a FLO-2D model. With a difference in area of only 8 square miles and further considerations of reduced accuracy using direct translation or the cost of creating an unsteady HEC-RAS model for the portion of Centennial Wash not included in FLO-2D, WEST recommends modeling the entire 46 square miles using FLO-2D.

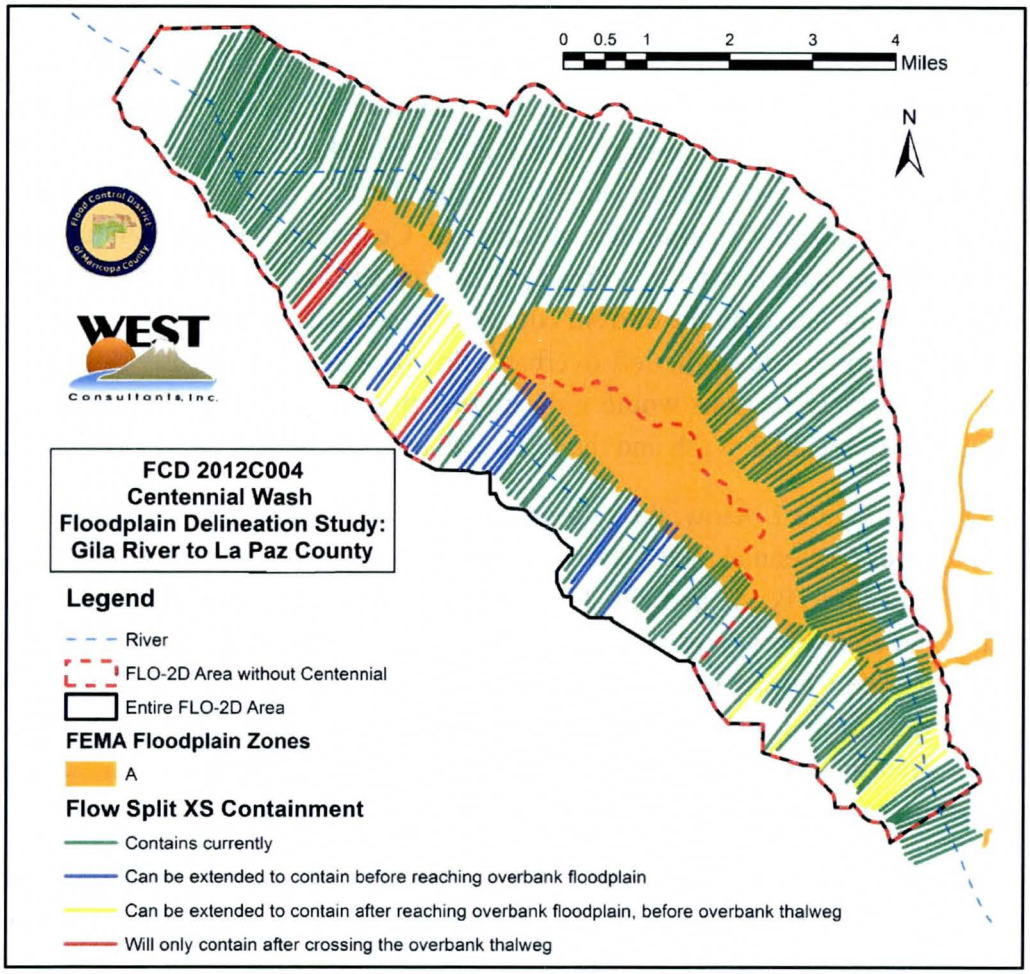


Figure 1. Cross Section Containment for the Effective Model Cross Section Alignments

In regards to grid size, with very little urban development in the project study area, a highly detailed grid resolution may not be warranted to assess flooding extents and model the hydraulics of the system. A grid size of 50 feet was discussed as reasonable, which would result in approximately 510,000 grid elements for the 46-square-mile study area or approximately 430,000 grid elements for the 38-square-mile study area. If the District would like to use a finer resolution grid, a grid size of 25 feet would result in approximately 2,000,000 grid elements for the 46-square-mile study area or approximately 1,700,000 grid elements for the 38-square-mile study area. Finally, a grid size of 35 feet would result in approximately 1,000,000 grid elements for the 46-square-mile study area or approximately 880,000 grid elements for the 38-square-mile study area.

Regardless of the final grid size, it was recommended to model the north-south drainage feature of the HVID system as a one-dimensional channel feature in FLO-2D. The District and WEST also discussed whether a FLO-2D model should be used as a stand-alone model to support FEMA mapping, or if the model should be used to calibrate an HEC-RAS steady-state model. This will continue to be discussed by the project team.

CENTENNIAL WASH FLOODPLAIN DELINEATION STUDY
GILA RIVER TO LA PAZ COUNTY

CONTRACT FCD 2012C004

DRAFT FLOW SPLIT ANALYSIS UPDATE TECHNICAL MEMORANDUM

Date: November 30, 2012

To: Jeff Shelton, Project Manager – District

From: Brian Wahlin, Project Manager – WEST Consultants, Inc.
Chuck Davis – WEST Consultants, Inc.
Suzie Monk – WEST Consultants, Inc.

The purpose of this technical memorandum is to outline the update of the flow split analysis within HEC-RAS to aid in model development and floodplain/floodway mapping for the Centennial Wash Floodplain Delineation Study (FDS) from Gila River to the La Paz County boundary. This flow split analysis was updated based on the original modeling developed for the flow split analysis from the final topographic surface and the Manning's roughness delineations delivered previously to the Flood Control District of Maricopa County (District) by WEST Consultants, Inc., (WEST). The original flow split analysis was provided to the District in a Technical Memorandum titled "Draft Flow Split Analysis Technical Memorandum" dated October 18, 2012. The primary flow split analyzed in the original analysis and in this update is the flow split immediately west of the Harquahala Valley Irrigation District's (HVID) west canal, as shown in Figure 1 below.

The steps used to update the original flow split analysis and discussed herein include the following:

1) Improve the representation of the lateral structures in the model by verifying that the lateral structures correctly capture the hydraulics of water spilling from one reach into the other.
2) Analyze the capacity of the main channel of Centennial Wash to determine what flow in the main channel would cause breakout flow to enter the overflow channel (i.e., the historic Tiger Wash alignment).
3) Analyze the capacity of the HVID flood control drainage feature that runs north-south parallel to Harquahala Valley Road.
4) Compare and analyze the results of the various models.

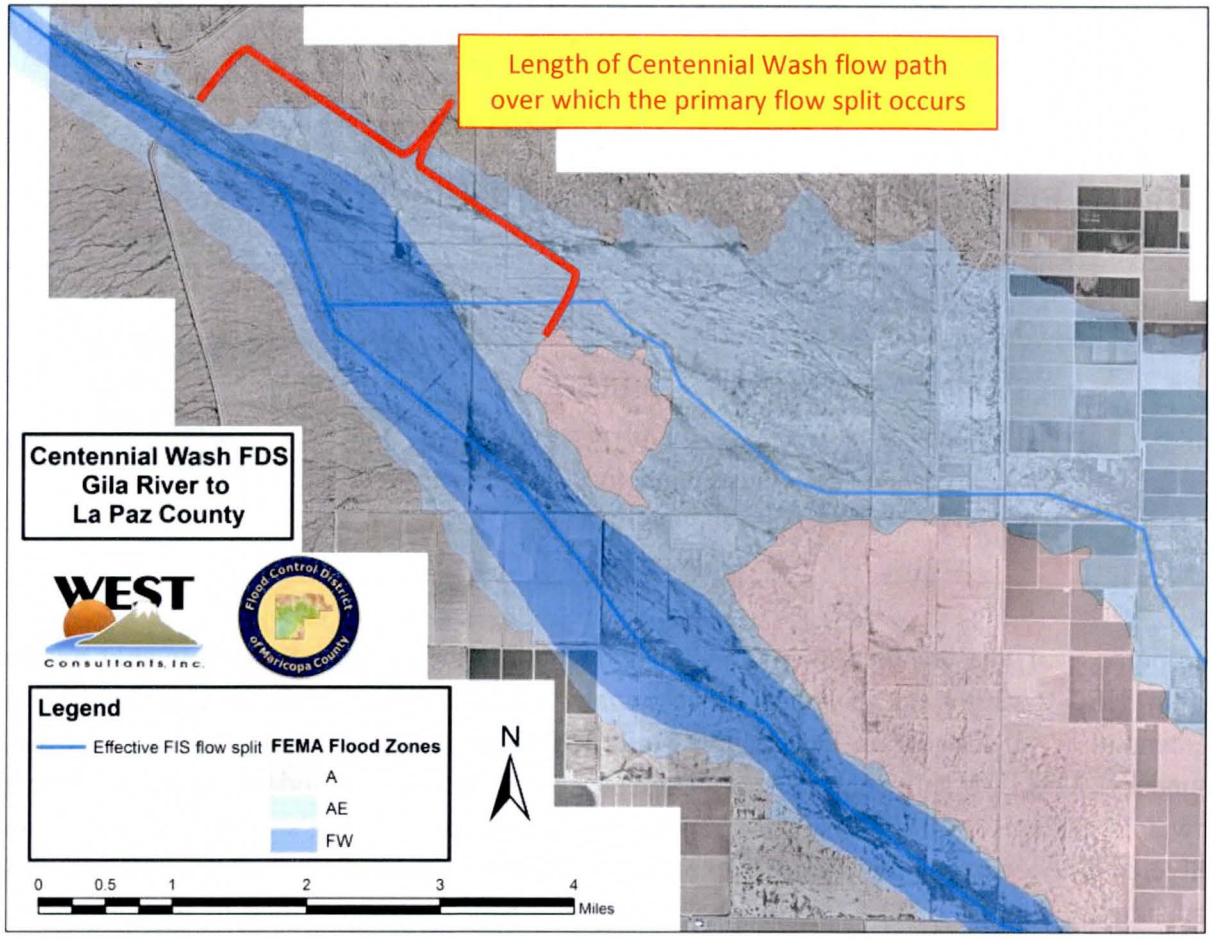


Figure 1. Primary flow split location along Centennial Wash

Step 1: Improve the representation of the lateral structures by verifying that the lateral structures correctly capture the hydraulics of water spilling from one reach into the other.

To improve the representation of the lateral structures in the model by verifying that the lateral structures correctly capture the hydraulics of water spilling from one reach into the other, WEST tested the sensitivity of the model results to the lateral weir structure lengths and weir coefficients. Additionally, the number of lateral weir structures utilized in the model and the level of detail included in the definition of the weir geometry were subjected to sensitivity testing. The final results still ranged from a maximum breakout flow between 8,000 and 13,500 cfs. Figure 2, Figure 3, and Figure 4 below showcase some of these results. The various geometries listed in these results figures refer to preliminary HEC-RAS geometries that represent the variations in lateral weir structure lengths, weir coefficients, the number of lateral structures used, and the level of detail included in the definition of the lateral structure weir geometry used to run the split flow analysis. These various geometries are explained following Figure 4.

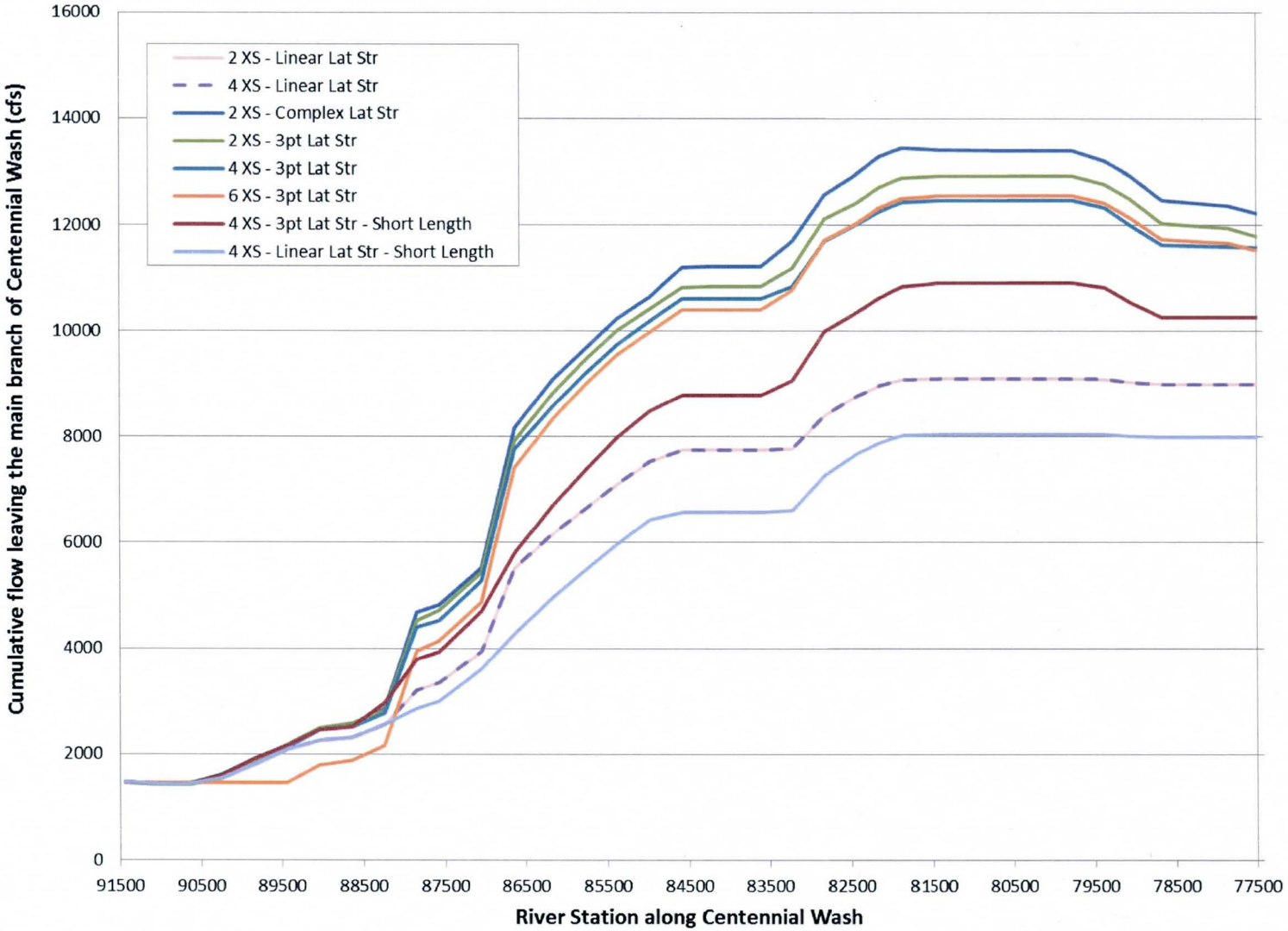


Figure 2. Flow split analysis results for various geometries used to define the flow split analysis along Centennial Wash

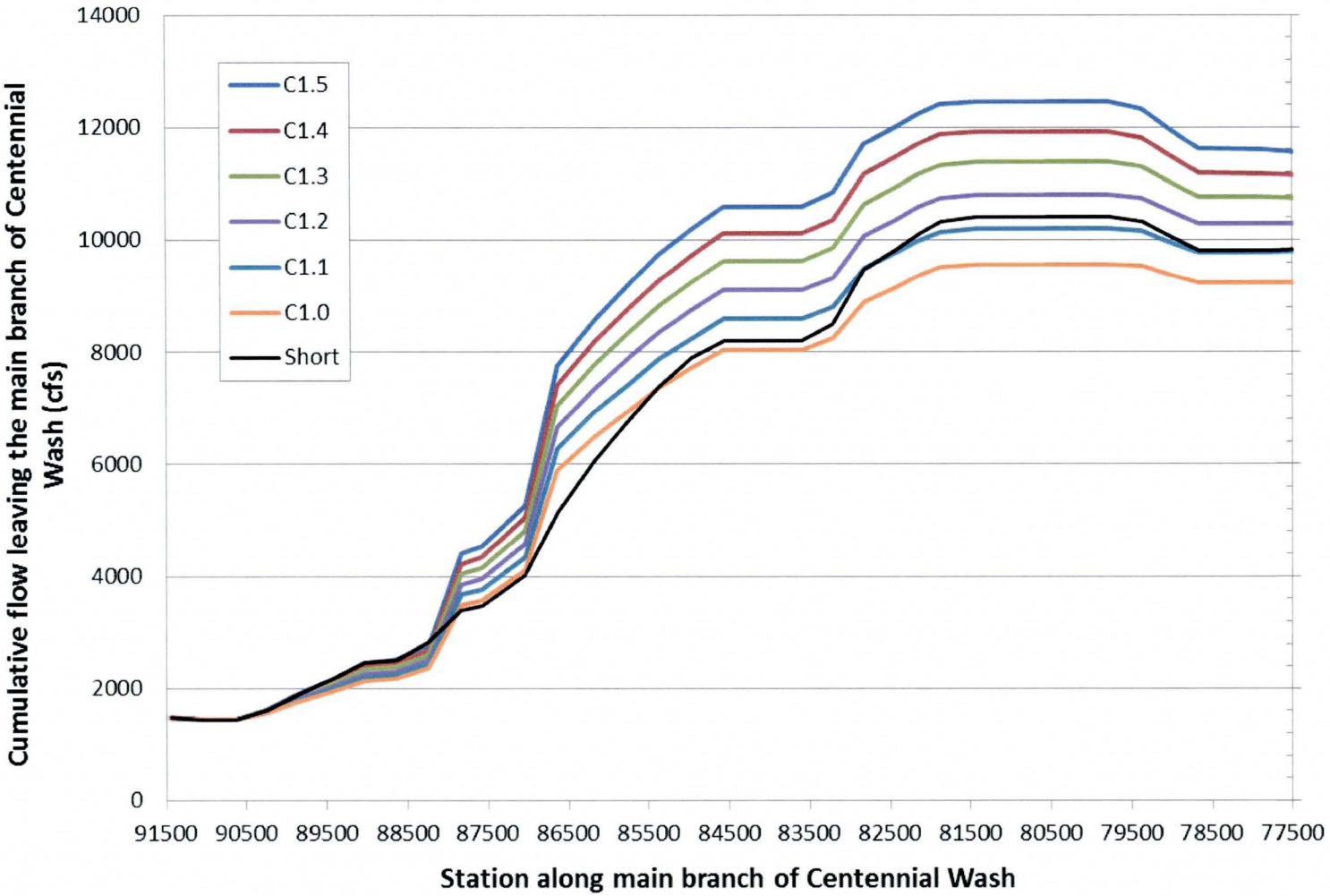


Figure 3. Flow split analysis results for the lateral structure weir coefficient sensitivity analysis for the "4 XS – 3pt Lat Str" geometry for Centennial Wash

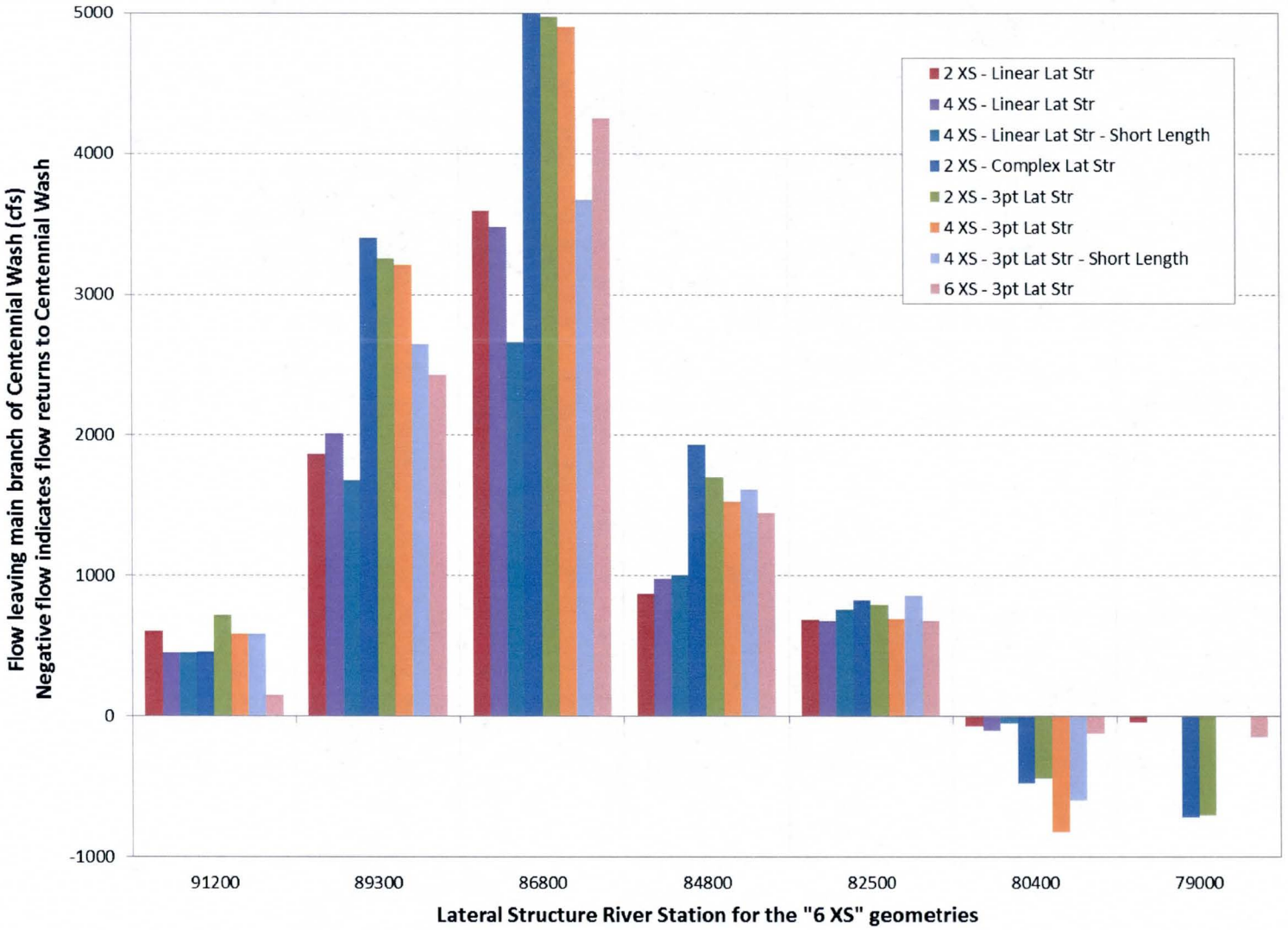


Figure 4. Flow split analysis results by reach for various geometries. The results from the two cross section and four cross section geometries were applied to the six cross section lateral structure reaches from the "6 XS" geometry for this figure.

Sensitivity to lateral weir structure lengths

In Figure 2, Figure 3, and Figure 4 above, there are two plans that include the text "Short Length" in the title. These plans refer to the length of the lateral structure itself. Figure 5 below shows the original lateral structures as defined in HEC-GeoRAS to capture the high ground in the left overbank of the main Centennial Wash cross sections. In between some cross sections, the lateral structure length is at a severely skewed angle compared to the cross section alignment to capture the high ground in the next cross section downstream. However, internal review by WEST personnel pointed out that the hydraulics of the flow spilling from one side to the other would not correspond to the much longer weir length afforded by this highly skewed angle; it would correspond to a more direct path from one cross section to the next. The longer length arbitrarily improves the efficiency of the lateral structure more than it should be. The yellow lines in Figure 5 show the reach lengths used to update the distance between cross sections with arbitrarily long weir lengths in the plans with "Short Length" in the title, which it can be seen effects the results by lowering the flow entering the overbank flow path significantly compared to the corresponding plan with the original reach lengths.

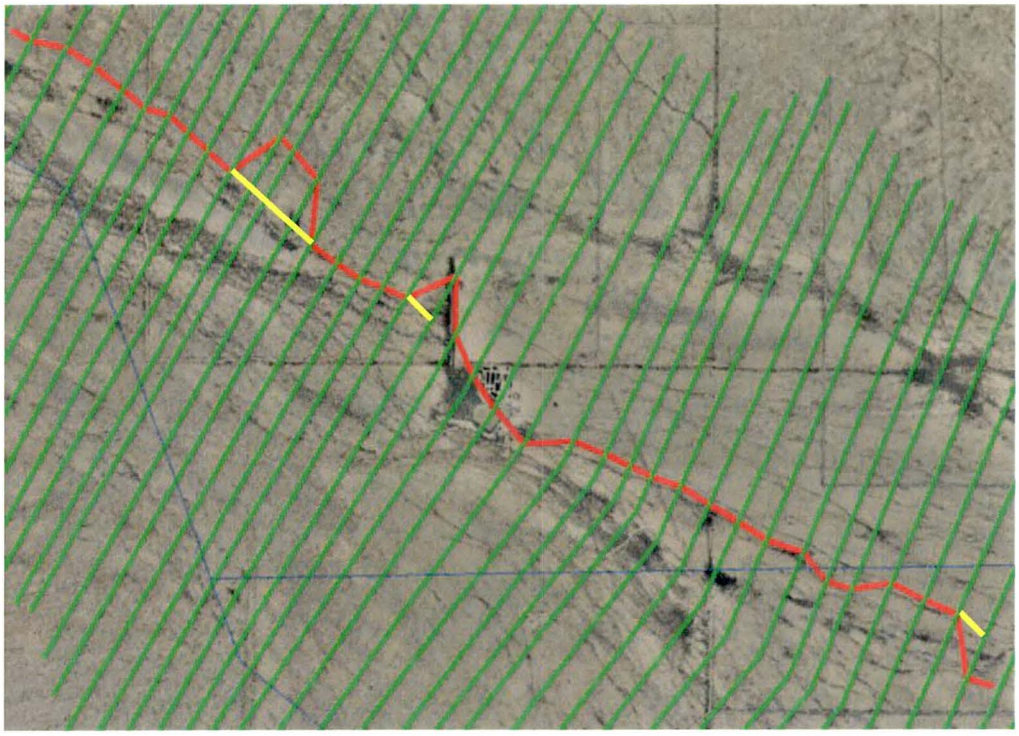


Figure 5. Consideration of lateral structure length in the model. The red lines correspond to the original lateral structure length between cross sections. The yellow lines correspond to the updated lateral structure length between cross sections for the "Short Length" plans

Sensitivity to lateral weir coefficients

The lateral weir coefficient value (C) used in the split flow analysis for all results in Figure 2 and Figure 4 was 1.5. This is low compared to typical values for weir coefficients (typically in the range of 2.6 to 3.0). However, this low value is warranted due to (1) the highly inefficient weir surface of the natural overbank area in the Centennial Wash study reach represented using the lateral structures and (2) the fact that flow is generally parallel to the lateral structure as opposed to perpendicular to a transverse weir structure across the channel (which is the situation for which the empirical weir equations were derived) making the losses more significant over these lateral structures.

In Figure 3 above, a sensitivity analysis was done for the "4 XS – 3pt Lat Str" plan to show the effects of various lateral weir coefficients on the split flow analysis results. As can be seen from these results, the value chosen for the lateral weir coefficient can vary the maximum flow leaving Centennial Wash significantly, from approximately 9,500 cfs for C = 1.0 up to approximately 12,500 cfs for C = 1.5.

Sensitivity to the number of lateral weir structures utilized in the model

The number of lateral weir structures utilized in the model is important for optimization purposes. Generally, these types of modeling exercises attempt to use the fewest number of lateral structures possible in the modeling effort to allow a single weir calculation to balance over as many cross sections as possible. This provides a better reach-averaged assessment of the energy that would drive flow one direction or the other in the case of the Centennial Wash flow split. However, defining a lateral structure that is too long (i.e., that spans too many cross sections) will not allow for the numerical optimization routines to converge on an acceptable answer for flow across the lateral structure. Therefore, modelers are left to determine the best way to define the lateral structures in the model.

In Figure 2 and Figure 4 above, each plan is denoted initially with an indicator of "2 XS", "4 XS", or "6 XS" which indicates the general number of cross sections that a single lateral structure spans in the model. The flow split in this analysis was defined over 39 of the original effective cross sections; due to the odd number of cross sections, not every lateral structure spanned exactly two, four, or six cross sections for the "2 XS", "4 XS", or "6 XS" plans, respectively. Therefore, the "2 XS" plans included 19 lateral structures, the "4 XS" plans included 9 lateral structures, and "6 XS" plans included 7 lateral structures.

Figure 6 below shows an example of the differences in the representation of the lateral structures spanning 6 cross sections near the stock pond in the Centennial Wash flow split area. The representation of the lateral structures across these six cross sections are broken into three lateral structures for a "2 XS" plan geometry, while this same area is represented with a single lateral structure for a "6 XS" plan geometry.

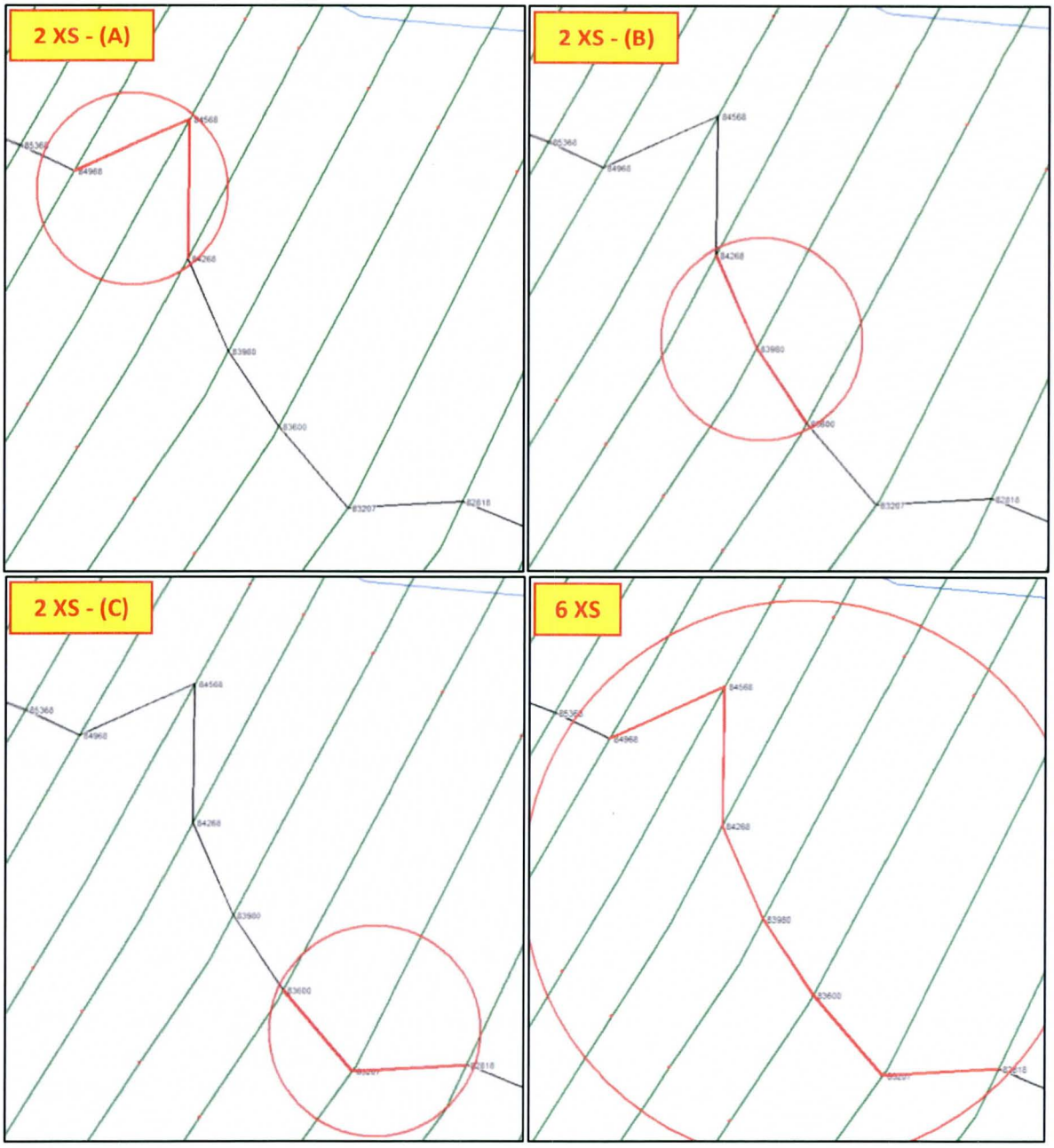


Figure 6. Schematic representation of the lateral structures spanning the same 6 cross sections for a "2 XS" plan (3 lateral structures shown in A, B, and C above) and a "6 XS" plan (1 lateral structure). Screenshots taken from the geometric data editor of HEC-RAS.

Sensitivity to the level of detail included in the definition of the weir geometry

The level of detail included in the definition of the lateral weir structure geometry utilized in the model is important for optimization purposes as well. Generally, these types of modeling exercises attempt to use the greatest level of detail possible to define the geometry of the weir structure to best represent the physical conditions of flow spilling from one reach to the other. However, highly complex definition of lateral structure geometry will not allow for the numerical optimization routines to converge on an acceptable answer for flow across the lateral structure. Therefore, modelers are left to determine the optimum amount of definition to include in the definition of the lateral structure geometry.

In Figure 2 and Figure 4 above, each plan is denoted with an indicator of "Complex Lat Str", "Linear Lat Str", or "3 pt Lat Str" which indicates the general number of points between cross sections used to define the geometry of the lateral structures in the model. "Complex Lat Str" indicates that as much definition as was available to extract from the final DEM surface for the Centennial Wash project was used to define the variation in weir geometry along the length of a lateral structure between cross sections. "Linear Lat Str" indicates that only the high-ground elevation at the left endpoint of each cross section along the main Centennial Wash alignment were used to define the weir geometry between cross sections; in other words, all of the detail and variation in ground elevation between cross sections was removed for the "Linear Lat Str" plans. Finally, "3 pt Lat Str" is effectively a compromise between these two options. Based on visual assessment, approximately three points were defined between each cross section to capture the general shape of the variation in weir geometry along the length of a lateral structure without including every single point extracted from the DEM.

Figure 7 below shows an example of the differences in the representation of the same lateral structure in various "2 XS" plans for the "Complex Lat Str", "Linear Lat Str", and "3 pt Lat Str" conditions. This figure shows the lateral structures in profile view with the top of the gray area representing the "weir crest" over which flow can spill from Centennial Wash into the overflow channel (or vice versa) during the calculations.

It was determined that the "Complex Lat Str" geometry was not able to optimize, but the "Linear Lat Str" geometries underestimated breakout flow significantly because low points between cross sections that were extracted from the DEM to define the longitudinal profile of the lateral structure were not included in this simplification of the weir geometry. Therefore, the "3 pt Lat Str" geometries were developed as a compromise between these two plans, and "3 pt Lat Str" geometries allowed the optimization schemes to converge on reasonable answers for the flow spilt analysis.

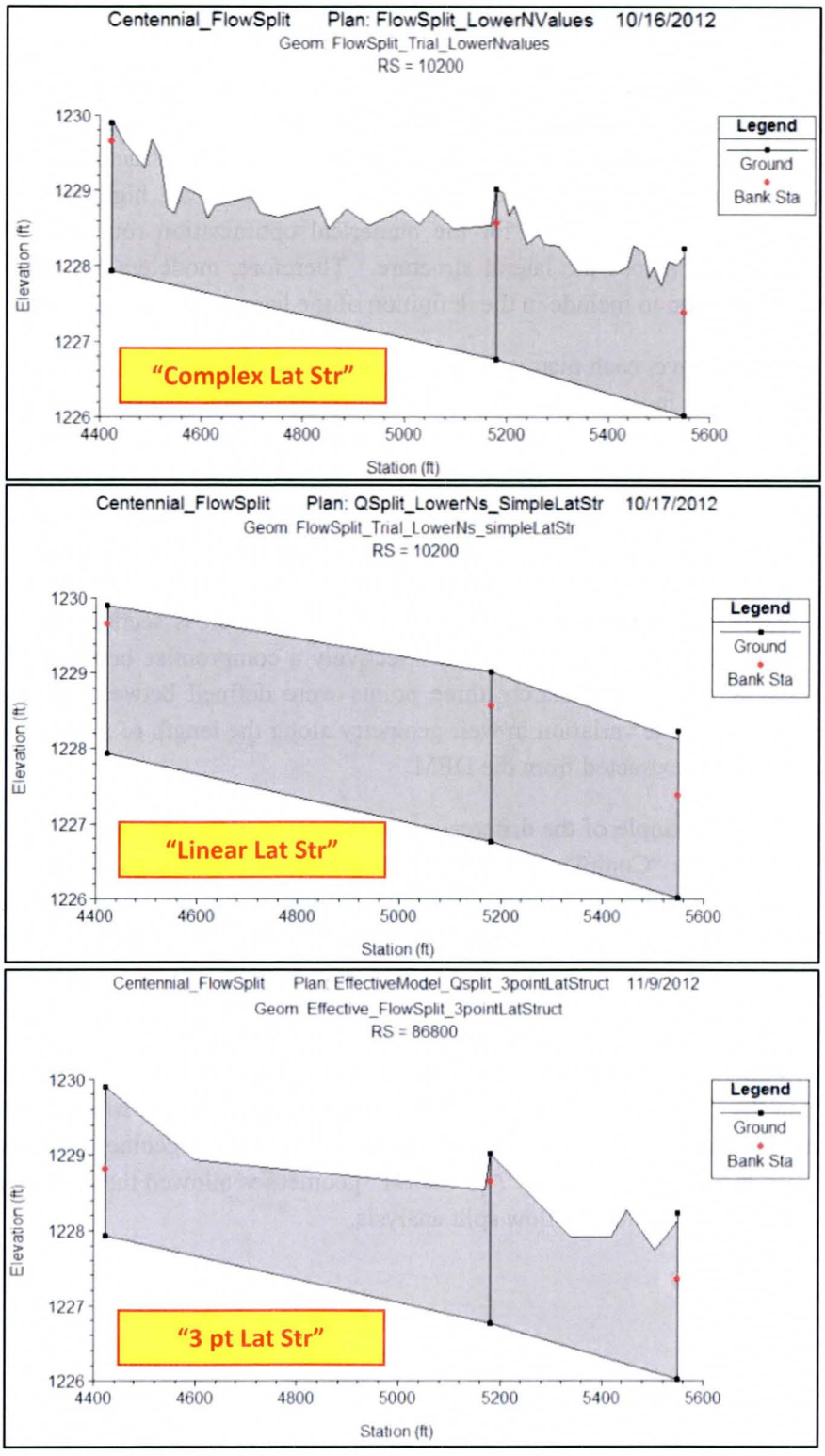


Figure 7. Profile view of the lateral structure geometry definition for the same lateral structure for "Complex Lat Str", "Linear Lat Str", and "3 pt Lat Str" plans. (Note that the difference in RS is due to differences in stationing scheme for the various plans, but this is the same lateral structure in the system).

Step 2: Analyze the capacity of the main channel of Centennial Wash to determine what flow in the main channel would cause breakout flow to enter the overflow channel.

WEST analyzed the capacity of the main channel of Centennial Wash to determine what flow in the main channel would cause breakout flow to enter the overflow channel (i.e., the historic Tiger Wash alignment). This analysis showed that, due to the flat topography in the study area and the lack of clearly defined high ground between the two channels, flows well below the peak flow of 34,347 cfs (as per the RBF CLOMR study) could still introduce significant amounts of flow into the breakout channel. From previous discussions between WEST and the District, it had been proposed to possibly analyze the flow split area using unsteady flow modeling to determine the volume of water that might leave the main stem during a flood event if the main channel contained completely the flows below some flow value near the peak (e.g., if the main channel could contain flows up to 32,000 cfs, then only that portion of the hydrograph above 32,000 would be available to leave the main channel). It was discussed that this unsteady flow analysis could possibly result in a peak flow in the breakout channel far less than a similar split flow analysis using steady-state flow modeling, which does not take into account the unsteady nature of storm events and the possible limitations in peak flow in the breakout channel due to volume constraints of the hydrograph. However, flows below 20,000 cfs were still shown to send significant amounts of flow into the breakout channel. From the unsteady flow hydrograph technical memorandum submitted to the District by WEST on November 5, the amount of time for which the flood hydrograph exceeds 20,000 cfs is a large percentage of the total time of the storm hydrograph. From this preliminary capacity analysis of the main branch of Centennial Wash and discussion between WEST and the District, it was determined that the possibility of an unsteady model significantly reducing the breakout flow was likely low, since there would likely be ample time for the amount of water leaving the main branch of Centennial Wash and entering the breakout channel to create an almost steady-state condition in the breakout channel that would be limited by head differential between the two channels and not limited by the volume of water available in the unsteady hydrograph. In other words, this preliminary unsteady modeling task supported the use of steady-state hydraulic modeling to analyze the flow splits. Therefore, the District and WEST decided to forgo unsteady HEC-RAS modeling for the flow split area at this time.

Step 3: Analyze the capacity of the HVID flood control drainage feature that runs north-south parallel to Harquahala Valley Road.

WEST analyzed the capacity of the HVID flood control drainage feature that runs north-south parallel to Harquahala Valley Road. This analysis showed that the capacity of the channel ranges from approximately 500 cfs near the northern end of the channel feature to on the order of 3,000 cfs near the downstream end of this channel feature. It was estimated that an overall average "capacity" of this feature would be between 1,000 and 2,000 cfs. This analysis agreed conceptually with the as-built plans for this channel, which shows that the channel increases in size (bottom width and flow depth) from upstream to downstream. The District and WEST discussed this analysis in detail at the meeting. Three things of specific note came from this discussion. First, this analysis still does not include the 3-barrel culvert in the north-south drainage feature at Centennial Road. Including this hydraulic structure directly

in the model could further reduce the capacity of this drainage feature for purposes of overall channel capacity. Second, the water surface elevation in the channel within the north-south drainage feature compared to the natural ground downstream of the embankment along the east bank of the north-south drainage feature was well over one foot at some locations. Therefore, for purposes of a FEMA assessment, this feature would be considered a non-certified embankment that cannot be relied upon for flood control purposes and must be removed for modeling purposes. Third, it appears that breakout could occur at multiple locations along the length of the north-south drainage feature, as flows below the minimum flow leaving the main branch of Centennial Wash as identified in the split flow analysis above would overwhelm the north-south drainage feature's downstream embankment at several locations.

Step 4: Compare and analyze the results of the various models.

Summarizing the HEC-RAS flow split analysis above based on sensitivity to various modeling parameters, WEST feels that the "4 XS – 3 pt Lat Str – Short Length" plan as defined in Figure 2 and Figure 4 above is likely the best representation of the flow split area to this point. However, WEST would like to point out the wide discrepancy in breakout flow values based on these sensitivity analyses; additionally, each of these modeling parameters tested in the sensitivity analyses were within a reasonable range of values based on engineering judgment. Additionally, WEST and the District aimed to make a determination regarding the best future direction for the flow split analysis considering the flow split analysis as well as the conclusions of the capacity analysis of the main branch of Centennial Wash and the capacity analysis of the HVID north-south drainage channel.

With these results in mind, the District and WEST began discussing the best methodology moving forward to analyze the area of the flow split for modeling and mapping purposes. The discussion concluded that a two-dimensional assessment of flooding conditions in this area—specifically, the use of FLO-2D—would be the best approach for quantifying flooding issues in the vicinity of the flow split for a number of reasons:

1) Due to the facts that (a) the thalweg of the breakout channel is lower than the Centennial Wash thalweg in the vicinity of the flow split and (b) there is little high ground dividing these two channels in an area of very flat topography, the resulting hydraulics of the flow split area are two-dimensional in nature. This can be seen in the significant discrepancy in flow values from the HEC-RAS modeling results for sensitivity analyses across an acceptable range of values for various modeling parameters. Utilizing a two-dimensional model will better quantify the flow split and provide certainty in the current steady-state analysis of flow split using steady-state HEC-RAS for the main flow split area.

2) The spatial distribution of flows entering the north-south drainage feature of the HVID system varies throughout its length, and there is also variation in the possible breakout of flows from this channel into the agricultural fields downstream. Quantifying the flow that may leave the overbank flow split area and re-enter Centennial Wash through the north-south drainage feature will be crucial to accurately assessing the realistic extents of flooding in this area.

3) The minimum breakout flow from Centennial Wash into the breakout channel estimated to this point is 8,000 cfs. The maximum capacity of the north-south drainage feature is approximately 3,000 cfs. Even though the analysis to this point has been preliminary, the large disparity of the minimum flow expected to break out of Centennial Wash and the maximum flow that can be contained in the north-south drainage feature lead the project team to anticipate that flow will break out of the north-south drainage feature, regardless of the continued refinement of the flow split analysis in HEC-RAS. Therefore, flows will enter a highly two-dimensional system of agricultural fields downstream of the eastern embankment of the HVID north-south drainage feature where, once again, realistically assessing flooding extents will be improved using a two-dimensional analysis.

4) Floodplain storage that occurs in very wide, flat cross sections is lost in a one-dimensional assessment of flooding extents (i.e., HEC-RAS). Two-dimensional analysis helps to account for attenuation of flooding that can occur due to floodplain storage, even in a steady-state analysis, due to reduction in the volume of water available in the downstream direction as water is stored in the floodplain elements.

CENTENNIAL WASH FLOODPLAIN DELINEATION STUDY
GILA RIVER TO LA PAZ COUNTY

CONTRACT FCD 2012C004

UPDATE TO THE BRIDGE CALIBRATION HEC-RAS MODEL TECHNICAL MEMORANDUM

Date: December 17, 2012

To: Jeff Shelton, Project Manager – FCDMC

From: Brian Wahlin, Project Manager – WEST Consultants, Inc.
Chuck Davis – WEST Consultants, Inc.
Suzie Monk – WEST Consultants, Inc.

The purpose of this technical memorandum is to outline the development of a calibration technique to estimate the flows through the various trestle openings of the Union Pacific Railroad Bridge over Centennial Wash for the HEC-RAS hydraulic model that will be used for updating the FEMA floodplain/floodway mapping of the Centennial Wash on FEMA's FIRM panels. The memorandum will first describe the nature of the Centennial Wash flows through the Union Pacific Railroad Bridge, then describe the recommended calibration technique determined by the FCDMC and WEST, and finally present results of this analysis.

Nature of the Centennial Wash flows through the Union Pacific Railroad Bridge

The Union Pacific Railroad Bridge crosses Centennial Wash approximately 7.2 miles upstream of the confluence of Centennial Wash with the Gila River. This bridge contains four (4) separate and distinct trestle crossings of the wash to allow flood flows from Centennial Wash that overwhelm the primary trestle crossing to pass through the other three trestle crossings and not overtop the embankment. Figure 1 below shows the locations of the four separate trestle crossings of the railroad embankment over the wash. The primary trestle crossing, Bridge Opening Number 1 in Figure 1 below, is the southwestern-most opening along the railroad embankment. This opening contains the gaging station maintained by the FCDMC. This opening has a high feature on the left overbank that persists for at least a mile upstream. This trestle crossing is also the lowest bridge opening as far as invert elevation, followed by bridge openings 4, 3, and 2 in order from lowest to highest. This is shown graphically in Figure 2, an elevation profile taken directly from the final surface along the top of the embankment for the railroad bridge.

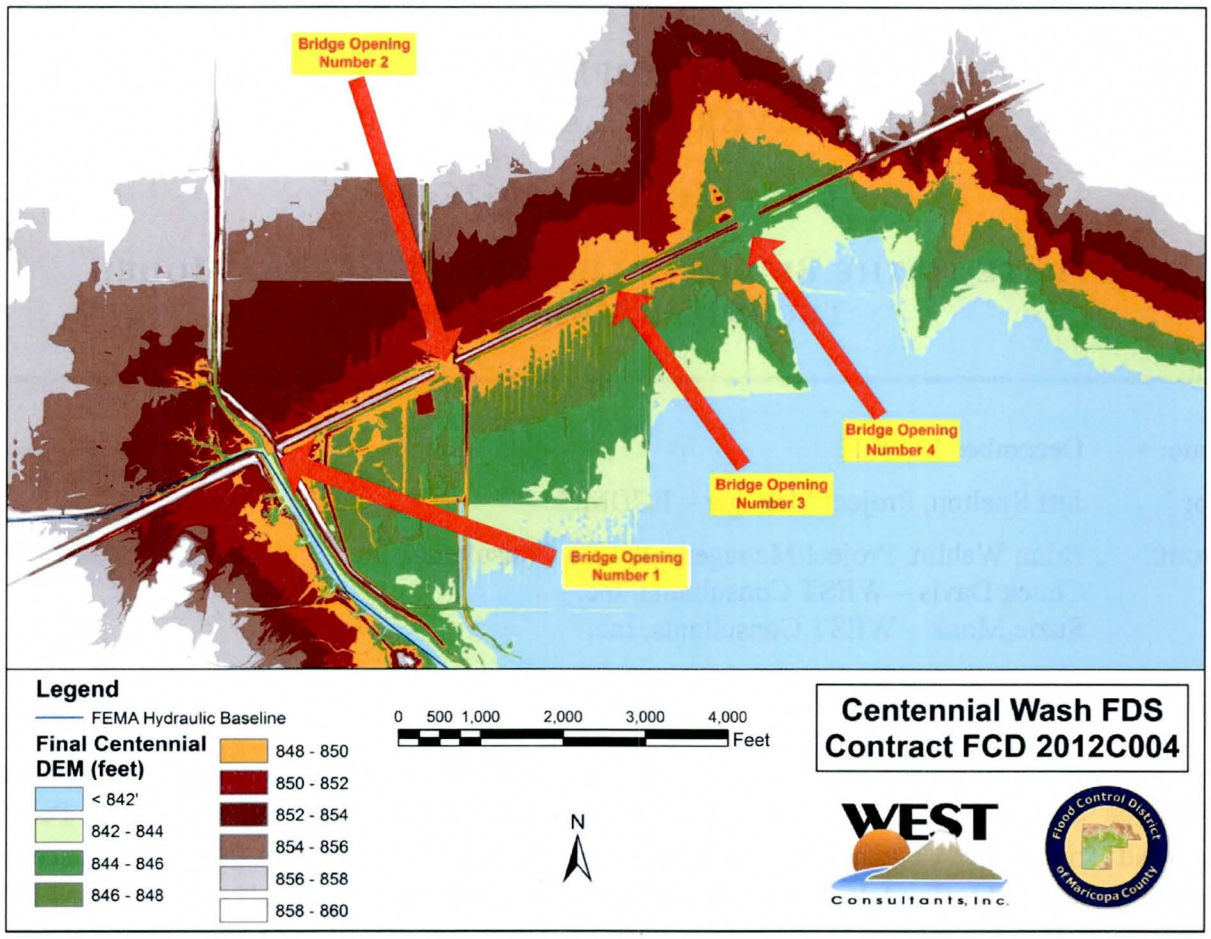


Figure 1. Trestle Crossing locations for UPRR Bridge

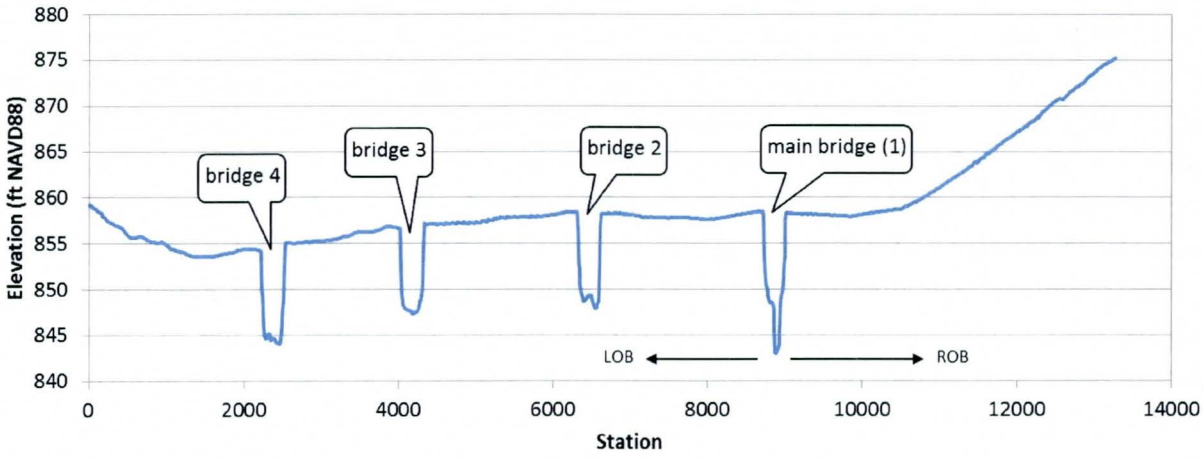


Figure 2. Profile from the DEM along the top of the railroad embankment

First calibration technique determined by the FCDMC and WEST

Jeff Shelton recommended a cross section alignment similar to that shown in Figure 3 below. This setup would create a junction upstream of the main bridge opening, with the primary flow path of Centennial Wash defined upstream and downstream of this junction. Cross sections upstream of this junction along Centennial Wash are similar to the alignments for the effective model cross sections. Cross section downstream of this junction along Centennial Wash are drawn parallel to the railroad embankment with the left endpoint of the cross section ending at the high-point of the levee-like embankment downstream of the railroad bridge along the main stem of Centennial Wash that separates flow in the main channel from flows in the left overbank. The third reach leaving this junction runs parallel to the railroad embankment just upstream of the start of the embankment itself. Cross sections on this reach are drawn perpendicular to the railroad embankment to capture flows leaving Centennial Wash and traveling along the railroad before flowing downstream through the additional railroad trestle crossings. Lateral structures were added to the right endpoints of these cross sections to capture water flowing through the additional trestle crossings.

WEST added to this recommended calibration technique by adding an overbank flow path in the left overbank downstream of the railroad bridge on the east side of the levee-like feature that would act to contain flow downstream of the primary opening of the bridge and separate flow in the main low-flow channel from the flow in the left overbank in this portion of the reach. This overbank flow path reconnects with the main stem of Centennial Wash at a low point in the levee-like structure downstream of the railroad embankment. Adding this overbank flow path allows water surface elevations in the left overbank downstream of the railroad embankment to be computed separately from the water surface elevations in the main channel.

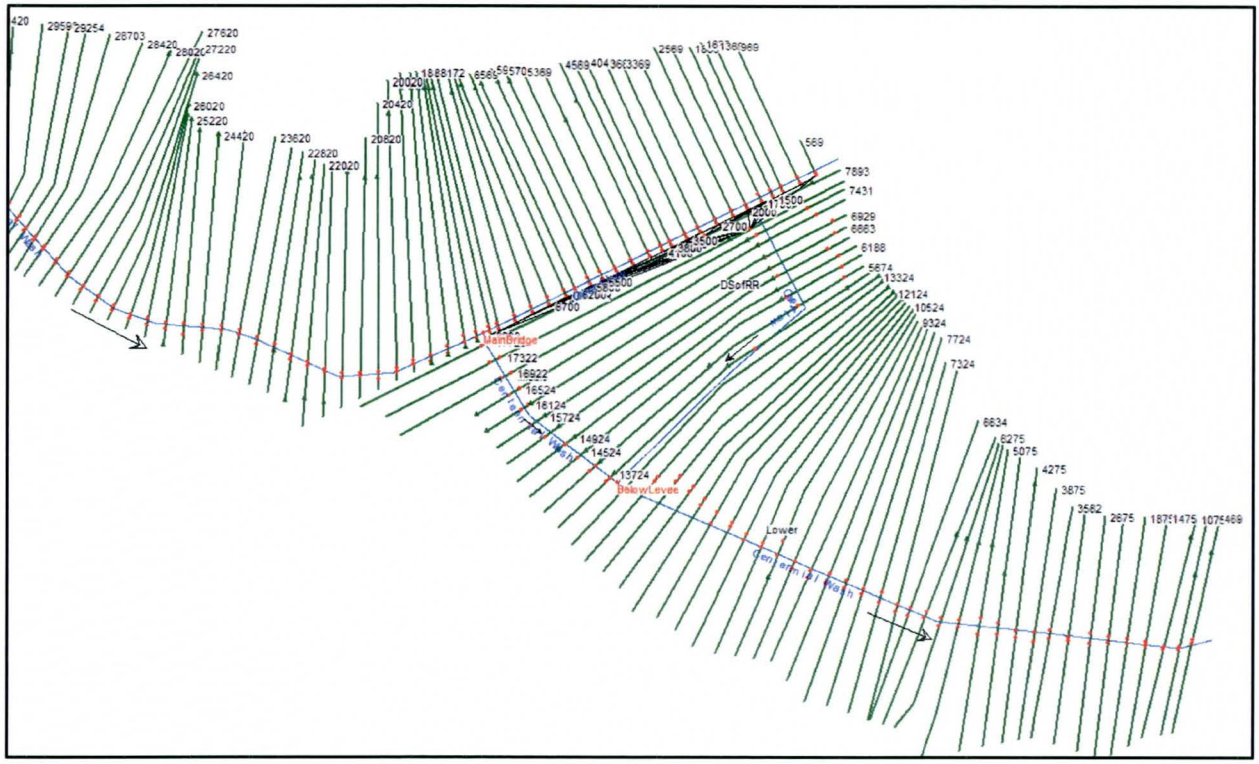


Figure 3. Plan view of HEC-RAS geometry for bridge calibration model 1

The flows in each channel using this geometry are presented in Table 1.

Table 1. Flows in each reach using calibration technique 1

Location	Flow (cfs)	Notes
Centennial Wash		
Upstream of bridge	38,552	
Middle reach (below bridge)	28,348	28,348 + 15,694 = 44,042 44,041 is the Q from CLOMR
Lower Reach (below confluence)	42,614	42,614 + 1,694 = 44,307 44,041 is the Q from CLOMR
Reach defined parallel to railroad		
Upstream of Trestle #2	15,694	41% of 38,552
Upstream of Trestle #3	8,224	21% of 38,552 52% of 15,694
Upstream of Trestle #4	1,694	04% of 38,552
Overbank flow path downstream of railroad	14,267	

Second calibration technique determined by WEST

After developing the model according to the first calibration technique, it was observed that the high feature in the left overbank upstream of the bridge structure acted as a weir that was not being captured by the existing cross sections. A second cross section geometry was developed as shown in Figure 4. In this setup, trestle bridges 1 and 4 are defined as bridges and bridges 2 and 3 are defined as lateral structures. The cross sections above the main bridge (trestle #1) are truncated at the embankment in the left overbank, where lateral structures are defined. These lateral structures lead into an overflow channel that runs along the railroad as in the first plan and diverts water downstream through the second and third bridge openings (piers are defined using ground points in the lateral structure for this plan). Three flow paths join at the downstream junction: the flow path downstream of bridge 1 (the main flow path of Centennial Wash), the flow path downstream of the second and third bridges, and the channel downstream of the fourth bridge. The flow change was defined downstream of the last lateral structure on Centennial Wash so only a percentage of 38552 cfs could be diverted through the lateral structures instead of a percentage of 44041 cfs as it was defined in the first method.

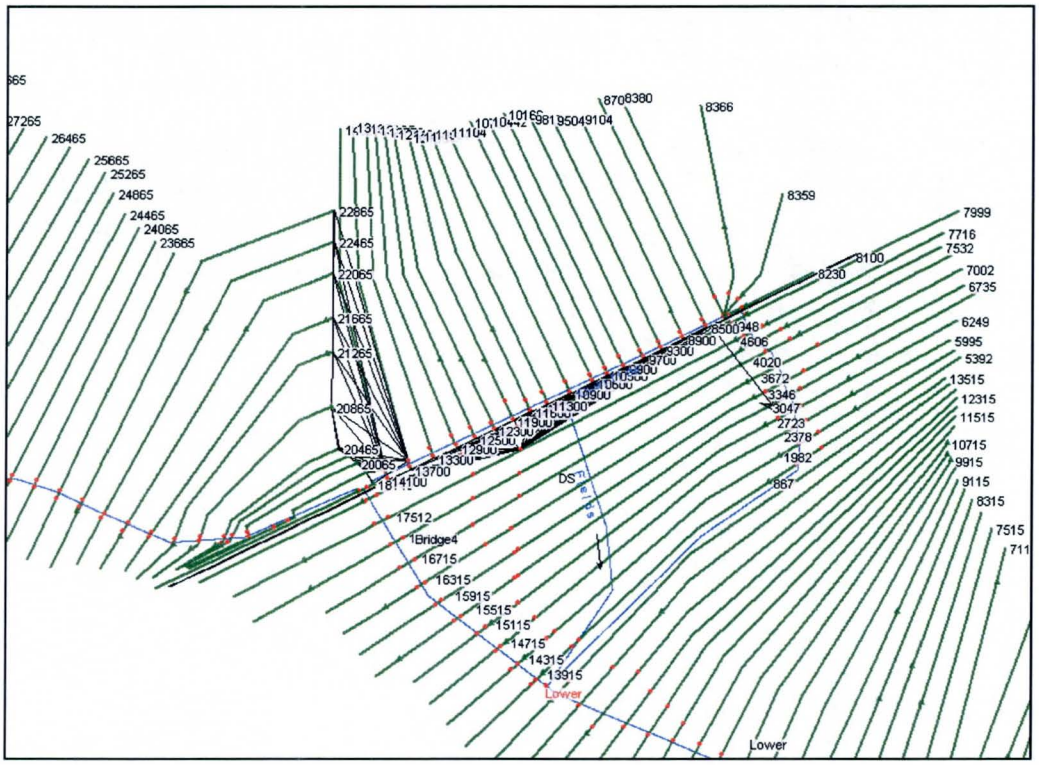


Figure 4. Plan view of HEC-RAS geometry for bridge calibration model 2

The flows in each channel using this second geometry are presented in Table 2.

Table 2. Flows in each reach using calibration technique 2

Location	Flow (cfs)	Notes
Centennial Wash		
Upstream of bridge	38,552	
After lateral structures, before Trestle #1	22,004	22,004 + 16,549 = 38,553 38,552 is the Q from CLOMR
After Trestle #1	27,493	22,004 + (44,041 - 38,552) = 27,493 44,041 is the Q from CLOMR at UPRR
Lower Reach (below confluence)	44,041	44,041 is the Q from CLOMR at UPRR
Reach defined parallel to railroad		
Upstream of Trestle #2	16,549	43% of 38,552
Upstream of Trestle #3	7,434	19% of 38,552 45% of 16,548
Upstream of Trestle #4	3,003	8% of 38,552 18% of 16,548
Flow path downstream of Trestles #2 and #3	13,547	
Flow path downstream of Trestle #4	3,003	

The second method results in approximately 1,000 cfs more going into the overbank channel but the added hydraulic complexity of increased detail in the representation of the bridge structure represents the flow patterns more accurately than the first method. Because of the significant differences between the two model geometries (i.e., the inclusion of greater detail in the definition of the bridge structures), the results should not be directly compared. For this reason, WEST suggests using the second method's results for calibration.

CENTENNIAL WASH FLOODPLAIN DELINEATION STUDY
GILA RIVER TO LA PAZ COUNTY

CONTRACT FCD 2012C004

FIRST DRAFT HEC-RAS MODEL DELIVERABLES TO FCDMC
TECHNICAL MEMORANDUM

Date: December 17, 2012

To: Jeff Shelton, Project Manager – FCDMC

From: Brian Wahlin, Project Manager – WEST Consultants, Inc.
Chuck Davis – WEST Consultants, Inc.
Suzie Monk – WEST Consultants, Inc.

The purpose of this technical memorandum is to outline the draft HEC-RAS submittal provided to the FCDMC as per the schedule for the Centennial Wash FDS. This technical memorandum provides (1) a brief outline of the electronic files submitted to the FCDMC for review and (2) a discussion of a few of the primary concerns that WEST feels the FCDMC staff may raise during the review process and the reason these concerns were not addressed more fully for this draft deliverable.

Outline of the electronic files submitted for the draft HEC-RAS review

Items submitted for the draft HEC-RAS model review for the Centennial Wash FDS include the HEC-RAS models themselves developed to this point for use in floodplain inundation mapping as well as support of other hydraulic analysis related to the system (i.e., analysis of the flow split area just east of the Harquahala Valley Irrigation District's Westside Canal, analysis of bridge hydraulics at the Union Pacific Railroad Bridge, etc.) as well as shapefiles supporting the development of these HEC-RAS models using HEC-GeoRAS. HEC-GeoRAS version 4.3.93 was used within ArcGIS version 9.3.1 to extract these cross sections from the final DEM surface developed by WEST from the topographic data provided previously by FCDMC to create the HEC-RAS models. The most recent public release of HEC-RAS, version 4.1, was used to create and run all models submitted herein.

Description of the HEC-RAS models submitted to the FCDMC for review

The HEC-RAS models submitted to the FCDMC for review include the following six models:

1) *Primary floodplain mapping models*
   a. *Centennial Wash above HVID Westside Canal*
      This is a model from the Maricopa County/La Paz County boundary to just downstream of the HVID Westside Canal siphon under Centennial Wash. The ground elevations for the upstream-most cross section in this model (RM 41.04) were extracted from the topography provided to WEST by the FCDMC; however, the FCDMC topography did not extend far enough into the right overbank (i.e., across the La Paz County border) to contain flow at this location. To overcome this issue, WEST utilized the effective geometry from the corresponding cross section to extend this cross section further into the right overbank. It should be noted that WEST aligned this cross section exactly with the corresponding cross section from the effective model (RS 280) in order to be able to complete this task. Additionally, WEST shifted the effective elevations for this cross section from NGVD29 to NAVD88 using a shift value of 2.14' (an average of the shift values as calculated by VERTCON for the four corners of the corresponding USGS quadrangle titled "Courthouse Well"). Ground points 0 to 3558.85 in this cross section were extracted from the FCDMC topography; ground points 3622.67 to 6232.87 were taken from the effective model cross section 280.

      The downstream station of this model is RM 36.70, just below the HVID Westside Canal.

   b. *Centennial Wash between the HVID Westside Canal and the confluence of the effective left overbank flowpath model*
      This is a model from the bottom of the model from Centennial Wash to the HVID Westside Canal (which ends at RM 36.70 immediately downstream of the HVID Westside Canal) to the confluence of the main branch of Centennial Wash with the effective left overbank flowpath for the flow split area through the Harquahala Valley. The upstream station in this model is RM 36.64, and the downstream station of this model is RM 23.11.

   c. *Centennial Wash below the confluence of the effective left overbank flowpath model to the Gila River*
      This is a model from the bottom of the model between the HVID Westside Canal and the confluence of Centennial Wash with the effective left overbank flowpath model (which ends at RM 23.11) to the confluence of the main branch of Centennial Wash with the Gila River. The upstream station in this model is RM 23.01, and the downstream station of this model is RM 0.76. The reasons no cross sections are present in the lowest three-quarters of a mile of the stream centerline as it has been defined for Centennial Wash include (1) attempting to contain flows in cross sections drawn parallel to the Gila River centerline in this area would be difficult as flows from Centennial would begin to flow down the Gila River itself, and (2) the Centennial Wash floodplain in this area will

definitively be within the influence area of the Gila River floodplain which WEST assumed would be deeper and therefore take precedence in mapping regardless of the Centennial Wash hydraulics.

WEST would like to specifically discuss the bridge modeling approach for the UPRR Bridge in this model. All four bridge openings (Trestles #1, 2, 3, and 4 as per the FCDMC survey crews naming convention) were modeled in a single bridge structure in this model. The pressure/weir option was selected for the high flow modeling approach (which HEC-RAS determined the high flow condition to be the controlling condition at this bridge in this model as opposed to a low flow condition). The entire 38,552 cfs upstream of the bridge calculated using this methodology is 0.99' below the low chord of the primary bridge opening (Trestle #1) in this scenario, and flow overtops the bridge deck in one location to the left of (i.e., to the east of) Trestle #4. However, it does not seem likely that flow would overtop the embankment to the left of Trestle #4 without even reaching the low chord of the opening at Trestle #1. This could possibly be verified using Steve Waters' rating curve for this gage to provide more confidence in this statement.

The model titled "bridge calibration" below was the model used to provide a better estimation of the hydraulics through the bridge using a different approach to the bridge hydraulics computations including additional flow paths and overbank flow optimization to not limit the calculations to a single water surface elevation along the entire upstream embankment of the bridge. The approach to computing different water surface elevations at each bridge opening is explained in greater detail in the "bridge calibration" model description immediately following this section.

2) *Bridge calibration – left overbank weir plan*

This model is described in greater detail in the memorandum titled "Update to the Bridge Calibration HEC-RAS Model" dated December 17, 2012. This technical memorandum provides explanation for the inputs to the models as well as the details results. To summarize that memorandum, flow from Centennial Wash will preferentially flow through the primary bridge opening (i.e., Trestle #1) before overtopping the large earthen embankment immediately adjacent to Trestle #1 before flowing downstream along the railroad embankment towards Trestles #2, 3, and 4. This two-dimensional system is not represented well by the single bridge shown in the "Centennial Wash below the confluence of the effective left overbank flowpath model to the Gila River" model described above, for which a single water surface elevation is calculated that does not show the embankment immediately adjacent to Trestle #1 come close to overtopping while Trestle #4 is completely overwhelmed. This problem occurs because the two-dimensional nature of flow around this bridge is not captured well with the one-dimensional analysis shown in the floodplain mapping model that includes all four openings as a single bridge in the model.

3) *Flow split calibration – looped network with the effective cross section alignments for the main branch of Centennial and the overbank flowpath reach*

This model was the basis for the determination to use FLO-2D to analyze the primary flow split area immediately downstream of the HVID Westside Canal. This model is described in greater detail in the technical memorandum titled "Draft Flow Split Analysis Update" dated November 30, 2012. The model submitted herein only includes the "4 XS – 3 pt Lat Str – Short Length" plan because, as stated in the other technical memorandum, WEST feels that this plan is likely the best representation of the flow split area to this point in HEC-RAS. The other plans discussed in that technical memorandum were not included in this deliverable for brevity of review. If the FCDMC would like to see any of the other plans discussed in that technical memorandum, WEST can provide those quickly.

WEST would like to point out a few things in regards to this model. First, the cross sections may not contain flow throughout, even in the right overbank of the main branch of Centennial Wash since WEST took the effective cross section alignments and extracted those cross sections directly from the updated topography. Right overbank flow containment was not considered critical at the time of model development for two reasons: (1) the process of extending cross sections for the floodplain mapping model (model 1.b. above) at a later time indicated that no cross section losing significant flow are in the right overbank with the alignment of the effective cross sections and (2) none of the cross sections that did not contain flow in the right overbank were in the vicinity of the primary flow split which was the focus of this analysis. A second thing WEST would like to point out in regards to this model is that the cross section alignment for the left overbank flow would need to be altered from the effective model cross section alignment if HEC-RAS is eventually used to map this area; however, the effective cross section alignment for the left overbank flowpath in the vicinity of the primary flow split is the same alignment that WEST would recommend for this area. Again, since the flow split was the focus of this analysis, the effective cross section alignments for the left overbank far downstream of the primary flow split were not altered for this model.

4) *Harquahala Valley Irrigation District north-south drainage channel feature*

This is a model of the HVID flood control drainage feature that runs north-south parallel to Harquahala Valley Road approximately one-half of a mile to the west of Harquahala Valley Road. The model extends from the northern end of this drainage feature (near the Bethany Home Road alignment) to the confluence of this drainage feature with Centennial Wash. The river stations for this model correspond to river feet instead of river miles (as is the case for the main branch of Centennial Wash). This model is also explained in greater detail in the technical memorandum "Draft Flow Split Analysis Update" dated November 30, 2012, and the conclusions of the capacity analysis of the flood control channel as determined by WEST based on this model is summarized in that technical memorandum as well.

The model begins at RS 33579 approximately one-quarter of a mile south of Bethany Home Road corresponding to the flood control embankment built as part of the HVID project; however, RS 26379 is the start of the much deeper channel associated with the

flood control embankment of the drainage feature. Therefore, WEST recommends reviewing this model from this river station downstream in the model. It should be noted that this model was used by WEST to analyze the capacity of the HVID flood control drainage feature that runs north-south parallel to Harquahala Valley Road. The left overbank of the cross sections in this model do not contain because the topography continues to fall away from the embankment when flow overtops this flood control feature. The cross sections are drawn completely perpendicular to the flood control channel, but flows that break out to the east of the embankment would actually flow parallel to this embankment. Therefore, not achieving containment in the left overbank would not be an issue since another model with cross sections oriented differently from those shown in this model would be required if flow were to break out of this channel. Also, the model does not contain in the right or left overbank near the downstream end of the flood control channel immediately before outfalling to the main branch of Centennial Wash. Once again, this portion of the model was not important to determine the capacity of the drainage feature upstream; therefore, these seeming errors were ignored for this analysis.

Description of the shapefiles submitted to the FCDMC for review

Each of the models describe above include submittals of the following shapefiles to the FCDMC to facilitate their review:

1) Cross section alignments for each of the models
2) Right and left overbank flowpath lengths for each of the models
3) Bank station points for each of the models
4) Stream centerline for each of the models

One additional shapefile was delivered to facilitate the FCDMC review of the centerline definition for Centennial Wash: a line shapefile showing the results of ArcHydro analysis of drainage lines based on the final WEST DEM. This shapefile product from ArcHydro was used significantly by WEST in the definition of the updated stream centerline for the main branch of Centennial Wash.

Discussion of primary concerns that WEST feels that FCDMC staff may raise during the review process

As a draft deliverable, there are five items discussed in greater detail that have not been addressed in the modeling effort by WEST at this time, but these five items may raise concern on the part of the FCDMC during their review. As such, WEST wanted to point these items out in the documentation corresponding to this deliverable to facilitate discussion of these issues with FCDMC staff at the upcoming monthly coordination meeting on December 20, 2012.

Issue #1: Tie-in location with the Gila River

Currently, the updated stream centerline for the Centennial Wash HEC-RAS models ties in to the effective stream centerline for the Gila River at the same location that the effective stream centerline for Centennial Wash tied in to the effective stream centerline for the Gila River. This was done with the understanding that a change to the tie-in location for the effective Gila River model would require updates to the currently effective flood profiles for the Gila River showing the location of confluence with Centennial Wash and possibly impact the downstream boundary condition for the Centennial Wash model. However, Catherine Regester (FCDMC) is currently managing a project for the FCMDC to work with a consultant to redelineate the Gila River floodplain including the confluence with Centennial Wash. Obtaining the updated Gila River stream centerline (if an update to the stream centerline is done as part of the Gila River Redelineation Study) will allow WEST to tie in the downstream end of the Centennial Wash stream centerline to the update Gila River stream centerline. This will be important as it could have impacts on (1) the number and longitudinal location of cross sections near the downstream end of the Centennial Wash model, (2) the horizontal extents of the Centennial Wash cross sections near the downstream end of the model, and (3) the river stationing of the Centennial Wash which must tie in to the downstream end of the updated Centennial Wash stream centerline at river mile 0.0.

Issue #2: Cross section containment in the main branch of Centennial Wash between the HVID Westside Canal and the confluence of the effective left overbank flowpath model

The purpose for submitting the HEC-RAS model for the main branch of Centennial Wash in the area of the flow split (i.e., downstream of the HVID Westside Canal and upstream of the confluence of the main branch of Centennial Wash with the effective left overbank flowpath model) in this draft deliverable package was to provide a well vetted draft HEC-RAS model that will serve as the basis for floodway encroachment analysis in the future for this portion of the main branch of Centennial Wash. Another model has been submitted in this draft deliverable package that analyzes the flow split area and includes a looped network for this area with reaches representing both the main branch of Centennial Wash and the effective overflow channel with junction connections and lateral structures providing a numerical optimization approach to estimating the flow split occurring just downstream of the HVID. The model discussed in this section does not provide analysis of the flow split or any estimate of inundation in the breakout channel section because only the main branch of Centennial Wash is included in this model.

The issue that WEST is anticipating the FCDMC to encounter during their review of this model is that this model has several cross sections that do not contain the water surface elevations in the left overbank of the cross sections because the areas of interaction bewteen the main branch of Centennial Wash and the breakout channel (corresponding to the modeled area of the effective

left overbank flowpath model) and all of the flow in the breakout channel itself are in a sense being "ignored" with this HEC-RAS analysis. This was done for two reasons. First, a more detailed, two-dimensional analysis will be used to better model the area of the flow split for hydraulic analysis including all of the locations where these cross sections overtop. Specifically, FLO-2D will be utilized as the modeling tool to better quantify flooding extents in this area. Second, extending cross sections far enough to the north to contain flow would require significant increases to some cross section lengths due to the very flat topography in the area. The area in the left overbank would all be modeled as ineffective flow because only the hydraulics of the main branch of Centennial Wash are beign considered in this model. However, increasing the cross sections to a much wider width (i.e., north of the currently effective overbank flowpath model cross sections in some cases) and using ineffective flow areas to not allow conveyance in the left overbank area may lead to confusion in the future if someone were to take that model and attempt to map the northern flooding extent using these cross sections. In other words, the cross sections that do not contain in the left overbank is truly representative of the hydraulics of the physical system because the flat topography of these wide cross sections would allow for flow to move into the far left overbank and interact with flows in the breakout channel. WEST would not want a model of the entire width of all possible flooding extents for both the main branch of Centennial Wash and the breakout channel to be misused or misinterpreted as a viable analysis of the flooding extents in the far northern overbank.

WEST has discussed this issue with FCDMC staff, and WEST obtained prior approval for the seemingly erroneous occurrence of cross sections not containing flow in this model prior to submitting the draft HEC-RAS deliverable based on the reasoning discussed above. Additionally, it should be noted that the entire flow available for both the main branch of Centennial Wash and the breakout channel (i.e., 34,347 cfs). If any amount of flow exits the main channel and enters the breakout channel for the final analysis, then the flow in the main branch of Centennial Wash will be less than 34,347 cfs, and some of the cross sections that currently do not show containment in the left overbank may contain with a lower flow value in this model.

Issue #3: Bridge deck geometry definition

In the definition of the bridge deck geometry (for both the single bridge plan with a single water surface elevation for all four bridge openings and the lateral weir bridge plan with different water surface elevations through all four bridge openings), an apparent "bump" can be noted visually above the bridge trestle openings along the bridge deck. This "bump" is due to the fact that the bridge scans at Trestles 1 through 4 include enough resolution to include the top of the railroad track itself in the virtual RTK survey that WEST then used to develop the bridge deck geometry. The bump is on the order of 0.4-0.6' above the surrounding deck geometry. However, for the remainder of the bridge deck in between the Trestle scans, the FCDMC 2' topography does not

include enough resolution to define the elevation of the top of the railroad track. To remove this seeming inconsistency in the definition of the embankment, WEST could add some average value for the track height to the top of the embankment geometry extracted from the final DEM surface if the District would like to do this. Alternatively, WEST could remove the top of track points from the bridge deck geometry above the trestles if the tracks should not be considered in the computation of weir flow.

Issue #4: Trestle #2 in the bridge calibration model used to define hydraulics near the bridge

For Model #2 as defined in the first section of this report (the "Bridge calibration – left overbank weir plan" model), the river "Overflow" and reach "Bridge4" are defined for water flowing parallel to the railroad embankment after it leaves the main branch of Centennial Wash just past Trestle #1 over the lateral structures defined along the embankment immediately east of the primary bridge opening for Centennial Wash (see Figure 1). Water can then flow along the railroad embankment and flow downstream through the subsequent bridge openings (i.e., Trestles #2, 3, and 4, in that order) as either flow through a lateral structure for Trestles #2 and #3 or flow through a bridge for Trestle #4. As explained in the corresponding "Update to the Bridge Calibration HEC-RAS Model" technical memorandum dated December 17, 2012, Trestles #2 and 3 allow a majority of flow to pass downstream prior to reaching Trestle #4; therefore, the hydraulics in the river "Overflow" and reach "Bridge4" are dominated by the lateral weir calculations of the lateral structures used to define Trestles #2 and #3.

To best define hydraulics through the bridge openings represented as lateral structures, the pier geometries were entered into the model by altering the "ground points" of the later structures themselves (see Figure 2). However at the conclusion of these calculations, WEST noticed that the water surface elevations computed along the river "Overflow" and reach "Bridge4" computed a water surface elevation that was higher than the low chord of the bridge, which can be seen in Figure 2 as water surface elevation being computed as overtopping the pier elevations (the pier elevations coincide with the low chord for this bridge specifically so WEST would know when the water surface elevation reached the low chord). As can also be seen in Figure 2, the water surface elevation does not interact with the bridge deck for Trestle #3 (i.e., the water surface profile is lower than the low chord for this bridge opening); therefore, the hydraulics of this opening appear to be valid.

The problem with the calculations of flow through Trestle #2 with the current geometry is that the bridge deck itself is not limiting flow through the opening, as a "lid" cannot be defined using ground points in a lateral structure. One way to overcome this issue is to define all of the 19 openings (18 piers are not buried and act as flow obstacles for this bridge, making 19 openings for flow to pass through) in this bridge as culverts. The obvious benefit to this solution is that a "lid" can be defined using the lateral structure geometry and then "punching" culverts through

the embankment to represent the 19 openings of the bridge. Problems immediately arise with this approach, however, such as how to define an irregular bottom geometry with a flat-bottom box culvert, how to define the culvert inlet/outlet elevations to correctly estimate bridge hydraulics using a culvert estimation, and how to assign appropriate loss coefficients to culvert barrels that actually can interact with each other by passing between the piers in a pier group. Due to these issues, WEST feels that a weir calculation approach to computing the hydraulics through this structure may be more defensible than a culvert approach. Finally, if Trestle #2 is modeled as a culvert, but Trestle #3 continues to be modeled using a weir calculation approach to the estimation of flow through that opening, you increase inconsistency in modeling style from one bridge to the next. If culverts are used for Trestle #2, WEST suggests using the same approach to modeling the flow through Trestle #3 as well.

Figure 1. Photo of the embankment immediately adjacent to the main branch of Centennial Wash just east of Trestle #1. View is looking to the north from just south of the railroad.

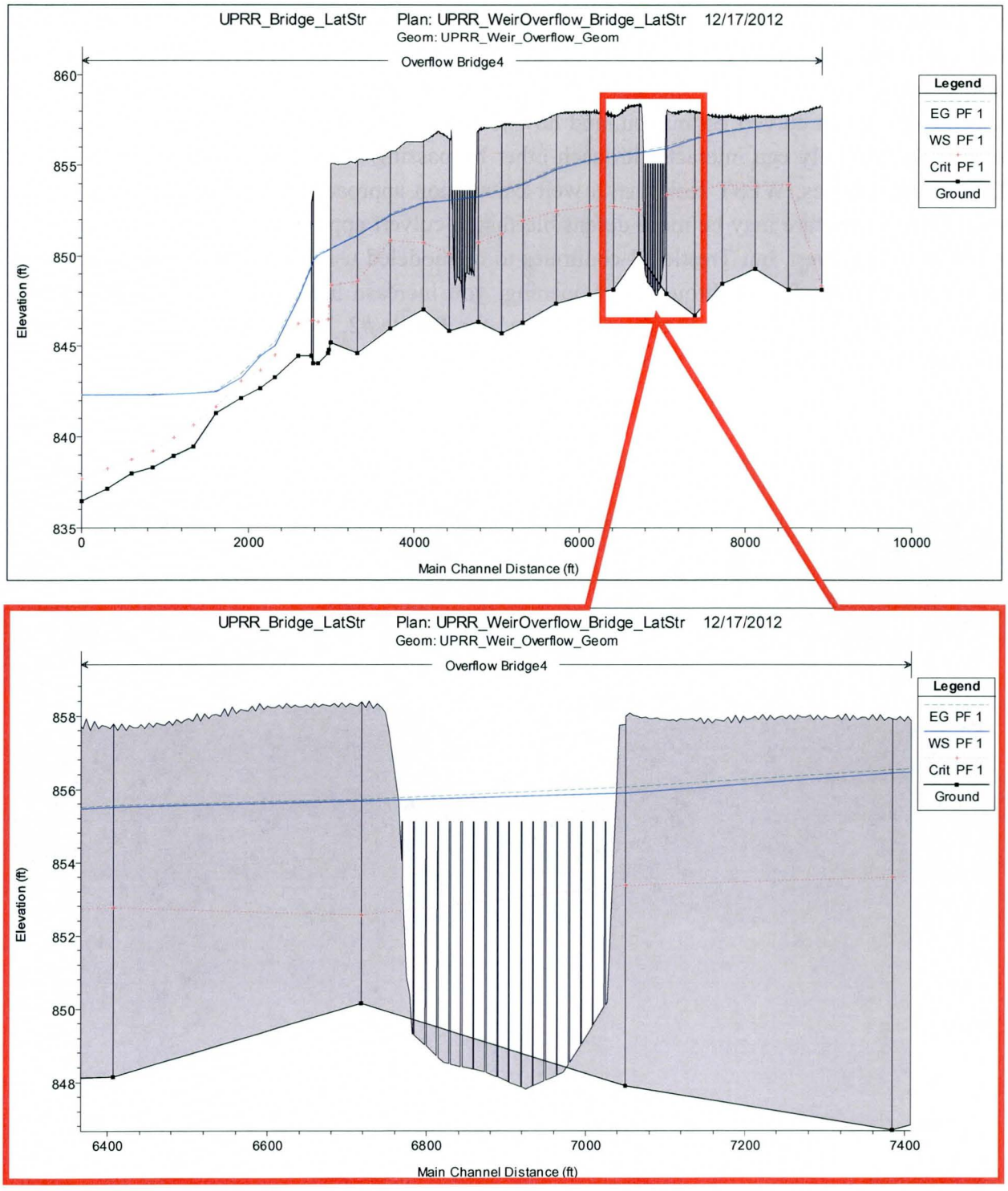


Figure 2. Issue with the calculation of hydraulics through Trestle #2 using the lateral structure option to define flow through this bridge opening

Issue #5: Seeming inconsistencies in the definition of ineffective flow areas

Finally, WEST would like to point out some seeming inconsistencies in the definition of ineffective flow areas throughout the model. Generally, flow that breaks out of a contained flow path such as Centennial Wash and enters farm fields without significant flooding depths in the fields will follow field furrows in a flow direction oftentimes perpendicular to the direction of flow in the main channel. Due to this phenomenon for shallow overbank flows compared to the farm furrow depths in farm fields, these fields will act as large areas of detention with flow velocities near zero in the downstream direction. In certain portions of the Harquahala Valley agricultural areas, WEST spent significant time attempting to determine where these areas may exist from aerial photos and field visits to these sites. Due to this, the ineffective flow areas may seem to be somewhat arbitrarily places in the middle of an overbank (right and/or left) in a particular cross section. Viewing the HEC-RAS geometry with the aerial photographs loaded into the geometric data editor is the methodology that WEST uses to set ineffective flow areas for this particular ineffective flow area type. This may help explain some oddly aligned ineffective flow areas.

There are seeming inconsistencies in ineffective flow areas throughout the length of the model as well. Specifically, the agricultural fields in the Harquahala Valley agricultural areas have ineffective flow areas defined as described above. However, agricultural fields in the Arlington Canal Company Irrigation District do not have ineffective flow areas defined in the same way. This is due to the facts that (1) some of the agricultural fields have furrows in the assumed direction of flow from west to east directly towards the Gila River and (2) the exact definitions of what is the primary flow path and what are the secondary or overbank flow paths in this area are difficult to determine. Some of the agricultural fields near the confluence of Centennial Wash with the Gila may need additional ineffective flow areas defined in addition to what has been defined already in the draft HEC-RAS deliverable.

CENTENNIAL WASH FLOODPLAIN DELINEATION STUDY
GILA RIVER TO LA PAZ COUNTY

CONTRACT FCD 2012C004

PIER MEASUREMENTS FROM BRIDGE SURVEY DATA
TECHNICAL MEMORANDUM

Date: December 18, 2012

To: Jeff Shelton, Project Manager – FCDMC

From: Brian Wahlin, Project Manager – WEST Consultants, Inc.
Chuck Davis – WEST Consultants, Inc.
Suzie Monk – WEST Consultants, Inc.

The purpose of this technical memorandum is to outline the method used in taking measurements from the survey data provided by the district. Pier widths were measured as well as high and low chord elevations, and the centerline station and number of piers as shown in the simplified point files for each bridge was verified.

Approximately thirteen piers were measured at each bridge opening and an average width of 1.0 ft was used. Diameters were measured in ArcScene by taking the XY coordinates of two points and calculating the distance between them. Two methods were used in taking these measurements. The first was using an orthometric, 3D view similar to that shown below in Figure 1. The problem with this method is that you can easily choose a point that is not directly across from the first and incorrectly skew the measurement. It is also difficult to take measurements of the first pier from directly upstream, even though that would be the most correct and useful measurement to take.

Figure 1. Trestle structure on Bridge #2.

This data set was used to make other pertinent measurements, like the high and low chord elevations for each bridge.

In order to avoid some of the difficulties listed above, the point cloud was limited to a certain volume. By limiting the range of elevations that were shown and filtering out some points outside the area directly underneath the bridge deck, it was much easier to take measurements from directly above. A comparison of the two point files is shown below. The light blue points are the full point file while the orange points are only the points 1 to 2.5 feet below the low chord of the bridge. This eliminates the bridge deck, ground, and vegetation from the point file so that it is much easier to take pier measurements.

Figure 2. Limited and full point set for bridge #2.

Using the limited data set, it is much easier to take diameter measurements, as shown below in Figure 3. It is also easier to discern the shapes of the piers, especially in the bridge 1 data set where there are I-beams as well as square and circular columns.

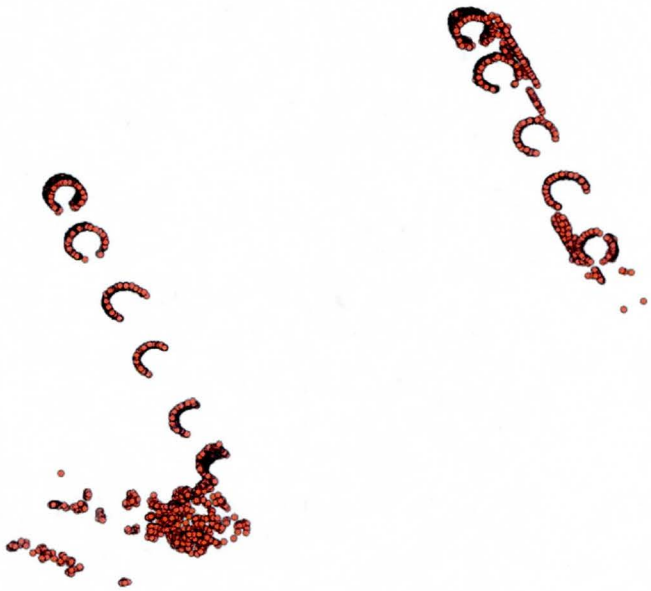


Figure 3. Bridge #2 piers from limited point set.

It may be useful to apply this filtering method to other elevation ranges to make more pier measurements or separate different elements of the bridge (a single trestle or just the bridge deck, for example). This method could also be used with similar data sets.

CENTENNIAL WASH FLOODPLAIN DELINEATION STUDY
GILA RIVER TO LA PAZ COUNTY

CONTRACT FCD 2012C004

BUILDINGS DELINEATION FOR FLO-2D TECHNICAL MEMORANDUM

Date: January 18, 2013

To: Jeff Shelton, Project Manager – FCDMC

From: Brian Wahlin, Project Manager – WEST Consultants, Inc.
Chuck Davis – WEST Consultants, Inc.
Suzie Monk – WEST Consultants, Inc.

The purpose of this technical memorandum is to outline the method used in delineating buildings for assigning areal reduction factors in FLO-2D model on Centennial Wash around the flow split area (RS 21.93 to 37.86). There are 72 total buildings in the flow split area clustered in several locations. The delineation was based on the 2011 aerials provided by the District.

The individual cells in the FLO-2D model measure 40 ft square, or 1600 ft^2. Table 1 provides some measurements on the buildings in the flow split area. The area of individual buildings ranges from 100 up to almost 10000 square feet and average approximately 1675 square feet. These result in possible areal reduction factors ranging from 0.06 to 5.82 with an average of 1.05. The actual areal reduction factors depend on the placement of the buildings in relation to the grid elements themselves. The total area attributed to buildings is equal to approximately 75 cells.

Table 1. Building areas and portions of grid cell

	Area (ft^2)	Area (Building/Cell)
Minimum	98.69	0.06
Maximum	9314.52	5.82
Average	1675.23	1.05
Total	120616.40	75.39

Eighteen of the 72 buildings may not be permanent structures or may be open air structures like animal sheds. Many of these may storage bins, sheds, pump houses, barns, or trailer storage structures. There are notes commenting on these features in the attribute table of the shapefile.

There are also 24 delineated areas that are actually large piles of tires. These are located near the stock tank in the upstream part of the flow split area. The average area of these piles is 2128 square feet. Figure 1 shows the aerial view of the area with the tire piles and a couple of other buildings. The buildings are highlighted in orange.

Figure 1. Tire piles near stock tank

The remaining buildings appear to be permanent residences or large trailers. Some examples of these are shown in Figures 2 and 3.

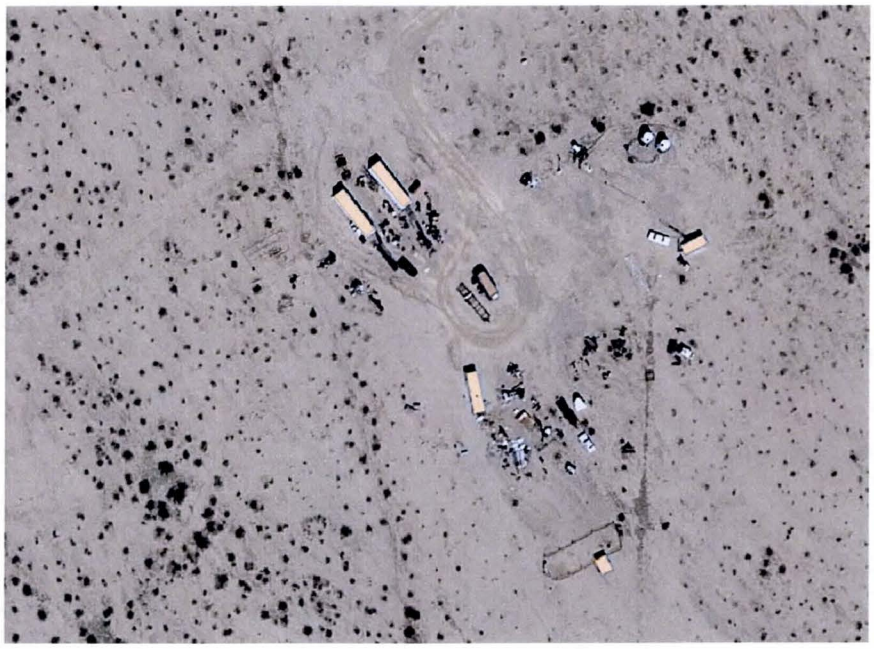


Figure 2. Buildings south of the stock tank

Figure 3. Buildings near the intersection of Harquahala Valley Road and W. Elwood Street

There are a couple of very small, lone buildings on the edges of fields as well. These buildings may be pump stations for irrigation or groundwater. An example of this type of building is shown in Figure 4.

Figure 4. Small building near edge of field

CENTENNIAL WASH FLOODPLAIN DELINEATION STUDY
GILA RIVER TO LA PAZ COUNTY

CONTRACT FCD 2012C004

RAIL ADDITION TO BRIDGE AND LATERAL STRUCTURES TECHNICAL MEMORANDUM

Date: January 31, 2013

To: Jeff Shelton, Project Manager – FCDMC

From: Brian Wahlin, Project Manager – WEST Consultants, Inc.
Chuck Davis – WEST Consultants, Inc.
Suzie Monk – WEST Consultants, Inc.

The purpose of this technical memorandum is to describe and provide justification for the changes made to the lateral structure and bridge deck elevations at the Union Pacific Railroad (UPRR). The topography from which the lateral structure and bridge elevations were extracted only represents the ground elevation. The bridge deck elevations in areas that were surveyed are approximately half a foot higher because of the addition of the height of the rail. This change in elevation can be seen very clearly in the bridge and lateral structure cross sections. Figure 1 shows the upstream bridge cross section.

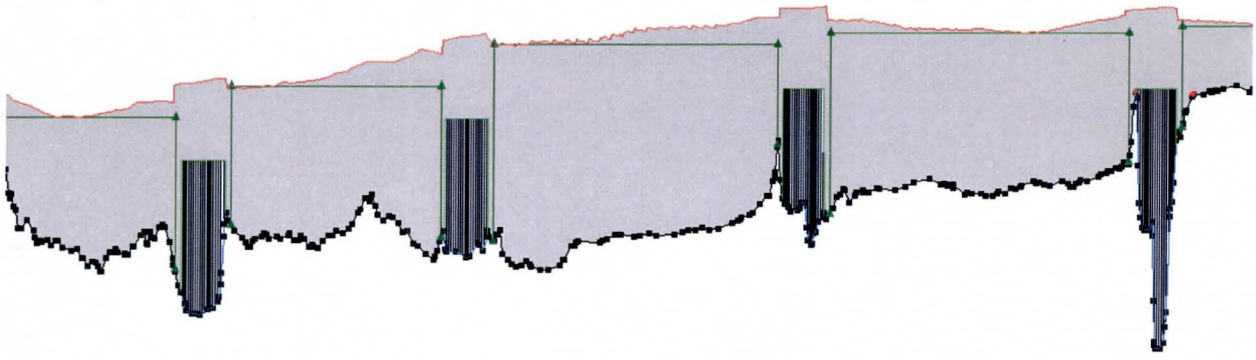


Figure 1. Upstream bridge cross section (RS 7.53) from CW_BaselineRdtoGila

Research showed that rail used for industrial tracks like the UPRR is typically 130 pounds per yard or greater. Additionally, plans for turnouts along UPRR showed that the rail used was either 133 or 136 lb/yd (Union Pacific Railroad, 2003). Rail dimensions from Unitrac Railroad Materials showed that rail in that weight range would measure between 7 and 7 5/16 inches in

height (Unitrac Railroad Materials Inc., 2007). Seven inches was used for the addition to the existing topography. The seven inches was added to a three-point moving average to smooth out some of the jagged areas from the topography. Areas that had elevations directly from the survey were left as is and were not added too. The station right next to the surveyed elevations on either side was an average of the point at that station with 7 inches added, the surveyed point, and the point on the other side with 7 inches added. This resulted in smoother transitions between surveyed and non-surveyed areas. The same cross sections shown in Figure 1 is shown in Figure 2 after the addition of the rail height.

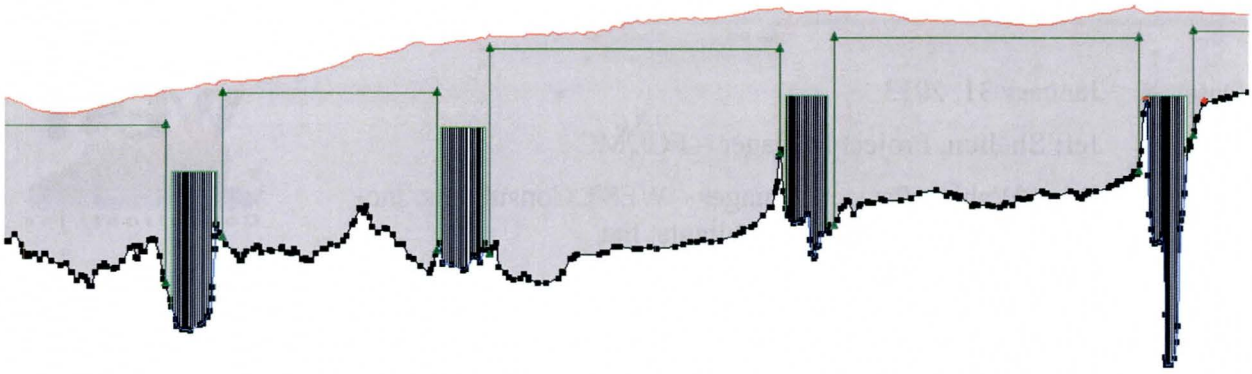


Figure 2. Upstream bridge cross section (RS 7.53) with rail addition

It is more difficult to tell with the lateral structures that any change was made since each segment is only 400 feet long. Since each lateral structure has a higher density of points than the 4-bridge cross section, there is more small-scale variation in elevation as well. Figure 3 is a graph of the elevations near bridge 2 that went into the lateral structure inputs. The high chord was the original elevations, direct adjustment is the high chord with 7 inches added at every point, and the running average is the average of the elevations at that station and the points directly before and after, as described previously. This method resulted in the smoothest transitions and smoothed out areas with a lot of small-scale variation.

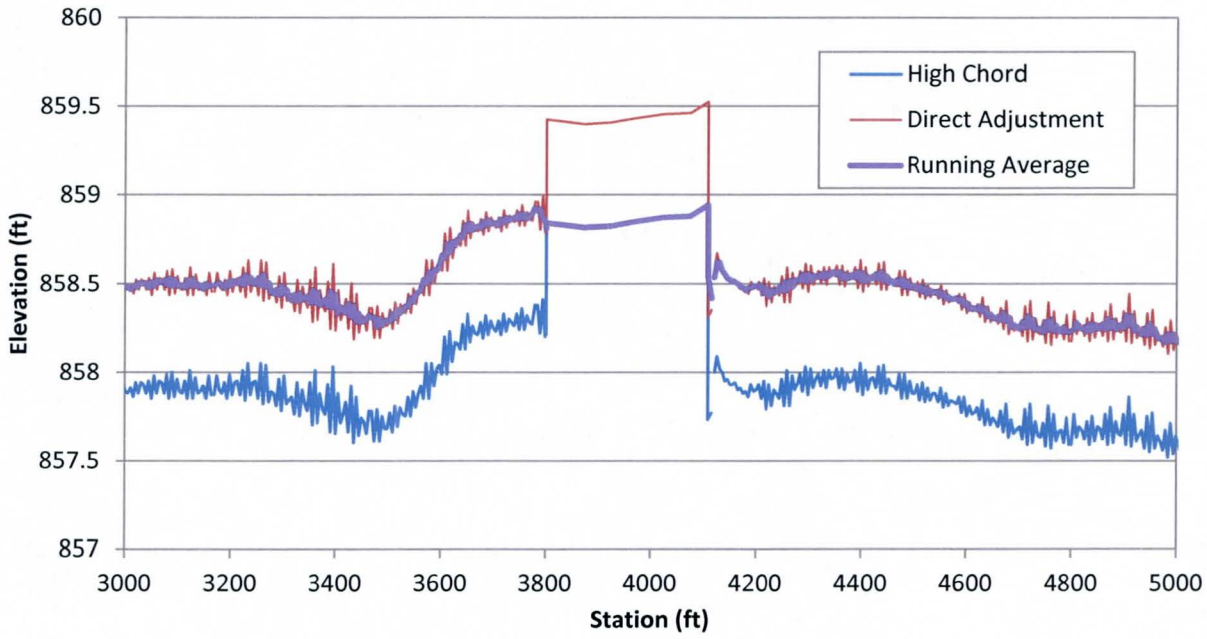


Figure 3. Bridge 2 upstream cross section

Bridge 1 and 4 are also truncated like bridges 2 and 3 which are represented by the lateral structures, but since there is more cross section on either side of them, it is easier to see the addition of the rail. Figures 4 and 5 show bridge 1 before and after the addition of the rail height.

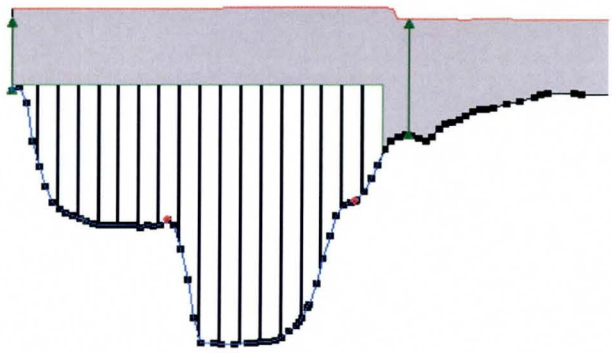


Figure 4. Bridge 1 (RS 18000) before rail addition

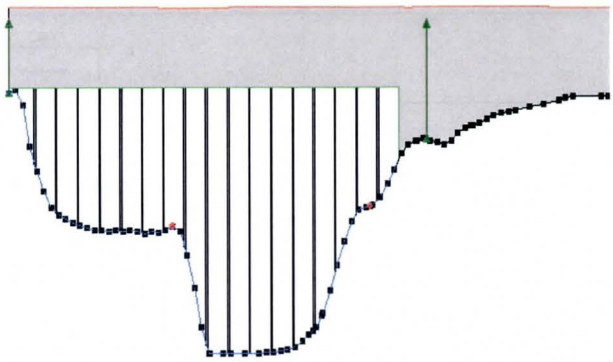


Figure 5. Bridge 1 (RS 18000) after rail addition

CENTENNIAL WASH FLOODPLAIN DELINEATION STUDY
GILA RIVER TO LA PAZ COUNTY

CONTRACT FCD 2012C004

HYDRAULIC STRUCTURE RATING CURVE DEVELOPMENT FOR CULVERTS UNDER VAN BUREN ROAD ALONG THE HVID NORTH-SOUTH FLOOD CONTROL CHANNEL TECHNICAL MEMORANDUM

Date: April 4, 2013

To: Jeff Shelton, Project Manager – FCDMC

From: Brian Wahlin, Project Manager – WEST Consultants, Inc.
Chuck Davis – WEST Consultants, Inc.

The purpose of this technical memorandum is to outline the development of the rating curve for use in FLO-2D to represent the culverts along the HVID north-south flood control channel (approximately one-half mile west of Harquahala Valley Road) which pass water beneath Van Buren Road.

As a sub-consultant to WEST Consultants, Inc. (WEST), David Evans and Associates (DEA) completed a detailed structure survey of these culverts, three 72-inch barrel culverts of approximately the same elevation. This detailed structure survey was used to enter roadway embankment data and culvert data into the HEC-RAS model created previously for the HVID north-south drainage channel and edited for input to the FLO-2D model as shown in Figure 1. It should be noted that the field survey collected a natural ground cross section just upstream of the culvert (approximately 8 feet upstream of the culverts), and the points collected in the ground survey show the natural ground elevation above the invert elevation of the culvert at the upstream face. However, field reconnaissance and field photos from this reconnaissance (Figure 2) show that the invert is not blocked immediately at the upstream face of the culvert, indicative of local scour processes occurring in the last 8 feet upstream of the culvert. Therefore, the ground points in the HEC-RAS model were dropped in the internal bridge upstream cross section to reflect this observation.

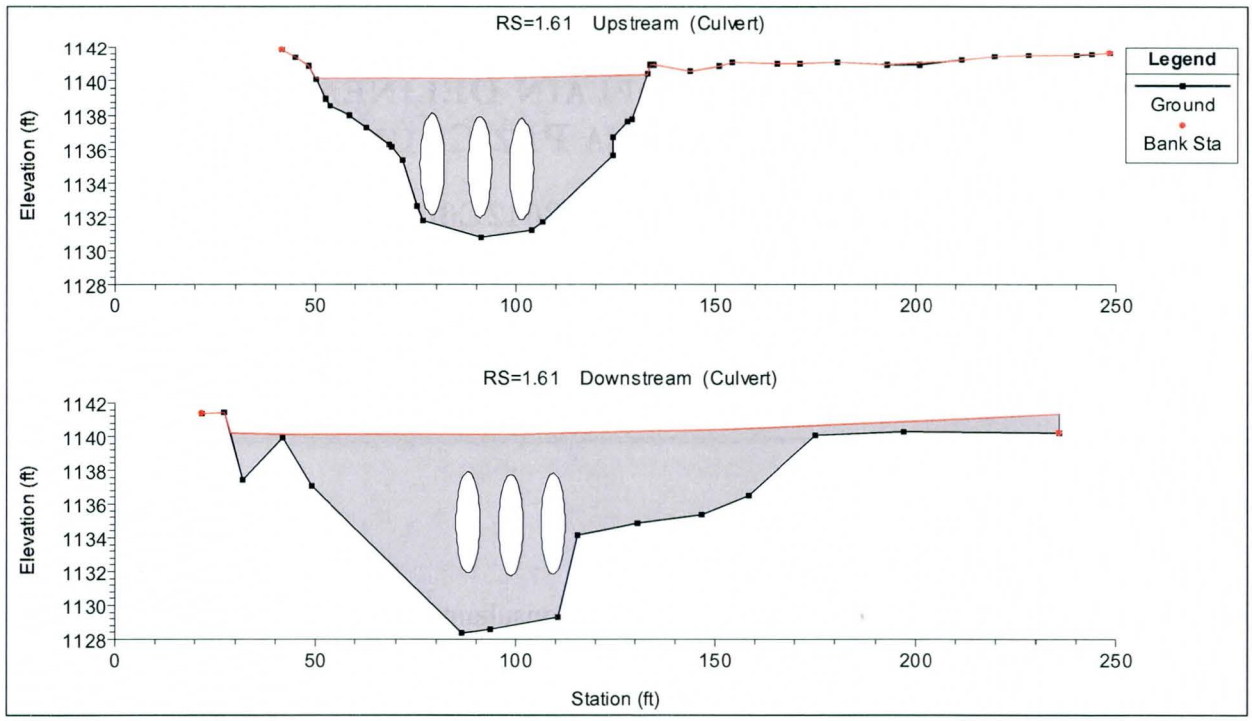


Figure 1. Representation of the three 72-inch barrel culverts under Van Buren Road in the HEC-RAS model.

Figure 2. Triple barrel 72-inch diameter culvert under Van Buren for the Harquahala drainage channel, viewed from upstream.

The HEC-RAS model was built, and flows were entered into the model from 1 to 7,000 cfs. From these results, a rating curve could be built relating upstream stage (depth referencing an elevation of 1132.59 feet NAVD88 as the datum, as this elevation was the minimum cross section elevation for the natural ground cross section upstream of the culvert) to flow. This relationship is shown in Figure 3 below. Two things should be pointed out in this figure. First, the apparent "break" in the data below approximately 12 cfs or 0.6 feet of depth occurs because below these depths the HEC-RAS model results default to critical depth. This is expected for very low flow values, as the Manning's roughness applied in the model is not representative of very low flow values. These calculations were not edited, however, as it was assumed less than 12 cfs or less than 0.6 feet of depth in the cross section upstream of the culvert would not significantly affect the results at the maximum depth on the FLO-2D grid. Secondly, the break occurring near approximately 650 cfs or 7.7 feet of depth occurs because flow begins spilling over the roadway embankment at this point. A table of data representing the points shown in Figure 3 was entered into the FLO-2D model using the HYSTRUC.DAT input file (shown in Appendix A of this document).

Early model results from FLO-2D show that the range of flows calculated for the culverts was sufficient for the FLO-2D model, as the maximum culvert flow computed was 2,859.61 cfs.

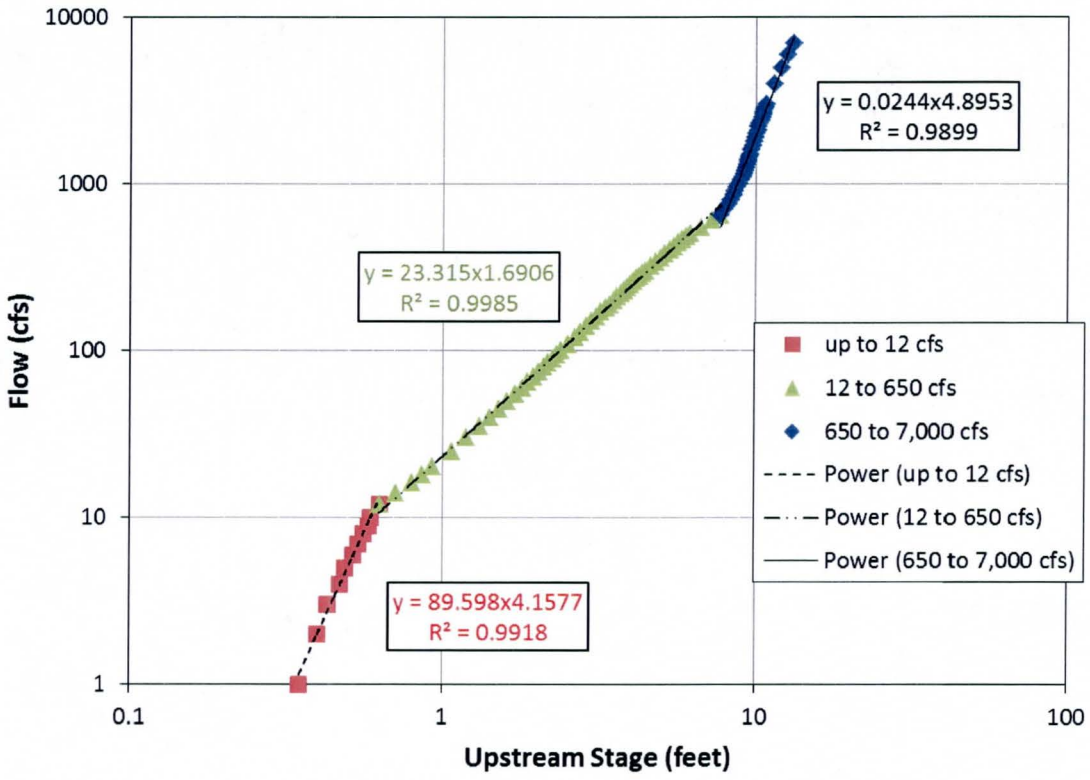


Figure 3. Rating curve for FLO-2D model from HEC-RAS runs.

Appendix A – HYSTRUC.DAT for the FLO-2D model

```
S  VanBuren  1        1        466480    467406    0        1132.59   0         0
  T        0         0
  T        0.47      4
  T        0.63      12
  T        1.41      40
  T        2.24      90
  T        2.99      150
  T        4.07      260
  T        5.13      380
  T        6.19      500
  T        7.74      650
  T        9.97      1300
  T        13.21     7000
```

CENTENNIAL WASH FLOODPLAIN DELINEATION STUDY
GILA RIVER TO LA PAZ COUNTY

CONTRACT FCD 2012C004

RESPONSE TO HEC-RAS COMMENTS BY THE FCDMC

Date: April 22, 2013

To: Jeff Shelton, Project Manager – FCDMC

From: Brian Wahlin, Project Manager – WEST Consultants, Inc.
Chuck Davis – WEST Consultants, Inc.
Suzie Monk – WEST Consultants, Inc.

The purpose of this technical memorandum is to provide responses to comments made by the FCDMC on the draft HEC-RAS models delivered. These comments were delivered by the FCDMC on January 25, 2013. In the following pages, the draft comments provided by the FCDMC are shown in bold, black text (grouped by the original headings provided by the FCDMC), and WEST's responses are shown in blue text.

RevisedCommentsTable_WEST Responses.docx

1. (See document with new FCD column)

   WEST Response: The only outstanding comment on this document by the FCDMC was in regards to a WEST response to the following original FCMDC comment: "*Our cross sections downstream of [FEMA effective XS] B might need tweaking, but I think it would be best to do this later. We could run the model with these cross sections and think about it. This is the area we might decide to do FLO-2D in because if the agricultural fields.*" WEST later responded that "*As of December 12, the FLO-2D optional task was authorized. WEST will revisit this at a later date with Jeff Shelton.*"

   WEST's response statement for the first entry should be deleted as the original comment from the District was referring to the area near the Gila confluence (FEMA effective XS B is near the downstream end of the study reach), and the FLO-2D optional task that was approved is in the Harquahala Valley near the upper end of the HEC-RAS modeling reach. This comment has been removed from the final version of this document.

Centennial_Draft_HECRAS_Submittal_12172012.docx

1. No comment

Centennial_BridgeCalibration_12172012.docx

1. The date on this memo should be December 17th not December 2nd. The date is also incorrect in the footer.
   WEST Response: This has been changed.

2. Page 3 middle 1st paragraph, roadway embankment should be railway or railroad embankment.
   WEST Response: This has been changed to read "railroad embankment."

Cent_FlowSplit

1. The stock tank at cross section 83600 prevents water from splitting into Centennial Wash Left Overbank. While refining the FLO-2D model we need to discuss what would happen if this tank were altered or washed away.
   WEST Response: For this specific area, FLO-2D will be used to determine the extents of the flow split. The embankment for the stock tank can be removed from HEC-RAS if desired. However, that has not been completed at this time as the FLO-2D model development is still actively ongoing.

CW_BaselineRdtoGila

1. The hydraulic baseline between our first cross section and the Gila River baseline takes more turns than it should. It may follow the low point, but does it follow the center of mass of the water from our first cross section to the Gila? Refer to shapefile CW_BaselineRdtoGila_River. A line parallel to the effective hydraulic baseline would be more correct.

   WEST Response: This has been changed to be parallel to the effective hydraulic baseline as shown below. The effective hydraulic baseline is shown in light blue, the hydraulic baseline used at the time of these comments is shown in dotted dark blue, and the edited hydraulic baseline is shown in solid dark blue. (Note: The stream centerline was changed before the cross section alignments, so the cross sections shown are not the most current version.)

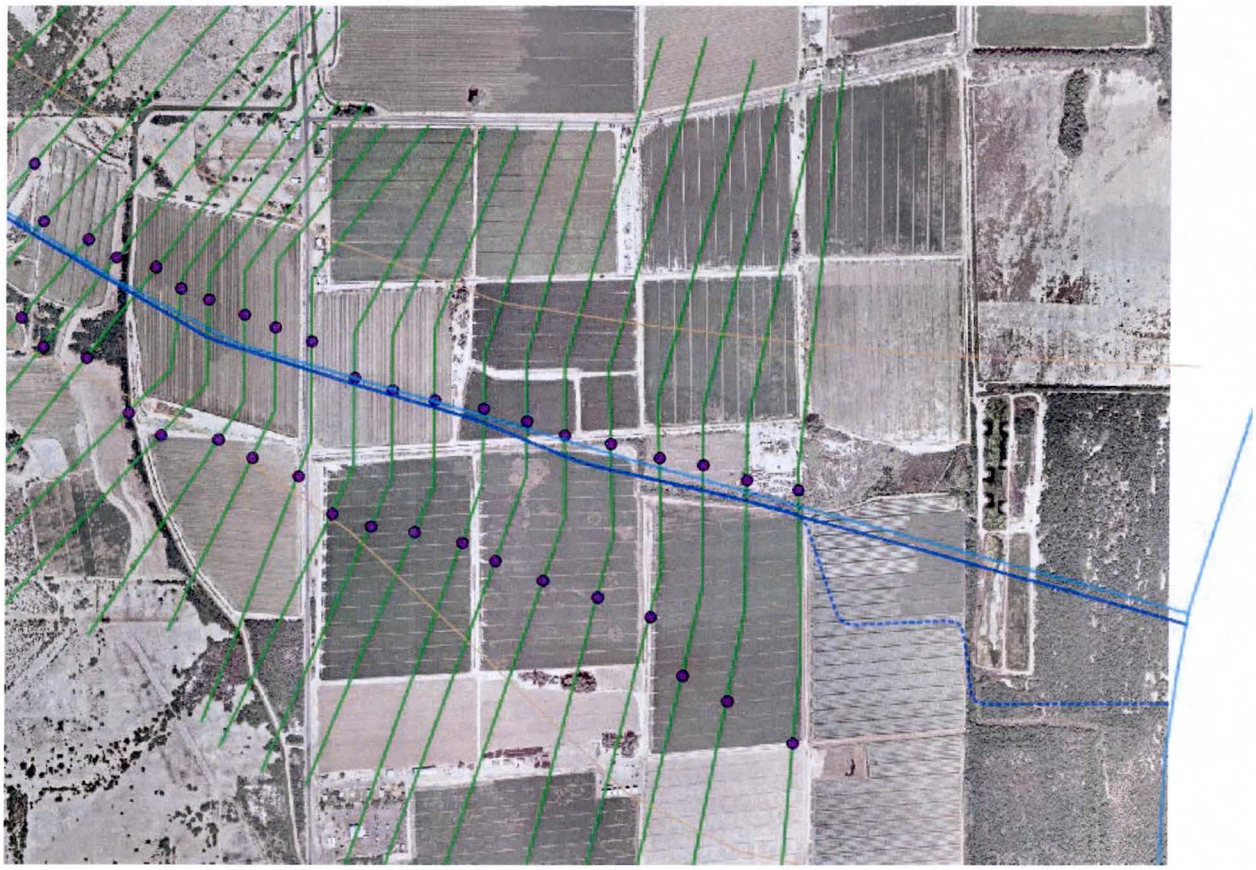


Figure 1. Baseline to Gila model at confluence with Gila River

2. I would like to discuss cross sections 0.76 to 1.74. I will bring a figure to our next meeting.

WEST Response: The cross sections near the confluence (0.76-1.74) were changed according to discussions at the meeting on 02/07/2013. The updated cross sections are shown below in Figure 2. The cross sections highlighted in yellow are the ones where the orientation was changed. The cross section alignments, ineffective areas, and bank stations were updated in both Baseline to Gila models (i.e., with and without lateral structures).

Figure 2. Baseline to Gila cross sections at confluence with Gila River

3. Note: The GIS length is 117,481 feet. The sum of HEC-RAS Length Chnl is 177,333 feet. The difference in first and last river stations is 117,480 feet. The difference between HEC-RAS Length Chnl and GIS length is 147 feet. This might not generate a comment in the final HEC-RAS submittal. The final submittal should be formatted in our data delivery specifications so I can run some GIS checks on it. If the additive errors between Length Chnl and GIS become visible to the eye at any location, there might be a comment made. You might decide to straighten out the GIS hydraulic baseline (CW_BaselineRdtoGila) a little.

   WEST Response: All models were updated with changes to the GIS data (cross section orientation, river alignment, flow path alignment, etc) by re-exporting from HEC-GeoRAS. All of these lengths should be resolved. Some changes made to the river alignment and flow paths are shown below. The edited hydraulic baseline is shown in solid blue and the unedited (used at the time of these comments) is shown in dotted blue.

Figure 3. Baseline to Gila model near cross section 6.67

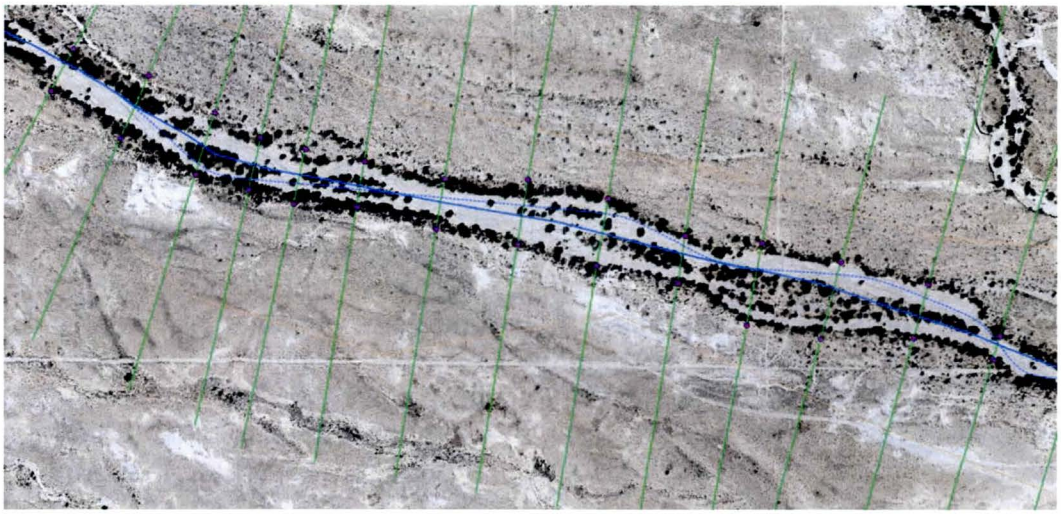


Figure 4. Baseline to Gila model near cross section 17.26

4. Cross Section 1.82, remove that portion of the cross section to the left of station 384.93.

   WEST Response: Cross section 1.82 was shortened on the left bank as suggested. Seven cross sections were also extended at the top of this model (near Baseline Road) to the right between 500 and 1000 feet so that they fully contain flow. These changes are shown below.

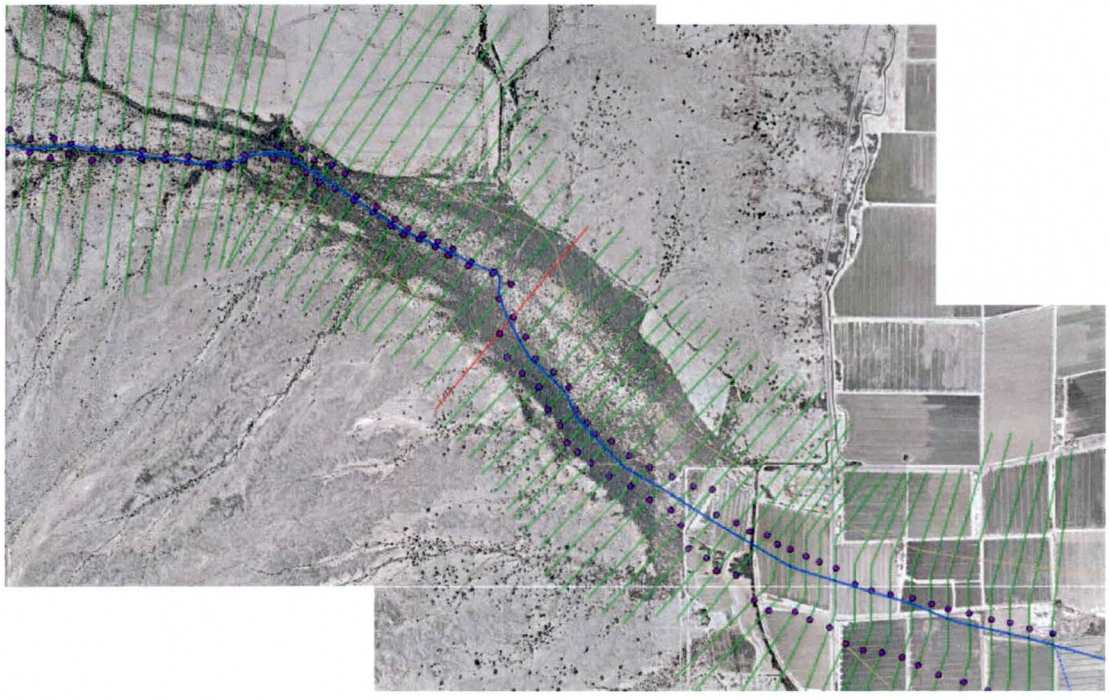


Figure 5. Baseline to Gila model near cross section 1.82 (highlighted in red)

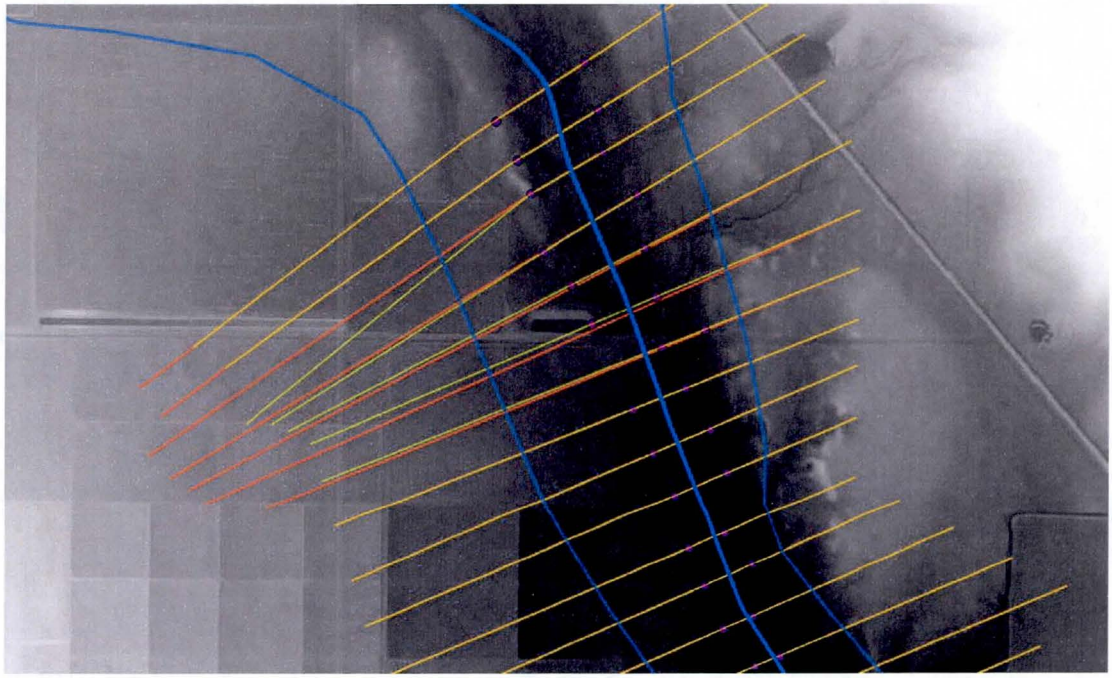
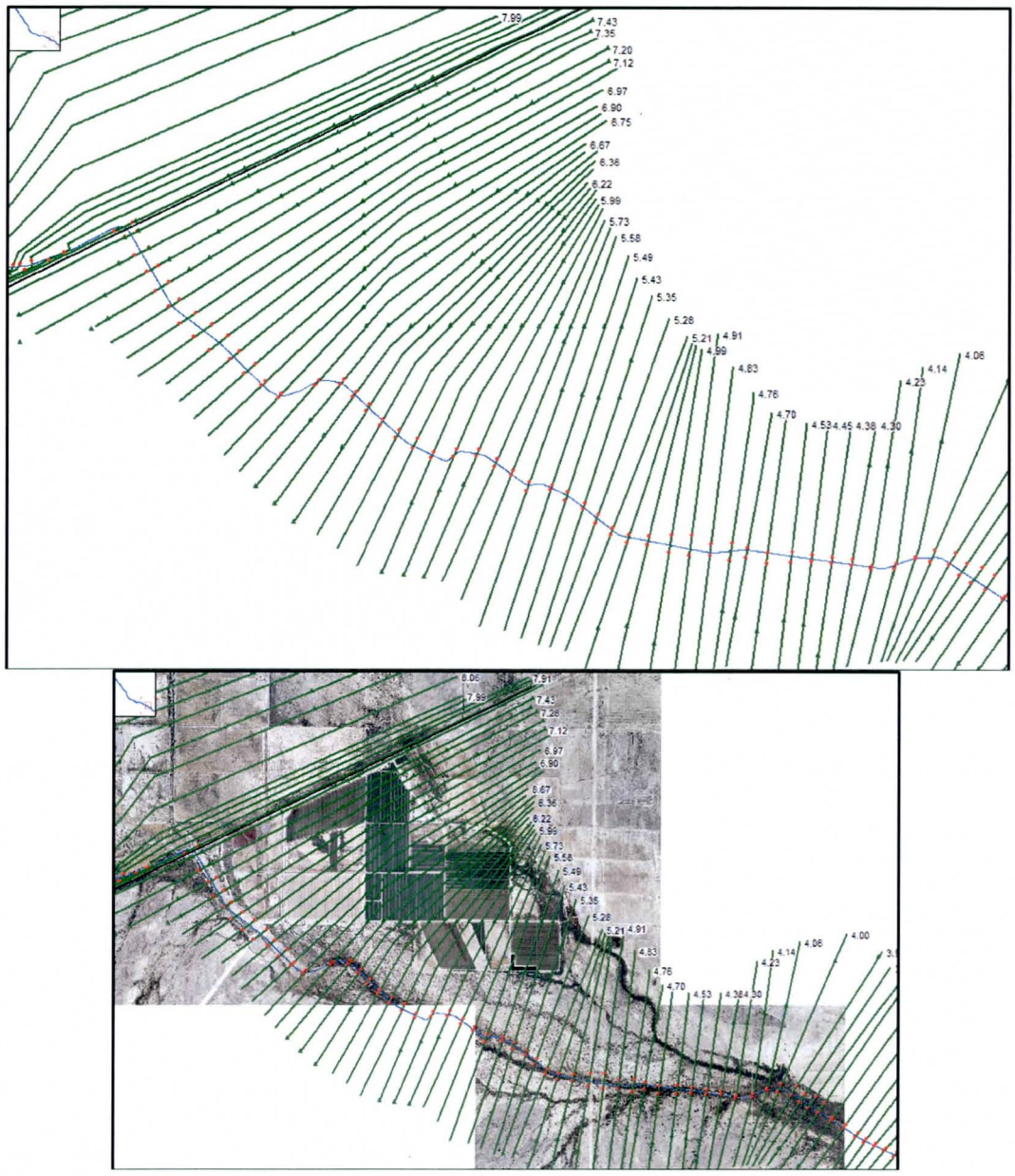


Figure 6. : Baseline to Gila model at upstream end (original cross sections in yellow, extended in red)

5. Cross Sections 4.84 to 5.29, what is the ineffective area on the left of these cross sections for? These cross sections are not on agricultural fields.

   WEST Response: The ineffective areas were placed originally to maintain continuity in ineffective flow area being defined in the far left overbank downstream of the irrigation tail water ditch between RS 5.43 and 5.58 (see Comment #12 in this section below). However, the reviewer makes a good observation that upstream of this pond the flow is effective across the entire cross section, meaning the flow connectivity could occur around the north side of this field. Low, permanent ineffective flow areas are now defined for agricultural fields from 4.84 to 5.29, but the entire left overbank was not considered ineffective with a high ineffective flow area as was originally defined. The two screenshots below show our ineffective flow areas in the HEC-RAS geometric data editor both with and without aerial images in the background. As can be seen, the ineffective flow areas are defined to follow the edges of the agricultural fields.



6. If we decide to show agricultural fields as ineffective, I believe that the areas should be set to permanent and should be at ground level. This applies to cross sections 5.35 to 6.15 and 21.62 to 23.01.

   WEST Response: Permanent ineffective areas were assigned on cross sections where existing ineffective areas corresponded to agricultural fields. The elevation of these ineffective areas was assigned as the approximate height of elevation, usually 1-1.5 feet above the average ground surface in the field. Multiple block ineffective areas were used in cross sections where there was an inaccessible low point in the cross section beyond the fields where permanent ineffective flow area was assigned. These ineffective areas were assigned to cross sections in all models except for La Paz to HVID Canal, since there are no agricultural fields in that area.

XS	Ineffective Area (low permanent, high non-permanent?)
22.96-22.35	low permanent
22.28-22.13	high non-permanent
22.05-21.82	low permanent
21.05-20.74	high non-permanent
Many from 20-7.78	low permanent
7.54-7.28	blocked non-permanent IFA's around bridge
6.14-5.49	low permanent
5.43-4.83	high non-permanent
1.69-end	low permanent (left) and high non-permanent (right)

7. Near the Gila, cross sections 1.40 and 1.46 could have ineffective flow area applied for Old US 80.

   WEST Response: Ineffective areas corresponding to the old highway were added at stations 3953.41 for RS 1.40 and 3018.09 for RS 1.46.

8. Ineffective flow area could be input on cross sections crossing Arlington Canal for the canal channel and upstream bank.

   WEST Response: Ineffective areas were added on the downstream side of the canal (updated RS 1.56) after the main channel crossed over it so water won't travel "upstream" across the canal. These were added as "high" ineffective areas that would not be overtopped.

9. Topic for discussion, we don't have to assume that agricultural berms/fields hold water. Will these berms just as likely wash away during major flood events?

   WEST Response: For this specific area, the RAS model is not assuming that these berms—some of which are represented with ineffective flow area on the "dry" side of the berm—will actually withhold water (i.e., the water surface elevation calculated on the "wet" side of the berm will be mapped on the "dry" side as well). WEST did not consider removing these berms from the topography entirely at this time.

10. Cross Section 1.87 has ponding at station 1820. It should have an ineffective flow area.

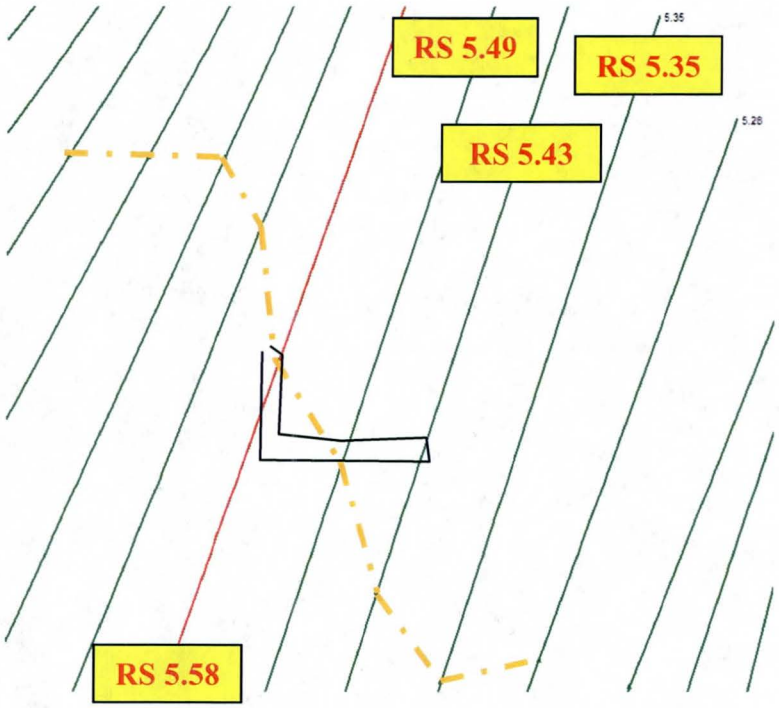
    WEST Response: An ineffective flow area was defined at station 1952.91 in the cross section (corresponding roughly to the Arlington Canal) which made the ponding area at Station 1820 ineffective.

11. Cross Sections 2.00 and 2.07 should have ineffective flow area on the right side.

    WEST Response: Ineffective areas were added to these cross sections in the right overbank at STA 4294.76 for RS 2.07 and STA 4487.8 for RS 2.00.

12. Cross Sections 5.35 to 5.58 should have ineffective flow area for tail water pond.

WEST Response: The figure below shows two screenshots of the geometric data editor in HEC-RAS for this area. One shows an underlying aerial; the other shows the approximate connection of the original ineffective flow areas from one cross section to the next (orange center line) and the outline of the tail water pond (black outline). As can be seen from this second figure, the only cross section between 5.35 and 5.58 that doesn't already include the tail water pond behind the ineffective flow area was 5.58. Ineffective flow area was added to XS 5.58 for the irrigation tail water pond at this cross section, RS 5.58.



13. Should Cross Sections 5.35 and 5.43 be rotated clockwise around the hydraulic baseline?

WEST Response: Cross sections 4.11, 4.17, 4.23, 5.35, 5.43 and 5.51 were rotated so that they were perpendicular to the hydraulic baseline as shown below. Two cross sections that were bent on the right side were also straightened.

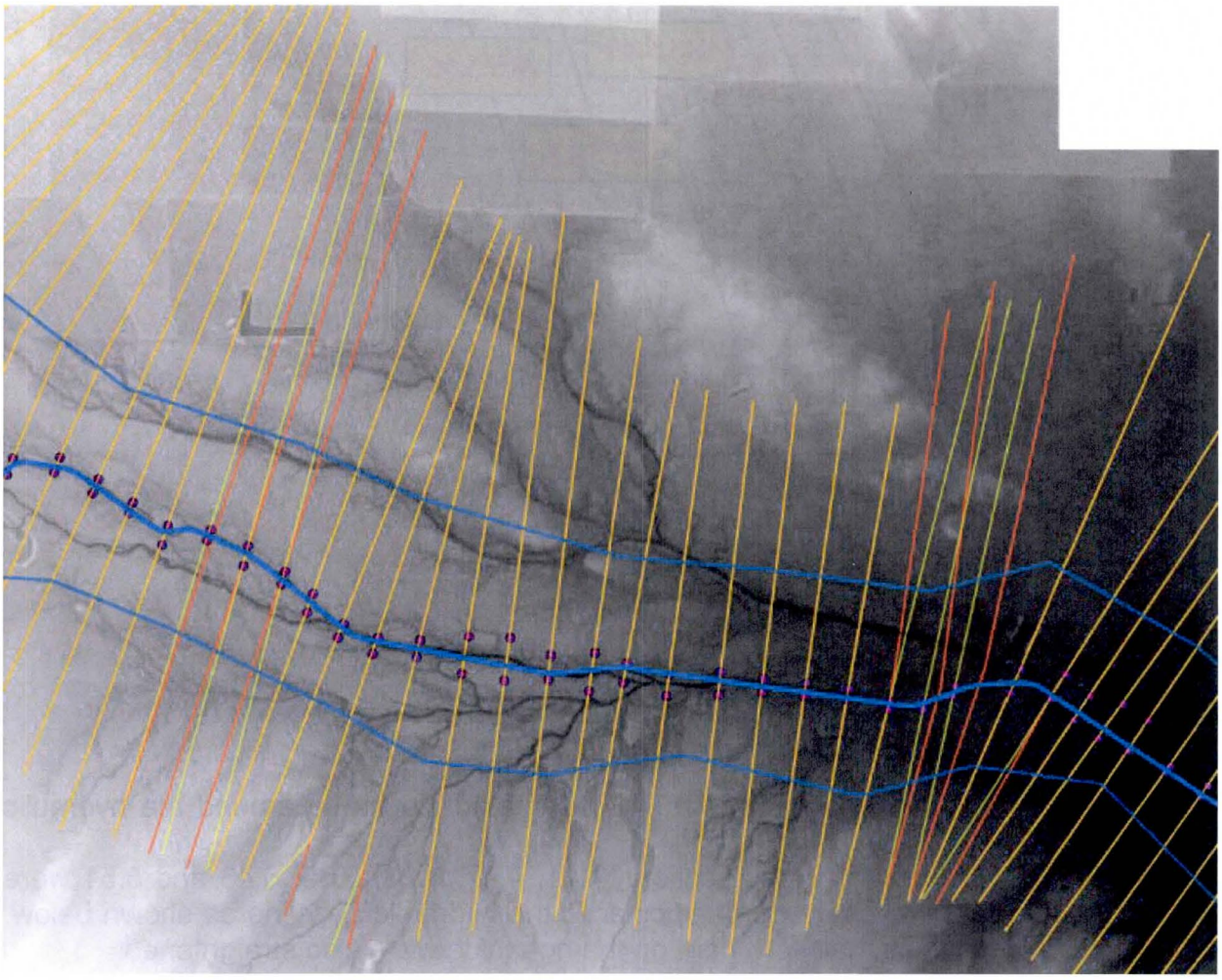


Figure 7. Baseline to Gila model cross sections downstream of bridge (original cross sections in yellow, extended in red)

14. Cross Sections 22.55 to 23.01 do not contain the discharge within ground points. The extension of these cross sections is dependent on the treatment of agricultural impoundment areas. If we remove or lower the ineffective area, the cross section might have containment.

    WEST Response: These cross sections now have containment. The top seven cross sections in this plan were extended so that they contain.

CW_CanaltoBaseline

1. Cross Sections 28.47 to 28.84 need ineffective flow area for that area which is downstream of the HVID drainage channel. We need to discuss doing a with and without embankment model for this channel.

   WEST Response: Ineffective flow area has been added downstream of the HVID north-south flood control drainage channel for XS 28.22 to 28.55. With very little chance for development downstream of this embankment, we could use the water surface elevation calculated upstream of the embankment with ineffective area downstream of the embankment, then project that water surface elevation downstream of the embankment until it meets the ground surface elevation. This way we're not spending significant time analyzing two water surface elevations and possibly mapping broken BFE's for an area with a low chance of development.

2. GIS hydraulic baseline (CW_CanaltoBaseline_River), HEC-RAS Length Chnl, and HEC-RAS river stationing are in good agreement. The hydraulic baseline could be straightened some at cross section 25.95 and between 27.65 and 31.41.

   WEST Response: The hydraulic baseline and flow paths were edited near these cross sections, as shown below. Cross sections25.95, 27.65 and 31.41 are highlighted in red.

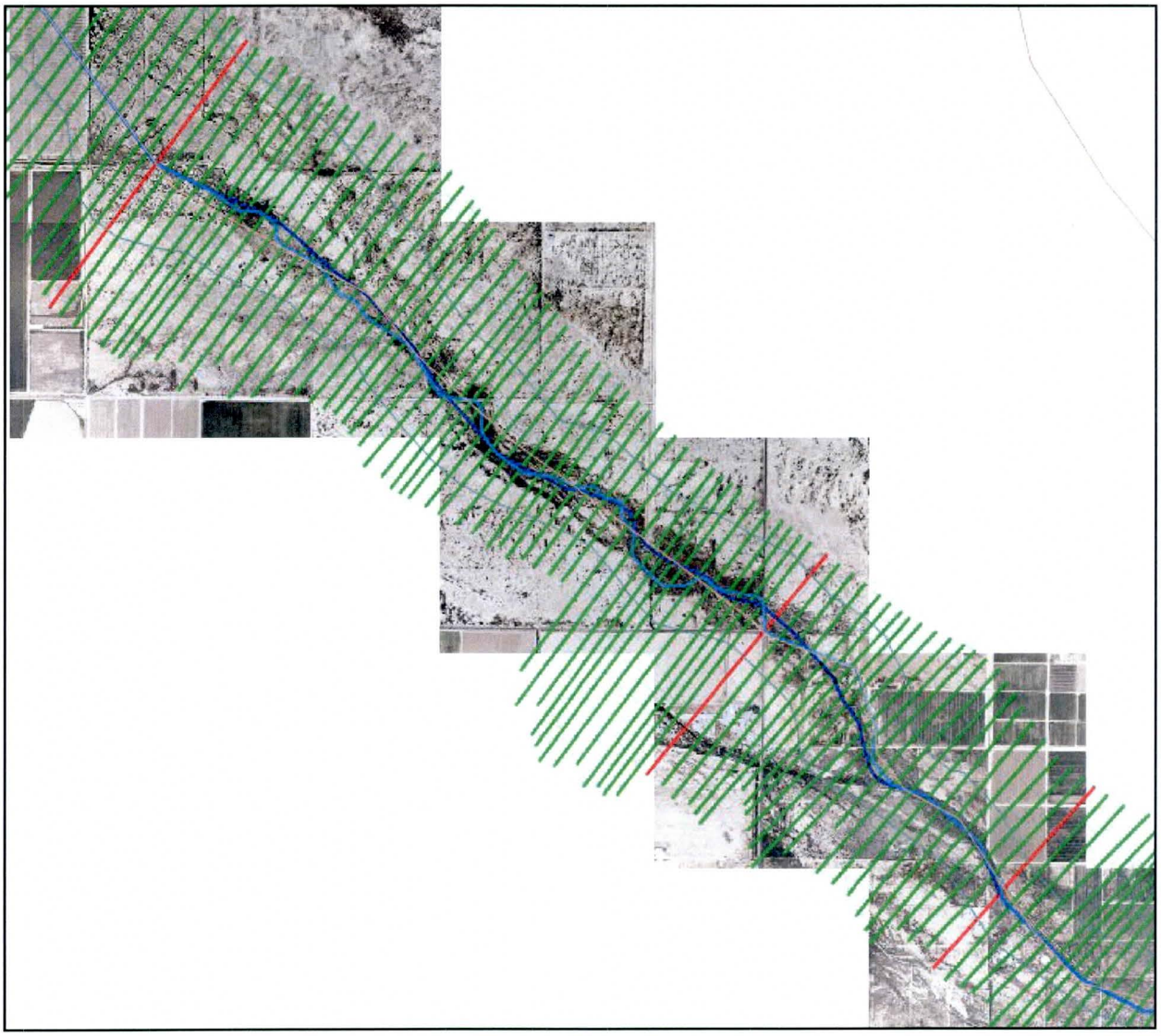


Figure 8. Canal to Baseline Road model (original hydraulic baseline in light blue, edited in dark blue)

3. The right overbank lengths are wrong for cross sections 31.69, 31.78, and 31.87.

   WEST Response: This issue should have been fixed by re-exporting the model from GeoRAS. Additionally, see response to Comment #10 below for a general response to reach length comments in this model.

4. The downstream lengths for Cross Section 24.87 are all long. I measure a perpendicular length of 336 feet for the channel. The HEC-RAS channel length is 431 feet. I measure about 431 feet between cross sections along CW_CanaltoBaseline_River, but this line is not perpendicular to the cross sections. CW_CanaltoBaseline_River is not perpendicular to many of the cross sections in the area between the canal and Baseline.

   WEST Response: This downstream reach lengths should have been fixed by re-exporting the model from GeoRAS. Some sections of the hydraulic baseline were straightened as well so that the existing cross sections are more perpendicular. Flow paths were updated to match the changes in hydraulic baseline alignment. Additionally, see response to Comment #10 below for a general response to reach length comments in this model.

5. For Cross Section 26.9, I measure a length of about 306 feet between this and the downstream cross section. The channel length in HEC-RAS is about 499 feet. CW_CanaltoBaseline_River is not perpendicular here as well. The LOB length is also too long at 390 feet.

   WEST Response: The downstream reach lengths should have been fixed by re-exporting the model from GeoRAS. Some sections of the hydraulic baseline were straightened as well so that the existing cross sections are more perpendicular. Flow paths were updated to match the changes in hydraulic baseline alignment. Additionally, see response to Comment #10 below for a general response to reach length comments in this model.

6. The ROB length is too long by about 100 feet for Cross Section 27.24.

   WEST Response: The downstream reach lengths should have been fixed by re-exporting the model from GeoRAS. Additionally, see response to Comment #10 below for a general response to reach length comments in this model.

7. Cross Section 27.77, CW_CanaltoBaseline_River is not perpendicular. The channel length is too long.

   WEST Response: The downstream reach lengths should have been fixed by re-exporting the model from GeoRAS. Some sections of the hydraulic baseline were straightened as well so that the existing cross sections are more perpendicular. Flow paths were updated to match the changes in hydraulic baseline alignment. Additionally, see response to Comment #10 below for a general response to reach length comments in this model.

8. Cross Sections 28.11 and 28.22, CW_CanaltoBaseline_River is not perpendicular. The channel lengths are too long.

   WEST Response: The downstream reach lengths should have been fixed by re-exporting the model from GeoRAS. Some sections of the hydraulic baseline were straightened as well so that the existing cross sections are more perpendicular. Flow paths were updated to match the changes in hydraulic baseline alignment. Additionally, see response to Comment #10 below for a general response to reach length comments in this model.

9. Cross Sections 28.58 and 28.69, CW_CanaltoBaseline_River is not perpendicular. The channel lengths are too long.

   WEST Response: The downstream reach lengths should have been fixed by re-exporting the model from GeoRAS. Some sections of the hydraulic baseline were straightened as well so that the existing cross sections are more perpendicular. Flow paths were updated to match the changes in hydraulic baseline alignment. Additionally, see response to Comment #10 below for a general response to reach length comments in this model.

10. See highlighted rows in spreadsheet CW_CanaltoBaseline_ch_length.xls for all of the cross sections where the LOB, Channel, and ROB downstream lengths are questionable.

    WEST Response: As discussed in a coordination meeting on March 28, the reach lengths of this entire reach were addressed by making the overbank reach length lines much more parallel to the main channel reach length line (i.e., the hydraulic baseline). Previously, the overbank flow paths were much more sinuous and would move far away from the hydraulic baseline, causing much longer or shorter overbank reach lengths than channel reach lengths at some cross sections. See the figure below for a visual representation of the updated linework.

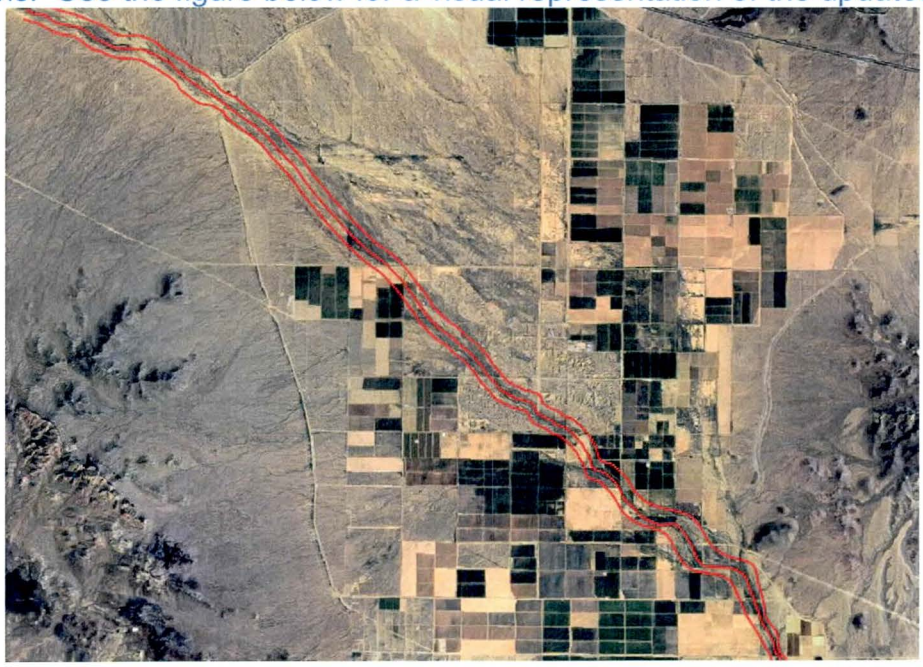


Figure 9. Updated overbank flowpath lines paralleling the hydraulic baseline

11. Cross Sections 23.36 to 24.33 will need to be extended left to include the Centennial Wash Left Overbank. This is likely where we will increase the discharge in the HEC-RAS model to 38,552 cfs.

    WEST Response: Cross sections downstream of the flow split were extended. Cross sections upstream of the flow split were left as they were before.

12. It looks like we have containment on the right side of all cross sections. As discussed, some cross sections do not have containment on the left side. Containment on the left side will be dealt with as we move forward with the FLO-2D model.

    WEST Response: As FLO-2D modeling is ongoing, we will not address these containment issues at this time.

CW_LaPaztoHVIDCanal

1. GIS hydraulic baseline (CW_CanaltoBaseline_River), HEC-RAS Length Chnl, and HEC-RAS river stationing are in good agreement. The hydraulic baseline could be straightened at cross section 38.98 and 36.94.

    WEST Response: The hydraulic baseline was straightened in some areas as shown below (old baseline shown in light blue, new baseline shown in dark blue). The flow paths (shown in purple) were updated to reflect changes in the hydraulic baseline. Cross sections 36.94 and 38.98 are highlighted in red.

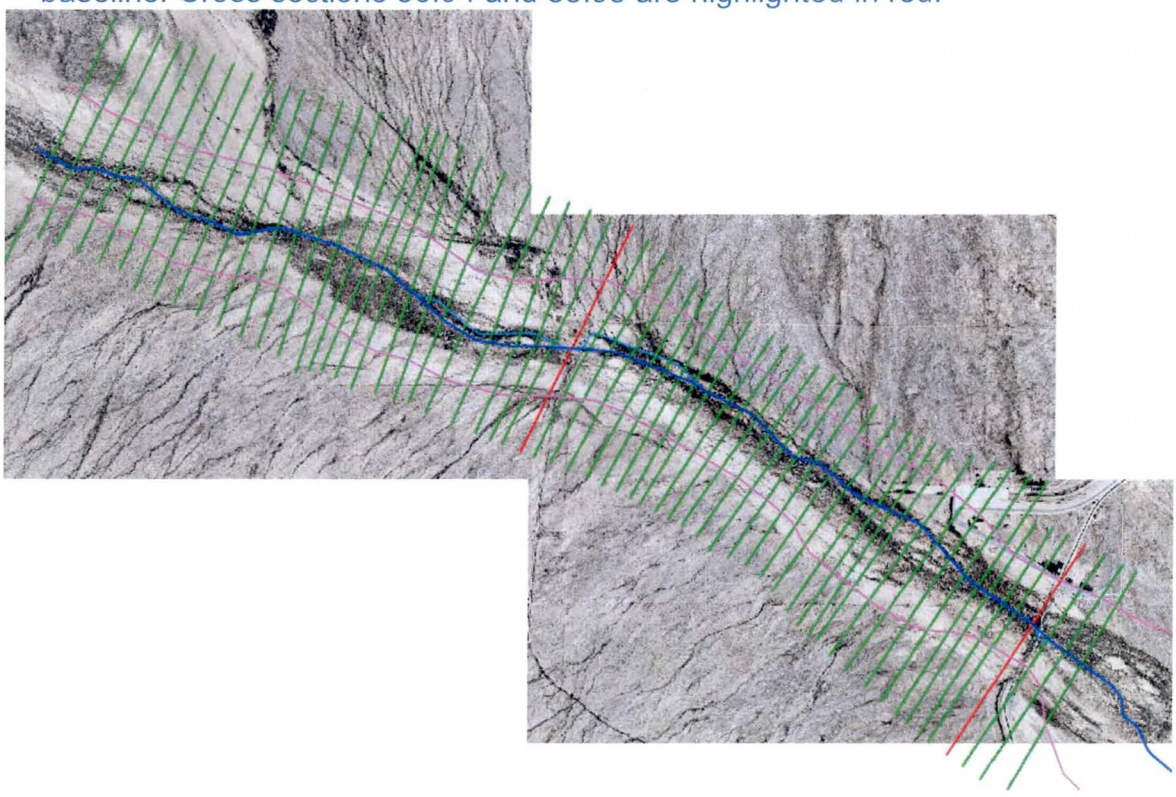


Figure 10. La Paz county to HVID canal model (original hydraulic baseline in light blue, edited in dark blue)

coefficients for elongated piers with semi-circular ends should be 1.33; and drag coefficients for square nosed piers should be 2.0.

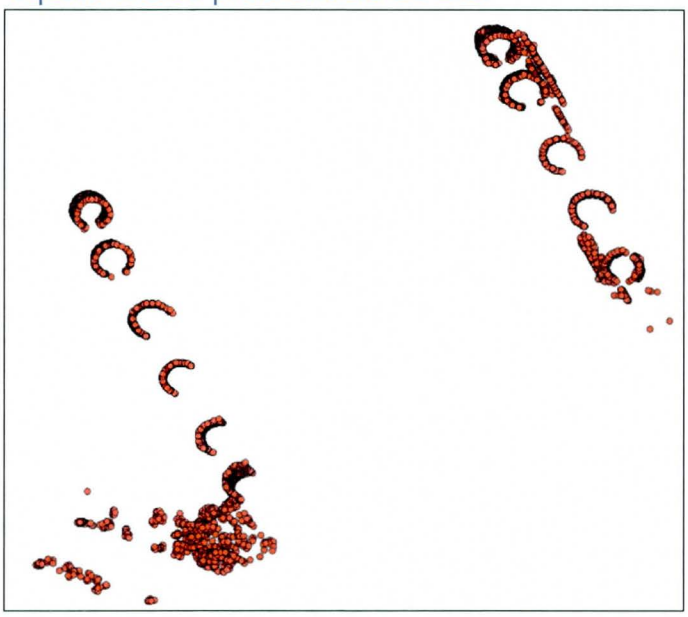


Figure 12. Cross section of two pier groups at bridge #2

For the Pier Shape coefficient for Yarnell's equation (referred to in Table 5-4 of the RAS v4.1 Hydraulic Reference Manual as *K*), reference values for various pier shapes and configurations are listed as 0.90 for piers with semi-circular noses and tails; 1.25 for piers with square noses and tails; and 2.5 for a ten pile trestle bent. Since these trestle bents are 5-pile bents, WEST elected to use a value of 2.0 for the pier shape coefficient.

6. All lateral weir embankment weir coefficients should be between 2.5 and 2.8 according to the H. W. King, E. F. Brater, "Handbook of Hydraulics," McGraw-Hill, 1963 and 1996.

WEST Response: The weir coefficient that we are using right now is 2.0. Internal QA/QC in WEST has suggested that we continue with this value. Several engineers in our firm said they have seen coefficients as low as 1.5 (possibly lower) so 2.0 may be appropriate. One engineer stated that values as low as 1.0 have been used in calibrated models (specifically on the Truckee River). To provide further confidence in the coefficients chosen for this study, the WEST internal QA/QC team recommended completing some external lateral structure weir coefficient estimation calculations (such as the Hager equation) results of these exercises are provided below.

The HEC-RAS Hydraulic Reference Manual states that the coefficient of discharge ranges from 2.5 to 3.1, but may be decreased if there is increased resistance to flow, which may be caused by obstructions like trash on the bridge railings, curbs, or other barriers. The base suggested value for a rectangular weir

with a breadth of 15 feet and H of 1 foot or more is 2.63 according to King's Handbook (1963). However, others have proposed decreases to these general values for weirs acting as side weirs (i.e., parallel to the flow direction as opposed to perpendicular to the flow direction).

A paper authored by S.M. Borghei, M.R. Jalili, and M. Ghodsian (1999) titled "Discharge Coefficient for Sharp-Crested Side Weir in Subcritical Flow" proposes the following equation for the De-Marchi coefficient of discharge for subcritical flow. This equation is applicable to sharp-crested, rectangular weirs with constant specific energy.

$$C_M = 0.7 - 0.48F_1 - 0.3\frac{w}{y_1} + 0.06\frac{L}{B}$$

Where F_1 = Froude number
w = weir height
y_1 = water depth in main channel
L = weir length
B = top width of flow
C_M = weir coefficient

For the most upstream lateral structure along Centennial Wash (updated RS 8.26), the width of the embankment (B) ranges from approximately 25 to 50 feet, resulting in the following De-Marchi coefficients (varying top width of flow used in the computations). The railroad embankment is approximately 20 feet across.

F_1	0.11	0.11	0.11
w (ft)	6.14	6.14	6.14
y_1 (ft)	4.28	4.28	4.28
L (ft)	400	400	400
B (ft)	20	25	50
C_M	1.42	1.18	0.70

Another paper authored by J.E. Davis and E.R. Holley (1988) titled "Modeling Side-Weir Diversions for Flood Control" presents the following generalization of the Hager (1987) equation for the coefficient of discharge for subcritical flow over side weirs. This equation is applicable to broad-crested weirs with constant specific energy.

$$C = C_n\omega = C_n\left\{\frac{F_w^2 + 2}{3F_w^2 + 2}\right\}^{1/2}$$

Where ω = a conversion a discharge coefficient (C_n) for a normal weir (a weir transverse to the direction of flow in the channel) into a discharge coefficient for the same weir used as a side weir
C = Discharge coefficient for side weir

F_w = Froude number of the approach flow

Froude numbers for flows approaching the lateral structures upstream of the bridge on the "Centennial Wash" River, "Upper" Reach are as high as 0.7, which would correspond to a discharge coefficient of 2.1 for these structures.

In summary, a range of values estimated for the lateral structure weir coefficient in this model has been completed and presented. Based on various methods, ranges of lateral weir coefficients can vary from 0.7 to 2.1 for the computations shown above, or could be placed at a higher value (in the range of standard weir coefficients for in-line weirs from 2.5 to 3.1). Based on this analysis and the range of values presented herein, WEST chose to retain a value of 2.0 for the lateral weir coefficients in this model.

7. Note: The GIS length for Centennial Wash Upper and Lower from first cross section to last is 36,605 feet. The sum of HEC-RAS Length Chnl is 36,526 feet. The difference in first and last river stations is 36,605 feet. The difference between HEC-RAS Length Chnl and GIS length is 78 feet. A new measurement over the junction could bring that distance to 144 feet. This might not generate a comment in the final HEC-RAS submittal. The final submittal should be formatted in our data delivery specifications so I can run some GIS checks on it. If the additive errors between Length Chnl and GIS become visible to the eye at any location, there might be a comment made. You might decide to straighten out the GIS hydraulic baseline (UPRR_Bridge_LatStr_River).

   WEST Response: All the models were re-exported, so this should fix the issue with the lengths not matching up. HIS deliverables have been provided to the District for cross section lines and the hydraulic baseline with this model deliverable to allow internal checks in the District's HIS system if desired.

CENTENNIAL WASH FLOODPLAIN DELINEATION STUDY
GILA RIVER TO LA PAZ COUNTY

CONTRACT FCD 2012C004

REMOVAL OF "EMBANKMENT-LIKE FEATURES" FOR THE "WITHOUT EMBANKMENT" FLO-2D MODELING SCENARIO TECHNICAL MEMORANDUM

Date: May 8, 2013

To: Jeff Shelton, Project Manager – District

From: Brian Wahlin, Project Manager – WEST Consultants, Inc.
Chuck Davis – WEST Consultants, Inc.

The purpose of this technical memorandum is to outline the process used to remove the "embankment-like features" from the topography as represented in the FLO-2D model grid for the "without embankment" scenario modeling. This effort included a review of the original topographic data to determine those "embankment-like features" that should be removed, a discussion of possible removal techniques, and a presentation of the final technique utilized to remove embankments from the FLO-2D model.

Review of the original topography to determine "embankment-like features" to be removed

In reviewing the general topography of the FLO-2D model area with District staff, the project team identified three areas in the model that would require the removal of "embankment-like features" to better understand the impacts that these features would have on flood inundation extents and depths throughout the system. These three areas are (1) the embankment on the west side of the north-south Harquahala Valley Irrigation District (HVID) drainage canal, (2) the stock tank embankment near the flow split area close to the upstream end of the FLO-2D model domain, and (3) the stock tank embankment near the Saddleback FRS outfall channel close to the downstream end of the FLO-2D model domain. Each of these areas will be discussed in greater detail below.

Embankment on the west side of the north-south HVID drainage canal

The north-south drainage channel owned and operated by the HVID that parallels Harquahala Valley Road approximately one-half mile west of the roadway alignment was designed to protect downstream agricultural fields from damages by overbank flooding from the main branch of Centennial Wash. As this channel and embankment will not be certified by FEMA to be a flood control feature in the system, a without embankment analysis will be required to determine if a "worst-case" flooding condition exists downstream of the embankment if it were to be washed away during a flooding event. Interestingly, a canal is on the downstream (i.e., east) side of the large embankment on the left bank (east side) of the channel which has a smaller embankment above natural grade as well (as can be seen in Figure 2). Figure 1 shows the location of a cross section cut from the final topography approximately 500 feet upstream of the Thomas Road alignment (Thomas Road is 1 mile north of the Centennial Road alignment). Figure 2 shows the station and elevation data associated with this cross section (the figure is oriented left-to-right looking downstream along the channel to the south).

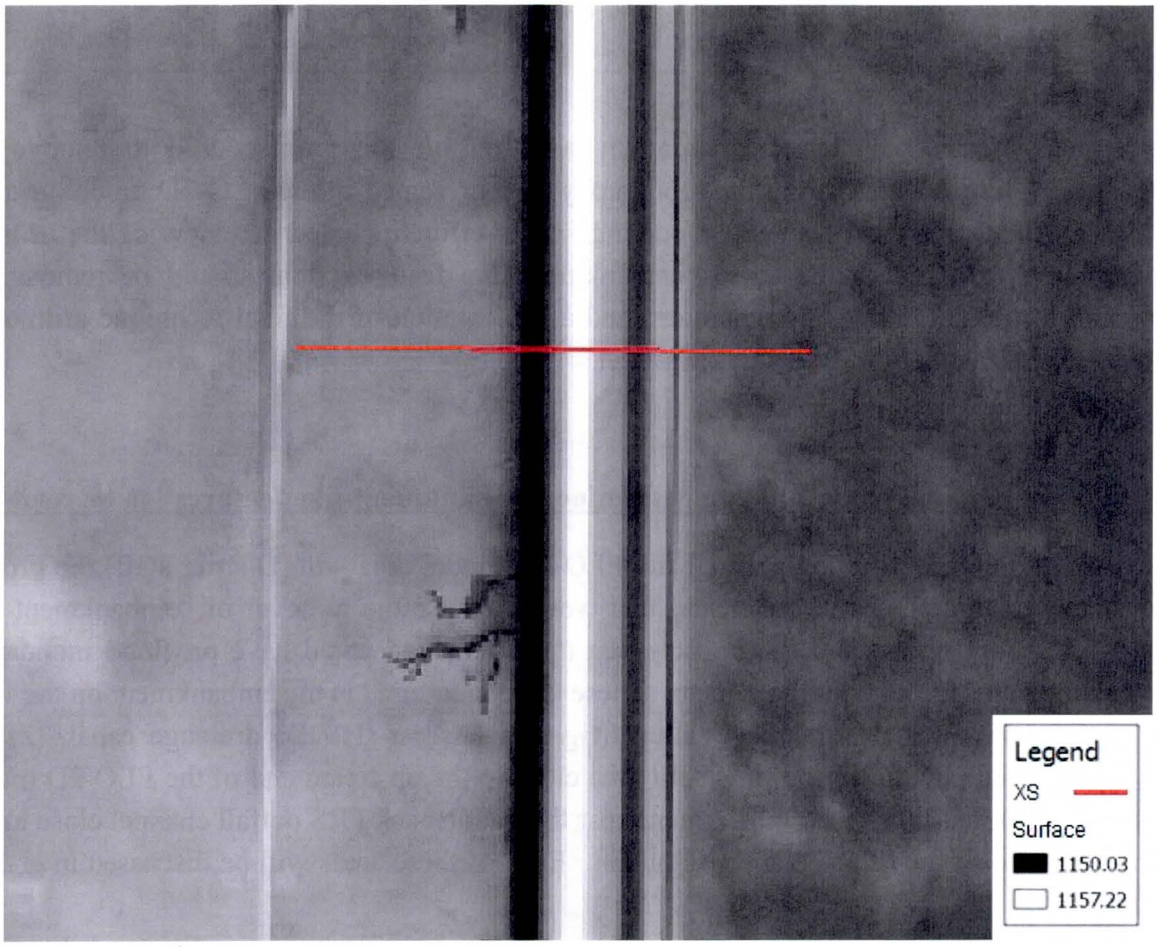


Figure 1. Location of the cross section of the HVID channel and downstream canal shown in Figure 2 cut from the final topography approximately 500 feet upstream of the Thomas Road alignment.

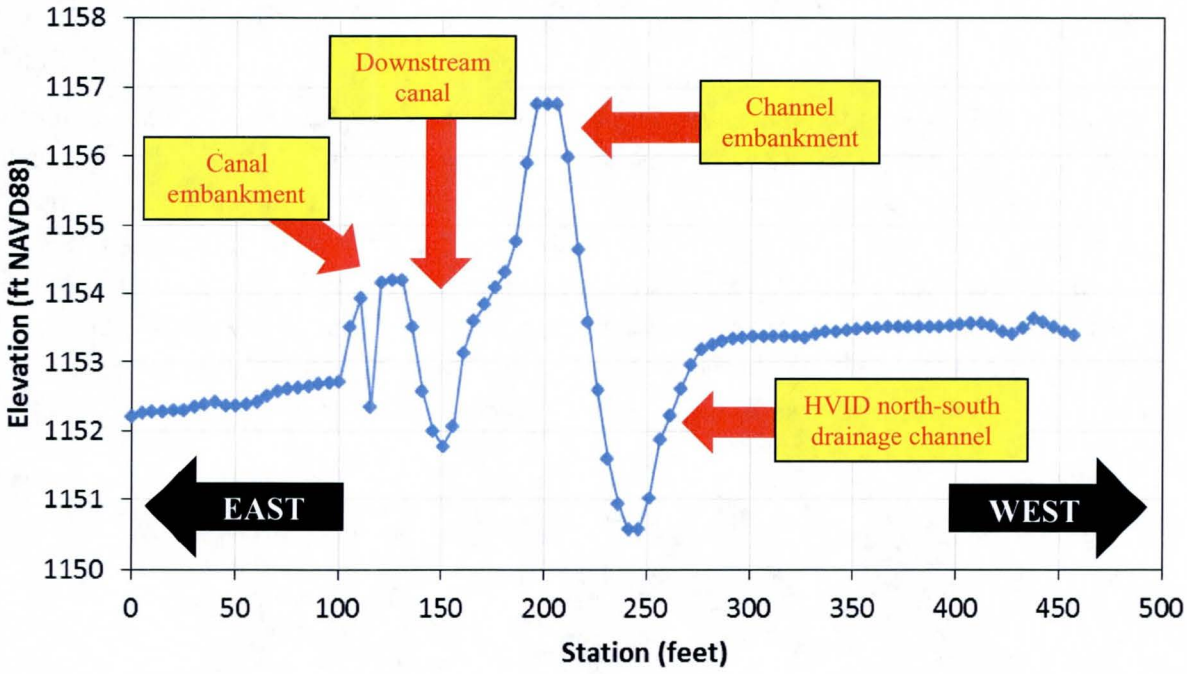


Figure 2. Station and elevation data associated with the cross section shown in Figure 1 (the cross section is oriented left-to-right looking downstream along the channel to the south).

This channel runs for approximately 5 miles from its origination at the north end of the channel until its terminus in the main channel of Centennial Wash (just north of the effective floodway boundary). This channel was an engineered channel designed by Franzoy, Corey & Associates (later acquired by Stantec). This channel increases in size in the downstream (southern) direction to account for additional required capacity from increased overland runoff area.

Stock tank embankment near the flow split area close to the upstream end of the FLO-2D model domain

A large stock tank exists in the main flowpath of Centennial Wash near the upstream end of the FLO-2D model domain. This stock tank is near the intersection of what would be the Indian School Road alignment and the 551st Avenue alignment although the site is accessible only by dirt roads. The stock pond is shown in Figure 3. The stock pond itself (i.e., the area in Figure 3 shown with ponded water) is excavated below natural grade. The stock pond and entrance to the stock pond is surrounded by an embankment approximately 4 to 5 feet above surrounding natural grade. Also, an embankment runs to the north approximately 1,200 feet, and this embankment is approximately 2 to 4 feet above surrounding natural grade.

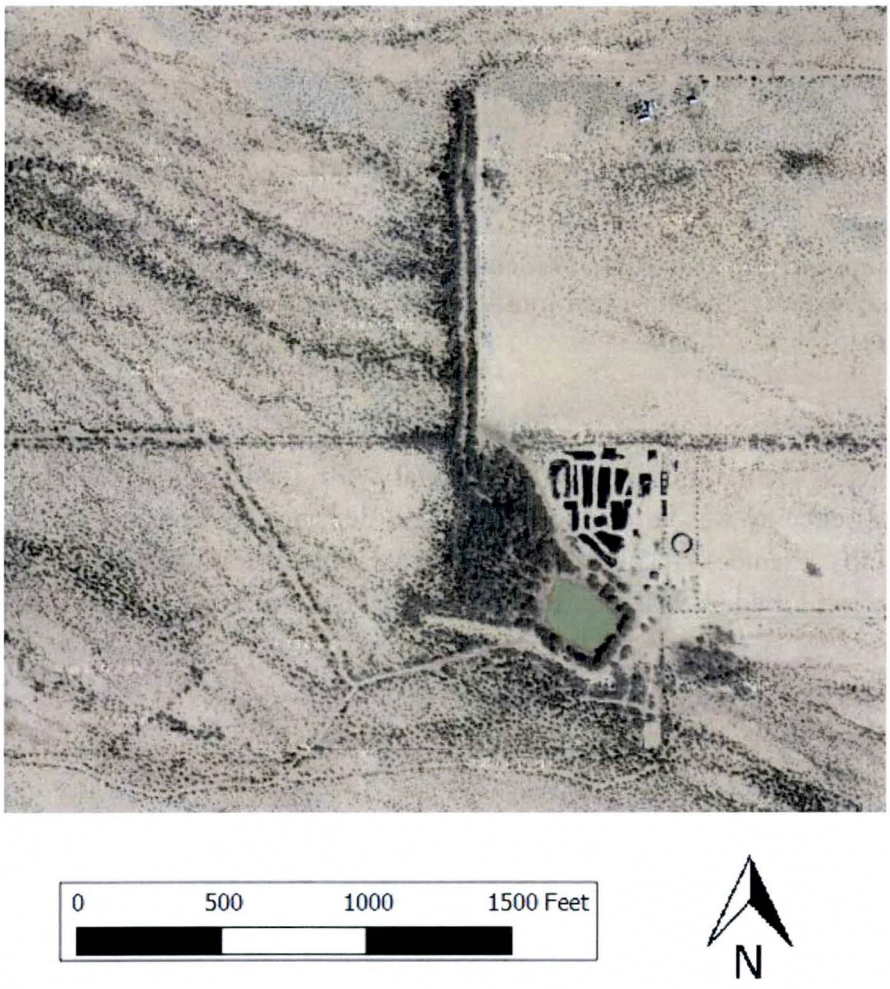


Figure 3. Stock pond near the upstream end of the FLO-2D model domain in the main branch of Centennial Wash.

Stock tank embankment near the Harquahala FRS outfall channel close to the downstream end of the FLO-2D model domain

A stock tank exists in the left overbank flowpath of Centennial Wash near the upstream end of the FLO-2D model domain. This stock tank is near the intersection of what would be the Broadway Road alignment and the 491st Avenue alignment and is located approximately 3,000 feet southwest of the end of the Saddleback FRS Outfall Channel. The stock pond itself (i.e., the area in Figure 4 shown as bare ground) is excavated below natural grade. The stock pond is surrounded by an embankment approximately 4 to 5 feet above surrounding natural grade.

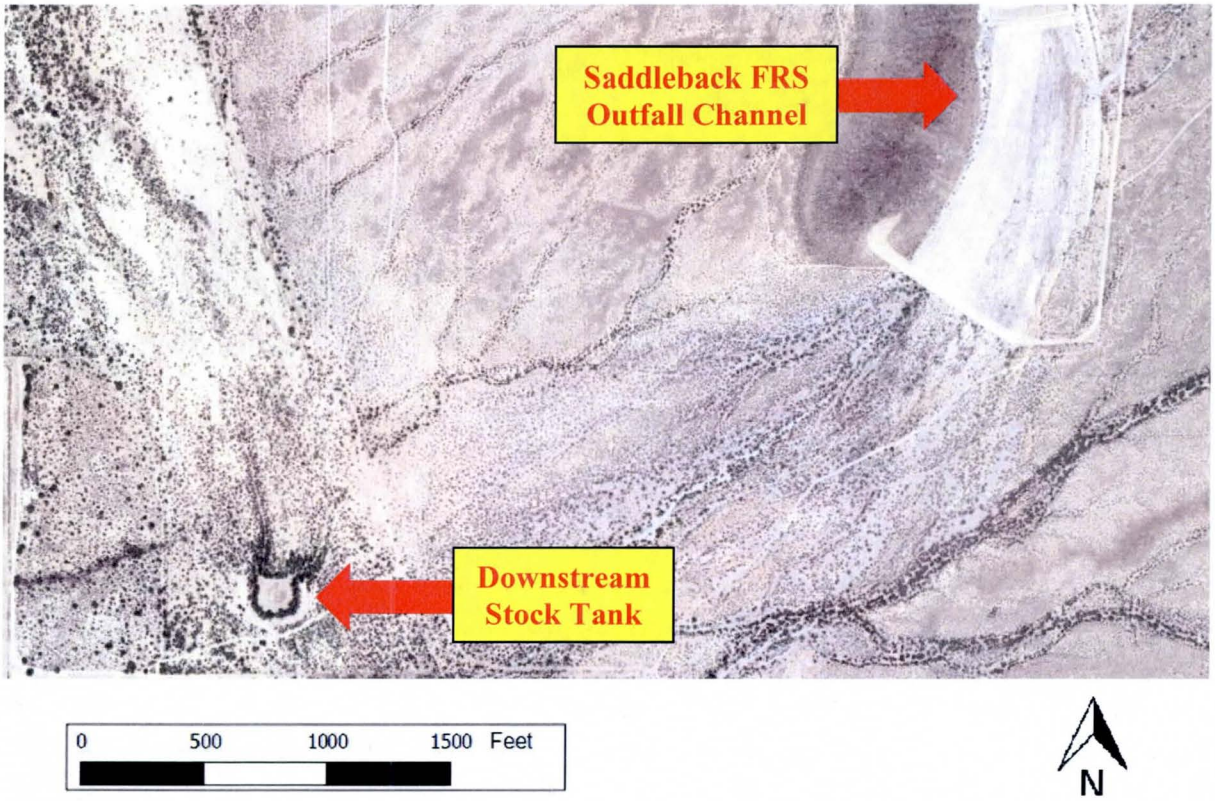


Figure 4. Stock pond near the downstream end of the FLO-2D model domain southwest of the Saddleback FRS Outfall Channel.

Discussion of possible removal techniques for the "embankment-like features"

For the three embankments listed above that needed to be removed from the topography of the FLO-2D grid in order to create a FLO-2D model for the without embankment scenario, a methodology had to be developed to remove the embankments from the topography efficiently.

It was determined that the two stock tanks should be edited manually for the entire area of the stock tank for a number of reasons. First, the area of the model grid affected by the stock tanks was small; manually editing the number of grid elements that represent each stock tank would not take significant time and effort. Second, removing "embankment-like features" from the topography around the stock tanks would be unique for each stock tank, as the height of the embankment and the number of cells influenced by the embankment varied. Finally, the District and WEST agreed that the excavated portions of the stock tanks themselves should be "filled in" as well, meaning that the elevation of the cell within the excavated areas should be increased to reflect the elevation of the pre-excavation natural grade. This manual editing could be done directly to the DEM created from the original topography data provided by the District, or it could be done by editing elevations of the FLO-2D model grid elements. The final technique selected for this process will be presented in the next section of this memorandum.

The embankment along the north-south HVID channel would be difficult to edit manually in an efficient manner due to the length of the channel and the number of cells required to be edited. Therefore, some type of automation process needed to be developed to remove the "embankment-like features" from the topography. This could be done in a number of different ways.

In the original topographic data, a rectangular area in the north south direction capturing the drainage channel embankment, the canal east of the drainage channel embankment, and the canal embankment east of the canal could be defined in GIS, and each of the DEM grid elevations (or TIN nodes or other points representing the elevation in the digital terrain model of choice) could be adjusted downward by a set amount. This is the easiest way to remove an embankment from a digital terrain model: determine the average height of the embankment, then subtract that height from the cells that represent the embankment. Two problems exist with this methodology including (1) while this technique might lower the drainage channel embankment canal embankment, effectively removing these from the topography, it may also drop the canal thalweg elevation lower than the thalweg of the drainage channel (see Figure 5) and (2) picking a single value that will remove not leave the drainage channel embankment too high or lower the canal embankment too much is difficult due to the difference in heights of these two embankments. Therefore, this first methodology was discarded due to the problems it would cause in the final FLO-2D model.

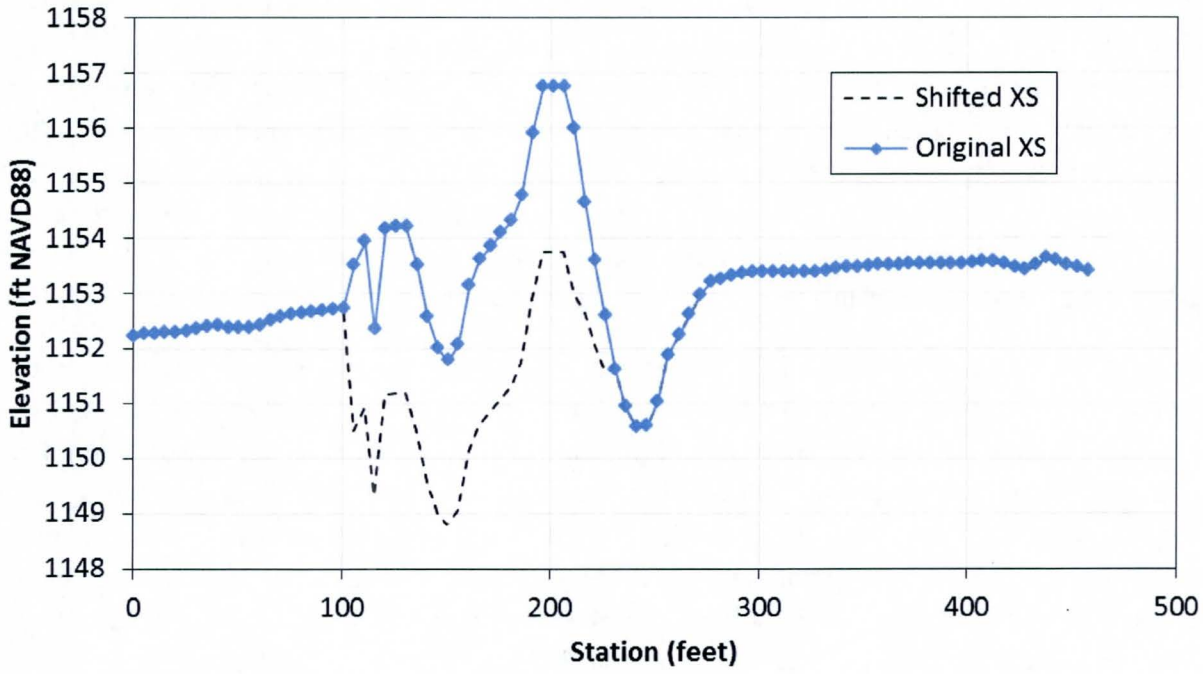


Figure 5. Example of the resulting cross section when applying a constant shift value to the entire area of the drainage channel embankment, canal, and canal embankment.

A second technique to edit the original topographic was similar to the first technique listed above but using three separate rectangular areas: one for the drainage channel embankment, one for the canal, and one for the canal embankment. Then different shift values could be applied to these three areas including a larger negative shift for the drainage channel embankment, a smaller negative shift for the canal embankment, and a negligible or positive shift for the canal thalweg. The process of defining these rectangular areas precisely would be difficult, however, and the amount of review needed to check the definitions of these areas would be significant. Then it would still be necessary to closely check the resulting interpolation of these edited elevations to the FLO-2D grid to ensure that the embankment is no longer represented in the model. This level of effort seemed incongruous with the overall level of effort for the task and was therefore abandoned.

A third technique to edit the original topographic data was to clip the mass point and breakline input files provided by the District to make the grid around the drainage channel embankment, the canal, and the canal embankment, and then regenerate a digital elevation model to interpolate across this gap in the data. This tends to be problematic from a GIS processing standpoint, however, as the interpolation across this gap may not present a smooth surface that would be expected. Ideally, the two points directly across from one another would interpolate linearly from one side of the gap (e.g., the thalweg of the drainage channel) to the other (e.g., the natural

ground in the field downstream of the canal embankment). But GIS interpolation would triangulate (if a TIN processing techniques was used) from many points along one side of the gap to a single point on the other side of the gap. This could result in a very unnatural, saw-tooth type pattern along the length of the channel which would not accurately reflect the hydraulics of the system. To improve on this interpolation, manual breaklines could be added crossing the gap to control interpolation, but these would need to be entered manually and reviewed carefully which required a level of effort that seemed incongruous with the overall level of effort for the task. Due to these reasons, this technique was abandoned as well.

Abandoning automation options to remove the HVID north-south channel embankment from the digital topography data used to interpolate grid elevations in FLO-2D left edits in FLO-2D as the only other option to remove these embankments. Some tools exist to select large numbers of cells and lower their elevation collectively by a certain amount. However, depending on the alignment of the drainage channel embankment, canal, and canal embankment in certain parts of the model compared to the alignment of the FLO-2D grid in a particular area, the interpolation procedure in FLO-2D may or may not have picked up an individual feature significantly in a given cross section. For example, if the canal thalweg falls in the middle of a FLO-2D grid element, that element will likely be significantly lower than the surrounding elements because the effects of the lowered canal elevation are exhibited more strongly in that cell during the interpolation procedure. On the other hand, if the canal thalweg falls on the boundary between two grid elements, then neither of those grid elements will be lowered as drastically as the grid element that entirely contains the canal width. The result of this is that a single shift value would not be applicable to every grid element that the canal crosses.

This lead WEST to realize that visualization of these grid elements in the cross sectional sense may help to visualize a technique to remove the embankment. A Microsoft Excel macro was developed to automatically read the grid elevations surrounding the embankment and plot these elevations. While viewing these plots, it occurred to WEST personnel that projecting the slope of the natural grade in the fields downstream of the canal embankment (i.e., east of the canal embankment) back through the drainage channel embankment provided a smoothed model grid that effectively removed the drainage channel embankment and the canal embankment from the model while not lowering the canal thalweg. This also seemed to provide a means by which to only edit the data in FLO-2D as opposed to editing data in both the spatial topography data in GIS as well as the final interpolated grid elevations in FLO-2D, thereby reducing the overall quality control required on the final product.

Final techniques utilized to remove embankments from the FLO-2D model

For the three embankments listed above that needed to be removed from the topography of the FLO-2D grid in order to create a FLO-2D model for the without embankment scenario, various methodologies to remove the embankments from the topography were presented in the preceding section. This section presents the final methodology used for the stock tanks and for the HVID north-south drainage channel area.

To manually edit the representation of the two stock tanks in the FLO-2D model, cross sections were taken from the FLO-2D grid and manually edited to visually follow the slope of the surrounding grade in the vicinity of the stock tanks. Results of this process can be seen in the documents titled "Remove_Lower_Stock_Tank.pdf" and "Remove_Upper_Stock_Tank.pdf" for cross section upstream, through, and downstream of the stock tanks.

To automatically remove the drainage channel embankment, the canal just east of the drainage channel, and the canal embankment from the FLO-2D model grid, WEST edited the visualization macro discussed above. Since the distance from the drainage channel embankment to the natural grade east of the canal embankment was approximately 120 feet in most places, WEST edited the macro to determine the grid element elevation three cells away (each cell in FLO-2D is 40 feet by 40 feet so three grid cells is 120 linear feet) from the cell representing the drainage channel embankment (defined herein as the left bank station of the 1-D channel cross sections entered into the FLO-2D model to represent the channel as a 1-D element in the FLO-2D model) and then used the next seven cells (280 linear feet) to determine an average slope for the natural grade in the field downstream of the canal to project grid elevations following that slope back through the drainage channel embankment. Once these calculations had been performed, the macro was further edited to rewrite the floodplain grid elevations for the FLO-2D input files, update the corresponding 1-D cross section left bank elevations to more closely match the new floodplain grid element without the levee embankment, and rewrite the 1-D channel cross section files with these updated left bank elevations. Examples of the visualization for this process at various cross sections are shown below in Figure 6 through Figure 13. It should be noted that each of these automated cross section calculations were verified visually, and those cross sections needing further edits beyond the automated process were completed as required. For example, Figure 13 shows the changes made to cross section 617 near the downstream end of the one-dimensional channel. An embankment also exists on the right bank (i.e., west side) of the channel near the downstream end, and this embankment was removed from the model as well. Any changes outside of the macro described herein were made manually in the model. A list of these manual edits beyond the edits completed automatically by the macro is provided in Table 1 below.

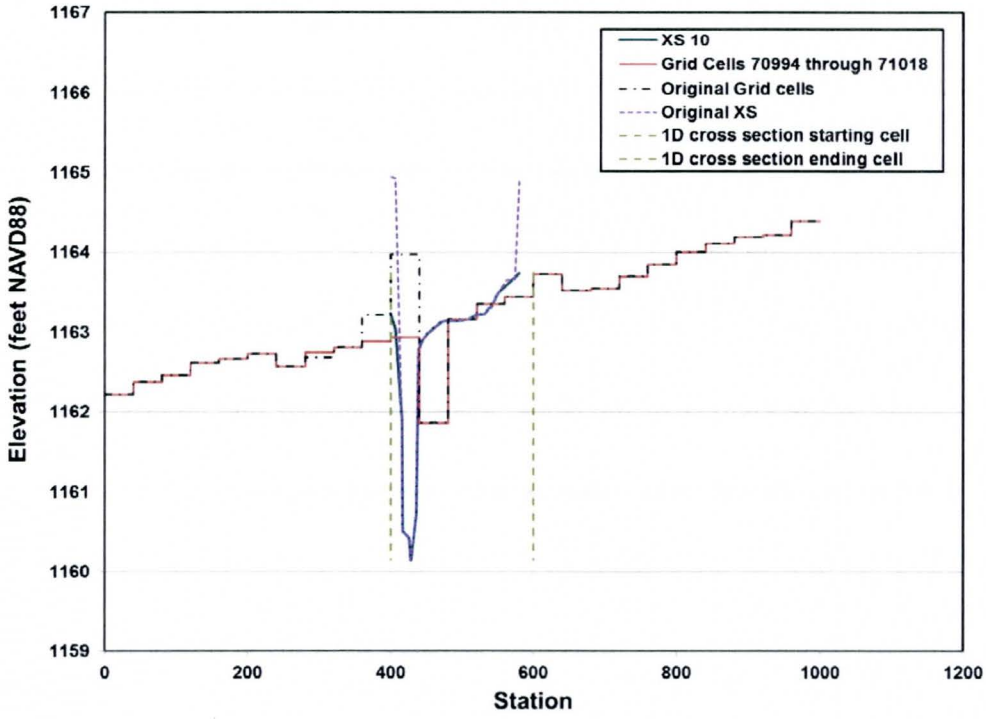


Figure 6. Visualization of the "without embankment" geometry for cross section 10 of the HVID north-south drainage channel as represented in the FLO-2D model.

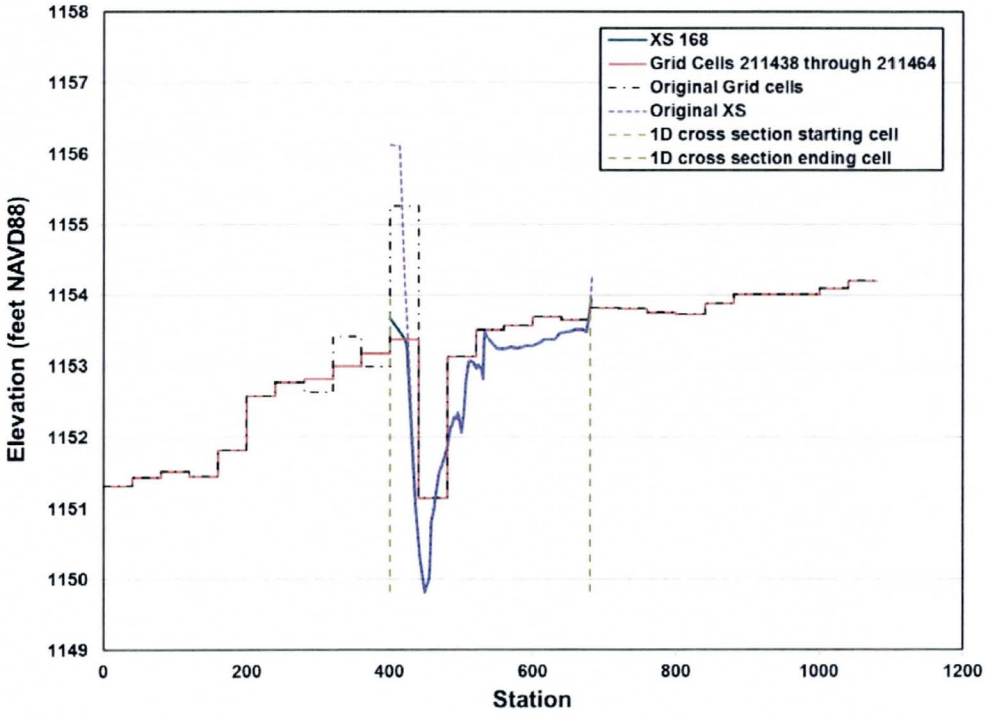


Figure 7. Visualization of the "without embankment" geometry for cross section 168 of the HVID north-south drainage channel as represented in the FLO-2D model.

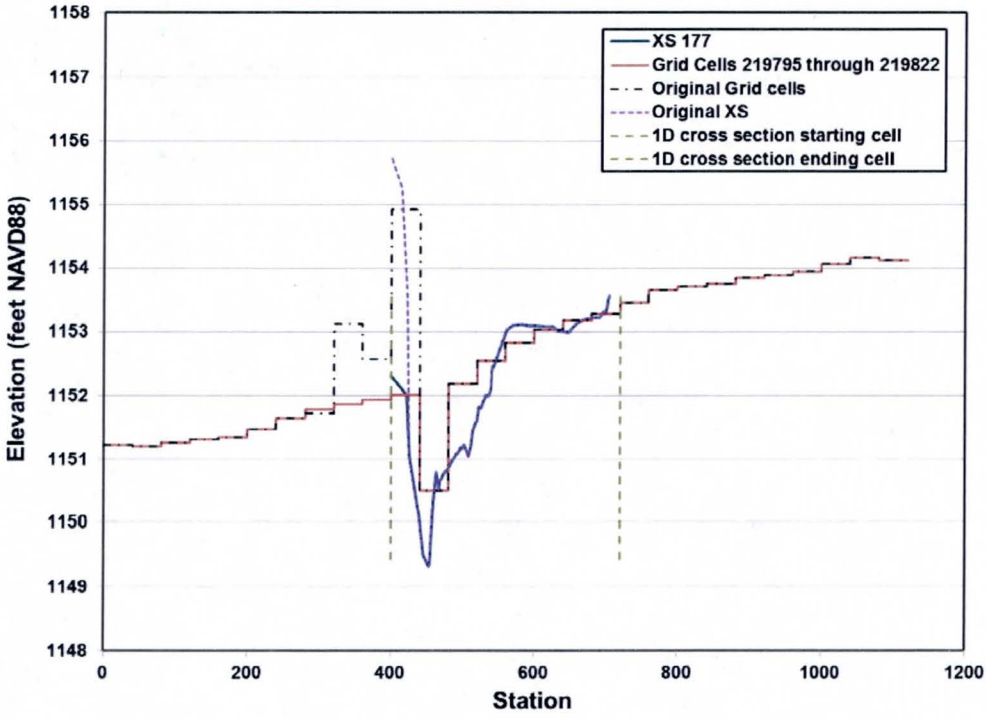


Figure 8. Visualization of the "without embankment" geometry for cross section 177 of the HVID north-south drainage channel as represented in the FLO-2D model.

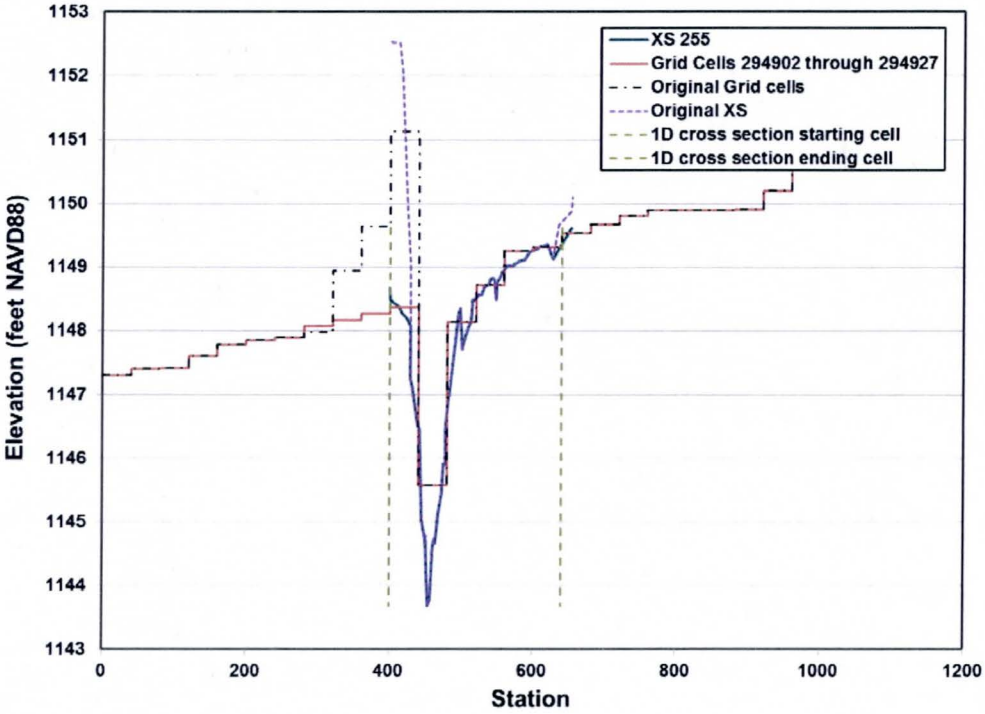


Figure 9. Visualization of the "without embankment" geometry for cross section 255 of the HVID north-south drainage channel as represented in the FLO-2D model.

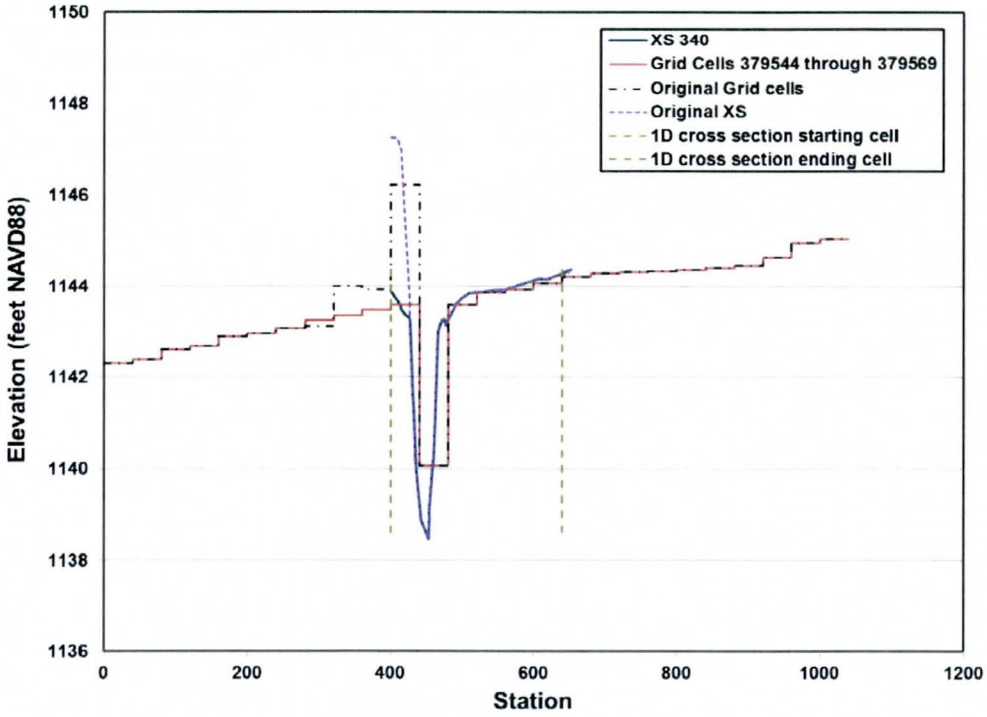


Figure 10. Visualization of the "without embankment" geometry for cross section 340 of the HVID north-south drainage channel as represented in the FLO-2D model.

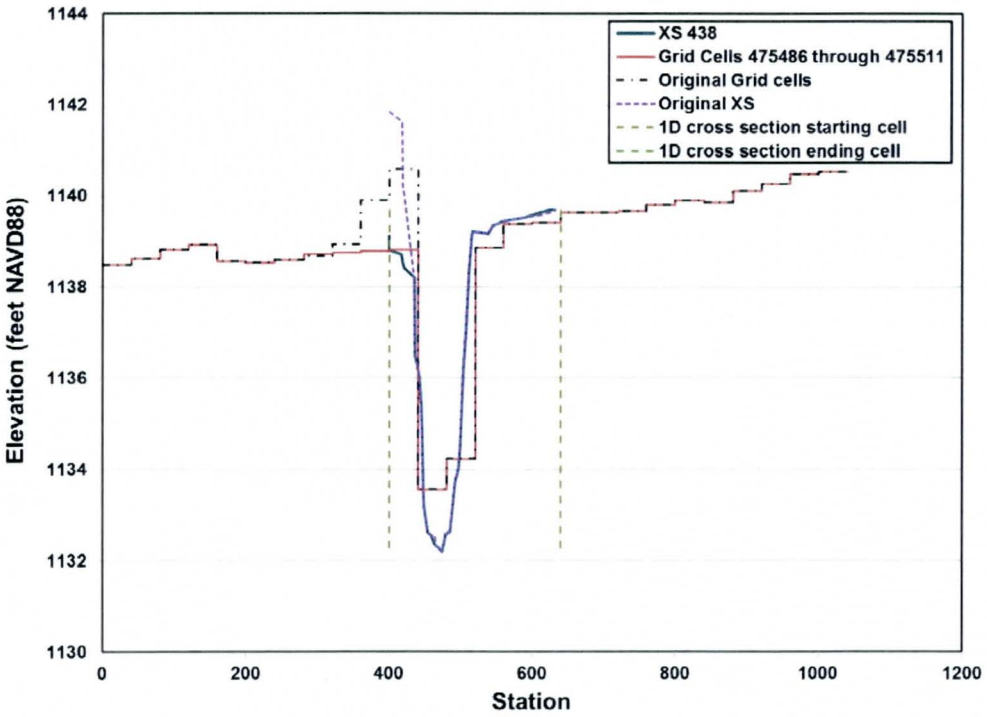


Figure 11. Visualization of the "without embankment" geometry for cross section 438 of the HVID north-south drainage channel as represented in the FLO-2D model.

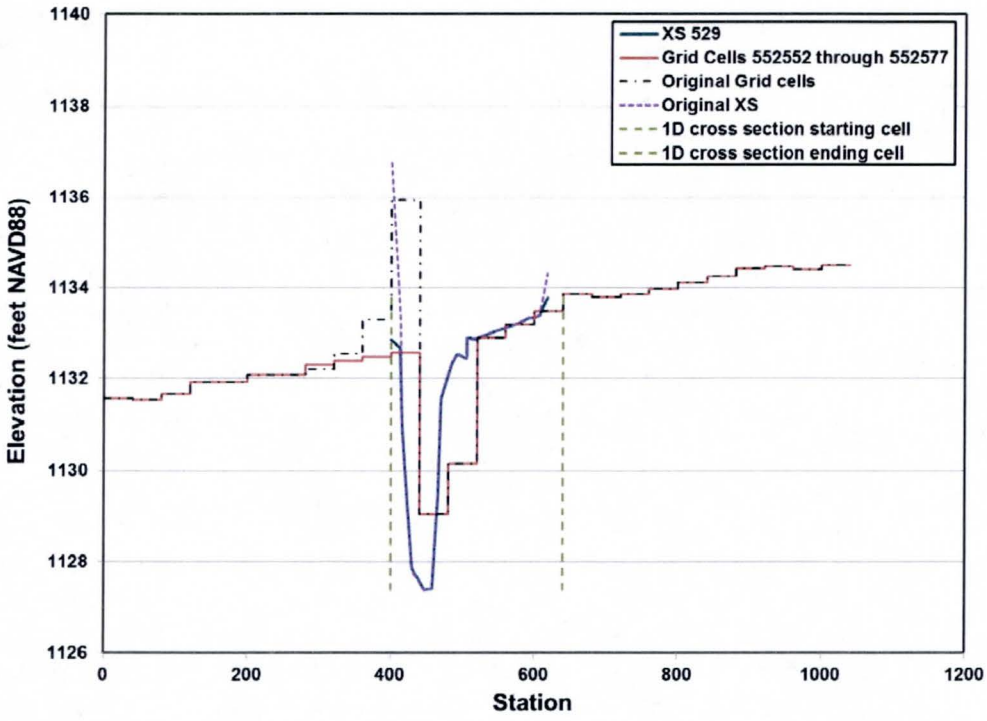


Figure 12. Visualization of the "without embankment" geometry for cross section 529 of the HVID north-south drainage channel as represented in the FLO-2D model.

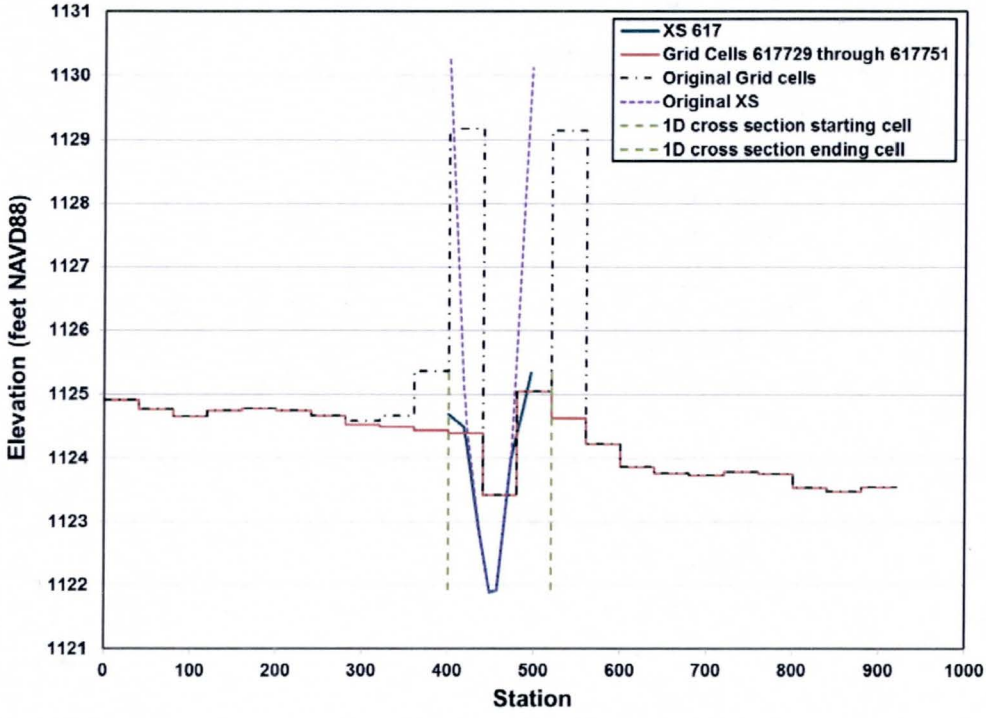


Figure 13. Visualization of the "without embankment" geometry for cross section 617 of the HVID north-south drainage channel as represented in the FLO-2D model.

Table 1. Manual cross section edits for the HVID north-south drainage channel

XS	Embankment effected	Description of manual edits beyond automated macro
15	Left	Further lowered three cells east of embankment and the left cross section points.
18	Left	Further lowered three cells east of embankment and the left cross section points.
25	Left	Used original elevations for cells 2 and 3 east of embankment, projected cell 2 elevation through embankment. Lowered the left cross section points.
26	Left	Used original elevations for cells 2 and 3 east of embankment, projected cell 2 elevation through embankment. Lowered the left cross section points.
27	Left	Used original elevations for cells 2 and 3 east of embankment, projected cell 2 elevation through embankment. Lowered the left cross section points.
28	Left	Used original elevations for cells 2 and 3 east of embankment, projected cell 2 elevation through embankment. Lowered the left cross section points.
29	Left	Used original elevations for cells 2 and 3 east of embankment, projected cell 2 elevation through embankment. Lowered the left cross section points.
30	Left	Used original elevations for cells 2 and 3 east of embankment, projected cell 2 elevation through embankment. Lowered the left cross section points.
31	Left	Used original elevations for cells 2 and 3 east of embankment, projected cell 2 elevation through embankment. Lowered the left cross section points.
48	Left	Used original elevations for 3 cells east of embankment, projected cell 3 elevation through embankment. Lowered the left cross section points.
49	Left	Used original elevations for 3 cells east of embankment, projected cell 3 elevation through embankment. Lowered the left cross section points.
50	Left	Used original elevations for 3 cells east of embankment, projected cell 3 elevation through embankment. Lowered the left cross section points.
54	Left	Used original elevations for 3 cells east of embankment, projected cell 3 elevation through embankment. Lowered the left cross section points.
55	Left	Used original elevations for 3 cells east of embankment, projected cell 3 elevation through embankment. Lowered the left cross section points.
67	Left	Used original elevations for 3 cells east of embankment, projected cell 3 elevation through embankment. Lowered the left cross section points.
68	Left	Used original elevations for 3 cells east of embankment, projected cell 3 elevation through embankment. Lowered the left cross section points.
86	Left	Used original elevations for 3 cells east of embankment, projected cell 3 elevation through embankment. Lowered the left cross section points.
96	Left	Used original elevation for the third cell east of embankment
98	Left	Yes, used original elevations for first 2 cells east of embankment, projected cell 3 elevation through embankment, projected cell 2 elevation through cell 1. Then lowered the left cross section points.
110	Left	Project newly calculated embankment cell one cell west of embankment
111	Left	Project newly calculated embankment cell one cell west of embankment
112	Left	Project newly calculated embankment cell one cell west of embankment
113	Left	Project newly calculated embankment cell one cell west of embankment

Table 1. (cont'd) Manual cross section edits for the HVID north-south drainage channel

XS	Embankment effected	Description of manual edits beyond automated macro
114	Left	Project newly calculated embankment cell one cell west of embankment
115	Left	Project newly calculated embankment cell one cell west of embankment
219	Left	Used original elevations for cell 4 east of embankment, projected that elevation through next 3 cells towards embankment, used original ground elevation just inside XS left bank. Lowered the left cross section points.
220	Left	Used original elevations for cell 4 east of embankment, projected that elevation through next 3 cells towards embankment, used original ground elevation just inside XS left bank. Lowered the left cross section points.
221	Left	Used original elevations for cell 4 east of embankment, projected that elevation through next 3 cells towards embankment, used original ground elevation just inside XS left bank. Lowered the left cross section points.
222	Left	Used original elevations for cell 4 east of embankment, projected that elevation through next 3 cells towards embankment, used original ground elevation just inside XS left bank. Lowered the left cross section points.
223	Left	Used original elevations for cell 4 east of embankment, projected that elevation through next 3 cells towards embankment, used original ground elevation just inside XS left bank. Lowered the left cross section points.
226	Left	Project newly calculated embankment cell one cell west of embankment
227	Left	Project newly calculated embankment cell one cell west of embankment
228	Left	Project newly calculated embankment cell one cell west of embankment
229	Left	Project newly calculated embankment cell one cell west of embankment
230	Left	Project newly calculated embankment cell one cell west of embankment
232	Left	Used original elevations for cell 4 east of embankment, projected that elevation through next 3 cells towards embankment, used original ground elevation just inside XS left bank. Lowered the left cross section points.
233	Left	Project newly calculated embankment cell one cell west of embankment
234	Left	Project newly calculated embankment cell one cell west of embankment
296	Left	Used original elevations for cell 4 east of embankment, projected that elevation through next 3 cells towards embankment, used original ground elevation just inside XS left bank. Lowered the left cross section points.
418	Left	Used original elevations for cell 4 east of embankment, projected that elevation through next 3 cells towards embankment, used original ground elevation just inside XS left bank. Lowered the left cross section points.
419	Left	Used original elevations for cell 4 east of embankment, projected that elevation through next 3 cells towards embankment, used original ground elevation just inside XS left bank. Lowered the left cross section points.
420	Left	Used original elevations for cell 4 east of embankment, projected that elevation through next 3 cells towards embankment, used original ground elevation just inside XS left bank. Lowered the left cross section points.
421	Left	Used original elevations for cell 4 east of embankment, projected that elevation through next 3 cells towards embankment, used original ground elevation just inside XS left bank. Lowered the left cross section points.

Table 1. (cont'd) Manual cross section edits for the HVID north-south drainage channel

XS	Embankment effected	Description of manual edits beyond automated macro
423	Left	Used original elevations for cell 4 east of embankment, projected that elevation through next 3 cells towards embankment, used original ground elevation just inside XS left bank. Lowered the left cross section points.
424	Left	Used original elevations for cell 4 east of embankment, projected that elevation through next 3 cells towards embankment, used original ground elevation just inside XS left bank. Lowered the left cross section points.
425	Left	Used original elevations for cell 4 east of embankment, projected that elevation through next 3 cells towards embankment, used original ground elevation just inside XS left bank. Lowered the left cross section points.
426	Left	Project newly calculated embankment cell one cell west of embankment
427	Left	Project newly calculated embankment cell one cell west of embankment
428	Left	Used original elevations for cell 4 east of embankment, projected that elevation through next 3 cells towards embankment, used original ground elevation just inside XS left bank. Lowered the left cross section points.
429	Left	Used original elevations for cell 4 east of embankment, projected that elevation through next 3 cells towards embankment, used original ground elevation just inside XS left bank. Lowered the left cross section points.
431	Left	Project newly calculated embankment cell one cell west of embankment
488	Left	Used original elevations for the 3 cells east of embankment, projected cell 3 through the embankment. Lowered the left cross section points.
489	Left	Used original elevations for the 2nd and 3rd cells east of embankment, projected cell 2 through cell 1 east of the embankment, used the original embankment cell elevation. Lowered the left cross section points.
490	Left	Used original elevations for the 2nd and 3rd cells east of embankment, projected cell 2 through cell 1 east of the embankment, used the original embankment cell elevation. Lowered the left cross section points.
491	Left	Used original elevations for the 2nd and 3rd cells east of embankment, projected cell 2 through cell 1 east of the embankment, used the original embankment cell elevation. Lowered the left cross section points.
492	Left	Used original elevations for the 2nd and 3rd cells east of embankment, projected cell 2 through cell 1 east of the embankment, used the original embankment cell elevation. Lowered the left cross section points.
498	Left	Used original elevations for the 2nd and 3rd cells east of embankment, projected cell 2 through cell 1 east of the embankment, used the original embankment cell elevation. Lowered the left cross section points.
499	Left	Used original elevations for the 2nd and 3rd cells east of embankment, projected cell 2 through cell 1 east of the embankment, used the original embankment cell elevation. Lowered the left cross section points.
504	Left	Used original elevations for the 2nd and 3rd cells east of embankment, projected cell 2 through cell 1 east of the embankment, used the original embankment cell elevation. Lowered the left cross section points.

Table 1. (cont'd) Manual cross section edits for the HVID north-south drainage channel

XS	Embankment effected	Description of manual edits beyond automated macro
505	Left	Used original elevations for the 2nd and 3rd cells east of embankment, projected cell 2 through cell 1 east of the embankment, used the original embankment cell elevation. Lowered the left cross section points.
509	Left	Project newly calculated embankment cell one cell west of embankment
510	Left	Project newly calculated embankment cell one cell west of embankment
511	Left	Project newly calculated embankment cell one cell west of embankment
512	Left	Project newly calculated embankment cell one cell west of embankment
555	Left	Yes, used original elevations for the 3 cells east of embankment, projected cell 3 through the embankment. Then lowered the left cross section points.
560	Left	Used original elevations for cell 4 east of embankment, projected cell through next 3 cells towards embankment, used original ground elevation just inside XS left bank. Lowered the left cross section points.
561	Left	Used original elevations for the 3 cells east of embankment and the first cell in the XS (the "embankment" cell at most XS's). Lowered the left cross section points.
570	Right	Lowered right embankment grid element (automated by averaging 2 cells)
571	Right	Lowered right embankment grid element (automated by averaging 2 cells)
572	Right	Lowered right embankment grid element (automated by averaging 2 cells)
573	Right	Lowered right embankment grid element (automated by averaging 2 cells)
574	Right	Lowered right embankment grid element (automated by averaging 2 cells)
575	Right	Lowered right embankment grid element (automated by averaging 2 cells)
576	Right	Lowered right embankment grid element (automated by averaging 2 cells)
577	Right	Lowered right embankment grid element (automated by averaging 2 cells)
578	Right	Lowered right embankment grid element (automated by averaging 2 cells)
579	Right	Lowered right embankment grid element (automated by averaging 2 cells)
580	Right	Lowered right embankment grid element (automated by averaging 2 cells)
581	Right	Lowered right embankment grid element (automated by averaging 2 cells)
582	Right	Lowered right embankment grid element (automated by averaging 2 cells)
583	Right	Lowered right embankment grid element (automated by averaging 2 cells)
584	Right	Lowered right embankment grid element (automated by averaging 2 cells)
585	Right	Lowered right embankment grid element (automated by averaging 2 cells)
586	Right	Lowered right embankment grid element (automated by averaging 2 cells)
587	Right	Lowered right embankment grid element (automated by averaging 2 cells)
588	Right	Lowered right embankment grid element (automated by averaging 2 cells)
589	Right	Lowered right embankment grid element (automated by averaging 2 cells)
590	Right	Lowered right embankment grid element (automated by averaging 2 cells)
591	Right	Lowered right embankment grid element (automated by averaging 2 cells)
592	Right	Lowered right embankment grid element (automated by averaging 2 cells)
593	Right	Lowered right embankment grid element (automated by averaging 2 cells)
594	Right	Lowered right embankment grid element (automated by averaging 2 cells)

Table 1. (cont'd) Manual cross section edits for the HVID north-south drainage channel

XS	Embankment effected	Description of manual edits beyond automated macro
595	Right	Lowered right embankment grid element (automated by averaging 2 cells)
596	Right	Lowered right embankment grid element (automated by averaging 2 cells)
597	Right	Lowered right embankment grid element (automated by averaging 2 cells)
598	Right	Lowered right embankment grid element (automated by averaging 2 cells)
599	Right	Lowered right embankment grid element (automated by averaging 2 cells)
600	Right	Lowered right embankment grid element (automated by averaging 2 cells)
601	Right	Lowered right embankment grid element (automated by averaging 2 cells)
602	Right	Lowered right embankment grid element (automated by averaging 2 cells)
603	Right	Lowered right embankment grid element (automated by averaging 2 cells)
604	Right	Lowered right embankment grid element (automated by averaging 2 cells)
605	Right	Lowered right embankment grid element (automated by averaging 2 cells)
606	Right	Lowered right embankment grid element (automated by averaging 2 cells)
607	Right	Lowered right embankment grid element (automated by averaging 2 cells)
608	Right	Lowered right embankment grid element (automated by averaging 2 cells)
609	Right	Lowered right embankment grid element (automated by averaging 2 cells)
610	Right	Lowered right embankment grid element (automated by averaging 2 cells)
611	Right	Lowered right embankment grid element (automated by averaging 2 cells)
612	Right	Lowered right embankment grid element (automated by averaging 2 cells)
613	Right	Lowered right embankment grid element (automated by averaging 2 cells)
614	Right	Lowered right embankment grid element (automated by averaging 2 cells)
615	Right	Lowered right embankment grid element (automated by averaging 2 cells)
616	Right	Lowered right embankment grid element (automated by averaging 2 cells)
617	Right	Lowered right embankment grid element (automated by averaging 2 cells)
618	Right	Lowered right embankment grid element (automated by averaging 2 cells)
619	Right	Lowered right embankment grid element (automated by averaging 2 cells)
620	Right	Lowered right embankment grid element (automated by averaging 2 cells)
621	Right	Lowered right embankment grid element (automated by averaging 2 cells)
622	Right	Lowered right embankment grid element (automated by averaging 2 cells)
623	Right	Lowered right embankment grid element (automated by averaging 2 cells)
624	Right	Lowered right embankment grid element (automated by averaging 2 cells)
625	Both	Lowered both embankment grid elements
626	Both	Lowered both embankment grid elements
627	Both	Lowered both embankment grid elements
628	Both	Lowered both embankment grid elements
629	Both	Lowered both embankment grid elements
630	Both	Lowered both embankment grid elements
631	Both	Lowered both embankment grid elements

CENTENNIAL WASH FLOODPLAIN DELINEATION STUDY
GILA RIVER TO LA PAZ COUNTY

CONTRACT FCD 2012C004

INCORPORATING FLO-2D RESULTS INTO HEC-RAS TECHNICAL MEMORANDUM

Date: May 31, 2013

To: Jeff Shelton, Project Manager – District

From: Brian Wahlin, Project Manager – WEST Consultants, Inc.
Chuck Davis – WEST Consultants, Inc.

The purpose of this technical memorandum is to outline the process used to incorporate results from the final FLO-2D modeling effort into the HEC-RAS model of the main stem of the Centennial Wash between the Harquahala Valley Irrigation District's west-side canal and Baseline Road for floodway/floodplain analysis. After discussion with the District, it was determined to assign six flow change locations in the RAS model based on data extracted directly from floodplain cross section results as assigned in the FLO-2D model. Figure 1 shows the locations of these floodplain cross sections as they were defined in the FLO-2D model compared to the HEC-RAS cross sections. It should be noted that this figure shows seven floodplain cross sections defined in FLO-2D. The two uppermost floodplain cross sections from the FLO-2D model will be reviewed in tangent to determine the flow patterns around the stock tank near the primary flow split; however, only one flow change location will be defined in the HEC-RAS model from these two floodplain cross sections.

Figure 2 and Figure 3 each show the location of these floodplain cross sections from the FLO-2D model as they overlay the maximum velocity grid and maximum depth grid, respectively, obtained from the final FLO-2D model results. As can be seen from Figure 2 and Figure 3, each of the floodplain cross sections defined in FLO-2D has a leftmost point (i.e., with the typical cross section convention of left-to-right looking in the downstream direction) corresponding to an area of very low depth and low velocity. These floodplain cross section locations were selected to provide a representative flow in a reach between locations where flow appears to be leaving the main channel and moving into the overbank. Results from early model runs with floodplain cross sections defined near the flow splits did not capture a representative flow rate for the reach downstream of the location of flow interaction with the main stem and the overbank. Therefore, it was decided to define these floodplain cross sections in the middle of the

reach where clear differentiation between main channel and overbank flow could be obtained from the model results.

For direct comparison, the flows from the floodplain cross sections of the FLO-2D model results will be applied at the overlapping HEC-RAS cross section as shown in Table 1. However, this flow could be applied upstream in the HEC-RAS model at the cross section near the "upstream end" of the reach for which the floodplain cross section was defined in the middle. The only exception to this would be floodplain cross section 6 (as numbered in Table 1) which should not be moved since this floodplain cross section captures flow immediately downstream of the HVID north-south drainage channel.

Finally, the with-embankment FLO-2D model will be used to extract final flows from the FLO-2D model since the with-embankment model would be the worst-case scenario for flows in the main channel of Centennial Wash.

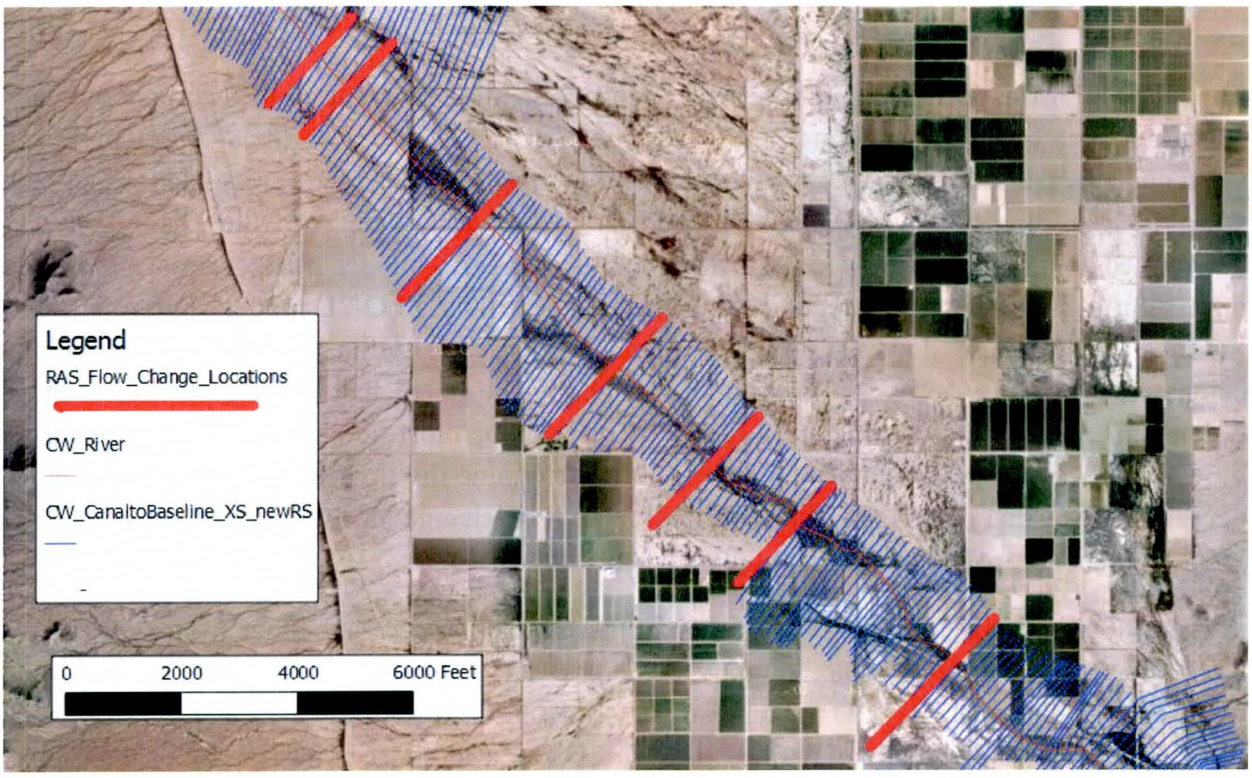


Figure 1. Location of the floodplain cross sections used in FLO-2D to extract flow data to enter into the HEC-RAS model (red lines) and the HEC-RAS cross sections (blue lines).

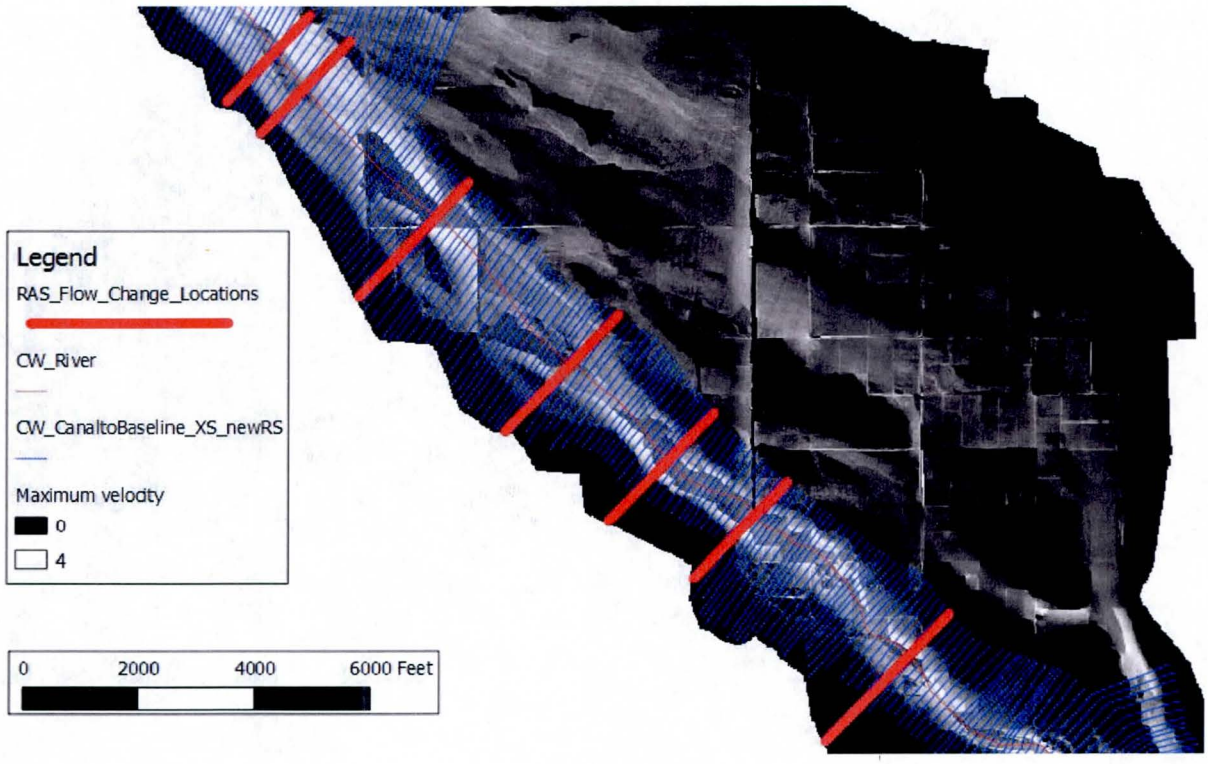


Figure 2. Location of the floodplain cross sections used in FLO-2D to extract flow data to enter into the HEC-RAS model (red lines) and the HEC-RAS cross sections (blue lines) overlaying the maximum velocity grid from the FLO-2D results files.

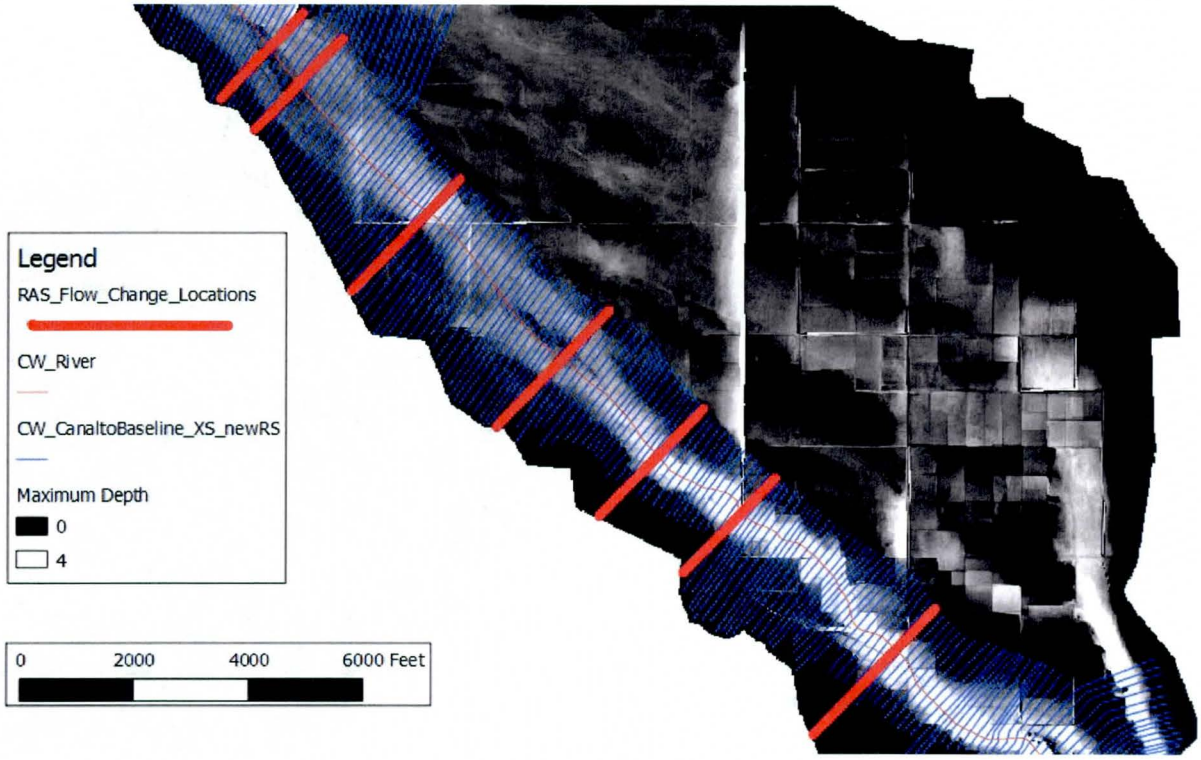


Figure 3. Location of the floodplain cross sections used in FLO-2D to extract flow data to enter into the HEC-RAS model (red lines) and the HEC-RAS cross sections (blue lines) overlaying the maximum depth grid from the FLO-2D results files.

Table 1. Manual cross section edits for the HVID north-south drainage channel

Floodplain cross section shown in Figure 1 numbered from upstream to downstream	Starting element for floodplain cross section	Corresponding HEC-RAS cross section	Notes
1	94846	34.19	Left endpoint in stock tank
2	121335	33.75	
3	277816	32.13	
4	437171	30.28	
5	541881	29.06	
6	605313	28.10	Immediately downstream of north-south drainage channel
7	699911	26.15	

Appendix F: Erosion, Sediment Transport, and Geomorphic Analysis Supporting Documentation

List of Exhibits

Exhibit A **Hydraulics Study Work Maps, 1" = 400' scale (reduced scale version reproduced herein, roll of entire map set provided to the District with final copy)**

Exhibit B **Annotated Flood Insurance Rate Maps**

Exhibit C **DVDs Containing Electronic Files**

EXHIBIT A

Hydraulics Study Work Maps, 1" = 400' scale

(reduced scale version reproduced herein, roll of entire map set provided to the District with final copy)

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

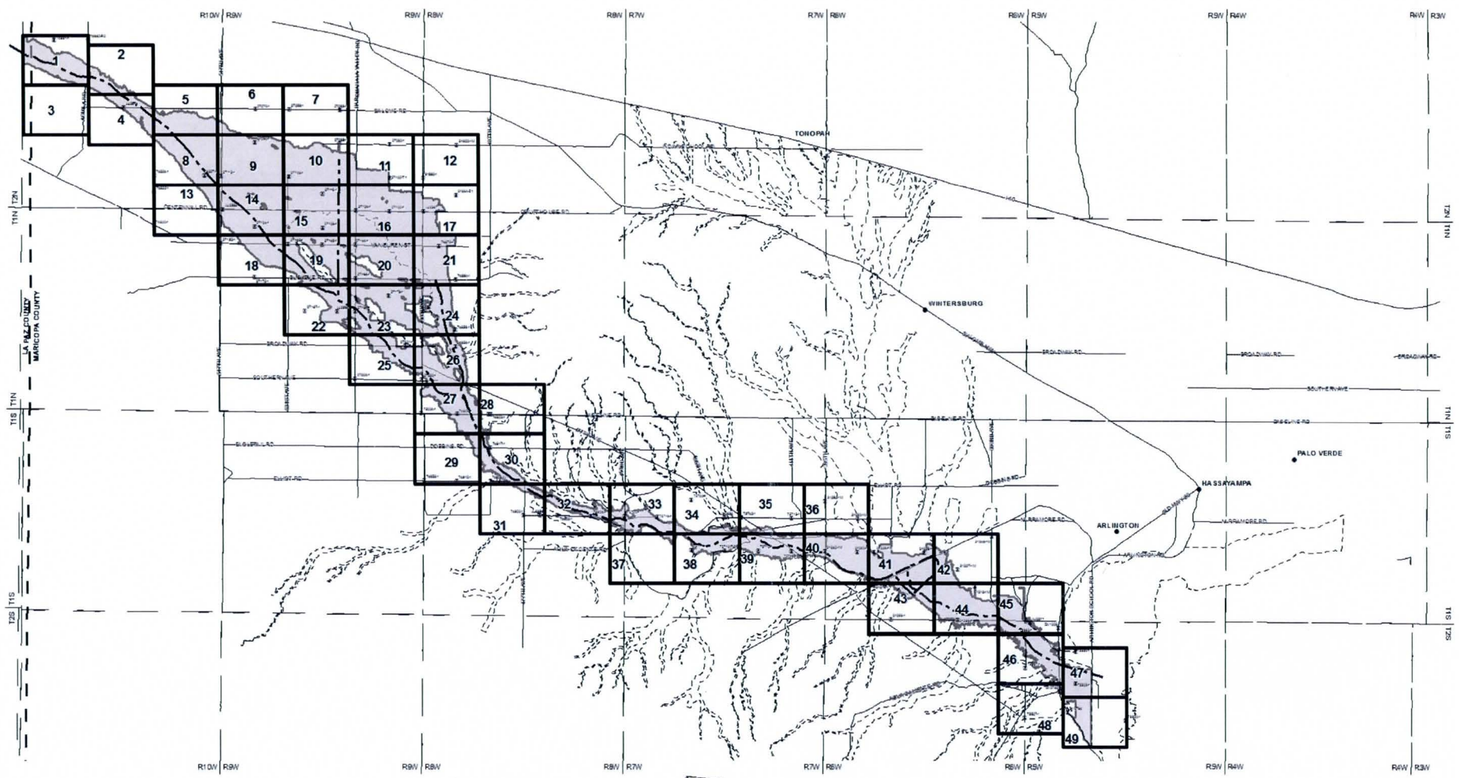
CENTENNIAL WASH
FLOODPLAIN DELINEATION STUDY:
GILA RIVER TO LA PAZ COUNTY

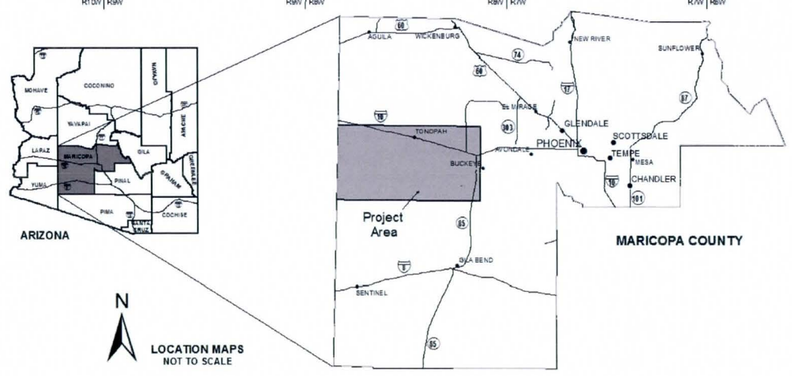
FCD CONTRACT NO. 2012C004
OCTOBER 2013

ELEVATION REFERENCE MARKS

GEODETIC DENSIFICATION CADASTRAL SURVEY (GDACS) CONTROL STATIONS

ID Number	Source	NAD 83 Northing (feet)	NAD 83 Easting (feet)	NAVD 88 Elevation (feet)
74691-1	MCDOT	925,824.30	273,039.50	1,309.86
74692-R2	MCDOT	925,758.90	278,305.60	1,306.15
AJ3674	NGS	915,169.10	283,850.20	1,260.96
27070-1	MCDOT	914,879.30	304,576.00	1,214.40
27068-1	MCDOT	914,813.20	309,857.80	1,197.50
27066-1	MCDOT	914,716.90	317,780.20	1,176.53
74834-1	MCDOT	904,504.00	268,636.40	1,256.65
74837-1	MCDOT	904,410.40	296,582.50	1,211.97
27112-1	MCDOT	904,379.80	299,206.60	1,203.75
27090-1	MCDOT	909,597.00	304,514.20	1,197.88
27106-1	MCDOT	904,251.20	309,734.60	1,177.00
27085-1	MCDOT	909,436.10	317,717.40	1,160.06
27082-1	MCDOT	909,343.70	325,641.40	1,148.38
27102-T1	MCDOT	904,003.50	325,652.00	1,133.24
31882-1	MCDOT	904,006.10	330,896.45	1,121.81
31900-1M	MCDOT	909,232.00	336,176.51	1,143.68
74820-1	MCDOT	895,586.60	288,540.20	1,273.61
74830-1	MCDOT	901,863.50	288,602.80	1,260.13
AJ3568	NGS	899,070.00	299,430.50	1,195.18
27134-1	MCDOT	896,387.40	304,362.80	1,176.72
27136-1	MCDOT	896,261.40	314,917.80	1,150.79
27116-1	MCDOT	901,545.90	314,985.00	1,156.29
27124-1	MCDOT	898,843.20	320,236.10	1,138.52
27122-1	MCDOT	898,782.10	325,518.00	1,120.29
AJ3567	NGS	898,753.00	330,933.70	1,114.70
31894-Z1	MCDOT	901,308.20	336,089.96	1,124.43
27152-1	MCDOT	893,817.10	299,070.80	1,196.64
27170-1	MCDOT	888,466.20	304,265.00	1,171.75
27148-1	MCDOT	893,682.60	309,598.20	1,158.50
27145-1	MCDOT	893,618.30	314,681.20	1,146.74
27164-1	MCDOT	888,278.40	320,103.10	1,123.69
27144-1	MCDOT	893,561.30	320,184.10	1,131.27
74872-1	MCDOT	893,415.60	333,343.60	1,106.22
74884-1	MCDOT	888,104.20	335,925.80	1,102.41
27187-1	MCDOT	883,089.60	312,114.50	1,133.50
27184-1	MCDOT	882,998.30	320,040.30	1,108.58
27179-1	MCDOT	885,577.20	325,352.40	1,101.36
27180-1	MCDOT	882,877.80	330,613.80	1,095.01
74855-1	MCDOT	880,179.00	335,841.00	1,089.15
AJ3564	NGS	883,066.60	917,198.40	1,122.05
27224-1	MCDOT	872,435.60	318,920.20	1,115.37
27201-1	MCDOT	877,624.10	327,910.40	1,092.14
27220-1	MCDOT	872,315.80	330,484.90	1,080.81
24854-1	MCDOT	877,537.50	335,814.00	1,072.45
75004-1	MCDOT	867,032.90	330,426.00	1,061.59
74925-1	MCDOT	866,998.10	336,052.30	1,059.99
74924-1	MCDOT	866,911.60	340,985.50	1,059.77
74923-1	MCDOT	341,333.80	341,333.80	1,062.22
74958-1	MCDOT	856,402.70	330,804.50	1,113.66
74910-1	MCDOT	856,342.50	335,944.40	1,075.34
74908-W1	MCDOT	856,349.70	341,222.80	1,044.45
74917-1	MCDOT	861,552.80	341,298.90	1,055.63
74902-1	MCDOT	850,942.80	346,454.40	1,023.44
74903-1	MCDOT	850,884.10	351,730.90	1,001.99
74904-1	MCDOT	850,821.90	357,007.50	986.12
75720-1	MCDOT	850,780.50	362,298.00	959.56
75719-1	MCDOT	850,723.20	367,440.70	980.75
75734-1	MCDOT	853,313.60	372,730.20	1,166.14
AJ3954	NGS	850,545.40	378,051.40	926.21
75743-1	MCDOT	850,596.20	380,646.60	920.66
75715-1	MCDOT	850,515.50	388,573.70	906.56
31363-1M	MCDOT	853,104.40	393,883.43	911.23
31360-1M	MCDOT	850,407.50	398,987.58	885.36
AJ3956	NGS	850,891.50	948,049.10	1,013.29
75711-1	MCDOT	845,385.10	372,672.20	939.34
75712-T2	MCDOT	845,318.10	377,957.30	922.16
75713-1	MCDOT	845,284.00	383,230.60	902.08
75714-1	MCDOT	845,232.00	388,523.40	887.62
31342-1M	MCDOT	845,178.80	393,809.98	875.30
31340-1	MCDOT	845,121.50	398,948.62	884.48
31339-1M	MCDOT	845,098.00	401,592.40	884.96
31336-1	MCDOT	845,035.00	409,514.66	853.01
31327-1M	MCDOT	842,335.90	414,778.72	839.30
31348-1M	MCDOT	847,586.40	420,097.84	883.80
31319-1	MCDOT	839,818.50	401,552.78	896.03
31298-1	MCDOT	834,516.00	404,157.05	874.70
31294-1	MCDOT	834,424.00	414,719.37	822.16
31313-1M	MCDOT	839,680.45	417,402.82	827.25
AJ3811	NGS	834,051.50	426,081.78	806.53
DV 1236	NGS	833,169.90	430,578.50	792.97
75598-1	MCDOT	832,179.20	425,318.40	796.39
75597-1	MCDOT	826,901.50	425,336.90	802.35
75550-1	MCDOT	829,585.60	433,292.30	780.56
75535-1	MCDOT	824,535.80	433,335.10	770.06
75527-1	MCDOT	819,093.10	425,252.90	833.25
DV 0793	NGS	823,196.40	430,673.50	787.49
DV 0794	NGS	820,016.80	432,081.10	781.82
75520-1	MCDOT	818,734.00	441,299.50	763.43





LEGEND

- PROPOSED 1% ANNUAL CHANCE FLOOD BOUNDARY
- EFFECTIVE FLOODPLAIN BOUNDARY (GILA RIVER AND CENTENNIAL WASH TRIBUTARIES ONLY)
- HYDRAULIC BASELINE
- COUNTY BOUNDARY
- SHEET WINDOW AND NUMBER (1)
- ELEV. REFERENCE MARK
- CITY OR TOWN
- TOWNSHIP AND RANGE LINE AND ID (R10W|R9W, T6N, T5S)

NOTES

ALL ELEVATIONS ARE BASED ON NORTH AMERICAN VERTICAL DATUM OF 1988. ELEVATION CONVERSION FACTOR: NAVD88 ELEV. = NGVD29 ELEV. + 2.1 FT.

NTS

N

4 2 0 4 Miles

SCALE: 1" = 2 MILES

NTS

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CENTENNIAL WASH FLOODPLAIN DELINEATION STUDY: GILA RIVER TO LA PAZ COUNTY

F.C.D. CONTRACT NUMBER 2012C004

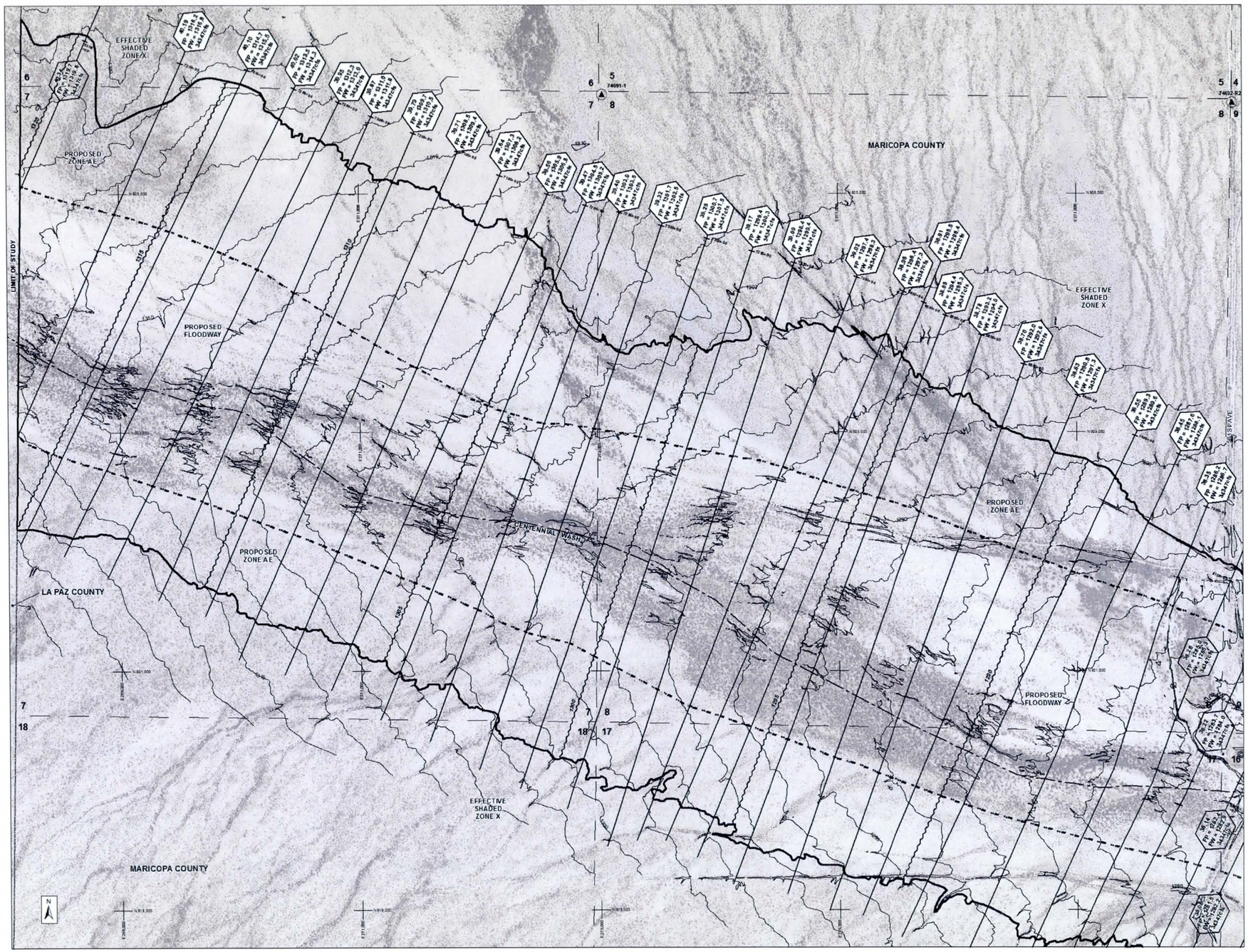
52895 CHARLES M. DAVIS — REGISTERED ENGINEER — CERTIFICATE NO. — ARIZONA, U.S.A.

Expires 12/31/2014

WEST Consultants, Inc.

	BY	DATE
DESIGN	---	---
DESIGN CHECK	---	---
PLANS	SJB	10/13
PLANS CHECK	CMD, JWH	10/13

COVER SHEET



AERIAL IMAGERY PROVIDED BY THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
FLIGHT DATE VARIES FROM SEPTEMBER THROUGH OCTOBER, 2010 AND 2011

400 200 0 400 800

NTS SCALE: 1" = 400 FEET NTS
CONTOUR INTERVAL = 2 FEET

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1" = 200' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS.

GROUND CONTROL SURVEY DATA & AERIAL MAPPING PROVIDED BY FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

LEGEND

ZONE AE BOUNDARIES — Revised / Effective
FLOODWAY BOUNDARIES — Revised / Effective
BASE FLOOD ELEVATION
HYDRAULIC BASELINE
ZONE AO1
ZONE AO2
ZONE AO3
ZONE A BOUNDARIES — Revised / Effective

1.009 — Cross Section River Mile Designation
FP = 2222.33 — Floodplain Water Surface Elevation
FW = 2222.33 — Floodway Water Surface Elevation
3333cfs — 100-year Discharge
B-B'/D — Cross Section Stationing Tick

ELEV. REFERENCE MARK
SECTION LINE AND ID — 5

ELEVATION REFERENCE MARKS

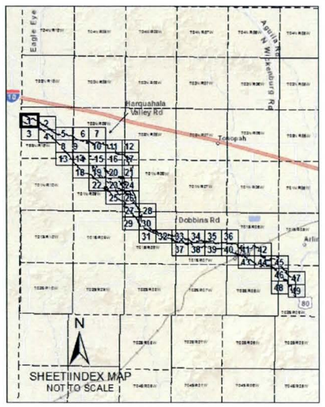
NOTE: ALL ELEVATIONS ARE BASED ON NORTH AMERICAN VERTICAL DATUM OF 1988. SEE MCDOT & NGS ONLINE RESOURCES FOR MORE INFORMATION.

I.D. NUMBER	ELEV. (FT)	DESCRIPTION/LOCATION
MCDOT 74691-1	1309.9	FD 2" IP 0.9' UP W/ 2 1/2" GLO BC STAMPED "T2N R10W S6 S5 S7 S8 1914"
MCDOT 74692-R2	1305.2	FD 1 1/4" PIPE 0.5' UP W/ 3" MC HWY DEPT BC STAMPED "RP SEC COR 40 W"

NOTES

1) ALL AREAS DESIGNATED ZONE X ARE SHADED ZONE X, EXCEPT WHERE NOTED.

2) AREA LOCATED IN TOWNSHIP 2N, RANGE 10W, SECTIONS 4-9 AND 16-18.



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CENTENNIAL WASH FLOODPLAIN DELINEATION STUDY: GILA RIVER TO LA PAZ COUNTY

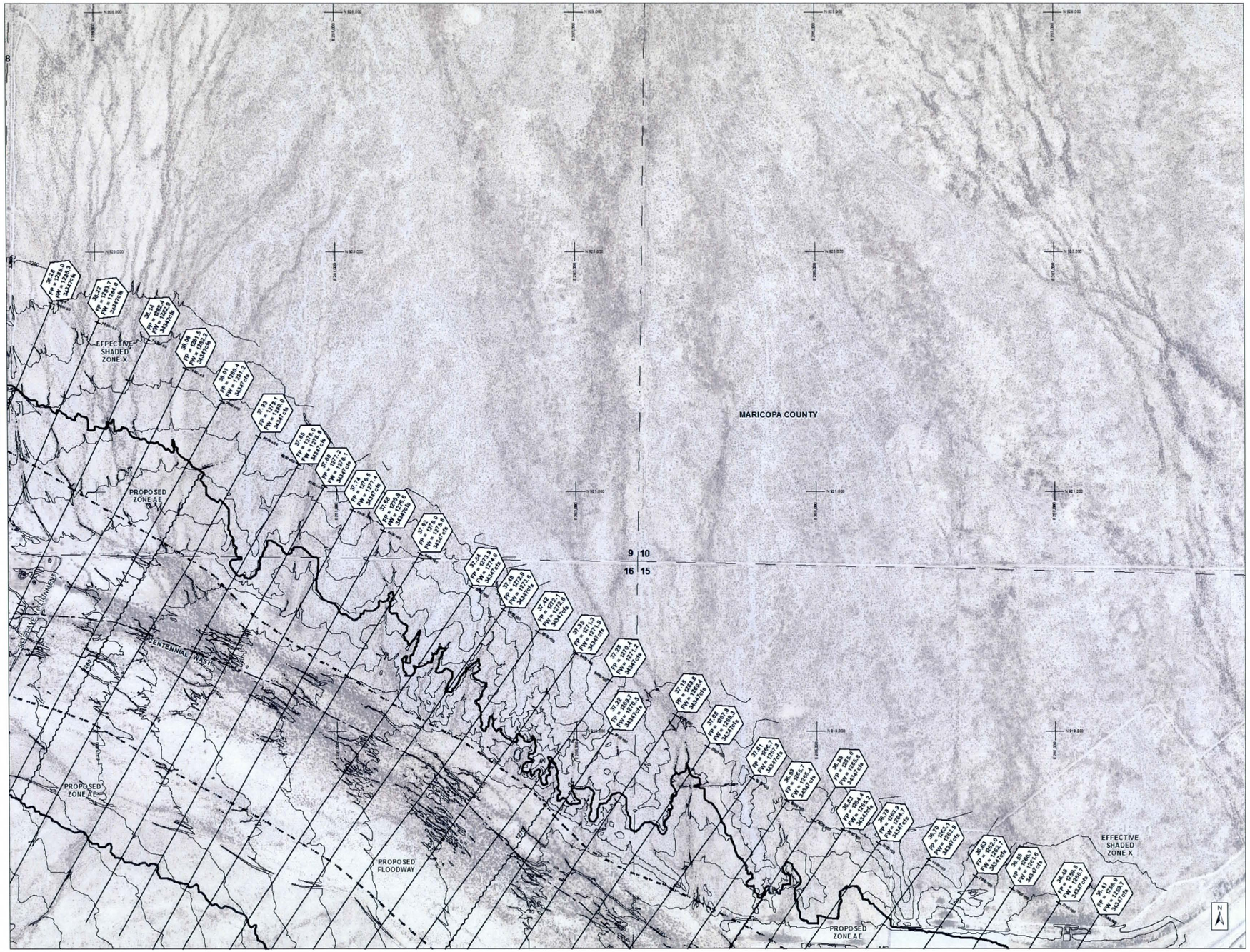
F.C.D. CONTRACT NUMBER 2012C004

52895 CHARLES M. DAVIS — Registered Professional Engineer — CERTIFICATE NO. — Date Signed 12/31/2013 — ARIZONA, U.S.A.
Expires 12/31/2014

WEST Consultants, Inc.

	BY	DATE
DESIGN	---	---
DESIGN CHECK	---	---
PLANS	SJB	9/13
PLANS CHECK	CMD, JWH	9/13

SHEET 1 OF 49



AERIAL IMAGERY PROVIDED BY THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
FLIGHT DATE VARIES FROM SEPTEMBER THROUGH OCTOBER, 2010 AND 2011

400 200 0 400 800

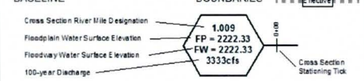
NTS SCALE: 1" = 400 FEET NTS
CONTOUR INTERVAL = 2 FEET

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1" = 200' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS.

GROUND CONTROL SURVEY DATA & AERIAL MAPPING PROVIDED BY FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

LEGEND

ZONE AE BOUNDARIES — Revised / Effective
FLOODWAY BOUNDARIES — Revised / Effective
BASE FLOOD ELEVATION
HYDRAULIC BASELINE
ZONE AO1
ZONE AO2
ZONE AO3
ZONE A BOUNDARIES — Revised / Effective



ELEV. REFERENCE MARK
SECTION LINE AND ID — 5

ELEVATION REFERENCE MARKS

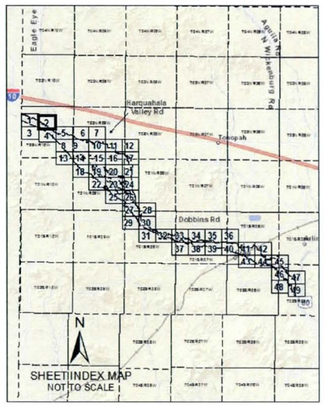
NOTE: ALL ELEVATIONS ARE BASED ON NORTH AMERICAN VERTICAL DATUM OF 1988. SEE MCDOT & NGS ONLINE RESOURCES FOR MORE INFORMATION.

I.D. NUMBER	ELEV. (FT)	DESCRIPTION/LOCATION

NOTES

1) ALL AREAS DESIGNATED ZONE X ARE SHADED ZONE X, EXCEPT WHERE NOTED.

2) AREA LOCATED IN TOWNSHIP 2N, RANGE 10W, SECTIONS 8-10 AND 15-16.



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CENTENNIAL WASH FLOODPLAIN DELINEATION STUDY: GILA RIVER TO LA PAZ COUNTY

F.C.D. CONTRACT NUMBER 2012C004

52895 CHARLES M. DAVIS — CERTIFICATE NO. — Expires 12/31/2014

WEST Consultants, Inc.

	BY	DATE
DESIGN	---	---
DESIGN CHECK	---	---
PLANS	SJB	10/13
PLANS CHECK	CMD, JWH	10/13

MATCH LINE SHEET 1

MATCH LINE SHEET 4

AERIAL IMAGERY PROVIDED BY THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
FLIGHT DATE VARIES FROM SEPTEMBER THROUGH OCTOBER, 2010 AND 2011

400 200 0 400 800

NTS SCALE: 1" = 400 FEET NTS
CONTOUR INTERVAL = 2 FEET

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1" = 200' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS.

GROUND CONTROL SURVEY DATA & AERIAL MAPPING PROVIDED BY FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

LEGEND

ZONE AE BOUNDARIES — Revised / Effective
FLOODWAY BOUNDARIES — Revised / Effective
BASE FLOOD ELEVATION
HYDRAULIC BASELINE
ZONE AO1
ZONE AO2
ZONE AO3
ZONE A BOUNDARIES — Revised / Effective

Cross Section River Mile Designation
Floodplain Water Surface Elevation
Floodway Water Surface Elevation
100-year Discharge
1.009
FP = 2222.33
FW = 2222.33
3333cfs
Cross Section Stationing Tick

ELEV. REFERENCE MARK
SECTION LINE AND ID — 5

ELEVATION REFERENCE MARKS

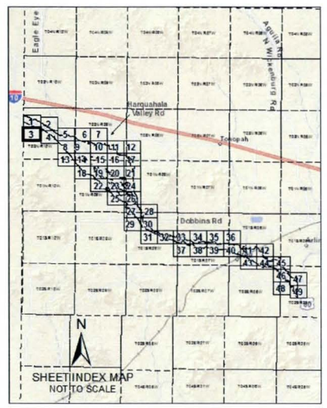
NOTE: ALL ELEVATIONS ARE BASED ON NORTH AMERICAN VERTICAL DATUM OF 1988. SEE MCDOT & NGS ONLINE RESOURCES FOR MORE INFORMATION.

I.D. NUMBER	ELEV. (FT)	DESCRIPTION/LOCATION

NOTES

1) ALL AREAS DESIGNATED ZONE X ARE SHADED ZONE X, EXCEPT WHERE NOTED.

2) AREA LOCATED IN TOWNSHIP 2N, RANGE 10W, SECTIONS 16-21.



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CENTENNIAL WASH FLOODPLAIN DELINEATION STUDY: GILA RIVER TO LA PAZ COUNTY

F.C.D. CONTRACT NUMBER 2012C004

52895 CHARLES M. DAVIS — REGISTERED ENGINEER — CERTIFICATE NO. — ARIZONA, U.S.A.
Expires 12/31/2014

WEST Consultants, Inc.

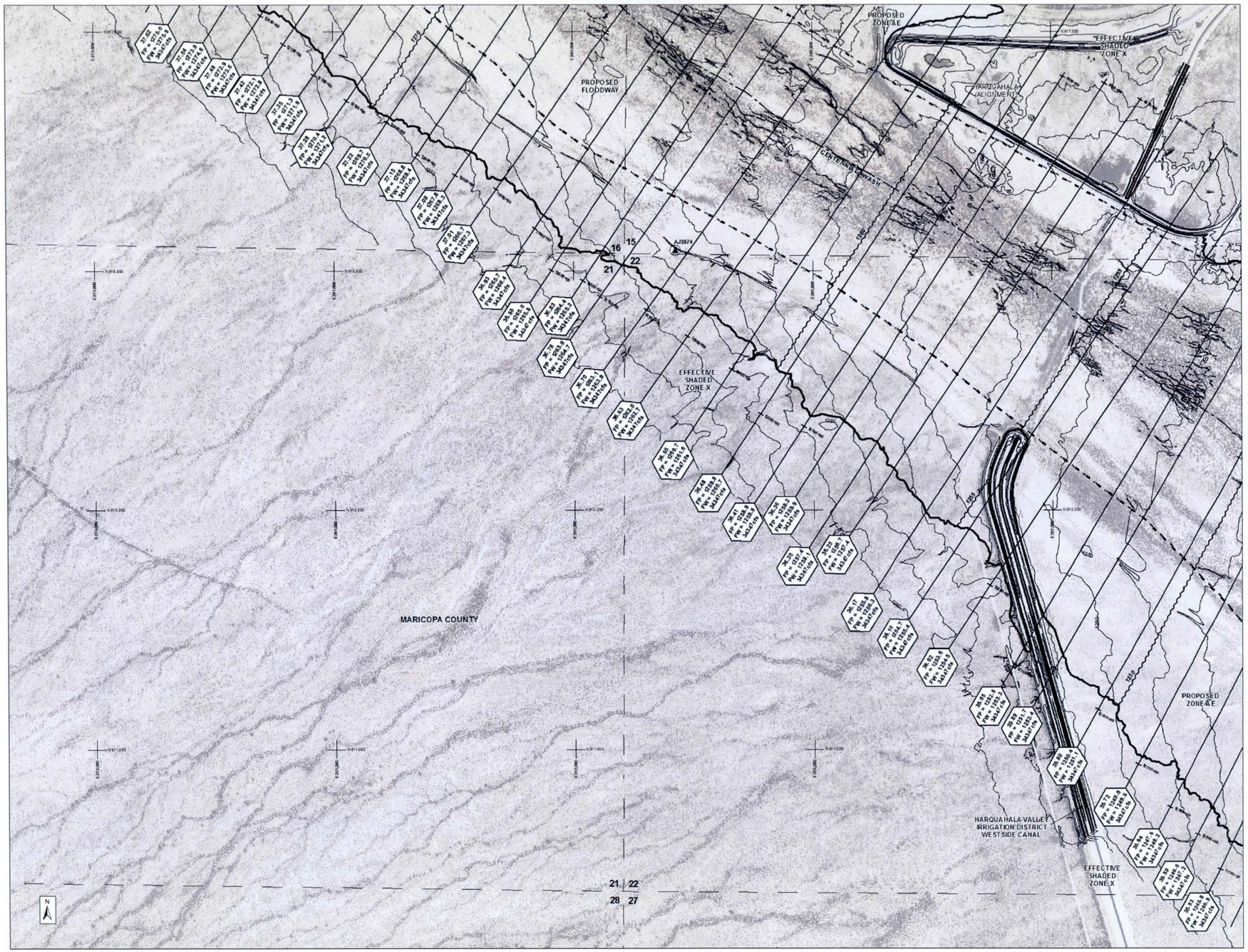
	BY	DATE
DESIGN	---	---
DESIGN CHECK	---	---
PLANS	SJB	10/13
PLANS CHECK	CMD, JWH	10/13

MATCH LINE SHEET 2

MATCH LINE SHEET 3

MATCH LINE SHEET 5

MATCH LINE SHEET 8



AERIAL IMAGERY PROVIDED BY THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
FLIGHT DATE VARIES FROM SEPTEMBER THROUGH OCTOBER, 2010 AND 2011

400 200 0 400 800

NTS SCALE: 1" = 400 FEET NTS
CONTOUR INTERVAL = 2 FEET

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1" = 200' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS.

GROUND CONTROL SURVEY DATA & AERIAL MAPPING PROVIDED BY FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

LEGEND

ZONE AE BOUNDARIES (Revised / Effective)
FLOODWAY BOUNDARIES (Revised / Effective)
BASE FLOOD ELEVATION
HYDRAULIC BASELINE
ZONE AO1
ZONE AO2
ZONE AO3
ZONE A BOUNDARIES (Revised / Effective)

Cross Section River Mile Designation
Floodplain Water Surface Elevation
Floodway Water Surface Elevation
100-year Discharge
1.000
FP = 2222.33
FW = 2222.33
3333cfs
Cross Section Stationing Tick

ELEV. REFERENCE MARK
SECTION LINE AND ID 5

ELEVATION REFERENCE MARKS

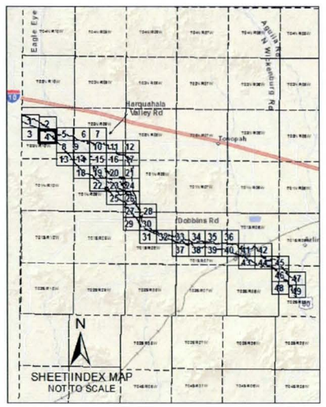
NOTE: ALL ELEVATIONS ARE BASED ON NORTH AMERICAN VERTICAL DATUM OF 1988. SEE MCDOT & NGS ONLINE RESOURCES FOR MORE INFORMATION.

I.D. NUMBER	ELEV. (FT)	DESCRIPTION/LOCATION
NGS AJ3574	1261.0	AL CAP COMPRESSED ON A 50' STAINLESS STEEL ROD, ENCASED IN A 1" PVC SLEEVE ENCLOSED IN A 5" PVC PIPE W/ COUNTY LOGO

NOTES

1) ALL AREAS DESIGNATED ZONE X ARE SHADED ZONE X, EXCEPT WHERE NOTED.

2) AREA LOCATED IN TOWNSHIP 2N, RANGE 10W, SECTIONS 15-16, 21-22 AND 27-28.



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CENTENNIAL WASH FLOODPLAIN DELINEATION STUDY: GILA RIVER TO LA PAZ COUNTY

F.C.D. CONTRACT NUMBER 2012C004

52695 CHARLES M. DAVIS — REGISTERED PROFESSIONAL ENGINEER — ARIZONA, U.S.A.
Expires 12/31/2014

WEST Consultants, Inc.

	BY	DATE
DESIGN	---	---
DESIGN CHECK	---	---
PLANS	SJB	10/13
PLANS CHECK	CMD, JWH	10/13

MATCH LINE SHEET 2

MATCH LINE SHEET 4

MATCH LINE SHEET 6

MARICOPA COUNTY

EFFECTIVE SHADED ZONE X

PROPOSED ZONE AE

FLOODPLAIN/FLOODWAY BOUNDARE STILL CONSIDERED

PROPOSED FLOODWAY

CENTENNIAL WASH

SOUTH AVE (ALIGNMENT)

(ALIGNMENT)

MATCH LINE SHEET 8

AERIAL IMAGERY PROVIDED BY THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
FLIGHT DATE VARIES FROM SEPTEMBER THROUGH OCTOBER, 2010 AND 2011

400 200 0 400 800

NTS SCALE: 1" = 400 FEET CONTOUR INTERVAL = 2 FEET NTS

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1" = 200' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS.

GROUND CONTROL SURVEY DATA & AERIAL MAPPING PROVIDED BY FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

LEGEND

ZONE AE BOUNDARIES (Revised / Effective)
FLOODWAY BOUNDARIES (Revised / Effective)
BASE FLOOD ELEVATION
HYDRAULIC BASELINE
ZONE AO1
ZONE AO2
ZONE AO3
ZONE A BOUNDARIES (Revised / Effective)

Cross Section River Mile Designation
Floodplain Water Surface Elevation
Floodway Water Surface Elevation
100-year Discharge
1.009
FP = 2222.33
FW = 2222.33
3333cfs
Cross Section Stationing Tick

ELEV. REFERENCE MARK

SECTION LINE AND ID 5

ELEVATION REFERENCE MARKS

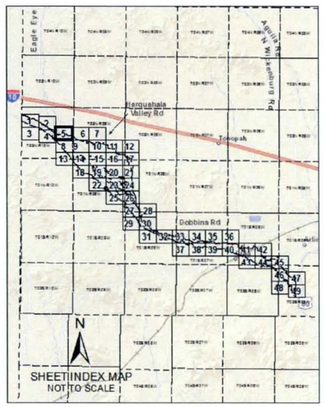
NOTE: ALL ELEVATIONS ARE BASED ON NORTH AMERICAN VERTICAL DATUM OF 1988. SEE MCDOT & NGS ONLINE RESOURCES FOR MORE INFORMATION.

I.D. NUMBER	ELEV. (FT)	DESCRIPTION/LOCATION

NOTES

1) ALL AREAS DESIGNATED ZONE X ARE SHADED ZONE X, EXCEPT WHERE NOTED.

2) AREA LOCATED IN TOWNSHIP 2N, RANGE 10W, SECTIONS 13-15 AND 22-24.



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CENTENNIAL WASH FLOODPLAIN DELINEATION STUDY: GILA RIVER TO LA PAZ COUNTY

F.C.D. CONTRACT NUMBER 2012C004

52895 CHARLES M. DAVIS
CERTIFICATE NO.
Expires 12/31/2014

WEST Consultants, Inc.

	BY	DATE
DESIGN	---	---
DESIGN CHECK	---	---
PLANS	SJB	10/13
PLANS CHECK	CMD, JWH	10/13

MATCH LINE SHEET 5

MATCH LINE SHEET 7

MATCH LINE SHEET 9

AERIAL IMAGERY PROVIDED BY THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
FLIGHT DATE VARIES FROM SEPTEMBER THROUGH OCTOBER, 2010 AND 2011

400 200 0 400 800

NTS SCALE: 1" = 400 FEET NTS
CONTOUR INTERVAL = 2 FEET

LEGEND

ZONE AE BOUNDARIES (Revised / Effective)
FLOODWAY BOUNDARIES (Revised / Effective)
BASE FLOOD ELEVATION
HYDRAULIC BASELINE
ZONE AO1
ZONE AO2
ZONE AO3
ZONE A BOUNDARIES (Revised / Effective)

Cross Section River Mile Designation
Floodplain Water Surface Elevation
Floodway Water Surface Elevation
100-year Discharge
1.009
FP = 2222.33
FW = 2222.33
3333cfs
Cross Section Stationing Tick

ELEV. REFERENCE MARK
SECTION LINE AND ID 5

ELEVATION REFERENCE MARKS

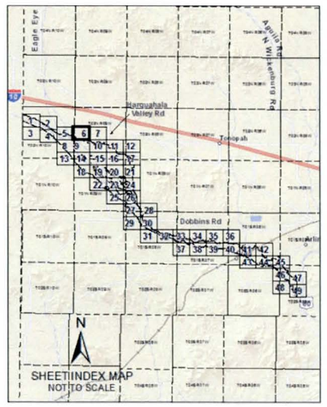
NOTE: ALL ELEVATIONS ARE BASED ON NORTH AMERICAN VERTICAL DATUM OF 1988. SEE MCDOT & NGS ONLINE RESOURCES FOR MORE INFORMATION.

I.D. NUMBER	ELEV. (FT)	DESCRIPTION/LOCATION
MCDOT 27070-1	1214.4	FD 2" IP 0.9' UP W/ 2 1/2" GLO BC STAMPED "T 2N R92 S17 S18 S19 S20 1914"

NOTES

1) ALL AREAS DESIGNATED ZONE X ARE SHADED ZONE X, EXCEPT WHERE NOTED.

2) AREA LOCATED IN TOWNSHIP 2N, RANGE 9W, SECTIONS 17-20 AND TOWNSHIP 2N, RANGE 10W, SECTIONS 13 AND 24.



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CENTENNIAL WASH FLOODPLAIN DELINEATION STUDY: GILA RIVER TO LA PAZ COUNTY

F.C.D. CONTRACT NUMBER 2012C004

52895 CHARLES M. DAVIS REGISTERED PROFESSIONAL ENGINEER ARIZONA, U.S.A.
Expires 12/31/2014

WEST Consultants, Inc.

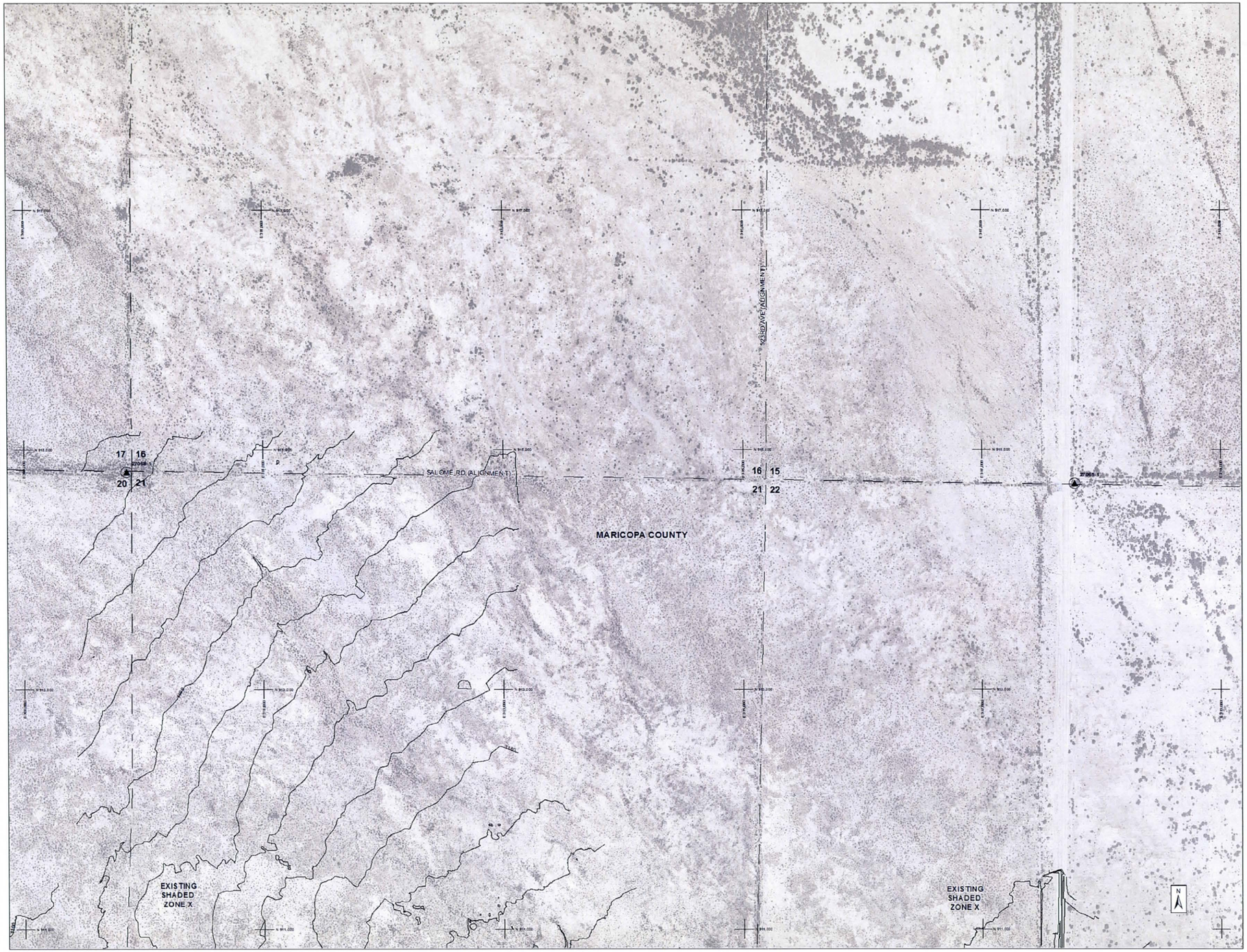
	BY	DATE
DESIGN	---	---
DESIGN CHECK	---	---
PLANS	SJB	10/13
PLANS CHECK	CMD; JWH	10/13

SHEET 6 OF 49

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1" = 200' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS

GROUND CONTROL SURVEY DATA & AERIAL MAPPING PROVIDED BY FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

MATCH LINE SHEET 6



MATCH LINE SHEET 10

AERIAL IMAGERY PROVIDED BY THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
FLIGHT DATE VARIES FROM SEPTEMBER THROUGH OCTOBER, 2010 AND 2011

400 200 0 400 800

NTS SCALE: 1" = 400 FEET NTS
CONTOUR INTERVAL = 2 FEET

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1" = 200' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS.

GROUND CONTROL SURVEY DATA & AERIAL MAPPING PROVIDED BY FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

LEGEND

ZONE AE BOUNDARIES — Revised / Effective
FLOODWAY BOUNDARIES — Revised / Effective
BASE FLOOD ELEVATION
HYDRAULIC BASELINE
ZONE AO1
ZONE AO2
ZONE AO3
ZONE A BOUNDARIES — Revised / Effective

Cross Section River Mile Designation
Floodplain Water Surface Elevation
Floodway Water Surface Elevation
100-year Discharge
1.009
FP = 2222.33
FW = 2222.33
3333cfs
Cross Section Stationing Tick

ELEV. REFERENCE MARK
SECTION LINE AND ID — 5

ELEVATION REFERENCE MARKS

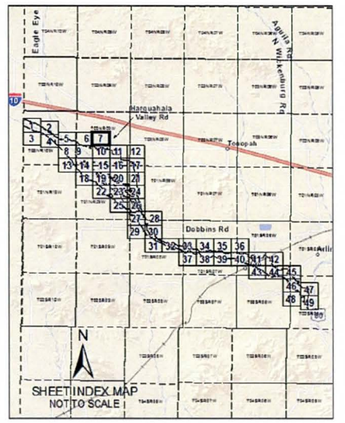
NOTE: ALL ELEVATIONS ARE BASED ON NORTH AMERICAN VERTICAL DATUM OF 1988. SEE MCDOT & NGS ONLINE RESOURCES FOR MORE INFORMATION.

I.D. NUMBER	ELEV. (FT)	DESCRIPTION/LOCATION
MCDOT 27068-1	1197.5	FD 2" IP 0.3' UP W/ 2 1/2" GLO BC STAMPED "1/4 S15 S22 1914"
MCDOT 27065-1	1176.5	FD 1" IP 1.55' UP W/ 2 1/2" GLO BC STAMPED "T2ND R9W S16 S17 S20 S21 1914"

NOTES

1) ALL AREAS DESIGNATED ZONE X ARE SHADED ZONE X, EXCEPT WHERE NOTED.

2) AREA LOCATED IN TOWNSHIP 2N, RANGE 9W, SECTIONS 15-17 AND 20-22.



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CENTENNIAL WASH FLOODPLAIN DELINEATION STUDY: GILA RIVER TO LA PAZ COUNTY

F.C.D. CONTRACT NUMBER 2012C004

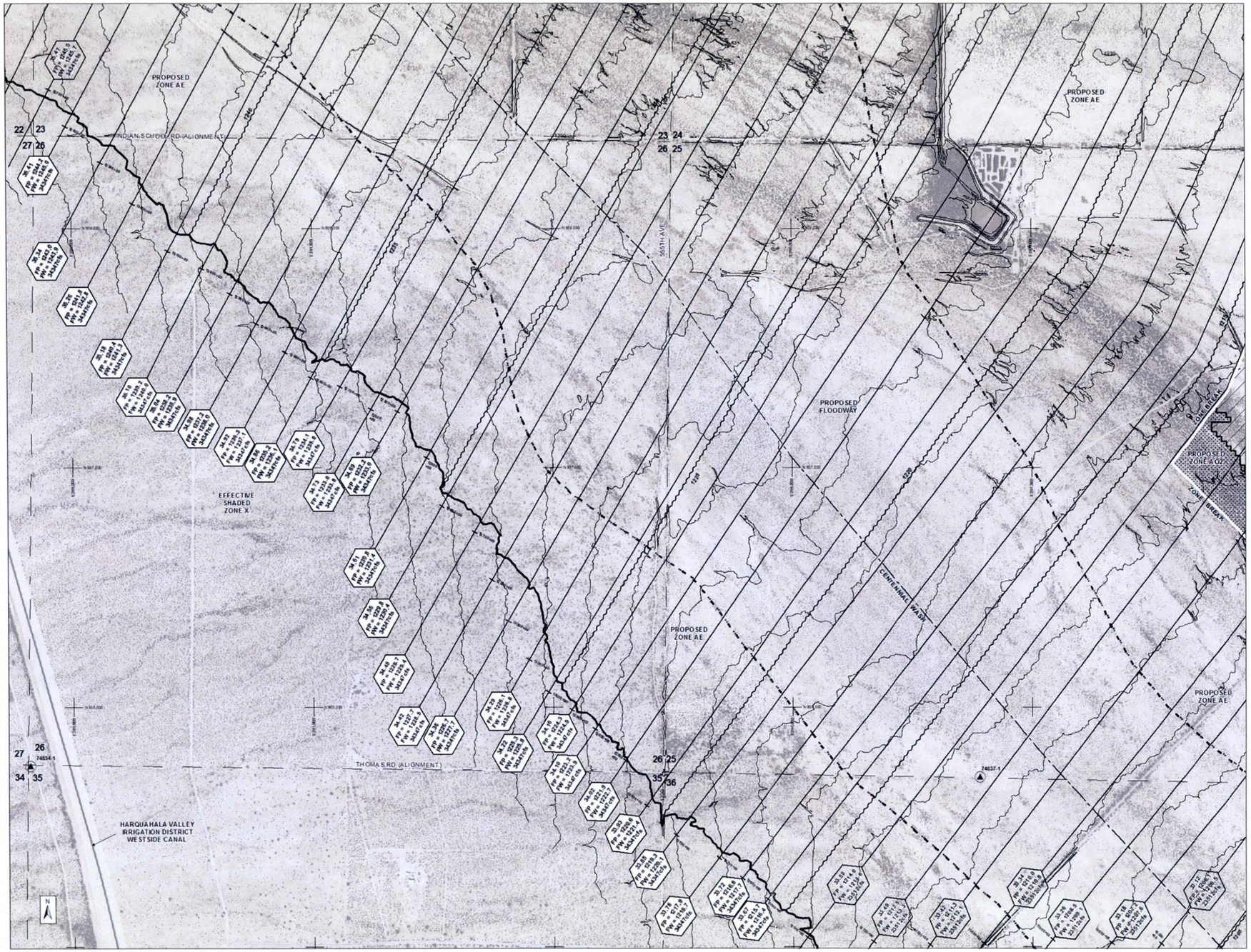
52895 CHARLES M. DAVIS — CERTIFICATE NO. — REGISTERED PROFESSIONAL ENGINEER — ARIZONA, U.S.A.
Expires 12/31/2014

WEST Consultants, Inc.

	BY	DATE
DESIGN	---	---
DESIGN CHECK	---	---
PLANS	SJB	1/14
PLANS CHECK	CMD, JWH	1/14

SHEET 7 OF 49

MATCH LINE SHEET 5



MATCH LINE SHEET 13

MATCH LINE SHEET 9

AERIAL IMAGERY PROVIDED BY THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
FLIGHT DATE VARIES FROM SEPTEMBER THROUGH OCTOBER, 2010 AND 2011

400 200 0 400 800

NTS SCALE: 1" = 400 FEET
CONTOUR INTERVAL = 2 FEET NTS

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1" = 200' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS

GROUND CONTROL SURVEY DATA & AERIAL MAPPING PROVIDED BY FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

LEGEND

ZONE AE BOUNDARIES (Revised / Effective)
FLOODWAY BOUNDARIES (Revised / Effective)
BASE FLOOD ELEVATION
HYDRAULIC BASELINE
ZONE AO1
ZONE AO2
ZONE AO3
ZONE A BOUNDARIES (Revised / Effective)

Cross Section River Mile Designation
Floodplain Water Surface Elevation
Floodway Water Surface Elevation
100-year Discharge
1.009
FP = 2222.33
FW = 2222.33
3333cfs
Cross Section Stationing Tick

ELEV. REFERENCE MARK

SECTION LINE AND ID 5

ELEVATION REFERENCE MARKS

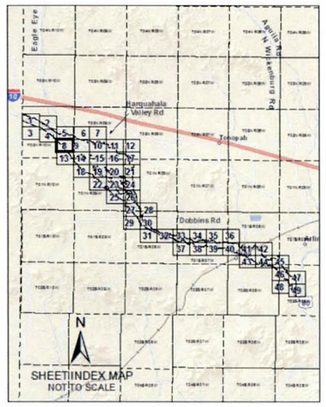
NOTE: ALL ELEVATIONS ARE BASED ON NORTH AMERICAN VERTICAL DATUM OF 1988. SEE MCDOT & NGS ONLINE RESOURCES FOR MORE INFORMATION

I.D. NUMBER	ELEV. (FT)	DESCRIPTION/LOCATION
MCDOT 74834-1	1256.6	FD 2" IP 0.7' UP W/ 2 1/2" GLO BC STAMPED "T2N R10W S27 S26 S34 S35 1914"
MCDOT 74837-1	1212.0	FD 1" IP 0.8' UP W/ 2 1/2" GLO BC STAMPED "S25 1/4 S36 1914"

NOTES

1) ALL AREAS DESIGNATED ZONE X ARE SHADED ZONE X, EXCEPT WHERE NOTED.

2) AREA LOCATED IN TOWNSHIP 2N, RANGE 10W, SECTIONS 22-27 AND 34-36.



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CENTENNIAL WASH FLOODPLAIN DELINEATION STUDY: GILA RIVER TO LA PAZ COUNTY

F.C.D. CONTRACT NUMBER 2012C004

Registered Professional Engineer, State of Arizona
CERTIFICATE NO. 52895
CHARLES M. DAVIS
ARIZONA, U.S.A.
Expires 12/31/2014

WEST Consultants, Inc.

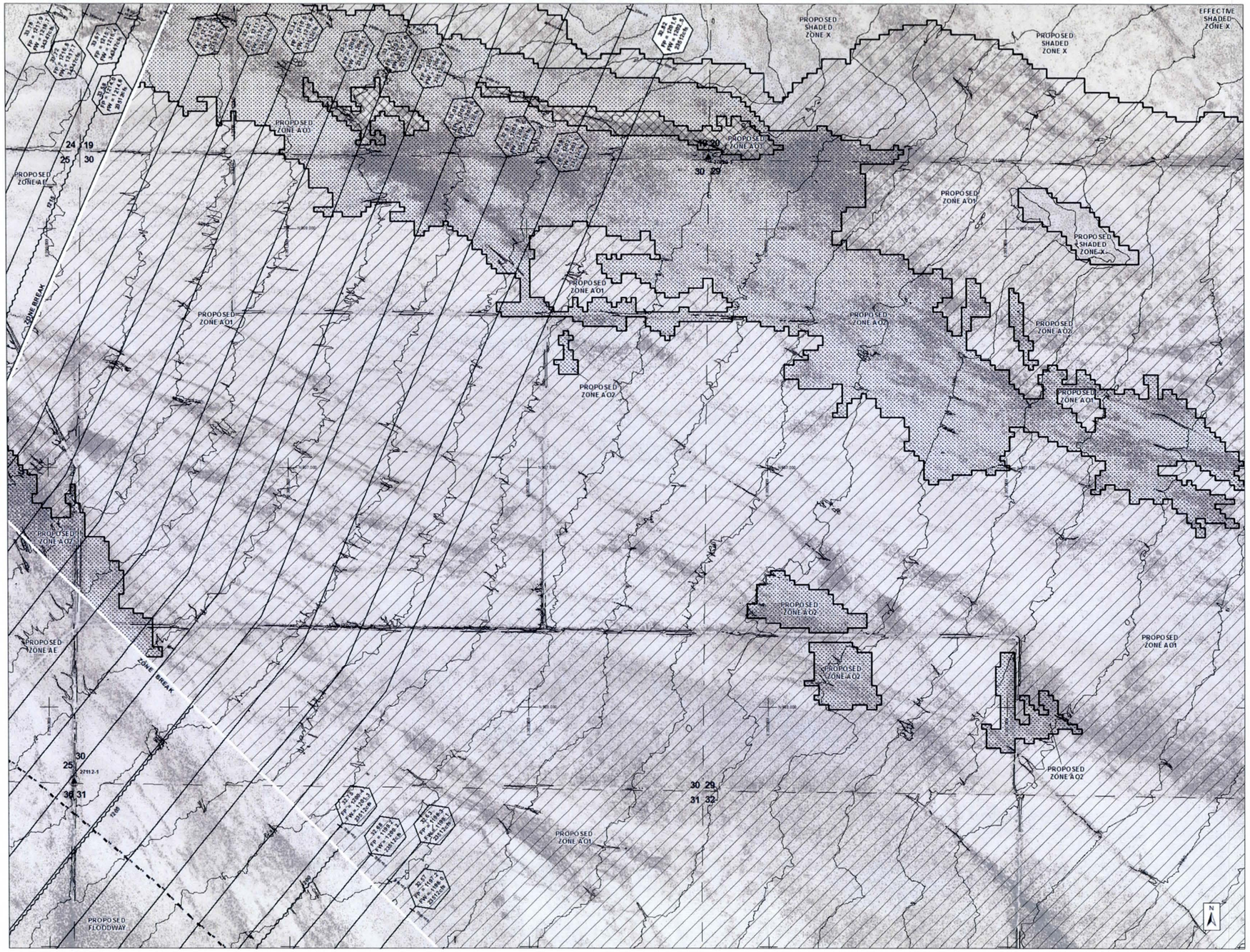
	BY	DATE
DESIGN	---	---
DESIGN CHECK	---	---
PLANS	SJB	10/13
PLANS CHECK	CMD, JWH	10/13

MATCH LINE SHEET 6

MATCH LINE SHEET 8

MATCH LINE SHEET 10

MATCH LINE SHEET 14



AERIAL IMAGERY PROVIDED BY THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
FLIGHT DATE VARIES FROM SEPTEMBER THROUGH OCTOBER, 2010 AND 2011

400 200 0 400 800

NTS SCALE: 1" = 400 FEET NTS
CONTOUR INTERVAL = 2 FEET

LEGEND

ZONE AE BOUNDARIES — Revised / Effective
FLOODWAY BOUNDARIES — Revised / Effective
BASE FLOOD ELEVATION
HYDRAULIC BASELINE
ZONE A01
ZONE A02
ZONE A03
ZONE A BOUNDARIES — Revised / Effective

Cross Section River Mile Designation
Floodplain Water Surface Elevation
Floodway Water Surface Elevation
100-year Discharge
1.009
FP = 2222.33
FW = 2222.33
3333cfs
Cross Section Stationing Tick

ELEV. REFERENCE MARK
SECTION LINE AND ID 5

ELEVATION REFERENCE MARKS

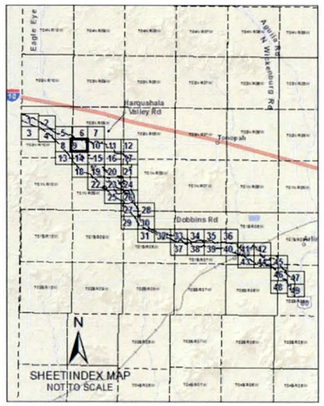
NOTE: ALL ELEVATIONS ARE BASED ON NORTH AMERICAN VERTICAL DATUM OF 1988. SEE MCDOT & NGS ONLINE RESOURCES FOR MORE INFORMATION.

I.D. NUMBER	ELEV. (FT.)	DESCRIPTION/LOCATION
MCDOT 27112-1	1203.7	FD 3" IP 0.45' DN W/ 3 1/2" GLO BC STAMPED "T2N R9W S19 S20 S29 S30 1914"
MCDOT 27090-1	1197.9	FD 2" IP 0.6' DN W/ 2 1/2" GLO BC STAMPED "T2N R10W S25 S36 R9W S30 S31 1914"

NOTES

1) ALL AREAS DESIGNATED ZONE X ARE SHADED ZONE X, EXCEPT WHERE NOTED.

2) AREA LOCATED IN TOWNSHIP 2N, RANGE 9W, SECTIONS 19-20 AND 29-32, AND TOWNSHIP 2N, RANGE 10W, SECTIONS 24-25 AND 36.



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CENTENNIAL WASH FLOODPLAIN DELINEATION STUDY: GILA RIVER TO LA PAZ COUNTY

F.C.D. CONTRACT NUMBER 2012C004

CERTIFICATE NO. 52895 CHARLES M. DAVIS — Expires 12/31/2014

WEST Consultants, Inc.

	BY	DATE
DESIGN	---	---
DESIGN CHECK	---	---
PLANS	SJB	10/13
PLANS CHECK	CMD, JWH	10/13

SHEET 9 OF 49

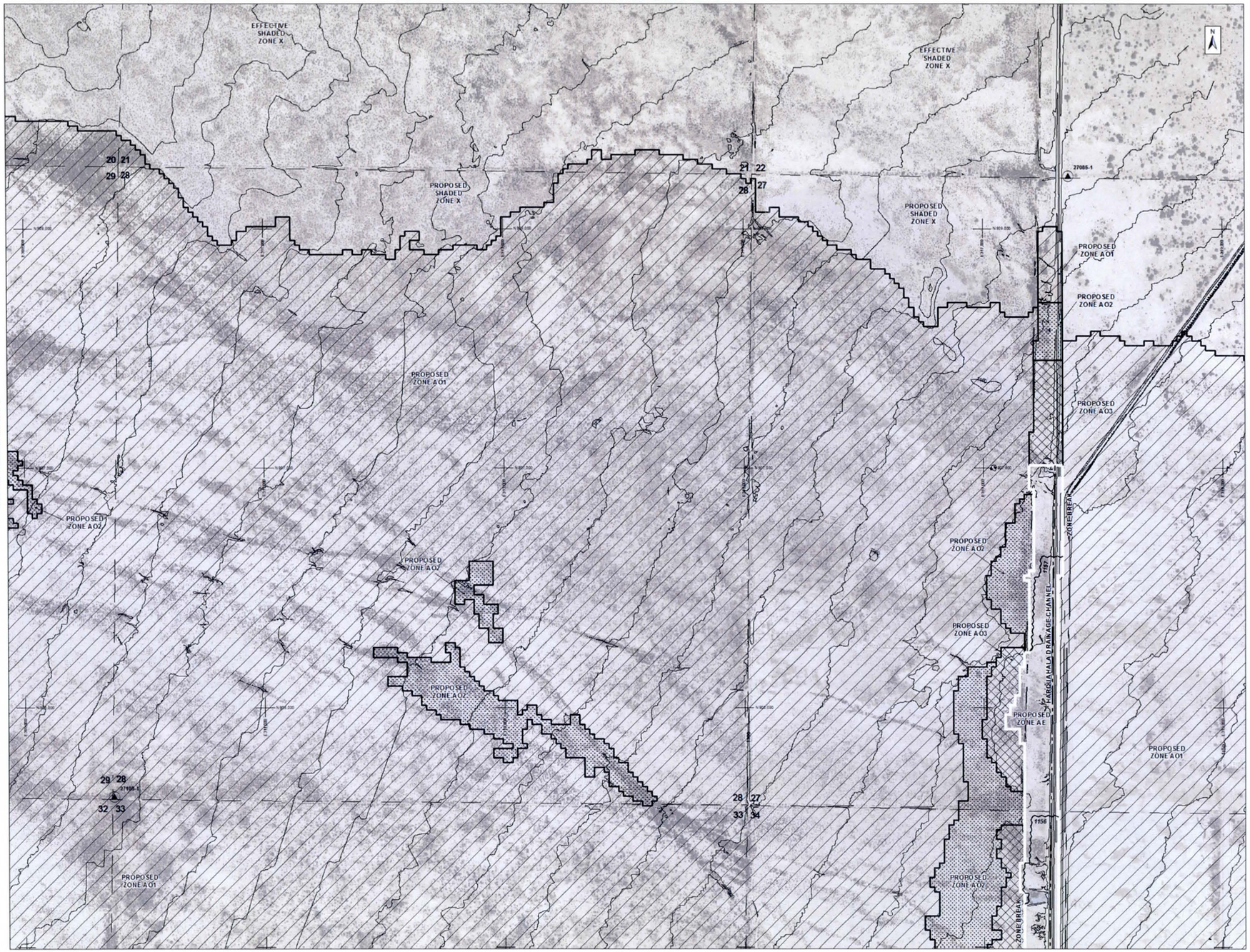
THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1" = 200' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS

GROUND CONTROL SURVEY DATA & AERIAL MAPPING PROVIDED BY FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

MATCH LINE SHEET 7

MATCH LINE SHEET 9

MATCH LINE SHEET 11



MATCH LINE SHEET 15

AERIAL IMAGERY PROVIDED BY THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
FLIGHT DATE VARIES FROM SEPTEMBER THROUGH OCTOBER, 2010 AND 2011

400 200 0 400 800

NTS SCALE: 1" = 400 FEET NTS
CONTOUR INTERVAL = 2 FEET

LEGEND

ZONE AE BOUNDARIES (Revised / Effective)
FLOODWAY BOUNDARIES (Revised / Effective)
BASE FLOOD ELEVATION
HYDRAULIC BASELINE
ZONE AO1
ZONE AO2
ZONE AO3
ZONE A BOUNDARIES (Revised / Effective)

Cross Section River Mile Designation
Floodplain Water Surface Elevation
Floodway Water Surface Elevation
100-year Discharge
1.009
FP = 2222.33
FW = 2222.33
3333cfs
Cross Section Stationing Tick

ELEV. REFERENCE MARK
SECTION LINE AND ID 5

ELEVATION REFERENCE MARKS

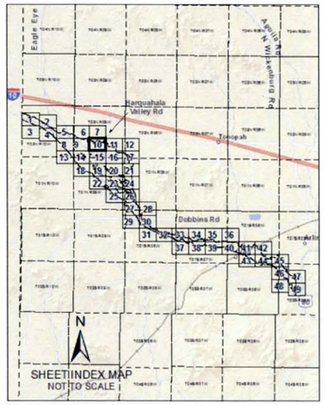
NOTE: ALL ELEVATIONS ARE BASED ON NORTH AMERICAN VERTICAL DATUM OF 1988. SEE MCDOT & NGS ONLINE RESOURCES FOR MORE INFORMATION.

I.D. NUMBER	ELEV. (FT)	DESCRIPTION/LOCATION
MCDOT 27108-1	1177.0	FD 2" IP 0.15' UP W/ 2 1/2" GLO BC STAMPED "T2N R9Z S28 S29 S32 S33 1914"
MCDOT 27085-1	1160.1	FD 1" IP 0.45' DN W/ 2 1/2" GLO BC STAMPED "1/4 S22 S27 1914"

NOTES

1) ALL AREAS DESIGNATED ZONE X ARE SHADED ZONE X, EXCEPT WHERE NOTED.

2) AREA LOCATED IN TOWNSHIP 2N, RANGE 9W, SECTIONS 20-21, 27-29, AND 32-34.



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CENTENNIAL WASH FLOODPLAIN DELINEATION STUDY: GILA RIVER TO LA PAZ COUNTY

F.C.D. CONTRACT NUMBER 2012C004

52895 CHARLES M. DAVIS — Expires 12/31/2014

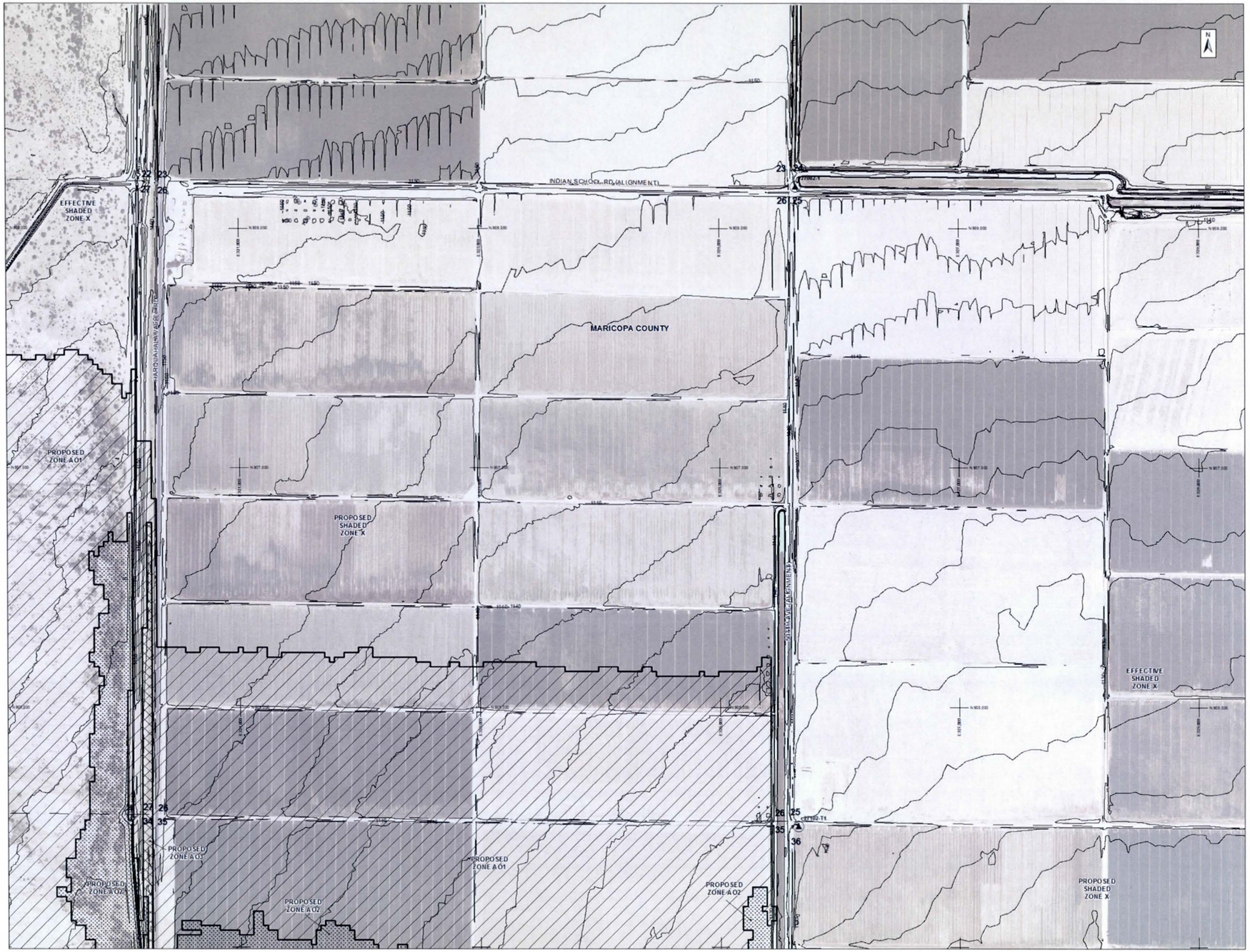
WEST Consultants, Inc.

	BY	DATE
DESIGN	---	---
DESIGN CHECK	---	---
PLANS	SJB	10/13
PLANS CHECK	CMD, JWH	10/13

SHEET 10 OF 49

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1" = 200' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS

GROUND CONTROL SURVEY DATA & AERIAL MAPPING PROVIDED BY FLOOD CONTROL DISTRICT OF MARICOPA COUNTY



AERIAL IMAGERY PROVIDED BY THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
FLIGHT DATE VARIES FROM SEPTEMBER THROUGH OCTOBER, 2010 AND 2011

400 200 0 400 800

NTS SCALE: 1" = 400 FEET NTS
CONTOUR INTERVAL = 2 FEET

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1" = 200' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS

GROUND CONTROL SURVEY DATA & AERIAL MAPPING PROVIDED BY FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

LEGEND

ZONE AE BOUNDARIES (Revised / Effective)
FLOODWAY BOUNDARIES (Revised / Effective)
BASE FLOOD ELEVATION
HYDRAULIC BASELINE
ZONE AO1
ZONE AO2
ZONE AO3
ZONE A BOUNDARIES (Revised / Effective)

Cross Section River Mile Designation
Floodplain Water Surface Elevation
Floodway Water Surface Elevation
100-year Discharge
1.009
FP = 2222.33
FW = 2222.33
3333cfs
Cross Section Stationing Tick

ELEV. REFERENCE MARK
SECTION LINE AND ID 5

ELEVATION REFERENCE MARKS

NOTE: ALL ELEVATIONS ARE BASED ON NORTH AMERICAN VERTICAL DATUM OF 1988. SEE MCDOT & NGS ONLINE RESOURCES FOR MORE INFORMATION.

I.D. NUMBER	ELEV. (FT)	DESCRIPTION/LOCATION
MCDOT 27082-1	1148.4	FD 1/2" ROUND STEEL METAL ROD 0.45' DN W/ NO ID
MCDOT 27102-T1	1133.2	FD CHIS X ON NW CORNER CONCRETE WELL PAD

NOTES

1) ALL AREAS DESIGNATED ZONE X ARE SHADED ZONE X, EXCEPT WHERE NOTED.

2) AREA LOCATED IN TOWNSHIP 2N, RANGE 9W, SECTIONS 22-27 AND 34-36.

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

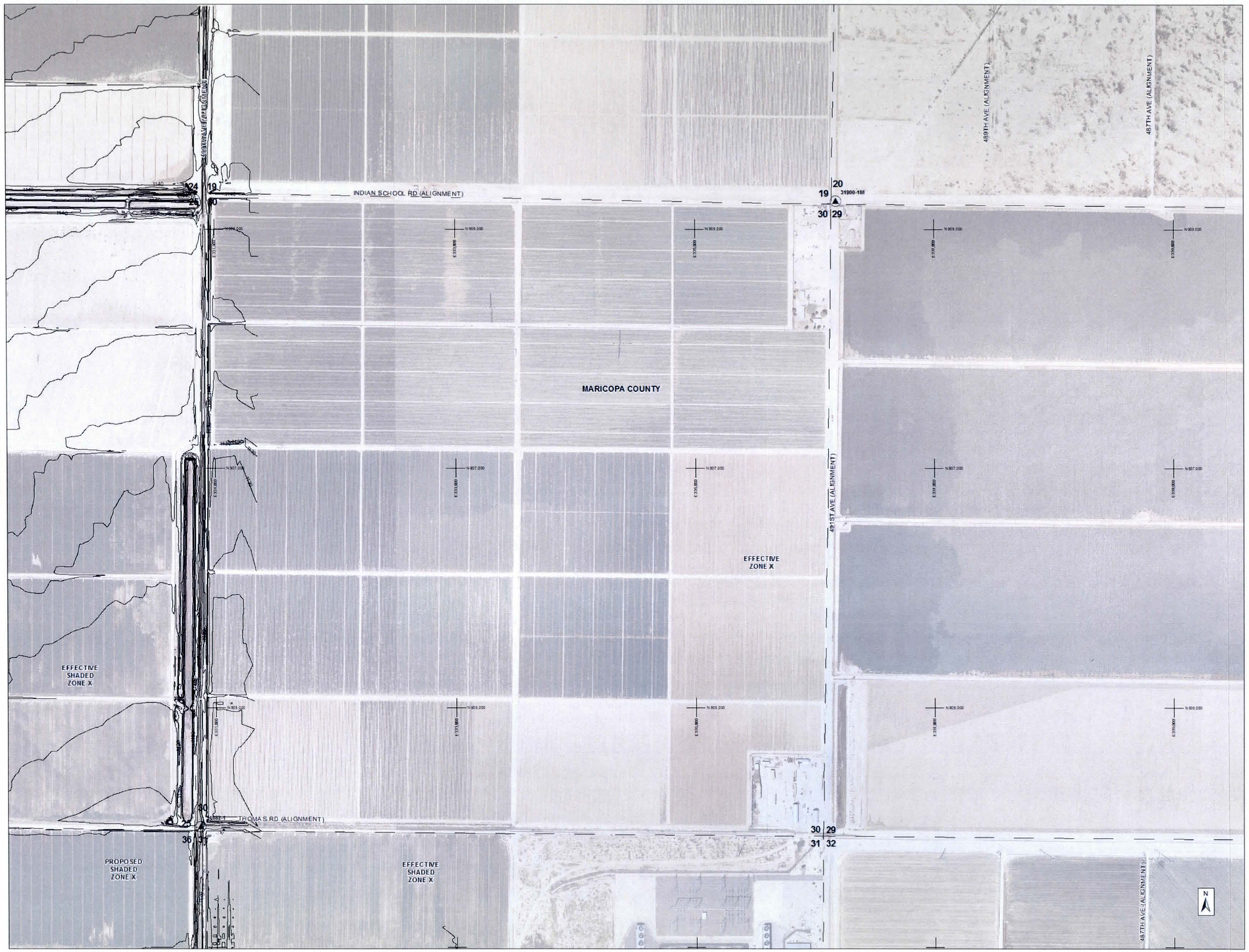
CENTENNIAL WASH FLOODPLAIN DELINEATION STUDY: GILA RIVER TO LA PAZ COUNTY

F.C.D. CONTRACT NUMBER 2012C004

52895 CHARLES M. DAVIS REGISTERED PROFESSIONAL ENGINEER CERTIFICATE NO. ARIZONA, U.S.A.
Expires 12/31/2014

WEST Consultants, Inc.

	BY	DATE
DESIGN	---	---
DESIGN CHECK	---	---
PLANS	SJB	10/13
PLANS CHECK	CMD, JWH	10/13



MATCH LINE SHEET 11

MATCH LINE SHEET 17

AERIAL IMAGERY PROVIDED BY THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
FLIGHT DATE VARIES FROM SEPTEMBER THROUGH OCTOBER, 2010 AND 2011

400 200 0 400 800

NTS SCALE: 1" = 400 FEET NTS
CONTOUR INTERVAL = 2 FEET

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1" = 200' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS.

GROUND CONTROL SURVEY DATA & AERIAL MAPPING PROVIDED BY FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

LEGEND

ZONE AE BOUNDARIES (Revised / Effective)
FLOODWAY BOUNDARIES (Revised / Effective)
BASE FLOOD ELEVATION
HYDRAULIC BASELINE
ZONE AO1
ZONE AO2
ZONE AO3
ZONE A BOUNDARIES (Revised / Effective)

Cross Section River Mile Designation
Floodplain Water Surface Elevation
Floodway Water Surface Elevation
100-year Discharge
1.009
FP = 2222.33
FW = 2222.33
3333cfs
Cross Section Stationing Tick

ELEV. REFERENCE MARK

SECTION LINE AND ID 5

ELEVATION REFERENCE MARKS

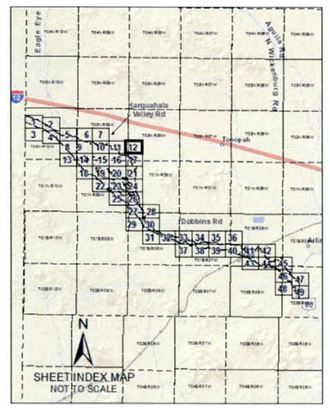
NOTE: ALL ELEVATIONS ARE BASED ON NORTH AMERICAN VERTICAL DATUM OF 1988. SEE MCDOT & NGS ONLINE RESOURCES FOR MORE INFORMATION.

I.D. NUMBER	ELEV. (FT)	DESCRIPTION/LOCATION
MCDOT 31882-1	1121.8	FD 3 1/2" BC FL STAMPED "T2N 25 30 R9W R8W 36 31 2001 LS 19354"
MCDOT 31900-1M	1143.7	FD 1/2" RB W/O ID 1.2' DN

NOTES

1) ALL AREAS DESIGNATED ZONE X ARE SHADED ZONE X, EXCEPT WHERE NOTED.

2) AREA LOCATED IN TOWNSHIP 2N, RANGE 8W, SECTIONS 19-20 AND 29-32, AND RANGE 9W, SECTIONS 24-25 AND 36.



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CENTENNIAL WASH FLOODPLAIN DELINEATION STUDY: GILA RIVER TO LA PAZ COUNTY

F.C.D. CONTRACT NUMBER 2012C004

CERTIFICATE NO. 52895 CHARLES M. DAVIS — REGISTERED PROFESSIONAL ENGINEER — ARIZONA, U.S.A.
Expires 12/31/2014

WEST Consultants, Inc.

	BY	DATE
DESIGN	---	---
DESIGN CHECK	---	---
PLANS	SJB	10/13
PLANS CHECK	CMD, JWH	10/13

MATCH LINE SHEET 8

MATCH LINE SHEET 14

AERIAL IMAGERY PROVIDED BY THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
FLIGHT DATE VARIES FROM SEPTEMBER THROUGH OCTOBER, 2010 AND 2011

400 200 0 400 800

NTS SCALE: 1" = 400 FEET NTS
CONTOUR INTERVAL = 2 FEET

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1" = 200' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS

GROUND CONTROL SURVEY DATA & AERIAL MAPPING PROVIDED BY FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

LEGEND

ZONE AE BOUNDARIES — Revised / Effective
FLOODWAY — Revised / Effective
BASE FLOOD ELEVATION
HYDRAULIC BASELINE
ZONE AO1
ZONE AO2
ZONE AO3
ZONE A BOUNDARIES — Revised / Effective

Cross Section River Mile Designation
Floodplain Water Surface Elevation
Floodway Water Surface Elevation
100-year Discharge
1.009
FP = 2222.33
FW = 2222.33
3333cfs
Cross Section Stationing Tick

ELEV. REFERENCE MARK
SECTION LINE AND ID 5

ELEVATION REFERENCE MARKS

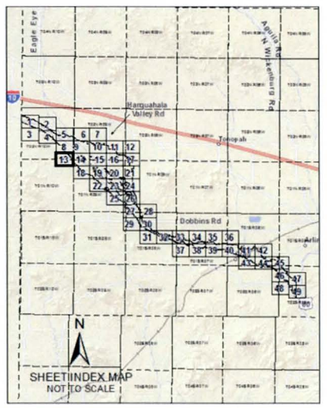
NOTE: ALL ELEVATIONS ARE BASED ON NORTH AMERICAN VERTICAL DATUM OF 1988. SEE MCDOT & NGS ONLINE RESOURCES FOR MORE INFORMATION

I.D. NUMBER	ELEV. (FT)	DESCRIPTION/LOCATION
MCDOT 74820-1	1273.6	FD 1" IP 1.4' UP W/ 2 1/2" GLO BC STAMPED "S3 1/4 S2 1914"
MCDOT 74830-1	1260.1	FD 1" IP 1.1' UP W/ 2 1/2" GLO BC STAMPED "S34 1/4 S35 1914"

NOTES

1) ALL AREAS DESIGNATED ZONE X ARE SHADED ZONE X, EXCEPT WHERE NOTED.

2) AREA LOCATED IN TOWNSHIP 1N, RANGE 10W, SECTIONS 1-3 AND TOWNSHIP 2N, RANGE 10W, SECTIONS 34-36.



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CENTENNIAL WASH FLOODPLAIN DELINEATION STUDY: GILA RIVER TO LA PAZ COUNTY

F.C.D. CONTRACT NUMBER 2012C004

52895 CHARLES M. DAVIS — REGISTERED PROFESSIONAL ENGINEER — ARIZONA, U.S.A.
Expires 12/31/2014

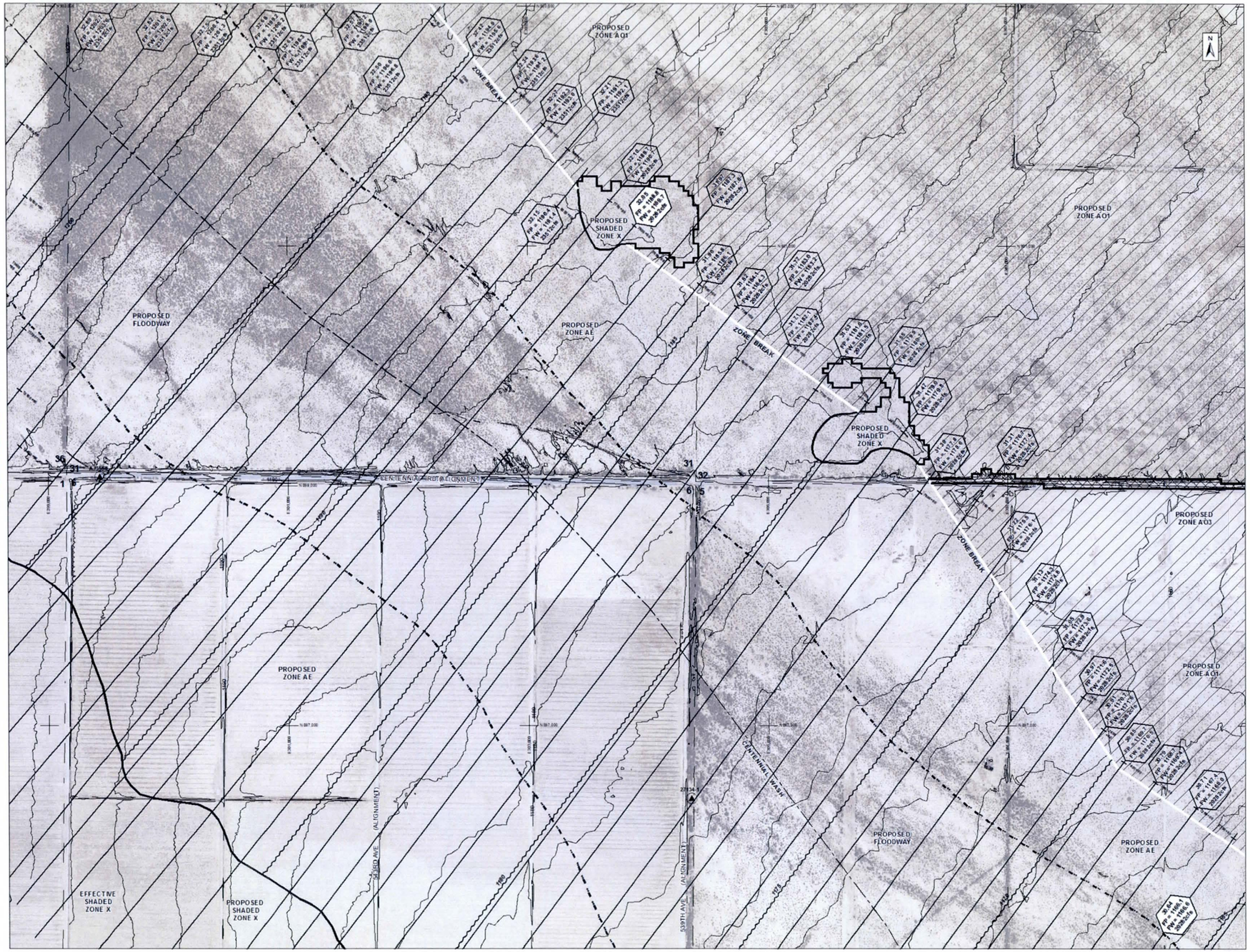
WEST Consultants, Inc.

	BY	DATE
DESIGN	---	---
DESIGN CHECK	---	---
PLANS	SJB	10/13
PLANS CHECK	CMD, JWH	10/13

MATCH LINE SHEET 9

MATCH LINE SHEET 13

MATCH LINE SHEET 15



MATCH LINE SHEET 18

AERIAL IMAGERY PROVIDED BY THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
FLIGHT DATE VARIES FROM SEPTEMBER THROUGH OCTOBER, 2010 AND 2011

400 200 0 400 800

NTS SCALE: 1" = 400 FEET NTS
CONTOUR INTERVAL = 2 FEET

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1" = 200' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS

GROUND CONTROL SURVEY DATA & AERIAL MAPPING PROVIDED BY FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

LEGEND

ZONE AE BOUNDARIES (Revised / Effective)
FLOODWAY BOUNDARIES (Revised / Effective)
BASE FLOOD ELEVATION
HYDRAULIC BASELINE
ZONE AO1
ZONE AO2
ZONE AO3
ZONE A BOUNDARIES (Revised / Effective)

Cross Section River Mile Designation
Floodplain Water Surface Elevation
Floodway Water Surface Elevation
100-year Discharge
1.009
FP = 2222.33
FW = 2222.33
3333cfs
Cross Section Stationing Tick

ELEV. REFERENCE MARK
SECTION LINE AND ID 5

ELEVATION REFERENCE MARKS

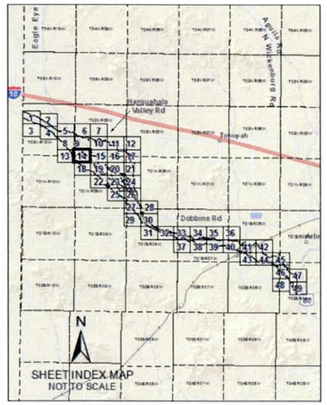
NOTE: ALL ELEVATIONS ARE BASED ON NORTH AMERICAN VERTICAL DATUM OF 1988. SEE MCDOT & NGS ONLINE RESOURCES FOR MORE INFORMATION.

I.D. NUMBER	ELEV. (FT)	DESCRIPTION/LOCATION
NGS AJ3568	1195.2	AL CAP ON 32' STAINLESS STEEL ROD, ENCASED IN 1" GREASED PVC SLEEVE ENCLOSED IN 5" PVC PIPE FD 1/2" RB W/ 1" PLASTIC CAP FL STAMPED "DON MILLER LS #15336"
MCDOT 27134-1	1176.7	

NOTES

1) ALL AREAS DESIGNATED ZONE X ARE SHADED ZONE X, EXCEPT WHERE NOTED.

2) AREA LOCATED IN TOWNSHIP 1N, RANGE 9W, SECTIONS 5-6 AND RANGE 10W, SECTION 1, AND TOWNSHIP 2N, RANGE 9W, SECTIONS 31-32 AND RANGE 10W, SECTION 36.



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CENTENNIAL WASH FLOODPLAIN DELINEATION STUDY: GILA RIVER TO LA PAZ COUNTY

F.C.D. CONTRACT NUMBER 2012C004

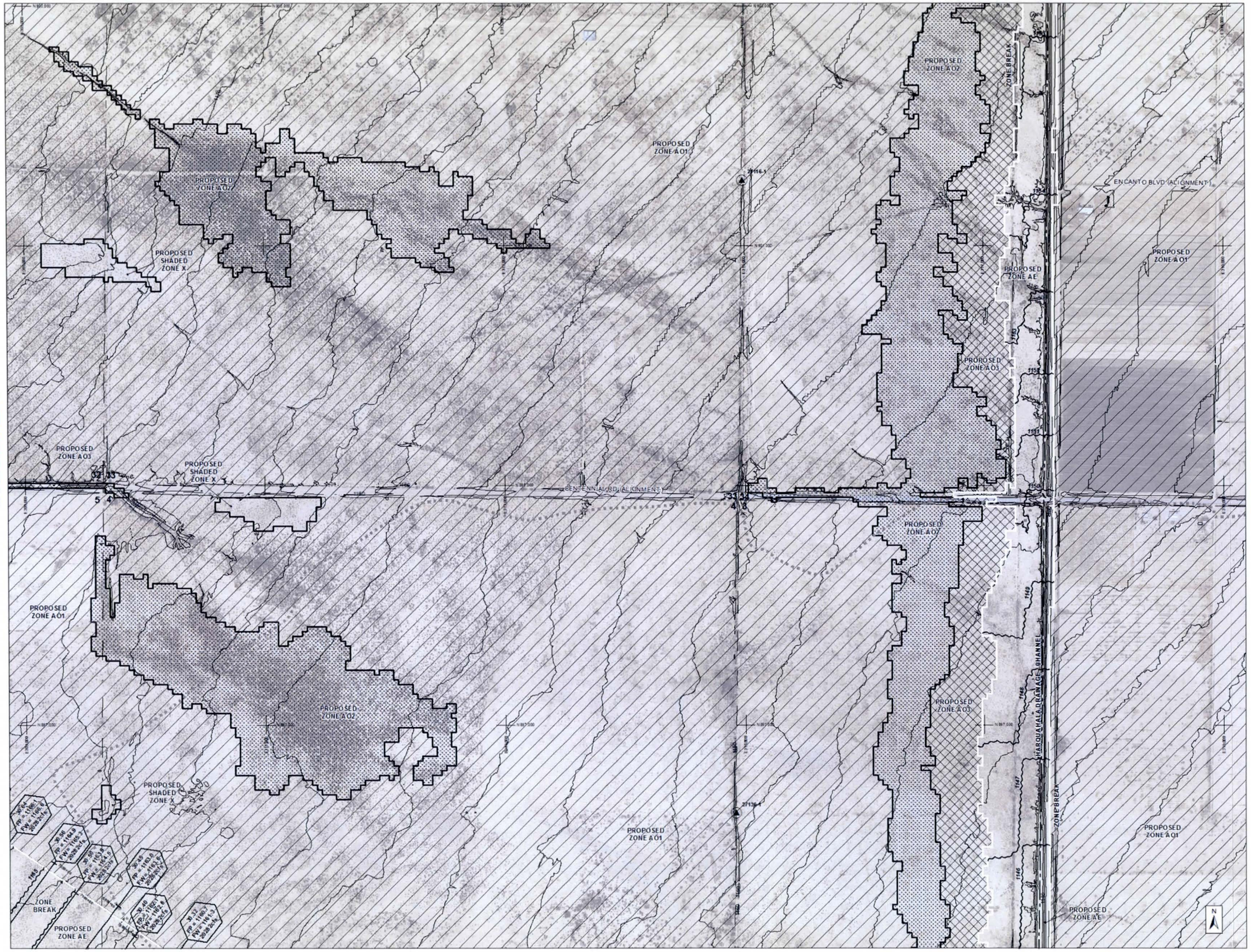
52895 CHARLES M. DAVIS — REGISTERED PROFESSIONAL ENGINEER — ARIZONA, U.S.A.
Expires 12/31/2014

WEST Consultants, Inc.

	BY	DATE
DESIGN	---	---
DESIGN CHECK	---	---
PLANS	SJB	10/13
PLANS CHECK	CMD, JWH	10/13

MATCH LINE SHEET 10

MATCH LINE SHEET 14



MATCH LINE SHEET 16

MATCH LINE SHEET 19

AERIAL IMAGERY PROVIDED BY THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
FLIGHT DATE VARIES FROM SEPTEMBER THROUGH OCTOBER, 2010 AND 2011

400 200 0 400 800

NTS

SCALE: 1" = 400 FEET
CONTOUR INTERVAL = 2 FEET

NTS

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1" = 200' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS

GROUND CONTROL SURVEY DATA & AERIAL MAPPING PROVIDED BY FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

LEGEND

ZONE AE BOUNDARIES (Revised / Effective)
FLOODWAY BOUNDARIES (Revised / Effective)
BASE FLOOD ELEVATION
HYDRAULIC BASELINE
ZONE AO1
ZONE AO2
ZONE AO3
ZONE A BOUNDARIES (Revised / Effective)

Cross Section River Mile Designation — 1.009
Floodplain Water Surface Elevation — FP = 2222.33
Floodway Water Surface Elevation — FW = 2222.33
100-year Discharge — 3333cfs
Cross Section Stationing Tick

ELEV. REFERENCE MARK

SECTION LINE AND ID — 5

ELEVATION REFERENCE MARKS

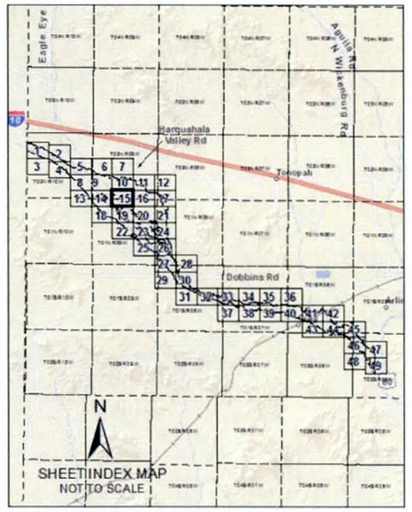
NOTE: ALL ELEVATIONS ARE BASED ON NORTH AMERICAN VERTICAL DATUM OF 1988. SEE MCDOT & NGS ONLINE RESOURCES FOR MORE INFORMATION.

I.D. NUMBER	ELEV. (FT)	DESCRIPTION/LOCATION
MCDOT 27136-1	1150.8	FD 1/2" RB W/ 1" PLAS CAP 0.4' UP STAMPED "MILLER LS #15336"
MCDOT 27116-1	1156.3	FD 1/2" RB W/ 1" PLAS CAP FL STAMPED "RLS 26404"

NOTES

1) ALL AREAS DESIGNATED ZONE X ARE SHADED ZONE X, EXCEPT WHERE NOTED.

2) AREA LOCATED IN TOWNSHIP 1N, RANGE 9W, SECTIONS 3-5 AND TOWNSHIP 2N, RANGE 9W, SECTIONS 32-34.



FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY

CENTENNIAL WASH
FLOODPLAIN DELINEATION STUDY:
GILA RIVER TO LA PAZ COUNTY

F.C.D. CONTRACT NUMBER 2012C004

Registered Professional Engineer (Civil) CERTIFICATE NO. 52895 CHARLES M. DAVIS Date Signed 10-31-2013 ARIZONA, U.S.A.
Expires 12/31/2014

WEST Consultants, Inc.

	BY	DATE
DESIGN	---	---
DESIGN CHECK	---	---
PLANS	SJB	10/13
PLANS CHECK	CMD, JWH	10/13

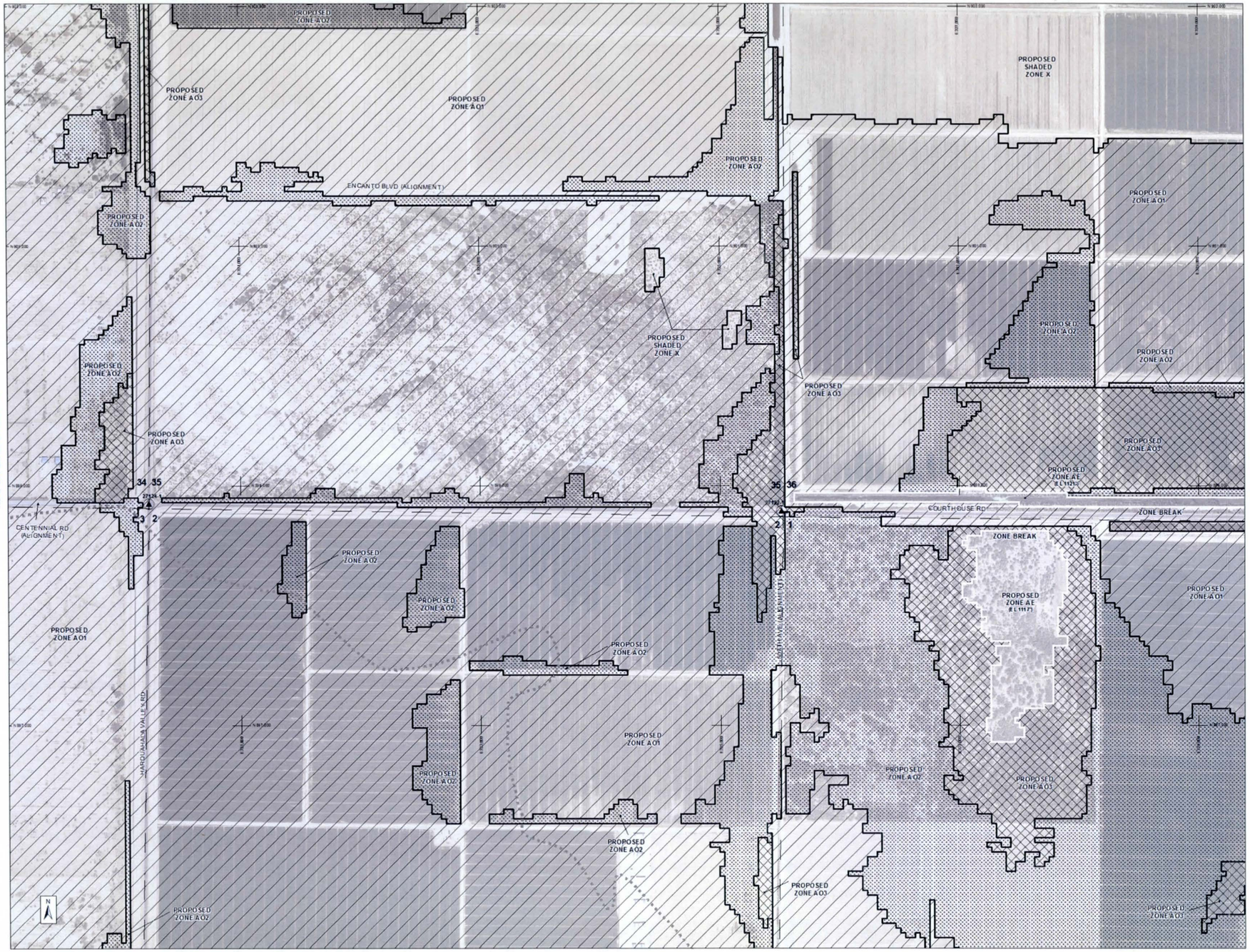
SHEET 15 OF 49

MATCH LINE SHEET 11

MATCH LINE SHEET 15

MATCH LINE SHEET 17

MATCH LINE SHEET 20



AERIAL IMAGERY PROVIDED BY THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
FLIGHT DATE VARIES FROM SEPTEMBER THROUGH OCTOBER, 2010 AND 2011

400 200 0 400 800

NTS SCALE: 1" = 400 FEET CONTOUR INTERVAL = 2 FEET NTS

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1" = 200' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS

GROUND CONTROL SURVEY DATA & AERIAL MAPPING PROVIDED BY FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

LEGEND

ZONE AE BOUNDARIES (Revised / Effective)
FLOODWAY BOUNDARIES (Revised / Effective)
BASE FLOOD ELEVATION
HYDRAULIC BASELINE
ZONE AO1
ZONE AO2
ZONE AO3
ZONE A BOUNDARIES (Revised / Effective)

Cross Section River Mile Designation
Floodplain Water Surface Elevation
Floodway Water Surface Elevation
100-year Discharge
1.089
FP = 2222.33
FW = 2222.33
3333cfs
Cross Section Stationing Tick

ELEV. REFERENCE MARK
SECTION LINE AND ID 5

ELEVATION REFERENCE MARKS

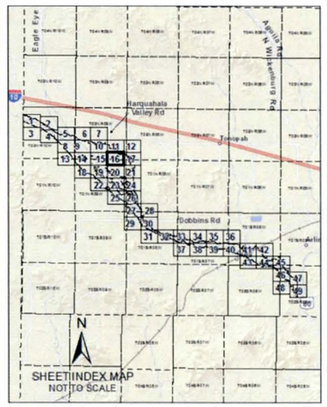
NOTE: ALL ELEVATIONS ARE BASED ON NORTH AMERICAN VERTICAL DATUM OF 1988. SEE MCDOT & NGS ONLINE RESOURCES FOR MORE INFORMATION.

I.D. NUMBER	ELEV. (FT)	DESCRIPTION/LOCATION
MCDOT 27124-1 HH	1138.5	FD 4" MC ENG DEPT BC IN 0.75' DN NO STAMPING
MCDOT 27122-1 HH	1120.3	FD 4" MC ENG DEPT BC IN

NOTES

1) ALL AREAS DESIGNATED ZONE X ARE SHADED ZONE X, EXCEPT WHERE NOTED.

2) AREA LOCATED IN TOWNSHIP 1N, RANGE 9W, SECTIONS 1-3 AND TOWNSHIP 2N, RANGE 9W, SECTIONS 34-36.



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CENTENNIAL WASH FLOODPLAIN DELINEATION STUDY: GILA RIVER TO LA PAZ COUNTY

F.C.D. CONTRACT NUMBER 2012C004

52895 CHARLES M. DAVIS — CERTIFICATE NO. — REGISTERED PROFESSIONAL ENGINEER — ARIZONA, U.S.A.

Expires 12/31/2014

WEST Consultants, Inc.

	BY	DATE
DESIGN	---	---
DESIGN CHECK	---	---
PLANS	SJB	10/13
PLANS CHECK	CMD, JWH	10/13

SHEET 16 OF 49

MATCH LINE SHEET 12

MATCH LINE SHEET 16

MATCH LINE SHEET 21

AERIAL IMAGERY PROVIDED BY THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
FLIGHT DATE VARIES FROM SEPTEMBER THROUGH OCTOBER, 2010 AND 2011

400 200 0 400 800

NTS SCALE: 1" = 400 FEET NTS
CONTOUR INTERVAL = 2 FEET

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1" = 200' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS

GROUND CONTROL SURVEY DATA & AERIAL MAPPING PROVIDED BY FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

LEGEND

ZONE AE BOUNDARIES (Revised / Effective)
FLOODWAY BOUNDARIES (Revised / Effective)
BASE FLOOD ELEVATION
HYDRAULIC BASELINE
ZONE AO1
ZONE AO2
ZONE AO3
ZONE A BOUNDARIES (Revised / Effective)

Cross Section River Mile Designation
Floodplain Water Surface Elevation
Floodway Water Surface Elevation
100-year Discharge
1.089
FP = 2222.33
FW = 2222.33
3333cfs
Cross Section Stationing Tick

ELEV. REFERENCE MARK
SECTION LINE AND ID 5

ELEVATION REFERENCE MARKS

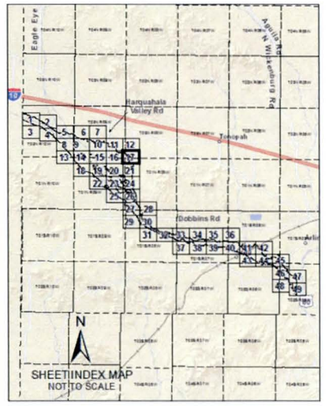
NOTE: ALL ELEVATIONS ARE BASED ON NORTH AMERICAN VERTICAL DATUM OF 1988. SEE MCDOT & NGS ONLINE RESOURCES FOR MORE INFORMATION.

I.D. NUMBER	ELEV. (FT)	DESCRIPTION/LOCATION
NGS AJ3567	1114.7	ALC AP ON 32' STAINLESS STEEL ROD, ENCASED IN 1" GREASED PVC SLEEVE ENCLOSED IN 5" PVC PIPE SET 5/8" RB W/ 2" MARICOPA COUNTY AL CAP FL STAMPED "T2N R8W 1/4 S31 S32 RLS 36563 2005"
MCDOT 31864-Z1	1124.4	

NOTES

1) ALL AREAS DESIGNATED ZONE X ARE SHADED ZONE X, EXCEPT WHERE NOTED.

2) AREA LOCATED IN TOWNSHIP 1N, RANGE 8W, SECTIONS 5-6 AND RANGE 9W, SECTION 1, AND TOWNSHIP 2N, RANGE 8W, SECTIONS 31-32 AND RANGE 9W, SECTION 36.



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CENTENNIAL WASH FLOODPLAIN DELINEATION STUDY: GILA RIVER TO LA PAZ COUNTY

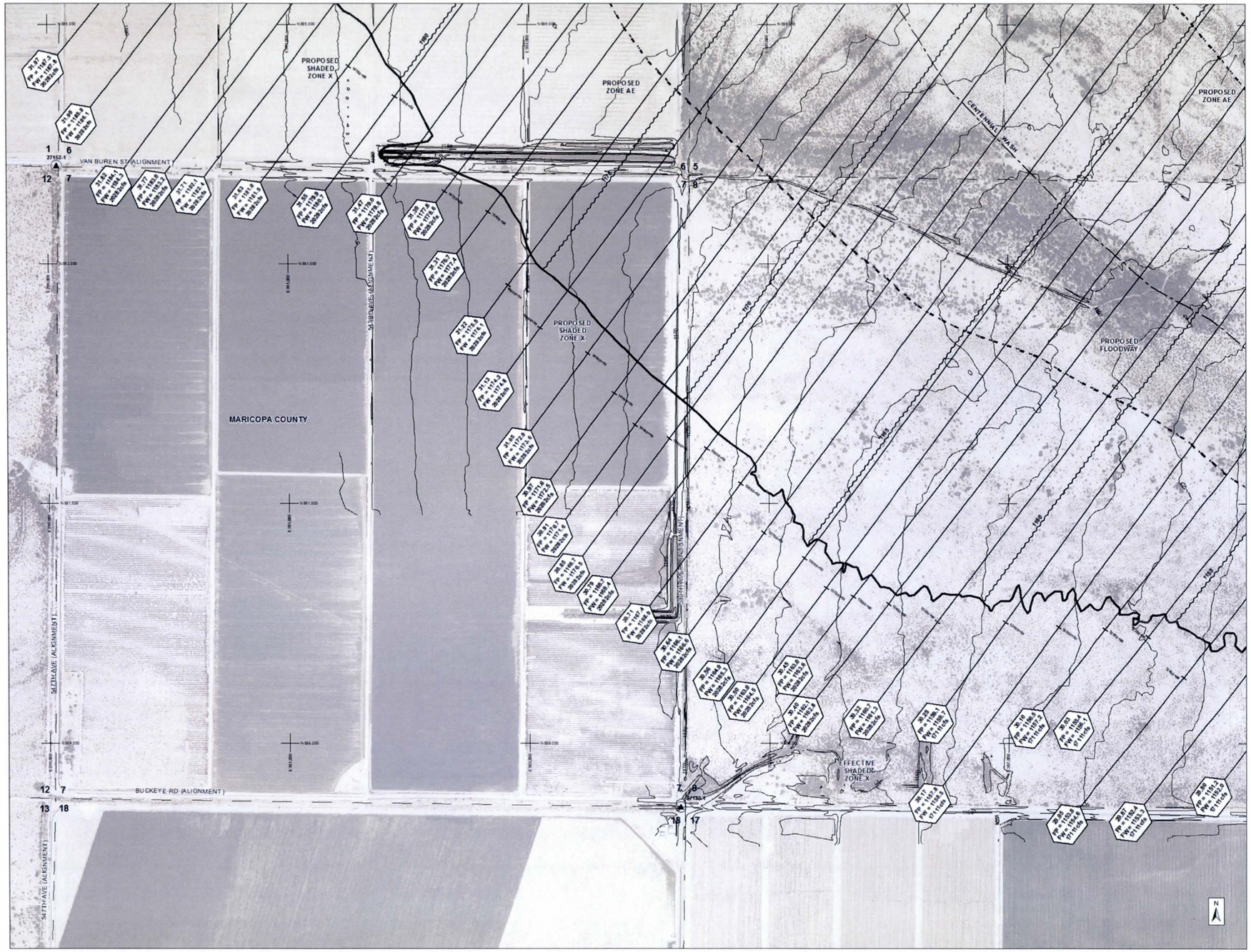
F.C.D. CONTRACT NUMBER 2012C004

52895 CHARLES M. DAVIS — Expires 12/31/2014

WEST Consultants, Inc.

	BY	DATE
DESIGN	---	---
DESIGN CHECK	---	---
PLANS	SJB	10/13
PLANS CHECK	CMD, JWH	10/13

MATCH LINE SHEET 14



MATCH LINE SHEET 19

AERIAL IMAGERY PROVIDED BY THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
FLIGHT DATE VARIES FROM SEPTEMBER THROUGH OCTOBER, 2010 AND 2011

400 200 0 400 800

NTS SCALE: 1" = 400 FEET CONTOUR INTERVAL = 2 FEET NTS

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1" = 200' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS

GROUND CONTROL SURVEY DATA & AERIAL MAPPING PROVIDED BY FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

LEGEND

ZONE AE BOUNDARIES (Revised / Effective)
FLOODWAY BOUNDARIES (Revised / Effective)
BASE FLOOD ELEVATION
HYDRAULIC BASELINE
ZONE AO1
ZONE AO2
ZONE AO3
ZONE A BOUNDARIES (Revised / Effective)

Cross Section River Mile Designation
Floodplain Water Surface Elevation
Floodway Water Surface Elevation
100-year Discharge
1.009
FP = 2222.33
FW = 2222.33
3333cfs
Cross Section Stationing Tick

ELEV. REFERENCE MARK
SECTION LINE AND ID 5

ELEVATION REFERENCE MARKS

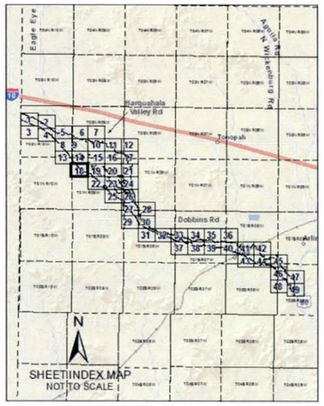
NOTE: ALL ELEVATIONS ARE BASED ON NORTH AMERICAN VERTICAL DATUM OF 1988. SEE MCDOT & NGS ONLINE RESOURCES FOR MORE INFORMATION

I.D. NUMBER	ELEV. (FT)	DESCRIPTION/LOCATION
MCDOT 27152-1	1196.6	FD 3" IP 0.77' UP W/ 3 1/2" GLO BC STAMPED "T1N R9W S6 S7 R10W S1 S12 1914 1988" FD 3" MARICOPA CO DEPT OF TRANSPORTATION BC FL STAMPED "T1N R9W S7 S17 S18"
MCDOT 27170-1	1171.8	

NOTES

1) ALL AREAS DESIGNATED ZONE X ARE SHADED ZONE X, EXCEPT WHERE NOTED.

2) AREA LOCATED IN TOWNSHIP 1N, RANGE 9W, SECTIONS 5-8 AND 17-18 AND RANGE 10W, SECTIONS 1 AND 12-13.



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CENTENNIAL WASH FLOODPLAIN DELINEATION STUDY: GILA RIVER TO LA PAZ COUNTY

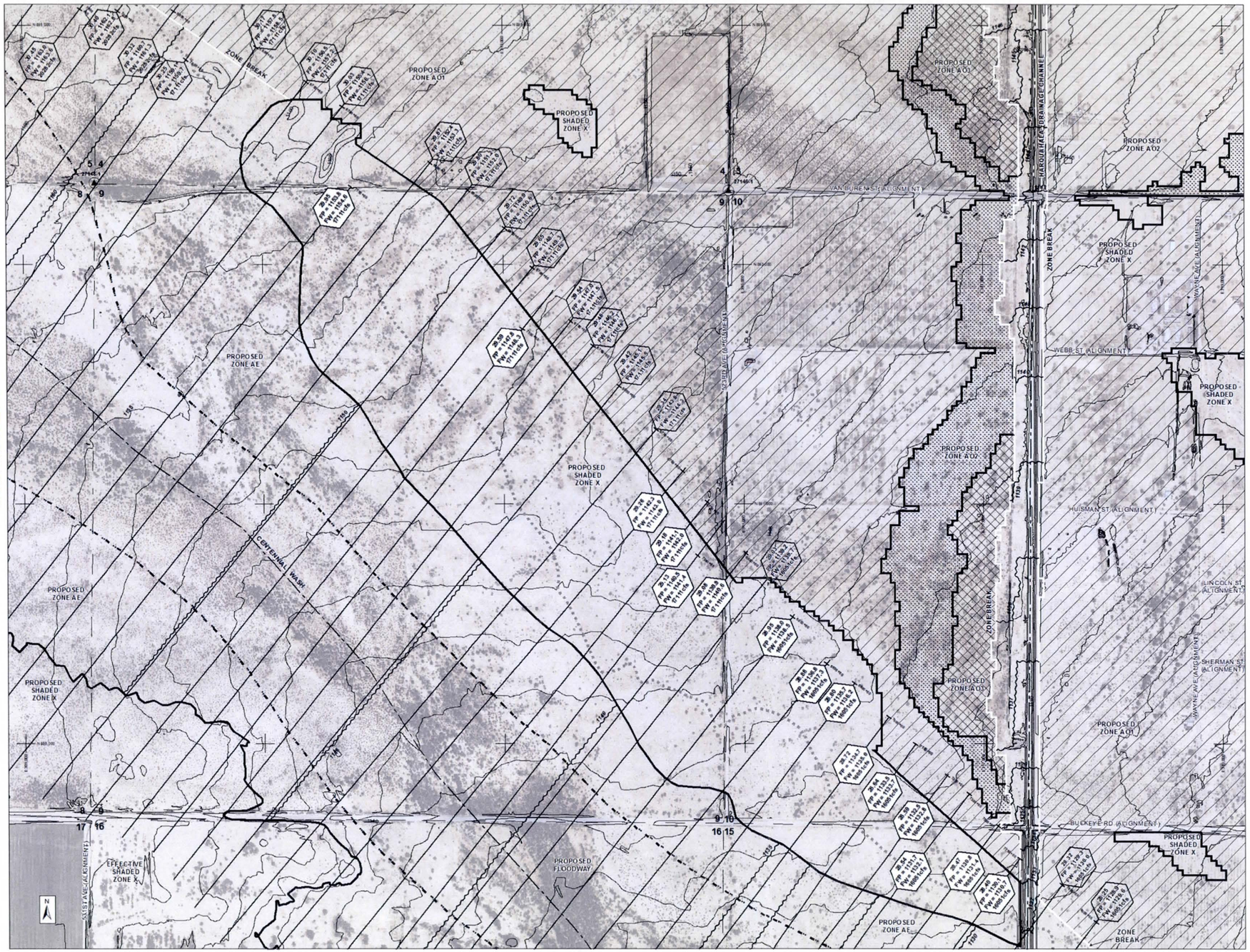
F.C.D. CONTRACT NUMBER 2012C004

CERTIFICATE NO. 52865 CHARLES M. DAVIS ARIZONA, U.S.A.
Expires 12/31/2014

WEST Consultants, Inc.

	BY	DATE
DESIGN	---	---
DESIGN CHECK	---	---
PLANS	SJB	10/13
PLANS CHECK	CMD, JWH	10/13

MATCH LINE SHEET 15



MATCH LINE SHEET 18

MATCH LINE SHEET 20

MATCH LINE SHEET 22

AERIAL IMAGERY PROVIDED BY THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
FLIGHT DATE VARIES FROM SEPTEMBER THROUGH OCTOBER, 2010 AND 2011

400 200 0 400 800

NTS SCALE: 1" = 400 FEET NTS
CONTOUR INTERVAL = 2 FEET

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1" = 200' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS

GROUND CONTROL SURVEY DATA & AERIAL MAPPING PROVIDED BY FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

LEGEND

ZONE AE BOUNDARIES — Revised / Effective
FLOODWAY BOUNDARIES — Revised / Effective
BASE FLOOD ELEVATION
HYDRAULIC BASELINE
ZONE AO1
ZONE AO2
ZONE AO3
ZONE A BOUNDARIES — Revised / Effective

Cross Section River Mile Designation
Floodplain Water Surface Elevation
Floodway Water Surface Elevation
100-year Discharge
1.009
FP = 2222.33
FW = 2222.33
3333cfs
Cross Section Stationing Tick

ELEV. REFERENCE MARK
SECTION LINE AND ID — 5

ELEVATION REFERENCE MARKS

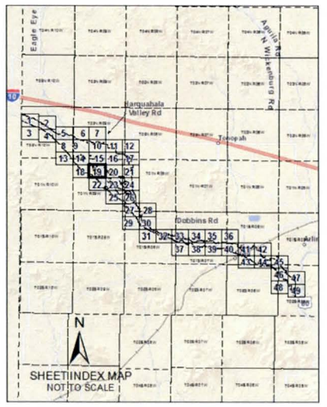
NOTE: ALL ELEVATIONS ARE BASED ON NORTH AMERICAN VERTICAL DATUM OF 1988. SEE MCDOT & NGS ONLINE RESOURCES FOR MORE INFORMATION

I.D. NUMBER	ELEV. (FT)	DESCRIPTION/LOCATION
MCDOT 27148-1	1158.5	FD 2" IP 0.63' UP W/ 2 1/2" GLO BC STAMPED "T1N R9W S4 S5 S8 S9 1914"
MCDOT 27146-1	1146.7	FD 3" MARICOPA COUNTY HIGHWAY DEPT BC IN HH 0.55' DN NO STAMPING

NOTES

1) ALL AREAS DESIGNATED ZONE X ARE SHADED ZONE X, EXCEPT WHERE NOTED.

2) AREA LOCATED IN TOWNSHIP 1N, RANGE 9W, SECTIONS 3-5, 8-10, AND 15-17.



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CENTENNIAL WASH FLOODPLAIN DELINEATION STUDY: GILA RIVER TO LA PAZ COUNTY

F.C.D. CONTRACT NUMBER 2012C004

52895 CHARLES M. DAVIS — Expires 12/31/2014

WEST Consultants, Inc.

	BY	DATE
DESIGN	---	---
DESIGN CHECK	---	---
PLANS	SJB	10/13
PLANS CHECK	CMD, JWH	10/13

SHEET 19 OF 49

MATCH LINE SHEET 16

MATCH LINE SHEET 19

MATCH LINE SHEET 21

MATCH LINE SHEET 23

PROPOSED ZONE AO1
PROPOSED ZONE AO2
PROPOSED ZONE AO3
PROPOSED SHADED ZONE X

WILLIAMS ST (ALIGNMENT)
WEBB ST (ALIGNMENT)
HUISMAN ST (ALIGNMENT)
LINCOLN ST (ALIGNMENT)
SHERMAN ST (ALIGNMENT)
TONTO ST (ALIGNMENT)
BUCKEYE RD (ALIGNMENT)
MARICOPA COUNTY
SOUTHERN PACIFIC RAILROAD
ESTRAVE (ALIGNMENT)

AERIAL IMAGERY PROVIDED BY THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
FLIGHT DATE VARIES FROM SEPTEMBER THROUGH OCTOBER, 2010 AND 2011

400 200 0 400 800

NTS SCALE: 1" = 400 FEET NTS
CONTOUR INTERVAL = 2 FEET

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1" = 200' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS

GROUND CONTROL SURVEY DATA & AERIAL MAPPING PROVIDED BY FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

LEGEND

ZONE AE BOUNDARIES (Revised / Effective)
FLOODWAY BOUNDARIES (Revised / Effective)
BASE FLOOD ELEVATION
HYDRAULIC BASELINE
ZONE AO1
ZONE AO2
ZONE AO3
ZONE A BOUNDARIES (Revised / Effective)

Cross Section River Mile Designation
Floodplain Water Surface Elevation
Floodway Water Surface Elevation
100-year Discharge
1.009
FP = 2222.33
FW = 2222.33
3333cfs
Cross Section Stationing Tick

ELEV. REFERENCE MARK
SECTION LINE AND ID 5

ELEVATION REFERENCE MARKS

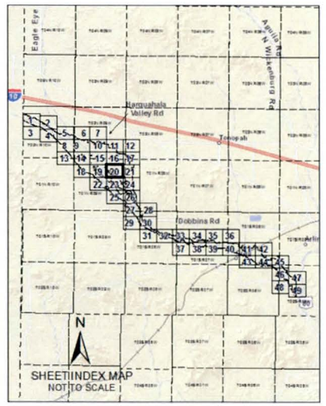
NOTE: ALL ELEVATIONS ARE BASED ON NORTH AMERICAN VERTICAL DATUM OF 1988. SEE MCDOT & NGS ONLINE RESOURCES FOR MORE INFORMATION.

I.D. NUMBER	ELEV. (FT)	DESCRIPTION/LOCATION
MCDOT 27164-1	1123.7	FD 2 1/2" GLO BC IN HH 0.65' DN STAMPED "T1N R9Z S10 S11 S14 S15"
MCDOT 27144-1	1131.3	FD 2 1/2" MARICOPA COUNTY HIGHWAY DEPT BC IN HH 1' DN NO STAMPING

NOTES

1) ALL AREAS DESIGNATED ZONE X ARE SHADED ZONE X, EXCEPT WHERE NOTED.

2) AREA LOCATED IN TOWNSHIP 1N, RANGE 9W, SECTIONS 1-3 AND 10-15.



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CENTENNIAL WASH FLOODPLAIN DELINEATION STUDY: GILA RIVER TO LA PAZ COUNTY

F.C.D. CONTRACT NUMBER 2012C004

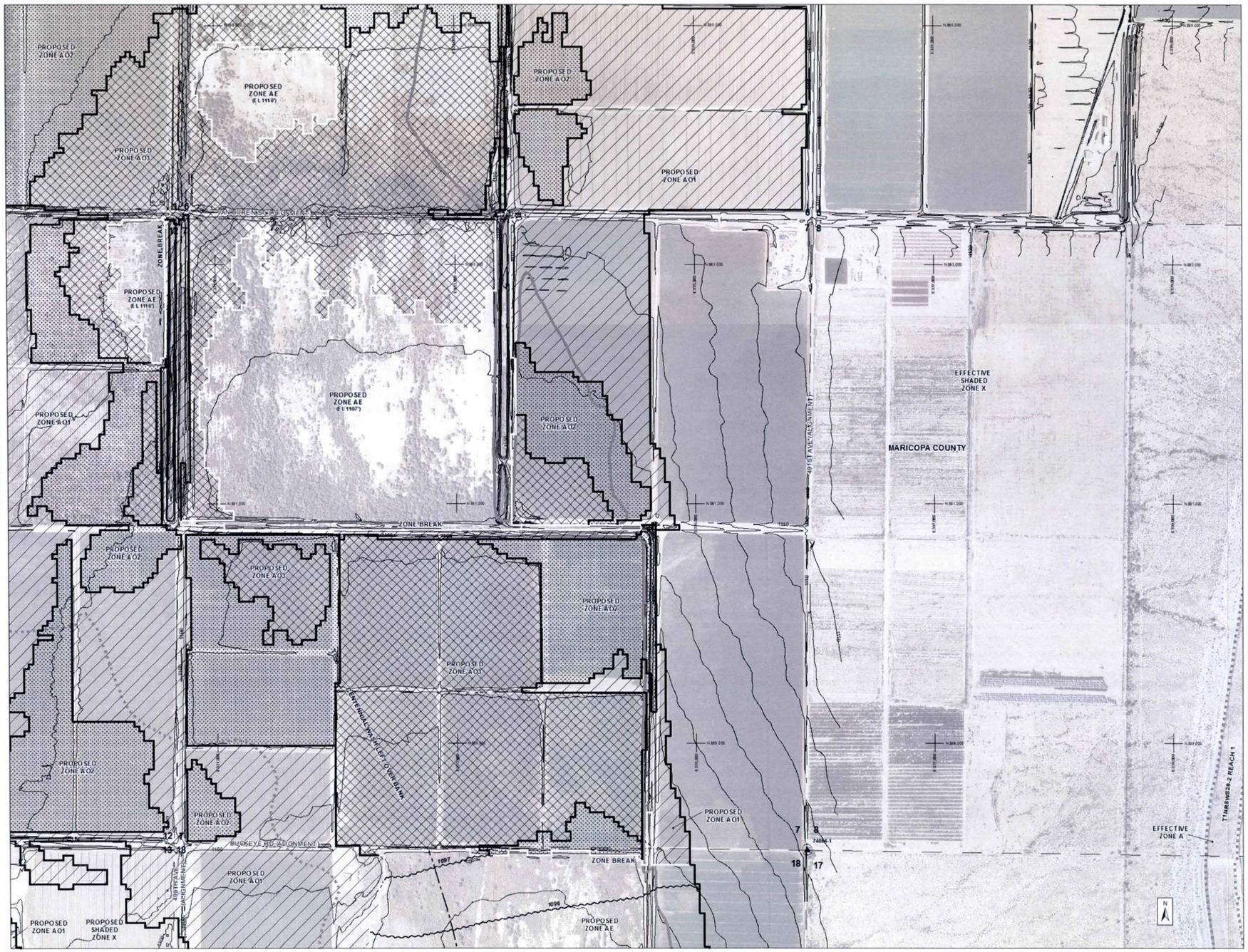
52895 CHARLES M. DAVIS — REGISTERED PROFESSIONAL ENGINEER — ARIZONA, U.S.A.
Expires 12/31/2014

WEST Consultants, Inc.

	BY	DATE
DESIGN	---	---
DESIGN CHECK	---	---
PLANS	SJB	10/13
PLANS CHECK	CMD, JWH	10/13

MATCH LINE SHEET 17

MATCH LINE SHEET 20



MATCH LINE SHEET 24

AERIAL IMAGERY PROVIDED BY THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
FLIGHT DATE VARIES FROM SEPTEMBER THROUGH OCTOBER, 2010 AND 2011

400 200 0 400 800

NTS SCALE: 1" = 400 FEET CONTOUR INTERVAL = 2 FEET NTS

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1" = 200' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS.

GROUND CONTROL SURVEY DATA & AERIAL MAPPING PROVIDED BY FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

LEGEND

ZONE AE BOUNDARIES (Revised / Effective)
FLOODWAY BOUNDARIES (Revised / Effective)
BASE FLOOD ELEVATION
HYDRAULIC BASELINE
ZONE AO1
ZONE AO2
ZONE AO3
ZONE A BOUNDARIES (Revised / Effective)

Cross Section River Mile Designation
Floodplain Water Surface Elevation
Floodway Water Surface Elevation
100-year Discharge
1.009
FP = 2222.33
FW = 2222.33
3333cfs
Cross Section Stationing Tick

ELEV. REFERENCE MARK

SECTION LINE AND ID 5

ELEVATION REFERENCE MARKS

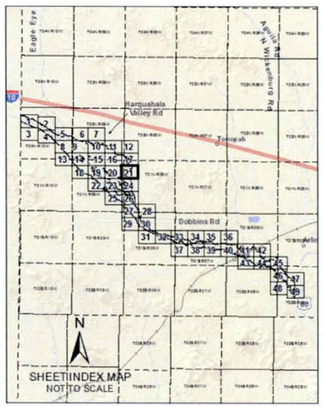
NOTE: ALL ELEVATIONS ARE BASED ON NORTH AMERICAN VERTICAL DATUM OF 1988. SEE MCDOT & NGS ONLINE RESOURCES FOR MORE INFORMATION.

I.D. NUMBER	ELEV. (FT)	DESCRIPTION/LOCATION
MCDOT 74872-1	1106.2	FD 1/2" RB W/ 2 1/2" AC IN HH 0.1' DN STAMPED "T1N R8W S6 1/4 S7 2007 RLS 33861"
MCDOT 74864-1	1102.4	FD 2" IP 0.2' DN W/ 2 1/2" GLO BC STAMPED "T 1N R8W S7 S8 S18 S17 19__"

NOTES

1) ALL AREAS DESIGNATED ZONE X ARE SHADED ZONE X, EXCEPT WHERE NOTED.

2) AREA LOCATED IN TOWNSHIP 1N, RANGE 8W, SECTIONS 5-8 AND 17-18 AND RANGE 9W, SECTIONS 1 AND 12-13.



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CENTENNIAL WASH FLOODPLAIN DELINEATION STUDY: GILA RIVER TO LA PAZ COUNTY

F.C.D. CONTRACT NUMBER 2012C004

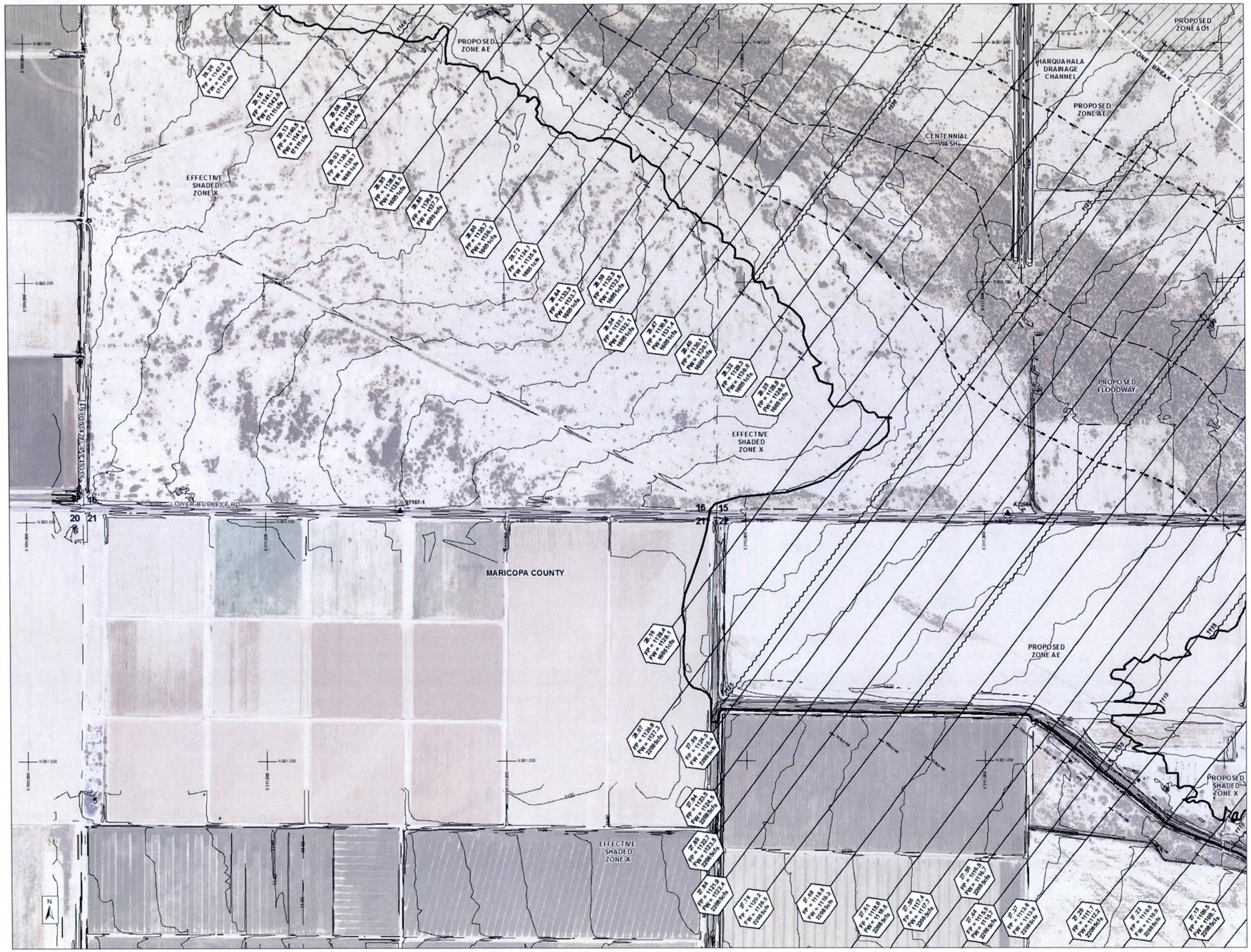
52895 CHARLES M. DAVIS ARIZONA, U.S.A. Expires 12/31/2014

WEST Consultants, Inc.

	BY	DATE
DESIGN	---	---
DESIGN CHECK	---	---
PLANS	SJB	10/13
PLANS CHECK	CMD, JWH	10/13

SHEET 21 OF 49

MATCH LINE SHEET 19



MATCH LINE SHEET 23

AERIAL IMAGERY PROVIDED BY THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
FLIGHT DATE VARIES FROM SEPTEMBER THROUGH OCTOBER, 2010 AND 2011

400 200 0 400 800

NTS SCALE: 1" = 400 FEET CONTOUR INTERVAL = 2 FEET NTS

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1" = 200' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS

GROUND CONTROL SURVEY DATA & AERIAL MAPPING PROVIDED BY FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

LEGEND

ZONE AE BOUNDARIES (Revised / Effective)
FLOODWAY BOUNDARIES (Revised / Effective)
BASE FLOOD ELEVATION
HYDRAULIC BASELINE
ZONE AO1
ZONE AO2
ZONE AO3
ZONE A BOUNDARIES (Revised / Effective)

Cross Section River Mile Designation
Floodplain Water Surface Elevation
Floodway Water Surface Elevation
100-year Discharge
1.009 FP = 2222.33 FW = 2222.33 3333cfs
R-W-B
Cross Section Stationing Trick

ELEV. REFERENCE MARK

SECTION LINE AND ID 5

ELEVATION REFERENCE MARKS

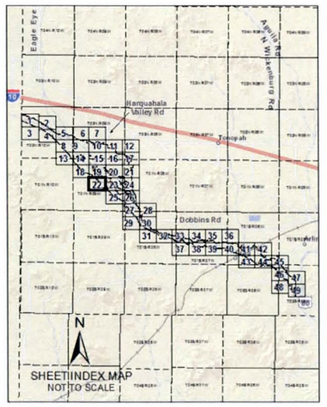
NOTE: ALL ELEVATIONS ARE BASED ON NORTH AMERICAN VERTICAL DATUM OF 1988. SEE MCDOT & NGS ONLINE RESOURCES FOR MORE INFORMATION

I.D. NUMBER	ELEV. (FT)	DESCRIPTION/LOCATION
MCDOT 27187-1	1133.5	FD 3" MARICOPA COUNTY DEPT OF TRANSPORTATION BC IN HH 0.5' DN STAMPED "T 1N R9W 1/4 S16 S21 LS 26411"
NGS AJ3564	1122.0	AL CAP ON 28' STAINLESS STEEL ROD ENCASED IN 1" GREASED PVC SLEEVE ENCLOSED IN 5" PVC PIPE

NOTES

1) ALL AREAS DESIGNATED ZONE X ARE SHADED ZONE X, EXCEPT WHERE NOTED.

2) AREA LOCATED IN TOWNSHIP 1N, RANGE 9W, SECTIONS 15-17 AND 20-22.



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CENTENNIAL WASH FLOODPLAIN DELINEATION STUDY: GILA RIVER TO LA PAZ COUNTY

F.C.D. CONTRACT NUMBER 2012C004

52895 CHARLES M. DAVIS REGISTERED PROFESSIONAL ENGINEER ARIZONA, U.S.A.

Expires 12/31/2014

WEST Consultants, Inc.

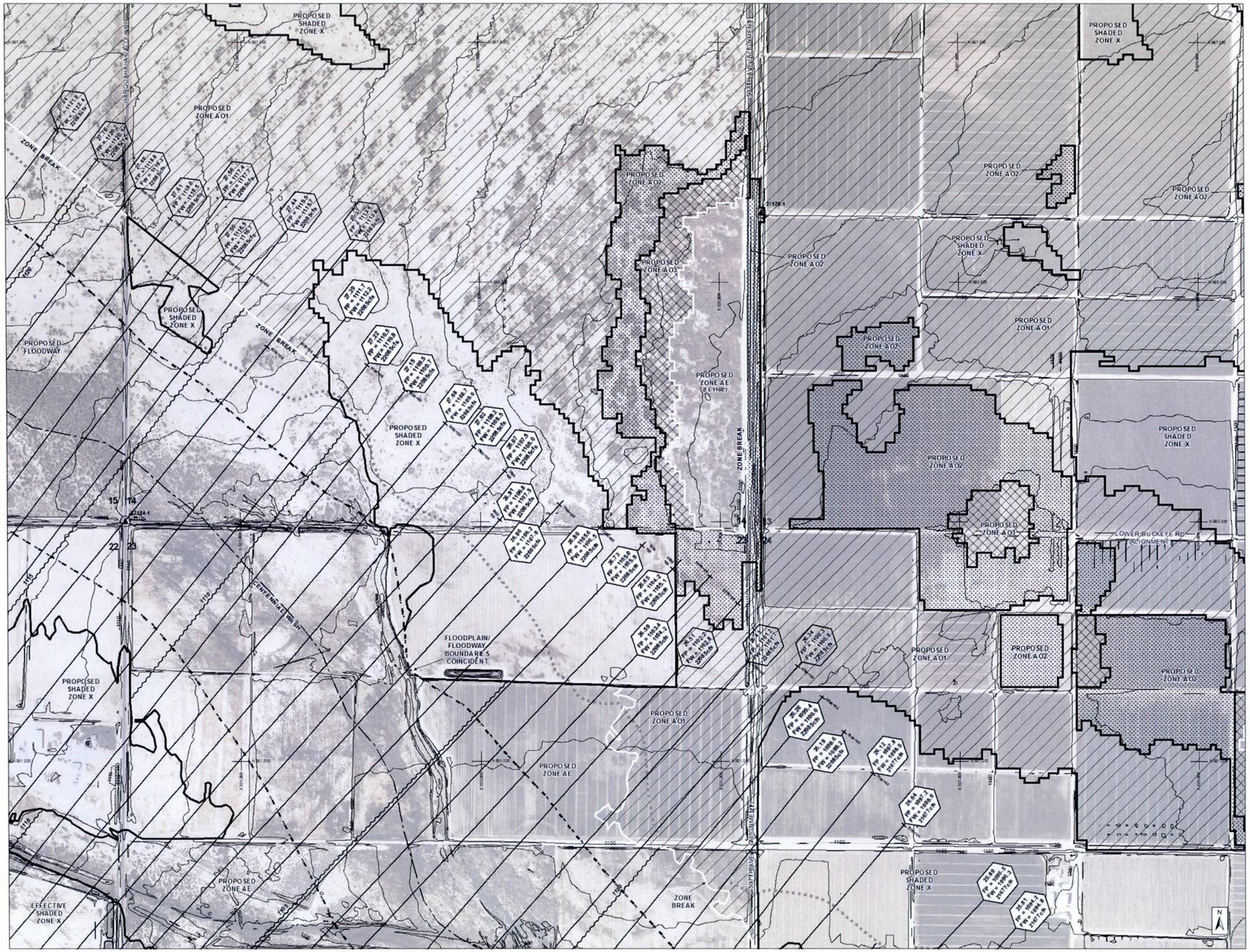
	BY	DATE
DESIGN	---	---
DESIGN CHECK	---	---
PLANS	SJB	10/13
PLANS CHECK	CMD, JWH	10/13

MATCH LINE SHEET 20

MATCH LINE SHEET 22

MATCH LINE SHEET 24

MATCH LINE SHEET 25



AERIAL IMAGERY PROVIDED BY THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
FLIGHT DATE VARIES FROM SEPTEMBER THROUGH OCTOBER, 2010 AND 2011

400 200 0 400 800

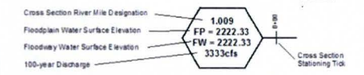
NTS SCALE: 1" = 400 FEET CONTOUR INTERVAL = 2 FEET NTS

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1" = 200' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS.

GROUND CONTROL SURVEY DATA & AERIAL MAPPING PROVIDED BY FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

LEGEND

ZONE AE BOUNDARIES (Revised / Effective)
FLOODWAY BOUNDARIES (Revised / Effective)
BASE FLOOD ELEVATION
HYDRAULIC BASELINE
ZONE AO1
ZONE AO2
ZONE AO3
ZONE A BOUNDARIES (Revised / Effective)



ELEV. REFERENCE MARK

SECTION LINE AND ID 5

ELEVATION REFERENCE MARKS

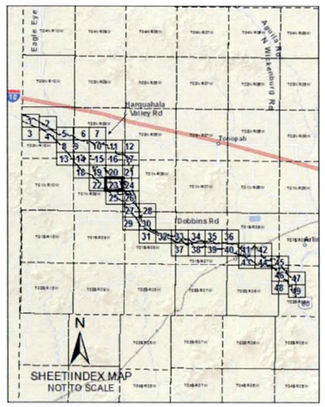
NOTE: ALL ELEVATIONS ARE BASED ON NORTH AMERICAN VERTICAL DATUM OF 1988. SEE MCDOT & NGS ONLINE RESOURCES FOR MORE INFORMATION.

I.D. NUMBER	ELEV. (FT)	DESCRIPTION/LOCATION
MCDOT 27184-1	1109.6	FD 4" MARICOPA COUNTY ENGINEERING DEPT BC IN HH 0.34' DN NO STAMPING
MCDOT 27178-1	1101.4	FD 1/2" RB W/ 2 1/2" AL CAP 0.36' DN STAMPED "T1N R9W 1/4 COR S13 S14 RLS 23371"

NOTES

1) ALL AREAS DESIGNATED ZONE X ARE SHADED ZONE X, EXCEPT WHERE NOTED.

2) AREA LOCATED IN TOWNSHIP 1N, RANGE 9W, SECTIONS 13-15 AND 22-24.



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CENTENNIAL WASH FLOODPLAIN DELINEATION STUDY: GILA RIVER TO LA PAZ COUNTY

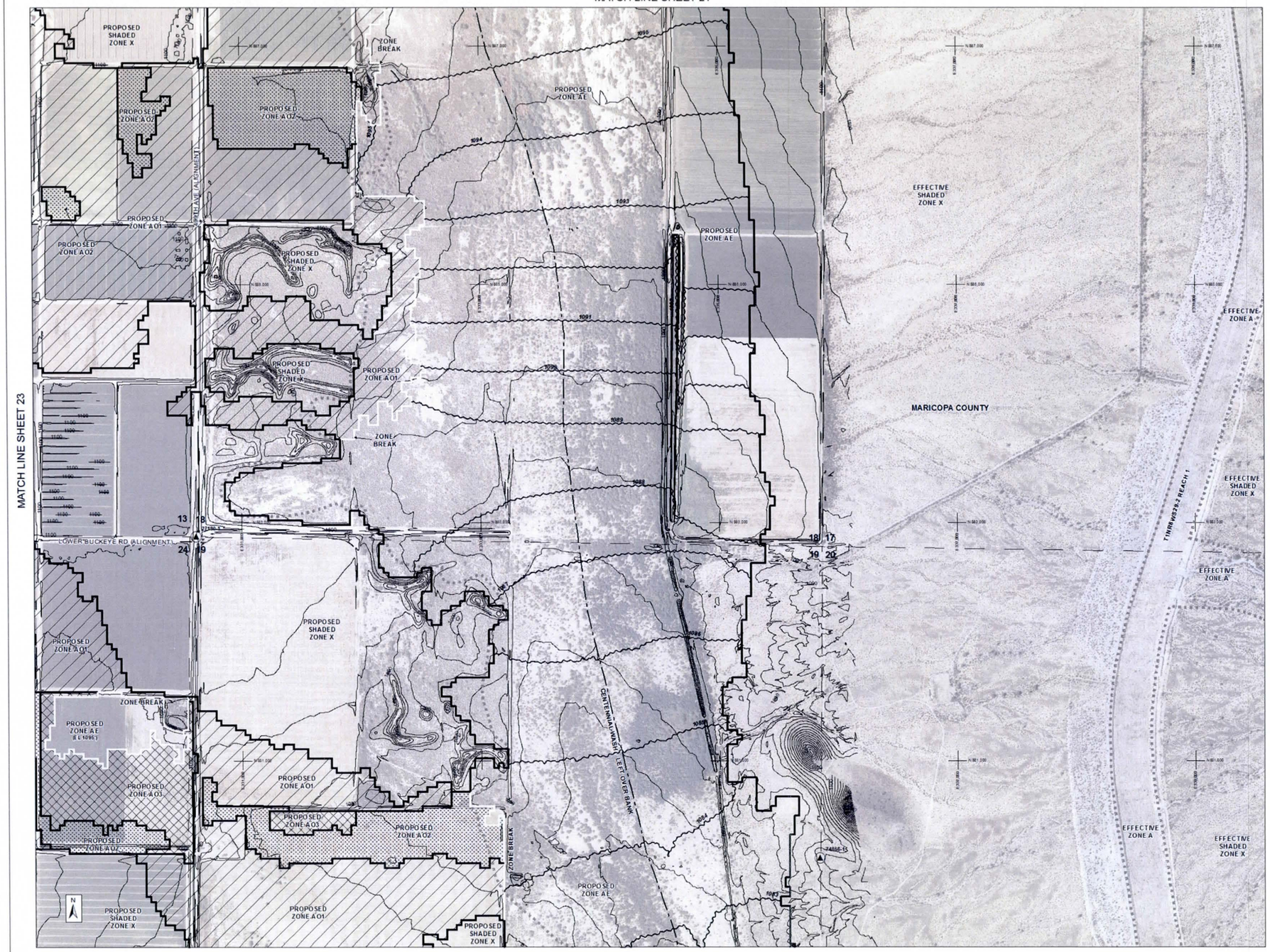
F.C.D. CONTRACT NUMBER 2012C004

52895 CHARLES M. DAVIS REGISTERED PROFESSIONAL ENGINEER ARIZONA, U.S.A.
Expires 12/31/2014

WEST Consultants, Inc.

	BY	DATE
DESIGN	---	---
DESIGN CHECK	---	---
PLANS	SJB	10/13
PLANS CHECK	CMD, JWH	10/13

MATCH LINE SHEET 21



MATCH LINE SHEET 23

MATCH LINE SHEET 26

AERIAL IMAGERY PROVIDED BY THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
FLIGHT DATE VARIES FROM SEPTEMBER THROUGH OCTOBER, 2010 AND 2011

400 200 0 400 800

NTS SCALE: 1" = 400 FEET NTS
CONTOUR INTERVAL = 2 FEET

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1" = 200' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS.

GROUND CONTROL SURVEY DATA & AERIAL MAPPING PROVIDED BY FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

LEGEND

ZONE AE BOUNDARIES (Revised / Effective)
FLOODWAY BOUNDARIES (Revised / Effective)
BASE FLOOD ELEVATION
HYDRAULIC BASELINE
ZONE AO1
ZONE AO2
ZONE AO3
ZONE A BOUNDARIES (Revised / Effective)

Cross Section River Mile Designation
Floodplain Water Surface Elevation
Floodway Water Surface Elevation
100-year Discharge
1.009
FP = 2222.33
FW = 2222.33
3333cfs
Cross Section Stationing Tick

ELEV. REFERENCE MARK
SECTION LINE AND ID 5

ELEVATION REFERENCE MARKS

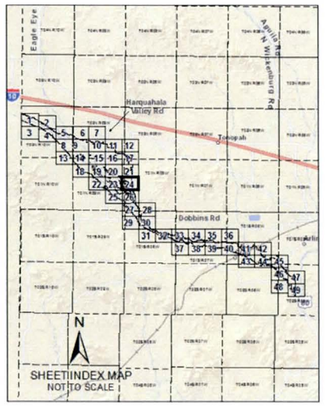
NOTE: ALL ELEVATIONS ARE BASED ON NORTH AMERICAN VERTICAL DATUM OF 1988. SEE MCDOT & NGS ONLINE RESOURCES FOR MORE INFORMATION.

I.D. NUMBER	ELEV. (FT)	DESCRIPTION/LOCATION
MCDOT 27180-1	1095.0	FD 3" IP 0.8' DN W/ 3 1/2" GLO BC STAMPED "T 1N R9W S13 S24 R8W S18 S19 1914"
MCDOT 74856-1	1089.1	FD 1" IP 0.3' UP W/ 2 1/2" GLO BC STAMPED "1/4 S19 S20 1914"

NOTES

1) ALL AREAS DESIGNATED ZONE X ARE SHADED ZONE X, EXCEPT WHERE NOTED.

2) AREA LOCATED IN TOWNSHIP 1N, RANGE 8W, SECTIONS 18-20 AND RANGE 9W, SECTIONS 13 AND 24.



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CENTENNIAL WASH FLOODPLAIN DELINEATION STUDY: GILA RIVER TO LA PAZ COUNTY

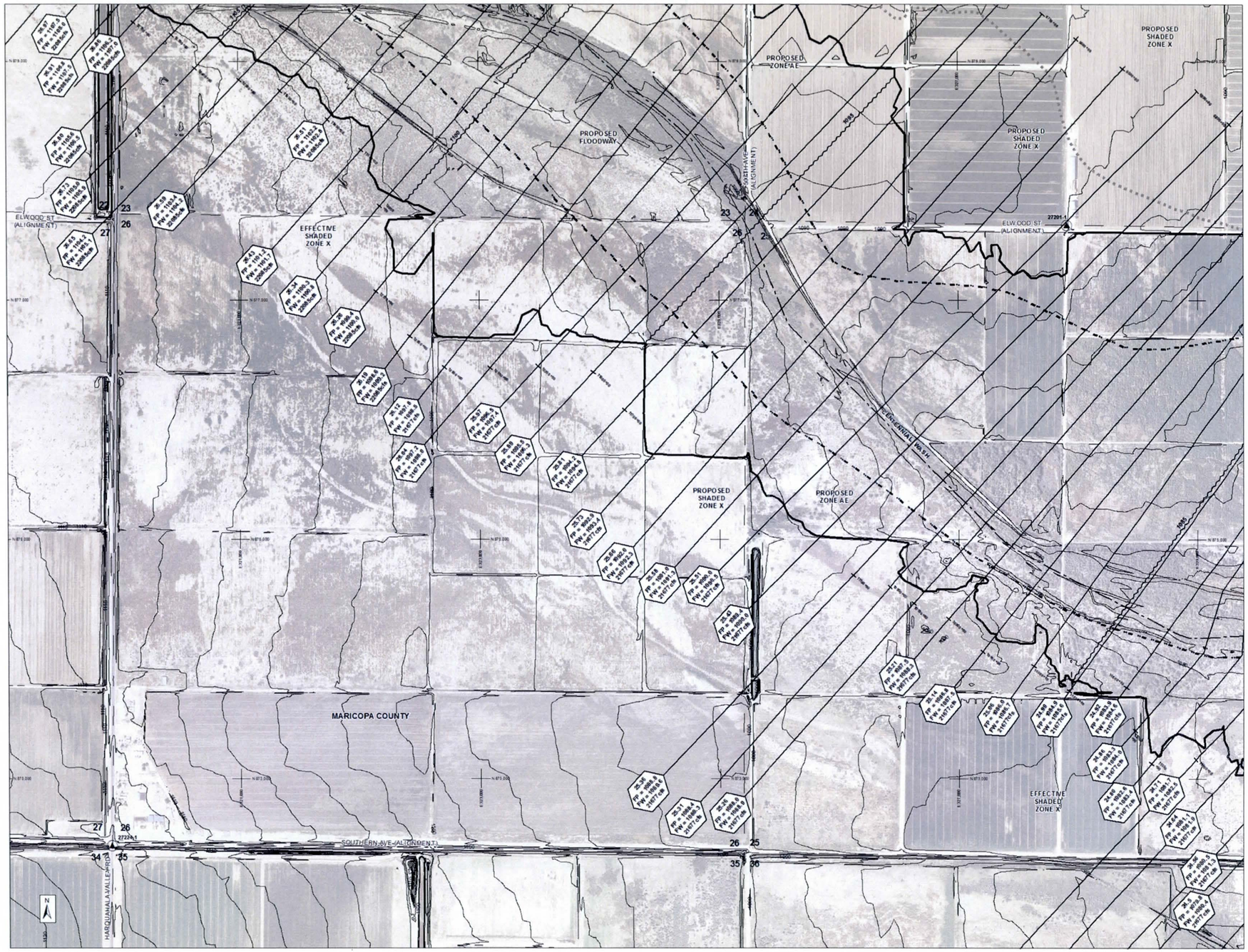
F.C.D. CONTRACT NUMBER 2012C004

CERTIFICATE NO. 52895 CHARLES M. DAVIS ARIZONA, U.S.A. Expires 12/31/2014

WEST Consultants, Inc.

	BY	DATE
DESIGN	---	---
DESIGN CHECK	---	---
PLANS	SJB	10/13
PLANS CHECK	CMD, JWH	10/13

MATCH LINE SHEET 23



MATCH LINE SHEET 26

AERIAL IMAGERY PROVIDED BY THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
FLIGHT DATE VARIES FROM SEPTEMBER THROUGH OCTOBER, 2010 AND 2011

400 200 0 400 800

NTS SCALE: 1" = 400 FEET NTS
CONTOUR INTERVAL = 2 FEET

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1" = 200' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS

GROUND CONTROL SURVEY DATA & AERIAL MAPPING PROVIDED BY FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

LEGEND

ZONE AE BOUNDARIES (Revised / Effective)
FLOODWAY BOUNDARIES (Revised / Effective)
BASE FLOOD ELEVATION
HYDRAULIC BASELINE
ZONE AO1
ZONE AO2
ZONE AO3
ZONE A BOUNDARIES (Revised / Effective)

Cross Section River Mile Designation
Floodplain Water Surface Elevation
Floodway Water Surface Elevation
100-year Discharge
1.009
FP = 2222.33
FW = 2222.33
3333cfs
R=90
Cross Section Stationing Tick

ELEV. REFERENCE MARK
SECTION LINE AND ID 5

ELEVATION REFERENCE MARKS

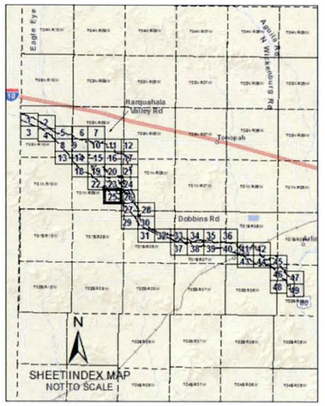
NOTE: ALL ELEVATIONS ARE BASED ON NORTH AMERICAN VERTICAL DATUM OF 1988. SEE MCDOT & NGS ONLINE RESOURCES FOR MORE INFORMATION

I.D. NUMBER	ELEV. (FT)	DESCRIPTION/LOCATION
MCDOT 27224-1	1115.4	FD 4" MARICOPA COUNTY ENGINEERING DEPT BC IN HH 0.6' DN NO STAMPING
MCDOT 27201-1	1092.1	FD 1/2" RB W/ 2 1/2" AL CAP 0.1' DN STAMPED "T1N R9W 1/4 COR S24 S25 RLS 23371"

NOTES

1) ALL AREAS DESIGNATED ZONE X ARE SHADED ZONE X, EXCEPT WHERE NOTED.

2) AREA LOCATED IN TOWNSHIP 1N, RANGE 9W, SECTIONS 22-27 AND 34-36.



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CENTENNIAL WASH FLOODPLAIN DELINEATION STUDY: GILA RIVER TO LA PAZ COUNTY

F.C.D. CONTRACT NUMBER 2012C004

52895 CHARLES M. DAVIS REGISTERED PROFESSIONAL ENGINEER ARIZONA, U.S.A.
Expires 12/31/2014

WEST Consultants, Inc.

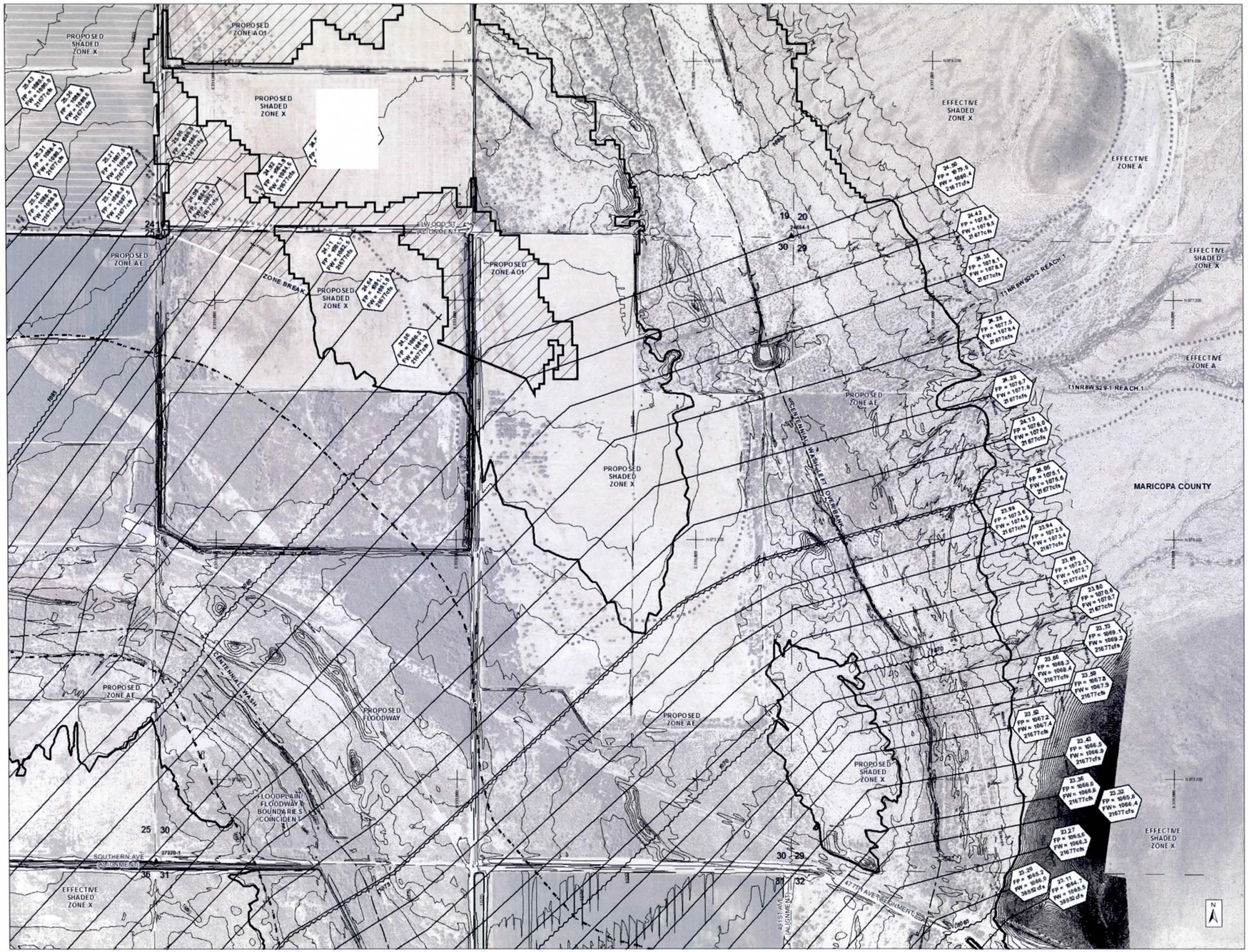
	BY	DATE
DESIGN	---	---
DESIGN CHECK	---	---
PLANS	SJB	10/13
PLANS CHECK	CMD, JWH	10/13

SHEET 25 OF 49

MATCH LINE SHEET 24

MATCH LINE SHEET 25

MATCH LINE SHEET 27



AERIAL IMAGERY PROVIDED BY THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
FLIGHT DATE VARIES FROM SEPTEMBER THROUGH OCTOBER, 2010 AND 2011

400 200 0 400 800

NTS SCALE: 1" = 400 FEET NTS
CONTOUR INTERVAL = 2 FEET

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1" = 200' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS

GROUND CONTROL SURVEY DATA & AERIAL MAPPING PROVIDED BY FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

LEGEND

ZONE AE BOUNDARIES (Revised / Effective)
FLOODWAY BOUNDARIES (Revised / Effective)
BASE FLOOD ELEVATION
HYDRAULIC BASELINE
ZONE A01
ZONE A02
ZONE A03
ZONE A BOUNDARIES (Revised / Effective)

Cross Section River Mile Designation
Floodplain Water Surface Elevation
Floodway Water Surface Elevation
100-year Discharge
1.009
FP = 2222.33
FW = 2222.33
3333cfs
Cross Section Stationing Tick

ELEV. REFERENCE MARK
SECTION LINE AND ID 5

ELEVATION REFERENCE MARKS

NOTE: ALL ELEVATIONS ARE BASED ON NORTH AMERICAN VERTICAL DATUM OF 1988. SEE MCDOT & NGS ONLINE RESOURCES FOR MORE INFORMATION.

I.D. NUMBER	ELEV. (FT)	DESCRIPTION/LOCATION
MCDOT 27220-1	1080.8	FD 2 1/2" IP 0.4' DN W/ 3" GLO BC STAMPED "T 1N R8W S30 S31 R9W S25 S36 1914"
MCDOT 24854-1	1072.5	FD 2" IP 0.5' UP W/ 2 1/2" GLO BC STAMPED "T 1N R8W S19 S20 S30 S29 1914"

NOTES

1) ALL AREAS DESIGNATED ZONE X ARE SHADED ZONE X, EXCEPT WHERE NOTED.

2) AREA LOCATED IN TOWNSHIP 1N, RANGE 8W, SECTIONS 19-20 AND 29-32 AND RANGE 9W, SECTIONS 24-25 AND 36.

N
SHEET INDEX MAP
NOT TO SCALE

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CENTENNIAL WASH FLOODPLAIN DELINEATION STUDY: GILA RIVER TO LA PAZ COUNTY

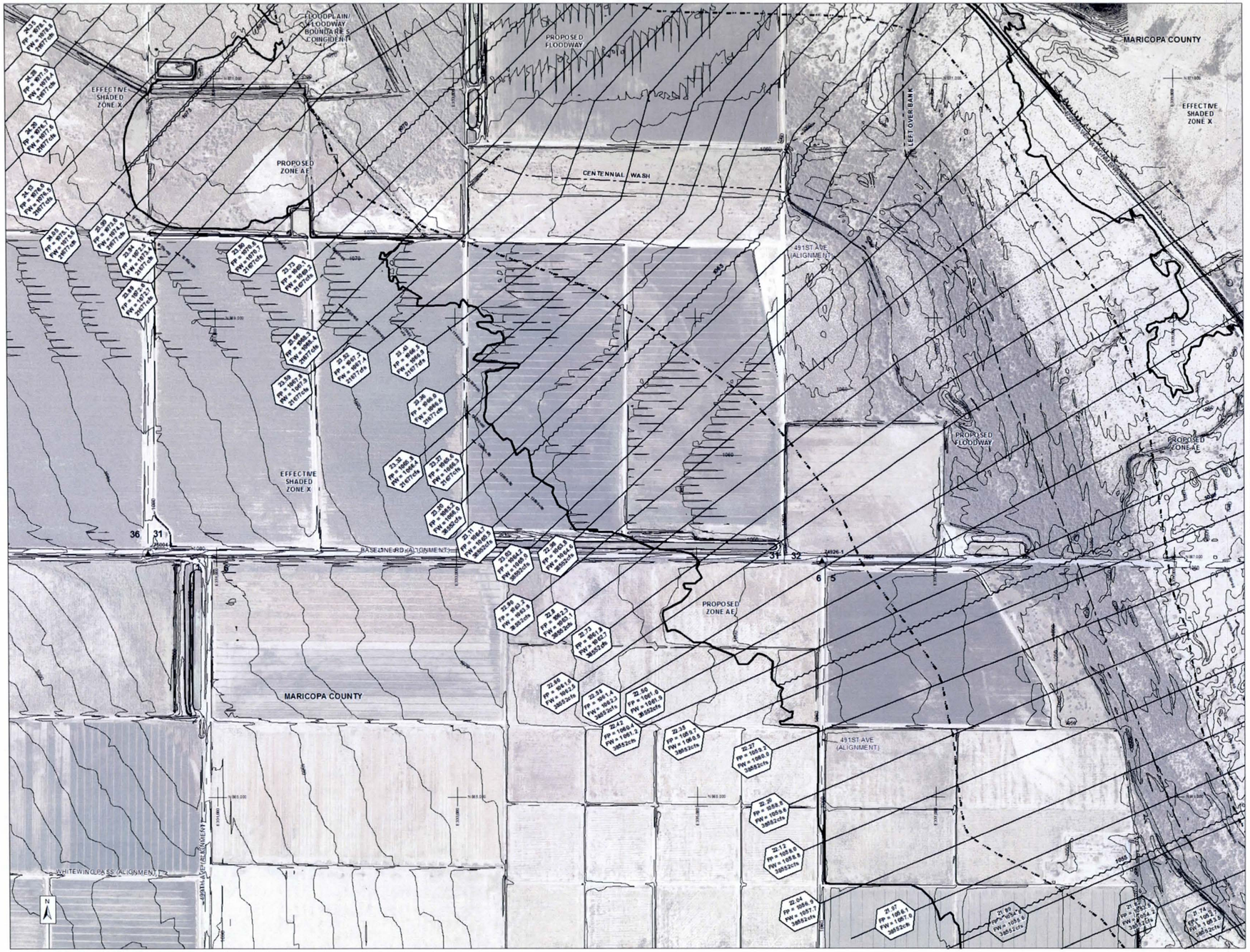
F.C.D. CONTRACT NUMBER 2012C004

CERTIFICATE NO. 52895 CHARLES M. DAVIS — REGISTERED PROFESSIONAL ENGINEER — ARIZONA, U.S.A.
Expires 12/31/2014

WEST Consultants, Inc.

	BY	DATE
DESIGN	---	---
DESIGN CHECK	---	---
PLANS	SJB	10/13
PLANS CHECK	CMD, JWH	10/13

MATCH LINE SHEET 26



MATCH LINE SHEET 28

MATCH LINE SHEET 29

AERIAL IMAGERY PROVIDED BY THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
FLIGHT DATE VARIES FROM SEPTEMBER THROUGH OCTOBER, 2010 AND 2011

400 200 0 400 800

NTS SCALE: 1" = 400 FEET NTS
CONTOUR INTERVAL = 2 FEET

LEGEND

ZONE AE BOUNDARIES — Revised / Effective
FLOODWAY BOUNDARIES — Revised / Effective
BASE FLOOD ELEVATION
HYDRAULIC BASELINE
ZONE AO1
ZONE AO2
ZONE AO3
ZONE A BOUNDARIES — Revised / Effective

Cross Section River Mile Designation
Floodplain Water Surface Elevation
Floodway Water Surface Elevation
100-year Discharge
1.009
FP = 2222.33
FW = 2222.33
3333cfs
Cross Section Stationing Tick

ELEV. REFERENCE MARK
SECTION LINE AND ID 5

ELEVATION REFERENCE MARKS

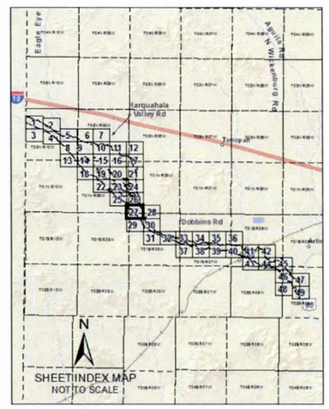
NOTE: ALL ELEVATIONS ARE BASED ON NORTH AMERICAN VERTICAL DATUM OF 1988. SEE MCDOT & NGS ONLINE RESOURCES FOR MORE INFORMATION

I.D. NUMBER	ELEV. (FT)	DESCRIPTION/LOCATION
MCDOT 75004-1	1081.6	FD 1/2" RB W/ 1" PLAS CAP 0.35' DN STAMPED "RLS 33861"
MCDOT 74926-1	1059.1	FD 1/2" RB W/ 1" PLAS CAP 0.65' DN STAMPED "RLS 33861"

NOTES

1) ALL AREAS DESIGNATED ZONE X ARE SHADED ZONE X, EXCEPT WHERE NOTED.

2) AREA LOCATED IN TOWNSHIP 1N, RANGE 8W, SECTIONS 31-32 AND RANGE 9W, SECTION 36; TOWNSHIP 1S, RANGE 8W, SECTIONS 5-6 AND RANGE 9W, SECTION 1.



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CENTENNIAL WASH FLOODPLAIN DELINEATION STUDY: GILA RIVER TO LA PAZ COUNTY

F.C.D. CONTRACT NUMBER 2012C004

52895 CHARLES M. DAVIS — CERTIFICATE NO. — REGISTERED PROFESSIONAL ENGINEER — ARIZONA, U.S.A.
Expires 12/31/2014

WEST Consultants, Inc.

	BY	DATE
DESIGN	---	---
DESIGN CHECK	---	---
PLANS	SJB	10/13
PLANS CHECK	CMD, JWH	10/13

SHEET 27 OF 49

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1" = 200 HORIZONTAL SCALE AND 2' CONTOUR INTERVALS

GROUND CONTROL SURVEY DATA & AERIAL MAPPING PROVIDED BY FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

AERIAL IMAGERY PROVIDED BY THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
FLIGHT DATE VARIES FROM SEPTEMBER THROUGH OCTOBER, 2010 AND 2011

MATCH LINE SHEET 30

400 200 0 400 800

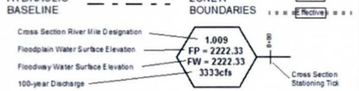
NTS SCALE: 1" = 400 FEET CONTOUR INTERVAL = 2 FEET NTS

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1" = 200' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS.

GROUND CONTROL SURVEY DATA & AERIAL MAPPING PROVIDED BY FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

LEGEND

ZONE AE BOUNDARIES (Revised / Effective)
FLOODWAY BOUNDARIES (Revised / Effective)
BASE FLOOD ELEVATION
HYDRAULIC BASELINE
ZONE AO1
ZONE AO2
ZONE AO3
ZONE A BOUNDARIES (Revised / Effective)



ELEV. REFERENCE MARK

SECTION LINE AND ID 5

ELEVATION REFERENCE MARKS

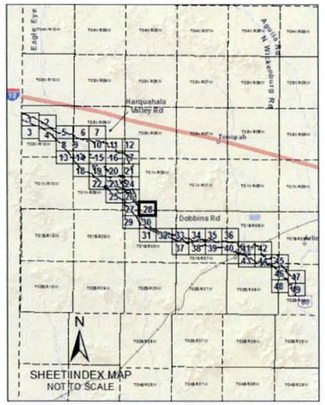
NOTE: ALL ELEVATIONS ARE BASED ON NORTH AMERICAN VERTICAL DATUM OF 1988. SEE MCDOT & NGS ONLINE RESOURCES FOR MORE INFORMATION

I.D. NUMBER	ELEV. (FT)	DESCRIPTION/LOCATION
MCDOT 74924-1	1059.8	FD 3" IP 0.3' UP W/ 3 1/3" GLO BC STAMPED "S C T 1N R8W S32 S33 1914"
MCDOT 74923-1	1062.2	FD 2" IP 1.2' UP W/ 2 1/2" GLO BC STAMPED "T 1N R8W S32 S33 C C S5 S4 1914"

NOTES

1) ALL AREAS DESIGNATED ZONE X ARE SHADED ZONE X, EXCEPT WHERE NOTED.

2) AREA LOCATED IN TOWNSHIP 1S, RANGE 8W, SECTIONS 3-5 AND TOWNSHIP 1N RANGE 8W, SECTIONS 32-34.



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CENTENNIAL WASH FLOODPLAIN DELINEATION STUDY: GILA RIVER TO LA PAZ COUNTY

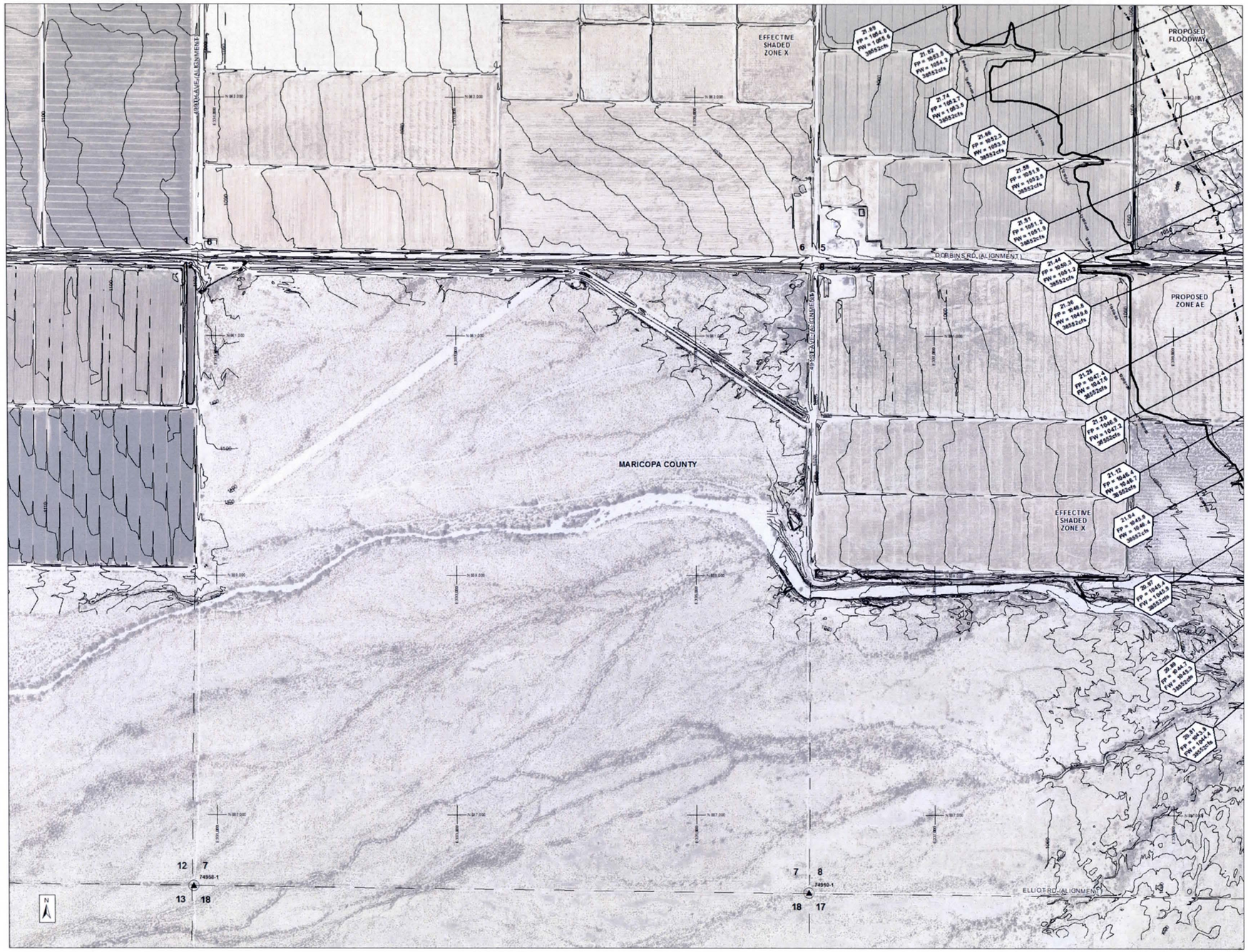
F.C.D. CONTRACT NUMBER 2012C004

52865 CHARLES M. DAVIS — Expires 12/31/2014

WEST Consultants, Inc.

	BY	DATE
DESIGN	---	---
DESIGN CHECK	---	---
PLANS	SJB	10/13
PLANS CHECK	CMD, JWH	10/13

MATCH LINE SHEET 27



MATCH LINE SHEET 30

AERIAL IMAGERY PROVIDED BY THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
FLIGHT DATE VARIES FROM SEPTEMBER THROUGH OCTOBER, 2010 AND 2011

400 200 0 400 800

NTS SCALE: 1" = 400 FEET CONTOUR INTERVAL = 2 FEET NTS

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1" = 200' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS

GROUND CONTROL SURVEY DATA & AERIAL MAPPING PROVIDED BY FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

LEGEND

ZONE AE BOUNDARIES (Revised / Effective)
FLOODWAY BOUNDARIES (Revised / Effective)
BASE FLOOD ELEVATION
HYDRAULIC BASELINE
ZONE AO1
ZONE AO2
ZONE AO3
ZONE A BOUNDARIES (Revised / Effective)

Cross Section River Mile Designation
Floodplain Water Surface Elevation
Floodway Water Surface Elevation
100-year Discharge
1.009 FP = 2222.33 FW = 2222.33 3333cfs
Cross Section Stationing Tick

ELEV. REFERENCE MARK
SECTION LINE AND ID 5

ELEVATION REFERENCE MARKS

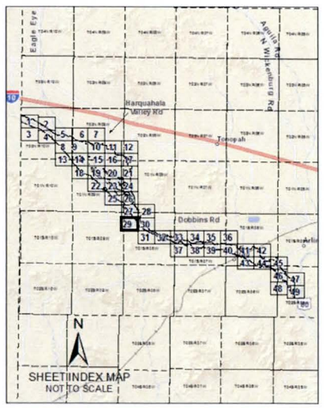
NOTE: ALL ELEVATIONS ARE BASED ON NORTH AMERICAN VERTICAL DATUM OF 1988. SEE MCDOT & NGS ONLINE RESOURCES FOR MORE INFORMATION.

I.D. NUMBER	ELEV (FT)	DESCRIPTION/LOCATION
MCDOT 74958-1	1113.7	FD 2" IP 0.7' UP W/ 2 1/2" GLO BC STAMPED "T 1S R9W S18 S17 S19 S20 1914"
MCDOT 74910-1	1075.3	FD 2" IP 1.6' UP W/ 2 1/2" GLO BC STAMPED "T 1S R8W S7 S8 S18 S17 1914"

NOTES

1) ALL AREAS DESIGNATED ZONE X ARE SHADED ZONE X, EXCEPT WHERE NOTED.

2) AREA LOCATED IN TOWNSHIP 1S, RANGE 8W, SECTIONS 6-8 AND 17-18 AND RANGE 9W, SECTIONS 1 AND 12-13.



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CENTENNIAL WASH FLOODPLAIN DELINEATION STUDY: GILA RIVER TO LA PAZ COUNTY

F.C.D. CONTRACT NUMBER 2012C004

52695 CHARLES M. DAVIS — Registered Professional Engineer — Arizona, U.S.A. — Expires 12/31/2014

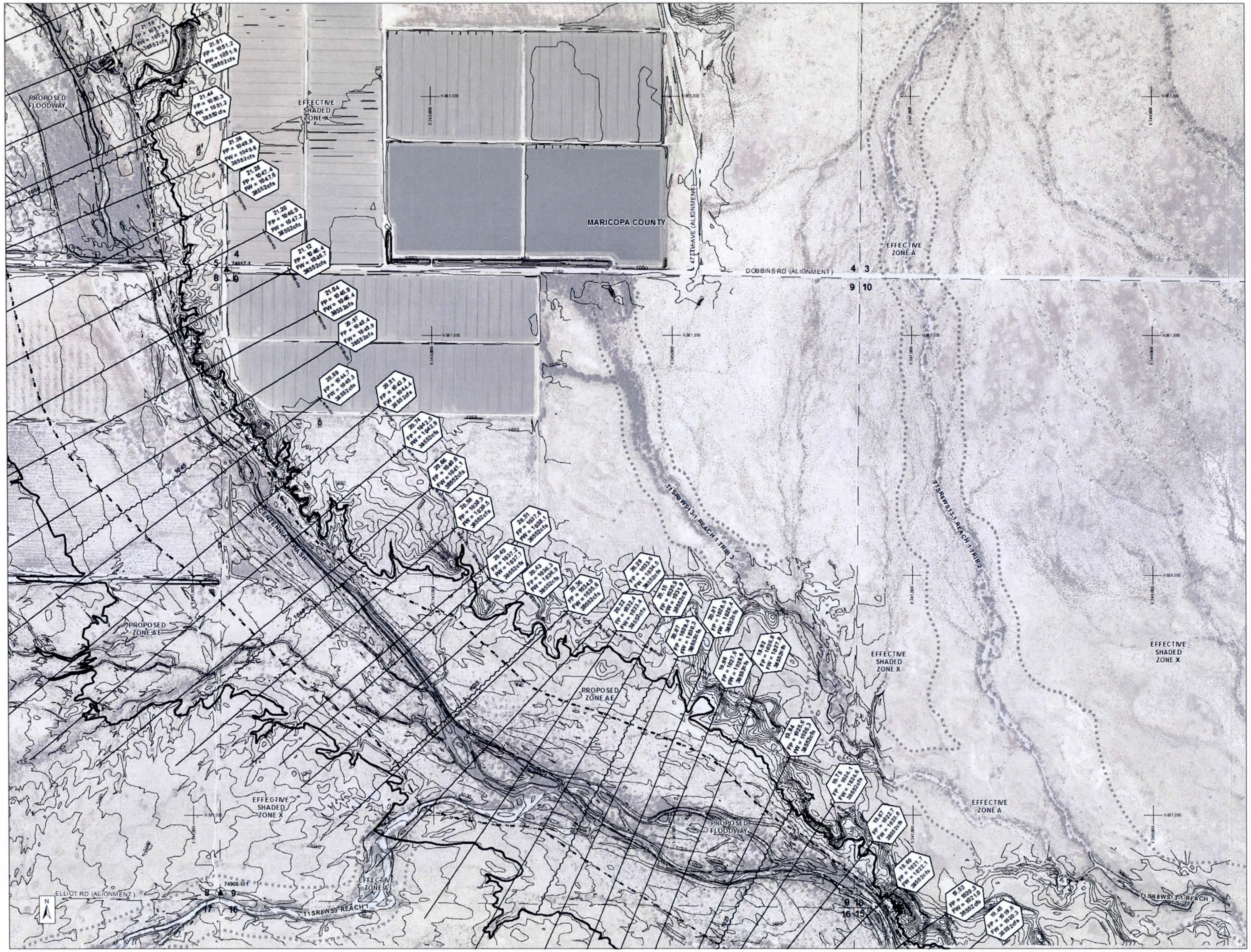
WEST Consultants, Inc.

	BY	DATE
DESIGN	---	---
DESIGN CHECK	---	---
PLANS	SJB	10/13
PLANS CHECK	CMD, JWH	10/13

SHEET 29 OF 49

MATCH LINE SHEET 28

MATCH LINE SHEET 29



MATCH LINE SHEET 31

AERIAL IMAGERY PROVIDED BY THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
FLIGHT DATE VARIES FROM SEPTEMBER THROUGH OCTOBER, 2010 AND 2011

400 200 0 400 800

NTS

SCALE: 1" = 400 FEET
CONTOUR INTERVAL = 2 FEET

NTS

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1" = 200' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS

GROUND CONTROL SURVEY DATA & AERIAL MAPPING PROVIDED BY FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

LEGEND

ZONE AE BOUNDARIES (Revised / Effective)
FLOODWAY BOUNDARIES (Revised / Effective)
BASE FLOOD ELEVATION
HYDRAULIC BASELINE
ZONE AO1
ZONE AO2
ZONE AO3
ZONE A BOUNDARIES (Revised / Effective)

Cross Section River Mile Designation — 1.009
Floodplain Water Surface Elevation — FP = 2222.33
Floodway Water Surface Elevation — FW = 2222.33
100-year Discharge — 3333cfs
Cross Section Stationing Tick

ELEV. REFERENCE MARK

SECTION LINE AND ID 5

ELEVATION REFERENCE MARKS

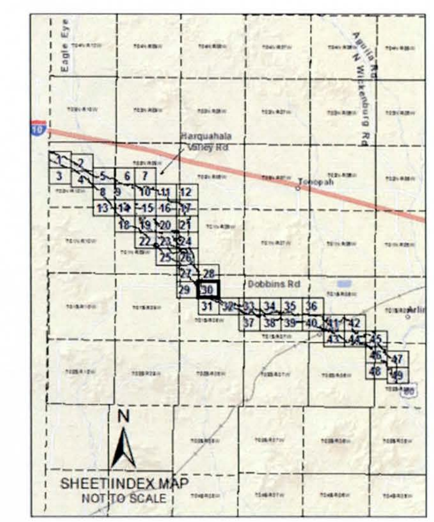
NOTE: ALL ELEVATIONS ARE BASED ON NORTH AMERICAN VERTICAL DATUM OF 1988. SEE MCDOT & NGS ONLINE RESOURCES FOR MORE INFORMATION.

I.D. NUMBER	ELEV. (FT)	DESCRIPTION/LOCATION
MCDOT 74908-W1	1044.4	FD 2" IP FL W/ 2 1/2" GLO BC STAMPED "WC T1S R8W S8 S9 S17 S16 1914"
MCDOT 74917-1	1056.6	FD 2" IP 1.1' UP W/ 2 1/2" GLO BC STAMPED "T1S R8W S5 S4 S8 S9 1914"

NOTES

1) ALL AREAS DESIGNATED ZONE X ARE SHADED ZONE X, EXCEPT WHERE NOTED.

2) AREA LOCATED IN TOWNSHIP 1S, RANGE 8W, SECTIONS 3-5, 8-10, AND 15-17.



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CENTENNIAL WASH FLOODPLAIN DELINEATION STUDY: GILA RIVER TO LA PAZ COUNTY

F.C.D. CONTRACT NUMBER 2012C004

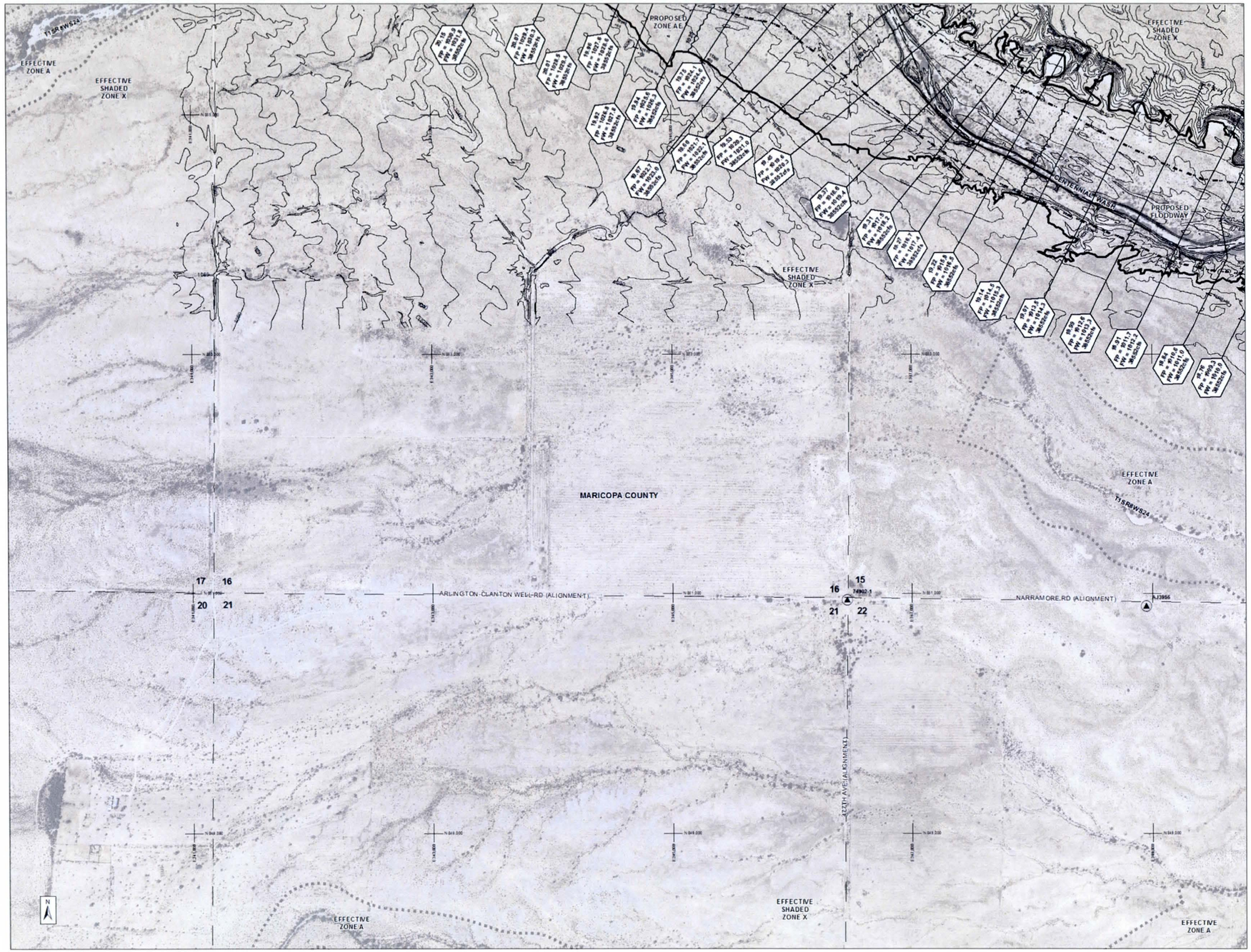
Registered Professional Engineer (Civil) CERTIFICATE NO. 52895 CHARLES M. DAVIS Date Signed 10-31-2013 ARIZONA, U.S.A.
Expires 12/31/2014

WEST Consultants, Inc.

	BY	DATE
DESIGN	---	---
DESIGN CHECK	---	---
PLANS	SJB	10/13
PLANS CHECK	CMD, JWH	10/13

SHEET 30 OF 49

MATCH LINE SHEET 30



MATCH LINE SHEET 32

AERIAL IMAGERY PROVIDED BY THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
FLIGHT DATE VARIES FROM SEPTEMBER THROUGH OCTOBER, 2010 AND 2011

400 200 0 400 800

NTS SCALE: 1" = 400 FEET CONTOUR INTERVAL = 2 FEET NTS

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1" = 200' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS.

GROUND CONTROL SURVEY DATA & AERIAL MAPPING PROVIDED BY FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

LEGEND

ZONE AE BOUNDARIES (Revised / Effective)
FLOODWAY BOUNDARIES (Revised / Effective)
BASE FLOOD ELEVATION
HYDRAULIC BASELINE
ZONE AO1
ZONE AO2
ZONE AO3
ZONE A BOUNDARIES (Revised / Effective)

Cross Section River Mile Designation
Floodplain Water Surface Elevation
Floodway Water Surface Elevation
100-year Discharge
1.009
FP = 2222.33
FW = 2222.33
3333cfs
Cross Section Stationing Trick

ELEV. REFERENCE MARK
SECTION LINE AND ID 5

ELEVATION REFERENCE MARKS

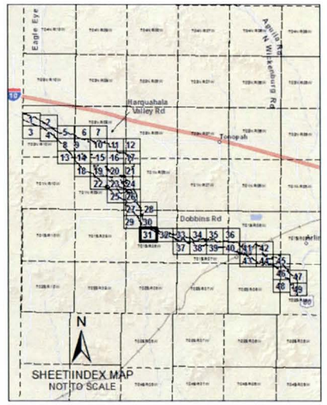
NOTE: ALL ELEVATIONS ARE BASED ON NORTH AMERICAN VERTICAL DATUM OF 1988. SEE MCDOT & NGS ONLINE RESOURCES FOR MORE INFORMATION.

I.D. NUMBER	ELEV. (FT)	DESCRIPTION/LOCATION
MCDOT 74902-1	1023.4	FD 1/2" RB W/ 1" PLAS CAP 0.1' DN STAMPED "SPRINGER RLS 34399"
NGS AJ3956	1013.3	AL CAP ON 30 FT STAINLESS STEEL ROD, ENCASED IN 1" GREASED PVC SLEEVE ENCLOSED IN A 5" PVC PIPE

NOTES

1) ALL AREAS DESIGNATED ZONE X ARE SHADED ZONE X, EXCEPT WHERE NOTED.

2) AREA LOCATED IN TOWNSHIP 1S, RANGE 8W, SECTIONS 15-17 AND 20-22.



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

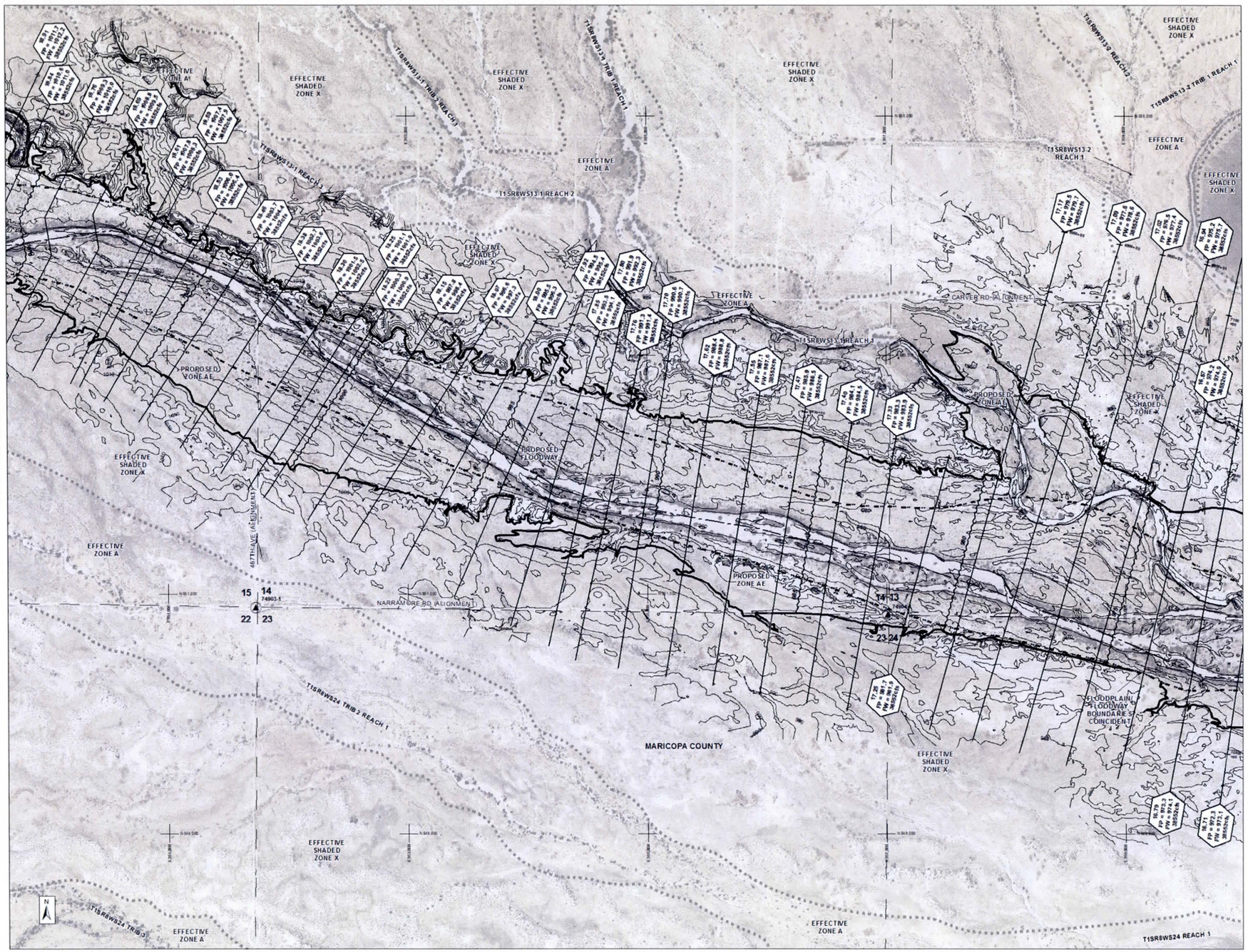
CENTENNIAL WASH FLOODPLAIN DELINEATION STUDY: GILA RIVER TO LA PAZ COUNTY

F.C.D. CONTRACT NUMBER 2012C004

52895 CHARLES M. DAVIS REGISTERED PROFESSIONAL ENGINEER ARIZONA, U.S.A.
Expires 12/31/2014

WEST Consultants, Inc.

	BY	DATE
DESIGN	---	---
DESIGN CHECK	---	---
PLANS	SJB	10/13
PLANS CHECK	CMD, JWH	10/13



AERIAL IMAGERY PROVIDED BY THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
FLIGHT DATE VARIES FROM SEPTEMBER THROUGH OCTOBER, 2010 AND 2011

400 200 0 400 800

NTS SCALE: 1" = 400 FEET NTS
CONTOUR INTERVAL = 2 FEET

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1" = 200 HORIZONTAL SCALE AND 2 CONTOUR INTERVALS

GROUND CONTROL SURVEY DATA & AERIAL MAPPING PROVIDED BY FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

LEGEND

ZONE AE BOUNDARIES (Revised / Effective)
FLOODWAY BOUNDARIES (Revised / Effective)
BASE FLOOD ELEVATION
HYDRAULIC BASELINE
ZONE AO1
ZONE AO2
ZONE AO3
ZONE A BOUNDARIES (Revised / Effective)

Cross Section River Mile Designation
Floodplain Water Surface Elevation
Floodway Water Surface Elevation
100-year Discharge
1.009
FP = 2222.33
FW = 2222.33
3333cfs
Cross Section Stationing Tick

ELEV. REFERENCE MARK
SECTION LINE AND ID 5

ELEVATION REFERENCE MARKS

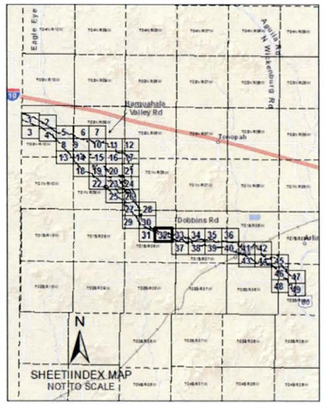
NOTE: ALL ELEVATIONS ARE BASED ON NORTH AMERICAN VERTICAL DATUM OF 1988. SEE MCDOT & NGS ONLINE RESOURCES FOR MORE INFORMATION.

I.D. NUMBER	ELEV. (FT)	DESCRIPTION/LOCATION
MCDOT 74903-1	1002.0	FD 1" IP 0.1' UP W/ 1" PLAS CAP STAMPED "LOFTIS 26404"
MCDOT 74904-1	986.1	FD 5/8" RB W/ NO ID 0.35' UP

NOTES

1) ALL AREAS DESIGNATED ZONE X ARE SHADED ZONE X, EXCEPT WHERE NOTED.

2) AREA LOCATED IN TOWNSHIP 1S, RANGE 8W, SECTIONS 13-15 AND 22-24.



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CENTENNIAL WASH FLOODPLAIN DELINEATION STUDY: GILA RIVER TO LA PAZ COUNTY

F.C.D. CONTRACT NUMBER 2012C004

52895 CHARLES M. DAVIS — CERTIFICATE NO. — ARIZONA, U.S.A. — Expires 12/31/2014

WEST Consultants, Inc.

	BY	DATE
DESIGN	---	---
DESIGN CHECK	---	---
PLANS	SJB	10/13
PLANS CHECK	CMD, JWH	10/13

AERIAL IMAGERY PROVIDED BY THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
FLIGHT DATE VARIES FROM SEPTEMBER THROUGH OCTOBER, 2010 AND 2011

400 200 0 400 800

NTS SCALE: 1" = 400 FEET CONTOUR INTERVAL = 2 FEET NTS

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1" = 200' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS

GROUND CONTROL SURVEY DATA & AERIAL MAPPING PROVIDED BY FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

LEGEND

ZONE AE BOUNDARIES (Revised / Effective)
FLOODWAY BOUNDARIES (Revised / Effective)
BASE FLOOD ELEVATION
HYDRAULIC BASELINE
ZONE AO1
ZONE AO2
ZONE AO3
ZONE A BOUNDARIES (Revised / Effective)

Cross Section River Mile Designation
Floodplain Water Surface Elevation
Floodway Water Surface Elevation
100-year Discharge
1.009
FP = 2222.33
FW = 2222.33
3333cfs
Cross Section Stationing Tick

ELEV. REFERENCE MARK
SECTION LINE AND ID 5

ELEVATION REFERENCE MARKS

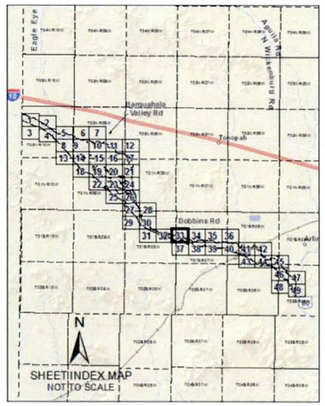
NOTE: ALL ELEVATIONS ARE BASED ON NORTH AMERICAN VERTICAL DATUM OF 1988. SEE MCDOT & NGS ONLINE RESOURCES FOR MORE INFORMATION.

I.D. NUMBER	ELEV. (FT)	DESCRIPTION/LOCATION
MCDOT 75720-1	958.6	FD 3" IP W/ NO ID 1.4' DN
MCDOT 75719-1	980.8	FD 2" IP 0.6' UP W/ 2 1/2" GLO BC STAMPED "T1S R7W S18 S17 S19 S20 1914"

NOTES

1) ALL AREAS DESIGNATED ZONE X ARE SHADED ZONE X, EXCEPT WHERE NOTED.

2) AREA LOCATED IN TOWNSHIP 1S, RANGE 7W, SECTIONS 18-20 AND RANGE 8W, SECTIONS 13 AND 24.



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CENTENNIAL WASH FLOODPLAIN DELINEATION STUDY: GILA RIVER TO LA PAZ COUNTY

F.C.D. CONTRACT NUMBER 2012C004

52895 CHARLES M. DAVIS — CERTIFICATE NO. — DATE OF REGISTRATION 12/31/2014 — ARIZONA, U.S.A.

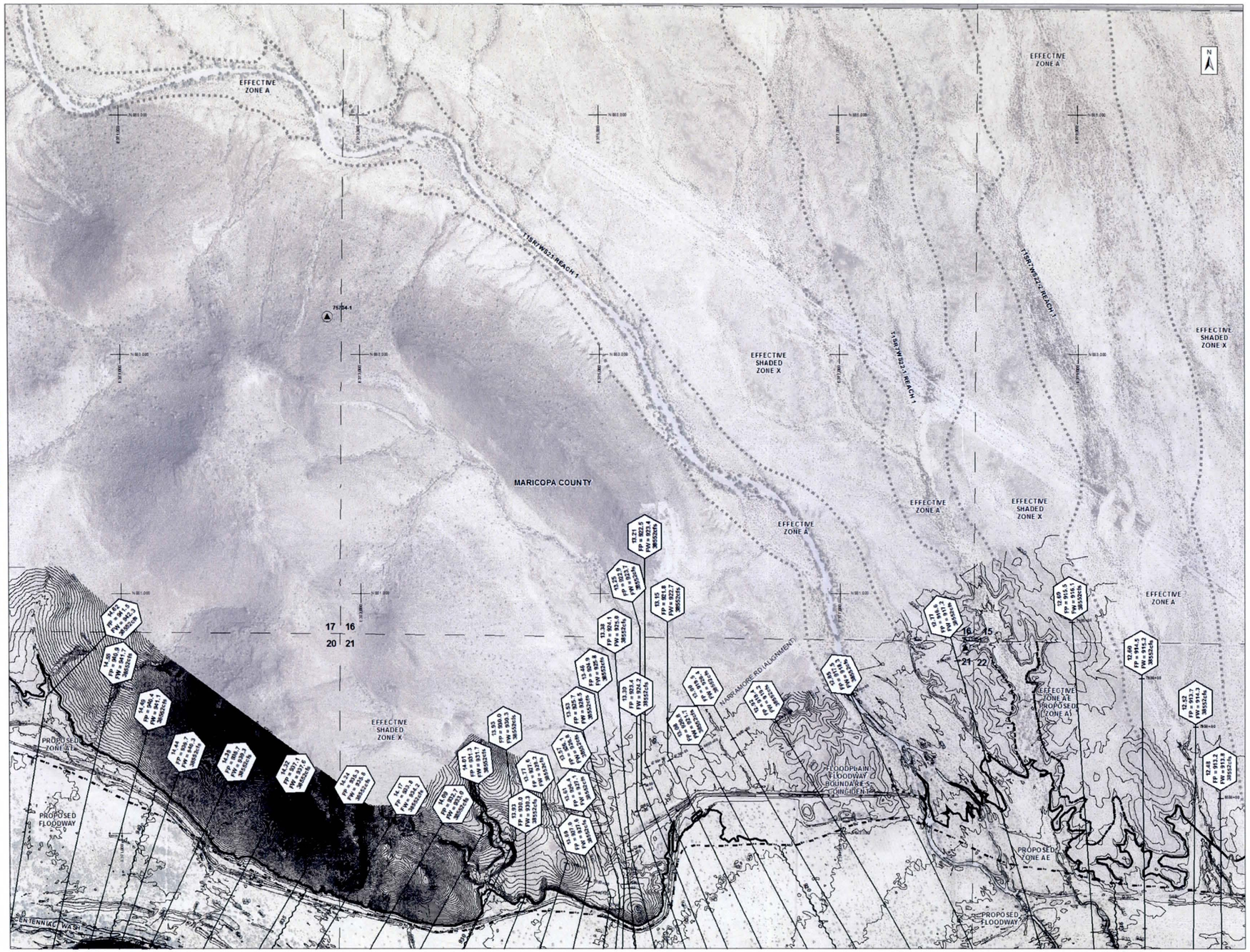
Expires 12/31/2014

WEST Consultants, Inc.

	BY	DATE
DESIGN	---	---
DESIGN CHECK	---	---
PLANS	SJB	10/13
PLANS CHECK	CMD, JWH	10/13

MATCH LINE SHEET 33

MATCH LINE SHEET 35



MATCH LINE SHEET 38

AERIAL IMAGERY PROVIDED BY THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
FLIGHT DATE VARIES FROM SEPTEMBER THROUGH OCTOBER, 2010 AND 2011

400 200 0 400 800

NTS SCALE: 1" = 400 FEET NTS
CONTOUR INTERVAL = 2 FEET

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1" = 200' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS

GROUND CONTROL SURVEY DATA & AERIAL MAPPING PROVIDED BY FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

LEGEND

ZONE AE BOUNDARIES (Revised / Effective)
FLOODWAY BOUNDARIES (Revised / Effective)
BASE FLOOD ELEVATION
HYDRAULIC BASELINE
ZONE AO1
ZONE AO2
ZONE AO3
ZONE A BOUNDARIES (Revised / Effective)

Cross Section River Mile Designation
Floodplain Water Surface Elevation
Floodway Water Surface Elevation
100-year Discharge
1.009
FP = 2222.33
FW = 2222.33
3333cfs
Cross Section Stationing Tick

ELEV. REFERENCE MARK
SECTION LINE AND ID 5

ELEVATION REFERENCE MARKS

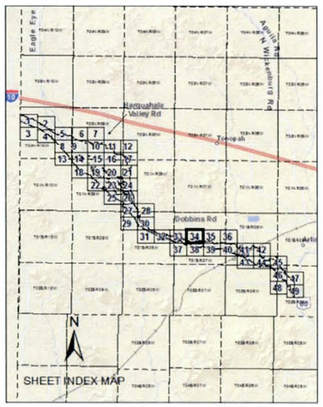
NOTE: ALL ELEVATIONS ARE BASED ON NORTH AMERICAN VERTICAL DATUM OF 1988. SEE MCDOT & NGS ONLINE RESOURCES FOR MORE INFORMATION.

I.D. NUMBER	ELEV. (FT)	DESCRIPTION/LOCATION
MCDOT 75734-1	1166.1	FD 1" IP I' UP W/ 2 1/2" GLO BC STAMPED "1/4 S17 S18 1914" AL CAP ON 24' STAINLESS STEEL ROD, ENCASED IN A 1" GREASED PVC SLEEVE ENCLOSED IN A 5" PVC PIPE
NGS AJ3954	926.2	

NOTES

1) ALL AREAS DESIGNATED ZONE X ARE SHADED ZONE X, EXCEPT WHERE NOTED.

2) AREA LOCATED IN TOWNSHIP 1S, RANGE 7W, SECTIONS 8-10, 15-17, AND 20-22.



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CENTENNIAL WASH FLOODPLAIN DELINEATION STUDY: GILA RIVER TO LA PAZ COUNTY

F.C.D. CONTRACT NUMBER 2012C004

52865 CHARLES M. DAVIS — Registered Professional Engineer — Arizona, U.S.A. — Expires 12/31/2014

WEST Consultants, Inc.

	BY	DATE
DESIGN	---	---
DESIGN CHECK	---	---
PLANS	SJB	10/13
PLANS CHECK	CMD, JWH	10/13

SHEET 34 OF 49

AERIAL IMAGERY PROVIDED BY THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
FLIGHT DATE VARIES FROM SEPTEMBER THROUGH OCTOBER, 2010 AND 2011

400 200 0 400 800

NTS SCALE: 1" = 400 FEET NTS
CONTOUR INTERVAL = 2 FEET

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1" = 200' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS

GROUND CONTROL SURVEY DATA & AERIAL MAPPING PROVIDED BY FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

LEGEND

ZONE AE BOUNDARIES (Revised / Effective)
FLOODWAY BOUNDARIES (Revised / Effective)
BASE FLOOD ELEVATION
HYDRAULIC BASELINE
ZONE AO1
ZONE AO2
ZONE AO3
ZONE A BOUNDARIES (Revised / Effective)

Cross Section River Mile Designation
Floodplain Water Surface Elevation
Floodway Water Surface Elevation
100-year Discharge
1.009
FP = 2222.33
FW = 2222.33
3333cfs
Cross Section Stationing Tick

ELEV. REFERENCE MARK
SECTION LINE AND ID 5

ELEVATION REFERENCE MARKS

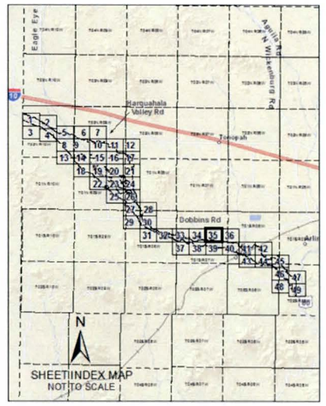
NOTE: ALL ELEVATIONS ARE BASED ON NORTH AMERICAN VERTICAL DATUM OF 1988. SEE MCDOT & NGS ONLINE RESOURCES FOR MORE INFORMATION.

I.D. NUMBER	ELEV. (FT)	DESCRIPTION/LOCATION
MCDOT 75743-1	920.6	FD 1" IP 1.2' UP W/ 2 1/2" GLO BC STAMPED "1/4 S17 S16 1914"
MCDOT 75715-1	906.6	FD 2" IP 0.8' UP W/ 2 1/2" GLO BC STAMPED "T 1S R7W S14 S13 S23 S24 1914"

NOTES

1) ALL AREAS DESIGNATED ZONE X ARE SHADED ZONE X, EXCEPT WHERE NOTED.

2) AREA LOCATED IN TOWNSHIP 1S, RANGE 7W, SECTIONS 10-15.



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CENTENNIAL WASH FLOODPLAIN DELINEATION STUDY: GILA RIVER TO LA PAZ COUNTY

F.C.D. CONTRACT NUMBER 2012C004

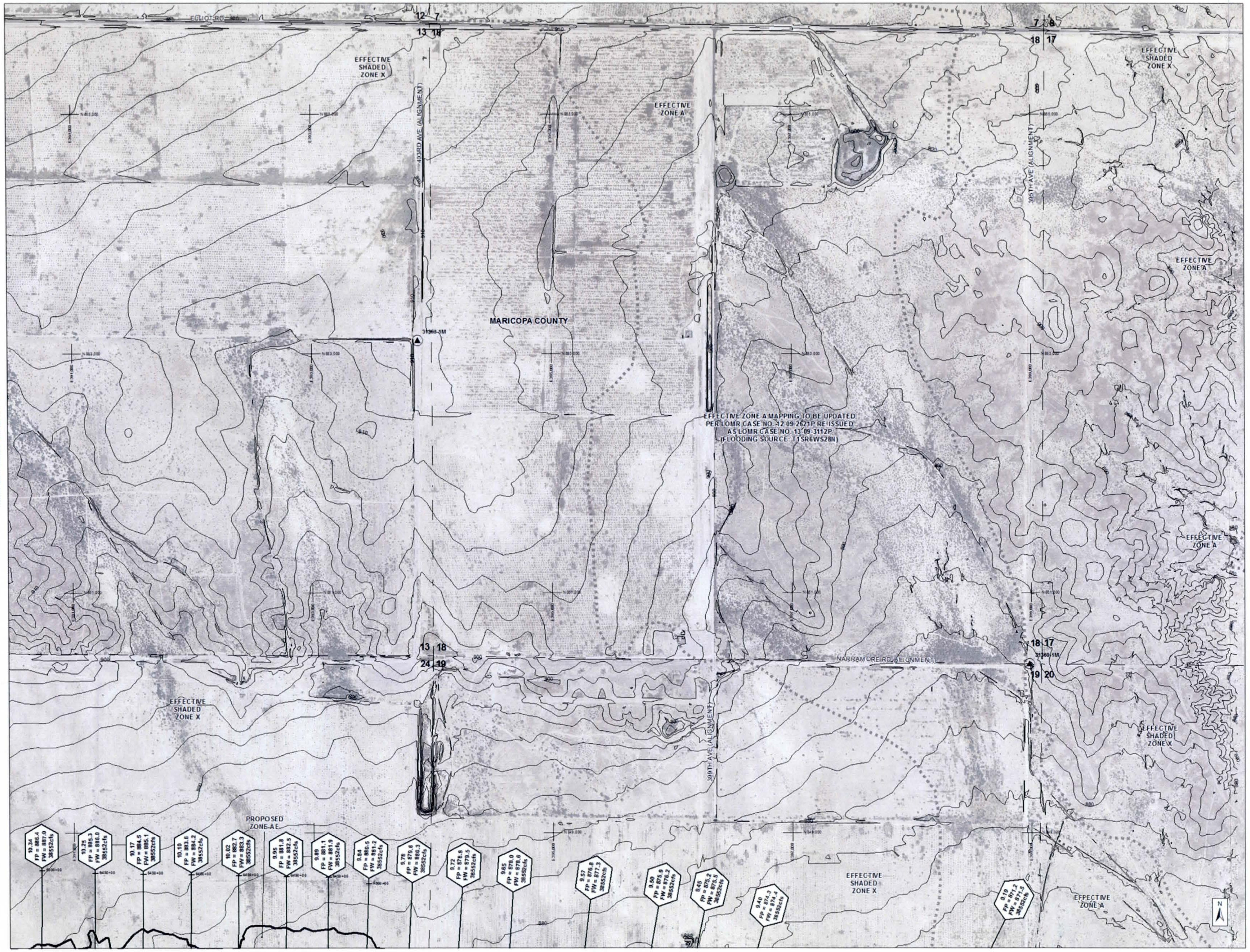
52895 CHARLES M. DAVIS — CERTIFICATE NO. — REGISTERED PROFESSIONAL ENGINEER — ARIZONA, U.S.A.
Expires 12/31/2014

WEST Consultants, Inc.

	BY	DATE
DESIGN	---	---
DESIGN CHECK	---	---
PLANS	SJB	10/13
PLANS CHECK	CMD, JWH	10/13

SHEET 35 OF 49

MATCH LINE SHEET 35



MATCH LINE SHEET 40

AERIAL IMAGERY PROVIDED BY THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
FLIGHT DATE VARIES FROM SEPTEMBER THROUGH OCTOBER, 2010 AND 2011

400 200 0 400 800

NTS SCALE: 1" = 400 FEET
CONTOUR INTERVAL = 2 FEET NTS

LEGEND

ZONE AE BOUNDARIES	Revised / Effective	ZONE AO1	
FLOODWAY BOUNDARIES	Revised / Effective	ZONE AO2	
BASE FLOOD ELEVATION		ZONE AO3	
HYDRAULIC BASELINE		ZONE A BOUNDARIES	Revised / Effective

Cross Section River Mile Designation — 1.009
Floodplain Water Surface Elevation — FP = 2222.33
Floodway Water Surface Elevation — FW = 2222.33
100-year Discharge — 3333cfs
Cross Section Stationing Tick

ELEV REFERENCE MARK

SECTION LINE AND ID 5

ELEVATION REFERENCE MARKS

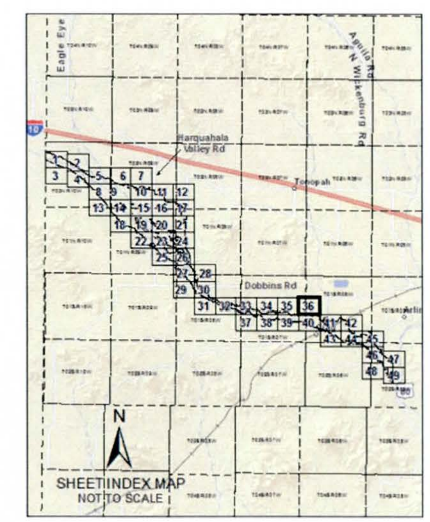
NOTE: ALL ELEVATIONS ARE BASED ON NORTH AMERICAN VERTICAL DATUM OF 1988. SEE MCDOT & NGS ONLINE RESOURCES FOR MORE INFORMATION.

I.D. NUMBER	ELEV (FT)	DESCRIPTION/LOCATION
MCDOT 31363-1M	911.2	FD 1/2" RB W/ 2" MC AL CAP STAMPED "T1S R7W R6W 1/4 S13 S18 RLS 36563 2004"
MCDOT 31360-1M	885.3	FD 1/2" RB W/ 3" MC BC STAMPED "T1S R6W S18 S17 S19 S20 RLS 36563 2004"

NOTES

1) ALL AREAS DESIGNATED ZONE X ARE SHADED ZONE X, EXCEPT WHERE NOTED.

2) AREA LOCATED IN TOWNSHIP 1S, RANGE 6W, SECTIONS 7-8 AND 17-20 AND RANGE 7W, SECTIONS 12-13 AND 24.



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CENTENNIAL WASH FLOODPLAIN DELINEATION STUDY: GILA RIVER TO LA PAZ COUNTY

F.C.D. CONTRACT NUMBER 2012C004

52895 CHARLES M. DAVIS
Expires 12/31/2014

WEST Consultants, Inc.

	BY	DATE
DESIGN	---	---
DESIGN CHECK	---	---
PLANS	SJB	10/13
PLANS CHECK	CMD, JWH	10/13

SHEET 36 OF 49

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1" = 200' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS

GROUND CONTROL SURVEY DATA & AERIAL MAPPING PROVIDED BY FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

MATCH LINE SHEET 33

MATCH LINE SHEET 38

AERIAL IMAGERY PROVIDED BY THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
FLIGHT DATE VARIES FROM SEPTEMBER THROUGH OCTOBER, 2010 AND 2011

400 200 0 400 800

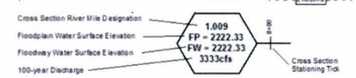
NTS SCALE: 1" = 400 FEET NTS
CONTOUR INTERVAL = 2 FEET

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1" = 200' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS

GROUND CONTROL SURVEY DATA & AERIAL MAPPING PROVIDED BY FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

LEGEND

ZONE AE BOUNDARIES — Revised / Effective
FLOODWAY BOUNDARIES — Revised / Effective
BASE FLOOD ELEVATION
HYDRAULIC BASELINE
ZONE AO1
ZONE AO2
ZONE AO3
ZONE A BOUNDARIES — Revised / Effective



ELEV. REFERENCE MARK
SECTION LINE AND ID — 5

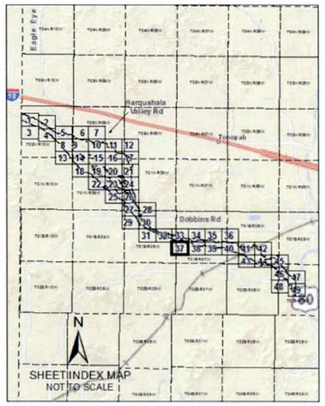
ELEVATION REFERENCE MARKS

NOTE: ALL ELEVATIONS ARE BASED ON NORTH AMERICAN VERTICAL DATUM OF 1988. SEE MCDOT & NGS ONLINE RESOURCES FOR MORE INFORMATION.

NOTES

1) ALL AREAS DESIGNATED ZONE X ARE SHADED ZONE X, EXCEPT WHERE NOTED.

2) AREA LOCATED IN TOWNSHIP 1S, RANGE 7W, SECTIONS 19-20 AND 29-30 AND RANGE 8W, SECTIONS 24-25 AND 36.



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CENTENNIAL WASH FLOODPLAIN DELINEATION STUDY: GILA RIVER TO LA PAZ COUNTY

F.C.D. CONTRACT NUMBER 2012C004

52895 CHARLES M. DAVIS — CERTIFICATE NO. — REGISTERED LAND SURVEYOR — ARIZONA, U.S.A.
Expires 12/31/2014

WEST Consultants, Inc.

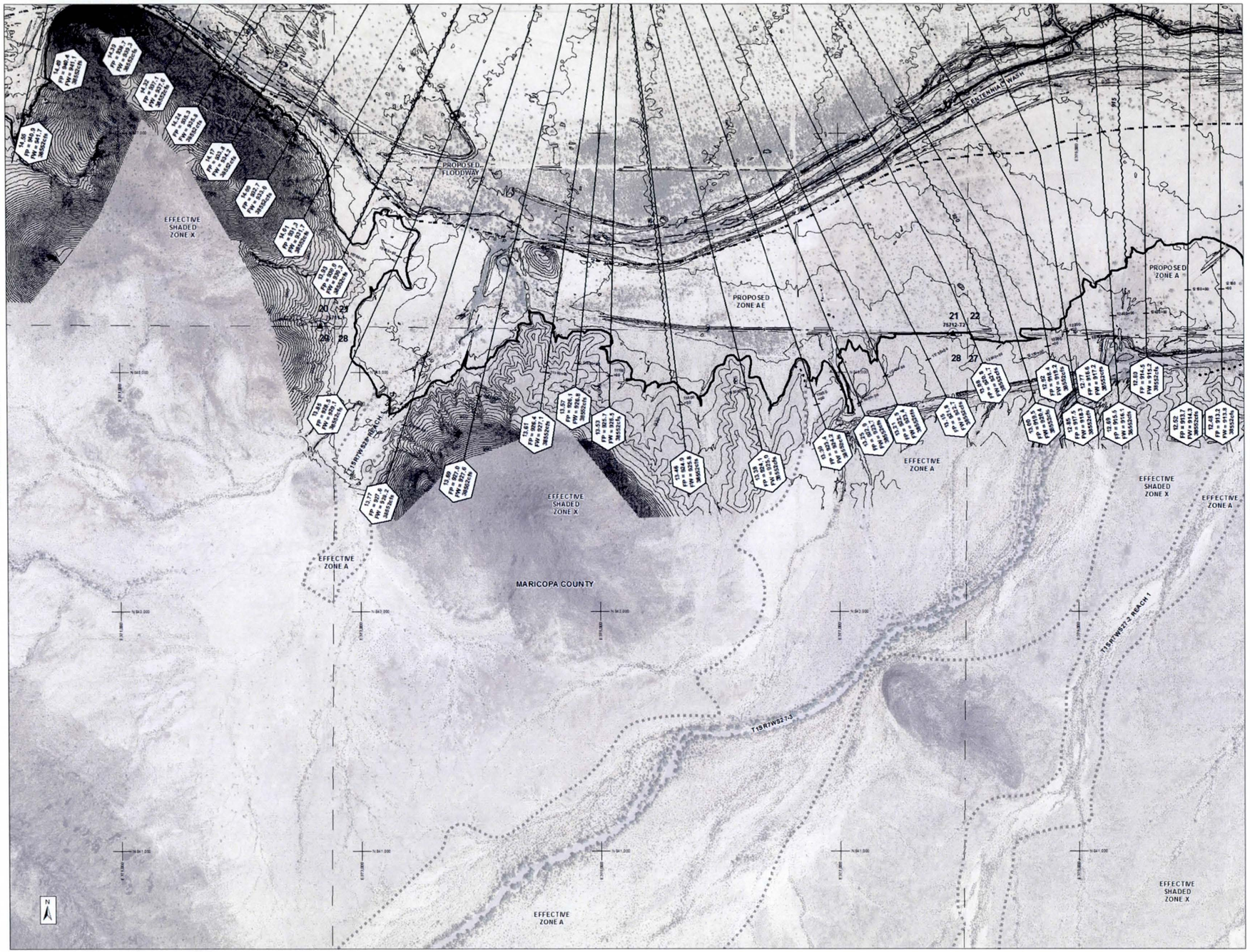
	BY	DATE
DESIGN	---	---
DESIGN CHECK	---	---
PLANS	SJB	10/13
PLANS CHECK	CMD, JWH	10/13

SHEET 37 OF 49

MATCH LINE SHEET 34

MATCH LINE SHEET 37

MATCH LINE SHEET 39



AERIAL IMAGERY PROVIDED BY THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
FLIGHT DATE VARIES FROM SEPTEMBER THROUGH OCTOBER, 2010 AND 2011

400 200 0 400 800

NTS SCALE: 1" = 400 FEET NTS
CONTOUR INTERVAL = 2 FEET

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1" = 200' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS

GROUND CONTROL SURVEY DATA & AERIAL MAPPING PROVIDED BY FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

LEGEND

ZONE AE BOUNDARIES — Revised / Effective
FLOODWAY BOUNDARIES — Revised / Effective
BASE FLOOD ELEVATION
HYDRAULIC BASELINE
ZONE AO1
ZONE AO2
ZONE AO3
ZONE A BOUNDARIES — Revised / Effective

Cross Section River Mile Designation
Floodplain Water Surface Elevation
Floodway Water Surface Elevation
100-year Discharge
1.089
FP = 2222.33
FW = 2222.33
3333cfs
Cross Section Stationing Tick

ELEV. REFERENCE MARK
SECTION LINE AND ID 5

ELEVATION REFERENCE MARKS

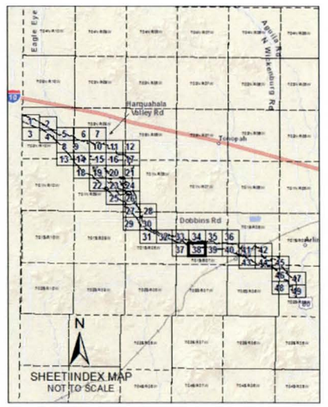
NOTE: ALL ELEVATIONS ARE BASED ON NORTH AMERICAN VERTICAL DATUM OF 1988. SEE MCDOT & NGS ONLINE RESOURCES FOR MORE INFORMATION.

I.D. NUMBER	ELEV. (FT)	DESCRIPTION/LOCATION
MCDOT 75711-1	939.3	FD 2" IP 0.9' UP W/ 2 1/2" GLO BC STAMPED "T1S R7W S20 S21 S29 S28 1914"
MCDOT 75712-T2	922.2	FD 1/2" RB W/ 1 1/2" A.C. FL NO STAMPING

NOTES

1) ALL AREAS DESIGNATED ZONE X ARE SHADED ZONE X, EXCEPT WHERE NOTED.

2) AREA LOCATED IN TOWNSHIP 1S, RANGE 7W, SECTIONS 20-22 AND 27-29.



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CENTENNIAL WASH FLOODPLAIN DELINEATION STUDY: GILA RIVER TO LA PAZ COUNTY

F.C.D. CONTRACT NUMBER 2012C004

52895 CHARLES M. DAVIS — CERTIFICATE OF — Professional Engineer — ARIZONA, U.S.A.
Expires 12/31/2014

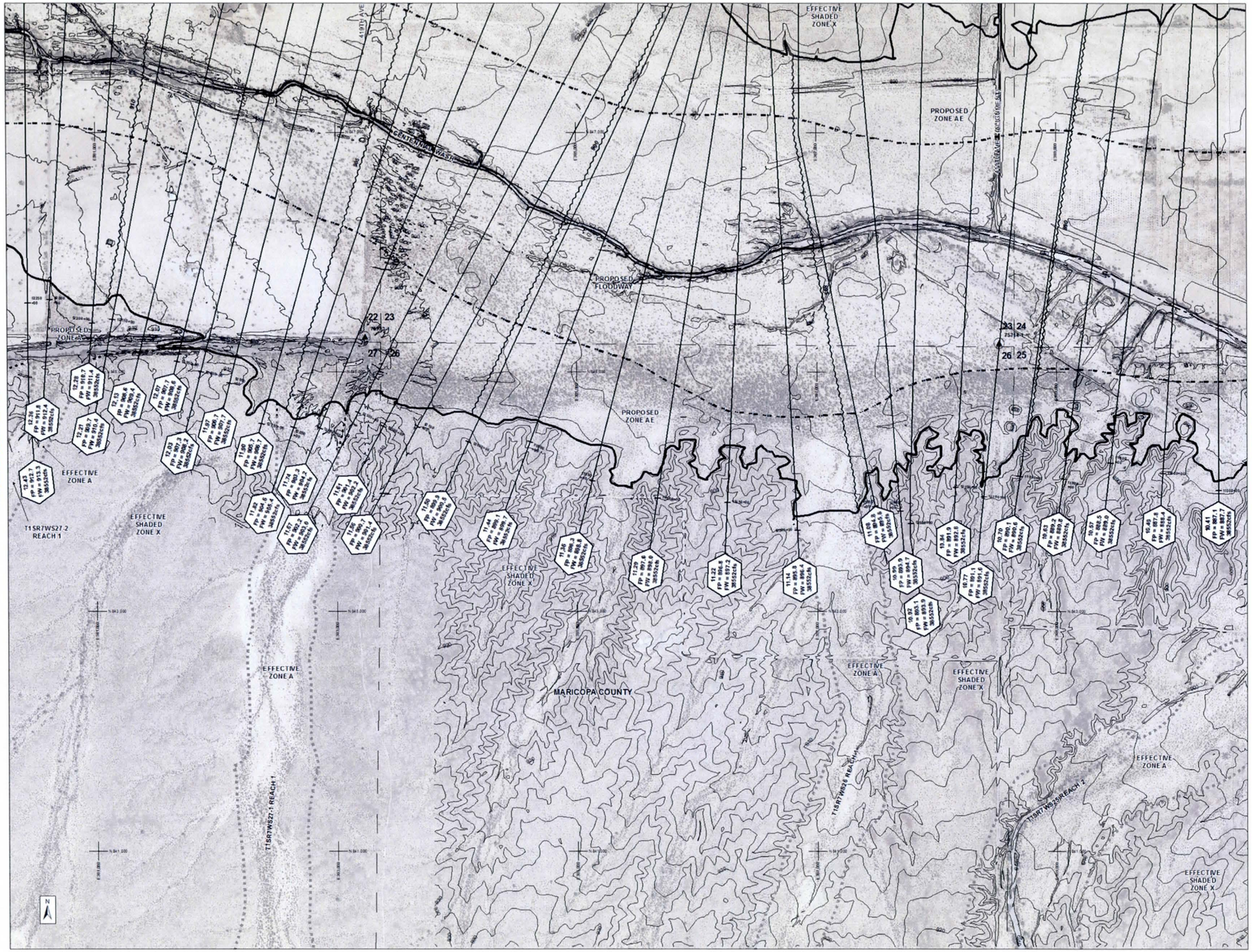
WEST Consultants, Inc.

	BY	DATE
DESIGN	---	---
DESIGN CHECK	---	---
PLANS	SJB	10/13
PLANS CHECK	CMD, JWH	10/13

MATCH LINE SHEET 35

MATCH LINE SHEET 38

MATCH LINE SHEET 40



AERIAL IMAGERY PROVIDED BY THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
FLIGHT DATE VARIES FROM SEPTEMBER THROUGH OCTOBER, 2010 AND 2011

400 200 0 400 800

NTS SCALE: 1" = 400 FEET CONTOUR INTERVAL = 2 FEET NTS

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1" = 200' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS.

GROUND CONTROL SURVEY DATA & AERIAL MAPPING PROVIDED BY FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

LEGEND

ZONE AE BOUNDARIES (Revised / Effective)
FLOODWAY BOUNDARIES (Revised / Effective)
BASE FLOOD ELEVATION
HYDRAULIC BASELINE
ZONE AO1
ZONE AO2
ZONE AO3
ZONE A BOUNDARIES (Revised / Effective)

1.009
FP = 2222.33
FW = 2222.33
3333cfs

Cross Section River Mile Designation
Floodplain Water Surface Elevation
Floodway Water Surface Elevation
100-year Discharge
Cross Section Stationing Tick

ELEV. REFERENCE MARK

SECTION LINE AND ID: 5

ELEVATION REFERENCE MARKS

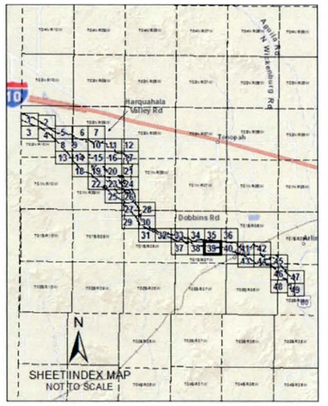
NOTE: ALL ELEVATIONS ARE BASED ON NORTH AMERICAN VERTICAL DATUM OF 1988. SEE MCDOT & NGS ONLINE RESOURCES FOR MORE INFORMATION.

I.D. NUMBER	ELEV. (FT)	DESCRIPTION/LOCATION
MCDOT 75713-1	902.1	FD 2" IP 1' DN W/ 2 1/2" GLO BC STAMPED "T 1S R7W S22 S23 S27 S26 1914"
MCDOT 75714-1	887.6	FD 2' IP FL W/ 2 1/2" GLO BC STAMPED "T1S R7W S23 S24 S26 S25 1914"

NOTES

1) ALL AREAS DESIGNATED ZONE X ARE SHADED ZONE X, EXCEPT WHERE NOTED.

2) AREA LOCATED IN TOWNSHIP 1S, RANGE 7W, SECTIONS 22-27



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CENTENNIAL WASH FLOODPLAIN DELINEATION STUDY: GILA RIVER TO LA PAZ COUNTY

F.C.D. CONTRACT NUMBER 2012C004

52865 CHARLES M. DAVIS REGISTERED PROFESSIONAL ENGINEER CERTIFICATE NO. 52865 ARIZONA, U.S.A.

Expires 12/31/2014

WEST Consultants, Inc.

	BY	DATE
DESIGN	---	---
DESIGN CHECK	---	---
PLANS	SJB	10/13
PLANS CHECK	CMD, JWH	10/13

SHEET 39 OF 49

MATCH LINE SHEET 36

MATCH LINE SHEET 39

MATCH LINE SHEET 41

AERIAL IMAGERY PROVIDED BY THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
FLIGHT DATE VARIES FROM SEPTEMBER THROUGH OCTOBER, 2010 AND 2011

400 200 0 400 800

NTS SCALE: 1" = 400 FEET NTS
CONTOUR INTERVAL = 2 FEET

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1" = 200' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS

GROUND CONTROL SURVEY DATA & AERIAL MAPPING PROVIDED BY FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

LEGEND

ZONE AE BOUNDARIES (Revised / Effective)
FLOODWAY BOUNDARIES (Revised / Effective)
BASE FLOOD ELEVATION
HYDRAULIC BASELINE
ZONE AO1
ZONE AO2
ZONE AO3
ZONE A BOUNDARIES (Revised / Effective)

Cross Section River Mile Designation
Floodplain Water Surface Elevation
Floodway Water Surface Elevation
100-year Discharge
1.009
FP = 2222.33
FW = 2222.33
3333cfs
Cross Section Stationing Tick

ELEV. REFERENCE MARK
SECTION LINE AND ID 5

ELEVATION REFERENCE MARKS

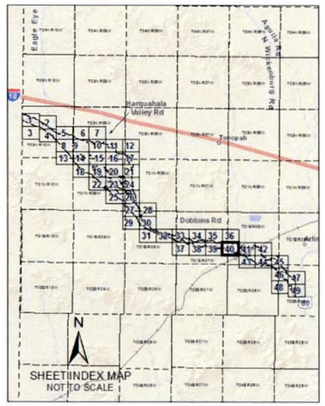
NOTE: ALL ELEVATIONS ARE BASED ON NORTH AMERICAN VERTICAL DATUM OF 1988. SEE MCDOT & NGS ONLINE RESOURCES FOR MORE INFORMATION.

I.D. NUMBER	ELEV. (FT)	DESCRIPTION/LOCATION
MCDOT 31342-1M	875.3	SET 9/16" SSTL ROD W/ 3" MC BC STAMPED "T1S R7W R6W S24 S19 S25 S30 RLS 36563 2004"
MCDOT 31340-1	864.5	FD 2" IP 0.2' DN W/ 2 1/2" GLO BC STAMPED "T1S R6W S19 S20 S30 S29 1914"

NOTES

1) ALL AREAS DESIGNATED ZONE X ARE SHADED ZONE X, EXCEPT WHERE NOTED.

2) AREA LOCATED IN TOWNSHIP 1S, RANGE 6W, SECTIONS 19-20 AND 29-30 AND RANGE 7W, SECTIONS 24-25.



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CENTENNIAL WASH FLOODPLAIN DELINEATION STUDY: GILA RIVER TO LA PAZ COUNTY

F.C.D. CONTRACT NUMBER 2012C004

52895 CHARLES M. DAVIS REGISTERED PROFESSIONAL ENGINEER ARIZONA, U.S.A.
Expires 12/31/2014

WEST Consultants, Inc.

	BY	DATE
DESIGN	---	---
DESIGN CHECK	---	---
PLANS	SJB	10/13
PLANS CHECK	CMD, JWH	10/13

SHEET 40 OF 49

AERIAL IMAGERY PROVIDED BY THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
FLIGHT DATE VARIES FROM SEPTEMBER THROUGH OCTOBER, 2010 AND 2011

400 200 0 400 800

NTS SCALE: 1" = 400 FEET NTS
CONTOUR INTERVAL = 2 FEET

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1" = 200' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS

GROUND CONTROL SURVEY DATA & AERIAL MAPPING PROVIDED BY FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

LEGEND

ZONE AE BOUNDARIES (Revised / Effective)
FLOODWAY BOUNDARIES (Revised / Effective)
BASE FLOOD ELEVATION
HYDRAULIC BASELINE
ZONE A O1
ZONE A O2
ZONE A O3
ZONE A BOUNDARIES (Revised / Effective)

Cross Section River Mile Designation
Floodplain Water Surface Elevation
Floodway Water Surface Elevation
100-year Discharge
1.009
FP = 2222.33
FW = 2222.33
3333cfs
Cross Section Stationing Tick

ELEV. REFERENCE MARK
SECTION LINE AND ID 5

ELEVATION REFERENCE MARKS

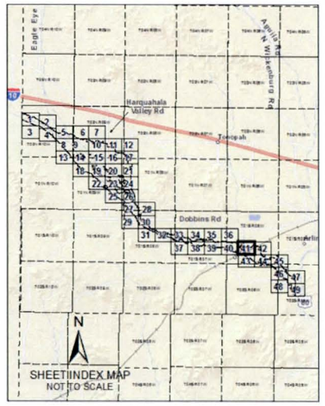
NOTE: ALL ELEVATIONS ARE BASED ON NORTH AMERICAN VERTICAL DATUM OF 1988. SEE MCDOT & NGS ONLINE RESOURCES FOR MORE INFORMATION

I.D. NUMBER	ELEV. (FT)	DESCRIPTION/LOCATION
MCDOT 31339-1M	865.0	FD 1" IP 0.4' DN W/ NO ID
MCDOT 31336-1	853.0	FD 2" IP 1' UP W/ 2 1/2" GLO BC STAMPED "T1S R6W S21 S22 S28 S27 1914"

NOTES

1) ALL AREAS DESIGNATED ZONE X ARE SHADED ZONE X, EXCEPT WHERE NOTED.

2) AREA LOCATED IN TOWNSHIP 1S, RANGE 6W, SECTIONS 20-22 AND 27-29.



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

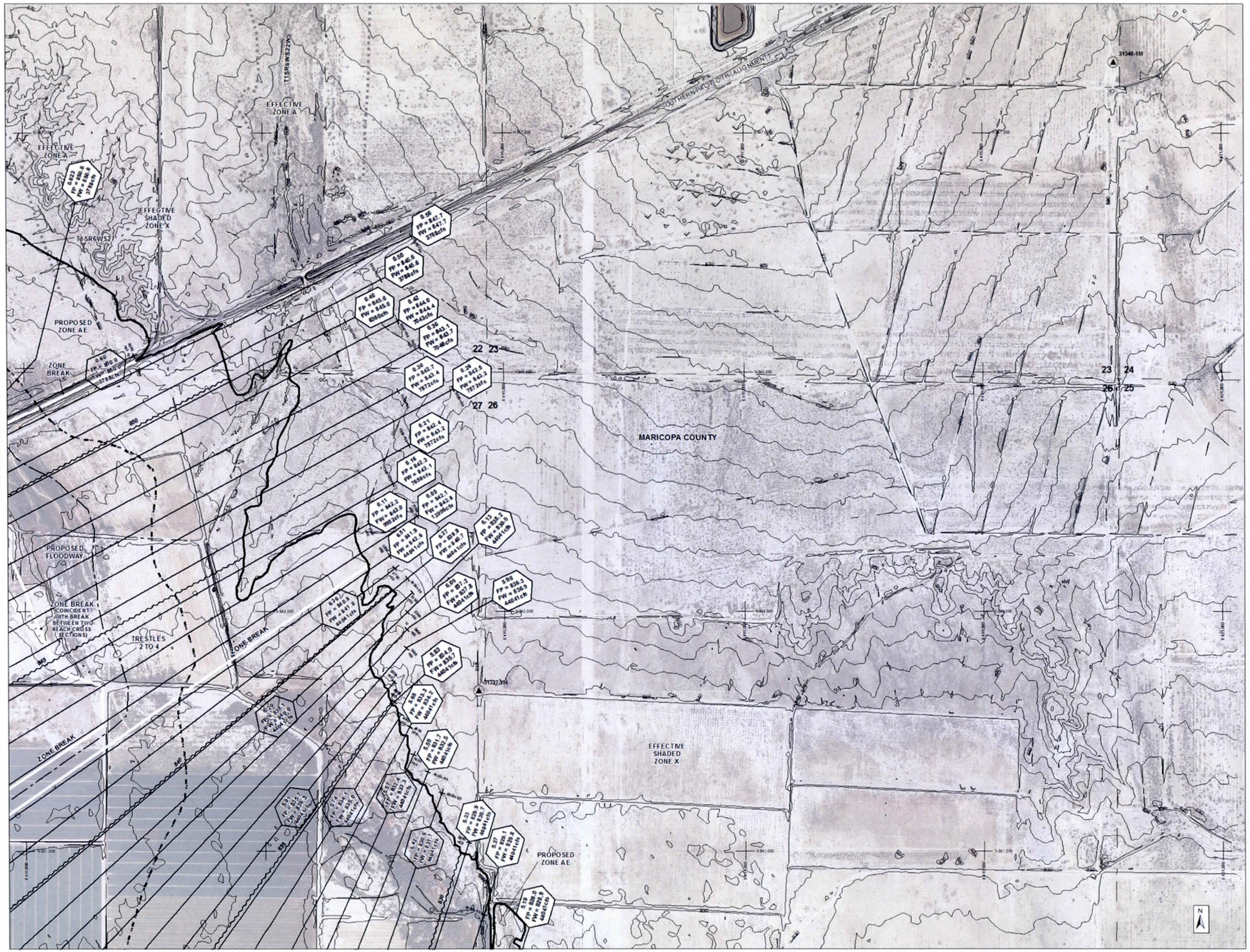
CENTENNIAL WASH FLOODPLAIN DELINEATION STUDY: GILA RIVER TO LA PAZ COUNTY

F.C.D. CONTRACT NUMBER 2012C004

52895 CHARLES M. DAVIS — REGISTERED PROFESSIONAL ENGINEER — ARIZONA, U.S.A.
Expires 12/31/2014

WEST Consultants, Inc.

	BY	DATE
DESIGN	---	---
DESIGN CHECK	---	---
PLANS	SJB	10/13
PLANS CHECK	CMD, JWH	10/13



AERIAL IMAGERY PROVIDED BY THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
FLIGHT DATE VARIES FROM SEPTEMBER THROUGH OCTOBER, 2010 AND 2011

400 200 0 400 800

NTS SCALE: 1" = 400 FEET CONTOUR INTERVAL = 2 FEET NTS

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1" = 200' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS

GROUND CONTROL SURVEY DATA & AERIAL MAPPING PROVIDED BY FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

LEGEND

ZONE AE BOUNDARIES (Revised / Effective)
FLOODWAY BOUNDARIES (Revised / Effective)
BASE FLOOD ELEVATION
HYDRAULIC BASELINE
ZONE AO1
ZONE AO2
ZONE AO3
ZONE A BOUNDARIES (Revised / Effective)

Cross Section River Mile Designation
Floodplain Water Surface Elevation
Floodway Water Surface Elevation
100-year Discharge
1.009
FP = 2222.33
FW = 2222.33
3333cfs
Cross Section Stationing Tick

ELEV. REFERENCE MARK

SECTION LINE AND ID 5

ELEVATION REFERENCE MARKS

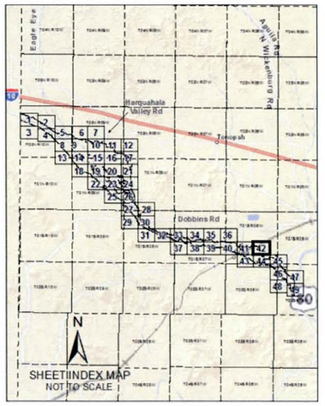
NOTE: ALL ELEVATIONS ARE BASED ON NORTH AMERICAN VERTICAL DATUM OF 1988. SEE MCDOT & NGS ONLINE RESOURCES FOR MORE INFORMATION.

I.D. NUMBER	ELEV. (FT)	DESCRIPTION/LOCATION
MCDOT 31327-1M	839.3	FD 1/2" RB W/O ID FL
MCDOT 31348-1M	863.8	FD 2" IP 1.6' DN W/ NO ID

NOTES

1) ALL AREAS DESIGNATED ZONE X ARE SHADED ZONE X, EXCEPT WHERE NOTED.

2) AREA LOCATED IN TOWNSHIP 1S, RANGE 6W, SECTIONS 22-27.



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CENTENNIAL WASH FLOODPLAIN DELINEATION STUDY: GILA RIVER TO LA PAZ COUNTY

F.C.D. CONTRACT NUMBER 2012C004

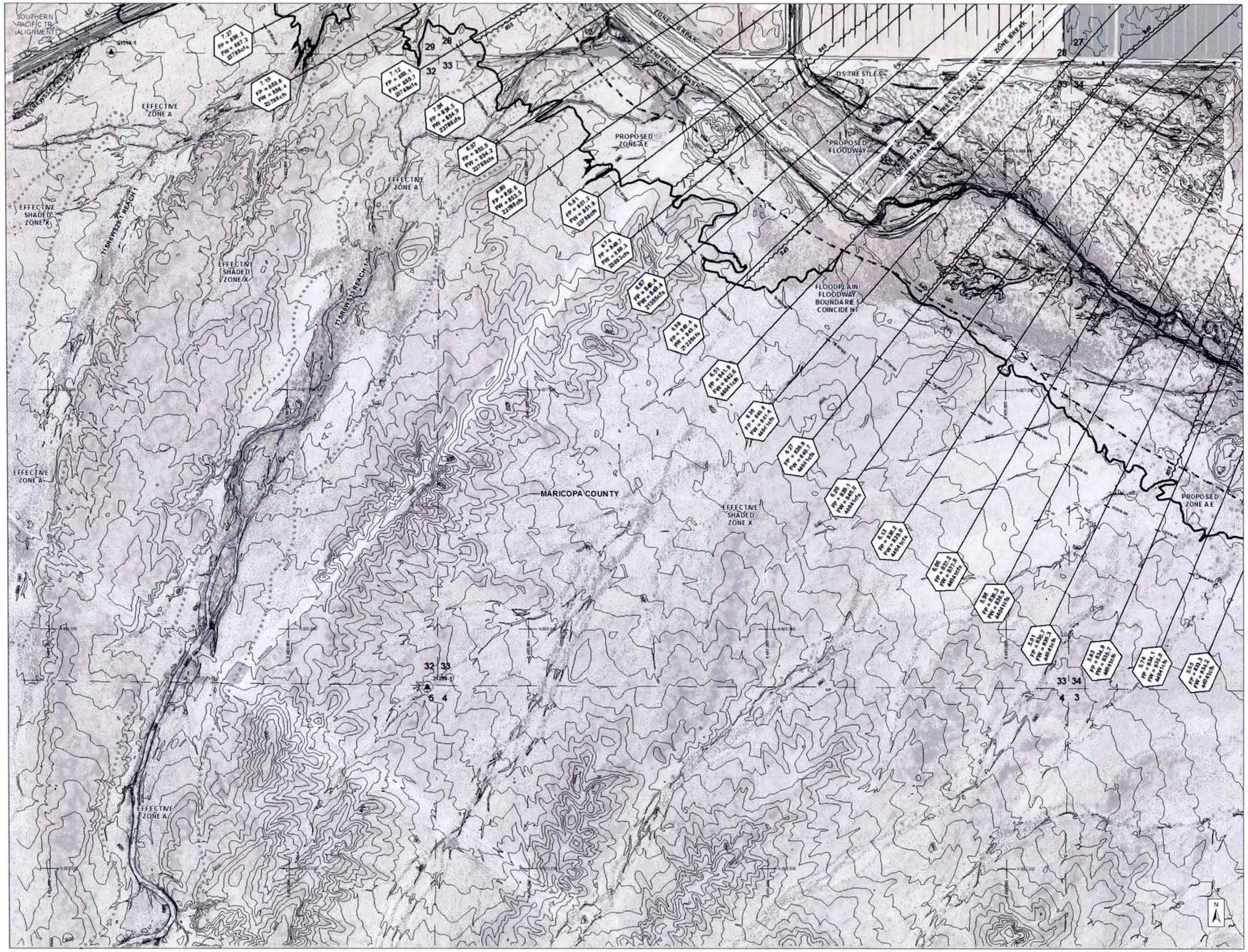
Professional Engineer Certificate (ESD) 52895 CHARLES M. DAVIS Date Signed 10-31-2013 ARIZONA, U.S.A.

Expires 12/31/2014

WEST Consultants, Inc.

	BY	DATE
DESIGN	---	---
DESIGN CHECK	---	---
PLANS	SJB	10/13
PLANS CHECK	CMD, JWH	10/13

MATCH LINE SHEET 41



MATCH LINE SHEET 44

AERIAL IMAGERY PROVIDED BY THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
FLIGHT DATE VARIES FROM SEPTEMBER THROUGH OCTOBER, 2010 AND 2011

400 200 0 400 800

NTS SCALE: 1" = 400 FEET CONTOUR INTERVAL = 2 FEET NTS

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1" = 200' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS.

GROUND CONTROL SURVEY DATA & AERIAL MAPPING PROVIDED BY FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

LEGEND

ZONE AE BOUNDARIES (Revised / Effective)
FLOODWAY BOUNDARIES (Revised / Effective)
BASE FLOOD ELEVATION
HYDRAULIC BASELINE
ZONE AO1
ZONE AO2
ZONE AO3
ZONE A BOUNDARIES (Revised / Effective)

Cross Section River Mile Designation
Floodplain Water Surface Elevation
Floodway Water Surface Elevation
100-year Discharge
1.009
FP = 2222.33
FW = 2222.33
3333cfs
Radii
Cross Section Stationing Tick

ELEV. REFERENCE MARK
SECTION LINE AND ID 5

ELEVATION REFERENCE MARKS

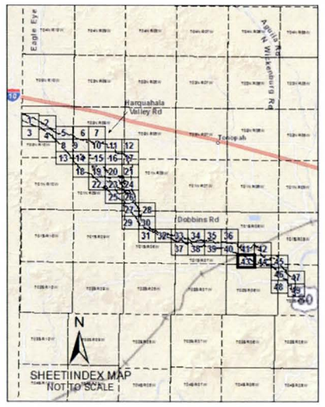
NOTE: ALL ELEVATIONS ARE BASED ON NORTH AMERICAN VERTICAL DATUM OF 1988. SEE MCDOT & NGS ONLINE RESOURCES FOR MORE INFORMATION.

I.D. NUMBER	ELEV. (FT)	DESCRIPTION/LOCATION
MCDOT 31319-1	866.0	FD 1" IP 1' UP W/ 2 1/2" GLO BC STAMPED "S29 1/4 S32 1914"
MCDOT 31298-1	874.7	FD 3" IP 0.8' UP W/ 3 1/2" GLO BC STAMPED "T1S S32 S33 R6W S5 S4 T2S 1914"

NOTES

1) ALL AREAS DESIGNATED ZONE X ARE SHADED ZONE X, EXCEPT WHERE NOTED.

2) AREA LOCATED IN TOWNSHIP 1S, RANGE 6W, SECTIONS 27-29 AND 32-34 AND TOWNSHIP 2S, RANGE 6W, SECTIONS 3-5.



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CENTENNIAL WASH FLOODPLAIN DELINEATION STUDY: GILA RIVER TO LA PAZ COUNTY

F.C.D. CONTRACT NUMBER 2012C004

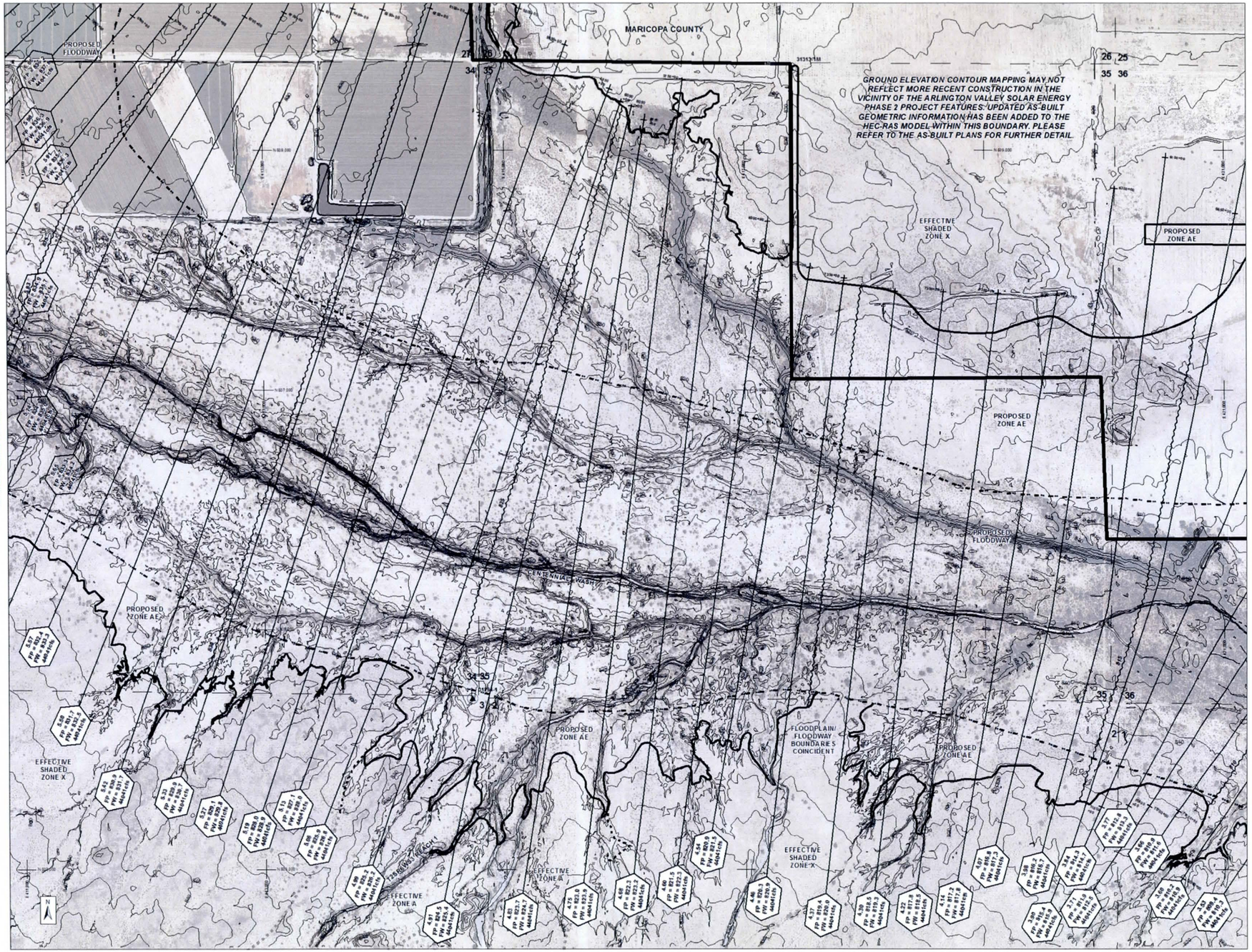
CERTIFICATE NO. 52695 CHARLES M. DAVIS Registered Professional Engineer ARIZONA, U.S.A. Expires 12/31/2014

WEST Consultants, Inc.

	BY	DATE
DESIGN	---	---
DESIGN CHECK	---	---
PLANS	SJB	10/13
PLANS CHECK	CMD, JWH	10/13

SHEET 43 OF 49

MATCH LINE SHEET 42



MATCH LINE SHEET 43

MATCH LINE SHEET 45

AERIAL IMAGERY PROVIDED BY THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
FLIGHT DATE VARIES FROM SEPTEMBER THROUGH OCTOBER, 2010 AND 2011

400 200 0 400 800

NTS SCALE: 1" = 400 FEET NTS
CONTOUR INTERVAL = 2 FEET

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1" = 200' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS

GROUND CONTROL SURVEY DATA & AERIAL MAPPING PROVIDED BY FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

LEGEND

ZONE AE BOUNDARIES (Revised / Effective)
FLOODWAY BOUNDARIES (Revised / Effective)
BASE FLOOD ELEVATION
HYDRAULIC BASELINE
ZONE AO1
ZONE AO2
ZONE AO3
ZONE A BOUNDARIES (Revised / Effective)

Cross Section River Mile Designation
Floodplain Water Surface Elevation
Floodway Water Surface Elevation
100-year Discharge
1.009
FP = 2222.33
FW = 2222.33
3333cfs
Cross Section Stationing Tick

ELEV. REFERENCE MARK
SECTION LINE AND ID 5

ELEVATION REFERENCE MARKS

NOTE: ALL ELEVATIONS ARE BASED ON NORTH AMERICAN VERTICAL DATUM OF 1988. SEE MCDOT & NGS ONLINE RESOURCES FOR MORE INFORMATION.

I.D. NUMBER	ELEV. (FT)	DESCRIPTION/LOCATION
MCDOT 31294-1	822.2	FD 3" IP 0.5' UP W/ 3 1/2" GLO BC STAMPED "T 1S S34 S35 R6W S3 S2 T2S 1914"
MCDOT 31313-1M	827.2	FD 1/2" RB W/ 2" MC AL CAP STAMPED "T1S R6W S27 S26 S34 S35 RLS 36563 2004"

NOTES

1) ALL AREAS DESIGNATED ZONE X ARE SHADED ZONE X, EXCEPT WHERE NOTED.

2) AREA LOCATED IN TOWNSHIP 1S, RANGE 6W, SECTIONS 25-27 AND 34-36 AND TOWNSHIP 2S, RANGE 6W, SECTIONS 1-3.

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

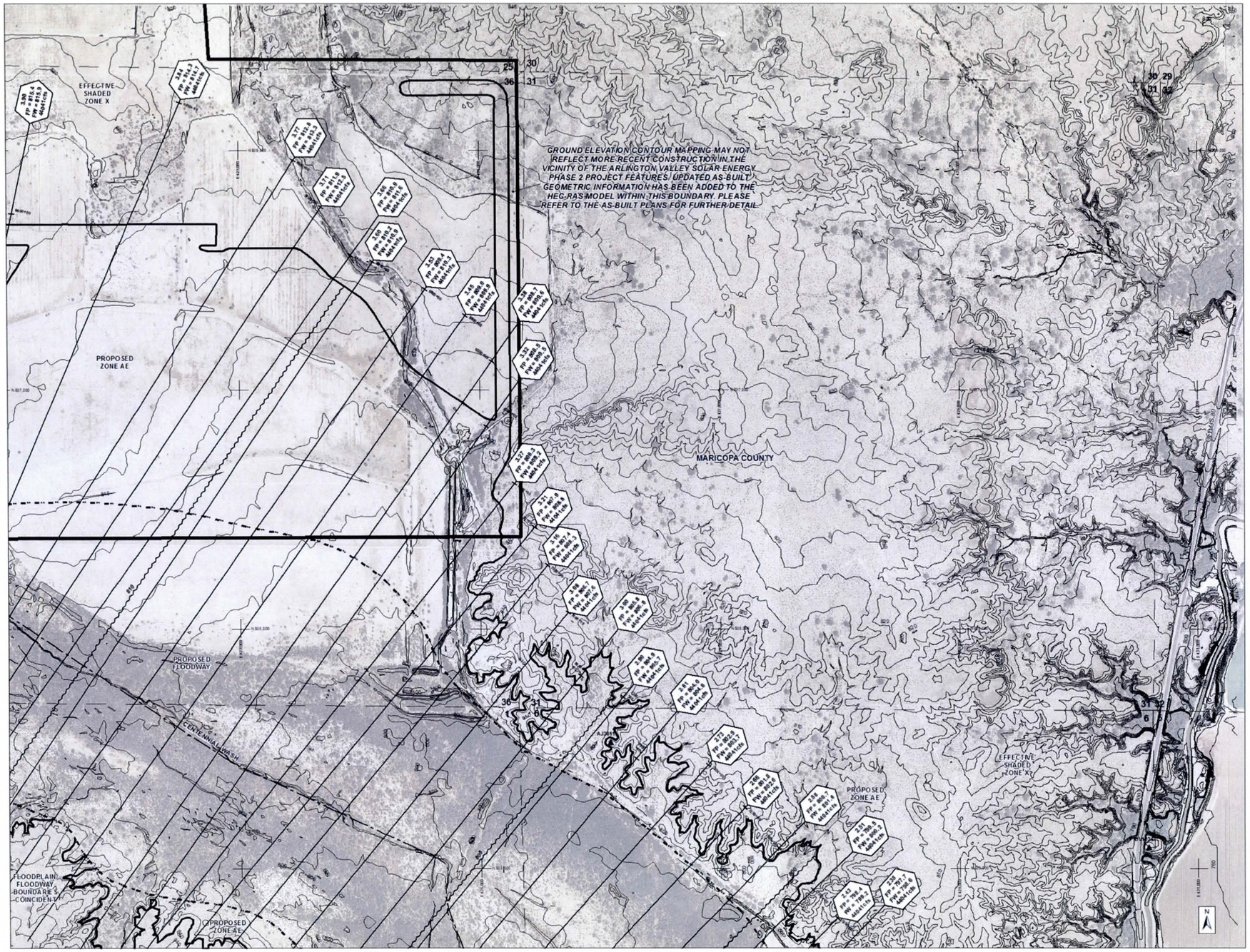
CENTENNIAL WASH FLOODPLAIN DELINEATION STUDY: GILA RIVER TO LA PAZ COUNTY

F.C.D. CONTRACT NUMBER 2012C004

52895 CHARLES M. DAVIS — Expires 12/31/2014

WEST Consultants, Inc.

	BY	DATE
DESIGN	---	---
DESIGN CHECK	---	---
PLANS	SJB	10/13
PLANS CHECK	CMD, JWH	10/13



AERIAL IMAGERY PROVIDED BY THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
FLIGHT DATE VARIES FROM SEPTEMBER THROUGH OCTOBER, 2010 AND 2011

400 200 0 400 800

NTS SCALE: 1" = 400 FEET CONTOUR INTERVAL = 2 FEET NTS

LEGEND

ZONE AE BOUNDARIES — Revised / Effective
FLOODWAY BOUNDARIES — Revised / Effective
BASE FLOOD ELEVATION
HYDRAULIC BASELINE
ZONE AO1
ZONE AO2
ZONE AO3
ZONE A BOUNDARIES — Revised / Effective

Cross Section River Mile Designation
Floodplain Water Surface Elevation
Floodway Water Surface Elevation
100-year Discharge
1.089
FP = 2222.33
FW = 2222.33
3333cfs
Cross Section Stationing Tick

ELEV. REFERENCE MARK
SECTION LINE AND ID 5

ELEVATION REFERENCE MARKS

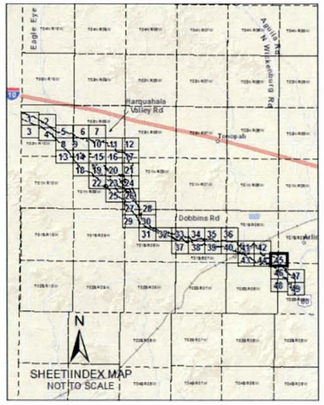
NOTE: ALL ELEVATIONS ARE BASED ON NORTH AMERICAN VERTICAL DATUM OF 1988. SEE MCDOT & NGS ONLINE RESOURCES FOR MORE INFORMATION.

I.D. NUMBER	ELEV. (FT)	DESCRIPTION/LOCATION
NGS AJ3811	806.5	STAINLESS STEEL ROD IN SLEEVE
NGS DV1236	793.0	AT DEEP WATER WELL IRRIGATION PUMP ON WEST BANK OF GILA BEND CANAL

NOTES

1) ALL AREAS DESIGNATED ZONE X ARE SHADED ZONE X, EXCEPT WHERE NOTED.

2) AREA LOCATED IN TOWNSHIP 1S, RANGE 5W, SECTIONS 29-32 AND RANGE 6W, SECTIONS 25 AND 36; AND TOWNSHIP 2S, RANGE 5W, SECTIONS 5-6 AND RANGE 6W, SECTION 1.



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CENTENNIAL WASH FLOODPLAIN DELINEATION STUDY: GILA RIVER TO LA PAZ COUNTY

F.C.D. CONTRACT NUMBER 2012C004

Registered Professional Engineer — CERTIFICATE NO. 52695 — CHARLES M. DAVIS — STATE OF ARIZONA, U.S.A.
Expires 12/31/2014

WEST Consultants, Inc.

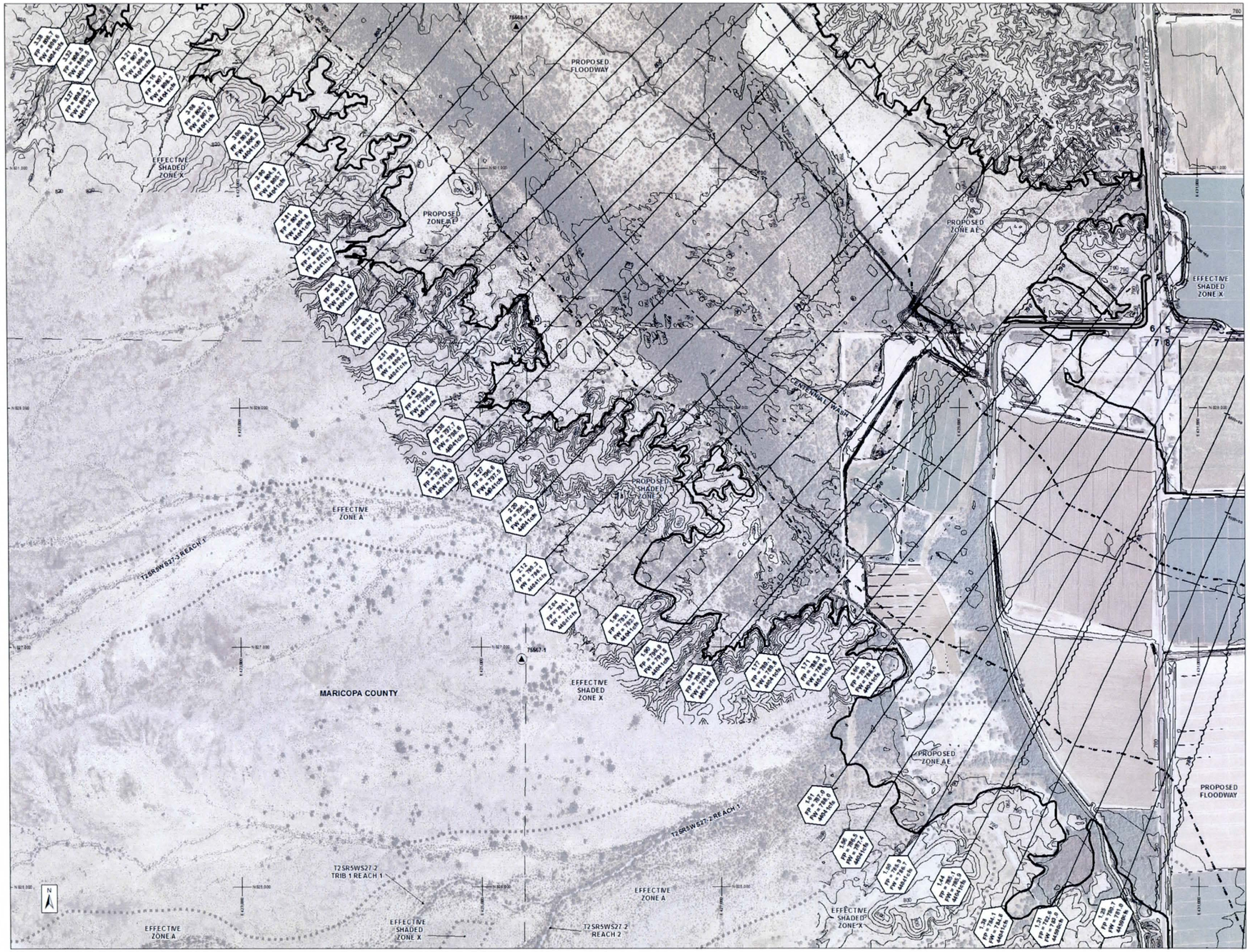
	BY	DATE
DESIGN	---	---
DESIGN CHECK	---	---
PLANS	SJB	10/13
PLANS CHECK	CMD, JWH	10/13

SHEET 45 OF 49

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1" = 200' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS

GROUND CONTROL SURVEY DATA & AERIAL MAPPING PROVIDED BY FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

MATCH LINE SHEET 45



MATCH LINE SHEET 47

MATCH LINE SHEET 48

AERIAL IMAGERY PROVIDED BY THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
FLIGHT DATE VARIES FROM SEPTEMBER THROUGH OCTOBER, 2010 AND 2011

400 200 0 400 800

NTS SCALE: 1" = 400 FEET NTS
CONTOUR INTERVAL = 2 FEET

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1" = 200' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS

GROUND CONTROL SURVEY DATA & AERIAL MAPPING PROVIDED BY FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

LEGEND

ZONE AE BOUNDARIES (Revised / Effective)
FLOODWAY BOUNDARIES (Revised / Effective)
BASE FLOOD ELEVATION
HYDRAULIC BASELINE
ZONE AO1
ZONE AO2
ZONE AO3
ZONE A BOUNDARIES (Revised / Effective)

Cross Section River Mile Designation
Floodplain Water Surface Elevation
Floodway Water Surface Elevation
100-year Discharge
1.009
FP = 2222.33
FW = 2222.33
3333cfs
Cross Section Stationing Tick

ELEV. REFERENCE MARK
SECTION LINE AND ID 5

ELEVATION REFERENCE MARKS

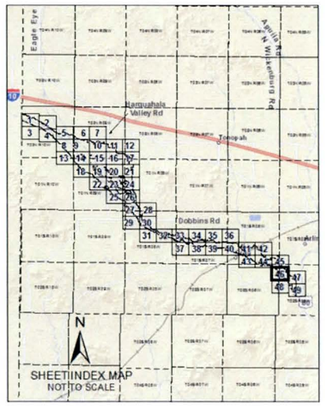
NOTE: ALL ELEVATIONS ARE BASED ON NORTH AMERICAN VERTICAL DATUM OF 1988. SEE MCDOT & NGS ONLINE RESOURCES FOR MORE INFORMATION.

I.D. NUMBER	ELEV. (FT)	DESCRIPTION/LOCATION
MCDOT 75568-1	796.4	FD 2 1/2" STEEP PIPE 0.1' UP W/ 3 1/4" BLM BC STAMPED "1/4 S1 1955"
MCDOT 75567-1	802.4	FD 2 1/2" STEEL PIPE 0.7' UP W/ 3 1/4" BLM BC STAMPED "1/4 S12 1955"

NOTES

1) ALL AREAS DESIGNATED ZONE X ARE SHADED ZONE X, EXCEPT WHERE NOTED.

2) AREA LOCATED IN TOWNSHIP 2S, RANGE 5W, SECTIONS 5-8 AND RANGE 6W, SECTIONS 1 AND 12.



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CENTENNIAL WASH FLOODPLAIN DELINEATION STUDY: GILA RIVER TO LA PAZ COUNTY

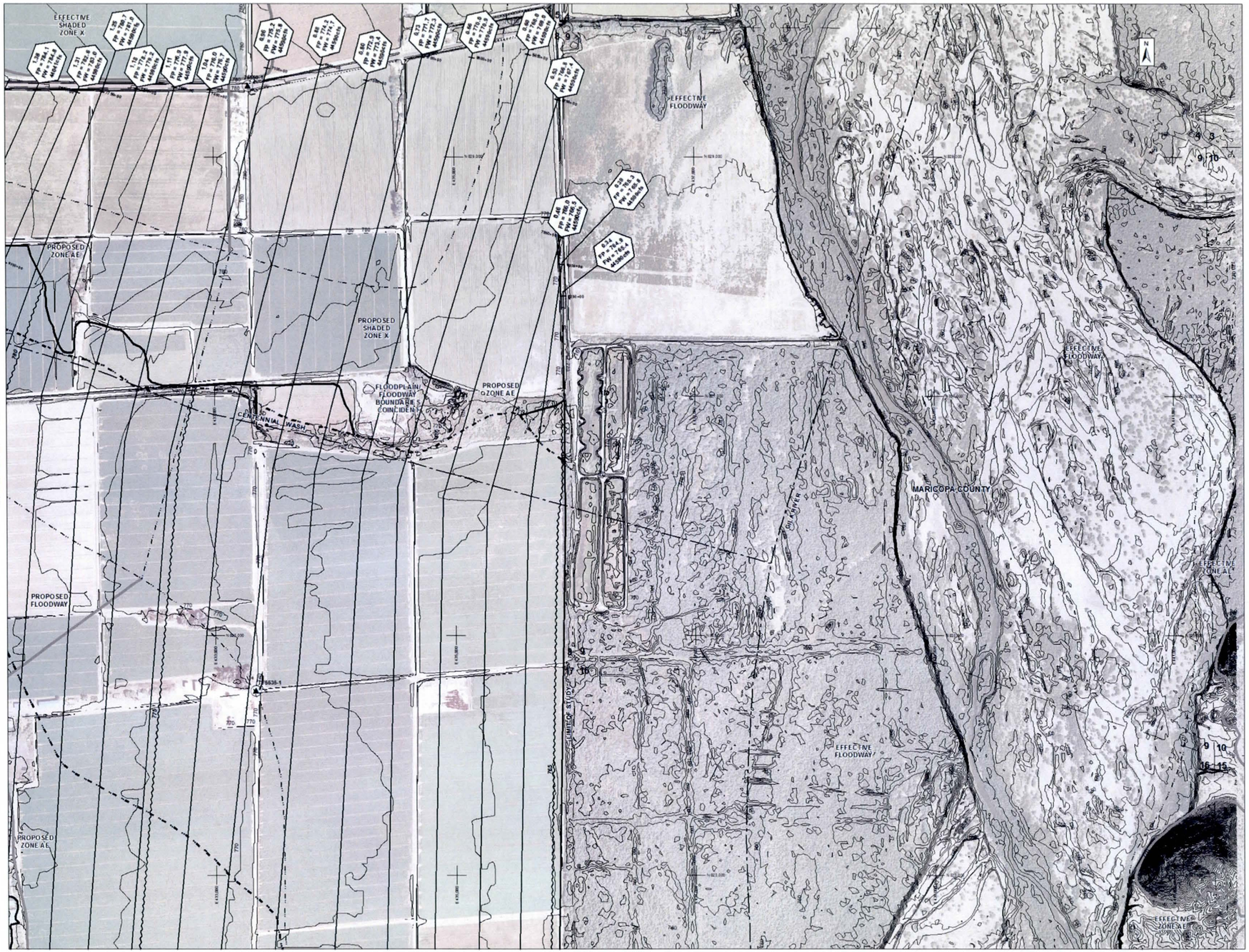
F.C.D. CONTRACT NUMBER 2012C004

52895 CHARLES M. DAVIS — CERTIFICATE NO. — REGISTERED PROFESSIONAL ENGINEER — ARIZONA, U.S.A.
Expires 12/31/2014

WEST Consultants, Inc.

	BY	DATE
DESIGN	---	---
DESIGN CHECK	---	---
PLANS	SJB	10/13
PLANS CHECK	CMD, JWH	10/13

SHEET 46 OF 49



AERIAL IMAGERY PROVIDED BY THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
FLIGHT DATE VARIES FROM SEPTEMBER THROUGH OCTOBER, 2010 AND 2011

400 200 0 400 800

NTS SCALE: 1" = 400 FEET NTS
CONTOUR INTERVAL = 2 FEET

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1" = 200' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS

GROUND CONTROL SURVEY DATA & AERIAL MAPPING PROVIDED BY FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

LEGEND

ZONE AE BOUNDARIES (Revised / Effective)
FLOODWAY BOUNDARIES (Revised / Effective)
BASE FLOOD ELEVATION
HYDRAULIC BASELINE
ZONE AO1
ZONE AO2
ZONE AO3
ZONE A BOUNDARIES (Revised / Effective)

Cross Section River Mile Designation
Floodplain Water Surface Elevation
Floodway Water Surface Elevation
100-year Discharge
1.009
FP = 2222.33
FW = 2222.33
3333cfs
Cross Section Stationing Tick

ELEV. REFERENCE MARK
SECTION LINE AND ID 5

ELEVATION REFERENCE MARKS

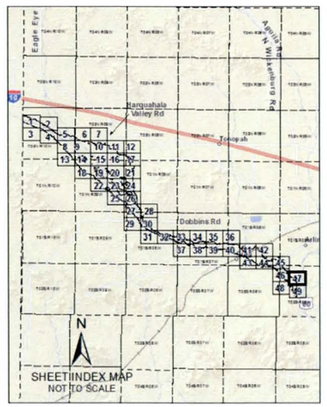
NOTE: ALL ELEVATIONS ARE BASED ON NORTH AMERICAN VERTICAL DATUM OF 1988. SEE MCDOT & NGS ONLINE RESOURCES FOR MORE INFORMATION

I.D. NUMBER	ELEV. (FT)	DESCRIPTION/LOCATION
MCDOT 75550-1	780.6	FD 5/8" RB W/ 3 1/4" A.C. 0.2' DN STAMPED "36562"
MCDOT 75535-1	770.1	FD 1/2" RB W/ NO ID 0.2' DN

NOTES

1) ALL AREAS DESIGNATED ZONE X ARE SHADED ZONE X, EXCEPT WHERE NOTED.

2) AREA LOCATED IN TOWNSHIP 2S, RANGE 5W, SECTIONS 3-5, 8-19, AND 15-17.



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CENTENNIAL WASH FLOODPLAIN DELINEATION STUDY: GILA RIVER TO LA PAZ COUNTY

F.C.D. CONTRACT NUMBER 2012C004

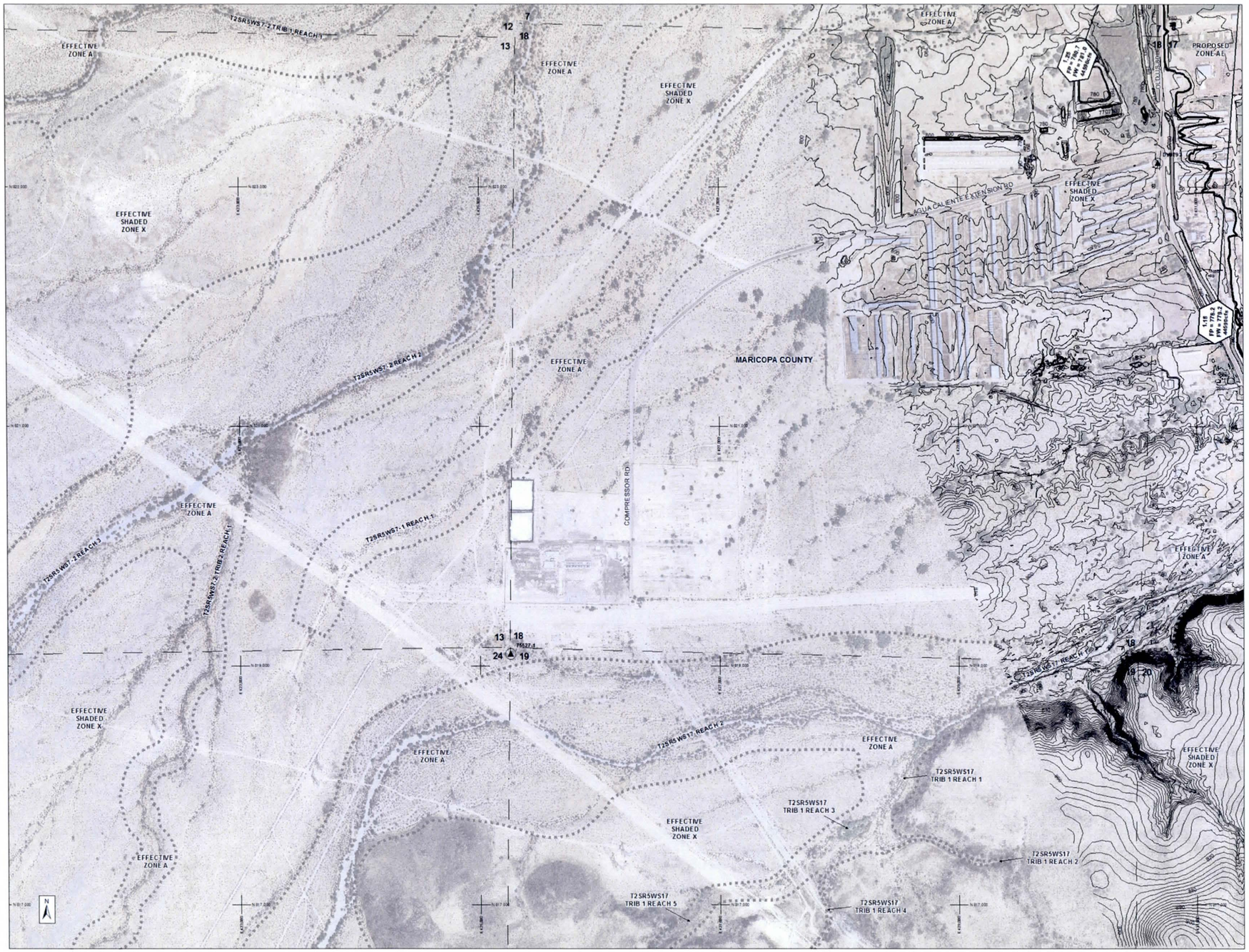
REGISTERED LAND SURVEYOR CERTIFICATE NO. 52895 CHARLES M. DAVIS ARIZONA, U.S.A.
Expires 12/31/2014

WEST Consultants, Inc.

	BY	DATE
DESIGN	---	---
DESIGN CHECK	---	---
PLANS	SJB	10/13
PLANS CHECK	CMD, JWH	10/13

SHEET 47 OF 49

MATCH LINE SHEET 46



MATCH LINE SHEET 47

MATCH LINE SHEET 49

AERIAL IMAGERY PROVIDED BY THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
FLIGHT DATE VARIES FROM SEPTEMBER THROUGH OCTOBER, 2010 AND 2011

400 200 0 400 800

NTS SCALE: 1" = 400 FEET NTS
CONTOUR INTERVAL = 2 FEET

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1" = 200' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS

GROUND CONTROL SURVEY DATA & AERIAL MAPPING PROVIDED BY FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

LEGEND

ZONE AE BOUNDARIES (Revised / Effective)
FLOODWAY BOUNDARIES (Revised / Effective)
BASE FLOOD ELEVATION
HYDRAULIC BASELINE
ZONE AO1
ZONE AO2
ZONE AO3
ZONE A BOUNDARIES (Revised / Effective)

Cross Section River Mile Designation
Floodplain Water Surface Elevation
Floodway Water Surface Elevation
100-year Discharge
1.009
FP = 2222.33
FW = 2222.33
3333cfs
Cross Section Stationing Tick

ELEV. REFERENCE MARK
SECTION LINE AND ID 5

ELEVATION REFERENCE MARKS

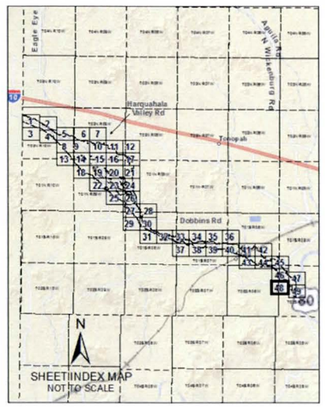
NOTE: ALL ELEVATIONS ARE BASED ON NORTH AMERICAN VERTICAL DATUM OF 1988. SEE MCDOT & NGS ONLINE RESOURCES FOR MORE INFORMATION.

I.D. NUMBER	ELEV. (FT)	DESCRIPTION/LOCATION
MCDOT 75527-1	833.3	FD 2 1/2" STEEL PIPE 0.7' UP W/ 3 1/4" BLM BC STAMPED "R6W R5W S13 S18 S19 1955" SET IN TOP OF CONCRETE POST REINFORCED BY 24" BLOCK OF CONCRETE
NGS DV0793	787.5	

NOTES

1) ALL AREAS DESIGNATED ZONE X ARE SHADED ZONE X, EXCEPT WHERE NOTED.

2) AREA LOCATED IN TOWNSHIP 2S, RANGE 5W, SECTIONS 7-8 AND 17-20 AND RANGE 6W, SECTIONS 12-13 AND 24.



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CENTENNIAL WASH FLOODPLAIN DELINEATION STUDY: GILA RIVER TO LA PAZ COUNTY

F.C.D. CONTRACT NUMBER 2012C004

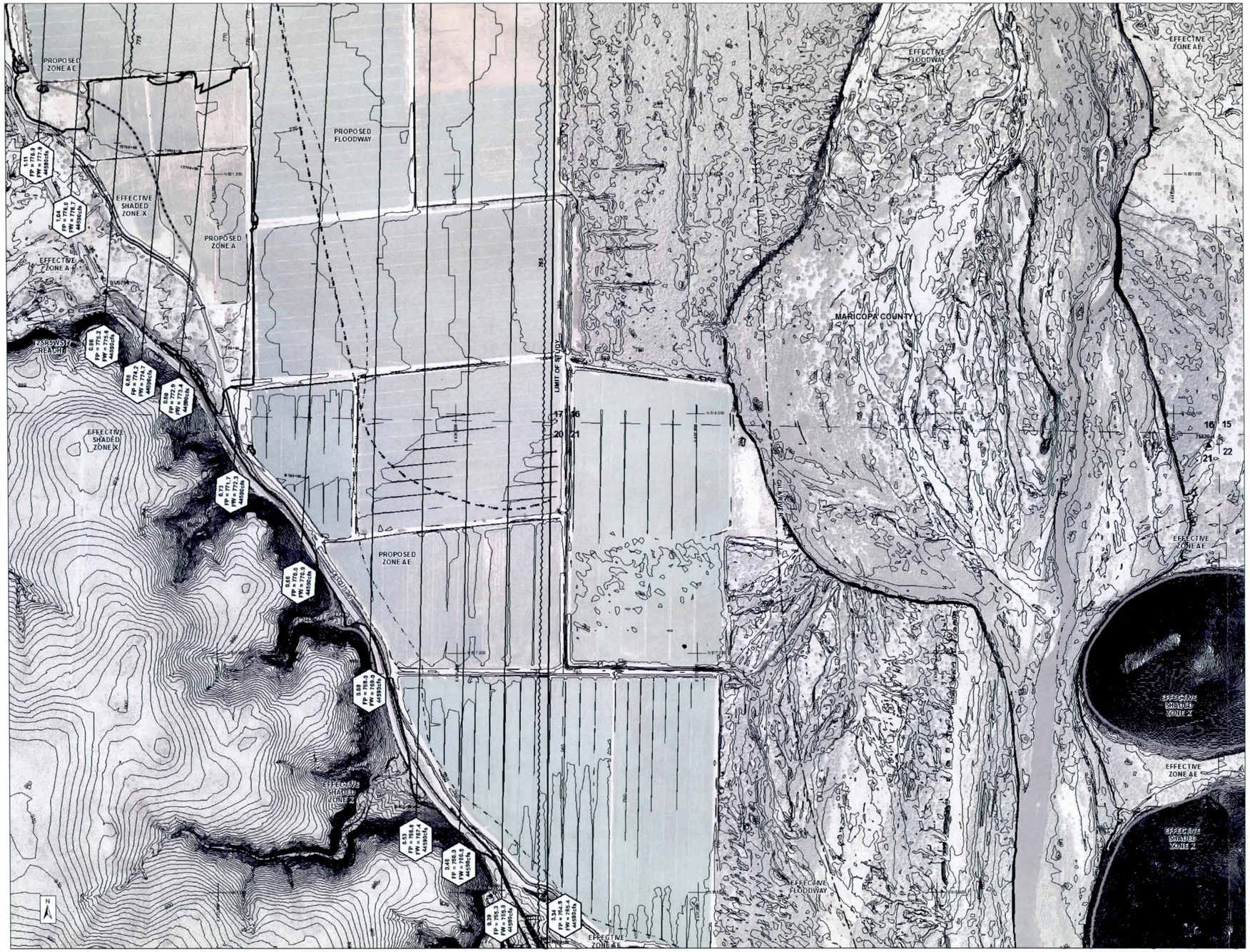
52855
CHARLES M. DAVIS
CERTIFICATE NO.
REGISTERED PROFESSIONAL ENGINEER
ARIZONA, U.S.A.
Expires 12/31/2014

WEST Consultants, Inc.

	BY	DATE
DESIGN	---	---
DESIGN CHECK	---	---
PLANS	SJB	10/13
PLANS CHECK	CMD, JWH	10/13

MATCH LINE SHEET 47

MATCH LINE SHEET 48



AERIAL IMAGERY PROVIDED BY THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
FLIGHT DATE VARIES FROM SEPTEMBER THROUGH OCTOBER, 2010 AND 2011

400 200 0 400 800

SCALE: 1" = 400 FEET
CONTOUR INTERVAL = 2 FEET

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1" = 200' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS.

GROUND CONTROL SURVEY DATA & AERIAL MAPPING PROVIDED BY FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

LEGEND

ZONE AE BOUNDARIES — Revised / Effective
FLOODWAY BOUNDARIES — Revised / Effective
BASE FLOOD ELEVATION
HYDRAULIC BASELINE
ZONE AO1
ZONE AO2
ZONE AO3
ZONE A BOUNDARIES — Revised / Effective

Cross Section River Mile Designation
Floodplain Water Surface Elevation
Floodway Water Surface Elevation
100-year Discharge
1.009
FP = 2222.33
FW = 2222.33
3333cfs
Cross Section Stationing Tick

ELEV. REFERENCE MARK
SECTION LINE AND ID 5

ELEVATION REFERENCE MARKS

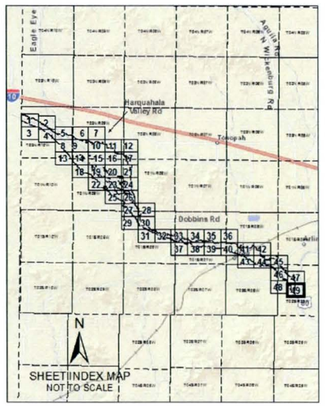
NOTE: ALL ELEVATIONS ARE BASED ON NORTH AMERICAN VERTICAL DATUM OF 1988. SEE MCDOT & NGS ONLINE RESOURCES FOR MORE INFORMATION.

I.D. NUMBER	ELEV. (FT)	DESCRIPTION/LOCATION
NGS DV0794	781.8	2.5' NORTH OF METAL WITNESS POST, 1' BELOW HIGHWAY, SET IN TOP OF CONCRETE POST
MCDOT 75520-1	763.4	FD 2 1/2" STEEL PIPE 0.6' UP W/ 3 1/4" BLM BC STAMPED "BLM T2S R5W S16 S15 S21 S22 1958"

NOTES

1) ALL AREAS DESIGNATED ZONE X ARE SHADED ZONE X, EXCEPT WHERE NOTED.

2) AREA LOCATED IN TOWNSHIP 2S, RANGE 5W, SECTIONS 15-17 AND 20-22.



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CENTENNIAL WASH FLOODPLAIN DELINEATION STUDY: GILA RIVER TO LA PAZ COUNTY

F.C.D. CONTRACT NUMBER 2012C004

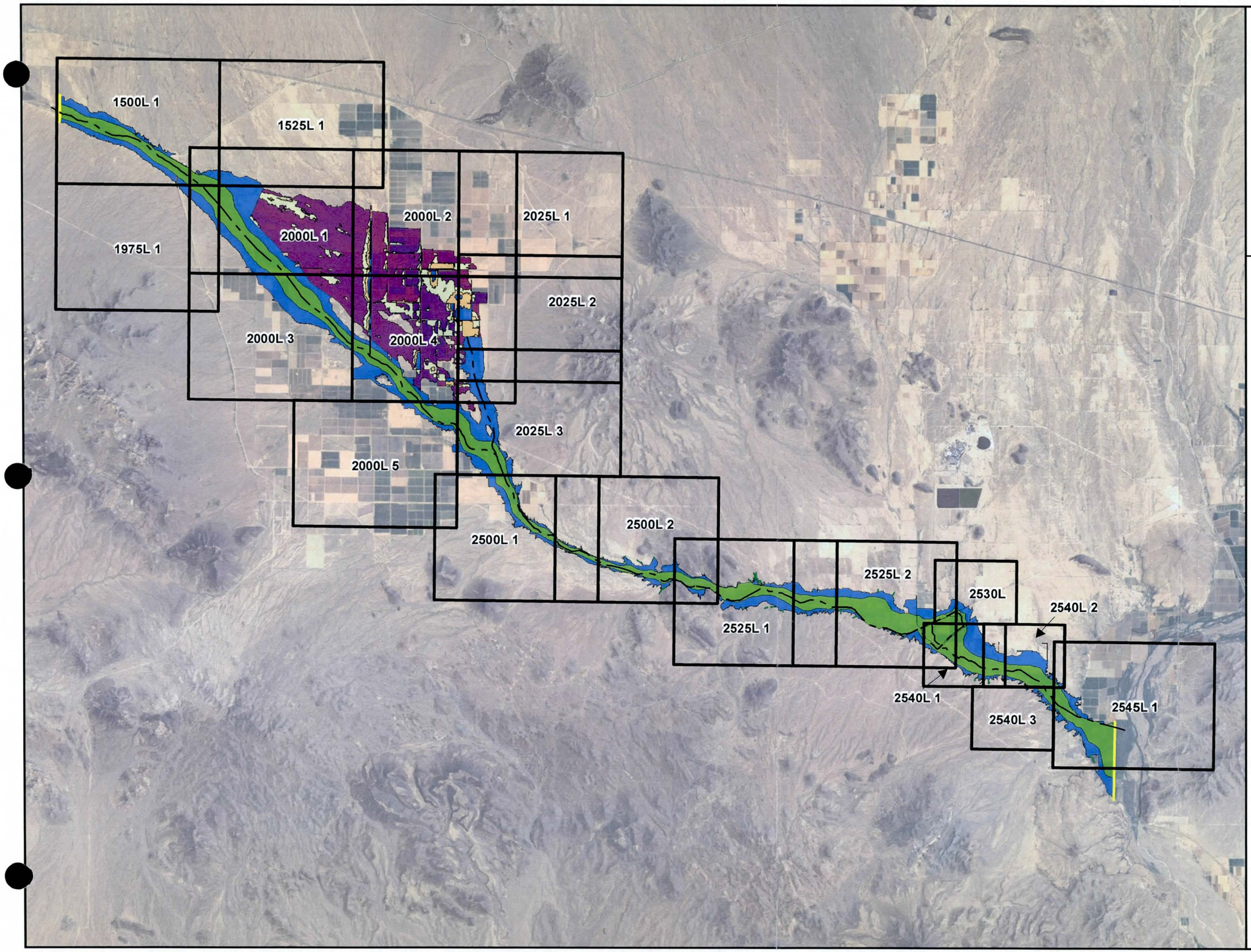
52895 CHARLES M. DAVIS — Expires 12/31/2014

WEST Consultants, Inc.

	BY	DATE
DESIGN	---	---
DESIGN CHECK	---	---
PLANS	SJB	10/13
PLANS CHECK	CMD, JWH	10/13

EXHIBIT B

Annotated Flood Insurance Rate Maps



LEGEND

- PROFILE BASELINE
- LIMIT OF STUDY
- PROPOSED FLOODWAY
- PROPOSED ZONE AE
- PROPOSED ZONE AO1
- PROPOSED ZONE AO2
- PROPOSED ZONE AO3
- 1600L-3 — ANNOTATED PANEL SHEET BOUNDARY & NO.

N

APPROXIMATE SCALE

15,000 7,500 0 15,000 Feet

NFIP

PANEL INDEX

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

MARICOPA COUNTY, ARIZONA
(AND INCORPORATED AREAS)

ONLY PANEL PRINTED

COMMUNITY NUMBER
04013C

EFFECTIVE DATE
OCTOBER 16, 2013

Federal Emergency Management Agency

T. 3 N.
T. 2 N.

DV1029

DV1572
T. 3 N.
T. 2 N.

LIMIT OF STUDY

NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 3 NORTH, RANGE 10 WEST AND TOWNSHIP 2 NORTH, RANGE 10 WEST.

Centennial Wash

Tiger Wash

AGUILA RD.

ZONE AE

ZONE A

CENTENNIAL WASH

CJ CK CI CH CG CF CE CD CC CB CA BZ

1319 1320 1314 1310 1308 1304 1300 1298 1294 1290 1286 1282 1278 1274 1270 1266 1262 1258 1254 1250 1246 1242 1238

6 5 4 3 2 7 8 9 10 11 18 17 16 15 14 19 20 21 22 23

JOINS PANEL 1975

SHEET 1500L

LEGEND

- PROFILE BASELINE
- PROPOSED ZONE A TIE-IN
- PROPOSED FLOODWAY
- PROPOSED ZONE AE
- PROPOSED ZONE AO1
- PROPOSED ZONE AO2
- PROPOSED ZONE AO3

N

APPROXIMATE SCALE

2,000 1,000 0 2,000 FEET

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1500L

FIRM

FLOOD INSURANCE RATE MAP

MARICOPA COUNTY, ARIZONA
(AND INCORPORATED AREAS)

ONLY PANEL PRINTED

CENTENNIAL WASH FDS:
GILA RIVER TO LA PAZ COUNTY

COMMUNITY-PANEL NUMBER
04013C1500L

EFFECTIVE DATE
OCTOBER 16, 2013

Federal Emergency Management Agency

SHEET 1525L

LEGEND

- PROFILE BASELINE
- PROPOSED ZONE A TIE-IN
- PROPOSED FLOODWAY
- PROPOSED ZONE AE
- PROPOSED ZONE AO1
- PROPOSED ZONE AO2
- PROPOSED ZONE AO3

N

APPROXIMATE SCALE

2,000 1,000 0 2,000 FEET

NFIP

PANEL 1525L

FIRM

FLOOD INSURANCE RATE MAP

MARICOPA COUNTY, ARIZONA
(AND INCORPORATED AREAS)

ONLY PANEL PRINTED

CENTENNIAL WASH FDS:
GILA RIVER TO LA PAZ COUNTY

COMMUNITY-PANEL NUMBER
04013C1525L

EFFECTIVE DATE
OCTOBER 16, 2013

Federal Emergency Management Agency

NATIONAL FLOOD INSURANCE PROGRAM

MARICOPA COUNTY
UNINCORPORATED AREAS
040037

T. 3 N.
T. 2 N.

DV1030 DV1534 DV1031 DV1536 DV1032 DV1033 DV1034 DV1036 DV1037 DV1035 DV1355 DV1354 DV1539 DV1038

HARQUAHALA

SALOME RD

N 523RD AVE

547TH AVE

523RD AVE

Tiger Wash

FLOODING EFFECTS FROM CENTENNIAL WASH

ZONE AE

1240

1218

BV BX BW BV BU BT

R.10W. R.9W.

SHEET 1975L

LEGEND

- PROFILE BASELINE
- PROPOSED ZONE A TIE-IN
- PROPOSED FLOODWAY
- PROPOSED ZONE AE
- PROPOSED ZONE AO1
- PROPOSED ZONE AO2
- PROPOSED ZONE AO3

N

APPROXIMATE SCALE

2,000 1,000 0 2,000 FEET

MARICOPA COUNTY
UNINCORPORATED AREAS
040037

ZONE AE

CENTENNIAL WASH

Centennial Wash

PROFILE BASE LINE

ZONE AE

579TH AVE

W THOMAS RD

THOMAS RD

CENTENNIAL RD

EL PASO PIPELINE

557TH AVE

EL PASO PIPELINE

CA 1247 BZ BY BX BW BV

19 20 21 22 30 29 28 27 26 31 32 33 34 35 6 5 4 3 2

T. 2 N.
T. 1 N.

T. 2 N.
T. 1 N.

NFIP

PANEL 1975L

FIRM

FLOOD INSURANCE RATE MAP

MARICOPA COUNTY, ARIZONA
(AND INCORPORATED AREAS)

ONLY PANEL PRINTED

CENTENNIAL WASH FDS:
GILA RIVER TO LA PAZ COUNTY

COMMUNITY-PANEL NUMBER
04013C1975L

EFFECTIVE DATE
OCTOBER 16, 2013

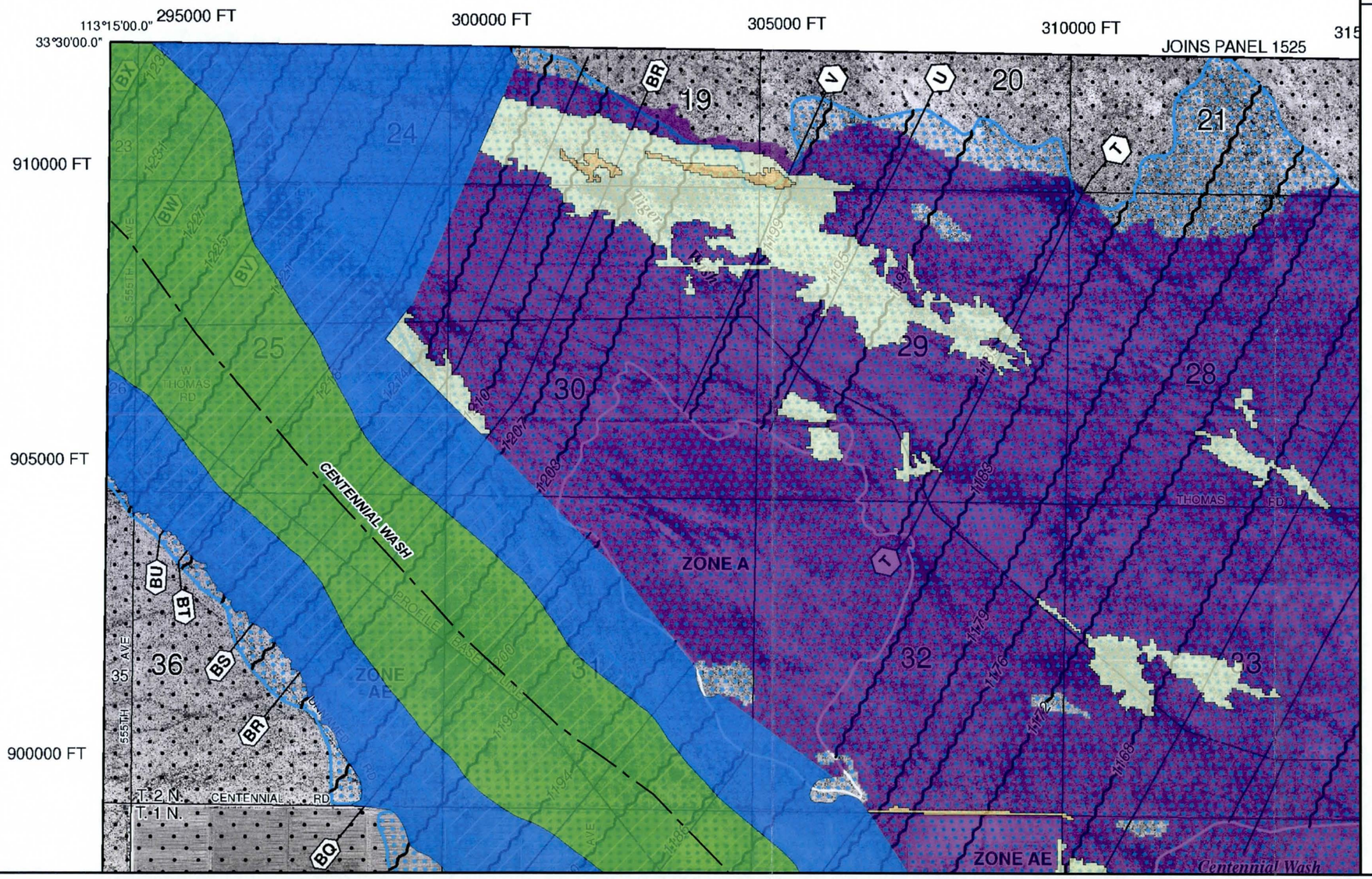
Federal Emergency Management Agency

NATIONAL FLOOD INSURANCE PROGRAM

SHEET 2000L-1

LEGEND

- PROFILE BASELINE
- PROPOSED ZONE A TIE-IN
- PROPOSED FLOODWAY
- PROPOSED ZONE AE
- PROPOSED ZONE AO1
- PROPOSED ZONE AO2
- PROPOSED ZONE AO3



N

APPROXIMATE SCALE

2,000 1,000 0 2,000 FEET

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 2000L

FIRM

FLOOD INSURANCE RATE MAP

MARICOPA COUNTY, ARIZONA
(AND INCORPORATED AREAS)

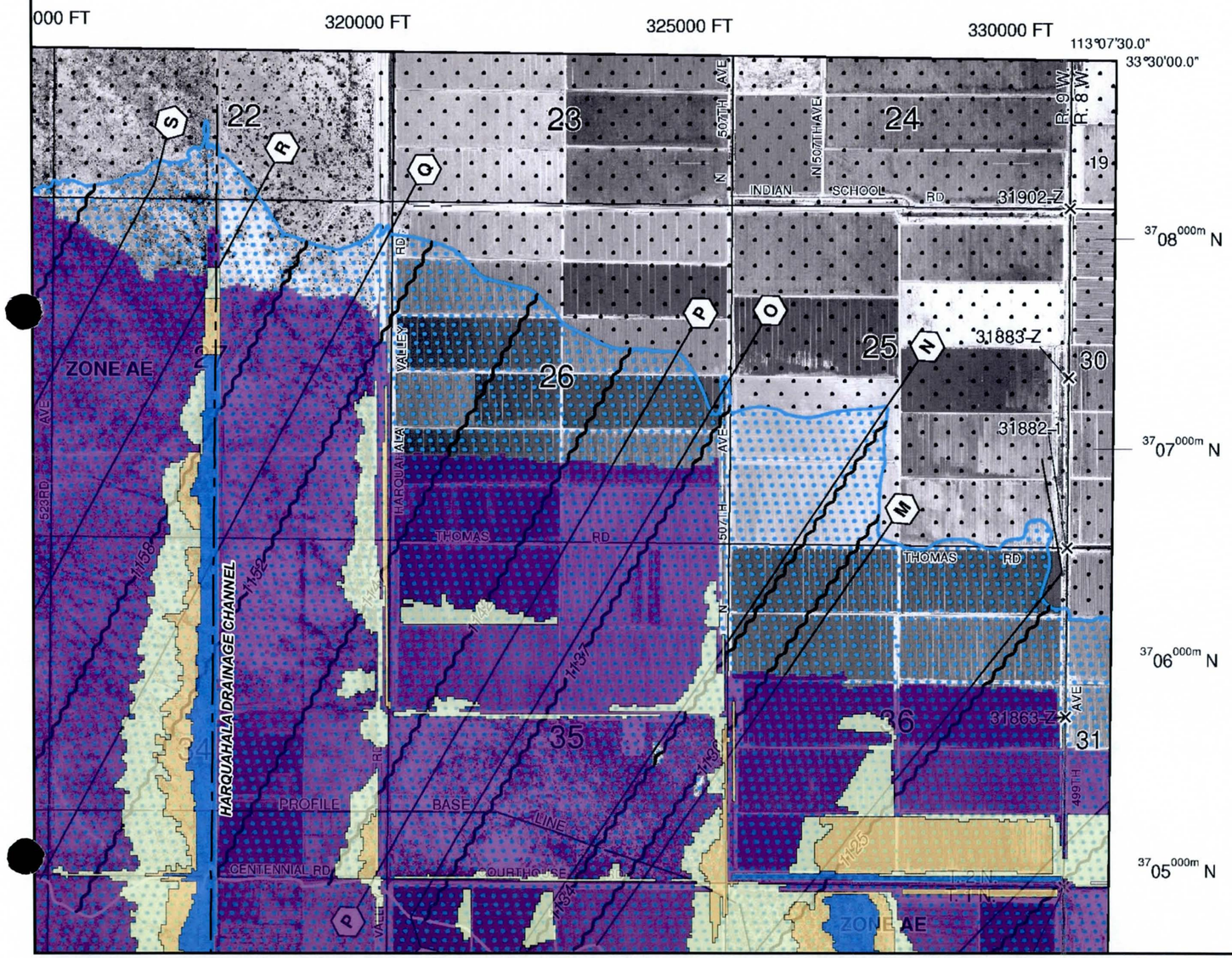
ONLY PANEL PRINTED

CENTENNIAL WASH FDS:
GILA RIVER TO LA PAZ COUNTY

COMMUNITY-PANEL NUMBER
04013C2000L

EFFECTIVE DATE
OCTOBER 16, 2013

Federal Emergency Management Agency



SHEET 2000L-2

LEGEND

- PROFILE BASELINE
- PROPOSED ZONE A TIE-IN
- PROPOSED FLOODWAY
- PROPOSED ZONE AE
- PROPOSED ZONE AO1
- PROPOSED ZONE AO2
- PROPOSED ZONE AO3

N

APPROXIMATE SCALE

2,000 1,000 0 2,000 FEET

NFIP

PANEL 2000L

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

MARICOPA COUNTY, ARIZONA
(AND INCORPORATED AREAS)

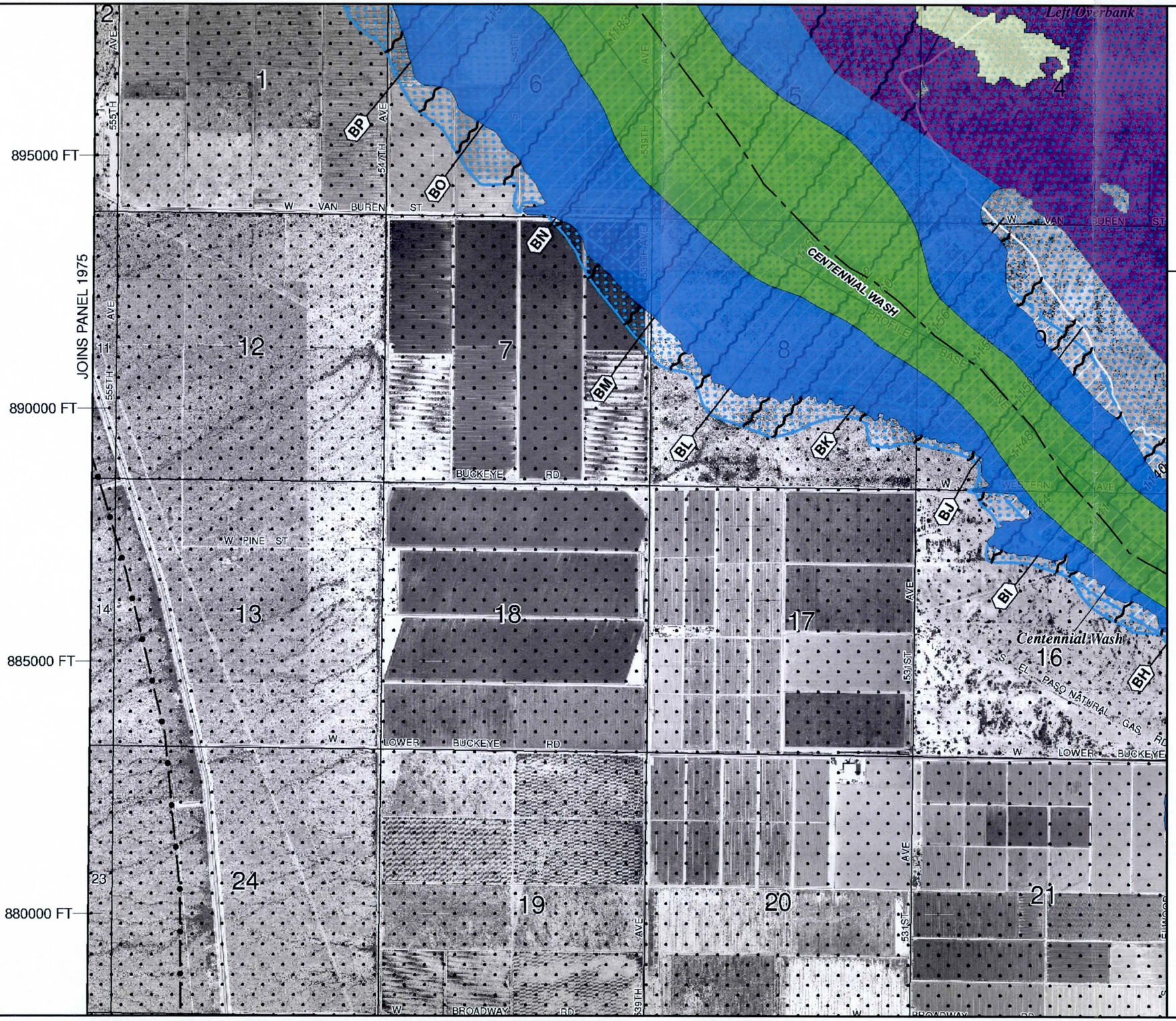
ONLY PANEL PRINTED

CENTENNIAL WASH FDS:
GILA RIVER TO LA PAZ COUNTY

COMMUNITY-PANEL NUMBER
04013C2000L

EFFECTIVE DATE
OCTOBER 16, 2013

Federal Emergency Management Agency



SHEET 2000L-3

LEGEND

- PROFILE BASELINE
- PROPOSED ZONE A TIE-IN
- PROPOSED FLOODWAY
- PROPOSED ZONE AE
- PROPOSED ZONE AO1
- PROPOSED ZONE AO2
- PROPOSED ZONE AO3

N

APPROXIMATE SCALE

2,000 1,000 0 2,000 FEET

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 2000L

FIRM

FLOOD INSURANCE RATE MAP

MARICOPA COUNTY, ARIZONA
(AND INCORPORATED AREAS)

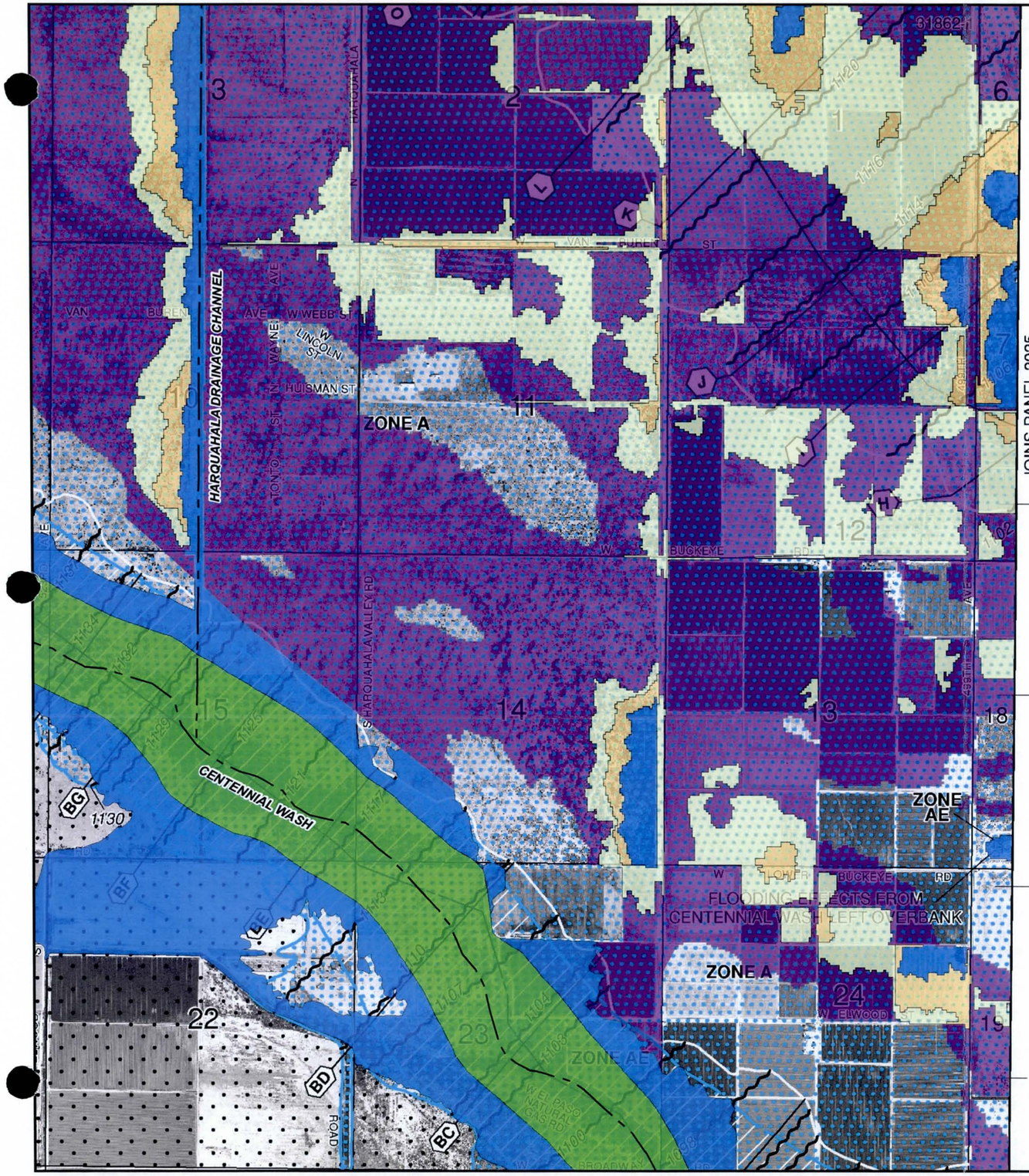
ONLY PANEL PRINTED

CENTENNIAL WASH FDS:
GILA RIVER TO LA PAZ COUNTY

COMMUNITY-PANEL NUMBER
04013C2000L

EFFECTIVE DATE
OCTOBER 16, 2013

Federal Emergency Management Agency



SHEET 2000L-4

LEGEND

- PROFILE BASELINE
- PROPOSED ZONE A TIE-IN
- PROPOSED FLOODWAY
- PROPOSED ZONE AE
- PROPOSED ZONE AO1
- PROPOSED ZONE AO2
- PROPOSED ZONE AO3

N

APPROXIMATE SCALE

2,000 1,000 0 2,000 FEET

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 2000L

FIRM

FLOOD INSURANCE RATE MAP

MARICOPA COUNTY, ARIZONA
(AND INCORPORATED AREAS)

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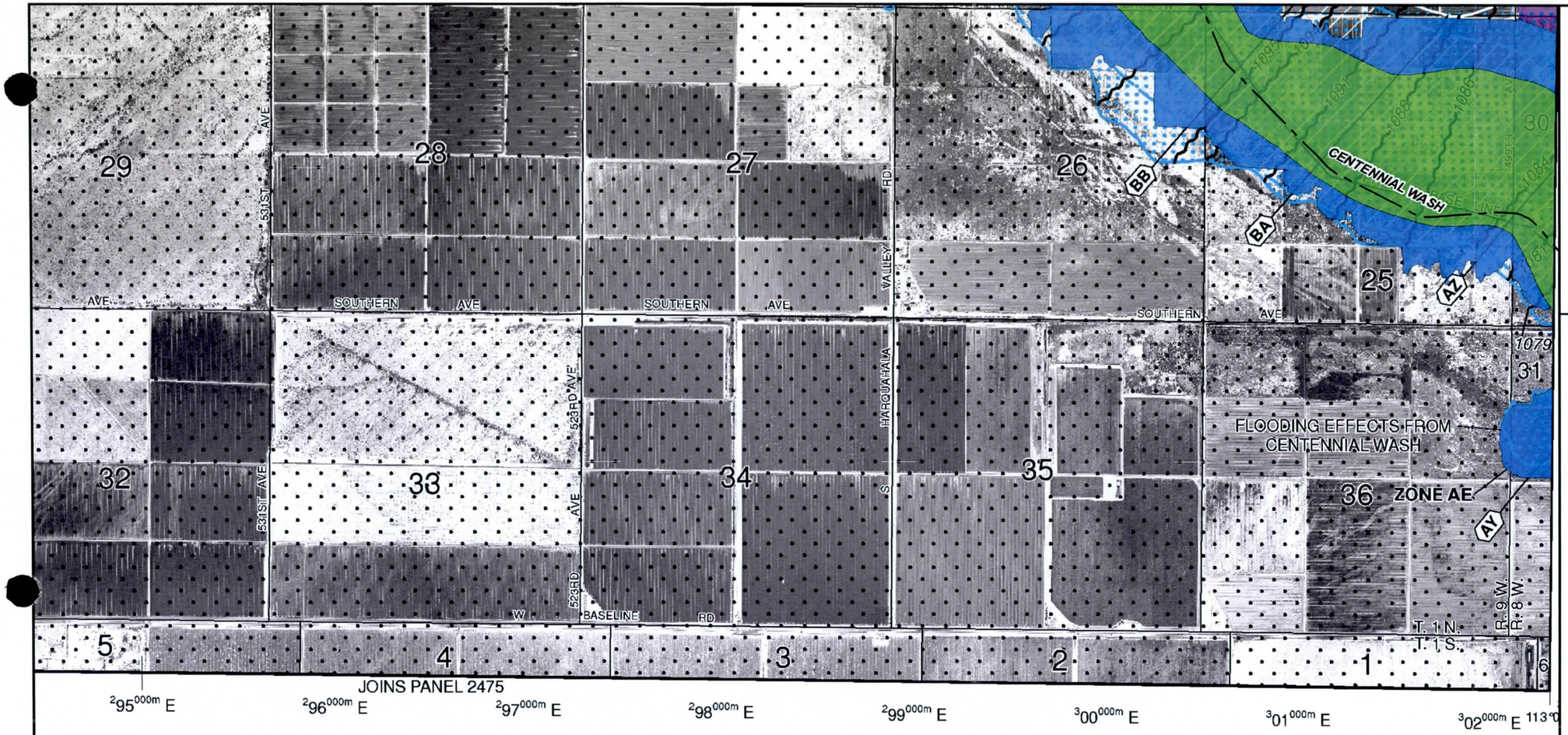
GILA RIVER TO LA PAZ COUNTY

COMMUNITY-PANEL NUMBER
04013C2000L

EFFECTIVE DATE
OCTOBER 16, 2013

Federal Emergency Management Agency



SHEET 2000L-5

LEGEND

- PROFILE BASELINE
- PROPOSED ZONE A TIE-IN
- PROPOSED FLOODWAY
- PROPOSED ZONE AE
- PROPOSED ZONE AO1
- PROPOSED ZONE AO2
- PROPOSED ZONE AO3

N

APPROXIMATE SCALE

2,000 1,000 0 2,000 FEET

NFIP

PANEL 2000L

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

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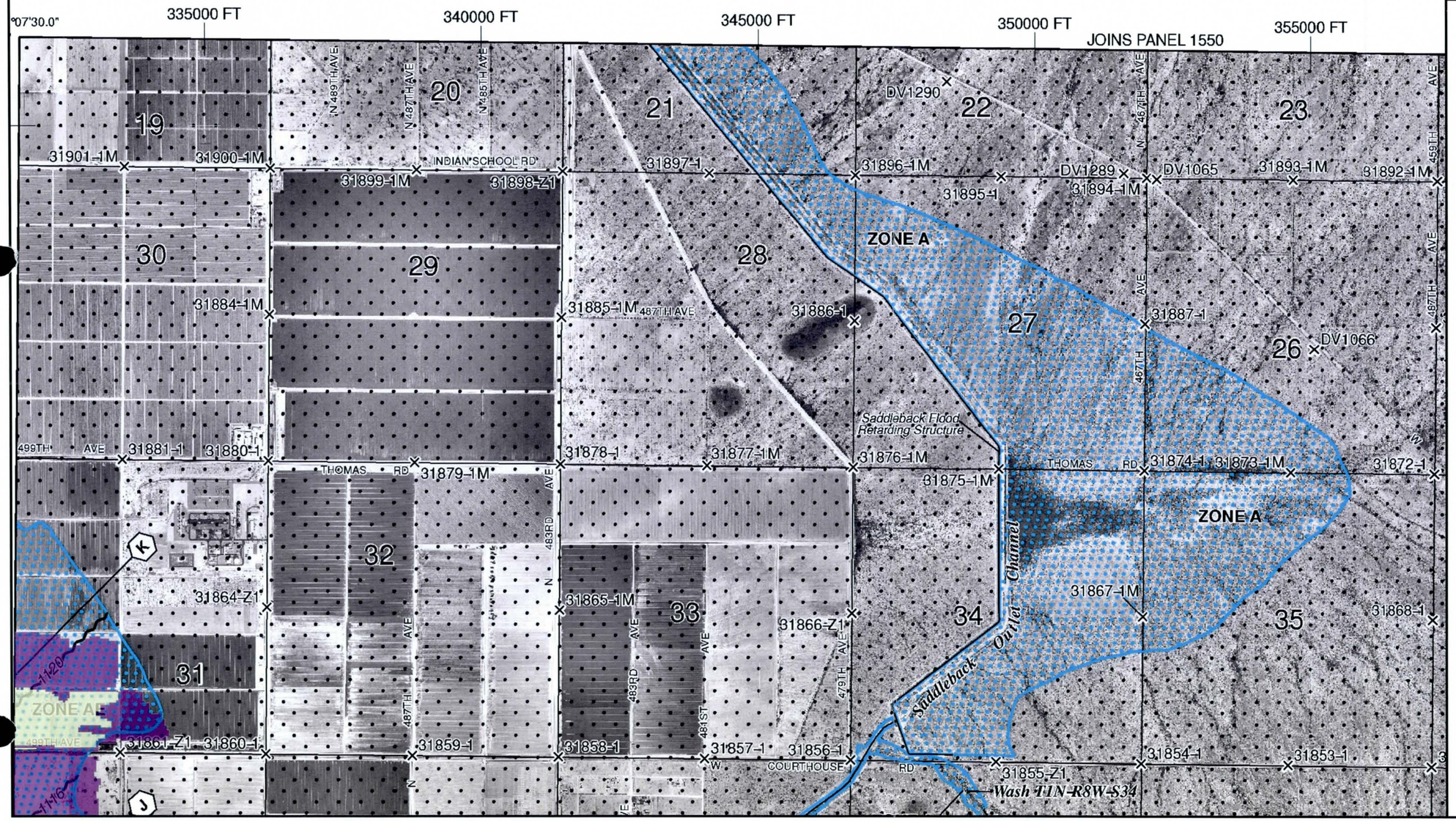
SHEET 2025L-1

LEGEND

- PROFILE BASELINE
- PROPOSED ZONE A TIE-IN
- PROPOSED FLOODWAY
- PROPOSED ZONE AE
- PROPOSED ZONE AO1
- PROPOSED ZONE AO2
- PROPOSED ZONE AO3



N

APPROXIMATE SCALE

2,000 1,000 0 2,000 FEET

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 2025L

FIRM

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SHEET 2025L-2

LEGEND

- PROFILE BASELINE
- PROPOSED ZONE A TIE-IN
- PROPOSED FLOODWAY
- PROPOSED ZONE AE
- PROPOSED ZONE AO1
- PROPOSED ZONE AO2
- PROPOSED ZONE AO3

N

APPROXIMATE SCALE

2,000 1,000 0 2,000 FEET

NFIP

PANEL 2025L

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

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MARICOPA COUNTY
UNINCORPORATED AREAS
040037

Saddleback Outlet Channel

Wash T1N-R8W-S34

Wash T1N-R8W-S8

Wash T1N-R8W-S8 Tributary 1

Wash T1N-R8W-S17

Wash T1N-R8W-S20 Tributary 1

Centennial Wash Left Overbank

CENTENNIAL WASH LEFT OVER BANK

ZONE A

ZONE AE

LIMIT OF STUDY

W VAN BUREN ST

W COURTHOUSE RD

W POLK ST

31866-Z1 31861-Z1 31860-1 31859-1 31858-1 31857-1 31856-1 31855-Z1 31854-1 31853-1

SHEET 2025L-3

LEGEND

- PROFILE BASELINE
- PROPOSED ZONE A TIE-IN
- PROPOSED FLOODWAY
- PROPOSED ZONE AE
- PROPOSED ZONE AO1
- PROPOSED ZONE AO2
- PROPOSED ZONE AO3

N

APPROXIMATE SCALE

2,000 1,000 0 2,000 FEET

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 2025L

FIRM

FLOOD INSURANCE RATE MAP

MARICOPA COUNTY, ARIZONA
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MARICOPA COUNTY
UNINCORPORATED AREAS
040037

CENTENNIAL WASH LEFT OVERBANK

Centennial Wash Left Overbank

Wash T1N-R8W-S29_2

Wash T1N-R8W-S20 Tributary 1

Wash T1N-R8W-S20

Wash T1N-R8W-S29-1 Tributary 1

Wash T1N-R8W-S29-1

Wash T1S-R8W-S13-1

Wash T1S-R8W-S13-1 Tributary 4

Wash T1S-R8W-S13-1 Tributary 1 Reach 7

Wash T1S-R8W-S13-1 Tributary 2

Wash T1S-R8W-S13-1 Tributary 1 Reach 2

Centennial Wash

Wash T1S-R8W-S5

ZONE A

ZONE AE

CENTENNIAL WASH

PROFILE BASE LINE

LIMIT OF STUDY

W BROADWAY RD

W EL PASO NATURAL GAS RD

AZTEC AVE

1ST AVE

SHEET 2500L-1

LEGEND

- PROFILE BASELINE
- PROPOSED ZONE A TIE-IN
- PROPOSED FLOODWAY
- PROPOSED ZONE AE
- PROPOSED ZONE AO1
- PROPOSED ZONE AO2
- PROPOSED ZONE AO3

N

APPROXIMATE SCALE

2,000 1,000 0 2,000 FEET

NFIP

PANEL 2500L

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

MARICOPA COUNTY, ARIZONA
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CENTENNIAL WASH FDS:
GILA RIVER TO LA PAZ COUNTY

COMMUNITY-PANEL NUMBER
04013C2500L

EFFECTIVE DATE
OCTOBER 16, 2013

Federal Emergency Management Agency

865000 FT
860000 FT
855000 FT
850000 FT

ZONE A
ZONE AE
ZONE AO
ZONE AR
ZONE AU
ZONE AS
ZONE AT
ZONE AP
ZONE AN
ZONE AM
LIMIT OF STUDY
PROFILE BASE LINE
BASELINE RD
W DOBBINS RD
W ELLIOT RD
W NARRAMORE RD
ARLINGTON-CLANTON WELL RD
S 491ST AVE
S 483RD AVE
S 487TH AVE
S 475TH AVE
S 467TH AVE
Wash T1S-R8W-S5
Wash T1S-R8W-S13-1
Wash T1S-R8W-S13-1 Tributary 3
Wash T1S-R8W-S13-1 Tributary 2
Wash T1S-R8W-S9 Reach 1
Wash T1S-R8W-S9 Tributary 1 Reach 1
Wash T1S-R8W-S9 Reach 2
Wash T1S-R8W-S24 Tributary 2 Reach 1
Centennial Wash
CENTENNIAL WASH
MARICOPA COUNTY UNINCORPORATED AREAS 040037
1058
1056
1053
1051
1048
1045
1042
1039
1038
1035
1033
1029
1026
1022
1018
1014
1011
1007
1005
1001
1000

33°22'30.0"

$^{36}94^{000m}$ N

$^{36}93^{000m}$ N

$^{36}92^{000m}$ N

$^{36}91^{000m}$ N

$^{36}90^{000m}$ N

$^{36}89^{000m}$ N

SHEET 2500L-2

LEGEND

- PROFILE BASELINE
- PROPOSED ZONE A TIE-IN
- PROPOSED FLOODWAY
- PROPOSED ZONE AE
- PROPOSED ZONE AO1
- PROPOSED ZONE AO2
- PROPOSED ZONE AO3

N

APPROXIMATE SCALE

2,000 1,000 0 2,000 FEET

NFIP

PANEL 2500L

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

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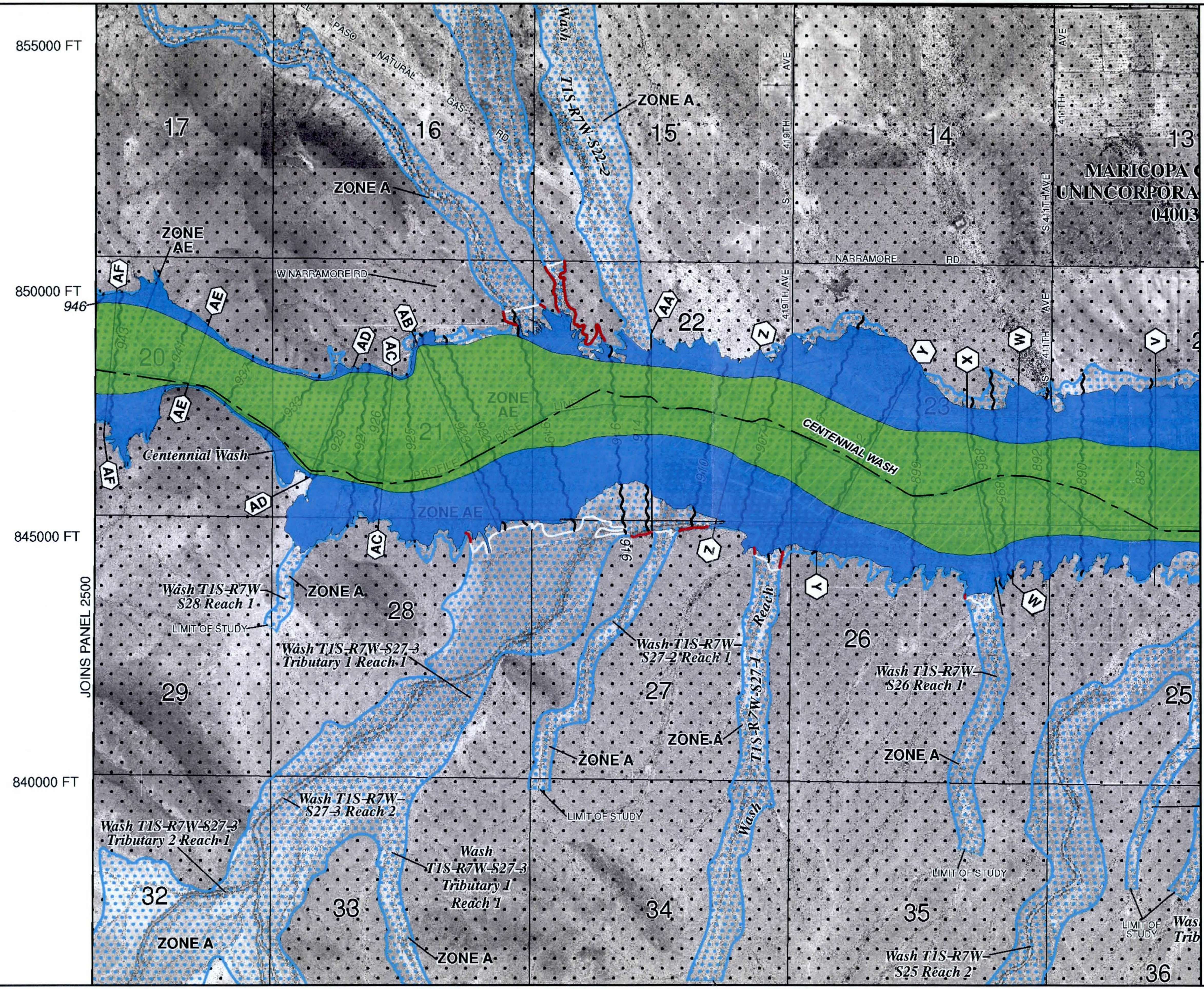

SHEET 2525L-1

LEGEND

- PROFILE BASELINE
- PROPOSED ZONE A TIE-IN
- PROPOSED FLOODWAY
- PROPOSED ZONE AE
- PROPOSED ZONE AO1
- PROPOSED ZONE AO2
- PROPOSED ZONE AO3

N

APPROXIMATE SCALE

2,000 1,000 0 2,000 FEET

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 2525L

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FLOOD INSURANCE RATE MAP

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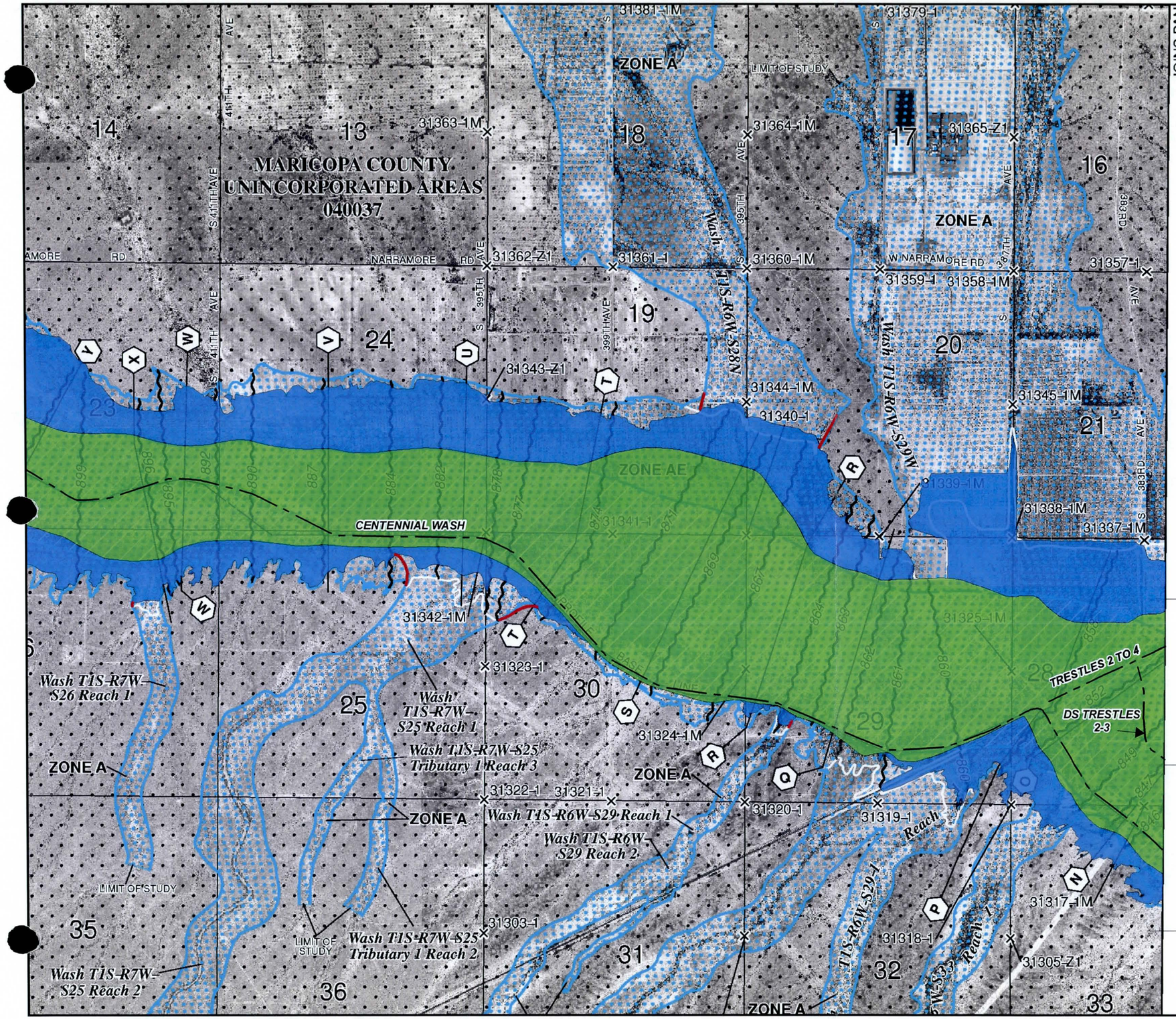

SHEET 2525L-2

LEGEND

- PROFILE BASELINE
- PROPOSED ZONE A TIE-IN
- PROPOSED FLOODWAY
- PROPOSED ZONE AE
- PROPOSED ZONE AO1
- PROPOSED ZONE AO2
- PROPOSED ZONE AO3

N

APPROXIMATE SCALE

2,000 1,000 0 2,000 FEET

NFIP

PANEL 2525L

FIRM

FLOOD INSURANCE RATE MAP

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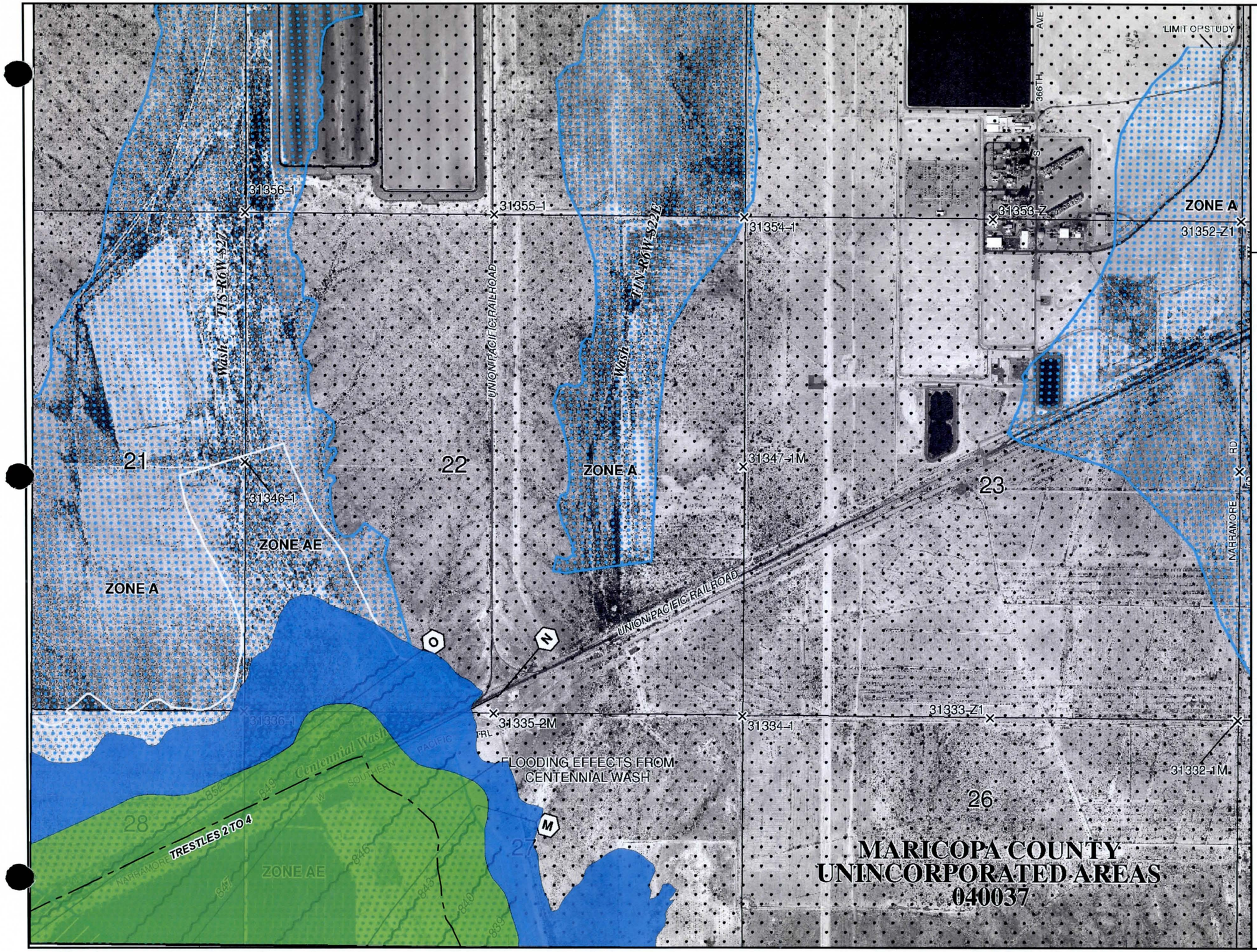
Federal Emergency Management Agency



SHEET 2530L

LEGEND

- PROFILE BASELINE
- PROPOSED ZONE A TIE-IN
- PROPOSED FLOODWAY
- PROPOSED ZONE AE
- PROPOSED ZONE AO1
- PROPOSED ZONE AO2
- PROPOSED ZONE AO3

N

APPROXIMATE SCALE

1,000 500 0 1,000 FEET

NFIP

PANEL 2530L

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

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GILA RIVER TO LA PAZ COUNTY

COMMUNITY-PANEL NUMBER
04013C2530L

EFFECTIVE DATE
OCTOBER 16, 2013

Federal Emergency Management Agency

33°18'45.0

840000 FT

835000 FT

JOINS PANEL 2530

31326-Z1

31315-Z1

31327-1M

MARICOPA COU
UNINCORPORATED
040037

SIBRUNNER RD

28

27

26

ZONE AE

TRESTLES 2 TO 4

DS TRESTLES 2-3

31316-1M

31314-1M

31313-1M

ZONE AE

PROFILE BASE LINE

31306-Z1

33

34

35

31307-Z1

Centennial Wash

CENTENNIAL WASH

PROFILE BASE LINE

31294-1

31294-2

T.1 S.
T.2 S.

31296-1

31295-1

ZONE A

ZONE A

31293-2

31293-1

MARICOPA COUNTY
UNINCORPORATED AREAS
040037

SHEET 2540L-1

LEGEND

- PROFILE BASELINE
- PROPOSED ZONE A TIE-IN
- PROPOSED FLOODWAY
- PROPOSED ZONE AE
- PROPOSED ZONE AO1
- PROPOSED ZONE AO2
- PROPOSED ZONE AO3

N

APPROXIMATE SCALE

1,000 500 0 1,000 FEET

NFIP

PANEL 2540L

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

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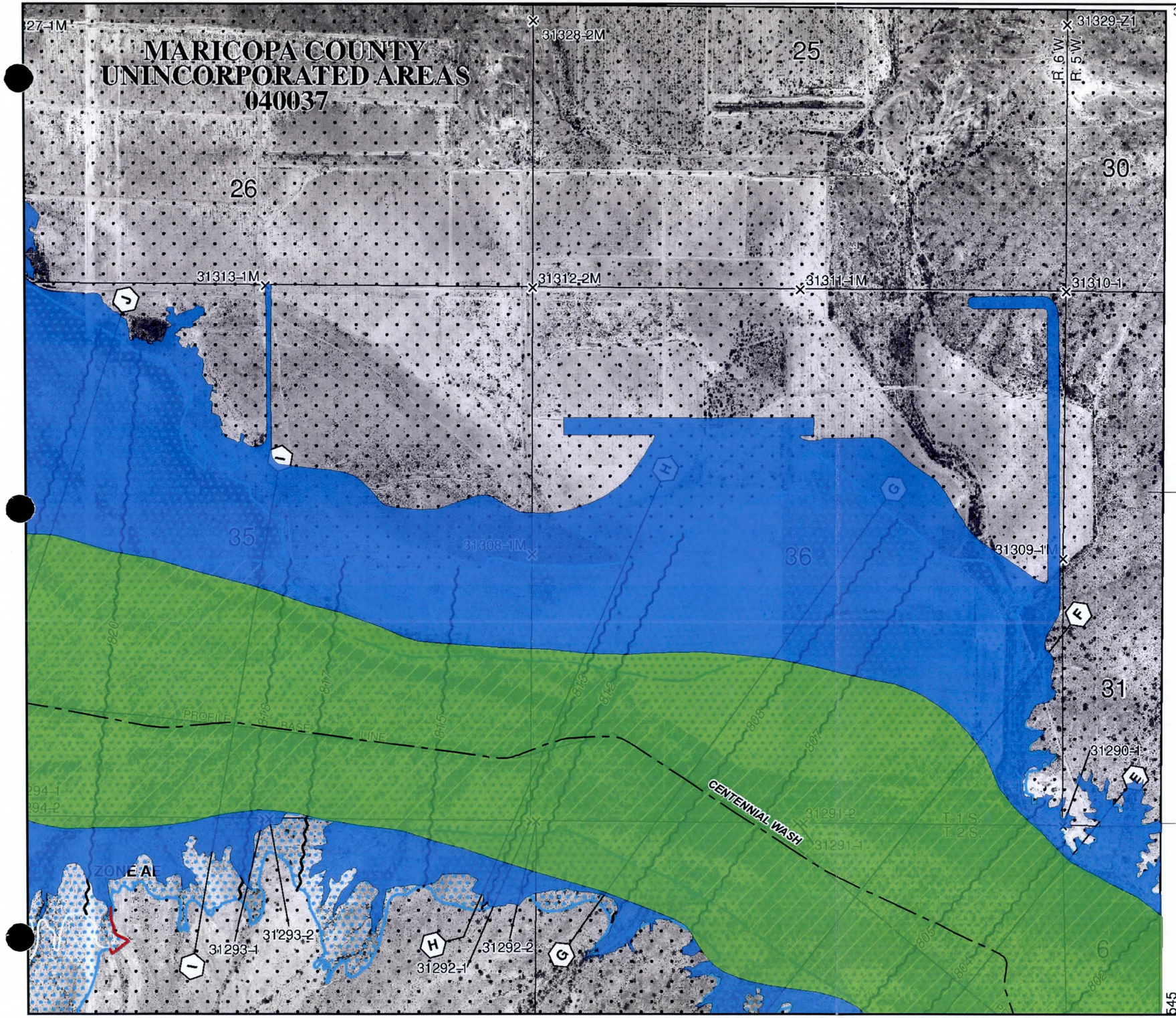

SHEET 2540L-2

LEGEND

- PROFILE BASELINE
- PROPOSED ZONE A TIE-IN
- PROPOSED FLOODWAY
- PROPOSED ZONE AE
- PROPOSED ZONE AO1
- PROPOSED ZONE AO2
- PROPOSED ZONE AO3

N

APPROXIMATE SCALE

1,000 500 0 1,000 FEET

NFIP

PANEL 2540L

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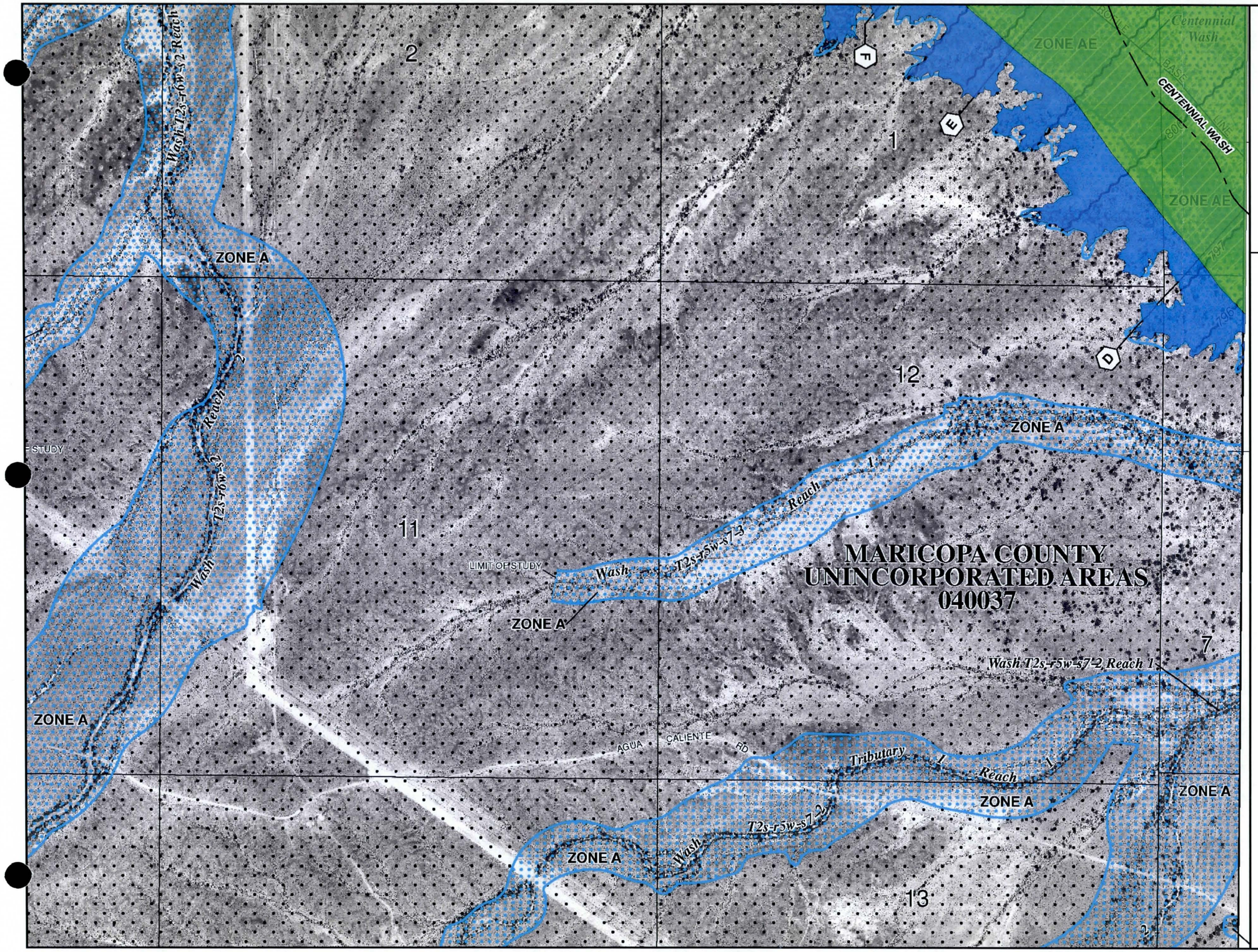

SHEET 2540L-3

LEGEND

- PROFILE BASELINE
- PROPOSED ZONE A TIE-IN
- PROPOSED FLOODWAY
- PROPOSED ZONE AE
- PROPOSED ZONE AO1
- PROPOSED ZONE AO2
- PROPOSED ZONE AO3

N

APPROXIMATE SCALE

1,000 500 0 1,000 FEET

NFIP

PANEL 2540L

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FIRM

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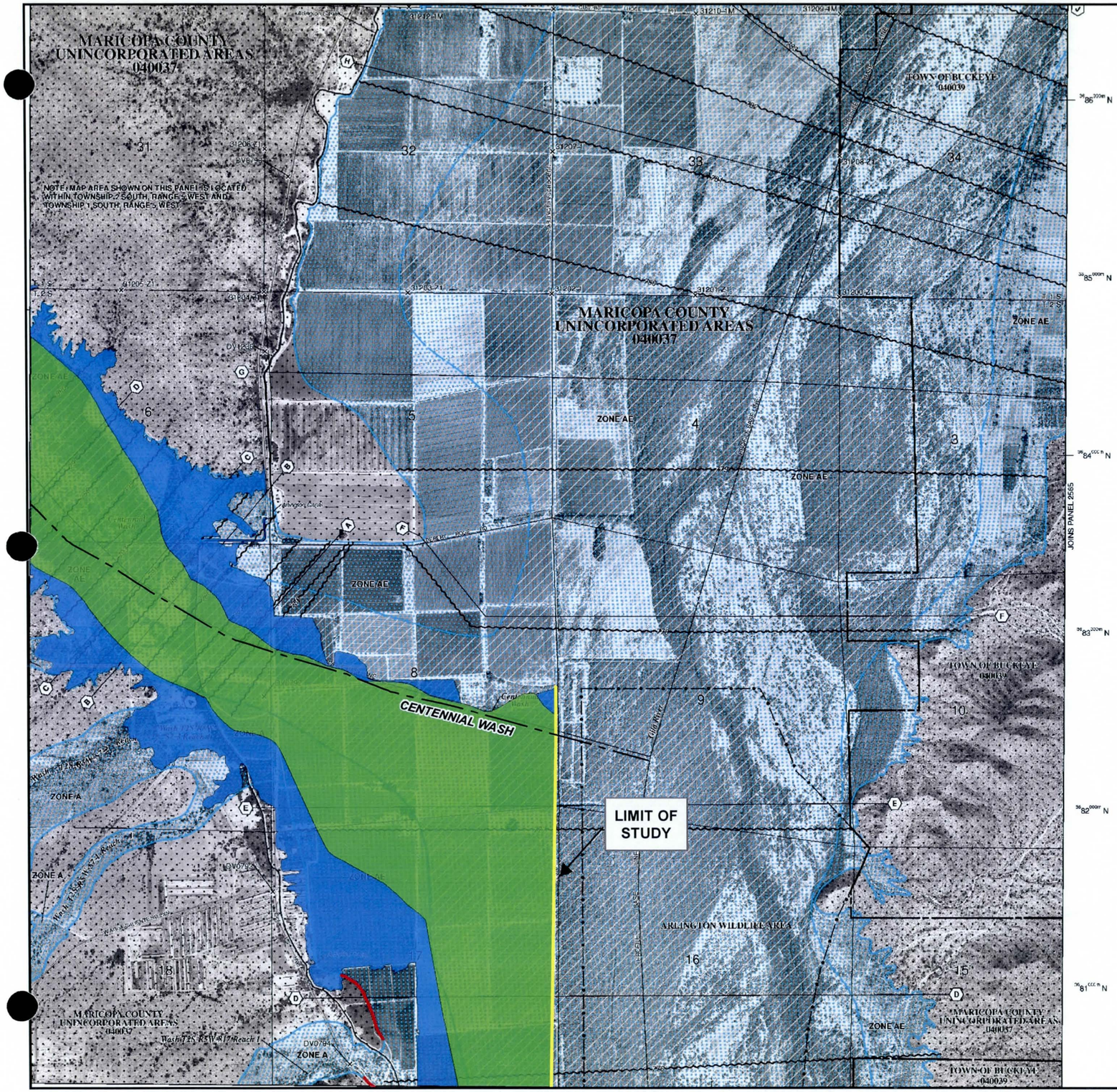

SHEET 2545L

LEGEND

- PROFILE BASELINE
- PROPOSED ZONE A TIE-IN
- PROPOSED FLOODWAY
- PROPOSED ZONE AE
- PROPOSED ZONE AO1
- PROPOSED ZONE AO2
- PROPOSED ZONE AO3

N

APPROXIMATE SCALE

2,000 1,000 0 2,000 FEET

NFIP

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FIRM

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EXHIBIT C

DVDs Containing Electronic Files