TECHNICAL DATA NOTEBOOK

WITTMANN PHASE IV FLOODPLAIN DELINEATION STUDY

Iona Tributary 1 West, Iona Tributary 1 West Extension, and Iona Tributary 2 West

Contract FCD 2011C003

November 23, 2011

Prepared for:
The Flood Control District of Maricopa County
2801 West Durango Street
Phoenix, Arizona 85009
602.506.1501

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Project Manager

Prepared by:
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Engineer

Technical Data Notebook

WITTMANN PHASE IV FLOODPLAIN DELINEATION STUDY Iona Tributary 1 West (T5NR3WS17-1W), Iona Tributary 1 West Extension (T5NR3WS17-1WE), and Iona Tributary 2 West (T5NR3WS17-2W)

CONTRACT FCD 2011C003

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Engineer:
Nathan Ford, P.E.

Registered Professional Engineer (Civil)
CERTIFICATE NO.
40054
NATHAN E.
FORD
Date Signed 11/23/11
ARIZONA, U.S.A.
Nathan Ford
Expires 12/31/12

November 23, 2011

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Section 1 Introduction

1.1. Purpose of Study

The purpose of this study is to delineate limited detail Zone AE 100-year floodplains (no floodway) for Iona Tributary 1 West (T5NR3WS17-1W), Iona Tributary 1 West Extension (T5NR3WS17-1WE), and Iona Tributary 2 West (T5NR3WS17-2W) within unincorporated Maricopa County (Refer to Figure 1). The study is located within the City of Surprise Special Planning Area (SPA) 5.

1.2. Authority for the Study

The Flood Control District of Maricopa County (FCDMC) contracted RBF Consulting to perform the study based on existing 2 and 4 foot contour interval topographic mapping. The main contacts, addresses, and other information about the FCDMC and RBF Consulting are:

Flood Control District of Maricopa County

Address:	2801 West Durango Street Phoenix, Arizona 85009
Phone:	(602) 506-1501
Project Manager:	Jonathan Lesperance, E.I.T., CFM

RBF Consulting

Address:	16605 North 28th Avenue, Suite 100 Phoenix, Arizona 85053
Phone:	(602) 467-2200
Principal-in-Charge:	Scott Larson, P.E.
Project Manager:	Nathan Ford, P.E.

1.3. Site Location and Description

The study watershed has a drainage area of about 16.8 square miles and is located in Maricopa County, Arizona (Refer to Figure 4.1). These washes are tributary to Iona Wash. Iona Wash is a large desert wash with a 100-year peak discharge of approximately 5,650 cfs downstream of the confluence with Iona Tributary 2 West. Iona Wash has a delineated 100-year floodway and floodplain. This report is organized according to Arizona State Standard 1-97 *Instructions for Organizing and Submitting Technical Documentation for Flood Studies* developed by the Arizona Department of Water Resources (ADWR), Flood Mitigation Section, dated November 1997 (ADWR, 1997).

1.4. Methodology

1.4.1. Hydrology

Peak flows were determined for both the 100-year 6-hour and 100-year 24-hour storms using the U.S. Army Corps of Engineers HEC-1 software package, version 4.1, dated June 1998, from the Wittmann Area Drainage Master Study Update (ADMSU) Hydrology and basin prorating as outlined in Section 4 of this report. A more detailed explanation of the hydrologic methodology and results are provided in Section 4.

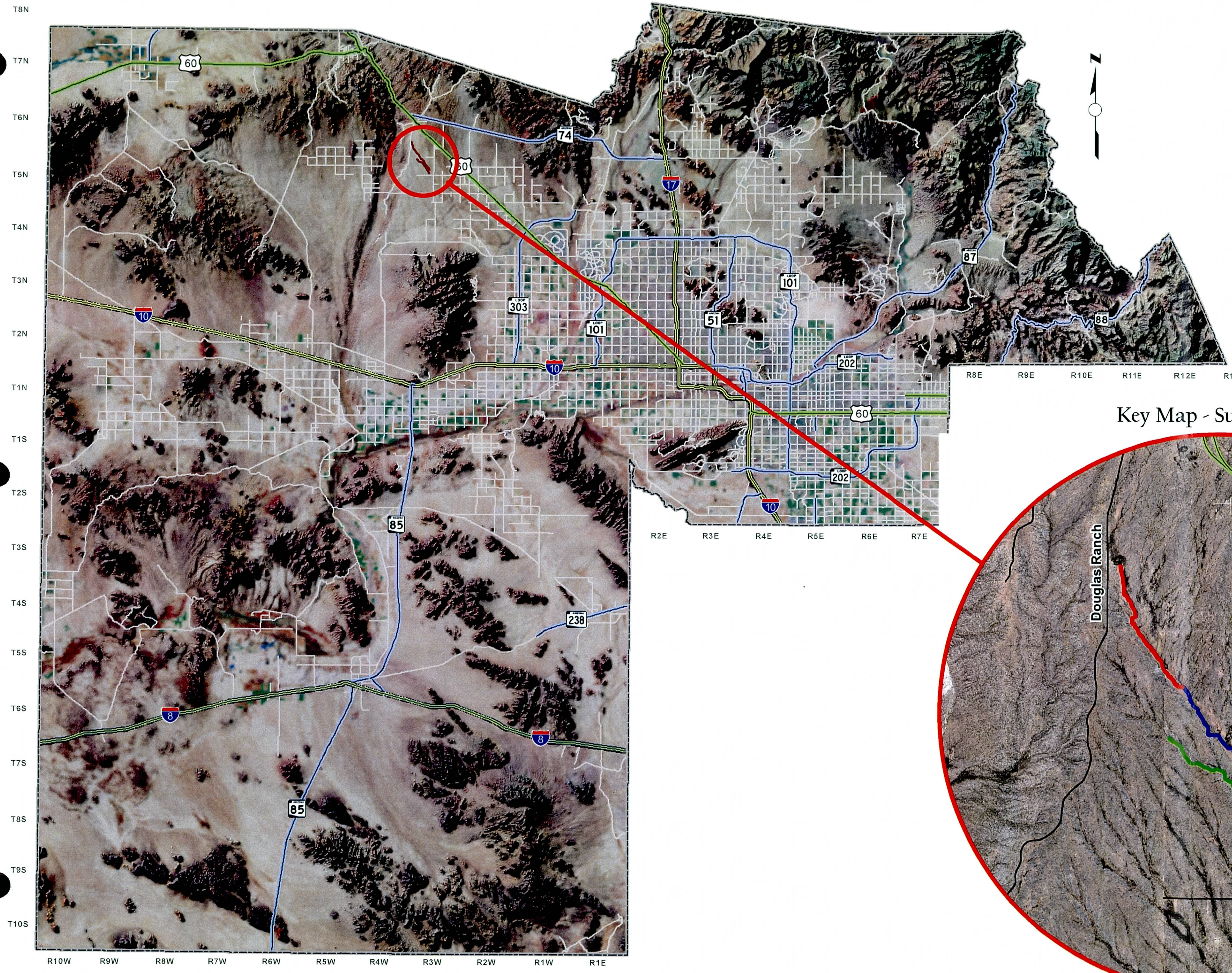
1.4.2. Hydraulics and Floodplain Delineation

The higher peak flow from the 100-year 6-hour and 100-year 24-hour HEC-1 model was used to delineate the floodplain. In all cases the 100-year 6-hour storm was the governing storm that produced the higher water surface elevation. The Zone AE floodplains were delineated using the U.S. Army Corps of Engineers Hydrologic Engineering Center River Analysis System (HEC-RAS) version 4.1.0 dated January 2010.

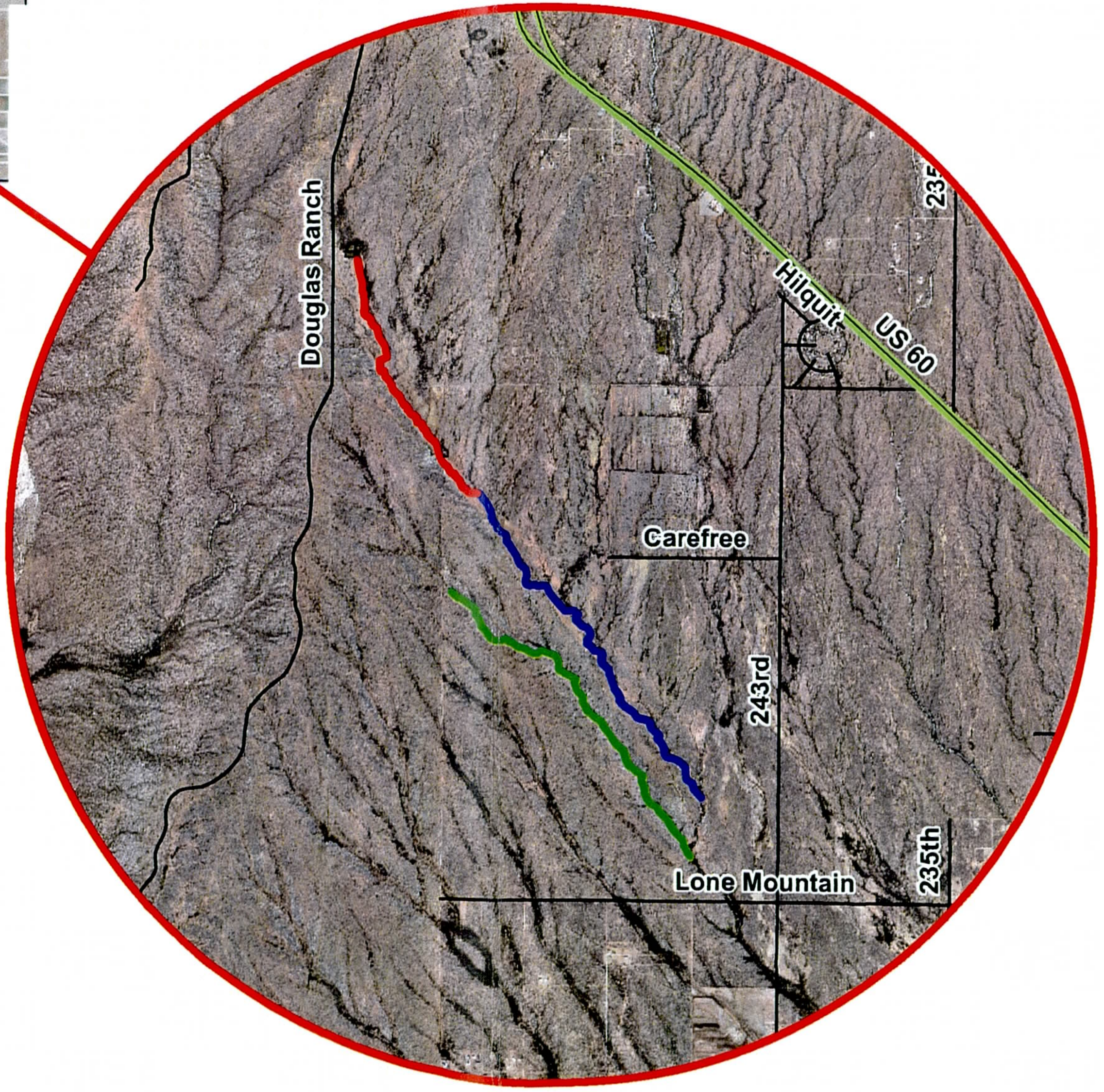
1.5. Summary of Results

The study resulted in the delineation of over six miles of limited detail Zone AE floodplains (no floodways). The floodplains have been plotted on the Hydraulic Study Maps, located at the end of Appendix E.

Wittmann Phase IV
Location Map
Figure 1



Key Map - Subject Area



File: H:\PDATA\45104608\GIS\Wittman Phase IV\Location Map.mxd

Section 2 FEMA Forms

2.1. Study Documentation Abstract for FEMA Submittals

Study Documentation Abstract for FEMA Submittals		Initial Study	X	Restudy		CLOMR		LOMR	X
2.1.1	Date Study Accepted								
2.1.2	Study Contractor Contact Address Phone Internal Reference #	RBF Consulting Scott Larson, P.E. or Nathan Ford, P.E. 16605 North 28th Avenue, Suite 100 Phoenix, Arizona 85053-7550 602-467-2200 45-104608							
2.1.3	FEMA Technical Review Contractor Contact Address Phone Internal Reference #								
2.1.4	FEMA Regional Reviewer Phone								
2.1.5	State NFIP Coordinator Phone	Brian Cosson, CFM Arizona Department of Water Resources 602-771-8657							
2.1.6	Local Technical Reviewer Phone	Flood Control District of Maricopa County Jonathan Lesperance, E.I.T., CFM 602-506-4699							
2.1.7	Reach Description	Desert Washes Iona Tributary 1 West, Iona Tributary 1 West Extension, and Iona Tributary 2 West in Maricopa County, Arizona							
2.1.8	USGS Quad Sheet Original photo date Latest photo revision date	Wittmann, Arizona and Wickenburg SW, Arizona 1965 and 1965 1981 and N/A							
2.1.9	Unique Conditions and Problems	N/A							
2.1.10	Coordination of Q's Discharges (Agency, Date, Comments)	N/A							

2.2. FEMA Forms

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
	Refer to attached sheet				

2. a. Flooding Source: Iona Tributary 1 West, Iona Tributary 1 West Extension, and Iona Tributary 2 West

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

3. Project Name/Identifier: Wittmann Phase IV Floodplain Delineation Study

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

5. Basis for Request and Type of Revision:

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

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

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

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

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

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

C. REVIEW FEE

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

☒ No, Attach Explanation

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

D. SIGNATURE

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

Name: Jonathan Lesperance, E.I.T., CFM	Company: FCDMC	
Mailing Address: 2801 W. Durango St Phoenix, AZ 85009	Daytime Telephone No.: (602) 506-4699	Fax No.: (602) 506-4601
	E-Mail Address: jonathanlesperance@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. Phillips, P.E. Chief Engineer & General Manager	Community Name: FCDMC	
Mailing Address: 2801 W. Durango St Phoenix, AZ 85009	Daytime Telephone No.: (602) 506-4701	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: Nathan Ford	License No.: 40054	Expiration Date: 12/31/12
Company Name: RBF Consulting	Telephone No.: (602) 467-2200	Fax No.: (602) 467-2201
Signature: Nathan Ford	Date: 11/23/11	E-Mail Address: nford@rbf.com

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

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

Seal (Optional)

The NFIP map panels affected for all impacted communities are:

Community No.	Community Name	State	Map No.	Panel No.	Effective Date
040037	Maricopa County	AZ	04013C	660G 670G 680G 689H 690H	9/30/05

The Flood Control District of Maricopa County is requesting a fee exemption for the LOMR based on map changes being based on flood hazard information meant to improve upon that shown on the flood map or within the flood study. The new study does not incorporate any manmade modifications within the SFHA.

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

RIVERINE HYDROLOGY & HYDRAULICS FORM

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

PAPERWORK BURDEN DISCLOSURE NOTICE

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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: Iona Tributary 1 West and Iona Tributary 1 West Extension

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: HEC-1 (Wittmann ADMSU)
☐ 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*	Iona Tributary 1 West	0.088	N/A	1722.8
Upstream Limit*	Iona Tributary 1 West Extension	4.161	N/A	1856.9

*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

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
	File Name:	Plan Name:	File Name:	Plan Name:	
Duplicate Effective Model*	File Name:	Plan Name:	File Name:	Plan Name:	
Corrected Effective Model*	File Name:	Plan Name:	File Name:	Plan Name:	
Existing or Pre-Project Conditions Model	File Name:	Plan Name:	File Name:	Plan Name:	
Revised or Post-Project Conditions Model	File Name:	Plan Name:	File Name:	Plan Name:	
Other - (attach description)	File Name:	Plan Name:	File Name:	Plan Name:	

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

☒ Digital Models Submitted? (Required)

C. MAPPING REQUIREMENTS

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

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

Topographic Information: 4 ft contour data

Source: Landdata Airborne Systems, Inc. for FCDMC Date: Flown April 2002

Accuracy: ______

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

☒ Annotated FIRM and/or FBFM (Required)

D. COMMON REGULATORY REQUIREMENTS*

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

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

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

   b. Does this LOMR request cause increase in the BFE and/or SFHA compared with the effective BFEs and/or SFHA? ☐ Yes ☒ No
   If Yes, please attach **proof of property owner notification and acceptance (if available)**. Elements of and examples of property owner notifications can be found in the MT-2 Form 2 Instructions.

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

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

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

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

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

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

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

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

RIVERINE HYDROLOGY & HYDRAULICS FORM

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Flooding Source: Iona Tributary 2 West

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: Prorate (Wittmann ADMSU)
☐ 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*	Iona Tributary 2 West	0.101	N/A	1710.0
Upstream Limit*	Iona Tributary 2 West	2.272	N/A	1784.8

*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

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:	Plan Name:	File Name:	Plan Name:	
Corrected Effective Model*	File Name:	Plan Name:	File Name:	Plan Name:	
Existing or Pre-Project Conditions Model	File Name:	Plan Name:	File Name:	Plan Name:	
Revised or Post-Project Conditions Model	File Name:	Plan Name:	File Name:	Plan Name:	
Other - (attach description)	File Name:	Plan Name:	File Name:	Plan Name:	

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

☒ Digital Models Submitted? (Required)

C. MAPPING REQUIREMENTS

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

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

Topographic Information: 4 ft contour data

Source: Landdata Airborne Systems, Inc. for FCDMC Date: Flown April 2002

Accuracy:

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

☒ Annotated FIRM and/or FBFM (Required)

D. COMMON REGULATORY REQUIREMENTS*

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

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

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

   b. Does this LOMR request cause increase in the BFE and/or SFHA compared with the effective BFEs and/or SFHA? ☐ Yes ☒ No
   If Yes, please attach **proof of property owner notification and acceptance (if available)**. Elements of and examples of property owner notifications can be found in the MT-2 Form 2 Instructions.

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

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

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

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

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

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

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

Section 3 Mapping and Survey Information

3.1. Field Survey Information

Field survey was collected for the bend on Iona Tributary 1 West between Cross Sections 1.827 and 1.776. Refer to the Ground Elevation Exhibit in Appendix C for additional information.

3.2. Mapping

RBF used existing digital terrain models (DTM) and contour data (2 and 4 ft) provided by the Flood Control District of Maricopa County. Landata Airborne Systems, Inc. created the DTM from digital ortho-photos that were created in 2002 for the Wittmann mapping. The coordinate system is based on NAD 83, Arizona State Plane – Central Zone. The vertical coordinate system is NAVD 88.

Section 4 Hydrology

4.1 Method Description

The Wittmann Area Drainage Master Study Update (ADMSU) Technical Data Notebook, ADMSU Hydrology, Volume HY-Addendum, Contract FCD2002C029, Final Addendum No. 1 July 2005 prepared by Entellus was used as the source of the hydrology analysis. The peak flows for both the 100-year 6-hour and 100-year 24-hour storms existing conditions were compared to determine which storm generated the larger peak flows. The 100-year 6-hour storm generated higher peak flows than the 100-year 24-hour storm for the watershed of Iona Tributary 1 West, Iona Tributary 1 West Extension, and Iona Tributary 2 West and was used for the floodplain delineation.

Additional subdivision of the drainage areas was required for hydraulic modeling where the detailed Wittmann ADMSU sub-basins were too large to accurately model a portion of the wash reach. The Wittmann ADMSU HEC-1 model was modified using two smaller sub-basins to obtain peak flows due to the routing of flows contributing at the concentration point of interest for the Iona Tributary 1 West and Iona Tributary 1 West Extension watershed. The peak flows for the three smaller sub-basins within the Iona Tributary 2 West watershed were determined using the unit peak flows (cfs/sq mi) obtained from the larger Wittmann ADMSU sub-basin and prorating based on the sub-basin area.

4.2 Parameter Estimation

Hydrologic parameters were obtained from the Wittmann ADMSU Hydrology. The following sections briefly discuss the parameter estimation. For more detail refer to the Wittmann ADMSU.

4.2.1 Drainage Area Boundaries

The Wittmann ADMSU delineates the Iona Tributary 1 West and Iona Tributary 1 West Extension watershed using seventeen sub-basins. The Iona Tributary 1 West and Iona Tributary 1 West Extension watershed extends to the north and northeast crossing the U.S 60, B.N.S.F. Railroad, and State Route 74. The watershed terminates near the Maricopa and Yavapai County line. The drainage area is approximately 15.1 square miles. Additional sub-basin delineation was required within the Wittmann ADMSU sub-basins. Two smaller sub-basins were delineated to more accurately determine the flow rates upstream of the confluence with tributary washes. These two sub-basins are IW353A and IW359A. The Wittmann ADMSU HEC-1 model was modified to account for the routing in lieu of proration for this watershed.

The Wittmann ADMSU delineates the Iona Tributary 2 West watershed using one sub-basin. This sub-basin is IW350. The Iona Tributary 2 West watershed extends to the northwest and is entirely south of the U.S. 60. The drainage area is approximately 1.66 square miles. Additional sub-basin delineation was required within sub-basin IW350. Three smaller sub-basins were delineated to determine the flow at the confluence with Iona Wash, at Dove Valley Road, and upstream of a potential flow split. Since there is only one ADMSU basin the peak flows were determined using proration based on the sub-basin area and the unit peak flow (cfs/sq mi) obtained from the Wittmann ADMSU sub-basin IW350.

Figures 4.1 and 4.2 show the sub-basin delineation for Iona Tributary 1 West and Iona Tributary 1 West Extension, and Iona Tributary 2 West watershed with aerial photos and topo lines as their respective backgrounds.

4.2.2 Watershed Work Maps

Figure 4.3 shows the sub-basin boundaries overlain on top of the soil map units, according to the Aguila-Carefree, Parts of Maricopa and Pinal Counties, Arizona Soil Survey. Figure 4.4 shows the land use designation obtained from the Maricopa Association of Governments (MAG).

4.2.3 Gage Data

There are no precipitation gages located within the watershed. Seven FCDMC operating precipitation gages are located within a distance of less than six and one-half miles from the watershed boundary. Figure 4.5 shows the location of the FCDMC precipitation gages. One precipitation gage FCDMC No. 5450 (installed on 5/13/1992) is located at an elevation of 1,620 feet and is about one and three-quarters miles south of the watershed boundary. The name of this gage is Patton Road and is located in Section 33, Township 5 North Range 3 West (latitude: 33°44'05.8"; longitude: 112°34'37.9").

Precipitation gage FCDMC No. 5455 (installed on 5/13/1992) is located at an elevation of 1,655 feet and is about three and three-quarters miles east of the watershed boundary. The name of this gage is Wittmann and is located in Section 13, Township 5 North Range 3 West (latitude: 33°46'13.8"; longitude: 112°31'15.7").

Precipitation gage FCDMC No. 5460 (installed on 10/31/1990) is located at an elevation of 1,705 feet and is about five and one-half miles east of the watershed boundary. The name of this gage is Chrylser Proving Ground and is located in Section 7, Township 5 North Range 2 West (latitude: 33°47'03.5"; longitude: 112°30'00.8").

Precipitation gage FCDMC No. 5475 (installed on 10/1/1982) is located at an elevation of 1,890 feet and is less than one-half mile east of the watershed boundary. The name of this gage is Circle City and is located in Section 32, Township 6 North Range 3 West (latitude: 33°49'20.9"; longitude: 112°35'23.8").

Precipitation gage FCDMC No. 5490 (installed on 10/20/1981) is located at an elevation of 2,685 feet and is about one and one-quarter miles east of the watershed boundary. The name of this gage is Castle Hot Springs and is located in Section 24, Township 7 North Range 3 West (latitude: 33°55'45.4"; longitude: 112°31'47.1").

Precipitation gage FCDMC No. 5220 (installed on 5/13/1992) is located at an elevation of 1,980 feet and is near the western watershed boundary. The name of this gage is Morristown and is located in Section 13, Township 6 North Range 4 West (latitude: 33°51'23.6"; longitude: 112°37'27.3").

Precipitation gage FCDMC No. 5495 (installed on 11/8/2007) is located at an elevation of 1,680 feet and is about six and one-half miles southwest of the watershed boundary. The name of this gage is Daggs Wash and is located in Section 25, Township 5 North Range 5 West (latitude: 33°44'45.2"; longitude: 112°43'30.2").

There are no stream gages located within the Wittmann Phase IV watershed.

4.2.4 Statistical Parameters

Statistical Parameters were not considered as part of this study.

4.2.5 Precipitation

The Wittmann ADSMU used the NOAA Atlas 2 rainfall depths. The point rainfall depths of the 100-year 6-hour storm and 100-year 24-hour storm are 3.40 inches and 4.20 inches, respectively. The point rainfall depths were adjusted by areal reduction factors as outlined in the Wittmann ADSMU.

4.2.6 Physical Parameters

Rainfall Losses

The Wittmann ADMSU used the Green-Ampt infiltration equations within HEC-1 to estimate rainfall losses. Table 4.1 lists the map unit values that were used in the Wittmann ADMSU to compute the rainfall losses for the eighteen sub-basins within the Wittmann Phase IV watershed.

Table 4.1 Soils Characteristics for Green-Ampt Parameters

Soil ID	Description	XKSAT (in/hr)	% Impervious	% Effective
3	Antho-Carrizo-Maripo complex	0.58	0	100
7	Anthony-Arizo complex, low precipitation	0.62	0	100
13	Carefree-Beardsley complex	0.01	0	100
21	Cipriano very gravelly loam	0.38	0	100
22	Contine clay loam	0.04	0	100
28	Continental-Ohaco complex	0.02	0	100
29	Denure-Momoli-Carrizo complex	0.34	0	100
31	Dixaleta-Rock outcrop complex, 25 to 65 percent slopes	0.33	35	100
33	Eba very gravelly loam, 1 to 8 percent slopes	0.23	0	100
36	Eba-Continental complex, 1 to 8 percent slopes	0.07	0	100
39	Eba-Nickel-Cave association, 3 to 25 percent slopes	0.29	0	100
42	Eba-Pinaleno complex, low precipitation, 3 to 20 percent slopes	0.17	0	100
44	Ebon very gravelly loam, 1 to 8 percent slopes	0.03	0	100
46	Ebon-Contine complex, 1 to 8 percent slopes	0.03	0	100
47	Ebon-Gunsight-Cipriano association, 3 to 25 percent slopes	0.11	0	100
48	Ebon-Pinamt complex, 3 to 20 percent slopes	0.06	0	100
49	Ebon-Pinamt complex, 20 to 40 percent slopes	0.06	0	100
53	Gadsden clay	0.02	0	100
55	Gilman loams	0.27	0	100
58	Gilman-Momoli-Denure complex	0.34	0	100
63	Gran-Wickenburg-Rock outcrop complex, 10 to 65 percent slopes	0.14	25	100
64	Gran-Wickenburg-Rock outcrop complex, low precipitation, 10 to 65 percent slopes	0.14	25	100
66	Greyeagle-Suncity Variant complex, 1 to 7 percent slopes	0.23	0	100
68	Gunsight-Ciprano complex, 1 to 7 percent slopes	0.63	0	100
70	Gunsight-Rillito complex, 1 to 25 percent slopes	0.36	0	100
73	Lehmans-Rock outcrop complex, low precipitation, 8 to 65 percent slopes	0.09	30	100
74	Luke-Cipriano association, 1 to 15 percent slopes	0.08	0	100
75	Mohall loam	0.23	0	100
77	Mohall clay loam	0.05	0	100
94	Nickel-Cave complex, low precipitation, 8 to 30 percent slopes	0.33	0	100
98	Pinamt-Tremant complex, 1 to 10 percent slopes	0.37	0	100
110	Suncity-Cipriano complex, 1 to 7 percent slopes	0.13	0	100
119	Tremant-Suncity complex, 1 to 8 percent slopes	0.14	0	100
121	Tres Hermanos-Anthony complex, 1 to 5 percent slopes	0.12	0	100

The Wittmann ADMSU used the Maricopa Association of Governments (MAG) Land Use. The values used for surface retention loss values, percent impervious, and vegetation cover are shown in Table 4.2 for the Wittmann Phase IV watershed.

Table 4.2 Land Use Characteristics for Green-Ampt Parameters

Land Use Description	Initial Abstraction (in)	% Impervious	% Vegetation	Soil Condition
Rural Residential (<=1/5du per acre)	0.30	5	30	normal
Estate Residential (<=1 du/acre)	0.30	10	30	normal
Large Lot Residential – Single Family (1 du/acre to 2 du/acre)	0.30	15	50	normal
Educational (Public schools, private schools, universities)	0.25	45	80	normal
Other Employment – low (Proving grounds and landfills)	0.15	80	25	normal
General Transportation (where no detail available)	0.10	20	30	normal
Transportation (Includes railroads, railyards, transit centers, and freeways)	0.10	80	30	normal
General Open Space (where no detail available)	0.35	5	30	normal
Passive Open Space (Includes mountain preserves and washes)	0.35	0	30	normal

The Green-Ampt rainfall loss parameters from the Wittmann ADMSU and the two supplemental sub-basins can be found in Table 4.3.

Table 4.3 Green-Ampt Parameters

BASIN	IA (in)	DTHETA	PSIF	XKSAT (in/hr)	RTIMP (%)
IW350	0.350	0.171	6.789	0.135	5.000
IW353	0.350	0.150	7.596	0.098	5.084
IW353A*	0.350	0.250	5.876	0.191	5.000
IW357	0.330	0.156	8.059	0.083	11.106
IW359	0.345	0.250	5.939	0.187	6.181
IW359A*	0.348	0.210	6.399	0.159	5.491
IW366	0.343	0.250	5.762	0.202	7.207
IW371	0.275	0.250	4.150	0.473	26.250
IW374	0.315	0.161	8.147	0.086	12.602
IW377	0.304	0.382	5.921	0.188	5.357
IW381	0.309	0.190	9.152	0.056	11.882
IW382	0.322	0.275	6.319	0.164	8.175
IW384	0.343	0.150	8.675	0.065	7.206
IW386	0.334	0.192	8.439	0.072	5.278
IW388	0.337	0.156	8.775	0.061	9.239
IW389	0.348	0.130	10.100	0.037	5.526
IW390	0.349	0.250	5.071	0.258	5.221

BASIN	IA (in)	DTHETA	PSIF	XKSAT (in/hr)	RTIMP (%)
IW390A	0.350	0.250	6.134	0.172	17.033
IW392	0.350	0.150	7.459	0.103	8.347
IW394	0.350	0.327	6.166	0.173	16.632

* Sub-basins created for the Wittmann Phase IV FDS

Unit Hydrograph Procedure

The Wittmann ADMSU used the Clark Unit Hydrograph method to compute the unit hydrographs. The time of concentration (T_c) and storage coefficient (R) information from the Wittmann ADMSU is shown in Table 4.4

Table 4.4 Sub-Basin Time of Concentration Parameters

Basin	L (mi)	Slope (ft/mi	100-YR 24-HR T_c (hr)	100-YR 24-HR R (hr)	100-YR 6-HR T_c (hr)	100-YR 6-HR R (hr)
IW350	4.946	34.8	1.363	1.203	1.308	1.150
IW353	4.736	54.9	1.004	0.717	0.996	0.710
IW353A*	1.717	54.7	N/A	N/A	0.629	0.412
IW357	2.981	67.8	0.742	0.752	0.700	0.705
IW359	3.796	46.4	0.979	0.571	0.983	0.574
IW359A*	3.500	46.9	N/A	N/A	0.946	0.659
IW366	2.729	54.2	0.796	0.622	0.763	0.593
IW371	0.541	70.2	0.308	0.327	0.275	0.288
IW374	1.450	67.6	0.475	0.374	0.442	0.345
IW377	1.116	78.9	0.442	0.566	0.408	0.519
IW381	2.406	60.7	0.704	0.873	0.650	0.799
IW382	2.183	56.8	0.688	0.599	0.642	0.555
IW384	0.654	61.1	0.338	0.327	0.308	0.296
IW386	1.805	66.5	0.917	0.945	0.838	0.855
IW388	2.950	61.0	1.200	0.958	1.133	0.900
IW389	1.197	88.6	0.638	0.825	0.588	0.753
IW390	2.038	83.4	1.021	1.302	0.929	1.173
IW390A	2.931	104.1	1.033	0.963	0.971	0.899
IW392	1.972	244.5	0.500	0.278	0.504	0.280
IW394	5.124	218.6	1.367	0.857	1.367	0.857

* Sub-basins created for the Wittmann Phase IV FDS

Channel Routing

The normal depth storage-outflow channel routing is used to route runoff hydrographs through sub-basins. The routing length, slope, and Manning's n values from the Wittmann ADMSU are shown in Table 4.5.

Table 4.5 Channel Routing Summary

Reach	Reach Length (ft)	Slope (ft/ft)	LOB n value	Channel n value	ROB n value
RIW357	16,693	0.0079	0.04	0.04	0.04
RIW359	13,031	0.0059	0.04	0.04	0.04
RIW359**	4,667	0.0051	0.04	0.04	0.04
R359*	9,280	0.0103	0.04	0.04	0.04
RIW366	9,657	0.0070	0.04	0.04	0.04
RIW366**	8,105	0.0070	0.04	0.04	0.04
RIW371	11,583	0.0088	0.04	0.04	0.04
RD371	1,409	0.0014	0.043	0.035	0.043
RIW374	20,437	0.0081	0.04	0.04	0.04
RIW374**	18,876	0.0081	0.04	0.04	0.04
RIW377	6,588	0.0096	0.04	0.04	0.04
RIW381	4,964	0.0096	0.04	0.04	0.04
RIW382	4,964	0.0120	0.04	0.04	0.04
RD382A	1,172	0.0068	0.043	0.035	0.043
RIW384	4,694	0.0124	0.04	0.04	0.04
RIW386	10,311	0.0078	0.043	0.035	0.043
RIW388	7,726	0.0094	0.04	0.04	0.04
RIW389	11,459	0.0124	0.04	0.04	0.04
RIW390	11,626	0.0101	0.043	0.035	0.043
R390A	8,577	0.0134	0.043	0.035	0.043
RIW394	7,697	0.0133	0.043	0.035	0.043

** Modified Routing created for the Wittmann Phase IV FDS

4.3 Problems Encountered During the Study

4.3.1 Special Problems and Solutions

None were encountered.

4.3.2 Modeling Warning and Error Messages

The HEC-1 model did not contain any warning or error messages.

4.4 Calibration

No model calibration was performed as part of this study.

4.5 Final Results

4.5.1 Hydrologic Analysis Results

The results for peak discharges are shown in Table 4.6. The higher peak flow between the 100-year 6-hour and 100-year 24-hour storms should be used for the floodplain delineation. In all cases, the 100-year 6-hour storm was the governing storm that produced the higher peak flows.

Concentration point CIW353 in the Wittmann ADMSU hydrology model combines additional area tributary to Iona Wash. Since the flow in Iona Tributary 1 West at the confluence of Iona Wash is necessary for the floodplain delineation purposes, the Wittmann ADMSU concentration point CIW353 was modified to exclude the flows from Iona Wash. In other words, CIW353 excludes sub-basin IW358, which contributes to Iona Wash instead of Iona Tributary 1 West.

Additional sub-basin delineation was necessary for five reaches. Table 4.7 shows the results of the prorated basins. Iona Tributary 1 West and Iona Tributary 1 West Extension each have one additional sub-basin added to account for flow upstream of the confluence with tributary washes. Iona Tributary 2 West has three sub-basins where flows were obtained from prorating basin IW350.

Table 4.6 Sub-basin Hydrologic Analysis Results

Drainage ID	Area (sq mi)	100-YR Peak Discharge (cfs)		Unit Peak (cfs/sq mi)	
		24-HR	6-HR	24-HR	6-HR
IW350	2.18	1,154	1,410	531	648
CIW359	5.97	3,105	3,423	520	573
CIW353*	15.12	4,986	5,467	330	362

*Modified from the Wittmann ADMSU

Table 4.7 Prorated Basin Results

Drainage ID	Area (sq mi)	Calculated Peak Flow (cfs)
CIW353A	6.69	3,561
CIW359A	3.50	2,334
IW350A	1.66	1,074
IW350B	1.25	811
IW350C	1.01	652

Table 4.8 Discharges used for Floodplain Delineation

Wash	Upstream Cross Section	Downstream Cross Section	100-Year Flow (cfs)
Iona Tributary 1 West	1.538	0.088	5,467
Iona Tributary 1 West	2.362	1.604	3,561
Iona Tributary 1 West Extension	2.646	2.456	3,423
Iona Tributary 1 West Extension	4.161	2.741	2,334
Iona Tributary 2 West	0.852	0.101	1,074
Iona Tributary 2 West	1.515	0.946	811
Iona Tributary 2 West	2.272	1.609	652

4.5.2 Verification of Results

The verification of results was performed using three indirect methods. Indirect Method No. 1 makes a comparison between seven envelope curves of maximum observed flood discharges. The seven point values (CIW353, CIW353A, CIW359, CIW359A, IW350A, IW350B, and IW350C) from the Wittmann ADMSU were lower than all seven envelope curves (Refer to the graphs located in Appendix D.6). Indirect Method No. 2 compares USGS data for Arizona. The seven point values from the Wittmann ADMSU are located near the Log Pierson Type 3 Curve and well within the 75% Tolerance Limits. Indirect Method No. 3 compares USGS Regional Regression Equations. The watershed for Iona Tributary 1 West, Iona Tributary 1 West Extension, and Iona Tributary 2 West is located within the Central Arizona Region (R12). This regional equation computes the 100-year discharge by relating the 100-year peak discharge with drainage area where AREA is the drainage area in square miles and ELEV is the mean basin elevation in feet divided by 1,000.

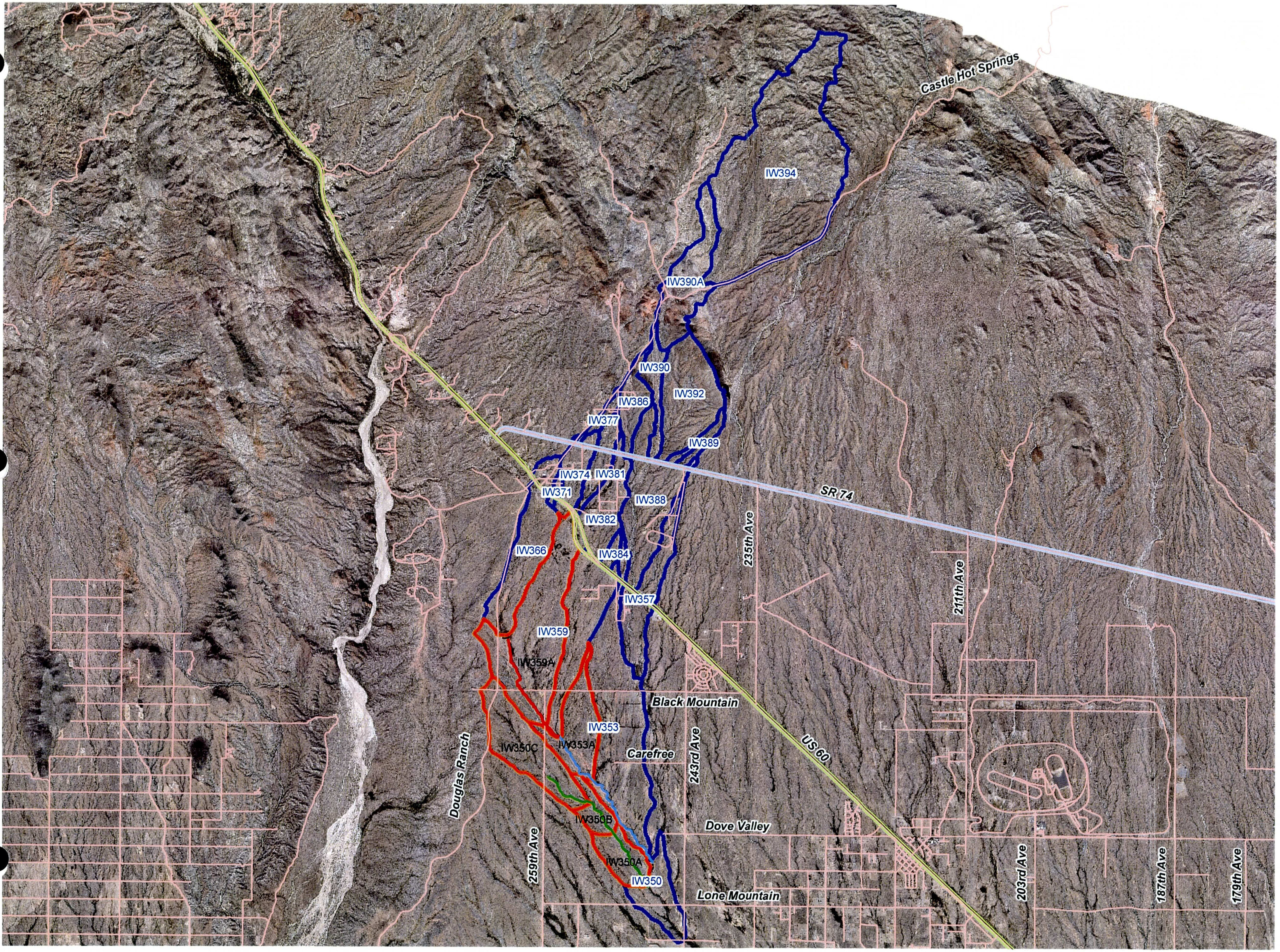
Regional Regression Equation for Central Arizona Region (R12)

$$Q_{100} = 10^{(6.55 - 3.17\,AREA^{-0.11} - 0.454\,LOGELEV)}$$

As can be seen in Table 4.9, the comparison shows the results from this study are lower than the USGS regional regression equation. It should be mentioned that the results of the Wittmann ADSMU should be more accurate than those using the regression equation because the study was more detailed.

Table 4.9 USGS Regional Regression Peak Discharge Comparison

Drainage ID	Area (sq mi)	Mean Elev (ft)	100-YR Peak Discharge (cfs)		USGS Regional Regression Equation (R12) 100-YR
			24-HR	6-HR	
CIW353	15.12	2548	4,986	5,467	10,334
CIW353A	6.69	2572	N/A	3,561	6,191
CIW359	5.97	2586	3,105	3,423	5,732
CIW359A	3.50	2590	N/A	2,334	3,985
IW350A	1.66	1780	881	1,074	2,743
IW350B	1.25	1790	663	811	2,198
IW350C	1.01	1803	536	652	1,850



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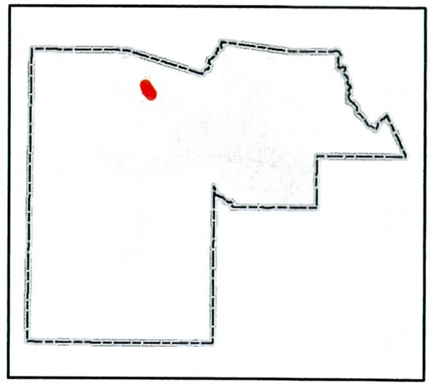

Wittmann Phase IV Floodplain Delineation Study

Legend

- Iona Tributary 1 West
- Iona Tributary 1 West Extension
- Iona Tributary 2 West
- Streets
- Prorated Basins
- WADMSU Subbasins

0 1,7503,500 7,000 Feet

1 inch = 7,000 feet

Sub-basin Boundaries W/ Aerial

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DLP	NEF

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DATE 8.8.11

FIGURE 4.1

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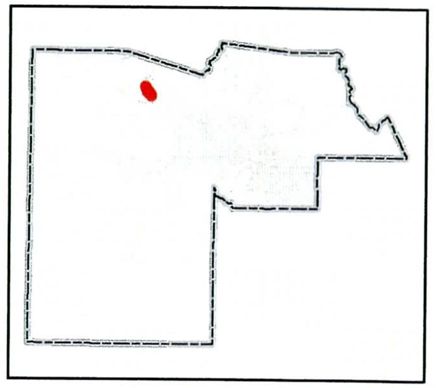
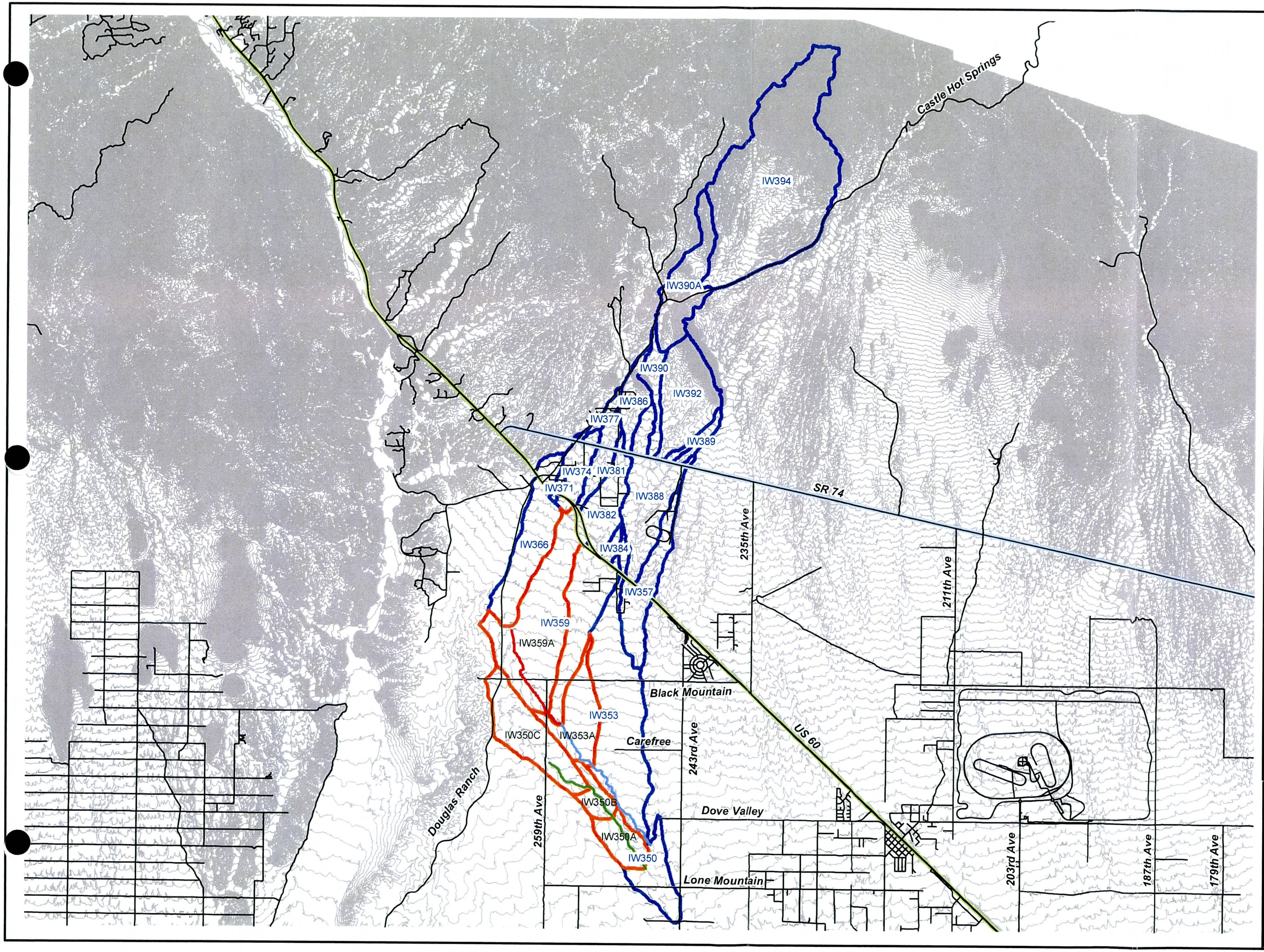
Flood Control District of Maricopa County



Wittmann Phase IV Floodplain Delineation Study



Legend

- Iona Tributary 1 West
- Iona Tributary 1 West Extension
- Iona Tributary 2 West
- Prorated Basins
- WADMSU Subbasins
- Contours
- Streets

0 1,750 3,500 7,000 Feet

1 inch = 7,000 feet

Sub-basin Boundaries W/ Topo

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FIGURE 4.2

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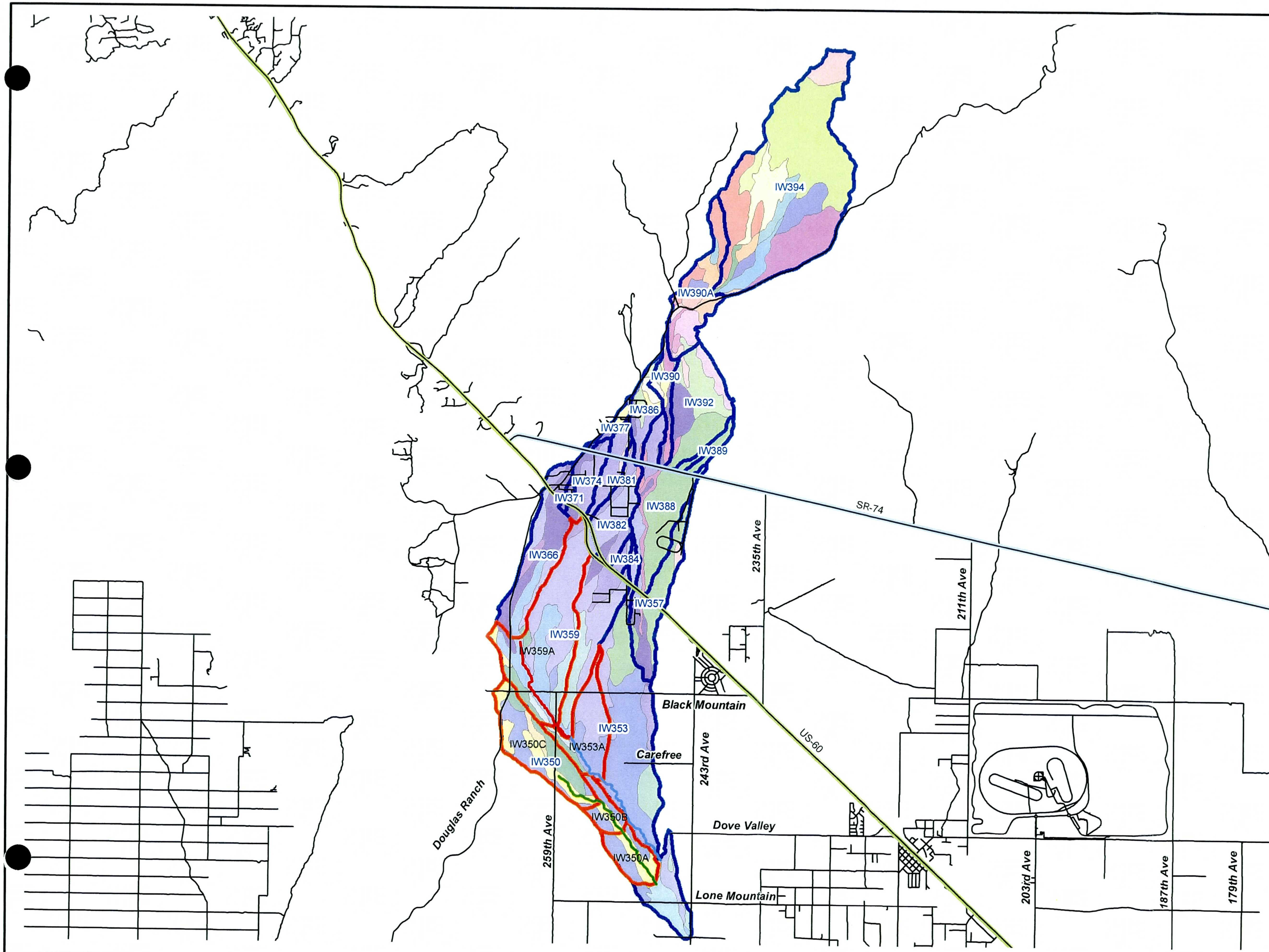

Flood Control District of Maricopa County

Wittmann Phase IV
Floodplain Delineation Study

Legend

- Prorated Basins
- WADMSU Subbasins
- Streets

Soils

DESCRIPTION

- Antho-Carrizo-Maripo complex
- Anthony-Arizo complex, low precipitation
- Carefree-Beardsley complex
- Cipriano very gravelly loam
- Contine clay loam
- Continental-Ohaco complex
- Denure-Momoli-Carrizo complex
- Dixaleta-Rock outcrop complex, 25 to 65 percent slopes
- Eba very gravelly loam, 1 to 8 percent slopes
- Eba-Continental complex, 1 to 8 percent slopes
- Eba-Nickel-Cave association, 3 to 25 percent slopes
- Eba-Pinaleno complex, low precipitation, 3 to 20 percent slopes
- Ebon very gravelly loam, 1 to 8 percent slopes
- Ebon-Contine complex, 1 to 8 percent
- Ebon-Gunsight-Cipriano association, 3 to 25 percent slopes
- Ebon-Pinamt complex, 20 to 40 percent slopes
- Ebon-Pinamt complex, 3 to 20 percent slopes
- Gadsden clay
- Gilman loams
- Gilman-Momoli-Denure complex
- Gran-Wickenburg-Rock outcrop complex, 1 to 7 percent slopes
- Gran-Wickenburg-Rock outcrop complex, low precipitation, 10 to 65 ?percent slopes
- Greyeagle-Suncity Variant complex, 1 to 7 percent slopes
- Gunsight-Cipriano complex, 1 to 7 percent slopes
- Gunsight-Rillito complex, 1 to 25 percent slopes
- Lehmans-Rock outcrop complex, low precipitation, 8 to 65 percent ?slopes
- Luke-Cipriano association, 1 to 15 percent slopes
- Mohall clay loam
- Mohall loam
- Nickel-Cave complex, low precipitation, 8 to 30 percent slopes
- Pinamt-Tremant complex, 1 to 10 percent slopes
- Suncity-Cipriano complex, 1 to 7 percent slopes
- Tremant-Suncity complex, 1 to 8 percent slopes
- Tres Hermanos-Anthony complex, 1 to 5 percent slopes

0 1,700 3,400 6,800 Feet

1 inch = 7,000 feet

Sub-basin Boundaries W/ Soils

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FIGURE 4.3

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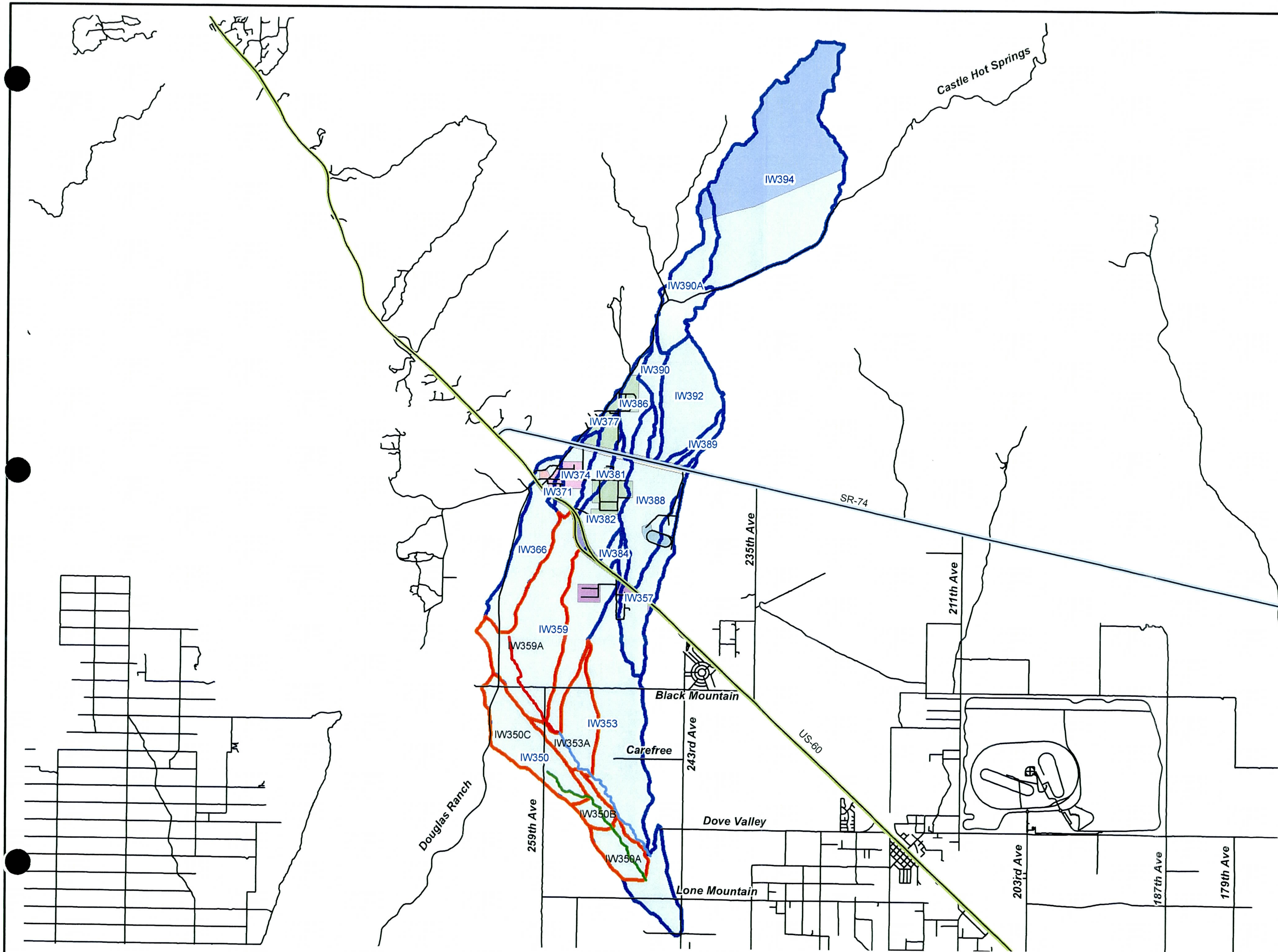
Flood Control District of Maricopa County

Wittmann Phase IV Floodplain Delineation Study



Legend
- Iona Tributary 1 West
- Iona Tributary 1 West Extension
- Iona Tributary 2 West
- Streets
- Prorated Basins
- WADMSU Subbasins

Landuse

DESCRIPTION
- Educational (Public schools, private schools and universities)
- Estate Residential (1/5 du per acre to 1 du per acre)
- General Open Space (Open space where no detail available)
- General Transportation (Transportation where no detail available)
- Large Lot Residential - Single Family (1 du per acre to 2 du per acre)
- Other Employment - low (Proving grounds and land fills)
- Passive Open Space (Includes mountain preserves and washes)
- Rural Residential (<= 1/5 du per acre)
- Transportation (Includes railroads, railyards, transit centers and freeways

0 1,7503,500 7,000 Feet

1 inch = 7,000 feet

Sub-basin Boundaries W/ Land Use

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FIGURE 4.4

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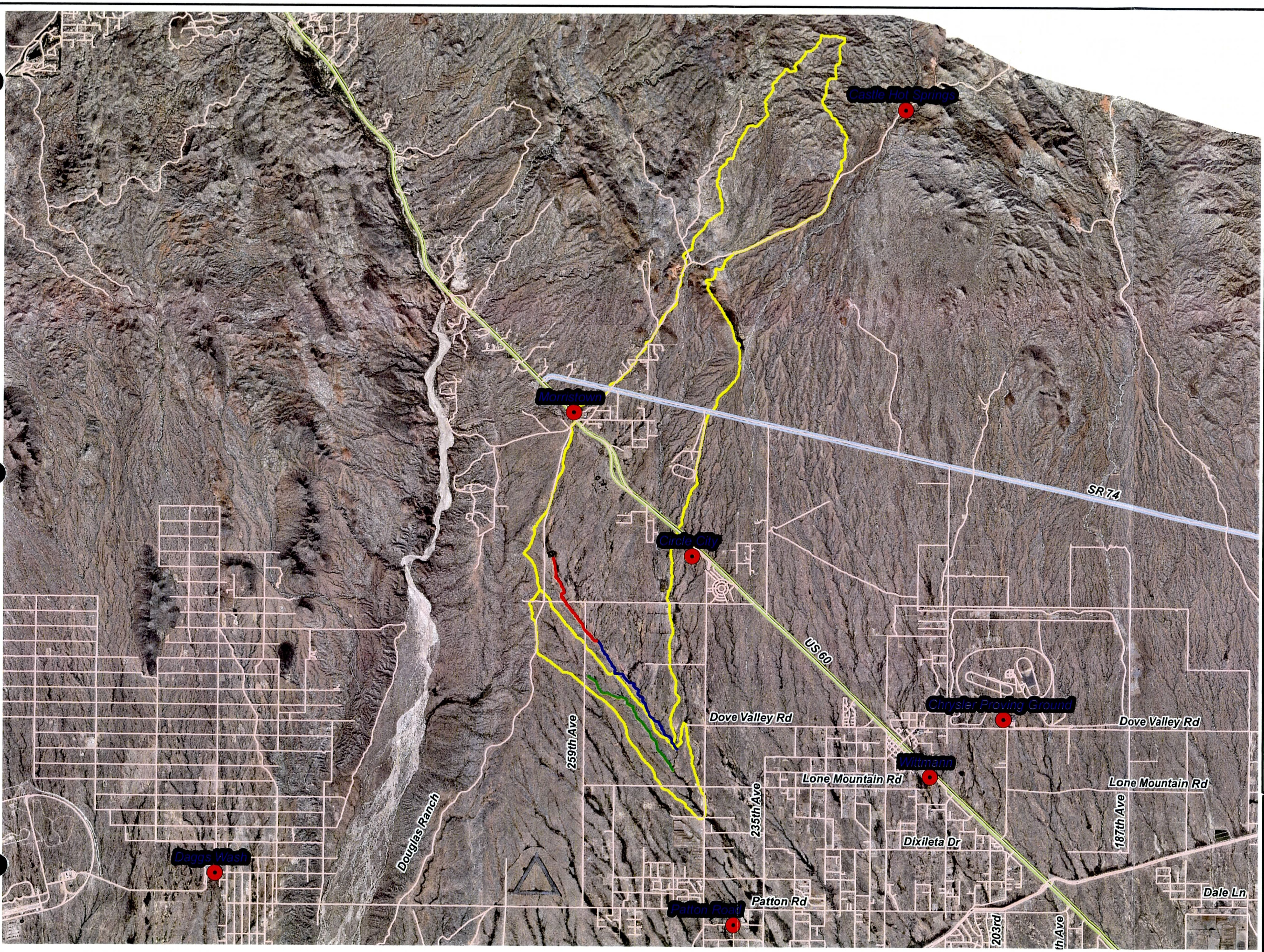
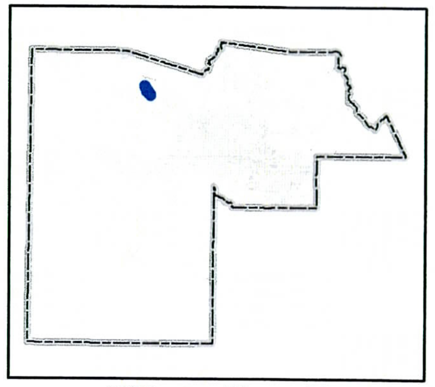


Flood Control District of Maricopa County



Wittmann Phase IV Floodplain Delineation Study

Legend

- Gages
- Iona Tributary 1 West
- Iona Tributary 1 West Extension
- Iona Tributary 2 West
- Streets
- Watershed

0 2,000 4,000 8,000 Feet

1 inch = 8,000 feet

Gage Locations

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PROJECT NUMBER	45104608
DATE 8.8.11	FIGURE 4.5

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Section 5 Hydraulics

5.1. Method Description

The U.S. Army Corps of Engineers Hydrologic Engineering Center River Analysis System (HEC-RAS) version 4.1.0 dated January 2010 was used to create the hydraulic model and floodplain delineation for this study. Cross sections were created from the existing elevation data provided by the FCDMC.

The name for each wash was obtained from the Wittmann ADMSU Floodplain Delineation Study. Iona Tributary 1 West and Iona Tributary 1 West Extension are used to differentiate where the previous Zone A floodplain delineation terminated. In addition, a name based on the location (Township, Range, and Section) of the wash discharge point was also included.

The floodplain delineation used the larger flow between the 100-year 6-hour and 100-year 24-hour storm. In all cases, the 100-year 6-hour storm event produced the higher peak flows.

According to Appendix C of FEMA's Guidelines and Specifications for Flood Hazard Mapping Partners, starting water-surface elevations for tributaries should be based on normal depth (i.e., slope-area method) unless a coincident peak situation is assumed, or the tributary flow depths are higher than the corresponding main stream events. The downstream boundary condition for both Iona Tributary 1 West and Iona Tributary 2 West used normal depth instead of the known water surface elevation for Iona Wash.

5.2. Work Study Maps

Work Study Maps that show the floodplain delineations have been prepared at a scale of 1 inch = 200 feet, according to FEMA standards using the 2 and 4 foot contour interval topographic mapping. A cover sheet shows the location of the study area. Each Work Study Map shows the floodplain baseline, zone boundaries, and cross sections used in the delineation.

5.3. Parameter Estimation

5.3.1. Roughness Coefficients

Iona Tributary 1 West, Iona Tributary 1 West Extension, and Iona Tributary 2 West are desert washes. The procedure used to determine the Manning's "n" value roughness coefficients is outlined in the USGS publication "Selection of Manning's Roughness Coefficients for Natural and Constructed Vegetated and Non-Vegetated Channels and Vegetation Maintenance Plan Guidelines for

Vegetated Channels in Central Arizona" (2006). Based on field observations, the Manning's roughness coefficients were fairly similar for each wash channel and overbanks. A list of the roughness coefficients for each wash, photos of each wash, and a description of how the roughness coefficients were obtained is provided in Appendix E.1

5.3.2. Expansion and Contraction Coefficients

The expansion and contraction coefficients used in the HEC-RAS model are 0.1 and 0.3, respectively. There are not any bridges or culverts within the study limits.

5.4. Cross Section Description

Cross sections were located at approximately 500 ft intervals along the washes. Additionally, cross sections were located near confluences and at particular areas of interest including future road crossings. The cross sections are oriented left to right looking downstream. A plot of each cross section is provided in Appendix E.2.

5.5. Modeling Considerations

There are many locations within Iona Tributary 1 West and Tributary 1 West Extension and a few locations within Iona Tributary 2 West that show divided flow conditions creating islands of higher ground. The elevation difference between the island and the adjacent water surface elevation at the majority of these locations was less than one foot and consists of a small area. Therefore, these island areas were shown as floodplain.

5.6. Floodway Modeling

Because this study is only producing limited detail Zone AE, floodways have not been modeled.

5.7. Problems Encountered During the Study

No major problems were encountered during the study. However, the two washes appear to have areas of significant erosion and there is evidence of head cutting occurring since the topography was completed.

There is also a potential break out area at a bend between Cross Section 1.776 and Cross Section 1.827. This section has widened since the topography was completed. The floodplain was drawn based on the 2011 aerial photographs for the right overbank. Additional survey points were collected to determine if the banks contained the 100-year flows. The water surface elevation exceeds the bank at this location. A limit of study was placed at this location and the potential flow split was not analyzed.

5.8. Calibration

Calibration was not performed as part of this study due to a lack of gages on the delineated washes.

5.9. Final Results

Refer to the floodplain maps located in the Appendix.

Section 6 Erosion and Sediment Transport

Erosion and sediment transport were not considered in this study.

Section 7 Draft FIS Report Data

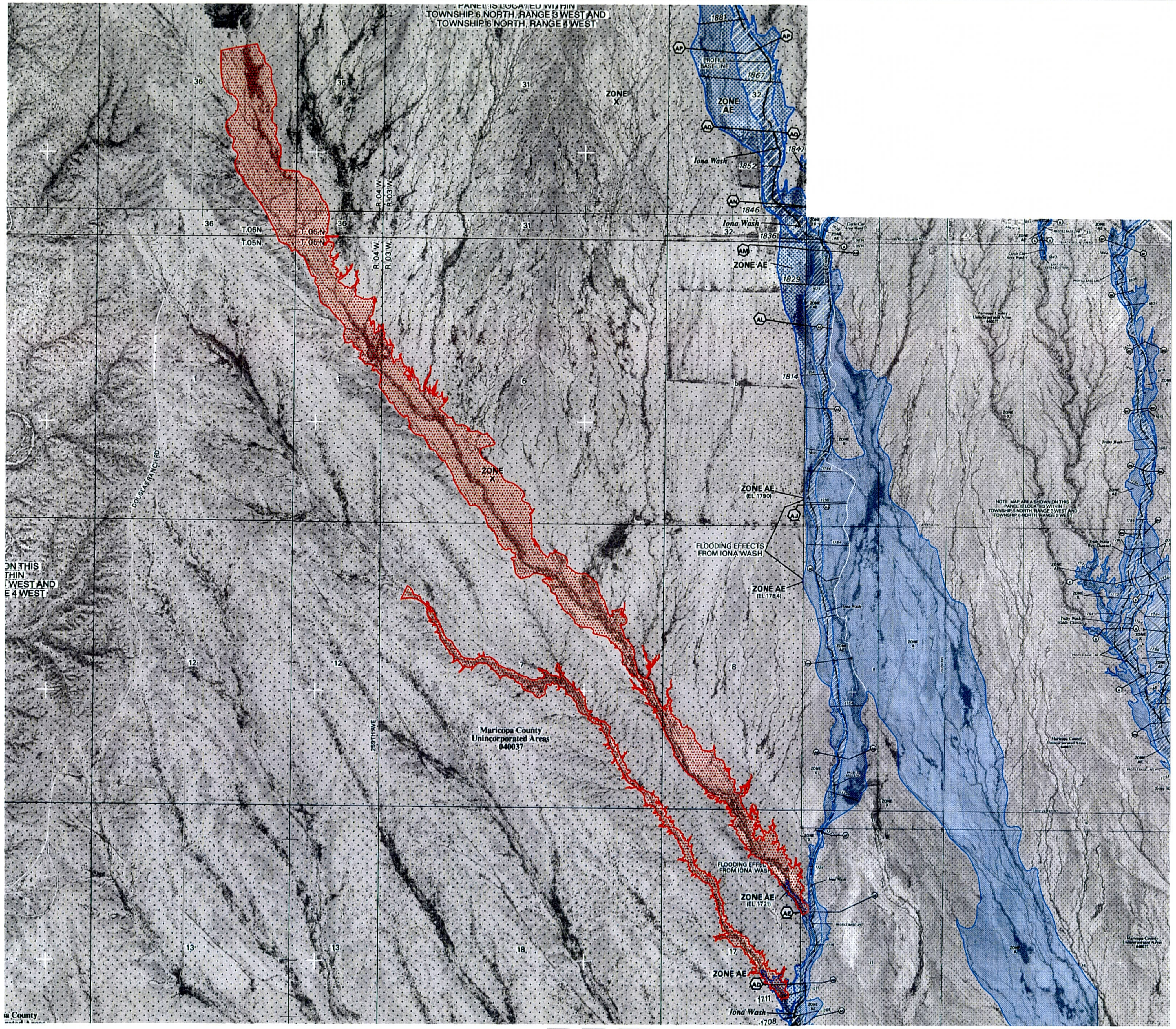
7.1. Summary of Discharges

Refer to Tables 4.6 through 4.8 and the HEC-1 model for the discharges of each subbasin.

7.2. Floodway Data and Flood Profiles

There are no floodway data because this is a limited detail Zone AE Floodplain. Refer to the floodplain profiles located in Appendix E.5.

7.3. Annotated FIRM



2000 1000 0 2000 4000 6000

SCALE: 1"=2000'

LEGEND

PROPOSED ZONE AE

ANNOTATED FIRM

SOURCE:
FIRM PANELS 04013C0660G, 04013C0670G, 04013C0680G, 04013C0687H, 04013C0689H, 04013C0690H
DATE: SEPTEMBER 30, 2005

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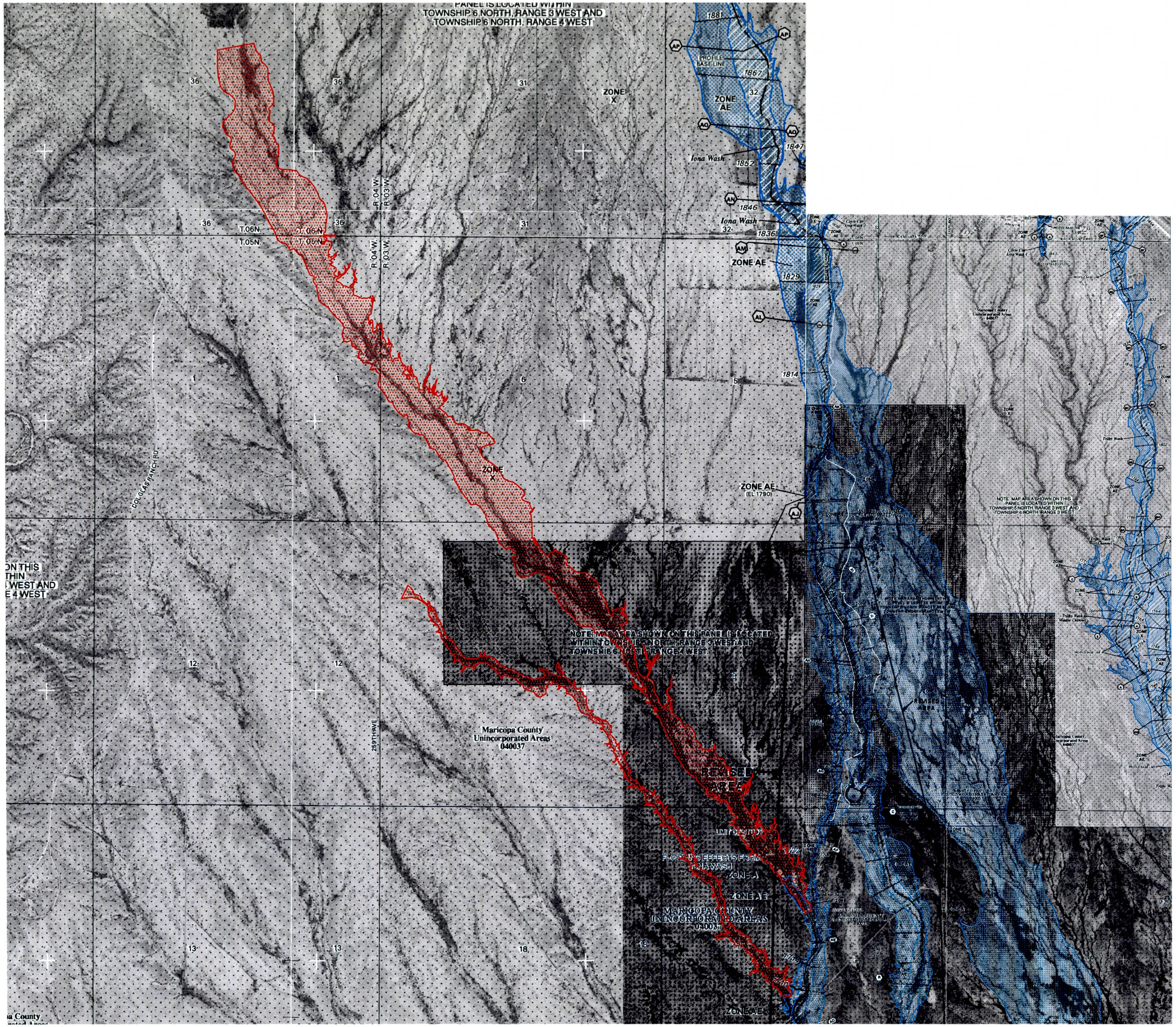

SCALE: 1"=2000'

2000 1000 0 2000 4000 6000

SCALE: 1"=2000'

LEGEND

PROPOSED ZONE AE

ANNOTATED FIRM
W/ LOMR DATED FEB. 4, 2011

SOURCE:
FIRM PANELS 04013C0660G, 04013C0670G, 04013C0680G, 04013C0687H, 04013C0689H, 04013C0690H
DATE: SEPTEMBER 30, 2005

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Appendix A References

A.1 Data Collection Summary

The following reports and studies were used in the preparation of this study.

Arizona Department of Water Resources (1997). "Instructions for Organizing and Submitting Technical Documentation for Flood Studies," Flood Mitigation Section, Arizona Department of Water Resources, Phoenix, Arizona 85004.

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.

Maricopa Association of Goverments (MAG). The digital GIS land use maps for Maricopa County.

Wittmann Area Drainage Master Study Update Hydrology Report Final Addendum (July 2005) prepared by Entellus for the Flood Control District of Maricopa County.

Wittmann Area Drainage Master Study Update Technical Data Notebook (September 2005) prepared by Entellus for the Flood Control District of Maricopa County.

A.2 Referenced Documents

Hydrologic Engineering Center (1991). "HEC-1 Flood Hydrograph Package, User's Manual," US Army Corps of Engineers.

Sabol, G. V., Rumann, J. M., Khalili, D., Waters, S. D., and T. Lehman (January, 1995). "Drainage Design Manual for Maricopa County, Arizona, Volume I, Hydrology," prepared for Flood Control District of Maricopa County.

United States Geological Survey (2006). "Selection of Manning's Roughness Coefficients for Natural and Constructed Vegetated and Non-Vegetated Channels, and Vegetation Maintenance Plan Guidelines for Vegetated Channels in Central Arizona"

Wittmann Phase IV Floodplain Delineation Study
DATA COLLECTION REPORT

Prepared for

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

Prepared by

RBF Consulting
16605 North 28th Avenue, Suite 100
Phoenix, Arizona 85053

August 2011

FCD 2011C003
RBF 45104608

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1. DATA COLLECTION AND FINDINGS

This section is intended to describe the data collection efforts for the Wittmann Phase IV Floodplain Delineation Study of Iona Tributary 1 West (T5NR3WS17-1W), Iona Tributary 1 West Extension (T5NR3WS17-1WE), and Iona Tributary 2 West (T5NR3WS17-2W) and provide a list of the data materials received from agencies and stakeholders. A considerable amount of background information was gathered, including reports and data from the FCDMC relative to the Wittmann ADMSU, MCDOT, and the City of Surprise. This report also outlines observations gathered during the project site visit.

2. DATA SOURCES

An extensive amount of information was sought and received from a variety of government agencies and stakeholders. Refer to Table 1 *List of Project Contacts* for those contacted during the data collection portion of the project. Some information was provided first hand from project stakeholders, supplemental information was also derived via email or through websites to complement the primary data sources. These stakeholders include:

- Flood Control District of Maricopa County
- City of Surprise
- FEMA
- Maricopa County Assessor
- Maricopa County Planning & Development
- Maricopa Association of Governments
- Maricopa County Department of Transportation
- State Land Department

3. DATA TYPES OBTAINED

The data received was provided in a variety of different formats. Table 2 *List of Collected Reports and Electronic Files* identifies and summarizes the data obtained and data types associated with each report, map, or piece of data received. A few examples of the various data types include:

- GIS Database layers
- Aerial Photography
- Area Topography
- Site Visit Photos
- Transportation Corridor Alignment Studies
- Flood Insurance Rate Maps
- Land Ownership Data
- Hydrology and Hydraulic Models and Reports
- Land Use Plans

4. PRELIMINARY FINDINGS OF FACT

4.1 PROPERTY OWNERSHIP

The Study Area includes mostly Arizona State Land with a few private landowners near the confluence of Iona Wash. Refer to Figure 1 and Table 3 for further illustration. Conversations with the City of Surprise and Maricopa County Planning and Development indicate that no development plans are currently being processed in the study area.

4.2 Existing Floodplain

The existing FEMA floodplain per the Flood Insurance Rate Map (FIRM) panels 04013C0660G, 04013C0670G, and 04013C0690H, effective September 30, 2005 classifies Iona Tributary 1 West, Iona Tributary 1 West Extension, and Iona Tributary 2 West as Zone X. Zone X is defined as "Areas of the 0.2% annual chance flood; areas of 1% annual chance flood with average depths less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood". These washes are tributary to Iona Wash. Iona Wash is classified as Zone AE floodplain and floodway. Zone AE is defined as "base flood elevation determined". Refer to Figure 2 for additional information.

The Wittmann Area Drainage Master Study Update (ADMSU) delineated Iona Tributary 1 West (referred to as Iona Tributary in ADMSU) as Zone A floodplain. Iona Tributary 1 West Extension and Iona Tributary 2 West were not delineated as part of the Wittmann ADMSU. The Wittmann ADMSU Floodplain Delineation Study was approved by FEMA as the best available data to use for floodplain management purposes in a letter dated September 26, 2007 FEMA case number 07-09-1634P. These floodplains will be published on the next effective FIRM publication. Refer to Figure 3 for additional information.

4.3 Proposed Floodplain

DEA proposed Zone A floodplain on portions of Iona Tributary 1 West Extension (referred to as Iona Tributary in DEA study) and Iona Tributary 2 West (referred to as T5N-R3W-S17 in DEA Study) as part of the City of Surprise Special Planning Areas 4 and 5 Zone A Floodplain Delineation Study. These floodplains have not been submitted to FEMA. Refer to Figure 4 for the results of this study.

4.4 GIS Database, Topography, and Aerial Photography

The FCDMC provided their most recent GIS database, topography, and aerial photography for the Study Area. This information was very useful for a variety of applications relative to aerial surveys, assessing development, and evaluating potential changes to hydrologic modeling.

4.5 Reports and Models

RBF received existing hydrologic studies prepared by Entellus for the Wittmann ADMSU in July 2005 and the floodplain delineation report prepared in September 2005. The Wittmann ADMSU shows the Iona Tributary 1 West watershed is 8.78 square miles and is divided into ten subbasins. The Iona Tributary 2 West watershed is 1.66 square miles and is located within one subbasin. Refer to Figure 3 to see a portion of the subbasin delineation and the Zone AE floodplains delineated as part of the Wittmann ADMSU.

DEA prepared a Technical Data Notebook for the City of Surprise Special Planning Areas 4 and 5 Zone A Floodplain Delineation Study in July 2008. DEA delineated intermediate basins and used a unit flowrate method to determine the flows based on the cfs/acre from the Wittmann ADSMU HEC-1 model. DEA used HEC-RAS to model the proposed Zone A floodplains. Refer to Figure 4 to see the proposed Zone A floodplains for Iona Tributary 1 West Extension and Iona Tributary 2 West.

4.6 GAGES

There are not any stream gages located on Iona Tributary 1 West, Iona Tributary 1 West Extension, or Iona Tributary 2 West. In addition, there are not any rain gages within the Iona Tributary 1 West, Iona Tributary 1 West Extension, and Iona Tributary 2 West watershed but there are several rain gages located near the watershed boundaries. Refer to Figure 5 which shows the gage name and location in relationship to the watershed.

4.7 STRUCTURES

Two stock tanks inline with Iona Tributary 1 West Extension were observed on the aerial photographs and on the site visit. No culverts were observed during the site visit. Conversations with the City of Surprise indicated no roadway improvement projects or development plans are currently planned for this area. MCDOT indicates that several corridor feasibility studies have been or will be completed in the near future. Turner Parkway is planned directly west of the proposed floodplain delineation study area limits. Wild Rose Parkway and Dove Valley Parkway are studies that should commence within the next year.

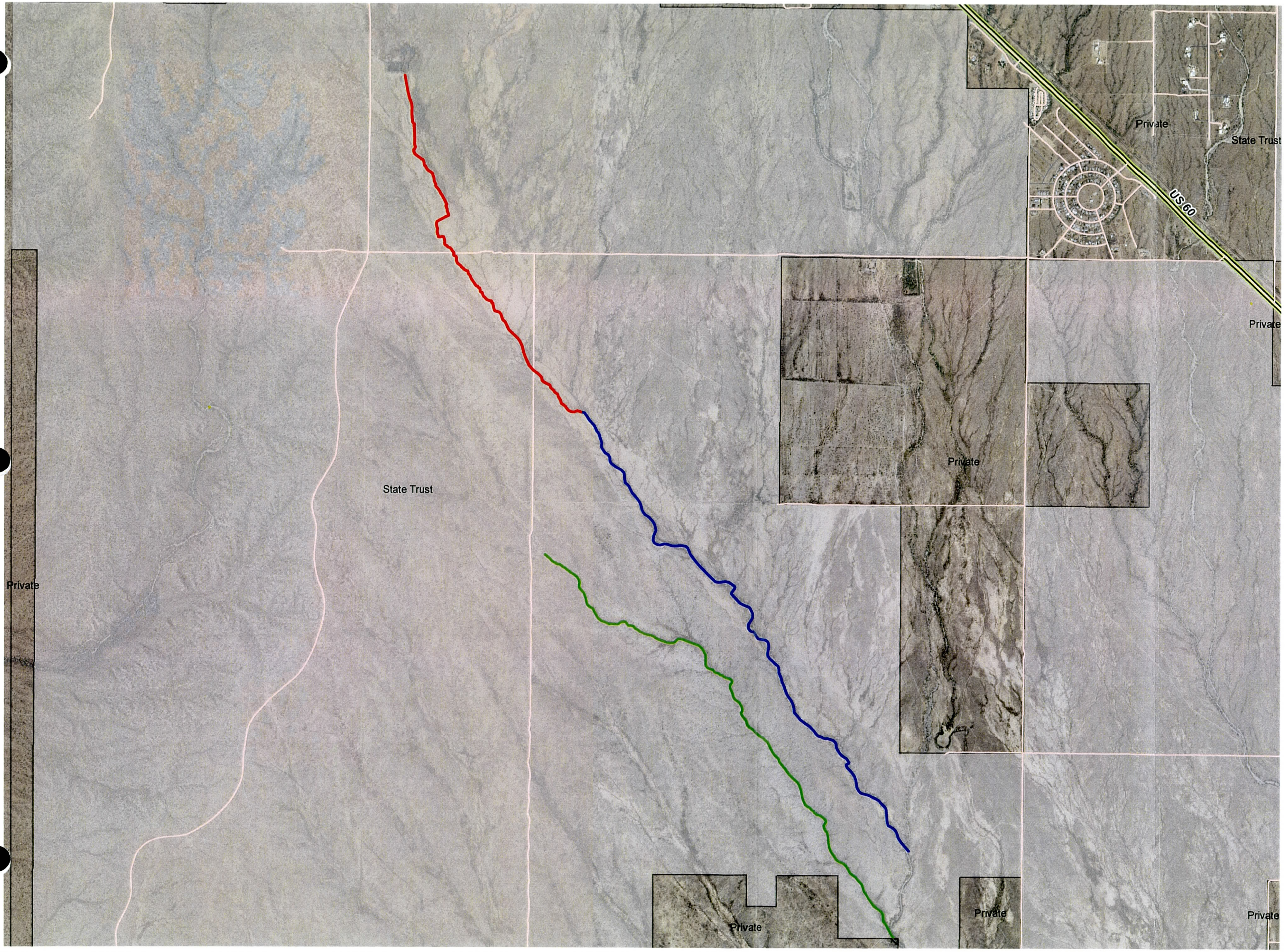
4.8 SITE VISIT

On July 27, 2011, RBF and District Staff conducted an initial site visit of the project study area. The field reconnaissance included a number of photographs and notations to obtain a preliminary understanding of the wash characteristics and other variables influencing the study area. Many areas within the entire study area were observed, many of the notable areas include:

- State Land is fenced and has been used to graze cattle – no development has occurred
- Two stock tanks have been built inline with Iona Tributary 1 West Extension
- Limited access to the study area – few dirt roads
- No culverts were observed during the site visit – washes flow over the dirt roads
- The washes are well defined by incised channels and by the amount of vegetation adjacent to the channels

Please refer to the photographs illustrating the channel character and areas of interest.

Figure 1 – Property Ownership



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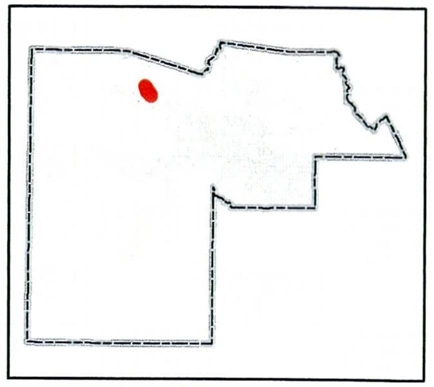

Wittmann Phase IV Floodplain Delineation Study

Legend

- Iona Tributary 1 West
- Iona Tributary 1 West Extension
- Iona Tributary 2 West
- Parcels
- Streets
- Bureau of Land Mgmt.
- Private Land
- State Trust Land

0 500 1,000 2,000 Feet

1 inch = 2,000 feet

Property Ownership

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DLP	NEF

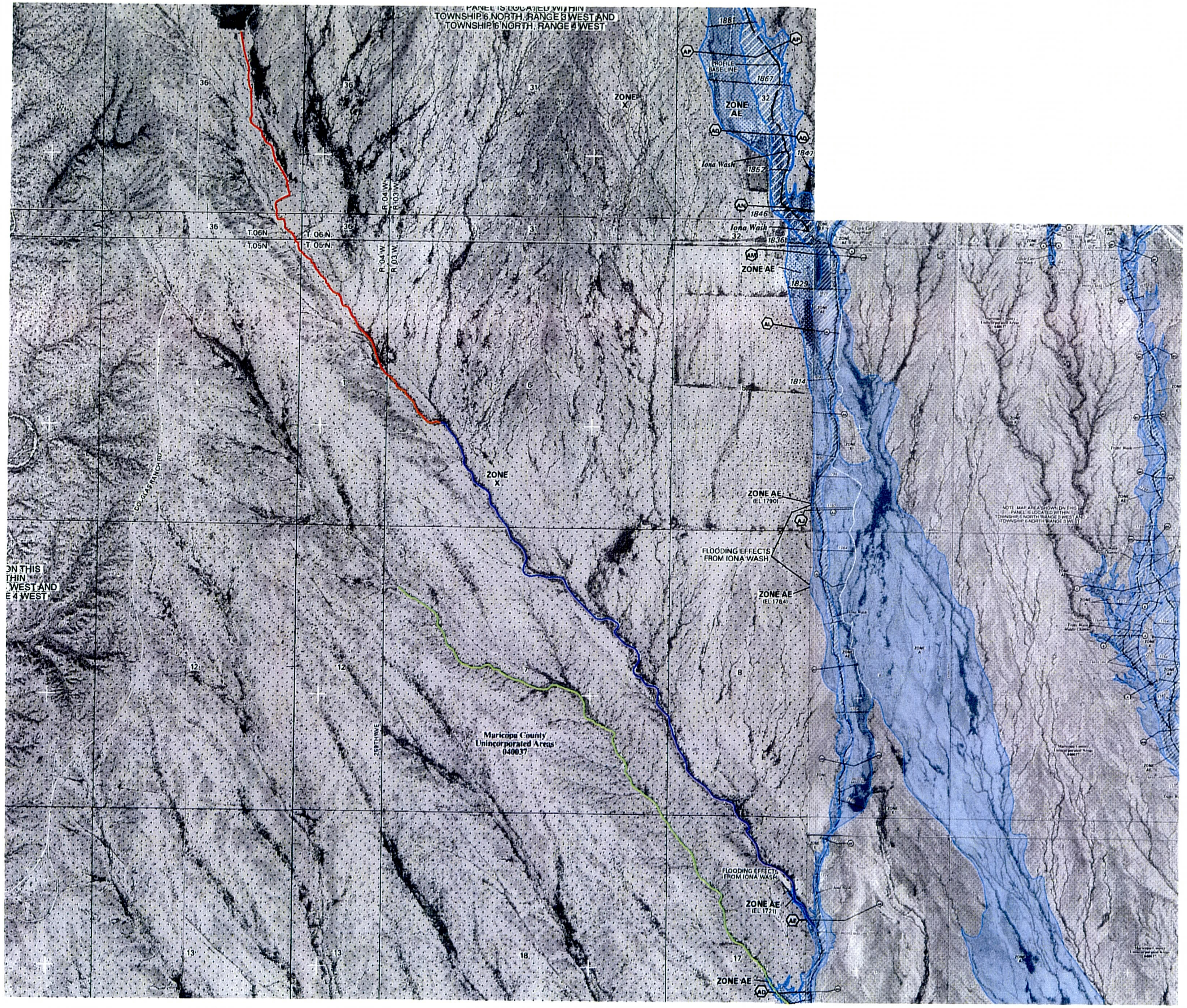
PROJECT NUMBER 45104608

DATE 8.25.11

FIGURE 1

File: H:\PDATA\45104608\GIS\Wittmann_Phase_IV\Property Ownership.mxd

Figure 2 – Existing FEMA Floodplain



SCALE: 1"=2000'

2000 1000 0 2000 4000 6000

SCALE: 1"=2000'

LEGEND

- IONA TRIBUTARY 1 WEST
- IONA TRIBUTARY 1 WEST EXTENSION
- IONA TRIBUTARY 2 WEST

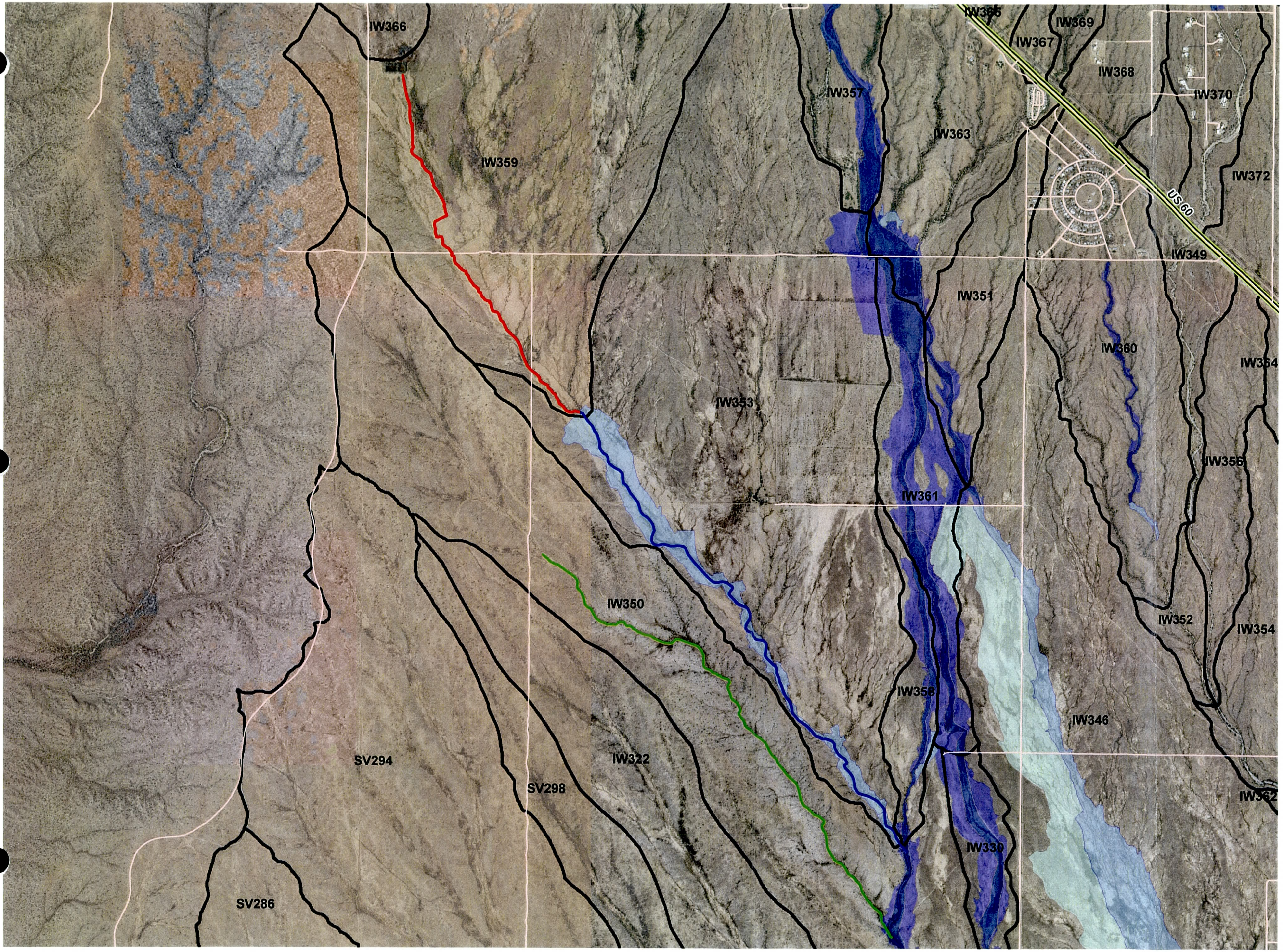
FIGURE 2
EXISTING FEMA FLOODPLAIN

SOURCE:
FIRM PANELS 04013C0660G, 04013C0670G, 04013C0680G, 04013C0687H, 04013C0689H, 04013C0690H
DATE: SEPTEMBER 30, 2005

RBF CONSULTING
PLANNING ■ DESIGN ■ CONSTRUCTION
16605 NORTH 28th AVENUE, SUITE 100
PHOENIX, ARIZONA 85053-7550
602.467.2200 ■ FAX 602.467.2201 ■ www.RBF.com

H:\PDATA\45104608\CADD\STRMWATER\EXHIBITS\WITTMANN PHASE IV\4608-FIRM.DWG DPEARCE 8/25/11 11:07 am

Figure 3 – Wittmann Area Drainage Master Study Update



Flood Control District of Maricopa County

Wittmann Phase IV
Floodplain Delineation Study

Legend

- Iona Tributary 1 West
- Iona Tributary 1 West Extension
- Iona Tributary 2 West
- Streets
- Wittmann ADMSU Subbasins
- A
- AE
- AO
- FW

0 500 1,000 2,000 Feet

1 inch = 2,000 feet

Wittmann ADMSU

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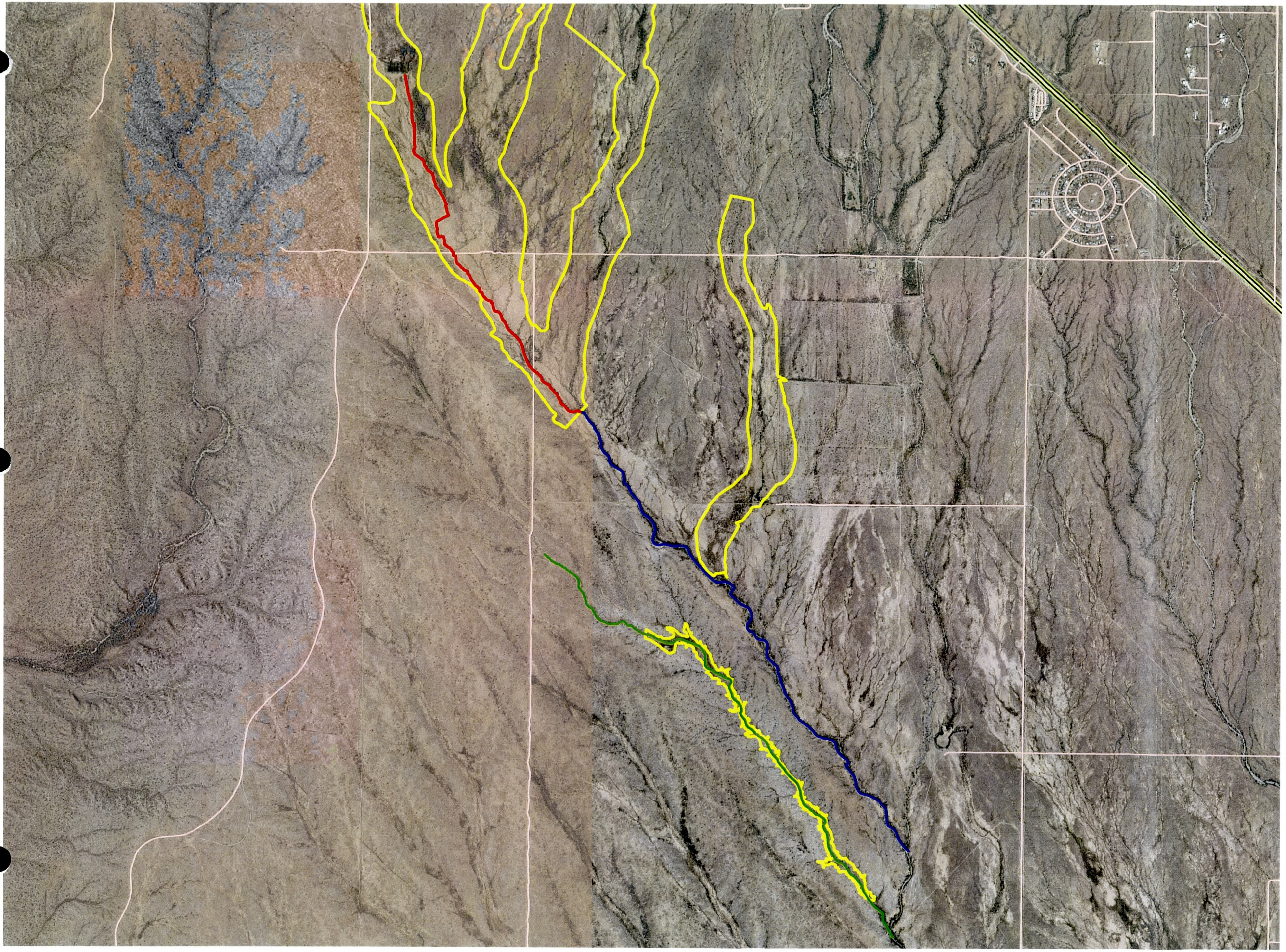
PHOENIX, ARIZONA 85053-7550
602-467-2200 FAX 602-467-2201 www.RBF.com

SURPRISE ARIZONA

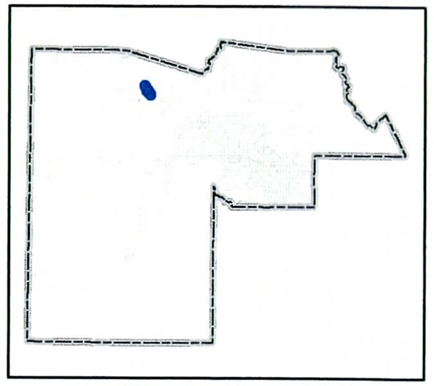
DRAFTED DLP	CHECKED NEF
PROJECT NUMBER	45104608
DATE 8.25.11	FIGURE 3

File: H:\PDATA\45104608\GIS\Wittman_Phase_IV\Floodplain\Wittmann ADMSU.mxd

Figure 4 – Special Planning Areas 4 and 5 Zone A FDS



Flood Control District of Maricopa County



Wittmann Phase IV Floodplain Delineation Study

Legend

- Iona Tributary 1 West
- Iona Tributary 1 West Extension
- Iona Tributary 2 West
- Zone A Floodplain

0 500 1,000 2,000 Feet

1 inch = 2,000 feet

Surprise Special Planning Areas 4 & 5 Zone A FDS

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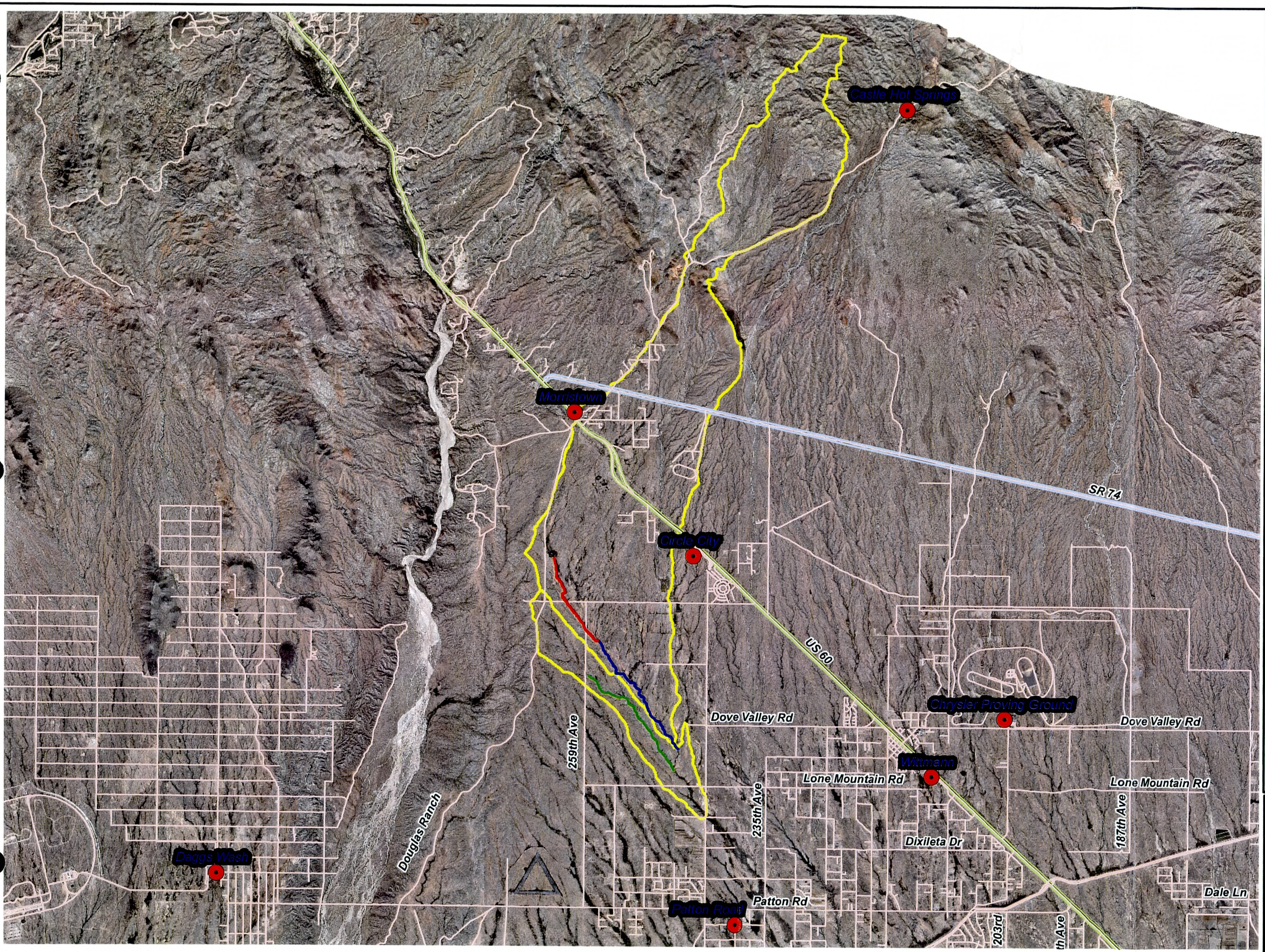
Flood Control District of Maricopa County

SURPRISE ARIZONA

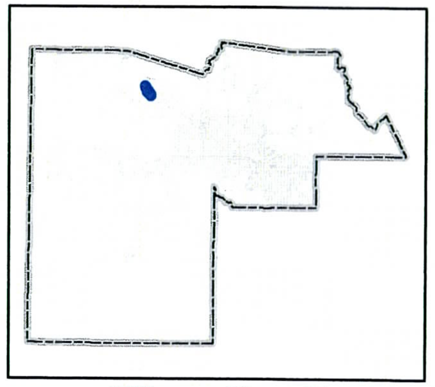
DRAFTED DLP	CHECKED NEF
PROJECT NUMBER	45104608
DATE 7.20.11	FIGURE 4

File: H:\PDATA\45104608\GIS\Wittmann_Phase_IV\SPA4_5FDS.mxd

Figure 5 – Gage Locations



Flood Control District of Maricopa County



Wittmann Phase IV Floodplain Delineation Study

Legend

- Gages
- Iona Tributary 1 West
- Iona Tributary 1 West Extension
- Iona Tributary 2 West
- Streets
- Watershed

0 2,000 4,000 8,000 Feet

1 inch = 8,000 feet

Gage Locations

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602-467-2200 FAX 602-467-2201 www.RBF.com

Flood Control District of Maricopa County

SURPRISE ARIZONA

DRAFTED	CHECKED
DLP	NEF

PROJECT NUMBER 45104608

DATE 8.25.11

FIGURE 5

File: H:\PDATA\45104608\GIS\Wittmann_Phase_IV\Gages.mxd

Site Visit Photos

Stock Tank Upstream of Iona Tributary 1 West Extension Limit of Study

Stock Tank on Iona Tributary 1 West Extension

Looking Downstream at Iona Tributary 1 West Extension from Downstream of Stock Tank

Looking Downstream at Iona Tributary 1 West from the Carefree Highway Alignment

Looking Upstream at Confluence of Iona Tributary 2 West with Iona Wash

Looking downstream at Iona Wash from Confluence with Iona Tributary 2 West

Table 1 – List of Project Contacts

Table 1 Data Collection Contacts

Name	Organization	email	Phone	Address	City	State	Zip
Jonathan Lesperance	FCDMC	jonathanlesperance@mail.maricopa.gov	602-506-4699	2801 W Durango St	Phoenix	AZ	85009
Richard Harris	FCDMC	rph@mail.maricopa.gov	602-506-4528	2801 W Durango St	Phoenix	AZ	85009
Robert Eroh	City of Surprise	robert.eroh@surpriseaz.com	623-222-6000	16000 N Civic Center Plaza	Surprise	AZ	85374
Jason Mahkovtz	City of Surprise	jason.mahkovtz@surpriseaz.com	623-222-6147	16000 N Civic Center Plaza	Surprise	AZ	85374
Denise Lacey	MCDOT	deniselacey@mail.maricopa.gov	602-506-6172	2901 W Durango St	Phoenix	AZ	85009
Eric Mayer	MCDOT	ericmayer@mail.maricopa.gov	602-506-8367	2901 W Durango St	Phoenix	AZ	85009
Michael Norris	Maricopa County P&D	michaelnorris@mail.maricopa.gov	602-372-4114	501 N 44th Street, Ste 200	Phoenix	AZ	85008
Manny Patel	Arizona State Land Department	mpatel@land.az.gov		1616 W Adams St	Phoenix	AZ	85007

Table 2 – List of Collected Reports and Electronic Files

Table 2 List of Collected Reports and Electronic Files

Document	Data Description	Media Type	Prepared By
Wittmann ADMSU Hydrology Report Final Addendum July 2005	Updated Hydrology for the Wittmann ADMSU	PDF	Entellus
Wittmann ADMSU Technical Data Notebook September 2005	Floodplain Delineation	PDF	Entellus
Surprise Special Planning Areas 4 and 5 Zone A Floodplain Delineation Study Technical Data Notebook Volumes 1-2 July 2008	Zone A Floodplain Delineation	PDF	David Evans and Associates, Inc.
Turner Parkway Corridor Feasibility Study I-10 to State Route 74	Corridor Feasibility Study	PDF	CK Group, Inc.

Table 3 – Property Ownership List

Table 3 Property Ownership List

Iona Tributary 1 West, Iona Tributary 1 West Extension, and Iona Tributary 2 West Floodplain Delineation Study, July 2011, FCD 2011C003

APN	Owner Name	Owner Address	City	State	Zip	USE Code	USE Code	Tax Owner	Tax Address	City	State	Zip	LotArea_Ac
50329002D	LUCKY COYOTE L L C	29811 N 255TH DR	WITTMANN	AZ	85361	SINGLE FAMILY RESIDENTIAL	RANCH PROPERTY	LUCKY COYOTE L L C	29811 N 255TH DR	WITTMANN	AZ	853615507	10.029
50329001	M&I MARSHALL & ILSLEY BANK	2525 E CAMELBACK RD 3RD FL	PHOENIX	AZ	85016	VACANT_LAND	RANCH PROPERTY	M&I MARSHALL & ILSLEY BANK	2525 E CAMELBACK RD 3RD FL	PHOENIX	AZ	850169239	39.997
50329002N	JHAA DEVELOPMENTLLC	29426 N 145TH PL	SCOTTSDALE	AZ	85262	VACANT_LAND	VACANT RESIDENTIAL RURAL NON-SUBDIVIDED	JHAA DEVELOPMENTLLC	29423 N 145TH PL	SCOTTSDALE	AZ	852627072	5.009
50329002C	ALOHA REVOCABLE LIVING TRUST	412 E CAREFREE HWY	PHOENIX	AZ	85085	VACANT_LAND	RANCH PROPERTY	ALOHA REVOCABLE LIVING TRUST	412 E CAREFREE HWY	PHOENIX	AZ	850857476	9.998
50329002L	ARRASMITH STEPHEN L/CAROLE MILLER	4903 W BANFF LN	GLENDALE	AZ	85306	VACANT_LAND	VACANT RESIDENTIAL RURAL NON-SUBDIVIDED	ARRASMITH STEPHEN L/CAROLE MILLER	4903 W BANFF	GLENDALE	AZ	853063505	1.005
50329002K	ARRASMITH STEPHEN L/CAROLE MILLER	4903 W BANFF LN	GLENDALE	AZ	85306	STATE OWNERSHIP	VACANT RESIDENTIAL RURAL NON-SUBDIVIDED	ARRASMITH STEPHEN L/CAROLE MILLER	4903 W BANFF	GLENDALE	AZ	853063505	1.019
50329002G	ARRASMITH STEPHEN L/CAROLE MILLER	4903 W BANFF LN	GLENDALE	AZ	85306		VACANT RESIDENTIAL RURAL NON-SUBDIVIDED	ARRASMITH STEPHEN L/CAROLE MILLER	4903 W BANFF	GLENDALE	AZ	853063505	1.002
50329002H	ARRASMITH STEPHEN L/CAROLE MILLER	4903 W BANFF LN	GLENDALE	AZ	85306		VACANT RESIDENTIAL RURAL NON-SUBDIVIDED	ARRASMITH STEPHEN L/CAROLE MILLER	4903 W BANFF LN	GLENDALE	AZ	853063505	1.001
50329002J	ARRASMITH STEPHEN L/CAROLE MILLER	4903 W BANFF LN	GLENDALE	AZ	85306		VACANT RESIDENTIAL RURAL NON-SUBDIVIDED	ARRASMITH STEPHEN L/CAROLE MILLER	4903 W BANFF	GLENDALE	AZ	853063505	1.01
	State Land Department												

Notes: List generated from Maricopa County Assessor Parcels Information
Parcels shown are within 1000 feet of floodplain baseline
The majority of the study parcels are State Land Parcels

Appendix B General Documentation and Correspondence

B.1 Special Problem Reports

B.2 Contact (Telephone) Reports

B.3 Meeting Minutes or Reports

FCD 2011C003
Wittmann Phase IV Floodplain Delineation Study
Scoping Meeting

July 6, 2011

Meeting Minutes

1. **Scope comments/revisions**

The wash names were discussed and how the names should be shown on the contract. The preference is to refer to the washes as Iona Tributary 1 West and 2 West with the Township, Range, and Section in parentheses. Iona Tributary 1 West is delineated as Zone A and Iona Tributary 1 West Extension would have the same name with the exception of the extension. The extension portion is the wash upstream of the previous Zone A floodplain delineation.

RBF is currently updating State Standard 1-97. Scope is to be updated to reference State Standard 1-97 or newer version. If State Standard is accepted before submittal to FEMA, RBF may be able to use updated version.

RBF asked the status of the USGS update of the Regional Regression Equations. RBF directed to plan on using the existing equations for the comparative analysis unless USGS completes project sooner. It is anticipated to be a year or more before completion.

RBF to update flow lines in locations that do not follow the wash or contours well.

New Public Information Officer at the FCDMC is Gant Wegner.

Final Deliverables may be sealed PDFs instead of sealed mylars.

Nathan to provide Jonathan with the track changes copy of the scope later today.

2. **Project schedule**

Minor updates were discussed. Goal is to submit to FEMA in November.

3. **Special considerations**

Terminate the floodplain delineation at the stock tank along Iona Tributary 1 West Extension.

Discuss the US60, railroad, and storage capacity in the Data Collection Report.

Evaluate the impact of the non-certified embankment of the railroad and US60 and the potential for with and without levee flows. Further information is needed. After the meeting Jonathan looked at the storage upstream of the railroad and does not believe the storage is sufficient to warrant both analyses.

Richard requested the GIS submittal not wait until FEMA approval so there is a pending layer is the FCDMC database.

RBF to complete information release form for the GIS data request after the meeting with the receptionist. RBF to provide shapefile of the area requested for the GIS data. Jonathan to submit GIS request to Eric Feldman after receiving the shapefile information from RBF.

4. Fee estimate

A draft fee estimate was discussed. RBF to provide a draft copy to Jonathan incorporating the requested modifications later today. After Jonathan's review a signed copy will be provided.

FCD 2011C003
Wittmann Phase IV Floodplain Delineation Study
Scoping Meeting

July 6, 2011

Sign In Sheet

	Name	Organization	Phone Number	E-Mail
1.	Nathan Ford	RBF Consulting	602-467-2200	nford@rbf.com
2.	Scott Larson	RBF Consulting	602-467-2200	slarson@rbf.com
3.	Jonathan Lesperance	FCDMC	602-506-4699	jonathanlesperance@mail.maricopa.gov
4.	Richard Harris	FCDMC	602-506-4582	rph@mail.maricopa.gov

FCD 2011C003
Wittmann Phase IV Floodplain Delineation Study
Progress Meeting

August 25, 2011

Agenda and Minutes

1. Data Collection Report Comments

RBF provided a revised Data Collection Report that addressed the provided comments. Some of Richard's comments will be added to the TDN at a later date such as the mailing list and site photos.

2. Hydrology Section 4 Comments

RBF provided a revised Section 4 that addressed the comments. Discussed why proration was not used in IW353 and IW359. The HEC-1 model was adjusted to account for the routing of multiple drainage paths. Proration was used for IW350 since there is only one basin.

3. Cross Section Submittal

RBF provided cross section submittal for review. Jonathan requested the cross sections be provided in shapefile format. Richard requested that the key map on each sheet have the sheet labeled and the sections not as dark.

4. Upcoming Submittals

Discussed the upcoming submittal of the n-value report to be submitted by September 7.

5. Invoice

RBF provided invoice and earned value analysis graph. District requested a summary of the work completed for the July invoice.

FCD 2011C003
Wittmann Phase IV Floodplain Delineation Study
Progress Meeting

August 25, 2011

Sign In Sheet

	Name	Organization	Phone Number	E-Mail
1.	Nathan Ford	RBF Consulting	602-467-2200	nford@rbf.com
2.	Jonathan Lesperance	FCDMC	602-506-501	jonathanlesperance@mail.maricopa.gov
3.	Richard Harris	FCDMC	602-506-4528	rph@mail.maricopa.gov
4.				

FCD 2011C003
Wittmann Phase IV Floodplain Delineation Study
Progress Meeting

October 27, 2011

Agenda and Meeting Minutes

1. Review Comments of Floodplain Work Maps

RBF provided response to review comments.

2. Survey of Bend

RBF to include ground elevation exhibit in Appendix C. Add limit of study to the floodplain work maps at this location.

3. Section 5 Submittal

Jonathan to provide review comments tomorrow for Section 5.

4. Upcoming Submittals

RBF to submit the draft TDN and GIS shapefiles on November 14.

5. Invoice

RBF submitted the monthly invoice.

FCD 2011C003
Wittmann Phase IV Floodplain Delineation Study
Progress Meeting

October 27, 2011

Sign In Sheet

	Name	Organization	Phone Number	E-Mail
1.	Nathan Ford	RBF Consulting	602-467-2200	nford@rbf.com
2.	Jonathan Lesperance	FCDMC	602-506-501	jonathanlesperance@mail.maricopa.gov
3.				
4.				

B.4 General Correspondence

B.5 Contract Documents

EXHIBIT A

SCOPE OF WORK

CONTRACT FCD 2011C003
Work Assignment No. 1

Floodplain Delineation Study of Washes Iona Tributary 1 West (T5NR3WS17-1W), Iona Tributary 1 West Extension (T5NR3WS17-1WE), & Iona Tributary 2 West (T5NR3WS17-2W)

EXHIBIT A

SCOPE OF WORK

CONTRACT FCD 2011C003
Work Assignment No. 1
Floodplain Delineation Study of Washes Iona Tributary 1 West (T5NR3WS17-1W), Iona Tributary 1 West Extension (T5NR3WS17-1WE), & Iona Tributary 2 West (T5NR3WS17-2W)

GENERAL

This study will re-delineate limited detail (without floodway) Zone AE 100-year floodplains for Iona Tributary 1 West (T5NR3WS17-1W) and delineate limited detail Zone AE 100-year floodplains for Iona Tributary 1 West Extension (T5NR3WS17-1WE), and Iona Tributary 2 West (T5NR3WS17-2W) Refer to Exhibit 1) using existing 4-foot contour interval mapping provided by the Flood Control District of Maricopa County. Approximately six (6) linear miles of limited detail 100-year floodplains will be delineated.

The CONSULTANT will use existing hydrology both directly and to develop intermediate discharges, and will develop new HEC-RAS modeling to determine the revised floodplain boundaries for Washes Iona Tributary 1 West (T5NR3WS17-1W), Iona Tributary 1 West Extension (T5NR3WS17-1WE), and Iona Tributary 2 West (T5NR3WS17-2W).

All work must meet the requirements of the DISTRICT's Consultant Guidelines, Third Edition – December 1, 2003 - Revision 1. All work must also meet Arizona Department of Water Resources (ADWR) and Federal Emergency Management Agency (FEMA) requirements for limited detail Zone AE floodplain delineation studies. Prior to the finalization of this contract, 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 must be completed within six hundred sixty five (665) days from the Notice to Proceed (NTP) which includes at least eighty four (84) days for DISTRICT reviews and the FEMA review period. All project activities including study data submittals and Milestones shall occur as defined in the attached Work Schedule dated 7/6/11. The Work Schedule may be updated during the course of the project given prior approval by the DISTRICT'S Project Manager.

TASK 1 - COORDINATION

1.1 Within seven (7) 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 schedule shall also show product submittal dates and DISTRICT product review periods. The CONSULTANT will update the project schedule as necessary and when otherwise directed by the DISTRICT.

1.2 The CONSULTANT will participate in regular coordination meetings (at least on a monthly basis) with the DISTRICT's Project Manager and in milestone coordination meetings in the development of the hydraulic analyses. The CONSULTANT is responsible for the minutes of any meetings.

Draft meeting minutes must be delivered to the DISTRICT within seven (7) working days of any monthly meeting. Coordination and milestone meetings should be combined whenever possible.

1.3 The CONSULTANT will submit an estimate of the total monthly billing projections within seven (7) days of the NTP. Thereafter, this estimate will be updated and submitted to the DISTRICT's Project Manager at least ten (10) days before the end of each quarter.

1.4 The CONSULTANT will submit monthly progress reports at submittal of monthly invoices. The report shall be brief and should be no longer than two (2) typed pages. At a minimum, the monthly report shall contain the following:

a. A description of the work accomplished by task during the reporting month.
b. Percent (%) completed for the month and percent (%) cumulative completed for each task.
c. A brief description of the work to be accomplished in the following month.
d. A description of any problems encountered.
e. An Earned Value Table and Graph to illustrate the actual work status compared to initial approved projection.

1.5 The DISTRICT will be responsible for placing the legal advertising at the beginning of the study. The advertisement will run once in the Arizona Business Gazette. After the newspaper runs the ad, the DISTRICT will supply the CONSULTANT with the original affidavit of publication from the newspaper for each day that the ad ran.

1.6 The DISTRICT has prepared a separate set of guidelines for the CONSULTANT on conducting public involvement and public information activities for the DISTRICT. A copy of these guidelines will be provided to the CONSULTANT by the Public Information Office and shall be used by the CONSULTANT if or when preparing public information related materials.

1.7 The DISTRICT will provide any public notice beyond that described in task 1.5

1.8 (Optional) The CONSULTANT will participate in a public information Open-house meeting prior to sending the study Technical Data Notebook (TDN) to FEMA. The CONSULTANT will prepare any displays for the meeting following DISTRICT recommendations. The DISTRICT will reserve the meeting venue and secure a certificate of insurance. The CONSULTANT will provide refreshments for the open house.

1.9 CONSULTANT/DISTRICT Performance Evaluations will be performed. A formal evaluation will be performed at the completion of the project upon receipt of all deliverables.

TASK 2 - DATA COLLECTION

2.1 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 and hydrology for the study area; existing readily available topographic mapping; proposed development plans, historical flooding information; as-built plans for existing structures; FEMA Flood Hazard Boundary Maps and any Letters of Map Amendment and/or Revisions, and other pertinent information.

2.2 The CONSULTANT will consult with officials from the DISTRICT and the City of Surprise and the County and State transportation departments, in order to identify local flooding problems and to obtain information on current and planned public works projects, channel modifications, storm-drainage systems, development, and corporate limits.

2.3 A written summary of the data collected will be included as a section in the Technical Data Notebook (TDN). A preliminary draft of this section is due within twenty-one (21) days of Notice to Proceed. The section will be updated to include information developed through continued research that may be necessary as the project proceeds.

TASK 3 - TOPOGRAPHIC MAPPING

3.1 Topographic mapping with 4-foot contour intervals (including digital terrain model data) will be provided for the study area by the DISTRICT. This topographic mapping will be referenced to the Arizona Central State Plane Coordinate System, which is tied to the North American Datum 1983 High-Accuracy Reference Network (NAD 83 HARN), horizontally; and the North American Vertical Datum 1988 (NAVD 88), vertically. The DISTRICT will provide the CONSULTANT with aerial photography imagery that is recent enough to be appropriate to the level of study and contiguous within the study area.

TASK 4 - FIELD SURVEY

4.1 As needed, field surveys and measurements of bridges, culverts, and hydraulic structures are to be obtained by either the CONSULTANT or the DISTRICT when as-built plans are not available, or when conditions have changed that may impact the delineation. Geodetic Densification and Cadastral Survey (GDACS) control will be the basis of field survey. This information should be reduced and compiled into an 11" x 17" (maximum size) drawing format approved by the DISTRICT, for inclusion in the TDN. The information presented in the drawing should be in a format appropriate for use in future HEC-RAS models. It may be necessary to field survey some structures since the as-built plans may not be on the same vertical datum as the study.

4.2 Copies of the survey field books and office calculations must be supplied by the CONSULTANT to the DISTRICT for inclusion in the TDN. An Arizona Registered Land Surveyor (RLS) must seal and sign the survey notes. This information can be submitted separately if approval is obtained from the DISTRICT's Project Manager.

TASK 5 - HYDROLOGY

5.1 Hydrologic Modeling

The hydrology from the previous study for this area (Wittmann Area Drainage Master Study Update (ADMSU) contract FCD 2002-29) will be used for this study in conjunction with more recent study results that may also be found to be appropriate. Therefore, the CONSULTANT will only need to complete minimal additional hydrologic calculations. A Hydrologic summary will be prepared by the CONSULTANT as a section in the TDN and it will be submitted for review and approval by the DISTRICT prior to commencing with floodplain modeling. The report will be prepared as a draft of Section 4 of the Technical Data Notebook and will be prepared in accordance with ADWR State Standards Attachment 1-97 (SS1-97) or most recent version. The report will be organized as specified by the DISTRICT, following SS 1-97 format or most recent version. Specific deviations from this scope shall not be undertaken without the specific written authorization from the DISTRICT'S Project Manager. The report will include backup documentation from the existing hydrology as well as comprehensive drainage displays to show all sub-basins and concentration points with discharge tables. A comparative analysis against regional regression equations will be included in the report.

5.2 Meeting and Field Visits

One (1) meeting associated with the development of the hydrologic data shall be held with DISTRICT staff at the following milestone:

A. Meeting number 1: This meeting will occur after the preliminary peak discharges have been estimated. At this time, the CONSULTANT will have an opportunity to discuss any preliminary comments by the DISTRICT.

5.3 Review and Approval

The CONSULTANT shall obtain approval from the DISTRICT at each of the following steps:

a. Preliminary discharge results (Meeting 1)
b. Cross section locations with respect to changes in discharge

5.4 The Hydrologic Report

5.4.1 The findings of the hydrologic study will be presented in Section 4 of the Technical Data Notebook and will be prepared in accordance with ADWR State Standards Attachment 1-97 (SSA 1-97) or most recent version. The report will be organized as specified by the DISTRICT, following SS 1-97 format. The report will include backup documentation from the existing hydrology as well as comprehensive drainage displays to show all sub-basins and concentration points with discharge tables. A comparative analysis against regression equations will be included in the report. Specific deviations from this hydrologic scope shall not be undertaken without the specific written authorization from the DISTRICT's Project Manager.

5.5 Tables and Figures

5.5.1 Drainage Maps(s) showing the sub-basins, major man-made structures such as highways, levees, railroads, or culverts, and references (i.e., street names, Township, Range, Section, etc.) at a scale to be agreed upon with DISTRICT Staff shall be included in the TDN as support for the related hydraulic analysis. A table will be prepared to show the results of the study (i.e. 6-hour and 24-hour peak flows, etc.) at major concentration points. The level of detail of this map is to be developed during the study period.

5.6 Digital Hydrologic Data Deliverables

Digital data in a GIS shape file format for any newly developed hydrologic information will be prepared in conformance with the DISTRICT's Hydrologic Information System Data Delivery Specifications, Revision 3.1. The following themes are the ones generally used for Hydrologic data. However, for this study there may not be data for every theme identified, or the CONSULTANT might develop data for themes not listed. Therefore, only those themes, for which there are data, need to be completed. If the CONSULTANT has data that doesn't fit one of the themes listed here, the DISTRICT's Project Manager shall be contacted to determine the appropriate theme for that data.

a. drnbsn (Drainage Basins)

b. drnpthln (Drainage Flowpaths and routes)

c. drnpthpt (Concentration Points)

TASK 6 - FLOODPLAIN DELINEATION

6.1 Limited detail Zone AE Floodplain delineations will be performed for approximately six (6) linear miles of washes Iona Tributary 1 West (T5NR3WS17-1W), Iona Tributary 1 West Extension (T5NR3WS17-1WE) and Iona Tributary 2 West (T5NR3WS17-2W). Hydraulic information upon which the re-delineations will be based will be obtained by modeling using the U.S. Army Corps of Engineers latest release of HEC-RAS (version 4.1.0 or later) and methodology acceptable to FEMA as defined in their Guidelines and Specification for Flood Hazard Mapping Partners, April 2003 and FIA Document 12, Appeals, Revisions, and Amendments to Flood Insurance Maps, December 1993. The completed delineation work will meet the requirements for floodplain delineations as prescribed by FEMA and the ADWR, including the Arizona State Standard for Hydraulic Modeling (SS9-02). The modeling and attendant re-delineations will tie-in vertically and horizontally at the downstream pending floodplain confluence of the Iona Wash floodplain boundary that was generated through the Wittmann ADMSU contract FCD 2002C029.

6.2 The floodplain delineation maps shall have a scale of 1 inch = 200 feet. The hydraulic modeling and delineation work maps shall be referenced to the North American Vertical Datum of 1988 (NAVD 88). This work shall include inserting the cross section and BFE boundary line work, river mile ticks and water surface elevation contour line work. If ponding-area floodplains occur in the study area the CONSULTANT shall provide the DISTRICT with the water surface elevations for these floodplain Zone AH ponding areas. If appropriate, the CONSULTANT will delineate conveyance areas, as floodplain Zone AE, between ponding areas.

The CONSULTANT shall provide annotated FIRM panels to illustrate the proposed floodplain boundaries in comparison with the effective information. The annotated FIRM panels will be part of a draft addition to the FIS, which shall also include water surface profiles data tables. These materials are normally included in Section Number 7 of the TDN. Excerpts from the effective FIS, as they relate to the study, shall be included within the TDN appendices.

The CONSULTANT will obtain DISTRICT approval at each of the following steps:

a. Estimation of Manning's "n" values.
b. Cross-section location and orientation (with respect to channel bed slope changes and mass flow paths)
c. Hydraulic model feature names in context with CAD/GIS standards
d. Hydraulic model documentation
e. Floodplain (natural) delineation.
f. Draft Hydraulics TDN section documentation (Section 5 of the TDN).

6.3 Field Reconnaissance

6.3.1 The CONSULTANT will conduct a field reconnaissance of the study area. This will include observation of channel and floodplain conditions for estimating Manning's "n" values; photographic documentation of floodplain characteristics; determination of channel bank characteristics; determination of channel bed particle size; observation of possible overflow area; observation and classification of levees or other flood control structures and nominal measurement of bridge and culvert dimensions not included in the survey task. Such measurement will be made to classify smaller cross-drainage structures as non-effective.

6.3.2 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 Channel, 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 "n" values will be presented for typical reach types observed in the project area, rather than specific reaches of specifically named watercourses. It is anticipated that several different reach types will be identified during the field reconnaissance. Supplemental field photos will be used to substantiate slight roughness value variations from otherwise typical reach types, for locations where slight roughness value variations can be applied without providing complete calculations. These variations will be fully documented in Section 5 of the TDN and in the hydraulic model's general Description.

6.3.3 Representative Manning's "n" values will be selected and documented in a reconnaissance, "n value" report. The report will present the calculated determination of channel and overbank "n" values using captioned color photographs for each type in the project area, and the extents of each type will be displayed on an exhibit. The "n value" report will also discuss floodplain conditions affecting the delineation, describe all structures and obstructions, and provide color photos or photocopies of major hydraulic structures. Photo location for channels, structures, and "n" value determinations will then be displayed on reduced scale mapping and included in the draft TDN Hydraulic documentation appendix and in all subsequent TDN versions.

6.4 Cross Sections

6.4.1 The location and alignment of cross sections and channel centerlines will be submitted for the DISTRICT's review and approval. Cross sections will be spaced approximately every five hundred 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 grade-breaks in the channel profile and existing structures such as roads, railways, drainage features and confluences, as well as at future roadway alignments and cadastral section lines. Cross section spacing should be done in such a way as to minimize computational head loss and where natural channel bed grade breaks evidently occur in thalweg profile plots. Cross section stationing will be from left to right looking downstream with the hydraulic baseline at station 10,000. Identification of cross section will be in river miles, increasing upstream. The station will tie into the specified river mile of any existing FEMA studies. The cross sections may need to be reoriented or altered after running the HEC-RAS model to ensure that they are perpendicular to the center of mass of flow per FEMA criteria. Cross sections developed by the HEC-RAS interpolation feature are not to be used. The CONSULTANT must coordinate and then document the methodology for generating the cross section geometric data. Acceptable methods might include collecting the data directly off paper copies of the DISTRICT's 4-foot contour interval mapping, use of a computer program to develop the data from digital information, or from field surveys.

6.4.2 The HEC-RAS output in the TDN, in addition to summary tables and a full output report, shall include fully labeled profile and cross section plots.

6.4.3 Check-RAS reports and RAS-PLOT profiles of the 100-year event will be created for inclusion into the TDN. Digital export file (dxf) format of the profiles will also be provided.

6.5 Bridges and culverts must be modeled according to HEC-RAS modeling requirements for the selected routine. Where multiple bridges occur, each bridge will be modeled separately. The HEC-RAS modeling results for bridges, culverts, and other hydraulic structures must be checked by using independent methods approved by the DISTRICT to analyze these structures. 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" in diameter), or, structures considered likely to become clogged during the 100-year peak discharge, shall not be included in the hydraulic analyses.

6.6 It is possible that during the course of the hydraulic modeling, it will be discovered that the 100-year event flows break out of one or more of the reaches being studied. If the modeling suggests that any flow breakouts occur, the CONSULTANT will promptly contact the DISTRICT to coordinate an appropriate course of action, which may include modification of the SOW and fee for the project.

6.7 Flood Zones will be determined according to FEMA criteria and will be clearly labeled on the final drawings. The drawing cover sheets shall show the study title and District contract number, and should show both location and vicinity maps, and a sheet index in a cadastral section background. A list of survey control monuments (or ERM's) with elevations and coordinates shall be shown along with topographic mapping contour interval, vertical and horizontal datums, coordinates, and the conversion factor between NAVD88 and NGVD29 vertical datums. A field survey certification note (if necessary) will be provided and will include the signature and seal of the RLS responsible for all ground survey. The dates of both the topographic flights and the aerial photography flights shall be listed.

6.8 The main project Description box of the HEC-RAS models should include the following:

a. Project Name, FCD Contract Number, work assignment number, and project control number
b. Consultant Name, phone number, address, website address, and company Job Number
c. Study Purpose
d. File Name and latest run date/final date if completed
e. Vertical Datum of the model, base map date, and base map contractor information
f. Any notable features that are considered unique or unusual to the hydraulic modeling
g. HEC-RAS program version
h. Source of Hydrology and discharges used
i. Wash names including River and Reach Names used in the HEC-RAS modeling
j. Subsequent update information, if any

In addition, minor descriptions should be added to the model for hydraulic cross sections located above or below drainage structures, at section lines, at highways and railway crossings, at canals, and at confluences. Model descriptions should be added to culverts and lateral structures, and at any other features considered pertinent to the modeling.

6.9 The CONSULTANT will provide work maps using the DISTRICT's most recent contour mapping. The work map drawings will be 24" X 36" in size. The work map scale will be 1" = 200'. The cover sheet of the work map drawings shall be prepared in a manner to be approved by the DISTRICT. Each study sheet work map drawings shall include the project title, contract number, source of topographic mapping, and a location map showing the geographic range covered by each specific mapping sheet. Each study sheet will include watercourse names and existing floodplain boundaries, proposed floodplain boundaries, a north arrow, map scale section lines and section 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 MCDOT's GDACS monuments and NGVD monuments located within individual sheet boundaries, major drainage features, corporate boundaries, hydraulic cross section lines, sheet index map, peak discharges, and relative Township and Range labels. A conversion factor from NAVD 88 to NGVD 29 should also be shown.

6.10 Technical Data Notebook (TDN)

6.10.1The findings of the floodplain delineation study will be presented in Section 5 of the TDN and will be prepared in accordance with ADWR State Standards Attachment 1-97 (SS1-97) or most recent version. The report will be organized as specified by the DISTRICT standards, following SS1-97 format.

6.10.2 The hydraulic analysis/HEC-RAS output in the TDN, in addition to summary tables and full output report, should include fully labeled cross section plots. Section plots should be grouped per study reach, and reach groups should be separated and then indexed within the main report to expedite data recovery.

6.11 The CONSULTANT shall review the output of the HEC-RAS computer model to ensure the flow depths and velocities are reasonable and realistic with respect to those expected in this watershed. Adjustments to the model input should be completed as necessary to obtain the most realistic results. The CONSULTANT shall provide proper QA/QC of the models and TDN before delivering to the DISTRICT.

6.12 The CONSULTANT shall fill out all the forms required by FEMA (MT-2 forms) for the submittal of a Floodplain Delineation Study as a Letter of Map Revision (LOMR) request.

TASK 7 – DIGITAL DATA

Digital data shall be delivered in a modified shape file format per Shape File Data Delivery Specifications V1.2, date May 1st, 2007 and will be prepared in conformance with the above standards. The following themes are generally used for the data developed for Floodplain Delineation Studies. However, for this study there may not be data for every theme identified here, or the CONSULTANT might develop data for themes not listed here. Therefore, only those themes for which there are data need to be completed. If the CONSULTANT has data that does not fit one of the themes listed here. the DISTRICT's Project Manager shall be contacted to determine the appropriate theme for that data.

a. PRJ (Project Boundaries)

b. DQ (Data Quality)

c. FPSRFFCD (Floodplain FCD Water Surface Elevation)
d. FPXFCD (Floodplain FCD Cross Section)
e. FPZNFCD (Floodplain FCD Zone)
f. FPBLN (Floodplain Baseline Route System)
g. PRJDAT (project identification)

TASK 8 – DELIVERABLES

8.1 Both paper and electronic deliverables will be made at the completion of each task.

8.2 Prior to FEMA Submittal: The CONSULTANT will deliver the following items to the DISTRICT.

8.2.1 Two (2) copies of the Draft TDN including draft work maps according to ADWR State Standards Attachment 1-97 (SS 1-97) or most recent version. The report shall be organized as specified by the DISTRICT standards, following SS 1-97 format.

8.2.2 Preliminary Digital Data Delivery including all digital files listed under Task 7 applicable to the final deliverable. The DISTRICT will be responsible for transmittal of one set of data to the City of Surprise.

8.3 FEMA Submittal: The CONSULTANT will submit the following items to the DISTRICT for review by FEMA and any other appropriate governmental agency. All of the following products are considered deliverables for the FEMA submittal:

8.3.1 Two (2) complete sets of blackline paper topographic base maps with aerial photo background and 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. The DISTRICT will be responsible for transmittal of one set of data to the City of Surprise.

8.3.2 Three (3) complete copies of the Technical Data Notebook, including completed FEMA forms, annotated Flood Insurance Rate Maps showing the proposed delineation and HEC-RAS input/output files on diskettes. The Technical Data Notebook will be prepared in accordance with ADWR State Standards Attachment 1-97 (SS 1-97) or most recent version. The notebook will be organized as specified by the DISTRICT, following SS 1-97 format. The DISTRICT will be responsible for transmittal of one set of data to the City of Surprise.

8.4 Final Submittal: The following products are considered deliverables for the final submittal to the DISTRICT after FEMA approval is issued.

8.4.1 One (1) complete set of Mylars and two (2) complete sets of sealed blackline paper flood study work topographic map sets with the aerial photo background and the floodplain delineations shown or sealed PDF copies. The DISTRICT will be responsible for transmittal of one set of data to the City of Surprise. 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.

8.4.2 All remaining hydrologic and floodplain delineation data in conformance with the DISTRICT's HIS Specifications.

8.4.3 Three (3) complete copies of the Technical Data Notebook including HEC-RAS input/output files on compact disc (based upon the level of changes during the FEMA review process, this may require only change-outs of modified pages and/or disks). The Technical Data Notebook will be prepared in accordance with ADWR State Standards Attachment 1-97 (SS 1-97) or most recent version. The notebook will be organized as specified by the DISTRICT, following SS 1-97 format. This submittal of the Technical Data Notebook shall include any correspondence and/or meeting minutes with the reviewing agencies and shall reflect any revisions required by those reviewing agencies. Revisions may include, but are not limited to, addressing FEMA's comments, modifications to the delineation maps, the HEC-RAS model, and/or the Final Report. The report shall also be prepared in PDF format. The DISTRICT will be responsible for transmittal of one set of data to the City of Surprise.

B.6 Public Information

AFFIDAVIT OF PUBLICATION

TRILBY WASH WATERSHED

01

Arizona Business Gazette

The business resource

PO BOX 194
Phoenix, Arizona 85001-0194
(602) 444-7315 FAX (602) 444-7364

STATE OF ARIZONA
COUNTY OF MARICOPA } SS.

Mark Gilmore, 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.

7/21/2011

ANNOUNCEMENT OF INTENT TO PERFORM A FLOODPLAIN DELINEATION STUDY WITHIN THE TRILBY WASH WATERSHED

The Flood Control District of Maricopa County (FCDMC) has contracted with RBF Consulting to prepare a study documentation package of limited detail Zone AE floodplain (without floodway) for two washes in the Trilby Wash Watershed. The study area is located in the northwestern part of Maricopa County in the Wittmann area, and is bounded by the U.S. Highway 60 to the north and the Central Arizona Project (CAP) to the south.

The study will examine and evaluate the flood hazard areas in the watershed to determine limited detail floodplain limits. Updated flood hazard boundaries will then be used to determine the flood insurance rates used by the Federal Emergency Management Agency (FEMA) for anticipated future development in the area.

This announcement is intended to inform all interested persons and communities of the commencement of this study so that they may have an opportunity to bring any relevant technical information to the attention of the FCDMC/FEMA, to be considered during the course of this study. Your comments should be addressed to Mr. Jonathan E. Lesperance at the Flood Control District of Maricopa County, 2801 West Durango Street, Phoenix, AZ 85009, (602) 506-4699.

Published: July 21, 2011

Sworn to before me this
21ST day of
JULY 2011

BRIAN BILLINGS
Notary Public - Arizona
Maricopa County
My Comm. Expires Jul 25, 2014

Notary Public

B.7 FEMA Correspondence

Flood Control District
of Maricopa County

INTEROFFICE MEMORANDUM

Date: November 28, 2011

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

From: Jonathan Lesperance, Hydrology and Hydraulics Branch

Subject: Wittmann Phase IV Floodplain Delineation Study TDN, Contract FCD 2011C003

The floodplain study for the Wittmann Phase IV FDS is ready for use as the best available technical information. The study documentation will be sent to FEMA for review and incorporation into the County's FIRM panels. Please find attached an MT-2 form requesting your signature.

The background for the study includes the following:

> The study delineates approximately 6.5 linear miles of limited detail Zone AE floodplain (no floodway). The topographic basis for the study is 2 and 4-foot contour interval mapping in NAVD88 vertical datum by Landata Airborne Systems, Inc. The photography for topographic mapping of the study area was flown April 23, 2002. The study Consultant was RBF Consulting. The project manager for the Consultant was Nathan Ford, P.E. The project manager for the District was Jonathan Lesperance.

Please concur and authorize below the use of this new study.

Date 11/28/11 [signature] Jonathan Lesperance Project Manager	Date: [signature] 12/7/11 Timothy S. Phillips, P.E. Chief Engineer and General Manager
Date: 12/5/11 [signature] Amir Motamedi, P.E. Hydrology/Hydraulics Branch Manager	Date: [signature] 12/5/2011 Ed Raleigh, P.E. Engineering Division Manager
12/8/2011 Date: [signature] Kelli Sertich, AICP Floodplain Management & Services Division Manager	Date:________
File Copies: 1. ____________ 2. ____________	YES ☐ GIS Posted (Pending Floodplain Only) Date:________ NO GIS In Progress

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

		Intl	Date
	Chief Engineer/General Manager		
5	Phillips, T.		
	Lemmon, J.		
	Medina, A.		
	PIO		
	Munoz, J.		
	Dodd, E.		
	Smith, D.		
	Wegner, G.		
	Human Resources		
	Trottie, J.		
	Facilities Mgt.		
	Robinson, C.		
	Sanborn, P.		
	Leon, J.		
	Willard, M.		
	Admin. Support		
	Mendenhall, L.		
	Harrington, C.		
	Charles, S.		
	Delpier, C.		
	Figueroa, L.		
	Gonzalez, J.		
	Johnson, T.		
	Lepe, N.		
	Lopez, D.		
	Summers, A.		
	Wu, S.		
	Administration Division		
	Wilson, D.		
	Contract Services		
	Bauer, M.		
	Rogers, S.		
	Schafer, P.		
	Financial Services		
	Arteaga, C.		
	Dungan, G.		
	Jasinski, C.		
	Mageo, H.		
	Scott, K.		
	Stevens, D.		
	Turner, D.		
	Engineering Division		
3	Raleigh, E.	[illegible]	12/5/2011
	Merkevicius, M.		
	Special Projects		
	Loomis, T.		
	Garcia, A.		
	Gerlach, S.		
	Riano, A.		

		Intl	Date
	Hydrology/Hydraulics		
2	Motamedi, A.	[illegible]	12/5
	Cox, J.		
	Gross, K.		
	Harris, R.		
	Holmes, J.		
1	Lesperance, J.	JEL	11/28
	Rakestraw, K.		
	Regester, C.		
	Serago, J.		
	Shelton, J.		
	Tucker, S.		
	Civil/Structures		
	Riddle, J.		
	Brown, S.		
	Glover, A.		
	Guzman, J.		
	Hanumaiah, K.		
	Hardesty, A.		
	Jones, M.		
	Kehlenbach, F.		
	Moore, G.		
	Shapiro, G.		
	Wagner, J.		
	Mapping & Surveying		
	Stock, J.		
	Ashley, J.		
	Orr, J.		
	Flood Warning		
	Waters. S.		
	Gardner, D.		
	Miller, C.		
	Hydromets		
	Kiefer, T.		
	Bushelman, J.		
	Irizarry, B.		
	Ontiveros, A.		
	Randez, R.		
	Water Quality		
	Oller, M.		
	Naud, B.		
	Eng App Dev/ River Mechanics		
	Zhao, B.		
	Card, G.		
	Chill, J.		
	Li, S.		
	Liu, D.		
	Pacheco, R.		
	Waskowsky, R.		
	GIS Division		
	Dent, M.		
	Smith, J.		

		Intl	Date
	System Programmers-GIS		
	Wolfson, L.		
	Agne, M.		
	Akuoko, K.		
	Bota, G.		
	Brewer, M.		
	Conklin, J.		
	LaVallee, K.		
	Sanchez, J.		
	Mapping Services-GIS.		
	Bruffy, S.		
	Feldman, E.		
	Furnas, C.		
	McGlincy, B.		
	Williams, T.		
	Wong, N.		
	O & M Division		
	Klenner, C.		
	Wiley, R.		
	O&M Supervisor		
	Rubin, S.		
	Central Yard		
	Long, G.		
	Norton, D.		
	North Yard		
	Shaffer, R.		
	Wise, J.		
	East Yard		
	Loy, E.		
	Ecology		
	Siegfried, T.		
	O&M/WCC		
	Rivera, C.		
	Arntz, E.		
	Buruato, A.		
	Michael, D.		
	Ramirez, M.		
	Wallace, N.		
	Shop		
	Olson, E.		
	Byington, I.		
	Pacheco, E.		
	Villalobos, I.		
	PPM Division		
	Rerick, D.		
	Cooper, H.		
	Holcomb, D.		
	Melo-Rodriguez, P.		
	Reinbold, L.		
	CIP/Policy		
	Fazio, C.		

		Intl	Date
	Planning		
	Williams, D.		
	Ahouraiyan, A.		
	Ganados, B.		
	Hathaway, J.		
	Jones, G.		
	Lokey, B.		
	Pinto, T.		
	Pokorski, J.		
	Samples, M.		
	Stuart, D.		
	Swick, V.		
	Terry, F.		
	Structures Management Branch		
	Renckly, T.		
	Degerness, D.		
	Duffy, D.		
	Greenslade, M.		
	Lawrence, D.		
	Leal, B.		
	Minero, A.		
	Sherman S.		
	Project Mgmt.		
	Vogel, S.		
	Beuche, A.		
	Duncan, M.		
	Maiers, G.		
	Ohler, B.		
	Stevens, B.		
	Wesch, G.		
	Construction		
	Huber, F.		
	Nase, T.		
	Lewis, M.		
	Rodriguez Jr, J.		
	Salisbury, D.		
	Shivaswamy, S.		
	Stanley, M.		
	Towers, M.		
	Real Estate Division.		
	Wilson, M.		
	Bell, L.		
	Lawton, H.		
	Prop. Acq.		
	Scott, G.		
	Berg, S.		
	Kottmer, K.		
	Leonard, G.		
	Mertz, P.		
	Pettigrew, K.		
	Romero, K.		
	Sachs, R.		

		Intl	Date
	Property Management.		
	Cunningham, D.		
	Amos, L.		
	Anderssohn, K.		
	Dickie, A.		
	Warburton, S.		
	Property Engineering .		
	Green, K.		
	Burns, J.		
	Campbell. J.		
	Gutierrez, A.		
	King, M.		
	Sanchez, J.		
	Van Schoyck, L.		
	Stanczyk, S.		
	Velasco, D.		
	FMS Management & Services		
4	Sertich, K.	KAS	12/6/11
	Gorbenko, A.		
	MPTP		
	Murphy, T.		
	Brown, F.		
	Frago, M.		
	Tavassoli, F.		
	McGuire, S.		
	Technical Plan Review		
	Thomas, L.		
	DeRoulhac, K.		
	DeVlieg, C.		
	Lapp, S.		
	Teneva, M.		
	Nangare, M.		
	FMS Floodplain		
	Schneeman, J.		
	Castillo, K.		
	Gattuso, C.		
	Jimenez, L.		
	LeBeau, D.		
	Mendoza, K. (P&D)		
	Enforcement /Inspections		
	Smith, M.		
	Carroll, D.		
	South J.		
	Bancod, F.		
	Schwartz, G.		

Central Files.

File#

Comments

Flood Control District
of Maricopa County

www.fcd.maricopa.gov
2801 West Durango Street
Phoenix, Arizona 85009
Phone: 602-506-1501
Fax: 602-506-4601
TT: 602-505-5897

November 28, 2011

LOMR Manager
LOMC Clearinghouse
7390 Coca Cola Drive, Suite 204
Hanover, MD 21076

Subject: Technical Data Notebook – Wittmann Phase IV Floodplain Delineation Study, Maricopa County, Arizona (Contract FCD 2011C003 – Work Assignment No. 1) by RBF Consulting

Communities: Maricopa County and Unincorporated Areas, Community No. 040037

Flooding Sources: Iona Wash and Tributaries

FIRM panels affected: 04013C660G, 04013C670G, 04013C680G, 04013C689H, 04013C690H

LOMR Manager:

Enclosed is the technical supporting data for the Letter of Map Revision request to delineate 6.5 linear miles of limited detail Zone AE floodplain (without floodway) along tributaries to Iona Wash in Unincorporated Maricopa County, Arizona. The study area is located in the northwest portion of Maricopa County. These washes have not been studied before and therefore we request the review fee be waived. However, please let us know if there is a fee required.

If you have any questions, please contact me at (602) 506-4699, or by email at: jonathanlesperance@mail.maricopa.gov.

Sincerely,

Jonathan Lesperance

Jonathan Lesperance, CFM
Hydrology and Hydraulics Branch

Enclosures: Technical Data Notebook

Copy to:

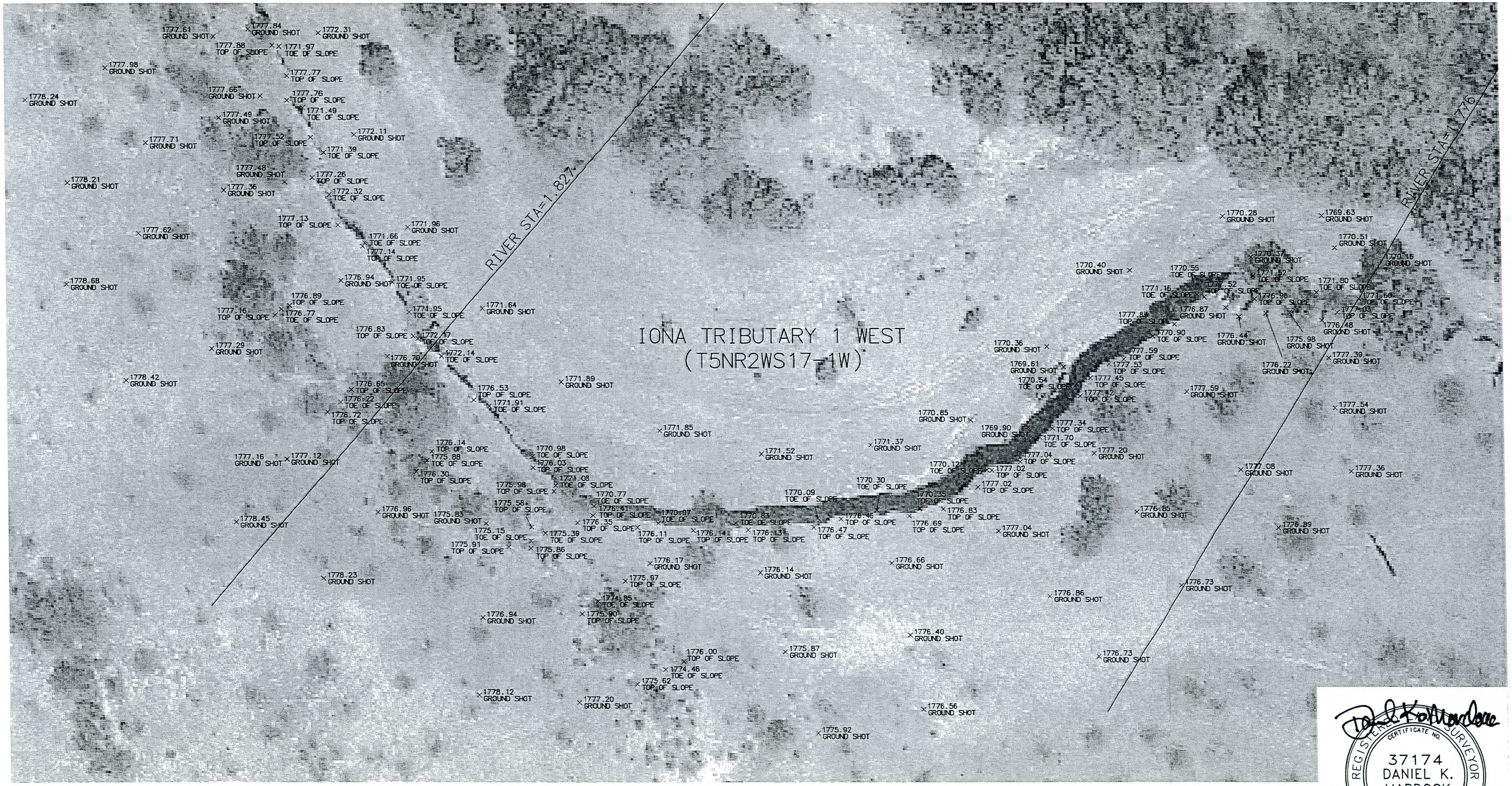
Brian Cosson, CFM
NFIP State Coordinator
Arizona Department of Water Resources
Office of Dam Safety and Flood Mitigation
3550 N. Central Ave.
Phoenix, AZ 85012

Robert Bezek
Federal Emergency Management Agency
Region IX
1111 Broadway, Suite 1200
Oakland, CA 94607

Nathan Ford, P.E. CFM
RBF Consulting
16605 North 28th Ave, Suite 100
Phoenix, AZ 85053-7550

Appendix C Survey Field Notes

WITTMANN PHASE IV FDS
GROUND ELEVATION EXHIBIT
IN TOWNSHIP 5 NORTH, RANGE 3 WEST, SECTION 7



37174
DANIEL K.
MARDOCK
11-7-11
REGISTERED LAND SURVEYOR
CERTIFICATE NO.
Date Signed
ARIZONA, U.S.A.
Expires: 03/31/13

RBF CONSULTING
PLANNING ■ DESIGN ■ CONSTRUCTION
16605 NORTH 28th AVENUE, SUITE 100
PHOENIX, ARIZONA 85053-7550
602.467.2200 ■ FAX 602.467.2201 ■ www.RBF.com

H:\PDATA\45104608\CADD\STRMWATER EXHIBITS\WITTMANN PHASE IV\4608-SW-BANKEXHIBIT-110711.DWG UPEARCE 11/7/11 4:44 pm

Appendix D Hydrologic Analysis Supporting Documentation

D.1 Precipitation Data

(Information obtained from July 2005 Wittmann ADMSU Hydrology Final Addendum prepared by Entellus)

Rainfall Data

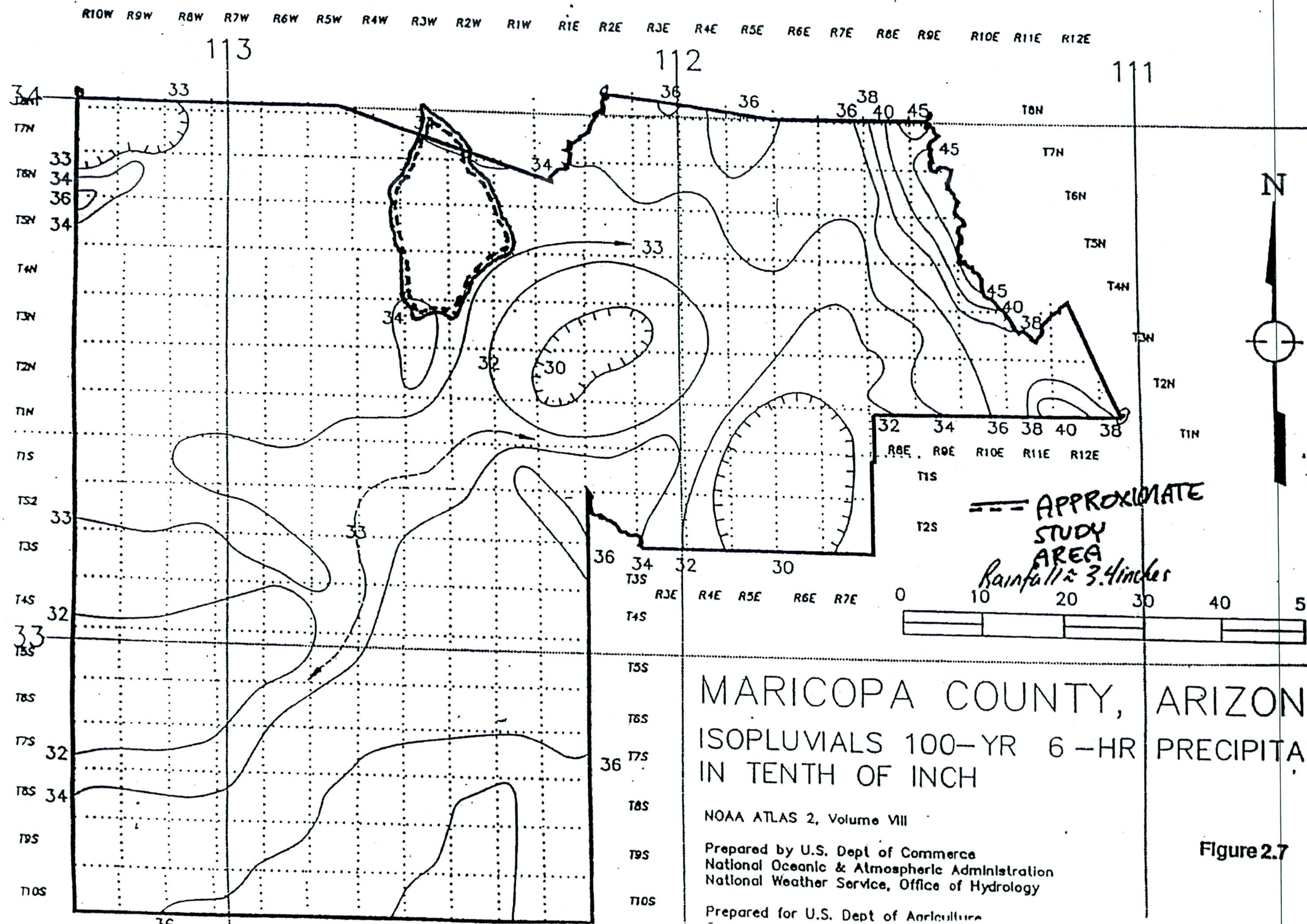
Primary Zone Number: 7 Latitude: 0.0 Elevation: 0

Short Duration Zone Number: 8 Longitude: 0.0

Duration	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr	500-yr
	Point Values (In)						
5 MIN	0.39	0.48	0.54	0.63	0.70	0.77	0.93
10 MIN	0.58	0.72	0.82	0.96	1.07	1.18	1.44
15 MIN	0.71	0.90	1.03	1.22	1.37	1.52	1.86
30 MIN	0.94	1.20	1.39	1.65	1.86	2.06	2.53
1 HOUR	1.14	1.49	1.72	2.06	2.31	2.57	3.17
2 HOUR	1.23	1.62	1.89	2.27	2.56	2.85	3.53
3 HOUR	1.29	1.72	2.01	2.41	2.73	3.04	3.77
6 HOUR	1.40	1.89	2.22	2.68	3.04	3.40	4.22
12 HOUR	1.50	2.07	2.45	2.98	3.39	3.80	4.74
24 HOUR	1.60	2.25	2.68	3.28	3.74	4.20	5.26

APPENDIX D.1.1

Page 1 of 5



MARICOPA COUNTY, ARIZONA

ISOPLUVIALS 100–YR 6 –HR PRECIPITATION IN TENTH OF INCH

NOAA ATLAS 2, Volume VIII

Prepared by U.S. Dept of Commerce
National Oceanic & Atmospheric Administration
National Weather Service, Office of Hydrology

Prepared for U.S. Dept of Agriculture

Figure 2.7

APPENDIX D.I.2

Page 2 of

D.2 Physical Parameter Calculations

(Information obtained from July 2005 Wittmann ADMSU Hydrology Final Addendum prepared by Entellus)

APPENDIX D.2.1: Soil Type Summary

Entellus

SHEET		OF	
BY		DATE	4/19/2004
CHECK		DATE	
JOB NO.	310.032		

CLIENT: FCDMC

JOB: Wittmann Area Drainage Master Study Update

Areas and percentage area reported to 4 significant digits by WMS. Actual precision of the data is only 2-3 significant digits

Basin ID	Total Basin Area (sq miles)	Soil Type (WMS)	Soil Type (DDMSW)	Soil Type Area (%)	Soil Type Area (sq-miles)	XKSAT (in/hr)	RTIMP
IW322	1.8923	64576	76	5.64%	0.1067	0.23	0
IW322	1.8923	64577	77	5.16%	0.0976	0.05	0
IW322	1.8923	64578	78	2.76%	0.0522	0.05	0
IW326	0.3331	645112	112	14.69%	0.0489	0.39	0
IW326	0.3331	64558	58	13.99%	0.0466	0.34	0
IW326	0.3331	64576	76	51.05%	0.1700	0.23	0
IW326	0.3331	64578	78	20.28%	0.0675	0.05	0
IW330	1.0372	64529	29	12.36%	0.1282	0.34	0
IW330	1.0372	64553	53	12.80%	0.1328	0.02	0
IW330	1.0372	64555	55	16.05%	0.1665	0.27	0
IW330	1.0372	64558	58	36.44%	0.3779	0.34	0
IW330	1.0372	64570	70	6.29%	0.0652	0.36	0
IW330	1.0372	64576	76	0.65%	0.0067	0.23	0
IW330	1.0372	64578	78	15.40%	0.1597	0.05	0
IW334	1.2571	645112	112	21.30%	0.2678	0.39	0
IW334	1.2571	64522	22	8.48%	0.1066	0.04	0
IW334	1.2571	64553	53	7.22%	0.0908	0.02	0
IW334	1.2571	64576	76	3.61%	0.0454	0.23	0
IW334	1.2571	64578	78	21.30%	0.2678	0.05	0
IW334	1.2571	64598	98	38.09%	0.4788	0.37	0
IW338	0.3390	645112	112	20.98%	0.0711	0.39	0
IW338	0.3390	64522	22	5.59%	0.0190	0.04	0
IW338	0.3390	64576	76	3.50%	0.0119	0.23	0
IW338	0.3390	64580	80	45.45%	0.1541	0.08	0
IW338	0.3390	64598	98	24.48%	0.0830	0.37	0
IW342	0.3535	645112	112	17.11%	0.0605	0.39	0
IW342	0.3535	64558	58	30.92%	0.1093	0.34	0
IW342	0.3535	64580	80	16.45%	0.0582	0.08	0
IW342	0.3535	64598	98	35.53%	0.1256	0.37	0
IW346	3.4432	645112	112	3.25%	0.1119	0.39	0
IW346	3.4432	64522	22	9.88%	0.3402	0.04	0
IW346	3.4432	64523	23	2.93%	0.1009	0.01	0
IW346	3.4432	64529	29	6.63%	0.2283	0.34	0
IW346	3.4432	64555	55	15.41%	0.5306	0.27	0
IW346	3.4432	64558	58	54.16%	1.8648	0.34	0
IW346	3.4432	64570	70	5.01%	0.1725	0.36	0
IW346	3.4432	64576	76	0.07%	0.0024	0.23	0
IW346	3.4432	64578	78	2.60%	0.0895	0.05	0
IW346	3.4432	64598	98	0.07%	0.0024	0.37	0
IW349	0.2498	645113	113	76.15%	0.1902	0.39	0
IW349	0.2498	64548	48	23.85%	0.0596	0.06	0
IW350	2.1751	645110	110	27.21%	0.5918	0.13	0
IW350	2.1751	645119	119	2.80%	0.0609	0.14	0
IW350	2.1751	64522	22	36.14%	0.7861	0.04	0
IW350	2.1751	64529	29	7.17%	0.1560	0.34	0
IW350	2.1751	64553	53	0.42%	0.0091	0.02	0
IW350	2.1751	64555	55	2.49%	0.0542	0.27	0
IW350	2.1751	64570	70	10.49%	0.2282	0.36	0

APPENDIX D.2.1: Soil Type Summary

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JOB NO. 310.032

Areas and percentage area reported to 4 significant digits by WMS. Actual precision of the data is only 2-3 significant digits

Basin ID	Total Basin Area (sq-miles)	Soil Type (WMS)	Soil Type (DDMSW)	Soil Type Area (%)	Soil Type Area (sq-miles)	XKSAT (in/hr)	RTIMP
IW350	2.1751	64575	75	13.29%	0.2891	0.23	0
IW351	0.3164	645113	113	2.17%	0.0069	0.39	0
IW351	0.3164	64546	46	5.80%	0.0183	0.03	0
IW351	0.3164	64558	58	20.29%	0.0642	0.34	0
IW351	0.3164	64598	98	71.74%	0.2270	0.37	0
IW352	0.0961	645113	113	48.84%	0.0469	0.39	0
IW352	0.0961	64548	48	11.63%	0.0112	0.06	0
IW352	0.0961	64558	58	37.21%	0.0357	0.34	0
IW352	0.0961	64598	98	2.33%	0.0022	0.37	0
IW353	2.8031	64521	21	1.12%	0.0314	0.38	0
IW353	2.8031	64522	22	50.20%	1.4072	0.04	0
IW353	2.8031	64529	29	23.38%	0.6554	0.34	0
IW353	2.8031	64544	44	4.32%	0.1211	0.03	0
IW353	2.8031	64546	46	10.41%	0.2918	0.03	0
IW353	2.8031	64553	53	0.16%	0.0045	0.02	0
IW353	2.8031	64555	55	0.16%	0.0045	0.27	0
IW353	2.8031	64558	58	6.89%	0.1931	0.34	0
IW353	2.8031	64575	75	2.64%	0.0740	0.23	0
IW353	2.8031	64598	98	0.72%	0.0202	0.37	0
IW354	0.3605	64548	48	92.90%	0.3349	0.06	0
IW354	0.3605	64558	58	7.10%	0.0256	0.34	0
IW356	0.2861	645113	113	24.03%	0.0688	0.39	0
IW356	0.2861	64548	48	75.97%	0.2174	0.06	0
IW357	0.7457	64522	22	0.30%	0.0022	0.04	0
IW357	0.7457	64529	29	3.03%	0.0226	0.34	0
IW357	0.7457	6453	3	4.24%	0.0316	0.58	0
IW357	0.7457	64546	46	63.64%	0.4746	0.03	0
IW357	0.7457	64574	74	6.36%	0.0474	0.08	0
IW357	0.7457	64598	98	22.42%	0.1672	0.37	0
IW358	0.1641	64522	22	7.58%	0.0124	0.04	0
IW358	0.1641	64529	29	12.12%	0.0199	0.34	0
IW358	0.1641	64555	55	25.76%	0.0423	0.27	0
IW358	0.1641	64558	58	54.55%	0.0895	0.34	0
IW359	2.9120	645110	110	2.01%	0.0585	0.13	0
IW359	2.9120	64521	21	1.47%	0.0428	0.38	0
IW359	2.9120	64522	22	0.93%	0.0271	0.04	0
IW359	2.9120	64529	29	45.91%	1.3369	0.34	0
IW359	2.9120	64544	44	6.48%	0.1887	0.03	0
IW359	2.9120	64553	53	19.52%	0.5684	0.02	0
IW359	2.9120	64555	55	15.20%	0.4426	0.27	0
IW359	2.9120	64575	75	4.71%	0.1372	0.23	0
IW359	2.9120	64598	98	3.78%	0.1101	0.37	0
IW360	0.8306	645113	113	29.05%	0.2413	0.39	0
IW360	0.8306	64558	58	3.63%	0.0302	0.34	0
IW360	0.8306	64598	98	67.32%	0.5592	0.37	0
IW361	0.3547	64522	22	2.58%	0.0092	0.04	0
IW361	0.3547	64529	29	7.10%	0.0252	0.34	0
IW361	0.3547	64544	44	17.42%	0.0618	0.03	0

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Areas and percentage area reported to 4 significant digits by WMS. Actual precision of the data is only 2-3 significant digits

Basin ID	Total Basin Area (sq-miles)	Soil Type (WMS)	Soil Type (DDMSW)	Soil Type Area (%)	Soil Type Area (sq-miles)	XKSAT (in/hr)	RTIMP
IW361	0.3547	64546	46	12.90%	0.0458	0.03	0
IW361	0.3547	64555	55	20.65%	0.0733	0.27	0
IW361	0.3547	64558	58	39.35%	0.1396	0.34	0
IW362	0.1794	64548	48	75.00%	0.1345	0.06	0
IW362	0.1794	64558	58	25.00%	0.0448	0.34	0
IW363	0.6278	645113	113	0.36%	0.0023	0.39	0
IW363	0.6278	64546	46	78.55%	0.4931	0.03	0
IW363	0.6278	64574	74	10.18%	0.0639	0.08	0
IW363	0.6278	64598	98	10.91%	0.0685	0.37	0
IW364	1.1451	645113	113	1.38%	0.0158	0.39	0
IW364	1.1451	64544	44	82.45%	0.9441	0.03	0
IW364	1.1451	64548	48	14.40%	0.1649	0.06	0
IW364	1.1451	64580	80	1.58%	0.0181	0.08	0
IW364	1.1451	64598	98	0.20%	0.0023	0.37	0
IW365	0.4729	64546	46	100.00%	0.4729	0.03	0
IW366	1.0558	64529	29	23.01%	0.2429	0.34	0
IW366	1.0558	64544	44	4.95%	0.0523	0.03	0
IW366	1.0558	64547	47	0.22%	0.0023	0.11	0
IW366	1.0558	64553	53	17.63%	0.1861	0.02	0
IW366	1.0558	64575	75	1.29%	0.0136	0.23	0
IW366	1.0558	64577	77	7.10%	0.0750	0.05	0
IW366	1.0558	64598	98	45.81%	0.4837	0.37	0
IW367	0.0512	64546	46	100.00%	0.0512	0.03	0
IW368	0.2907	645113	113	100.00%	0.2907	0.39	0
IW369	0.7949	645113	113	6.86%	0.0545	0.39	0
IW369	0.7949	64546	46	93.14%	0.7404	0.03	0
IW370	0.8795	645113	113	57.11%	0.5023	0.39	0
IW370	0.8795	6453	3	25.58%	0.2250	0.58	0
IW370	0.8795	64546	46	17.31%	0.1522	0.03	0
IW371	0.0529	64598	98	100.00%	0.0529	0.37	0
IW372	0.3175	645113	113	78.57%	0.2495	0.39	0
IW372	0.3175	6453	3	0.71%	0.0023	0.58	0
IW372	0.3175	64544	44	20.71%	0.0658	0.03	0
IW374	0.3875	64544	44	68.42%	0.2651	0.03	0
IW374	0.3875	64598	98	31.58%	0.1224	0.37	0
IW375	0.6582	645113	113	46.48%	0.3059	0.39	0
IW375	0.6582	64544	44	53.52%	0.3523	0.03	0
IW377	0.1126	645110	110	38.10%	0.0429	0.13	0
IW377	0.1126	64544	44	19.05%	0.0214	0.03	0
IW377	0.1126	64598	98	42.86%	0.0482	0.37	0
IW380	0.4998	6453	3	12.56%	0.0628	0.58	0
IW380	0.4998	64535	35	15.35%	0.0767	0.23	0
IW380	0.4998	64539	39	4.65%	0.0232	0.29	0
IW380	0.4998	64544	44	43.26%	0.2162	0.03	0
IW380	0.4998	64546	46	11.63%	0.0581	0.03	0
IW380	0.4998	64548	48	0.93%	0.0046	0.06	0
IW380	0.4998	6457	7	11.63%	0.0581	0.62	0
IW381	0.3841	64529	29	14.12%	0.0542	0.34	0

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Areas and percentage area reported to 4 significant digits by WMS. Actual precision of the data is only 2-3 significant digits

Basin ID	Total Basin Area (sq-miles)	Soil Type (WMS)	Soil Type (DDMSW)	Soil Type Area (%)	Soil Type Area (sq-miles)	XKSAT (in/hr)	RTIMP
IW381	0.3841	64544	44	77.06%	0.2960	0.03	0
IW381	0.3841	64574	74	8.82%	0.0339	0.08	0
IW382	0.6196	64513	13	1.82%	0.0113	0.01	0
IW382	0.6196	64529	29	54.74%	0.3392	0.34	0
IW382	0.6196	64544	44	33.94%	0.2103	0.03	0
IW382	0.6196	64574	74	3.28%	0.0203	0.08	0
IW382	0.6196	64598	98	6.20%	0.0384	0.37	0
IW384	0.0826	64529	29	23.53%	0.0194	0.34	0
IW384	0.0826	64544	44	76.47%	0.0631	0.03	0
IW386	0.3732	645110	110	7.41%	0.0277	0.13	0
IW386	0.3732	64513	13	3.09%	0.0115	0.01	0
IW386	0.3732	64544	44	33.95%	0.1267	0.03	0
IW386	0.3732	64548	48	28.40%	0.1060	0.06	0
IW386	0.3732	64549	49	14.20%	0.0530	0.06	0
IW386	0.3732	64574	74	1.23%	0.0046	0.08	0
IW386	0.3732	64598	98	11.73%	0.0438	0.37	0
IW387	1.3509	64536	36	32.72%	0.4420	0.07	0
IW387	1.3509	64539	39	43.85%	0.5924	0.29	0
IW387	1.3509	64564	64	9.80%	0.1324	0.14	25
IW387	1.3509	6457	7	1.66%	0.0224	0.62	0
IW387	1.3509	64594	94	11.96%	0.1616	0.33	0
IW388	1.2257	64513	13	3.49%	0.0428	0.01	0
IW388	1.2257	64529	29	8.26%	0.1012	0.34	0
IW388	1.2257	6453	3	9.54%	0.1169	0.58	0
IW388	1.2257	64544	44	13.39%	0.1641	0.03	0
IW388	1.2257	64546	46	62.20%	0.7624	0.03	0
IW388	1.2257	64598	98	3.12%	0.0382	0.37	0
IW389	0.1312	64546	46	100.00%	0.1312	0.03	0
IW390	0.3110	645110	110	14.60%	0.0454	0.13	0
IW390	0.3110	6453	3	29.20%	0.0908	0.58	0
IW390	0.3110	64544	44	0.73%	0.0023	0.03	0
IW390	0.3110	64548	48	12.41%	0.0386	0.06	0
IW390	0.3110	64549	49	8.76%	0.0272	0.06	0
IW390	0.3110	64574	74	5.84%	0.0182	0.08	0
IW390	0.3110	64598	98	28.47%	0.0885	0.37	0
IW390A	0.9003	64513	13	1.52%	0.0137	0.01	0
IW390A	0.9003	64528	28	5.56%	0.0501	0.02	0
IW390A	0.9003	6453	3	5.81%	0.0523	0.58	0
IW390A	0.9003	64542	42	5.05%	0.0455	0.17	0
IW390A	0.9003	64548	48	2.78%	0.0250	0.06	0
IW390A	0.9003	64564	64	16.16%	0.1455	0.14	25
IW390A	0.9003	64566	66	3.28%	0.0295	0.23	0
IW390A	0.9003	64568	68	3.03%	0.0273	0.63	0
IW390A	0.9003	64573	73	28.03%	0.2524	0.09	30
IW390A	0.9003	64574	74	5.81%	0.0523	0.08	0
IW390A	0.9003	64594	94	22.98%	0.2069	0.33	0
IW392	1.1135	6453	3	2.65%	0.0295	0.58	0
IW392	1.1135	64546	46	28.98%	0.3227	0.03	0

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Basin ID	Total Basin Area (sq-miles)	Soil Type (WMS)	Soil Type (DDMSW)	Soil Type Area (%)	Soil Type Area (sq-miles)	XKSAT (in/hr)	RTIMP
IW392	1.1135	64548	48	31.84%	0.3546	0.06	0
IW392	1.1135	64564	64	13.27%	0.1478	0.14	25
IW392	1.1135	64574	74	3.27%	0.0364	0.08	0
IW392	1.1135	64598	98	20.00%	0.2227	0.37	0
IW394	4.1731	645121	121	4.74%	0.1978	0.12	0
IW394	4.1731	64531	31	5.11%	0.2132	0.33	35
IW394	4.1731	64533	33	9.20%	0.3839	0.23	0
IW394	4.1731	64536	36	15.45%	0.6448	0.07	0
IW394	4.1731	64539	39	2.91%	0.1214	0.29	0
IW394	4.1731	64542	42	7.00%	0.2921	0.17	0
IW394	4.1731	64563	63	37.30%	1.5566	0.14	25
IW394	4.1731	64566	66	3.34%	0.1394	0.23	0
IW394	4.1731	6457	7	1.18%	0.0492	0.62	0
IW394	4.1731	64573	73	11.52%	0.4807	0.09	30
IW394	4.1731	64594	94	2.26%	0.0943	0.33	0
IW395	7.8618	637244526	CmD	3.37%	0.2649	0.00	0
IW395	7.8618	6374229	Le	5.23%	0.4112	0.00	0
IW395	7.8618	6374235	Lh	1.14%	0.0896	0.00	0
IW395	7.8618	6375455	Rr	3.26%	0.2563	0.00	0
IW395	7.8618	645104	104	1.23%	0.0967	0.14	60
IW395	7.8618	64516	16	0.23%	0.0181	0.44	15
IW395	7.8618	64531	31	3.49%	0.2744	0.33	35
IW395	7.8618	64534	34	5.12%	0.4025	0.23	0
IW395	7.8618	64536	36	1.40%	0.1101	0.07	0
IW395	7.8618	64543	43	1.06%	0.0833	0.17	0
IW395	7.8618	64562	62	0.17%	0.0134	0.15	0
IW395	7.8618	64563	63	65.28%	5.1322	0.14	25
IW395	7.8618	6457	7	1.20%	0.0943	0.62	0
IW395	7.8618	64572	72	7.01%	0.5511	0.09	30
IW395	7.8618	64597	97	0.80%	0.0629	0.07	0
IW396	0.5863	64535	35	26.54%	0.1556	0.23	0
IW396	0.5863	64536	36	12.69%	0.0744	0.07	0
IW396	0.5863	64539	39	13.85%	0.0812	0.29	0
IW396	0.5863	64543	43	5.38%	0.0315	0.17	0
IW396	0.5863	64544	44	0.38%	0.0022	0.03	0
IW396	0.5863	64564	64	0.77%	0.0045	0.14	25
IW396	0.5863	6457	7	40.38%	0.2367	0.62	0
IW397	4.8148	637244526	CmD	44.82%	2.1580	0.00	0
IW397	4.8148	637244730	CnF	0.28%	0.0135	0.00	0
IW397	4.8148	6374229	Le	16.65%	0.8017	0.00	0
IW397	4.8148	6374235	Lh	16.60%	0.7993	0.00	0
IW397	4.8148	6375455	Rr	21.64%	1.0419	0.00	0
PD700	1.3998	651203222	AGB	1.63%	0.0228	0.40	0
PD700	1.3998	651203424	AHC	10.60%	0.1484	0.38	0
PD700	1.3998	6513244	GM	18.27%	0.2557	0.29	0
PD700	1.3998	651326426	GWD	2.77%	0.0388	0.35	0
PD700	1.3998	651326826	GYD	12.72%	0.1780	0.26	0
PD700	1.3998	651445822	MTB	26.59%	0.3722	0.15	0

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Appendix D.2.2

SHEET ________ OF ________

BY ________ DATE ________

CLIENT: FCDMC

CHECK ________ DATE ________

JOB: Wittmann Area Drainage Master Study Update

JOB NO. 310.032

Existing Land Use Summary by Basin

Basin ID	Area (sqmiles)	WMS Land Use Code	Mag Land Use Code	IA (in) Initial Abstractions	RTIMP	% Vegetation	Land Use Definition
IW302	1.09	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW302	0.02	740	WTR	0.00	0	0	Water
IW310	0.33	120	LDR-1	0.30	10	30	Estate Residential (1/5 du per acre to 1 du per acre)
IW310	0.00	130	LDR-2	0.30	15	50	Large Lot Residential - Single Family (1 du per acre to 2 du per acre)
IW310	0.82	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW310	0.02	740	WTR	0.00	0	0	Water
IW312	0.02	600	FWY-1	0.30	20	30	General Transportation (Transportation where no detail available)
IW312	0.01	610	FWY-2	0.10	80	30	Transportation (Includes railroads, railyards, transit centers and freeways)
IW312	0.53	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW314	0.09	120	LDR-1	0.30	10	30	Estate Residential (1/5 du per acre to 1 du per acre)
IW314	0.01	130	LDR-2	0.30	15	50	Large Lot Residential - Single Family (1 du per acre to 2 du per acre)
IW314	2.05	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW314	0.01	740	WTR	0.00	0	0	Water
IW318	0.13	130	LDR-2	0.30	15	50	Large Lot Residential - Single Family (1 du per acre to 2 du per acre)
IW318	0.43	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW322	1.87	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW326	0.32	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW330	1.03	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW334	0.10	120	LDR-1	0.30	10	30	Estate Residential (1/5 du per acre to 1 du per acre)
IW334	1.13	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW334	0.02	740	WTR	0.00	0	0	Water
IW338	0.09	120	LDR-1	0.30	10	30	Estate Residential (1/5 du per acre to 1 du per acre)
IW338	0.23	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW342	0.06	110	VLDR	0.30	5	30	Rural Residential (<= 1/5 du per acre)
IW342	0.28	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW346	0.10	110	VLDR	0.30	5	30	Rural Residential (<= 1/5 du per acre)
IW346	3.35	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW349	0.02	130	LDR-2	0.30	15	50	Large Lot Residential - Single Family (1 du per acre to 2 du per acre)
IW349	0.05	140	MDR-1	0.25	30	50	Medium Lot Residential - Single Family (2-4 du per acre)
IW349	0.01	610	FWY-2	0.10	80	30	Transportation (Includes railroads, railyards, transit centers and freeways)
IW349	0.16	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW350	2.16	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW351	0.04	140	MDR-1	0.25	30	50	Medium Lot Residential - Single Family (2-4 du per acre)
IW351	0.27	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW352	0.10	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW353	0.01	120	LDR-1	0.30	10	30	Estate Residential (1/5 du per acre to 1 du per acre)
IW353	0.00	610	FWY-2	0.10	80	30	Transportation (Includes railroads, railyards, transit centers and freeways)
IW353	2.78	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)

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Appendix D.2.2

CLIENT: FCDMC

JOB: Wittmann Area Drainage Master Study Update

SHEET ________ OF ________

BY ________ DATE ________

CHECK ________ DATE ________

JOB NO. 310.032

Existing Land Use Summary by Basin

Basin ID	Area (sqmiles)	WMS Land Use Code	Mag Land Use Code	IA (in) Initial Abstractions	RTIMP	% Vegetation	Land Use Definition
IW354	0.35	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW356	0.29	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW357	0.03	120	LDR-1	0.30	10	30	Estate Residential (1/5 du per acre to 1 du per acre)
IW357	0.03	570	IND-4	0.15	80	25	Other Employment - low (Proving grounds and land fills)
IW357	0.03	610	FWY-2	0.10	80	30	Transportation (Includes railroads, railyards, transit centers and freeways)
IW357	0.65	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW358	0.15	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW359	0.08	120	LDR-1	0.30	10	30	Estate Residential (1/5 du per acre to 1 du per acre)
IW359	0.04	610	FWY-2	0.10	80	30	Transportation (Includes railroads, railyards, transit centers and freeways)
IW359	2.78	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW360	0.22	140	MDR-1	0.25	30	50	Medium Lot Residential - Single Family (2-4 du per acre)
IW360	0.01	610	FWY-2	0.10	80	30	Transportation (Includes railroads, railyards, transit centers and freeways)
IW360	0.57	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW361	0.35	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW362	0.17	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW363	0.02	120	LDR-1	0.30	10	30	Estate Residential (1/5 du per acre to 1 du per acre)
IW363	0.01	140	MDR-1	0.25	30	50	Medium Lot Residential - Single Family (2-4 du per acre)
IW363	0.04	160	VSLR	0.25	40	50	Very Small Lot Residential - Single Family (>6 du per acre-includes mobile home
IW363	0.03	610	FWY-2	0.10	80	30	Transportation (Includes railroads, railyards, transit centers and freeways)
IW363	0.51	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW364	0.04	610	FWY-2	0.10	80	30	Transportation (Includes railroads, railyards, transit centers and freeways)
IW364	1.10	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW365	0.03	600	FWY-1	0.30	20	30	General Transportation (Transportation where no detail available)
IW365	0.00	610	FWY-2	0.10	80	30	Transportation (Includes railroads, railyards, transit centers and freeways)
IW365	0.44	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW366	0.02	130	LDR-2	0.30	15	50	Large Lot Residential - Single Family (1 du per acre to 2 du per acre)
IW366	0.01	520	INS-1	0.25	45	80	Educational (Public schools, private schools and universities)
IW366	0.02	610	FWY-2	0.10	80	30	Transportation (Includes railroads, railyards, transit centers and freeways)
IW366	0.98	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW367	0.00	610	FWY-2	0.10	80	30	Transportation (Includes railroads, railyards, transit centers and freeways)
IW367	0.04	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW368	0.01	610	FWY-2	0.10	80	30	Transportation (Includes railroads, railyards, transit centers and freeways)
IW368	0.26	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW369	0.02	600	FWY-1	0.30	20	30	General Transportation (Transportation where no detail available)
IW369	0.00	610	FWY-2	0.10	80	30	Transportation (Includes railroads, railyards, transit centers and freeways)
IW369	0.77	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW370	0.16	130	LDR-2	0.30	15	50	Large Lot Residential - Single Family (1 du per acre to 2 du per acre)
IW370	0.03	600	FWY-1	0.30	20	30	General Transportation (Transportation where no detail available)

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Appendix D.2.2

SHEET ________ OF ________

BY ________ DATE ________

CLIENT: FCDMC

CHECK ________ DATE ________

JOB: Wittmann Area Drainage Master Study Update

JOB NO. 310.032

Existing Land Use Summary by Basin

Basin ID	Area (sqmiles)	WMS Land Use Code	Mag Land Use Code	IA (in) Initial Abstractions	RTIMP	% Vegetation	Land Use Definition
IW370	0.01	610	FWY-2	0.10	80	30	Transportation (Includes railroads, railyards, transit centers and freeways)
IW370	0.67	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW371	0.01	130	LDR-2	0.30	15	50	Large Lot Residential - Single Family (1 du per acre to 2 du per acre)
IW371	0.01	610	FWY-2	0.10	80	30	Transportation (Includes railroads, railyards, transit centers and freeways)
IW371	0.02	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW372	0.00	130	LDR-2	0.30	15	50	Large Lot Residential - Single Family (1 du per acre to 2 du per acre)
IW372	0.02	610	FWY-2	0.10	80	30	Transportation (Includes railroads, railyards, transit centers and freeways)
IW372	0.29	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW374	0.03	110	VLDR	0.30	5	30	Rural Residential (<= 1/5 du per acre)
IW374	0.14	130	LDR-2	0.30	15	50	Large Lot Residential - Single Family (1 du per acre to 2 du per acre)
IW374	0.04	600	FWY-1	0.30	20	30	General Transportation (Transportation where no detail available)
IW374	0.01	610	FWY-2	0.10	80	30	Transportation (Includes railroads, railyards, transit centers and freeways)
IW374	0.17	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW375	0.00	610	FWY-2	0.10	80	30	Transportation (Includes railroads, railyards, transit centers and freeways)
IW375	0.63	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW377	0.09	110	VLDR	0.30	5	30	Rural Residential (<= 1/5 du per acre)
IW377	0.00	600	FWY-1	0.30	20	30	General Transportation (Transportation where no detail available)
IW377	0.01	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW380	0.00	600	FWY-1	0.30	20	30	General Transportation (Transportation where no detail available)
IW380	0.48	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW381	0.14	110	VLDR	0.30	5	30	Rural Residential (<= 1/5 du per acre)
IW381	0.03	600	FWY-1	0.30	20	30	General Transportation (Transportation where no detail available)
IW381	0.06	610	FWY-2	0.10	80	30	Transportation (Includes railroads, railyards, transit centers and freeways)
IW381	0.15	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW382	0.21	110	VLDR	0.30	5	30	Rural Residential (<= 1/5 du per acre)
IW382	0.02	600	FWY-1	0.30	20	30	General Transportation (Transportation where no detail available)
IW382	0.02	610	FWY-2	0.10	80	30	Transportation (Includes railroads, railyards, transit centers and freeways)
IW382	0.36	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW384	0.00	610	FWY-2	0.10	80	30	Transportation (Includes railroads, railyards, transit centers and freeways)
IW384	0.07	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW386	0.11	110	VLDR	0.30	5	30	Rural Residential (<= 1/5 du per acre)
IW386	0.01	600	FWY-1	0.30	20	30	General Transportation (Transportation where no detail available)
IW386	0.25	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW387	1.35	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW388	0.01	110	VLDR	0.30	5	30	Rural Residential (<= 1/5 du per acre)
IW388	0.05	570	IND-4	0.15	80	25	Other Employment - low (Proving grounds and land fills)
IW388	0.09	600	FWY-1	0.30	20	30	General Transportation (Transportation where no detail available)
IW388	1.07	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)

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Appendix D.2.2

SHEET ______ OF ______

BY ______ DATE ______

CLIENT: FCDMC

CHECK ______ DATE ______

JOB: Wittmann Area Drainage Master Study Update

JOB NO. 310.032

Existing Land Use Summary by Basin

Basin ID	Area (sqmiles)	WMS Land Use Code	Mag Land Use Code	IA (in) Initial Abstractions	RTIMP	% Vegetation	Land Use Definition
IW389	0.00	600	FWY-1	0.30	20	30	General Transportation (Transportation where no detail available)
IW389	0.12	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW390	0.00	600	FWY-1	0.30	20	30	General Transportation (Transportation where no detail available)
IW390	0.30	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW390A	0.81	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW390A	0.07	730	OPEN-4	0.35	0	30	Passive Open Space (Includes mountain preserves and washes)
IW392	0.00	600	FWY-1	0.30	20	30	General Transportation (Transportation where no detail available)
IW392	1.10	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW394	1.71	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW394	2.45	730	OPEN-4	0.35	0	30	Passive Open Space (Includes mountain preserves and washes)
IW395	0.97	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW395	6.87	730	OPEN-4	0.35	0	30	Passive Open Space (Includes mountain preserves and washes)
IW396	0.58	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW397	4.79	730	OPEN-4	0.35	0	30	Passive Open Space (Includes mountain preserves and washes)
PD700	1.35	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
PD700	0.02	740	WTR	0.00	0	0	Water
PD704	0.17	570	IND-4	0.15	80	25	Other Employment - low (Proving grounds and land fills)
PD704	0.18	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
PD704	0.00	740	WTR	0.00	0	0	Water
PD708	0.01	570	IND-4	0.15	80	25	Other Employment - low (Proving grounds and land fills)
PD708	2.35	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
PD708	0.05	740	WTR	0.00	0	0	Water
PD712	0.17	300	IND-1	0.15	55	60	General Industrial (Industrial where no detail available)
PD712	0.71	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
PD712A	0.76	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
PD716	1.73	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
PD716	0.01	740	WTR	0.00	0	0	Water
PD720	0.57	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
PD720	0.02	740	WTR	0.00	0	0	Water
PD726	0.13	120	LDR-1	0.30	10	30	Estate Residential (1/5 du per acre to 1 du per acre)
PD726	0.29	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
PD726A	0.00	120	LDR-1	0.30	10	30	Estate Residential (1/5 du per acre to 1 du per acre)
PD726A	1.08	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
PD726A	0.01	740	WTR	0.00	0	0	Water
PD726B	0.56	120	LDR-1	0.30	10	30	Estate Residential (1/5 du per acre to 1 du per acre)
PD726B	0.39	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
PD732	0.44	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
PD732	0.03	740	WTR	0.00	0	0	Water

APPENDIX D.2.3

EXISTING CONDITIONS
BASIN LG CARD SUMMARY

Basin	IA	DTHETA	PSIF	XKSAT	RTIMP*
AF800	0.276	0.328	6.447	0.135	1.369
AF802	0.342	0.244	5.222	0.251	4.882
AF803	0.253	0.279	5.068	0.289	24.728
AF805	0.325	0.283	5.475	0.217	3.741
AF807	0.358	0.282	6.738	0.150	0.170
AF810	0.325	0.251	4.419	0.389	10.927
AF820	0.350	0.250	4.217	0.423	5.000
AF830	0.350	0.162	6.880	0.130	5.000
AF850	0.213	0.250	5.050	0.307	44.259
AF852	0.211	0.181	6.691	0.168	42.843
AF854	0.208	0.250	5.078	0.304	43.333
AF860	0.229	0.250	4.023	0.518	35.172
AF862	0.273	0.250	4.025	0.487	24.286
AF864	0.150	0.250	5.594	0.280	55.000
AF866	0.204	0.207	6.431	0.192	44.271
IW300	0.333	0.243	5.605	0.213	5.544
IW302	0.314	0.246	4.918	0.296	12.350
IW310	0.331	0.148	8.143	0.081	6.392
IW312	0.344	0.139	9.923	0.042	6.860
IW314	0.346	0.244	6.048	0.180	5.233
IW318	0.338	0.150	8.597	0.070	7.372
IW322	0.350	0.150	8.622	0.067	5.000
IW326	0.350	0.250	5.374	0.235	5.000
IW330	0.350	0.250	5.701	0.208	5.000
IW334	0.341	0.246	5.789	0.196	5.325
IW338	0.336	0.250	5.780	0.198	6.399
IW342	0.341	0.268	4.586	0.346	5.000
IW346	0.349	0.253	5.005	0.281	5.000
IW349	0.315	0.250	4.804	0.321	13.991
IW350	0.350	0.171	6.789	0.135	5.000
IW351	0.338	0.250	4.426	0.393	7.899
IW352	0.350	0.250	4.511	0.364	5.000
IW353	0.350	0.150	7.596	0.098	5.084
IW354	0.350	0.150	8.086	0.083	5.000
IW356	0.350	0.150	7.178	0.115	5.000
IW357	0.330	0.156	8.059	0.083	11.106
IW358	0.350	0.250	4.638	0.333	5.000
IW359	0.345	0.250	5.939	0.187	6.181
IW360	0.319	0.250	4.127	0.480	13.031
IW361	0.350	0.244	6.061	0.180	5.000
IW362	0.350	0.150	7.223	0.113	5.000
IW363	0.328	0.150	9.339	0.055	11.655
IW364	0.342	0.140	9.898	0.043	7.515
IW365	0.345	0.130	10.100	0.037	6.579
IW366	0.343	0.250	5.762	0.202	7.207
IW367	0.324	0.130	10.100	0.037	12.895

*Ggreen and Ampt parameters are reported to 3 decimal places by WMS, but the actual precision of the data is only 2-3 significant figures.

APPENDIX D.2.3

EXISTING CONDITIONS
BASIN LG CARD SUMMARY

Basin	IA	DTHETA	PSIF	XKSAT	RTIMP*
IW368	0.344	0.250	4.000	0.477	6.907
IW369	0.348	0.142	9.869	0.044	5.514
IW370	0.337	0.250	4.616	0.331	7.933
IW371	0.275	0.250	4.150	0.473	26.250
IW372	0.335	0.250	5.001	0.281	9.357
IW374	0.315	0.161	8.147	0.086	12.602
IW375	0.348	0.150	7.035	0.121	5.528
IW377	0.304	0.382	5.921	0.188	5.357
IW380	0.350	0.150	7.161	0.111	5.140
IW381	0.309	0.190	9.152	0.056	11.882
IW382	0.322	0.275	6.319	0.164	8.175
IW384	0.343	0.150	8.675	0.065	7.206
IW386	0.334	0.192	8.439	0.072	5.278
IW387	0.350	0.250	5.656	0.213	7.450
IW388	0.337	0.156	8.775	0.061	9.239
IW389	0.348	0.130	10.100	0.037	5.526
IW390	0.349	0.250	5.071	0.258	5.221
IW390A	0.350	0.250	6.134	0.172	17.033
IW392	0.350	0.150	7.459	0.103	8.347
IW394	0.350	0.327	6.166	0.173	16.632
IW395	0.350	0.374	6.125	0.175	27.313
IW396	0.350	0.250	4.518	0.336	5.192
IW397	0.350	0.381	6.390	0.159	39.233
PD700	0.344	0.246	5.243	0.250	4.918
PD704	0.299	0.297	4.461	0.342	2.516
PD708	0.342	0.245	4.987	0.268	10.121
PD712	0.311	0.250	5.374	0.248	28.595
PD712A	0.350	0.250	4.955	0.280	15.000
PD716	0.348	0.249	5.684	0.209	9.472
PD720	0.341	0.243	5.039	0.275	4.865
PD726	0.335	0.250	4.531	0.353	6.505
PD726A	0.346	0.247	4.501	0.366	8.937
PD726B	0.320	0.250	4.368	0.399	9.751
PD732	0.325	0.232	4.928	0.286	4.645
PD736	0.347	0.248	4.632	0.334	5.248
PD740	0.315	0.242	4.227	0.427	8.181
PD744	0.342	0.249	4.427	0.357	5.989
PD748	0.350	0.283	4.527	0.356	31.290
PD752	0.325	0.277	4.160	0.413	30.417
PD756	0.349	0.346	4.292	0.415	27.514
PD760	0.344	0.336	5.039	0.275	6.919
PI600	0.342	0.244	5.047	0.268	4.887
PI600A	0.345	0.246	5.184	0.252	4.929
PI603	0.344	0.250	4.660	0.316	7.957
PI604	0.307	0.250	4.970	0.285	22.848
PI606	0.324	0.250	4.383	0.419	10.725

*Ggreen and Ampt parameters are reported to 3 decimal places by WMS, but the actual precision of the data is only 2-3 significant figures.

Entellus

CLIENT: FCDMC JOB NO. 310.032
JOB: Wittmann Area Drainage Master Study Update

Basin	TOC Length	TOC Length	US Elev	DS Elev	Slope	Area	Adjusted Length	TOC adjusted slope	basin adjusted slope	Adjusted Slope	Resistance Coefficient Class K_b[e]	24-hr Tc	24-hr R	6-hr Tc	6-hr R	Existing Time-Area Relation	Future Time-Area Relation
	[ft]	[mi]	[ft]	[ft]	[ft/mi]	[mi²]	[mi]	[ft/mi]	[ft/mi]	[ft/mi]	[A, B, C, D]	[hr]	[hr]	[hr]	[hr]		
IW326	7473	1.415	1660	1592	48.0	0.3331		48.0		48.0	B	0.588	0.506	0.538	0.459	Natural	Natural
IW330	16152	3.059	1744	1630	37.3	1.0372		37.3		37.3	B	1.058	0.944	1.008	0.895	Natural	Natural
IW334	12266	2.323	1632	1548	36.2	1.2571		36.2		36.2	B	0.838	0.523	0.808	0.503	Natural	Natural
IW338	7098	1.344	1644	1584	44.6	0.3390		44.6		44.6	B	0.575	0.470	0.529	0.428	Natural	Natural
IW342	11257	2.132	1698	1606	43.2	0.3535		43.2		43.2	B	0.888	1.074	0.800	0.957	Natural	Natural
IW346	26458	5.011	1842	1608	46.7	3.4432		46.7		46.7	B	1.254	0.854	1.271	0.866	Natural	Natural
IW349	9959	1.886	1906	1780	66.8	0.2498		66.8		66.8	B	0.650	0.840	0.596	0.763	Natural	Natural
IW350	26115	4.946	1852	1680	34.8	2.1751		34.8		34.8	B	1.363	1.203	1.308	1.150	Natural	Natural
IW351	8979	1.701	1888	1790	57.6	0.3164		57.6		57.6	B	0.642	0.658	0.596	0.615	Natural	Natural
IW352	4164	0.789	1780	1736	55.8	0.0961		55.8		55.8	B	0.421	0.445	0.383	0.401	Natural	Natural
IW353	25008	4.736	1976	1716	54.9	2.8031		54.9		54.9	B	1.004	0.717	0.996	0.710	Natural	Natural
IW354	8758	1.659	1812	1712	60.3	0.3605		60.3		60.3	B	0.550	0.511	0.508	0.468	Natural	Natural
IW356	9366	1.774	1850	1736	64.3	0.2861		64.3		64.3	B	0.579	0.651	0.533	0.594	Natural	Natural
IW357	15742	2.981	2050	1848	67.8	0.7457		67.8		67.8	B	0.742	0.752	0.700	0.705	Natural	Natural
IW358	8063	1.527	1790	1716	48.5	0.1641		48.5		48.5	B	0.683	0.953	0.625	0.863	Natural	Natural
IW359	20045	3.796	1968	1792	46.4	2.9120		46.4		46.4	B	0.979	0.571	0.983	0.574	Natural	Natural
IW360	11142	2.110	1888	1756	62.6	0.8306		62.6		62.6	B	0.683	0.490	0.654	0.467	Urban	Urban
IW361	11395	2.158	1838	1740	45.4	0.3547		45.4		45.4	B	0.804	0.970	0.733	0.876	Urban	Natural
IW362	6905	1.308	1750	1680	53.5	0.1794		53.5		53.5	B	0.525	0.597	0.488	0.550	Natural	Natural
IW363	9983	1.891	1940	1824	61.4	0.6278		61.4		61.4	B	0.563	0.424	0.529	0.396	Natural	Natural
IW364	13961	2.644	1836	1680	59.0	1.1451		59.0		59.0	B	0.683	0.489	0.667	0.475	Natural	Natural
IW365	14686	2.781	2110	1892	78.4	0.4729		78.4		78.4	C	1.113	1.447	1.000	1.285	Natural	Natural

[a] Adjusted length used for Tc calculation
[b] Adjusted slope used
[c] S-Graphs used (***** used to identify S-Graph basins)
[d] Adjusted length and slope used
[e] Roughness classes determined based on Hydrology Manual definitions

Entellus

CLIENT: FCDMC **JOB NO.** 310.032

JOB: Wittmann Area Drainage Master Study Update

Basin	TOC Length	TOC Length	US Elev	DS Elev	Slope	Area	Adjusted Length	TOC adjusted slope	basin adjusted slope	Adjusted Slope	Resistance Coefficient Class K_b[e]	24-hr Tc	24-hr R	6-hr Tc	6-hr R	Existing Time-Area Relation	Future Time-Area Relation
	[ft]	[mi]	[ft]	[ft]	[ft/mi]	[mi^2]	[mi]	[ft/mi]	[ft/mi]	[ft/mi]	[A, B, C, D]	[hr]	[hr]	[hr]	[hr]		
IW366	14409	2.729	2012	1864	54.2	1.0558		54.2		54.2	B	0.796	0.622	0.763	0.593	Natural	Natural
IW367	2549	0.483	1924	1880	91.2	0.0512		91.2		91.2	C	0.371	0.374	0.338	0.337	Natural	Natural
IW368	7212	1.366	1980	1872	79.1	0.2907		79.1		79.1	C	0.833	0.784	0.754	0.702	Natural	Natural
IW369	17914	3.393	2130	1882	73.1	0.7949		73.1		73.1	C	1.271	1.462	1.175	1.340	Natural	Natural
IW370	20797	3.939	2150	1852	75.7	0.8795		75.7		75.7	B	0.967	1.148	0.917	1.082	Natural	Natural
IW371	2857	0.541	2002	1964	70.2	0.0529		70.2		70.2	B	0.308	0.327	0.275	0.288	Urban	Urban
IW372	7532	1.427	1930	1818	78.5	0.3175		78.5		78.5	B	0.479	0.418	0.442	0.382	Natural	Natural
IW374	7657	1.450	2056	1958	67.6	0.3875		67.6		67.6	B	0.475	0.374	0.442	0.345	Natural	Natural
IW375	18208	3.448	2052	1806	71.3	0.6582		71.3		71.3	C	1.392	1.824	1.296	1.685	Natural	Natural
IW377	5891	1.116	2110	2022	78.9	0.1126		78.9		78.9	B	0.442	0.566	0.408	0.519	Natural	Natural
IW380	13534	2.563	2340	2072	104.6	0.4998		104.6		104.6	B	0.575	0.631	0.533	0.581	Natural	Natural
IW381	12702	2.406	2086	1940	60.7	0.3841		60.7		60.7	B	0.704	0.873	0.650	0.799	Natural	Natural
IW382	11526	2.183	2060	1936	56.8	0.6196		56.8		56.8	B	0.688	0.599	0.642	0.555	Urban	Urban
IW384	3456	0.654	1976	1936	61.1	0.0826		61.1		61.1	B	0.338	0.327	0.308	0.296	Natural	Natural
IW386	9528	1.805	2160	2040	66.5	0.3732		66.5		66.5	C	0.917	0.945	0.838	0.855	Natural	Natural
IW387	13341	2.527	2440	2180	102.9	1.3509		102.9		102.9	C	0.921	0.597	0.892	0.576	Natural	Natural
IW388	15575	2.950	2100	1920	61.0	1.2257		61.0		61.0	C	1.200	0.958	1.133	0.900	Natural	Natural
IW389	6318	1.197	2160	2054	88.6	0.1312		88.6		88.6	C	0.638	0.825	0.588	0.753	Natural	Natural
IW390	10762	2.038	2210	2040	83.4	0.3110		83.4		83.4	C	1.021	1.302	0.929	1.173	Natural	Natural
IW390A	15477	2.931	2460	2155	104.1	0.9003		104.1		104.1	C	1.033	0.963	0.971	0.899	Natural	Natural
[b] **IW392**	10410	1.972	2520	2038	244.5	1.1135		244.5	233.0	233.0	C	0.500	0.278	0.504	0.280	Natural	Natural
[b] **IW394**	27057	5.124	3380	2260	218.6	4.1731		218.6	212.0	212.0	D	1.367	0.857	1.367	0.857	Natural	Natural

[a] Adjusted length used for Tc calculation
[b] Adjusted slope used
[c] S-Graphs used (***** used to identify S-Graph basins)
[d] Adjusted length and slope used
[e] Roughness classes determined based on Hydrology Manual definitions

D.3 Hydrograph Routing Data

(Information obtained from July 2005 Wittmann ADMSU Hydrology Final Addendum prepared by Entellus)

Appendix D.3

Entellus

BY ____________ DATE ____________

CHECK ____________ DATE ____________

JOB NO. 310.032

CLIENT: FCDMC

JOB: Wittmann Area Drainage Master Study Update

Storm: 100-yr, 6-hr Existing Conditions **Route N-Step vs Velocity**

Route (Model Order)	Previous Time to Peak [hr]	Route Time to Peak [hr]	Difference in Time to peak [hr]	Route Length [ft]	HEC-1 Velocity [fps]	Normal Depth Velocity [fps]	HEC-1 Flow [cfs]	Normal Depth Flow [cfs]	Typical Cross Section	Route Slope [ft/ft]	Manning's "n" Value	HEC-1 N-step
RWT140	5.17	5.42	0.25	13053	14.50	6.45	1849	1857	WTTS20_1	0.019	0.035	3
RWT130	5.25	5.83	0.58	5750	2.75	4.18	2498	2507	Channel	0.001	0.035	5
RWT160	4.58	6.25	1.67	18961	3.15	2.55	501	509	WTTS10_1	0.012	0.035	12
R150A	5.08	5.25	0.17	9557	15.62	9.29	2582	2590	WTTS20_2	0.021	0.035	3
RWT150	5.17	5.58	0.41	16082	10.90	6.22	2752	2758	WTTS20_1	0.013	0.035	5
RWT120	5.67	6.17	0.50	6168	3.43	5.13	5198	5206	Channel	0.001	0.035	7
RWT110	6.17	6.83	0.66	7640	3.22	5.06	4924	4932	Channel	0.001	0.035	5
RWT100	6.75	7.17	0.42	4778	3.16	4.97	4614	4623	Channel	0.001	0.035	1
RTW406	4.08	8.42	4.34	16567	1.06	0.56	40	31	TSR408	0.007	0.04	6
RTW408	4.83	7.75	2.92	11703	1.11	1.49	298	306	TWTS50	0.005	0.04	10
RTW404	7.17	7.50	0.33	14969	12.60	3.48	4499	4500	TSR408	0.008	0.035	2
RIW371	4.08	6.50	2.42	20437	2.35	0.39	15	5	TSR371	0.008	0.04	15
RIW366	4.58	5.00	0.42	6797	4.50	4.87	957	966	TSR375	0.009	0.04	4
RIW377	4.50	5.25	0.75	4964	1.84	1.06	98	89	TSR371	0.010	0.04	6
RD371	4.08	4.33	0.25	1828	2.03	0.96	40	30	WITS130	0.003	0.035	1
RIW374	4.25	5.92	1.67	6588	1.10	1.64	404	411	TSR371	0.010	0.04	15
RIW386	4.58	5.42	0.84	7726	2.55	3.13	301	310	IWTS20_2	0.009	0.035	6
RIW382	4.33	4.83	0.50	10311	5.73	2.31	253	262	IWTS20_1	0.008	0.04	3
RD382A	4.33	4.42	0.09	2942	9.08	2.38	196	205	WITS130	0.009	0.035	1
RIW384	4.33	4.67	0.34	1005	0.82	2.42	310	319	TWTS20	0.014	0.04	3
RIW381	4.50	4.83	0.33	4694	3.95	1.97	574	581	TSR371	0.012	0.04	3
R359*	4.83	5.17	0.34	9280	7.58	5.48	937	946	IWTS30_2	0.010	0.04	4
RIW359 **	5.00	5.33	0.33	17152	14.44	5.93	3233	3241	IWTS30_1	0.006	0.04	4
RIW389	4.42	5.75	1.33	7697	1.61	3.05	102	92	IWTS10_1	0.013	0.04	6
RIW394	5.08	5.25	0.17	6512	10.64	6.00	2613	2620	TWTS10	0.014	0.035	2
R390A	5.25	5.42	0.17	8577	14.01	8.04	2925	2933	IWTS10_1	0.013	0.035	2

+ Time lapse less than time step of 5 minutes, so 1 time step was assumed for HEC-1 Velocity Calculation

** Modified Typical X-Section

x Modified Time To Peak Used

Appendix D.3

Entellus

BY ______________ DATE ______________

CHECK ______________ DATE ______________

JOB NO. 310.032

CLIENT: FCDMC

JOB: Wittmann Area Drainage Master Study Update

Storm: 100-yr, 6-hr Existing Conditions **Route N-Step vs Velocity**

Route (Model Order)	Previous Time to Peak [hr]	Route Time to Peak [hr]	Difference in Time to peak [hr]	Route Length [ft]	HEC-1 Velocity [fps]	Normal Depth Velocity [fps]	HEC-1 Flow [cfs]	Normal Depth Flow [cfs]	Typical Cross Section	Route Slope [ft/ft]	Manning's "n" Value	HEC-1 N-step
RIW390	5.50	5.75	0.25	13324	14.80	6.62	2969	2975	TWTS10	0.017	0.035	3
RIW388	5.67	5.92	0.25	11626	12.92	6.06	3450	3456	IWTS20_1	0.010	0.04	2
RIW357 **	5.92	6.42	0.50	2593	1.44	3.36	2608	2614	TWTS20	0.008	0.04	9
RIW353	5.50	5.75	0.25	2643	2.94	3.06	5328	5326	TSR371	0.009	0.04	2
RIW312	4.75	5.83	1.08	17570	4.52	2.06	238	248	TSR294	0.005	0.04	1
RD312	4.75	4.92	0.17	4244	6.93	2.26	223	232	TWTS20	0.011	0.035	1
RIW365	4.83	5.42	0.59	11648	5.48	3.58	298	307	TSR375	0.010	0.04	5
RD365	4.83	5.00	0.17	1927	3.15	2.13	268	277	WITS130	0.005	0.035	2
RIW369	5.00	5.33	0.33	11583	9.75	1.64	463	471	TSR371	0.009	0.04	4
RD357	5.92	6.00	0.08	3820	13.26	5.03	930	939	IWTS30_1	0.009	0.04	2
RIW363	5.50	6.08	0.58	7351	3.52	5.33	1281	1290	IWTS30_1	0.009	0.04	4
RD369	4.92	5.17	0.25	1409	1.57	1.41	344	353	WITS130	0.001	0.035	1
RIW368	5.08	5.67	0.59	7248	3.41	2.29	438	447	TWTS20	0.010	0.04	6
RIW360	4.33	4.42	0.09	11127	34.34	4.89	751	760	IWTS30_1	0.008	0.035	1
RIW397	4.92	5.42	0.50	2780	1.54	3.99	3662	3668	PDTS40_1	0.006	0.035	8
RIW395	5.25	5.50	0.25	21294	23.66	9.49	7558	7561	TWTS10	0.021	0.035	3
RIW387 +	4.67	4.67	0.08	11459	38.20	2.71	1332	1338	TSR371	0.012	0.035	1
RIW396	5.42	5.58	0.16	5924	10.28	4.75	7911	7917	PDTS40_1	0.006	0.035	1
RIW380 **	5.58	6.67	1.09	4964	1.27	3.87	5586	5582	TSR371	0.012	0.035	11
RIW370 **	6.58	7.17	0.59	15367	7.23	9.16	5504	5511	TSR375	0.010	0.035	3
RIW349	7.17	7.25	0.08	7496	26.03	3.39	2088	2094	IWTS40_1	0.005	0.035	1
RD349 **	7.17	7.42	0.25	6586	7.32	7.04	3318	3326	IWTS30_1	0.008	0.035	1
RIW356 **	7.33	7.42	0.09	13031	40.22	8.57	5405	5413	IWTS30_2	0.006	0.04	1
RIW354 **	7.42	7.75	0.33	16693	14.05	7.27	5317	5324	IWTS30_1	0.008	0.04	2
RIW372	4.33	5.50	1.17	13330	3.16	2.84	153	162	TSR375	0.010	0.04	9
RD372	4.33	4.50	0.17	1142	1.87	1.44	203	212	TWTS20	0.004	0.035	1

+ Time lapse less than time step of 5 minutes, so 1 time step was assumed for HEC-1 Velocity Calculation
** Modified Typical X-Section
x Modified Time To Peak Used

Appendix D.3

Entellus

BY ________________ DATE ________________

CHECK ________________ DATE ________________

CLIENT: FCDMC

JOB NO. 310.032

JOB: Wittmann Area Drainage Master Study Update

Storm: 100-yr, 6-hr Existing Conditions **Route N-Step vs Velocity**

Route (Model Order)	Previous Time to Peak [hr]	Route Time to Peak [hr]	Difference in Time to peak [hr]	Route Length [ft]	HEC-1 Velocity [fps]	Normal Depth Velocity [fps]	HEC-1 Flow [cfs]	Normal Depth Flow [cfs]	Typical Cross Section	Route Slope [ft/ft]	Manning's "n" Value	HEC-1 N-step
RIW375	4.92	5.58	0.66	16914	7.12	2.53	413	421	TWTS20	0.013	0.04	8
RIW364 **	7.67	8.33	0.66	9657	4.06	9.01	5302	5309	IWTS30_2	0.007	0.04	7
RD363	5.50	5.75	0.25	1700	1.89	3.10	598	606	WITS130	0.011	0.04	1
RIW351	5.42	8.25	2.83	4523	0.44	0.90	80	71	TSR371	0.007	0.04	10
RIW346	8.25	8.50	0.25	24311	27.01	9.23	5250	5258	IWTS30_2	0.008	0.04	2
RIW338	8.50	8.92	0.42	4331	2.86	5.20	5177	5177	TWTS20	0.016	0.04	5
RIW326	4.33	4.92	0.59	21501	10.12	2.40	355	364	TWTS40	0.007	0.04	5
RIW334	9.00	9.83	0.83	3706	1.24	4.28	5042	5048	TWTS30	0.005	0.04	12
RD351	5.42	5.75	0.33	2791	2.35	4.22	595	604	IWTS30_1	0.008	0.04	3
RIW361 **	5.92	6.58	0.66	10402	4.38	2.21	1870	1872	TSR371	0.007	0.04	12
R350*	5.92	6.25	0.33	8310	6.99	4.66	6886	6888	IWTS40_1	0.006	0.04	3
RIW330	6.17	6.33	0.16	7227	12.55	4.95	6885	6888	TWTS30	0.006	0.04	1
RIW322	6.33	7.00	0.67	2771	1.15	3.89	7151	7152	IWTS40_2	0.005	0.04	12
RIW318	4.67	6.33	1.66	8066	1.35	2.33	415	424	TWTS30	0.006	0.04	15
RIW310	4.92	5.00	0.08	20068	69.68	2.36	880	888	IWTS50	0.005	0.04	1
RIW314 **	7.42	8.50	1.08	12886	3.31	3.90	6625	6627	IWTS40_2	0.005	0.04	15
RIW300	8.50	8.83	0.33	860	0.72	2.76	6532	6535	IWTS50	0.002	0.04	3
RIW302	9.33	9.67	0.34	8292	6.77	9.70	9794	9800	TSR375	0.010	0.04	3
R264A	5.08	5.50	0.42	4042	2.67	2.26	1691	1699	TSR264A	0.003	0.04	1
RSV264	5.25	5.75	0.50	2946	1.64	2.53	2353	2362	SVTS50_1	0.001	0.04	1
RSV298	5.00	6.25	1.25	6826	1.52	3.85	591	601	Channel	0.004	0.04	14
RSV286	4.75	5.00	0.25	13500	15.00	3.48	1299	1308	TSR294	0.006	0.04	1
RSV284	4.92	5.58	0.66	3544	1.49	3.36	1213	1221	TSR294	0.006	0.04	4
RSV290	4.58	5.67	1.09	14316	3.65	2.79	543	552	TSR294	0.006	0.04	5
RSV272	5.58	5.67	0.09	1016	3.14	3.65	1949	1957	SVTS50_1	0.004	0.04	1
RSV294	5.00	5.75	0.75	15129	5.60	3.71	1815	1822	TSR294	0.006	0.04	5

+ Time lapse less than time step of 5 minutes, so 1 time step was assumed for HEC-1 Velocity Calculation

** Modified Typical X-Section

x Modified Time To Peak Used

Entellus

BY ________ DATE ____________

CHECK ________ DATE ____________

CLIENT: FCDMC

JOB NO. 310.032

JOB: Wittmann Area Drainage Master Study Update

Route ID	Mannings' n-values Overbank	Channel	length [ft]	length [miles]	US elev [ft]	DS elev [ft]	slope [ft/ft]	Typical Cross Section ID
RD678	0.043	0.035	6108.0	1.16	1574	1550.0	0.0039	WITS110_2
RD744	0.043	0.035	3177.0	0.60	1338	1320.0	0.0057	TSR606
RD800	0.043	0.035	5888.0	1.12	1346	1311.0	0.0059	PDTS40_1
RDCP07	0.043	0.035	6956.4	1.32	1552	1494.0	0.0083	WITS120
RDCP08	0.043	0.035	4229.1	0.80	1556	1508.0	0.0114	WITS120
RDCP09	0.043	0.035	14617.9	2.77	1558	1426.0	0.0090	WITS120
RDCP10	0.043	0.035	6701.3	1.27	1550	1496.0	0.0081	WITS120
RDCP11	0.043	0.035	6376.9	1.21	1550	1490.0	0.0094	PITS10_2
RDCP12	0.043	0.035	6159.0	1.17	1548.4	1490.7	0.0094	PITS30
RDCP13	0.043	0.035	11034.4	2.09	1544	1446.0	0.0089	PITS30
RDCP14	0.043	0.035	20385.8	3.86	1556	1380.0	0.0086	PITS30
RDCP15	0.043	0.035	9601.8	1.82	1556	1454.0	0.0106	PITS30
RDCP16	0.043	0.035	10753.8	2.04	1556	1436.0	0.0112	PDTS30
RDCP17	0.043	0.035	10399.9	1.97	1556	1436.0	0.0115	PDTS30
RDCP18	0.043	0.035	14927.0	2.83	1556	1406.0	0.0100	PDTS30
RDCP19	0.043	0.035	5902.3	1.12	1552	1464.0	0.0149	PDTS30
RDCPOT	0.040	0.04	8638.0	1.64	1538	1474.0	0.0074	WITS70
RIW300	0.040	0.04	6125.0	1.16	1445.1	1418.8	0.0043	TWTS50
RIW302	0.040	0.04	5720.1	1.08	1443.9	1418.8	0.0044	TWTS50
RIW310	0.040	0.04	860.0	0.16	1548.7	1547.0	0.0020	IWTS50
RIW312	0.040	0.04	8292.4	1.57	1908.3	1828.3	0.0096	TSR375
RIW314	0.040	0.04	20067.8	3.80	1547	1445.1	0.0051	IWTS50
RIW318	0.040	0.04	17570.2	3.33	1634.9	1548.7	0.0049	TSR294
RIW322	0.040	0.04	12886.2	2.44	1616.3	1547.0	0.0054	IWTS40_2
RIW326	0.040	0.04	8065.9	1.53	1594.9	1548.7	0.0057	TWTS30
RIW330	0.040	0.04	2770.8	0.52	1630.4	1616.3	0.0051	IWTS40_2
RIW334	0.040	0.04	21501.4	4.07	1588.6	1443.9	0.0067	TWTS40
RIW338	0.040	0.04	7227.0	1.37	1588.6	1548.7	0.0055	TWTS30
RIW346	0.040	0.04	3705.8	0.70	1605.5	1588.6	0.0046	TWTS30
RIW349	0.043	0.035	4331.4	0.82	1782.7	1712.9	0.0161	TWTS20
RIW351	0.040	0.04	24311.3	4.60	1791.5	1606.6	0.0076	IWTS30_2
RIW353	0.040	0.04	7495.9	1.42	1720	1680.0	0.0053	IWTS40_1
RIW354	0.040	0.04	4522.5	0.86	1712.9	1680.3	0.0072	TSR371
RIW356	0.040	0.04	2643.0	0.50	1735.5	1712.9	0.0086	TSR371
RIW357	0.040	0.04	16692.7	3.16	1848	1716.8	0.0079	IWTS30_1
RIW359	0.040	0.04	13031.3	2.47	1793.4	1716.8	0.0059	IWTS30_2
RIW360	0.043	0.035	2593.3	0.49	1756	1735.5	0.0079	TWTS20

Entellus

BY ________ DATE ____________

CHECK ________ DATE ____________

CLIENT: FCDMC

JOB NO. 310.032

JOB: Wittmann Area Drainage Master Study Update

Route ID	Mannings' n-values Overbank	Channel	length [ft]	length [miles]	US elev [ft]	DS elev [ft]	slope [ft/ft]	Typical Cross Section ID
RIW361	0.040	0.04	17152.4	3.25	1740	1630.0	0.0064	IWTS30_1
RIW363	0.040	0.04	11126.8	2.11	1826	1740.0	0.0077	IWTS30_1
RIW364	0.040	0.04	10401.5	1.97	1682.4	1605.5	0.0074	TSR371
RIW365	0.040	0.04	7350.8	1.39	1893.6	1828.3	0.0089	IWTS30_1
RIW366	0.040	0.04	9656.7	1.83	1864	1796.0	0.0070	IWTS30_2
RIW368	0.040	0.04	11647.7	2.21	1875.5	1756.0	0.0103	TSR375
RIW369	0.040	0.04	6796.8	1.29	1887.1	1828.3	0.0087	TSR375
RIW370	0.043	0.035	7247.6	1.37	1851.8	1782.7	0.0095	TWTS20
RIW371	0.040	0.04	11583.3	2.19	1965.7	1864.0	0.0088	TSR371
RIW372	0.040	0.04	15366.7	2.91	1828	1680.0	0.0096	TSR375
RIW374	0.040	0.04	20436.7	3.87	1962	1796.0	0.0081	TSR371
RIW375	0.040	0.04	13330.0	2.52	1814	1681.5	0.0099	TSR375
RIW377	0.040	0.04	6588.4	1.25	2025.8	1962.6	0.0096	TSR371
RIW380	0.043	0.035	16914.1	3.20	2072.5	1851.8	0.0130	TWTS20
RIW381	0.040	0.04	4964.3	0.94	1939.5	1892.0	0.0096	TSR371
RIW382	0.040	0.04	4964.3	0.94	1947.8	1888.0	0.0120	TSR371
RIW384	0.040	0.04	4694.3	0.89	1940	1882.0	0.0124	TSR371
RIW386	0.043	0.035	10311.1	1.95	2027.8	1947.8	0.0078	IWTS20_1
RIW387	0.043	0.035	1005.1	0.19	2179.3	2165.2	0.0140	TWTS20
RIW388	0.040	0.04	7725.8	1.46	1920.8	1848.0	0.0094	IWTS20_2
RIW389	0.040	0.04	11459.2	2.17	2063.1	1920.8	0.0124	TSR371
RIW390	0.043	0.035	11625.6	2.20	2038.3	1920.8	0.0101	IWTS20_1
RIW394	0.043	0.035	7697.0	1.46	2257	2155.0	0.0133	IWTS10_1
RIW395	0.043	0.035	13324.0	2.52	2389.6	2165.2	0.0168	TWTS10
RIW396	0.043	0.035	6512.2	1.23	2165.2	2072.5	0.0142	TWTS10
RIW397	0.043	0.035	21294.0	4.03	2830	2390.0	0.0207	TWTS10
RPD704	0.043	0.035	5924.4	1.12	1334.9	1302.6	0.0055	PDTS40_1
RPD708	0.043	0.035	2780.0	0.53	1351	1334.9	0.0058	PDTS40_1
RD716	0.043	0.035	4300.0	0.81	1341.9	1302.6	0.0091	PDTS40_1
RPD720	0.045	0.035	1840.0	0.35	1320.9	1302.6	0.0099	Channel
RPD726	0.043	0.035	4959.0	0.94	1342	1320.0	0.0044	PDTS40_1
RPD732	0.043	0.035	10623.0	2.01	1464	1396.0	0.0064	PDTS30
RPD736	0.043	0.035	1894.0	0.36	1406	1396.0	0.0053	PDTS30
RPD740	0.043	0.035	5434.0	1.03	1436	1402.0	0.0063	PDTS30
RPD748	0.043	0.035	6476.1	1.23	1524	1430.0	0.0145	PDTS40_2
RPD756	0.043	0.035	8775.3	1.66	1540	1430.0	0.0125	PDTS40_2
RPD760	0.043	0.035	5148.6	0.98	1516	1464.0	0.0101	PDTS30

D.4 Reservoir Routing Data

(Not Applicable to This Study)

D.5 Flow Splits and Diversion Data

(Not Applicable to This Study)

D.6 Hydrologic Calculations

(Information obtained from July 2005 Wittmann ADMSU Hydrology Final Addendum prepared by Entellus)

Table D.6: Summary of Peak Discharges

Model ID	100-yr 24-hr Storm			100-yr 6-hr Storm			Controlling Storm			
	Drainage Area [mi²]	Exst. Cond. Q [cfs]	Fut. Cond. Q [cfs]	Drainage Area [mi²]	Exst. Cond. Q [cfs]	Fut. Cond. Q [cfs]	Exst. Cond.		Fut Cond.	
							Storm	Q [cfs]	Storm	Q [cfs]
C576B	1.69	687	619	1.69	919	837	6-hour	919	6-hour	837
C580A	3.13	2,218	1,878	3.13	2,424	2,129	6-hour	2,424	6-hour	2,129
C600A	8.62	1,288	1,493	9.67	1,221	1,410	24-hour	1,288	24-hour	1,493
C606A	4.08	363	375	3.55	368	396	6-hour	368	6-hour	396
C624A	6.92	2,060	2,199	7.56	1,746	2,115	24-hour	2,060	24-hour	2,199
C700*	302.88	6,286	7,625	302.88	4,027	5,534	24-hour	6,286	24-hour	7,625
C708*	3.70	1,563	1,750	3.70	1,685	2,010	6-hour	1,685	6-hour	2,010
C726*	41.19	3,037	3,389	36.10	2,672	3,211	24-hour	3,037	24-hour	3,389
C726A	21.41	1,812	1,971	18.85	1,657	1,909	24-hour	1,812	24-hour	1,971
C726B	19.77	1,298	1,654	17.24	1,229	1,695	24-hour	1,298	6-hour	1,695
C802*	313.51	7,038	8,537	313.51	4,057	5,638	24-hour	7,038	24-hour	8,537
CAF807	4.49	2,508	2,600	4.49	2,926	2,905	6-hour	2,926	6-hour	2,905
CAF810	320.12	7,163	8,766	320.12	4,048	5,631	24-hour	7,163	24-hour	8,766
CAF820	320.81	7,160	8,755	320.81	4,038	5,615	24-hour	7,160	24-hour	8,755
CAF850	0.72	1,140	1,184	0.72	1,545	1,596	6-hour	1,545	6-hour	1,596
CAF852	0.51	812	817	0.51	1,174	1,179	6-hour	1,174	6-hour	1,179
CAF860	1.08	860	914	1.08	1,151	1,226	6-hour	1,151	6-hour	1,226
CAF862	0.26	373	364	0.26	555	543	6-hour	555	6-hour	543
CAP1*	53.75	14,390	15,575	53.76	13,205	14,655	24-hour	14,390	24-hour	15,575
CAP2*	39.36	8,461	10,018	33.74	6,672	8,797	24-hour	8,461	24-hour	10,018
CIW300	30.57	6,941	7,056	30.55	6,611	6,819	24-hour	6,941	24-hour	7,056
CIW302	24.18	5,078	5,239	24.24	5,042	5,220	24-hour	5,078	24-hour	5,239
CIW310	1.75	708	686	1.75	885	891	6-hour	885	6-hour	891
CIW314	29.09	7,496	7,416	29.07	7,566	7,448	6-hour	7,566	6-hour	7,448
CIW322	25.16	7,021	6,791	25.14	7,314	7,020	6-hour	7,314	6-hour	7,020
CIW330	23.27	6,608	6,392	23.25	6,979	6,677	6-hour	6,979	6-hour	6,677
CIW334	22.85	5,156	5,266	22.91	5,175	5,351	6-hour	5,175	6-hour	5,351
CIW338	21.26	5,213	5,289	21.32	5,248	5,425	6-hour	5,248	6-hour	5,425
CIW342	17.25	5,157	5,226	17.30	5,302	5,474	6-hour	5,302	6-hour	5,474
CIW346	20.92	5,247	5,319	20.98	5,297	5,470	6-hour	5,297	6-hour	5,470
CIW349	12.30	5,399	5,508	12.27	5,506	5,721	6-hour	5,506	6-hour	5,721
CIW350	17.41	5,647	5,297	17.45	6,037	5,645	6-hour	6,037	6-hour	5,645
CIW351	1.71	559	568	1.67	697	711	6-hour	697	6-hour	711
CIW352	6.31	2,192	2,204	6.39	2,291	2,355	6-hour	2,291	6-hour	2,355
CIW353	15.24	5,023	4,662	15.28	5,494	5,051	6-hour	5,494	6-hour	5,051
CIW354	14.59	5,244	5,334	14.64	5,405	5,595	6-hour	5,405	6-hour	5,595
CIW356	14.23	5,308	5,397	14.28	5,452	5,643	6-hour	5,452	6-hour	5,643

* Drainage areas may differ between the 24-hour and 6-hour storms: the HEC-1 hard coding was performed separately for the 24-hour and 6-hour storms.

Table D.6: Summary of Peak Discharges

Model ID	100-yr 24-hr Storm			100-yr 6-hr Storm			Controlling Storm			
	Drainage Area [mi^2]	Exst. Cond. Q [cfs]	Fut. Cond. Q [cfs]	Drainage Area [mi^2]	Exst. Cond. Q [cfs]	Fut. Cond. Q [cfs]	Exst. Cond. Storm	Exst. Cond. Q [cfs]	Fut Cond. Storm	Fut Cond. Q [cfs]
CIW357	8.60	3,504	3,311	8.60	3,583	3,404	6-hour	3,583	6-hour	3,404
CIW359	5.97	3,105	2,625	5.97	3,423	3,009	6-hour	3,423	6-hour	3,009
CIW360	1.54	666	668	1.62	771	775	6-hour	771	6-hour	775
CIW361	4.82	1,600	1,588	4.76	1,886	1,854	6-hour	1,886	6-hour	1,854
CIW362	14.77	5,141	5,227	14.82	5,316	5,506	6-hour	5,316	6-hour	5,506
CIW363	4.38	1,640	1,570	4.26	1,903	1,805	6-hour	1,903	6-hour	1,805
CIW364	2.13	1,337	1,273	2.13	1,456	1,433	6-hour	1,456	6-hour	1,433
CIW365	0.63	353	330	0.74	583	557	6-hour	583	6-hour	557
CIW366	1.08	881	785	1.07	1,105	989	6-hour	1,105	6-hour	989
CIW367	0.17	80	75	0.43	320	301	6-hour	320	6-hour	301
CIW368	0.71	296	301	0.79	479	498	6-hour	479	6-hour	498
CIW370	12.05	5,663	5,761	12.02	5,750	5,961	6-hour	5,750	6-hour	5,961
CIW374	0.53	558	526	0.54	784	757	6-hour	784	6-hour	757
CIW375	0.82	306	329	0.85	446	493	6-hour	446	6-hour	493
CIW380	15.11	7,968	8,319	15.11	7,995	8,664	6-hour	7,995	6-hour	8,664
CIW381	0.72	493	477	0.64	619	599	6-hour	619	6-hour	599
CIW382	0.99	525	539	0.99	685	708	6-hour	685	6-hour	708
CIW384	0.23	164	157	0.41	390	394	6-hour	390	6-hour	394
CIW388	7.85	3,436	3,268	7.85	3,532	3,396	6-hour	3,532	6-hour	3,396
CIW390	6.50	3,038	2,945	6.50	3,093	3,091	6-hour	3,093	6-hour	3,091
CIW395	12.68	7,572	8,032	12.68	7,766	8,463	6-hour	7,766	6-hour	8,463
CIW396	14.61	7,924	8,342	14.61	8,001	8,699	6-hour	8,001	6-hour	8,699
CPD700	313.12	7,038	8,525	313.12	4,058	5,638	24-hour	7,038	24-hour	8,525
CPD704	8.84	3,060	3,449	8.84	3,265	3,804	6-hour	3,265	6-hour	3,804
CPD708	7.76	2,728	3,185	7.76	2,957	3,529	6-hour	2,957	6-hour	3,529
CPD720	293.30	5,843	7,004	296.13	4,030	5,174	24-hour	5,843	24-hour	7,004
CPD726	44.29	2,998	3,378	39.20	2,581	3,146	24-hour	2,998	24-hour	3,378
CPD732	15.04	1,200	1,349	13.11	1,085	1,319	24-hour	1,200	24-hour	1,349
CPD736	5.27	451	476	4.64	441	489	24-hour	451	6-hour	489
CPD740	18.84	1,273	1,652	16.31	1,249	1,698	24-hour	1,273	6-hour	1,698
CPD748	0.47	605	614	0.47	910	914	6-hour	910	6-hour	914
CPI600	258.01	4,434	4,798	263.07	2,593	3,266	24-hour	4,434	24-hour	4,798
CPI603	15.46	2,450	2,713	15.98	2,200	2,506	24-hour	2,450	24-hour	2,713
CPI604	2.03	321	382	1.82	469	496	6-hour	469	6-hour	496
CPI606	3.49	701	785	3.17	753	881	6-hour	753	6-hour	881
CPI609	8.10	1,197	1,393	9.15	1,118	1,300	24-hour	1,197	24-hour	1,393
CPI612	12.43	1,406	1,586	14.40	1,278	1,425	24-hour	1,406	24-hour	1,586

* Drainage areas may differ between the 24-hour and 6-hour storms: the HEC-1 hard coding was performed separately for the 24-hour and 6-hour storms.

100-Year 6-Hour Storm HEC-1 Model

(Excerpts from the Wittmann ADSMU model)

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1*****************************************                  *****************************************
 *                                       *                  *                                       *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                  *   U.S. ARMY CORPS OF ENGINEERS        *
 *              JUN   1998               *                  *   HYDROLOGIC ENGINEERING CENTER       *
 *            VERSION 4.1                *                  *          609 SECOND STREET            *
 *                                       *                  *        DAVIS, CALIFORNIA 95616        *
 * RUN DATE   03AUG11  TIME  17:11:23    *                  *            (916) 756-1104             *
 *                                       *                  *                                       *
 *****************************************                  *****************************************


                    X     X  XXXXXXX   XXXXX          X
                    X     X  X        X     X        XX
                    X     X  X        X               X
                    XXXXXXX  XXXX     X       XXXXX   X
                    X     X  X        X               X
                    X     X  X        X     X         X
                    X     X  XXXXXXX   XXXXX         XXX


THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL    LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1                                    HEC-1 INPUT                                          PAGE  1

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  1           ID   Wittmann Phase IV Floodplain Delineation Study
  2           ID   August 2011
  3           ID   Mod1 removes subbasin IW358 to determine flow at Iona Tributary 1 West
  4           ID   ******************************************************************************
  5           ID   **-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-**
  6           ID   **-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-**
  7           ID   ******************************************************************************
  8           ID   **                                                                          **
  9           ID   **  ADDENDUM TO THE WITTMANN AREA DRAINAGE MASTER STUDY UPDATE HYDROLOGY    **
 10           ID   **                                                                          **
 11           ID   ******************************************************************************
 12           ID   **-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-**
 13           ID   **-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-**
 14           ID   ******************************************************************************
 15           ID   **                                                                          **
 16           ID   ** THE FOLLOWING CHANGES HAVE BEEN MADE TO THE WITTMANN HYDROLOGY MODELS    **
 17           ID   ** DATED OCTOBER 2004:                                                      **
 18           ID   **                                                                          **
 19           ID   **     -Diversion added after CTW480                                        **
 20           ID   **          -Main flow (5%) to CTW478                                       **
 21           ID   **          -Diverted flow (95%) to CWI584                                  **
 22           ID   **          -Added concentration point CWI584 combining RD480 and WI584     **
 23           ID   **          -Hard coding was added to CTW478                                **
 24           ID   **          -Route added after D480 (Diversion Recovery)                    **
 25           ID   **          -Route RWI584 was adjusted                                      **
 26           ID   **          -Storage Route SCP050 was adjusted                              **
 27           ID   **          -Route R508* was adjusted                                       **
 28           ID   **          -Hard coding for CWI510 was adjusted                            **
 29           ID   **                                                                          **
 30           ID   **     -Diversion D618 was moved from after CPI618 to before RDCP12         **
 31           ID   **          -Updated route RD618 information                                **
 32           ID   **          -Hard coding on CPI618 was adjusted                             **
 33           ID   **          -Hard coding on CPI615 was adjusted                             **
 34           ID   **                                                                          **
 35           ID   **     -Route RPI639 changed from following US60 to CPI636 to route         **
 36           ID   **      through US60/RR structures and combine with CWI506                  **
 37           ID   **          -Cards PI639, D524, RD524, CPI639 and RPI639 were changed from  **
 38           ID   **           following R624A to follow RWI524                               **
 39           ID   **          -CPI636 was removed-no longer needed to combine PI636 & RPI639  **
 40           ID   **          -RPI639 information was changed to reflect new route            **
 41           ID   **          -CWI506 changed from combining 3 to combine 4:                  **
 42           ID   **           RWI525, RWI524, RPI639 & WI506                                 **
 43           ID   **          -Hard coding on CWI506 was adjusted                             **
 44           ID   **          -Hard Coding on CWI500 was adjusted                             **
 45           ID   **                                                                          **
 46           ID   ******************************************************************************
 47           ID   **-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-**
 48           ID   **-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-**
 49           ID   ******************************************************************************
 50           ID
 51           ID
 52           ID
 53           ID   ******************************************************************************
 54           ID   ******************************************************************************
 55           ID   **                                                                          **
1                                    HEC-1 INPUT                                          PAGE  2

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 56           ID   **    WITTMANN AREA DRAINAGE MASTER STUDY UPDATE-HYDROLOGY MODEL 2004       **
 57           ID   **                                                                          **
 58           ID   ******************************************************************************
 59           ID   ******************************************************************************
 60           ID
 61           ID   PROJECT:                  Wittmann ADMS Update
 62           ID   CLIENT:                   Flood Control District of Maricopa County
 63           ID   PREPARED BY:              Entellus, Inc.
 64           ID   PROJECT NO:               FCD 2002C029            Entellus 310.032
```

```
 65      ID   FILE NAME: WTEC6-addendum.hc1          CREATED DATE: JUL 01, 2004
 66      ID                                          MODIFIED DATE: MAY 04, 2005
 67      ID
 68      ID   STORM:
 69      ID                          100-year 6-hour Storm
 70      ID
 71      ID   DEVELOPMENT CONDITIONS:
 72      ID                          Existing Conditions
 73      ID
 74      ID   MODELING ASSUMPTIONS:
 75      ID                          It was assumed that the US60 did not have adequate
 76      ID                          storage to cause any significant attenuation.
 77      ID
 78      ID                          The assumption was made that the CAP Canal embankment
 79      ID                          would not be breached under a large flood event.
 80      ID
 81      ID                          The assumption was made that the Beardsley Canal would
 82      ID                          not fail under a large storm event (Per District
 83      ID                          Instruction).  In addition, the berm north of the
 84      ID                          Beardsley canal and east of US60 was assumed to fail
 85      ID                          (per district Instruction).
 86      ID
 87      ID                          For both the CAP and Beardsley Canals, once the berm
 88      ID                          elevation was reached weir flow was assumed.  It was
 89      ID                          also assumed that any weir flow over the canal that
 90      ID                          might enter the canal and be diverted out of the study
 91      ID                          area was insignificant, and thus was ignored.  In other
 92      ID                          words all weir flow over the canal embankment reaches
 93      ID                          the downstream concentration point.
 94      ID
 95      ID                          Typical X-sects were developed, and it was assumed
 96      ID                          that a typical x-sect could adequately represent
 97      ID                          various reaches.
 98      ID
 99      ID                          Time-Area Relations were used base on the District's
100      ID                          Hydrology Manual criteria.  Two Time-Area Relation
101      ID                          Curves were utilized:
102      ID                                -Urban
103      ID                                -Natural
104      ID                          The Time-Area Relation Curves were taken directly
105      ID                          from the manual
106      ID
107      ID   MODELING METHODS:
108      ID                          This model utilizes QI cards to input the Padelford
109      ID                          hydrographs from the 100-year 6-hour existing
110      ID                          conditions model developed by A-N West Inc. for the
1                                           HEC-1 INPUT                                PAGE  3

LINE     ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

111      ID                          Padelford Wash Floodplain Delineation Study.  The
112      ID                          hydrograph was altered from its original form
113      ID                          (2-minute interval to 5-minute interval) through
114      ID                          simple interpolation.
115      ID
116      ID                          Clark Unit Hydrographs were used for all subbasins
117      ID                          except the two subbasins directly upstream of the
118      ID                          Bonita Dam (PD726B and PD740 use S-graphs).  The UC
119      ID                          parameters were calculated using the WMS7.0 software.
120      ID
121      ID                          For Basins PD726B and PD740 S-Graphs were utilized per
122      ID                          the request of the FCDMC.  Limited details regarding
123      ID                          the calculations of the S-graphs can be found in the
124      ID                          model by the basin KK card.  For full details of the
125      ID                          S-graph calculations refer to the Appendix.
126      ID
127      ID                          Normal Depth routing was used for all routing reaches.
128      ID
129      ID                          Hard coding was used to account for the percentage of
130      ID                          area associated with a diversion.  Because of the use
131      ID                          of JD cards and aereal reduction, hard coding was
132      ID                          necessary to properly account for area.  For a given
133      ID                          diversion a percentage of the flow is routed to two
134      ID                          different locations.  The same percentage of area
135      ID                          follows that diverted flow.  In addition the area
136      ID                          downstream of the main path is reduced or increased and
137      ID                          is hard coded to account for the loss or gain of area.
138      ID                          Hard coding was performed based on the 6-hour existing
139      ID                          conditions model.
140      ID
141      ID                          Stage-storage was developed for all the structures
142      ID                          along the CAP Canal, as well as along the Beardsley
143      ID                          Canal.  In addition several stage-storage locations
144      ID                          were developed for areas with significant storage
145      ID                          along the SR74.  No storage was modeled along the US60
146      ID                          and railroad, but the culverts were analyzed for
147      ID                          diversion potential.  Diversions were placed in the
148      ID                          model where deemed appropriate.  See appendix for
149      ID                          details.
150      ID
151      ID                          FLO-2D was utilized to calculate the split flows at
152      ID                          concentration points CIW351. CIW357, CIW363 and CWI576.
153      ID                          See appendix for modeling details.
154      ID
155      ID   ***************************************************************************
156      ID   ***************************************************************************
157      ID
         *DIAGRAM
158      IT       5                0     1500
159      IO       5
160      IN      15                0
161      JD    3.40     0.01
         * 6-hour distribution
162      PC   0.000    0.008    0.016    0.025    0.033    0.041    0.050    0.058    0.066    0.074
163      PC   0.087    0.099    0.118    0.138    0.216    0.377    0.834    0.911    0.931    0.950
1                                           HEC-1 INPUT                                PAGE  4
```

```
ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

PC   0.962   0.972   0.983   0.991   1.000
*
JD   3.378    0.50
JD   3.314    2.80
PC   0.000   0.009   0.016   0.025   0.034   0.042   0.051   0.059   0.067   0.076
PC   0.087   0.100   0.120   0.163   0.252   0.451   0.694   0.837   0.900   0.938
PC   0.950   0.963   0.975   0.988   1.000
*
JD   3.135   16.00
PC   0.000   0.009   0.020   0.030   0.048   0.063   0.076   0.090   0.105   0.119
PC   0.135   0.152   0.175   0.222   0.304   0.472   0.670   0.796   0.868   0.912
PC   0.946   0.960   0.973   0.987   1.000
*
JD   2.761   90.00
PC   0.000   0.021   0.035   0.051   0.071   0.087   0.105   0.125   0.143   0.160
PC   0.179   0.201   0.232   0.281   0.364   0.500   0.658   0.773   0.841   0.888
PC   0.927   0.945   0.964   0.982   1.000
*
JD   1.938  500.00
PC   0.000   0.024   0.043   0.059   0.078   0.098   0.119   0.141   0.162   0.186
PC   0.212   0.239   0.271   0.321   0.408   0.515   0.627   0.735   0.814   0.864
PC   0.907   0.930   0.954   0.977   1.000
*
*
*
*
* ******************************************************************************** *
* ******************************************************************************** *
* ******************** BEGINNING OF IONA WASH SUBAREA ******************************* *
* ******************************************************************************** *
* ******************************************************************************** *
*
*
* ******************************************************************************** *
* ******************** BEGINNING OF IONA WASH REGION 1 ****************************** *
* ******************************************************************************** *
*
*

KK   IW371
KO       0       0     0.0       1      22
BA  0.0529
LG   0.275    0.25    4.15   0.473   26.25
UC   0.275   0.288
* Urban Time-Area Relation
UA       0       5      16      30      65      77      84      90      94      97
UA     100
*
* Railroad Diversion: Main path to CIW366, Diversion to CIW374
* From Structure RR40, See Appendix D.5 for analysis
1                                  HEC-1 INPUT                                          PAGE  5

ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


KK    D371
KO       0       0     0.0       0      22
DT   DO371
DI     0.0      14      79     208     383     823    1374    2014    2724
DQ     0.0       0      55     173     335     763    1302    1930    2632
*
*
* ROUTE UPDATED 4/14/4

KK  RIW371
KO       0       0     0.0       0      22
RS      15    FLOW     0.0     0.0
RC    0.04    0.04    0.04   11583  0.0088
* TSR371
RX       0     142     486     525     651     770    1000    1518
RY    1900    1900    1899    1897    1896    1899  1899.5    1900
*
*

KK   IW366
KO       0       0     0.0       1      22
BA  1.0558
LG   0.343    0.25   5.762   0.202   7.207
UC   0.763   0.593
* Natural Time-Area Relation
UA       0       3       5       8      12      20      43      75      90      96
UA     100
*
*
* Combines IW366 and RIW371

KK  CIW366
KO       0       0     0.0       0      22
* hard coded
HC       2    1.07
*
*
* ROUTE UPDATED 4/14/4

KK  RIW366
KO       0       0     0.0       0      22
RS       4    FLOW     0.0     0.0
RC    0.04    0.04    0.04    9657   0.007
* IWTS30_2
RX       0     6.5      13      57     102     104     109     110
RY    1728  1725.5    1724    1723    1724  1725.5    1727    1728
*
*
```

```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 216          KK   IW377
 217          KO       0       0     0.0       1      22
 218          BA  0.1125
 219          LG   0.304   0.382   5.921   0.188   5.357
 220          UC   0.408   0.519
              * Natural Time-Area Relation
 221          UA       0       3       5       8      12      20      43      75      90      96
 222          UA     100
              *
              *
              * *** STAGE DISCHARGE / STORAGE BEHIND STRUCTURE SR010 (HWY74 CULVERT)

 223          KK  SSR010
 224          RS       1    STOR       0
 225          SQ       0      36     100     160
 226          SA       0     .05     .41    1.98
 227          SE  2021.3    2024    2026    2028
              *
              *
              * ROUTE UPDATED 4/14/4

 228          KK  RIW377
 229          KO       0       0     0.0       0      22
 230          RS       6    FLOW     0.0     0.0
 231          RC    0.04    0.04    0.04    6588  0.0096
              * TSR371
 232          RX       0     142     486     525     651     770    1000    1518
 233          RY    1900    1900    1899    1897    1896    1899  1899.5    1900
              *
              *

 234          KK   IW374
 235          KO       0       0     0.0       1      22
 236          BA  0.3874
 237          LG   0.315   0.161   8.147   0.086  12.602
 238          UC   0.442   0.345
              * Natural Time-Area Relation
 239          UA       0       3       5       8      12      20      43      75      90      96
 240          UA     100
              *
              *
              * RAILROAD DIVERSION RECOVERY: ALONG RAILROAD FROM STRUCTURE RR40

 241          KK    D371
 242          KO       0       0     0.0       0      22
 243          DR   DO371
              *
              *
              * ROUTE UPDATED 4/14/4
```



```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 244          KK   RD371
 245          KO       0       0     0.0       0      22
 246          RS       1    FLOW     0.0     0.0
 247          RC   0.043   0.035   0.043    1409  0.0014
              * WITS130
 248          RX       0     400     456     575     620     650     660     682
 249          RY  1396.5    1394  1393.5    1393    1392    1394    1395  1396.5
              *
              *
              * Combines RD371, IW374 and RIW377

 250          KK  CIW374
 251          KO       0       0     0.0       0      22
              * Hard Coded
 252          HC       3    0.54
              *
              *
              * ROUTE UPDATED 4/14/4

 253          KK  RIW374
 254          KO       0       0     0.0       0      22
 255          RS      15    FLOW     0.0     0.0
 256          RC    0.04    0.04    0.04   20437  0.0081
              * TSR371
 257          RX       0     142     486     525     651     770    1000    1518
 258          RY    1900    1900    1899    1897    1896    1899  1899.5    1900
              *
              *

 259          KK   IW386
 260          KO       0       0     0.0       1      22
 261          BA  0.3731
 262          LG   0.334   0.192   8.439   0.072   5.278
 263          UC   0.838   0.855
              * Natural Time-Area Relation
 264          UA       0       3       5       8      12      20      43      75      90      96
 265          UA     100
              *
              *
              * ROUTE UPDATED 4/14/4

 266          KK  RIW386
 267          KO       0       0     0.0       0      22
 268          RS       6    FLOW     0.0     0.0
 269          RC   0.043   0.035   0.043   10311  0.0078
              * IWTS20_1
 270          RX       0      21      75      93     234     280     301     391
```

```
  271           RY    1952     1949     1948     1946     1945     1948   1948.5     1952
                *
                *
1                                        HEC-1 INPUT                                           PAGE  8

 LINE           ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


  272           KK   IW382
  273           KO       0        0      0.0        1       22
  274           BA  0.6196
  275           LG   0.322    0.275    6.319    0.164    8.175
  276           UC   0.642    0.555
                * Urban Time-Area Relation
  277           UA       0        5       16       30       65       77       84       90       94       97
  278           UA     100
                *
                *
                * Combines IW382 and RIW386

  279           KK  CIW382
  280           KO       0        0      0.0        0       22
  281           HC       2
                *
                * US60 Diversion: Main path to D382A, Diversion to CIW381
                * From Structures US006 and US007, See Appendix D.5 for analysis

  282           KK   D382B
  283           KO       0        0      0.0        0       22
  284           DT  D0382B
  285           DI       0       24      180    10000
  286           DQ       0       24      180      180
                *
                * Railroad Diversion: Main path to C359*, Diversion to CIW384
                * From Structure RR90 and RR100, See Appendix D.5 for analysis

  287           KK   D382A
  288           KO       0        0      0.0        0       22
  289           DT  D0382A
  290           DI       0       14       60      200      315      448      629     1371
  291           DQ       0        0        0        0       55      174      338     1045
                *
                *
                * ROUTE UPDATED 4/14/4

  292           KK  RIW382
  293           KO       0        0      0.0        0       22
  294           RS       3     FLOW      0.0      0.0
  295           RC    0.04     0.04     0.04     4964    0.012
                * TSR371
  296           RX       0      142      486      525      651      770     1000     1518
  297           RY    1900     1900     1899     1897     1896     1899   1899.5     1900
                *
                *

  298           KK   IW384
  299           KO       0        0      0.0        1       22
  300           BA  0.0825
  301           LG   0.343     0.15    8.675    0.065    7.206
  302           UC   0.308    0.296
                * Natural Time-Area Relation
  303           UA       0        3        5        8       12       20       43       75       90       96
1                                        HEC-1 INPUT                                           PAGE  9

 LINE           ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  304           UA     100
                *
                *
                * Railroad Diversion Recovery: Outflow from structures RR90 AND RR100

  305           KK   D382A
  306           KO       0        0      0.0        0       22
  307           DR  D0382A
                *
                *
                * ROUTE UPDATED 4/14/4

  308           KK  RD382A
  309           KO       0        0      0.0        0       22
  310           RS       1     FLOW      0.0      0.0
  311           RC   0.043    0.035    0.043     1172   0.0068
                * WITS130
  312           RX       0      400      456      575      620      650      660      682
  313           RY  1396.5     1394   1393.5     1393     1392     1394     1395   1396.5
                *
                *
                * Combines RD382A and IW384

  314           KK  CIW384
  315           KO       0        0      0.0        0       22
                * Hard Coded
  316           HC       2     0.41
                *
                *
                * ROUTE UPDATED 4/14/4

  317           KK  RIW384
  318           KO       0        0      0.0        0       22
  319           RS       3     FLOW      0.0      0.0
  320           RC    0.04     0.04     0.04     4694   0.0124
                * TSR371
  321           RX       0      142      486      525      651      770     1000     1518
  322           RY    1900     1900     1899     1897     1896     1899   1899.5     1900
                *
                *
```

```
 323          KK   IW381
 324          KO       0        0     0.0       1      22
 325          BA  0.3841
 326          LG   0.309     0.19   9.152   0.056  11.882
 327          UC   0.650    0.799
              * Natural Time-Area Relation
 328          UA       0        3       5       8      12      20      43      75      90      96
 329          UA     100
              *
              *
              *
              * This diversion is not routed because the distance traveled from the actual
              * point of diversion (not CIW382) to CIW382 is approximately the same as the
              * distance from the same point of diversion to CIW381.  Thus to avoid double
              * counting storage in the routes, a route for the diversion was not included
              * in the model.
              *
              * US60 Diversion Recovery: Outflow from structures US006 and US007
1                                           HEC-1 INPUT                                         PAGE 10

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 330          KK   D382B
 331          KO       0        0     0.0       0      22
 332          DR  DO382B
              *
              *
              * Combines D382B and IW381

 333          KK  CIW381
              * Hard Coded
 334          HC       2     0.64
              *
              *
              * ROUTE UPDATED 4/14/4

 335          KK  RIW381
 336          KO       0        0     0.0       0      22
 337          RS       3     FLOW     0.0     0.0
 338          RC    0.04     0.04    0.04    4964  0.0096
              * TSR371
 339          RX       0      142     486     525     651     770    1000    1518
 340          RY    1900     1900    1899    1897    1896    1899  1899.5    1900
              *
              *
              * Combines RIW381, RIW382 and RIW384

 341          KK   C359*
 342          KO       0        0     0.0       0      22
              * Hard Coded
 343          HC       3     1.45
              *
              *
              * ROUTE UPDATED 4/14/4

 344          KK   R359*
 345          KO       0        0     0.0       0      22
 346          RS       4     FLOW     0.0     0.0
 347          RC    0.04     0.04    0.04    9280  0.0103
              * IWTS30_2
 348          RX       0      6.5      13      57     102     104     109     110
 349          RY    1728   1725.5    1724    1723    1724  1725.5    1727    1728
              *
              *

 350          KK   IW359
 351          KO       0        0     0.0       1      22
 352          BA   2.912
 353          LG   0.345     0.25   5.939   0.187   6.181
 354          UC   0.983    0.574
              * Natural Time-Area Relation
 355          UA       0        3       5       8      12      20      43      75      90      96
 356          UA     100
              *
              *
              * Combines IW359, R359*, RIW374 and RIW366
1                                           HEC-1 INPUT                                         PAGE 11

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 357          KK  CIW359
 358          KO       0        0     0.0       0      22
 359          HC       4
              *
              *
              * ROUTE UPDATED 4/14/4

 360          KK  RIW359
 361          KO       0        0     0.0       0      22
 362          RS       4     FLOW     0.0     0.0
 363          RC    0.04     0.04    0.04   13031  0.0059
              * IWTS30_2 modified
 364          RX       0      6.5      13      57     102     104     109     110
 365          RY    1730   1725.5    1724    1723    1724  1725.5    1727    1730
              *
              *
              *
              * ****************************************************************************** *
              * ********************** END OF IONA WASH REGION 1 ************************** *
              * ****************************************************************************** *
              *
              *
              *
```

```
                * ************************************************************************* *
                * ******************* BEGINNING OF IONA WASH REGION 2 ************************ *
                * ************************************************************************* *
                *
                *
                *

 366            KK   IW389
 367            KO       0        0      0.0        1       22
 368            BA  0.1312
 369            LG   0.348     0.13     10.1    0.037    5.526
 370            UC   0.588    0.753
                * Natural Time-Area Relation
 371            UA       0        3        5        8       12       20       43       75       90       96
 372            UA     100
                *
                *
                * *** STAGE DISCHARGE / STORAGE BEHIND STRUCTURE SR190 (HWY74 CULVERT)

 373            KK  SSR190
 374            KO       0        0      0.0        1       22
 375            RS       1     STOR        0
 376            SQ       0       69      161      184      207      230
 377            SE  2053.8   2055.5  2056.83   2057.1   2057.4   2057.7
 378            SA       0      .01      .08      .22      .39     1.13
 379            SE    2052     2054     2056     2058     2060     2062
                *
                *
                * ROUTE UPDATED 4/14/4
1                                             HEC-1 INPUT                                        PAGE 12

 LINE           ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 380            KK  RIW389
 381            KO       0        0      0.0        0       22
 382            RS       6     FLOW      0.0      0.0
 383            RC    0.04     0.04     0.04    11459   0.0124
                * TSR371
 384            RX       0      142      486      525      651      770     1000     1518
 385            RY    1900     1900     1899     1897     1896     1899   1899.5     1900
                *
                *

 386            KK   IW394
 387            KO       0        0      0.0        1       22
 388            BA  4.1731
 389            LG    0.35    0.327    6.166    0.173   16.632
 390            UC   1.367    0.857
                * Natural Time-Area Relation
 391            UA       0        3        5        8       12       20       43       75       90       96
 392            UA     100
                *
                *
                * ROUTE UPDATED 4/14/4

 393            KK  RIW394
 394            KO       0        0      0.0        0       22
 395            RS       2     FLOW      0.0      0.0
 396            RC   0.043    0.035    0.043     7697   0.0133
                * IWTS10_1
 397            RX       0       34       89      134      161      198      298      333
 398            RY    2160     2158     2154     2152     2154     2156     2158     2160
                *
                *

 399            KK  IW390A
 400            KO       0        0      0.0        1       22
 401            BA  0.9003
 402            LG    0.35     0.25    6.134    0.172   17.033
 403            UC   0.971    0.899
                * Natural Time-Area Relation
 404            UA       0        3        5        8       12       20       43       75       90       96
 405            UA     100
                *
                *
                * Combines IW390A and RIW394

 406            KK   C390A
 407            KO       0        0      0.0        0       22
 408            HC       2
                *
                *
                * ROUTE UPDATED 4/14/4
1                                             HEC-1 INPUT                                        PAGE 13

 LINE           ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 409            KK   R390A
 410            KO       0        0      0.0        0       22
 411            RS       2     FLOW      0.0      0.0
 412            RC   0.043    0.035    0.043     8577   0.0134
                * IWTS10_1
 413            RX       0       34       89      134      161      198      298      333
 414            RY    2160     2158     2154     2152     2154     2156     2158     2160
                *
                *

 415            KK   IW390
 416            KO       0        0      0.0        1       22
 417            BA  0.3110
 418            LG   0.349     0.25    5.071    0.258    5.221
 419            UC   0.929    1.173
                * Natural Time-Area Relation
 420            UA       0        3        5        8       12       20       43       75       90       96
```

```
 421          UA    100
              *
              *

 422          KK   IW392
 423          KO       0       0     0.0       1      22
 424          BA  1.1135
 425          LG    0.35    0.15   7.459   0.103   8.347
 426          UC   0.504   0.280
              * Natural Time-Area Relation
 427          UA       0       3       5       8      12      20      43      75      90      96
 428          UA     100
              *
              *
              * Combines IW392, IW390 and R390A

 429          KK  CIW390
 430          KO       0       0     0.0       0      22
 431          HC       3
              *
              *
              * *** STAGE DISCHARGE / STORAGE BEHIND STRUCTURE SR160 (HWY74 CULVERT)

 432          KK  SSR160
 433          RS       1    STOR       0
 434          SQ       0     762    1440    2640    3840    5040
 435          SA     0.0    0.04    0.36    3.17    4.85    6.69
 436          SE    2033    2036    2038    2040    2042    2044
              *
              *
              * ROUTE UPDATED 4/14/4
1                                         HEC-1 INPUT                                              PAGE 14

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 437          KK  RIW390
 438          KO       0       0     0.0       0      22
 439          RS       3    FLOW     0.0     0.0
 440          RC   0.043   0.035   0.043   11626  0.0101
              * IWTS20_1
 441          RX       0      21      75      93     234     280     301     391
 442          RY    1952    1949    1948    1946    1945    1948  1948.5    1952
              *
              *

 443          KK   IW388
 444          KO       0       0     0.0       1      22
 445          BA  1.2256
 446          LG   0.337   0.156   8.775   0.061   9.239
 447          UC   1.133   0.900
              * Natural Time-Area Relation
 448          UA       0       3       5       8      12      20      43      75      90      96
 449          UA     100
              *
              *
              * Combines IW388, RIW390 and RIW389

 450          KK  CIW388
 451          KO       0       0     0.0       0      22
 452          HC       3
              *
              *
              * ROUTE UPDATED 4/14/4

 453          KK  RIW388
 454          KO       0       0     0.0       0      22
 455          RS       2    FLOW     0.0     0.0
 456          RC    0.04    0.04    0.04    7726  0.0094
              * IWTS20_2
 457          RX       0      79     201     242     303     327     346     350
 458          RY    1940    1938    1936  1933.5    1936  1936.5    1940    1940
              *
              *

 459          KK   IW357
 460          KO       0       0     0.0       1      22
 461          BA  0.7456
 462          LG    0.33   0.156   8.059   0.083  11.106
 463          UC   0.700   0.705
              * Natural Time-Area Relation
 464          UA       0       3       5       8      12      20      43      75      90      96
 465          UA     100
              *
              *
              * Combines IW357 and RIW388
1                                         HEC-1 INPUT                                              PAGE 15

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 466          KK  CIW357
 467          KO       0       0     0.0       0      22
 468          HC       2
              *
              *
              * This split was determined using FLO-2D.  The model is titled "WEST" and
              * details and documentation about the model are contained in the Appendix D 5.4.

 469          KK    D357
 470          DT   DO357
 471          DI       0     258     530     766     975    1140    1340    1556    1789    1937
 472          DI    2120    2357    2514    2736    2992    3255    3301    3472    3610    5000
 473          DQ       0      56     144     211     291     357     437     383     451     502
 474          DQ     532     601     633     705     737     793     854     930     947    1312
              *
```

```
                  *
                  * ROUTE UPDATED 4/14/4

 475              KK  RIW357
 476              KO       0        0     0.0        0       22
 477              RS       9     FLOW     0.0      0.0
 478              RC    0.04     0.04    0.04    16693   0.0079
                  * IWTS30_1 modified
 479              RX       0       50      96      135      160      177      190      206
 480              RY    1881     1879    1878     1876     1876     1878     1879     1881
                  *
                  *
                  *
                  * ****************************************************************************** *
                  * ********************** END OF IONA WASH REGION 2 **************************** *
                  * ****************************************************************************** *
                  *
                  *
                  *
                  * ****************************************************************************** *
                  * ******************** BEGINNING OF IONA WASH REGION 3 ************************ *
                  * ****************************************************************************** *
                  *
                  *
                  *
                  *


 481              KK   IW353
 482              KO       0        0     0.0        1       22
 483              BA  2.8030
 484              LG    0.35     0.15   7.596    0.098    5.084
 485              UC   0.996    0.710
                  * Natural Time-Area Relation
 486              UA       0        3       5        8       12       20       43       75       90       96
 487              UA     100
                  *
                  *
                  * Combines IW353, RIW357, and RIW359
1                                            HEC-1 INPUT                                                PAGE 16

 LINE             ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 488              KK  CIW353
 489              KO       0        0     0.0        0       22
                  * Hard Coded
 490              HC       3    15.12
                  *
                  *
                  * ROUTE UPDATED 4/14/4

 491              KK  RIW353
 492              KO       0        0     0.0        0       22
 493              RS       2     FLOW     0.0      0.0
 494              RC    0.04     0.04    0.04     7496   0.0053
                  * IWTS40_1
 495              RX       0      147     714      840      930     1073     1087     1417
 496              RY    1708     1704    1700     1696     1696     1700     1704     1708
                  *
                  *


 497              KK   IW350
 498              KO       0        0     0.0        1       22
 499              BA  2.1750
 500              LG    0.35    0.171   6.789    0.135      5.0
 501              UC   1.308    1.150
                  * Natural Time-Area Relation
 502              UA       0        3       5        8       12       20       43       75       90       96
 503              UA     100
                  *
                  *
                  * Combines IW350 and RIW353

 504              KK  CIW350
 505              KO       0        0     0.0        0       22
 506              HC       2
                  *
                  *
                  *
                  * ****************************************************************************** *
                  * ********************** END OF IONA WASH REGION 3 **************************** *
                  * ****************************************************************************** *
                  *
 507              ZZ
1
             SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

  NO.       (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

  182        IW371
               .
               .
  191          .------->   DO371
  189         D371
               V
               V
  194       RIW371
               .
               .
  200          .        IW366
               .            .
               .            .
  207       CIW366...........
               V
```

```
              V
210      RIW366
              .
              .
216           .       IW377
              .           V
              .           V
223           .      SSR010
              .           V
              .           V
228           .      RIW377
              .           .
              .           .
234           .           .       IW374
              .           .           .
              .           .           .
243           .           .           .           .<-------   DO371
241           .           .           .        D371
              .           .           .           V
              .           .           .           V
244           .           .           .       RD371
              .           .           .           .
              .           .           .           .
250           .      CIW374........................
              .           V
              .           V
253           .      RIW374
              .           .
              .           .
259           .           .       IW386
              .           .           V
              .           .           V
266           .           .      RIW386
              .           .           .
              .           .           .
272           .           .           .       IW382
              .           .           .           .
              .           .           .           .
279           .           .      CIW382............
              .           .           .
              .           .           .
284           .           .           .------->  DO382B
282           .           .       D382B
              .           .           .
              .           .           .
289           .           .           .------->  DO382A
287           .           .       D382A
              .           .           V
              .           .           V
292           .           .      RIW382
              .           .           .
              .           .           .
298           .           .           .       IW384
              .           .           .           .
              .           .           .           .
307           .           .           .           .           .<-------   DO382A
305           .           .           .           .       D382A
              .           .           .           .           V
              .           .           .           .           V
308           .           .           .           .      RD382A
              .           .           .           .           .
              .           .           .           .           .
314           .           .           .      CIW384............
              .           .           .           V
              .           .           .           V
317           .           .           .      RIW384
              .           .           .           .
              .           .           .           .
323           .           .           .           .       IW381
              .           .           .           .           .
              .           .           .           .           .
332           .           .           .           .           .           .<-------   DO382B
330           .           .           .           .           .       D382B
              .           .           .           .           .           .
              .           .           .           .           .           .
333           .           .           .           .      CIW381............
              .           .           .           .           V
              .           .           .           .           V
335           .           .           .           .      RIW381
              .           .           .           .           .
              .           .           .           .           .
341           .           .       C359*........................
              .           .           V
              .           .           V
344           .           .       R359*
              .           .           .
              .           .           .
350           .           .           .       IW359
              .           .           .           .
              .           .           .           .
357      CIW359....................................
              V
              V
360      RIW359
              .
              .
366           .       IW389
              .           V
              .           V
373           .      SSR190
              .           V
              .           V
380           .      RIW389
              .           .
              .           .
386           .           .       IW394
```

```
                 .           .           V
                 .           .           V
 393             .           .        RIW394
                 .           .           .
 399             .           .           .         IW390A
                 .           .           .            .
                 .           .           .            .
 406             .           .        C390A...........
                 .           .           V
                 .           .           V
 409             .           .        R390A
                 .           .           .
 415             .           .           .         IW390
                 .           .           .            .
 422             .           .           .            .          IW392
                 .           .           .            .            .
                 .           .           .            .            .
 429             .           .        CIW390.......................
                 .           .           V
                 .           .           V
 432             .           .        SSR160
                 .           .           V
                 .           .           V
 437             .           .        RIW390
                 .           .           .
 443             .           .           .         IW388
                 .           .           .            .
                 .           .           .            .
 450             .        CIW388.......................
                 .           V
                 .           V
 453             .        RIW388
                 .           .
 459             .           .        IW357
                 .           .           .
                 .           .           .
 466             .        CIW357...........
                 .           .
                 .           .
 470             .           .------->   DO357
 469             .         D357
                 .           V
                 .           V
 475             .        RIW357
                 .           .
 481             .           .        IW353
                 .           .           .
                 .           .           .
 488          CIW353.......................
                 V
                 V
 491          RIW353
                 .
 497             .        IW350
                 .           .
                 .           .
 504          CIW350...........

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION
1*****************************************
 *                                       *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
 *             JUN   1998                *
 *           VERSION 4.1                 *
 *                                       *
 * RUN DATE    03AUG11  TIME   17:11:23  *
 *                                       *
 *****************************************

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


Wittmann Phase IV Floodplain Delineation Study
August 2011
Mod1 removes subbasin IW358 to determine flow at Iona Tributary 1 West
*****************************************************************************
**-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-**
**-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-**
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**                                                                         **
**  ADDENDUM TO THE WITTMANN AREA DRAINAGE MASTER STUDY UPDATE HYDROLOGY   **
**                                                                         **
*****************************************************************************
**-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-**
**-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-**
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**                                                                         **
** THE FOLLOWING CHANGES HAVE BEEN MADE TO THE WITTMANN HYDROLOGY MODELS    **
** DATED OCTOBER 2004:                                                     **
**                                                                         **
**     -Diversion added after CTW480                                       **
**          -Main flow (5%) to CTW478                                      **
**          -Diverted flow (95%) to CWI584                                 **
**          -Added concentration point CWI584 combining RD480 and WI584    **
**          -Hard coding was added to CTW478                               **
**          -Route added after D480 (Diversion Recovery)                   **
**          -Route RWI584 was adjusted                                     **
**          -Storage Route SCP050 was adjusted                             **
```

```
**         -Route R508* was adjusted                                      **
**         -Hard coding for CWI510 was adjusted                           **
**                                                                        **
**     -Diversion D618 was moved from after CPI618 to before RDCP12       **
**         -Updated route RD618 information                               **
**         -Hard coding on CPI618 was adjusted                            **
**         -Hard coding on CPI615 was adjusted                            **
**                                                                        **
**     -Route RPI639 changed from following US60 to CPI636 to route       **
**      through US60/RR structures and combine with CWI506                **
**         -Cards PI639, D524, RD524, CPI639 and RPI639 were changed from **
**          following R624A to follow RWI524                              **
**         -CPI636 was removed-no longer needed to combine PI636 & RPI639 **
**         -RPI639 information was changed to reflect new route           **
**         -CWI506 changed from combining 3 to combine 4:                 **
**          RWI525, RWI524, RPI639 & WI506                                **
**         -Hard coding on CWI506 was adjusted                            **
**         -Hard Coding on CWI500 was adjusted                            **
**                                                                        **
****************************************************************************
**-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-**
**-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-**
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**                                                                        **
**    WITTMANN AREA DRAINAGE MASTER STUDY UPDATE-HYDROLOGY MODEL 2004     **
**                                                                        **
****************************************************************************
****************************************************************************

PROJECT:                 Wittmann ADMS Update
CLIENT:                  Flood Control District of Maricopa County
PREPARED BY:             Entellus, Inc.
PROJECT NO:              FCD 2002C029              Entellus 310.032
FILE NAME: WTEC6-addendum.hcl               CREATED DATE: JUL 01, 2004
                                           MODIFIED DATE: MAY 04, 2005

STORM:
                        100-year 6-hour Storm

DEVELOPMENT CONDITIONS:
                        Existing Conditions

MODELING ASSUMPTIONS:
                        It was assumed that the US60 did not have adequate
                        storage to cause any significant attenuation.

                        The assumption was made that the CAP Canal embankment
                        would not be breached under a large flood event.

                        The assumption was made that the Beardsley Canal would
                        not fail under a large storm event (Per District
                        Instruction).  In addition, the berm north of the
                        Beardsley canal and east of US60 was assumed to fail
                        (per district Instruction).

                        For both the CAP and Beardsley Canals, once the berm
                        elevation was reached weir flow was assumed.  It was
                        also assumed that any weir flow over the canal that
                        might enter the canal and be diverted out of the study
                        area was insignificant, and thus was ignored.  In other
                        words all weir flow over the canal embankment reaches
                        the downstream concentration point.

                        Typical X-sects were developed, and it was assumed
                        that a typical x-sect could adequately represent
                        various reaches.

                        Time-Area Relations were used base on the District's
                        Hydrology Manual criteria.  Two Time-Area Relation
                        Curves were utilized:
                                -Urban
                                -Natural
                        The Time-Area Relation Curves were taken directly
                        from the manual

MODELING METHODS:
                        This model utilizes QI cards to input the Padelford
                        hydrographs from the 100-year 6-hour existing
                        conditions model developed by A-N West Inc. for the
                        Padelford Wash Floodplain Delineation Study.  The
                        hydrograph was altered from its original form
                        (2-minute interval to 5-minute interval) through
                        simple interpolation.

                        Clark Unit Hydrographs were used for all subbasins
                        except the two subbasins directly upstream of the
                        Bonita Dam (PD726B and PD740 use S-graphs).  The UC
                        parameters were calculated using the WMS7.0 software.

                        For Basins PD726B and PD740 S-Graphs were utilized per
                        the request of the FCDMC.  Limited details regarding
                        the calculations of the S-graphs can be found in the
                        model by the basin KK card.  For full details of the
                        S-graph calculations refer to the Appendix.

                        Normal Depth routing was used for all routing reaches.

                        Hard coding was used to account for the percentage of
                        area associated with a diversion.  Because of the use
                        of JD cards and aereal reduction, hard coding was
                        necessary to properly account for area.  For a given
```

diversion a percentage of the flow is routed to two different locations. The same percentage of area follows that diverted flow. In addition the area downstream of the main path is reduced or increased and is hard coded to account for the loss or gain of area. Hard coding was performed based on the 6-hour existing conditions model.

Stage-storage was developed for all the structures along the CAP Canal, as well as along the Beardsley Canal. In addition several stage-storage locations were developed for areas with significant storage along the SR74. No storage was modeled along the US60 and railroad, but the culverts were analyzed for diversion potential. Diversions were placed in the model where deemed appropriate. See appendix for details.

FLO-2D was utilized to calculate the split flows at concentration points CIW351. CIW357, CIW363 and CWI576. See appendix for modeling details.

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****************************************************************************

159 IO          OUTPUT CONTROL VARIABLES
                      IPRNT           5   PRINT CONTROL
                      IPLOT           0   PLOT CONTROL
                      QSCAL          0.   HYDROGRAPH PLOT SCALE

    IT          HYDROGRAPH TIME DATA
                       NMIN           5   MINUTES IN COMPUTATION INTERVAL
                      IDATE      1    0   STARTING DATE
                      ITIME        0000   STARTING TIME
                         NQ        1500   NUMBER OF HYDROGRAPH ORDINATES
                     NDDATE      6    0   ENDING DATE
                     NDTIME        0455   ENDING TIME
                      ICENT          19   CENTURY MARK

                 COMPUTATION INTERVAL    0.08 HOURS
                      TOTAL TIME BASE  124.92 HOURS

        ENGLISH UNITS
             DRAINAGE AREA          SQUARE MILES
             PRECIPITATION DEPTH    INCHES
             LENGTH, ELEVATION      FEET
             FLOW                   CUBIC FEET PER SECOND
             STORAGE VOLUME         ACRE-FEET
             SURFACE AREA           ACRES
             TEMPERATURE            DEGREES FAHRENHEIT

161 JD          INDEX STORM NO. 1
                       STRM        3.40   PRECIPITATION DEPTH
                       TRDA        0.01   TRANSPOSITION DRAINAGE AREA

162 PI            PRECIPITATION PATTERN
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.01      0.01      0.01      0.01      0.01      0.01      0.03
                    0.03      0.03      0.05      0.05      0.05      0.15      0.15      0.15      0.03      0.03
                    0.03      0.01      0.01      0.01      0.01      0.01      0.01      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00

165 JD          INDEX STORM NO. 2
                       STRM        3.38   PRECIPITATION DEPTH
                       TRDA        0.50   TRANSPOSITION DRAINAGE AREA

  0 PI            PRECIPITATION PATTERN
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.01      0.01      0.01      0.01      0.01      0.01      0.03
                    0.03      0.03      0.05      0.05      0.05      0.15      0.15      0.15      0.03      0.03
                    0.03      0.01      0.01      0.01      0.01      0.01      0.01      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00

166 JD          INDEX STORM NO. 3
                       STRM        3.31   PRECIPITATION DEPTH
                       TRDA        2.80   TRANSPOSITION DRAINAGE AREA

167 PI            PRECIPITATION PATTERN
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.01      0.01      0.01      0.01      0.01      0.01      0.03
                    0.03      0.03      0.07      0.07      0.07      0.08      0.08      0.08      0.05      0.05
                    0.05      0.02      0.02      0.02      0.01      0.01      0.01      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00

170 JD          INDEX STORM NO. 4
                       STRM        3.13   PRECIPITATION DEPTH
                       TRDA       16.00   TRANSPOSITION DRAINAGE AREA

171 PI            PRECIPITATION PATTERN
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.01
                    0.01      0.01      0.00      0.01      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.01      0.00      0.00      0.00      0.00      0.01      0.01      0.01
                    0.01      0.01      0.01      0.01      0.01      0.01      0.02      0.02      0.02      0.03
                    0.03      0.03      0.06      0.06      0.06      0.07      0.07      0.07      0.04      0.04
                    0.04      0.02      0.02      0.02      0.01      0.01      0.01      0.01      0.01      0.01
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
```

```
                 0.00      0.00

174 JD        INDEX STORM NO. 5
                STRM      2.76  PRECIPITATION DEPTH
                TRDA     90.00  TRANSPOSITION DRAINAGE AREA

175 PI          PRECIPITATION PATTERN
                 0.01      0.01      0.01      0.00      0.00      0.00      0.01      0.01      0.01      0.01
                 0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01
                 0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01
                 0.01      0.01      0.01      0.01      0.01      0.01      0.02      0.02      0.02      0.03
                 0.03      0.03      0.05      0.05      0.05      0.05      0.05      0.05      0.04      0.04
                 0.04      0.02      0.02      0.02      0.02      0.02      0.02      0.01      0.01      0.01
                 0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01
                 0.01      0.01

178 JD        INDEX STORM NO. 6
                STRM      1.94  PRECIPITATION DEPTH
                TRDA    500.00  TRANSPOSITION DRAINAGE AREA

179 PI          PRECIPITATION PATTERN
                 0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01
                 0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01
                 0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01
                 0.01      0.01      0.01      0.01      0.01      0.01      0.02      0.02      0.02      0.03
                 0.03      0.03      0.04      0.04      0.04      0.04      0.04      0.04      0.04      0.04
                 0.04      0.03      0.03      0.03      0.02      0.02      0.02      0.01      0.01      0.01
                 0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01
                 0.01      0.01

*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

           **************
           *            *
182 KK     *   IW371    *
           *            *
           **************

183 KO        OUTPUT CONTROL VARIABLES
                 IPRNT          5  PRINT CONTROL
                 IPLOT          0  PLOT CONTROL
                 QSCAL         0.  HYDROGRAPH PLOT SCALE
                 IPNCH          1  PUNCH COMPUTED HYDROGRAPH
                  IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                 ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                 ISAV2       1500  LAST ORDINATE PUNCHED OR SAVED
                TIMINT      0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

           **************
           *            *
189 KK     *    D371    *
           *            *
           **************

190 KO        OUTPUT CONTROL VARIABLES
                 IPRNT          5  PRINT CONTROL
                 IPLOT          0  PLOT CONTROL
                 QSCAL         0.  HYDROGRAPH PLOT SCALE
                 IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                  IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                 ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                 ISAV2       1500  LAST ORDINATE PUNCHED OR SAVED
                TIMINT      0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

           **************
           *            *
194 KK     *   RIW371   *
           *            *
           **************

195 KO        OUTPUT CONTROL VARIABLES
                 IPRNT          5  PRINT CONTROL
                 IPLOT          0  PLOT CONTROL
                 QSCAL         0.  HYDROGRAPH PLOT SCALE
                 IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                  IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                 ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                 ISAV2       1500  LAST ORDINATE PUNCHED OR SAVED
                TIMINT      0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

           **************
           *            *
200 KK     *   IW366    *
           *            *
           **************
```

```
201 KO          OUTPUT CONTROL VARIABLES
                       IPRNT          5  PRINT CONTROL
                       IPLOT          0  PLOT CONTROL
                       QSCAL         0.  HYDROGRAPH PLOT SCALE
                       IPNCH          1  PUNCH COMPUTED HYDROGRAPH
                        IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                       ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                       ISAV2       1500  LAST ORDINATE PUNCHED OR SAVED
                      TIMINT      0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

            ***************
            *             *
207 KK      *    CIW366   *
            *             *
            ***************

208 KO          OUTPUT CONTROL VARIABLES
                       IPRNT          5  PRINT CONTROL
                       IPLOT          0  PLOT CONTROL
                       QSCAL         0.  HYDROGRAPH PLOT SCALE
                       IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                        IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                       ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                       ISAV2       1500  LAST ORDINATE PUNCHED OR SAVED
                      TIMINT      0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

            ***************
            *             *
210 KK      *    RIW366   *
            *             *
            ***************

211 KO          OUTPUT CONTROL VARIABLES
                       IPRNT          5  PRINT CONTROL
                       IPLOT          0  PLOT CONTROL
                       QSCAL         0.  HYDROGRAPH PLOT SCALE
                       IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                        IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                       ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                       ISAV2       1500  LAST ORDINATE PUNCHED OR SAVED
                      TIMINT      0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

            ***************
            *             *
216 KK      *     IW377   *
            *             *
            ***************

217 KO          OUTPUT CONTROL VARIABLES
                       IPRNT          5  PRINT CONTROL
                       IPLOT          0  PLOT CONTROL
                       QSCAL         0.  HYDROGRAPH PLOT SCALE
                       IPNCH          1  PUNCH COMPUTED HYDROGRAPH
                        IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                       ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                       ISAV2       1500  LAST ORDINATE PUNCHED OR SAVED
                      TIMINT      0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

            ***************
            *             *
228 KK      *    RIW377   *
            *             *
            ***************

229 KO          OUTPUT CONTROL VARIABLES
                       IPRNT          5  PRINT CONTROL
                       IPLOT          0  PLOT CONTROL
                       QSCAL         0.  HYDROGRAPH PLOT SCALE
                       IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                        IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                       ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                       ISAV2       1500  LAST ORDINATE PUNCHED OR SAVED
                      TIMINT      0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

            ***************
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                  *              *
 234 KK           *     IW374    *
                  *              *
                  ****************

 235 KO                OUTPUT CONTROL VARIABLES
                              IPRNT            5  PRINT CONTROL
                              IPLOT            0  PLOT CONTROL
                              QSCAL           0.  HYDROGRAPH PLOT SCALE
                              IPNCH            1  PUNCH COMPUTED HYDROGRAPH
                               IOUT           22  SAVE HYDROGRAPH ON THIS UNIT
                              ISAV1            1  FIRST ORDINATE PUNCHED OR SAVED
                              ISAV2         1500  LAST ORDINATE PUNCHED OR SAVED
                             TIMINT        0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

                  ****************
                  *              *
 241 KK           *      D371    *
                  *              *
                  ****************

 242 KO                OUTPUT CONTROL VARIABLES
                              IPRNT            5  PRINT CONTROL
                              IPLOT            0  PLOT CONTROL
                              QSCAL           0.  HYDROGRAPH PLOT SCALE
                              IPNCH            0  PUNCH COMPUTED HYDROGRAPH
                               IOUT           22  SAVE HYDROGRAPH ON THIS UNIT
                              ISAV1            1  FIRST ORDINATE PUNCHED OR SAVED
                              ISAV2         1500  LAST ORDINATE PUNCHED OR SAVED
                             TIMINT        0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

                  ****************
                  *              *
 244 KK           *     RD371    *
                  *              *
                  ****************

 245 KO                OUTPUT CONTROL VARIABLES
                              IPRNT            5  PRINT CONTROL
                              IPLOT            0  PLOT CONTROL
                              QSCAL           0.  HYDROGRAPH PLOT SCALE
                              IPNCH            0  PUNCH COMPUTED HYDROGRAPH
                               IOUT           22  SAVE HYDROGRAPH ON THIS UNIT
                              ISAV1            1  FIRST ORDINATE PUNCHED OR SAVED
                              ISAV2         1500  LAST ORDINATE PUNCHED OR SAVED
                             TIMINT        0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

                  ****************
                  *              *
 250 KK           *    CIW374    *
                  *              *
                  ****************

 251 KO                OUTPUT CONTROL VARIABLES
                              IPRNT            5  PRINT CONTROL
                              IPLOT            0  PLOT CONTROL
                              QSCAL           0.  HYDROGRAPH PLOT SCALE
                              IPNCH            0  PUNCH COMPUTED HYDROGRAPH
                               IOUT           22  SAVE HYDROGRAPH ON THIS UNIT
                              ISAV1            1  FIRST ORDINATE PUNCHED OR SAVED
                              ISAV2         1500  LAST ORDINATE PUNCHED OR SAVED
                             TIMINT        0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

                  ****************
                  *              *
 253 KK           *    RIW374    *
                  *              *
                  ****************

 254 KO                OUTPUT CONTROL VARIABLES
                              IPRNT            5  PRINT CONTROL
                              IPLOT            0  PLOT CONTROL
                              QSCAL           0.  HYDROGRAPH PLOT SCALE
                              IPNCH            0  PUNCH COMPUTED HYDROGRAPH
                               IOUT           22  SAVE HYDROGRAPH ON THIS UNIT
                              ISAV1            1  FIRST ORDINATE PUNCHED OR SAVED
                              ISAV2         1500  LAST ORDINATE PUNCHED OR SAVED
                             TIMINT        0.083  TIME INTERVAL IN HOURS
```

```
*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

              ***************
              *             *
259 KK        *    IW386    *
              *             *
              ***************

260 KO            OUTPUT CONTROL VARIABLES
                        IPRNT           5  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
                        IPNCH           1  PUNCH COMPUTED HYDROGRAPH
                         IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2        1500  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT       0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

              ***************
              *             *
266 KK        *   RIW386    *
              *             *
              ***************

267 KO            OUTPUT CONTROL VARIABLES
                        IPRNT           5  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
                        IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                         IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2        1500  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT       0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

              ***************
              *             *
272 KK        *    IW382    *
              *             *
              ***************

273 KO            OUTPUT CONTROL VARIABLES
                        IPRNT           5  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
                        IPNCH           1  PUNCH COMPUTED HYDROGRAPH
                         IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2        1500  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT       0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

              ***************
              *             *
279 KK        *   CIW382    *
              *             *
              ***************

280 KO            OUTPUT CONTROL VARIABLES
                        IPRNT           5  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
                        IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                         IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2        1500  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT       0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

              ***************
              *             *
282 KK        *    D382B    *
              *             *
              ***************

283 KO            OUTPUT CONTROL VARIABLES
                        IPRNT           5  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
                        IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                         IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2        1500  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT       0.083  TIME INTERVAL IN HOURS
```

```
*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

           **************
           *            *
 287 KK    *    D382A   *
           *            *
           **************

 288 KO         OUTPUT CONTROL VARIABLES
                      IPRNT            5  PRINT CONTROL
                      IPLOT            0  PLOT CONTROL
                      QSCAL           0.  HYDROGRAPH PLOT SCALE
                      IPNCH            0  PUNCH COMPUTED HYDROGRAPH
                       IOUT           22  SAVE HYDROGRAPH ON THIS UNIT
                      ISAV1            1  FIRST ORDINATE PUNCHED OR SAVED
                      ISAV2         1500  LAST ORDINATE PUNCHED OR SAVED
                     TIMINT        0.083  TIME INTERVAL IN HOURS

*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

           **************
           *            *
 292 KK    *   RIW382   *
           *            *
           **************

 293 KO         OUTPUT CONTROL VARIABLES
                      IPRNT            5  PRINT CONTROL
                      IPLOT            0  PLOT CONTROL
                      QSCAL           0.  HYDROGRAPH PLOT SCALE
                      IPNCH            0  PUNCH COMPUTED HYDROGRAPH
                       IOUT           22  SAVE HYDROGRAPH ON THIS UNIT
                      ISAV1            1  FIRST ORDINATE PUNCHED OR SAVED
                      ISAV2         1500  LAST ORDINATE PUNCHED OR SAVED
                     TIMINT        0.083  TIME INTERVAL IN HOURS

*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

           **************
           *            *
 298 KK    *    IW384   *
           *            *
           **************

 299 KO         OUTPUT CONTROL VARIABLES
                      IPRNT            5  PRINT CONTROL
                      IPLOT            0  PLOT CONTROL
                      QSCAL           0.  HYDROGRAPH PLOT SCALE
                      IPNCH            1  PUNCH COMPUTED HYDROGRAPH
                       IOUT           22  SAVE HYDROGRAPH ON THIS UNIT
                      ISAV1            1  FIRST ORDINATE PUNCHED OR SAVED
                      ISAV2         1500  LAST ORDINATE PUNCHED OR SAVED
                     TIMINT        0.083  TIME INTERVAL IN HOURS

*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

           **************
           *            *
 305 KK    *    D382A   *
           *            *
           **************

 306 KO         OUTPUT CONTROL VARIABLES
                      IPRNT            5  PRINT CONTROL
                      IPLOT            0  PLOT CONTROL
                      QSCAL           0.  HYDROGRAPH PLOT SCALE
                      IPNCH            0  PUNCH COMPUTED HYDROGRAPH
                       IOUT           22  SAVE HYDROGRAPH ON THIS UNIT
                      ISAV1            1  FIRST ORDINATE PUNCHED OR SAVED
                      ISAV2         1500  LAST ORDINATE PUNCHED OR SAVED
                     TIMINT        0.083  TIME INTERVAL IN HOURS

*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

           **************
           *            *
 308 KK    *   RD382A   *
           *            *
           **************

 309 KO         OUTPUT CONTROL VARIABLES
                      IPRNT            5  PRINT CONTROL
                      IPLOT            0  PLOT CONTROL
                      QSCAL           0.  HYDROGRAPH PLOT SCALE
                      IPNCH            0  PUNCH COMPUTED HYDROGRAPH
```

```
                  IOUT           22  SAVE HYDROGRAPH ON THIS UNIT
                 ISAV1            1  FIRST ORDINATE PUNCHED OR SAVED
                 ISAV2         1500  LAST ORDINATE PUNCHED OR SAVED
                TIMINT        0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

            **************
            *            *
 314 KK     *    CIW384  *
            *            *
            **************

 315 KO           OUTPUT CONTROL VARIABLES
                 IPRNT            5  PRINT CONTROL
                 IPLOT            0  PLOT CONTROL
                 QSCAL           0.  HYDROGRAPH PLOT SCALE
                 IPNCH            0  PUNCH COMPUTED HYDROGRAPH
                  IOUT           22  SAVE HYDROGRAPH ON THIS UNIT
                 ISAV1            1  FIRST ORDINATE PUNCHED OR SAVED
                 ISAV2         1500  LAST ORDINATE PUNCHED OR SAVED
                TIMINT        0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

            **************
            *            *
 317 KK     *    RIW384  *
            *            *
            **************

 318 KO           OUTPUT CONTROL VARIABLES
                 IPRNT            5  PRINT CONTROL
                 IPLOT            0  PLOT CONTROL
                 QSCAL           0.  HYDROGRAPH PLOT SCALE
                 IPNCH            0  PUNCH COMPUTED HYDROGRAPH
                  IOUT           22  SAVE HYDROGRAPH ON THIS UNIT
                 ISAV1            1  FIRST ORDINATE PUNCHED OR SAVED
                 ISAV2         1500  LAST ORDINATE PUNCHED OR SAVED
                TIMINT        0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

            **************
            *            *
 323 KK     *     IW381  *
            *            *
            **************

 324 KO           OUTPUT CONTROL VARIABLES
                 IPRNT            5  PRINT CONTROL
                 IPLOT            0  PLOT CONTROL
                 QSCAL           0.  HYDROGRAPH PLOT SCALE
                 IPNCH            1  PUNCH COMPUTED HYDROGRAPH
                  IOUT           22  SAVE HYDROGRAPH ON THIS UNIT
                 ISAV1            1  FIRST ORDINATE PUNCHED OR SAVED
                 ISAV2         1500  LAST ORDINATE PUNCHED OR SAVED
                TIMINT        0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

            **************
            *            *
 330 KK     *     D382B  *
            *            *
            **************

 331 KO           OUTPUT CONTROL VARIABLES
                 IPRNT            5  PRINT CONTROL
                 IPLOT            0  PLOT CONTROL
                 QSCAL           0.  HYDROGRAPH PLOT SCALE
                 IPNCH            0  PUNCH COMPUTED HYDROGRAPH
                  IOUT           22  SAVE HYDROGRAPH ON THIS UNIT
                 ISAV1            1  FIRST ORDINATE PUNCHED OR SAVED
                 ISAV2         1500  LAST ORDINATE PUNCHED OR SAVED
                TIMINT        0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

            **************
            *            *
 335 KK     *    RIW381  *
            *            *
            **************

 336 KO           OUTPUT CONTROL VARIABLES
```

```
                  IPRNT           5  PRINT CONTROL
                  IPLOT           0  PLOT CONTROL
                  QSCAL          0.  HYDROGRAPH PLOT SCALE
                  IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                   IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                  ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                  ISAV2        1500  LAST ORDINATE PUNCHED OR SAVED
                 TIMINT       0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

             **************
             *            *
 341 KK      *     C359*  *
             *            *
             **************

 342 KO          OUTPUT CONTROL VARIABLES
                  IPRNT           5  PRINT CONTROL
                  IPLOT           0  PLOT CONTROL
                  QSCAL          0.  HYDROGRAPH PLOT SCALE
                  IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                   IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                  ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                  ISAV2        1500  LAST ORDINATE PUNCHED OR SAVED
                 TIMINT       0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

             **************
             *            *
 344 KK      *     R359*  *
             *            *
             **************

 345 KO          OUTPUT CONTROL VARIABLES
                  IPRNT           5  PRINT CONTROL
                  IPLOT           0  PLOT CONTROL
                  QSCAL          0.  HYDROGRAPH PLOT SCALE
                  IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                   IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                  ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                  ISAV2        1500  LAST ORDINATE PUNCHED OR SAVED
                 TIMINT       0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

             **************
             *            *
 350 KK      *    IW359   *
             *            *
             **************

 351 KO          OUTPUT CONTROL VARIABLES
                  IPRNT           5  PRINT CONTROL
                  IPLOT           0  PLOT CONTROL
                  QSCAL          0.  HYDROGRAPH PLOT SCALE
                  IPNCH           1  PUNCH COMPUTED HYDROGRAPH
                   IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                  ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                  ISAV2        1500  LAST ORDINATE PUNCHED OR SAVED
                 TIMINT       0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

             **************
             *            *
 357 KK      *   CIW359   *
             *            *
             **************

 358 KO          OUTPUT CONTROL VARIABLES
                  IPRNT           5  PRINT CONTROL
                  IPLOT           0  PLOT CONTROL
                  QSCAL          0.  HYDROGRAPH PLOT SCALE
                  IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                   IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                  ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                  ISAV2        1500  LAST ORDINATE PUNCHED OR SAVED
                 TIMINT       0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

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             *            *
 360 KK      *   RIW359   *
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          *              *
          ****************

361 KO         OUTPUT CONTROL VARIABLES
                    IPRNT          5  PRINT CONTROL
                    IPLOT          0  PLOT CONTROL
                    QSCAL         0.  HYDROGRAPH PLOT SCALE
                    IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                     IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                    ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                    ISAV2       1500  LAST ORDINATE PUNCHED OR SAVED
                   TIMINT      0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

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          *              *
366 KK    *    IW389     *
          *              *
          ****************

367 KO         OUTPUT CONTROL VARIABLES
                    IPRNT          5  PRINT CONTROL
                    IPLOT          0  PLOT CONTROL
                    QSCAL         0.  HYDROGRAPH PLOT SCALE
                    IPNCH          1  PUNCH COMPUTED HYDROGRAPH
                     IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                    ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                    ISAV2       1500  LAST ORDINATE PUNCHED OR SAVED
                   TIMINT      0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

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          *              *
373 KK    *    SSR190    *
          *              *
          ****************

374 KO         OUTPUT CONTROL VARIABLES
                    IPRNT          5  PRINT CONTROL
                    IPLOT          0  PLOT CONTROL
                    QSCAL         0.  HYDROGRAPH PLOT SCALE
                    IPNCH          1  PUNCH COMPUTED HYDROGRAPH
                     IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                    ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                    ISAV2       1500  LAST ORDINATE PUNCHED OR SAVED
                   TIMINT      0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

          ****************
          *              *
380 KK    *    RIW389    *
          *              *
          ****************

381 KO         OUTPUT CONTROL VARIABLES
                    IPRNT          5  PRINT CONTROL
                    IPLOT          0  PLOT CONTROL
                    QSCAL         0.  HYDROGRAPH PLOT SCALE
                    IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                     IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                    ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                    ISAV2       1500  LAST ORDINATE PUNCHED OR SAVED
                   TIMINT      0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

          ****************
          *              *
386 KK    *    IW394     *
          *              *
          ****************

387 KO         OUTPUT CONTROL VARIABLES
                    IPRNT          5  PRINT CONTROL
                    IPLOT          0  PLOT CONTROL
                    QSCAL         0.  HYDROGRAPH PLOT SCALE
                    IPNCH          1  PUNCH COMPUTED HYDROGRAPH
                     IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                    ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                    ISAV2       1500  LAST ORDINATE PUNCHED OR SAVED
                   TIMINT      0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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              **************
              *            *
393 KK        *   RIW394   *
              *            *
              **************

394 KO             OUTPUT CONTROL VARIABLES
                         IPRNT           5  PRINT CONTROL
                         IPLOT           0  PLOT CONTROL
                         QSCAL          0.  HYDROGRAPH PLOT SCALE
                         IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                          IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                         ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                         ISAV2        1500  LAST ORDINATE PUNCHED OR SAVED
                        TIMINT       0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

              **************
              *            *
399 KK        *   IW390A   *
              *            *
              **************

400 KO             OUTPUT CONTROL VARIABLES
                         IPRNT           5  PRINT CONTROL
                         IPLOT           0  PLOT CONTROL
                         QSCAL          0.  HYDROGRAPH PLOT SCALE
                         IPNCH           1  PUNCH COMPUTED HYDROGRAPH
                          IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                         ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                         ISAV2        1500  LAST ORDINATE PUNCHED OR SAVED
                        TIMINT       0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

              **************
              *            *
406 KK        *    C390A   *
              *            *
              **************

407 KO             OUTPUT CONTROL VARIABLES
                         IPRNT           5  PRINT CONTROL
                         IPLOT           0  PLOT CONTROL
                         QSCAL          0.  HYDROGRAPH PLOT SCALE
                         IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                          IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                         ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                         ISAV2        1500  LAST ORDINATE PUNCHED OR SAVED
                        TIMINT       0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

              **************
              *            *
409 KK        *    R390A   *
              *            *
              **************

410 KO             OUTPUT CONTROL VARIABLES
                         IPRNT           5  PRINT CONTROL
                         IPLOT           0  PLOT CONTROL
                         QSCAL          0.  HYDROGRAPH PLOT SCALE
                         IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                          IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                         ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                         ISAV2        1500  LAST ORDINATE PUNCHED OR SAVED
                        TIMINT       0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

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              *            *
415 KK        *    IW390   *
              *            *
              **************

416 KO             OUTPUT CONTROL VARIABLES
                         IPRNT           5  PRINT CONTROL
                         IPLOT           0  PLOT CONTROL
                         QSCAL          0.  HYDROGRAPH PLOT SCALE
                         IPNCH           1  PUNCH COMPUTED HYDROGRAPH
                          IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                         ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                         ISAV2        1500  LAST ORDINATE PUNCHED OR SAVED
                        TIMINT       0.083  TIME INTERVAL IN HOURS
```

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*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

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          *            *
422 KK    *    IW392   *
          *            *
          **************

423 KO         OUTPUT CONTROL VARIABLES
                     IPRNT            5  PRINT CONTROL
                     IPLOT            0  PLOT CONTROL
                     QSCAL           0.  HYDROGRAPH PLOT SCALE
                     IPNCH            1  PUNCH COMPUTED HYDROGRAPH
                      IOUT           22  SAVE HYDROGRAPH ON THIS UNIT
                     ISAV1            1  FIRST ORDINATE PUNCHED OR SAVED
                     ISAV2         1500  LAST ORDINATE PUNCHED OR SAVED
                    TIMINT        0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

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          *            *
429 KK    *   CIW390   *
          *            *
          **************

430 KO         OUTPUT CONTROL VARIABLES
                     IPRNT            5  PRINT CONTROL
                     IPLOT            0  PLOT CONTROL
                     QSCAL           0.  HYDROGRAPH PLOT SCALE
                     IPNCH            0  PUNCH COMPUTED HYDROGRAPH
                      IOUT           22  SAVE HYDROGRAPH ON THIS UNIT
                     ISAV1            1  FIRST ORDINATE PUNCHED OR SAVED
                     ISAV2         1500  LAST ORDINATE PUNCHED OR SAVED
                    TIMINT        0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

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          *            *
437 KK    *   RIW390   *
          *            *
          **************

438 KO         OUTPUT CONTROL VARIABLES
                     IPRNT            5  PRINT CONTROL
                     IPLOT            0  PLOT CONTROL
                     QSCAL           0.  HYDROGRAPH PLOT SCALE
                     IPNCH            0  PUNCH COMPUTED HYDROGRAPH
                      IOUT           22  SAVE HYDROGRAPH ON THIS UNIT
                     ISAV1            1  FIRST ORDINATE PUNCHED OR SAVED
                     ISAV2         1500  LAST ORDINATE PUNCHED OR SAVED
                    TIMINT        0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

          **************
          *            *
443 KK    *    IW388   *
          *            *
          **************

444 KO         OUTPUT CONTROL VARIABLES
                     IPRNT            5  PRINT CONTROL
                     IPLOT            0  PLOT CONTROL
                     QSCAL           0.  HYDROGRAPH PLOT SCALE
                     IPNCH            1  PUNCH COMPUTED HYDROGRAPH
                      IOUT           22  SAVE HYDROGRAPH ON THIS UNIT
                     ISAV1            1  FIRST ORDINATE PUNCHED OR SAVED
                     ISAV2         1500  LAST ORDINATE PUNCHED OR SAVED
                    TIMINT        0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

          **************
          *            *
450 KK    *   CIW388   *
          *            *
          **************

451 KO         OUTPUT CONTROL VARIABLES
                     IPRNT            5  PRINT CONTROL
                     IPLOT            0  PLOT CONTROL
                     QSCAL           0.  HYDROGRAPH PLOT SCALE
                     IPNCH            0  PUNCH COMPUTED HYDROGRAPH
                      IOUT           22  SAVE HYDROGRAPH ON THIS UNIT
                     ISAV1            1  FIRST ORDINATE PUNCHED OR SAVED
```

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                ISAV2        1500  LAST ORDINATE PUNCHED OR SAVED
               TIMINT       0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

         **************
         *            *
453 KK   *   RIW388   *
         *            *
         **************

454 KO        OUTPUT CONTROL VARIABLES
                IPRNT           5  PRINT CONTROL
                IPLOT           0  PLOT CONTROL
                QSCAL          0.  HYDROGRAPH PLOT SCALE
                IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                 IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                ISAV2        1500  LAST ORDINATE PUNCHED OR SAVED
               TIMINT       0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

         **************
         *            *
459 KK   *    IW357   *
         *            *
         **************

460 KO        OUTPUT CONTROL VARIABLES
                IPRNT           5  PRINT CONTROL
                IPLOT           0  PLOT CONTROL
                QSCAL          0.  HYDROGRAPH PLOT SCALE
                IPNCH           1  PUNCH COMPUTED HYDROGRAPH
                 IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                ISAV2        1500  LAST ORDINATE PUNCHED OR SAVED
               TIMINT       0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

         **************
         *            *
466 KK   *   CIW357   *
         *            *
         **************

467 KO        OUTPUT CONTROL VARIABLES
                IPRNT           5  PRINT CONTROL
                IPLOT           0  PLOT CONTROL
                QSCAL          0.  HYDROGRAPH PLOT SCALE
                IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                 IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                ISAV2        1500  LAST ORDINATE PUNCHED OR SAVED
               TIMINT       0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

         **************
         *            *
475 KK   *   RIW357   *
         *            *
         **************

476 KO        OUTPUT CONTROL VARIABLES
                IPRNT           5  PRINT CONTROL
                IPLOT           0  PLOT CONTROL
                QSCAL          0.  HYDROGRAPH PLOT SCALE
                IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                 IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                ISAV2        1500  LAST ORDINATE PUNCHED OR SAVED
               TIMINT       0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

         **************
         *            *
481 KK   *    IW353   *
         *            *
         **************

482 KO        OUTPUT CONTROL VARIABLES
                IPRNT           5  PRINT CONTROL
                IPLOT           0  PLOT CONTROL
```

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                 QSCAL          0.  HYDROGRAPH PLOT SCALE
                 IPNCH          1  PUNCH COMPUTED HYDROGRAPH
                  IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                 ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                 ISAV2       1500  LAST ORDINATE PUNCHED OR SAVED
                TIMINT      0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** 

          ***************
          *             *
 488 KK   *   CIW353    *
          *             *
          ***************

 489 KO        OUTPUT CONTROL VARIABLES
                 IPRNT          5  PRINT CONTROL
                 IPLOT          0  PLOT CONTROL
                 QSCAL          0.  HYDROGRAPH PLOT SCALE
                 IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                  IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                 ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                 ISAV2       1500  LAST ORDINATE PUNCHED OR SAVED
                TIMINT      0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** 

          ***************
          *             *
 491 KK   *   RIW353    *
          *             *
          ***************

 492 KO        OUTPUT CONTROL VARIABLES
                 IPRNT          5  PRINT CONTROL
                 IPLOT          0  PLOT CONTROL
                 QSCAL          0.  HYDROGRAPH PLOT SCALE
                 IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                  IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                 ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                 ISAV2       1500  LAST ORDINATE PUNCHED OR SAVED
                TIMINT      0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** 

          ***************
          *             *
 497 KK   *    IW350    *
          *             *
          ***************

 498 KO        OUTPUT CONTROL VARIABLES
                 IPRNT          5  PRINT CONTROL
                 IPLOT          0  PLOT CONTROL
                 QSCAL          0.  HYDROGRAPH PLOT SCALE
                 IPNCH          1  PUNCH COMPUTED HYDROGRAPH
                  IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                 ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                 ISAV2       1500  LAST ORDINATE PUNCHED OR SAVED
                TIMINT      0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** 

          ***************
          *             *
 504 KK   *   CIW350    *
          *             *
          ***************

 505 KO        OUTPUT CONTROL VARIABLES
                 IPRNT          5  PRINT CONTROL
                 IPLOT          0  PLOT CONTROL
                 QSCAL          0.  HYDROGRAPH PLOT SCALE
                 IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                  IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                 ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                 ISAV2       1500  LAST ORDINATE PUNCHED OR SAVED
                TIMINT      0.083  TIME INTERVAL IN HOURS
1
```

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+	HYDROGRAPH AT	IW371	103.	4.08	12.	3.	1.	0.05		

+	DIVERSION TO	DO371	77.	4.08	6.	2.	1.	0.05
+	HYDROGRAPH AT	D371	26.	4.08	5.	1.	0.	0.05
+	ROUTED TO	RIW371	15.	6.50	5.	1.	0.	0.05
+	HYDROGRAPH AT	IW366	1107.	4.58	209.	52.	17.	1.06
+	2 COMBINED AT	CIW366	1105.	4.58	213.	54.	18.	1.07
+	ROUTED TO	RIW366	957.	5.00	212.	54.	18.	1.07
+	HYDROGRAPH AT	IW377	153.	4.25	22.	6.	2.	0.11
+	ROUTED TO	SSR010	121.	4.50	22.	6.	2.	0.11
+	ROUTED TO	RIW377	98.	5.25	22.	6.	2.	0.11
+	HYDROGRAPH AT	IW374	758.	4.25	97.	24.	8.	0.39
+	HYDROGRAPH AT	D371	77.	4.08	6.	2.	1.	0.05
+	ROUTED TO	RD371	40.	4.33	6.	2.	1.	0.05
+	3 COMBINED AT	CIW374	784.	4.25	124.	31.	10.	0.54
+	ROUTED TO	RIW374	404.	5.92	121.	31.	10.	0.54
+	HYDROGRAPH AT	IW386	395.	4.58	90.	23.	8.	0.37
+	ROUTED TO	RIW386	301.	5.42	89.	23.	8.	0.37
+	HYDROGRAPH AT	IW382	738.	4.33	131.	33.	11.	0.62
+	2 COMBINED AT	CIW382	685.	4.33	211.	54.	18.	0.99
+	DIVERSION TO	DO382B	180.	3.92	112.	29.	10.	0.99
+	HYDROGRAPH AT	D382B	505.	4.33	99.	25.	8.	0.99
+	DIVERSION TO	DO382A	226.	4.33	20.	5.	2.	0.99
+	HYDROGRAPH AT	D382A	279.	4.33	79.	20.	7.	0.99
+	ROUTED TO	RIW382	253.	4.83	79.	20.	7.	0.99
+	HYDROGRAPH AT	IW384	184.	4.17	21.	5.	2.	0.08
+	HYDROGRAPH AT	D382A	226.	4.33	20.	5.	2.	0.99
+	ROUTED TO	RD382A	196.	4.42	20.	5.	2.	0.99
+	2 COMBINED AT	CIW384	390.	4.33	47.	12.	4.	0.41
+	ROUTED TO	RIW384	310.	4.67	47.	12.	4.	0.41
+	HYDROGRAPH AT	IW381	454.	4.50	98.	25.	8.	0.38
+	HYDROGRAPH AT	D382B	180.	3.92	112.	29.	10.	0.99
+	2 COMBINED AT	CIW381	619.	4.50	208.	54.	18.	0.64
+	ROUTED TO	RIW381	574.	4.83	207.	54.	18.	0.64
+	3 COMBINED AT	C359*	990.	4.83	320.	82.	27.	1.45
+	ROUTED TO	R359*	937.	5.17	317.	82.	27.	1.45
+	HYDROGRAPH AT	IW359	2496.	4.75	537.	135.	45.	2.91

+	4 COMBINED AT	CIW359	3423.	5.00	1059.	274.	91.	5.97
+	ROUTED TO	RIW359	3233.	5.33	1045.	274.	91.	5.97
+	HYDROGRAPH AT	IW389	168.	4.42	35.	9.	3.	0.13
+	ROUTED TO	SSR190	166.	4.42	35.	9.	3.	0.13
+	ROUTED TO	RIW389	102.	5.75	34.	9.	3.	0.13
+	HYDROGRAPH AT	IW394	2700.	5.08	777.	198.	66.	4.17
+	ROUTED TO	RIW394	2613.	5.25	776.	198.	66.	4.17
+	HYDROGRAPH AT	IW390A	771.	4.75	197.	50.	17.	0.90
+	2 COMBINED AT	C390A	3030.	5.25	936.	239.	80.	5.07
+	ROUTED TO	R390A	2925.	5.42	935.	239.	80.	5.07
+	HYDROGRAPH AT	IW390	221.	4.75	61.	16.	5.	0.31
+	HYDROGRAPH AT	IW392	1985.	4.33	262.	66.	22.	1.11
+	3 COMBINED AT	CIW390	3093.	5.42	1193.	305.	102.	6.50
+	ROUTED TO	SSR160	3068.	5.50	1193.	305.	102.	6.50
+	ROUTED TO	RIW390	2969.	5.75	1183.	305.	102.	6.50
+	HYDROGRAPH AT	IW388	1107.	4.83	303.	76.	25.	1.23
+	3 COMBINED AT	CIW388	3532.	5.67	1464.	378.	126.	7.85
+	ROUTED TO	RIW388	3450.	5.92	1457.	378.	126.	7.85
+	HYDROGRAPH AT	IW357	879.	4.50	184.	46.	15.	0.75
+	2 COMBINED AT	CIW357	3583.	5.92	1595.	416.	139.	8.60
+	DIVERSION TO	DO357	937.	5.92	416.	108.	36.	8.60
+	HYDROGRAPH AT	D357	2646.	5.92	1179.	308.	103.	8.60
+	ROUTED TO	RIW357	2608.	6.42	1169.	308.	103.	8.60
+	HYDROGRAPH AT	IW353	2512.	4.83	629.	158.	53.	2.80
+	3 COMBINED AT	CIW353	5467.	5.50	2558.	682.	227.	15.12
+	ROUTED TO	RIW353	5298.	5.83	2534.	682.	227.	15.12
+	HYDROGRAPH AT	IW350	1410.	5.08	457.	116.	39.	2.17
+	2 COMBINED AT	CIW350	6011.	5.75	2855.	768.	256.	17.30

*** NORMAL END OF HEC-1 ***

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1*****************************************                    ***************************************
 *                                       *                    *                                     *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                    *   U.S. ARMY CORPS OF ENGINEERS      *
 *              JUN   1998               *                    *   HYDROLOGIC ENGINEERING CENTER     *
 *           VERSION 4.1                 *                    *        609 SECOND STREET            *
 *                                       *                    *     DAVIS, CALIFORNIA 95616         *
 * RUN DATE    06AUG11  TIME  13:25:46   *                    *         (916) 756-1104              *
 *                                       *                    *                                     *
 *****************************************                    ***************************************


                    X     X  XXXXXXX   XXXXX           X
                    X     X  X        X     X         XX
                    X     X  X        X                X
                    XXXXXXX  XXXX     X        XXXXX   X
                    X     X  X        X                X
                    X     X  X        X     X          X
                    X     X  XXXXXXX   XXXXX          XXX


 THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

 THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
 THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
 NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
 DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
 KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1                                    HEC-1 INPUT                                           PAGE  1

 LINE      ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

           ID   Wittmann Phase IV Floodplain Delineation Study
           ID   August 2011
           ID   Mod2 removes subbasin IW358 and CIW357
           ID   Mod2 replaces IW353 with IW353A and updates RIW359
           ID   Mod2 truncates model at CW353A
           ID   **************************************************************************
           ID   **-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-**
           ID   **-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-**
           ID   **************************************************************************
           ID   **                                                                      **
           ID   **  ADDENDUM TO THE WITTMANN AREA DRAINAGE MASTER STUDY UPDATE HYDROLOGY **
           ID   **                                                                      **
           ID   **************************************************************************
           ID   **-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-**
           ID   **-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-**
           ID   **************************************************************************
           ID   **                                                                      **
           ID   ** THE FOLLOWING CHANGES HAVE BEEN MADE TO THE WITTMANN HYDROLOGY MODELS **
           ID   ** DATED OCTOBER 2004:                                                  **
           ID   **                                                                      **
           ID   **     -Diversion added after CTW480                                    **
           ID   **          -Main flow (5%) to CTW478                                   **
           ID   **          -Diverted flow (95%) to CWI584                              **
           ID   **          -Added concentration point CWI584 combining RD480 and WI584 **
           ID   **          -Hard coding was added to CTW478                            **
           ID   **          -Route added after D480 (Diversion Recovery)                **
           ID   **          -Route RWI584 was adjusted                                  **
           ID   **          -Storage Route SCP050 was adjusted                          **
           ID   **          -Route R508* was adjusted                                   **
           ID   **          -Hard coding for CWI510 was adjusted                        **
           ID   **                                                                      **
           ID   **     -Diversion D618 was moved from after CPI618 to before RDCP12     **
           ID   **          -Updated route RD618 information                            **
           ID   **          -Hard coding on CPI618 was adjusted                         **
           ID   **          -Hard coding on CPI615 was adjusted                         **
           ID   **                                                                      **
           ID   **     -Route RPI639 changed from following US60 to CPI636 to route     **
           ID   **      through US60/RR structures and combine with CWI506              **
           ID   **          -Cards PI639, D524, RD524, CPI639 and RPI639 were changed from **
           ID   **           following R624A to follow RWI524                           **
           ID   **          -CPI636 was removed-no longer needed to combine PI636 & RPI639 **
           ID   **          -RPI639 information was changed to reflect new route        **
           ID   **          -CWI506 changed from combining 3 to combine 4:              **
           ID   **           RWI525, RWI524, RPI639 & WI506                             **
           ID   **          -Hard coding on CWI506 was adjusted                         **
           ID   **          -Hard Coding on CWI500 was adjusted                         **
           ID   **                                                                      **
           ID   **************************************************************************
           ID   **-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-**
           ID   **-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-**
           ID   **************************************************************************
           ID
           ID
           ID
           ID   **************************************************************************
1                                    HEC-1 INPUT                                           PAGE  2

 LINE      ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

           ID   **************************************************************************
           ID   **                                                                      **
           ID   **    WITTMANN AREA DRAINAGE MASTER STUDY UPDATE-HYDROLOGY MODEL 2004   **
           ID   **                                                                      **
           ID   **************************************************************************
           ID   **************************************************************************
           ID
           ID   PROJECT:                Wittmann ADMS Update
           ID   CLIENT:                 Flood Control District of Maricopa County
```

```
ID   PREPARED BY:            Entellus, Inc.
ID   PROJECT No:             FCD 2002C029              Entellus 310.032
ID   FILE NAME: WTEC6-addendum.hc1            CREATED DATE: JUL 01, 2004
ID                                           MODIFIED DATE: MAY 04, 2005
ID
ID   STORM:
ID                          100-year 6-hour Storm
ID
ID   DEVELOPMENT CONDITIONS:
ID                          Existing Conditions
ID
ID   MODELING ASSUMPTIONS:
ID                          It was assumed that the US60 did not have adequate
ID                          storage to cause any significant attenuation.
ID
ID                          The assumption was made that the CAP Canal embankment
ID                          would not be breached under a large flood event.
ID
ID                          The assumption was made that the Beardsley Canal would
ID                          not fail under a large storm event (Per District
ID                          Instruction).  In addition, the berm north of the
ID                          Beardsley canal and east of US60 was assumed to fail
ID                          (per district Instruction).
ID
ID                          For both the CAP and Beardsley Canals, once the berm
ID                          elevation was reached weir flow was assumed.  It was
ID                          also assumed that any weir flow over the canal that
ID                          might enter the canal and be diverted out of the study
ID                          area was insignificant, and thus was ignored.  In other
ID                          words all weir flow over the canal embankment reaches
ID                          the downstream concentration point.
ID
ID                          Typical X-sects were developed, and it was assumed
ID                          that a typical x-sect could adequately represent
ID                          various reaches.
ID
ID                          Time-Area Relations were used base on the District's
ID                          Hydrology Manual criteria.  Two Time-Area Relation
ID                          Curves were utilized:
ID                                 -Urban
ID                                 -Natural
ID                          The Time-Area Relation Curves were taken directly
ID                          from the manual
ID
ID    MODELING METHODS:
ID                          This model utilizes QI cards to input the Padelford
1                               HEC-1 INPUT                                        PAGE  3

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

ID                          hydrographs from the 100-year 6-hour existing
ID                          conditions model developed by A-N West Inc. for the
ID                          Padelford Wash Floodplain Delineation Study.  The
ID                          hydrograph was altered from its original form
ID                          (2-minute interval to 5-minute interval) through
ID                          simple interpolation.
ID
ID                          Clark Unit Hydrographs were used for all subbasins
ID                          except the two subbasins directly upstream of the
ID                          Bonita Dam (PD726B and PD740 use S-graphs).  The UC
ID                          parameters were calculated using the WMS7.0 software.
ID
ID                          For Basins PD726B and PD740 S-Graphs were utilized per
ID                          the request of the FCDMC.  Limited details regarding
ID                          the calculations of the S-graphs can be found in the
ID                          model by the basin KK card.  For full details of the
ID                          S-graph calculations refer to the Appendix.
ID
ID                          Normal Depth routing was used for all routing reaches.
ID
ID                          Hard coding was used to account for the percentage of
ID                          area associated with a diversion.  Because of the use
ID                          of JD cards and aereal reduction, hard coding was
ID                          necessary to properly account for area.  For a given
ID                          diversion a percentage of the flow is routed to two
ID                          different locations.  The same percentage of area
ID                          follows that diverted flow.  In addition the area
ID                          downstream of the main path is reduced or increased and
ID                          is hard coded to account for the loss or gain of area.
ID                          Hard coding was performed based on the 6-hour existing
ID                          conditions model.
ID
ID                          Stage-storage was developed for all the structures
ID                          along the CAP Canal, as well as along the Beardsley
ID                          Canal.  In addition several stage-storage locations
ID                          were developed for areas with significant storage
ID                          along the SR74.  No storage was modeled along the US60
ID                          and railroad, but the culverts were analyzed for
ID                          diversion potential.  Diversions were placed in the
ID                          model where deemed appropriate.  See appendix for
ID                          details.
ID
ID                          FLO-2D was utilized to calculate the split flows at
ID                          concentration points CIW351. CIW357, CIW363 and CWI576.
ID                          See appendix for modeling details.
ID
ID   ****************************************************************************
ID   ****************************************************************************
ID
*DIAGRAM
IT       5                 0     1500
IO       5
IN      15                 0
JD    3.40    0.01
* 6-hour distribution
1                               HEC-1 INPUT                                        PAGE  4
```

```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 164          PC   0.000   0.008   0.016   0.025   0.033   0.041   0.050   0.058   0.066   0.074
 165          PC   0.087   0.099   0.118   0.138   0.216   0.377   0.834   0.911   0.931   0.950
 166          PC   0.962   0.972   0.983   0.991   1.000
              *
 167          JD   3.378    0.50
 168          JD   3.314    2.80
 169          PC   0.000   0.009   0.016   0.025   0.034   0.042   0.051   0.059   0.067   0.076
 170          PC   0.087   0.100   0.120   0.163   0.252   0.451   0.694   0.837   0.900   0.938
 171          PC   0.950   0.963   0.975   0.988   1.000
              *
 172          JD   3.135   16.00
 173          PC   0.000   0.009   0.020   0.030   0.048   0.063   0.076   0.090   0.105   0.119
 174          PC   0.135   0.152   0.175   0.222   0.304   0.472   0.670   0.796   0.868   0.912
 175          PC   0.946   0.960   0.973   0.987   1.000
              *
 176          JD   2.761   90.00
 177          PC   0.000   0.021   0.035   0.051   0.071   0.087   0.105   0.125   0.143   0.160
 178          PC   0.179   0.201   0.232   0.281   0.364   0.500   0.658   0.773   0.841   0.888
 179          PC   0.927   0.945   0.964   0.982   1.000
              *
 180          JD   1.938  500.00
 181          PC   0.000   0.024   0.043   0.059   0.078   0.098   0.119   0.141   0.162   0.186
 182          PC   0.212   0.239   0.271   0.321   0.408   0.515   0.627   0.735   0.814   0.864
 183          PC   0.907   0.930   0.954   0.977   1.000
              *
              *
              *
              *
              * ************************************************************************ *
              * ************************************************************************ *
              * ******************** BEGINNING OF IONA WASH SUBAREA ********************** *
              * ************************************************************************ *
              * ************************************************************************ *
              *
              *
              * ************************************************************************ *
              * ******************** BEGINNING OF IONA WASH REGION 1 ********************* *
              * ************************************************************************ *
              *
              *

 184          KK   IW371
 185          KO       0       0     0.0       1      22
 186          BA  0.0529
 187          LG   0.275    0.25    4.15   0.473   26.25
 188          UC   0.275   0.288
              * Urban Time-Area Relation
 189          UA       0       5      16      30      65      77      84      90      94      97
 190          UA     100
              *
              * Railroad Diversion: Main path to CIW366, Diversion to CIW374
              * From Structure RR40, See Appendix D.5 for analysis
1                                        HEC-1 INPUT                                              PAGE  5

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 191          KK    D371
 192          KO       0       0     0.0       0      22
 193          DT   DO371
 194          DI     0.0      14      79     208     383     823    1374    2014    2724
 195          DQ     0.0       0      55     173     335     763    1302    1930    2632
              *
              *
              * ROUTE UPDATED 4/14/4

 196          KK  RIW371
 197          KO       0       0     0.0       0      22
 198          RS      15    FLOW     0.0     0.0
 199          RC    0.04    0.04    0.04   11583  0.0088
              * TSR371
 200          RX       0     142     486     525     651     770    1000    1518
 201          RY    1900    1900    1899    1897    1896    1899  1899.5    1900
              *
              *

 202          KK   IW366
 203          KO       0       0     0.0       1      22
 204          BA  1.0558
 205          LG   0.343    0.25   5.762   0.202   7.207
 206          UC   0.763   0.593
              * Natural Time-Area Relation
 207          UA       0       3       5       8      12      20      43      75      90      96
 208          UA     100
              *
              *
              * Combines IW366 and RIW371

 209          KK  CIW366
 210          KO       0       0     0.0       0      22
              * hard coded
 211          HC       2    1.07
              *
              *
              * ROUTE UPDATED 4/14/4

 212          KK  RIW366
 213          KO       0       0     0.0       0      22
 214          RS       4    FLOW     0.0     0.0
 215          RC    0.04    0.04    0.04    9657   0.007
              * IWTS30_2
 216          RX       0     6.5      13      57     102     104     109     110
 217          RY    1728  1725.5    1724    1723    1724  1725.5    1727    1728
```

```
                    *
                    *
 1                                         HEC-1 INPUT                                         PAGE  6

 LINE               ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  218               KK   IW377
  219               KO       0       0     0.0       1      22
  220               BA  0.1125
  221               LG   0.304   0.382   5.921   0.188   5.357
  222               UC   0.408   0.519
                    * Natural Time-Area Relation
  223               UA       0       3       5       8      12      20      43      75      90      96
  224               UA     100
                    *
                    *
                    * *** STAGE DISCHARGE / STORAGE BEHIND STRUCTURE SR010 (HWY74 CULVERT)

  225               KK  SSR010
  226               RS       1    STOR       0
  227               SQ       0      36     100     160
  228               SA       0     .05     .41    1.98
  229               SE  2021.3    2024    2026    2028
                    *
                    *
                    * ROUTE UPDATED 4/14/4

  230               KK  RIW377
  231               KO       0       0     0.0       0      22
  232               RS       6    FLOW     0.0     0.0
  233               RC    0.04    0.04    0.04    6588  0.0096
                    * TSR371
  234               RX       0     142     486     525     651     770    1000    1518
  235               RY    1900    1900    1899    1897    1896    1899  1899.5    1900
                    *
                    *

  236               KK   IW374
  237               KO       0       0     0.0       1      22
  238               BA  0.3874
  239               LG   0.315   0.161   8.147   0.086  12.602
  240               UC   0.442   0.345
                    * Natural Time-Area Relation
  241               UA       0       3       5       8      12      20      43      75      90      96
  242               UA     100
                    *
                    *
                    * RAILROAD DIVERSION RECOVERY: ALONG RAILROAD FROM STRUCTURE RR40

  243               KK    D371
  244               KO       0       0     0.0       0      22
  245               DR   DO371
                    *
                    *
                    * ROUTE UPDATED 4/14/4
 1                                         HEC-1 INPUT                                         PAGE  7

 LINE               ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  246               KK   RD371
  247               KO       0       0     0.0       0      22
  248               RS       1    FLOW     0.0     0.0
  249               RC   0.043   0.035   0.043    1409  0.0014
                    * WITS130
  250               RX       0     400     456     575     620     650     660     682
  251               RY  1396.5    1394  1393.5    1393    1392    1394    1395  1396.5
                    *
                    *
                    * Combines RD371, IW374 and RIW377

  252               KK  CIW374
  253               KO       0       0     0.0       0      22
                    * Hard Coded
  254               HC       3    0.54
                    *
                    *
                    * ROUTE UPDATED 4/14/4

  255               KK  RIW374
  256               KO       0       0     0.0       0      22
  257               RS      15    FLOW     0.0     0.0
  258               RC    0.04    0.04    0.04   20437  0.0081
                    * TSR371
  259               RX       0     142     486     525     651     770    1000    1518
  260               RY    1900    1900    1899    1897    1896    1899  1899.5    1900
                    *
                    *

  261               KK   IW386
  262               KO       0       0     0.0       1      22
  263               BA  0.3731
  264               LG   0.334   0.192   8.439   0.072   5.278
  265               UC   0.838   0.855
                    * Natural Time-Area Relation
  266               UA       0       3       5       8      12      20      43      75      90      96
  267               UA     100
                    *
                    *
                    * ROUTE UPDATED 4/14/4

  268               KK  RIW386
  269               KO       0       0     0.0       0      22
  270               RS       6    FLOW     0.0     0.0
  271               RC   0.043   0.035   0.043   10311  0.0078
```

```
                   * IWTS20_1
 272               RX       0      21      75      93     234     280     301     391
 273               RY    1952    1949    1948    1946    1945    1948  1948.5    1952
                   *
                   *
1                                              HEC-1 INPUT                                        PAGE  8

 LINE              ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 274               KK   IW382
 275               KO       0       0     0.0       1      22
 276               BA  0.6196
 277               LG   0.322   0.275   6.319   0.164   8.175
 278               UC   0.642   0.555
                   * Urban Time-Area Relation
 279               UA       0       5      16      30      65      77      84      90      94      97
 280               UA     100
                   *
                   *
                   * Combines IW382 and RIW386

 281               KK  CIW382
 282               KO       0       0     0.0       0      22
 283               HC       2
                   *
                   * US60 Diversion: Main path to D382A, Diversion to CIW381
                   * From Structures US006 and US007, See Appendix D.5 for analysis

 284               KK   D382B
 285               KO       0       0     0.0       0      22
 286               DT  DO382B
 287               DI       0      24     180   10000
 288               DQ       0      24     180     180
                   *
                   * Railroad Diversion: Main path to C359*, Diversion to CIW384
                   * From Structure RR90 and RR100, See Appendix D.5 for analysis

 289               KK   D382A
 290               KO       0       0     0.0       0      22
 291               DT  DO382A
 292               DI       0      14      60     200     315     448     629    1371
 293               DQ       0       0       0       0      55     174     338    1045
                   *
                   *
                   * ROUTE UPDATED 4/14/4

 294               KK  RIW382
 295               KO       0       0     0.0       0      22
 296               RS       3    FLOW     0.0     0.0
 297               RC    0.04    0.04    0.04    4964   0.012
                   * TSR371
 298               RX       0     142     486     525     651     770    1000    1518
 299               RY    1900    1900    1899    1897    1896    1899  1899.5    1900
                   *
                   *

 300               KK   IW384
 301               KO       0       0     0.0       1      22
 302               BA  0.0825
 303               LG   0.343    0.15   8.675   0.065   7.206
 304               UC   0.308   0.296
                   * Natural Time-Area Relation
 305               UA       0       3       5       8      12      20      43      75      90      96
1                                              HEC-1 INPUT                                        PAGE  9

 LINE              ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 306               UA     100
                   *
                   *
                   * Railroad Diversion Recovery: Outflow from structures RR90 AND RR100

 307               KK   D382A
 308               KO       0       0     0.0       0      22
 309               DR  DO382A
                   *
                   *
                   * ROUTE UPDATED 4/14/4

 310               KK  RD382A
 311               KO       0       0     0.0       0      22
 312               RS       1    FLOW     0.0     0.0
 313               RC   0.043   0.035   0.043    1172  0.0068
                   * WITS130
 314               RX       0     400     456     575     620     650     660     682
 315               RY  1396.5    1394  1393.5    1393    1392    1394    1395  1396.5
                   *
                   *
                   * Combines RD382A and IW384

 316               KK  CIW384
 317               KO       0       0     0.0       0      22
                   * Hard Coded
 318               HC       2    0.41
                   *
                   *
                   * ROUTE UPDATED 4/14/4

 319               KK  RIW384
 320               KO       0       0     0.0       0      22
 321               RS       3    FLOW     0.0     0.0
 322               RC    0.04    0.04    0.04    4694  0.0124
                   * TSR371
 323               RX       0     142     486     525     651     770    1000    1518
 324               RY    1900    1900    1899    1897    1896    1899  1899.5    1900
```

```
            *
            *
 325        KK   IW381
 326        KO       0       0     0.0       1      22
 327        BA  0.3841
 328        LG   0.309    0.19   9.152   0.056  11.882
 329        UC   0.650   0.799
            * Natural Time-Area Relation
 330        UA       0       3       5       8      12      20      43      75      90      96
 331        UA     100
            *
            *
            *
            * This diversion is not routed because the distance traveled from the actual
            * point of diversion (not CIW382) to CIW382 is approximately the same as the
            * distance from the same point of diversion to CIW381.  Thus to avoid double
            * counting storage in the routes, a route for the diversion was not included
            * in the model.
            *
            * US60 Diversion Recovery: Outflow from structures US006 and US007
1                                       HEC-1 INPUT                                          PAGE 10

 LINE       ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 332        KK   D382B
 333        KO       0       0     0.0       0      22
 334        DR  DO382B
            *
            *
            * Combines D382B and IW381

 335        KK  CIW381
            * Hard Coded
 336        HC       2    0.64
            *
            *
            * ROUTE UPDATED 4/14/4

 337        KK  RIW381
 338        KO       0       0     0.0       0      22
 339        RS       3    FLOW     0.0     0.0
 340        RC    0.04    0.04    0.04    4964  0.0096
            * TSR371
 341        RX       0     142     486     525     651     770    1000    1518
 342        RY    1900    1900    1899    1897    1896    1899  1899.5    1900
            *
            *
            * Combines RIW381, RIW382 and RIW384

 343        KK   C359*
 344        KO       0       0     0.0       0      22
            * Hard Coded
 345        HC       3    1.45
            *
            *
            * ROUTE UPDATED 4/14/4

 346        KK   R359*
 347        KO       0       0     0.0       0      22
 348        RS       4    FLOW     0.0     0.0
 349        RC    0.04    0.04    0.04    9280  0.0103
            * IWTS30_2
 350        RX       0     6.5      13      57     102     104     109     110
 351        RY    1728  1725.5    1724    1723    1724  1725.5    1727    1728
            *
            *

 352        KK   IW359
 353        KO       0       0     0.0       1      22
 354        BA   2.912
 355        LG   0.345    0.25   5.939   0.187   6.181
 356        UC   0.983   0.574
            * Natural Time-Area Relation
 357        UA       0       3       5       8      12      20      43      75      90      96
 358        UA     100
            *
            *
            * Combines IW359, R359*, RIW374 and RIW366
1                                       HEC-1 INPUT                                          PAGE 11

 LINE       ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 359        KK  CIW359
 360        KO       0       0     0.0       0      22
 361        HC       4
            *
            *
            * ROUTE UPDATED 4/14/4

 362        KK  RIW359
 363        KO       0       0     0.0       0      22
 364        RS       1    FLOW     0.0     0.0
 365        RC    0.04    0.04    0.04    4667  0.0051
            * IWTS30_2 modified
 366        RX       0     6.5      13      57     102     104     109     110
 367        RY    1730  1725.5    1724    1723    1724  1725.5    1727    1730
            *
            *
            *
            * ************************************************************************** *
            * ********************** END OF IONA WASH REGION 1 ************************** *
            * ************************************************************************** *
            *
```

```
                 *
                 * ***************************************************************************** *
                 * ******************** BEGINNING OF IONA WASH REGION 3 ************************ *
                 * ***************************************************************************** *
                 *
                 *
                 *
                 *

     368         KK  IW353A
     369         KO       0        0     0.0       1      22
     370         BA  0.7164
     371         LG    0.35     0.25   5.876   0.191     5.0
     372         UC   0.629    0.412
                 * Natural Time-Area Relation
     373         UA       0        3       5       8      12      20      43      75      90      96
     374         UA     100
                 *
                 *
                 * Combines IW353A and RIW359

     375         KK  CW353A
     376         KO       0        0     0.0       0      22
     377         HC       2
                 *
                 * ***************************************************************************** *
                 * ********************* END OF IONA WASH REGION 3 ***************************** *
                 * ***************************************************************************** *
                 *
     378         ZZ
1
          SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE   (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

  NO.    (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

  184     IW371
              .
              .
  193         .------->   DO371
  191      D371
              V
              V
  196    RIW371
              .
              .
  202         .         IW366
              .             .
              .             .
  209    CIW366.............
              V
              V
  212    RIW366
              .
              .
  218         .         IW377
              .             V
              .             V
  225         .        SSR010
              .             V
              .             V
  230         .        RIW377
              .             .
              .             .
  236         .             .         IW374
              .             .             .
              .             .             .
  245         .             .             .         .<-------   DO371
  243         .             .             .      D371
              .             .             .         V
              .             .             .         V
  246         .             .             .     RD371
              .             .             .         .
              .             .             .         .
  252         .        CIW374.......................
              .             V
              .             V
  255         .        RIW374
              .             .
              .             .
  261         .             .         IW386
              .             .             V
              .             .             V
  268         .             .        RIW386
              .             .             .
              .             .             .
  274         .             .             .         IW382
              .             .             .             .
              .             .             .             .
  281         .             .        CIW382.............
              .             .             .
              .             .             .
  286         .             .             .------->   DO382B
  284         .             .         D382B
              .             .             .
              .             .             .
  291         .             .             .------->   DO382A
  289         .             .         D382A
              .             .             V
              .             .             V
  294         .             .        RIW382
              .             .             .
              .             .             .
  300         .             .             .         IW384
              .             .             .             .
```

```
 309            .           .           .           .           .<-------  DO382A
 307            .           .           .           .       D382A
                .           .           .           .           V
                .           .           .           .           V
 310            .           .           .           .      RD382A
                .           .           .           .           .
                .           .           .           .           .
 316            .           .           .     CIW384............
                .           .           .           V
                .           .           .           V
 319            .           .           .     RIW384
                .           .           .           .
                .           .           .           .
 325            .           .           .           .       IW381
                .           .           .           .           .
                .           .           .           .           .
 334            .           .           .           .           .           .<-------  DO382B
 332            .           .           .           .           .       D382B
                .           .           .           .           .           .
                .           .           .           .           .           .
 335            .           .           .           .      CIW381............
                .           .           .           .           V
                .           .           .           .           V
 337            .           .           .           .      RIW381
                .           .           .           .           .
                .           .           .           .           .
 343            .           .       C359*........................
                .           .           V
                .           .           V
 346            .           .       R359*
                .           .           .
                .           .           .
 352            .           .           .       IW359
                .           .           .           .
                .           .           .           .
 359       CIW359....................................
                V
                V
 362       RIW359
                .
                .
 368            .     IW353A
                .           .
                .           .
 375       CW353A............
(***) RUNOFF ALSO COMPUTED AT THIS LOCATION
```

```
1*****************************************                                       *****************************************
 *                                       *                                       *                                       *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                                       *   U.S. ARMY CORPS OF ENGINEERS        *
 *            JUN   1998                 *                                       *   HYDROLOGIC ENGINEERING CENTER       *
 *           VERSION 4.1                 *                                       *        609 SECOND STREET              *
 *                                       *                                       *     DAVIS, CALIFORNIA 95616           *
 * RUN DATE   06AUG11  TIME  13:25:46    *                                       *         (916) 756-1104                *
 *                                       *                                       *                                       *
 *****************************************                                       *****************************************
```

```
Wittmann Phase IV Floodplain Delineation Study
August 2011
Mod2 removes subbasin IW358 and CIW357
Mod2 replaces IW353 with IW353A and updates RIW359
Mod2 truncates model at CW353A
****************************************************************************
**-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-**
**-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-**
****************************************************************************
**                                                                        **
**  ADDENDUM TO THE WITTMANN AREA DRAINAGE MASTER STUDY UPDATE HYDROLOGY   **
**                                                                        **
****************************************************************************
**-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-**
**-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-**
****************************************************************************
**                                                                        **
** THE FOLLOWING CHANGES HAVE BEEN MADE TO THE WITTMANN HYDROLOGY MODELS    **
** DATED OCTOBER 2004:                                                    **
**                                                                        **
**     -Diversion added after CTW480                                      **
**          -Main flow (5%) to CTW478                                     **
**          -Diverted flow (95%) to CWI584                                **
**          -Added concentration point CWI584 combining RD480 and WI584   **
**          -Hard coding was added to CTW478                              **
**          -Route added after D480 (Diversion Recovery)                  **
**          -Route RWI584 was adjusted                                    **
**          -Storage Route SCP050 was adjusted                            **
**          -Route R508* was adjusted                                     **
**          -Hard coding for CWI510 was adjusted                          **
**                                                                        **
**     -Diversion D618 was moved from after CPI618 to before RDCP12       **
**          -Updated route RD618 information                              **
**          -Hard coding on CPI618 was adjusted                           **
**          -Hard coding on CPI615 was adjusted                           **
**                                                                        **
**     -Route RPI639 changed from following US60 to CPI636 to route       **
**      through US60/RR structures and combine with CWI506                **
**          -Cards PI639, D524, RD524, CPI639 and RPI639 were changed from **
**           following R624A to follow RWI524                             **
**          -CPI636 was removed-no longer needed to combine PI636 & RPI639 **
**          -RPI639 information was changed to reflect new route          **
**          -CWI506 changed from combining 3 to combine 4:                **
**           RWI525, RWI524, RPI639 & WI506                               **
```

```
**          -Hard coding on CWI506 was adjusted                         **
**          -Hard Coding on CWI500 was adjusted                         **
**                                                                      **
**************************************************************************
**-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-**
**-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-**
**************************************************************************


**************************************************************************
**************************************************************************
**                                                                      **
**    WITTMANN AREA DRAINAGE MASTER STUDY UPDATE-HYDROLOGY MODEL 2004    **
**                                                                      **
**************************************************************************
**************************************************************************
```

PROJECT: Wittmann ADMS Update
CLIENT: Flood Control District of Maricopa County
PREPARED BY: Entellus, Inc.
PROJECT No: FCD 2002C029 Entellus 310.032
FILE NAME: WTEC6-addendum.hc1 CREATED DATE: JUL 01, 2004
MODIFIED DATE: MAY 04, 2005

STORM:
100-year 6-hour Storm

DEVELOPMENT CONDITIONS:
Existing Conditions

MODELING ASSUMPTIONS:

It was assumed that the US60 did not have adequate storage to cause any significant attenuation.

The assumption was made that the CAP Canal embankment would not be breached under a large flood event.

The assumption was made that the Beardsley Canal would not fail under a large storm event (Per District Instruction). In addition, the berm north of the Beardsley canal and east of US60 was assumed to fail (per district Instruction).

For both the CAP and Beardsley Canals, once the berm elevation was reached weir flow was assumed. It was also assumed that any weir flow over the canal that might enter the canal and be diverted out of the study area was insignificant, and thus was ignored. In other words all weir flow over the canal embankment reaches the downstream concentration point.

Typical X-sects were developed, and it was assumed that a typical x-sect could adequately represent various reaches.

Time-Area Relations were used base on the District's Hydrology Manual criteria. Two Time-Area Relation Curves were utilized:
-Urban
-Natural
The Time-Area Relation Curves were taken directly from the manual

MODELING METHODS:

This model utilizes QI cards to input the Padelford hydrographs from the 100-year 6-hour existing conditions model developed by A-N West Inc. for the Padelford Wash Floodplain Delineation Study. The hydrograph was altered from its original form (2-minute interval to 5-minute interval) through simple interpolation.

Clark Unit Hydrographs were used for all subbasins except the two subbasins directly upstream of the Bonita Dam (PD726B and PD740 use S-graphs). The UC parameters were calculated using the WMS7.0 software.

For Basins PD726B and PD740 S-Graphs were utilized per the request of the FCDMC. Limited details regarding the calculations of the S-graphs can be found in the model by the basin KK card. For full details of the S-graph calculations refer to the Appendix.

Normal Depth routing was used for all routing reaches.

Hard coding was used to account for the percentage of area associated with a diversion. Because of the use of JD cards and aereal reduction, hard coding was necessary to properly account for area. For a given diversion a percentage of the flow is routed to two different locations. The same percentage of area follows that diverted flow. In addition the area downstream of the main path is reduced or increased and is hard coded to account for the loss or gain of area. Hard coding was performed based on the 6-hour existing conditions model.

Stage-storage was developed for all the structures along the CAP Canal, as well as along the Beardsley Canal. In addition several stage-storage locations were developed for areas with significant storage along the SR74. No storage was modeled along the US60 and railroad, but the culverts were analyzed for diversion potential. Diversions were placed in the model where deemed appropriate. See appendix for

```
                              details.

                              FLO-2D was utilized to calculate the split flows at
                              concentration points CIW351. CIW357, CIW363 and CWI576.
                              See appendix for modeling details.

                    ****************************************************************************
                    ****************************************************************************


161 IO          OUTPUT CONTROL VARIABLES
                      IPRNT           5  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE

    IT          HYDROGRAPH TIME DATA
                       NMIN           5  MINUTES IN COMPUTATION INTERVAL
                      IDATE      1    0  STARTING DATE
                      ITIME        0000  STARTING TIME
                         NQ        1500  NUMBER OF HYDROGRAPH ORDINATES
                     NDDATE      6    0  ENDING DATE
                     NDTIME        0455  ENDING TIME
                      ICENT          19  CENTURY MARK

                  COMPUTATION INTERVAL    0.08 HOURS
                       TOTAL TIME BASE  124.92 HOURS

         ENGLISH UNITS
              DRAINAGE AREA          SQUARE MILES
              PRECIPITATION DEPTH    INCHES
              LENGTH, ELEVATION      FEET
              FLOW                   CUBIC FEET PER SECOND
              STORAGE VOLUME         ACRE-FEET
              SURFACE AREA           ACRES
              TEMPERATURE            DEGREES FAHRENHEIT

163 JD          INDEX STORM NO. 1
                       STRM        3.40  PRECIPITATION DEPTH
                       TRDA        0.01  TRANSPOSITION DRAINAGE AREA

164 PI            PRECIPITATION PATTERN
                     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                     0.00      0.00      0.00      0.01      0.01      0.01      0.01      0.01      0.01      0.03
                     0.03      0.03      0.05      0.05      0.05      0.15      0.15      0.15      0.03      0.03
                     0.03      0.01      0.01      0.01      0.01      0.01      0.01      0.00      0.00      0.00
                     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                     0.00      0.00

167 JD          INDEX STORM NO. 2
                       STRM        3.38  PRECIPITATION DEPTH
                       TRDA        0.50  TRANSPOSITION DRAINAGE AREA

  0 PI            PRECIPITATION PATTERN
                     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                     0.00      0.00      0.00      0.01      0.01      0.01      0.01      0.01      0.01      0.03
                     0.03      0.03      0.05      0.05      0.05      0.15      0.15      0.15      0.03      0.03
                     0.03      0.01      0.01      0.01      0.01      0.01      0.01      0.00      0.00      0.00
                     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                     0.00      0.00

168 JD          INDEX STORM NO. 3
                       STRM        3.31  PRECIPITATION DEPTH
                       TRDA        2.80  TRANSPOSITION DRAINAGE AREA

169 PI            PRECIPITATION PATTERN
                     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                     0.00      0.00      0.00      0.01      0.01      0.01      0.01      0.01      0.01      0.03
                     0.03      0.03      0.07      0.07      0.07      0.08      0.08      0.08      0.05      0.05
                     0.05      0.02      0.02      0.02      0.01      0.01      0.01      0.00      0.00      0.00
                     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                     0.00      0.00

172 JD          INDEX STORM NO. 4
                       STRM        3.13  PRECIPITATION DEPTH
                       TRDA       16.00  TRANSPOSITION DRAINAGE AREA

173 PI            PRECIPITATION PATTERN
                     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.01
                     0.01      0.01      0.00      0.01      0.00      0.00      0.00      0.00      0.00      0.00
                     0.00      0.00      0.01      0.00      0.00      0.00      0.00      0.01      0.01      0.01
                     0.01      0.01      0.01      0.01      0.01      0.01      0.02      0.02      0.02      0.03
                     0.03      0.03      0.06      0.06      0.06      0.07      0.07      0.07      0.04      0.04
                     0.04      0.02      0.02      0.02      0.01      0.01      0.01      0.01      0.01      0.01
                     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                     0.00      0.00

176 JD          INDEX STORM NO. 5
                       STRM        2.76  PRECIPITATION DEPTH
                       TRDA       90.00  TRANSPOSITION DRAINAGE AREA

177 PI            PRECIPITATION PATTERN
                     0.01      0.01      0.01      0.00      0.00      0.00      0.01      0.01      0.01      0.01
                     0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01
                     0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01
                     0.01      0.01      0.01      0.01      0.01      0.01      0.02      0.02      0.02      0.03
                     0.03      0.03      0.05      0.05      0.05      0.05      0.05      0.05      0.04      0.04
                     0.04      0.02      0.02      0.02      0.02      0.02      0.02      0.01      0.01      0.01
                     0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01
                     0.01      0.01
```

```
180 JD          INDEX STORM NO.  6
                       STRM        1.94  PRECIPITATION DEPTH
                       TRDA      500.00  TRANSPOSITION DRAINAGE AREA

181 PI            PRECIPITATION PATTERN
                    0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01
                    0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01
                    0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01
                    0.01      0.01      0.01      0.01      0.01      0.01      0.02      0.02      0.02      0.03
                    0.03      0.03      0.04      0.04      0.04      0.04      0.04      0.04      0.04      0.04
                    0.04      0.03      0.03      0.03      0.02      0.02      0.02      0.01      0.01      0.01
                    0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01
                    0.01      0.01

*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

              **************
              *            *
184 KK        *   IW371    *
              *            *
              **************

185 KO          OUTPUT CONTROL VARIABLES
                       IPRNT          5  PRINT CONTROL
                       IPLOT          0  PLOT CONTROL
                       QSCAL         0.  HYDROGRAPH PLOT SCALE
                       IPNCH          1  PUNCH COMPUTED HYDROGRAPH
                        IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                       ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                       ISAV2       1500  LAST ORDINATE PUNCHED OR SAVED
                      TIMINT      0.083  TIME INTERVAL IN HOURS

*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

              **************
              *            *
191 KK        *    D371    *
              *            *
              **************

192 KO          OUTPUT CONTROL VARIABLES
                       IPRNT          5  PRINT CONTROL
                       IPLOT          0  PLOT CONTROL
                       QSCAL         0.  HYDROGRAPH PLOT SCALE
                       IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                        IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                       ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                       ISAV2       1500  LAST ORDINATE PUNCHED OR SAVED
                      TIMINT      0.083  TIME INTERVAL IN HOURS

*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

              **************
              *            *
196 KK        *   RIW371   *
              *            *
              **************

197 KO          OUTPUT CONTROL VARIABLES
                       IPRNT          5  PRINT CONTROL
                       IPLOT          0  PLOT CONTROL
                       QSCAL         0.  HYDROGRAPH PLOT SCALE
                       IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                        IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                       ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                       ISAV2       1500  LAST ORDINATE PUNCHED OR SAVED
                      TIMINT      0.083  TIME INTERVAL IN HOURS

*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

              **************
              *            *
202 KK        *   IW366    *
              *            *
              **************

203 KO          OUTPUT CONTROL VARIABLES
                       IPRNT          5  PRINT CONTROL
                       IPLOT          0  PLOT CONTROL
                       QSCAL         0.  HYDROGRAPH PLOT SCALE
                       IPNCH          1  PUNCH COMPUTED HYDROGRAPH
                        IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                       ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                       ISAV2       1500  LAST ORDINATE PUNCHED OR SAVED
                      TIMINT      0.083  TIME INTERVAL IN HOURS

*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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```
                  ***************
                  *             *
209 KK            *    CIW366   *
                  *             *
                  ***************

210 KO            OUTPUT CONTROL VARIABLES
                        IPRNT          5  PRINT CONTROL
                        IPLOT          0  PLOT CONTROL
                        QSCAL         0.  HYDROGRAPH PLOT SCALE
                        IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                         IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2       1500  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT      0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** 

                  ***************
                  *             *
212 KK            *    RIW366   *
                  *             *
                  ***************

213 KO            OUTPUT CONTROL VARIABLES
                        IPRNT          5  PRINT CONTROL
                        IPLOT          0  PLOT CONTROL
                        QSCAL         0.  HYDROGRAPH PLOT SCALE
                        IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                         IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2       1500  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT      0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** 

                  ***************
                  *             *
218 KK            *     IW377   *
                  *             *
                  ***************

219 KO            OUTPUT CONTROL VARIABLES
                        IPRNT          5  PRINT CONTROL
                        IPLOT          0  PLOT CONTROL
                        QSCAL         0.  HYDROGRAPH PLOT SCALE
                        IPNCH          1  PUNCH COMPUTED HYDROGRAPH
                         IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2       1500  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT      0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** 

                  ***************
                  *             *
230 KK            *    RIW377   *
                  *             *
                  ***************

231 KO            OUTPUT CONTROL VARIABLES
                        IPRNT          5  PRINT CONTROL
                        IPLOT          0  PLOT CONTROL
                        QSCAL         0.  HYDROGRAPH PLOT SCALE
                        IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                         IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2       1500  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT      0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** 

                  ***************
                  *             *
236 KK            *     IW374   *
                  *             *
                  ***************

237 KO            OUTPUT CONTROL VARIABLES
                        IPRNT          5  PRINT CONTROL
                        IPLOT          0  PLOT CONTROL
                        QSCAL         0.  HYDROGRAPH PLOT SCALE
                        IPNCH          1  PUNCH COMPUTED HYDROGRAPH
                         IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2       1500  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT      0.083  TIME INTERVAL IN HOURS
```

```
*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

              **************
              *            *
 243 KK       *    D371    *
              *            *
              **************

 244 KO          OUTPUT CONTROL VARIABLES
                       IPRNT           5  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE
                       IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                        IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                       ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                       ISAV2        1500  LAST ORDINATE PUNCHED OR SAVED
                      TIMINT       0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

              **************
              *            *
 246 KK       *   RD371    *
              *            *
              **************

 247 KO          OUTPUT CONTROL VARIABLES
                       IPRNT           5  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE
                       IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                        IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                       ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                       ISAV2        1500  LAST ORDINATE PUNCHED OR SAVED
                      TIMINT       0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

              **************
              *            *
 252 KK       *   CIW374   *
              *            *
              **************

 253 KO          OUTPUT CONTROL VARIABLES
                       IPRNT           5  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE
                       IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                        IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                       ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                       ISAV2        1500  LAST ORDINATE PUNCHED OR SAVED
                      TIMINT       0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

              **************
              *            *
 255 KK       *   RIW374   *
              *            *
              **************

 256 KO          OUTPUT CONTROL VARIABLES
                       IPRNT           5  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE
                       IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                        IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                       ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                       ISAV2        1500  LAST ORDINATE PUNCHED OR SAVED
                      TIMINT       0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

              **************
              *            *
 261 KK       *   IW386    *
              *            *
              **************

 262 KO          OUTPUT CONTROL VARIABLES
                       IPRNT           5  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE
                       IPNCH           1  PUNCH COMPUTED HYDROGRAPH
                        IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                       ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
```

```
                  ISAV2        1500  LAST ORDINATE PUNCHED OR SAVED
                 TIMINT       0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

              ***************
              *             *
 268 KK       *    RIW386   *
              *             *
              ***************

 269 KO             OUTPUT CONTROL VARIABLES
                        IPRNT           5  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
                        IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                         IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2        1500  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT       0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

              ***************
              *             *
 274 KK       *     IW382   *
              *             *
              ***************

 275 KO             OUTPUT CONTROL VARIABLES
                        IPRNT           5  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
                        IPNCH           1  PUNCH COMPUTED HYDROGRAPH
                         IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2        1500  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT       0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

              ***************
              *             *
 281 KK       *    CIW382   *
              *             *
              ***************

 282 KO             OUTPUT CONTROL VARIABLES
                        IPRNT           5  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
                        IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                         IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2        1500  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT       0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

              ***************
              *             *
 284 KK       *     D382B   *
              *             *
              ***************

 285 KO             OUTPUT CONTROL VARIABLES
                        IPRNT           5  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
                        IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                         IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2        1500  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT       0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

              ***************
              *             *
 289 KK       *     D382A   *
              *             *
              ***************

 290 KO             OUTPUT CONTROL VARIABLES
                        IPRNT           5  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
```

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                  QSCAL          0.  HYDROGRAPH PLOT SCALE
                  IPNCH          0   PUNCH COMPUTED HYDROGRAPH
                   IOUT         22   SAVE HYDROGRAPH ON THIS UNIT
                  ISAV1          1   FIRST ORDINATE PUNCHED OR SAVED
                  ISAV2       1500   LAST ORDINATE PUNCHED OR SAVED
                 TIMINT      0.083   TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

           **************
           *            *
  294 KK   *   RIW382   *
           *            *
           **************

  295 KO        OUTPUT CONTROL VARIABLES
                  IPRNT          5   PRINT CONTROL
                  IPLOT          0   PLOT CONTROL
                  QSCAL          0.  HYDROGRAPH PLOT SCALE
                  IPNCH          0   PUNCH COMPUTED HYDROGRAPH
                   IOUT         22   SAVE HYDROGRAPH ON THIS UNIT
                  ISAV1          1   FIRST ORDINATE PUNCHED OR SAVED
                  ISAV2       1500   LAST ORDINATE PUNCHED OR SAVED
                 TIMINT      0.083   TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

           **************
           *            *
  300 KK   *    IW384   *
           *            *
           **************

  301 KO        OUTPUT CONTROL VARIABLES
                  IPRNT          5   PRINT CONTROL
                  IPLOT          0   PLOT CONTROL
                  QSCAL          0.  HYDROGRAPH PLOT SCALE
                  IPNCH          1   PUNCH COMPUTED HYDROGRAPH
                   IOUT         22   SAVE HYDROGRAPH ON THIS UNIT
                  ISAV1          1   FIRST ORDINATE PUNCHED OR SAVED
                  ISAV2       1500   LAST ORDINATE PUNCHED OR SAVED
                 TIMINT      0.083   TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

           **************
           *            *
  307 KK   *    D382A   *
           *            *
           **************

  308 KO        OUTPUT CONTROL VARIABLES
                  IPRNT          5   PRINT CONTROL
                  IPLOT          0   PLOT CONTROL
                  QSCAL          0.  HYDROGRAPH PLOT SCALE
                  IPNCH          0   PUNCH COMPUTED HYDROGRAPH
                   IOUT         22   SAVE HYDROGRAPH ON THIS UNIT
                  ISAV1          1   FIRST ORDINATE PUNCHED OR SAVED
                  ISAV2       1500   LAST ORDINATE PUNCHED OR SAVED
                 TIMINT      0.083   TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

           **************
           *            *
  310 KK   *   RD382A   *
           *            *
           **************

  311 KO        OUTPUT CONTROL VARIABLES
                  IPRNT          5   PRINT CONTROL
                  IPLOT          0   PLOT CONTROL
                  QSCAL          0.  HYDROGRAPH PLOT SCALE
                  IPNCH          0   PUNCH COMPUTED HYDROGRAPH
                   IOUT         22   SAVE HYDROGRAPH ON THIS UNIT
                  ISAV1          1   FIRST ORDINATE PUNCHED OR SAVED
                  ISAV2       1500   LAST ORDINATE PUNCHED OR SAVED
                 TIMINT      0.083   TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

           **************
           *            *
  316 KK   *   CIW384   *
           *            *
           **************
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317 KO          OUTPUT CONTROL VARIABLES
                        IPRNT           5  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
                        IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                         IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2        1500  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT       0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

            **************
            *            *
319 KK      *   RIW384   *
            *            *
            **************

320 KO          OUTPUT CONTROL VARIABLES
                        IPRNT           5  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
                        IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                         IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2        1500  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT       0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

            **************
            *            *
325 KK      *    IW381   *
            *            *
            **************

326 KO          OUTPUT CONTROL VARIABLES
                        IPRNT           5  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
                        IPNCH           1  PUNCH COMPUTED HYDROGRAPH
                         IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2        1500  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT       0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

            **************
            *            *
332 KK      *    D382B   *
            *            *
            **************

333 KO          OUTPUT CONTROL VARIABLES
                        IPRNT           5  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
                        IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                         IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2        1500  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT       0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

            **************
            *            *
337 KK      *   RIW381   *
            *            *
            **************

338 KO          OUTPUT CONTROL VARIABLES
                        IPRNT           5  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
                        IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                         IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2        1500  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT       0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

            **************
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              *             *
343 KK        *      C359*  *
              *             *
              **************

344 KO             OUTPUT CONTROL VARIABLES
                         IPRNT          5  PRINT CONTROL
                         IPLOT          0  PLOT CONTROL
                         QSCAL         0.  HYDROGRAPH PLOT SCALE
                         IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                          IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                         ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                         ISAV2       1500  LAST ORDINATE PUNCHED OR SAVED
                        TIMINT      0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

              **************
              *             *
346 KK        *      R359*  *
              *             *
              **************

347 KO             OUTPUT CONTROL VARIABLES
                         IPRNT          5  PRINT CONTROL
                         IPLOT          0  PLOT CONTROL
                         QSCAL         0.  HYDROGRAPH PLOT SCALE
                         IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                          IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                         ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                         ISAV2       1500  LAST ORDINATE PUNCHED OR SAVED
                        TIMINT      0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

              **************
              *             *
352 KK        *      IW359  *
              *             *
              **************

353 KO             OUTPUT CONTROL VARIABLES
                         IPRNT          5  PRINT CONTROL
                         IPLOT          0  PLOT CONTROL
                         QSCAL         0.  HYDROGRAPH PLOT SCALE
                         IPNCH          1  PUNCH COMPUTED HYDROGRAPH
                          IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                         ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                         ISAV2       1500  LAST ORDINATE PUNCHED OR SAVED
                        TIMINT      0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

              **************
              *             *
359 KK        *     CIW359  *
              *             *
              **************

360 KO             OUTPUT CONTROL VARIABLES
                         IPRNT          5  PRINT CONTROL
                         IPLOT          0  PLOT CONTROL
                         QSCAL         0.  HYDROGRAPH PLOT SCALE
                         IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                          IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                         ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                         ISAV2       1500  LAST ORDINATE PUNCHED OR SAVED
                        TIMINT      0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

              **************
              *             *
362 KK        *     RIW359  *
              *             *
              **************

363 KO             OUTPUT CONTROL VARIABLES
                         IPRNT          5  PRINT CONTROL
                         IPLOT          0  PLOT CONTROL
                         QSCAL         0.  HYDROGRAPH PLOT SCALE
                         IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                          IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                         ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                         ISAV2       1500  LAST ORDINATE PUNCHED OR SAVED
                        TIMINT      0.083  TIME INTERVAL IN HOURS
```

*** ***

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          ***************
          *             *
368 KK    *    IW353A   *
          *             *
          ***************

369 KO          OUTPUT CONTROL VARIABLES
                        IPRNT           5  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
                        IPNCH           1  PUNCH COMPUTED HYDROGRAPH
                         IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2        1500  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT       0.083  TIME INTERVAL IN HOURS
```

*** ***

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          ***************
          *             *
375 KK    *    CW353A   *
          *             *
          ***************

376 KO          OUTPUT CONTROL VARIABLES
                        IPRNT           5  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
                        IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                         IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2        1500  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT       0.083  TIME INTERVAL IN HOURS
```

1

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+	HYDROGRAPH AT	IW371	103.	4.08	12.	3.	1.	0.05		
+	DIVERSION TO	DO371	77.	4.08	6.	2.	1.	0.05		
+	HYDROGRAPH AT	D371	26.	4.08	5.	1.	0.	0.05		
+	ROUTED TO	RIW371	15.	6.50	5.	1.	0.	0.05		
+	HYDROGRAPH AT	IW366	1107.	4.58	209.	52.	17.	1.06		
+	2 COMBINED AT	CIW366	1105.	4.58	213.	54.	18.	1.07		
+	ROUTED TO	RIW366	957.	5.00	212.	54.	18.	1.07		
+	HYDROGRAPH AT	IW377	153.	4.25	22.	6.	2.	0.11		
+	ROUTED TO	SSR010	121.	4.50	22.	6.	2.	0.11		
+	ROUTED TO	RIW377	98.	5.25	22.	6.	2.	0.11		
+	HYDROGRAPH AT	IW374	758.	4.25	97.	24.	8.	0.39		
+	HYDROGRAPH AT	D371	77.	4.08	6.	2.	1.	0.05		
+	ROUTED TO	RD371	40.	4.33	6.	2.	1.	0.05		
+	3 COMBINED AT	CIW374	784.	4.25	124.	31.	10.	0.54		
+	ROUTED TO	RIW374	404.	5.92	121.	31.	10.	0.54		
+	HYDROGRAPH AT	IW386	395.	4.58	90.	23.	8.	0.37		
+	ROUTED TO	RIW386	301.	5.42	89.	23.	8.	0.37		
+	HYDROGRAPH AT	IW382	738.	4.33	131.	33.	11.	0.62		
+	2 COMBINED AT	CIW382	685.	4.33	211.	54.	18.	0.99		

+	DIVERSION TO	DO382B	180.	3.92	112.	29.	10.	0.99
+	HYDROGRAPH AT	D382B	505.	4.33	99.	25.	8.	0.99
+	DIVERSION TO	DO382A	226.	4.33	20.	5.	2.	0.99
+	HYDROGRAPH AT	D382A	279.	4.33	79.	20.	7.	0.99
+	ROUTED TO	RIW382	253.	4.83	79.	20.	7.	0.99
+	HYDROGRAPH AT	IW384	184.	4.17	21.	5.	2.	0.08
+	HYDROGRAPH AT	D382A	226.	4.33	20.	5.	2.	0.99
+	ROUTED TO	RD382A	196.	4.42	20.	5.	2.	0.99
+	2 COMBINED AT	CIW384	390.	4.33	47.	12.	4.	0.41
+	ROUTED TO	RIW384	310.	4.67	47.	12.	4.	0.41
+	HYDROGRAPH AT	IW381	454.	4.50	98.	25.	8.	0.38
+	HYDROGRAPH AT	D382B	180.	3.92	112.	29.	10.	0.99
+	2 COMBINED AT	CIW381	619.	4.50	208.	54.	18.	0.64
+	ROUTED TO	RIW381	574.	4.83	207.	54.	18.	0.64
+	3 COMBINED AT	C359*	990.	4.83	320.	82.	27.	1.45
+	ROUTED TO	R359*	937.	5.17	317.	82.	27.	1.45
+	HYDROGRAPH AT	IW359	2496.	4.75	537.	135.	45.	2.91
+	4 COMBINED AT	CIW359	3423.	5.00	1059.	274.	91.	5.97
+	ROUTED TO	RIW359	3323.	5.08	1054.	274.	91.	5.97
+	HYDROGRAPH AT	IW353A	1029.	4.42	145.	36.	12.	0.72
+	2 COMBINED AT	CW353A	3561.	5.08	1156.	301.	100.	6.69

*** NORMAL END OF HEC-1 ***

```
1****************************************                    ****************************************
*                                      *                    *                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                    *   U.S. ARMY CORPS OF ENGINEERS       *
*             JUN   1998               *                    *   HYDROLOGIC ENGINEERING CENTER      *
*           VERSION 4.1                *                    *        609 SECOND STREET             *
*                                      *                    *     DAVIS, CALIFORNIA 95616          *
*  RUN DATE   05AUG11  TIME  16:03:06  *                    *        (916) 756-1104                *
*                                      *                    *                                      *
****************************************                    ****************************************


                    X     X  XXXXXXX    XXXXX          X
                    X     X  X         X     X        XX
                    X     X  X         X               X
                    XXXXXXX  XXXX      X       XXXXX   X
                    X     X  X         X               X
                    X     X  X         X     X         X
                    X     X  XXXXXXX    XXXXX         XXX


 THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

 THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
 THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
 NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
 DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
 KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1                                        HEC-1 INPUT                                        PAGE  1

 LINE      ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

   1       ID   Wittmann Phase IV Floodplain Delineation Study
   2       ID   August 2011
   3       ID   Mod3 removes subbasin IW358, IW353, CIW357, and C359
   4       ID   Mod3 replaces IW359 with IW359A and updates RIW366 and RIW374
   5       ID   Mod3 truncates model at CW359A
   6       ID   ***************************************************************************
   7       ID   **-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-**
   8       ID   **-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-**
   9       ID   ***************************************************************************
  10       ID   **                                                                       **
  11       ID   **  ADDENDUM TO THE WITTMANN AREA DRAINAGE MASTER STUDY UPDATE HYDROLOGY  **
  12       ID   **                                                                       **
  13       ID   ***************************************************************************
  14       ID   **-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-**
  15       ID   **-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-**
  16       ID   ***************************************************************************
  17       ID   **                                                                       **
  18       ID   ** THE FOLLOWING CHANGES HAVE BEEN MADE TO THE WITTMANN HYDROLOGY MODELS  **
  19       ID   ** DATED OCTOBER 2004:                                                    **
  20       ID   **                                                                       **
  21       ID   **      -Diversion added after CTW480                                    **
  22       ID   **           -Main flow (5%) to CTW478                                   **
  23       ID   **           -Diverted flow (95%) to CWI584                              **
  24       ID   **           -Added concentration point CWI584 combining RD480 and WI584 **
  25       ID   **           -Hard coding was added to CTW478                            **
  26       ID   **           -Route added after D480 (Diversion Recovery)                **
  27       ID   **           -Route RWI584 was adjusted                                  **
  28       ID   **           -Storage Route SCP050 was adjusted                          **
  29       ID   **           -Route R508* was adjusted                                   **
  30       ID   **           -Hard coding for CWI510 was adjusted                        **
  31       ID   **                                                                       **
  32       ID   **      -Diversion D618 was moved from after CPI618 to before RDCP12     **
  33       ID   **           -Updated route RD618 information                            **
  34       ID   **           -Hard coding on CPI618 was adjusted                         **
  35       ID   **           -Hard coding on CPI615 was adjusted                         **
  36       ID   **                                                                       **
  37       ID   **      -Route RPI639 changed from following US60 to CPI636 to route     **
  38       ID   **       through US60/RR structures and combine with CWI506              **
  39       ID   **           -Cards PI639, D524, RD524, CPI639 and RPI639 were changed from **
  40       ID   **            following R624A to follow RWI524                           **
  41       ID   **           -CPI636 was removed-no longer needed to combine PI636 & RPI639 **
  42       ID   **           -RPI639 information was changed to reflect new route        **
  43       ID   **           -CWI506 changed from combining 3 to combine 4:              **
  44       ID   **            RWI525, RWI524, RPI639 & WI506                             **
  45       ID   **           -Hard coding on CWI506 was adjusted                         **
  46       ID   **           -Hard Coding on CWI500 was adjusted                         **
  47       ID   **                                                                       **
  48       ID   ***************************************************************************
  49       ID   **-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-**
  50       ID   **-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-**
  51       ID   ***************************************************************************
  52       ID
  53       ID
  54       ID
  55       ID   ***************************************************************************
1                                        HEC-1 INPUT                                        PAGE  2

 LINE      ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  56       ID   ***************************************************************************
  57       ID   **                                                                       **
  58       ID   **    WITTMANN AREA DRAINAGE MASTER STUDY UPDATE-HYDROLOGY MODEL 2004    **
  59       ID   **                                                                       **
  60       ID   ***************************************************************************
  61       ID   ***************************************************************************
  62       ID
  63       ID   PROJECT:                    Wittmann ADMS Update
  64       ID   CLIENT:                     Flood Control District of Maricopa County
```

```
ID   PREPARED BY:              Entellus, Inc.
ID   PROJECT NO:               FCD 2002C029               Entellus 310.032
ID   FILE NAME: WTEC6-addendum.hcl            CREATED DATE: JUL 01, 2004
ID                                           MODIFIED DATE: MAY 04, 2005
ID
ID   STORM:
ID                             100-year 6-hour Storm
ID
ID   DEVELOPMENT CONDITIONS:
ID                             Existing Conditions
ID
ID   MODELING ASSUMPTIONS:
ID                             It was assumed that the US60 did not have adequate
ID                             storage to cause any significant attenuation.
ID
ID                             The assumption was made that the CAP Canal embankment
ID                             would not be breached under a large flood event.
ID
ID                             The assumption was made that the Beardsley Canal would
ID                             not fail under a large storm event (Per District
ID                             Instruction).  In addition, the berm north of the
ID                             Beardsley canal and east of US60 was assumed to fail
ID                             (per district Instruction).
ID
ID                             For both the CAP and Beardsley Canals, once the berm
ID                             elevation was reached weir flow was assumed.  It was
ID                             also assumed that any weir flow over the canal that
ID                             might enter the canal and be diverted out of the study
ID                             area was insignificant, and thus was ignored.  In other
ID                             words all weir flow over the canal embankment reaches
ID                             the downstream concentration point.
ID
ID                             Typical X-sects were developed, and it was assumed
ID                             that a typical x-sect could adequately represent
ID                             various reaches.
ID
ID                             Time-Area Relations were used base on the District's
ID                             Hydrology Manual criteria.  Two Time-Area Relation
ID                             Curves were utilized:
ID                                     -Urban
ID                                     -Natural
ID                             The Time-Area Relation Curves were taken directly
ID                             from the manual
ID
ID   MODELING METHODS:
ID                             This model utilizes QI cards to input the Padelford
1                                   HEC-1 INPUT                                      PAGE  3

LINE      ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

ID                             hydrographs from the 100-year 6-hour existing
ID                             conditions model developed by A-N West Inc. for the
ID                             Padelford Wash Floodplain Delineation Study.  The
ID                             hydrograph was altered from its original form
ID                             (2-minute interval to 5-minute interval) through
ID                             simple interpolation.
ID
ID                             Clark Unit Hydrographs were used for all subbasins
ID                             except the two subbasins directly upstream of the
ID                             Bonita Dam (PD726B and PD740 use S-graphs).  The UC
ID                             parameters were calculated using the WMS7.0 software.
ID
ID                             For Basins PD726B and PD740 S-Graphs were utilized per
ID                             the request of the FCDMC.  Limited details regarding
ID                             the calculations of the S-graphs can be found in the
ID                             model by the basin KK card.  For full details of the
ID                             S-graph calculations refer to the Appendix.
ID
ID                             Normal Depth routing was used for all routing reaches.
ID
ID                             Hard coding was used to account for the percentage of
ID                             area associated with a diversion.  Because of the use
ID                             of JD cards and aereal reduction, hard coding was
ID                             necessary to properly account for area.  For a given
ID                             diversion a percentage of the flow is routed to two
ID                             different locations.  The same percentage of area
ID                             follows that diverted flow.  In addition the area
ID                             downstream of the main path is reduced or increased and
ID                             is hard coded to account for the loss or gain of area.
ID                             Hard coding was performed based on the 6-hour existing
ID                             conditions model.
ID
ID                             Stage-storage was developed for all the structures
ID                             along the CAP Canal, as well as along the Beardsley
ID                             Canal.  In addition several stage-storage locations
ID                             were developed for areas with significant storage
ID                             along the SR74.  No storage was modeled along the US60
ID                             and railroad, but the culverts were analyzed for
ID                             diversion potential.  Diversions were placed in the
ID                             model where deemed appropriate.  See appendix for
ID                             details.
ID
ID                             FLO-2D was utilized to calculate the split flows at
ID                             concentration points CIW351. CIW357, CIW363 and CWI576.
ID                             See appendix for modeling details.
ID
ID   ****************************************************************************
ID   ****************************************************************************
ID
*DIAGRAM
IT        5                    0     1500
IO        5
IN       15                    0
JD     3.40     0.01
* 6-hour distribution
1                                   HEC-1 INPUT                                      PAGE  4
```

```
LINE           ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 164           PC   0.000    0.008    0.016    0.025    0.033    0.041    0.050    0.058    0.066    0.074
 165           PC   0.087    0.099    0.118    0.138    0.216    0.377    0.834    0.911    0.931    0.950
 166           PC   0.962    0.972    0.983    0.991    1.000
               *
 167           JD   3.378     0.50
 168           JD   3.314     2.80
 169           PC   0.000    0.009    0.016    0.025    0.034    0.042    0.051    0.059    0.067    0.076
 170           PC   0.087    0.100    0.120    0.163    0.252    0.451    0.694    0.837    0.900    0.938
 171           PC   0.950    0.963    0.975    0.988    1.000
               *
 172           JD   3.135    16.00
 173           PC   0.000    0.009    0.020    0.030    0.048    0.063    0.076    0.090    0.105    0.119
 174           PC   0.135    0.152    0.175    0.222    0.304    0.472    0.670    0.796    0.868    0.912
 175           PC   0.946    0.960    0.973    0.987    1.000
               *
 176           JD   2.761    90.00
 177           PC   0.000    0.021    0.035    0.051    0.071    0.087    0.105    0.125    0.143    0.160
 178           PC   0.179    0.201    0.232    0.281    0.364    0.500    0.658    0.773    0.841    0.888
 179           PC   0.927    0.945    0.964    0.982    1.000
               *
 180           JD   1.938   500.00
 181           PC   0.000    0.024    0.043    0.059    0.078    0.098    0.119    0.141    0.162    0.186
 182           PC   0.212    0.239    0.271    0.321    0.408    0.515    0.627    0.735    0.814    0.864
 183           PC   0.907    0.930    0.954    0.977    1.000
               *
               *
               *
               *
               * *************************************************************************** *
               * *************************************************************************** *
               * ******************** BEGINNING OF IONA WASH SUBAREA *********************** *
               * *************************************************************************** *
               * *************************************************************************** *
               *
               *
               * *************************************************************************** *
               * ******************** BEGINNING OF IONA WASH REGION 1 ********************** *
               * *************************************************************************** *
               *
               *

 184           KK   IW371
 185           KO       0        0      0.0        1       22
 186           BA  0.0529
 187           LG   0.275     0.25     4.15    0.473    26.25
 188           UC   0.275    0.288
               * Urban Time-Area Relation
 189           UA       0        5       16       30       65       77       84       90       94       97
 190           UA     100
               *
               * Railroad Diversion: Main path to CIW366, Diversion to CIW374
               * From Structure RR40, See Appendix D.5 for analysis
1                                        HEC-1 INPUT                                                PAGE  5

LINE           ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 191           KK    D371
 192           KO       0        0      0.0        0       22
 193           DT   DO371
 194           DI     0.0       14       79      208      383      823     1374     2014     2724
 195           DQ     0.0        0       55      173      335      763     1302     1930     2632
               *
               *
               * ROUTE UPDATED 4/14/4

 196           KK  RIW371
 197           KO       0        0      0.0        0       22
 198           RS      15     FLOW      0.0      0.0
 199           RC    0.04     0.04     0.04    11583   0.0088
               * TSR371
 200           RX       0      142      486      525      651      770     1000     1518
 201           RY    1900     1900     1899     1897     1896     1899   1899.5     1900
               *
               *

 202           KK   IW366
 203           KO       0        0      0.0        1       22
 204           BA  1.0558
 205           LG   0.343     0.25    5.762    0.202    7.207
 206           UC   0.763    0.593
               * Natural Time-Area Relation
 207           UA       0        3        5        8       12       20       43       75       90       96
 208           UA     100
               *
               *
               * Combines IW366 and RIW371

 209           KK  CIW366
 210           KO       0        0      0.0        0       22
               * hard coded
 211           HC       2     1.07
               *
               *
               * ROUTE UPDATED 4/14/4

 212           KK  RIW366
 213           KO       0        0      0.0        0       22
 214           RS       4     FLOW      0.0      0.0
 215           RC    0.04     0.04     0.04     8105    0.007
               * IWTS30_2
 216           RX       0      6.5       13       57      102      104      109      110
 217           RY    1728   1725.5     1724     1723     1724   1725.5     1727     1728
```

```
                 *
                 *
1                                              HEC-1 INPUT                                          PAGE  6

 LINE            ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


  218            KK   IW377
  219            KO       0       0     0.0       1      22
  220            BA  0.1125
  221            LG   0.304   0.382   5.921   0.188   5.357
  222            UC   0.408   0.519
                 * Natural Time-Area Relation
  223            UA       0       3       5       8      12      20      43      75      90      96
  224            UA     100
                 *
                 *
                 * *** STAGE DISCHARGE / STORAGE BEHIND STRUCTURE SR010 (HWY74 CULVERT)

  225            KK  SSR010
  226            RS       1    STOR       0
  227            SQ       0      36     100     160
  228            SA       0     .05     .41    1.98
  229            SE  2021.3    2024    2026    2028
                 *
                 *
                 * ROUTE UPDATED 4/14/4

  230            KK  RIW377
  231            KO       0       0     0.0       0      22
  232            RS       6    FLOW     0.0     0.0
  233            RC    0.04    0.04    0.04    6588  0.0096
                 * TSR371
  234            RX       0     142     486     525     651     770    1000    1518
  235            RY    1900    1900    1899    1897    1896    1899  1899.5    1900
                 *
                 *

  236            KK   IW374
  237            KO       0       0     0.0       1      22
  238            BA  0.3874
  239            LG   0.315   0.161   8.147   0.086  12.602
  240            UC   0.442   0.345
                 * Natural Time-Area Relation
  241            UA       0       3       5       8      12      20      43      75      90      96
  242            UA     100
                 *
                 *
                 * RAILROAD DIVERSION RECOVERY: ALONG RAILROAD FROM STRUCTURE RR40

  243            KK    D371
  244            KO       0       0     0.0       0      22
  245            DR   D0371
                 *
                 *
                 * ROUTE UPDATED 4/14/4
1                                              HEC-1 INPUT                                          PAGE  7

 LINE            ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


  246            KK   RD371
  247            KO       0       0     0.0       0      22
  248            RS       1    FLOW     0.0     0.0
  249            RC   0.043   0.035   0.043    1409  0.0014
                 * WITS130
  250            RX       0     400     456     575     620     650     660     682
  251            RY  1396.5    1394  1393.5    1393    1392    1394    1395  1396.5
                 *
                 *
                 * Combines RD371, IW374 and RIW377

  252            KK  CIW374
  253            KO       0       0     0.0       0      22
                 * Hard Coded
  254            HC       3    0.54
                 *
                 *
                 * ROUTE UPDATED 4/14/4

  255            KK  RIW374
  256            KO       0       0     0.0       0      22
  257            RS      15    FLOW     0.0     0.0
  258            RC    0.04    0.04    0.04   18876  0.0081
                 * TSR371
  259            RX       0     142     486     525     651     770    1000    1518
  260            RY    1900    1900    1899    1897    1896    1899  1899.5    1900
                 *
                 *
                 *

  261            KK  IW359A
  262            KO       0       0     0.0       1      22
  263            BA   1.893
  264            LG   0.348    0.21   6.399   0.159   5.491
  265            UC   0.946   0.659
                 * Natural Time-Area Relation
  266            UA       0       3       5       8      12      20      43      75      90      96
  267            UA     100
                 *
                 *
                 * Combines IW359A, RIW374, and RIW366

  268            KK  CW359A
  269            KO       0       0     0.0       0      22
  270            HC       3
```

```
                         *
                         *
          271            ZZ
1
                SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE        (V) ROUTING           (--->) DIVERSION OR PUMP FLOW

  NO.         (.) CONNECTOR         (<---) RETURN OF DIVERTED OR PUMPED FLOW

  184          IW371
                  .
                  .
  193             .------->     DO371
  191           D371
                  V
                  V
  196         RIW371
                  .
                  .
  202             .           IW366
                  .               .
                  .               .
  209         CIW366.............
                  V
                  V
  212         RIW366
                  .
                  .
  218             .           IW377
                  .               V
                  .               V
  225             .          SSR010
                  .               V
                  .               V
  230             .          RIW377
                  .               .
                  .               .
  236             .               .           IW374
                  .               .               .
                  .               .               .
  245             .               .               .          .<-------     DO371
  243             .               .               .         D371
                  .               .               .           V
                  .               .               .           V
  246             .               .               .        RD371
                  .               .               .           .
                  .               .               .           .
  252             .          CIW374........................
                  .               V
                  .               V
  255             .          RIW374
                  .               .
                  .               .
  261             .               .          IW359A
                  .               .               .
                  .               .               .
  268          CW359A........................

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION
1*****************************************                                                *****************************************
*                                        *                                               *                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)    *                                               *   U.S. ARMY CORPS OF ENGINEERS        *
*             JUN   1998                 *                                               *   HYDROLOGIC ENGINEERING CENTER       *
*           VERSION 4.1                  *                                               *        609 SECOND STREET              *
*                                        *                                               *     DAVIS, CALIFORNIA 95616           *
* RUN DATE   05AUG11  TIME  16:03:06     *                                               *        (916) 756-1104                 *
*                                        *                                               *                                       *
******************************************                                               *****************************************


                    Wittmann Phase IV Floodplain Delineation Study
                    August 2011
                    Mod3 removes subbasin IW358, IW353, CIW357, and C359
                    Mod3 replaces IW359 with IW359A and updates RIW366 and RIW374
                    Mod3 truncates model at CW359A
                    ******************************************************************************
                    **-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-**
                    **-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-**
                    ******************************************************************************
                    **                                                                          **
                    **  ADDENDUM TO THE WITTMANN AREA DRAINAGE MASTER STUDY UPDATE HYDROLOGY    **
                    **                                                                          **
                    ******************************************************************************
                    **-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-**
                    **-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-**
                    ******************************************************************************
                    **                                                                          **
                    ** THE FOLLOWING CHANGES HAVE BEEN MADE TO THE WITTMANN HYDROLOGY MODELS     **
                    ** DATED OCTOBER 2004:                                                      **
                    **                                                                          **
                    **     -Diversion added after CTW480                                        **
                    **          -Main flow (5%) to CTW478                                       **
                    **          -Diverted flow (95%) to CWI584                                  **
                    **          -Added concentration point CWI584 combining RD480 and WI584     **
                    **          -Hard coding was added to CTW478                                **
                    **          -Route added after D480 (Diversion Recovery)                    **
                    **          -Route RWI584 was adjusted                                      **
                    **          -Storage Route SCP050 was adjusted                              **
                    **          -Route R508* was adjusted                                       **
                    **          -Hard coding for CWI510 was adjusted                            **
                    **                                                                          **
                    **     -Diversion D618 was moved from after CPI618 to before RDCP12         **
```

```
**          -Updated route RD618 information                                   **
**          -Hard coding on CPI618 was adjusted                                **
**          -Hard coding on CPI615 was adjusted                                **
**                                                                             **
**       -Route RPI639 changed from following US60 to CPI636 to route          **
**        through US60/RR structures and combine with CWI506                   **
**          -Cards PI639, D524, RD524, CPI639 and RPI639 were changed from     **
**           following R624A to follow RWI524                                  **
**          -CPI636 was removed-no longer needed to combine PI636 & RPI639     **
**          -RPI639 information was changed to reflect new route               **
**          -CWI506 changed from combining 3 to combine 4:                     **
**           RWI525, RWI524, RPI639 & WI506                                    **
**          -Hard coding on CWI506 was adjusted                                **
**          -Hard Coding on CWI500 was adjusted                                **
**                                                                             **
*********************************************************************************
**-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-**
**-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-**
*********************************************************************************


*********************************************************************************
*********************************************************************************
**                                                                             **
**   WITTMANN AREA DRAINAGE MASTER STUDY UPDATE-HYDROLOGY MODEL 2004           **
**                                                                             **
*********************************************************************************
*********************************************************************************

PROJECT:                  Wittmann ADMS Update
CLIENT:                   Flood Control District of Maricopa County
PREPARED BY:              Entellus, Inc.
PROJECT No:               FCD 2002C029            Entellus 310.032
FILE NAME: WTEC6-addendum.hc1         CREATED DATE: JUL 01, 2004
                                     MODIFIED DATE: MAY 04, 2005

STORM:
                     100-year 6-hour Storm

DEVELOPMENT CONDITIONS:
                     Existing Conditions

MODELING ASSUMPTIONS:
                     It was assumed that the US60 did not have adequate
                     storage to cause any significant attenuation.

                     The assumption was made that the CAP Canal embankment
                     would not be breached under a large flood event.

                     The assumption was made that the Beardsley Canal would
                     not fail under a large storm event (Per District
                     Instruction).  In addition, the berm north of the
                     Beardsley canal and east of US60 was assumed to fail
                     (per district Instruction).

                     For both the CAP and Beardsley Canals, once the berm
                     elevation was reached weir flow was assumed.  It was
                     also assumed that any weir flow over the canal that
                     might enter the canal and be diverted out of the study
                     area was insignificant, and thus was ignored.  In other
                     words all weir flow over the canal embankment reaches
                     the downstream concentration point.

                     Typical X-sects were developed, and it was assumed
                     that a typical x-sect could adequately represent
                     various reaches.

                     Time-Area Relations were used base on the District's
                     Hydrology Manual criteria.  Two Time-Area Relation
                     Curves were utilized:
                            -Urban
                            -Natural
                     The Time-Area Relation Curves were taken directly
                     from the manual

MODELING METHODS:
                     This model utilizes QI cards to input the Padelford
                     hydrographs from the 100-year 6-hour existing
                     conditions model developed by A-N West Inc. for the
                     Padelford Wash Floodplain Delineation Study.  The
                     hydrograph was altered from its original form
                     (2-minute interval to 5-minute interval) through
                     simple interpolation.

                     Clark Unit Hydrographs were used for all subbasins
                     except the two subbasins directly upstream of the
                     Bonita Dam (PD726B and PD740 use S-graphs).  The UC
                     parameters were calculated using the WMS7.0 software.

                     For Basins PD726B and PD740 S-Graphs were utilized per
                     the request of the FCDMC.  Limited details regarding
                     the calculations of the S-graphs can be found in the
                     model by the basin KK card.  For full details of the
                     S-graph calculations refer to the Appendix.

                     Normal Depth routing was used for all routing reaches.

                     Hard coding was used to account for the percentage of
                     area associated with a diversion.  Because of the use
                     of JD cards and aereal reduction, hard coding was
                     necessary to properly account for area.  For a given
                     diversion a percentage of the flow is routed to two
                     different locations.  The same percentage of area
                     follows that diverted flow.  In addition the area
                     downstream of the main path is reduced or increased and
```

```
is hard coded to account for the loss or gain of area.
Hard coding was performed based on the 6-hour existing
conditions model.

Stage-storage was developed for all the structures
along the CAP Canal, as well as along the Beardsley
Canal.  In addition several stage-storage locations
were developed for areas with significant storage
along the SR74.  No storage was modeled along the US60
and railroad, but the culverts were analyzed for
diversion potential.  Diversions were placed in the
model where deemed appropriate.  See appendix for
details.

FLO-2D was utilized to calculate the split flows at
concentration points CIW351. CIW357, CIW363 and CWI576.
See appendix for modeling details.

*****************************************************************************
*****************************************************************************
```

```
161 IO        OUTPUT CONTROL VARIABLES
                    IPRNT          5  PRINT CONTROL
                    IPLOT          0  PLOT CONTROL
                    QSCAL         0.  HYDROGRAPH PLOT SCALE

    IT        HYDROGRAPH TIME DATA
                     NMIN          5  MINUTES IN COMPUTATION INTERVAL
                    IDATE      1   0  STARTING DATE
                    ITIME       0000  STARTING TIME
                       NQ       1500  NUMBER OF HYDROGRAPH ORDINATES
                   NDDATE      6   0  ENDING DATE
                   NDTIME       0455  ENDING TIME
                    ICENT         19  CENTURY MARK

                COMPUTATION INTERVAL    0.08 HOURS
                     TOTAL TIME BASE  124.92 HOURS

         ENGLISH UNITS
              DRAINAGE AREA          SQUARE MILES
              PRECIPITATION DEPTH    INCHES
              LENGTH, ELEVATION      FEET
              FLOW                   CUBIC FEET PER SECOND
              STORAGE VOLUME         ACRE-FEET
              SURFACE AREA           ACRES
              TEMPERATURE            DEGREES FAHRENHEIT

163 JD         INDEX STORM NO. 1
                    STRM        3.40  PRECIPITATION DEPTH
                    TRDA        0.01  TRANSPOSITION DRAINAGE AREA

164 PI           PRECIPITATION PATTERN
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.01      0.01      0.01      0.01      0.01      0.01      0.03
                 0.03      0.03      0.05      0.05      0.05      0.15      0.15      0.15      0.03      0.03
                 0.03      0.01      0.01      0.01      0.01      0.01      0.01      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00

167 JD         INDEX STORM NO. 2
                    STRM        3.38  PRECIPITATION DEPTH
                    TRDA        0.50  TRANSPOSITION DRAINAGE AREA

  0 PI           PRECIPITATION PATTERN
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.01      0.01      0.01      0.01      0.01      0.01      0.03
                 0.03      0.03      0.05      0.05      0.05      0.15      0.15      0.15      0.03      0.03
                 0.03      0.01      0.01      0.01      0.01      0.01      0.01      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00

168 JD         INDEX STORM NO. 3
                    STRM        3.31  PRECIPITATION DEPTH
                    TRDA        2.80  TRANSPOSITION DRAINAGE AREA

169 PI           PRECIPITATION PATTERN
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.01      0.01      0.01      0.01      0.01      0.01      0.03
                 0.03      0.03      0.07      0.07      0.07      0.08      0.08      0.08      0.05      0.05
                 0.05      0.02      0.02      0.02      0.01      0.01      0.01      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00

172 JD         INDEX STORM NO. 4
                    STRM        3.13  PRECIPITATION DEPTH
                    TRDA       16.00  TRANSPOSITION DRAINAGE AREA

173 PI           PRECIPITATION PATTERN
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.01
                 0.01      0.01      0.00      0.01      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.01      0.00      0.00      0.00      0.00      0.01      0.01      0.01
                 0.01      0.01      0.01      0.01      0.01      0.01      0.02      0.02      0.02      0.03
                 0.03      0.03      0.06      0.06      0.06      0.07      0.07      0.07      0.04      0.04
                 0.04      0.02      0.02      0.02      0.01      0.01      0.01      0.01      0.01      0.01
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00

176 JD         INDEX STORM NO. 5
                    STRM        2.76  PRECIPITATION DEPTH
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                    TRDA       90.00  TRANSPOSITION DRAINAGE AREA

 177 PI            PRECIPITATION PATTERN
                      0.01      0.01      0.01      0.00      0.00      0.00      0.01      0.01      0.01      0.01
                      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01
                      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01
                      0.01      0.01      0.01      0.01      0.01      0.01      0.02      0.02      0.02      0.03
                      0.03      0.03      0.05      0.05      0.05      0.05      0.05      0.05      0.04      0.04
                      0.04      0.02      0.02      0.02      0.02      0.02      0.02      0.01      0.01      0.01
                      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01
                      0.01      0.01

 180 JD          INDEX STORM NO. 6
                    STRM        1.94  PRECIPITATION DEPTH
                    TRDA      500.00  TRANSPOSITION DRAINAGE AREA

 181 PI            PRECIPITATION PATTERN
                      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01
                      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01
                      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01
                      0.01      0.01      0.01      0.01      0.01      0.01      0.02      0.02      0.02      0.03
                      0.03      0.03      0.04      0.04      0.04      0.04      0.04      0.04      0.04      0.04
                      0.04      0.03      0.03      0.03      0.02      0.02      0.02      0.01      0.01      0.01
                      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01
                      0.01      0.01


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            **************
            *            *
 184 KK     *    IW371   *
            *            *
            **************

 185 KO          OUTPUT CONTROL VARIABLES
                      IPRNT           5  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE
                      IPNCH           1  PUNCH COMPUTED HYDROGRAPH
                       IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                      ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                      ISAV2        1500  LAST ORDINATE PUNCHED OR SAVED
                     TIMINT       0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

            **************
            *            *
 191 KK     *     D371   *
            *            *
            **************

 192 KO          OUTPUT CONTROL VARIABLES
                      IPRNT           5  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE
                      IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                       IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                      ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                      ISAV2        1500  LAST ORDINATE PUNCHED OR SAVED
                     TIMINT       0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

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            *            *
 196 KK     *   RIW371   *
            *            *
            **************

 197 KO          OUTPUT CONTROL VARIABLES
                      IPRNT           5  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE
                      IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                       IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                      ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                      ISAV2        1500  LAST ORDINATE PUNCHED OR SAVED
                     TIMINT       0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

            **************
            *            *
 202 KK     *    IW366   *
            *            *
            **************

 203 KO          OUTPUT CONTROL VARIABLES
                      IPRNT           5  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
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                    QSCAL           0.  HYDROGRAPH PLOT SCALE
                    IPNCH           1   PUNCH COMPUTED HYDROGRAPH
                     IOUT          22   SAVE HYDROGRAPH ON THIS UNIT
                    ISAV1           1   FIRST ORDINATE PUNCHED OR SAVED
                    ISAV2        1500   LAST ORDINATE PUNCHED OR SAVED
                   TIMINT       0.083   TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

              **************
              *            *
  209 KK      *   CIW366   *
              *            *
              **************

  210 KO          OUTPUT CONTROL VARIABLES
                    IPRNT           5   PRINT CONTROL
                    IPLOT           0   PLOT CONTROL
                    QSCAL           0.  HYDROGRAPH PLOT SCALE
                    IPNCH           0   PUNCH COMPUTED HYDROGRAPH
                     IOUT          22   SAVE HYDROGRAPH ON THIS UNIT
                    ISAV1           1   FIRST ORDINATE PUNCHED OR SAVED
                    ISAV2        1500   LAST ORDINATE PUNCHED OR SAVED
                   TIMINT       0.083   TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

              **************
              *            *
  212 KK      *   RIW366   *
              *            *
              **************

  213 KO          OUTPUT CONTROL VARIABLES
                    IPRNT           5   PRINT CONTROL
                    IPLOT           0   PLOT CONTROL
                    QSCAL           0.  HYDROGRAPH PLOT SCALE
                    IPNCH           0   PUNCH COMPUTED HYDROGRAPH
                     IOUT          22   SAVE HYDROGRAPH ON THIS UNIT
                    ISAV1           1   FIRST ORDINATE PUNCHED OR SAVED
                    ISAV2        1500   LAST ORDINATE PUNCHED OR SAVED
                   TIMINT       0.083   TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

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              *            *
  218 KK      *    IW377   *
              *            *
              **************

  219 KO          OUTPUT CONTROL VARIABLES
                    IPRNT           5   PRINT CONTROL
                    IPLOT           0   PLOT CONTROL
                    QSCAL           0.  HYDROGRAPH PLOT SCALE
                    IPNCH           1   PUNCH COMPUTED HYDROGRAPH
                     IOUT          22   SAVE HYDROGRAPH ON THIS UNIT
                    ISAV1           1   FIRST ORDINATE PUNCHED OR SAVED
                    ISAV2        1500   LAST ORDINATE PUNCHED OR SAVED
                   TIMINT       0.083   TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

              **************
              *            *
  230 KK      *   RIW377   *
              *            *
              **************

  231 KO          OUTPUT CONTROL VARIABLES
                    IPRNT           5   PRINT CONTROL
                    IPLOT           0   PLOT CONTROL
                    QSCAL           0.  HYDROGRAPH PLOT SCALE
                    IPNCH           0   PUNCH COMPUTED HYDROGRAPH
                     IOUT          22   SAVE HYDROGRAPH ON THIS UNIT
                    ISAV1           1   FIRST ORDINATE PUNCHED OR SAVED
                    ISAV2        1500   LAST ORDINATE PUNCHED OR SAVED
                   TIMINT       0.083   TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

              **************
              *            *
  236 KK      *    IW374   *
              *            *
              **************
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237 KO          OUTPUT CONTROL VARIABLES
                      IPRNT            5  PRINT CONTROL
                      IPLOT            0  PLOT CONTROL
                      QSCAL           0.  HYDROGRAPH PLOT SCALE
                      IPNCH            1  PUNCH COMPUTED HYDROGRAPH
                       IOUT           22  SAVE HYDROGRAPH ON THIS UNIT
                      ISAV1            1  FIRST ORDINATE PUNCHED OR SAVED
                      ISAV2         1500  LAST ORDINATE PUNCHED OR SAVED
                     TIMINT        0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

              ***************
              *             *
243 KK        *    D371     *
              *             *
              ***************

244 KO          OUTPUT CONTROL VARIABLES
                      IPRNT            5  PRINT CONTROL
                      IPLOT            0  PLOT CONTROL
                      QSCAL           0.  HYDROGRAPH PLOT SCALE
                      IPNCH            0  PUNCH COMPUTED HYDROGRAPH
                       IOUT           22  SAVE HYDROGRAPH ON THIS UNIT
                      ISAV1            1  FIRST ORDINATE PUNCHED OR SAVED
                      ISAV2         1500  LAST ORDINATE PUNCHED OR SAVED
                     TIMINT        0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

              ***************
              *             *
246 KK        *    RD371    *
              *             *
              ***************

247 KO          OUTPUT CONTROL VARIABLES
                      IPRNT            5  PRINT CONTROL
                      IPLOT            0  PLOT CONTROL
                      QSCAL           0.  HYDROGRAPH PLOT SCALE
                      IPNCH            0  PUNCH COMPUTED HYDROGRAPH
                       IOUT           22  SAVE HYDROGRAPH ON THIS UNIT
                      ISAV1            1  FIRST ORDINATE PUNCHED OR SAVED
                      ISAV2         1500  LAST ORDINATE PUNCHED OR SAVED
                     TIMINT        0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

              ***************
              *             *
252 KK        *   CIW374    *
              *             *
              ***************

253 KO          OUTPUT CONTROL VARIABLES
                      IPRNT            5  PRINT CONTROL
                      IPLOT            0  PLOT CONTROL
                      QSCAL           0.  HYDROGRAPH PLOT SCALE
                      IPNCH            0  PUNCH COMPUTED HYDROGRAPH
                       IOUT           22  SAVE HYDROGRAPH ON THIS UNIT
                      ISAV1            1  FIRST ORDINATE PUNCHED OR SAVED
                      ISAV2         1500  LAST ORDINATE PUNCHED OR SAVED
                     TIMINT        0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

              ***************
              *             *
255 KK        *   RIW374    *
              *             *
              ***************

256 KO          OUTPUT CONTROL VARIABLES
                      IPRNT            5  PRINT CONTROL
                      IPLOT            0  PLOT CONTROL
                      QSCAL           0.  HYDROGRAPH PLOT SCALE
                      IPNCH            0  PUNCH COMPUTED HYDROGRAPH
                       IOUT           22  SAVE HYDROGRAPH ON THIS UNIT
                      ISAV1            1  FIRST ORDINATE PUNCHED OR SAVED
                      ISAV2         1500  LAST ORDINATE PUNCHED OR SAVED
                     TIMINT        0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

              ***************
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                  *            *
 261 KK           *   IW359A   *
                  *            *
                  **************

 262 KO               OUTPUT CONTROL VARIABLES
                          IPRNT          5  PRINT CONTROL
                          IPLOT          0  PLOT CONTROL
                          QSCAL         0.  HYDROGRAPH PLOT SCALE
                          IPNCH          1  PUNCH COMPUTED HYDROGRAPH
                           IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                          ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                          ISAV2       1500  LAST ORDINATE PUNCHED OR SAVED
                         TIMINT      0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** 

                  **************
                  *            *
 268 KK           *   CW359A   *
                  *            *
                  **************

 269 KO               OUTPUT CONTROL VARIABLES
                          IPRNT          5  PRINT CONTROL
                          IPLOT          0  PLOT CONTROL
                          QSCAL         0.  HYDROGRAPH PLOT SCALE
                          IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                           IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                          ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                          ISAV2       1500  LAST ORDINATE PUNCHED OR SAVED
                         TIMINT      0.083  TIME INTERVAL IN HOURS
```

1

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+	HYDROGRAPH AT	IW371	103.	4.08	12.	3.	1.	0.05		
+	DIVERSION TO	DO371	77.	4.08	6.	2.	1.	0.05		
+	HYDROGRAPH AT	D371	26.	4.08	5.	1.	0.	0.05		
+	ROUTED TO	RIW371	15.	6.50	5.	1.	0.	0.05		
+	HYDROGRAPH AT	IW366	1107.	4.58	209.	52.	17.	1.06		
+	2 COMBINED AT	CIW366	1105.	4.58	213.	54.	18.	1.07		
+	ROUTED TO	RIW366	1002.	4.92	212.	54.	18.	1.07		
+	HYDROGRAPH AT	IW377	153.	4.25	22.	6.	2.	0.11		
+	ROUTED TO	SSR010	121.	4.50	22.	6.	2.	0.11		
+	ROUTED TO	RIW377	98.	5.25	22.	6.	2.	0.11		
+	HYDROGRAPH AT	IW374	758.	4.25	97.	24.	8.	0.39		
+	HYDROGRAPH AT	D371	77.	4.08	6.	2.	1.	0.05		
+	ROUTED TO	RD371	40.	4.33	6.	2.	1.	0.05		
+	3 COMBINED AT	CIW374	784.	4.25	124.	31.	10.	0.54		
+	ROUTED TO	RIW374	434.	5.75	121.	31.	10.	0.54		
+	HYDROGRAPH AT	IW359A	1716.	4.75	382.	96.	32.	1.89		
+	3 COMBINED AT	CW359A	2334.	4.83	662.	169.	56.	3.50		

*** NORMAL END OF HEC-1 ***

100-Year 24-Hour Storm HEC-1 Model

(Excerpts from the Wittmann ADMSU model)

```
1*****************************************                          ****************************************
 *                                       *                          *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                          *   U.S. ARMY CORPS OF ENGINEERS       *
 *             JUN   1998                *                          *   HYDROLOGIC ENGINEERING CENTER      *
 *           VERSION 4.1                 *                          *         609 SECOND STREET            *
 *                                       *                          *      DAVIS, CALIFORNIA 95616         *
 * RUN DATE   03AUG11  TIME  17:14:59    *                          *         (916) 756-1104               *
 *                                       *                          *                                      *
 *****************************************                          ****************************************


                 X     X  XXXXXXX   XXXXX           X
                 X     X  X        X     X         XX
                 X     X  X        X                X
                 XXXXXXX  XXXX     X          XXXXX X
                 X     X  X        X                X
                 X     X  X        X     X          X
                 X     X  XXXXXXX   XXXXX          XXX


 THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

 THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
 THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
 NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
 DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL    LOSS RATE:GREEN AND AMPT INFILTRATION
 KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1                                  HEC-1 INPUT                                          PAGE  1

 LINE      ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

   1       ID     *****************************************************************************
   2       ID     **-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-**
   3       ID     **-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-**
   4       ID     *****************************************************************************
   5       ID     **                                                                         **
   6       ID     **   ADDENDUM TO THE WITTMANN AREA DRAINAGE MASTER STUDY UPDATE HYDROLOGY  **
   7       ID     **                                                                         **
   8       ID     *****************************************************************************
   9       ID     **-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-**
  10       ID     **-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-**
  11       ID     *****************************************************************************
  12       ID     **                                                                         **
  13       ID     ** THE FOLLOWING CHANGES HAVE BEEN MADE TO THE WITTMANN HYDROLOGY MODELS   **
  14       ID     ** DATED OCTOBER 2004:                                                     **
  15       ID     **                                                                         **
  16       ID     **     -Diversion added after CTW480                                       **
  17       ID     **          -Main flow (5%) to CTW478                                      **
  18       ID     **          -Diverted flow (95%) to CWI584                                 **
  19       ID     **          -Added concentration point CWI584 combining RD480 and WI584    **
  20       ID     **          -Hard coding was added to CTW478                               **
  21       ID     **          -Route added after D480 (Diversion Recovery)                   **
  22       ID     **          -Route RWI584 was adjusted                                     **
  23       ID     **          -Storage Route SCP050 was adjusted                             **
  24       ID     **          -Route R508* was adjusted                                      **
  25       ID     **          -Hard coding for CWI510 was adjusted                           **
  26       ID     **                                                                         **
  27       ID     **     -Diversion D618 was moved from after CPI618 to before RDCP12        **
  28       ID     **          -Updated route RD618 information                               **
  29       ID     **          -Hard coding on CPI618 was adjusted                            **
  30       ID     **          -Hard coding on CPI615 was adjusted                            **
  31       ID     **                                                                         **
  32       ID     **     -Route RPI639 changed from following US60 to CPI636 to route        **
  33       ID     **      through US60/RR structures and combine with CWI506                 **
  34       ID     **          -Cards PI639, D524, RD524, CPI639 and RPI639 were changed from **
  35       ID     **           following R624A to follow RWI524                              **
  36       ID     **          -CPI636 was removed-no longer needed to combine PI636 & RPI639 **
  37       ID     **          -RPI639 information was changed to reflect new route           **
  38       ID     **          -CWI506 changed from combining 3 to combine 4:                 **
  39       ID     **           RWI525, RWI524, RPI639 & WI506                                **
  40       ID     **          -Hard coding on CWI506 was adjusted                            **
  41       ID     **          -Hard Coding on CWI500 was adjusted                            **
  42       ID     **                                                                         **
  43       ID     *****************************************************************************
  44       ID     **-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-**
  45       ID     **-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-**
  46       ID     *****************************************************************************
  47       ID
  48       ID
  49       ID
  50       ID     *****************************************************************************
  51       ID     *****************************************************************************
  52       ID     **                                                                         **
  53       ID     **     WITTMANN AREA DRAINAGE MASTER STUDY UPDATE-HYDROLOGY MODEL 2004     **
  54       ID     **                                                                         **
  55       ID     *****************************************************************************
1                                  HEC-1 INPUT                                          PAGE  2

 LINE      ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  56       ID     *****************************************************************************
  57       ID
  58       ID     PROJECT:                 Wittmann ADMS Update
  59       ID     CLIENT:                  Flood Control District of Maricopa County
  60       ID     PREPARED BY:             Entellus, Inc.
  61       ID     PROJECT NO:              FCD 2002C029             Entellus 310.032
  62       ID     FILE NAME: WTEC24-addendum.hc1              CREATED DATE: FEB 01, 2004
  63       ID                                                MODIFIED DATE: MAY 04, 2005
  64       ID
```

```
ID   STORM:
ID                            100-year 24-hour Storm
ID
ID   DEVELOPMENT CONDITIONS:
ID                            Existing Conditions
ID
ID   MODELING ASSUMPTIONS:
ID                            It was assumed that the US60 did not have adequate
ID                            storage to cause any significant attenuation.
ID
ID                            The assumption was made that the CAP Canal embankment
ID                            would not be breached under a large flood event.
ID
ID                            The assumption was made that the Beardsley Canal would
ID                            not fail under a large storm event (Per District
ID                            Instruction).  In addition, the berm north of the
ID                            Beardsley canal and east of US60 was assumed to fail
ID                            (per district Instruction).
ID
ID                            For both the CAP and Beardsley Canals, once the berm
ID                            elevation was reached weir flow was assumed.  It was
ID                            also assumed that any weir flow over the canal that
ID                            might enter the canal and be diverted out of the study
ID                            area was insignificant, and thus was ignored.  In other
ID                            words all weir flow over the canal embankment reaches
ID                            the downstream concentration point.
ID
ID                            Typical X-sects were developed, and it was assumed
ID                            that a typical x-sect could adequately represent
ID                            various reaches.
ID
ID                            Time-Area Relations were used base on the District's
ID                            Hydrology Manual criteria.  Two Time-Area Relation
ID                            Curves were utilized:
ID                                    -Urban
ID                                    -Natural
ID                            The Time-Area Relation Curves were taken directly
ID                            from the manual
ID
ID   MODELING METHODS:
ID                            This model utilizes QI cards to input the Padelford
ID                            hydrographs from the 100-year 6-hour existing
ID                            conditions model developed by A-N West Inc. for the
ID                            Padelford Wash Floodplain Delineation Study.  The
ID                            hydrograph was altered from its original form
ID                            (2-minute interval to 5-minute interval) through
                                HEC-1 INPUT                                          PAGE  3
1

LINE       ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

ID                            simple interpolation.
ID
ID                            Clark Unit Hydrographs were used for all subbasins
ID                            except the two subbasins directly upstream of the
ID                            Bonita Dam (PD726B and PD740 use S-graphs).  The UC
ID                            parameters were calculated using the WMS7.0 software.
ID
ID                            For Basins PD726B and PD740 S-Graphs were utilized per
ID                            the request of the FCDMC.  Limited details regarding
ID                            the calculations of the S-graphs can be found in the
ID                            model by the basin KK card.  For full details of the
ID                            S-graph calculations refer to the Appendix.
ID
ID                            Normal Depth routing was used for all routing reaches.
ID
ID                            Hard coding was used to account for the percentage of
ID                            area associated with a diversion.  Because of the use
ID                            of JD cards and aereal reduction, hard coding  was
ID                            necessary to properly account for area.  For a given
ID                            diversion a percentage of the flow is routed to two
ID                            different locations.  The same percentage of area
ID                            follows that diverted flow.  In addition the area
ID                            downstream of the main path is reduced or increased and
ID                            is hard coded to account for the loss or gain of area.
ID                            Hard coding was performed based on the 24-hour existing
ID                            conditions model.
ID
ID                            Stage-storage was developed for all the structures
ID                            along the CAP Canal, as well as along the Beardsley
ID                            Canal.  In addition several stage-storage locations
ID                            were developed for areas with significant storage
ID                            along the SR74.  No storage was modeled along the US60
ID                            and railroad, but the culverts were analyzed for
ID                            diversion potential.  Diversions were placed in the
ID                            model where deemed appropriate.  See appendix for
ID                            details.
ID
ID                            FLO-2D was utilized to calculate the split flows at
ID                            concentration points CIW351. CIW357, CIW363 and CWI576.
ID                            See appendix for modeling details.
ID
ID   ****************************************************************************
ID   ****************************************************************************
ID
*DIAGRAM
IT      5              0     1500
IO      5
IN     15              0
JD   4.18    0.01
* 24-hour distribution
PC    0.0   0.002   0.005   0.008   0.011   0.014   0.017    0.02   0.023   0.026
PC  0.029   0.032   0.035   0.038   0.041   0.044   0.048   0.052   0.056    0.06
PC  0.064   0.068   0.072   0.076    0.08   0.085    0.09   0.095     0.1   0.105
PC   0.11   0.115    0.12   0.126   0.133    0.14   0.147   0.155   0.163   0.172
PC  0.181   0.191   0.203   0.218   0.236   0.257   0.283   0.387   0.663   0.707
1                               HEC-1 INPUT                                          PAGE  4
```

```
LINE           ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 164           PC   0.735   0.758   0.776   0.791   0.804   0.815   0.825   0.834   0.842   0.849
 165           PC   0.856   0.863   0.869   0.875   0.881   0.887   0.893   0.898   0.903   0.908
 166           PC   0.913   0.918   0.922   0.926    0.93   0.934   0.938   0.942   0.946    0.95
 167           PC   0.953   0.956   0.959   0.962   0.965   0.968   0.971   0.974   0.977    0.98
 168           PC   0.983   0.986   0.989   0.992   0.995   0.998     1.0
 169           JD   3.929    10.0
 170           JD   3.856    20.0
 171           JD   3.725    40.0
 172           JD   3.599    80.0
 173           JD   3.532   120.0
 174           JD   3.444   200.0
 175           JD   3.385   300.0
 176           JD   3.289   500.0
               *
               *
               *
               * ************************************************************************** *
               * ************************************************************************** *
               * ******************** BEGINNING OF IONA WASH SUBAREA ********************** *
               * ************************************************************************** *
               * ************************************************************************** *
               *
               *
               * ************************************************************************** *
               * ******************** BEGINNING OF IONA WASH REGION 1 ********************* *
               * ************************************************************************** *
               *
               *

 177           KK   IW371
 178           KO       0       0     0.0       1      22
 179           BA  0.0529
 180           LG   0.275    0.25    4.15   0.473   26.25
 181           UC   0.308   0.327
               * Urban Time-Area Relation
 182           UA       0       5      16      30      65      77      84      90      94      97
 183           UA     100
               *
               * Railroad Diversion: Main path to CIW366, Diversion to CIW374
               * From Structure RR40, See Appendix D.5 for analysis

 184           KK    D371
 185           KO       0       0     0.0       0      22
 186           DT   DO371     0.0     0.0
 187           DI     0.0      14      79     208     383     823    1374    2014    2724
 188           DQ     0.0       0      55     173     335     763    1302    1930    2632
               *
               *
               * ROUTE UPDATED 4/14/4
1                                          HEC-1 INPUT                                        PAGE  5

LINE           ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 189           KK  RIW371
 190           KO       0       0     0.0       0      22
 191           RS      15    FLOW     0.0     0.0
 192           RC    0.04    0.04    0.04   11583  0.0088
               * TSR371
 193           RX       0     142     486     525     651     770    1000    1518
 194           RY    1900    1900    1899    1897    1896    1899  1899.5    1900
               *
               *

 195           KK   IW366
 196           KO       0       0     0.0       1      22
 197           BA  1.0558
 198           LG   0.343    0.25   5.762   0.202   7.207
 199           UC   0.796   0.622
               * Natural Time-Area Relation
 200           UA       0       3       5       8      12      20      43      75      90      96
 201           UA     100
               *
               *
               * Combines IW366 and RIW371

 202           KK  CIW366
 203           KO       0       0     0.0       0      22
               * hard coded
 204           HC       2    1.08
               *
               *
               * ROUTE UPDATED 4/14/4

 205           KK  RIW366
 206           KO       0       0     0.0       0      22
 207           RS       6    FLOW     0.0     0.0
 208           RC    0.04    0.04    0.04    9657   0.007
               * IWTS30_2
 209           RX       0     6.5      13      57     102     104     109     110
 210           RY    1728  1725.5    1724    1723    1724  1725.5    1727    1728
               *
               *

 211           KK   IW377
 212           KO       0       0     0.0       1      22
 213           BA  0.1125
 214           LG   0.304   0.382   5.921   0.188   5.357
 215           UC   0.442   0.566
               * Natural Time-Area Relation
 216           UA       0       3       5       8      12      20      43      75      90      96
 217           UA     100
               *
```

```
                  *
                  * *** STAGE DISCHARGE / STORAGE BEHIND STRUCTURE SR010 (HWY74 CULVERT)
1                                             HEC-1 INPUT                                              PAGE  6

 LINE             ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


  218             KK  SSR010
  219             RS       1    STOR       0
  220             SQ       0      36     100     160
  221             SA       0     .05     .41    1.98
  222             SE  2021.3    2024    2026    2028
                  *
                  *
                  * ROUTE UPDATED 4/14/4

  223             KK  RIW377
  224             KO       0       0     0.0       0      22
  225             RS       6    FLOW     0.0     0.0
  226             RC    0.04    0.04    0.04    6588  0.0096
                  * TSR371
  227             RX       0     142     486     525     651     770    1000    1518
  228             RY    1900    1900    1899    1897    1896    1899  1899.5    1900
                  *
                  *

  229             KK   IW374
  230             KO       0       0     0.0       1      22
  231             BA  0.3874
  232             LG   0.315   0.161   8.147   0.086  12.602
  233             UC   0.475   0.374
                  * Natural Time-Area Relation
  234             UA       0       3       5       8      12      20      43      75      90      96
  235             UA     100
                  *
                  *
                  * RAILROAD DIVERSION RECOVERY: ALONG RAILROAD FROM STRUCTURE RR40

  236             KK    D371
  237             KO       0       0     0.0       0      22
  238             DR   DO371
                  *
                  *
                  * ROUTE UPDATED 4/14/4

  239             KK   RD371
  240             KO       0       0     0.0       0      22
  241             RS       1    FLOW     0.0     0.0
  242             RC   0.043   0.035   0.043    1409  0.0014
                  * WITS130
  243             RX       0     400     456     575     620     650     660     682
  244             RY  1396.5    1394  1393.5    1393    1392    1394    1395  1396.5
                  *
                  *
                  * Combines RD371, IW374 and RIW377
1                                             HEC-1 INPUT                                              PAGE  7

 LINE             ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


  245             KK  CIW374
  246             KO       0       0     0.0       0      22
                  * Hard Coded
  247             HC       3    0.53
                  *
                  *
                  * ROUTE UPDATED 4/14/4

  248             KK  RIW374
  249             KO       0       0     0.0       0      22
  250             RS      15    FLOW     0.0     0.0
  251             RC    0.04    0.04    0.04   20437  0.0081
                  * TSR371
  252             RX       0     142     486     525     651     770    1000    1518
  253             RY    1900    1900    1899    1897    1896    1899  1899.5    1900
                  *
                  *

  254             KK   IW386
  255             KO       0       0     0.0       1      22
  256             BA  0.3731
  257             LG   0.334   0.192   8.439   0.072   5.278
  258             UC   0.917   0.945
                  * Natural Time-Area Relation
  259             UA       0       3       5       8      12      20      43      75      90      96
  260             UA     100
                  *
                  *
                  * ROUTE UPDATED 4/14/4

  261             KK  RIW386
  262             KO       0       0     0.0       0      22
  263             RS       6    FLOW     0.0     0.0
  264             RC   0.043   0.035   0.043   10311  0.0078
                  * IWTS20_1
  265             RX       0      21      75      93     234     280     301     391
  266             RY    1952    1949    1948    1946    1945    1948  1948.5    1952
                  *
                  *

  267             KK   IW382
  268             KO       0       0     0.0       1      22
  269             BA  0.6196
  270             LG   0.322   0.275   6.319   0.164   8.175
  271             UC   0.688   0.599
                  * Urban Time-Area Relation
```

```
 272          UA       0       5      16      30      65      77      84      90      94      97
 273          UA     100
              *
              *
              * Combines IW382 and RIW386
1                                            HEC-1 INPUT                                        PAGE  8

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 274          KK  CIW382
 275          KO       0       0     0.0       0      22
 276          HC       2
              *
              * US60 Diversion: Main path to D382A, Diversion to  CIW381
              * From Structures US006 and US007, See Appendix D.5 for analysis

 277          KK    D382B
 278          KO       0       0     0.0       0      22
 279          DT  DO382B     0.0     0.0
 280          DI       0      24     180   10000
 281          DQ       0      24     180     180
              *
              * Railroad Diversion: Main path to C359*, Diversion to CIW384
              * From Structure RR90 and RR100, See Appendix D.5 for analysis

 282          KK    D382A
 283          KO       0       0     0.0       0      22
 284          DT  DO382A     0.0     0.0
 285          DI       0      14      60     200     315     448     629    1371
 286          DQ       0       0       0       0      55     174     338    1045
              *
              *
              * ROUTE UPDATED 4/14/4

 287          KK  RIW382
 288          KO       0       0     0.0       0      22
 289          RS       3    FLOW     0.0     0.0
 290          RC    0.04    0.04    0.04    4964   0.012
              * TSR371
 291          RX       0     142     486     525     651     770    1000    1518
 292          RY    1900    1900    1899    1897    1896    1899  1899.5    1900
              *
              *

 293          KK   IW384
 294          KO       0       0     0.0       1      22
 295          BA  0.0825
 296          LG   0.343    0.15   8.675   0.065   7.206
 297          UC   0.338   0.327
              * Natural Time-Area Relation
 298          UA       0       3       5       8      12      20      43      75      90      96
 299          UA     100
              *
              *
              * Railroad Diversion Recovery: Outflow from structures RR90 AND RR100

 300          KK   D382A
 301          KO       0       0     0.0       0      22
 302          DR  DO382A
              *
              *
              * ROUTE UPDATED 4/14/4
1                                            HEC-1 INPUT                                        PAGE  9

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 303          KK  RD382A
 304          KO       0       0     0.0       0      22
 305          RS       1    FLOW     0.0     0.0
 306          RC   0.043   0.035   0.043    1172  0.0068
              * WITS130
 307          RX       0     400     456     575     620     650     660     682
 308          RY  1396.5    1394  1393.5    1393    1392    1394    1395  1396.5
              *
              *
              * Combines RD382A and IW384

 309          KK  CIW384
 310          KO       0       0     0.0       0      22
              * Hard Coded
 311          HC       2    0.23
              *
              *
              * ROUTE UPDATED 4/14/4

 312          KK  RIW384
 313          KO       0       0     0.0       0      22
 314          RS       3    FLOW     0.0     0.0
 315          RC    0.04    0.04    0.04    4694  0.0124
              * TSR371
 316          RX       0     142     486     525     651     770    1000    1518
 317          RY    1900    1900    1899    1897    1896    1899  1899.5    1900
              *
              *

 318          KK   IW381
 319          KO       0       0     0.0       1      22
 320          BA  0.3841
 321          LG   0.309    0.19   9.152   0.056  11.882
 322          UC   0.704   0.873
              * Natural Time-Area Relation
 323          UA       0       3       5       8      12      20      43      75      90      96
 324          UA     100
              *
```

```
          *
          *
          * This diversion is not routed because the distance traveled from the actual
          * point of diversion (not CIW382) to CIW382 is approximately the same as the
          * distance from the same point of diversion to CIW381.  Thus to avoid double
          * counting storage in the routes, a route for the diversion was not included
          * in the model.
          *
          * US60 Diversion Recovery: Outflow from structures US006 and US007

 325      KK   D382B
 326      KO       0       0     0.0       0      22
 327      DR  DO382B
          *
          *
          * Combines D382B and IW381
1                                   HEC-1 INPUT                                        PAGE 10

LINE      ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 328      KK  CIW381
          * Hard Coded
 329      HC       2    0.72
          *
          *
          * ROUTE UPDATED 4/14/4

 330      KK  RIW381
 331      KO       0       0     0.0       0      22
 332      RS       3    FLOW     0.0     0.0
 333      RC    0.04    0.04    0.04    4964  0.0096
          * TSR371
 334      RX       0     142     486     525     651     770    1000    1518
 335      RY    1900    1900    1899    1897    1896    1899  1899.5    1900
          *
          *
          * Combines RIW381, RIW382 and RIW384

 336      KK    C359*
 337      KO       0       0     0.0       0      22
          * Hard Coded
 338      HC       3    1.45
          *
          *
          * ROUTE UPDATED 4/14/4

 339      KK    R359*
 340      KO       0       0     0.0       0      22
 341      RS       4    FLOW     0.0     0.0
 342      RC    0.04    0.04    0.04    9280  0.0103
          * IWTS30_2
 343      RX       0     6.5      13      57     102     104     109     110
 344      RY    1728  1725.5    1724    1723    1724  1725.5    1727    1728
          *
          *

 345      KK   IW359
 346      KO       0       0     0.0       1      22
 347      BA   2.912
 348      LG   0.345    0.25   5.939   0.187   6.181
 349      UC   0.979   0.571
          * Natural Time-Area Relation
 350      UA       0       3       5       8      12      20      43      75      90      96
 351      UA     100
          *
          *
          * Combines IW359, R359*, RIW374 and RIW366

 352      KK  CIW359
 353      KO       0       0     0.0       0      22
 354      HC       4
          *
          *
          * ROUTE UPDATED 4/14/4
1                                   HEC-1 INPUT                                        PAGE 11

LINE      ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 355      KK  RIW359
 356      KO       0       0     0.0       0      22
 357      RS       5    FLOW     0.0     0.0
 358      RC    0.04    0.04    0.04   13031  0.0059
          * IWTS30_2 modified
 359      RX       0     6.5      13      57     102     104     109     110
 360      RY  1728.5  1725.5    1724    1723    1724  1725.5    1727  1728.5
          *
          *
          *
          * ************************************************************************** *
          * ********************** END OF IONA WASH REGION 1 ************************** *
          * ************************************************************************** *
          *
          *
          *
          * ************************************************************************** *
          * ******************* BEGINNING OF IONA WASH REGION 2 *********************** *
          * ************************************************************************** *
          *
          *
          *

 361      KK   IW389
 362      KO       0       0     0.0       1      22
 363      BA  0.1312
```

```
364            LG   0.348    0.13    10.1   0.037   5.526
365            UC   0.638   0.825
               * Natural Time-Area Relation
366            UA       0       3       5       8      12      20      43      75      90      96
367            UA     100
               *
               *
               * *** STAGE DISCHARGE / STORAGE BEHIND STRUCTURE SR190 (HWY74 CULVERT)

368            KK   SSR190
369            RS       1    STOR       0
370            SQ       0      69     161     184     207     230
371            SE  2053.8  2055.5 2056.83  2057.1  2057.4  2057.7
372            SA       0     .01     .08     .22     .39    1.13
373            SE    2052    2054    2056    2058    2060    2062
               *
               *
               * ROUTE UPDATED 4/14/4

374            KK   RIW389
375            KO       0       0     0.0       0      22
376            RS       6    FLOW     0.0     0.0
377            RC    0.04    0.04    0.04   11459  0.0124
               * TSR371
378            RX       0     142     486     525     651     770    1000    1518
379            RY    1900    1900    1899    1897    1896    1899  1899.5    1900
               *
               *
1                                        HEC-1 INPUT                                         PAGE 12

LINE           ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


380            KK    IW394
381            KO       0       0     0.0       1      22
382            BA  4.1731
383            LG    0.35   0.327   6.166   0.173  16.632
384            UC   1.367   0.857
               * Natural Time-Area Relation
385            UA       0       3       5       8      12      20      43      75      90      96
386            UA     100
               *
               *
               * ROUTE UPDATED 4/14/4

387            KK   RIW394
388            KO       0       0     0.0       0      22
389            RS       3    FLOW     0.0     0.0
390            RC   0.043   0.035   0.043    7697  0.0133
               * IWTS10_1
391            RX       0      34      89     134     161     198     298     333
392            RY    2160    2158    2154    2152    2154    2156    2158    2160
               *
               *

393            KK   IW390A
394            KO       0       0     0.0       1      22
395            BA  0.9003
396            LG    0.35    0.25   6.134   0.172  17.033
397            UC   1.033   0.963
               * Natural Time-Area Relation
398            UA       0       3       5       8      12      20      43      75      90      96
399            UA     100
               *
               *
               * Combines IW390A and RIW394

400            KK    C390A
401            KO       0       0     0.0       0      22
402            HC       2
               *
               *
               * ROUTE UPDATED 4/14/4

403            KK    R390A
404            KO       0       0     0.0       0      22
405            RS       4    FLOW     0.0     0.0
406            RC   0.043   0.035   0.043    8577  0.0134
               * IWTS10_1
407            RX       0      34      89     134     161     198     298     333
408            RY    2160    2158    2154    2152    2154    2156    2158    2160
               *
               *
1                                        HEC-1 INPUT                                         PAGE 13

LINE           ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


409            KK    IW390
410            KO       0       0     0.0       1      22
411            BA  0.3110
412            LG   0.349    0.25   5.071   0.258   5.221
413            UC   1.021   1.302
               * Natural Time-Area Relation
414            UA       0       3       5       8      12      20      43      75      90      96
415            UA     100
               *
               *

416            KK    IW392
417            KO       0       0     0.0       1      22
418            BA  1.1135
419            LG    0.35    0.15   7.459   0.103   8.347
420            UC   0.500   0.278
               * Natural Time-Area Relation
421            UA       0       3       5       8      12      20      43      75      90      96
```

```
 422            UA     100
                *
                *
                * Combines IW392, IW390 and R390A

 423            KK  CIW390
 424            KO       0       0     0.0       0      22
 425            HC       3
                *
                *
                * *** STAGE DISCHARGE / STORAGE BEHIND STRUCTURE SR160 (HWY74 CULVERT)

 426            KK  SSR160
 427            RS       1    STOR       0
 428            SQ       0     762    1440    2640    3840    5040
 429            SA     0.0    0.04    0.36    3.17    4.85    6.69
 430            SE    2033    2036    2038    2040    2042    2044
                *
                *
                * ROUTE UPDATED 4/14/4

 431            KK  RIW390
 432            KO       0       0     0.0       0      22
 433            RS       5    FLOW     0.0     0.0
 434            RC   0.043   0.035   0.043   11626  0.0101
                * IWTS20_1
 435            RX       0      21      75      93     234     280     301     391
 436            RY    1952    1949    1948    1946    1945    1948  1948.5    1952
                *
                *
1                                         HEC-1 INPUT                                             PAGE 14

LINE            ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 437            KK   IW388
 438            KO       0       0     0.0       1      22
 439            BA  1.2256
 440            LG   0.337   0.156   8.775   0.061   9.239
 441            UC   1.200   0.958
                * Natural Time-Area Relation
 442            UA       0       3       5       8      12      20      43      75      90      96
 443            UA     100
                *
                *
                * Combines IW388, RIW390 and RIW389

 444            KK  CIW388
 445            KO       0       0     0.0       0      22
 446            HC       3
                *
                *
                * ROUTE UPDATED 4/14/4

 447            KK  RIW388
 448            KO       0       0     0.0       0      22
 449            RS       4    FLOW     0.0     0.0
 450            RC    0.04    0.04    0.04    7726  0.0094
                * IWTS20_2
 451            RX       0      79     201     242     303     327     346     350
 452            RY    1940    1938    1936  1933.5    1936  1936.5    1940    1940
                *
                *

 453            KK   IW357
 454            KO       0       0     0.0       1      22
 455            BA  0.7456
 456            LG    0.33   0.156   8.059   0.083  11.106
 457            UC   0.742   0.752
                * Natural Time-Area Relation
 458            UA       0       3       5       8      12      20      43      75      90      96
 459            UA     100
                *
                *
                * Combines IW357 and RIW388

 460            KK  CIW357
 461            KO       0       0     0.0       0      22
 462            HC       2
                *
                *
                * This split was determined using FLO-2D.  The model is titled "WEST" and
                * details and documentation about the model are contained in the Appendix D 5.4.
1                                         HEC-1 INPUT                                             PAGE 15

LINE            ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 463            KK    D357
 464            DT   DO357     0.0     0.0
 465            DI       0     258     530     766     975    1140    1340    1556    1789    1937
 466            DI    2120    2357    2514    2736    2992    3255    3301    3472    3610    5000
 467            DQ       0      56     144     211     291     357     437     383     451     502
 468            DQ     532     601     633     705     737     793     854     930     947    1312
                *
                *
                * ROUTE UPDATED 4/14/4

 469            KK  RIW357
 470            KO       0       0     0.0       0      22
 471            RS       9    FLOW     0.0     0.0
 472            RC    0.04    0.04    0.04   16693  0.0079
                * IWTS30_1 modified
 473            RX       0      50      96     135     160     177     190     206
 474            RY    1881    1879    1878    1876    1876    1878    1879    1881
                *
```

```
                  *
                  *
                  * ************************************************************************* *
                  * ********************** END OF IONA WASH REGION 2 ************************** *
                  * ************************************************************************* *
                  *
                  *
                  *
                  * ************************************************************************* *
                  * ******************** BEGINNING OF IONA WASH REGION 3 ********************** *
                  * ************************************************************************* *
                  *
                  *
                  *
                  *
 475              KK   IW353
 476              KO       0       0     0.0       1      22
 477              BA  2.8030
 478              LG    0.35    0.15   7.596   0.098   5.084
 479              UC   1.004   0.717
                  * Natural Time-Area Relation
 480              UA       0       3       5       8      12      20      43      75      90      96
 481              UA     100
                  *
                  *
                  * Combines IW353, RIW357, and RIW359

 482              KK  CIW353
 483              KO       0       0     0.0       0      22
                  * Hard Coded
 484              HC       3   15.08
                  *
                  *
                  * ROUTE UPDATED 4/14/4
1                                                 HEC-1 INPUT                                            PAGE 16

 LINE             ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 485              KK  RIW353
 486              KO       0       0     0.0       0      22
 487              RS       2    FLOW     0.0     0.0
 488              RC    0.04    0.04    0.04    7496  0.0053
                  * IWTS40_1
 489              RX       0     147     714     840     930    1073    1087    1417
 490              RY    1708    1704    1700    1696    1696    1700    1704    1708
                  *
                  *

 491              KK   IW350
 492              KO       0       0     0.0       1      22
 493              BA  2.1750
 494              LG    0.35   0.171   6.789   0.135     5.0
 495              UC   1.363   1.203
                  * Natural Time-Area Relation
 496              UA       0       3       5       8      12      20      43      75      90      96
 497              UA     100
                  *
                  *
                  * Combines IW350 and RIW353

 498              KK  CIW350
 499              KO       0       0     0.0       0      22
 500              HC       2
                  *
                  *
                  *
                  * ************************************************************************* *
                  * ********************** END OF IONA WASH REGION 3 ************************** *
                  * ************************************************************************* *
                  *
 501              ZZ
1
           SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

  NO.       (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

  177        IW371
                 .
                 .
  186            .------->   D0371
  184         D371
                 V
                 V
  189       RIW371
                 .
                 .
  195            .          IW366
                 .              .
                 .              .
  202       CIW366...........
                 V
                 V
  205       RIW366
                 .
                 .
  211            .          IW377
                 .              V
                 .              V
  218            .         SSR010
                 .              V
                 .              V
  223            .         RIW377
```

```
            .         .
229         .         .    IW374
            .         .        .
238         .         .        .        .<-------   DO371
236         .         .        .    D371
            .         .        .        v
            .         .        .        v
239         .         .        .   RD371
            .         .        .        .
245         .    CIW374.........................
            .         v
            .         v
248         .    RIW374
            .         .
254         .         .    IW386
            .         .        v
            .         .        v
261         .         .   RIW386
            .         .        .
267         .         .        .    IW382
            .         .        .        .
274         .         .   CIW382.........
            .         .        .
279         .         .        .------->  DO382B
277         .         .    D382B
            .         .        .
284         .         .        .------->  DO382A
282         .         .    D382A
            .         .        v
            .         .        v
287         .         .   RIW382
            .         .        .
293         .         .        .    IW384
            .         .        .        .
302         .         .        .        .        .<-------   DO382A
300         .         .        .        .    D382A
            .         .        .        .        v
            .         .        .        .        v
303         .         .        .        .   RD382A
            .         .        .        .        .
309         .         .        .   CIW384.........
            .         .        .        v
            .         .        .        v
312         .         .        .   RIW384
            .         .        .        .
318         .         .        .        .    IW381
            .         .        .        .        .
327         .         .        .        .        .        .<-------   DO382B
325         .         .        .        .        .    D382B
            .         .        .        .        .        .
328         .         .        .        .   CIW381.........
            .         .        .        .        v
            .         .        .        .        v
330         .         .        .        .   RIW381
            .         .        .        .        .
336         .         .    C359*.......................
            .         .        v
            .         .        v
339         .         .    R359*
            .         .        .
345         .         .        .    IW359
            .         .        .        .
352    CIW359..................................
            v
            v
355    RIW359
            .
361         .     IW389
            .         v
            .         v
368         .    SSR190
            .         v
            .         v
374         .    RIW389
            .         .
380         .         .    IW394
            .         .        v
            .         .        v
387         .         .   RIW394
            .         .        .
393         .         .        .   IW390A
            .         .        .        .
400         .         .    C390A.........
            .         .        v
            .         .        v
```

```
403          .             .          R390A
             .             .              .
             .             .              .
409          .             .              .          IW390
             .             .              .              .
             .             .              .              .
416          .             .              .              .          IW392
             .             .              .              .              .
             .             .              .              .              .
423          .             .          CIW390.........................
             .             .              V
             .             .              V
426          .             .          SSR160
             .             .              V
             .             .              V
431          .             .          RIW390
             .             .              .
             .             .              .
437          .             .              .          IW388
             .             .              .              .
             .             .              .              .
444          .         CIW388........................
             .             V
             .             V
447          .         RIW388
             .             .
             .             .
453          .             .          IW357
             .             .              .
             .             .              .
460          .         CIW357............
             .             .
             .             .
464          .             .------->  DO357
463          .          D357
             .             V
             .             V
469          .         RIW357
             .             .
             .             .
475          .             .          IW353
             .             .              .
             .             .              .
482     CIW353........................
             V
             V
485     RIW353
             .
             .
491          .          IW350
             .              .
             .              .
498     CIW350............
```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1*****************************************
*                                         *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)     *
*              JUN   1998                 *
*           VERSION 4.1                   *
*                                         *
*  RUN DATE   03AUG11  TIME  17:14:59     *
*                                         *
*******************************************

*******************************************
*                                         *
*   U.S. ARMY CORPS OF ENGINEERS          *
*   HYDROLOGIC ENGINEERING CENTER         *
*       609 SECOND STREET                 *
*     DAVIS, CALIFORNIA 95616             *
*         (916) 756-1104                  *
*                                         *
*******************************************
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**-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-**
**-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-**
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**                                                                          **
**  ADDENDUM TO THE WITTMANN AREA DRAINAGE MASTER STUDY UPDATE HYDROLOGY    **
**                                                                          **
******************************************************************************
**-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-**
**-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-**
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**                                                                          **
** THE FOLLOWING CHANGES HAVE BEEN MADE TO THE WITTMANN HYDROLOGY MODELS     **
** DATED OCTOBER 2004:                                                      **
**                                                                          **
**     -Diversion added after CTW480                                        **
**          -Main flow (5%) to CTW478                                       **
**          -Diverted flow (95%) to CWI584                                  **
**          -Added concentration point CWI584 combining RD480 and WI584     **
**          -Hard coding was added to CTW478                                **
**          -Route added after D480 (Diversion Recovery)                    **
**          -Route RWI584 was adjusted                                      **
**          -Storage Route SCP050 was adjusted                              **
**          -Route R508* was adjusted                                       **
**          -Hard coding for CWI510 was adjusted                            **
**                                                                          **
**     -Diversion D618 was moved from after CPI618 to before RDCP12         **
**          -Updated route RD618 information                                **
**          -Hard coding on CPI618 was adjusted                             **
**          -Hard coding on CPI615 was adjusted                             **
**                                                                          **
**     -Route RPI639 changed from following US60 to CPI636 to route         **
**      through US60/RR structures and combine with CWI506                  **
**          -Cards PI639, D524, RD524, CPI639 and RPI639 were changed from  **
**           following R624A to follow RWI524                               **
**          -CPI636 was removed-no longer needed to combine PI636 & RPI639  **
**          -RPI639 information was changed to reflect new route            **
```

```
**          -CWI506 changed from combining 3 to combine 4:                  **
**           RWI525, RWI524, RPI639 & WI506                                 **
**          -Hard coding on CWI506 was adjusted                             **
**          -Hard Coding on CWI500 was adjusted                             **
**                                                                          **
******************************************************************************
**-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-**
**-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-ADDENDUM-**
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******************************************************************************
**                                                                          **
**    WITTMANN AREA DRAINAGE MASTER STUDY UPDATE-HYDROLOGY MODEL 2004       **
**                                                                          **
******************************************************************************
******************************************************************************

PROJECT:                 Wittmann ADMS Update
CLIENT:                  Flood Control District of Maricopa County
PREPARED BY:             Entellus, Inc.
PROJECT No:              FCD 2002C029              Entellus 310.032
FILE NAME: WTEC24-addendum.hc1          CREATED DATE: FEB 01, 2004
                                       MODIFIED DATE: MAY 04, 2005

STORM:
                        100-year 24-hour Storm

DEVELOPMENT CONDITIONS:
                        Existing Conditions

MODELING ASSUMPTIONS:
                        It was assumed that the US60 did not have adequate
                        storage to cause any significant attenuation.

                        The assumption was made that the CAP Canal embankment
                        would not be breached under a large flood event.

                        The assumption was made that the Beardsley Canal would
                        not fail under a large storm event (Per District
                        Instruction).  In addition, the berm north of the
                        Beardsley canal and east of US60 was assumed to fail
                        (per district Instruction).

                        For both the CAP and Beardsley Canals, once the berm
                        elevation was reached weir flow was assumed.  It was
                        also assumed that any weir flow over the canal that
                        might enter the canal and be diverted out of the study
                        area was insignificant, and thus was ignored.  In other
                        words all weir flow over the canal embankment reaches
                        the downstream concentration point.

                        Typical X-sects were developed, and it was assumed
                        that a typical x-sect could adequately represent
                        various reaches.

                        Time-Area Relations were used base on the District's
                        Hydrology Manual criteria.  Two Time-Area Relation
                        Curves were utilized:
                                -Urban
                                -Natural
                        The Time-Area Relation Curves were taken directly
                        from the manual

MODELING METHODS:
                        This model utilizes QI cards to input the Padelford
                        hydrographs from the 100-year 6-hour existing
                        conditions model developed by A-N West Inc. for the
                        Padelford Wash Floodplain Delineation Study.  The
                        hydrograph was altered from its original form
                        (2-minute interval to 5-minute interval) through
                        simple interpolation.

                        Clark Unit Hydrographs were used for all subbasins
                        except the two subbasins directly upstream of the
                        Bonita Dam (PD726B and PD740 use S-graphs).  The UC
                        parameters were calculated using the WMS7.0 software.

                        For Basins PD726B and PD740 S-Graphs were utilized per
                        the request of the FCDMC.  Limited details regarding
                        the calculations of the S-graphs can be found in the
                        model by the basin KK card.  For full details of the
                        S-graph calculations refer to the Appendix.

                        Normal Depth routing was used for all routing reaches.

                        Hard coding was used to account for the percentage of
                        area associated with a diversion.  Because of the use
                        of JD cards and aereal reduction, hard coding  was
                        necessary to properly account for area.  For a given
                        diversion a percentage of the flow is routed to two
                        different locations.  The same percentage of area
                        follows that diverted flow.  In addition the area
                        downstream of the main path is reduced or increased and
                        is hard coded to account for the loss or gain of area.
                        Hard coding was performed based on the 24-hour existing
                        conditions model.

                        Stage-storage was developed for all the structures
                        along the CAP Canal, as well as along the Beardsley
                        Canal.  In addition several stage-storage locations
                        were developed for areas with significant storage
                        along the SR74.  No storage was modeled along the US60
                        and railroad, but the culverts were analyzed for
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                                    diversion potential.  Diversions were placed in the
                                    model where deemed appropriate.  See appendix for
                                    details.

                                    FLO-2D was utilized to calculate the split flows at
                                    concentration points CIW351. CIW357, CIW363 and CWI576.
                                    See appendix for modeling details.

                         ******************************************************************************
                         ******************************************************************************


156 IO          OUTPUT CONTROL VARIABLES
                      IPRNT          5  PRINT CONTROL
                      IPLOT          0  PLOT CONTROL
                      QSCAL         0.  HYDROGRAPH PLOT SCALE

    IT          HYDROGRAPH TIME DATA
                       NMIN          5  MINUTES IN COMPUTATION INTERVAL
                      IDATE      1   0  STARTING DATE
                      ITIME       0000  STARTING TIME
                         NQ       1500  NUMBER OF HYDROGRAPH ORDINATES
                     NDDATE      6   0  ENDING DATE
                     NDTIME       0455  ENDING TIME
                      ICENT         19  CENTURY MARK

                  COMPUTATION INTERVAL     0.08 HOURS
                       TOTAL TIME BASE   124.92 HOURS

           ENGLISH UNITS
                DRAINAGE AREA          SQUARE MILES
                PRECIPITATION DEPTH    INCHES
                LENGTH, ELEVATION      FEET
                FLOW                   CUBIC FEET PER SECOND
                STORAGE VOLUME         ACRE-FEET
                SURFACE AREA           ACRES
                TEMPERATURE            DEGREES FAHRENHEIT

158 JD           INDEX STORM NO. 1
                      STRM        4.18  PRECIPITATION DEPTH
                      TRDA        0.01  TRANSPOSITION DRAINAGE AREA

159 PI             PRECIPITATION PATTERN
                     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
                     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
                     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
                     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
                     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
                     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
                     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
                     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
                     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
                     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
                     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
                     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
                     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.01     0.00     0.01
                     0.01     0.01     0.01     0.01     0.01     0.01     0.01     0.01     0.03     0.03
                     0.03     0.09     0.09     0.09     0.01     0.01     0.01     0.01     0.01     0.01
                     0.01     0.01     0.01     0.01     0.01     0.01     0.00     0.00     0.00     0.00
                     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
                     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
                     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
                     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
                     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
                     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
                     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
                     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
                     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
                     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
                     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
                     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
                     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00

169 JD           INDEX STORM NO. 2
                      STRM        3.93  PRECIPITATION DEPTH
                      TRDA       10.00  TRANSPOSITION DRAINAGE AREA

  0 PI             PRECIPITATION PATTERN
                     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
                     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
                     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
                     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
                     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
                     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
                     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
                     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
                     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
                     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
                     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
                     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
                     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.01     0.00     0.01
                     0.01     0.01     0.01     0.01     0.01     0.01     0.01     0.01     0.03     0.03
                     0.03     0.09     0.09     0.09     0.01     0.01     0.01     0.01     0.01     0.01
                     0.01     0.01     0.01     0.01     0.01     0.01     0.00     0.00     0.00     0.00
                     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
                     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
                     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
                     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
                     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
                     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
                     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
                     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
                     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
                     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
                     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
                     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
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                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00

170 JD            INDEX STORM NO. 3
                        STRM      3.86  PRECIPITATION DEPTH
                        TRDA     20.00  TRANSPOSITION DRAINAGE AREA

  0 PI              PRECIPITATION PATTERN
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.01      0.00      0.01
                  0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.03      0.03
                  0.03      0.09      0.09      0.09      0.01      0.01      0.01      0.01      0.01      0.01
                  0.01      0.01      0.01      0.01      0.01      0.01      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00

171 JD            INDEX STORM NO. 4
                        STRM      3.72  PRECIPITATION DEPTH
                        TRDA     40.00  TRANSPOSITION DRAINAGE AREA

  0 PI              PRECIPITATION PATTERN
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.01      0.00      0.01
                  0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.03      0.03
                  0.03      0.09      0.09      0.09      0.01      0.01      0.01      0.01      0.01      0.01
                  0.01      0.01      0.01      0.01      0.01      0.01      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00

172 JD            INDEX STORM NO. 5
                        STRM      3.60  PRECIPITATION DEPTH
                        TRDA     80.00  TRANSPOSITION DRAINAGE AREA

  0 PI              PRECIPITATION PATTERN
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.01      0.00      0.01
                  0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.03      0.03
                  0.03      0.09      0.09      0.09      0.01      0.01      0.01      0.01      0.01      0.01
                  0.01      0.01      0.01      0.01      0.01      0.01      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
```

173 JD INDEX STORM NO. 6
STRM 3.53 PRECIPITATION DEPTH
TRDA 120.00 TRANSPOSITION DRAINAGE AREA

0 PI PRECIPITATION PATTERN

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01
0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.03	0.03
0.03	0.09	0.09	0.09	0.01	0.01	0.01	0.01	0.01	0.01
0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		

174 JD INDEX STORM NO. 7
STRM 3.44 PRECIPITATION DEPTH
TRDA 200.00 TRANSPOSITION DRAINAGE AREA

0 PI PRECIPITATION PATTERN

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01
0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.03	0.03
0.03	0.09	0.09	0.09	0.01	0.01	0.01	0.01	0.01	0.01
0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		

175 JD INDEX STORM NO. 8
STRM 3.38 PRECIPITATION DEPTH
TRDA 300.00 TRANSPOSITION DRAINAGE AREA

0 PI PRECIPITATION PATTERN

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01
0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.03	0.03
0.03	0.09	0.09	0.09	0.01	0.01	0.01	0.01	0.01	0.01
0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		

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176 JD         INDEX STORM NO. 9
                    STRM        3.29  PRECIPITATION DEPTH
                    TRDA      500.00  TRANSPOSITION DRAINAGE AREA

  0 PI           PRECIPITATION PATTERN
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.01      0.00      0.01
                    0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.03      0.03
                    0.03      0.09      0.09      0.09      0.01      0.01      0.01      0.01      0.01      0.01
                    0.01      0.01      0.01      0.01      0.01      0.01      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00

*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

           **************
           *            *
177 KK     *    IW371   *
           *            *
           **************

178 KO         OUTPUT CONTROL VARIABLES
                    IPRNT           5  PRINT CONTROL
                    IPLOT           0  PLOT CONTROL
                    QSCAL          0.  HYDROGRAPH PLOT SCALE
                    IPNCH           1  PUNCH COMPUTED HYDROGRAPH
                     IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                    ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                    ISAV2        1500  LAST ORDINATE PUNCHED OR SAVED
                   TIMINT       0.083  TIME INTERVAL IN HOURS

*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

           **************
           *            *
184 KK     *     D371   *
           *            *
           **************

185 KO         OUTPUT CONTROL VARIABLES
                    IPRNT           5  PRINT CONTROL
                    IPLOT           0  PLOT CONTROL
                    QSCAL          0.  HYDROGRAPH PLOT SCALE
                    IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                     IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                    ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                    ISAV2        1500  LAST ORDINATE PUNCHED OR SAVED
                   TIMINT       0.083  TIME INTERVAL IN HOURS

*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

           **************
           *            *
189 KK     *   RIW371   *
           *            *
           **************

190 KO         OUTPUT CONTROL VARIABLES
                    IPRNT           5  PRINT CONTROL
                    IPLOT           0  PLOT CONTROL
                    QSCAL          0.  HYDROGRAPH PLOT SCALE
                    IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                     IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                    ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                    ISAV2        1500  LAST ORDINATE PUNCHED OR SAVED
                   TIMINT       0.083  TIME INTERVAL IN HOURS

*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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             **************
             *            *
 195 KK      *    IW366   *
             *            *
             **************

 196 KO          OUTPUT CONTROL VARIABLES
                       IPRNT          5  PRINT CONTROL
                       IPLOT          0  PLOT CONTROL
                       QSCAL         0.  HYDROGRAPH PLOT SCALE
                       IPNCH          1  PUNCH COMPUTED HYDROGRAPH
                        IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                       ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                       ISAV2       1500  LAST ORDINATE PUNCHED OR SAVED
                      TIMINT      0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

             **************
             *            *
 202 KK      *   CIW366   *
             *            *
             **************

 203 KO          OUTPUT CONTROL VARIABLES
                       IPRNT          5  PRINT CONTROL
                       IPLOT          0  PLOT CONTROL
                       QSCAL         0.  HYDROGRAPH PLOT SCALE
                       IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                        IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                       ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                       ISAV2       1500  LAST ORDINATE PUNCHED OR SAVED
                      TIMINT      0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

             **************
             *            *
 205 KK      *   RIW366   *
             *            *
             **************

 206 KO          OUTPUT CONTROL VARIABLES
                       IPRNT          5  PRINT CONTROL
                       IPLOT          0  PLOT CONTROL
                       QSCAL         0.  HYDROGRAPH PLOT SCALE
                       IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                        IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                       ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                       ISAV2       1500  LAST ORDINATE PUNCHED OR SAVED
                      TIMINT      0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

             **************
             *            *
 211 KK      *    IW377   *
             *            *
             **************

 212 KO          OUTPUT CONTROL VARIABLES
                       IPRNT          5  PRINT CONTROL
                       IPLOT          0  PLOT CONTROL
                       QSCAL         0.  HYDROGRAPH PLOT SCALE
                       IPNCH          1  PUNCH COMPUTED HYDROGRAPH
                        IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                       ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                       ISAV2       1500  LAST ORDINATE PUNCHED OR SAVED
                      TIMINT      0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

             **************
             *            *
 223 KK      *   RIW377   *
             *            *
             **************

 224 KO          OUTPUT CONTROL VARIABLES
                       IPRNT          5  PRINT CONTROL
                       IPLOT          0  PLOT CONTROL
                       QSCAL         0.  HYDROGRAPH PLOT SCALE
                       IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                        IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                       ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                       ISAV2       1500  LAST ORDINATE PUNCHED OR SAVED
                      TIMINT      0.083  TIME INTERVAL IN HOURS
```

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*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

          **************
          *            *
 229 KK   *    IW374   *
          *            *
          **************

 230 KO        OUTPUT CONTROL VARIABLES
                     IPRNT          5  PRINT CONTROL
                     IPLOT          0  PLOT CONTROL
                     QSCAL         0.  HYDROGRAPH PLOT SCALE
                     IPNCH          1  PUNCH COMPUTED HYDROGRAPH
                      IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                     ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                     ISAV2       1500  LAST ORDINATE PUNCHED OR SAVED
                    TIMINT      0.083  TIME INTERVAL IN HOURS

*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

          **************
          *            *
 236 KK   *     D371   *
          *            *
          **************

 237 KO        OUTPUT CONTROL VARIABLES
                     IPRNT          5  PRINT CONTROL
                     IPLOT          0  PLOT CONTROL
                     QSCAL         0.  HYDROGRAPH PLOT SCALE
                     IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                      IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                     ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                     ISAV2       1500  LAST ORDINATE PUNCHED OR SAVED
                    TIMINT      0.083  TIME INTERVAL IN HOURS

*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

          **************
          *            *
 239 KK   *    RD371   *
          *            *
          **************

 240 KO        OUTPUT CONTROL VARIABLES
                     IPRNT          5  PRINT CONTROL
                     IPLOT          0  PLOT CONTROL
                     QSCAL         0.  HYDROGRAPH PLOT SCALE
                     IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                      IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                     ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                     ISAV2       1500  LAST ORDINATE PUNCHED OR SAVED
                    TIMINT      0.083  TIME INTERVAL IN HOURS

*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

          **************
          *            *
 245 KK   *   CIW374   *
          *            *
          **************

 246 KO        OUTPUT CONTROL VARIABLES
                     IPRNT          5  PRINT CONTROL
                     IPLOT          0  PLOT CONTROL
                     QSCAL         0.  HYDROGRAPH PLOT SCALE
                     IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                      IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                     ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                     ISAV2       1500  LAST ORDINATE PUNCHED OR SAVED
                    TIMINT      0.083  TIME INTERVAL IN HOURS

*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

          **************
          *            *
 248 KK   *   RIW374   *
          *            *
          **************

 249 KO        OUTPUT CONTROL VARIABLES
                     IPRNT          5  PRINT CONTROL
                     IPLOT          0  PLOT CONTROL
                     QSCAL         0.  HYDROGRAPH PLOT SCALE
                     IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                      IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                     ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                     ISAV2       1500  LAST ORDINATE PUNCHED OR SAVED
```

```
                TIMINT        0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

          **************
          *            *
254 KK    *    IW386   *
          *            *
          **************

255 KO         OUTPUT CONTROL VARIABLES
                IPRNT           5  PRINT CONTROL
                IPLOT           0  PLOT CONTROL
                QSCAL          0.  HYDROGRAPH PLOT SCALE
                IPNCH           1  PUNCH COMPUTED HYDROGRAPH
                 IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                ISAV2        1500  LAST ORDINATE PUNCHED OR SAVED
               TIMINT       0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

          **************
          *            *
261 KK    *   RIW386   *
          *            *
          **************

262 KO         OUTPUT CONTROL VARIABLES
                IPRNT           5  PRINT CONTROL
                IPLOT           0  PLOT CONTROL
                QSCAL          0.  HYDROGRAPH PLOT SCALE
                IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                 IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                ISAV2        1500  LAST ORDINATE PUNCHED OR SAVED
               TIMINT       0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

          **************
          *            *
267 KK    *    IW382   *
          *            *
          **************

268 KO         OUTPUT CONTROL VARIABLES
                IPRNT           5  PRINT CONTROL
                IPLOT           0  PLOT CONTROL
                QSCAL          0.  HYDROGRAPH PLOT SCALE
                IPNCH           1  PUNCH COMPUTED HYDROGRAPH
                 IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                ISAV2        1500  LAST ORDINATE PUNCHED OR SAVED
               TIMINT       0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

          **************
          *            *
274 KK    *   CIW382   *
          *            *
          **************

275 KO         OUTPUT CONTROL VARIABLES
                IPRNT           5  PRINT CONTROL
                IPLOT           0  PLOT CONTROL
                QSCAL          0.  HYDROGRAPH PLOT SCALE
                IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                 IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                ISAV2        1500  LAST ORDINATE PUNCHED OR SAVED
               TIMINT       0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

          **************
          *            *
277 KK    *    D382B   *
          *            *
          **************

278 KO         OUTPUT CONTROL VARIABLES
                IPRNT           5  PRINT CONTROL
                IPLOT           0  PLOT CONTROL
                QSCAL          0.  HYDROGRAPH PLOT SCALE
```

```
                IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                 IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                ISAV2        1500  LAST ORDINATE PUNCHED OR SAVED
               TIMINT       0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

            **************
            *            *
 282 KK     *    D382A   *
            *            *
            **************

 283 KO         OUTPUT CONTROL VARIABLES
                IPRNT           5  PRINT CONTROL
                IPLOT           0  PLOT CONTROL
                QSCAL          0.  HYDROGRAPH PLOT SCALE
                IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                 IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                ISAV2        1500  LAST ORDINATE PUNCHED OR SAVED
               TIMINT       0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

            **************
            *            *
 287 KK     *   RIW382   *
            *            *
            **************

 288 KO         OUTPUT CONTROL VARIABLES
                IPRNT           5  PRINT CONTROL
                IPLOT           0  PLOT CONTROL
                QSCAL          0.  HYDROGRAPH PLOT SCALE
                IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                 IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                ISAV2        1500  LAST ORDINATE PUNCHED OR SAVED
               TIMINT       0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

            **************
            *            *
 293 KK     *    IW384   *
            *            *
            **************

 294 KO         OUTPUT CONTROL VARIABLES
                IPRNT           5  PRINT CONTROL
                IPLOT           0  PLOT CONTROL
                QSCAL          0.  HYDROGRAPH PLOT SCALE
                IPNCH           1  PUNCH COMPUTED HYDROGRAPH
                 IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                ISAV2        1500  LAST ORDINATE PUNCHED OR SAVED
               TIMINT       0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

            **************
            *            *
 300 KK     *    D382A   *
            *            *
            **************

 301 KO         OUTPUT CONTROL VARIABLES
                IPRNT           5  PRINT CONTROL
                IPLOT           0  PLOT CONTROL
                QSCAL          0.  HYDROGRAPH PLOT SCALE
                IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                 IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                ISAV2        1500  LAST ORDINATE PUNCHED OR SAVED
               TIMINT       0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

            **************
            *            *
 303 KK     *   RD382A   *
            *            *
            **************
```

```
304 KO          OUTPUT CONTROL VARIABLES
                      IPRNT            5  PRINT CONTROL
                      IPLOT            0  PLOT CONTROL
                      QSCAL           0.  HYDROGRAPH PLOT SCALE
                      IPNCH            0  PUNCH COMPUTED HYDROGRAPH
                       IOUT           22  SAVE HYDROGRAPH ON THIS UNIT
                      ISAV1            1  FIRST ORDINATE PUNCHED OR SAVED
                      ISAV2         1500  LAST ORDINATE PUNCHED OR SAVED
                     TIMINT        0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

            **************
            *            *
309 KK      *   CIW384   *
            *            *
            **************

310 KO          OUTPUT CONTROL VARIABLES
                      IPRNT            5  PRINT CONTROL
                      IPLOT            0  PLOT CONTROL
                      QSCAL           0.  HYDROGRAPH PLOT SCALE
                      IPNCH            0  PUNCH COMPUTED HYDROGRAPH
                       IOUT           22  SAVE HYDROGRAPH ON THIS UNIT
                      ISAV1            1  FIRST ORDINATE PUNCHED OR SAVED
                      ISAV2         1500  LAST ORDINATE PUNCHED OR SAVED
                     TIMINT        0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

            **************
            *            *
312 KK      *   RIW384   *
            *            *
            **************

313 KO          OUTPUT CONTROL VARIABLES
                      IPRNT            5  PRINT CONTROL
                      IPLOT            0  PLOT CONTROL
                      QSCAL           0.  HYDROGRAPH PLOT SCALE
                      IPNCH            0  PUNCH COMPUTED HYDROGRAPH
                       IOUT           22  SAVE HYDROGRAPH ON THIS UNIT
                      ISAV1            1  FIRST ORDINATE PUNCHED OR SAVED
                      ISAV2         1500  LAST ORDINATE PUNCHED OR SAVED
                     TIMINT        0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

            **************
            *            *
318 KK      *    IW381   *
            *            *
            **************

319 KO          OUTPUT CONTROL VARIABLES
                      IPRNT            5  PRINT CONTROL
                      IPLOT            0  PLOT CONTROL
                      QSCAL           0.  HYDROGRAPH PLOT SCALE
                      IPNCH            1  PUNCH COMPUTED HYDROGRAPH
                       IOUT           22  SAVE HYDROGRAPH ON THIS UNIT
                      ISAV1            1  FIRST ORDINATE PUNCHED OR SAVED
                      ISAV2         1500  LAST ORDINATE PUNCHED OR SAVED
                     TIMINT        0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

            **************
            *            *
325 KK      *    D382B   *
            *            *
            **************

326 KO          OUTPUT CONTROL VARIABLES
                      IPRNT            5  PRINT CONTROL
                      IPLOT            0  PLOT CONTROL
                      QSCAL           0.  HYDROGRAPH PLOT SCALE
                      IPNCH            0  PUNCH COMPUTED HYDROGRAPH
                       IOUT           22  SAVE HYDROGRAPH ON THIS UNIT
                      ISAV1            1  FIRST ORDINATE PUNCHED OR SAVED
                      ISAV2         1500  LAST ORDINATE PUNCHED OR SAVED
                     TIMINT        0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

            **************
            *            *
```

```
330 KK      *    RIW381  *
            *            *
            **************

331 KO          OUTPUT CONTROL VARIABLES
                      IPRNT          5  PRINT CONTROL
                      IPLOT          0  PLOT CONTROL
                      QSCAL         0.  HYDROGRAPH PLOT SCALE
                      IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                       IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                      ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                      ISAV2       1500  LAST ORDINATE PUNCHED OR SAVED
                     TIMINT      0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

            **************
            *            *
336 KK      *     C359*  *
            *            *
            **************

337 KO          OUTPUT CONTROL VARIABLES
                      IPRNT          5  PRINT CONTROL
                      IPLOT          0  PLOT CONTROL
                      QSCAL         0.  HYDROGRAPH PLOT SCALE
                      IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                       IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                      ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                      ISAV2       1500  LAST ORDINATE PUNCHED OR SAVED
                     TIMINT      0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

            **************
            *            *
339 KK      *     R359*  *
            *            *
            **************

340 KO          OUTPUT CONTROL VARIABLES
                      IPRNT          5  PRINT CONTROL
                      IPLOT          0  PLOT CONTROL
                      QSCAL         0.  HYDROGRAPH PLOT SCALE
                      IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                       IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                      ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                      ISAV2       1500  LAST ORDINATE PUNCHED OR SAVED
                     TIMINT      0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

            **************
            *            *
345 KK      *     IW359  *
            *            *
            **************

346 KO          OUTPUT CONTROL VARIABLES
                      IPRNT          5  PRINT CONTROL
                      IPLOT          0  PLOT CONTROL
                      QSCAL         0.  HYDROGRAPH PLOT SCALE
                      IPNCH          1  PUNCH COMPUTED HYDROGRAPH
                       IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                      ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                      ISAV2       1500  LAST ORDINATE PUNCHED OR SAVED
                     TIMINT      0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

            **************
            *            *
352 KK      *    CIW359  *
            *            *
            **************

353 KO          OUTPUT CONTROL VARIABLES
                      IPRNT          5  PRINT CONTROL
                      IPLOT          0  PLOT CONTROL
                      QSCAL         0.  HYDROGRAPH PLOT SCALE
                      IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                       IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                      ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                      ISAV2       1500  LAST ORDINATE PUNCHED OR SAVED
                     TIMINT      0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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```
         ***************
         *             *
 355 KK  *   RIW359    *
         *             *
         ***************

 356 KO        OUTPUT CONTROL VARIABLES
                     IPRNT           5  PRINT CONTROL
                     IPLOT           0  PLOT CONTROL
                     QSCAL          0.  HYDROGRAPH PLOT SCALE
                     IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                     IOUT           22  SAVE HYDROGRAPH ON THIS UNIT
                     ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                     ISAV2        1500  LAST ORDINATE PUNCHED OR SAVED
                    TIMINT       0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

         ***************
         *             *
 361 KK  *    IW389    *
         *             *
         ***************

 362 KO        OUTPUT CONTROL VARIABLES
                     IPRNT           5  PRINT CONTROL
                     IPLOT           0  PLOT CONTROL
                     QSCAL          0.  HYDROGRAPH PLOT SCALE
                     IPNCH           1  PUNCH COMPUTED HYDROGRAPH
                     IOUT           22  SAVE HYDROGRAPH ON THIS UNIT
                     ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                     ISAV2        1500  LAST ORDINATE PUNCHED OR SAVED
                    TIMINT       0.083  TIME INTERVAL IN HOURS

      WARNING EXCESS AT PONDING LESS THAN ZERO FOR PERIOD. EXCESS SET TO ZERO


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

         ***************
         *             *
 374 KK  *   RIW389    *
         *             *
         ***************

 375 KO        OUTPUT CONTROL VARIABLES
                     IPRNT           5  PRINT CONTROL
                     IPLOT           0  PLOT CONTROL
                     QSCAL          0.  HYDROGRAPH PLOT SCALE
                     IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                     IOUT           22  SAVE HYDROGRAPH ON THIS UNIT
                     ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                     ISAV2        1500  LAST ORDINATE PUNCHED OR SAVED
                    TIMINT       0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

         ***************
         *             *
 380 KK  *    IW394    *
         *             *
         ***************

 381 KO        OUTPUT CONTROL VARIABLES
                     IPRNT           5  PRINT CONTROL
                     IPLOT           0  PLOT CONTROL
                     QSCAL          0.  HYDROGRAPH PLOT SCALE
                     IPNCH           1  PUNCH COMPUTED HYDROGRAPH
                     IOUT           22  SAVE HYDROGRAPH ON THIS UNIT
                     ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                     ISAV2        1500  LAST ORDINATE PUNCHED OR SAVED
                    TIMINT       0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

         ***************
         *             *
 387 KK  *   RIW394    *
         *             *
         ***************

 388 KO        OUTPUT CONTROL VARIABLES
                     IPRNT           5  PRINT CONTROL
                     IPLOT           0  PLOT CONTROL
                     QSCAL          0.  HYDROGRAPH PLOT SCALE
                     IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                     IOUT           22  SAVE HYDROGRAPH ON THIS UNIT
                     ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                     ISAV2        1500  LAST ORDINATE PUNCHED OR SAVED
                    TIMINT       0.083  TIME INTERVAL IN HOURS
```

```
*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

              **************
              *            *
 393 KK       *   IW390A   *
              *            *
              **************

 394 KO            OUTPUT CONTROL VARIABLES
                        IPRNT          5  PRINT CONTROL
                        IPLOT          0  PLOT CONTROL
                        QSCAL         0.  HYDROGRAPH PLOT SCALE
                        IPNCH          1  PUNCH COMPUTED HYDROGRAPH
                         IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2       1500  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT      0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

              **************
              *            *
 400 KK       *    C390A   *
              *            *
              **************

 401 KO            OUTPUT CONTROL VARIABLES
                        IPRNT          5  PRINT CONTROL
                        IPLOT          0  PLOT CONTROL
                        QSCAL         0.  HYDROGRAPH PLOT SCALE
                        IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                         IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2       1500  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT      0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

              **************
              *            *
 403 KK       *    R390A   *
              *            *
              **************

 404 KO            OUTPUT CONTROL VARIABLES
                        IPRNT          5  PRINT CONTROL
                        IPLOT          0  PLOT CONTROL
                        QSCAL         0.  HYDROGRAPH PLOT SCALE
                        IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                         IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2       1500  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT      0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

              **************
              *            *
 409 KK       *    IW390   *
              *            *
              **************

 410 KO            OUTPUT CONTROL VARIABLES
                        IPRNT          5  PRINT CONTROL
                        IPLOT          0  PLOT CONTROL
                        QSCAL         0.  HYDROGRAPH PLOT SCALE
                        IPNCH          1  PUNCH COMPUTED HYDROGRAPH
                         IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2       1500  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT      0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

              **************
              *            *
 416 KK       *    IW392   *
              *            *
              **************

 417 KO            OUTPUT CONTROL VARIABLES
                        IPRNT          5  PRINT CONTROL
                        IPLOT          0  PLOT CONTROL
                        QSCAL         0.  HYDROGRAPH PLOT SCALE
                        IPNCH          1  PUNCH COMPUTED HYDROGRAPH
```

```
                 IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                ISAV2        1500  LAST ORDINATE PUNCHED OR SAVED
               TIMINT       0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

            **************
            *            *
 423 KK     *   CIW390   *
            *            *
            **************

 424 KO          OUTPUT CONTROL VARIABLES
                IPRNT           5  PRINT CONTROL
                IPLOT           0  PLOT CONTROL
                QSCAL          0.  HYDROGRAPH PLOT SCALE
                IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                 IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                ISAV2        1500  LAST ORDINATE PUNCHED OR SAVED
               TIMINT       0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

            **************
            *            *
 431 KK     *   RIW390   *
            *            *
            **************

 432 KO          OUTPUT CONTROL VARIABLES
                IPRNT           5  PRINT CONTROL
                IPLOT           0  PLOT CONTROL
                QSCAL          0.  HYDROGRAPH PLOT SCALE
                IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                 IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                ISAV2        1500  LAST ORDINATE PUNCHED OR SAVED
               TIMINT       0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

            **************
            *            *
 437 KK     *    IW388   *
            *            *
            **************

 438 KO          OUTPUT CONTROL VARIABLES
                IPRNT           5  PRINT CONTROL
                IPLOT           0  PLOT CONTROL
                QSCAL          0.  HYDROGRAPH PLOT SCALE
                IPNCH           1  PUNCH COMPUTED HYDROGRAPH
                 IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                ISAV2        1500  LAST ORDINATE PUNCHED OR SAVED
               TIMINT       0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

            **************
            *            *
 444 KK     *   CIW388   *
            *            *
            **************

 445 KO          OUTPUT CONTROL VARIABLES
                IPRNT           5  PRINT CONTROL
                IPLOT           0  PLOT CONTROL
                QSCAL          0.  HYDROGRAPH PLOT SCALE
                IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                 IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                ISAV2        1500  LAST ORDINATE PUNCHED OR SAVED
               TIMINT       0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

            **************
            *            *
 447 KK     *   RIW388   *
            *            *
            **************

 448 KO          OUTPUT CONTROL VARIABLES
```

```
                 IPRNT            5  PRINT CONTROL
                 IPLOT            0  PLOT CONTROL
                 QSCAL           0.  HYDROGRAPH PLOT SCALE
                 IPNCH            0  PUNCH COMPUTED HYDROGRAPH
                  IOUT           22  SAVE HYDROGRAPH ON THIS UNIT
                 ISAV1            1  FIRST ORDINATE PUNCHED OR SAVED
                 ISAV2         1500  LAST ORDINATE PUNCHED OR SAVED
                TIMINT        0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

            **************
            *            *
 453 KK     *    IW357   *
            *            *
            **************

 454 KO          OUTPUT CONTROL VARIABLES
                 IPRNT            5  PRINT CONTROL
                 IPLOT            0  PLOT CONTROL
                 QSCAL           0.  HYDROGRAPH PLOT SCALE
                 IPNCH            1  PUNCH COMPUTED HYDROGRAPH
                  IOUT           22  SAVE HYDROGRAPH ON THIS UNIT
                 ISAV1            1  FIRST ORDINATE PUNCHED OR SAVED
                 ISAV2         1500  LAST ORDINATE PUNCHED OR SAVED
                TIMINT        0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

            **************
            *            *
 460 KK     *   CIW357   *
            *            *
            **************

 461 KO          OUTPUT CONTROL VARIABLES
                 IPRNT            5  PRINT CONTROL
                 IPLOT            0  PLOT CONTROL
                 QSCAL           0.  HYDROGRAPH PLOT SCALE
                 IPNCH            0  PUNCH COMPUTED HYDROGRAPH
                  IOUT           22  SAVE HYDROGRAPH ON THIS UNIT
                 ISAV1            1  FIRST ORDINATE PUNCHED OR SAVED
                 ISAV2         1500  LAST ORDINATE PUNCHED OR SAVED
                TIMINT        0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

            **************
            *            *
 469 KK     *   RIW357   *
            *            *
            **************

 470 KO          OUTPUT CONTROL VARIABLES
                 IPRNT            5  PRINT CONTROL
                 IPLOT            0  PLOT CONTROL
                 QSCAL           0.  HYDROGRAPH PLOT SCALE
                 IPNCH            0  PUNCH COMPUTED HYDROGRAPH
                  IOUT           22  SAVE HYDROGRAPH ON THIS UNIT
                 ISAV1            1  FIRST ORDINATE PUNCHED OR SAVED
                 ISAV2         1500  LAST ORDINATE PUNCHED OR SAVED
                TIMINT        0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

            **************
            *            *
 475 KK     *    IW353   *
            *            *
            **************

 476 KO          OUTPUT CONTROL VARIABLES
                 IPRNT            5  PRINT CONTROL
                 IPLOT            0  PLOT CONTROL
                 QSCAL           0.  HYDROGRAPH PLOT SCALE
                 IPNCH            1  PUNCH COMPUTED HYDROGRAPH
                  IOUT           22  SAVE HYDROGRAPH ON THIS UNIT
                 ISAV1            1  FIRST ORDINATE PUNCHED OR SAVED
                 ISAV2         1500  LAST ORDINATE PUNCHED OR SAVED
                TIMINT        0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

            **************
            *            *
 482 KK     *   CIW353   *
```

```
          *            *
          **************

483 KO        OUTPUT CONTROL VARIABLES
                    IPRNT           5  PRINT CONTROL
                    IPLOT           0  PLOT CONTROL
                    QSCAL          0.  HYDROGRAPH PLOT SCALE
                    IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                     IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                    ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                    ISAV2        1500  LAST ORDINATE PUNCHED OR SAVED
                   TIMINT       0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

          **************
          *            *
485 KK    *   RIW353   *
          *            *
          **************

486 KO        OUTPUT CONTROL VARIABLES
                    IPRNT           5  PRINT CONTROL
                    IPLOT           0  PLOT CONTROL
                    QSCAL          0.  HYDROGRAPH PLOT SCALE
                    IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                     IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                    ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                    ISAV2        1500  LAST ORDINATE PUNCHED OR SAVED
                   TIMINT       0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

          **************
          *            *
491 KK    *    IW350   *
          *            *
          **************

492 KO        OUTPUT CONTROL VARIABLES
                    IPRNT           5  PRINT CONTROL
                    IPLOT           0  PLOT CONTROL
                    QSCAL          0.  HYDROGRAPH PLOT SCALE
                    IPNCH           1  PUNCH COMPUTED HYDROGRAPH
                     IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                    ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                    ISAV2        1500  LAST ORDINATE PUNCHED OR SAVED
                   TIMINT       0.083  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

          **************
          *            *
498 KK    *   CIW350   *
          *            *
          **************

499 KO        OUTPUT CONTROL VARIABLES
                    IPRNT           5  PRINT CONTROL
                    IPLOT           0  PLOT CONTROL
                    QSCAL          0.  HYDROGRAPH PLOT SCALE
                    IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                     IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                    ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                    ISAV2        1500  LAST ORDINATE PUNCHED OR SAVED
                   TIMINT       0.083  TIME INTERVAL IN HOURS

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```

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+										
+	HYDROGRAPH AT	IW371	68.	12.08	9.	3.	1.	0.05		
+	DIVERSION TO	DO371	46.	12.08	4.	1.	0.	0.05		
+	HYDROGRAPH AT	D371	22.	12.08	5.	2.	1.	0.05		
+	ROUTED TO	RIW371	13.	14.58	5.	2.	1.	0.05		
+	HYDROGRAPH AT	IW366	881.	12.58	162.	43.	14.	1.06		
+	2 COMBINED AT	CIW366	881.	12.58	167.	45.	15.	1.08		

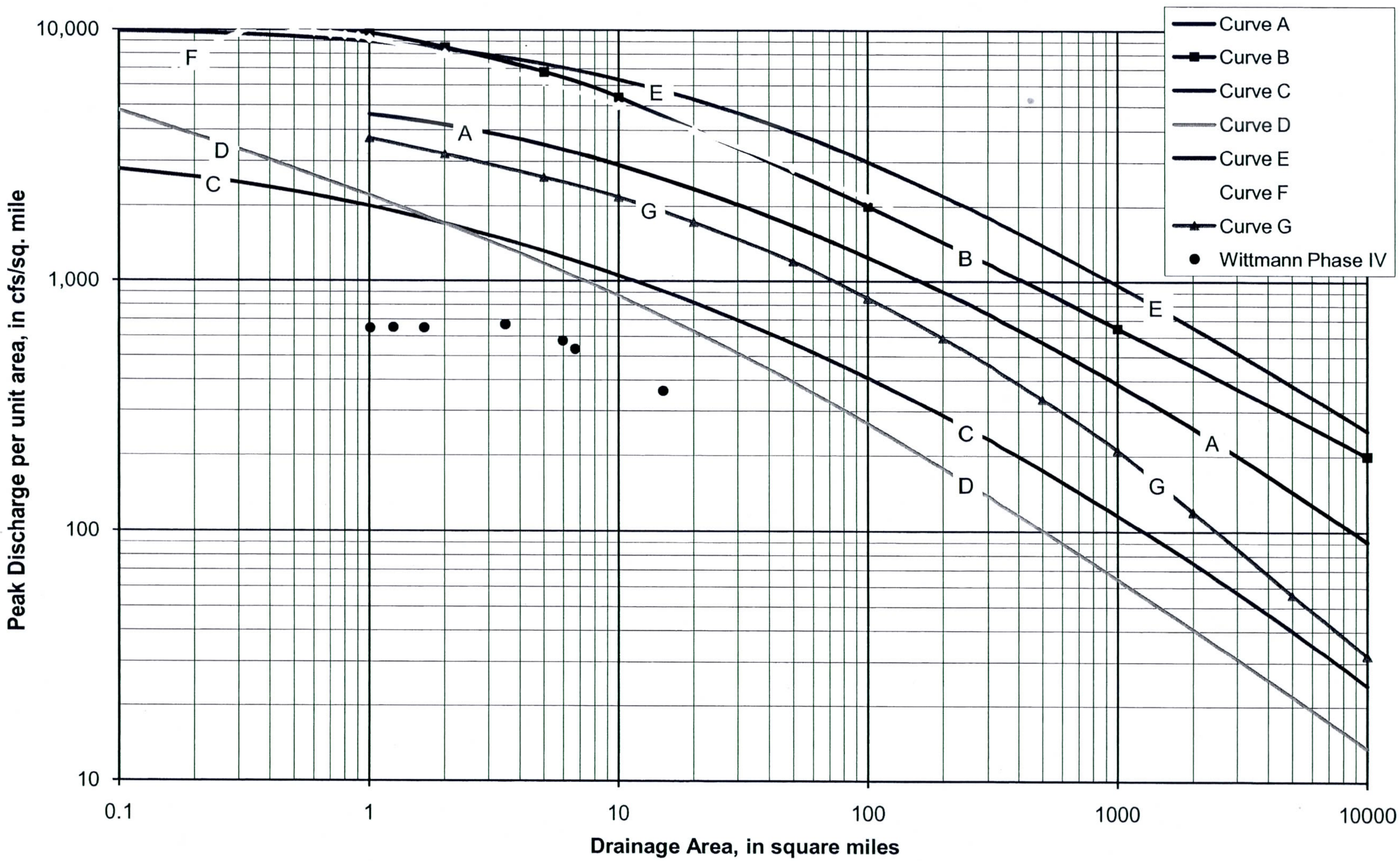
+	ROUTED TO	RIW366	771.	13.00	166.	45.	15.	1.08
+	HYDROGRAPH AT	IW377	106.	12.33	17.	4.	1.	0.11
+	ROUTED TO	SSR010	99.	12.42	17.	4.	1.	0.11
+	ROUTED TO	RIW377	67.	13.25	17.	4.	1.	0.11
+	HYDROGRAPH AT	IW374	534.	12.33	79.	21.	7.	0.39
+	HYDROGRAPH AT	D371	46.	12.08	4.	1.	0.	0.05
+	ROUTED TO	RD371	26.	12.33	4.	1.	0.	0.05
+	3 COMBINED AT	CIW374	558.	12.33	98.	26.	9.	0.53
+	ROUTED TO	RIW374	279.	14.17	96.	26.	9.	0.53
+	HYDROGRAPH AT	IW386	271.	12.67	73.	19.	6.	0.37
+	ROUTED TO	RIW386	208.	13.75	72.	19.	6.	0.37
+	HYDROGRAPH AT	IW382	526.	12.33	100.	26.	9.	0.62
+	2 COMBINED AT	CIW382	525.	12.33	168.	45.	15.	0.99
+	DIVERSION TO	DO382B	180.	12.00	112.	31.	10.	0.99
+	HYDROGRAPH AT	D382B	345.	12.33	56.	14.	5.	0.99
+	DIVERSION TO	DO382A	82.	12.33	5.	1.	0.	0.99
+	HYDROGRAPH AT	D382A	263.	12.33	51.	13.	4.	0.99
+	ROUTED TO	RIW382	212.	12.83	51.	13.	4.	0.99
+	HYDROGRAPH AT	IW384	128.	12.25	18.	5.	2.	0.08
+	HYDROGRAPH AT	D382A	82.	12.33	5.	1.	0.	0.99
+	ROUTED TO	RD382A	60.	12.42	5.	1.	0.	0.99
+	2 COMBINED AT	CIW384	164.	12.33	23.	6.	2.	0.23
+	ROUTED TO	RIW384	120.	12.75	23.	6.	2.	0.23
+	HYDROGRAPH AT	IW381	315.	12.50	83.	22.	7.	0.38
+	HYDROGRAPH AT	D382B	180.	12.00	112.	31.	10.	0.99
+	2 COMBINED AT	CIW381	493.	12.50	194.	53.	18.	0.72
+	ROUTED TO	RIW381	460.	12.92	193.	53.	18.	0.72
+	3 COMBINED AT	C359*	778.	12.83	264.	71.	24.	1.45
+	ROUTED TO	R359*	719.	13.25	261.	71.	24.	1.45
+	HYDROGRAPH AT	IW359	2442.	12.67	444.	116.	39.	2.91
+	4 COMBINED AT	CIW359	3105.	12.92	939.	253.	85.	5.97
+	ROUTED TO	RIW359	2943.	13.25	928.	253.	85.	5.97
+	HYDROGRAPH AT	IW389	118.	12.50	32.	8.	3.	0.13
+	ROUTED TO	SSR190	118.	12.50	32.	8.	3.	0.13
+	ROUTED TO	RIW389	76.	13.92	31.	8.	3.	0.13
	HYDROGRAPH AT							

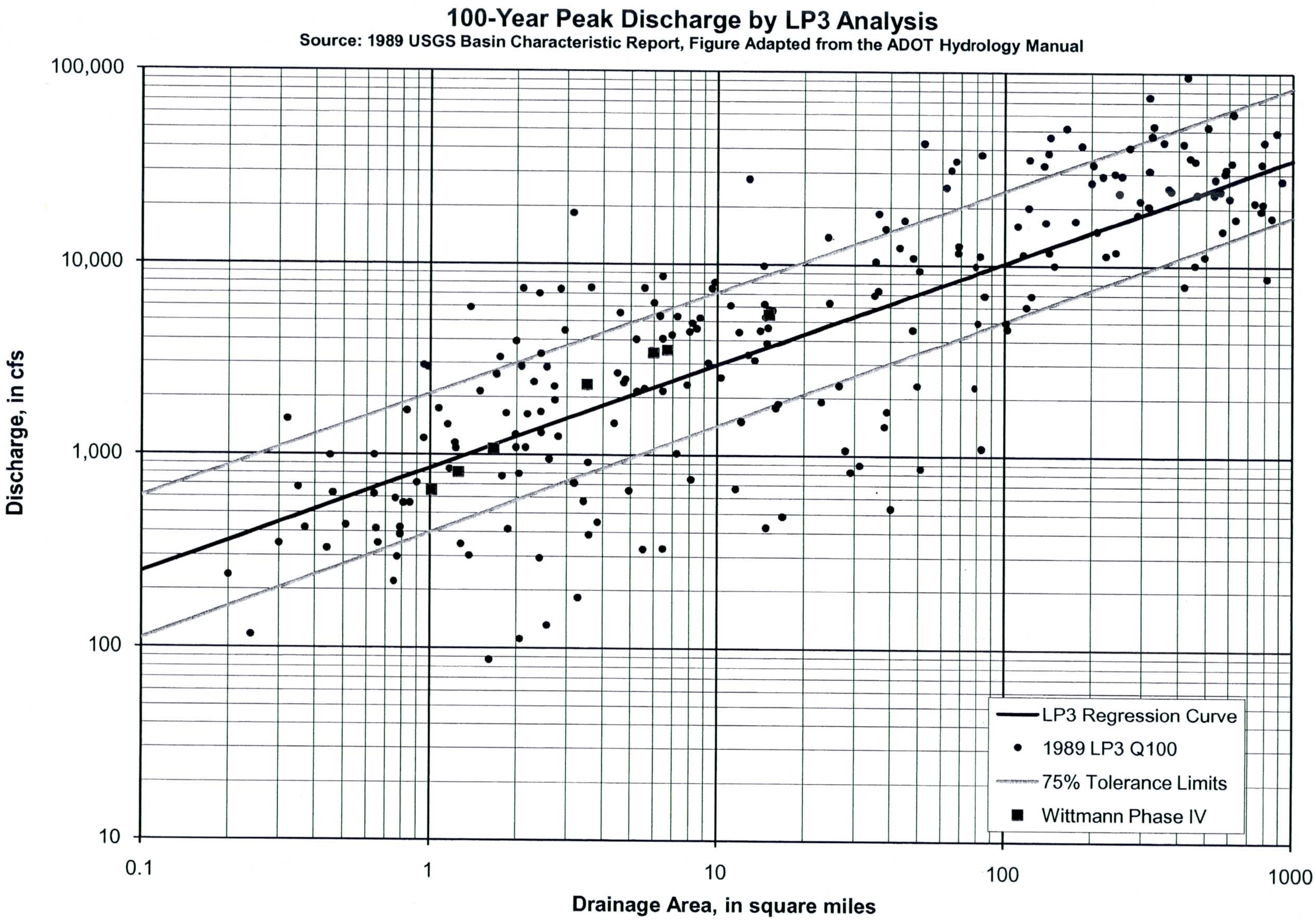
+		IW394	2569.	13.00	682.	192.	64.	4.17
	ROUTED TO							
+		RIW394	2473.	13.17	682.	192.	64.	4.17
	HYDROGRAPH AT							
+		IW390A	576.	12.75	156.	44.	15.	0.90
	2 COMBINED AT							
+		C390A	2903.	13.17	832.	235.	78.	5.07
	ROUTED TO							
+		R390A	2827.	13.42	832.	234.	78.	5.07
	HYDROGRAPH AT							
+		IW390	146.	12.75	45.	12.	4.	0.31
	HYDROGRAPH AT							
+		IW392	1713.	12.33	213.	56.	19.	1.11
	3 COMBINED AT							
+		CIW390	3038.	13.33	1076.	300.	100.	6.50
	ROUTED TO							
+		SSR160	2996.	13.42	1076.	300.	100.	6.50
	ROUTED TO							
+		RIW390	2891.	13.75	1070.	299.	100.	6.50
	HYDROGRAPH AT							
+		IW388	867.	12.92	259.	68.	23.	1.23
	3 COMBINED AT							
+		CIW388	3436.	13.75	1343.	373.	125.	7.85
	ROUTED TO							
+		RIW388	3364.	14.00	1341.	373.	125.	7.85
	HYDROGRAPH AT							
+		IW357	647.	12.50	151.	40.	14.	0.75
	2 COMBINED AT							
+		CIW357	3504.	14.00	1474.	411.	138.	8.60
	DIVERSION TO							
+		DO357	935.	14.00	387.	106.	36.	8.60
	HYDROGRAPH AT							
+		D357	2569.	14.00	1087.	305.	102.	8.60
	ROUTED TO							
+		RIW357	2494.	14.50	1080.	305.	102.	8.60
	HYDROGRAPH AT							
+		IW353	2307.	12.75	524.	135.	45.	2.80
	3 COMBINED AT							
+		CIW353	4986.	13.42	2430.	677.	227.	15.08
	ROUTED TO							
+		RIW353	4862.	13.75	2410.	677.	227.	15.08
	HYDROGRAPH AT							
+		IW350	1154.	13.00	368.	96.	32.	2.17
	2 COMBINED AT							
+		CIW350	5607.	13.67	2739.	765.	257.	17.25

*** NORMAL END OF HEC-1 ***

Indirect Method Comparison Graphs

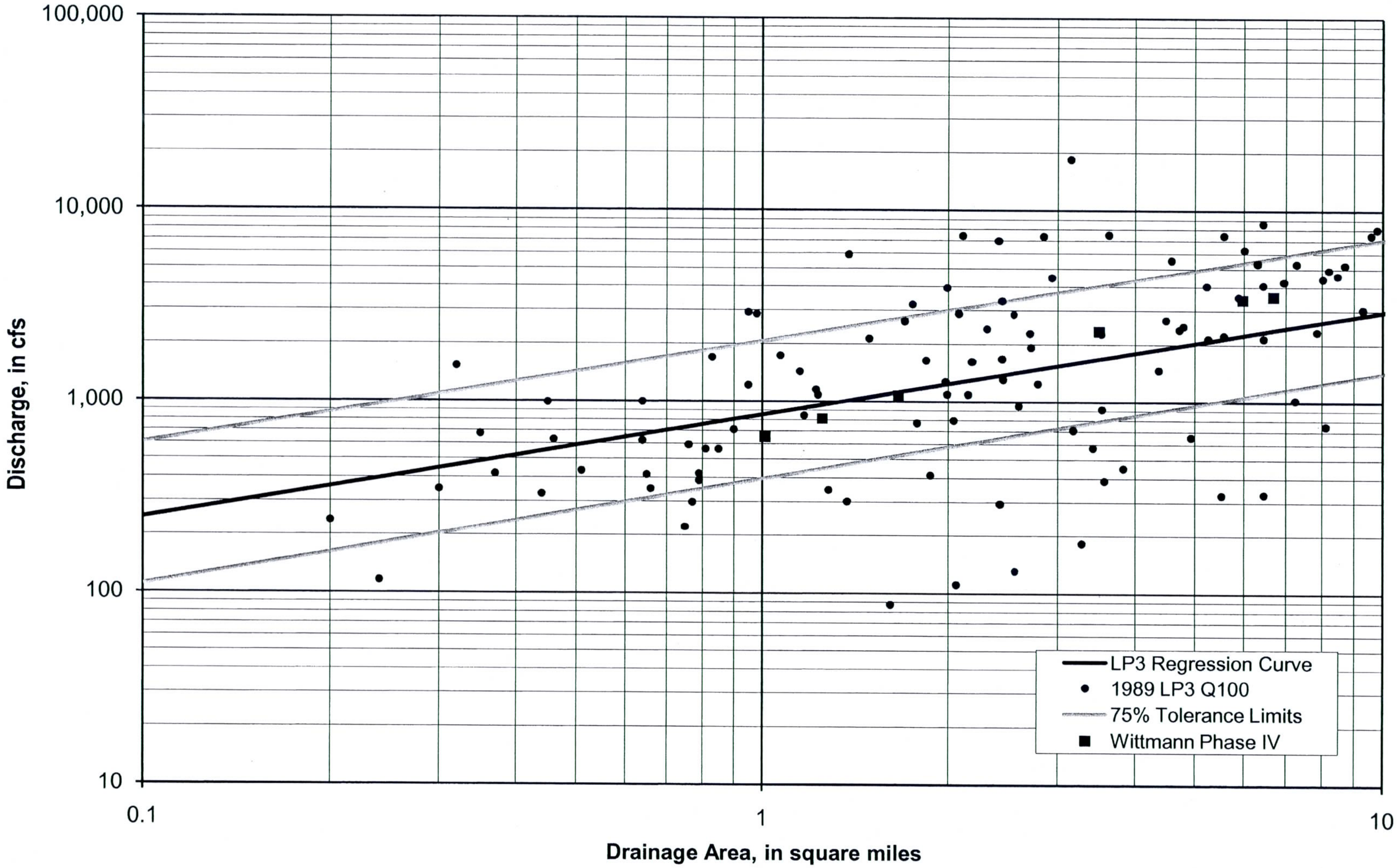
Peak Discharge Relations and Envelope Curves




100-Year Peak Discharge by LP3 Analysis
Source: 1989 USGS Basin Characteristic Report, Figure Adapted from the ADOT Hydrology Manual
100,000
10,000
1,000
100
10
Discharge, in cfs
0.1
1
10
100
1000
Drainage Area, in square miles
LP3 Regression Curve
1989 LP3 Q100
75% Tolerance Limits
Wittmann Phase IV

100-Year Peak Discharge by LP3 Analysis

Source: 1989 USGS Basin Characteristic Report, Figure Adapted from the ADOT Hydrology Manual



Appendix E Hydraulic Analysis Supporting Documentation

E.1 Roughness Coefficient Estimation

Manning's "n" Value Determination

The procedure used to determine Manning's roughness coefficient, "n", is outlined in the USGS publication "Selection of Manning's Roughness Coefficients for Natural and Constructed Vegetated and Non-Vegetated Channels, and Vegetation Maintenance Plan Guidelines for Vegetated Channels in Central Arizona" (2006). The following equation was used:

$n = (n_b+n_1+n_2+n_3+n_4)m$

Where n = estimated Manning's roughness coefficient

- n_b= base value of n for a straight, uniform channel,
- n_1= value for surface irregularities,
- n_2= value for obstruction,
- n_3= value for vegetation,
- n_4= value for variation in channel cross section, and
- m = degree of meandering.

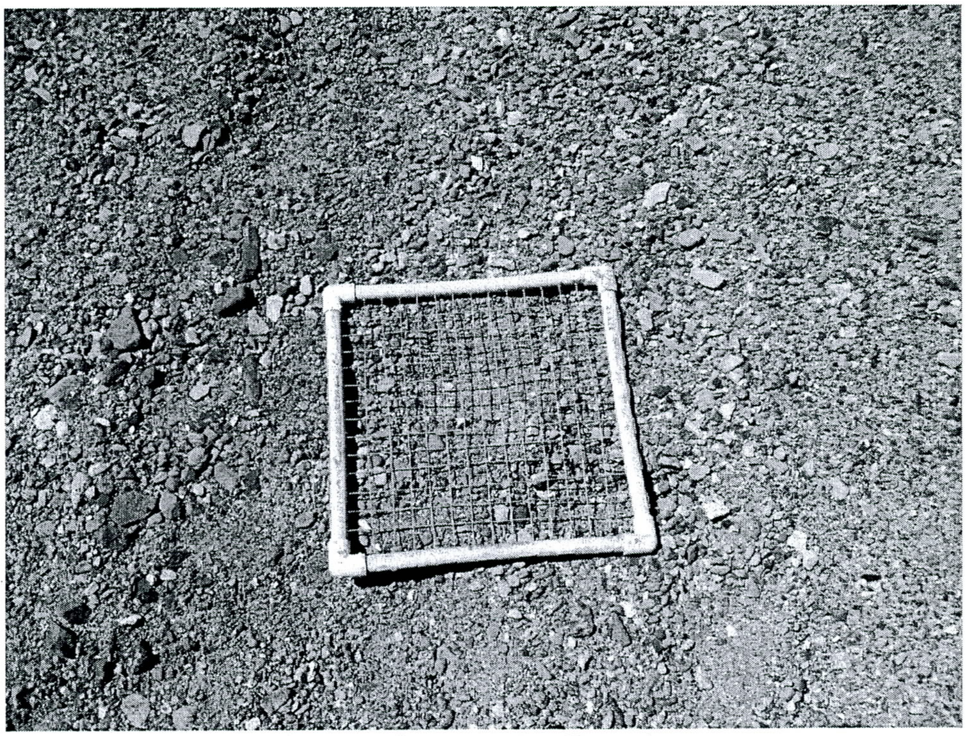
"Guidelines and Specifications for Flood Hazard Mapping Partners" recommends that the number of cross sections be minimized to one or two sections that are representative of the entire flooding source. In addition, Manning roughness coefficients should be estimated from field inspection and should be minimized by choosing values that are representative of the entire flooding source.

Based on the site visit the washes within this study are very similar. The base n, n_b, is established by the size of the bed material of the channel. Material described as coarse sand has a base n value ranging from 0.026-0.035. Material described as gravel ranges from 0.028-0.035. The value 0.026 was chosen for washes with sand and 0.028-0.030 for washes with gravel. The degree of irregularity was smooth for the channel and overbanks. The n_1 value for the channel and for the overbanks was 0.000. The effect of obstruction in the channel and for the overbanks is negligible (few scattered obstructions, less than 5% of the cross-sectional area). The values of n_2 chosen were 0.002 for the channel and for the overbanks. The channels have little vegetation and the overbanks have medium to large vegetation. The value of n_3 for the channel was chosen to be 0.002 and the overbanks ranges from 0.010 to 0.025. The variation in channel cross section size and shape changes gradually so n_4 is 0.000. The degree of meandering is minor so a value of 1 was used for m. The Table below summarizes the Manning's roughness coefficients.

Wash Name	**Location**	**n_b**	**n_1**	**n_2**	**n_3**	**n_4**	**m**	**n**
Iona Tributary 1 West (Location 1)	Channel	0.028	0.000	0.002	0.002	0.000	1.00	**0.032**
	Overbanks	0.026	0.000	0.002	0.025	0.000	1.00	**0.053**
Iona Tributary 1 West (Location 2)	Channel	0.028	0.000	0.002	0.002	0.000	1.00	**0.032**
	Overbanks	0.026	0.000	0.002	0.025	0.000	1.00	**0.053**

Iona Tributary 1 West Extension (Location 3)	Channel	0.030	0.000	0.002	0.002	0.000	1.00	**0.034**
	Overbanks	0.026	0.000	0.002	0.025	0.000	1.00	**0.053**
Iona Tributary 1 West Extension (Location 4)	Channel	0.026	0.000	0.002	0.002	0.000	1.00	**0.030**
	Overbanks	0.026	0.000	0.002	0.025	0.000	1.00	**0.053**
Iona Tributary 1 West Extension (Location 5)	Channel	0.026	0.000	0.002	0.002	0.000	1.00	**0.030**
	Overbanks	0.026	0.000	0.002	0.018	0.000	1.00	**0.046**
Iona Tributary 1 West Extension (Location 6)	Channel	0.026	0.000	0.002	0.002	0.000	1.00	**0.030**
	Overbanks	0.026	0.000	0.002	0.018	0.000	1.00	**0.046**
Iona Tributary 2 West (Location 7)	Channel	0.026	0.000	0.002	0.002	0.000	1.00	**0.030**
	Overbanks	0.026	0.000	0.002	0.025	0.000	1.00	**0.053**
Iona Tributary 2 West (Location 8)	Channel	0.026	0.000	0.002	0.002	0.000	1.00	**0.030**
	Overbanks	0.026	0.000	0.002	0.010	0.000	1.00	**0.038**
Iona Tributary 2 West (Location 9)	Channel	0.026	0.000	0.002	0.002	0.000	1.00	**0.030**
	Overbanks	0.026	0.000	0.002	0.010	0.000	1.00	**0.038**

Iona Tributary 1 West Looking Upstream
South of Dove Valley Road Alignment (Location 1)

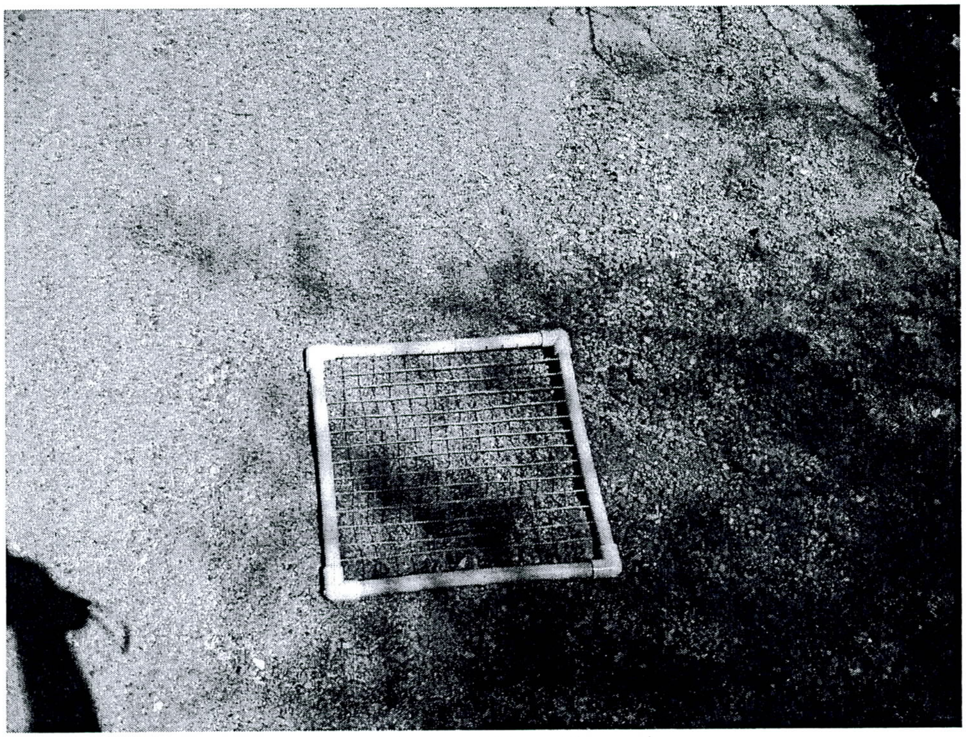


Iona Tributary 1 West Channel
South of Dove Valley Road Alignment (Location 1)

Iona Tributary 1 West Looking Upstream at Left Bank
South of Dove Valley Road Alignment (Location 1)

Iona Tributary 1 West Looking Upstream at Right Bank
South of Dove Valley Road Alignment (Location 1)

Iona Tributary 1 West Looking Upstream
Near Carefree Highway Alignment (Location 2)

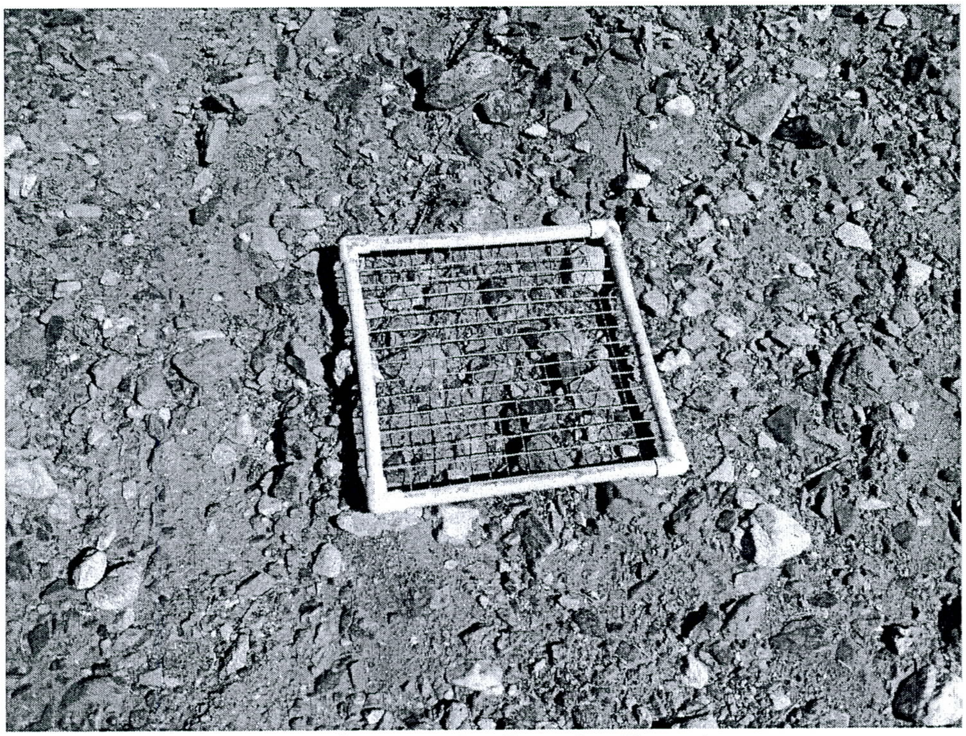


Iona Tributary 1 West Channel
Near Carefree Highway Alignment (Location 2)

Iona Tributary 1 West Looking Upstream at Left Bank
Near Carefree Highway Alignment (Location 2)

Iona Tributary 1 West Looking Upstream at Right Bank
Near Carefree Highway Alignment (Location 2)

Iona Tributary 1 West Extension Looking Upstream
Downstream of Stock Tank (Location 3)

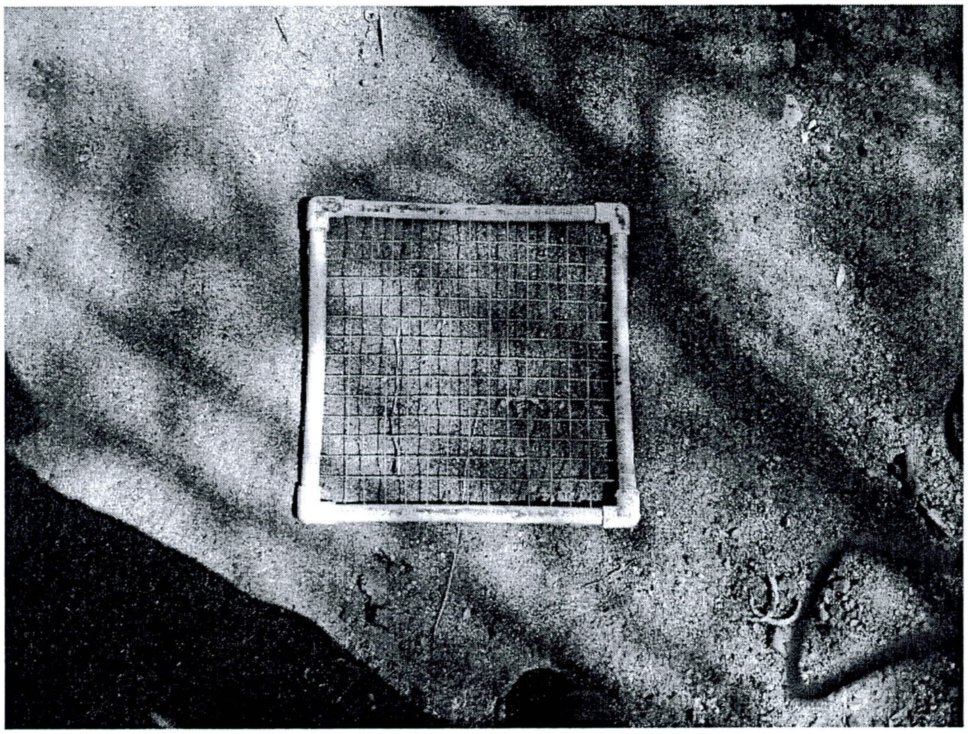


Iona Tributary 1 West Extension Channel
Downstream of Stock Tank (Location 3)

Iona Tributary 1 West Extension Looking Upstream at Left Bank
Downstream of Stock Tank (Location 3)

Iona Tributary 1 West Extension Looking Upstream at Right Bank
Downstream of Stock Tank (Location 3)

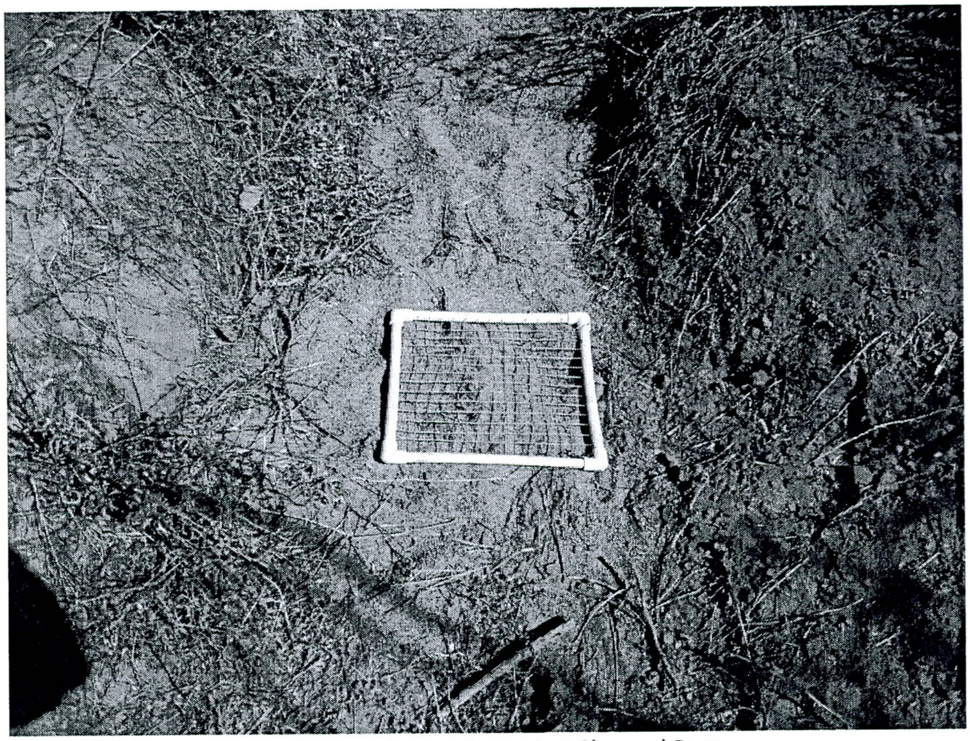
Iona Tributary 1 West Extension Looking Upstream
Upstream of Stock Tank (Location 4)



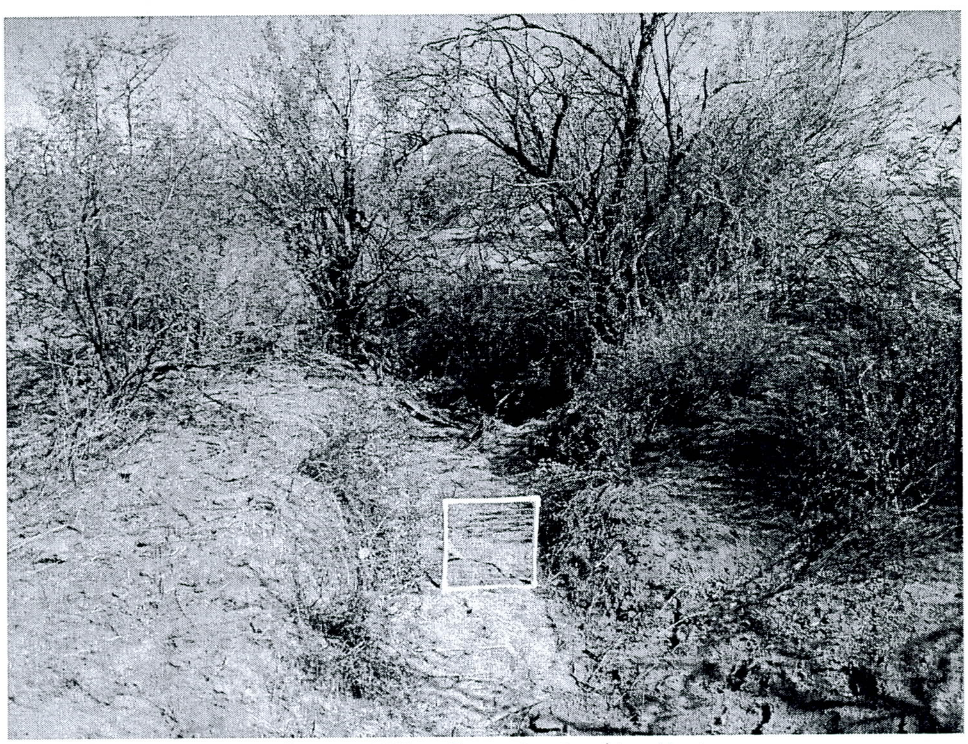
Iona Tributary 1 West Extension Channel
Upstream of Stock Tank (Location 4)

Iona Tributary 1 West Extension Looking Upstream at Left Bank
Upstream of Stock Tank (Location 4)

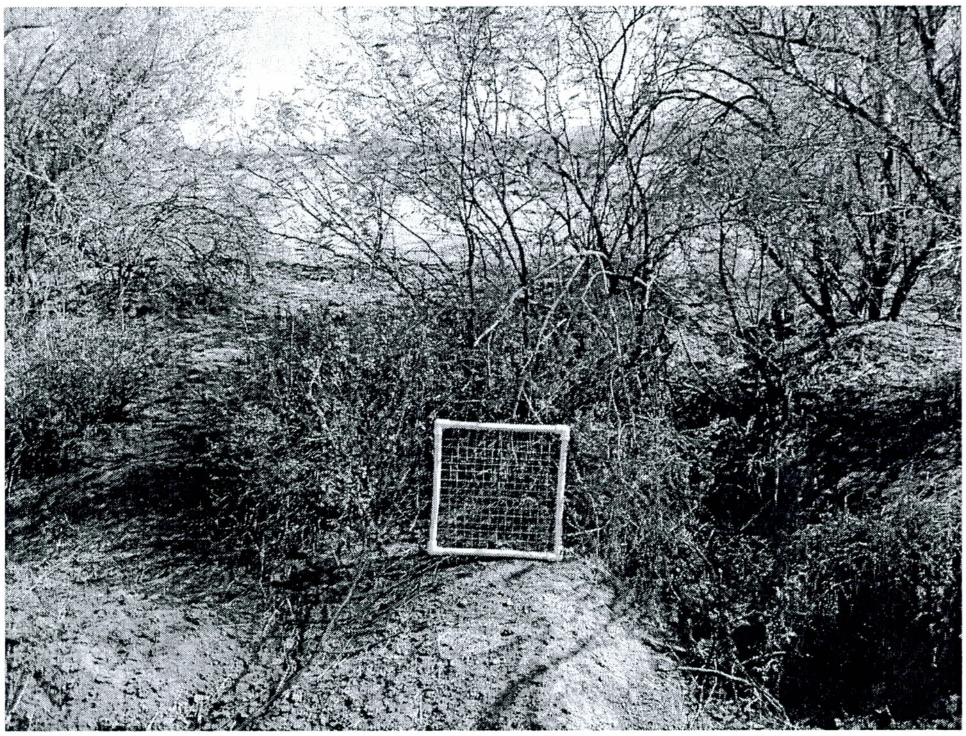
Iona Tributary 1 West Extension Looking Upstream at Right Bank
Upstream of Stock Tank (Location 4)



Iona Tributary 1 West Extension Channel Bottom
Near Black Mountain Road Alignment (Location 5)

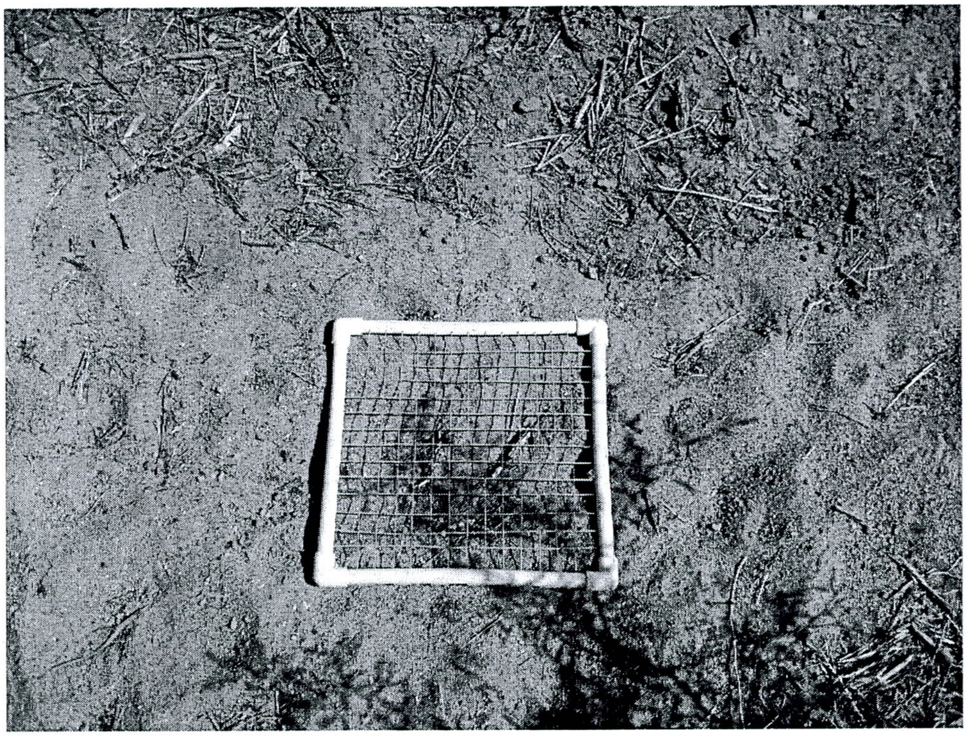


Iona Tributary 1 West Extension Looking Upstream
Near Black Mountain Road Alignment (Location 5)

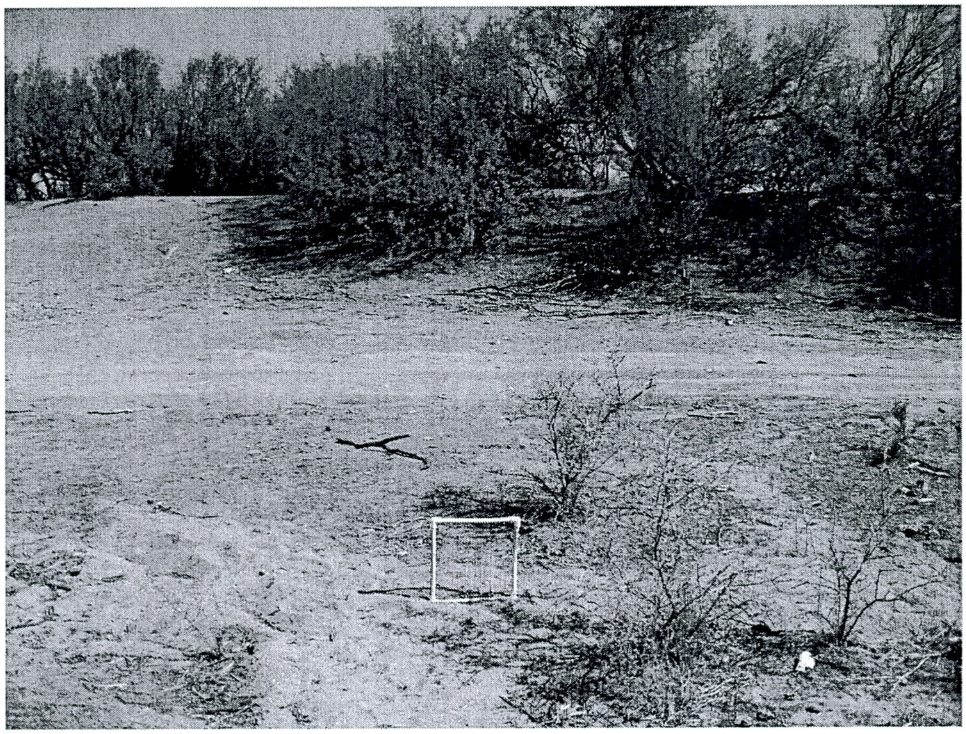


Iona Tributary 1 West Extension Looking Upstream at Left Bank
Near Black Mountain Road Alignment (Location 5)

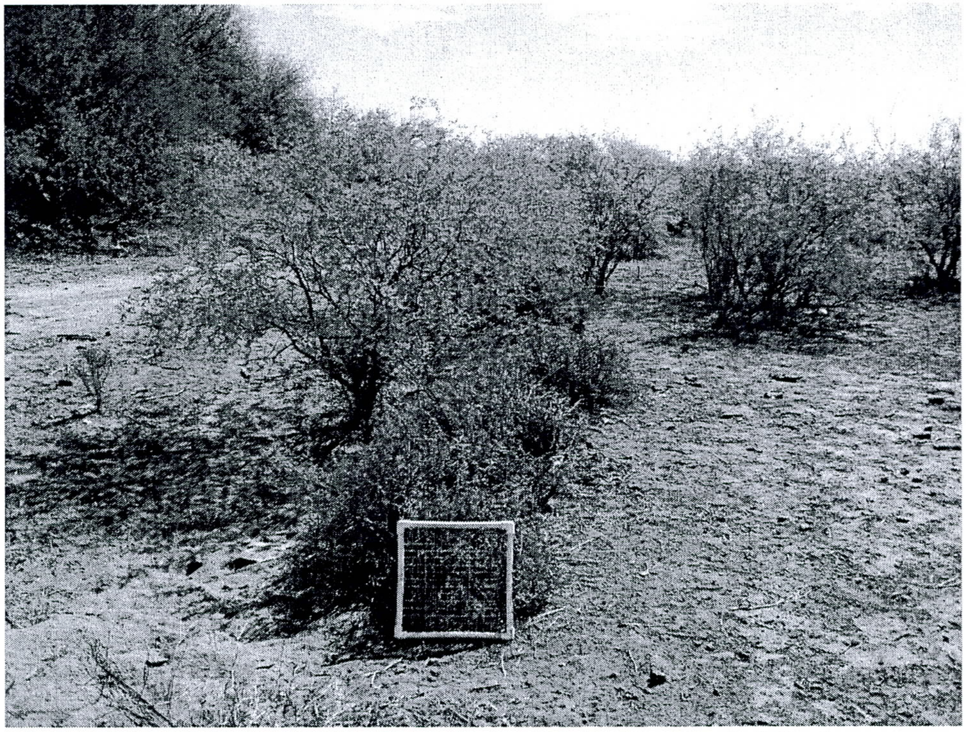
Iona Tributary 1 West Extension Looking Upstream at Right Bank
Near Black Mountain Road Alignment (Location 5)



Iona Tributary 1 West Extension Channel Bottom
Limit of Study Downstream of Stock Tank (Location 6)



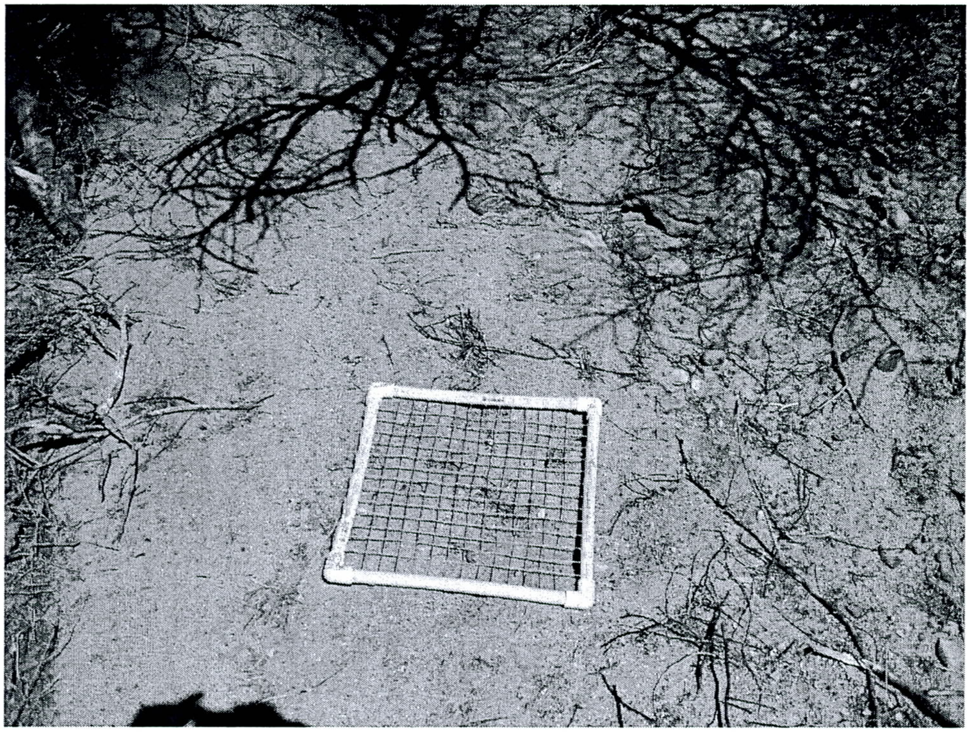
Iona Tributary 1 West Extension Looking Upstream
Limit of Study Downstream of Stock Tank (Location 6)



Iona Tributary 1 West Extension Looking Upstream at Left Bank
Limit of Study Downstream of Stock Tank (Location 6)

Iona Tributary 1 West Extension Looking Upstream at Right Bank
Limit of Study Downstream of Stock Tank (Location 6)

Iona Tributary 2 West Looking Upstream
Near the Confluence with Iona Wash (Location 7)

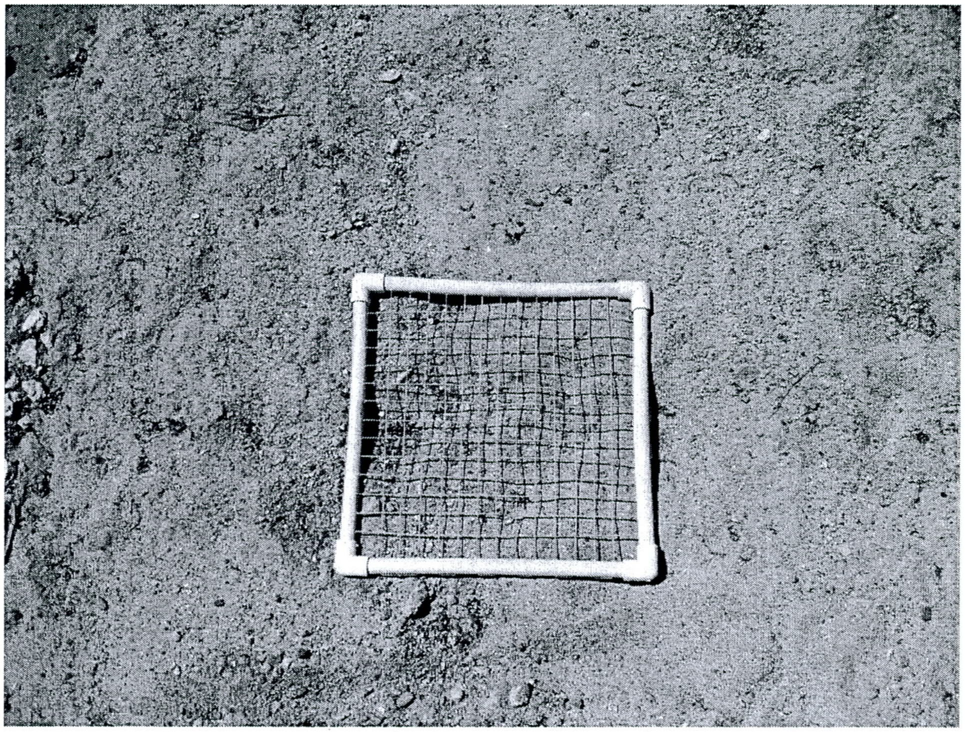


Iona Tributary 2 West Channel
Near the Confluence with Iona Wash (Location 7)

Iona Tributary 2 West Looking Upstream at Left Bank
Near the Confluence with Iona Wash (Location 7)

Iona Tributary 2 West Looking Upstream at Right Bank
Near the Confluence with Iona Wash (Location 7)

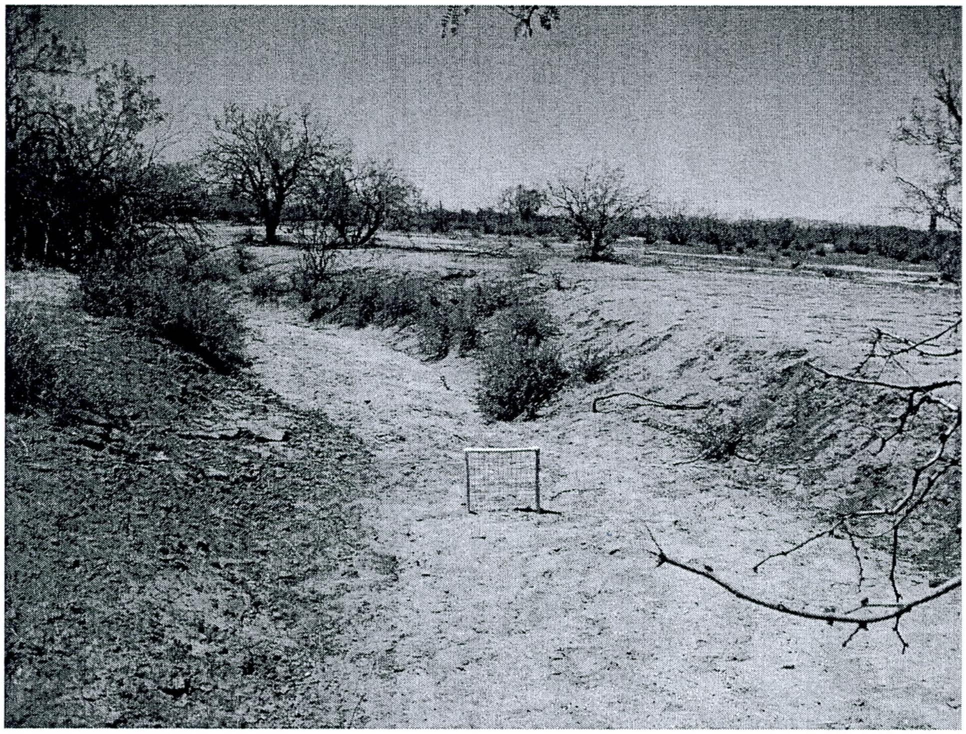
Iona Tributary 2 West Looking Upstream
South of Dove Valley Road Alignment (Location 8)



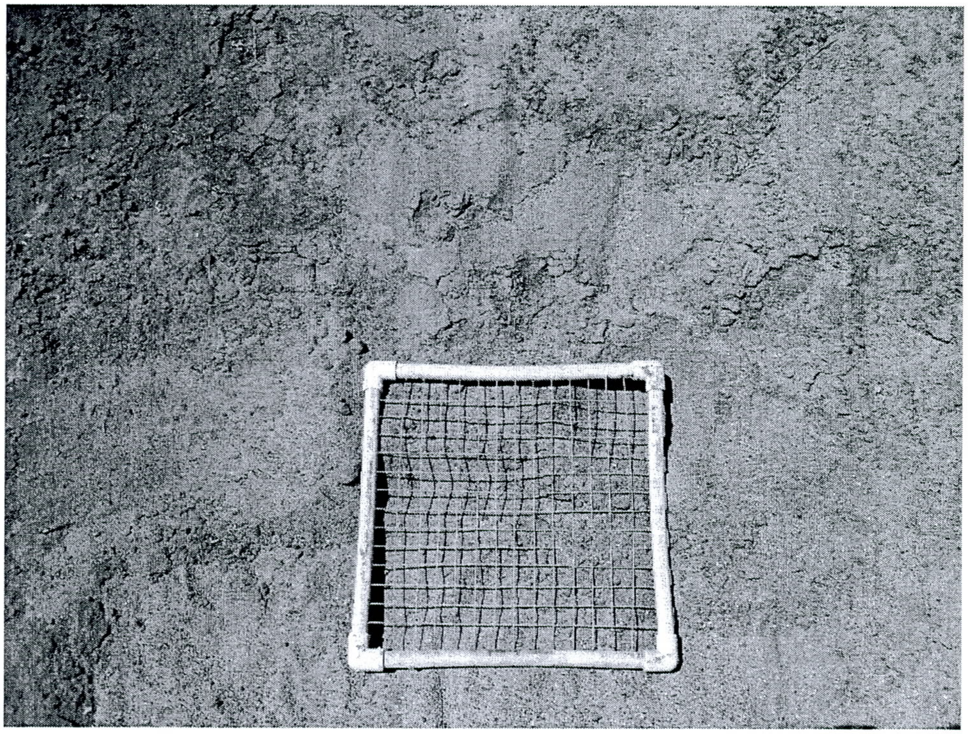
Iona Tributary 2 West Channel
South of Dove Valley Road Alignment (Location 8)

Iona Tributary 2 West Looking Upstream at Left Bank
South of Dove Valley Road Alignment (Location 8)

Iona Tributary 2 West Looking Upstream at Right Bank
South of Dove Valley Road Alignment (Location 8)

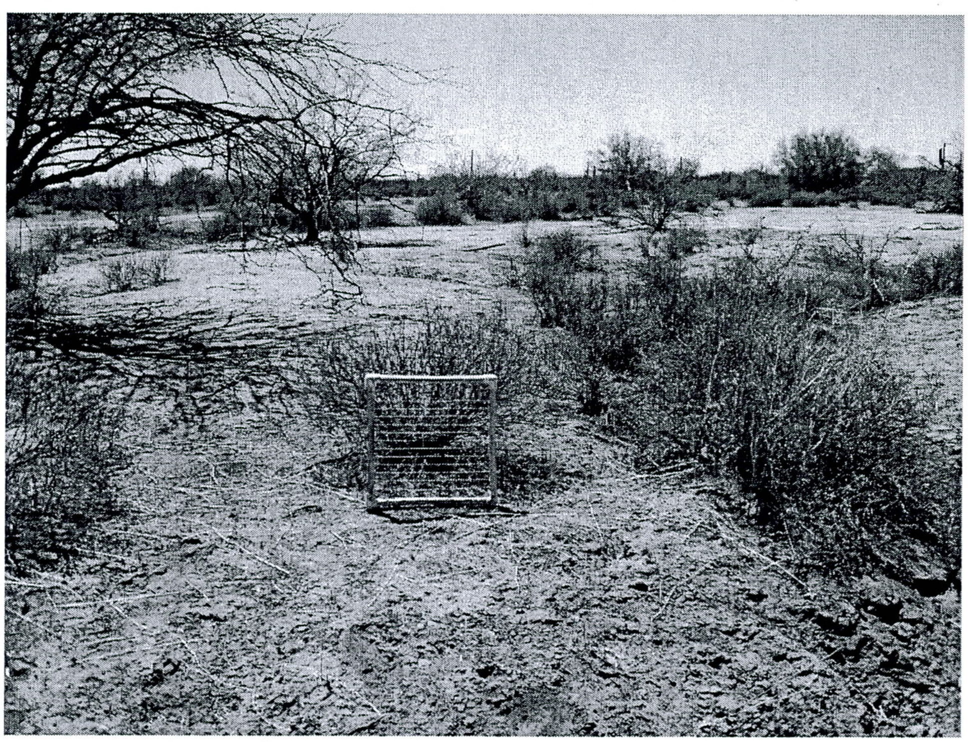


Iona Tributary 2 West Looking Upstream
East of 259th Avenue Alignment Near Limit of Study (Location 9)

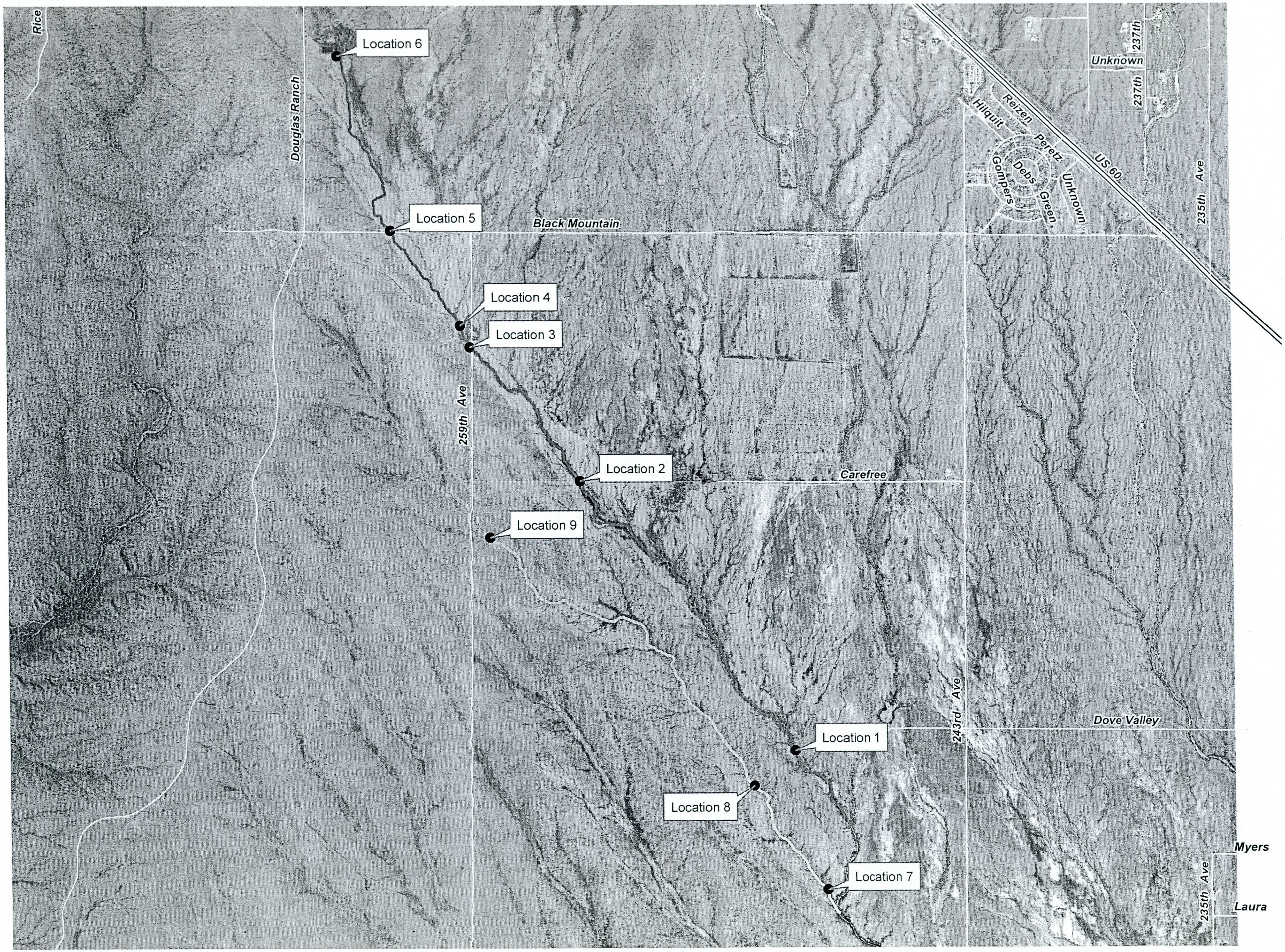


Iona Tributary 2 West Channel
East of 259th Avenue Alignment Near Limit of Study (Location 9)

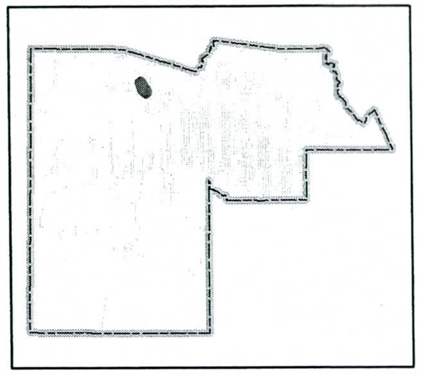
Iona Tributary 2 West Looking Upstream at Left Bank
East of 259th Avenue Alignment Near Limit of Study (Location 9)



Iona Tributary 2 West Looking Upstream at Right Bank
East of 259th Avenue Alignment Near Limit of Study (Location 9)



Flood Control District of Maricopa County



Wittmann Phase IV Floodplain Delineation Study

Legend

- Iona Tributary 1 West
- Iona Tributary 1 West Extension
- Iona Tributary 2 West
- Streets

0 500 1,000 2,000 Feet

1 inch = 2,000 feet

Photo Locations
n Value Determination

RBF CONSULTING — PLANNING ▪ DESIGN ▪ CONSTRUCTION
16605 NORTH 28th AVENUE, SUITE 100
PHOENIX, ARIZONA 85053-7550
602-467-2200 FAX 602-467-2201 www.RBF.com

Flood Control District of Maricopa County

SURPRISE ARIZONA

DRAFTED	CHECKED
DLP	NEF

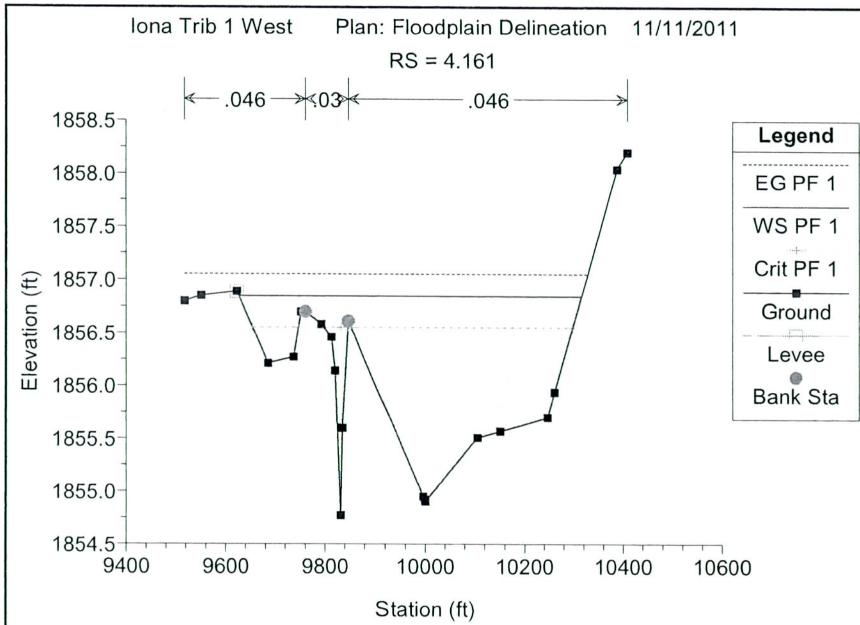
PROJECT NUMBER 45104608

DATE 9.08.11

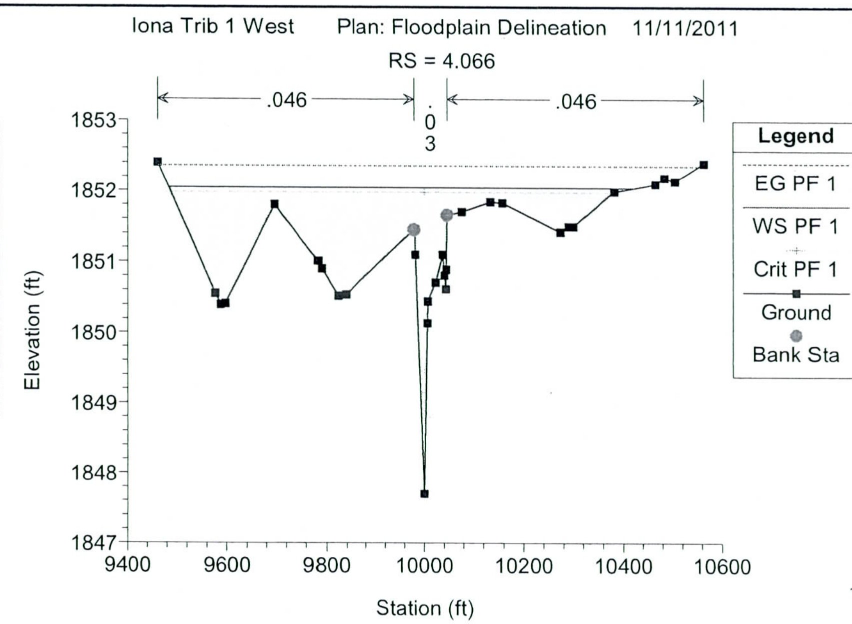
FIGURE 1

File: H:\PDATA\45104608\GIS\Wittmann_Phase_IV\N_Value_Locations.mxd

E.2 Cross Section Plots



Iona Trib 1 West Plan: Floodplain Delineation 11/11/2011
RS = 4.161
.046 .03 .046
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta



Iona Trib 1 West Plan: Floodplain Delineation 11/11/2011
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Elevation (ft)
Station (ft)
Legend
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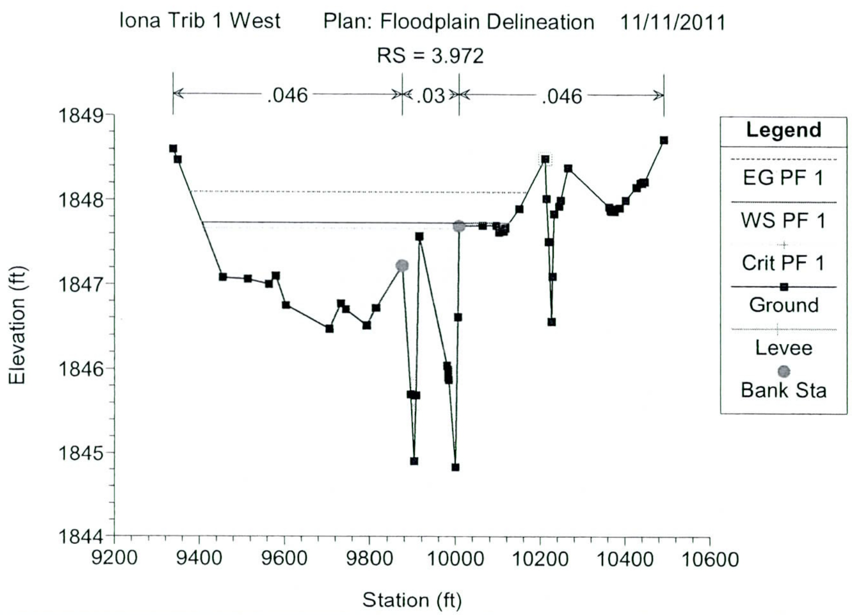
Crit PF 1
Ground
Bank Sta



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Station (ft)
Legend
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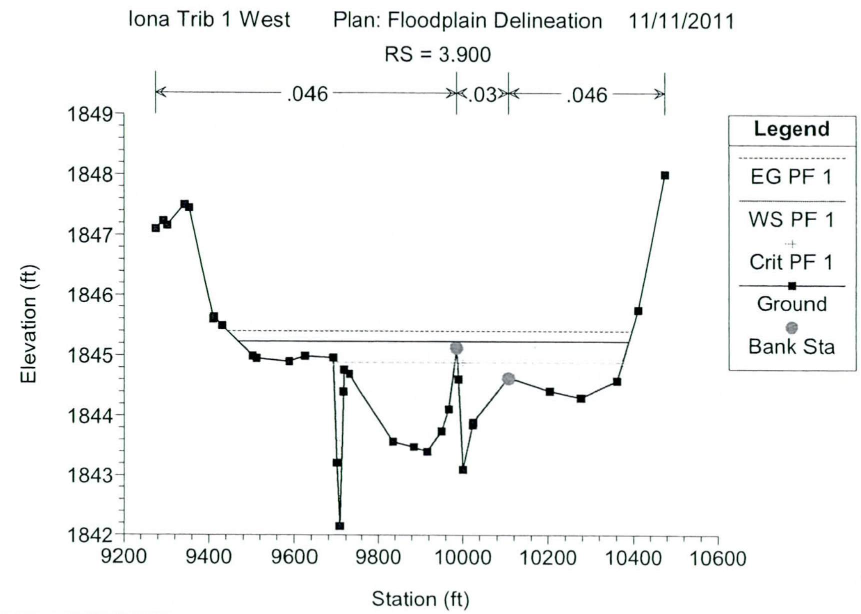
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta



Iona Trib 1 West Plan: Floodplain Delineation 11/11/2011
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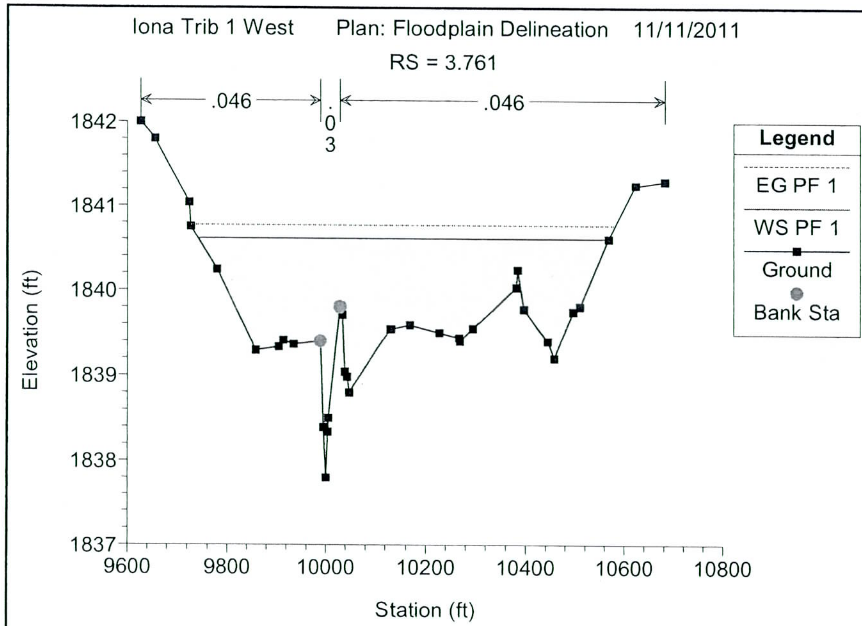
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta


Iona Trib 1 West Plan: Floodplain Delineation 11/11/2011
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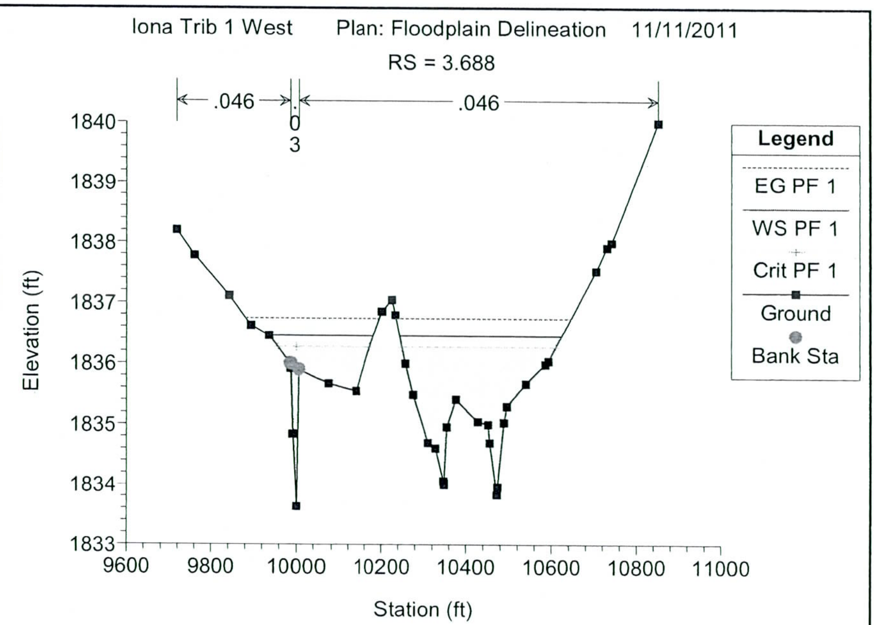
0
3
.046
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Ground
Bank Sta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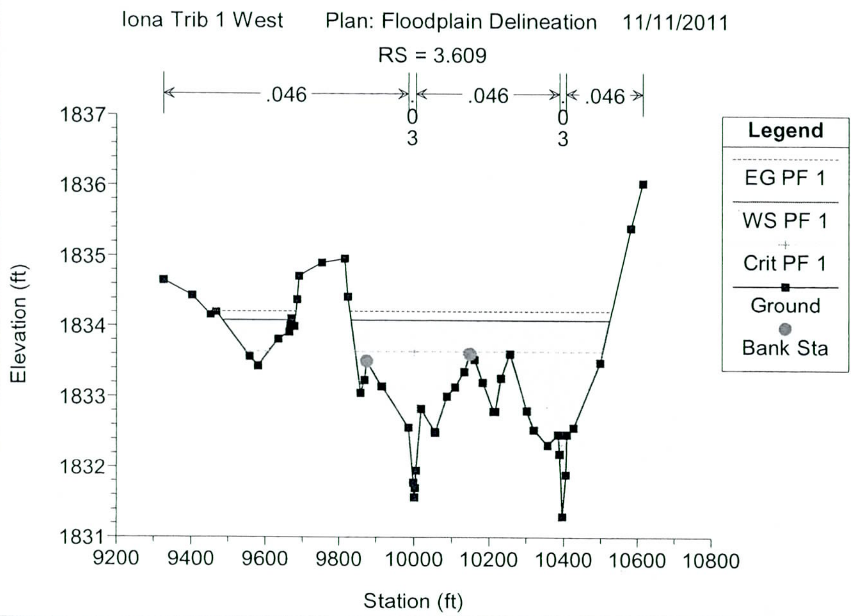
3
.046
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta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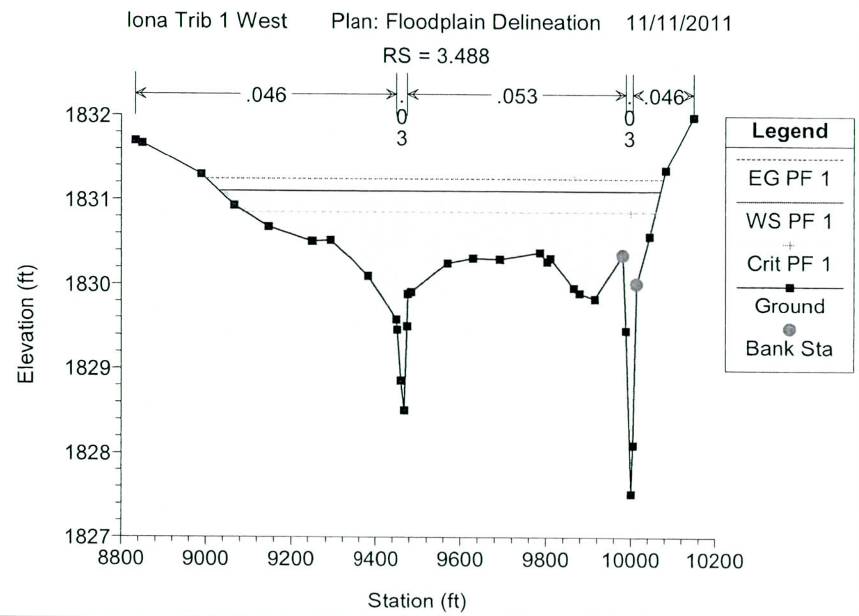
3
.046
0
3
.046
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta


Iona Trib 1 West Plan: Floodplain Delineation 11/11/2011
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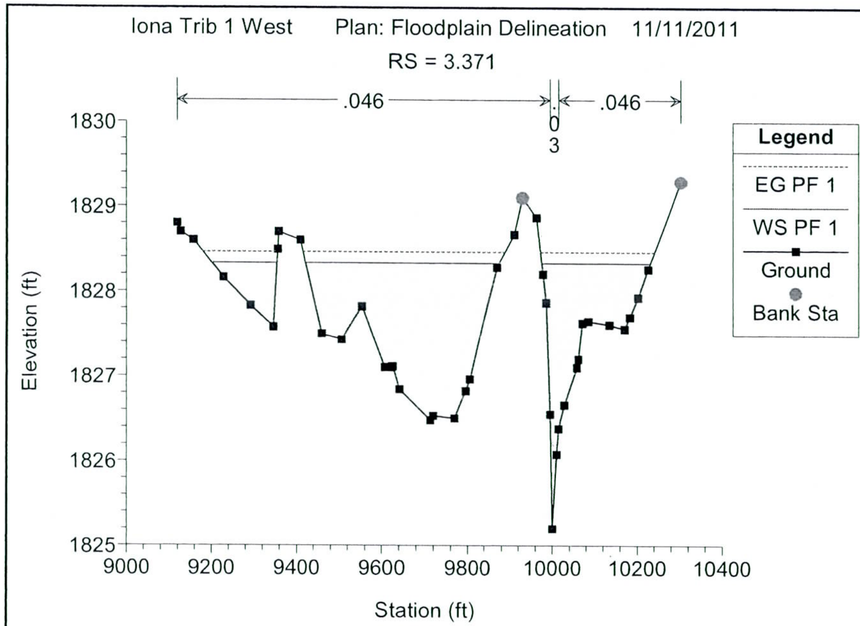
3
.053
0
3
.046
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta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.046
. 0 3
Elevation (ft)
Station (ft)
Legend
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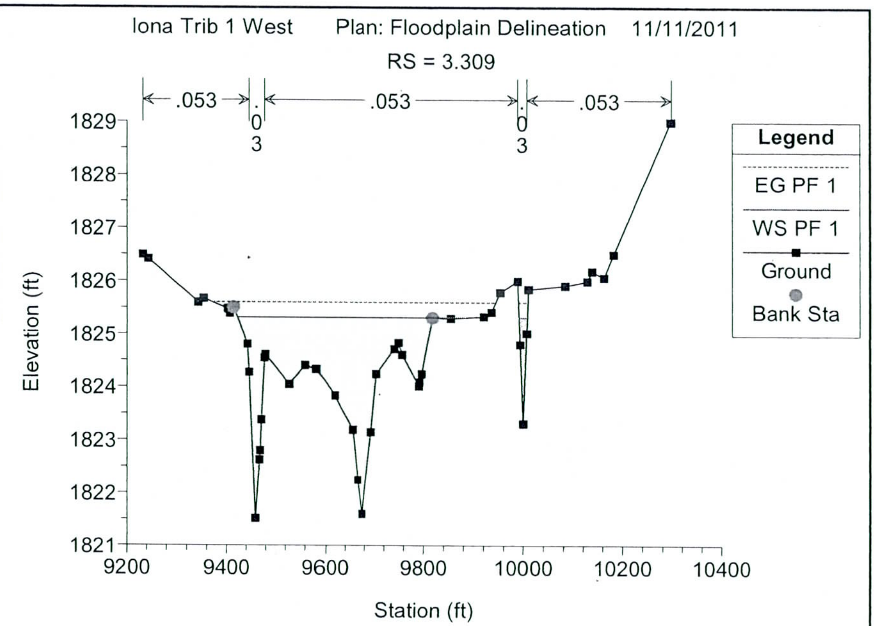
WS PF 1
Ground
Bank Sta


Iona Trib 1 West Plan: Floodplain Delineation 11/11/2011
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.053
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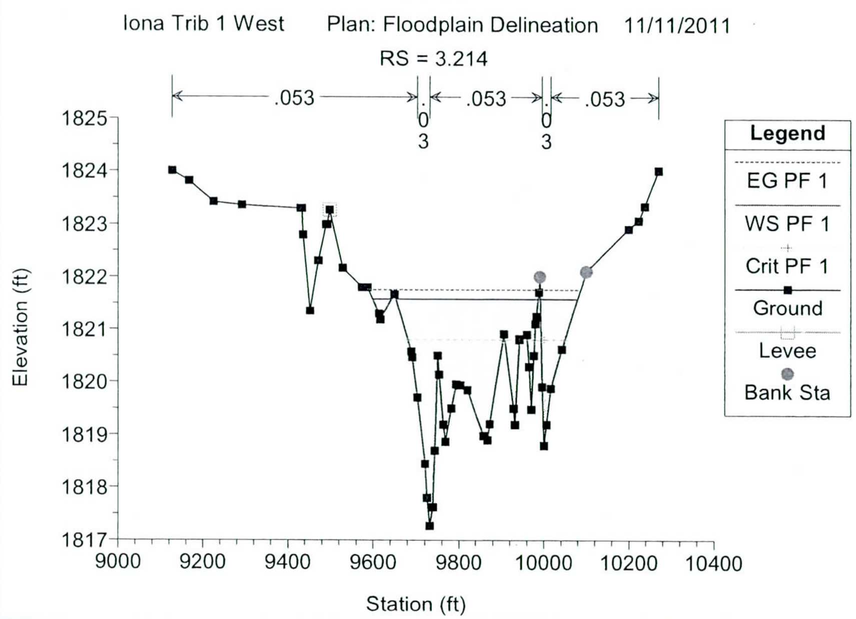
. 0 3
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Ground
Bank Sta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.053
.053
.053
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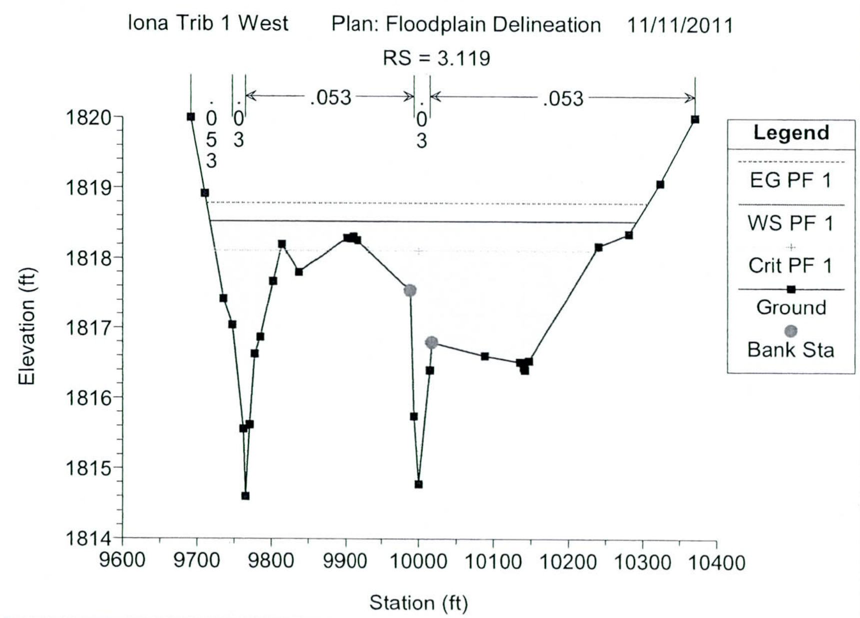
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta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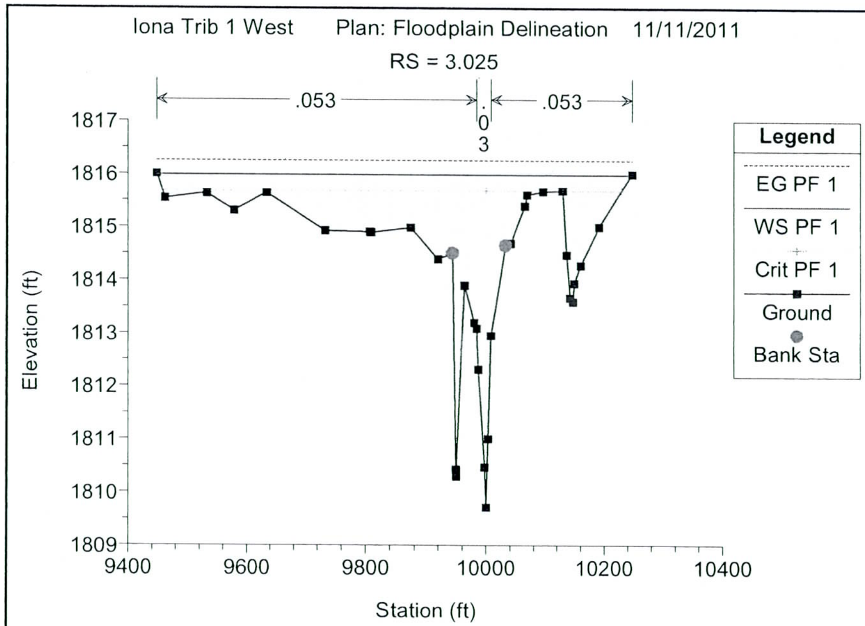
. 0 3
.053
. 0 3
.053
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta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RS = 3.025
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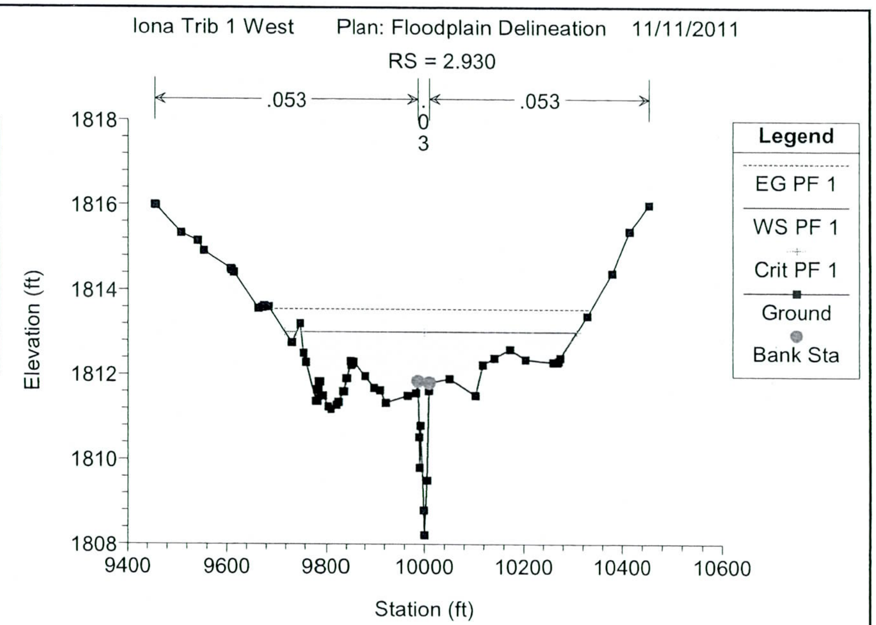
.053
.03
Elevation (ft)
Station (ft)
1817
1816
1815
1814
1813
1812
1811
1810
1809
9400
9600
9800
10000
10200
10400
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta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.053
.03
Elevation (ft)
Station (ft)
1818
1816
1814
1812
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10000
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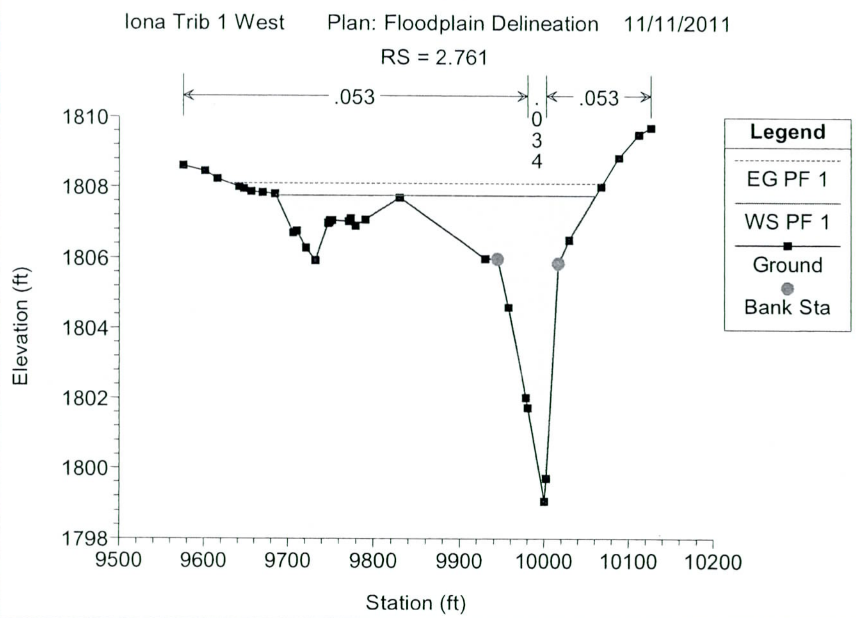
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta


Iona Trib 1 West Plan: Floodplain Delineation 11/11/2011
RS = 2.761
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.053
.034
Elevation (ft)
Station (ft)
1810
1808
1806
1804
1802
1800
1798
9500
9600
9700
9800
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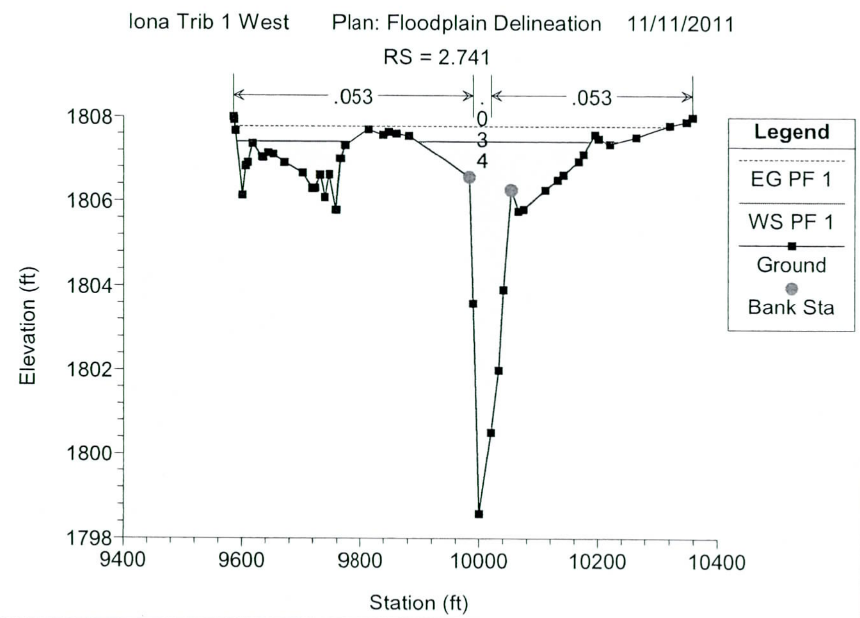
10000
10100
10200
Legend
EG PF 1
WS PF 1
Ground
Bank Sta


Iona Trib 1 West Plan: Floodplain Delineation 11/11/2011
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.053
.034
Elevation (ft)
Station (ft)
1808
1806
1804
1802
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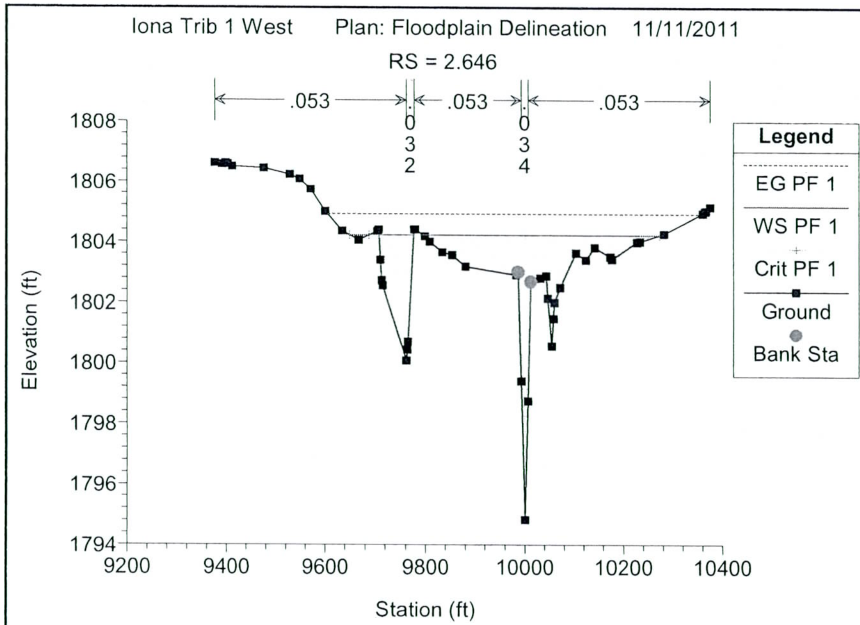
1798
9400
9600
9800
10000
10200
10400
Legend
EG PF 1
WS PF 1
Ground
Bank Sta



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.053
.053
Legend
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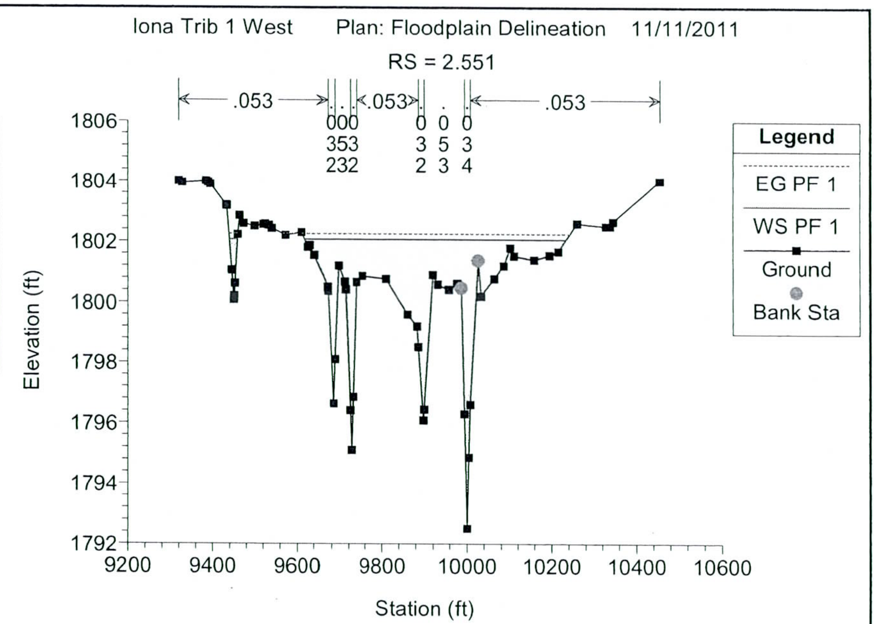
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)



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.053
.053
Legend
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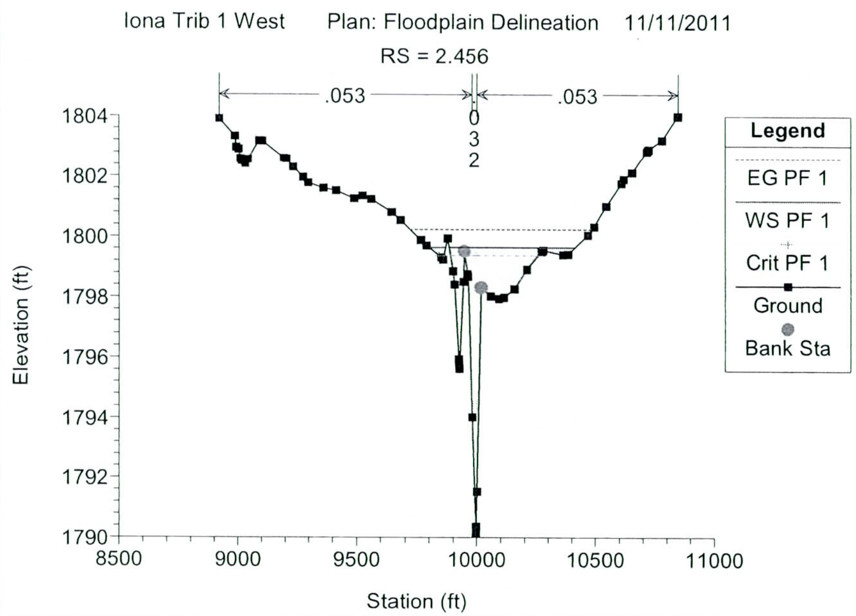
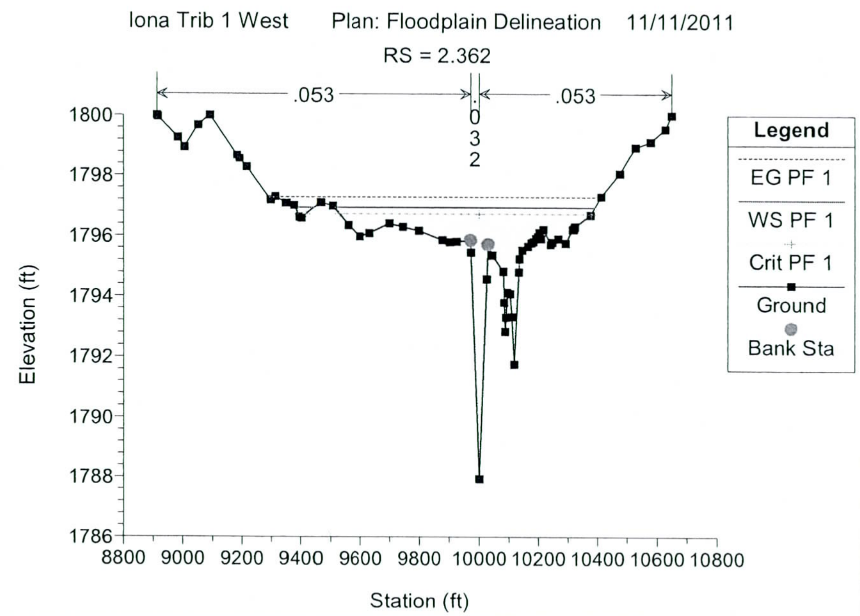
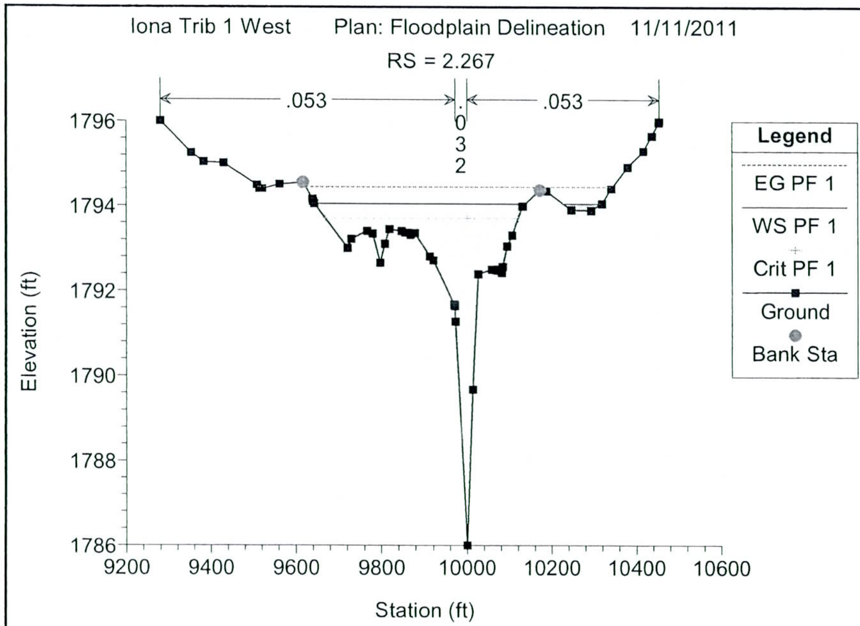
Ground
Bank Sta
Elevation (ft)
Station (ft)

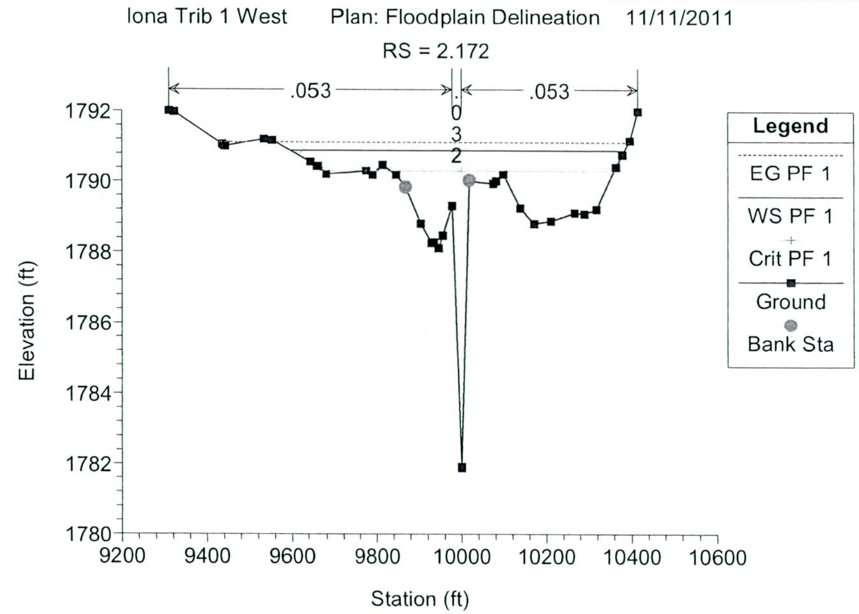


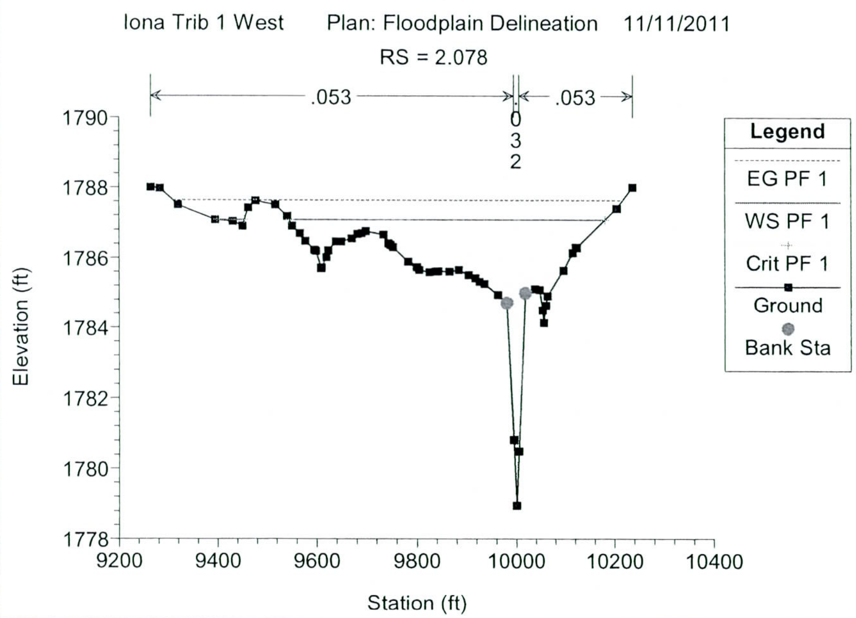
Iona Trib 1 West Plan: Floodplain Delineation 11/11/2011
RS = 2.456
.053
.053
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

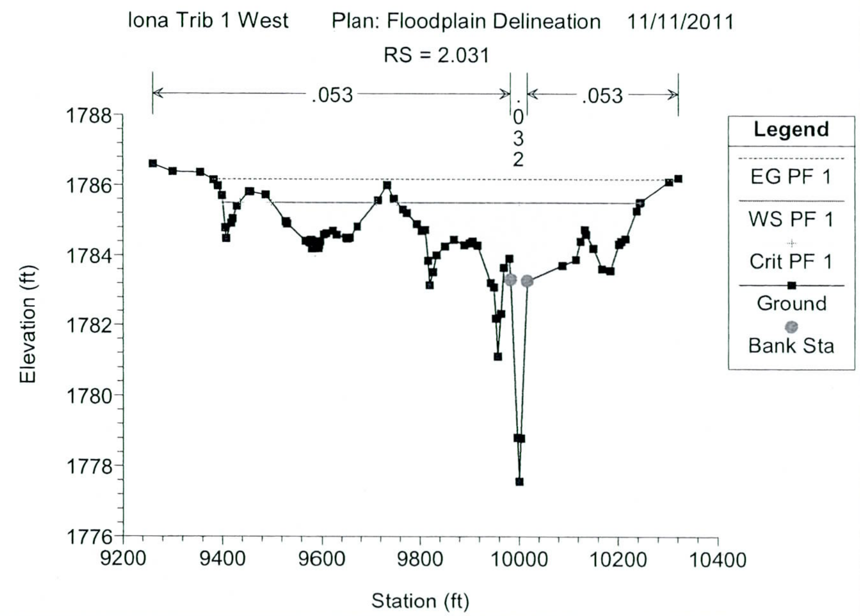


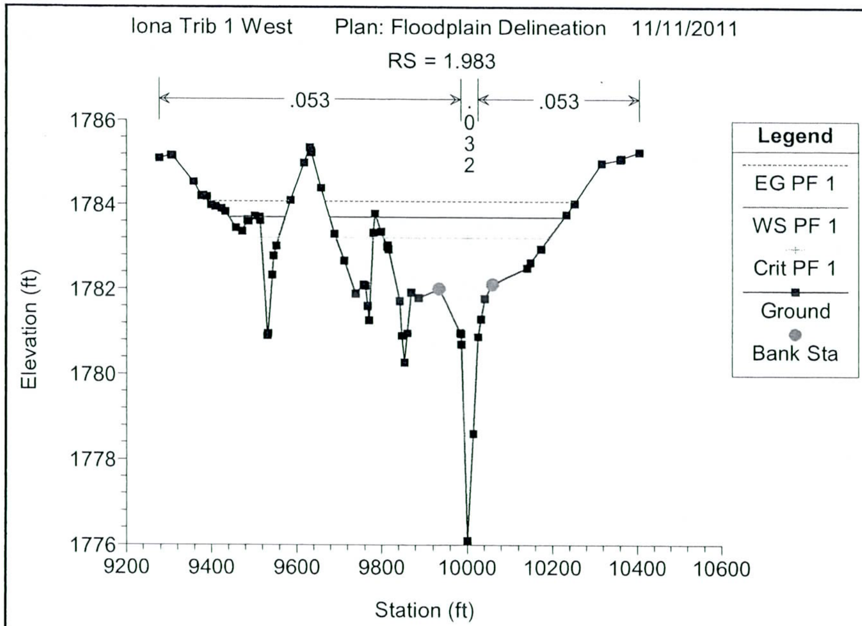
Iona Trib 1 West Plan: Floodplain Delineation 11/11/2011
RS = 2.362
.053
.053
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

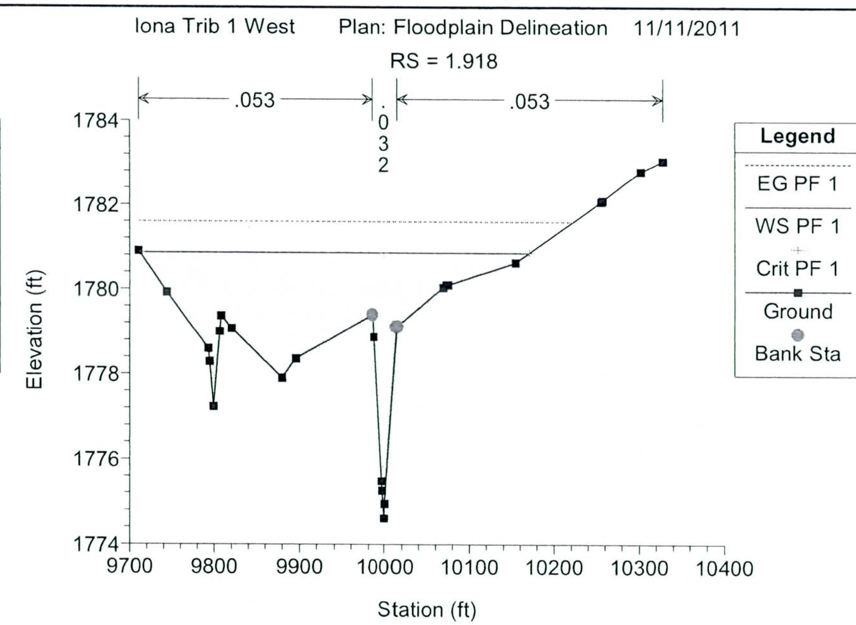

Iona Trib 1 West Plan: Floodplain Delineation 11/11/2011
RS = 2.267
.053
.032
.053
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1786
1788
1790
1792
1794
1796
9200
9400
9600
9800
10000
10200
10400
10600

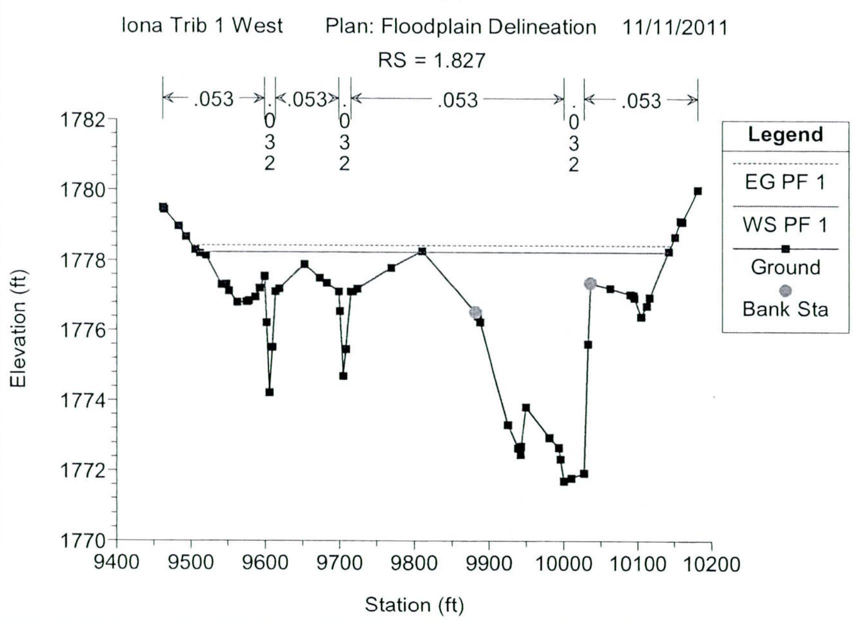

Iona Trib 1 West Plan: Floodplain Delineation 11/11/2011
RS = 2.172
.053
.032
.053
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1780
1782
1784
1786
1788
1790
1792
9200
9400
9600
9800
10000
10200
10400
10600

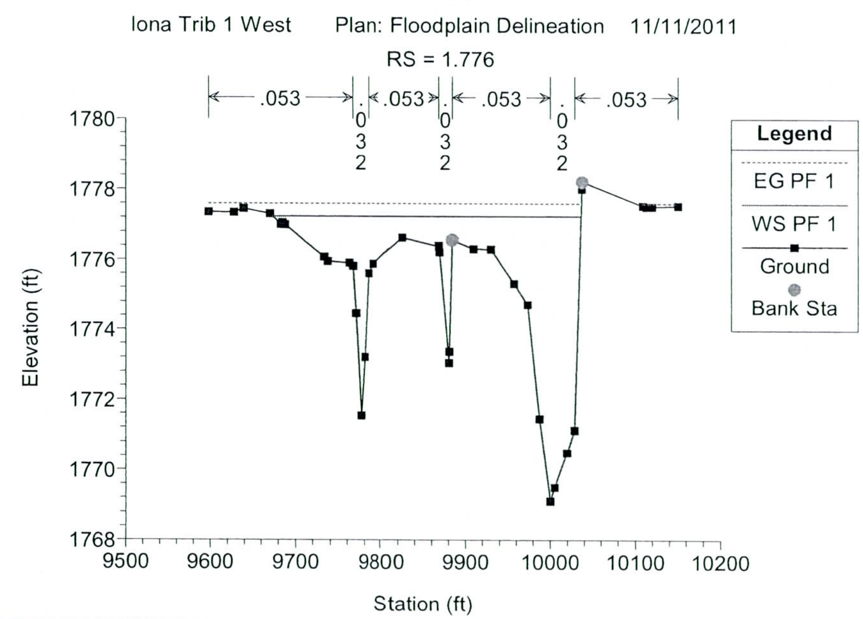

Iona Trib 1 West Plan: Floodplain Delineation 11/11/2011
RS = 2.078
.053
.032
.053
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1778
1780
1782
1784
1786
1788
1790
9200
9400
9600
9800
10000
10200
10400

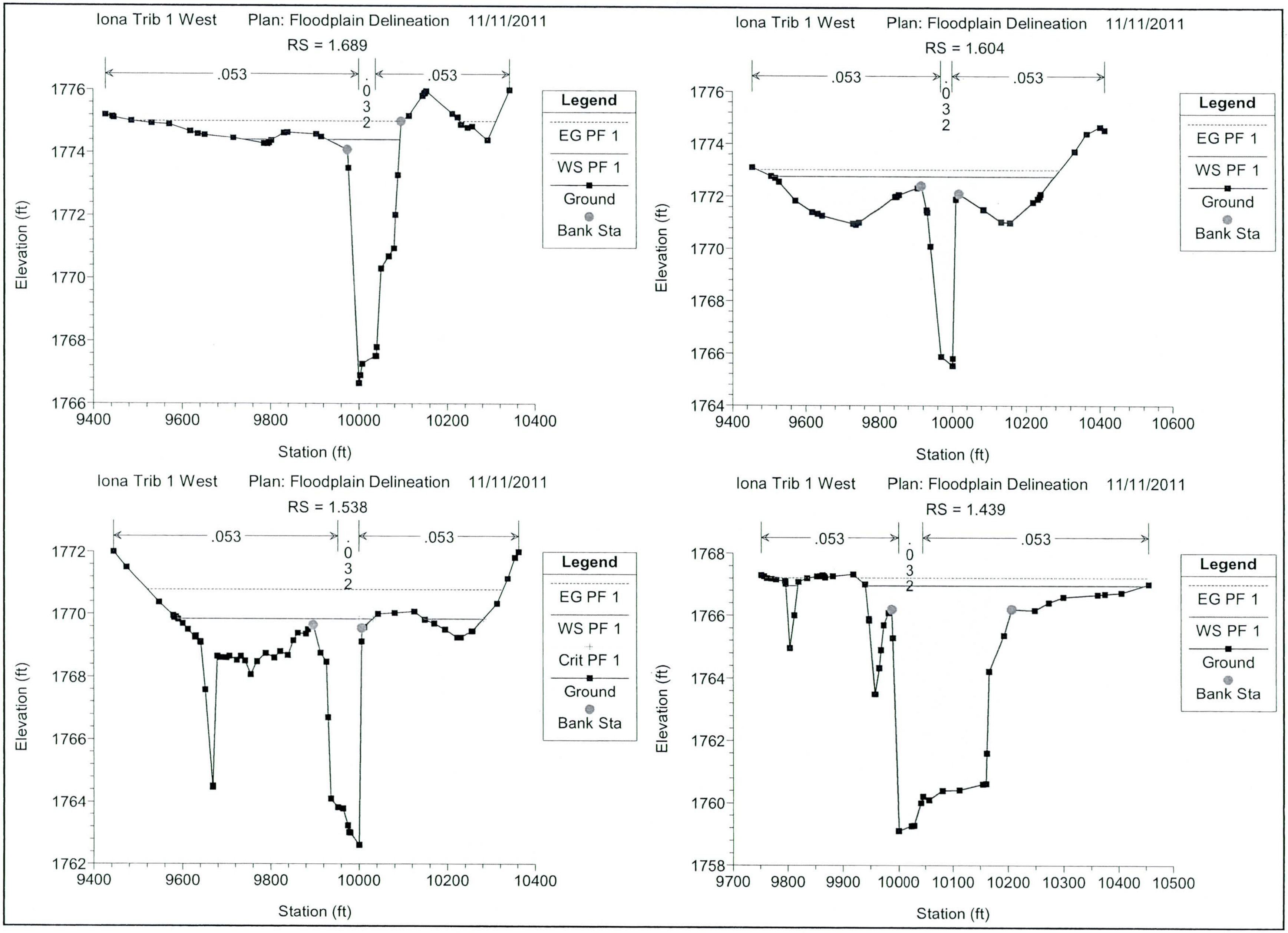

Iona Trib 1 West Plan: Floodplain Delineation 11/11/2011
RS = 2.031
.053
.032
.053
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1776
1778
1780
1782
1784
1786
1788
9200
9400
9600
9800
10000
10200
10400


Iona Trib 1 West Plan: Floodplain Delineation 11/11/2011
RS = 1.983
.053
.032
.053
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1786
1784
1782
1780
1778
1776
9200
9400
9600
9800
10000
10200
10400
10600

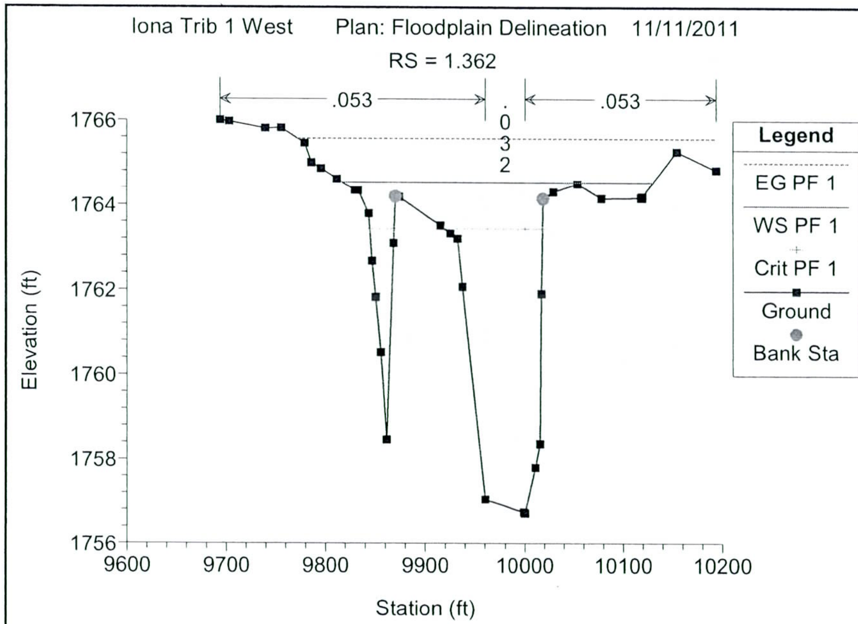

Iona Trib 1 West Plan: Floodplain Delineation 11/11/2011
RS = 1.918
.053
.032
.053
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1784
1782
1780
1778
1776
1774
9700
9800
9900
10000
10100
10200
10300
10400

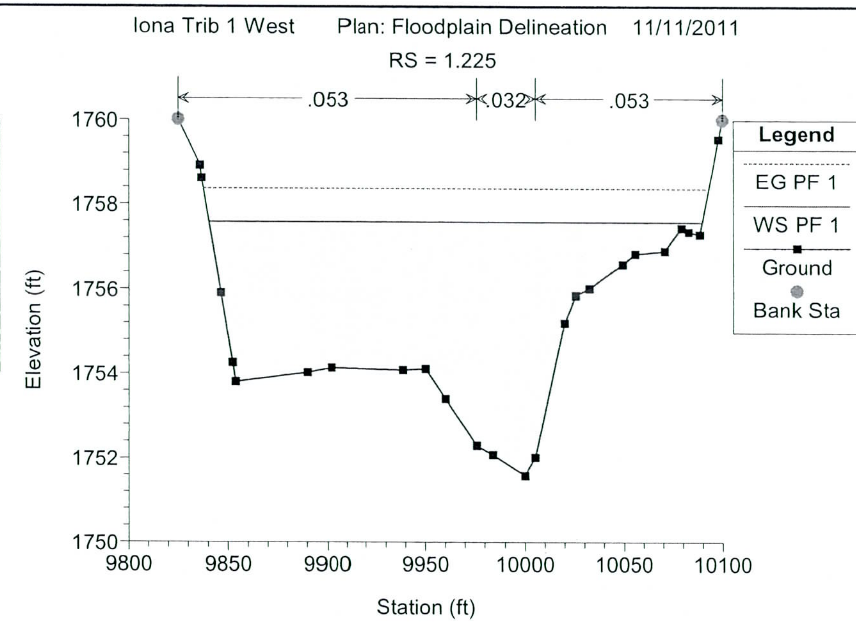

Iona Trib 1 West Plan: Floodplain Delineation 11/11/2011
RS = 1.827
.053
.032
.053
.032
.053
.032
.053
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1782
1780
1778
1776
1774
1772
1770
9400
9500
9600
9700
9800
9900
10000
10100
10200

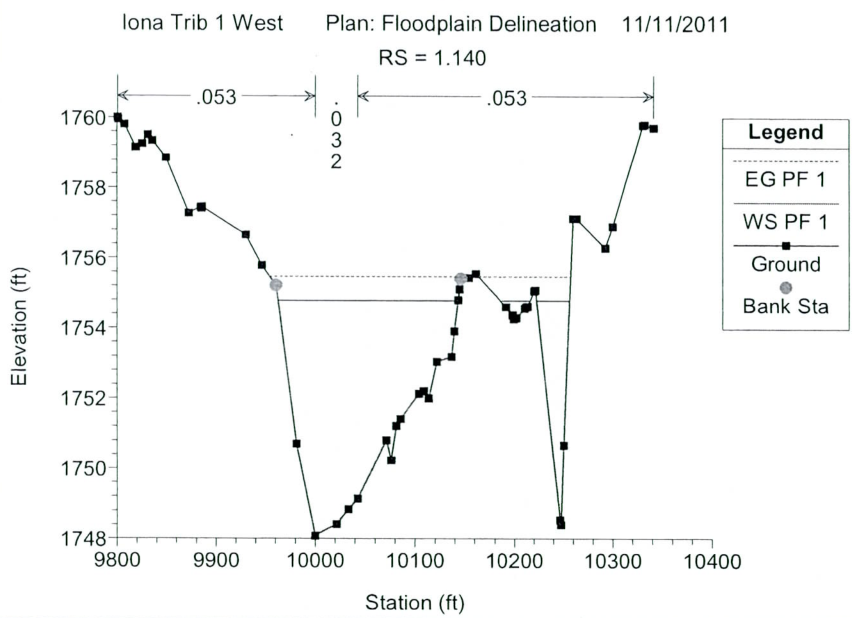

Iona Trib 1 West Plan: Floodplain Delineation 11/11/2011
RS = 1.776
.053
.032
.053
.032
.053
.032
.053
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1780
1778
1776
1774
1772
1770
1768
9500
9600
9700
9800
9900
10000
10100
10200

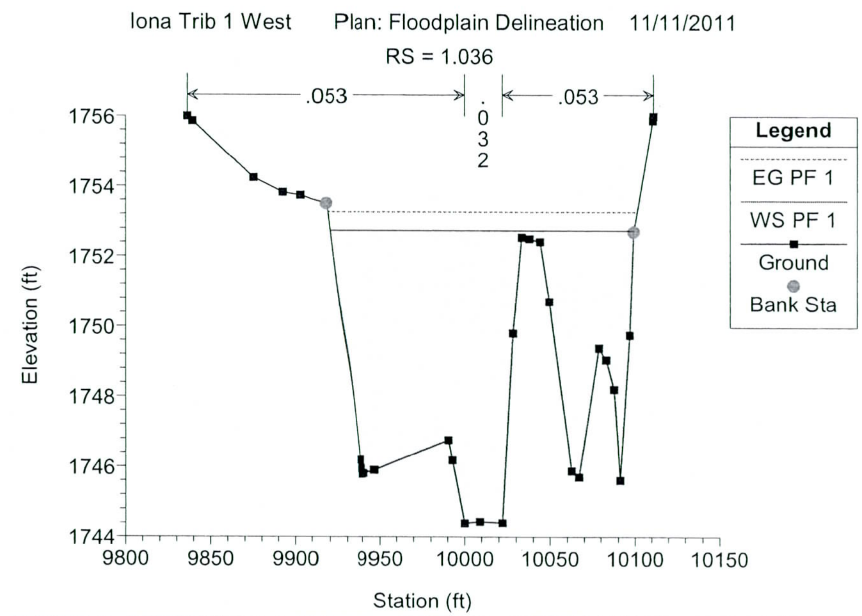


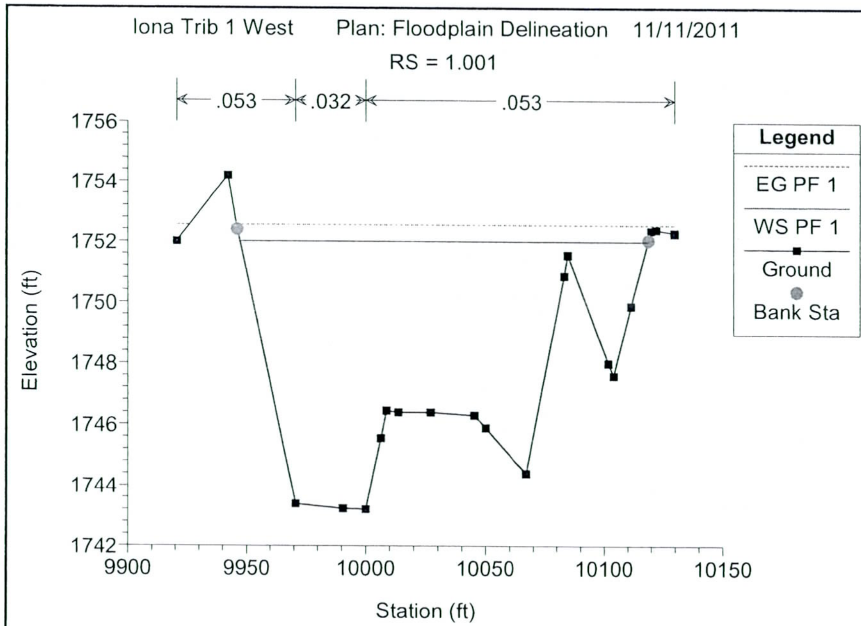
Iona Trib 1 West Plan: Floodplain Delineation 11/11/2011
RS = 1.689
.053
.032
.053
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Iona Trib 1 West Plan: Floodplain Delineation 11/11/2011
RS = 1.604
.053
.032
.053
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Iona Trib 1 West Plan: Floodplain Delineation 11/11/2011
RS = 1.538
.053
.032
.053
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Iona Trib 1 West Plan: Floodplain Delineation 11/11/2011
RS = 1.439
.053
.032
.053
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


Iona Trib 1 West
Plan: Floodplain Delineation
11/11/2011
RS = 1.362
.053
.032
.053
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
1756
1758
1760
1762
1764
1766
Station (ft)
9600
9700
9800
9900
10000
10100
10200

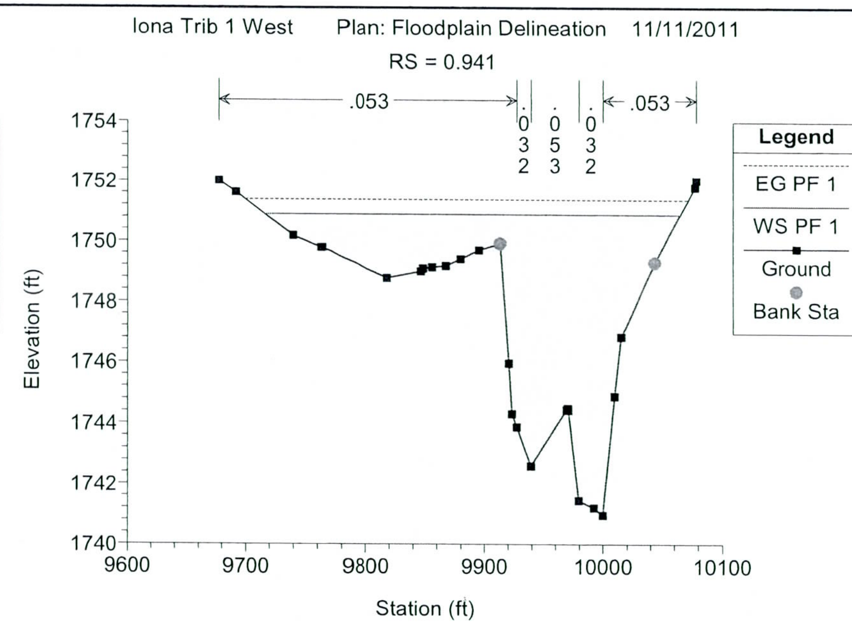

Iona Trib 1 West
Plan: Floodplain Delineation
11/11/2011
RS = 1.225
.053
.032
.053
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
1750
1752
1754
1756
1758
1760
Station (ft)
9800
9850
9900
9950
10000
10050
10100


Iona Trib 1 West
Plan: Floodplain Delineation
11/11/2011
RS = 1.140
.053
.032
.053
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
1748
1750
1752
1754
1756
1758
1760
Station (ft)
9800
9900
10000
10100
10200
10300
10400

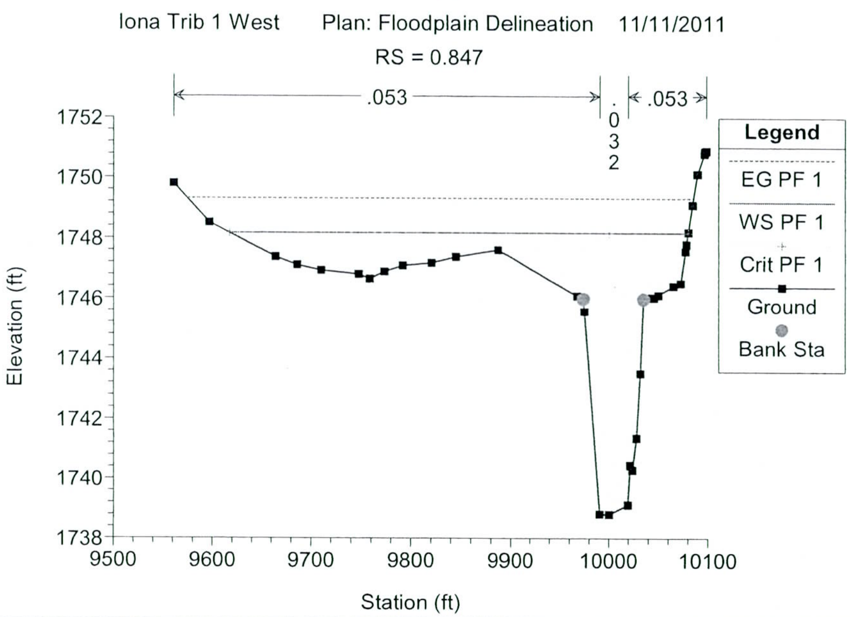

Iona Trib 1 West
Plan: Floodplain Delineation
11/11/2011
RS = 1.036
.053
.032
.053
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
1744
1746
1748
1750
1752
1754
1756
Station (ft)
9800
9850
9900
9950
10000
10050
10100
10150



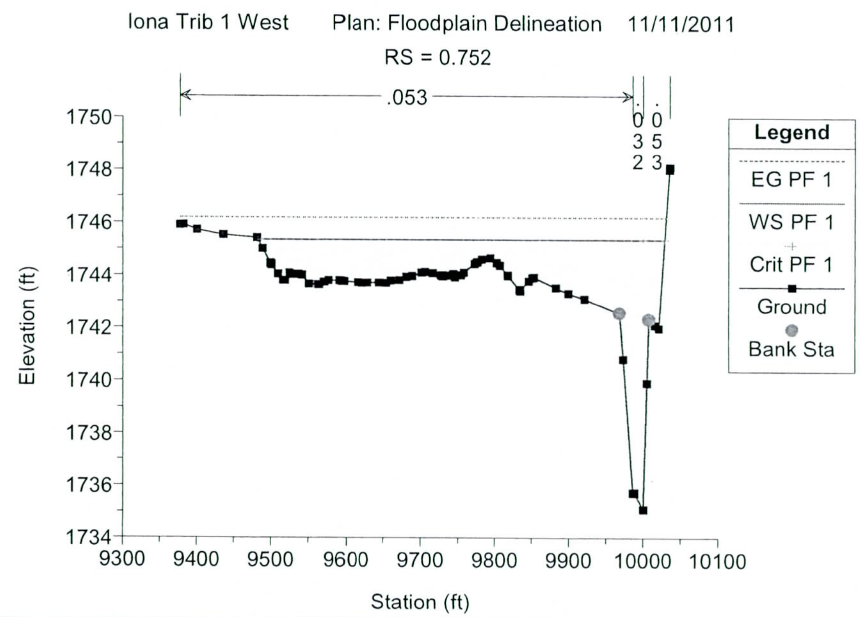
Iona Trib 1 West
Plan: Floodplain Delineation
11/11/2011
RS = 1.001
.053
.032
.053
Elevation (ft)
Station (ft)
1756
1754
1752
1750
1748
1746
1744
1742
9900
9950
10000
10050
10100
10150
Legend
EG PF 1
WS PF 1
Ground
Bank Sta



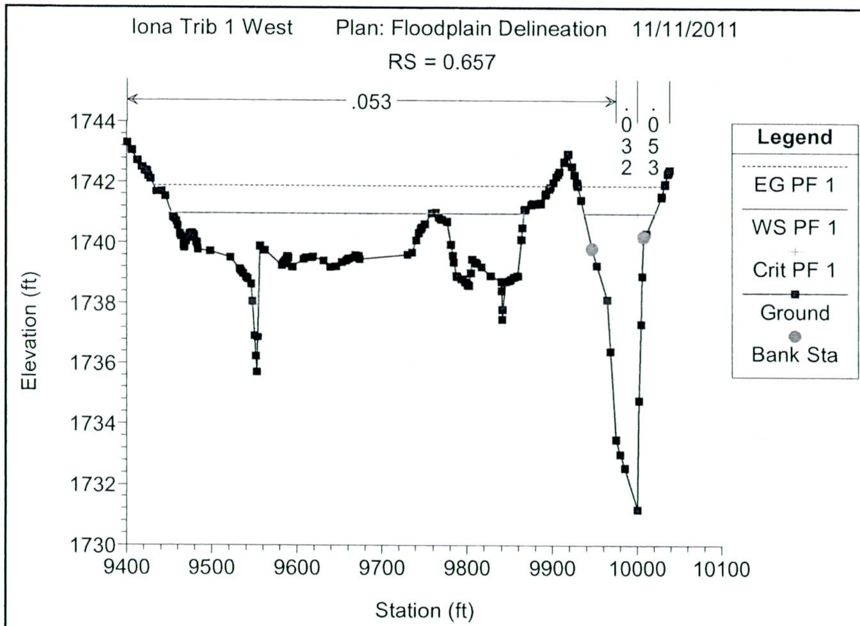
Iona Trib 1 West
Plan: Floodplain Delineation
11/11/2011
RS = 0.941
.053
.032
.053
.032
.053
Elevation (ft)
Station (ft)
1754
1752
1750
1748
1746
1744
1742
1740
9600
9700
9800
9900
10000
10100
Legend
EG PF 1
WS PF 1
Ground
Bank Sta

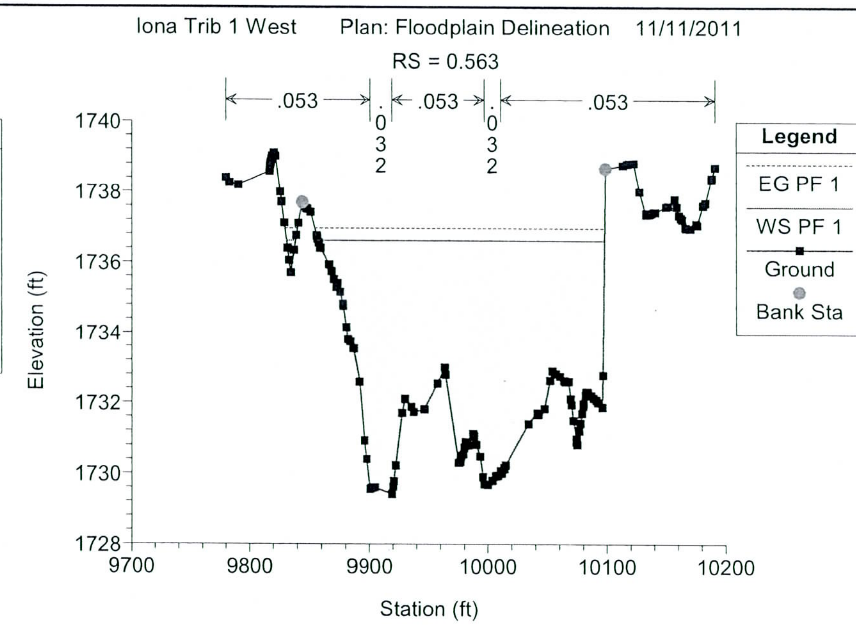


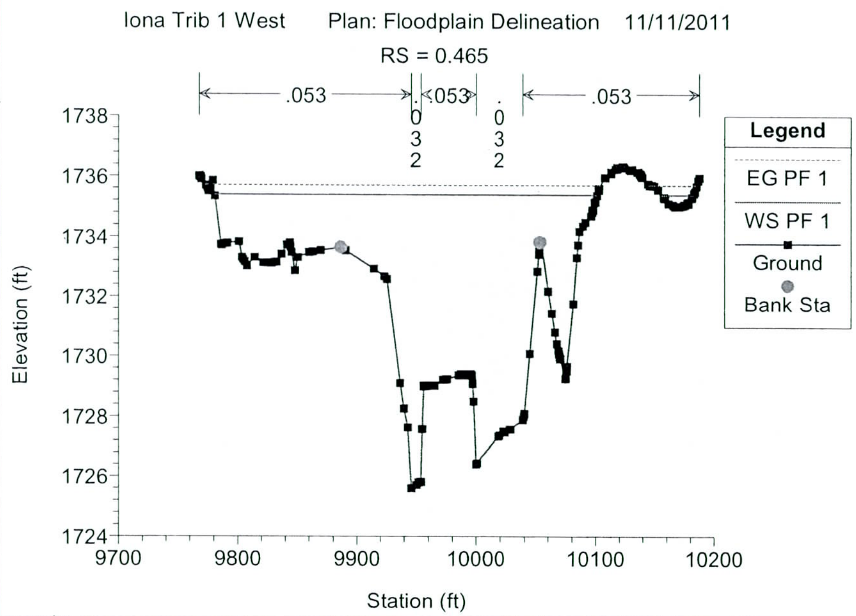
Iona Trib 1 West
Plan: Floodplain Delineation
11/11/2011
RS = 0.847
.053
.032
.053
Elevation (ft)
Station (ft)
1752
1750
1748
1746
1744
1742
1740
1738
9500
9600
9700
9800
9900
10000
10100
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta

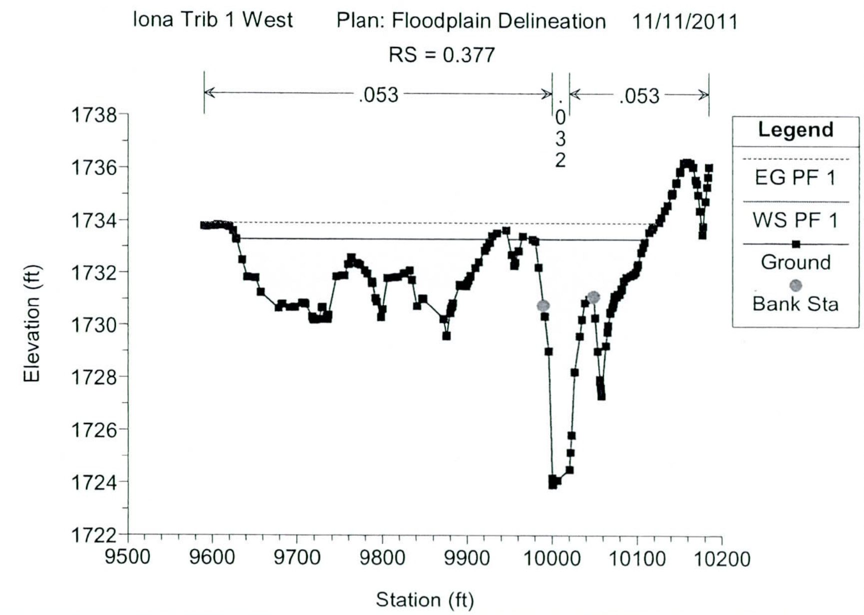


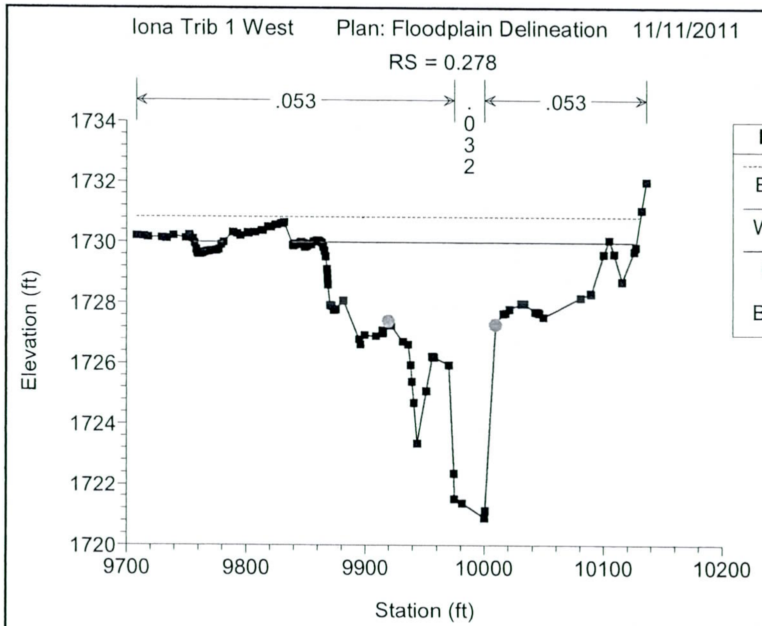
Iona Trib 1 West
Plan: Floodplain Delineation
11/11/2011
RS = 0.752
.053
.032
.053
Elevation (ft)
Station (ft)
1750
1748
1746
1744
1742
1740
1738
1736
1734
9300
9400
9500
9600
9700
9800
9900
10000
10100
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta

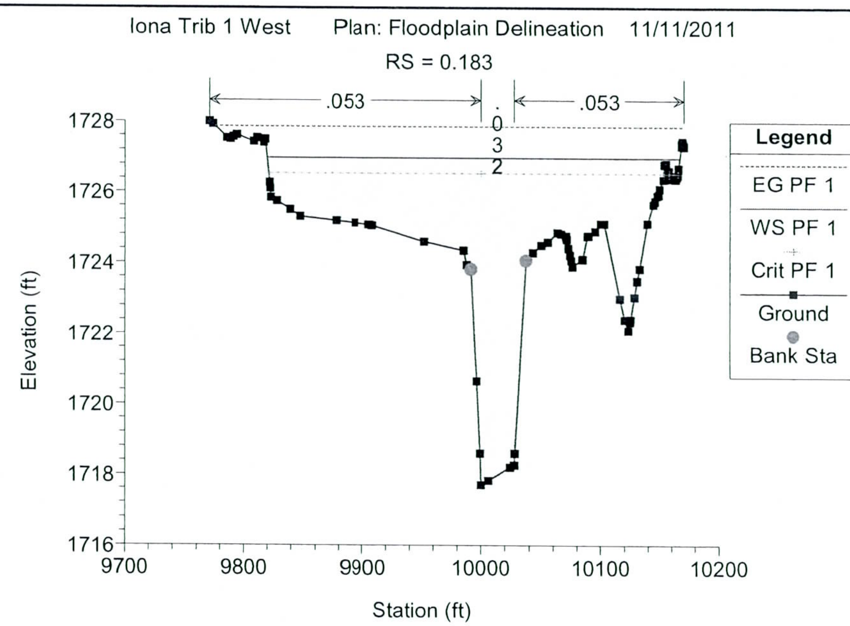

Iona Trib 1 West Plan: Floodplain Delineation 11/11/2011
RS = 0.657
.053
.032
.053
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1730
1732
1734
1736
1738
1740
1742
1744
9400
9500
9600
9700
9800
9900
10000
10100

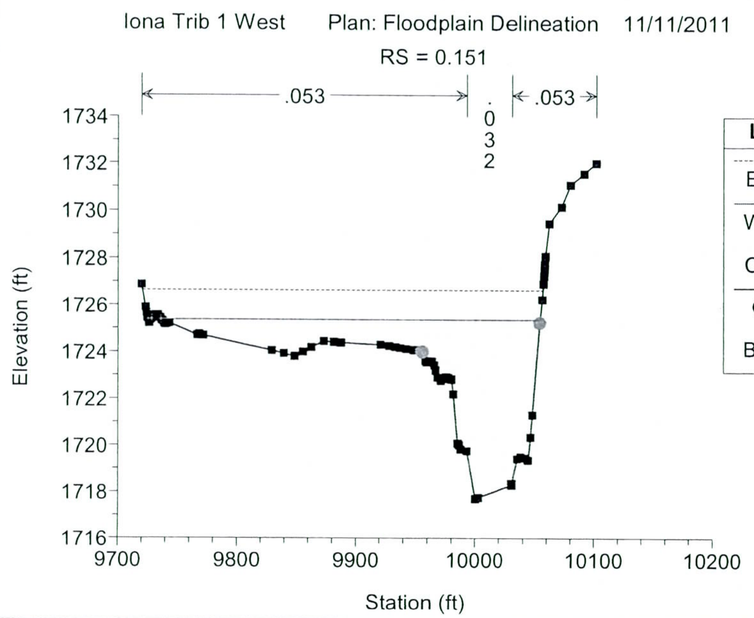

Iona Trib 1 West Plan: Floodplain Delineation 11/11/2011
RS = 0.563
.053
.032
.053
.032
.053
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1728
1730
1732
1734
1736
1738
1740
9700
9800
9900
10000
10100
10200

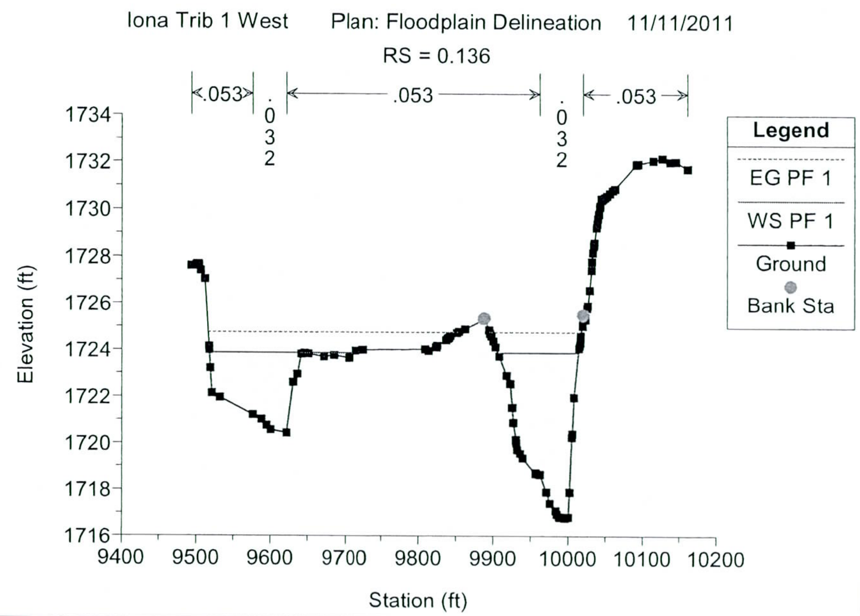

Iona Trib 1 West Plan: Floodplain Delineation 11/11/2011
RS = 0.465
.053
.032
.053
.032
.053
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1724
1726
1728
1730
1732
1734
1736
1738
9700
9800
9900
10000
10100
10200

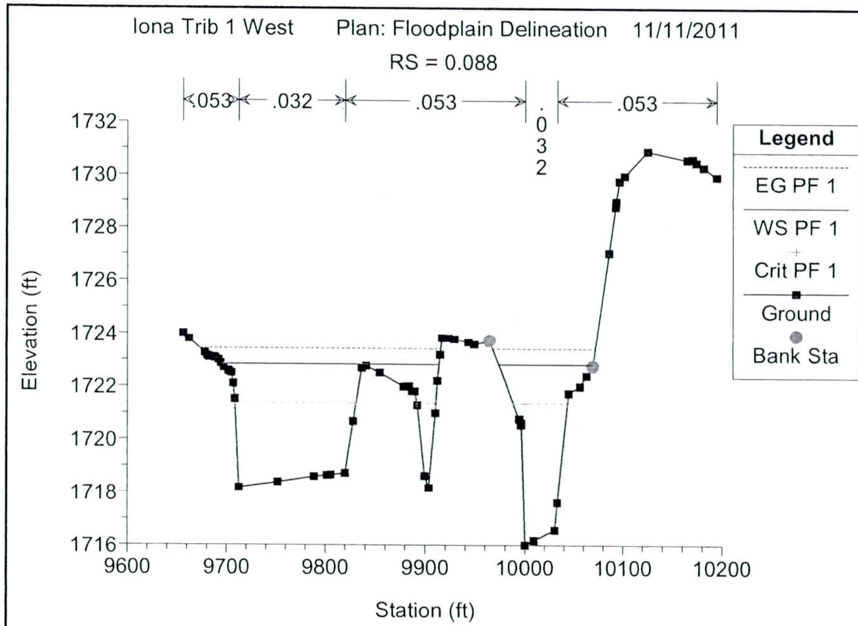

Iona Trib 1 West Plan: Floodplain Delineation 11/11/2011
RS = 0.377
.053
.032
.053
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1722
1724
1726
1728
1730
1732
1734
1736
1738
9500
9600
9700
9800
9900
10000
10100
10200

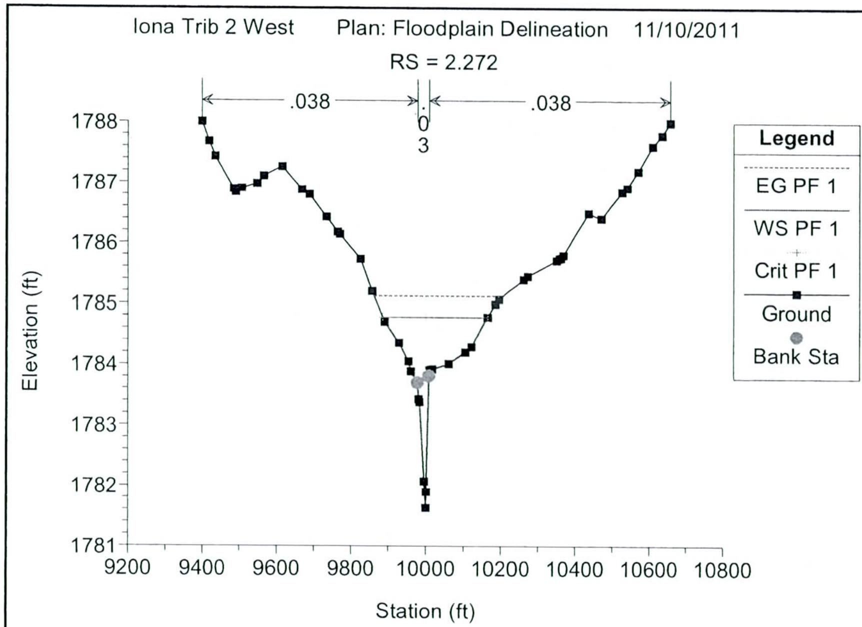

Iona Trib 1 West
Plan: Floodplain Delineation 11/11/2011
RS = 0.278
.053
.032
.053
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
1734
1732
1730
1728
1726
1724
1722
1720
9700
9800
9900
10000
10100
10200
Station (ft)

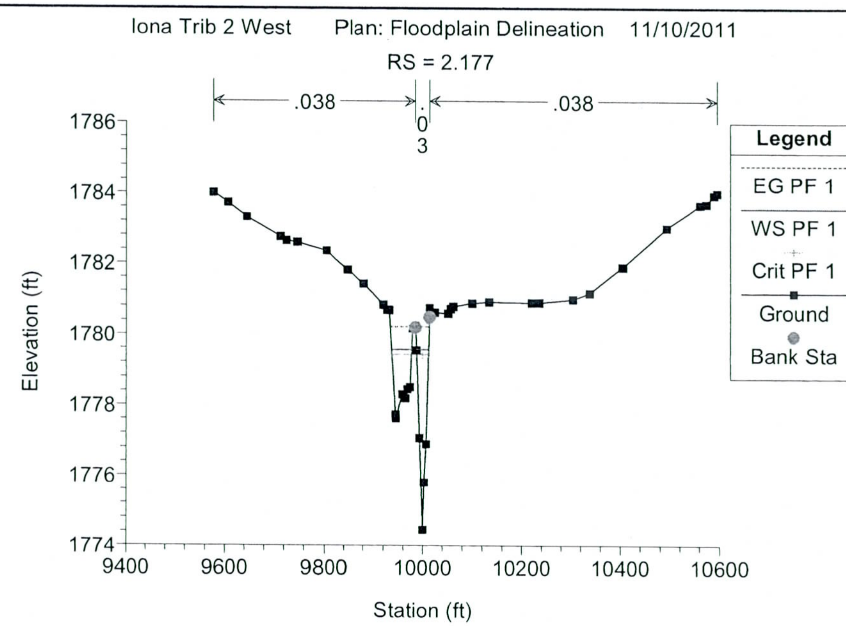

Iona Trib 1 West
Plan: Floodplain Delineation 11/11/2011
RS = 0.183
.053
.032
.053
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
1728
1726
1724
1722
1720
1718
1716
9700
9800
9900
10000
10100
10200
Station (ft)

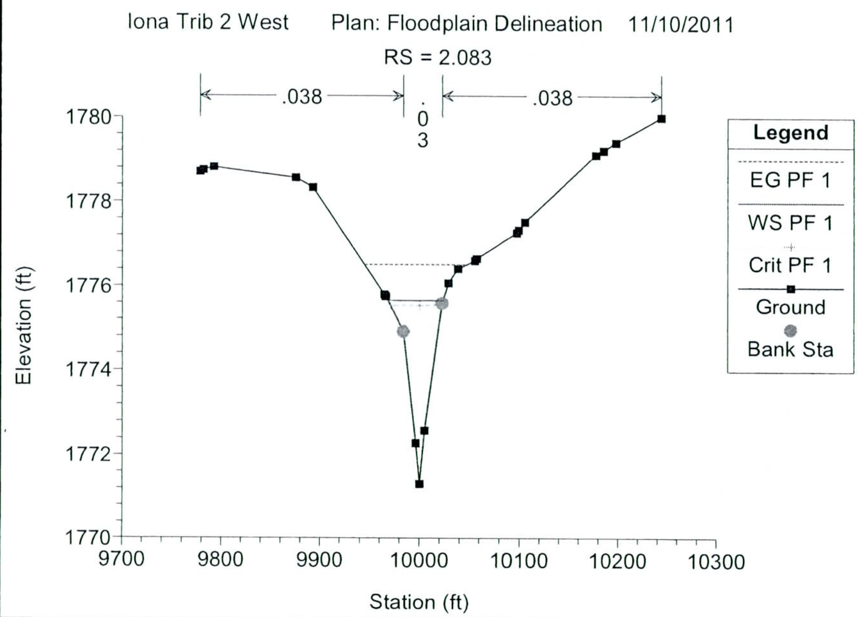

Iona Trib 1 West
Plan: Floodplain Delineation 11/11/2011
RS = 0.151
.053
.032
.053
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
1734
1732
1730
1728
1726
1724
1722
1720
1718
1716
9700
9800
9900
10000
10100
10200
Station (ft)

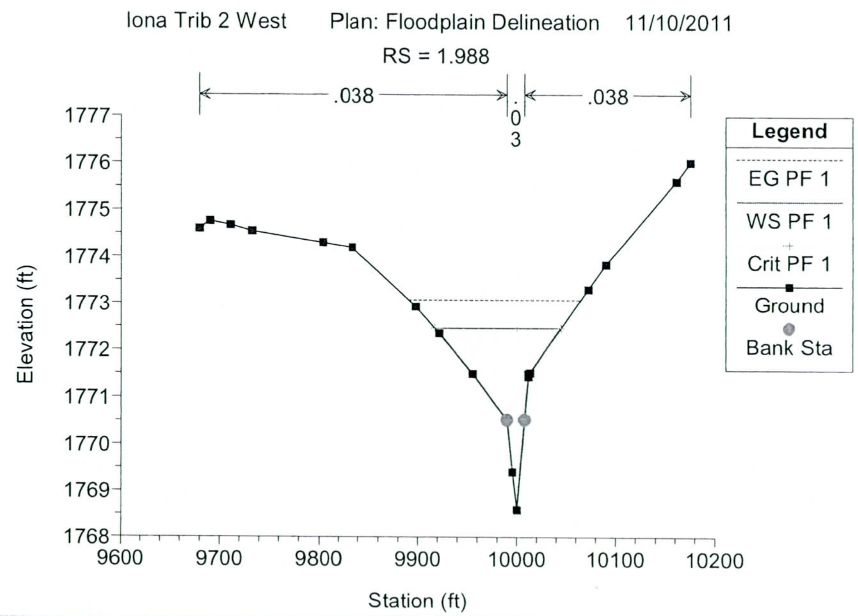

Iona Trib 1 West
Plan: Floodplain Delineation 11/11/2011
RS = 0.136
.053
.032
.053
.032
.053
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
1734
1732
1730
1728
1726
1724
1722
1720
1718
1716
9400
9500
9600
9700
9800
9900
10000
10100
10200
Station (ft)

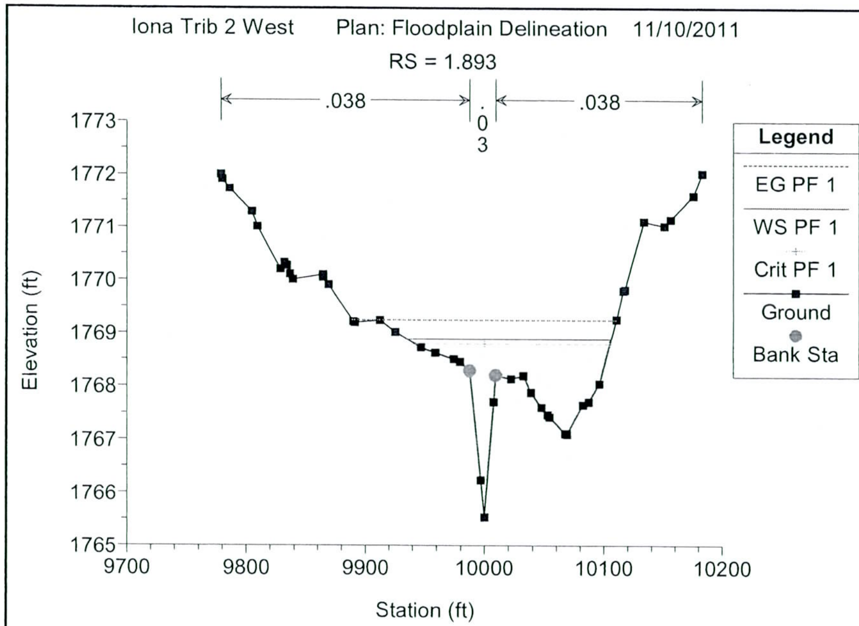

Iona Trib 1 West Plan: Floodplain Delineation 11/11/2011
RS = 0.088
.053
.032
.053
.032
.053
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
1732
1730
1728
1726
1724
1722
1720
1718
1716
9600
9700
9800
9900
10000
10100
10200
Station (ft)

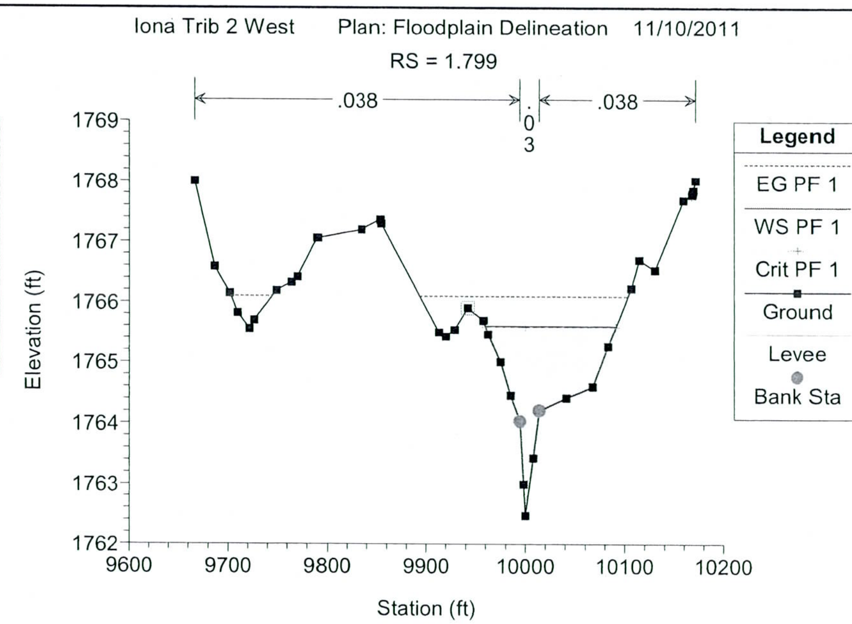

Iona Trib 2 West
Plan: Floodplain Delineation
11/10/2011
RS = 2.272
.038
.038
.
0
3
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1788
1787
1786
1785
1784
1783
1782
1781
9200
9400
9600
9800
10000
10200
10400
10600
10800

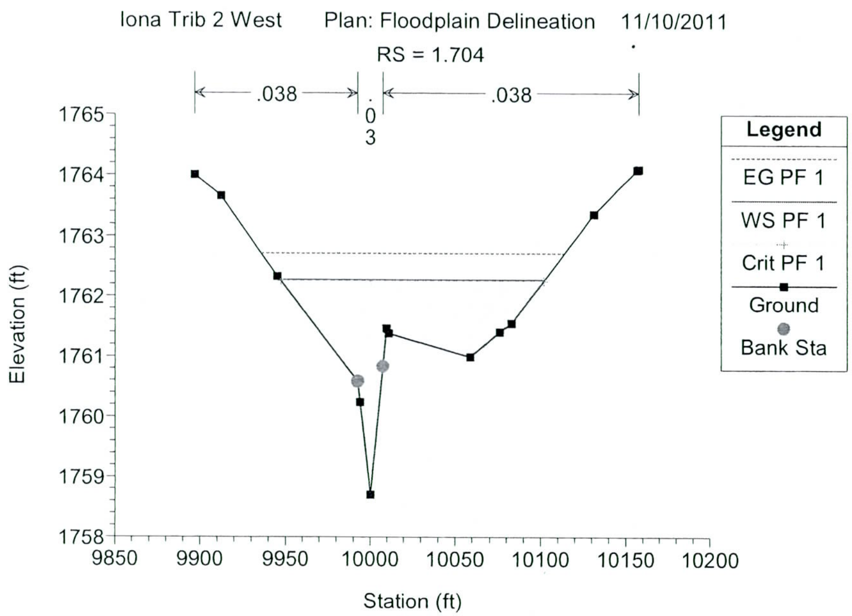

Iona Trib 2 West
Plan: Floodplain Delineation
11/10/2011
RS = 2.177
.038
.038
.
0
3
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1786
1784
1782
1780
1778
1776
1774
9400
9600
9800
10000
10200
10400
10600


Iona Trib 2 West
Plan: Floodplain Delineation
11/10/2011
RS = 2.083
.038
.038
.
0
3
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1780
1778
1776
1774
1772
1770
9700
9800
9900
10000
10100
10200
10300


Iona Trib 2 West
Plan: Floodplain Delineation
11/10/2011
RS = 1.988
.038
.038
.
0
3
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1777
1776
1775
1774
1773
1772
1771
1770
1769
1768
9600
9700
9800
9900
10000
10100
10200


Iona Trib 2 West Plan: Floodplain Delineation 11/10/2011
RS = 1.893
.038
.03
.038
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
1765
1766
1767
1768
1769
1770
1771
1772
1773
Station (ft)
9700
9800
9900
10000
10100
10200


Iona Trib 2 West Plan: Floodplain Delineation 11/10/2011
RS = 1.799
.038
.03
.038
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta
Elevation (ft)
1762
1763
1764
1765
1766
1767
1768
1769
Station (ft)
9600
9700
9800
9900
10000
10100
10200


Iona Trib 2 West Plan: Floodplain Delineation 11/10/2011
RS = 1.704
.038
.03
.038
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
1758
1759
1760
1761
1762
1763
1764
1765
Station (ft)
9850
9900
9950
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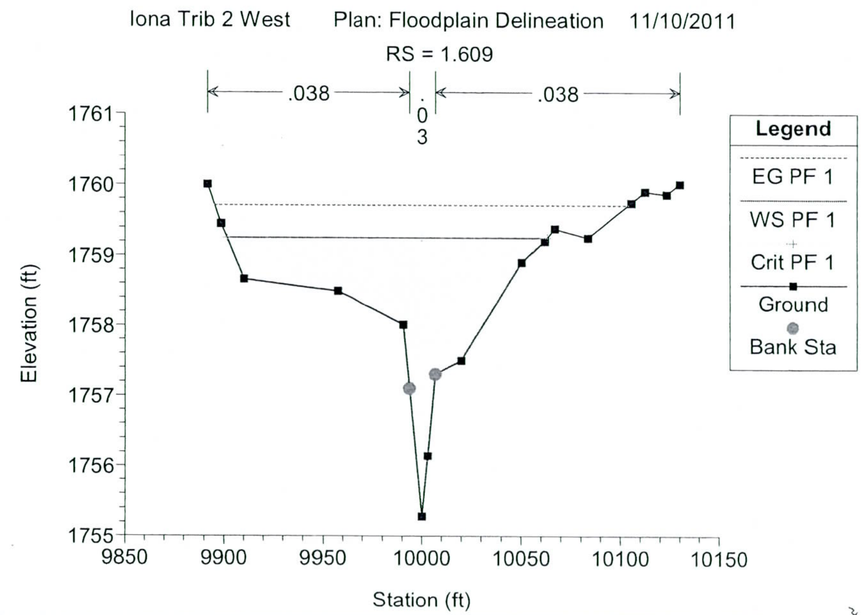
10050
10100
10150
10200


Iona Trib 2 West Plan: Floodplain Delineation 11/10/2011
RS = 1.609
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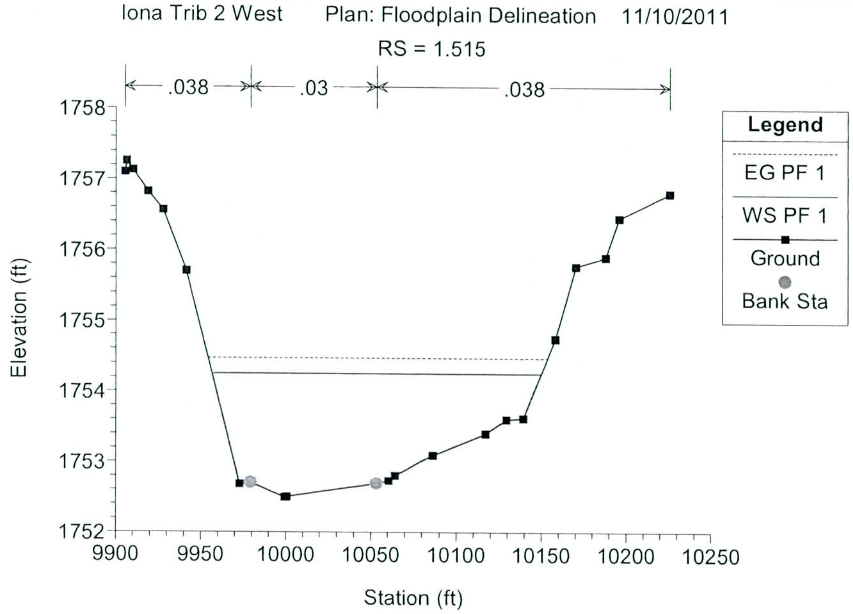
.03
.038
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
1755
1756
1757
1758
1759
1760
1761
Station (ft)
9850
9900
9950
10000
10050
10100
10150



Iona Trib 2 West Plan: Floodplain Delineation 11/10/2011
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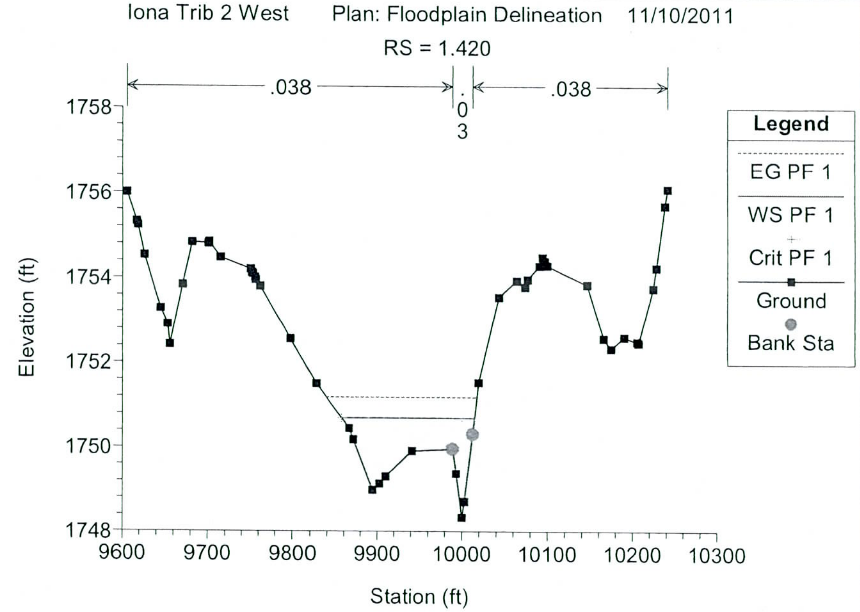
.038 .03 .038
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)



Iona Trib 2 West Plan: Floodplain Delineation 11/10/2011
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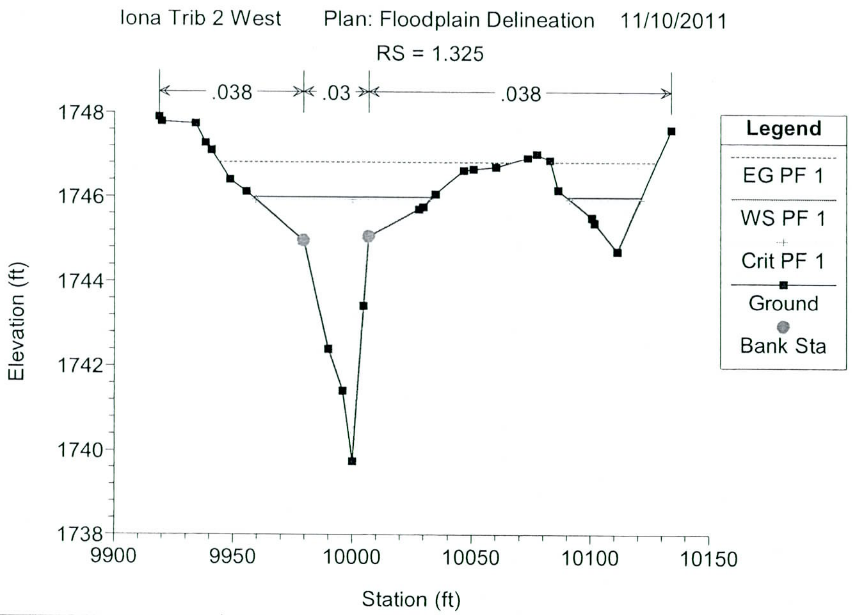
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)



Iona Trib 2 West Plan: Floodplain Delineation 11/10/2011
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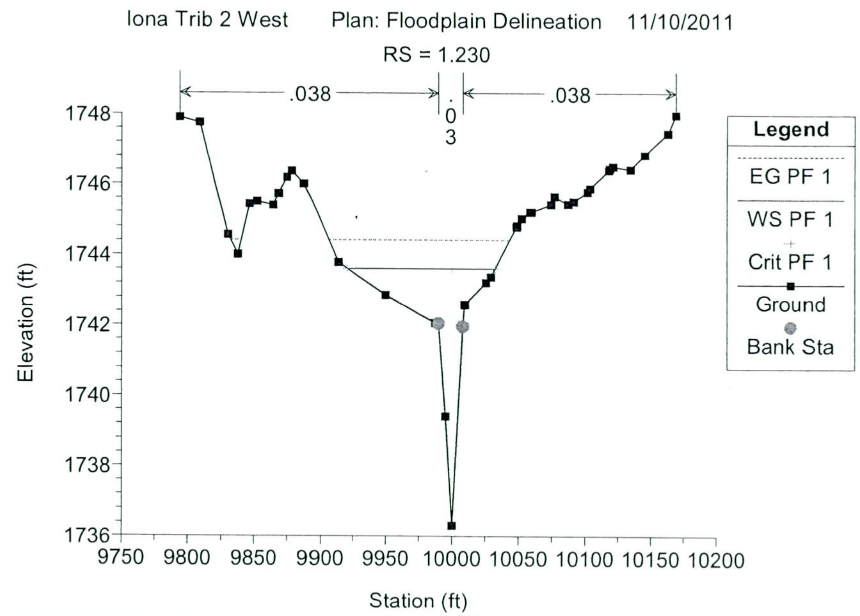
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)



Iona Trib 2 West Plan: Floodplain Delineation 11/10/2011
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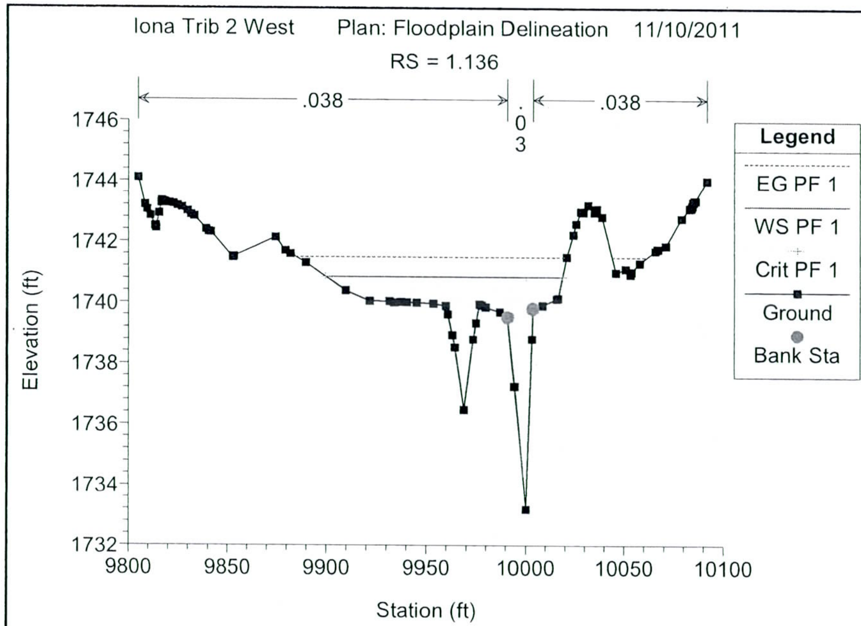
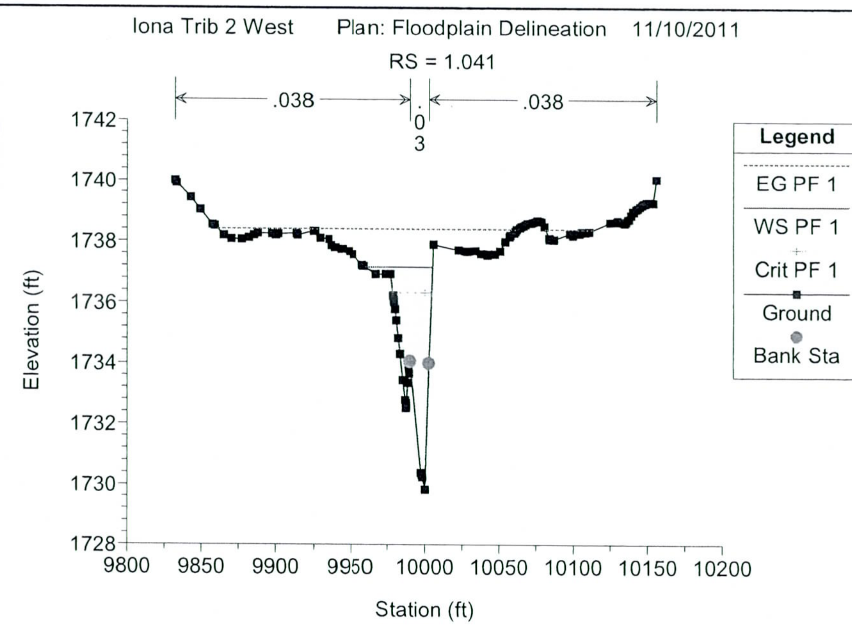
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


Iona Trib 2 West Plan: Floodplain Delineation 11/10/2011
RS = 1.136
.038
.03
.038
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1746
1744
1742
1740
1738
1736
1734
1732
9800
9850
9900
9950
10000
10050
10100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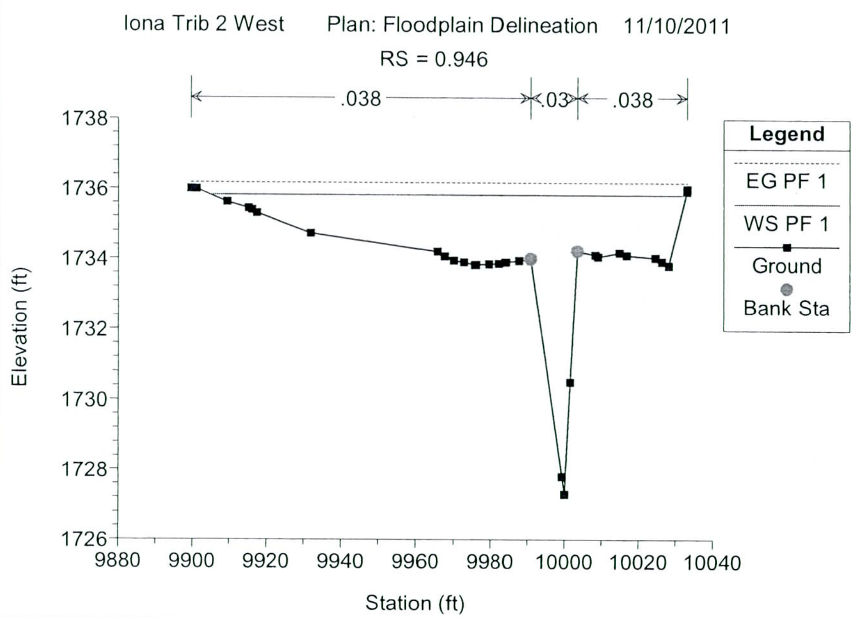
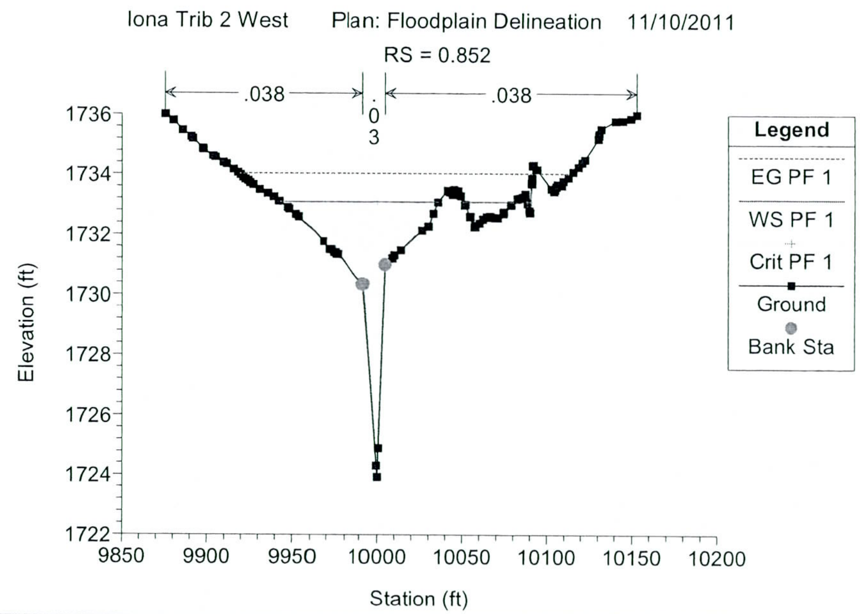
.03
.038
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1742
1740
1738
1736
1734
1732
1730
1728
9800
9850
9900
9950
10000
10050
10100
10150
10200


Iona Trib 2 West Plan: Floodplain Delineation 11/10/2011
RS = 0.946
.038
.03
.038
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1738
1736
1734
1732
1730
1728
1726
9880
9900
9920
9940
9960
9980
10000
10020
10040


Iona Trib 2 West Plan: Floodplain Delineation 11/10/2011
RS = 0.852
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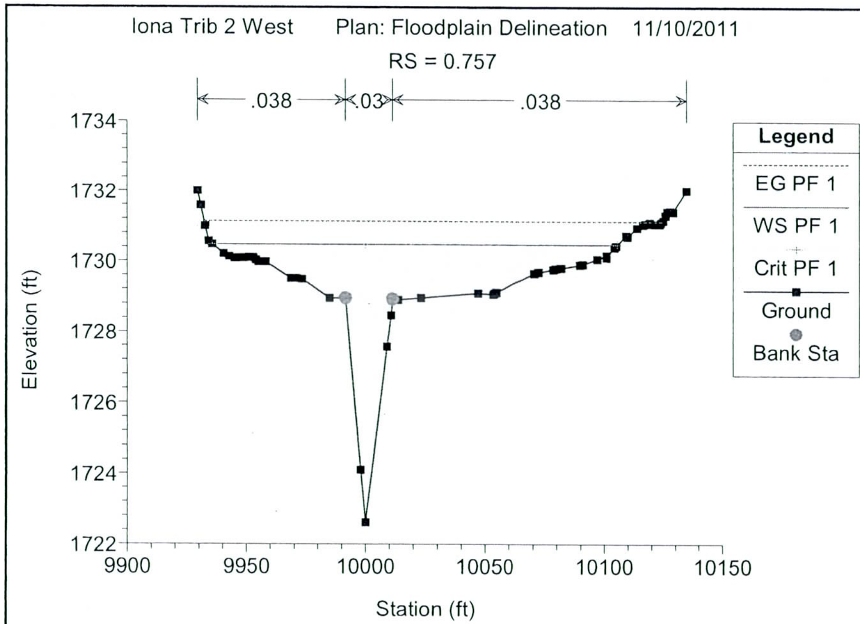
.03
.038
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1736
1734
1732
1730
1728
1726
1724
1722
9850
9900
9950
10000
10050
10100
10150
10200


Iona Trib 2 West Plan: Floodplain Delineation 11/10/2011
RS = 0.757
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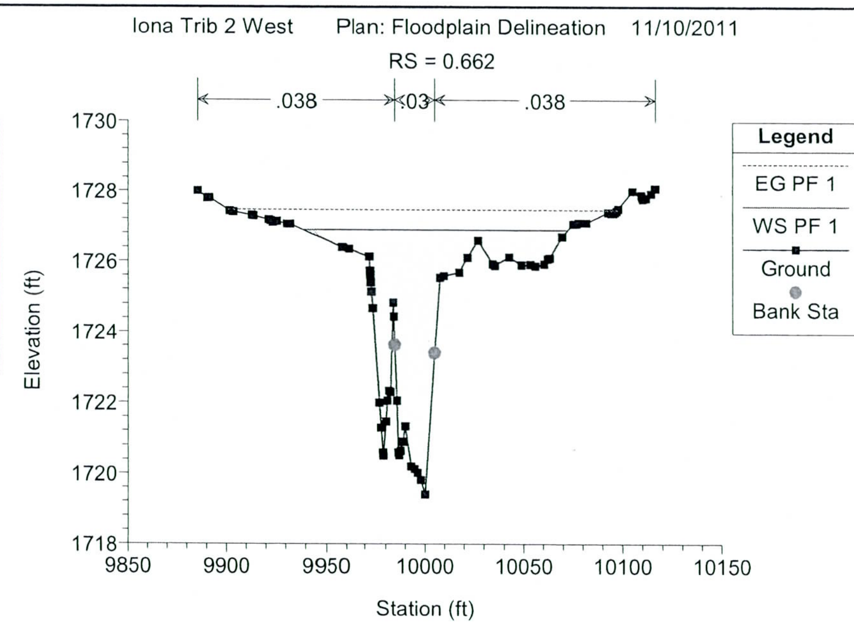
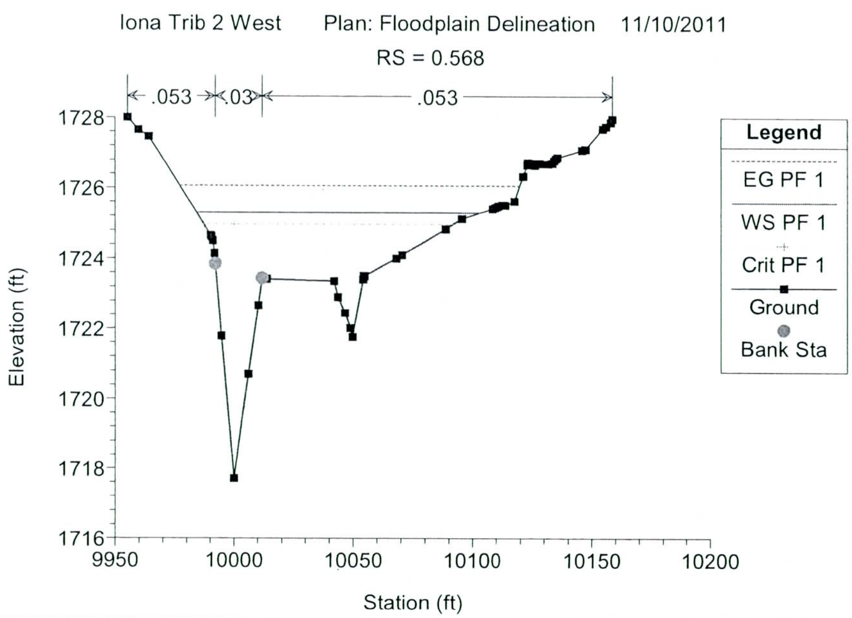
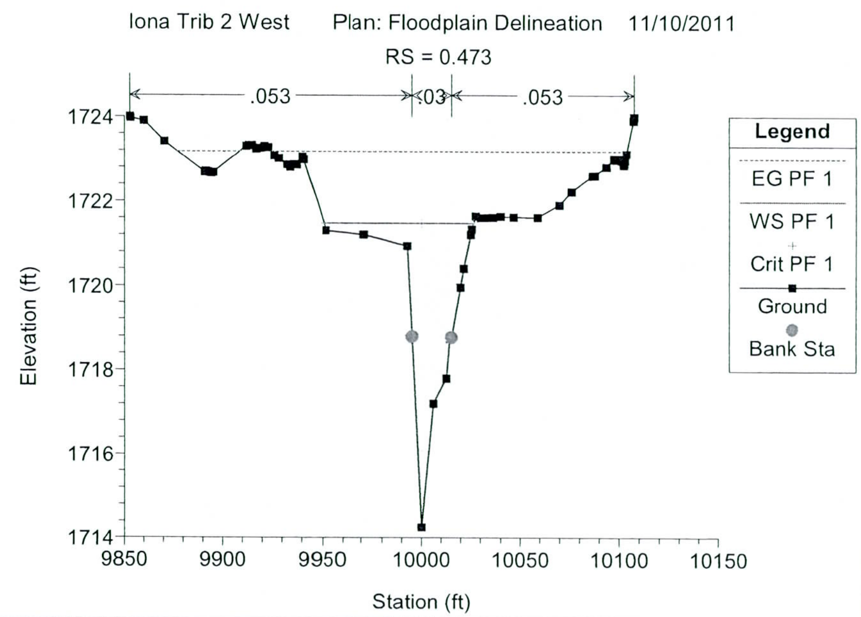
.03
.038
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1722
1724
1726
1728
1730
1732
1734
9900
9950
10000
10050
10100
10150


Iona Trib 2 West Plan: Floodplain Delineation 11/10/2011
RS = 0.662
.038
.03
.038
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1718
1720
1722
1724
1726
1728
1730
9850
9900
9950
10000
10050
10100
10150


Iona Trib 2 West Plan: Floodplain Delineation 11/10/2011
RS = 0.568
.053
.03
.053
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1716
1718
1720
1722
1724
1726
1728
9950
10000
10050
10100
10150
10200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RS = 0.473
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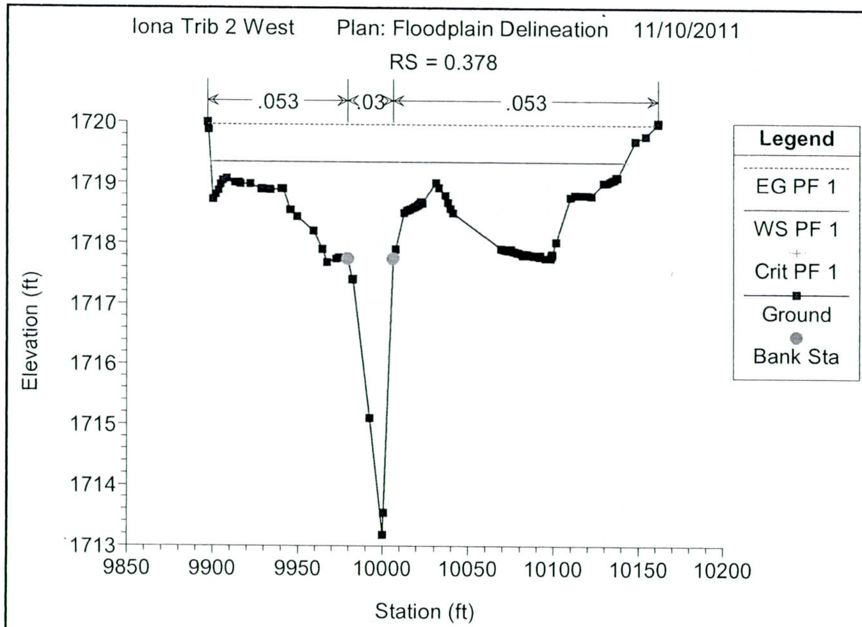
.03
.053
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1714
1716
1718
1720
1722
1724
9850
9900
9950
10000
10050
10100
10150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.03
.053
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
1713
1714
1715
1716
1717
1718
1719
1720
Station (ft)
9850
9900
9950
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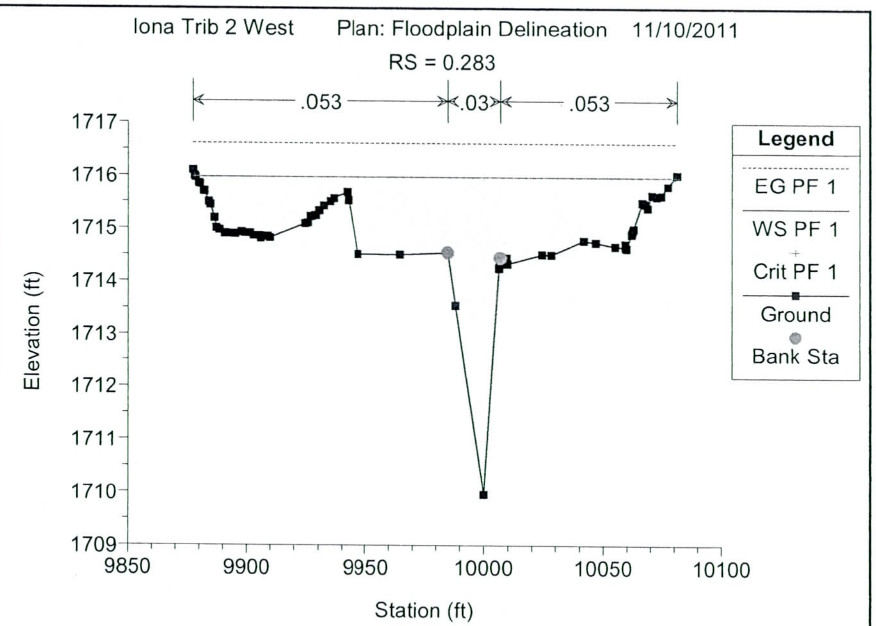
10050
10100
10150
10200


Iona Trib 2 West Plan: Floodplain Delineation 11/10/2011
RS = 0.283
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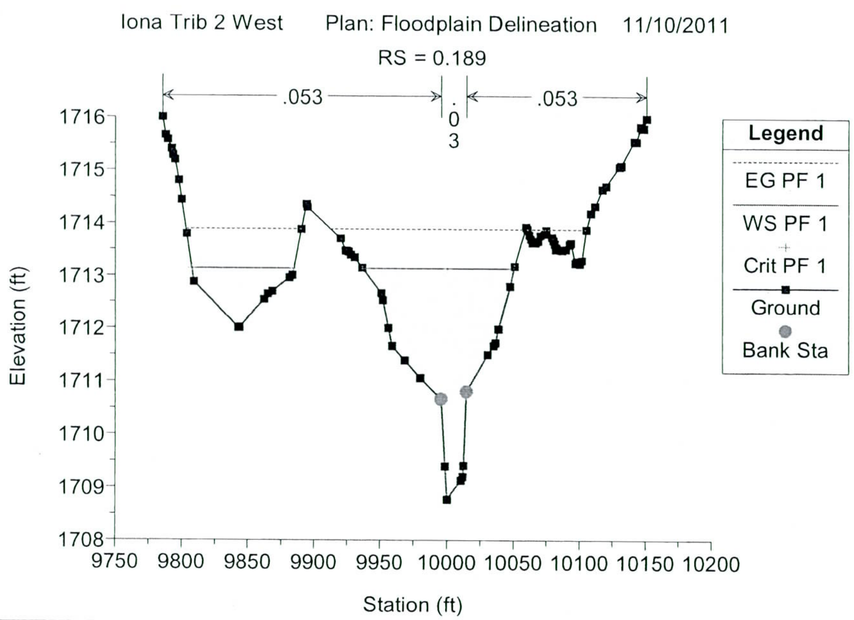
.03
.053
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
1709
1710
1711
1712
1713
1714
1715
1716
1717
Station (ft)
9850
9900
9950
10000
10050
10100


Iona Trib 2 West Plan: Floodplain Delineation 11/10/2011
RS = 0.189
.053
.03
.053
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
1708
1709
1710
1711
1712
1713
1714
1715
1716
Station (ft)
9750
9800
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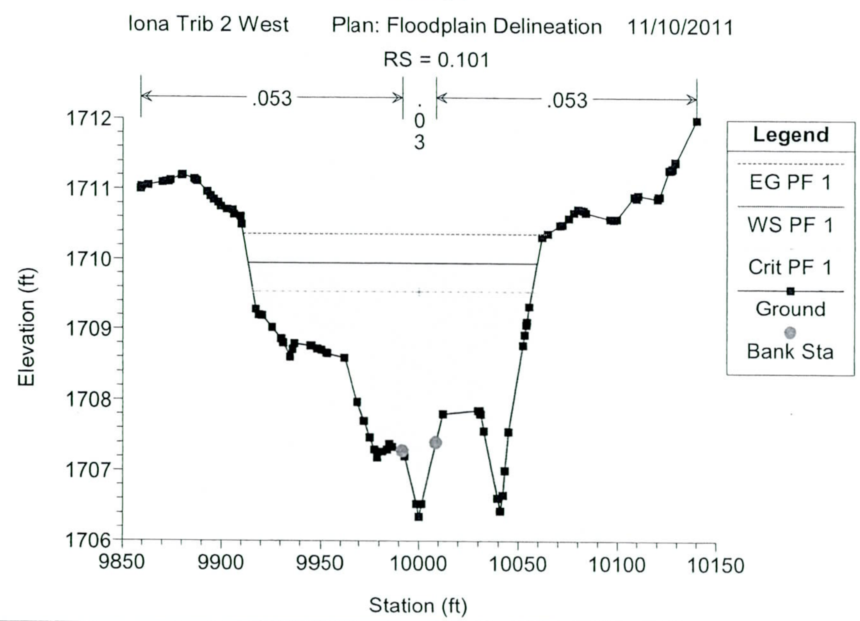
10050
10100
10150
10200


Iona Trib 2 West Plan: Floodplain Delineation 11/10/2011
RS = 0.101
.053
.03
.053
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
1706
1707
1708
1709
1710
1711
1712
Station (ft)
9850
9900
9950
10000
10050
10100
10150

E.3 Expansion and Contraction Coefficient

E.4 Analysis of Structures

(Not Applicable to This Study)

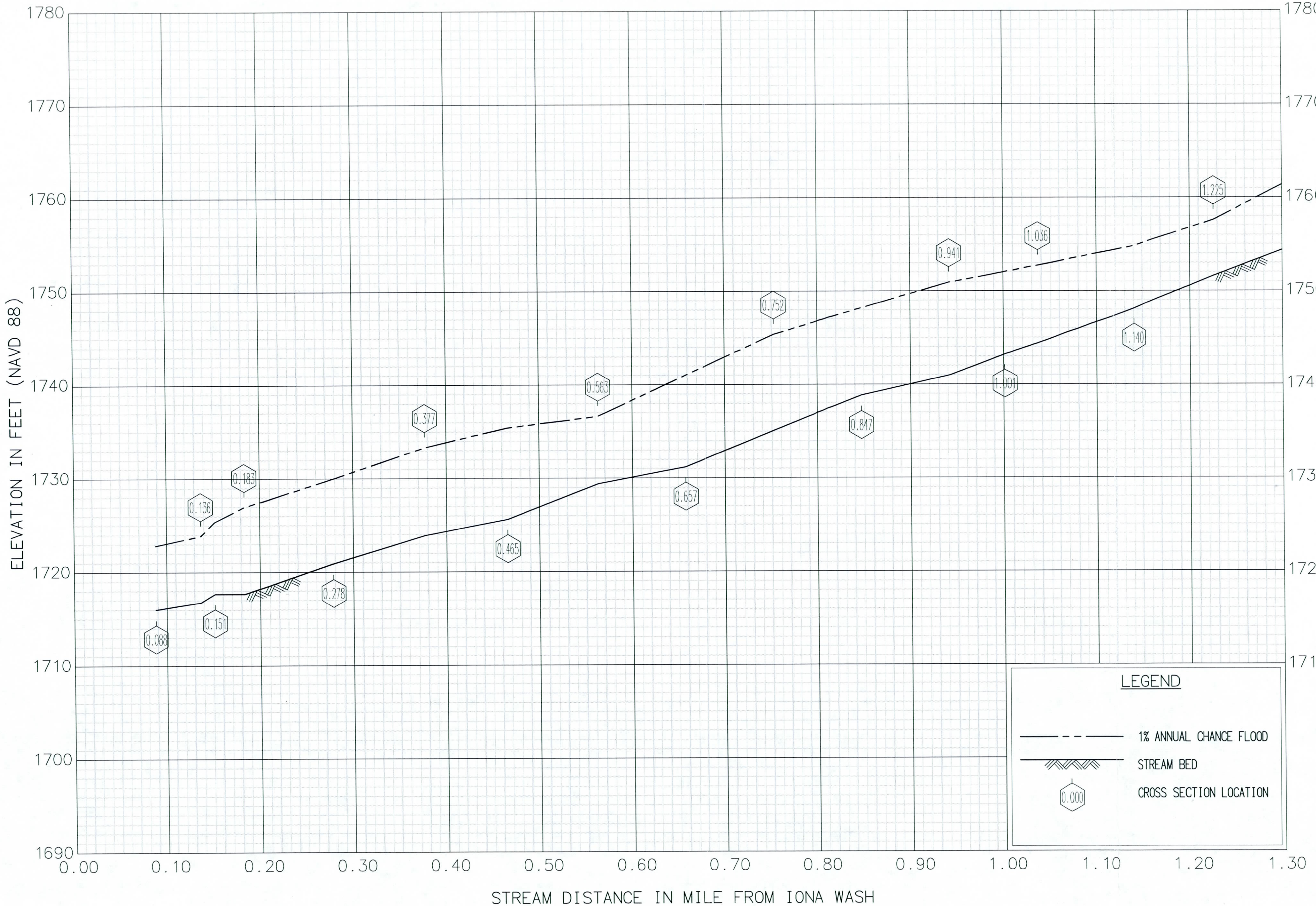
E.5 Hydraulic Calculations

HEC-RAS Plan: FP River: T5N-R3W-S17-1W Reach: 1 West Profile: PF 1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
1 West	4.161	PF 1	2334.00	1854.77	1856.85	1856.55	1857.05	0.010530	3.43	660.28	688.75	0.81
1 West	4.066	PF 1	2334.00	1847.70	1852.04	1851.97	1852.36	0.008346	6.65	716.89	938.69	0.87
1 West	3.972	PF 1	2334.00	1844.83	1847.73	1847.67	1848.09	0.010258	6.18	592.87	720.89	0.93
1 West	3.900	PF 1	2334.00	1843.10	1845.23	1844.88	1845.40	0.007805	4.76	800.81	920.04	0.79
1 West	3.761	PF 1	2334.00	1837.80	1840.61		1840.77	0.005853	5.50	857.25	826.35	0.73
1 West	3.688	PF 1	2334.00	1833.63	1836.46	1836.27	1836.74	0.012016	7.66	607.22	625.60	1.03
1 West	3.609	PF 1	2334.00	1831.57	1834.08	1833.63	1834.21	0.005230	2.95	855.69	886.27	0.47
1 West	3.488	PF 1	2334.00	1827.52	1831.10	1830.85	1831.24	0.006845	5.12	887.78	1039.43	0.61
1 West	3.371	PF 1	2334.00	1825.20	1828.33		1828.47	0.006687	3.36	807.16	864.04	0.61
1 West	3.309	PF 1	2334.00	1821.51	1825.32		1825.61	0.010853	4.27	543.87	479.35	0.65
1 West	3.214	PF 1	2334.00	1818.80	1821.58	1820.80	1821.76	0.005199	2.44	695.26	467.17	0.40
1 West	3.119	PF 1	2334.00	1814.78	1818.53	1818.11	1818.79	0.007270	6.62	688.20	574.83	0.71
1 West	3.025	PF 1	2334.00	1809.71	1815.98	1815.68	1816.25	0.003572	5.11	870.14	797.39	0.50
1 West	2.930	PF 1	2334.00	1808.22	1813.02	1813.02	1813.57	0.009819	9.88	628.62	579.96	0.99
1 West	2.761	PF 1	2334.00	1799.06	1807.75		1808.10	0.003193	5.17	645.47	375.26	0.40
1 West	2.741	PF 1	2334.00	1798.58	1807.41		1807.77	0.002756	5.19	672.71	509.61	0.39
1 West	2.646	PF 1	3423.00	1794.82	1804.22	1804.22	1804.92	0.010527	9.63	712.94	583.31	0.73
1 West	2.551	PF 1	3423.00	1792.51	1802.07		1802.25	0.002620	4.37	1107.48	635.41	0.35
1 West	2.456	PF 1	3423.00	1790.13	1799.63	1799.36	1800.23	0.008465	7.41	753.26	599.76	0.63
1 West	2.362	PF 1	3561.00	1787.93	1796.93	1796.71	1797.28	0.004090	6.28	1178.28	943.45	0.49
1 West	2.267	PF 1	3561.00	1786.00	1794.05	1793.71	1794.44	0.007958	5.04	716.39	585.68	0.74
1 West	2.172	PF 1	3561.00	1781.88	1790.89	1790.30	1791.11	0.005654	4.52	1101.83	788.31	0.47
1 West	2.078	PF 1	3561.00	1778.95	1787.08	1787.08	1787.64	0.008514	8.35	881.59	691.74	0.65
1 West	2.031	PF 1	3561.00	1777.57	1785.51	1785.51	1786.16	0.004929	9.28	1010.91	738.62	0.73
1 West	1.983	PF 1	3561.00	1776.10	1783.70	1783.20	1784.08	0.003847	5.92	998.45	663.40	0.59
1 West	1.918	PF 1	3561.00	1774.60	1780.86	1780.86	1781.60	0.008959	10.53	748.96	459.26	0.94
1 West	1.827	PF 1	3561.00	1771.70	1778.24		1778.43	0.002112	3.87	1182.72	628.04	0.31
1 West	1.776	PF 1	3561.00	1769.10	1777.23		1777.59	0.006108	5.04	747.44	363.08	0.50
1 West	1.689	PF 1	3561.00	1766.65	1774.41		1775.01	0.004770	6.19	587.13	238.96	0.50
1 West	1.604	PF 1	3561.00	1765.52	1772.76		1773.02	0.003774	4.99	1180.67	769.45	0.43
1 West	1.538	PF 1	5467.00	1762.61	1769.85	1769.85	1770.78	0.009465	8.63	911.98	577.75	0.71
1 West	1.439	PF 1	5467.00	1759.10	1766.95		1767.21	0.001920	4.20	1446.31	526.98	0.31
1 West	1.362	PF 1	5467.00	1756.71	1764.54	1763.44	1765.57	0.011922	8.40	721.76	313.95	0.74
1 West	1.225	PF 1	5467.00	1751.58	1757.58		1758.36	0.008239	7.08	771.70	249.42	0.71
1 West	1.140	PF 1	5467.00	1748.07	1754.78		1755.47	0.004915	6.85	849.26	244.74	0.60
1 West	1.036	PF 1	5467.00	1744.39	1752.73		1753.26	0.003315	5.83	937.55	179.44	0.45
1 West	1.001	PF 1	5467.00	1743.20	1752.01		1752.56	0.004334	5.92	922.78	171.52	0.45
1 West	0.941	PF 1	5467.00	1740.96	1750.90		1751.38	0.003094	5.84	1132.29	349.46	0.40

HEC-RAS Plan: FP River: T5N-R3W-S17-2W Reach: Reach 1 Profile: PF 1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	2.272	PF 1	652.00	1781.63	1784.78	1784.78	1785.12	0.005754	5.99	201.20	279.36	0.74
Reach 1	2.177	PF 1	652.00	1774.44	1779.58	1779.43	1780.22	0.006772	7.29	114.55	65.15	0.80
Reach 1	2.083	PF 1	652.00	1771.30	1775.66	1775.54	1776.51	0.007980	7.46	91.84	54.87	0.88
Reach 1	1.988	PF 1	652.00	1768.59	1772.46	1772.46	1773.07	0.005812	7.61	144.63	127.62	0.78
Reach 1	1.893	PF 1	652.00	1765.53	1768.88	1768.78	1769.25	0.006757	6.34	163.11	170.64	0.79
Reach 1	1.799	PF 1	652.00	1762.47	1765.61	1765.59	1766.10	0.007185	7.25	148.02	131.79	0.84
Reach 1	1.704	PF 1	652.00	1758.70	1762.27	1762.25	1762.71	0.006544	7.35	164.29	155.77	0.81
Reach 1	1.609	PF 1	652.00	1755.28	1759.25	1759.25	1759.71	0.005555	7.50	170.75	161.61	0.76
Reach 1	1.515	PF 1	811.00	1752.49	1754.25		1754.47	0.003860	4.30	240.18	193.19	0.59
Reach 1	1.420	PF 1	811.00	1748.33	1750.70	1750.70	1751.18	0.013805	7.49	159.69	158.19	1.09
Reach 1	1.325	PF 1	811.00	1739.74	1745.99	1745.94	1746.82	0.005122	7.66	138.77	106.74	0.72
Reach 1	1.230	PF 1	811.00	1736.30	1743.61	1743.61	1744.42	0.004587	8.01	154.32	112.57	0.68
Reach 1	1.136	PF 1	811.00	1733.19	1740.85	1740.85	1741.50	0.006115	8.12	168.31	119.06	0.68
Reach 1	1.041	PF 1	811.00	1729.83	1737.16	1736.33	1738.40	0.005319	9.65	112.07	44.98	0.73
Reach 1	0.946	PF 1	811.00	1727.29	1735.82		1736.17	0.002991	6.13	221.52	127.93	0.48
Reach 1	0.852	PF 1	1074.00	1723.92	1733.08	1733.08	1734.03	0.005710	9.36	189.90	124.40	0.68
Reach 1	0.757	PF 1	1074.00	1722.61	1730.47	1730.47	1731.13	0.003853	7.73	238.80	170.01	0.63
Reach 1	0.662	PF 1	1074.00	1719.40	1726.90		1727.46	0.002052	6.75	249.99	134.08	0.48
Reach 1	0.568	PF 1	1074.00	1717.71	1725.30	1724.96	1726.05	0.004388	8.20	229.50	119.54	0.67
Reach 1	0.473	PF 1	1074.00	1714.25	1721.47	1721.47	1723.18	0.007253	10.77	125.20	75.96	0.88
Reach 1	0.378	PF 1	1074.00	1713.18	1719.35	1719.35	1719.96	0.004343	7.48	292.38	243.15	0.68
Reach 1	0.283	PF 1	1074.00	1709.96	1715.98	1715.98	1716.61	0.005078	7.99	279.56	201.98	0.73
Reach 1	0.189	PF 1	1074.00	1708.77	1713.14	1713.14	1713.89	0.005466	8.75	257.19	190.45	0.79
Reach 1	0.101	PF 1	1074.00	1706.35	1709.95	1709.54	1710.37	0.005203	7.55	280.04	146.12	0.76



FLOOD PROFILES

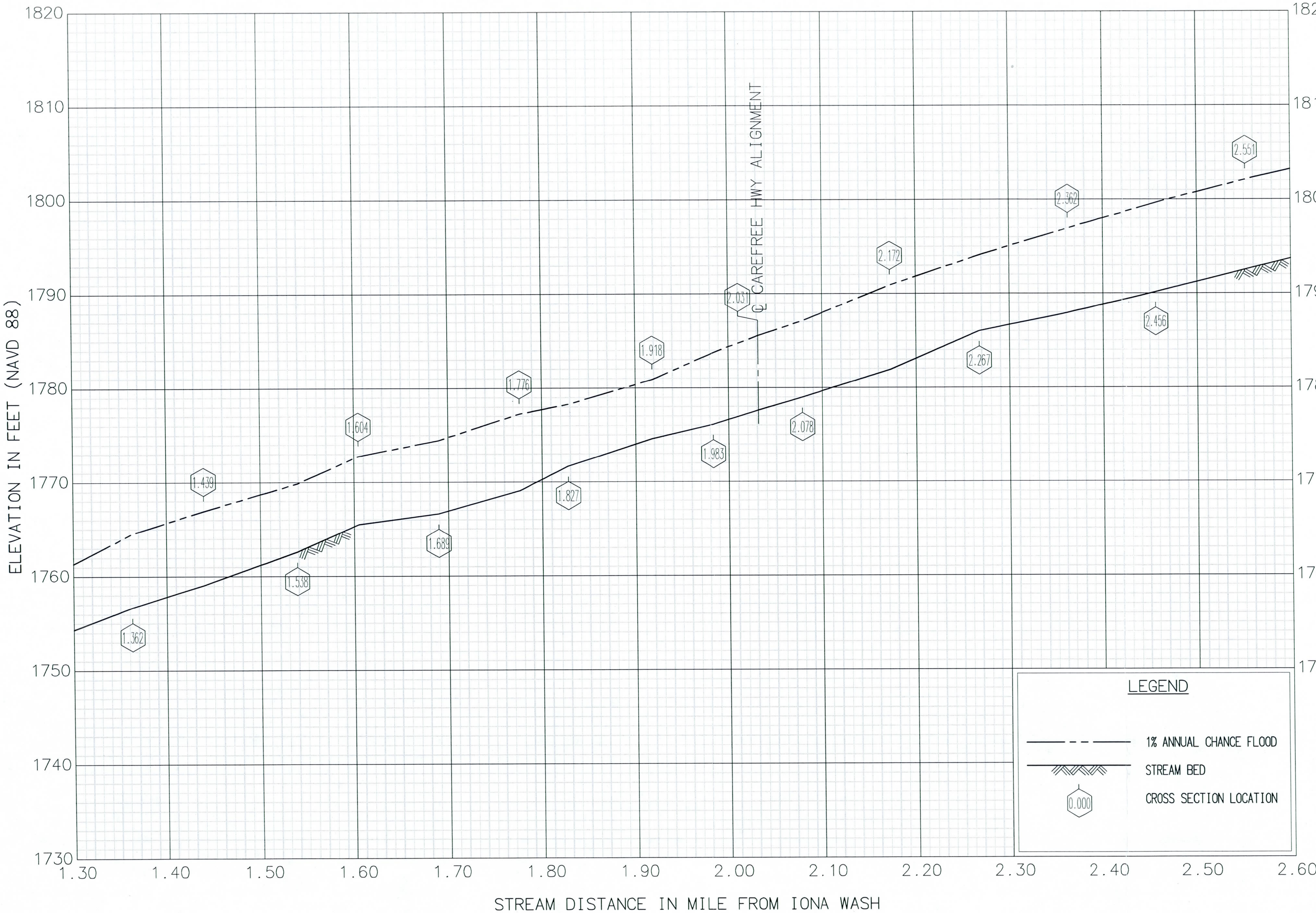
IONA TRIBUTARY 1 WEST (T5NR3WS17-1W)

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ

MARICOPA

01P



FLOOD PROFILES

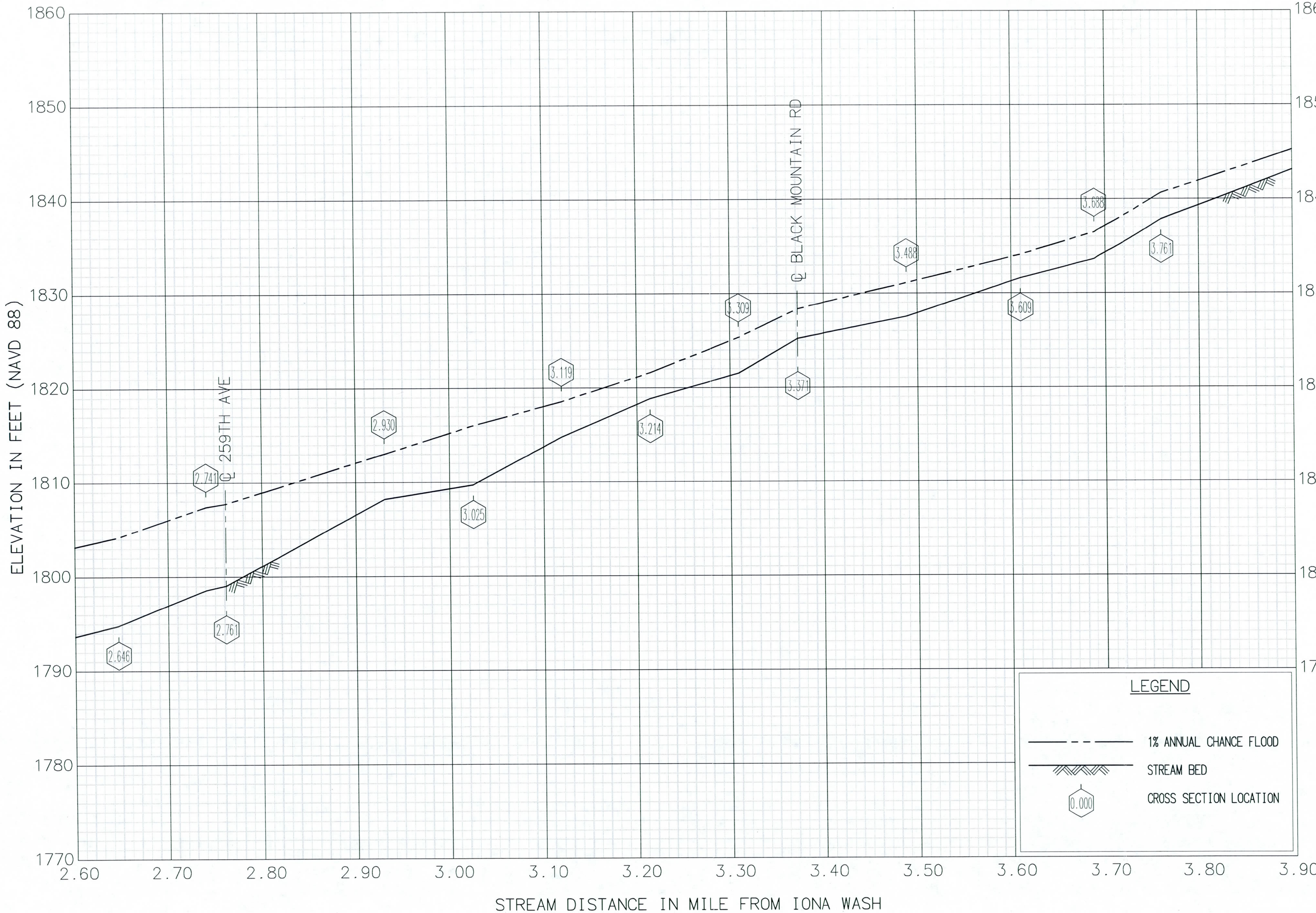
IONA TRIBUTARY 1 WEST (T5NR3WS17-1W)

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ

MARICOPA

02P



FLOOD PROFILES

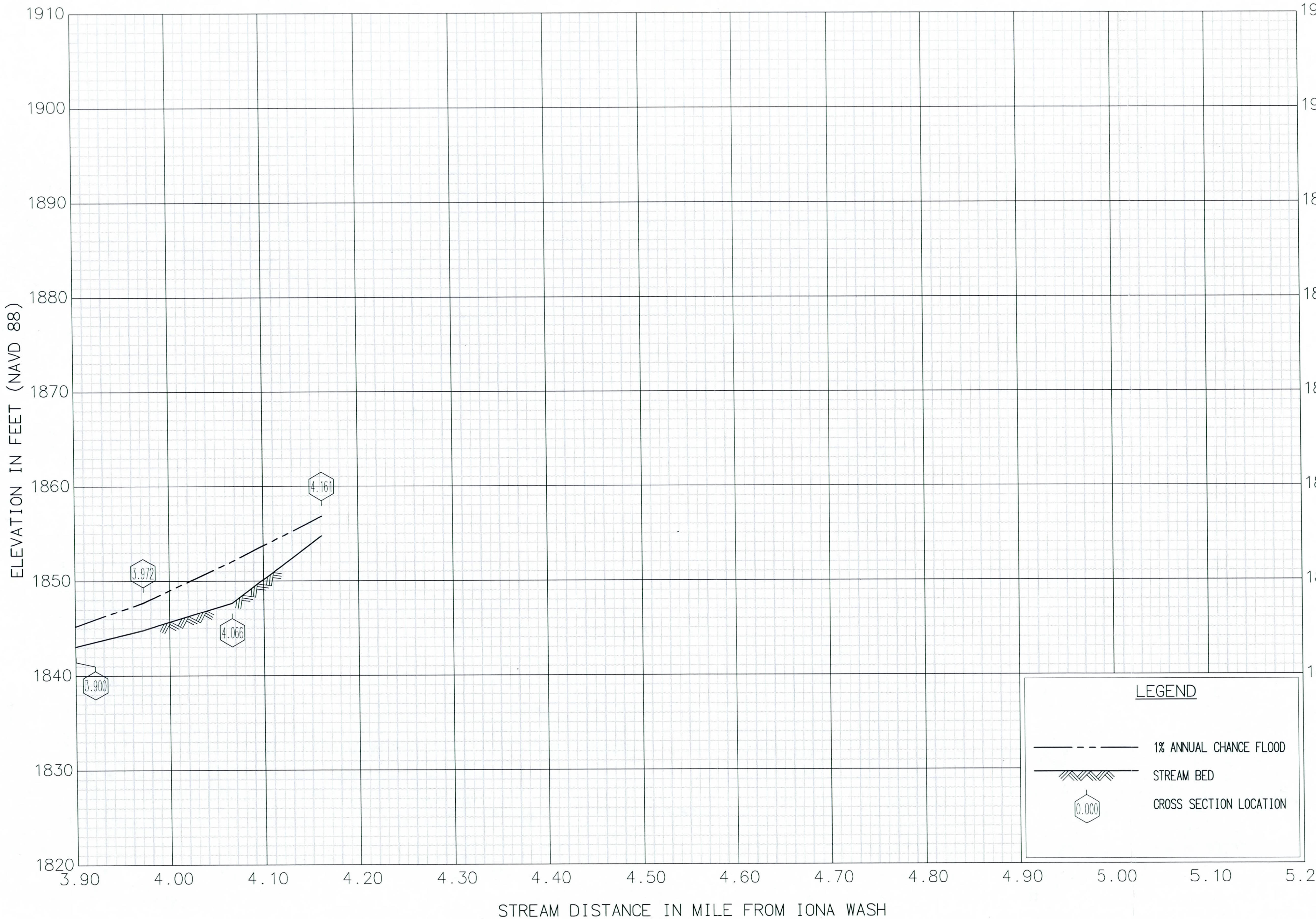
IONA TRIBUTARY 1 WEST (T5NR3WS17-1W)

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ

MARICOPA

03P



FLOOD PROFILES

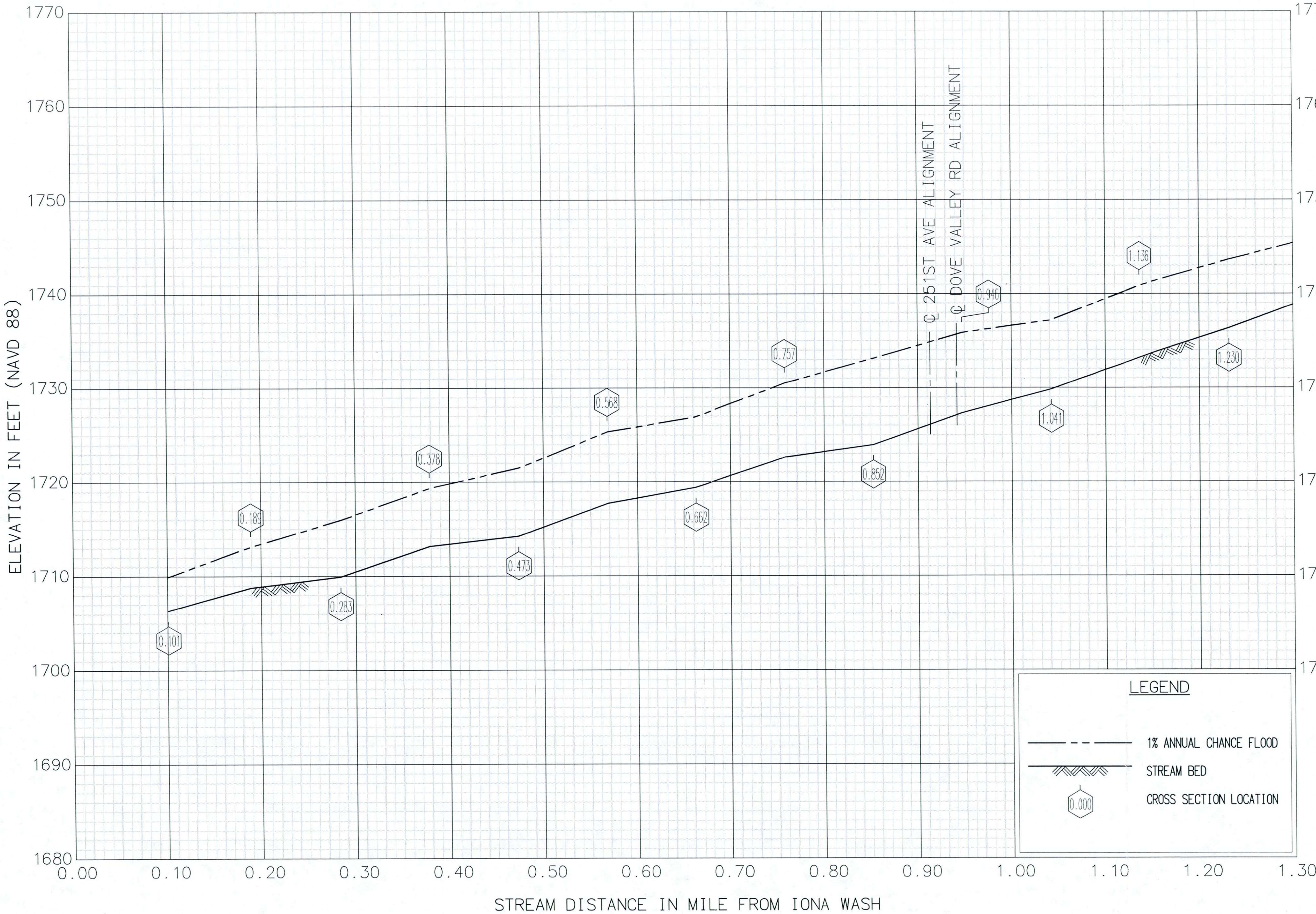
IONA TRIBUTARY 1 WEST (T5NR3WS17-1W)

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ

MARICOPA

04P



FLOOD PROFILES

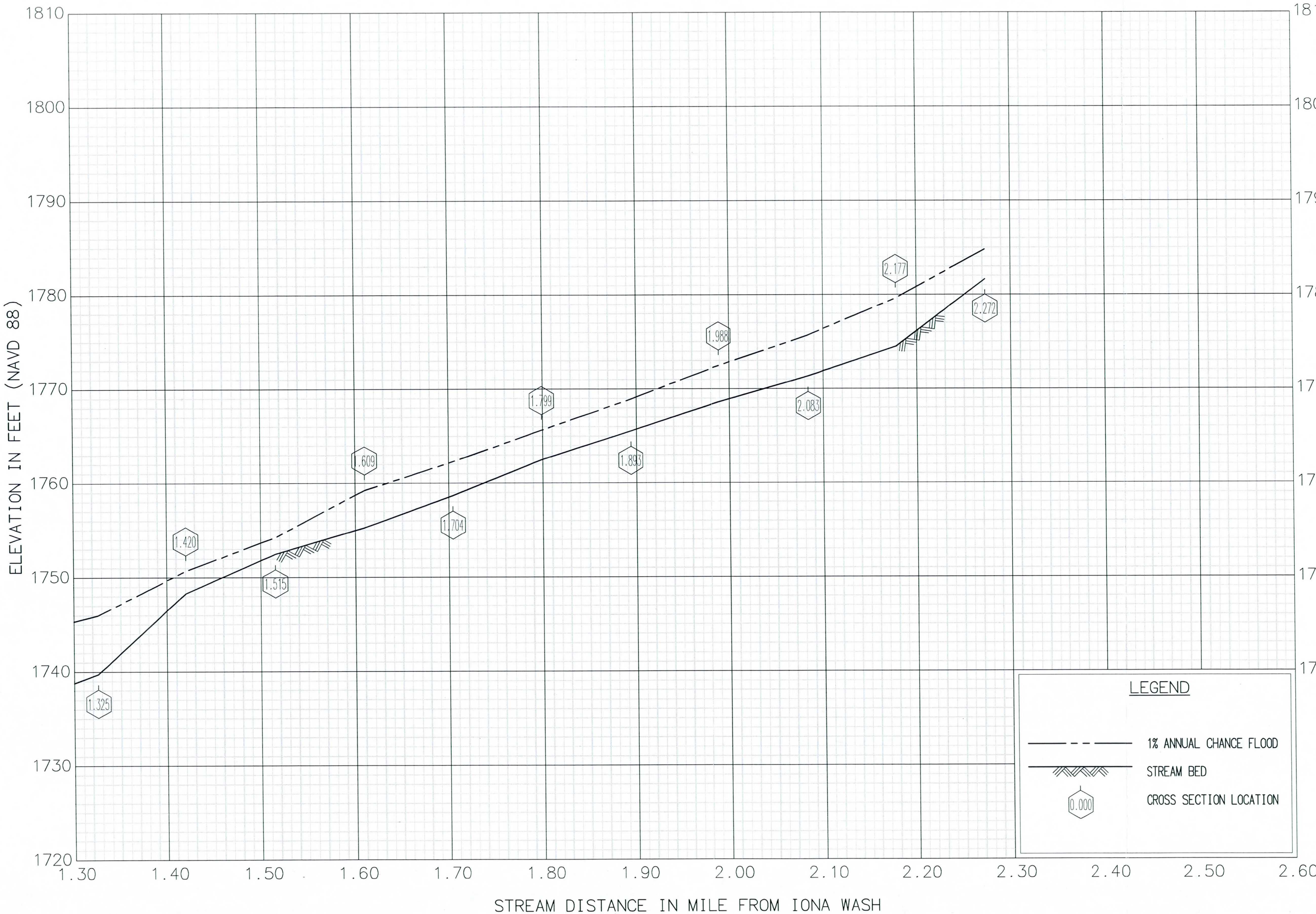
IONA TRIBUTARY 2 WEST (T5NR3WS17-2W)

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ

MARICOPA

01P



FLOOD PROFILES

IONA TRIBUTARY 2 WEST (T5NR3WS17-2W)

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ

MARICOPA

02P

Flood Control District
of Maricopa County

INTEROFFICE MEMORANDUM

Date: November 28, 2011

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

From: Jonathan Lesperance, Hydrology and Hydraulics Branch

Subject: Wittmann Phase IV Floodplain Delineation Study TDN, Contract FCD 2011C003

The floodplain study for the Wittmann Phase IV FDS is ready for use as the best available technical information. The study documentation will be sent to FEMA for review and incorporation into the County's FIRM panels. Please find attached an MT-2 form requesting your signature.

The background for the study includes the following:

> The study delineates approximately 6.5 linear miles of limited detail Zone AE floodplain (no floodway). The topographic basis for the study is 2 and 4-foot contour interval mapping in NAVD88 vertical datum by Landata Airborne Systems, Inc. The photography for topographic mapping of the study area was flown April 23, 2002. The study Consultant was RBF Consulting. The project manager for the Consultant was Nathan Ford, P.E. The project manager for the District was Jonathan Lesperance.

Please concur and authorize below the use of this new study.

Date 11/28/11 [signature] Jonathan Lesperance Project Manager	Date: [signature] 12/7/11 Timothy S. Phillips, P.E. Chief Engineer and General Manager
Date: 12/5/11 [signature] Amir Motamedi, P.E. Hydrology/Hydraulics Branch Manager	Date: [signature] 12/5/2011 Ed Raleigh, P.E. Engineering Division Manager
12/6/2011 Date: [signature] Kelli Sertich, AICP Floodplain Management & Services Division Manager	Date:
File Copies: 1. ____ 2. ____	YES ☐ GIS Posted (Pending Floodplain Only) Date:____ (NO) GIS In Progress

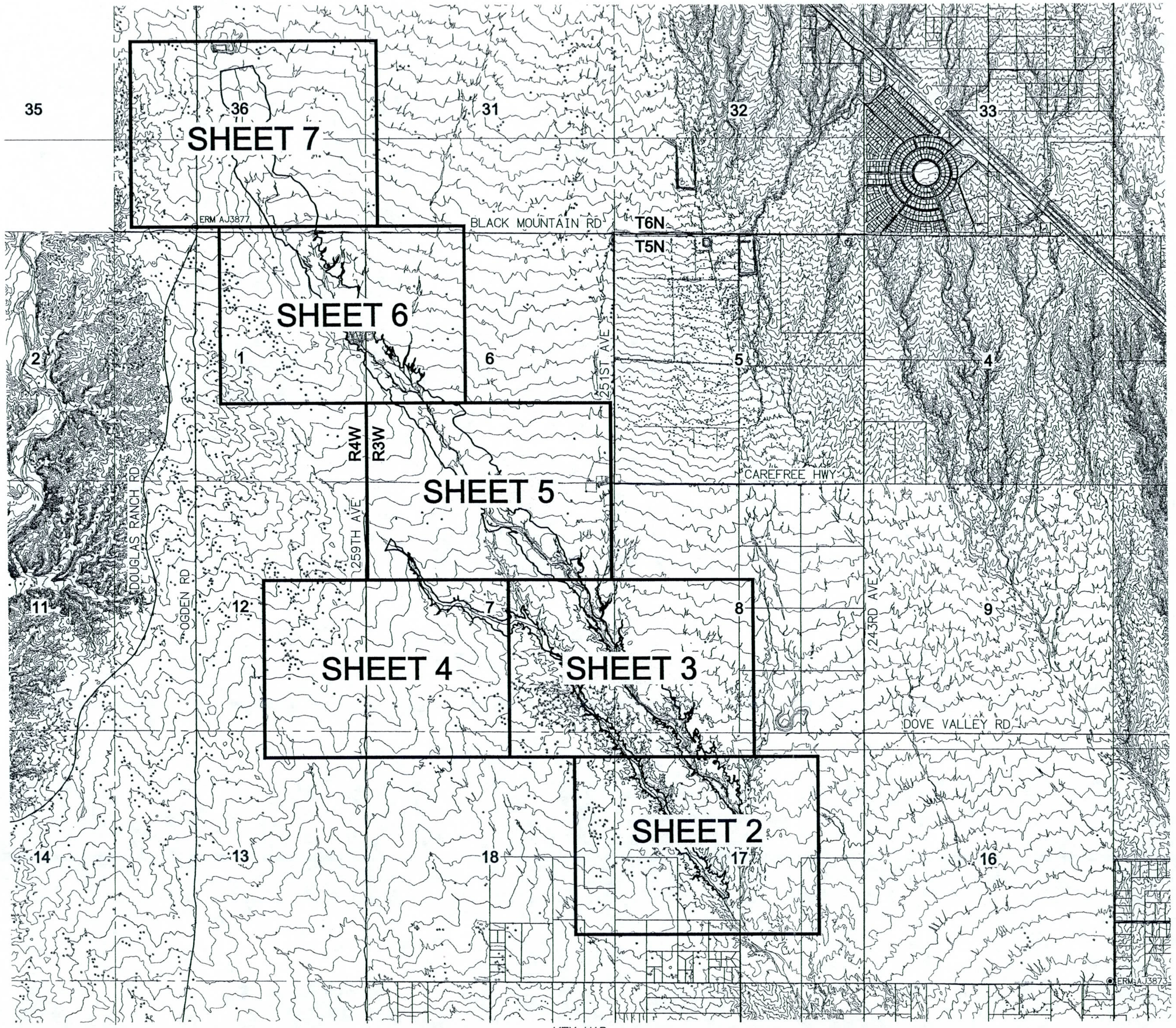
2801 West Durango Street Phoenix, Arizona 85009 Phone: 602-506-1501 Fax: 602-506-4601

FLOODPLAIN WORK MAP

FOR

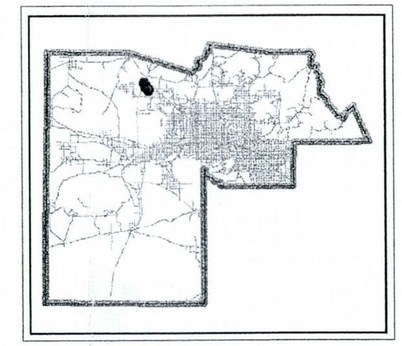
WITTMANN PHASE IV FLOODPLAIN DELINEATION STUDY

CONTRACT FCD 2011C003



KEY MAP

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY



WITTMANN PHASE IV FLOODPLAIN DELINEATION STUDY

1200 600 0 1200 2400 3600

SCALE: 1"=1200'

NOTE: WITTMANN PHASE IV FLOODPLAIN DELINEATION STUDY INCLUDES IONA TRIBUTARY 1 WEST (T5NR3WS17-1W), IONA TRIBUTARY 1 WEST EXTENSION (T5NR3WS17-1WE) & IONA TRIBUTARY 2 WEST (T5NR3WS17-2W).

SHEET INDEX

1	COVER SHEET
2-7	FLOODPLAIN WORK MAP

ENGINEER

RBF CONSULTING
NATHAN E. FORD, P.E.
16605 N. 28TH AVENUE, STE 100
PHOENIX, ARIZONA 85053
PHONE (602) 467-2200
FAX (602) 467-2201

DATUM

HORIZONTAL: NORTH AMERICAN DATUM 1983

VERTICAL: NORTH AMERICAN VERTICAL DATUM 1988 (NAVD88)

ELEVATION REFERENCE MARKS

- ◉ ERM AJ3877 (1844.7 FT)
- ◉ ERM AJ3873 (1679.9 FT)

NOTE: DATA FOR ELEVATION REFERENCE MARKS (ERM) OBTAINED FROM THE NATIONAL GEODETIC SURVEY DATA SHEETS AVAILABLE AT WWW.NGS.NOAA.GOV

NOTE:
THIS MAP WAS PREPARED USING 2 AND 4 FT CONTOUR DATA PROVIDED BY THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY FROM AERIAL PHOTOGRAPHS FLOWN ON APRIL 2002 BY LANDATA AIRBORNE SYSTEMS, INC.

RBF CONSULTING
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16605 NORTH 28th AVENUE, SUITE 100
PHOENIX, ARIZONA 85053-7550
602.467.2200 • FAX 602.467.2201 • www.RBF.com

DESIGN/LAYOUT	DRAFTED	CHECKED	MANAGING ENGINEER/SURVEYOR
NEF	DLP	NEF	NATHAN E. FORD, P.E.

DRAWING SCALE	PROJECT COORDINATION
1" = 1200'	NATHAN E. FORD, P.E.

REVISIONS

NO.	BY	DESCRIPTION	APP'D	DATE

OWNER/DEVELOPER: FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

PROJECT NAME: WITTMANN PHASE IV

PLAN TYPE: FLOODPLAIN WORK MAP

SEALED

Registered Professional Engineer (Civil) CERTIFICATE NO. 40054 NATHAN E. FORD Date Signed 11/23/11 ARIZONA, U.S.A.

Expires 12/31/12

ORIGINAL PLAN DATE: NOV/2011

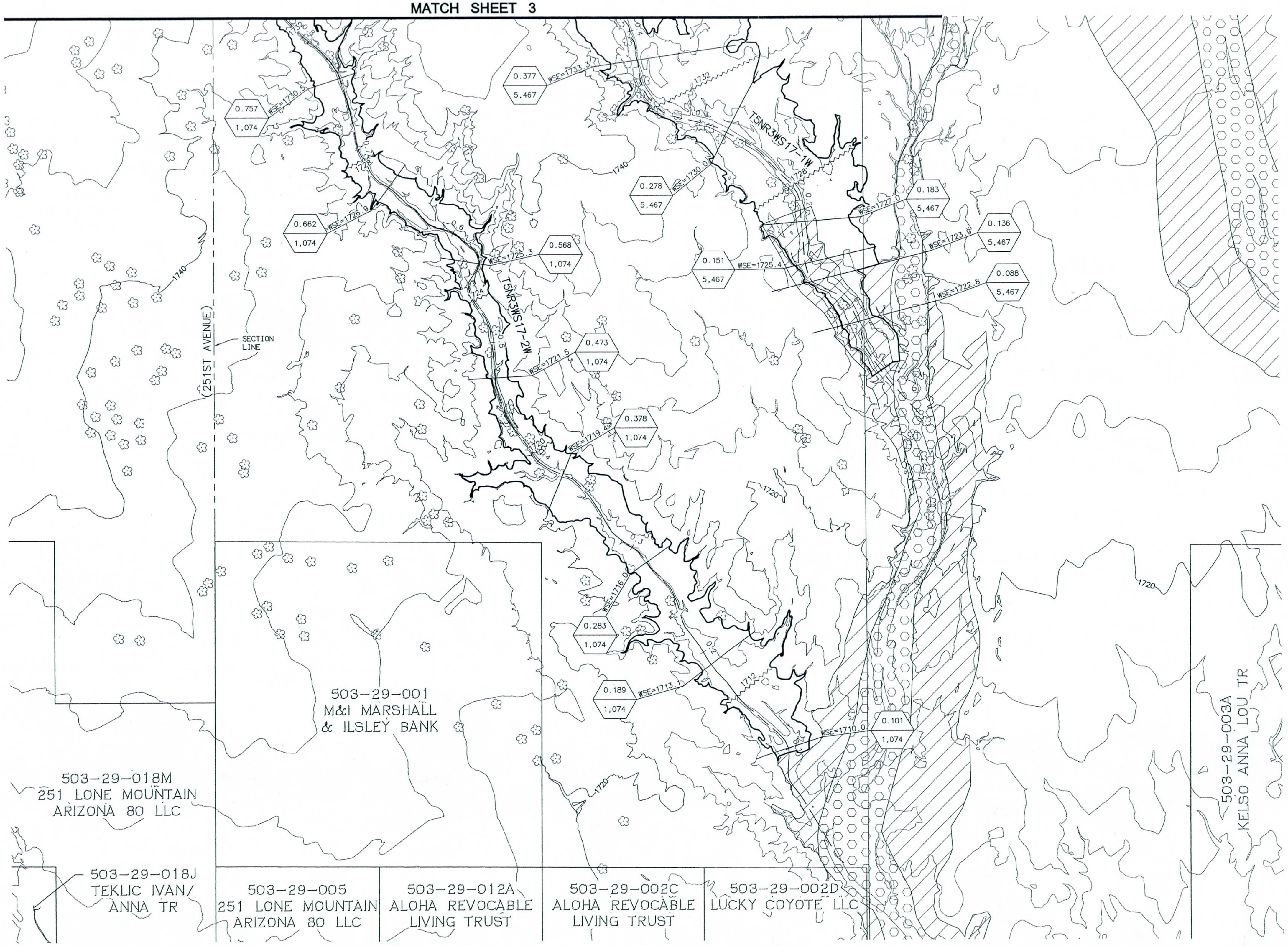
LATEST PLAN REVISION: –

SHEET NUMBER: 1 OF 7

PROJECT NUMBER: 45104608

H:\PDATA\45104608\CADD\STRMWATER\DLV\WITTMANN_PHASE_IV\4608-SW-001.DWG DPEARCE 11/21/11 1:47 pm

MATCH SHEET 3



FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY

WITTMANN PHASE IV
FLOODPLAIN DELINEATION STUDY

SCALE: 1"=200'

LEGEND

EFFECTIVE ZONE AE
EFFECTIVE FLOODWAY
HYDRAULIC BASE LINE
T4N-R2W-S15N WASH I.D.
STATION RIVER MILE
CROSS SECTION
Q100 (CFS)
CROSS SECTIONS
ZONE AE FLOODPLAIN
1700 EXISTING CONTOUR
1700 BASE FLOOD ELEVATION

NOTE:
THIS MAP WAS PREPARED USING 4 FT CONTOUR DATA PROVIDED BY THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY FROM AERIAL PHOTOGRAPHS FLOWN ON APRIL 2002 BY LANDATA AIRBORNE SYSTEMS, INC.

WITTMANN PHASE IV
FLOODPLAIN WORK MAP

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PHOENIX, ARIZONA 85053-7550
602.467.2200 • FAX 602.467.2201 • www.RBF.com

LAYOUT	DRAFTED	CHECKED
NEF	DLP	NEF

DRAWING SCALE(S): 1" = 200'
PLAN DATE: NOV/2011
PROJECT NUMBER: 45104608
SHEET NO. 2 OF 7 SHEETS

Registered Professional Engineer (Civil) — CERTIFICATE NO. 40054 NATHAN E. FORD — ARIZONA, U.S.A.

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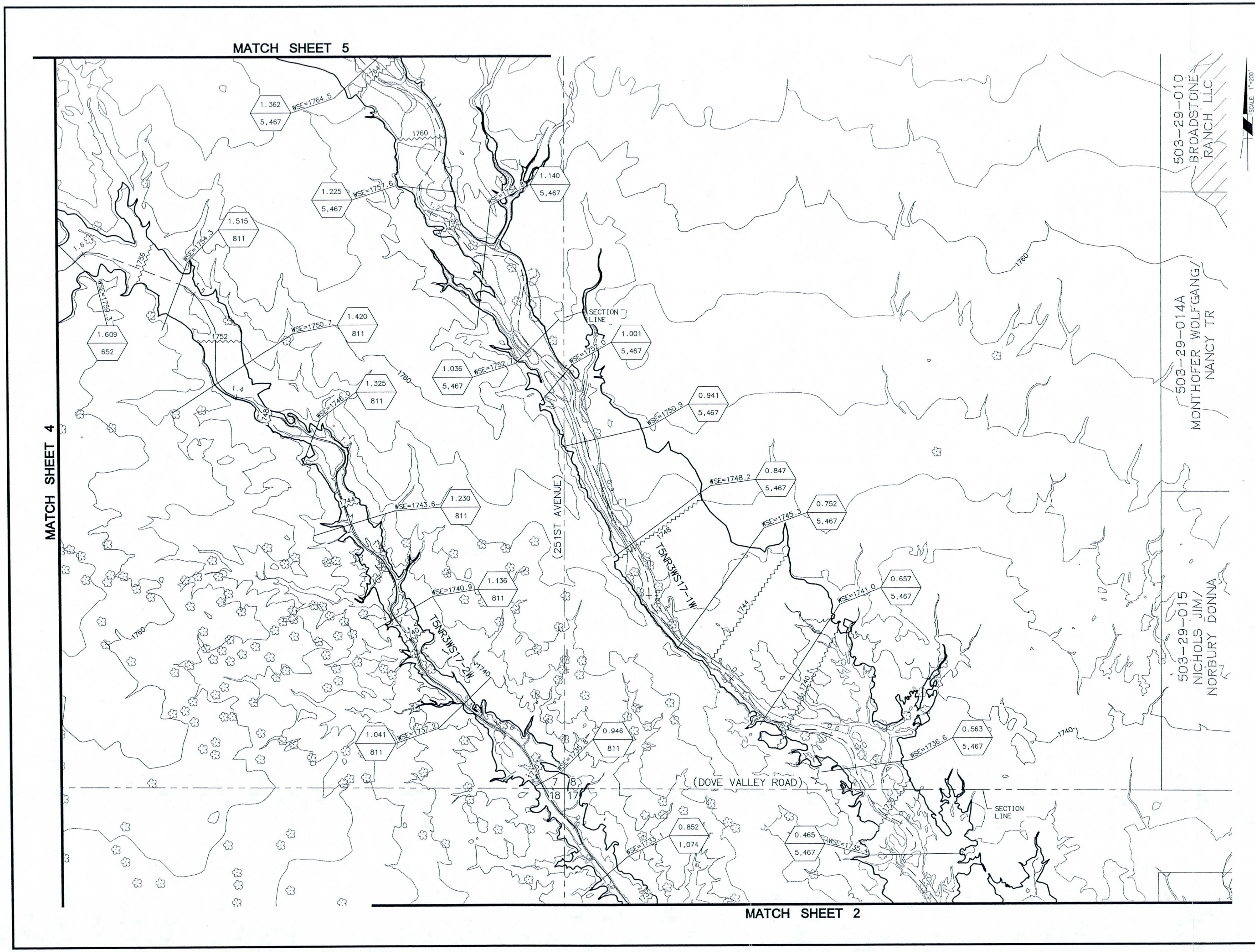
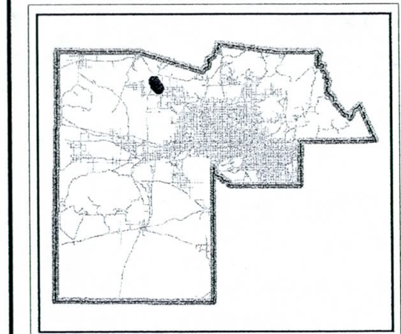


FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY

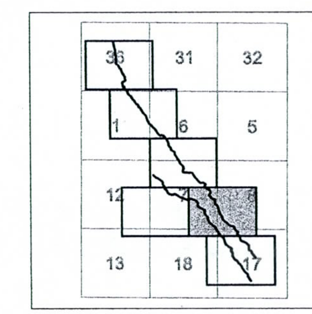


WITTMANN PHASE IV
FLOODPLAIN DELINEATION STUDY

SCALE: 1"=200'

LEGEND

- EFFECTIVE ZONE AE
- EFFECTIVE FLOODWAY
- HYDRAULIC BASE LINE
- T4N-R2W-S15N — WASH I.D.
- 0.189 — STATION RIVER MILE CROSS SECTION
- 1156 — Q100 (CFS)
- CROSS SECTIONS
- ZONE AE FLOODPLAIN
- 1700 — EXISTING CONTOUR
- 1700 — BASE FLOOD ELEVATION



NOTE:
THIS MAP WAS PREPARED USING 4 FT CONTOUR DATA PROVIDED BY THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY FROM AERIAL PHOTOGRAPHS FLOWN ON APRIL 2002 BY LANDATA AIRBORNE SYSTEMS, INC.

WITTMANN PHASE IV
FLOODPLAIN WORK MAP

RBF CONSULTING
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Registered Professional Engineer (Civil)
CERTIFICATE NO. 40054
NATHAN E. FORD
Date Signed 11/23/11
ARIZONA, U.S.A.
Expires 12/31/12

LAYOUT	DRAFTED	CHECKED
NEF	DLP	NEF

DRAWING SCALE(S): 1" = 200'

PLAN DATE: NOV/2011

PROJECT NUMBER: 45104608

SHEET NO. 3 OF 7 SHEETS

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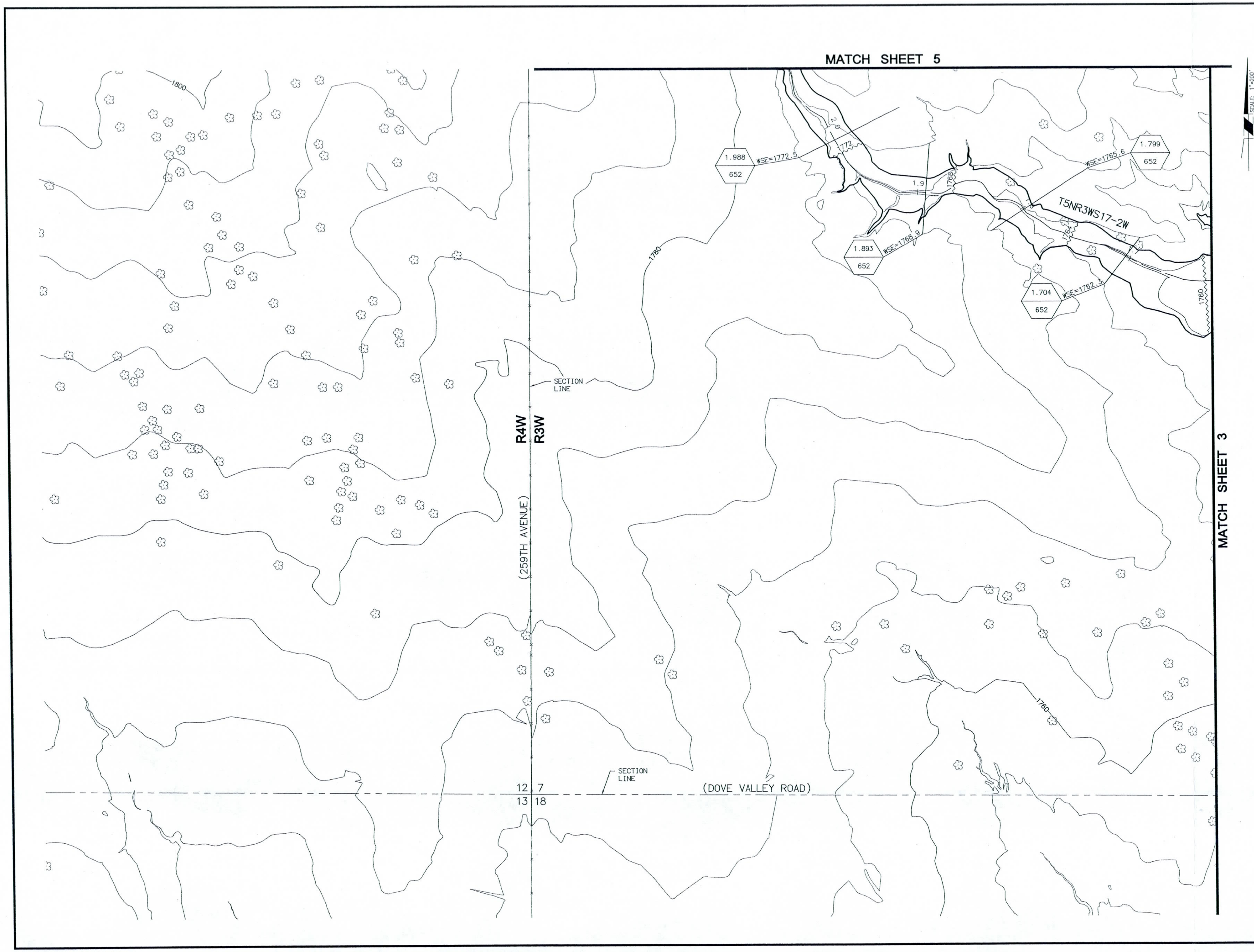
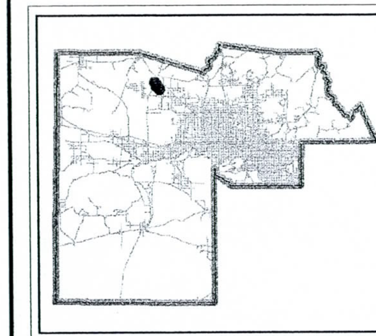


FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY



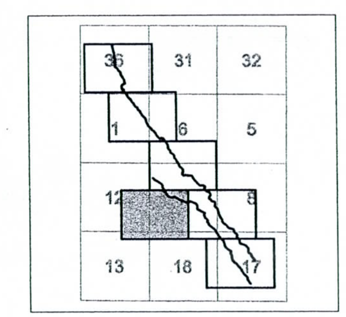
WITTMANN PHASE IV
FLOODPLAIN DELINEATION STUDY

200 100 0 200 400 600

SCALE: 1"=200'

LEGEND

EFFECTIVE ZONE AE
EFFECTIVE FLOODWAY
HYDRAULIC BASE LINE
T4N-R2W-S15N WASH I.D.
0.189 STATION RIVER MILE
CROSS SECTION
1156 Q100 (CFS)
CROSS SECTIONS
ZONE AE FLOODPLAIN
1700 EXISTING CONTOUR
1700 BASE FLOOD ELEVATION



NOTE:
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WITTMANN PHASE IV
FLOODPLAIN WORK MAP

RBF CONSULTING
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16605 NORTH 28th AVENUE, SUITE 100
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Registered Professional Engineer (Civil)
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NATHAN E. FORD
Date Signed 11/23/11
ARIZONA, U.S.A.
Expires 12/31/12

LAYOUT	DRAFTED	CHECKED
NEF	DLP	NEF

DRAWING SCALE(S)
1" = 200'

PLAN DATE
NOV/2011

PROJECT NUMBER
45104608

SHEET NO.
4
OF 7 SHEETS

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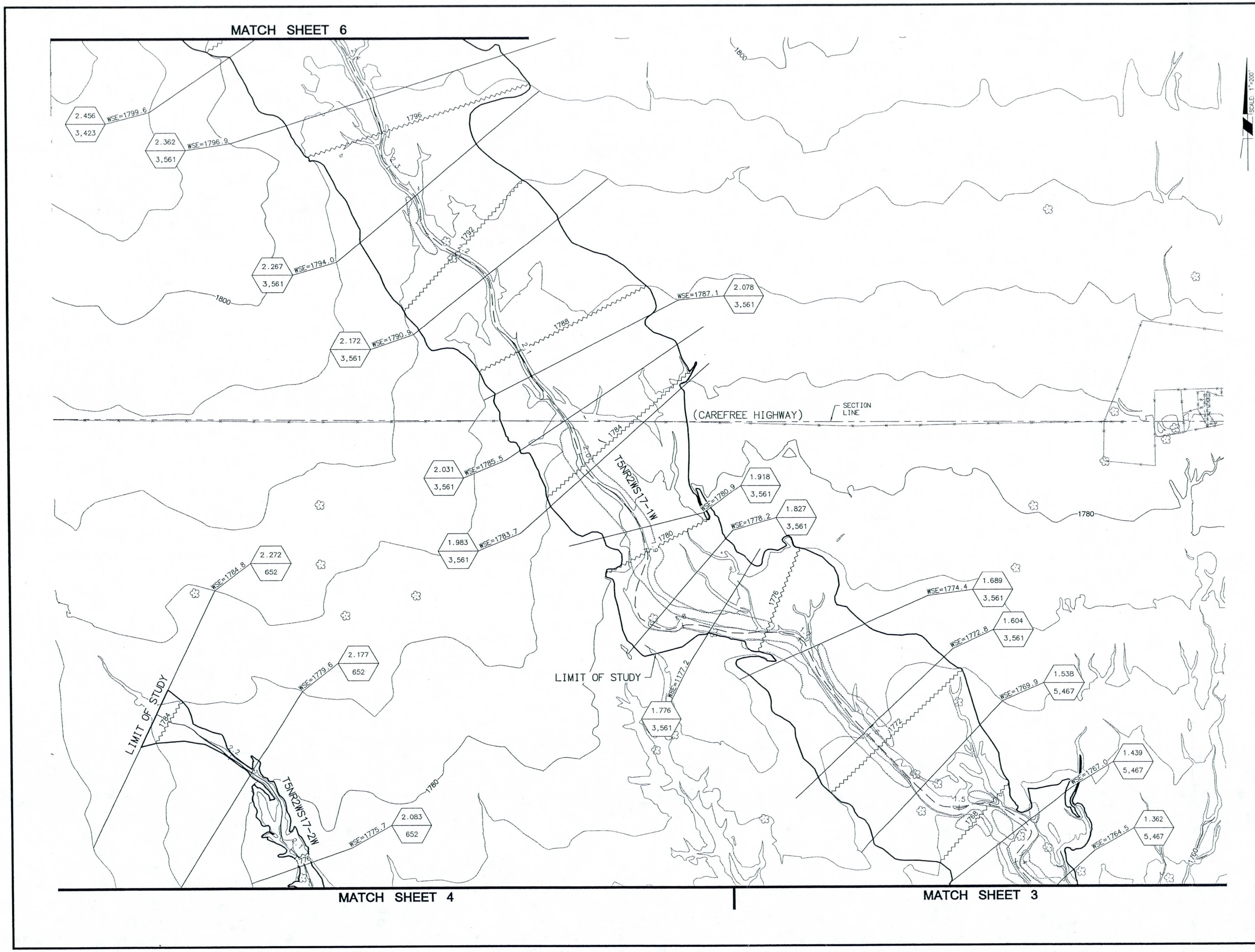
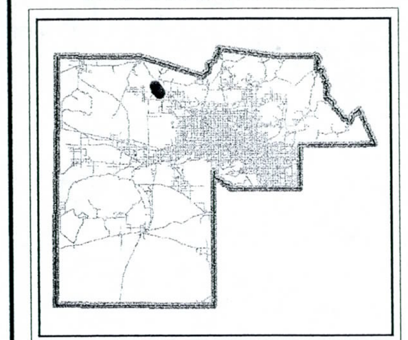


FLOOD CONTROL DISTRICT OF MARICOPA COUNTY



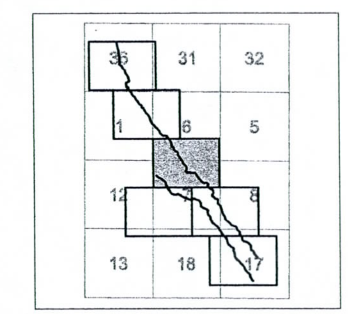
WITTMANN PHASE IV FLOODPLAIN DELINEATION STUDY

200 100 0 200 400 600

SCALE: 1"=200'

LEGEND

- EFFECTIVE ZONE AE
- EFFECTIVE FLOODWAY
- HYDRAULIC BASE LINE
- T4N-R2W-S15N — WASH I.D.
- 0.189 / 1156 — STATION RIVER MILE, CROSS SECTION, Q100 (CFS)
- CROSS SECTIONS
- ZONE AE FLOODPLAIN
- 1700 — EXISTING CONTOUR
- 1700 — BASE FLOOD ELEVATION



NOTE:
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WITTMANN PHASE IV FLOODPLAIN WORK MAP

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Registered Professional Engineer (Civil)
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Date Signed 11/23/11
ARIZONA, U.S.A.
Expires 12/31/12

LAYOUT	DRAFTED	CHECKED
NEF	DLP	NEF

DRAWING SCALE(S): 1" = 200'

PLAN DATE: NOV/2011

PROJECT NUMBER: 45104608

SHEET NO. 5 OF 7 SHEETS

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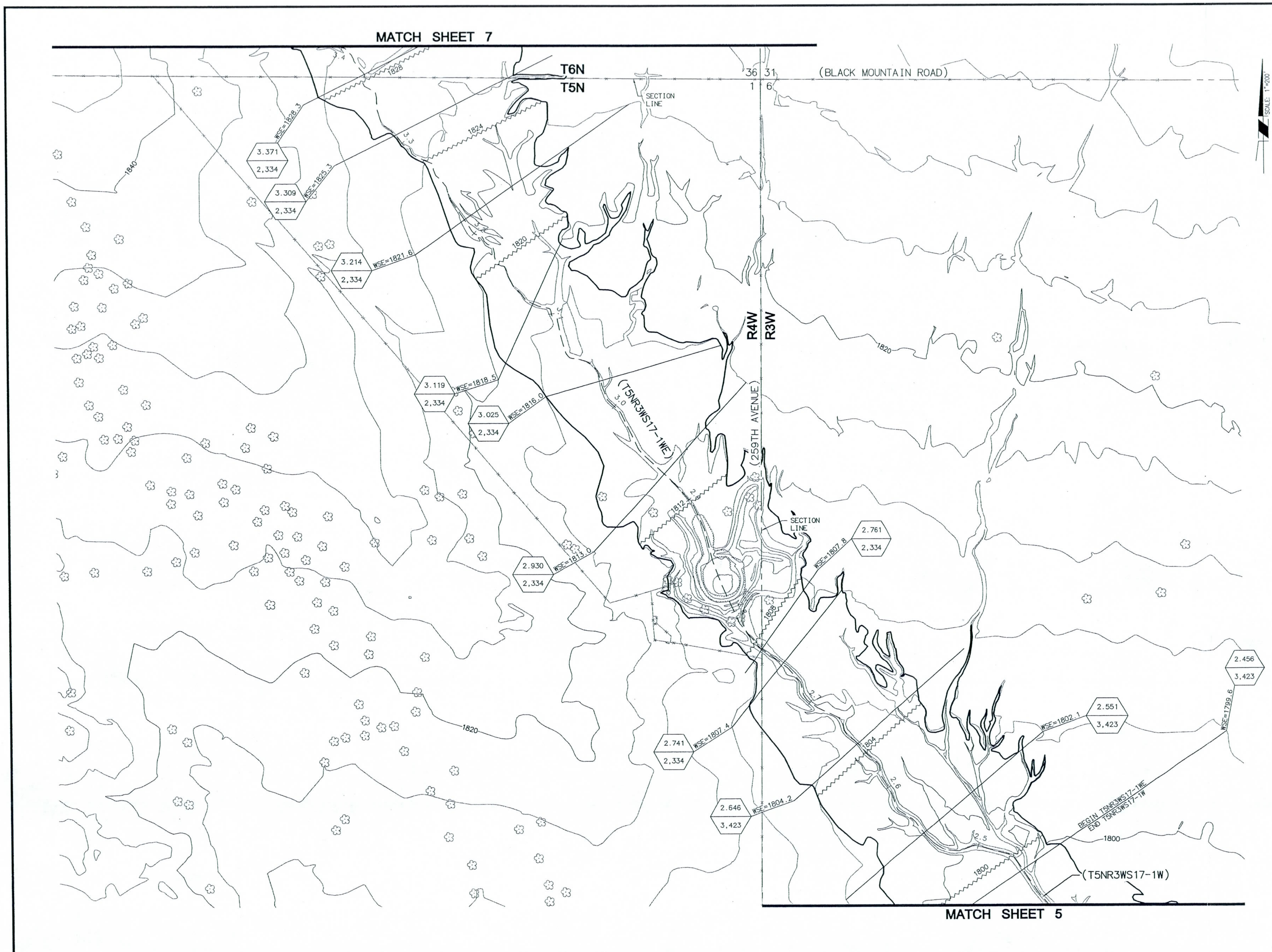

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

WITTMANN PHASE IV FLOODPLAIN DELINEATION STUDY

200 100 0 200 400 600

SCALE: 1"=200'

LEGEND

	EFFECTIVE ZONE AE
	EFFECTIVE FLOODWAY
	HYDRAULIC BASE LINE
T4N-R2W-S15N	WASH I.D.
0.189 / 1156	STATION RIVER MILE; CROSS SECTION; Q100 (CFS)
	CROSS SECTIONS
	ZONE AE FLOODPLAIN
1700	EXISTING CONTOUR
1700	BASE FLOOD ELEVATION

36 31 32
6 5
12 8
13 18 17

NOTE:
THIS MAP WAS PREPARED USING 4 FT CONTOUR DATA PROVIDED BY THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY FROM AERIAL PHOTOGRAPHS FLOWN ON APRIL 2002 BY LANDATA AIRBORNE SYSTEMS, INC.

WITTMANN PHASE IV FLOODPLAIN WORK MAP

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PHOENIX, ARIZONA 85053-7550
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Registered Professional Engineer (Civil) — CERTIFICATE NO. 40054 — NATHAN E. FORD — ARIZONA, U.S.A. — Date Signed — Expires 12/31/12

LAYOUT	DRAFTED	CHECKED
NEF	DLP	NEF

DRAWING SCALE(S): 1" = 200'

PLAN DATE: NOV/2011

PROJECT NUMBER: 45104608

SHEET NO. 6 OF 7 SHEETS

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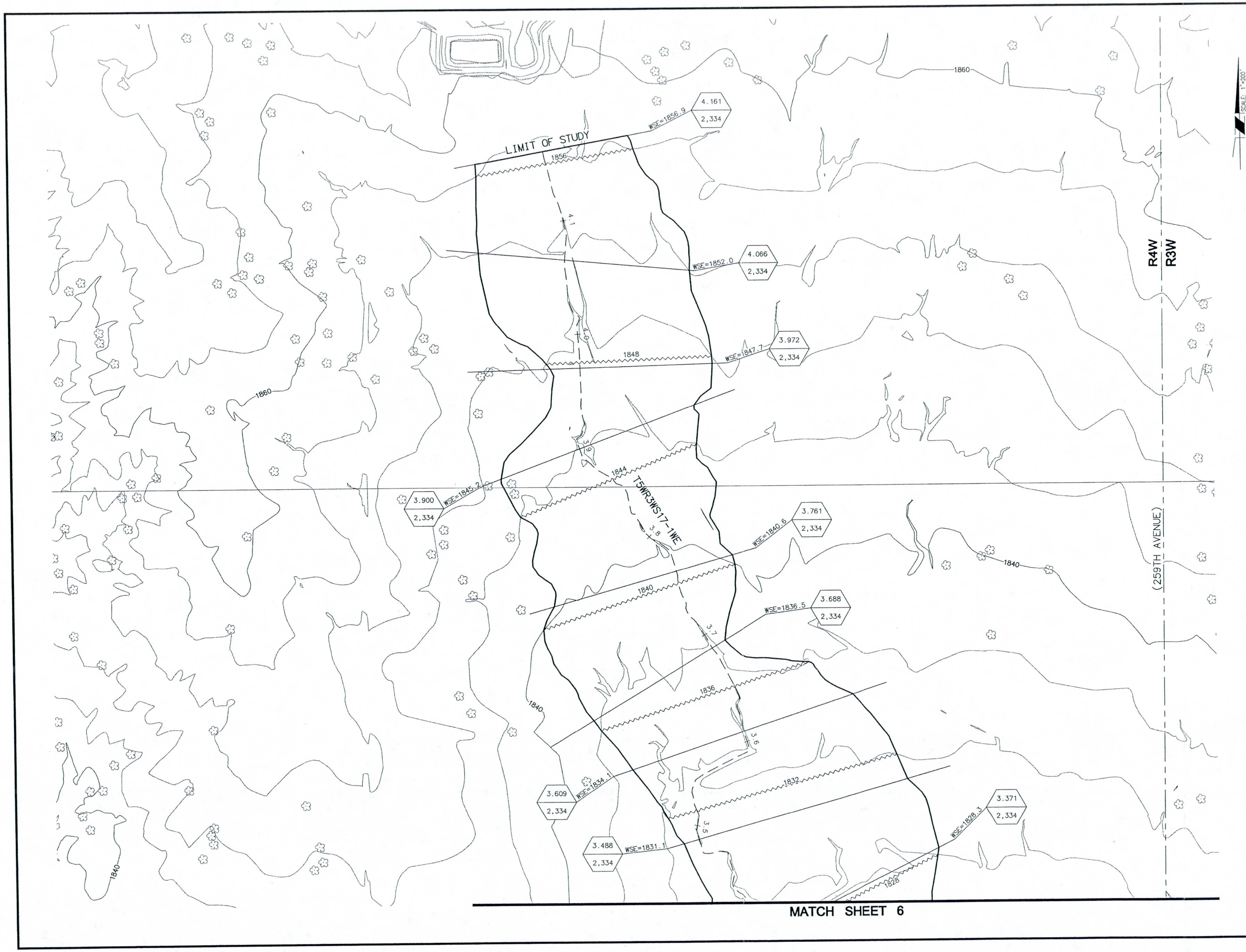
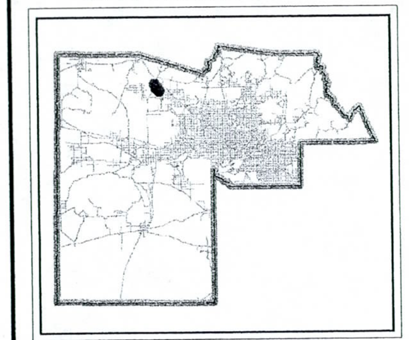


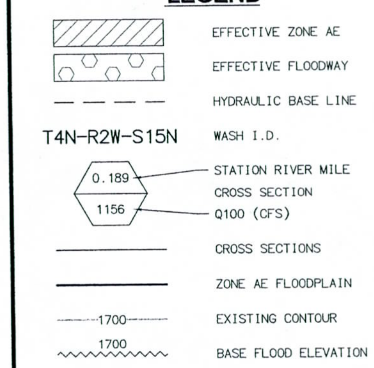
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

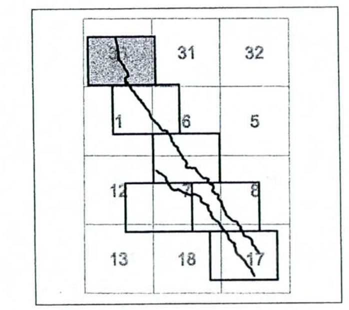


WITTMANN PHASE IV FLOODPLAIN DELINEATION STUDY

SCALE: 1"=200'

LEGEND





NOTE:
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WITTMANN PHASE IV FLOODPLAIN WORK MAP

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Registered Professional Engineer (Civil)
CERTIFICATE NO.
40054
NATHAN E. FORD
Date Signed 11/23/11
ARIZONA, U.S.A.
Expires 12/31/12

LAYOUT	DRAFTED	CHECKED
NEF	DLP	NEF

DRAWING SCALE(S): 1" = 200'

PLAN DATE: NOV/2011

PROJECT NUMBER: 45104608

SHEET NO. 7 OF 7 SHEETS

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