Technical Data Notebook

UPPER AGUA FRIA WATERSHED ZONE A FLOODPLAIN DELINEATION STUDY WATERSHEDS NO. 3 & 4

CONTRACT FCD 2000C020

Prepared for:

The Flood Control District of Maricopa County
2801 West Durango Street
Phoenix, Arizona 85009
(602) 506-1501

Prepared By:

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Engineer:
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5-28-03

May 28, 2003

Technical Data Notebook

UPPER AGUA FRIA WATERSHED
ZONE A FLOODPLAIN DELINEATION STUDY
WATERSHEDS 3 & 4 (MOORES GULCH & LITTLE SQUAW CREEK)

CONTRACT FCD 2000C020

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Prepared for:
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2801 West Durango Street
Phoenix, Arizona 85009
(602)506-1501

Project Manager:
Richard Harris, P.E., C.F.M.

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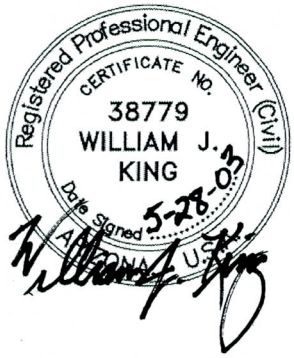

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Section 1: Introduction

1.1 Purpose of Study

The purpose of this study is to delineate Zone A Floodplains for a portion of Watershed "UU" (Table Mesa Road Area) on all washes that have drainage areas greater than ½ square mile. At the outset of the project the Flood Control District of Maricopa County had a goal to delineate all of the floodplains in Maricopa County within a 5 year period. One of the purposes of this goal is to delineate floodplains before development occurs in order to better control floodplain management and minimize losses due to flooding.

1.2 Authority for the Study

The Flood Control District of Maricopa County contracted RBF Consulting to perform the study based on existing topographic mapping. The main contacts, addresses, and other information about both the Flood Control District and RBF Consulting are:

Flood Control District of Maricopa County

Address:	2801 West Durango Street Phoenix, Arizona 85009
Phone:	(602)506-1501
Project Manager:	Mr. Richard Harris, P.E., C.F.M.

RBF Consulting

Address:	16605 North 28th Avenue, Suite 100 Phoenix, Arizona 85053
Phone:	(602)467-2200
Principal-in-Charge:	Scott M. Larson, P.E., R.L.S.
Project Manager:	William J. King, P.E.

1.3 Site Location and Description

The Watershed "UU", the Upper Agua Fria Watershed, is located in the north part of Maricopa County, north of the New Waddell Dam, which creates Lake Pleasant (See Figure 1-1). The portion of the Upper Agua Fria Watershed that is being studied under this contract is east of the Agua Fria River.

The floodplain delineations have been divided into four areas, watersheds 1-4. Watershed No. 1 and 2 were submitted separately while watersheds 3 and 4 have been combined in this Technical Data Notebook. This report discusses the delineation of approximately 30.8 miles of washes. These washes drain into the Agua Fria River, and are classified as desert-mountain washes with steep slopes. The drainage area for these washes has been classified as Watersheds No. 3 & 4, and the washes have been named according to the Township, Range, and Section where the headwaters are located, according to Maricopa County requirements. See Figure 1-2 for a location of Watersheds 3&4 and the floodplains being delineated as part of this report.

1.4 . Methodology

1.4.1 Hydrology

Peak flows were determined for the 100-year 6-hour storm using the Army Corps of Engineers HEC-1 software package, version 4.1, dated June 1998, as outlined in Section 4 of this report. HEC-1 Model parameters were determined using WMS 6.1, the Watershed Modeling System, distributed by Environmental Modeling Systems- Incorporated (EMS-I). WMS describes itself as a "comprehensive environment for hydrologic analysis...developed by the Environmental Modeling Research Laboratory of Brigham Young University in cooperation with the U.S. Army Corps of Engineers Waterways Experiment Station." (BYU-EMRL, pg 1-1). The Flood Control District of Maricopa County provided RBF Consulting with a digital elevation model (DEM) that contains elevation data points on 10 foot grid elements. The Flood Control District created this DEM from an existing grid of points spaced at 50 foot intervals, breaklines, and flow lines. WMS analyzed the DEM, SCS soils data, and land use data in order to create a HEC-1 model based on the Flood Control District's criteria. The peak flows produced by the HEC-1 model were then compared to regional regression equations from the USGS's National Flood Frequency Program (NFF). A more detailed explanation of the hydrologic methodology and the results are provided in Section 4.

1.4.2 Hydraulics and Floodplain Delineation

Both normal depth and critical depth of the peak flow rate were calculated for each wash. Normal depth was used to delineate the Zone A floodplains if it was subcritical flow. Critical depth was used to map the floodplain when normal depth indicated supercritical flow. Manning's equation was used to determine normal depth. A Triangulated Irregular Network (TIN) was created from the DEM discussed in Section 1.4.1. WMS was used to determine the cross section geometry at different locations in each wash, and to determine the normal depth for the 100-year storm using Manning's equation. Once the normal depth was determined, WMS was used to automatically delineate the Zone A floodplain using the TIN.

1.5 Summary of Results

The study resulted in the delineation of approximately 30.8 miles of Zone A floodplain through approximate methods. The floodplains have been plotted on the Hydraulic Study Maps, located at the end of this report.

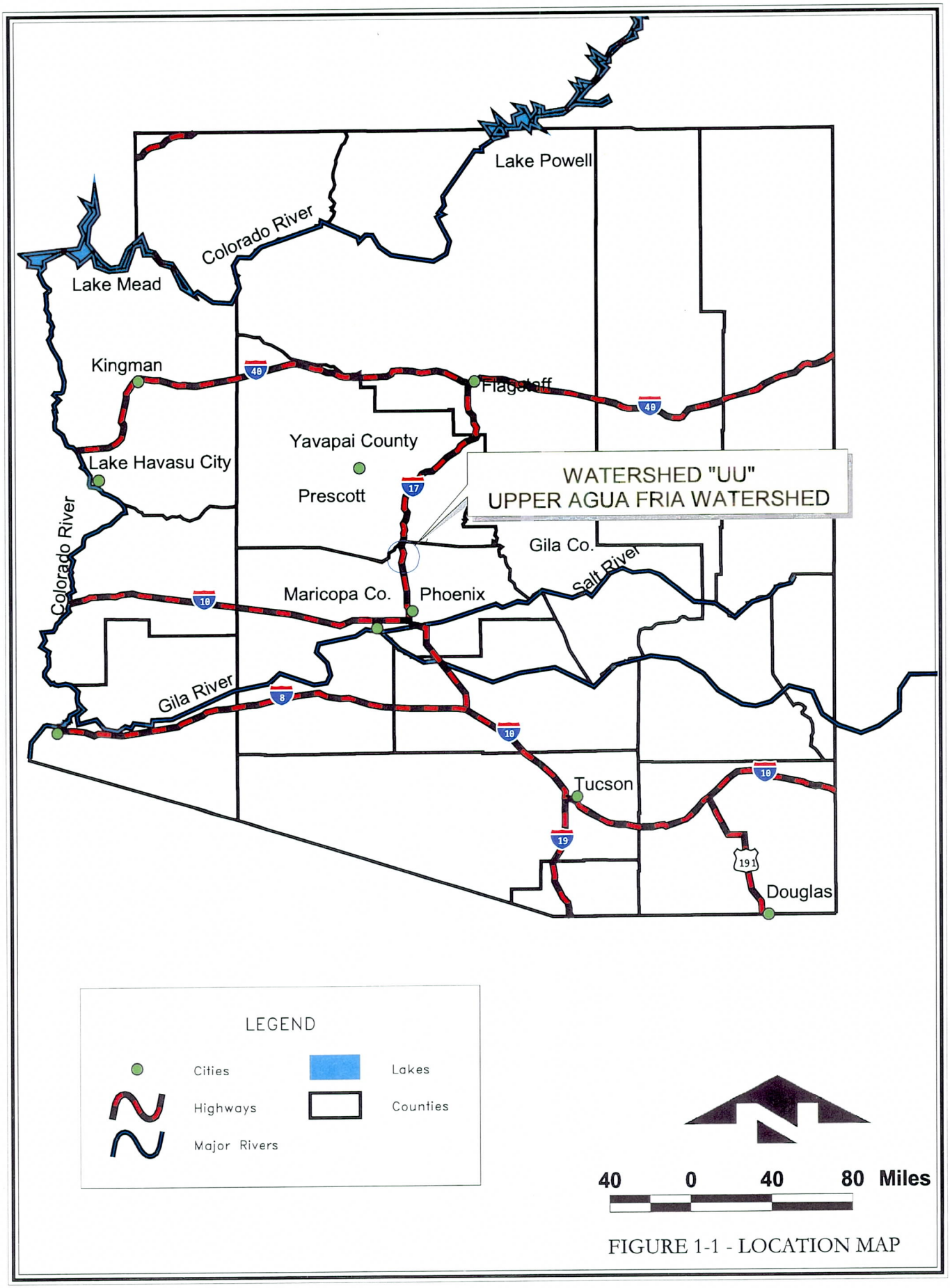

FIGURE 1-1 - LOCATION MAP

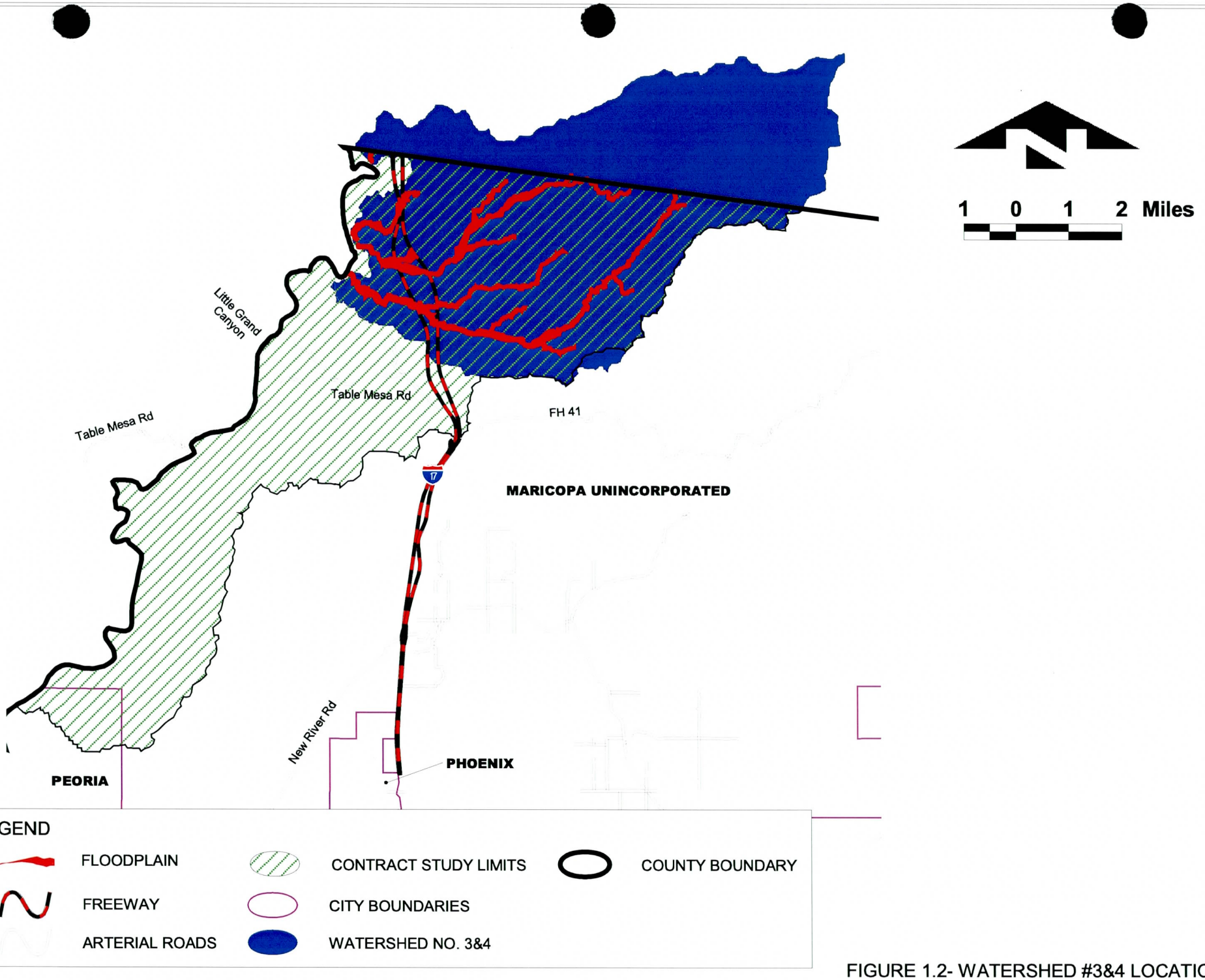

FIGURE 1.2- WATERSHED #3&4 LOCATION

Section 2: FEMA Forms and Local Government Abstracts

2.1 Study Documentation Abstract for FEMA Submittals

Study Documentation Abstract for FEMA Submittals		Initial Study	X	Restudy		CLOMR		LOMR	
2.1.1	Date Study Accepted								
2.1.2	Study Contractor Contacts Address Phone Internal Reference No.	RBF Consulting Scott M. Larson, P.E., R.L.S. 16605 North 28th Avenue, Suite 100 Phoenix, Arizona 85053 (602)467-2200 45-100648							
2.1.3	FEMA Technical Review Contractor Contact Address Phone Internal Reference No.	Michael Baker, Jr., Inc. Pernille Buch-Pederson 3600 Eisenhower Ave, Suite 600 Alexandria, VA 22304 703-317-6224							
2.1.4	FEMA Regional Reviewer Phone	Michael Baker, Jr., Inc. 703-960-8800							
2.1.5	State Technical Reviewer Phone	Arizona Department of Water Resources 602-417-2445							
2.1.6	Local Technical Reviewer Phone	Flood Control District of Maricopa County (FCDMC) (602)506-1501							
2.1.7	Reach Description	Moores Gulch, Moores Gulch Trib. 1, Moores Gulch Trib. 2, Moores Gulch Trib. 3, Moores Gulch Trib. 4, Moores Gulch Trib. 5, Moores Gulch Trib. 6, Little Squaw Creek, Little Squaw Creek Trib. 1, Little Squaw Creek Trib. 2, Little Squaw Creek Trib. 3, Little Squaw Creek Trib. 4, Little Squaw Creek Trib. 5, and Wash 8N2ES16 are desert-mountain washes that all drain into the Agua Fria River.							
2.1.8	USGS Quad Sheet Original photo date Latest photo revision date	Black Canyon City, AZ 1969	Daisy Mountain, AZ 1962	Squaw Creek AZ 1969	New River Mesa, AZ 1964 1981				
2.1.9	Unique Conditions and Problems								
2.1.10	Coordination of Q's Discharges (Agency, Date, Comments)								

2.2 FEMA Forms

FEDERAL EMERGENCY MANAGEMENT AGENCY

OVERVIEW & CONCURRENCE FORM

O.M.B No. 3067-0148
Expires September 30, 2005

PAPERWORK BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 1 hour per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing, reviewing, and submitting the form. You are not required to respond to this collection of information unless a valid OMB control number appears in the upper right corner of this form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Federal Emergency Management Agency, 500 C Street, SW, Washington DC 20472, Paperwork Reduction Project (3067-0148). 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.**

A. REQUESTED RESPONSE FROM FEMA

This request is for a (check one):

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

☒ LOMR: A letter from FEMA officially revising the current NFIP map to show the changes to floodplains, regulatory floodway or flood elevations. (See Parts 60 & 65 of the NFIP Regulations.)

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
Ex: 480301	City of Katy	TX	480301	0005D	02/08/83
480287	Harris County	TX	48201C	0220G	09/28/90
040037	Maricopa County	AZ	04013C	0025E	7/19/01
040037	Maricopa County	AZ	04013C	0050E	7/19/01

2. Flooding Source: Moores Gulch, Moores Gulch Trib. 1,2,3,4,5, & 6; Little Squaw Creek, Little Squaw Creek Trib. 1,2,3,4, & 5; Wash 8N2ES16

3. Project Name/Identifier: Approximate Zone A Floodplain Delineation Study of Upper Agua Fria Watershed 3 & 4 FCD 2000C020

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

5. Basis for Request and Type of Revision:

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

☐ Physical Change ☒ Improved Methodology/Data

☐ Regulatory Floodway Revision ☐ 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 types of flooding and structures (check all that apply)

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

C. REVIEW FEE

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

☒ No, Attach Explanation

Please see the FEMA Web site at http://www.fema.gov/mit/tsd/frm_fees.htm **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: Richard Harris, P.E., C.F.M.	Company: Flood Control District Maricopa County	
Mailing Address: 2801 West Durango Street Phoenix, AZ 85009	Daytime Telephone No.: 602-506-4528	Fax No.: 602-506-4601
	E-Mail Address: rph@mail.maricopa.gov	
Signature of Requester (required): Richard P. Harris	Date: 06/04/03	

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 requirement that no fill be 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. 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: Michael S. Ellegood, P.E., Chief Engineer and General Manager		Telephone No.: 602-506-1501
Community Name: Maricopa County	Community Official's Signature (required):	Date: 7/7/03

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. 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: William J. King, P.E.	License No.: 38779 (AZ)	Expiration Date: 3/31/2006
Company Name: RBF Consulting	Telephone No.: 602-467-2200	Fax No.: 602-467-2201
Signature: William J. King		Date: 5-27-03

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)

FEDERAL EMERGENCY MANAGEMENT AGENCY

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☐ Regulatory Floodway Revision ☐ Other (Attach Description)

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

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

☐ Alluvial fan ☐ Lakes ☐ Other (Attach Description)

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

☐ Dam ☐ Fill ☐ Other, Attach Description

C. REVIEW FEE

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

☒ No, Attach Explanation

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Community Official's Name and Title: Michael S. Ellegood, P.E., Chief Engineer and General Manager		Telephone No.: 602-506-1501
Community Name: Maricopa County	Community Official's Signature (required):	Date:

CERTIFICATION BY REGISTERED PROFESSIONAL ENGINEER AND/OR LAND SURVEYOR

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Certifier's Name: William J. King, P.E.	License No.: 38779 (AZ)	Expiration Date: 3/31/2006
Company Name: RBF Consulting	Telephone No.: 602-467-2200	Fax No.: 602-467-2201
Signature: William J. King		Date: 5-27-03

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

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☒ 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)

FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE HYDROLOGY & HYDRAULICS FORM

O.M.B No. 3067-0148
Expires September 30, 2005

PAPERWORK REDUCTION ACT

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Flooding Source: Moores Gulch
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 2) ☐ 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.)	FIS (cfs)	Revised (cfs)
Confluence with Agua Fria	14.71	Unknown	9321

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

☐ Statistical Analysis of Gage Records ☒ Precipitation/Runoff Model HEC-1 [TR-20, HEC-1, HEC-HMS etc.]
☒ 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. The document, "Numerical Models Accepted by FEMA for NFIP Usage" lists the models accepted by FEMA. This document can be found at: http://www.fema.gov/mit/tsd/en_modl.htm.

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

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

B. HYDRAULICS

1. Reach to be Revised

	Description	Cross Section	Water-Surface Elevations (ft.) Effective	Water-Surface Elevations (ft.) Proposed/Revised
Downstream Limit				
Upstream Limit				

2. Hydraulic Method Used

Hydraulic Analysis Normal Depth Analysis [HEC-2 , HEC-RAS, Other (Attach description)]

B. HYDRAULICS (CONTINUED)

3. Pre-Submittal Review of Hydraulic Models

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. These review programs verify that the hydraulic estimates and assumptions in the model data are in accordance with NFIP requirements, and that the data are comparable with the assumptions and limitations of HEC-2/HEC-RAS. CHECK-2 and CHECK-RAS identify areas of potential error or concern. These tools do not replace engineering judgment. CHECK-2 and CHECK-RAS can be downloaded from http://www.fema.gov/mit/tsd/frm_soft.htm. We recommend that you review your HEC-2 and HEC-RAS models with CHECK-2 and CHECK-RAS. If you disagree with a message, please attach an explanation of why the message is not valid in this case. Review of your submittal and resolution of valid modeling discrepancies will result in reduced review time.

HEC-2/HEC-RAS models reviewed with CHECK-2/CHECK-RAS? ☐ Yes ☐ No

4. Models Submitted

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

*Not required for revisions to approximate 1%-annual-chance floodplains (Zone A) – for details, refer to the corresponding section of the instructions.

The document "Numerical Models Accepted by FEMA for NFIP Usage" lists the models accepted by FEMA. This document can be found at: http://www.fema.gov/mit/tsd/en_modl.htm.

C. MAPPING REQUIREMENTS

A **certified topographic 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.).

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,** 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 of revision.

D. COMMON REGULATORY REQUIREMENTS

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

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.
- The proposed project encroaches upon a SFHA with BFEs established and would result in increases above 1.00 foot.

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 added. Elements and examples of regulatory floodway revision notification can be found in the MT-2 Form 2 Instructions.)

4. For LOMR requests, does this request require property owner notification and acceptance of BFE increases? ☐ Yes ☒ No

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

FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE HYDROLOGY & HYDRAULICS FORM

O.M.B No. 3067-0148
Expires September 30, 2005

PAPERWORK REDUCTION ACT

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Flooding Source: Moores Gulch Tributary 1
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 2) ☒ 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.)	FIS (cfs)	Revised (cfs)
Confluence Moores Gulch	0.60	Not Studied	1109

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

☐ Statistical Analysis of Gage Records ☒ Precipitation/Runoff Model HEC-1 [TR-20, HEC-1, HEC-HMS etc.]
☒ 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. The document, "Numerical Models Accepted by FEMA for NFIP Usage" lists the models accepted by FEMA. This document can be found at: http://www.fema.gov/mit/tsd/en_modl.htm.

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

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

B. HYDRAULICS

1. Reach to be Revised

	Description	Cross Section	Water-Surface Elevations (ft.) Effective	Water-Surface Elevations (ft.) Proposed/Revised
Downstream Limit				
Upstream Limit				

2. Hydraulic Method Used

Hydraulic Analysis Normal Depth Analysis [HEC-2 , HEC-RAS, Other (Attach description)]

B. HYDRAULICS (CONTINUED)

3. Pre-Submittal Review of Hydraulic Models

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. These review programs verify that the hydraulic estimates and assumptions in the model data are in accordance with NFIP requirements, and that the data are comparable with the assumptions and limitations of HEC-2/HEC-RAS. CHECK-2 and CHECK-RAS identify areas of potential error or concern. These tools do not replace engineering judgment. CHECK-2 and CHECK-RAS can be downloaded from http://www.fema.gov/mit/tsd/frm_soft.htm. We recommend that you review your HEC-2 and HEC-RAS models with CHECK-2 and CHECK-RAS. If you disagree with a message, please attach an explanation of why the message is not valid in this case. Review of your submittal and resolution of valid modeling discrepancies will result in reduced review time.

HEC-2/HEC-RAS models reviewed with CHECK-2/CHECK-RAS? ☐ Yes ☐ No

4. Models Submitted

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

*Not required for revisions to approximate 1%-annual-chance floodplains (Zone A) – for details, refer to the corresponding section of the instructions.

The document "Numerical Models Accepted by FEMA for NFIP Usage" lists the models accepted by FEMA. This document can be found at: http://www.fema.gov/mit/tsd/en_modl.htm.

C. MAPPING REQUIREMENTS

A **certified topographic 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.).

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,** 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 of revision.

D. COMMON REGULATORY REQUIREMENTS

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

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.
- The proposed project encroaches upon a SFHA with BFEs established and would result in increases above 1.00 foot.

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 added. Elements and examples of regulatory floodway revision notification can be found in the MT-2 Form 2 Instructions.)

4. For LOMR requests, does this request require property owner notification and acceptance of BFE increases? ☐ Yes ☒ No

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

FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE HYDROLOGY & HYDRAULICS FORM

O.M.B No. 3067-0148
Expires September 30, 2005

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Flooding Source: Moores Gulch Tributary 2
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 2) ☒ 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.)	FIS (cfs)	Revised (cfs)
Confluence Moores Gulch	2.10	Not Studied	2396

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

☐ Statistical Analysis of Gage Records ☒ Precipitation/Runoff Model HEC-1 [TR-20, HEC-1, HEC-HMS etc.]
☒ 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. The document, "Numerical Models Accepted by FEMA for NFIP Usage" lists the models accepted by FEMA. This document can be found at: http://www.fema.gov/mit/tsd/en_modl.htm.

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

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

B. HYDRAULICS

1. Reach to be Revised

	Description	Cross Section	Water-Surface Elevations (ft.) Effective	Water-Surface Elevations (ft.) Proposed/Revised
Downstream Limit				
Upstream Limit				

2. Hydraulic Method Used

Hydraulic Analysis Normal Depth Analysis [HEC-2 , HEC-RAS, Other (Attach description)]

B. HYDRAULICS (CONTINUED)

3. Pre-Submittal Review of Hydraulic Models

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. These review programs verify that the hydraulic estimates and assumptions in the model data are in accordance with NFIP requirements, and that the data are comparable with the assumptions and limitations of HEC-2/HEC-RAS. CHECK-2 and CHECK-RAS identify areas of potential error or concern. These tools do not replace engineering judgment. CHECK-2 and CHECK-RAS can be downloaded from http://www.fema.gov/mit/tsd/frm_soft.htm. We recommend that you review your HEC-2 and HEC-RAS models with CHECK-2 and CHECK-RAS. If you disagree with a message, please attach an explanation of why the message is not valid in this case. Review of your submittal and resolution of valid modeling discrepancies will result in reduced review time.

HEC-2/HEC-RAS models reviewed with CHECK-2/CHECK-RAS? ☐ Yes ☐ No

4. Models Submitted

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

*Not required for revisions to approximate 1%-annual-chance floodplains (Zone A) – for details, refer to the corresponding section of the instructions.

The document "Numerical Models Accepted by FEMA for NFIP Usage" lists the models accepted by FEMA. This document can be found at: http://www.fema.gov/mit/tsd/en_modl.htm.

C. MAPPING REQUIREMENTS

A **certified topographic 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.).

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,** 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 of revision.

D. COMMON REGULATORY REQUIREMENTS

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

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.
- The proposed project encroaches upon a SFHA with BFEs established and would result in increases above 1.00 foot.

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 added. Elements and examples of regulatory floodway revision notification can be found in the MT-2 Form 2 Instructions.)

4. For LOMR requests, does this request require property owner notification and acceptance of BFE increases? ☐ Yes ☒ No

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

FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE HYDROLOGY & HYDRAULICS FORM

O.M.B No. 3067-0148
Expires September 30, 2005

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Flooding Source: Moores Gulch Tributary 3
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 2) ☒ 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.)	FIS (cfs)	Revised (cfs)
Confluence Moores Gulch	0.87	Not Studied	1251

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

☐ Statistical Analysis of Gage Records ☒ Precipitation/Runoff Model HEC-1 [TR-20, HEC-1, HEC-HMS etc.]
☒ 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. The document, "Numerical Models Accepted by FEMA for NFIP Usage" lists the models accepted by FEMA. This document can be found at: http://www.fema.gov/mit/tsd/en_modl.htm.

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

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

B. HYDRAULICS

1. Reach to be Revised

	Description	Cross Section	Water-Surface Elevations (ft.) Effective	Water-Surface Elevations (ft.) Proposed/Revised
Downstream Limit				
Upstream Limit				

2. Hydraulic Method Used

Hydraulic Analysis Normal Depth Analysis [HEC-2 , HEC-RAS, Other (Attach description)]

B. HYDRAULICS (CONTINUED)

3. Pre-Submittal Review of Hydraulic Models

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. These review programs verify that the hydraulic estimates and assumptions in the model data are in accordance with NFIP requirements, and that the data are comparable with the assumptions and limitations of HEC-2/HEC-RAS. CHECK-2 and CHECK-RAS identify areas of potential error or concern. These tools do not replace engineering judgment. CHECK-2 and CHECK-RAS can be downloaded from http://www.fema.gov/mit/tsd/frm_soft.htm. We recommend that you review your HEC-2 and HEC-RAS models with CHECK-2 and CHECK-RAS. If you disagree with a message, please attach an explanation of why the message is not valid in this case. Review of your submittal and resolution of valid modeling discrepancies will result in reduced review time.

HEC-2/HEC-RAS models reviewed with CHECK-2/CHECK-RAS? ☐ Yes ☐ No

4. Models Submitted

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

*Not required for revisions to approximate 1%-annual-chance floodplains (Zone A) – for details, refer to the corresponding section of the instructions.

The document "Numerical Models Accepted by FEMA for NFIP Usage" lists the models accepted by FEMA. This document can be found at: http://www.fema.gov/mit/tsd/en_modl.htm.

C. MAPPING REQUIREMENTS

A **certified topographic 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.).

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,** 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 of revision.

D. COMMON REGULATORY REQUIREMENTS

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

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.
- The proposed project encroaches upon a SFHA with BFEs established and would result in increases above 1.00 foot.

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 added. Elements and examples of regulatory floodway revision notification can be found in the MT-2 Form 2 Instructions.)

4. For LOMR requests, does this request require property owner notification and acceptance of BFE increases? ☐ Yes ☒ No

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

FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE HYDROLOGY & HYDRAULICS FORM

O.M.B No. 3067-0148
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Flooding Source: Moores Gulch Tributary 4
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 2) ☒ 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.)	FIS (cfs)	Revised (cfs)
Confluence Moores Gulch	1.27	Not Studied	2017

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

☐ Statistical Analysis of Gage Records ☒ Precipitation/Runoff Model HEC-1 [TR-20, HEC-1, HEC-HMS etc.]
☒ 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. The document, "Numerical Models Accepted by FEMA for NFIP Usage" lists the models accepted by FEMA. This document can be found at: http://www.fema.gov/mit/tsd/en_modl.htm.

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

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

B. HYDRAULICS

1. Reach to be Revised

	Description	Cross Section	Water-Surface Elevations (ft.) Effective	Water-Surface Elevations (ft.) Proposed/Revised
Downstream Limit				
Upstream Limit				

2. Hydraulic Method Used

Hydraulic Analysis Normal Depth Analysis [HEC-2 , HEC-RAS, Other (Attach description)]

B. HYDRAULICS (CONTINUED)

3. Pre-Submittal Review of Hydraulic Models

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. These review programs verify that the hydraulic estimates and assumptions in the model data are in accordance with NFIP requirements, and that the data are comparable with the assumptions and limitations of HEC-2/HEC-RAS. CHECK-2 and CHECK-RAS identify areas of potential error or concern. These tools do not replace engineering judgment. CHECK-2 and CHECK-RAS can be downloaded from http://www.fema.gov/mit/tsd/frm_soft.htm. We recommend that you review your HEC-2 and HEC-RAS models with CHECK-2 and CHECK-RAS. If you disagree with a message, please attach an explanation of why the message is not valid in this case. Review of your submittal and resolution of valid modeling discrepancies will result in reduced review time.

HEC-2/HEC-RAS models reviewed with CHECK-2/CHECK-RAS? ☐ Yes ☐ No

4. Models Submitted

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

*Not required for revisions to approximate 1%-annual-chance floodplains (Zone A) – for details, refer to the corresponding section of the instructions.

The document "Numerical Models Accepted by FEMA for NFIP Usage" lists the models accepted by FEMA. This document can be found at: http://www.fema.gov/mit/tsd/en_modl.htm.

C. MAPPING REQUIREMENTS

A **certified topographic 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.).

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,** 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 of revision.

D. COMMON REGULATORY REQUIREMENTS

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

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.
- The proposed project encroaches upon a SFHA with BFEs established and would result in increases above 1.00 foot.

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 added. Elements and examples of regulatory floodway revision notification can be found in the MT-2 Form 2 Instructions.)

4. For LOMR requests, does this request require property owner notification and acceptance of BFE increases? ☐ Yes ☒ No

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

FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE HYDROLOGY & HYDRAULICS FORM

O.M.B No. 3067-0148
Expires September 30, 2005

PAPERWORK REDUCTION ACT

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Flooding Source: Moores Gulch Tributary 5
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 2) ☒ 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.)	FIS (cfs)	Revised (cfs)
Confluence Moores Gulch	0.95	Not Studied	1726

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

☐ Statistical Analysis of Gage Records ☒ Precipitation/Runoff Model HEC-1 [TR-20, HEC-1, HEC-HMS etc.]
☒ 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. The document, "Numerical Models Accepted by FEMA for NFIP Usage" lists the models accepted by FEMA. This document can be found at: http://www.fema.gov/mit/tsd/en_modl.htm.

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

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

B. HYDRAULICS

1. Reach to be Revised

	Description	Cross Section	Water-Surface Elevations (ft.) Effective	Proposed/Revised
Downstream Limit				
Upstream Limit				

2. Hydraulic Method Used

Hydraulic Analysis Normal Depth Analysis [HEC-2 , HEC-RAS, Other (Attach description)]

B. HYDRAULICS (CONTINUED)

3. Pre-Submittal Review of Hydraulic Models

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. These review programs verify that the hydraulic estimates and assumptions in the model data are in accordance with NFIP requirements, and that the data are comparable with the assumptions and limitations of HEC-2/HEC-RAS. CHECK-2 and CHECK-RAS identify areas of potential error or concern. These tools do not replace engineering judgment. CHECK-2 and CHECK-RAS can be downloaded from http://www.fema.gov/mit/tsd/frm_soft.htm. We recommend that you review your HEC-2 and HEC-RAS models with CHECK-2 and CHECK-RAS. If you disagree with a message, please attach an explanation of why the message is not valid in this case. Review of your submittal and resolution of valid modeling discrepancies will result in reduced review time.

HEC-2/HEC-RAS models reviewed with CHECK-2/CHECK-RAS? ☐ Yes ☐ No

4. Models Submitted

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

*Not required for revisions to approximate 1%-annual-chance floodplains (Zone A) – for details, refer to the corresponding section of the instructions.

The document "Numerical Models Accepted by FEMA for NFIP Usage" lists the models accepted by FEMA. This document can be found at: http://www.fema.gov/mit/tsd/en_modl.htm.

C. MAPPING REQUIREMENTS

A **certified topographic 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.).

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,** 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 of revision.

D. COMMON REGULATORY REQUIREMENTS

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

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.
- The proposed project encroaches upon a SFHA with BFEs established and would result in increases above 1.00 foot.

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 added. Elements and examples of regulatory floodway revision notification can be found in the MT-2 Form 2 Instructions.)

4. For LOMR requests, does this request require property owner notification and acceptance of BFE increases? ☐ Yes ☒ No

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

FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE HYDROLOGY & HYDRAULICS FORM

O.M.B No. 3067-0148
Expires September 30, 2005

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Flooding Source: Moores Gulch Tributary 6
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 2) ☒ 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.)	FIS (cfs)	Revised (cfs)
Confluence Moores Gulch	0.70	Not Studied	1691

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

☐ Statistical Analysis of Gage Records ☒ Precipitation/Runoff Model HEC-1 [TR-20, HEC-1, HEC-HMS etc.]
☒ 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. The document, "Numerical Models Accepted by FEMA for NFIP Usage" lists the models accepted by FEMA. This document can be found at: http://www.fema.gov/mit/tsd/en_modl.htm.

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

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

B. HYDRAULICS

1. Reach to be Revised

	Description	Cross Section	Water-Surface Elevations (ft.) Effective	Water-Surface Elevations (ft.) Proposed/Revised
Downstream Limit				
Upstream Limit				

2. Hydraulic Method Used

Hydraulic Analysis Normal Depth Analysis [HEC-2 , HEC-RAS, Other (Attach description)]

B. HYDRAULICS (CONTINUED)

3. Pre-Submittal Review of Hydraulic Models

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. These review programs verify that the hydraulic estimates and assumptions in the model data are in accordance with NFIP requirements, and that the data are comparable with the assumptions and limitations of HEC-2/HEC-RAS. CHECK-2 and CHECK-RAS identify areas of potential error or concern. These tools do not replace engineering judgment. CHECK-2 and CHECK-RAS can be downloaded from http://www.fema.gov/mit/tsd/frm_soft.htm. We recommend that you review your HEC-2 and HEC-RAS models with CHECK-2 and CHECK-RAS. If you disagree with a message, please attach an explanation of why the message is not valid in this case. Review of your submittal and resolution of valid modeling discrepancies will result in reduced review time.

HEC-2/HEC-RAS models reviewed with CHECK-2/CHECK-RAS? ☐ Yes ☐ No

4. Models Submitted

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

*Not required for revisions to approximate 1%-annual-chance floodplains (Zone A) – for details, refer to the corresponding section of the instructions.

The document "Numerical Models Accepted by FEMA for NFIP Usage" lists the models accepted by FEMA. This document can be found at: http://www.fema.gov/mit/tsd/en_modl.htm.

C. MAPPING REQUIREMENTS

A **certified topographic 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.).

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,** 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 of revision.

D. COMMON REGULATORY REQUIREMENTS

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

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.
- The proposed project encroaches upon a SFHA with BFEs established and would result in increases above 1.00 foot.

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 added. Elements and examples of regulatory floodway revision notification can be found in the MT-2 Form 2 Instructions.)

4. For LOMR requests, does this request require property owner notification and acceptance of BFE increases? ☐ Yes ☒ No

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

FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE HYDROLOGY & HYDRAULICS FORM

O.M.B No. 3067-0148
Expires September 30, 2005

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Flooding Source: Little Squaw Creek
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 2) ☐ 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.)	FIS (cfs)	Revised (cfs)
Confluence with Agua Fria	17.36	Unknown	9190

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

☐ Statistical Analysis of Gage Records ☒ Precipitation/Runoff Model HEC-1 [TR-20, HEC-1, HEC-HMS etc.]
☒ 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. The document, "Numerical Models Accepted by FEMA for NFIP Usage" lists the models accepted by FEMA. This document can be found at: http://www.fema.gov/mit/tsd/en_modl.htm.

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

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

B. HYDRAULICS

1. Reach to be Revised

	Description	Cross Section	Water-Surface Elevations (ft.) Effective	Water-Surface Elevations (ft.) Proposed/Revised
Downstream Limit				
Upstream Limit				

2. Hydraulic Method Used

Hydraulic Analysis Normal Depth Analysis [HEC-2 , HEC-RAS, Other (Attach description)]

B. HYDRAULICS (CONTINUED)

3. Pre-Submittal Review of Hydraulic Models

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. These review programs verify that the hydraulic estimates and assumptions in the model data are in accordance with NFIP requirements, and that the data are comparable with the assumptions and limitations of HEC-2/HEC-RAS. CHECK-2 and CHECK-RAS identify areas of potential error or concern. These tools do not replace engineering judgment. CHECK-2 and CHECK-RAS can be downloaded from http://www.fema.gov/mit/tsd/frm_soft.htm. We recommend that you review your HEC-2 and HEC-RAS models with CHECK-2 and CHECK-RAS. If you disagree with a message, please attach an explanation of why the message is not valid in this case. Review of your submittal and resolution of valid modeling discrepancies will result in reduced review time.

HEC-2/HEC-RAS models reviewed with CHECK-2/CHECK-RAS? ☐ Yes ☐ No

4. Models Submitted

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

*Not required for revisions to approximate 1%-annual-chance floodplains (Zone A) – for details, refer to the corresponding section of the instructions.

The document "Numerical Models Accepted by FEMA for NFIP Usage" lists the models accepted by FEMA. This document can be found at: http://www.fema.gov/mit/tsd/en_modl.htm.

C. MAPPING REQUIREMENTS

A **certified topographic 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.).

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,** 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 of revision.

D. COMMON REGULATORY REQUIREMENTS

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

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.
- The proposed project encroaches upon a SFHA with BFEs established and would result in increases above 1.00 foot.

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 added. Elements and examples of regulatory floodway revision notification can be found in the MT-2 Form 2 Instructions.)

4. For LOMR requests, does this request require property owner notification and acceptance of BFE increases? ☐ Yes ☒ No

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

FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE HYDROLOGY & HYDRAULICS FORM

O.M.B No. 3067-0148
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Flooding Source: Little Squaw Creek (LSC) Tributary 1
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 2) ☒ 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.)	FIS (cfs)	Revised (cfs)
Confluence LSC	1.88	Not Studied	2462

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

☐ Statistical Analysis of Gage Records ☒ Precipitation/Runoff Model HEC-1 [TR-20, HEC-1, HEC-HMS etc.]
☒ 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. The document, "Numerical Models Accepted by FEMA for NFIP Usage" lists the models accepted by FEMA. This document can be found at: http://www.fema.gov/mit/tsd/en_modl.htm.

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

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

B. HYDRAULICS

1. Reach to be Revised

	Description	Cross Section	Water-Surface Elevations (ft.) Effective	Water-Surface Elevations (ft.) Proposed/Revised
Downstream Limit				
Upstream Limit				

2. Hydraulic Method Used

Hydraulic Analysis Normal Depth Analysis [HEC-2 , HEC-RAS, Other (Attach description)]

B. HYDRAULICS (CONTINUED)

3. Pre-Submittal Review of Hydraulic Models

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. These review programs verify that the hydraulic estimates and assumptions in the model data are in accordance with NFIP requirements, and that the data are comparable with the assumptions and limitations of HEC-2/HEC-RAS. CHECK-2 and CHECK-RAS identify areas of potential error or concern. These tools do not replace engineering judgment. CHECK-2 and CHECK-RAS can be downloaded from http://www.fema.gov/mit/tsd/frm_soft.htm. We recommend that you review your HEC-2 and HEC-RAS models with CHECK-2 and CHECK-RAS. If you disagree with a message, please attach an explanation of why the message is not valid in this case. Review of your submittal and resolution of valid modeling discrepancies will result in reduced review time.

HEC-2/HEC-RAS models reviewed with CHECK-2/CHECK-RAS? ☐ Yes ☐ No

4. Models Submitted

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

*Not required for revisions to approximate 1%-annual-chance floodplains (Zone A) – for details, refer to the corresponding section of the instructions.

The document "Numerical Models Accepted by FEMA for NFIP Usage" lists the models accepted by FEMA. This document can be found at: http://www.fema.gov/mit/tsd/en_modl.htm.

C. MAPPING REQUIREMENTS

A **certified topographic 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.).

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,** 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 of revision.

D. COMMON REGULATORY REQUIREMENTS

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

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.
- The proposed project encroaches upon a SFHA with BFEs established and would result in increases above 1.00 foot.

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 added. Elements and examples of regulatory floodway revision notification can be found in the MT-2 Form 2 Instructions.)

4. For LOMR requests, does this request require property owner notification and acceptance of BFE increases? ☐ Yes ☒ No

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

FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE HYDROLOGY & HYDRAULICS FORM

O.M.B No. 3067-0148
Expires September 30, 2005

PAPERWORK REDUCTION ACT

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Flooding Source: Little Squaw Creek (LSC) Tributary 2
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 2) ☒ 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.)	FIS (cfs)	Revised (cfs)
Confluence LSC	0.73	Not Studied	1540

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

☐ Statistical Analysis of Gage Records ☒ Precipitation/Runoff Model HEC-1 [TR-20, HEC-1, HEC-HMS etc.]
☒ 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. The document, "Numerical Models Accepted by FEMA for NFIP Usage" lists the models accepted by FEMA. This document can be found at: http://www.fema.gov/mit/tsd/en_modl.htm.

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

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

B. HYDRAULICS

1. Reach to be Revised

	Description	Cross Section	Water-Surface Elevations (ft.) Effective	Water-Surface Elevations (ft.) Proposed/Revised
Downstream Limit				
Upstream Limit				

2. Hydraulic Method Used

Hydraulic Analysis Normal Depth Analysis [HEC-2 , HEC-RAS, Other (Attach description)]

B. HYDRAULICS (CONTINUED)

3. Pre-Submittal Review of Hydraulic Models

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. These review programs verify that the hydraulic estimates and assumptions in the model data are in accordance with NFIP requirements, and that the data are comparable with the assumptions and limitations of HEC-2/HEC-RAS. CHECK-2 and CHECK-RAS identify areas of potential error or concern. These tools do not replace engineering judgment. CHECK-2 and CHECK-RAS can be downloaded from http://www.fema.gov/mit/tsd/frm_soft.htm. We recommend that you review your HEC-2 and HEC-RAS models with CHECK-2 and CHECK-RAS. If you disagree with a message, please attach an explanation of why the message is not valid in this case. Review of your submittal and resolution of valid modeling discrepancies will result in reduced review time.

HEC-2/HEC-RAS models reviewed with CHECK-2/CHECK-RAS? ☐ Yes ☐ No

4. Models Submitted

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

*Not required for revisions to approximate 1%-annual-chance floodplains (Zone A) – for details, refer to the corresponding section of the instructions.

The document "Numerical Models Accepted by FEMA for NFIP Usage" lists the models accepted by FEMA. This document can be found at: http://www.fema.gov/mit/tsd/en_modl.htm.

C. MAPPING REQUIREMENTS

A **certified topographic 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.).

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,** 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 of revision.

D. COMMON REGULATORY REQUIREMENTS

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

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.
- The proposed project encroaches upon a SFHA with BFEs established and would result in increases above 1.00 foot.

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 added. Elements and examples of regulatory floodway revision notification can be found in the MT-2 Form 2 Instructions.)

4. For LOMR requests, does this request require property owner notification and acceptance of BFE increases? ☐ Yes ☒ No

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

FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE HYDROLOGY & HYDRAULICS FORM

O.M.B No. 3067-0148
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Flooding Source: Little Squaw Creek (LSC) Tributary 3
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 2) ☒ 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.)	FIS (cfs)	Revised (cfs)
Confluence LSC	1.16	Not Studied	1716

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

☐ Statistical Analysis of Gage Records ☒ Precipitation/Runoff Model HEC-1 [TR-20, HEC-1, HEC-HMS etc.]
☒ 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. The document, "Numerical Models Accepted by FEMA for NFIP Usage" lists the models accepted by FEMA. This document can be found at: http://www.fema.gov/mit/tsd/en_modl.htm.

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

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

B. HYDRAULICS

1. Reach to be Revised

	Description	Cross Section	Water-Surface Elevations (ft.) Effective	Water-Surface Elevations (ft.) Proposed/Revised
Downstream Limit				
Upstream Limit				

2. Hydraulic Method Used

Hydraulic Analysis Normal Depth Analysis [HEC-2 , HEC-RAS, Other (Attach description)]

B. HYDRAULICS (CONTINUED)

3. Pre-Submittal Review of Hydraulic Models

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. These review programs verify that the hydraulic estimates and assumptions in the model data are in accordance with NFIP requirements, and that the data are comparable with the assumptions and limitations of HEC-2/HEC-RAS. CHECK-2 and CHECK-RAS identify areas of potential error or concern. These tools do not replace engineering judgment. CHECK-2 and CHECK-RAS can be downloaded from http://www.fema.gov/mit/tsd/frm_soft.htm. We recommend that you review your HEC-2 and HEC-RAS models with CHECK-2 and CHECK-RAS. If you disagree with a message, please attach an explanation of why the message is not valid in this case. Review of your submittal and resolution of valid modeling discrepancies will result in reduced review time.

HEC-2/HEC-RAS models reviewed with CHECK-2/CHECK-RAS? ☐ Yes ☐ No

4. Models Submitted

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

*Not required for revisions to approximate 1%-annual-chance floodplains (Zone A) – for details, refer to the corresponding section of the instructions.

The document "Numerical Models Accepted by FEMA for NFIP Usage" lists the models accepted by FEMA. This document can be found at: http://www.fema.gov/mit/tsd/en_modl.htm.

C. MAPPING REQUIREMENTS

A **certified topographic 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.).

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,** 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 of revision.

D. COMMON REGULATORY REQUIREMENTS

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

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.
- The proposed project encroaches upon a SFHA with BFEs established and would result in increases above 1.00 foot.

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 added. Elements and examples of regulatory floodway revision notification can be found in the MT-2 Form 2 Instructions.)

4. For LOMR requests, does this request require property owner notification and acceptance of BFE increases? ☐ Yes ☒ No

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

FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE HYDROLOGY & HYDRAULICS FORM

O.M.B No. 3067-0148
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Flooding Source: Little Squaw Creek (LSC) Tributary 4
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 2) ☒ 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.)	FIS (cfs)	Revised (cfs)
Confluence LSC	1.41	Not Studied	2332

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

☐ Statistical Analysis of Gage Records ☒ Precipitation/Runoff Model HEC-1 [TR-20, HEC-1, HEC-HMS etc.]
☒ 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. The document, "Numerical Models Accepted by FEMA for NFIP Usage" lists the models accepted by FEMA. This document can be found at: http://www.fema.gov/mit/tsd/en_modl.htm.

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

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

B. HYDRAULICS

1. Reach to be Revised

	Description	Cross Section	Water-Surface Elevations (ft.) Effective	Proposed/Revised
Downstream Limit				
Upstream Limit				

2. Hydraulic Method Used

Hydraulic Analysis Normal Depth Analysis [HEC-2 , HEC-RAS, Other (Attach description)]

B. HYDRAULICS (CONTINUED)

3. Pre-Submittal Review of Hydraulic Models

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. These review programs verify that the hydraulic estimates and assumptions in the model data are in accordance with NFIP requirements, and that the data are comparable with the assumptions and limitations of HEC-2/HEC-RAS. CHECK-2 and CHECK-RAS identify areas of potential error or concern. These tools do not replace engineering judgment. CHECK-2 and CHECK-RAS can be downloaded from http://www.fema.gov/mit/tsd/frm_soft.htm. We recommend that you review your HEC-2 and HEC-RAS models with CHECK-2 and CHECK-RAS. If you disagree with a message, please attach an explanation of why the message is not valid in this case. Review of your submittal and resolution of valid modeling discrepancies will result in reduced review time.

HEC-2/HEC-RAS models reviewed with CHECK-2/CHECK-RAS? ☐ Yes ☐ No

4. Models Submitted

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

*Not required for revisions to approximate 1%-annual-chance floodplains (Zone A) – for details, refer to the corresponding section of the instructions.

The document "Numerical Models Accepted by FEMA for NFIP Usage" lists the models accepted by FEMA. This document can be found at: http://www.fema.gov/mit/tsd/en_modl.htm.

C. MAPPING REQUIREMENTS

A **certified topographic 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.).

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,** 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 of revision.

D. COMMON REGULATORY REQUIREMENTS

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

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.
- The proposed project encroaches upon a SFHA with BFEs established and would result in increases above 1.00 foot.

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 added. Elements and examples of regulatory floodway revision notification can be found in the MT-2 Form 2 Instructions.)

4. For LOMR requests, does this request require property owner notification and acceptance of BFE increases? ☐ Yes ☒ No

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

FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE HYDROLOGY & HYDRAULICS FORM

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Flooding Source: Little Squaw Creek (LSC) Tributary 5
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 2) ☒ 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.)	FIS (cfs)	Revised (cfs)
Confluence LSC	1.93	Not Studied	1699

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

☐ Statistical Analysis of Gage Records ☒ Precipitation/Runoff Model HEC-1 [TR-20, HEC-1, HEC-HMS etc.]
☒ 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. The document, "Numerical Models Accepted by FEMA for NFIP Usage" lists the models accepted by FEMA. This document can be found at: http://www.fema.gov/mit/tsd/en_modl.htm.

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

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

B. HYDRAULICS

1. Reach to be Revised

	Description	Cross Section	Water-Surface Elevations (ft.) Effective	Water-Surface Elevations (ft.) Proposed/Revised
Downstream Limit				
Upstream Limit				

2. Hydraulic Method Used

Hydraulic Analysis Normal Depth Analysis [HEC-2 , HEC-RAS, Other (Attach description)]

B. HYDRAULICS (CONTINUED)

3. Pre-Submittal Review of Hydraulic Models

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. These review programs verify that the hydraulic estimates and assumptions in the model data are in accordance with NFIP requirements, and that the data are comparable with the assumptions and limitations of HEC-2/HEC-RAS. CHECK-2 and CHECK-RAS identify areas of potential error or concern. These tools do not replace engineering judgment. CHECK-2 and CHECK-RAS can be downloaded from http://www.fema.gov/mit/tsd/frm_soft.htm. We recommend that you review your HEC-2 and HEC-RAS models with CHECK-2 and CHECK-RAS. If you disagree with a message, please attach an explanation of why the message is not valid in this case. Review of your submittal and resolution of valid modeling discrepancies will result in reduced review time.

HEC-2/HEC-RAS models reviewed with CHECK-2/CHECK-RAS? ☐ Yes ☐ No

4. Models Submitted

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

*Not required for revisions to approximate 1%-annual-chance floodplains (Zone A) – for details, refer to the corresponding section of the instructions.

The document "Numerical Models Accepted by FEMA for NFIP Usage" lists the models accepted by FEMA. This document can be found at: http://www.fema.gov/mit/tsd/en_modl.htm.

C. MAPPING REQUIREMENTS

A **certified topographic 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.).

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,** 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 of revision.

D. COMMON REGULATORY REQUIREMENTS

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

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.
- The proposed project encroaches upon a SFHA with BFEs established and would result in increases above 1.00 foot.

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 added. Elements and examples of regulatory floodway revision notification can be found in the MT-2 Form 2 Instructions.)

4. For LOMR requests, does this request require property owner notification and acceptance of BFE increases? ☐ Yes ☒ No

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

FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE HYDROLOGY & HYDRAULICS FORM

O.M.B No. 3067-0148
Expires September 30, 2005

PAPERWORK REDUCTION ACT

Public reporting burden for this form is estimated to average 3 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing, reviewing, and submitting the form. You are not required to respond to this collection of information unless a valid OMB control number appears in the upper right corner of this form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Federal Emergency Management Agency, 500 C Street, SW, Washington DC 20472, Paperwork Reduction Project (3067-0148). 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.**

Flooding Source: Wash 8N2ES16
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 2) ☒ 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.)	FIS (cfs)	Revised (cfs)
Confluence Agua Fria	1.98	Not Studied	2549

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

☐ Statistical Analysis of Gage Records ☒ Precipitation/Runoff Model HEC-1 [TR-20, HEC-1, HEC-HMS etc.]
☒ 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. The document, "Numerical Models Accepted by FEMA for NFIP Usage" lists the models accepted by FEMA. This document can be found at: http://www.fema.gov/mit/tsd/en_modl.htm.

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

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

B. HYDRAULICS

1. Reach to be Revised

	Description	Cross Section	Water-Surface Elevations (ft.) Effective	Proposed/Revised
Downstream Limit				
Upstream Limit				

2. Hydraulic Method Used

Hydraulic Analysis Normal Depth Analysis [HEC-2 , HEC-RAS, Other (Attach description)]

B. HYDRAULICS (CONTINUED)

3. Pre-Submittal Review of Hydraulic Models

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. These review programs verify that the hydraulic estimates and assumptions in the model data are in accordance with NFIP requirements, and that the data are comparable with the assumptions and limitations of HEC-2/HEC-RAS. CHECK-2 and CHECK-RAS identify areas of potential error or concern. These tools do not replace engineering judgment. CHECK-2 and CHECK-RAS can be downloaded from http://www.fema.gov/mit/tsd/frm_soft.htm. We recommend that you review your HEC-2 and HEC-RAS models with CHECK-2 and CHECK-RAS. If you disagree with a message, please attach an explanation of why the message is not valid in this case. Review of your submittal and resolution of valid modeling discrepancies will result in reduced review time.

HEC-2/HEC-RAS models reviewed with CHECK-2/CHECK-RAS? ☐ Yes ☐ No

4. Models Submitted

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

*Not required for revisions to approximate 1%-annual-chance floodplains (Zone A) – for details, refer to the corresponding section of the instructions.

The document "Numerical Models Accepted by FEMA for NFIP Usage" lists the models accepted by FEMA. This document can be found at: http://www.fema.gov/mit/tsd/en_modl.htm.

C. MAPPING REQUIREMENTS

A **certified topographic 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.).

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,** 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 of revision.

D. COMMON REGULATORY REQUIREMENTS

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

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.
- The proposed project encroaches upon a SFHA with BFEs established and would result in increases above 1.00 foot.

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 added. Elements and examples of regulatory floodway revision notification can be found in the MT-2 Form 2 Instructions.)

4. For LOMR requests, does this request require property owner notification and acceptance of BFE increases? ☐ Yes ☒ No

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

FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE STRUCTURES FORM

O.M.B. No. 3067-0148
Expires September 30, 2005

PAPERWORK REDUCTION ACT

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Flooding Source: Moores Gulch
Note: Fill out one form for each flooding source studied

A. GENERAL

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

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

Description Of Structure

1. **Name of Structure: Moores Gulch Bridge at I-17**

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

   Location of Structure: Moores Gulch R.S. 1.837

   Downstream Limit/Cross Section:

   Upstream Limit/Cross Section:

2. **Name of Structure: Moores Gulch Bridge at I-17**

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

   Location of Structure: Moores Gulch 2.417

   Downstream Limit/Cross Section:

   Upstream Limit/Cross Section:

3. **Name of Structure:**

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

   Location of Structure:

   Downstream Limit/Cross Section:

   Upstream Limit/Cross Section:

NOTE: For more structures, attach additional pages as needed.

B. CHANNELIZATION

Flooding Source:

Name of Structure:

1. Accessory Structures

   The channelization includes (check one):

   - ☐ Levees [Attach Section E (Levee/Floodwall)]
   - ☐ Superelevated sections
   - ☐ Debris basin/detention basin
   - ☐ Other (Describe):
   - ☐ Drop structures
   - ☐ Transitions in cross sectional geometry
   - ☐ Energy dissipator

2. Drawing Checklist

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

3. Hydraulic Considerations

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

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

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

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

   ☐ Inlet to channel ☐ Outlet of channel ☐ At Drop Structures ☐ At Transitions
   ☐ Other locations (specify):

4. Sediment Transport Considerations

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

C. BRIDGE/CULVERT

Flooding Source: Moores Gulch

Name of Structure: Moores Gulch R.S. 1.837

1. This revision reflects (check one):

   - ☒ New bridge/culvert not modeled in the FIS
   - ☐ Modified bridge/culvert previously modeled in the FIS
   - ☐ New analysis of bridge/culvert previously modeled in the FIS

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

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

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

4. Sediment Transport Considerations

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

B. CHANNELIZATION

Flooding Source:

Name of Structure:

1. Accessory Structures

The channelization includes (check one):

- ☐ Levees [Attach Section E (Levee/Floodwall)]
- ☐ Superelevated sections
- ☐ Debris basin/detention basin
- ☐ Other (Describe):
- ☐ Drop structures
- ☐ Transitions in cross sectional geometry
- ☐ Energy dissipator

2. Drawing Checklist

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

3. Hydraulic Considerations

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

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

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

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

☐ Inlet to channel ☐ Outlet of channel ☐ At Drop Structures ☐ At Transitions
☐ Other locations (specify):

4. Sediment Transport Considerations

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

C. BRIDGE/CULVERT

Flooding Source: Moores Gulch

Name of Structure: Moores Gulch R.S. 2.417

1. This revision reflects (check one):

- ☒ New bridge/culvert not modeled in the FIS
- ☐ Modified bridge/culvert previously modeled in the FIS
- ☐ New analysis of bridge/culvert previously modeled in the FIS

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

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

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

4. Sediment Transport Considerations

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

FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE STRUCTURES FORM

O.M.B. No. 3067-0148
Expires September 30, 2005

PAPERWORK REDUCTION ACT

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Flooding Source: Moores Gulch Tributary 2
Note: Fill out one form for each flooding source studied

A. GENERAL

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

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

Description Of Structure

1. **Name of Structure: Moores Gulch Tributary 2 Culvert**

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

   Location of Structure: Moores Gulch Tributary 2 R.S. 0.521

   Downstream Limit/Cross Section:

   Upstream Limit/Cross Section:

2. **Name of Structure:**

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

   Location of Structure:

   Downstream Limit/Cross Section:

   Upstream Limit/Cross Section:

3. **Name of Structure:**

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

   Location of Structure:

   Downstream Limit/Cross Section:

   Upstream Limit/Cross Section:

NOTE: For more structures, attach additional pages as needed.

B. CHANNELIZATION

Flooding Source:

Name of Structure:

1. Accessory Structures

The channelization includes (check one):

- ☐ Levees [Attach Section E (Levee/Floodwall)]
- ☐ Superelevated sections
- ☐ Debris basin/detention basin
- ☐ Other (Describe):
- ☐ Drop structures
- ☐ Transitions in cross sectional geometry
- ☐ Energy dissipator

2. Drawing Checklist

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

3. Hydraulic Considerations

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

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

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

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

☐ Inlet to channel ☐ Outlet of channel ☐ At Drop Structures ☐ At Transitions
☐ Other locations (specify):

4. Sediment Transport Considerations

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

C. BRIDGE/CULVERT

Flooding Source: Moores Gulch Tributary 2

Name of Structure: Moores Gulch Tributary 2 Culvert

1. This revision reflects (check one):

- ☒ New bridge/culvert not modeled in the FIS
- ☐ Modified bridge/culvert previously modeled in the FIS
- ☐ New analysis of bridge/culvert previously modeled in the FIS

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

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

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

4. Sediment Transport Considerations

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

FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE STRUCTURES FORM

O.M.B. No. 3067-0148
Expires September 30, 2005

PAPERWORK REDUCTION ACT

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Flooding Source: Little Squaw Creek
Note: Fill out one form for each flooding source studied

A. GENERAL

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

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

Description Of Structure

1. **Name of Structure: Little Squaw Creek Bridge at I-17**

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

   Location of Structure: Little Squaw Creek R.S. 1.070

   Downstream Limit/Cross Section:

   Upstream Limit/Cross Section:

2. **Name of Structure: Little Squaw Creek Bridge at I-17**

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

   Location of Structure: Little Squaw Creek R.S. 1.689

   Downstream Limit/Cross Section:

   Upstream Limit/Cross Section:

3. **Name of Structure:**

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

   Location of Structure:

   Downstream Limit/Cross Section:

   Upstream Limit/Cross Section:

NOTE: For more structures, attach additional pages as needed.

B. CHANNELIZATION

Flooding Source:

Name of Structure:

1. Accessory Structures

   The channelization includes (check one):

   ☐ Levees [Attach Section E (Levee/Floodwall)]
   ☐ Superelevated sections
   ☐ Debris basin/detention basin
   ☐ Other (Describe):
   ☐ Drop structures
   ☐ Transitions in cross sectional geometry
   ☐ Energy dissipator

2. Drawing Checklist

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

3. Hydraulic Considerations

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

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

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

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

   ☐ Inlet to channel ☐ Outlet of channel ☐ At Drop Structures ☐ At Transitions
   ☐ Other locations (specify):

4. Sediment Transport Considerations

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

C. BRIDGE/CULVERT

Flooding Source: Little Squaw Creek

Name of Structure: Little Squaw Creek Bridge R.S. 1.070

1. This revision reflects (check one):

   ☒ New bridge/culvert not modeled in the FIS
   ☐ Modified bridge/culvert previously modeled in the FIS
   ☐ New analysis of bridge/culvert previously modeled in the FIS

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

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

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

4. Sediment Transport Considerations

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

B. CHANNELIZATION

Flooding Source:

Name of Structure:

1. Accessory Structures

   The channelization includes (check one):

   ☐ Levees [Attach Section E (Levee/Floodwall)]
   ☐ Superelevated sections
   ☐ Debris basin/detention basin
   ☐ Other (Describe):
   ☐ Drop structures
   ☐ Transitions in cross sectional geometry
   ☐ Energy dissipator

2. Drawing Checklist

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

3. Hydraulic Considerations

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

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

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

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

   ☐ Inlet to channel ☐ Outlet of channel ☐ At Drop Structures ☐ At Transitions
   ☐ Other locations (specify):

4. Sediment Transport Considerations

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

C. BRIDGE/CULVERT

Flooding Source: Little Squaw Creek

Name of Structure: Little Squaw Creek Bridge R.S. 1.689

1. This revision reflects (check one):

   ☒ New bridge/culvert not modeled in the FIS
   ☐ Modified bridge/culvert previously modeled in the FIS
   ☐ New analysis of bridge/culvert previously modeled in the FIS

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

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

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

4. Sediment Transport Considerations

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

FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE STRUCTURES FORM

O.M.B. No. 3067-0148
Expires September 30, 2005

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Flooding Source: Little Squaw Creek Tributary 1
Note: Fill out one form for each flooding source studied

A. GENERAL

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

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

Description Of Structure

1. **Name of Structure: Little Squaw Creek Tributary 1 Culvert**

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

   Location of Structure: Little Squaw Creek Tributary R.S. 1.856

   Downstream Limit/Cross Section:

   Upstream Limit/Cross Section:

2. **Name of Structure: Little Squaw Creek Tributary 1 Culvert**

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

   Location of Structure: Little Squaw Creek Tributary 1 R.S. 1.909

   Downstream Limit/Cross Section:

   Upstream Limit/Cross Section:

3. **Name of Structure:**

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

   Location of Structure:

   Downstream Limit/Cross Section:

   Upstream Limit/Cross Section:

NOTE: For more structures, attach additional pages as needed.

B. CHANNELIZATION

Flooding Source:

Name of Structure:

1. Accessory Structures

The channelization includes (check one):

- ☐ Levees [Attach Section E (Levee/Floodwall)]
- ☐ Superelevated sections
- ☐ Debris basin/detention basin
- ☐ Other (Describe):
- ☐ Drop structures
- ☐ Transitions in cross sectional geometry
- ☐ Energy dissipator

2. Drawing Checklist

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

3. Hydraulic Considerations

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

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

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

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

☐ Inlet to channel ☐ Outlet of channel ☐ At Drop Structures ☐ At Transitions
☐ Other locations (specify):

4. Sediment Transport Considerations

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

C. BRIDGE/CULVERT

Flooding Source: Little Squaw Creek Tributary 1

Name of Structure: Little Squaw Creek Tributary 1 Culvert R.S. 1.856

1. This revision reflects (check one):

- ☒ New bridge/culvert not modeled in the FIS
- ☐ Modified bridge/culvert previously modeled in the FIS
- ☐ New analysis of bridge/culvert previously modeled in the FIS

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

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

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

4. Sediment Transport Considerations

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

B. CHANNELIZATION

Flooding Source:

Name of Structure:

1. Accessory Structures

The channelization includes (check one):

- ☐ Levees [Attach Section E (Levee/Floodwall)]
- ☐ Superelevated sections
- ☐ Debris basin/detention basin
- ☐ Other (Describe):
- ☐ Drop structures
- ☐ Transitions in cross sectional geometry
- ☐ Energy dissipator

2. Drawing Checklist

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

3. Hydraulic Considerations

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

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

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

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

☐ Inlet to channel ☐ Outlet of channel ☐ At Drop Structures ☐ At Transitions
☐ Other locations (specify):

4. Sediment Transport Considerations

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

C. BRIDGE/CULVERT

Flooding Source: Little Squaw Creek Tributary 1

Name of Structure: Little Squaw Creek Tributary 1 Culvert R.S. 1.909

1. This revision reflects (check one):

- ☒ New bridge/culvert not modeled in the FIS
- ☐ Modified bridge/culvert previously modeled in the FIS
- ☐ New analysis of bridge/culvert previously modeled in the FIS

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

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

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

4. Sediment Transport Considerations

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

FEDERAL EMERGENCY MANAGEMENT AGENCY

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Flooding Source: Little Squaw Creek Tributary 2
Note: Fill out one form for each flooding source studied

A. GENERAL

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

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

Description Of Structure

1. **Name of Structure: Little Squaw Creek Tributary 2 Culvert**

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

   Location of Structure: Little Squaw Creek Tributary R.S. 0.234

   Downstream Limit/Cross Section:

   Upstream Limit/Cross Section:

2. **Name of Structure: Little Squaw Creek Tributary 2 Culvert**

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

   Location of Structure: Little Squaw Creek Tributary 1 R.S. 0.650

   Downstream Limit/Cross Section:

   Upstream Limit/Cross Section:

3. **Name of Structure:**

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

   Location of Structure:

   Downstream Limit/Cross Section:

   Upstream Limit/Cross Section:

NOTE: For more structures, attach additional pages as needed.

B. CHANNELIZATION

Flooding Source:

Name of Structure:

1. Accessory Structures

   The channelization includes (check one):

   - ☐ Levees [Attach Section E (Levee/Floodwall)]
   - ☐ Superelevated sections
   - ☐ Debris basin/detention basin
   - ☐ Other (Describe):
   - ☐ Drop structures
   - ☐ Transitions in cross sectional geometry
   - ☐ Energy dissipator

2. Drawing Checklist

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

3. Hydraulic Considerations

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

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

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

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

   ☐ Inlet to channel ☐ Outlet of channel ☐ At Drop Structures ☐ At Transitions
   ☐ Other locations (specify):

4. Sediment Transport Considerations

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

C. BRIDGE/CULVERT

Flooding Source: Little Squaw Creek Tributary 2

Name of Structure: Little Squaw Creek Tributary 2 Culvert R.S. 0.234

1. This revision reflects (check one):

   - ☒ New bridge/culvert not modeled in the FIS
   - ☐ Modified bridge/culvert previously modeled in the FIS
   - ☐ New analysis of bridge/culvert previously modeled in the FIS

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

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

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

4. Sediment Transport Considerations

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

B. CHANNELIZATION

Flooding Source:

Name of Structure:

1. Accessory Structures

The channelization includes (check one):

- ☐ Levees [Attach Section E (Levee/Floodwall)]
- ☐ Superelevated sections
- ☐ Debris basin/detention basin
- ☐ Other (Describe):
- ☐ Drop structures
- ☐ Transitions in cross sectional geometry
- ☐ Energy dissipator

2. Drawing Checklist

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

3. Hydraulic Considerations

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

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

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

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

☐ Inlet to channel ☐ Outlet of channel ☐ At Drop Structures ☐ At Transitions
☐ Other locations (specify):

4. Sediment Transport Considerations

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

C. BRIDGE/CULVERT

Flooding Source: Little Squaw Creek Tributary 2

Name of Structure: Little Squaw Creek Tributary 2 Culvert R.S. 0.650

1. This revision reflects (check one):

- ☒ New bridge/culvert not modeled in the FIS
- ☐ Modified bridge/culvert previously modeled in the FIS
- ☐ New analysis of bridge/culvert previously modeled in the FIS

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

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

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

4. Sediment Transport Considerations

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

Section 3: Survey and Mapping Information

3.1 Field Survey Information

Field survey related to this contract consisted of surveying any man made structures that would impact the floodplains within this watershed and setting elevation reference monuments (ERMs). Field survey was conducted under the supervision of Brent J. Smith, R.L.S. Field notes for the ERMs are contained in the document *Upper Agua Fria Floodplain Delineation Study, Elevation Reference Monuments.* Field notes for the hydraulic structure survey are provided in the document *Upper Agua Fria Floodplain Delineation Study, Structure Survey.* Copies of the field notes that pertain to Watersheds 3 & 4 are provided in Appendix C.

3.2 Mapping

RBF used existing digital elevation models (DEM) and digital terrain models (DTM) provided by the Flood Control District of Maricopa County. Landata Airborn Systems created the DTM from digital ortho-photos that were created as part of the Maricopa County Ortho-photo project in 2000 and 2001. Landata Airborn Systems produced the photography and DTMs under the supervision of Kas Ebrahim.

RBF Consulting set the panels and supplied the horizontal and vertical control for the Maricopa County Ortho-photo project under the supervision of Brent J. Smith, R.L.S. The coordinate system is based on NAD 83, Arizona State Plane- Central Zone. The vertical coordinate system is NAVD 88. The RBF Consulting job number for the mapping is 45-100774.

As part of the Maricopa County Ortho-photo project Landata flew aerial photography for the entire county. The dates the photos were flown are December 16, 2000 through March 15, 2001. The vertical control was based on GDACS monuments established by the Maricopa County Department of Transportation.

Appendix C contains part of the narrative from the "Maricopa County Ortho-photo GPS-Summary of Procedure Final Report" stamped by Brent J. Smith, R.L.S.

Section 4: Hydrology

4.1 Method Description

The purpose of the hydrologic analysis is to provide peak flow data for the Zone A flood plain delineation of all washes in this watershed that have a drainage area of at least one-half square mile. Peak flows for the 100-year 6-hour storm were computed using the Army Corps of Engineers' Flood Hydrograph Package HEC-1, version 4.1, dated June 1998. Environmental Modeling Systems Incorporated's (EMS-I) Watershed Modeling System version 6.1 (WMS), dated January 21, 2003, was used to build the hydrologic model using a grid of elevation data and geographic information system (GIS) data provided by the Flood Control District of Maricopa County (FCD).

The *Flood Insurance Study for Maricopa County and Incorporated Areas* (FIS, 2001) was consulted in order determine the peak flow values for the existing Zone A delineations on Little Squaw Creek and Moores Gulch. The FIS listed that these two washes have been delineated, but it does not give the peak flows used to delineate the floodplain. A search of the library at the Flood Control District of Maricopa County also failed to turn up any report that details the previous study. Because the watersheds are ungaged true verification of the results of the HEC-1 model are impossible. The Flood Control District of Maricopa County's computer program DDMSW was used to determine whether the HEC-1 peak flows fell within the range of peak flow estimates obtained using regression equations. This comparison provides a check for the accuracy of the HEC-1 peak flows.

4.2 Parameter Estimation

Hydrologic parameters were estimated using the FCD's methodology, as outlined in Volume I of the *Drainage Design Manual For Maricopa County* (DDM), dated January 1, 1995. The following sections discuss the parameter estimation in detail.

4.2.1 Drainage Area Boundaries

Figure 4.1 shows the sub-basin delineation for the Upper Agua Fria Watersheds 3 & 4. There are three tributaries to the Agua Fria River in Watersheds 3 & 4 that have drainage areas greater than ½ square mile. The first two tributaries are Moore's Gulch and Little Squaw Creek. The third wash is unnamed, and is referred to as Wash 8N2ES16 in this report. All of the Sub-basins were labeled with a letter that signifies which wash they drain to, followed by a number, beginning with 1, and increasing upstream. The letter used to signify Moores Gulch is "M", Little Squaw Creek is "L", and Wash 8N2ES16 is "BC" (for Black Canyon City). Moore's Gulch and Little Squaw Creek have several tributaries. To differentiate these sub-basins from the others, a "T" is placed after either the "M' or "L" to indicate that it is a tributary. The farthest downstream tributary is identified by "T1", with the number increasing upstream. Those tributaries that have more than one Sub-basin along the tributary are indicated by the letters "A", "B", or "C" following the "T1".

Watersheds 3 & 4 are mostly undeveloped, upland desert. The Moores Gulch Watershed is approximately 14.71 square miles, is mainly undeveloped upland desert surrounded by mountains at the far upstream end of the watershed. The Little Squaw Creek Watershed is approximately 19.24 square miles of undeveloped upland desert that also is surrounded by mountains at the upstream end. The watershed for Wash 8N2ES16 is 1.98 square miles of upland desert that has some sparse

development related to the towns of Rock Springs and Black Canyon City. There are several dirt roads within the each watershed, a power line easement, a gas pipeline, campgrounds, a few buildings, and the Interstate-17 Freeway. The freeway, power line easement, gas pipeline, and towns are shown on the USGS maps used for the background image in Figure 4.1. Both Little Squaw Creek and Moores Gulch have bridges that cross the washes in two places. When possible, concentration points have been placed at each freeway bridge or culvert

Sub-basin delineation was performed by WMS using an digital elevation model (DEM) produced from the digital orthophotos, dated May 26, 2001 . The grid spacing of the DEM is 50 feet and it has an accuracy of plus or minus five feet.

4.2.2 Watershed Work Maps

Figure 4.1 and Exhibit 1 show the sub-basin boundaries, confluence or concentration points, and routing reaches. The concentration point for each sub-basin is labeled with a "CP" in front of the name of the upstream sub-basin. The routing reach is named by replacing the "CP" with an "R" for the reach downstream of the concentration point.

Figure 4.2 shows the watershed boundaries overlain on top of the soil map units, according to the Aguila-Carefree Soil Survey. Figure 4.3 shows the land use designation for Watersheds 3 & 4.

4.2.3 Gage Data

Table 4.1 lists the rain gage locations in the vicinity of Watersheds 3 & 4. None of these gages are within Watersheds 3 & 4..

Table 4.1- List of Gages Near Watersheds 3 & 4

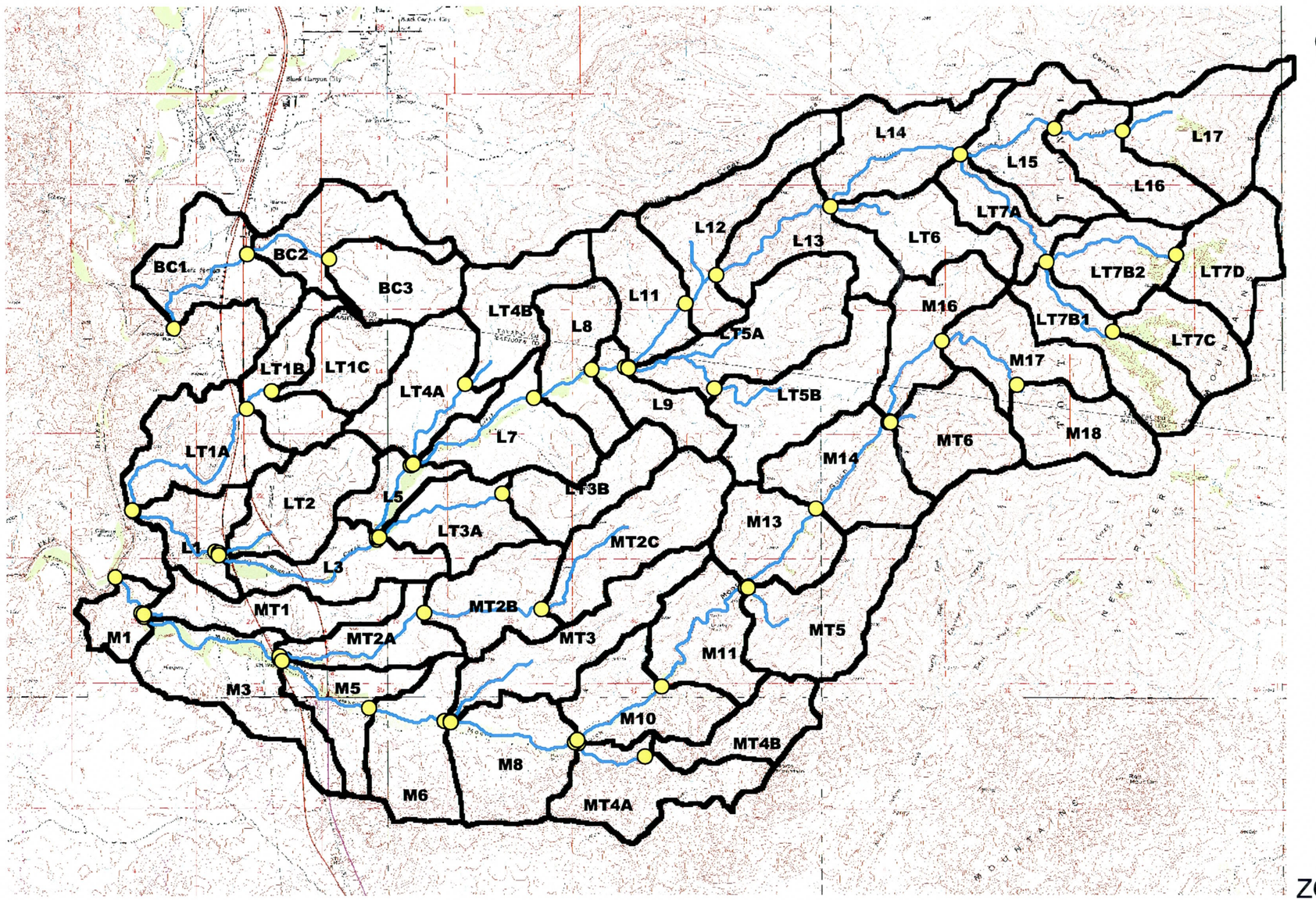
Gage I.D.	Name	Installation Date	Type
5650	Lake Pleasant	12/10/1991	Precipitation
5630	New River Landfill	4/29/1993	Precipitation
5625	Sun Up Ranch	3/21/1984	Precipitation
5583	Skunk Creek near New River	6/2/95	Telemetry Stage

4.2.4 Statistical Parameters

Statistical Parameters have not been considered at this stage of the study.

4.2.5 Precipitation

The NOAA Atlas II was used to obtain a 100-year 6-hour point precipitation value of 3.55 inches for Watersheds 3 & 4. According to the DDM's Design Rainfall Criteria for Maricopa County (pg. 2-3), watersheds with drainage areas of 20 square miles or less should be analyzed using the 6-hour local storm. Because the drainage areas are 1.98 square miles for Wash 8N2ES16, 14.71 square miles for Moores Gulch and 19.24 square miles for Little Squaw Creek the 6-hour local storm will



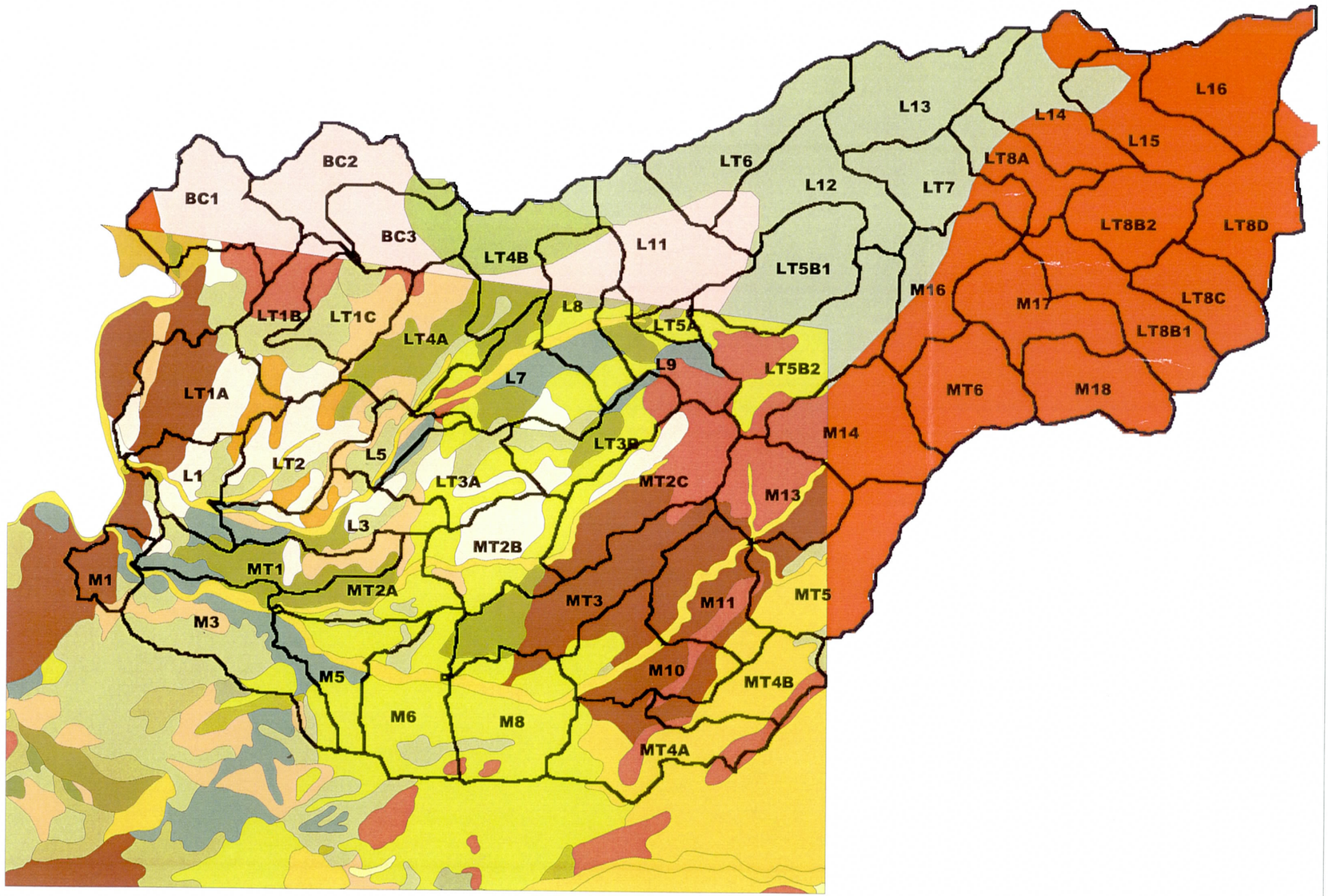
6000 0 6000 12000 Feet

LEGEND

- CONCENTRATION POINTS
- WASHES
- SUB-BASIN BOUNDARIES
- M1 SUB-BASIN ID

SEE EXHIBIT 1, OR APPENDIX D.3 FOR THE LOCATION OF ROUTING REACHES.

UPPER AGUA FRIA WATERSHED
ZONE A FLOODPLAIN DELINEATION STUDY
WATERSHEDS 3 & 4
SUB-BASIN BOUNDARIES
FIGURE 4.1



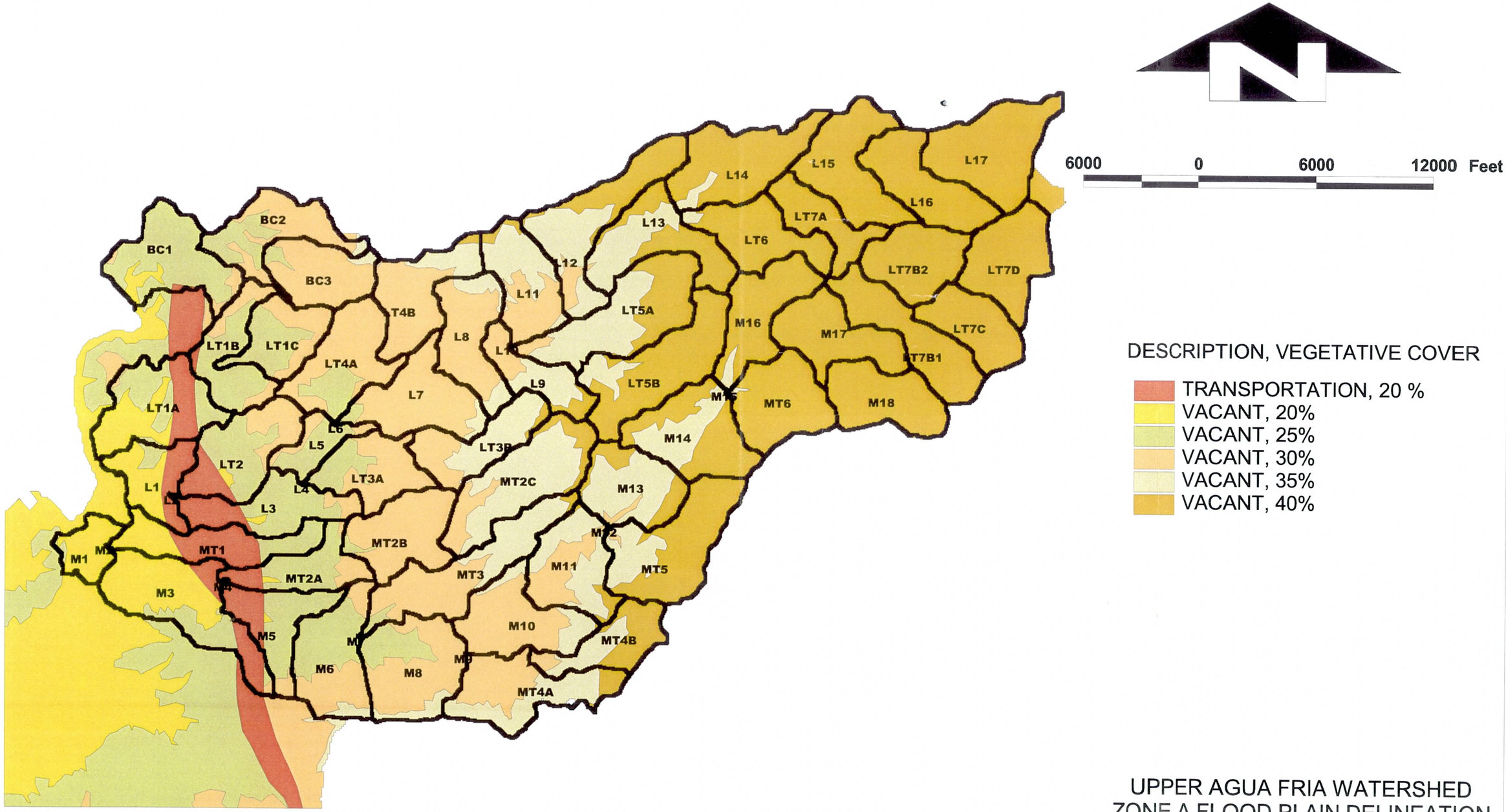
6000 0 6000 12000 Feet

LEGEND

SOIL TYPE

- 103, Rock outcrop-Gachado complex, 5 to 55 percent slopes
- 104, Rock outcrop-Lehmans complex, 15 to 65 percent slopes
- 105, Rock outcrop-Lehmans complex, low precipitation, 15 to
- 111, Torriorthents, 15 to 40 percent slopes
- 126, Sandy Loam
- 16, Cellar-Rock outcrop complex, 10 to 70 percent slopes
- 24, continental clay loam, 0 to 3 percent slopes
- 26, Continental cobbly clay loam, 1 to 8 percent slopes
- 28, Continental-Ohaco complex
- 31, Dixaleta-Rock outcrop complex, 25 to 65 percent slopes
- 33, Eba very gravelly loam, 1 to 8 percent slopes
- 34, Eba very gravelly loam, 8 to 20 percent slopes
- 36, Eba-Continental complex, 1 to 8 percent slopes
- 37, Eba-Continental-Cave association, 3 to 20 percent slopes
- 39, Eba-Nickel-Cave association, 3 to 25 percent slopes
- 40, Eba-Pinaleno complex, 3 to 20 percent slopes
- 41, Eba-Pinaleno complex, 20 to 40 percent slopes
- 45, Ebon very gravelly loam, 8 to 20 percent slopes
- 542, EBA-PINALENO (AZO42)
- 549, GRAN-ROCK OUTCROP LEHMANS (AZ049)
- 549, GRAN-ROCK OUTCROP-LEHMANS (AZ049)
- 61, Gran-Wickenburg complex, 1 to 10 percent slopes
- 63, Gran-Wickenburg-Rock outcrop complex, 1 to 7 percent slo
- 66, Greyeagle-Suncity Variant complex, 1 to 7 percent slopes
- 675, QUINTANA (AZ175)
- 72, Lehmans-Rock outcrop complex, 8 to 65 percent slopes
- 8, Arizo cobbly sandy loam
- 93, Nickel-Cave complex, 8 to 30 percent slopes
- 96, Pinaleno-Tres Hermanos complex, 1 to 10 percent slopes

UPPER AGUA FRIA WATERSHED
ZONE A FLOODPLAIN DELINEATION STUDY
WATERSHEDS 3 & 4
SOILS MAP
FIGURE 4.2



UPPER AGUA FRIA WATERSHED
ZONE A FLOOD PLAIN DELINEATION
WATERSHEDS 3 & 4
LAND USE CLASSIFICATION
FIGURE 4.3

be used.

HEC-1's JD card option was used to reduce point precipitation values using the depth-area reduction factors from the DDM. Table 4.2 lists the depth-area rainfall relations that were input on the JD cards. The appropriate rainfall distribution pattern for the 6-hour storm was also input onto the corresponding PC cards.

Table 4.2- Depth-Area Relation used in the HEC-1 Model

Depth Inches	Area Square Miles	Rainfall Distribution Pattern
3.55	0.0001	1
3.53	0.5	1
3.46	2.8	2
3.28	16.0	3
2.84	90	4

4.2.6 Physical Parameters

Rainfall Losses

The Green and Ampt infiltration equations were used within HEC-1 to estimate rainfall losses according to the procedures outlined in the DDM. WMS was used to calculate the logarithmic area averages of the hydraulic conductivities of each map unit within each sub-basin. WMS also selects the capillary suction (PSIF) and soil moisture deficit (DTHETA) using the average XKSAT value. After PSIF and DTHETA are calculated the XKSAT value is adjusted for vegetative cover.

A GIS based soils map of the SCS *Soil Survey of Aguila-Carefree Area, Parts of Maricopa County and Pinal Counties, Arizona,* issued April 1986 was obtained from the FCD for input into WMS. This data was used to obtain soils information inside of Maricopa County. A detailed soil survey does not exist for those portions of the watershed outside of Maricopa County. WEST Consultants used the statewide soil survey for Arizona (STATSGO) data provided by the NRCS to estimate soil boundaries and XKSAT values. Figure 4.2 shows the soils map for Watersheds 3 & 4. The soils with WMS I.D.s 542, 549, and 675 were obtained from WEST Consultants. For a more detailed explanation of how the XKSAT values for these soils were calculated see WEST's report "Upper Agua Fria Watershed Soil Delineation Study" dated August 2002.

A table relating the Map Unit numbers to the XKSAT values was obtained from Appendix A of the DDM. Table 4.3 lists the map unit values that were input into WMS to compute the rainfall losses.

Table 4.3- Sub-Basin Soils used in Rainfall Loss Calculations

WMS I.D.	Description	XKSAT inch/hr	Impervious Area %	% Effective
8	Carrizo Gravelly Loamy Sand	1.20	0	100
16	Gilman Loam	0.25	0	100
24	Pimer clay Loam	0.04	0	100
26	Pinal Gravelly Loam, 1-3% slopes	0.40	0	100
28	Pinamt very gravelly loam, 0-1% slopes	0.40	0	100
31	Rillito Gravelly Loam, 1-3% slopes	0.40	0	100
33	Rough Broken Land	0.40	20	100
34	Tremant Gravelly Loam, 1-3% slopes	0.10	0	100
36	Valencia Sandy Loam	0.40	0	100
37	Vecont Clay	0.01	0	100
39	Lakes, Ponds, Reservoirs- Perennial	0.00	0	100
40	Antho Sandy Loams	0.41	0	100
41	Antho Gravelly Sandy Loams	0.41	0	100
45	Anthony-Arizo Complex	0.62	0	100
61	Contine Clay Loam	0.04	0	100
63	Continental Clay Loam, 0-3% slopes	0.02	0	100
66	Continenta-Mohave Comples, 1-7% slopes	0.01	0	100
72	Eba very gravelly loam, 1-8% slopes	0.23	0	100
93	Gila Fine Sandy Loams	0.29	0	100
96	Gilman Clay loam	0.06	0	100
103	Gran-Wickenburg-Rock Outcrop complex, low precipitation, 10-65% slopes	0.14	25	100
104	Greyeagle-Continental-Nickel Assoctiation, 1-40% slopes	0.19	0	100
105	Greyeagle-Suncity variant complex, 1-7% Slopes	0.23	0	100
111	Lehmans-Rock outcrop complex	0.09	30	100
126	Mohave Complex	0.04	0	100
542	Eba-Pinaleno (STATSGO AZ042)	0.20	0	100

Table 4.3- Sub-Basin Soils used in Rainfall Loss Calculations

WMS I.D.	Description	XKSAT inch/hr	Impervious Area %	% Effective
549	Gran-Rock Outcrop-Lehmans (STATSGO AZ049)	0.08	0	100
675	Quintana (STATSGO AZ175)	1.30	0	100

The FCD provided land use data in shape file (GIS) format based on Maricopa Associated Governments (MAG) Data. The percent vegetative cover was varied according to the elevation range as specified by the Flood Control District of Maricopa County. A description of the MAG data is provided in Appendix D. Table 4.4 lists the land use data that was imported into WMS to help determine rainfall losses. The land use data provided initial abstraction calculations.

Table 4.4- Land Use Characteristics used to Compute Green-Ampt Parameters

Land Use Classification	Description	Initial Abstraction inches	Soil Condition	Impervious Area %	Vegetative Cover %
Vacant	Hillslopes, Sonoran Desert	0.35	Dry	0	20-40
Transportation	Developed	0.10	Normal	80	75

The values listed in Tables 4.3 and 4.4 were used in WMS to calculate the Green-Ampt parameters for each Sub-Basin according to the Flood Control District of Maricopa County's methodology as outlined in the DDM. The results are listed in Table 4.5. WMS calculated the hydraulic conductivity (XKSAT) values listed in Table 4.5 by "areally averaging" the XKSAT values of each individual soil in the Sub-basin, and then adjusting that value according to the vegetative cover. WMS determines volumetric soil moisture deficit at the starting of rainfall (DTHETA) and wetting front capillary suction (PSIF) according to a relation with XKSAT (prior to being adjusted for vegetative cover) as outlined in the DDM. Surface retention loss, or initial abstraction, (IA) and percent impervious cover (RTIMP) are determined from the Land Use Coverage. See Section 4 of the DDM for a more detailed description of the methodology.

Table 4.5- Green-Ampt Parameters for Watersheds 3 & 4

Sub-Basin	IA inches	DTHETA	PSIF	Adj. XKSAT in./hr.	RTIMP %
M1	0.35	0.35	4.55	0.30	2
M3	0.30	0.34	5.25	0.24	21
M5	0.27	0.32	4.35	0.38	25

Table 4.5- Green-Ampt Parameters for Watersheds 3 & 4

Sub-Basin	IA inches	DTHETA	PSIF	Adj. XKSAT in./hr.	RTIMP %
M6	0.35	0.35	4.05	0.40	0
M8	0.35	0.35	3.86	0.43	0
M10	0.35	0.35	3.94	0.44	0
M11	0.35	0.35	4.02	0.43	0
M13	0.35	0.35	4.61	0.33	0
M14	0.35	0.36	6.88	0.14	0
M16	0.35	0.39	5.78	0.20	0
M17	0.35	0.32	7.60	0.11	0
M18	0.35	0.32	7.60	0.11	0
MT1	0.24	0.18	10.16	0.04	41
MT2A	0.30	0.34	6.44	0.15	18
MT2B	0.35	0.36	6.85	0.11	7
MT2C	0.35	0.35	4.86	0.29	0
MT3	0.35	0.39	5.81	0.16	0
MT4A	0.35	0.35	4.79	0.31	0
MT4B	0.35	0.37	5.15	0.28	0
MT5	0.35	0.39	6.15	0.18	0
MT6	0.35	0.32	7.60	0.11	0
L1	0.25	0.29	6.81	0.14	31
L3	0.27	0.27	7.35	0.11	31
L5	0.35	0.38	5.40	0.22	3
L7	0.35	0.36	6.84	0.12	0
L8	0.35	0.39	5.71	0.20	0
L9	0.35	0.38	6.50	0.16	0
L11	0.35	0.35	4.19	0.41	0
L12	0.35	0.35	2.96	0.84	0
L13	0.35	0.35	2.64	1.05	0

Table 4.5- Green-Ampt Parameters for Watersheds 3 & 4

Sub-Basin	IA inches	DTHETA	PSIF	Adj. XKSAT in./hr.	RTIMP %
L14	0.35	0.35	2.35	1.30	0
L15	0.35	0.35	4.74	0.31	0
L16	0.35	0.39	6.20	0.18	0
L17	0.35	0.32	7.60	0.11	0
LT1A	0.29	0.32	6.67	0.14	20
LT1B	0.34	0.38	6.32	0.16	4
LT1C	0.35	0.38	5.62	0.21	6
LT2	0.27	0.23	9.18	0.06	25
LT3A	0.35	0.39	6.20	0.16	2
LT3B	0.35	0.39	6.23	0.16	0
LT4A	0.35	0.26	9.15	0.05	5
LT4B	0.35	0.31	7.73	0.09	0
LT5A	0.35	0.35	2.89	0.86	0
LT5B	0.35	0.35	3.55	0.57	0
LT6	0.35	0.35	3.21	0.72	0
LT7A	0.35	0.38	5.41	0.23	0
LT7B1	0.35	0.32	7.60	0.11	0
LT7B2	0.35	0.32	7.60	0.11	0
LT7C	0.35	0.32	7.60	0.11	0
LT7D	0.35	0.32	7.60	0.11	0
BC1	0.35	0.38	5.63	0.21	1
BC2	0.35	0.38	5.50	0.22	0
BC3	0.35	0.40	5.95	0.19	0

Unit Hydrograph Procedure

The S-Graph procedure was used to obtain the unit hydrographs for Watershed's 3 & 4 because the total drainage areas for Watersheds 3 & 4 are greater than 10 square miles each. Lag time is

calculated using the following equation from the DDM (pg 5-24):

$$Lag = C(LL_{ca}/S^{P})^{m}$$

where Lag is the basin's lag time in hours and

L = length of flow path in miles,
L_{ca} = length along the watercourse to a point opposite the centroid in miles,
S = watercourse slope in feet/mile,
C = 20 k_n, Coefficient that relates the watersheds roughness.

C was obtained from Figure 5.11 of Appendix K in the DDM. According to the U.S. Army Corps of Engineers the New River at New River Arizona has a K_n of 0.045. The New River at New River is adjacent to Watersheds 3 & 4, and has many similar characteristics, therefore a k_n of 0.045 was chosen for Watersheds 3 & 4. P is equal to 0.5, and m is equal to 0.38 according to the U.S. Army Corps of Engineers' equations. Calculations of Lag Time are presented in Appendix D.2 at the end of this report. Table 4.6 summarizes the calculations

Table 4.6- Sub-Basin Lag Time Summary

Sub-Basin	L, miles	L_{ca}, miles	S, feet/mile	Lag, minutes
M1	0.83	0.41	275	12
M3	2.79	1.50	210	34
M5	1.56	0.72	268	20
M6	1.55	0.83	496	18
M8	1.44	0.58	449	16
M10	1.60	0.65	623	16
M11	1.64	0.68	469	17
M13	1.25	0.48	776	13
M14	1.35	0.42	952	12
M16	1.97	0.98	625	20
M17	1.83	0.76	757	17
M18	1.61	0.82	1081	16
MT1	2.65	1.18	135	33
MT2A	1.80	1.02	200	25
MT2B	1.56	0.74	325	19

Table 4.6- Sub-Basin Lag Time Summary

Sub-Basin	L, miles	L_{ca}, miles	S, feet/mile	Lag, minutes
MT2C	2.28	1.19	407	25
MT3	2.99	1.46	333	31
MT4A	1.90	0.72	849	17
MT4B	1.67	0.95	654	19
MT5	2.12	0.94	773	20
MT6	1.39	0.77	1020	15
L1	1.32	0.57	155	19
L3	2.30	1.15	204	28
L5	1.21	0.42	228	15
L7	2.02	0.91	330	23
L8	1.34	0.60	470	15
L9	1.49	0.74	624	17
L11	1.54	0.80	478	18
L12	2.41	1.06	434	24
L13	2.31	0.96	390	23
L14	2.15	0.86	344	22
L15	1.56	0.57	620	15
L16	1.78	0.84	1094	17
L17	1.71	0.60	1035	15
LT1A	2.03	0.84	173	25
LT1B	1.62	0.52	271	17
LT1C	1.50	0.78	172	22
LT2	1.87	0.92	264	23
LT3A	1.83	0.82	282	22
LT3B	2.20	1.12	413	24
LT4A	1.56	0.70	356	18
LT4B	1.97	0.91	440	21

Table 4.6- Sub-Basin Lag Time Summary

Sub-Basin	L, miles	L_{ca}, miles	S, feet/mile	Lag, minutes
LT5A	2.40	1.27	412	26
LT5B	2.50	0.96	339	25
LT6	1.99	0.94	581	20
LT7A	1.64	0.70	577	17
LT7B1	2.10	1.10	940	20
LT7B2	1.56	0.70	904	15
LT7C	1.30	0.64	1553	12
LT7D	1.04	0.51	1424	11
BC1	1.83	0.83	220	23
BC2	2.05	0.88	353	22
BC3	1.51	0.57	410	16

Page 5-20 of the DDM states that the HEC-1 computation interval, or time step (NMIN), should equal about 0.15 times the lag time, or be within a range from 0.1 to 0.25 times the lag time (Sabol, 1995). Based on the lag times shown in Table 4.6, the time step for the Moore's Gulch HEC-1 model (Moores.hc1) was selected to be 2 minutes, the Little Squaw Creek HEC-1 Model (LSC.hc1) was selected to be two minutes, and the time step for Wash 8N2ES16 HEC-1 model (BCC.hc1) was selected to be 2 minutes. These calculations are provided in Appendix D.2.

The S-Graph chosen to create the unit hydrographs for each model is the Phoenix Mountain S-Graph, as shown in the DDM (pg 5-22). The time step for the watershed (NMIN) and calculated lag time for each sub-basin was entered into WMS, which calculated the unit hydrograph for each sub-basin and prepared it for input into the HEC-1 input file.

Channel Routing

There are thirty-five reaches that require channel routing. Normal depth routing was performed in HEC-1 for these reaches. The Cross-sections were created in WMS using the cross section editor on a DEM. Normal depth was calculated using WMS's channel calculator. Cross-section plots are provided in Appendix D.3, along with the calculation results. Table 4.7 summarizes the normal depth routing calculations.

Table 4.7- Channel Routing Parameters for Normal Depth Routing

Reach	Reach Length* feet	Slope ft/ft	Velocity fps	NSTPS
RM2	2295	0.01768	11.541	1

Table 4.7- Channel Routing Parameters for Normal Depth Routing

Reach	Reach Length* feet	Slope ft/ft	Velocity fps	NSTPS
RM4	7420	0.01405	7.109	6
RM6	4756	0.01747	7.623	3
RM7	3639	0.01872	8.01	3
RM9	6023	0.01962	8.266	4
RM11	4614	0.02097	7.555	3
RM12	7632	0.0276	12.615	3
RM14	4985	0.02823	12.232	2
RM15	5167	0.03273	12.431	2
RM17	4907	0.05738	14.16	2
RM18	5144	0.0800	11.07	3
RMT2B	7796	0.0295	8.366	5
RMT2C	5798	0.0393	11.376	3
RMT4B	3498	0.0416	10.412	2
RL2	4673	0.0189	14	3
RL4	8237	0.0193	8	9
RL6	3643	0.0184	8	4
RL8	6667	0.0202	9	6
RL9	3019	0.0209	9	3
RL10	1478	0.0264	11	1
RL12	3791	0.0322	12	3
RL13	1974	0.0354	13	1
RL14	6706	0.0442	13	4
RL15	7280	0.0359	13	5
RL16	4972	0.0452	9	5
RL17	3414	0.0755	13	2
RLT1B	9734	0.0215	8	10
RLT1C	1642	0.0215	16	1

Table 4.7- Channel Routing Parameters for Normal Depth Routing

Reach	Reach Length* feet	Slope ft/ft	Velocity fps	NSTPS
RLT3B	6271	0.0281	10	5
RLT4B	4856	0.0192	6	7
RLT5B	4915	0.0614	13	3
RLT7B	6841	0.0422	12	5
RLT7C	5450	0.0807	12	4
RLT7D	6738	0.1133	16	4

* Reach length and slope are obtained from WMS by listing the stream segment length (SL) and stream segment slope (SS). These values may match maximum stream length (MSL) and maximum stream slope (MSS) in some cases, but not in all cases. SL and SS will not match MSL and MSS if there is a stream defined in WMS that is not the routing reach, but it is longer than the routing reach.

Reservoir Storage Routing

There are several locations at Interstate 17 where the runoff could back up at culverts causing a need to perform reservoir storage routing. Reservoir storage routing was not performed in this study due to its nature of being a Zone A Delineation Study and the difference between the accuracy of the surveyed culvert data and the topography used in this study. Several of the culvert invert elevations are about 5 feet lower than the aerial mapping shows. Additionally, reservoir routing was performed on a couple of the culverts in order to see the effect on the peak flows. The results showed that the storage upstream of the culverts did not significantly alter the downstream peak flow quantities. Therefore, reservoir storage routing has not been performed.

4.3 Problems Encountered During the Study

4.3.1 Special Problems and Solutions

Modeling watersheds in WMS using DEMs, TINs, and Map Objects presents a problem when two branches of a stream join at a confluence point. When using the DEM, TIN, or Map modules for watershed modeling, WMS will not allow an outlet to exist without a connected sub-basin. If two washes are combining, and each wash is receiving routed flow from an upstream sub-basin, four hydrographs will be generated and combined at the confluence point. It is often desirable, especially in floodplain modeling, to know the combined peak flow of a routing reach and a sub-basin before the flows are combined at a tributary confluence. For Watersheds 3 & 4 this problem was avoided by adding an outlet just upstream of a confluence, and one downstream, at the next grid point. This creates small drainage areas in the WMS Map Files that have negligible area. The input unit hydrographs for each of these small "Dummy" sub-basins was set to a series of zeros, which produces an outflow from these sub-basins of 0 cfs. These sub-basins are labeled as "Dummy Drainage Areas" in the HEC-1 model.

Another inconvenience with WMS is that it inserts a routing reach label for every outlet or

concentration point. The result is that the last card in each HEC-1 model is a blank routing card that has no data in it. For Little Squaw Creek and Wash 8N2ES16 the peak flows are the same for the furthest downstream concentration point and routing reach. In the Moores Gulch model it changes slightly. Nevertheless, this is not a problem because the peak flow at the concentration point is used for floodplain modeling.

A problem was encountered using the Watershed Modeling System (WMS v6.1) to run the HEC-1 model for Moore's Gulch. After opening the moores.wpr file (WMS project file) one of the unit hydrograph records was duplicated throughout the HEC-1 input file. In order to remedy this problem the moores.hc1 file was read in separately, which properly assigned the appropriate unit hydrographs to their respective basins.

Note: After reading in the *.hc1 file the user must verify that the JD cards have not been duplicated and that their rainfall patterns are properly assigned. Storms 1 and 2 should use rainfall Pattern 1 while Storms 3,4, and 5 should use Patterns 2, 3, and 4, respectively.

This problem is currently being investigated by EMS-I and EMRL, the distributors and developers of WMS.

4.3.2 Modeling Warning and Error Messages

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

4.4 Calibration

Recorded data has not been used to calibrate the model at this stage of the study.

4.5 Final Results

4.5.1 Hydrologic Analysis Results

Table 4.8 lists the results of the hydrologic analysis.

Table 4.8- HEC-1 Results

Drainage ID	Peak Discharge cfs	Time to Peak hours	Runoff Volume acre-feet	Area sq. miles	Unit Peak cfs/sq. mi.
CPM1	9321	4.93	1048	14.71	634
M1	751	4.10	26	0.27	2781
CPM2	9360	4.90	1033	14.44	648
CPM3	8993	4.90	954	13.83	650
M3	1326	4.37	107	0.96	1381
CPM4	8803	4.73	878	12.88	683

Table 4.8- HEC-1 Results

Drainage ID	Peak Discharge cfs	Time to Peak hours	Runoff Volume acre-feet	Area sq. miles	Unit Peak cfs/sq. mi.
CPM5	7548	4.73	732	10.78	700
M5	1141	4.17	61	0.53	2153
CPM6	7567	4.60	690	10.25	738
M6	1390	4.17	61	0.75	1853
CPM7	7487	4.53	657	9.50	788
CPM8	6920	4.53	598	8.63	802
M8	1619	4.13	68	0.86	1883
CPM9	6875	4.43	560	7.77	885
CPM10	6101	4.47	491	6.49	940
M10	1415	4.13	57	0.72	1965
CPM11	5872	4.40	457	5.77	1018
M11	1342	4.13	56	0.70	1917
CPM12	5589	4.30	424	5.07	1102
CPM13	4735	4.33	358	4.12	1149
M13	1523	4.10	57	0.66	2308
CPM14	4355	4.27	319	3.46	1259
M14	2055	4.10	83	0.82	2506
CPM15	3671	4.23	252	2.64	1391
CPM16	2977	4.27	186	1.94	1535
M16	1274	4.17	62	0.65	1960
CPM17	2447	4.20	135	1.29	1897
M17	1501	4.13	71	0.65	2309
CPM18	1550	4.13	69	0.64	2422
CPMT1	1109	4.33	94	0.60	1848
CPMT2A	2396	4.47	199	2.10	1141
MT2A	962	4.23	58	0.48	2004

Table 4.8- HEC-1 Results

Drainage ID	Peak Discharge cfs	Time to Peak hours	Runoff Volume acre-feet	Area sq. miles	Unit Peak cfs/sq. mi.
CPMT2B	2161	4.27	149	1.62	1334
MT2B	1476	4.17	76	0.68	2171
CPMT2C	1403	4.23	82	0.94	1493
CPMT3	1251	4.33	85	0.87	1438
CPMT4A	2017	4.20	104	1.27	1588
MT4A	1526	4.13	67	0.78	1956
CPMT4B	1038	4.17	45	0.49	2118
CPMT5	1726	4.17	88	0.95	1817
CPMT6	1691	4.13	75	0.70	2416
CPL1	9190	5.10	1105	17.36	529
L1	1150	4.17	63	0.47	2447
CPL2	9209	5.03	1059	16.89	545
CPL3	9036	5.03	980	16.16	559
L3	1176	4.27	85	0.62	1897
CPL4	9053	4.83	915	15.54	583
CPL5	8643	4.83	843	14.38	601
L5	724	4.13	29	0.29	2497
CPL6	8779	4.73	826	14.09	623
CPL7	8027	4.73	699	12.68	633
L7	1387	4.20	78	0.74	1874
CPL8	8001	4.57	644	11.94	670
L8	1489	4.13	61	0.64	2327
CPL9	7898	4.50	607	11.29	700
L9	985	4.13	42	0.42	2345
CPL10	7736	4.50	580	10.88	711
CPL11	7212	4.50	532	8.95	806

Table 4.8- HEC-1 Results

Drainage ID	Peak Discharge cfs	Time to Peak hours	Runoff Volume acre-feet	Area sq. miles	Unit Peak cfs/sq. mi.
L11	1210	4.17	52	0.63	1921
CPL12	7042	4.43	504	8.32	846
L12	1053	4.23	52	0.89	1183
CPL13	6884	4.40	485	7.43	927
L13	893	4.23	41	0.75	1191
CPL14	6855	4.33	475	6.67	1028
L14	872	4.20	39	0.82	1063
CPL15	6648	4.23	452	5.24	1269
L15	1622	4.13	68	0.78	2079
CPL16	2769	4.17	150	1.54	1798
L16	1441	4.13	64	0.67	2151
CPL17	1998	4.13	93	0.87	2297
CPLT1A	2462	4.40	194	1.88	1310
LT1A	1484	4.23	99	0.81	1832
CPLT1B	1849	4.20	104	1.07	1728
LT1B	1311	4.13	59	0.57	2300
CPLT1C	1005	4.20	51	0.50	2010
CPLT2	1540	4.20	102	0.73	2110
CPLT3A	1716	4.30	110	1.16	1479
LT3A	1135	4.20	59	0.58	1957
CPLT3B	1071	4.23	58	0.58	1847
CPLT4A	2332	4.23	163	1.41	1654
LT4A	1731	4.17	93	0.75	2308
CPLT4B	1393	4.20	75	0.67	2079
CPLT5A	1699	4.30	103	1.93	880
LT5A	1039	4.27	56	0.98	1060

Table 4.8- HEC-1 Results

Drainage ID	Peak Discharge cfs	Time to Peak hours	Runoff Volume acre-feet	Area sq. miles	Unit Peak cfs/sq. mi.
CPLT5B	1226	4.23	65	0.95	1291
LT6	976	4.17	42	0.61	1600
LT7A	979	4.13	41	0.43	2277
CPLT7B	3979	4.17	250	2.49	1598
LT7B1	1465	4.17	77	0.72	2035
LT7B2	1509	4.13	65	0.60	2515
CPLT7C	1477	4.10	56	0.51	2896
CPLT7D	1868	4.10	72	0.67	2788
CPBC1	2549	4.33	169	1.98	1287
BC1	1353	4.20	74	0.78	1735
CPBC2	1980	4.27	107	1.20	1650
BC2	1174	4.20	60	0.64	1834
CPBC3	1313	4.13	55	0.56	2345

Table 4.9 lists the peak flow values that will be used in the hydraulic modeling phase of the study.

Table 4.9- Peak Discharges Used in Hydraulic Calculations

Wash	Drainage ID	Peak Discharge
MooresGulch, Reach 1	CPM1	9321
MooresGulch, Reach 2	CPM3	8993
MooresGulch, Reach 3	CPM5	7548
MooresGulch, Reach 4	CPM6	7567
MooresGulch, Reach 5	CPM8	6920
MooresGulch, Reach 6	CPM10	6101
MooresGulch, Reach 7	CPM11	5872
MooresGulch, Reach 8	CPM13	4735
MooresGulch, Reach 9	CPM14	4355

Table 4.9- Peak Discharges Used in Hydraulic Calculations

Wash	Drainage ID	Peak Discharge
MooresGulch, Reach10	CPM16	2977
MooresGulch, Tributary 1	CPMT1	1109
MooresGulch, Tributary 2, Reach 1	CPMT2A	2396
MooresGulch, Tributary 2, Reach 2	CPMT2B	2161
MooresGulch, Tributary 2, Reach 3	CPMT2C	1403
MooresGulch, Tributary 3	CPMT3	1251
MooresGulch, Tributary 4, Reach 1	CPMT4A	2017
MooresGulch, Tributary 4, Reach 2	CPMT4B	1038
MooresGulch, Tributary 5	CPMT5	1726
MooresGulch, Tributary 6	CPMT6	1691
Little Squaw Creek, Reach 1	CPL1	9190
Little Squaw Creek, Reach 2	CPL3	9036
Little Squaw Creek, Reach 3	CPL5	8643
Little Squaw Creek, Reach 4	CPL7	8027
Little Squaw Creek, Reach 5	CPL8	8001
Little Squaw Creek, Reach 6	CPL9	7898
Little Squaw Creek, Reach 7	CPL11	7212
Little Squaw Creek, Tributary 1, Reach 1	CPLT1A	2462
Little Squaw Creek, Tributary 1, Reach 2	CPLT1B	1849
Little Squaw Creek, Tributary 1, Reach 3	CPLT1C	1005
Little Squaw Creek, Tributary 2	CPLT2	1540
Little Squaw Creek, Tributary 3, Reach 1	CPLT3A	1716
Little Squaw Creek, Tributary 3, Reach 2	CPLT3B	1071
Little Squaw Creek, Tributary 4, Reach 1	CPLT4A	2332
Little Squaw Creek, Tributary 4, Reach 2	CPLT4B	1393
Little Squaw Creek, Tributary 5, Reach 1	CPLT5A	1699
Little Squaw Creek, Tributary 5, Reach 2	CPLT5B	1226

Table 4.9- Peak Discharges Used in Hydraulic Calculations

Wash	Drainage ID	Peak Discharge
Wash 8N2ES16	CPBC1	2549

4.5.2 Verification of Results

The Flood Control District of Maricopa County's computer program DDMSW was used to compare three different regression equations to the HEC-1 results. The three equations are identified as USGS, Malvick, and Boughton. The comparison is provided in Appendix D6 in the form of graphs showing a plot of the regression equation as a line and the HEC-1 files as points.

All of the HEC-1 results are within the USGS envelope curves, and lie relatively close to the regressions equations. The HEC-1 discharges are slightly higher than Malvick's curve, and slightly lower than Boughton's curve. The different plots indicate that the HEC-1 discharges are within acceptable limits. True verification cannot occur because the watershed is ungaged.

Section 5: Hydraulics

5.1 Method Description

All of the washes delineated in this study are desert-mountain washes. Environmental Modeling Systems Incorporated's (EMS-I) Watershed Modeling System version 6.1 (WMS), dated January 21, 2003, was used to create a Triangulated Irregular Network (TIN) from the existing elevation data provided by the Flood Control District. Different tools within WMS were used to obtain cross sections and calculate both the normal and critical depths at each cross section. Locations of the cross sections are shown on the work study maps and in Appendix E5. Hydraulic Structures were analyzed using Haestad Method's Culvert Master and the Army Corps of Engineers bridge pier methodology. The floodplain delineation tools within WMS were then used to interpolate water surface elevations along the wash and to delineate the Zone A boundary for each wash.

The limits of each floodplain delineation reach matches the reaches used in the hydrologic modeling. Table 4.9 lists the reaches that are used in floodplain mapping, and the corresponding downstream hydrologic concentration point. On each wash, Reach 1 is located the closest to the Agua Fria River, and the reach numbering increases at each concentration point moving upstream. There are also several tributaries to Moores Gulch and Little Squaw Creek. The tributary that has a confluence with the main stream closest to the Agua Fria River is named Tributary 1, and the numbering increases at each confluence location upstream. Wash 8N2ES16, the third wash, has been labeled according to Maricopa County requirements, using the Township, Range, and Section numbers.

Only the portion of each wash and its tributaries located within Maricopa County are delineated.

5.2 Work Study Maps

Work study maps that show the floodplain delineations have been prepared at a scale of 1 inch = 500 feet, according to FEMA standards. A cover sheet shows the location of each wash and the corresponding floodplain in relation to each other. Each work study map shows the thalweg of each wash, the Zone A boundaries, and the cross sections used in the delineation.

5.3 Parameter Estimation

5.3.1 Roughness Coefficients

The procedures used to determine the Manning's "n" roughness coefficients are outlined in the USGS publication "Estimated Manning's Roughness Coefficients for Stream Channels and Floodplains in Maricopa County, Arizona" (April 1991). Based on field observations, the Manning's Roughness Coefficients were calculated for each wash in the channel and overbanks. A list of the roughness coefficients for each wash, photos of each wash, and description of how the roughness coefficients were obtained is provided in Appendix E.1.

5.4 Cross Section Description

Cross section locations were selected within each sub-basin that has a drainage area greater than 0.5 square miles. The location within each sub-basin was selected by looking at the profile and finding the most mild slope. A cross section location was selected along the portion of the wash with the mildest slope where the cross section would give the deepest water depth. This method was used to make sure that the depth of water within that reach was either equal to or greater than the portion of that reach with a steeper slope.

The cross sections were digitized into WMS, and a TIN was created of the elevation points. The plan and profile of each wash based on the TIN is provided in Appendix E5. Tools within WMS were used to cut the cross sections and weed out any unnecessary points. The peak flows listed in Tables 4.9 and 5.1 were then used in WMS's channel calculator to calculate both critical depth and normal depth at each cross section. If flow is supercritical, then critical depth was used to plot the floodplain boundaries. A plot of each cross section and the normal depth calculation results are provided in Appendix E.5.

5.5 Modeling Considerations

Because this study is only producing approximate Zone A delineations, many of the modeling considerations that would accompany a detailed study have not been considered in this study.

5.6 Floodway Modeling

Because this study is only producing approximate Zone A delineations floodways have not been modeled.

5.7 Problems Encountered During the Study

The straight forward procedures of Zone A delineations eliminated all significant problems. WMS, the hydraulic modeling software, does not produce any warning or error messages for normal depth calculations.

5.8 Calibration

Calibration was not performed as part of this study.

5.9 Final Results

Table 5.1 lists the results of the hydraulic calculations for both the normal depth and critical depth. Table 5.2 lists the values used to map the floodplain The floodplain delineation tools in WMS 6.1

were used to map the Zone A floodplain limits using the depth values listed in Table 5.2.

Table 5.1- Results of the Hydraulic Calculations

Wash	R.S. (mile)	Peak Q (cfs)	Normal Depth Calculations				Critical Depth (ft)	
			Depth (ft)	Top Width (ft)	Avg. Vel. (ft/s)	Froude No.	Depth (ft)	Avg. Vel. (ft/s)
Moores Gulch Reach 1	0.216	9321	11.7	98	11.9	0.74	10.0	15.0
Moores Gulch Reach 2	0.988	8993	10.1	268	7.2	0.59	8.2	11.2
Moores Gulch Reach 3	2.681	7548	8.4	331	6.7	0.63	7.4	9.4
Moores Gulch Reach 4	3.112	7567	7.7	237	7.8	0.68	6.6	10.6
Moores Gulch Reach 5	4.350	6920	6.3	188	8.6	0.73	5.3	10.9
Moores Gulch Reach 6	5.218	6101	3.7	216	8.3	0.79	3.1	9.7
Moores Gulch Reach 7	6.280	5872	13.9	51	14.6	0.92	13.3	15.7
Moores Gulch Reach 8	7.631	4735	7.7	87	11.8	0.97	7.6	12.1
Moores Gulch Reach 9	8.666	4355	10.0	53	14.1	1.03	10.2	13.8
Moores Gulch Reach 10	9.352	2977	7.6	55	14.2	1.28	8.4	11.6
Moores Gulch Tributary 1	0.104	1109	4.1	67	7.0	0.81	3.7	8.3
Moores Gulch Tributary 2 Reach 1	1.005	2396	5.6	109	7.6	0.78	5.0	9.2
Moores Gulch Tributary 2 Reach 2	2.185	2161	4.5	64	9.8	0.93	4.3	10.3

Table 5.1- Results of the Hydraulic Calculations

Wash	R.S. (mile)	Peak Q (cfs)	Normal Depth Calculations				Critical Depth (ft)	
			Depth (ft)	Top Width (ft)	Avg. Vel. (ft/s)	Froude No.	Depth (ft)	Avg. Vel. (ft/s)
Moores Gulch Tributary 2 Reach 3	3.165	1403	6.2	35	10.7	0.98	6.1	10.9
Moores Gulch Tributary 3	0.476	1251	5.8	45	9.1	0.91	5.6	9.7
Moores Gulch Tributary 4 Reach 1	0.238	2017	13.7	72	3.3	0.20	6.6	11.1
Moores Gulch Tributary 4 Reach 2	0.729	1038	4.5	35	10.2	1.05	4.6	9.8
Moores Gulch Tributary 5	0.106	1726	7.7	37	12.4	0.21	8.0	11.4
Moores Gulch Tributary 6	0.048	1691	10.4	26	12.4	0.96	10.2	12.8
Little Squaw Creek Reach 1	0.655	9190	11.0	77	13.3	0.78	9.5	15.9
Little Squaw Creek Reach 2	1.943	9036	8.7	246	8.2	0.69	7.5	11.1
Little Squaw Creek Reach 3	2.994	8643	5.7	389	6.7	0.65	4.7	9.2
Little Squaw Creek Reach 4	3.640	8027	8.8	176	9.1	0.71	7.6	11.9
Little Squaw Creek Reach 5	4.820	8001	10.3	196	8.6	0.70	8.9	11.8
Little Squaw Creek Reach 6	5.239	7898	9.9	137	10.8	0.82	9.2	12.6
Little Squaw Creek Reach 7	5.448	7212	10.7	62	15.1	0.96	10.4	15.6
Little Squaw Creek Tributary 1 Reach 1	1.538	2462	5.8	99	7.4	0.71	5.0	9.6

Table 5.1- Results of the Hydraulic Calculations

Wash	R.S. (mile)	Peak Q (cfs)	Normal Depth Calculations				Critical Depth (ft)	
			Depth (ft)	Top Width (ft)	Avg. Vel. (ft/s)	Froude No.	Depth (ft)	Avg. Vel. (ft/s)
Little Squaw Creek Tributary 1 Reach 2	2.225	1849	5.9	71	7.5	0.71	5.1	9.8
Little Squaw Creek Tributary 1 Reach 3	2.307	1005	4.5	108	4.9	0.63	3.6	7.9
Little Squaw Creek Tributary 2	0.393	1540	5.5	91	6.1	0.65	4.6	8.6
Little Squaw Creek Tributary 3 Reach 1	0.917	1716	5.5	64	8.3	0.81	5.0	9.7
Little Squaw Creek Tributary 3 Reach 2	1.420	1071	4.7	38	10.1	1.07	4.8	9.6
Little Squaw Creek Tributary 4 Reach 1	0.541	2332	5.5	143	6.0	0.64	4.6	8.6
Little Squaw Creek Tributary 4 Reach 2	1.568	1393	2.5	124	5.6	0.69	2.0	7.3
Little Squaw Creek Tributary 5 Reach 1	0.244	1680	6.8	40	12.4	1.18	7.3	10.8
Little Squaw Creek Tributary 5 Reach 2	1.660	1226	3.6	42	11.5	1.26	4.1	9.6
Wash 8N2ES16	0.203	2549	12.8	28	14.3	1.00	12.7	14.3

Table 5.2- Hydraulic Calculations Used in Floodplain Mapping

Wash	R.S. (mile)	Peak Q (cfs)	Depth Method Used	Depth Used (ft)	Top Width Used (ft)	Vel. Used (ft/s)
Moores Gulch Reach 1	0.216	9321	Subcritical	11.7	98	11.9
Moores Gulch Reach 2	0.988	8993	Subcritical	10.1	268	7.2
Moores Gulch Reach 3	2.681	7548	Subcritical	8.4	331	6.7
Moores Gulch Reach 4	3.112	7567	Subcritical	7.7	237	7.8
Moores Gulch Reach 5	4.350	6920	Subcritical	6.3	188	8.6
Moores Gulch Reach 6	5.218	6101	Subcritical	3.7	216	8.3
Moores Gulch Reach 7	6.280	5872	Subcritical	13.9	51	14.6
Moores Gulch Reach 8	7.631	4735	Subcritical	7.7	87	11.8
Moores Gulch Reach 9	8.666	4355	Critical	10.2	54	13.8
Moores Gulch Reach 10	9.352	2977	Critical	8.4	61	11.6
Moores Gulch Tributary 1	0.104	1109	Subcritical	4.1	67	7.0
Moores Gulch Tributary 2 Reach 1	1.005	2396	Subcritical	5.6	109	7.6
Moores Gulch Tributary 2 Reach 2	2.185	2161	Subcritical	4.5	64	9.8
Moores Gulch Tributary 2 Reach 3	3.165	1403	Subcritical	6.2	35	10.7
Moores Gulch Tributary 3	0.476	1251	Subcritical	5.8	45	9.1

Table 5.2- Hydraulic Calculations Used in Floodplain Mapping

Wash	R.S. (mile)	Peak Q (cfs)	Depth Method Used	Depth Used (ft)	Top Width Used (ft)	Vel. Used (ft/s)
Moores Gulch Tributary 4 Reach 1	0.238	2017	Subcritical	13.7	72	3.3
Moores Gulch Tributary 4 Reach 2	0.729	1038	Critical	4.6	35	9.8
Moores Gulch Tributary 5	0.106	1726	Critical	8.0	38	11.4
Moores Gulch Tributary 6	0.048	1691	Subcritical	10.4	26	12.4
Little Squaw Creek Reach 1	0.655	9190	Subcritical	11.0	77	13.3
Little Squaw Creek Reach 2	1.943	9036	Subcritical	8.7	246	8.2
Little Squaw Creek Reach 3	2.994	8643	Subcritical	5.7	388	6.7
Little Squaw Creek Reach 4	3.640	8027	Subcritical	8.8	176	9.1
Little Squaw Creek Reach 5	4.820	8001	Subcritical	10.3	196	8.6
Little Squaw Creek Reach 6	5.239	7898	Subcritical	9.9	137	10.8
Little Squaw Creek Reach 7	5.448	7212	Subcritical	10.7	62	15.1
Little Squaw Creek Tributary 1 Reach 1	1.538	2462	Subcritical	5.8	99	7.4
Little Squaw Creek Tributary 1 Reach 2	2.225	1849	Subcritical	5.9	71	7.5
Little Squaw Creek Tributary 1 Reach 3	2.307	1005	Subcritical	4.5	108	4.9

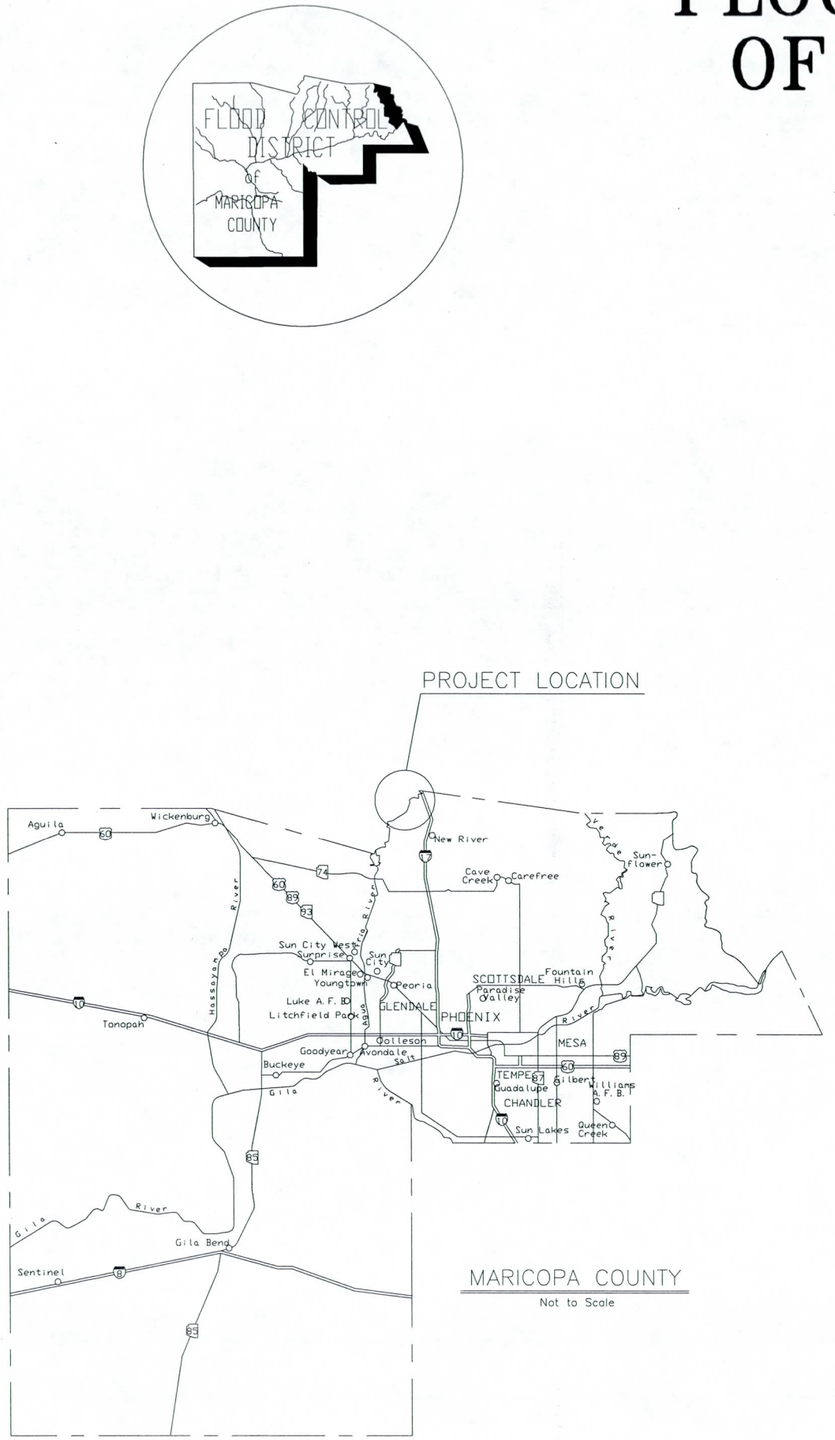
Table 5.2- Hydraulic Calculations Used in Floodplain Mapping

Wash	R.S. (mile)	Peak Q (cfs)	Depth Method Used	Depth Used (ft)	Top Width Used (ft)	Vel. Used (ft/s)
Little Squaw Creek Tributary 2	0.393	1540	Subcritical	5.5	91	6.1
Little Squaw Creek Tributary 3 Reach 1	0.917	1716	Subcritical	5.5	64	8.3
Little Squaw Creek Tributary 3 Reach 2	1.420	1071	Critical	4.8	39	9.6
Little Squaw Creek Tributary 4 Reach 1	0.541	2332	Subcritical	5.5	143	6.0
Little Squaw Creek Tributary 4 Reach 2	1.568	1393	Subcritical	2.5	124	5.6
Little Squaw Creek Tributary 5 Reach 1	0.244	1699	Critical	7.3	43	10.9
Little Squaw Creek Tributary 5 Reach 2	1.660	1226	Critical	4.1	45	9.6
Wash 8N2ES16	0.203	2549	Subcritical	12.8	28	14.3

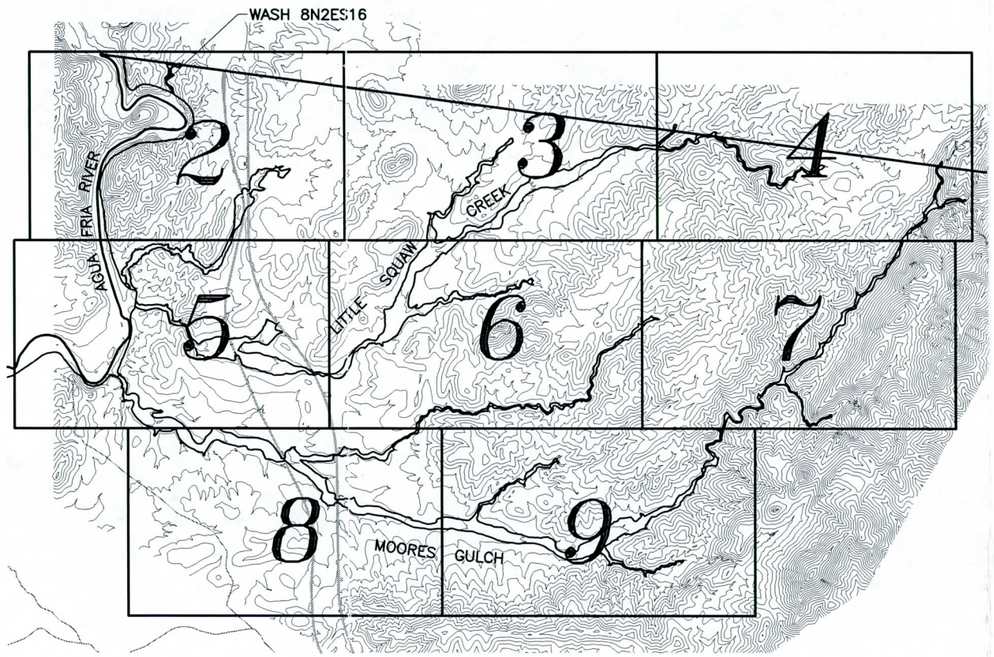
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

SUB WATERSHEDS 3 & 4
UPPER AGUA FRIA WATERSHED
ZONE A FLOODPLAIN DELINEATION STUDY
CONTRACT F.C.D. 2000C020

PROJECT LOCATION



MARICOPA COUNTY
Not to Scale



STUDY AREA MAP
AND SHEET INDEX

SHEET INDEX
SHEET 2-9 FLOOD DELINEATION STUDY

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SCALE: 1"= 6000 FEET
FLIGHT DATES:
12/16/2000-03/15/2001

HYDROLOGY & HYDRAULICS
RBF CONSULTING
16605 N 28TH AVENUE, SUITE 100
PHOENIX, ARIZONA, 85053
(602)467-2200

AERIAL PHOTOGRAPHY
LANDATA AIRBORNE SYSTEMS

CONTOUR INTERVAL: 10 FEET

GROUND CONTROL
RBF CONSULTING
16605 N 28TH AVENUE, SUITE 100
PHOENIX, ARIZONA, 85053
(602)467-2200

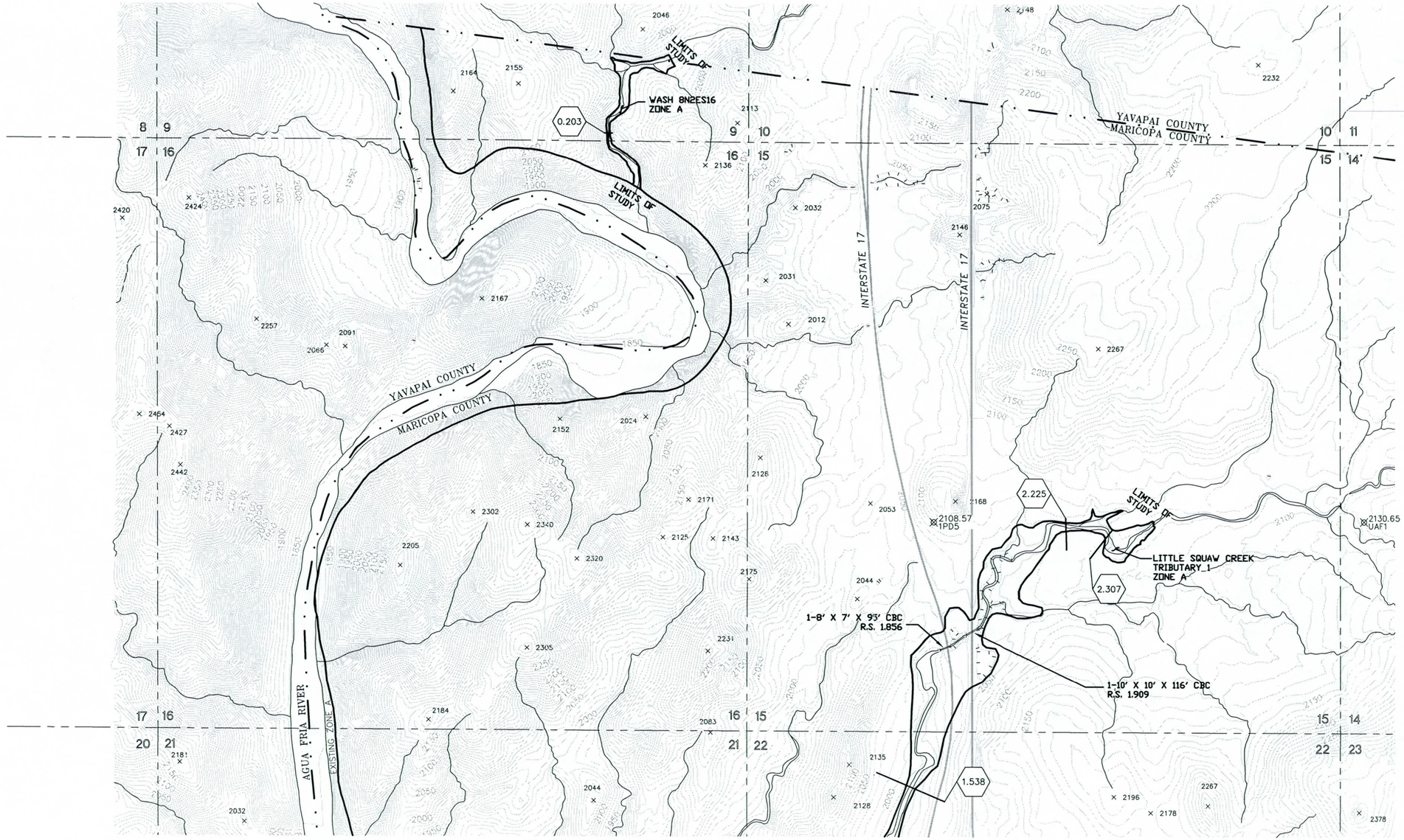
NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY

UPPER AGUA FRIA WATERSHED
SUB WATERSHEDS 3 & 4
ZONE A
FLOODPLAIN DELINEATION STUDY
F.C.D. CONTRACT NO. 2000C020

RBF CONSULTING
PLANNING ■ DESIGN ■ CONSTRUCTION
16605 NORTH 28th AVENUE, SUITE 100
PHOENIX, ARIZONA 85053-0902
602.467.2200 • FAX 602.467.2201 • www.RBF.com

	BY	DATE
DESIGN	W.JK	05/28/03
DESIGN CHK.	NEF	05/28/03
PLANS	FBW	05/28/03
PLANS CHK.	W.JK	05/28/03



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SCALE: 1"= 1000 FEET
FLIGHT DATES:
12/16/2000-03/15/2001

LEGEND

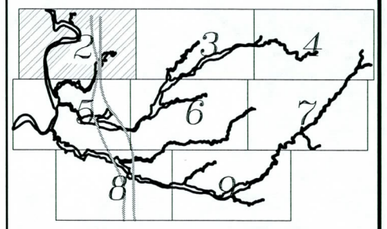
100-YR FLOODPLAIN BOUNDARY	
SECTION LINE	
CORPORATE LIMITS	Corporate Limits
COUNTY, PARISH, STATE OR INTERNATIONAL BOUNDARY	County Boundary
SECTION NUMBERS	32
ZONE DESIGNATIONS	ZONE A
ELEVATION REFERENCE MARK	1758.96 UAF 32
CROSS SECTION	0.1000 (CROSS SECTION INDEX MILL DESIGNATION)
TOPOGRAPHICAL DEPRESSIONS	

ELEVATION REFERENCE MARKS

NOTE: ALL ELEVATIONS ARE BASED ON NORTH AMERICA VERTICAL DATUM OF 1988.
TO CONVERT TO 1929 NGVD, SUBTRACT 2.27 FEET.

I.D. NUMBER	ELEVATION (FT)	DESCRIPTION/LOCATION
UAF 1	2130.65	SET FCDMC BRASS CAP AT LAT. N-34°02'09" LONG. W-112°08'02"
1PD 5	2108.57	FOUND AT LAT. N-34°02'8.93" LONG. W-112°08'48.19"

NOTES



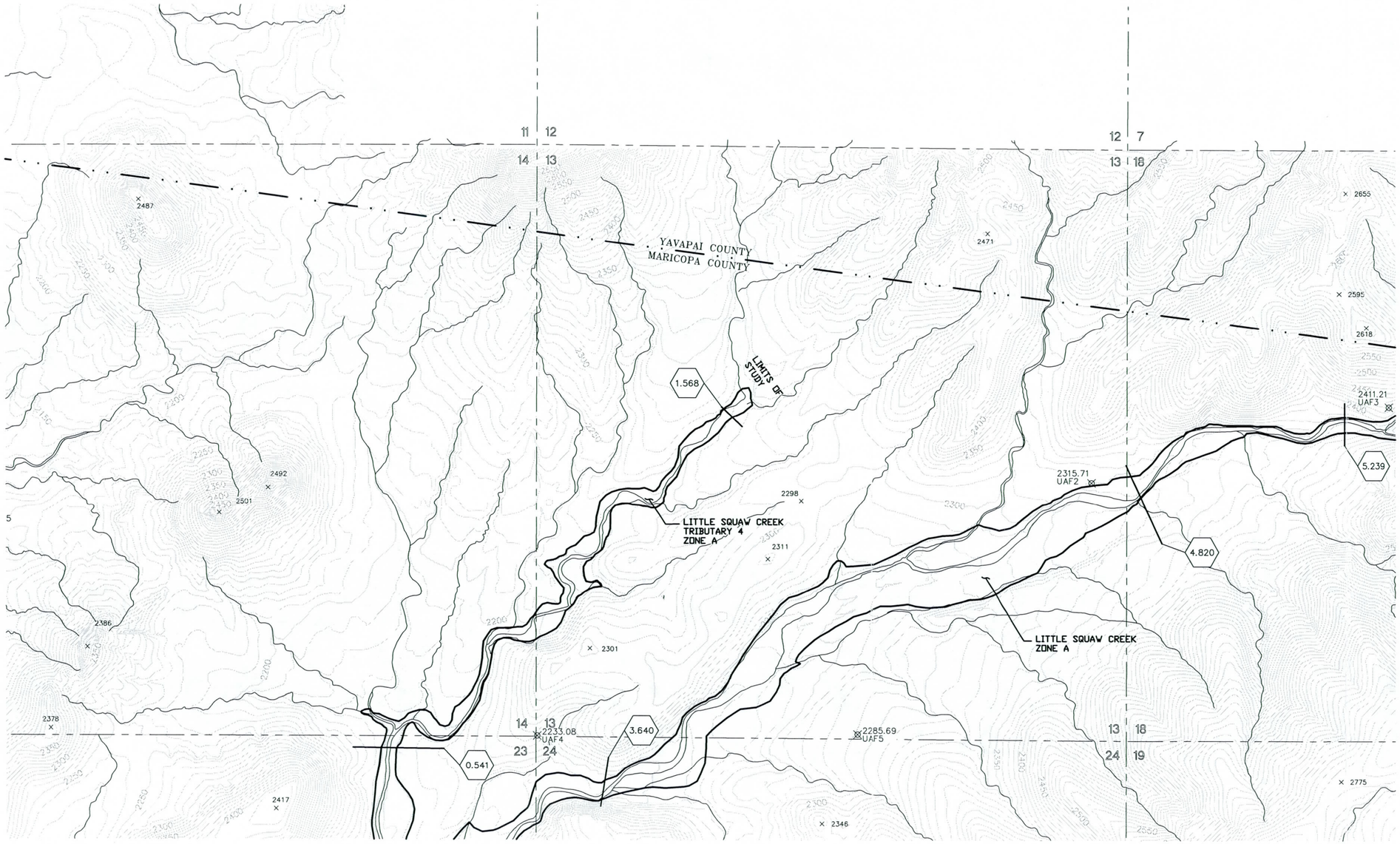
NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

UPPER AGUA FRIA WATERSHED
SUB WATERSHEDS 3 & 4
ZONE A
FLOODPLAIN DELINEATION STUDY
F.C.D. CONTRACT NO. 2000C020

RBF CONSULTING
PLANNING ■ DESIGN ■ CONSTRUCTION
9140S NORTH 28th AVENUE, SUITE 100
PHOENIX, ARIZONA 85002-0602
602.467.2200 • FAX 602.467.2201 • www.RBF.com

	BY	DATE
DESIGN	WJK	05/28/03
DESIGN CHK.	NEF	05/28/03
PLANS	FBW	05/28/03
PLANS CHK.	WJK	05/28/03



N

500' 0' 500' 1000'

SCALE: 1"= 1000 FEET

FLIGHT DATES:
12/16/2000-03/15/2001

LEGEND

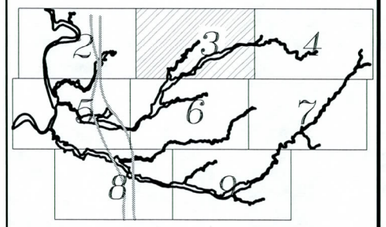
100-YR FLOODPLAIN BOUNDARY	
SECTION LINE	
CORPORATE LIMITS	Corporate Limits
COUNTY, PARISH, STATE OR INTERNATIONAL BOUNDARY	County Boundary
SECTION NUMBERS	32
ZONE DESIGNATIONS	ZONE A
ELEVATION REFERENCE MARK	⊠1758.96 UAF 32
CROSS SECTION	0.1000 (CROSS SECTION INDEX AND DESIGNATION)
TOPOGRAPHICAL DEPRESSIONS	

ELEVATION REFERENCE MARKS

NOTE: ALL ELEVATIONS ARE BASED ON NORTH AMERICA VERTICAL DATUM OF 1988. TO CONVERT TO 1929 NGVD, SUBTRACT 2.27 FEET.

I.D. NUMBER	ELEVATION (FT)	DESCRIPTION/LOCATION
UAF 4	2233.08	SET FCDMC BRASS CAP AT LAT. N-34°01'50" LONG. W-112°07'02"
UAF 5	2285.69	SET FCDMC BRASS CAP AT LAT. N-34°01'50" LONG. W-112°06'28"
UAF 2	2315.71	SET FCDMC BRASS CAP AT LAT. N-34°02'13" LONG. W-112°06'03"
UAF 3	2411.21	SET FCDMC BRASS CAP AT LAT. N-34°02'20" LONG. W-112°05'32"

NOTES



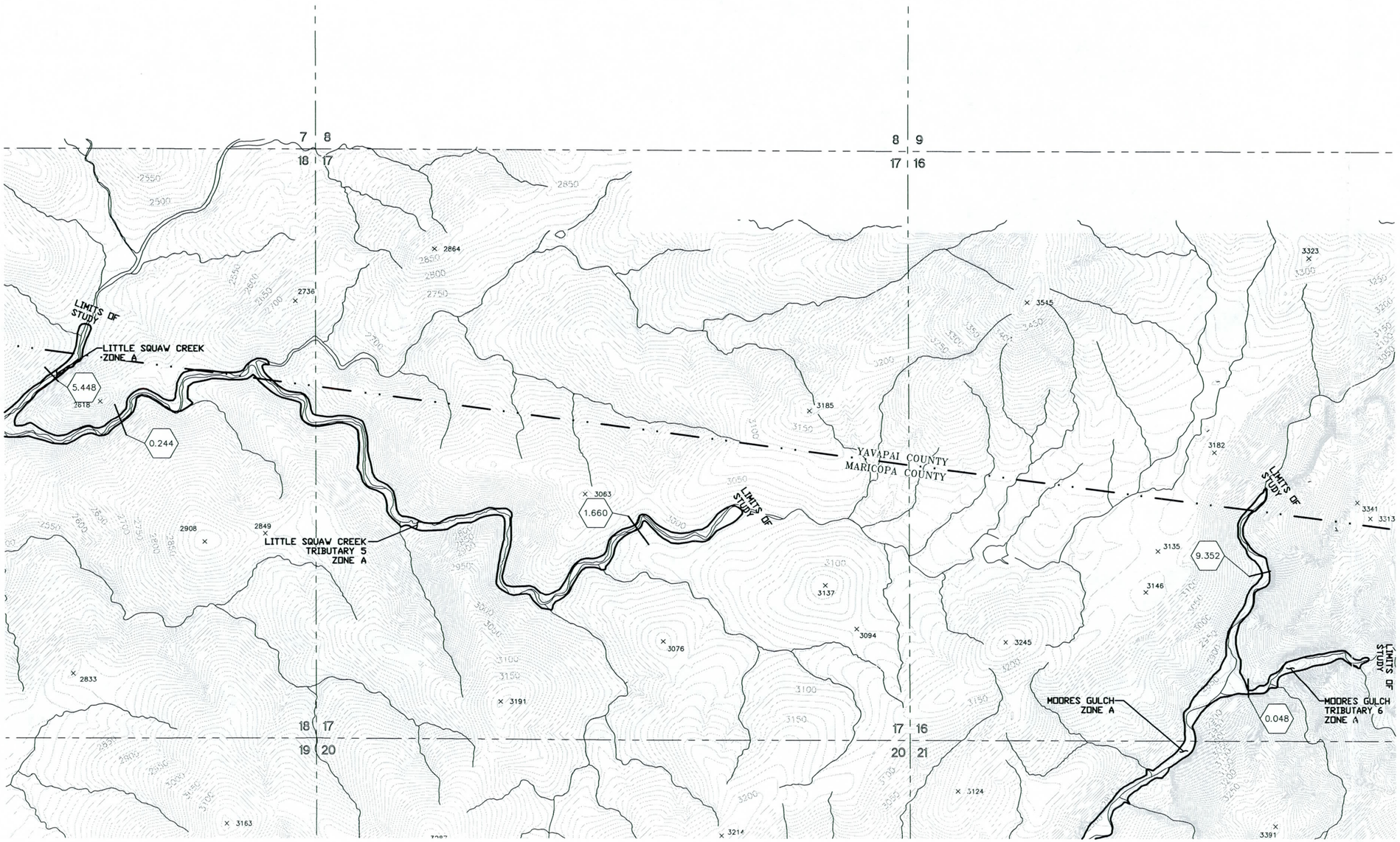
NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

UPPER AGUA FRIA WATERSHED
SUB WATERSHEDS 3 & 4
ZONE A
FLOODPLAIN DELINEATION STUDY
F.C.D. CONTRACT NO. 2000C020

RBF CONSULTING
PLANNING ■ DESIGN ■ CONSTRUCTION
9envi NORTH 28th AVENUE, SUITE 160
PHOENIX, ARIZONA 85027-2902
602-957-2200 • FAX 602-957-2291 • www.RBF.com

	BY	DATE
DESIGN	W.K	05/28/03
DESIGN CHK.	NEF	05/28/03
PLANS	FBW	05/28/03
PLANS CHK.	W.K	05/28/03



500' 0' 500' 1000'

SCALE: 1"= 1000 FEET
FLIGHT DATES:
12/16/2000-03/15/2001

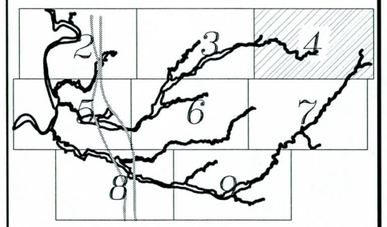
LEGEND

100-YR FLOODPLAIN BOUNDARY	
SECTION LINE	
CORPORATE LIMITS	Corporate Limits
COUNTY, PARISH, STATE OR INTERNATIONAL BOUNDARY	County Boundary
SECTION NUMBERS	32
ZONE DESIGNATIONS	ZONE A
ELEVATION REFERENCE MARK	⊗1758.96 UAF 32
CROSS SECTION	0.1000 (CROSS SECTION ENDS NO DOWNFLOW)
TOPOGRAPHICAL DEPRESSIONS	

ELEVATION REFERENCE MARKS

NOTE: ALL ELEVATIONS ARE BASED ON NORTH AMERICA VERTICAL DATUM OF 1988. TO CONVERT TO 1929 NGVD, SUBTRACT 2.27 FEET.

NOTES



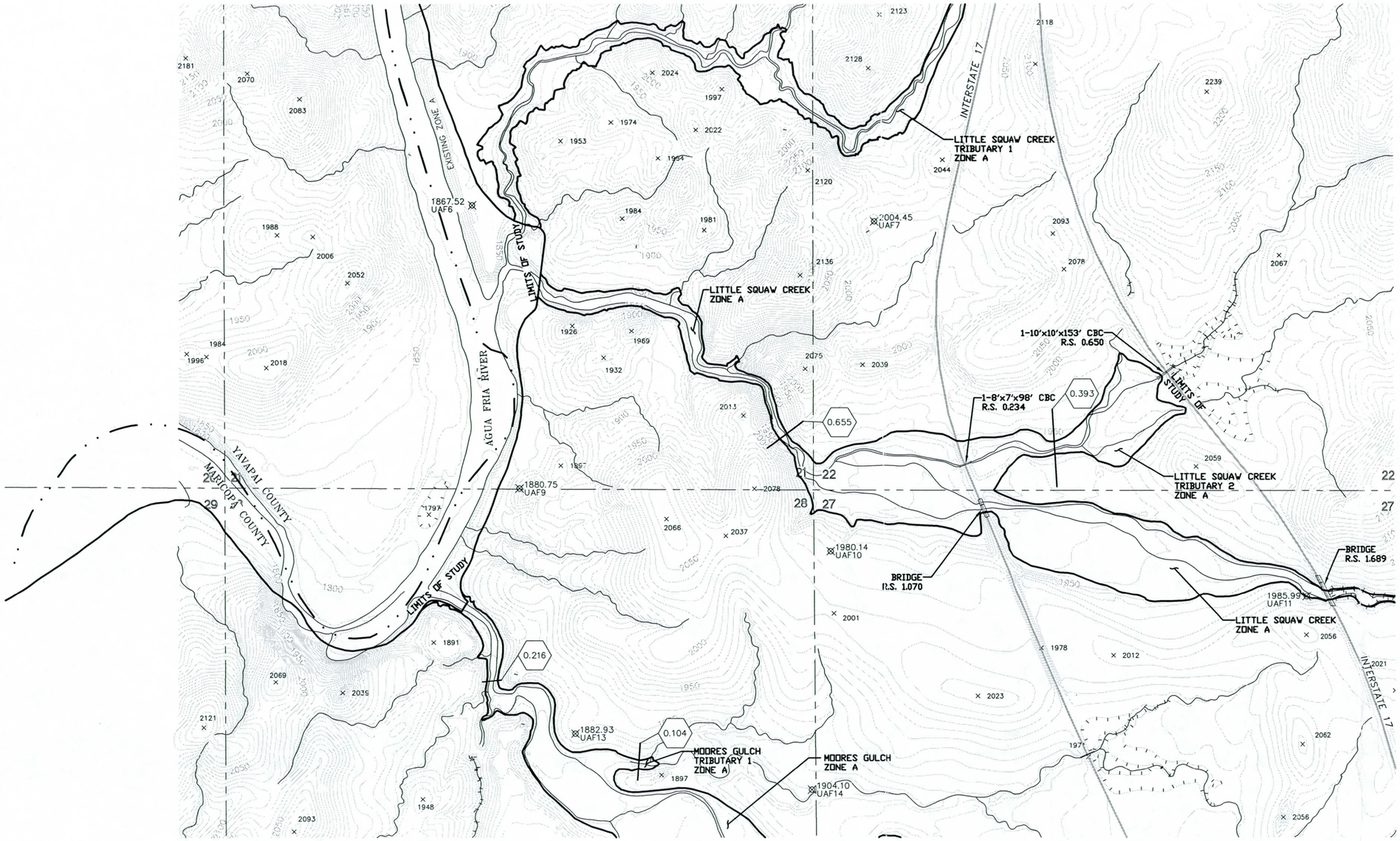
NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

UPPER AGUA FRIA WATERSHED
SUB WATERSHEDS 3 & 4
ZONE A
FLOODPLAIN DELINEATION STUDY
F.C.D. CONTRACT NO. 2000C020

RBF CONSULTING
PLANNING ■ DESIGN ■ CONSTRUCTION
8900E NORTH 28th AVENUE, SUITE 100
PHOENIX, ARIZONA 85032-3902
602.457.2200 • FAX 602.457.2205 • www.RBF.com

	BY	DATE
DESIGN	WJK	05/28/03
DESIGN CHK.	NEF	05/28/03
PLANS	FBW	05/28/03
PLANS CHK.	WJK	05/28/03



500' 0' 500' 1000'

SCALE: 1"= 1000 FEET

FLIGHT DATES:
12/16/2000-03/15/2001

LEGEND

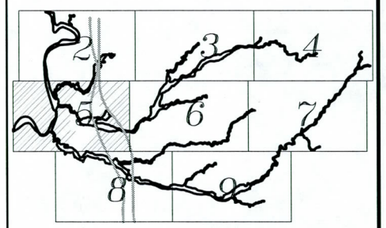
100-YR FLOODPLAIN BOUNDARY	
SECTION LINE	
CORPORATE LIMITS	Corporate Limits
COUNTY, PARISH, STATE OR INTERNATIONAL BOUNDARY	County Boundary
SECTION NUMBERS	32
ZONE DESIGNATIONS	ZONE A
ELEVATION REFERENCE MARK	1758.96 UAF 32
CROSS SECTION	0.1000 (CROSS SECTION INDEX NO.)
TOPOGRAPHICAL DEPRESSIONS	

ELEVATION REFERENCE MARKS

NOTE: ALL ELEVATIONS ARE BASED ON NORTH AMERICA VERTICAL DATUM OF 1988.
TO CONVERT TO 1929 NGVD, SUBTRACT 2.27 FEET.

I.D. NUMBER	ELEVATION (FT)	DESCRIPTION/LOCATION
UAF 6	1867.52	SET FCDMC BRASS CAP AT LAT. N-34°01'23" LONG. W-112°09'44"
UAF 7	2004.45	SET FCDMC BRASS CAP AT LAT. N-34°01'22" LONG. W-112°09'01"
UAF 9	1880.75	SET FCDMC BRASS CAP AT LAT. N-34°00'58" LONG. W-112°09'39"
UAF 10	1980.14	SET FCDMC BRASS CAP AT LAT. N-34°00'53" LONG. W-112°09'06"
UAF 11	1985.99	SET FCDMC BRASS CAP AT LAT. N-34°00'49" LONG. W-112°08'15"
UAF 13	1882.93	SET FCDMC BRASS CAP AT LAT. N-34°00'36" LONG. W-112°09'33"
UAF 14	1904.10	SET FCDMC BRASS CAP AT LAT. N-34°00'32" LONG. W-112°09'08"

NOTES



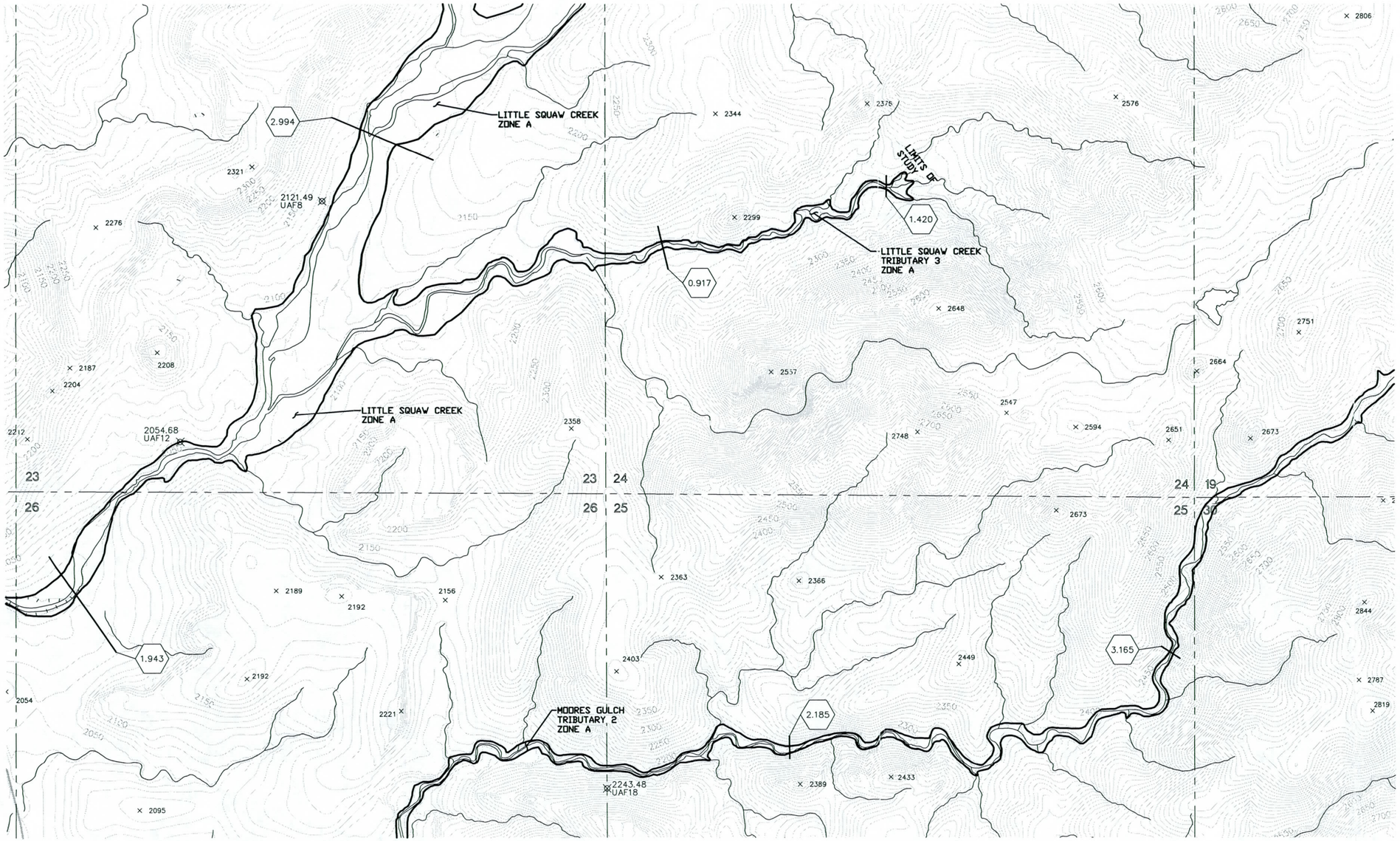
NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

UPPER AGUA FRIA WATERSHED
SUB WATERSHEDS 3 & 4
ZONE A
FLOODPLAIN DELINEATION STUDY
F.C.D. CONTRACT NO. 2000C020

RBF CONSULTING
PLANNING ■ DESIGN ■ CONSTRUCTION
3200E NORTH 28th AVENUE, SUITE 100
PHOENIX, ARIZONA 85032-3902
602.457.2200 • FAX 602.457.2299 • www.RBF.com

	BY	DATE
DESIGN	WJK	05/28/03
DESIGN CHK.	NEF	05/28/03
PLANS	FBW	05/28/03
PLANS CHK.	WJK	05/28/03



LEGEND

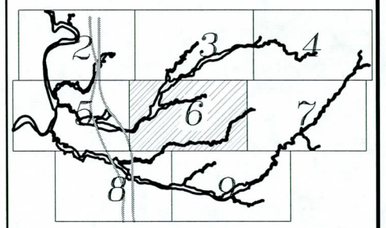
100-YR FLOODPLAIN BOUNDARY	
SECTION LINE	
CORPORATE LIMITS	Corporate Limits
COUNTY, PARISH, STATE OR INTERNATIONAL BOUNDARY	County Boundary
SECTION NUMBERS	32
ZONE DESIGNATIONS	ZONE A
ELEVATION REFERENCE MARK	⊠1758.96 UAF 32
CROSS SECTION	0.1000 (CROSS SECTION AND WSEL DESIGNATION)
TOPOGRAPHICAL DEPRESSIONS	

ELEVATION REFERENCE MARKS

NOTE: ALL ELEVATIONS ARE BASED ON NORTH AMERICA VERTICAL DATUM OF 1988. TO CONVERT TO 1929 NGVD, SUBTRACT 2.27 FEET.

I.D. NUMBER	ELEVATION (FT)	DESCRIPTION/LOCATION
UAF 8	2121.49	SET FCDMC BRASS CAP AT LAT. N-34°01'24" LONG. W-112°07'32"
UAF 12	2054.68	SET FCDMC BRASS CAP AT LAT. N-34°01'02" LONG. W-112°07'48"
UAF 18	2243.48	SET FCDMC BRASS CAP AT LAT. N-34°00'32" LONG. W-112°07'02"

NOTES



NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

UPPER AGUA FRIA WATERSHED
SUB WATERSHEDS 3 & 4
ZONE A
FLOODPLAIN DELINEATION STUDY
F.C.D. CONTRACT NO. 2000C020

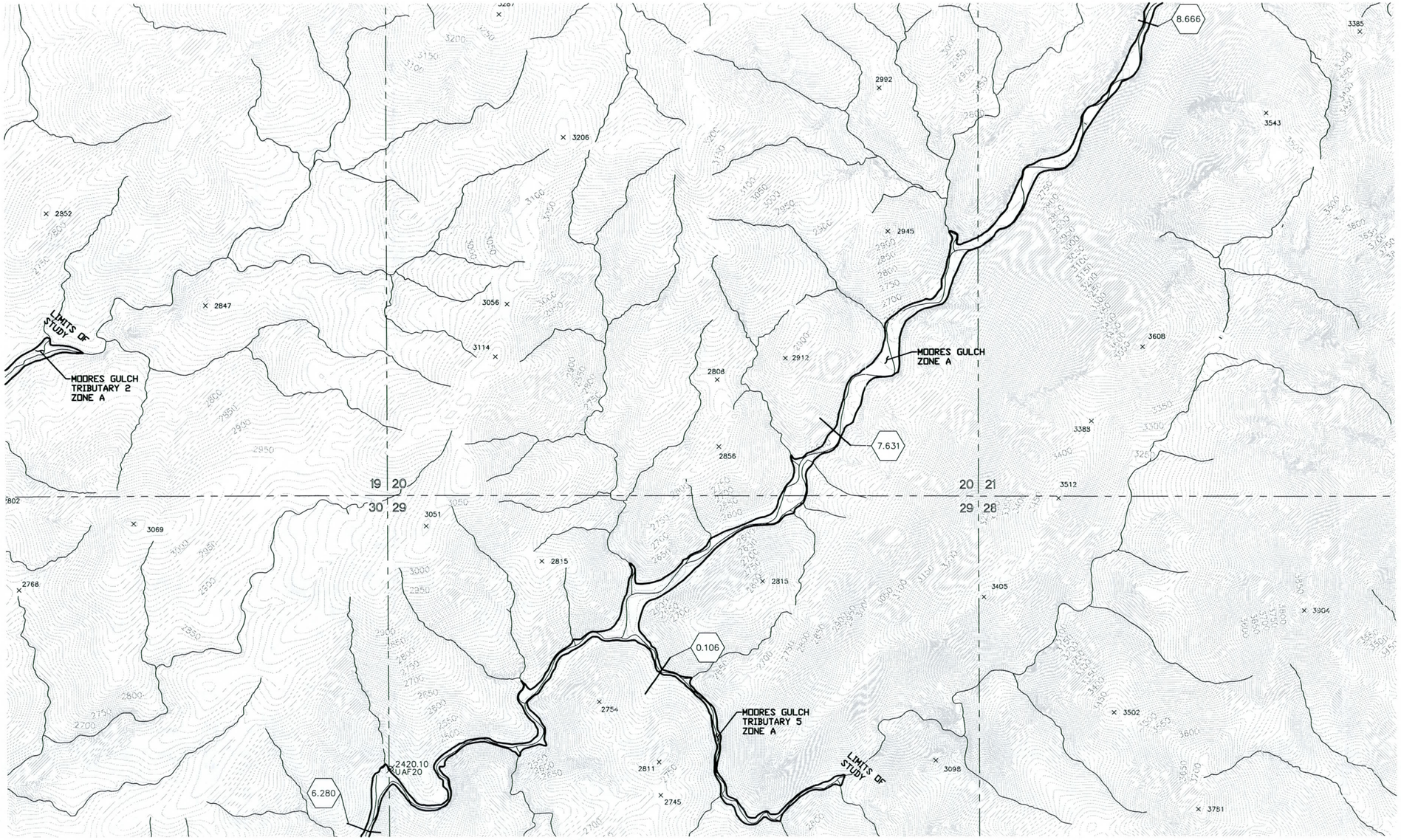
500' 0' 500' 1000'

SCALE: 1"= 1000 FEET
FLIGHT DATES:
12/16/2000-03/15/2001

RBF CONSULTING — PLANNING ■ DESIGN ■ CONSTRUCTION
3200 NORTH 28th AVENUE, SUITE 100
PHOENIX, ARIZONA 85012-3902
602.457.2200 • FAX 602.457.2201 • www.RBF.com

	BY	DATE
DESIGN	WJK	05/28/03
DESIGN CHK.	NEF	05/28/03
PLANS	FBW	05/28/03
PLANS CHK.	WJK	05/28/03

SHEET 6 OF 9



N

500' 0' 500' 1000'

SCALE: 1"= 1000 FEET

FLIGHT DATES:
12/16/2000-03/15/2001

LEGEND

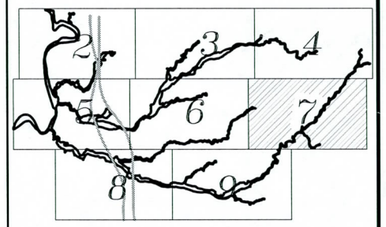
100-YR FLOODPLAIN BOUNDARY	
SECTION LINE	
CORPORATE LIMITS	Corporate Limits
COUNTY, PARISH, STATE OR INTERNATIONAL BOUNDARY	County Boundary
SECTION NUMBERS	32
ZONE DESIGNATIONS	ZONE A
ELEVATION REFERENCE MARK	⊠ 1758.96 UAF 32
CROSS SECTION	0.1000 (CROSS SECTION INDEX NO.)
TOPOGRAPHICAL DEPRESSIONS	

ELEVATION REFERENCE MARKS

NOTE: ALL ELEVATIONS ARE BASED ON NORTH AMERICA VERTICAL DATUM OF 1988.
TO CONVERT TO 1929 NGVD, SUBTRACT 2.27 FEET.

I.D. NUMBER	ELEVATION (FT)	DESCRIPTION/LOCATION
UAF 20	2420.10	SET FCDMC BRASS CAP AT LAT. N-34°00'24" LONG. W-112°04'58"

NOTES



NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

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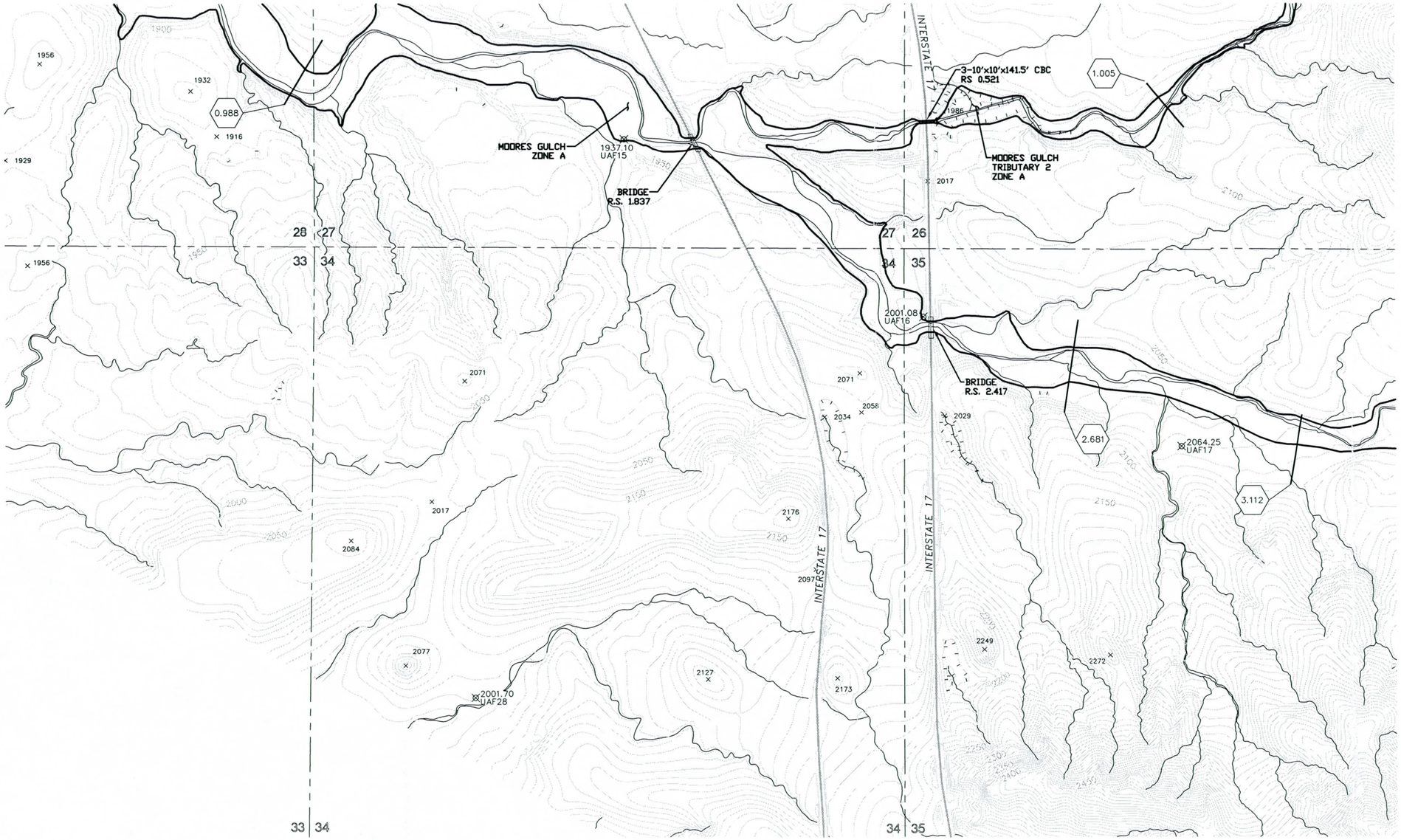
8600 NORTH 23RD AVENUE, SUITE 100
PHOENIX, ARIZONA 85021-5902
602.457.2200 • FAX 602.457.2205 • www.RBF.com

	BY	DATE
DESIGN	WJK	05/28/03
DESIGN CHK.	NEF	05/28/03
PLANS	FBW	05/28/03
PLANS CHK.	WJK	05/28/03



N

500' 0' 500' 1000'

SCALE: 1"= 1000 FEET

FLIGHT DATES:
12/16/2000-03/15/2001

LEGEND

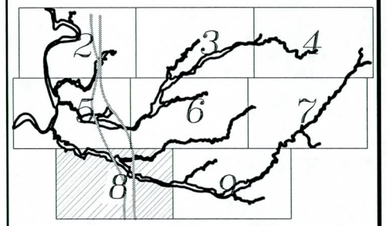
100-YR FLOODPLAIN BOUNDARY	
SECTION LINE	
CORPORATE LIMITS	Corporate Limits
COUNTY, PARISH, STATE OR INTERNATIONAL BOUNDARY	County Boundary
SECTION NUMBERS	32
ZONE DESIGNATIONS	ZONE A
ELEVATION REFERENCE MARK	⊠1758.96 UAF32
CROSS SECTION	0.1000 (CROSS SECTION RINDS SKET DESIGNATION)
TOPOGRAPHICAL DEPRESSIONS	

ELEVATION REFERENCE MARKS

NOTE: ALL ELEVATIONS ARE BASED ON NORTH AMERICA VERTICAL DATUM OF 1988. TO CONVERT TO 1929 NGVD, SUBTRACT 2.27 FEET.

I.D. NUMBER	ELEVATION (FT)	DESCRIPTION/LOCATION
UAF 28	2001.70	SET FCDMC BRASS CAP AT LAT. N-33°59'26" LONG. W-112°08'51"
UAF 15	1937.10	SET FCDMC BRASS CAP AT LAT. N-34°00'15" LONG. W-112°08'35"
UAF 16	2001.08	SET FCDMC BRASS CAP AT LAT. N-34°00'00" LONG. W-112°08'03"
UAF 17	2064.25	SET FCDMC BRASS CAP AT LAT. N-33°59'48" LONG. W-112°07'35"

NOTES



NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

UPPER AGUA FRIA WATERSHED
SUB WATERSHEDS 3 & 4
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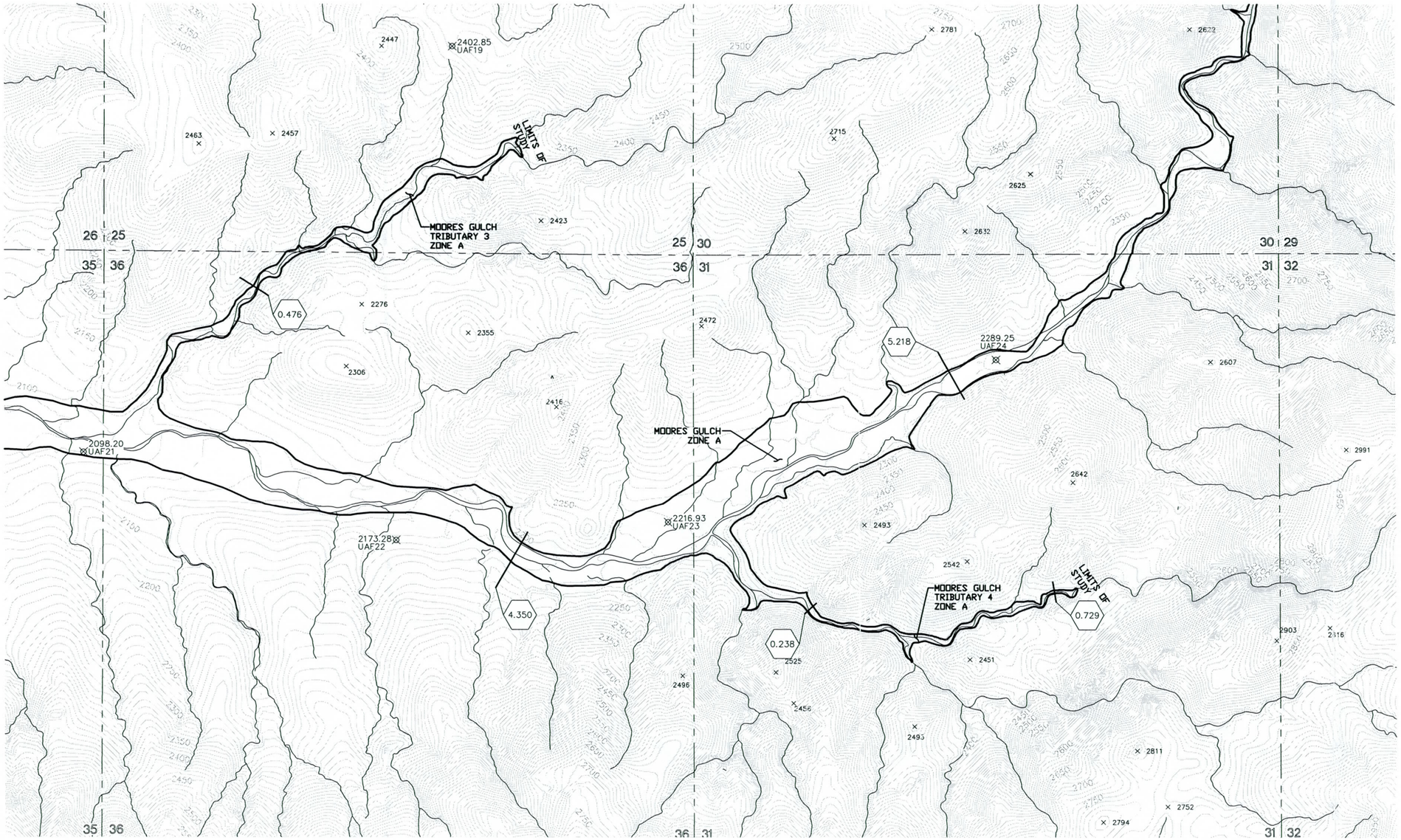
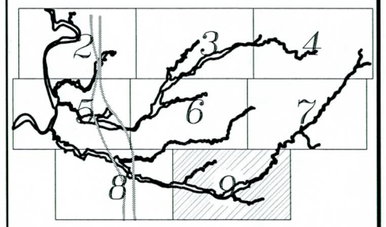
RBF CONSULTING
PLANNING & DESIGN & CONSTRUCTION
3200 NORTH 28th AVENUE, SUITE 100
PHOENIX, ARIZONA 85012-3402
602.457.2200 • FAX 602.457.2201 • www.RBF.com

	BY	DATE
DESIGN	WJK	05/28/03
DESIGN CHK.	NEF	05/28/03
PLANS	FBW	05/28/03
PLANS CHK.	WJK	05/28/03





LEGEND

100-YR FLOODPLAIN BOUNDARY	
SECTION LINE	
CORPORATE LIMITS	Corporate Limits
COUNTY, PARISH, STATE OR INTERNATIONAL BOUNDARY	County Boundary
SECTION NUMBERS	32
ZONE DESIGNATIONS	ZONE A
ELEVATION REFERENCE MARK	1758.96 UAF 32
CROSS SECTION	0.1000 (INDEX SECTION NUMBER AND DESIGNATION)
TOPOGRAPHICAL DEPRESSIONS	

ELEVATION REFERENCE MARKS

NOTE: ALL ELEVATIONS ARE BASED ON NORTH AMERICA VERTICAL DATUM OF 1988. TO CONVERT TO 1929 NGVD, SUBTRACT 2.27 FEET.

I.D. NUMBER	ELEVATION (FT)	DESCRIPTION/LOCATION
UAF 19	2402.85	SET FCDMC BRASS CAP AT LAT. N-33°00'24" LONG. W-112°06'25"
UAF 21	2098.20	SET FCDMC BRASS CAP AT LAT. N-33°59'48" LONG. W-112°07'04"
UAF 22	2173.28	SET FCDMC BRASS CAP AT LAT. N-33°59'40" LONG. W-112°06'31"
UAF 23	2216.93	SET FCDMC BRASS CAP AT LAT. N-33°59'42" LONG. W-112°06'03"
UAF 24	2289.25	SET FCDMC BRASS CAP AT LAT. N-33°59'56" LONG. W-112°05'28"

NOTES

500' 0' 500' 1000'

SCALE: 1"= 1000 FEET

FLIGHT DATES:
12/16/2000-03/15/2001

NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

UPPER AGUA FRIA WATERSHED
SUB WATERSHEDS 3 & 4
ZONE A
FLOODPLAIN DELINEATION STUDY
F.C.D. CONTRACT NO. 2000C020

RBF CONSULTING
PLANNING ■ DESIGN ■ CONSTRUCTION
16605 NORTH 28th AVENUE, SUITE 100
PHOENIX, ARIZONA 85053-3402
602.467.2200 • FAX 602.467.2201 • www.RBF.com

	BY	DATE
DESIGN	WJK	05/28/03
DESIGN CHK.	NEF	05/28/03
PLANS	FBW	05/28/03
PLANS CHK.	WJK	05/28/03

Section 6: Erosion and Sediment Transport

Erosion and sediment transport is not being considered in this study.

Section 7: Draft FIS Report Data

7.1 Summary of Discharges

Table 7.1- Summary of Discharges

Flooding Source and Location	Drainage Area (square miles)	Peak 100-year Discharge (cfs)
Moores Gulch Confluence with the Agua Fria River	14.71	9,321
Moores Gulch Tributary 1 0.43 miles upstream of the Agua Fria River	0.60	1,109
Moores Gulch Tributary 2 1.84 miles upstream of the Agua Fria River	2.10	2,396
Moores Gulch Tributary 3 3.43 miles upstream of the Agua Fria River	0.87	1,251
Moores Gulch Tributary 4 4.57 miles upstream of the Agua Fria River	1.27	2,017
Moores Gulch Tributary 5 6.89 miles upstream of the Agua Fria River	0.95	1,726
Moores Gulch Tributary 6 8.81 miles upstream of the Agua Fria River	0.70	1,691
Little Squaw Creek Confluence with Agua Fria River	17.36	9,190
Little Squaw Creek Tributary 1 Confluence with Agua Fria River	1.88	2,462
Little Squaw Creek Tributary 2 0.89 miles upstream of the Agua Fria River	0.73	1,540
Little Squaw Creek Tributary 3 2.45 miles upstream of the Agua Fria River	1.16	1,716
Little Squaw Creek Tributary 4 3.14 miles upstream of the Agua Fria River	1.41	2,332
Little Squaw Creek Tributary 5 5.25 miles upstream of the Agua Fria River	1.93	1,699
Little Squaw Creek Tributary 6 7.61 miles upstream of the Agua Fria River	0.61	976

Table 7.1- Summary of Discharges

Flooding Source and Location	Drainage Area (square miles)	Peak 100-year Discharge (cfs)
Little Squaw Creek Tributary 7 8.99 miles upstream of the Agua Fria River	2.49	3979
8N2ES16 Confluence with the Agua Fria River	1.98	2,549

7.2 Floodway Data and Flood Profiles

Because this is an approximate delineation for Zone A flood plains, there is no floodway data nor Flood Profiles.

7.3 Annotated FIRMs

A.1 Data Collection Summary

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

Soil Survey of the Aguila-Carefree Area, Parts of Maricopa and Pinal Counties, Arizona, April 1986, USDA Soil Conservations Service (SCS)

"Maricopa County Ortho-Photo GPS Summary of Procedure Final Report", April 2001, RBF Consulting, Phoenix, Arizona

"Upper Agua Fria Floodplain Delineation Study, Elevation Reference Monuments", July 1, 2002, RBF Conslulting, Phoenix, Arizona

"Upper Agua Fria Floodplain Delineation Study, Structure Survey", July 1, 2002, RBF Consulting, Phoenix, Arizona

A.2 Referenced Documents

Sabol, George, et al, *Drainage Design Manual for Maricopa County, Arizona, Volume I*, January 1995, Flood Control District of Maricopa County

Thomsen, B.W., and H.W. Hjalmarson, *Estimated Manning's Roughness Coefficients for Stream Channels and Flood Plains in Maricopa County, Arizona*, April 1991, U.S. Geological Survey Water Resources Division

Jennings, M.E., W.O. Thomas, Jr., and H.C. Riggs, *Nationwide Summary of U.S. Geological Survey Regional Regression Equations for Estimating Magnitude of Frequency of Floods for Ungaged Sites, 1993*, U.S. Geological Survey Water Resources Investigative Report 94-4002., 1994, Reston, Virginia

WMS Watershed Modeling System Reference Manual, 1999, Brigham Young University, Environmental Modeling Research Laboratory, Provo, Utah

B.1 Special Problem Reports

RBF CONSULTING

April 24, 2003

JN 45-100648.001

Mr. Richard Harris, P.E.
Flood Control District of Maricopa County
2801 West Durango Street
Phoenix, Arizona 85009

Subject: *Upper Agua Fria Watershed Floodplain Delineation Study*
Policy for the determination of the WTR_ELV field in the CAD Deliverable file: **fpxfcd-a.xls**

Dear Richard:

The WTR_ELV field in the CAD Deliverable file *fpxfcd-a.xls* was obtained by taking the lowest elevation along each cross-section extracted from WMS, and adding the normal depth (or critical depth, whichever is higher) to obtain water surface elevations. The lowest, or thalweg, elevations, as well as the water depths, are found in Appendix E of each Technical Data Notebook for this study. Screen captures and calculation outputs are provided for every reach utilized to delineate the floodplain. These values were manually entered into the WTR_ELV field of the fpxfcd-a.xls file.

Sincerely,

William J. King, P.E.
Water Resources

H:\PDATA\45100648\Word\cadeliv-fpxfcd-a.doc

B.2 Contact (Telephone) Reports

	Incoming Call	Job No.	45-100648
X	Outgoing Call	Date	10-11-01
Individual Contact	Angela Mobile	By	Travis Nuttall
Title	Reality Specialist	Phone	(623)580-5500
Company /Agency	BLM/ Phoenix	Project Name	Upper Agua Fria Zone A Flood Plain Delineaton Study
Address	21605 North 7th Ave		
Subject of Contact	Searching for As-Built Data on the BLM Property		
Items Discussed	They have R.O.W. files and maps of what is going to be built. Costs 13 cents per page to copy, paid by check, plastic, or cash. The are open 7:30 a.m. to 4:00 p.m. Mon-Fri.		
Action to be Taken			
Route to			

	Incoming Call	Job No.	45-100648
X	Outgoing Call	Date	10-11-01
Individual Contact	Sarah	By	Travis Nuttall
Title		Phone	(602)225-5200
Company/ Agency	Tonto National Forest Soil Survey Team	Project Name	Upper Agua Fria Zone A Flood Plain Delineaton Study
Address			
Subject of Contact	Searching for soil survey information in Yavapai County. Black Canyon City and Rock Springs area.		
Items Discussed	Maybe the NRCS has some. Call Hays Dye at 602-280-8815. She will call me back after doing some research herself. These areas are out of their jurisdiction. Rock Springs in BLM area. Black Canyon City in NRCS area.		
Action to be Taken			
Route to			

	Incoming Call	Job No.	45-100648
X	Outgoing Call	Date	10-11-01
Individual Contact	Hays Dye	By	Travis Nuttall
Title	Regional Manager	Phone	(623)280-8815
Company/ Agency	NRCS	Project Name	Upper Agua Fria Zone A Flood Plain Delineaton Study
Address			
Subject of Contact	Looking for Soil Survey Data		
Items Discussed	Phil Camp- 602-280-8837 is the Arizona Manager. Can download off of website. Http://www.ftw.nrcs.usda.gov/ssur.data.html. ID# AZ645- In ArcInfo format. GIS Specialist is Eric Wolfbrandt, 280-8822		
Action to be Taken			
Route to			

B.3 Meeting Minutes or Reports

April 23, 2003

Flood Control District of Maricopa County's Upper Agua Fria Zone A Floodplain Delineation.

Meeting with Dave Degerness, Richard Harris, Bill King, Nathan Ford, Scott Larson and Mike Worlton

Items needed to be changed or added:

1. Add concentration points and color plot of exhibit 1
2. E-mail comments to Dave djd@mail.maricopa.gov and Richard
3. Put disks in plastic sleeves in the TDN so they don't get separated
4. Add readme file to disk and make a hard copy to put in front of the disk in the TDN.
5. Put all CAD deliverable data on disk and turn it in also.
6. Add letter by Bill King regarding how depth was computed in WMS to TDN
7. Verify reasoning for stage storage omission in HEC 1 model.
8. Check difference between boundary one and two (see cad submittal)

Flood Control District
Scoping Meeting

August 25, 2000

There are about 44-45 watersheds within Maricopa County. Performing floodplain delineation within those watersheds is prioritized, primarily when cities request delineation.

The watershed we will be studying is the part of Watershed UU west of the Agua Fria River.
We want to map as many bluelines that we can.
Want to do all of the blue lines in Maricopa County within 5 years.
The Flood Control District (FCD) has a contract with BYU (EMS-I) to implement features into WMS that aid in flood control.

Write into the contract that we will work with BYU (ems-i) and WMS to modify WMS to work out the bugs.

Upper Agua Fria Zone A Floodplain Delineation

Basic reason for Zone A-

Zone A floodplains usually have 20% more area than floodplains delineated using detailed methods.

The FCD wants to pre-empt development. They want to get the floodplains delienated before any development occurs.

Zone A delineations are cost effective.

Zone A is used in outlying areas.

In advance of development.

Most miles per $.

Some bluelines are not washes, and some washes aren't bluelines. RBF and the FCD will need to decide together what are, and what are not washes. We may go out with a hand held GPS unit. One cross section per mile. About 100 miles of delineation.

Constraints

- Only delineate washes within Maricopa County
- Hydrology outside of county
- Watershed based hydrology to the east of Lake Pleasant.
- No watershed with a drainage area less than one square mile (maybe ½).
- No new mapping.
- We'll get aerial photos from them
- We'll get the DEM from them.
- Meet HIS deliverable requirements

- CAD Operator required to take 6-hour course.
- Consultant Guidelines
- Lump Sum contract. Put timeline together. Forebearance letters (3) if you're behind schedule. Schedule is important. Minimal project management on Joe's part. If there is a problem, recommend 3 solutions. He won't solve the problems. Use milestones/ deadlines.
- Most of the land is forest service & BLM.
- Use FEMA 265.
- Have Scott and I go out and look.
- First 2 or 3 watersheds will be setting up watersheds by subsections.
- No existing HEC-1/hydrology. Can use regression equations.
- Not doing the Agua Fria
- No ERMs or benchmarks required.
- Backing away from the technical. Going back 20 years. Verification is not necessary. May take some field cross sections. Interpolate DEM. Compare to field sections. Minimize survey. Maximize engineering time.
- Modify existing Zone As.
- Naming washes at the T,R,S of the confluence (T1NR1S Sec 32).
- Comply with SS 1-97- Come look at a typical Zone A TDN.
- Start project with a 'Pilot' watershed for first submittal.
- Maybe divide it into two (or several) projects. (North and south)
- Breaking it down is nicer for FCD and FEMA, especially for review.
- Joe and FCD would like to go to the field with us.
- Joe come to office once a month or every other week.
- Access through rough terrain
- Constraint- Eagle's habitat. Babbit wants to turn it over to a regional park

- DPGS may be an option.
- May make 1,2, or 3 submittals to FEMA.
- After a workable floodplain map.
- Usually $1500 to $2500 per mile.

Kick-Off Meeting
August 30, 2001

People Attending:

Scott Larson, RBF	Richard Harris, FCD	Marta Dent, FCD
Roy McDaniel, RBF	Michael Duncan, FCD	Bing Zhao, FCD
Tim Murphy, FCD	Dave Degerness, FCD	

- Use State Standard 1-97 for the Technical Data Notebook.
- The Flood Control District gets the original Legal Advertising.
- Richard Harris will give me sample right-of-entry examples and legal counsel for right-of-entry.
- Received a copy of general guidelines
- Marta will give us the ASCII Grid files, RMS is approximately 2.5 feet.
- GDACS is the basis for ground control.
- We need to schedule a field trip.
- Naming convention of the washes should include section, township, and range.
- Contact Dave Degerness about naming convention.
- The HIS training is coming up.
- Advertise the study in the Desert Advocate and the Arizona Republic
- Get property ownership from Jim Smith. Use the survey letter as the initial letter. Give 72 hours notice. Give surveyors a copy of the state statute to have on hand. About 40 owners.
- Task 5.4c should read DRNPTH. Look at the book.
- Got a copy of the Estimate Manning's Roughness book for Maricopa County
- Scheduled a field trip for 1 week from yesterday. Come up with a route map if we are taking different vehicles. Meet at RBF office at 8:00 a.m.
- Have a meeting every 2 weeks at our office.
- We will do a public mailing instead of a public meeting at the end of the project.
- If we need to get on private property, use certified mail.
- Mapping scale- Work with Richard. Use either 1" = 400' or 1" = 1000'. Topo maps will be printed at 1" = 500'. Explore this.
- Borrow an example TDN from Richard.
- David Evans- May be designing a proposed subdivision in the area. The FCD will check.
- The "Sweat Canyon TDN" and the New River TDN are good examples for comparative hydrology.
- Use 100-year 24-hour and Clark Unit Hydrograph for the 1st study, if applicable.
- Study FEMA 37 and FEMA 265 (January 95)
- CADD Techs and Engineers should attend the HIS Training.
- Get new soils info. From Marta and Dave.
- Meet Wed for Field Trip.
- Plan a meeting at our office on the 12th, 8:30 a.m.

B.4 General Correspondence

AFFIDAVIT OF PUBLICATION

THE ARIZONA REPUBLIC

ANNOUNCEMENT OF INTENT TO PERFORM FLOODPLAIN DELINEATION STUDY

The Flood Control District of Maricopa County (FCDMC), under authority of the National Flood Insurance Act of 1968 (PL-90-448), as amended, and the Flood Disaster Protection Act of 1973 (PL-93-234), is funding a study of flood hazard areas along the shores of and near Lake Pleasant. The FCDMC has contracted with RBF Consulting to perform floodplain delineations of approximately 50 miles of washes that are tributary to the Agua Fria River. The study area will extend from Lake Pleasant northward to the Maricopa County line. All washes to be delineated are located in the Upper Agua Fria River Watershed, and will include Moore Gulch, Little Squaw Creek, washes in the Table Mesa Road area, and several other nearby washes.

This study will examine and evaluate the flood hazard areas for the Upper Agua Fria Watershed. The results will be published to update the flood insurance rate maps (FIRMs) used by the Federal Emergency Management Agency (FEMA). The FIRMs will be used to determine flood insurance rates.

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. Richard Harris, P.E., Project Manager at the Flood Control District of Maricopa County, 2801 West Durango Street, Phoenix, AZ 85009, (602) 506-1501.

01693- September 28; October 5, 2001

STATE OF ARIZONA
COUNTY OF MARICOPA } SS.

TOM BIANCO, being first duly sworn, upon oath deposes and says: That he is the legal advertising manager of the Arizona Business Gazette, a newspaper of general circulation in the county of Maricopa, State of Arizona, published at Phoenix, Arizona, by Phoenix Newspapers Inc., which also publishes The Arizona Republic, and that the copy hereto attached is a true copy of the advertisement published in the said paper on the dates as indicated.

The Arizona Republic/West Zone

September 28; October 5, 2001

Sworn to before me this
9 TH day of
October A.D. 2001

OFFICIAL SEAL
GLORIA SALDIVAR
NOTARY PUBLIC-ARIZONA
MARICOPA COUNTY
My Comm. Expires Dec. 1, 2003

Gloria Saldivar
Notary Public

THE DESERT ADVOCATE
47027 N. New River Rd.
New River, Arizona 85087
Tel: 623-465-9384 Fax: 623-465-5729
E-Mail: desertadvocate@uswest.net

CERTIFICATE OF PUBLICATION

The Desert Advocate newspaper has published Floodplain Delineations Study under authority of NFIA of 1968 (PL-90-448). The Public Notice was commissioned to be published on October 2, 2001 and October 16, 2001 issues as requested by the Flood Control District of Maricopa County.

Date: October 23, 2001

Karen K. Seemeyer
Publisher,
The Desert Advocate

RBF
CONSULTING

September 25, 2001

ROCK LTD PARTNERSHIP
Hc I Box 2000
Rock Springs, AZ 85324

Subject: Right of Entry for Surveying Purposes

Parcel Nos.: 202 01 001

Dear Property Owner:

The Flood Control District of Maricopa County has contracted with RBF Consulting to perform a floodplain delineation study for the Upper Agua Fria Watershed. The purpose of this study is to determine flood related hazard zones and delineate areas that may be subject to inundation during a "100-year flood" event. According to records at the Maricopa County Assessor's office, you own one or more parcel of land within the limits of the study area.

The intent of this letter is to notify you of the commencement of surveying activities in support of the above mentioned study. In order to perform these surveys it may be necessary to enter your property. This activity should not result in any inconvenience or damage to property. If you have any objections to the entry onto your property you must notify Mr. Richard Harris, P.E., of the Flood Control District at (602) 506-1501. Otherwise it will be assumed that you consent to the entry onto your property.

The study and resulting maps will be used for floodplain management purposes and submitted to the Federal Emergency Management Agency for flood insurance information and revision of Flood Insurance Rate Maps. This study will be available to the public in approximately 9 months.

The Flood Control District and its representatives appreciate your help in assuring the accuracy of this study by allowing access to your property for the surveyors and by providing any information you may have regarding past flooding or related problems.

If you have any questions regarding this study or the right of entry, please contact Mr. Richard Harris, P.E., of the Flood Control District or Mr. Roy McDaniel, P.E., of RBF Consulting.

Mr. Richard Harris, P.E., Project Manager, Flood Control District, (602) 506-1501.

Mr. Roy McDaniel, P.E., Project Manager, RBF Consulting, (602) 467-2200

Sincerely,

Roy McDaniel

Roy McDaniel, P.E.
Project Manager

RBF CONSULTING

September 25, 2001

Arlo W Richardson
1124 S Palo Verde St
Mesa, AZ 85208

Subject: Right of Entry for Surveying Purposes

Parcel Nos.: 202 01 002, 202 01 003, 202 01 004, 202 01 005, 202 02 001A, 202 03 001

Dear Property Owner:

The Flood Control District of Maricopa County has contracted with RBF Consulting to perform a floodplain delineation study for the Upper Agua Fria Watershed. The purpose of this study is to determine flood related hazard zones and delineate areas that may be subject to inundation during a "100-year flood" event. According to records at the Maricopa County Assessor's office, you own one or more parcel of land within the limits of the study area.

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The Flood Control District and its representatives appreciate your help in assuring the accuracy of this study by allowing access to your property for the surveyors and by providing any information you may have regarding past flooding or related problems.

If you have any questions regarding this study or the right of entry, please contact Mr. Richard Harris, P.E., of the Flood Control District or Mr. Roy McDaniel, P.E., of RBF Consulting.

Mr. Richard Harris, P.E., Project Manager, Flood Control District, (602) 506-1501.

Mr. Roy McDaniel, P.E., Project Manager, RBF Consulting, (602) 467-2200

Sincerely,

Roy McDaniel

Roy McDaniel, P.E.
Project Manager

RBF CONSULTING

September 25, 2001

EXUM & ASSOC LTD
12322 E Doubletree Ranch Rd
Scottsdale, AZ 85259

Subject: Right of Entry for Surveying Purposes

Parcel Nos.: 202 01 006

Dear Property Owner:

The Flood Control District of Maricopa County has contracted with RBF Consulting to perform a floodplain delineation study for the Upper Agua Fria Watershed. The purpose of this study is to determine flood related hazard zones and delineate areas that may be subject to inundation during a "100-year flood" event. According to records at the Maricopa County Assessor's office, you own one or more parcel of land within the limits of the study area.

The intent of this letter is to notify you of the commencement of surveying activities in support of the above mentioned study. In order to perform these surveys it may be necessary to enter your property. This activity should not result in any inconvenience or damage to property. If you have any objections to the entry onto your property you must notify Mr. Richard Harris, P.E., of the Flood Control District at (602) 506-1501. Otherwise it will be assumed that you consent to the entry onto your property.

The study and resulting maps will be used for floodplain management purposes and submitted to the Federal Emergency Management Agency for flood insurance information and revision of Flood Insurance Rate Maps. This study will be available to the public in approximately 9 months.

The Flood Control District and its representatives appreciate your help in assuring the accuracy of this study by allowing access to your property for the surveyors and by providing any information you may have regarding past flooding or related problems.

If you have any questions regarding this study or the right of entry, please contact Mr. Richard Harris, P.E., of the Flood Control District or Mr. Roy McDaniel, P.E., of RBF Consulting.

Mr. Richard Harris, P.E., Project Manager, Flood Control District, (602) 506-1501.

Mr. Roy McDaniel, P.E., Project Manager, RBF Consulting, (602) 467-2200

Sincerely,

Roy McDaniel

Roy McDaniel, P.E.
Project Manager

RBF CONSULTING

September 25, 2001

Richard & Norine Tr Rick
3010 E Madison St
Phoenix, AZ 85034

Subject: Right of Entry for Surveying Purposes

Parcel Nos.: 202 02 002A

Dear Property Owner:

The Flood Control District of Maricopa County has contracted with RBF Consulting to perform a floodplain delineation study for the Upper Agua Fria Watershed. The purpose of this study is to determine flood related hazard zones and delineate areas that may be subject to inundation during a "100-year flood" event. According to records at the Maricopa County Assessor's office, you own one or more parcel of land within the limits of the study area.

The intent of this letter is to notify you of the commencement of surveying activities in support of the above mentioned study. In order to perform these surveys it may be necessary to enter your property. This activity should not result in any inconvenience or damage to property. If you have any objections to the entry onto your property you must notify Mr. Richard Harris, P.E., of the Flood Control District at (602) 506-1501. Otherwise it will be assumed that you consent to the entry onto your property.

The study and resulting maps will be used for floodplain management purposes and submitted to the Federal Emergency Management Agency for flood insurance information and revision of Flood Insurance Rate Maps. This study will be available to the public in approximately 9 months.

The Flood Control District and its representatives appreciate your help in assuring the accuracy of this study by allowing access to your property for the surveyors and by providing any information you may have regarding past flooding or related problems.

If you have any questions regarding this study or the right of entry, please contact Mr. Richard Harris, P.E., of the Flood Control District or Mr. Roy McDaniel, P.E., of RBF Consulting.

Mr. Richard Harris, P.E., Project Manager, Flood Control District, (602) 506-1501.

Mr. Roy McDaniel, P.E., Project Manager, RBF Consulting, (602) 467-2200

Sincerely,

Roy McDaniel

Roy McDaniel, P.E.
Project Manager

RBF
CONSULTING

September 25, 2001

Jeanette Louise Shoecraft
1320 W Elliot Rd #103-505
Tempe, AZ 85284

Subject: Right of Entry for Surveying Purposes

Parcel Nos.: 202 03 002

Dear Property Owner:

The Flood Control District of Maricopa County has contracted with RBF Consulting to perform a floodplain delineation study for the Upper Agua Fria Watershed. The purpose of this study is to determine flood related hazard zones and delineate areas that may be subject to inundation during a "100-year flood" event. According to records at the Maricopa County Assessor's office, you own one or more parcel of land within the limits of the study area.

The intent of this letter is to notify you of the commencement of surveying activities in support of the above mentioned study. In order to perform these surveys it may be necessary to enter your property. This activity should not result in any inconvenience or damage to property. If you have any objections to the entry onto your property you must notify Mr. Richard Harris, P.E., of the Flood Control District at (602) 506-1501. Otherwise it will be assumed that you consent to the entry onto your property.

The study and resulting maps will be used for floodplain management purposes and submitted to the Federal Emergency Management Agency for flood insurance information and revision of Flood Insurance Rate Maps. This study will be available to the public in approximately 9 months.

The Flood Control District and its representatives appreciate your help in assuring the accuracy of this study by allowing access to your property for the surveyors and by providing any information you may have regarding past flooding or related problems.

If you have any questions regarding this study or the right of entry, please contact Mr. Richard Harris, P.E., of the Flood Control District or Mr. Roy McDaniel, P.E., of RBF Consulting.

Mr. Richard Harris, P.E., Project Manager, Flood Control District, (602) 506-1501.

Mr. Roy McDaniel, P.E., Project Manager, RBF Consulting, (602) 467-2200

Sincerely,

Roy McDaniel

Roy McDaniel, P.E.
Project Manager

RBF
CONSULTING

September 25, 2001

Charles V Wilder Jr.
5950 W Table Mesa Rd
Phoenix, AZ 85087

Subject: Right of Entry for Surveying Purposes

Parcel Nos.: 202 03 003

Dear Property Owner:

The Flood Control District of Maricopa County has contracted with RBF Consulting to perform a floodplain delineation study for the Upper Agua Fria Watershed. The purpose of this study is to determine flood related hazard zones and delineate areas that may be subject to inundation during a "100-year flood" event. According to records at the Maricopa County Assessor's office, you own one or more parcel of land within the limits of the study area.

The intent of this letter is to notify you of the commencement of surveying activities in support of the above mentioned study. In order to perform these surveys it may be necessary to enter your property. This activity should not result in any inconvenience or damage to property. If you have any objections to the entry onto your property you must notify Mr. Richard Harris, P.E., of the Flood Control District at (602) 506-1501. Otherwise it will be assumed that you consent to the entry onto your property.

The study and resulting maps will be used for floodplain management purposes and submitted to the Federal Emergency Management Agency for flood insurance information and revision of Flood Insurance Rate Maps. This study will be available to the public in approximately 9 months.

The Flood Control District and its representatives appreciate your help in assuring the accuracy of this study by allowing access to your property for the surveyors and by providing any information you may have regarding past flooding or related problems.

If you have any questions regarding this study or the right of entry, please contact Mr. Richard Harris, P.E., of the Flood Control District or Mr. Roy McDaniel, P.E., of RBF Consulting.

Mr. Richard Harris, P.E., Project Manager, Flood Control District, (602) 506-1501.

Mr. Roy McDaniel, P.E., Project Manager, RBF Consulting, (602) 467-2200

Sincerely,

Roy McDaniel

Roy McDaniel, P.E.
Project Manager

RBF CONSULTING

September 25, 2001

U S A
23636 N 7Th St
Phoenix, AZ 85024

Subject: Right of Entry for Surveying Purposes

Parcel Nos.: 202 04 001, 202 04 002, 202 05 004, 202 05 005, 202 05 006A, 202 05 008, 202 24 001

Dear Property Owner:

The Flood Control District of Maricopa County has contracted with RBF Consulting to perform a floodplain delineation study for the Upper Agua Fria Watershed. The purpose of this study is to determine flood related hazard zones and delineate areas that may be subject to inundation during a "100-year flood" event. According to records at the Maricopa County Assessor's office, you own one or more parcel of land within the limits of the study area.

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If you have any questions regarding this study or the right of entry, please contact Mr. Richard Harris, P.E., of the Flood Control District or Mr. Roy McDaniel, P.E., of RBF Consulting.

Mr. Richard Harris, P.E., Project Manager, Flood Control District, (602) 506-1501.

Mr. Roy McDaniel, P.E., Project Manager, RBF Consulting, (602) 467-2200

Sincerely,

Roy McDaniel

Roy McDaniel, P.E.
Project Manager

RBF
CONSULTING

September 25, 2001

UNITED STATES OF AMERICA
PO Box 9980
Phoenix, AZ 85068

Subject: Right of Entry for Surveying Purposes

Parcel Nos.: 202 05 001A, 202 05 002, 202 05 003, 202 05 007A

Dear Property Owner:

The Flood Control District of Maricopa County has contracted with RBF Consulting to perform a floodplain delineation study for the Upper Agua Fria Watershed. The purpose of this study is to determine flood related hazard zones and delineate areas that may be subject to inundation during a "100-year flood" event. According to records at the Maricopa County Assessor's office, you own one or more parcel of land within the limits of the study area.

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The Flood Control District and its representatives appreciate your help in assuring the accuracy of this study by allowing access to your property for the surveyors and by providing any information you may have regarding past flooding or related problems.

If you have any questions regarding this study or the right of entry, please contact Mr. Richard Harris, P.E., of the Flood Control District or Mr. Roy McDaniel, P.E., of RBF Consulting.

Mr. Richard Harris, P.E., Project Manager, Flood Control District, (602) 506-1501.

Mr. Roy McDaniel, P.E., Project Manager, RBF Consulting, (602) 467-2200

Sincerely,

Roy McDaniel

Roy McDaniel, P.E.
Project Manager

RBF
CONSULTING

September 25, 2001

John F & Belle S Swartz
PO Box 10500
Phoenix, AZ 85064

Subject: Right of Entry for Surveying Purposes

Parcel Nos.: 202 24 002

Dear Property Owner:

The Flood Control District of Maricopa County has contracted with RBF Consulting to perform a floodplain delineation study for the Upper Agua Fria Watershed. The purpose of this study is to determine flood related hazard zones and delineate areas that may be subject to inundation during a "100-year flood" event. According to records at the Maricopa County Assessor's office, you own one or more parcel of land within the limits of the study area.

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If you have any questions regarding this study or the right of entry, please contact Mr. Richard Harris, P.E., of the Flood Control District or Mr. Roy McDaniel, P.E., of RBF Consulting.

Mr. Richard Harris, P.E., Project Manager, Flood Control District, (602) 506-1501.

Mr. Roy McDaniel, P.E., Project Manager, RBF Consulting, (602) 467-2200

Sincerely,

Roy McDaniel

Roy McDaniel, P.E.
Project Manager

RBF
CONSULTING

September 25, 2001

DI PIETRO ARIZONA FAMILY LIMIT
10320 W Indian School Rd
Phoenix, AZ 85037

Subject: Right of Entry for Surveying Purposes

Parcel Nos.: 202 05 007D, 202 05 007E

Dear Property Owner:

The Flood Control District of Maricopa County has contracted with RBF Consulting to perform a floodplain delineation study for the Upper Agua Fria Watershed. The purpose of this study is to determine flood related hazard zones and delineate areas that may be subject to inundation during a "100-year flood" event. According to records at the Maricopa County Assessor's office, you own one or more parcel of land within the limits of the study area.

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If you have any questions regarding this study or the right of entry, please contact Mr. Richard Harris, P.E., of the Flood Control District or Mr. Roy McDaniel, P.E., of RBF Consulting.

Mr. Richard Harris, P.E., Project Manager, Flood Control District, (602) 506-1501.

Mr. Roy McDaniel, P.E., Project Manager, RBF Consulting, (602) 467-2200

Sincerely,

Roy McDaniel

Roy McDaniel, P.E.
Project Manager

RBF CONSULTING

September 25, 2001

DI PIETRO ARIZONA FAMILY LP
440 Lake Cook Rd
Deerfield, IL 60015

Subject: Right of Entry for Surveying Purposes

Parcel Nos.: 202 05 007F

Dear Property Owner:

The Flood Control District of Maricopa County has contracted with RBF Consulting to perform a floodplain delineation study for the Upper Agua Fria Watershed. The purpose of this study is to determine flood related hazard zones and delineate areas that may be subject to inundation during a "100-year flood" event. According to records at the Maricopa County Assessor's office, you own one or more parcel of land within the limits of the study area.

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Mr. Richard Harris, P.E., Project Manager, Flood Control District, (602) 506-1501.

Mr. Roy McDaniel, P.E., Project Manager, RBF Consulting, (602) 467-2200

Sincerely,

Roy McDaniel

Roy McDaniel, P.E.
Project Manager

RBF CONSULTING

November 8, 2002 JN 45-100648

Mr. Richard Oxford
Arizona State Land Department
1616 West Adams
Phoenix, Arizona 850007

Subject: Notification of Floodplain Delineation

Dear Mr. Oxford:

The Flood Control District of Maricopa County, under authority of the National Flood Insurance Act of 1968 (P.L. 90-448) as amended, and the Flood Disaster Act of 1973 (P.L. 93-234), has completed an approximate study of flood hazard areas in northern Maricopa County, Arizona, for five tributaries to the Agua Fria River. The study area surrounds is in the vicinity of Table Mesa Road, west of Interstate-17.

The purpose of this study was to determine flood related hazard zones and delineate areas that may be subject to inundation during a "100-year flood" event. Flood hazard zones will be used by Maricopa County to insure compliance to the floodplain management objectives of the National Flood Insurance Program. They will also be used by insurance agents as the basis for determining appropriate flood insurance premium rates applicable for buildings and their contents.

This announcement is intended to notify all interested persons of this study so that they may have an opportunity to bring any relevant facts and technical data concerning local flood hazards to the attention of the Flood Control District. The study will be available for review at the Flood Control District Office, located at 2801 West Durango Road, Phoenix, Arizona, beginning November 13.

The study results will be submitted to the Federal Emergency Management Agency (FEMA) for approval. Upon approval by FEMA, the study results will be used for revising Flood Insurance Rate Maps for the area. They will be used for regulating potential future development so as to reduce or prevent possible flood damage to property and structures.

Please call the District's Project Manager, Richard P. Harris, P.E., at (602) 506-1501 for more information.

Sincerely,

Roy B. McDaniel

Roy B. McDaniel, P.E.
Project Engineer
Storm Water Management

H:\PDATA\45100648\wp\Watershed2\0648statelandnotification.doc

16605 N. 28th Avenue, Suite 100, Phoenix, AZ 85053-7550 ■ 602.467.2200 ■ Fax 602.467.2201
Offices located throughout California, Arizona & Nevada ■ www.RBF.com

printed on recycled paper

RBF CONSULTING

November 8, 2002 JN 45-100648

Bureau of Land Management
Arizona State Office
P.O. Box 45155
222 North Central Avenue
Phoenix, AZ 85004

Subject: Notification of Floodplain Delineation

To Whom It May Concern:

The Flood Control District of Maricopa County, under authority of the National Flood Insurance Act of 1968 (P.L. 90-448) as amended, and the Flood Disaster Act of 1973 (P.L. 93-234), has completed an approximate study of flood hazard areas in northern Maricopa County, Arizona, for five tributaries to the Agua Fria River. The study area surrounds is in the vicinity of Table Mesa Road, west of Interstate-17.

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Please call the District's Project Manager, Richard P. Harris, P.E., at (602) 506-1501 for more information.

Sincerely,

Roy B. McDaniel

Roy B. McDaniel, P.E.
Project Engineer
Storm Water Management

H:\PDATA\45100648\wp\Watershed2\0648blmnotification.doc

16605 N. 28th Avenue, Suite 100, Phoenix, AZ 85053-7550 ■ 602.467.2200 ■ Fax 602.467.2201
Offices located throughout California, Arizona & Nevada ■ www.RBF.com

printed on recycled paper

RBF CONSULTING

November 8, 2002

JN 45-100648

Mr. Charles V. Wilder Jr.
5950 West Table Mesa Road
Phoenix, Arizona 85087-7060

Subject: Notification of Floodplain Delineation

Dear Mr. Wilder:

The Flood Control District of Maricopa County, under authority of the National Flood Insurance Act of 1968 (P.L. 90-448) as amended, and the Flood Disaster Act of 1973 (P.L. 93-234), has completed an approximate study of flood hazard areas in northern Maricopa County, Arizona, for five tributaries to the Agua Fria River. The study area surrounds is in the vicinity of Table Mesa Road, west of Interstate-17.

The purpose of this study was to determine flood related hazard zones and delineate areas that may be subject to inundation during a "100-year flood" event. Flood hazard zones will be used by Maricopa County to insure compliance to the floodplain management objectives of the National Flood Insurance Program. They will also be used by insurance agents as the basis for determining appropriate flood insurance premium rates applicable for buildings and their contents.

This announcement is intended to notify all interested persons of this study so that they may have an opportunity to bring any relevant facts and technical data concerning local flood hazards to the attention of the Flood Control District. The study will be available for review at the Flood Control District Office, located at 2801 West Durango Road, Phoenix, Arizona, beginning November 13.

The study results will be submitted to the Federal Emergency Management Agency (FEMA) for approval. Upon approval by FEMA, the study results will be used for revising Flood Insurance Rate Maps for the area. They will be used for regulating potential future development so as to reduce or prevent possible flood damage to property and structures.

Please call the District's Project Manager, Richard P. Harris, P.E., at (602) 506-1501 for more information.

Sincerely,

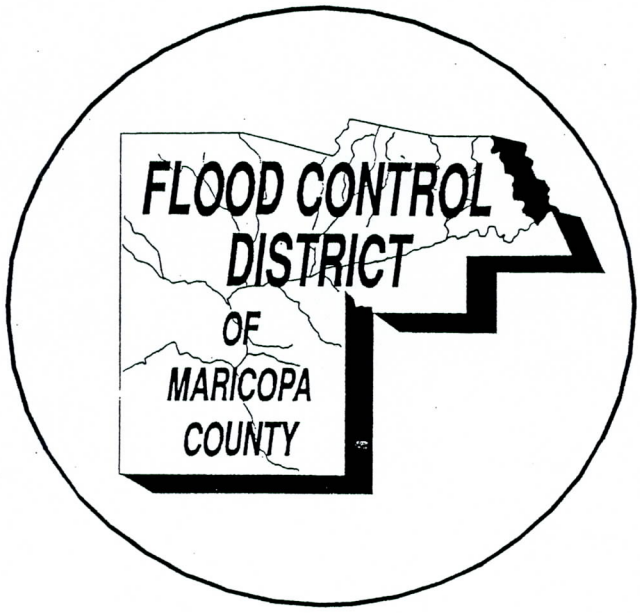
Roy B. McDaniel

Roy B. McDaniel, P.E.
Project Engineer
Storm Water Management

H:\PDATA\45100648\wp\Watershed2\0648mrwildernotification.doc

B.5 Contract Documents

EXHIBIT A



SCOPE OF WORK

CONTRACT FCD 2000C020

UPPER AGUA FRIA WATERSHED
ZONE A FLOODPLAIN DELINEATION STUDY

EXHIBIT A

SCOPE OF WORK

CONTRACT FCD 2000C020

UPPER AGUA FRIA WATERSHED ZONE A FLOODPLAIN DELINEATION STUDY

GENERAL

The goal of this project is to delineate an estimated 50 miles of approximate Zone A 100-year floodplains in Watershed "UU" (a.k.a., Upper Agua Fria Watershed) east of Lake Pleasant within Maricopa County. The limits of Watershed "UU" are shown on Exhibit A.1.

In order to accomplish the study's goal, the consultant will have to 1) coordinate the study with the District and others, 2) collect and analyze existing data, 3) use existing USGS topographic mapping, 4) perform field surveys as required, 5) develop the 100-year peak discharges, 6) delineate the Zone A floodplains, 7) prepare the study results in an electronic form (HIS data will be submitted with each appropriate task deliverable), and 8) deliver all of the study documentation in formats acceptable to the District and Federal Emergency Management Agency (FEMA).

The consultant must use sound engineering judgement in the development of the hydrologic data and hydraulic models. All work must meet Arizona Department of Water Resources (ADWR) and the Federal Emergency Management Agency (FEMA) requirements for Zone A floodplain delineations. Prior to the finalization of this contract, FEMA and the District must review and accept the results of this study, and all items called for in this Scope of Work must be delivered to the District. All work completed under this scope of services is to conform with District Consultant Contracting Guidelines dated August 1, 2000.

The floodplain delineations will be phased according to the sub-watershed identification as identified in Exhibit A.1 and prioritization presented in Table 1, below.

Table 1: Sub-Watershed Prioritization

Sub-Watershed	Relative Priority	Miles of Delineation
06N 01E SEC 4 (EAST LAKE PLEASANT)	1	9
07N 02E SEC 7 (TABLE MESA RD AREA)	2	12
08N 02E SEC 28 (MOORE GULCH)	3	15
08N 02E SEC 21 (LITTLE SQUAW CREEK)	4	13
Total Area		49

The time frame for delineation of the Zone floodplains will be 180 days including 90 days for FCD review. Additional time, equal to 120 days will be allowed for FEMA review. All work must be completed including FEMA review within 300 days from the notice to proceed.

TASK 1 - COORDINATION

1.1 Within fourteen days of Notice to Proceed (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. The consultant will update this project schedule when appropriate.

1.2 The consultant will participate in regular coordination meetings (at least every 4 weeks) with the District's Project Manager and in milestone coordination meetings in the development of the hydrologic and hydraulic analyses. The consultant is responsible for the minutes of any meetings. Whenever possible, coordination and milestone meetings will be combined.

1.3 The consultant will submit an estimate of the monthly billing within 14 days of Notice to Proceed. Thereafter, this estimate will be updated and submitted to the District's project manager at least 10 days before the end of each quarter.

1.4 The consultant will submit monthly progress reports at least 5 days before submittal of monthly invoices. The report shall be brief and should be no longer than two 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 and a recommended solution.

1.5 The consultant is responsible for placing the legal advertising at the beginning of the study, notifying the public of the study. The ad will be run in a widely circulated local newspaper twice, with approximately one week between runs. The ad must also be run twice in a local newspaper that serves the area being studied. After the newspapers run the ad, the consultant will supply the District with the original affidavit of publication from each newspaper for each day that the ad ran.

1.6 The consultant will notify all property owners and obtain any necessary Rights of Entry for the study area. The District will furnish the consultant with a list of all the property owners to be notified. The consultant will furnish the District with a sample Right of Entry letter.

1.7 The consultant will meet with officials from the District and send a letter of notification to any incorporated communities affected.

1.8 The District will provide any public notice beyond that described in Task 1.6.

1.9 Consultant/District Performance Evaluations will be performed. An informal evaluation will be performed at the completion of the hydrologic analysis. A formal evaluation will be performed at the completion of the project upon receipt of all deliverables.

1.10 The Consultant will partake in the District's 6-hour HIS Training Course.

1.11 **(OPTIONAL)** The Consultant will work with the District to identify problems in WMS that are encountered during the services defined in this scope of work. The Consultant will contract with EMS-I to customize WMS for floodplain delineation and correct the identified problems. This work will only be undertaken through written authorization by the District's Project Manager based upon review and approval of specific tasks and costs.

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 A written report summarizing the data collected will be included as a section in the Technical Data Notebook (TDN). A preliminary draft of this section is due within 90 days of Notice to Proceed.

TASK 3 - TOPOGRAPHIC MAPPING

The consultant will use existing USGS topographic mapping and/or other topographic mapping provided by the District.

TASK 4 - FIELD SURVEY

4.1 **(OPTIONAL)** Field measurements of bridges, culverts, and hydraulic structures are to be obtained by the consultant when as-built plans are not available, or when conditions have changed that impact the Zone A delineation. This information should be reduced and compiled into an 11"x 17" (maximum size) drawing for inclusion in the TDN. The information presented in the drawing should be in a format appropriate for use in future HEC-RAS models. This task is not authorized with the NTP and may be authorized in writing by the DISTRICT.

4.2 Copies of the survey field books and office calculations must be included in the TDN. This information can be submitted separately if approval is obtained from the District's Project Manager.

4.3 **(OPTIONAL)** The Consultant shall provide field survey data for cross sections used for approximate floodplain delineations where USGS DEM data are not adequate. This task is not authorized with the NTP and may be authorized in writing by the DISTRICT.

4.4 Digital data in either a CADD or GIS format will be prepared in conformance with the District's Hydrologic Information System Data Delivery Specifications, Revision 3.1 (or CADD Data Delivery Specifications Rev. 1.0, January 2000). The following themes are the ones generally used for the data developed for Field Survey. 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 don'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. CORNERS (if any)

b. CTRL (Misc. Control Survey Pts.)

c. FPCTLFCD (ERMs)

e. FPXFCD (Floodplain Cross Sections)

TASK 5 - HYDROLOGY

5.1 The Consultant will develop hydrology using the Watershed Modeling System (WMS). The peak discharges for sub-watersheds will be developed using HEC-1 and will be verified using regression equations. The watersheds will cover the portion of Watershed "UU" located east of Lake Pleasant and the Agua Fria within Maricopa County, and that portion of the watershed within Yavapai County that drains into Maricopa County as shown in Exhibit A. Data needed for the hydrologic study will be provided by the District for the portion of the watershed within Maricopa County. Necessary hydrologic data for the portion of the watershed located within Yavapai County will be developed by the Consultant and reviewed and approved by the District. No sub-basin will have a drainage area smaller than ½ square mile. The consultant must analyze the data carefully and in some instances correlate data against other hydrologic data such as regression equations in order to obtain the most realistic results.

5.2 Meetings shall be held with the Flood Control District staff at the following milestones:

a. Meeting number 1: field trip at the start of the project to scope out the critical points of the watershed and problem areas.

b. Meeting number 2: as soon as basic data are gathered and the sub-basins have been delineated. A copy of the draft maps of the sub-basins must be delivered to the District at this meeting. The method for generating the peak discharges will be agreed upon at this meeting.

c. Meeting number 3: to review of final document and comments by the District.

5.3 The Hydrologic Report

5.3.1 The findings of the hydrologic study will be presented in Section 3 of the Technical Data Notebook and will be prepared in accordance with ADWR State Standards Attachment 1-97 (SSA 1-97). The report will be organized as specified by the District, following SSA 1-97 format. Specific deviations from this hydrologic scope shall not be undertaken without the specific written authorization from the District's Project Manager.

5.4 Digital data in either a CADD or GIS format will be prepared in conformance with the District's Hydrologic Information System Data Delivery Specifications, Revision 3.1 (or CADD Data Delivery Specification, Rev. 1.0, January 2000). The following themes are the ones generally used for the data developed for hydrology. 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. DRNBSN (Drainage Boundary)

b. PRJDAT (Project Identification)

c. DRMPTH (Drainage Path)

TASK 6 - FLOODPLAIN DELINEATION

6.1 Floodplain delineations will be conducted using methodology as outlined by FEMA. The consultant will prepare the study using the guidelines established in FEMA 37, *Flood Insurance Study Guidelines and Specification for Study Contractors*, January 1995, FIA 12, *Appeals, Revisions, and Amendments to Flood Insurance Maps*, December 1993, and FEMA 265, *Managing Floodplain Development in Approximate Zone A Areas*, April 1995.

6.2 The delineation work shall meet requirements for floodplain delineations as prescribed by FEMA and the Arizona Department of Water Resources.

6.3 The delineation study shall be based on the final results of the hydrologic study as directed by the District.

6.4 The consultant must obtain District approval at each of the following steps:

a. Draft field reconnaissance section of the TDN and estimation of Manning's "n" values.

b. Proposed location and alignment of the cross sections.

c. Methodology used for both the floodplain and optional floodway delineations.

d. Approximate floodplain (natural) delineation.

e. Final hydraulics section of the TDN.

6.5 Field Reconnaissance

6.5.1 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; observation of possible overflow areas; observation of levees or other flood control structures; and measurement of bridge dimensions.

6.5.2 Manning's "n" values are to be determined using the methodology in the USGS report, *Estimated Manning's Roughness Coefficients for Stream Channels and Flood Plains in Maricopa County, Arizona*, April 1991. Copies of the report are available through the District. Manning's Roughness Coefficients will be presented for typical reach types observed in the project area, rather than specific reaches of specific named washes. It is anticipated that between 5 and 10 typical reach types will be identified during the field reconnaissance.

6.5.3 Representative "n" values for each typical reach type will be selected. The reconnaissance report will present the determination of channel and overbank "n" values using captioned color photographs or color photocopies for each identified reach type in the project area. The report will also discuss floodplain conditions affecting the delineation, describe structures and obstructions, and provide color photos or photocopies of major hydraulic structures. Photo locations, structures, and "n" values will be displayed on reduced scale mapping and included in the Final Report. The reconnaissance or n-value report will be included in all subsequent phased TDN submittals associated with this contract.

6.6 Cross Sections

6.6.1 The location and alignment of cross sections will be submitted for the District's review and approval before developing the cross section data. The Consultant must coordinate the methodology for generating the cross section geometric data. Acceptable methods include using WMS and USGS DEMs provided by the District, or field surveys possibly using GPS when the USGS maps and DEMs do not provide adequate information. In the majority of instances the channel centerline will be the centerline indicated on the USGS map, on the FEMA FIRM, or in the GIS data provided by the District.

6.6.2 The cross section plots will at a minimum show computed normal depth, and "n" values. All plots are to be accompanied by a legend. These plots should be available at all reviews.

6.7 The hydraulics of bridges and culverts should be incorporated into assessing the floodplain around such structures especially in areas where ponding will occur. The Zone A limits must be determined according to FEMA criteria and clearly labeled on the final drawings. Conveyance through minor structures such as small culverts (i.e., less than 30" in diameter), or structures which are likely to become clogged during the 100-year peak discharge shall not be included in the hydraulic analyses.

6.8 The findings of the floodplain delineation 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). The report will be organized as specified by the District standards, following SSA 1-97 format.

6.9 The Consultant shall fill out all the forms required by FEMA for the submittal of a Floodplain Delineation Study.

6.10 The consultant will provide work maps on monochrome USGS digital raster graphic quadrangle USGS maps. The consultant will develop check plots and certify that they have been examined, and that the check plots faithfully represent the data and maps used in the report and /or work maps. The drawings will be 24" X 36" in size. The work map scale will be determined by the consultant, and will vary between 1"=400' and 1"=1000' scale base maps depending on the terrain and the floodplain widths.

A cover sheet will be part of the work study drawings and shall have on it the project title, source and date of topographic mapping, and a location map showing geographic range covered by each specific mapping sheet. Each drawing will include the floodplain, a north arrow, scale, section corners, current streets and highway names, State Plane Coordinate System, major drainage features, corporate boundaries, cross section lines, channel centerline, index map, the floodplain boundaries, and peak discharge and Section, Township, Range for each wash delineated.

6.11 Digital data in either a CADD or GIS format will be prepared in conformance with the District's Hydrologic Information System Data Delivery Specifications, Revision 3.1 (or CADD Data Delivery Specifications, Rev. 1.0, January 2000). The following themes are the ones generally used for the data developed for hydraulics. 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 don'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. CULVERT (culverts)

b. CARTO (Cartographic Features)

c. DQ (Data Quality)

d. FPXFCD (Cross Sections)

e. FPZNFCD (Floodplain Zones)

f. NDXPRJ (Map Sheet Index)

g. PRJDAT (Project Identification)

h. BRIDGES (Bridges)

i. PRJ (Project Boundary)

TASK 7 - DELIVERABLES

7.1 Both paper and electronic deliverables will be made at the completion of each task. The consultant will deliver the following items to the District before delivering the FEMA submittal package:

7.1.1 Original Affidavits of Publication of the legal advertisements. Additional copies are to be included in the Technical Data Notebook.

7.1.2 All topographic and related data for the District's Hydrologic Information System that isn't subject to change during FEMA's review should be submitted at this time.

7.1.3 If bound separately from the Technical Data Notebook, two (2) copies of the field survey notes and office calculations.

7.2 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:

7.2.1 Two (2) complete sets of blackline topographic base maps with the floodplain delineations shown. All drawings will be signed and sealed by persons of appropriate professional registration(s). Each registrant will provide a specific statement as to what service they performed.

7.2.2 Two (2) complete copies of the Technical Data Notebook. The Technical Data Notebook will be prepared in accordance with ADWR State Standards Attachment 1-97 (SSA 1-97). The notebook will be organized as specified by the District, following SSA 1-97 format. These copies will be updated if necessary based upon FEMA's review comments. Completed FEMA forms will be included in the Technical Data Notebook.

7.3 Final Submittal: The following products are considered deliverables for the final submittal to the District after FEMA approval is issued:

7.3.1 One (1) complete composite set of sealed non-erasable mylars with the topographic data and floodplain delineations shown. The sheets shall be 24" X 36" in size, and 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.

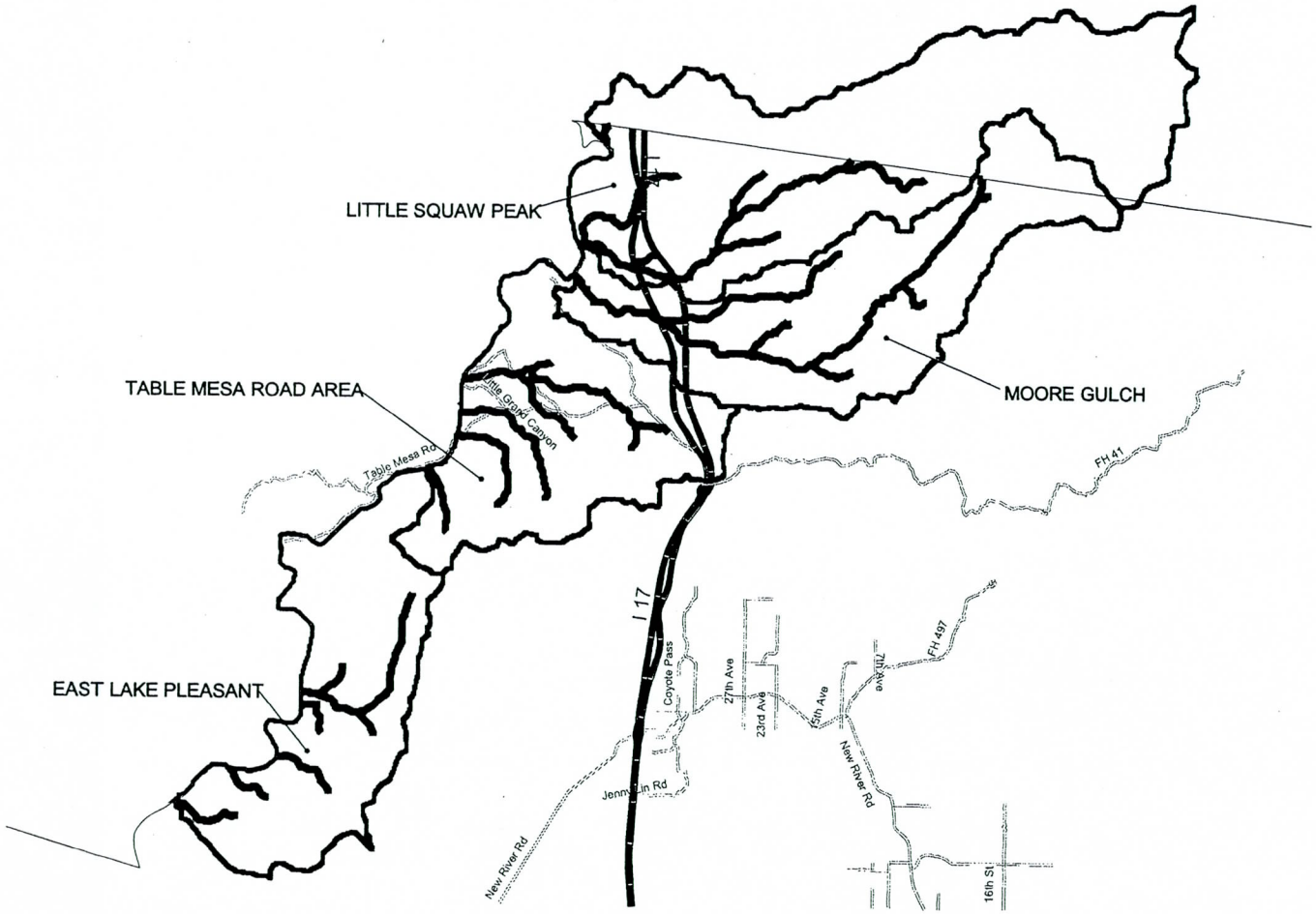
7.3.2 All remaining hydrologic and floodplain delineation data in conformance with the District's HIS Specifications.

7.3.3 Two (2) complete copies of the Technical Data Notebooks. The Technical Data Notebook will be prepared in accordance with ADWR State Standards Attachment 1-97 (SSA 1-97). The notebook will be organized as specified by the District, following SSA 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.

7.4 Separate submittals by subwatershed: The consultant will submit a separate TDN for each sub-watershed division established in Table 1 and shown in Exhibit A.1.

EXHIBIT A

FLOODPLAIN DELINEATION PHASING



COUNTY LINE
STUDY BASIN BOUNDARIES
WASHES TO BE DELINEATED

N
W
E
S

2 0 2 4 6 Miles

B.6 Public Information

RBF
CONSULTING

July 2, 2003

JN 45-100648

Mr. Richard Oxford
Arizona State Land Department
1616 West Adams
Phoenix, Arizona 85007

Subject: Notification of Floodplain Delineation Study Results, Upper Agua Fria FDS

Dear Mr. Oxford:

The Flood Control District of Maricopa County, under authority of the National Flood Insurance Act of 1968 (P.L. 90-448) as amended, and the Flood Disaster Act of 1973 (P.L. 93-234), has completed an approximate study of flood hazard areas in northern Maricopa County, Arizona, for five tributaries to the Agua Fria River. This letter is being sent to you because some part of land owned or managed by you has been found to be within the study area.

The purpose of this study was to determine flood related hazard zones and delineate areas that may be subject to inundation during a "100-year flood" event. Flood hazard zones will be used by Maricopa County to ensure compliance to the floodplain management objectives of the National Flood Insurance Program. Insurance agents will also use them as the basis for determining appropriate flood insurance premium rates applicable for buildings and their contents.

Study results are being sent to the Federal Emergency Management Agency (FEMA) for final review. Approval is expected within six months upon receipt of this letter. The study results will be used for revising Flood Insurance Rate Maps and to regulate future development so as to reduce or prevent possible flood damage to property and structures.

This announcement is intended to notify all interested persons that during the FEMA review period, the study results will be available for review at the Flood Control District Office, located at 2801 West Durango Road, Phoenix, Arizona. If you would like more information or wish to review study results, please call the District's Project Manager, Richard P. Harris, PE, CFM, at (602) 506-1501.

Sincerely,

William J. King

William J. King, P.E.
Design Engineer
Storm Water Management

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RBF CONSULTING

July 2, 2003

JN 45-100648

Mr. Charles V. Wilder Jr.
5950 W. Table Mesa Road
Phoenix, Arizona 85087-7060

Subject: Notification of Floodplain Delineation Study Results, Upper Agua Fria FDS

Dear Mr. Wilder:

The Flood Control District of Maricopa County, under authority of the National Flood Insurance Act of 1968 (P.L. 90-448) as amended, and the Flood Disaster Act of 1973 (P.L. 93-234), has completed an approximate study of flood hazard areas in northern Maricopa County, Arizona, for five tributaries to the Agua Fria River. This letter is being sent to you because some part of land owned or managed by you has been found to be within the study area.

The purpose of this study was to determine flood related hazard zones and delineate areas that may be subject to inundation during a "100-year flood" event. Flood hazard zones will be used by Maricopa County to ensure compliance to the floodplain management objectives of the National Flood Insurance Program. Insurance agents will also use them as the basis for determining appropriate flood insurance premium rates applicable for buildings and their contents.

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This announcement is intended to notify all interested persons that during the FEMA review period, the study results will be available for review at the Flood Control District Office, located at 2801 West Durango Road, Phoenix, Arizona. If you would like more information or wish to review study results, please call the District's Project Manager, Richard P. Harris, PE, CFM, at (602) 506-1501.

Sincerely,

William J. King

William J. King, P.E.
Design Engineer
Storm Water Management

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RBF CONSULTING

July 2, 2003 JN 45-100648

Bureau of Land Management
Arizona State Office
222 North Central Avenue
Phoenix, Arizona 85004

Subject: Notification of Floodplain Delineation Study Results, Upper Agua Fria FDS

To Whom It May Concern:

The Flood Control District of Maricopa County, under authority of the National Flood Insurance Act of 1968 (P.L. 90-448) as amended, and the Flood Disaster Act of 1973 (P.L. 93-234), has completed an approximate study of flood hazard areas in northern Maricopa County, Arizona, for five tributaries to the Agua Fria River. This letter is being sent to you because some part of land owned or managed by you has been found to be within the study area.

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Sincerely,

William J. King

William J. King, P.E.
Design Engineer
Storm Water Management

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B.7 FEMA Correspondence

Federal Emergency Management Agency

Washington, D.C. 20472

DEC 19 2003

RBF CONSULTING

DEC 22 2003

RECEIVED

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

IN REPLY REFER TO:
Case No.: 03-09-1312P

The Honorable Fulton Brock
Chairman, Maricopa County
Board of Supervisors
301 West Jefferson Street, 10th Floor
Phoenix, AZ 85003

Community: Maricopa County, AZ
Community No.: 040037
Panels Affected: 04013C0025 E, 0050 E, 0375 F, and 0400 G
Effective Date of This Revision: JAN 19 2004

102-I-C

Dear Mr. Brock:

This responds to a request that the Department of Homeland Security's Federal Emergency Management Agency (FEMA) revise the effective Flood Insurance Rate Map (FIRM) and Flood Insurance Study (FIS) report for Maricopa County, Arizona and Incorporated Areas, in accordance with Part 65 of the National Flood Insurance Program (NFIP) regulations. In a letter dated July 8, 2003, Mr. Richard P. Harris, P.E., CFM, Project Manager, Engineering Division, Flood Control District of Maricopa County, requested that FEMA revise the FIRM to show the effects of new hydrologic and hydraulic analyses, new topographic data, and updated bridge and culvert information along Moores Gulch, Moores Gulch Tributaries 1 through 6, Little Squaw Creek, Little Squaw Creek Tributaries 1 through 5, and Wash 8N2ES16. On the effective FIRM, the Special Flood Hazard Area (SFHA), the area that would be inundated by the flood having a 1-percent chance of being equaled or exceeded in any given year (base flood), along Moores Gulch from just upstream to approximately 31,300 feet upstream of its confluence with the Agua Fria River is designated Zone A, an SFHA with no Base Flood Elevations determined. The effective FIRM also shows an SFHA designated Zone A along Little Squaw Creek from just upstream to approximately 23,500 feet upstream of its confluence with the Agua Fria River. In addition, the effective FIRM shows an area designated Zone D, an area in which flood hazards are possible but undetermined, along Moores Gulch from approximately 43,000 feet upstream to approximately 49,500 feet upstream of its confluence with the Agua Fria River.

All data required to complete our review of this request were submitted with letters from Mr. Harris. Because this Letter of Map Revision (LOMR) is based on flood hazard information meant to improve upon that shown on the flood map or within the flood study, and does not partially or wholly incorporate manmade modifications within the SFHA, fees were not assessed for the review.

We have completed our review of the submitted data and the flood data shown on the effective FIRM and in the effective FIS report. We have revised the FIRM to modify the floodplain boundary delineations and zone designations of the base flood along Moores Gulch, Moores Gulch Tributaries 1 through 6, Little Squaw Creek, Little Squaw Creek Tributaries 1 through 5, and Wash 8N2ES16.

As a result of the modifications, the width of the SFHA for Moores Gulch decreased from just upstream to approximately 12,400 feet upstream of its confluence with the Agua Fria River; a new SFHA designated Zone A was delineated along Moores Gulch from approximately 31,300 feet upstream to approximately 49,500 feet upstream of its confluence with the Agua Fria River; and a new area designated Zone X (shaded), an area subject to inundation by the base flood with average depths of less than 1 foot, was added along Moores Gulch from approximately 43,000 feet upstream to approximately 49,500 feet upstream of its confluence with the Agua Fria River. Also as a result of the modifications, the width of the SFHA for Little Squaw Creek decreased from just upstream to approximately 24,700 feet upstream of its

confluence with the Agua Fria River; new SFHAs designated Zone A were delineated for Moores Gulch Tributaries 1 through 6, Little Squaw Creek Tributaries 1 through 5, and Wash 8N2ES16; and an area designated Zone X (shaded) was added along Moores Gulch Tributary 6 from just upstream to approximately 1,600 feet upstream of its confluence with Moores Gulch. The modifications are shown on the enclosed annotated copies of FIRM Panels 04013C0025 E, 04013C0050 E, 04013C0375 F, and 04013C0400 G and affected portions of the Summary of Discharges Table. This LOMR hereby revises the above-referenced panels of the effective FIRM and the affected portions of the FIS report, both dated July 19, 2001.

The modifications are effective as of the date shown above. The map panels as listed above and as modified by this letter will be used for all flood insurance policies and renewals issued for your community.

A review of the determination made by this LOMR and any requests to alter this determination should be made within 30 days. Any request to alter the determination must be based on scientific or technical data.

We will not physically revise and republish the FIRM and FIS report for your community to reflect the modifications made by this LOMR at this time. When changes to the previously cited FIRM panels and FIS report warrant physical revision and republication in the future, we will incorporate the modifications made by this LOMR at that time.

This LOMR is based on minimum floodplain management criteria established under the NFIP. Your community is responsible for approving all floodplain development and for ensuring all necessary permits required by Federal or State law have been received. State, county, and community officials, based on knowledge of local conditions and in the interest of safety, may set higher standards for construction in the SFHA. If the State, county, or community has adopted more restrictive or comprehensive floodplain management criteria, these criteria take precedence over the minimum NFIP criteria.

The basis of this LOMR is, in whole or in part, a culvert project. NFIP regulations, as cited in Paragraph 60.3(b)(7), require that communities ensure that the flood-carrying capacity within the altered or relocated portion of any watercourse is maintained. This provision is incorporated into your community's existing floodplain management regulations. Consequently, the ultimate responsibility for maintenance of the culverts rests with your community.

Because this LOMR will not be printed and distributed to primary users, such as local insurance agents and mortgage lenders, your community will serve as a repository for these new data. We encourage you to disseminate the information reflected by this LOMR throughout the community, so that interested persons, such as property owners, local insurance agents, and mortgage lenders, may benefit from the information. We also encourage you to prepare a related article for publication in your community's local newspaper. This article should describe the changes that have been made and the assistance that officials of your community will give to interested persons by providing these data and interpreting the NFIP maps.

This determination has been made pursuant to Section 206 of the Flood Disaster Protection Act of 1973 (Public Law 93-234) and is in accordance with the National Flood Insurance Act of 1968, as amended (Title XIII of the Housing and Urban Development Act of 1968, Public Law 90-448), 42 U.S.C. 4001-4128, and 44 CFR Part 65. Pursuant to Section 1361 of the National Flood Insurance Act of 1968, as amended, communities participating in the NFIP are required to adopt and enforce floodplain management regulations that meet or exceed minimum NFIP criteria. These criteria are the minimum and do not supersede any State or local requirements of a more stringent nature. This includes adoption of the effective FIRM to which the regulations apply and the modifications made by this LOMR. Our records show that your community has met this requirement.

A Consultation Coordination Officer (CCO) has been designated to assist your community. The CCO will be the primary liaison between your community and FEMA. For information regarding your CCO, please contact:

Mr. Jack Eldridge
Chief, National Flood Insurance Program Branch
Federal Emergency Management Agency, Region IX
1111 Broadway Street, Suite 1200
Oakland, CA 94607-4052
(510) 627-7184

If you have any questions regarding floodplain management regulations for your community or the NFIP in general, please call the CCO for your community at the telephone number cited above. If you have any questions regarding this LOMR, please call our Map Assistance Center, toll free, at 1-877-FEMA MAP (1-877-336-2627).

Sincerely,

Max H. Yuan, P.E., Project Engineer
Hazard Identification Section
Mitigation Division
Emergency Preparedness
and Response Directorate

For: Doug Bellomo, P.E., CFM, Acting Chief
Hazard Identification Section
Mitigation Division
Emergency Preparedness
and Response Directorate

Enclosures

cc: Mr. Richard P. Harris, P.E., CFM
Project Manager
Engineering Division
Flood Control District of Maricopa County

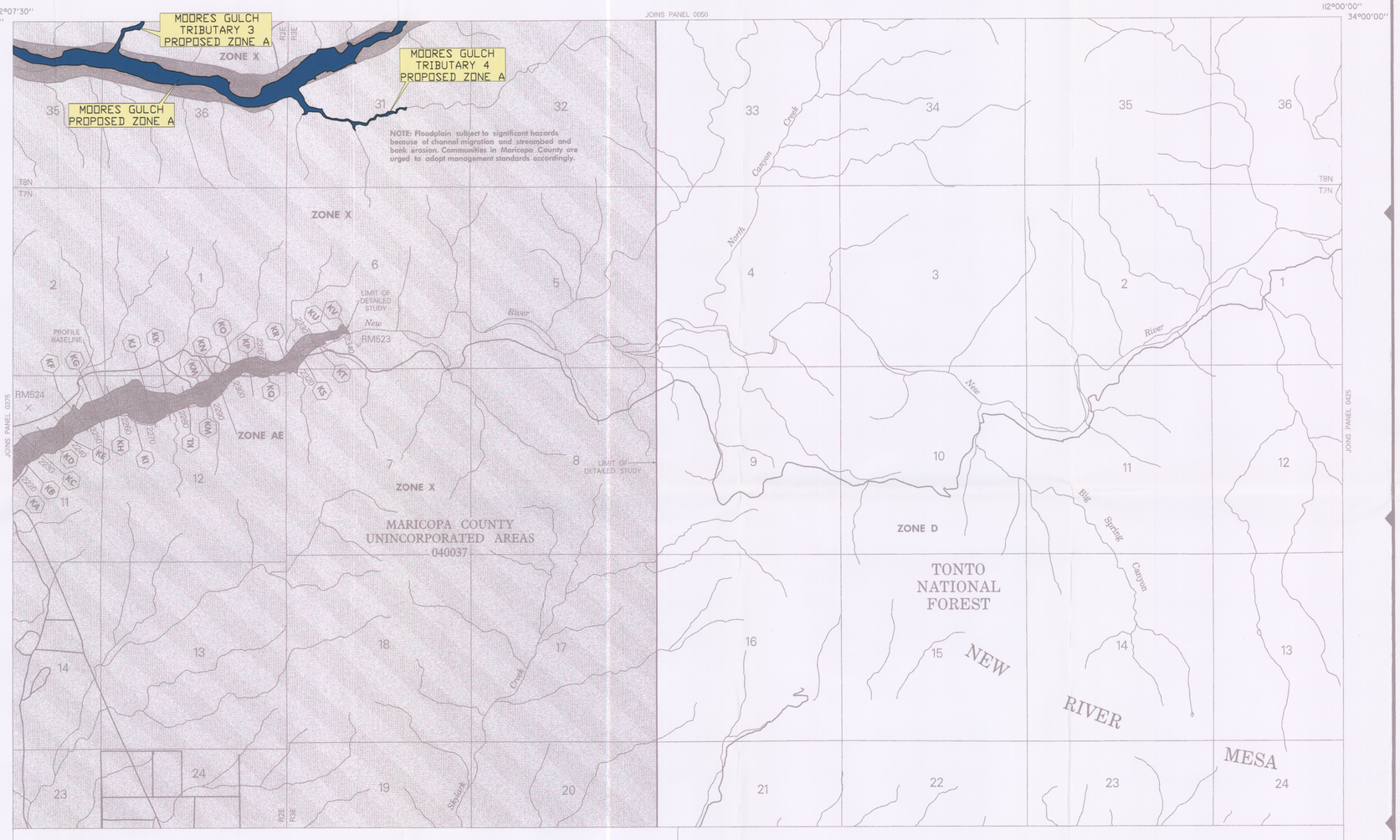
Ms. Shanna Yager, CFM
Principal
Floodplain Administration
Flood Control District of Maricopa County

Mr. Brian Casson
NFIP Coordinator
Arizona Department of Water Resources

Mr. Paul Sclafani
Project Manager
RBF Consulting, Inc.

ELEVATION REFERENCE MARKS

REFERENCE MARK	ELEVATION (FEET NGVD)	DESCRIPTION OF LOCATION
RM523	2434.38	A +-inch rebar set on a rocky knoll on the west edge of ridge 200 feet q north of Track Road 1 mile east of Tee Ranch 2100 feet q east of the southwest corner of section 6, T7N, R3E.
RM524	2215.85	The mark Z-56 is a USC&GS brass cap in a concrete post as described by the USC&GS, 2300 feet q west of the northeast corner of section 11, T7N, R2E.



THIS AREA IS SHOWN ON MAP NUMBER 04013C0390

THIS AREA IS SHOWN ON MAP NUMBER 04013C0395

LEGEND

To obtain more detailed information in areas where Base Flood Elevations (BFEs)and /or floodways have been determined, users are encouraged to consult the Flood Profiles and Floodway Data tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations and therefore may not exactly reflect the flood elevation data presented in the FIS. BFEs shown on the FIRM are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS should be utilized in conjunction with the FIRM for purposes of construction and /or floodplain management.

ERM elevations listed on this map were obtained and/or developed to establish vertical control for determination of flood elevations and floodplain boundaries portrayed on this map. Users should be aware that these ERM elevations may have changed since the publication of this map. To obtain up-to-date elevation information on National Geodetic Survey (NGS) ERMs shown on this map, please contact the Information Services Branch of the NGS at (301) 713-3242, or visit their website at www.ngs.noaa.gov. Map users should seek verification of non-NGS ERM monument elevations when using these elevations for construction or floodplain management purposes.

Coastal BFE's shown on this map may apply only landward of 0.0' NGVD. Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this community. Elevations shown in the Summary of Stillwater Elevations table should be used for construction, and /or floodplain management purposes when they are higher than the elevations shown on this FIRM.

LEGEND

SPECIAL FLOOD HAZARD AREAS INUNDATED BY 100-YEAR FLOOD

- **ZONE A** No base flood elevations determined.
- **ZONE AE** Base flood elevations determined.
- **ZONE AH** Flood depths of 1 to 3 feet (usually areas of ponding); base flood elevations determined.
- **ZONE AO** Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
- **ZONE A99** To be protected from 100-year flood by Federal flood protection system under construction ; no base flood elevations determined.
- **ZONE V** Coastal flood with velocity hazard (wave action); no base flood elevations determined.
- **ZONE VE** Coastal flood with velocity hazard (wave action); base flood elevations determined.

FLOODWAY AREAS IN ZONE AE

OTHER FLOOD AREAS

- **ZONE X** Areas of 500-year flood; areas of 100-year flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 100-year flood.

OTHER AREAS

- **ZONE X** Areas determined to be outside 500-year floodplain.
- **ZONE D** Areas in which flood hazards are undetermined.

UNDEVELOPED COASTAL BARRIERS

Identified 1983 | Identified 1990 | Otherwise Protected Areas

Coastal barrier areas are normally located within or adjacent to Special Flood Hazard Areas.

- Floodplain Boundary
- Floodway Boundary
- Zone D Boundary
- Boundary Dividing Special Flood Hazard Zones, and Boundary Dividing Areas of Different Coastal Base Flood Elevations Within Special Flood Hazard Zones.
- 513 — Base Flood Elevation Line; Elevation in Feet. See Map Index for Elevation Datum.
- D — D — Cross Section Line
- (EL 987) — Base Flood Elevation in Feet Where Uniform Within Zone. See Map Index for Elevation Datum.
- RM7 — Elevation Reference Mark
- M2 — River Mile
- 97°07'30", 32°22'30" — Horizontal Coordinates Based on North American Datum of 1927 (NAD 27) Projection.

NOTES

This map is for use in administering the National Flood Insurance Program; it does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size, or all planimetric features outside Special Flood Hazard Areas. The community map repository should be consulted for more detailed data on BFE's, and for any information on floodway delineations, prior to use of this map for property purchase or construction purposes.

Areas of Special Flood Hazard (100-year flood) include Zones A, AE, A1-A30, AH, AO, A99, V, VE and V1-V30.

Certain areas not in Special Flood Hazard Areas may be protected by flood control structures.

Boundaries of the floodways were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the Federal Emergency Management Agency.

Floodway widths in some areas may be too narrow to show to scale. Refer to Floodway Data Table where floodway width is shown at 1'20 inch.

Corporate limits shown are current as of the date of this map. The user should contact appropriate community officials to determine if corporate limits have changed subsequent to the issuance of this map.

This map may incorporate approximate boundaries of Coastal Barrier Resource System Units and /or Otherwise Protected Areas established under the Coastal Barrier Improvement Act of 1990 (PL 101-591).

For community map revision history prior to countywide mapping, see Section 6.0 of the Flood Insurance Study Report.

For adjoining map panels and base map source see separately printed Map Index.

MAP REPOSITORY
Refer to Repository Listing on Map Index

EFFECTIVE DATE OF
COUNTYWIDE FLOOD INSURANCE RATE MAP:
APRIL 15, 1988

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL:
SEPTEMBER 29, 1989, DECEMBER 3, 1993

Map revised July 19, 2001 to update corporate limits, to change base flood elevations, to add Special Flood Hazard Areas, to change Special Flood Hazard Areas, to change zone designations, to update map format, to add roads and road names, and to incorporate previously issued Letters of Map Revision.

To determine if flood insurance is available, contact an insurance agent or call the National Flood Insurance Program at (800) 638-6620.

APPROXIMATE SCALE IN FEET
2000 0 2000

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

MARICOPA COUNTY, ARIZONA AND INCORPORATED AREAS

PANEL 400 OF 4350
(SEE MAP INDEX FOR PANELS NOT PRINTED)

CONTAINS: COMMUNITY	NUMBER	PANEL	SUFFIX
MARICOPA COUNTY, UNINCORPORATED AREAS	040037	0400	G

PROPOSED ZONE A

FLOODPLAINS

MAP NUMBER
04013C0400 G

MAP REVISED:
JULY 19, 2001

Federal Emergency Management Agency

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevation** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevation (BFEs) shown on this map apply only landward of 0.0' National Geodetic Vertical Datum (NGVD). Users of this FIRM should be aware that coastal flood elevations may also be provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this community. Elevations shown in the Summary of Stillwater Elevations table should be used for construction, and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures.** Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures in this jurisdiction.

The **projection** used in the preparation of this map is Universal Tranverse Mercator (UTM) zone 12. The **horizontal datum** is NAD27, CLARKE1866 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of the FIRM.

Flood elevations on this map are referenced to the National Geodetic Vertical Datum of 1929. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum.** For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

Spatial Reference System Division
National Geodetic Survey, NOAA
Silver Spring Metro Center
1315 East-West Highway
Silver Spring, Maryland 20910
(301) 713-3191

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713-3242,** or visit their website at www.ngs.noaa.gov.

Base map information shown on this FIRM was provided in digital format by Maricopa County GIS Department.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

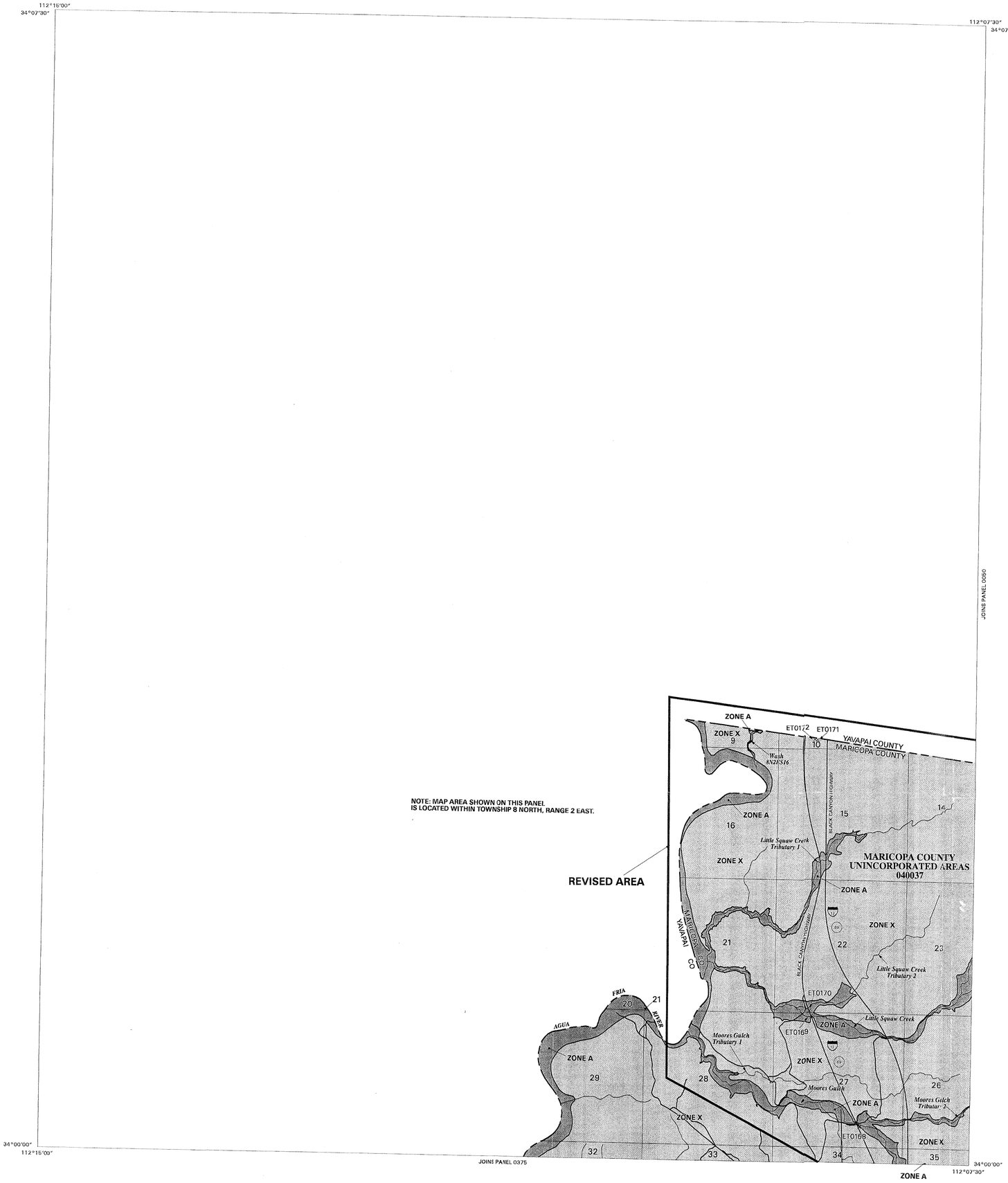
Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

An accompanying Flood Insurance Study report, Letters of Map Revision or Letters of Map Amendment revising portions of this panel, and digital versions of this PANEL may be available. Contact the **FEMA Map Service Center** at the following phone numbers and Internet address for information on all related products available from FEMA:

Phone: 800-358-9616
FAX: 800-358-9620
www.fema.gov/msc

If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA-MAP** (1-877-336-2627) or visit the FEMA website at www.fema.gov.

This map reflects more detailed and up-to-date stream channel configurations than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study report may reflect stream channel distances that differ from what is shown on this map.



NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 8 NORTH, RANGE 2 EAST.

RBF CONSULTING

DEC 22 2003

RECEIVED

LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD EVENT

The **1%** annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water surface elevation of the 1% annual chance flood.

ZONE A No base flood elevations determined.

ZONE AE Base flood elevations determined.

ZONE AH Flood depths of 1 to 3 feet (usually areas of ponding); base flood elevations determined.

ZONE AO Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.

ZONE AR Area of special flood hazard formerly protected from the 1% annual chance flood event by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood event.

ZONE A99 Area to be protected from 1% annual chance flood event by a Federal flood protection system under construction; no base flood elevations determined.

ZONE V Coastal flood zone with velocity hazard (wave action); no base flood elevations determined.

ZONE VE Coastal flood zone with velocity hazard (wave action); base flood elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X Areas determined to be outside the 0.2% annual chance floodplain.

ZONE D Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

- Floodplain boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or velocities.
- 513 — Base Flood Elevation line and value; elevation in feet*
- (EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the National Geodetic Vertical Datum of 1929

- A — A — Cross Section Line
- 23 — 23 — Transect Line
- 97°07'30", 32°22'30" — Geographic coordinates referenced to the North American Datum of 1927 (NAD 27)
- 4276000M — 1000-meter Universal Transverse Mercator grid values, zone 12
- 600000 FT — 5000-foot grid ticks
- DX5510 — Bench mark (see explanation in Notes to Users section of this FIRM panel).
- M1.5 — River Mile

MAP REPOSITORY
Refer to Repository Listing on Index Map

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
APRIL 15, 1988

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

Map revised July 19, 2001 to update corporate limits, to change base flood elevations, to add base flood elevations, to add Special Flood Hazard Areas, to change Special Flood Hazard Areas, to change zone designations, to update map format, to add roads and road names, and to incorporate previously issued Letters of Map Revision.

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at (800) 638-6620.

MAP SCALE 1" = 2000'

1000 0 2000 4000 FEET

600 0 600 1200 METERS

PANEL 0025E

FIRM

FLOOD INSURANCE RATE MAP

MARICOPA COUNTY,
ARIZONA
AND INCORPORATED AREAS

PANEL 25 OF 4350

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
MARICOPA COUNTY, UNINCORPORATED AREAS	040037	0025	E

REVISED TO REFLECT LOMR DATED JAN 19 2004

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
04013C0025E

MAP REVISED:
JULY 19, 2001

Federal Emergency Management Agency

NFIP — THIS IS AN OFFICIAL COPY OF A PORTION OF THE ABOVE REFERENCED FLOOD MAP. IT WAS EXTRACTED USING F-MIT ON-DEMAND. THIS MAP DOES NOT REFLECT CHANGES OR AMENDMENTS WHICH MAY HAVE BEEN MADE SUBSEQUENT TO THE DATE ON THE TITLE BLOCK. FOR THE LATEST PRODUCT INFORMATION, REFER TO THE COMMUNITY MAP REPOSITORY OR CONTACT THE FLOOD INSURANCE PROGRAM AT 1-800-638-6620.

112°15'00"
34°00'00"

JOINS PANEL 0025

ZONE X

112°07'30"
34°00'00"

MOORES GULCH
PROPOSED ZONE A

Moore Gulch

ZONE A

ZONE A

ZONE X

T8N
T7N

YAVAPAI COUNTY

ZONE A

RI1E
R2E

AGUA FRIA RIVER

MARICOPA COUNTY
UNINCORPORATED AREAS
040037

Floodplain subject to significant hazards because of channel migration and stream bed and bank erosion. Communities in Maricopa County are urged to adopt management standards accordingly.

LIMIT OF DETAILED STUDY

RM525

ZONE AE

ZONE X

LIMIT OF DETAILED STUDY

New River

RM526

ZONE X

ZONE A

ZONE X

JOINS PANEL 0360

JOINS PANEL 0400

JOINS PANEL 0390

THIS AREA IS SHOWN ON MAP NUMBER 04013C0365

THIS AREA IS SHOWN ON MAP NUMBER 04013C0370

33°52'30"
112°15'00"

JOINS PANEL 0755

JOINS PANEL 0760

33°52'30"
112°07'30"

ELEVATION REFERENCE MARKS

REFERENCE MARK	ELEVATION (FEET NGVD)	DESCRIPTION OF LOCATION
RM525	2307.18	A +-inch rebar set 30 feet q north of two saguaros atop flat knoll, proceed west on Track Road 0.1 q mile from Table Mesa Interchange then south along a meandering road 0.4q mile to bend turning west, proceed west 650 feet q to mark; approximately 1800 feet q north of the southwest corner of section 11, T7N, R2E.
RM526	2157.48	A PK nail and shiner in the safety lane of northbound I-17 0.15 q mile north of mile post no. 234, 1100 feet q east of the northeast corner of section 22, T7N, R2E.

LEGEND

To obtain more detailed information in areas where Base Flood Elevations (BFEs)and /or floodways have been determined, users are encouraged to consult the Flood Profiles and Floodway Data tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations and therefore may not exactly reflect the flood elevation data presented in the FIS. BFEs shown on the FIRM are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS should be utilized in conjunction with the FIRM for purposes of construction and /or floodplain management.

ERM elevations listed on this map were obtained and/or developed to establish vertical control for determination of flood elevations and floodplain boundaries portrayed on this map. Users should be aware that these ERM elevations may have changed since the publication of this map. To obtain up-to-date elevation information on National Geodetic Survey (NGS) ERMs shown on this map, please contact the Information Services Branch of the NGS at (301) 713-3242, or visit their website at www.ngs.noaa.gov. Map users should seek verification of non-NGS ERM monument elevations when using these elevations for construction or floodplain management purposes.

Coastal BFE's shown on this map may apply only landward of 0.0' NGVD. Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this community. Elevations shown in the Summary of Stillwater Elevations table should be used for construction, and /or floodplain management purposes when they are higher than the elevations shown on this FIRM.

LEGEND

SPECIAL FLOOD HAZARD AREAS INUNDATED BY 100-YEAR FLOOD

- **ZONE A** No base flood elevations determined.
- **ZONE AE** Base flood elevations determined.
- **ZONE AH** Flood depths of 1 to 3 feet (usually areas of ponding); base flood elevations determined.
- **ZONE AO** Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
- **ZONE A99** To be protected from 100-year flood by Federal flood protection system under construction ; no base flood elevations determined.
- **ZONE V** Coastal flood with velocity hazard (wave action); no base flood elevations determined.
- **ZONE VE** Coastal flood with velocity hazard (wave action); base flood elevations determined.

FLOODWAY AREAS IN ZONE AE

OTHER FLOOD AREAS

- **ZONE X** Areas of 500-year flood; areas of 100-year flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 100-year flood.

OTHER AREAS

- **ZONE X** Areas determined to be outside 500-year floodplain.
- **ZONE D** Areas in which flood hazards are undetermined.

UNDEVELOPED COASTAL BARRIERS

Identified 1983 | Identified 1990 | Otherwise Protected Areas

Coastal barrier areas are normally located within or adjacent to Special Flood Hazard Areas.

Floodplain Boundary

Floodway Boundary

Zone D Boundary

Boundary Dividing Special Flood Hazard Zones, and Boundary Dividing Areas of Different Coastal Base Flood Elevations Within Special Flood Hazard Zones.

513 — Base Flood Elevation Line; Elevation in Feet. See Map Index for Elevation Datum.

D — D — Cross Section Line

(EL 987) — Base Flood Elevation in Feet Where Uniform Within Zone. See Map Index for Elevation Datum.

RM7 — Elevation Reference Mark

M2 — River Mile

97°07'30", 32°22'30" — Horizontal Coordinates Based on North American Datum of 1927 (NAD 27) Projection.

NOTES

This map is for use in administering the National Flood Insurance Program; it does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size, or all planimetric features outside Special Flood Hazard Areas. The community map repository should be consulted for more detailed data on BFE's, and for any information on floodway delineations, prior to use of this map for property purchase or construction purposes.

Areas of Special Flood Hazard (100-year flood) include Zones A, AE, A1-A30, AH, AO, A99, V, VE and V1-V30.

Certain areas not in Special Flood Hazard Areas may be protected by flood control structures.

Boundaries of the floodways were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the Federal Emergency Management Agency.

Floodway widths in some areas may be too narrow to show to scale. Refer to Floodway Data Table where floodway width is shown at V20 inch.

Corporate limits shown are current as of the date of this map. The user should contact appropriate community officials to determine if corporate limits have changed subsequent to the issuance of this map.

This map may incorporate approximate boundaries of Coastal Barrier Resource System Units and /or Otherwise Protected Areas established under the Coastal Barrier Improvement Act of 1990 (PL 101-591).

For community map revision history prior to countywide mapping, see Section 6.0 of the Flood Insurance Study Report.

For adjoining map panels and base map source see separately printed Map Index.

MAP REPOSITORY
Refer to Repository Listing on Map Index

EFFECTIVE DATE OF
COUNTYWIDE FLOOD INSURANCE RATE MAP:
APRIL 15, 1988

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL:
SEPTEMBER 29, 1989

Map revised July 19, 2001 to update corporate limits, to change base flood elevations, to add base flood elevations, to add Special Flood Hazard Areas, to change Special Flood Hazard Areas, to change zone designations, to update map format, to add roads and road names, and to incorporate previously issued Letters of Map Revision.

To determine if flood insurance is available, contact an insurance agent or call the National Flood Insurance Program at (800) 638-6620.

APPROXIMATE SCALE IN FEET
2000 0 2000

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

MARICOPA COUNTY, ARIZONA AND INCORPORATED AREAS

PANEL 375 OF 4350
(SEE MAP INDEX FOR PANELS NOT PRINTED)

CONTAINS: COMMUNITY	NUMBER	PANEL	SUFFIX
MARICOPA COUNTY UNINCORPORATED AREAS	040037	0375	F

PROPOSED ZONE A FLOODPLAINS

MAP NUMBER 04013C0375 F

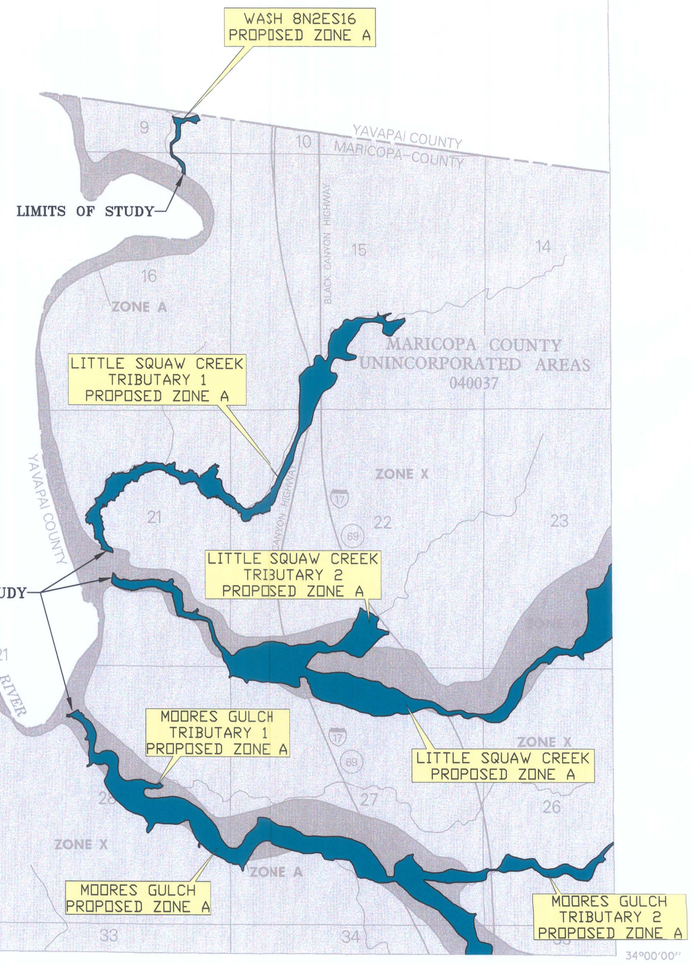
MAP REVISED: JULY 19, 2001

Federal Emergency Management Agency

B C D E F

1 2 3 4 5 6

112°15'00" 34°07'30" 112°07'30" 34°07'30"



NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 8 NORTH, RANGE 2 EAST.

JOINS PANEL 0050

JOINS PANEL 0375

34°00'00" 112°15'00" 34°00'00" 112°07'30"

LEGEND

To obtain more detailed information in areas where Base Flood Elevations (BFEs)and /or floodways have been determined, users are encouraged to consult the Flood Profiles and Floodway Data tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations and therefore may not exactly reflect the flood elevation data presented in the FIS. BFEs shown on the FIRM are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS should be utilized in conjunction with the FIRM for purposes of construction and /or floodplain management.

ERM elevations listed on this map were obtained and/or developed to establish vertical control for determination of flood elevations and floodplain boundaries portrayed on this map. Users should be aware that these ERM elevations may have changed since the publication of this map. To obtain up-to-date elevation information on National Geodetic Survey (NGS) ERMs shown on this map, please contact the Information Services Branch of the NGS at (301) 713-3242, or visit their website at www.ngs.noaa.gov. Map users should seek verification of non-NGS ERM monument elevations when using these elevations for construction or floodplain management purposes.

Coastal BFE's shown on this map may apply only landward of 0.0' NGVD. Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this community. Elevations shown in the Summary of Stillwater Elevations table should be used for construction, and /or floodplain management purposes when they are higher than the elevations shown on this FIRM.

LEGEND

SPECIAL FLOOD HAZARD AREAS INUNDATED BY 100-YEAR FLOOD

ZONE A No base flood elevations determined.

ZONE AE Base flood elevations determined.

ZONE AH Flood depths of 1 to 3 feet (usually areas of ponding); base flood elevations determined.

ZONE AO Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.

ZONE A99 To be protected from 100-year flood by Federal flood protection system under construction ; no base flood elevations determined.

ZONE V Coastal flood with velocity hazard (wave action); no base flood elevations determined.

ZONE VE Coastal flood with velocity hazard (wave action); base flood elevations determined.

FLOODWAY AREAS IN ZONE AE

OTHER FLOOD AREAS

ZONE X Areas of 500-year flood; areas of 100-year flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 100-year flood.

OTHER AREAS

ZONE X Areas determined to be outside 500-year floodplain.

ZONE D Areas in which flood hazards are undetermined.

UNDEVELOPED COASTAL BARRIERS

Identified 1983 | Identified 1990 | Otherwise Protected Areas

Coastal barrier areas are normally located within or adjacent to Special Flood Hazard Areas.

Floodplain Boundary

Floodway Boundary

Zone D Boundary

Boundary Dividing Special Flood Hazard Zones, and Boundary Dividing Areas of Different Coastal Base Flood Elevations Within Special Flood Hazard Zones.

513 — Base Flood Elevation Line; Elevation in Feet. See Map Index for Elevation Datum.

D — D — Cross Section Line

(EL 987) — Base Flood Elevation in Feet Where Uniform Within Zone. See Map Index for Elevation Datum.

RM7 × M2 — Elevation Reference Mark

• River Mile

97°07'30", 32°22'30" — Horizontal Coordinates Based on North American Datum of 1927 (NAD 27) Projection

NOTES

This map is for use in administering the National Flood Insurance Program; it does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size, or all planimetric features outside Special Flood Hazard Areas. The community map repository should be consulted for more detailed data on BFE's, and for any information on floodway delineations, prior to use of this map for property purchase or construction purposes.

Areas of Special Flood Hazard (100-year flood) include Zones A, AE, A1-A30, AH, AO, A99, V, VE and V1-V30.

Certain areas not in Special Flood Hazard Areas may be protected by flood control structures.

Boundaries of the floodways were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the Federal Emergency Management Agency.

Floodway widths in some areas may be too narrow to show to scale. Refer to Floodway Data Table where floodway width is shown at V20 inch.

Corporate limits shown are current as of the date of this map. The user should contact appropriate community officials to determine if corporate limits have changed subsequent to the issuance of this map.

This map may incorporate approximate boundaries of Coastal Barrier Resource System Units and /or Otherwise Protected Areas established under the Coastal Barrier Improvement Act of 1990 (PL 101-591).

For community map revision history prior to countywide mapping, see Section 6.0 of the Flood Insurance Study Report.

For adjoining map panels and base map source see separately printed Map Index.

MAP REPOSITORY
Refer to Repository Listing on Map Index

EFFECTIVE DATE OF
COUNTYWIDE FLOOD INSURANCE RATE MAP:
APRIL 15, 1988

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL:

Map revised July 19, 2001 to update corporate limits, to change base flood elevations, to add base flood elevations, to add Special Flood Hazard Areas, to change Special Flood Hazard Areas, to change zone designations, to update map format, to add roads and road names, and to incorporate previously issued Letters of Map Revision.

To determine if flood insurance is available, contact an insurance agent or call the National Flood Insurance Program at (800) 638-6620.

APPROXIMATE SCALE IN FEET
2000 0 2000

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

MARICOPA COUNTY, ARIZONA AND INCORPORATED AREAS

PANEL 25 OF 4350
(SEE MAP INDEX FOR PANELS NOT PRINTED)

CONTAINS: COMMUNITY	NUMBER	PANEL	SUFFIX
MARICOPA COUNTY, UNINCORPORATED AREAS	040037	0025	E

PROPOSED ZONE A FLOODPLAINS

MAP NUMBER
04013C0025 E

MAP REVISED:
JULY 19, 2001

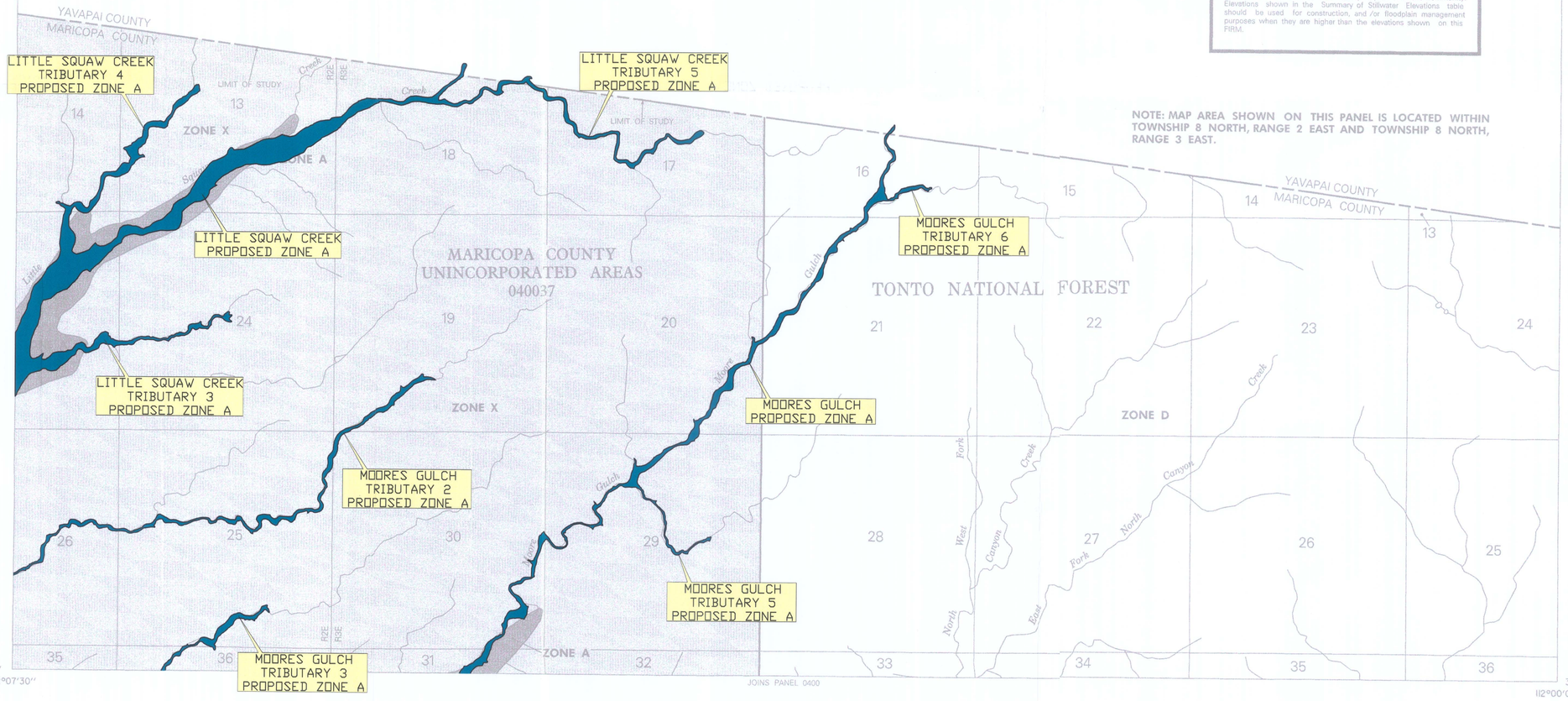
Federal Emergency Management Agency

112°07'30"
34°07'30"

112°00'00"
34°07'30"

JOINS PANEL 0025

JOINS PANEL 0075



34°00'00"
112°07'30"

JOINS PANEL 0400

34°00'00"
112°00'00"

LEGEND

To obtain more detailed information in areas where Base Flood Elevations (BFEs)and /or floodways have been determined, users are encouraged to consult the Flood Profiles and Floodway Data tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations and therefore may not exactly reflect the flood elevation data presented in the FIS. BFEs shown on the FIRM are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS should be utilized in conjunction with the FIRM for purposes of construction and /or floodplain management.

ERM elevations listed on this map were obtained and/or developed to establish vertical control for determination of flood elevations and floodplain boundaries portrayed on this map. Users should be aware that these ERM elevations may have changed since the publication of this map. To obtain up-to-date elevaton information on National Geodetic Survey (NGS) ERMs shown on this map, please contact the Information Services Branch of the NGS at (301) 713-3242, or visit their website at www.ngs.noaa.gov. Map users should seek verification of non-NGS ERM monument elevations when using these elevations for construction or floodplain management purposes.

Coastal BFE's shown on this map may apply only landward of 0.0' NGVD. Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this community. Elevations shown in the Summary of Stillwater Elevations table should be used for construction, and /or floodplain management purposes when they are higher than the elevations shown on this FIRM.

NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 8 NORTH, RANGE 2 EAST AND TOWNSHIP 8 NORTH, RANGE 3 EAST.

LEGEND

SPECIAL FLOOD HAZARD AREAS INUNDATED BY 100-YEAR FLOOD

ZONE A No base flood elevations determined.

ZONE AE Base flood elevations determined.

ZONE AH Flood depths of 1 to 3 feet (usually areas of ponding); base flood elevations determined.

ZONE AO Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.

ZONE A99 To be protected from 100-year flood by Federal flood protection system under construction ; no base flood elevations determined.

ZONE V Coastal flood with velocity hazard (wave action); no base flood elevations determined.

ZONE VE Coastal flood with velocity hazard (wave action); base flood elevations determined.

FLOODWAY AREAS IN ZONE AE

OTHER FLOOD AREAS

ZONE X Areas of 500-year flood; areas of 100-year flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 100-year flood.

OTHER AREAS

ZONE X Areas determined to be outside 500-year floodplain.

ZONE D Areas in which flood hazards are undetermined.

UNDEVELOPED COASTAL BARRIERS

Identified 1983 | Identified 1990 | Otherwise Protected Areas

Coastal barrier areas are normally located within or adjacent to Special Flood Hazard Areas.

Floodplain Boundary

Floodway Boundary

Zone D Boundary

Boundary Dividing Special Flood Hazard Zones, and Boundary Dividing Areas of Different Coastal Base Flood Elevations Within Special Flood Hazard Zones.

513 — Base Flood Elevation Line; Elevation in Feet. See Map Index for Elevation Datum.

D — D — Cross Section Line

(EL 987) — Base Flood Elevation in Feet Where Uniform Within Zone. See Map Index for Elevation Datum.

RM7 — Elevation Reference Mark

M2 — River Mile

97°07'30", 32°22'30" — Horizontal Coordinates Based on North American Datum of 1927 (NAD 27) Projection.

NOTES

This map is for use in administering the National Flood Insurance Program; it does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size, or all planimetric features outside Special Flood Hazard Areas. The community map repository should be consulted for more detailed data on BFE's, and for any informations on floodway delineations, prior to use of this map for property purchase or construction purposes.

Areas of Special Flood Hazard (100-year flood) include Zones A, AE, A1-A30, AH, AO, A99, V, VE and V1-V30.

Certain areas not in Special Flood Hazard Areas may be protected by flood control structures.

Boundaries of the floodways were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the Federal Emergency Management Agency.

Floodway widths in some areas may be too narrow to show to scale. Refer to Floodway Data Table where floodway width is shown at 1/20 inch.

Corporate limits shown are current as of the date of this map. The user should contact appropriate community officials to determine if corporate limits have changed subsequent to the issuance of this map.

This map may incorporate approximate boundaries of Coastal Barrier Resource System Units and /or Otherwise Protected Areas established under the Coastal Barrier Improvement Act of 1990 (PL 101-591).

For community map revision history prior to countywide mapping, see Section 6.0 of the Flood Insurance Study Report.

For adjoining map panels and base map source see separately printed Map Index.

MAP REPOSITORY
Refer to Repository Listing on Map Index

EFFECTIVE DATE OF
COUNTYWIDE FLOOD INSURANCE RATE MAP:
APRIL 15, 1988

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL:

Map revised July 19, 2001 to update corporate limits, to change base flood elevations, to add base flood elevations, to add Special Flood Hazard Areas, to change Special Flood Hazard Areas, to change zone designations, to update map format, to add roads and road names, and to incorporate previously issued Letters of Map Revision.

To determine if flood insurance is available, contact an insurance agent or call the National Flood Insurance Program at (800) 638-6620.

APPROXIMATE SCALE IN FEET
2000 0 2000

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

MARICOPA COUNTY, ARIZONA AND INCORPORATED AREAS

PANEL 50 OF 4350
(SEE MAP INDEX FOR PANELS NOT PRINTED)

CONTAINS: COMMUNITY	NUMBER	PANEL	SUFFIX
MARICOPA COUNTY, UNINCORPORATED AREAS	040037	0050	E

PROPOSED ZONE A FLOODPLAINS

MAP NUMBER
04013C0050 E

MAP REVISED:
JULY 19, 2001

Federal Emergency Management Agency

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevation** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevation (BFEs) shown on this map apply only landward of 0.0' National Geodetic Vertical Datum (NGVD). Users of this FIRM should be aware that coastal flood elevations may also be provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this community. Elevations shown in the Summary of Stillwater Elevations table should be used for construction, and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures.** Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures in this jurisdiction.

The **projection** used in the preparation of this map is Universal Tranverse Mercator (UTM) zone 12. The **horizontal datum** is NAD27, CLARKE1866 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of the FIRM.

Flood elevations on this map are referenced to the National Geodetic Vertical Datum of 1929. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum.** For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

Spatial Reference System Division
National Geodetic Survey, NOAA
Silver Spring Metro Center
1315 East-West Highway
Silver Spring, Maryland 20910
(301) 713-3191

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713-3242,** or visit their website at www.ngs.noaa.gov.

Base map information shown on this FIRM was provided in digital format by Maricopa County GIS Department.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

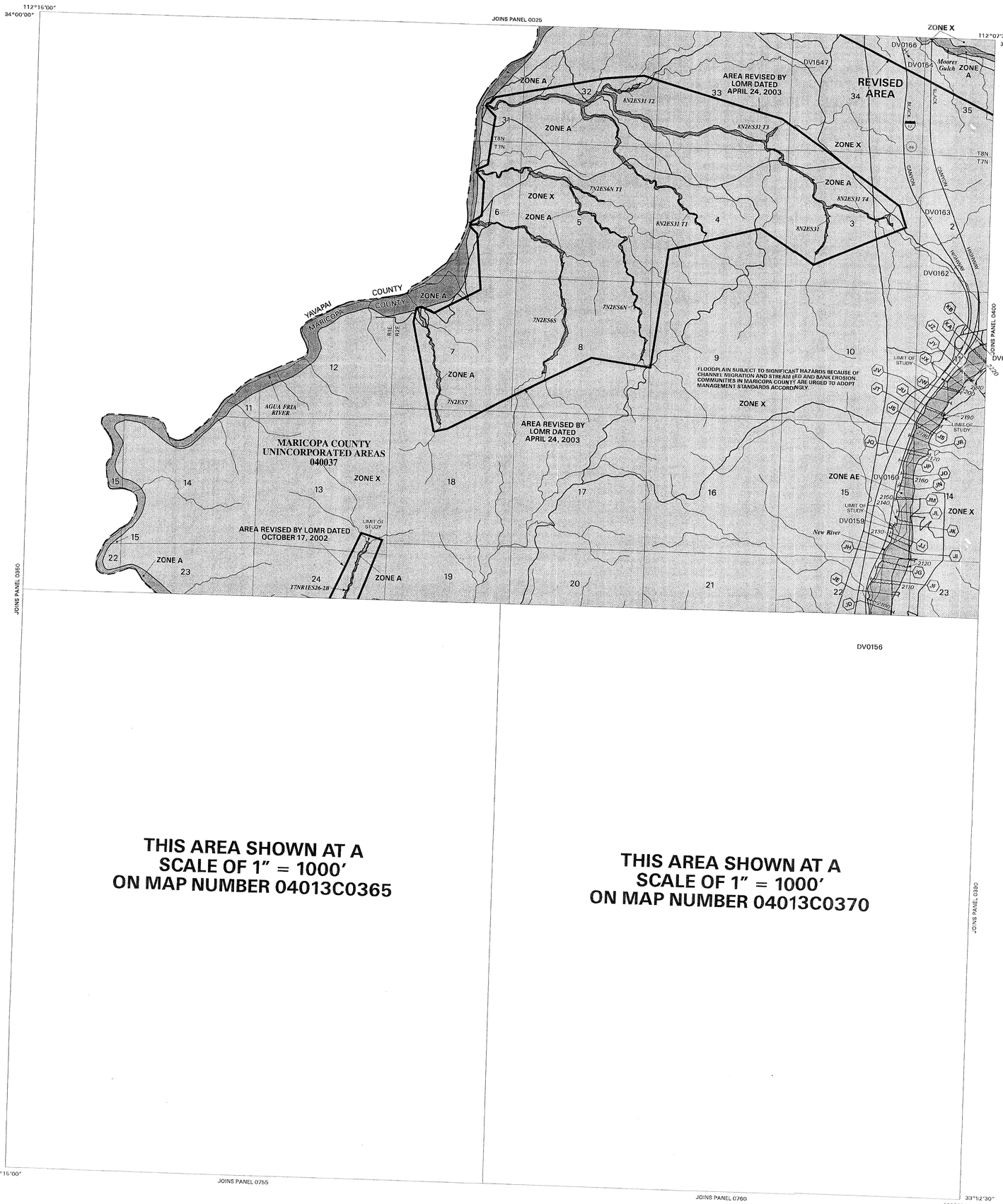
Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

An accompanying Flood Insurance Study report, Letters of Map Revision or Letters of Map Amendment revising portions of this panel, and digital versions of this PANEL may be available. Contact the **FEMA Map Service Center** at the following phone numbers and Internet address for information on all related products available from FEMA;

Phone: 800-358-9616
FAX: 800-358-9620
www.fema.gov/msc

If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA-MAP** (1-877-336-2627) or visit the FEMA website at www.fema.gov.

This map reflects more detailed and up-to-date stream channel configurations than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study report may reflect stream channel distances that differ from what is shown on this map.



THIS AREA SHOWN AT A SCALE OF 1" = 1000' ON MAP NUMBER 04013C0365

THIS AREA SHOWN AT A SCALE OF 1" = 1000' ON MAP NUMBER 04013C0370

RBF CONSULTING

DEC 22 2003

LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD EVENT

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water surface elevation of the 1% annual chance flood.

ZONE A No base flood elevations determined.

ZONE AE Base flood elevations determined.

ZONE AH Flood depths of 1 to 3 feet (usually areas of ponding); base flood elevations determined.

ZONE AO Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.

ZONE AR Area of special flood hazard formerly protected from the 1% annual chance flood event by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood event.

ZONE A99 Area to be protected from 1% annual chance flood event by a Federal flood protection system under construction; no base flood elevations determined.

ZONE V Coastal flood zone with velocity hazard (wave action); no base flood elevations determined.

ZONE VE Coastal flood zone with velocity hazard (wave action); base flood elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X Areas determined to be outside the 0.2% annual chance floodplain.

ZONE D Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

- Floodplain boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or velocities.
- 513 — Base Flood Elevation line and value; elevation in feet*
- (EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the National Geodetic Vertical Datum of 1929

- A — A — Cross Section Line
- 23 — 23 — Transect Line
- 97°07'30", 32°22'30" — Geographic coordinates referenced to the North American Datum of 1927 (NAD 27)
- 4276000M — 1000-meter Universal Transverse Mercator grid values, zone 12
- 600000 FT — 5000-foot grid ticks
- DX5510 × — Bench mark (see explanation in Notes to Users section of this FIRM panel).
- M1.5 — River Mile

MAP REPOSITORY
Refer to Repository Listing on Index Map

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
APRIL 15, 1989

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
SEPTEMBER 29, 1989
Map revised July 19, 2001 to update corporate limits, to change base flood elevations, to add base flood elevations, to add Special Flood Hazard Areas, to change Special Flood Hazard Areas, to change zone designations, to update map format, to add roads and road names, and to incorporate previously issued Letters of Map Revision.

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at (800) 638-6620.

MAP SCALE 1" = 2000'
1000 0 2000 4000 FEET
600 0 600 1200 METERS

NFIP — PANEL 0375F

FIRM
FLOOD INSURANCE RATE MAP
MARICOPA COUNTY, ARIZONA
AND INCORPORATED AREAS

PANEL 375 OF 4350
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
MARICOPA COUNTY, UNINCORPORATED AREAS	040037	0375	F

REVISED TO REFLECT LOMR DATED JAN 19 2004

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER 04013C0375F

MAP REVISED: JULY 19, 2001

Federal Emergency Management Agency

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevation** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

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Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures.** Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures in this jurisdiction.

The **projection** used in the preparation of this map is Universal Tranverse Mercator (UTM) zone 12. The **horizontal datum** is NAD27, CLARKE1866 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of the FIRM.

Flood elevations on this map are referenced to the National Geodetic Vertical Datum of 1929. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum.** For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

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Silver Spring Metro Center
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Silver Spring, Maryland 20910
(301) 713-3191

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FAX: 800-358-9620
www.fema.gov/msc

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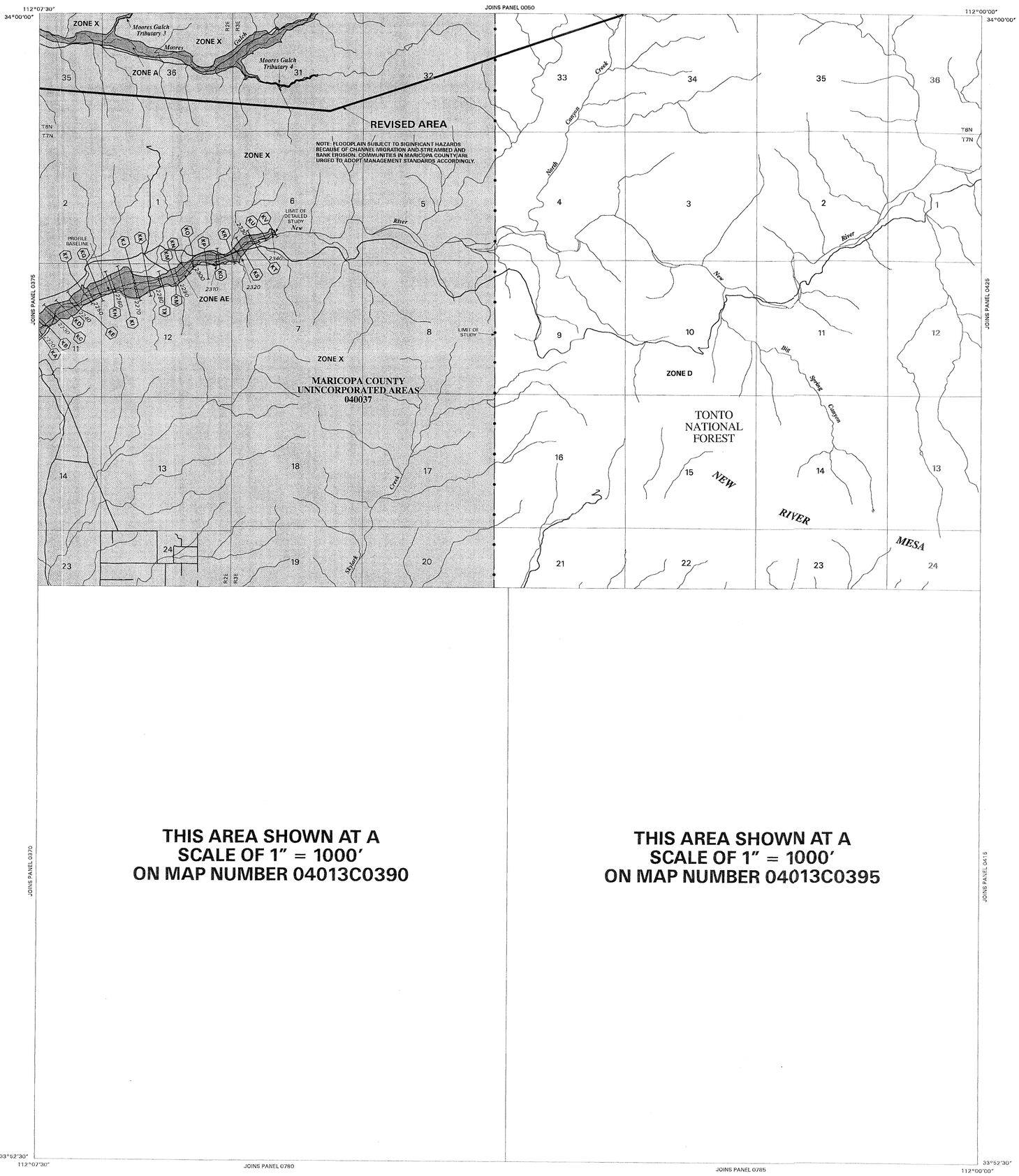

LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD EVENT

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water surface elevation of the 1% annual chance flood.

ZONE A No base flood elevations determined.

ZONE AE Base flood elevations determined.

ZONE AH Flood depths of 1 to 3 feet (usually areas of ponding); base flood elevations determined.

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ZONE A99 Area to be protected from 1% annual chance flood event by a Federal flood protection system under construction; no base flood elevations determined.

ZONE V Coastal flood zone with velocity hazard (wave action); no base flood elevations determined.

ZONE VE Coastal flood zone with velocity hazard (wave action); base flood elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X Areas determined to be outside the 0.2% annual chance floodplain.

ZONE D Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

- Floodplain boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or velocities.
- 513 — Base Flood Elevation line and value; elevation in feet*
- (EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the National Geodetic Vertical Datum of 1929

- A — A — Cross Section Line
- 23 — 23 — Transect Line
- 97°07'30", 32°22'30" — Geographic coordinates referenced to the North American Datum of 1927 (NAD 27)
- 4276000M — 1000-meter Universal Transverse Mercator grid values, zone 12
- 600000 FT — 5000-foot grid ticks
- DX5510× — Bench mark (see explanation in Notes to Users section of this FIRM panel).
- M1.5 — River Mile

MAP REPOSITORY
Refer to Repository Listing on Index Map

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
APRIL 15, 1988

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

SEPTEMBER 29, 1989
DECEMBER 3, 1993
Map revised July 19, 2001 to update corporate limits, to change base flood elevations, to add base flood elevations, to add Special Flood Hazard Areas, to change Special Flood Hazard Areas, to change zone designations, to update map format, to add roads and road names, and to incorporate previously issued Letters of Map Revision.

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at (800) 638-6620.

MAP SCALE 1" = 2000'

1000 0 2000 4000 FEET
600 0 600 1200 METERS

RBF CONSULTING
DEC 22 2003
RECEIVED

PANEL 0400G

FIRM
FLOOD INSURANCE RATE MAP

MARICOPA COUNTY,
ARIZONA
AND INCORPORATED AREAS

PANEL 400 OF 4350

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
MARICOPA COUNTY, UNINCORPORATED AREAS	040037	0400	G

REVISED TO REFLECT LOMR DATED JAN 19 2004

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER 04013C0400G

MAP REVISED: JULY 19, 2001

Federal Emergency Management Agency

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevation** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevation (BFEs) shown on this map apply only landward of 0.0' National Geodetic Vertical Datum (NGVD). Users of this FIRM should be aware that coastal flood elevations may also be provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this community. Elevations shown in the Summary of Stillwater Elevations table should be used for construction, and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures.** Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures in this jurisdiction.

The **projection** used in the preparation of this map is Universal Tranverse Mercator (UTM) zone 12. The **horizontal datum** is NAD27, CLARKE1866 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of the FIRM.

Flood elevations on this map are referenced to the National Geodetic Vertical Datum of 1929. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum.** For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

Spatial Reference System Division
National Geodetic Survey, NOAA
Silver Spring Metro Center
1315 East-West Highway
Silver Spring, Maryland 20910
(301) 713-3191

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713-3242,** or visit their website at www.ngs.noaa.gov.

Base map information shown on this FIRM was provided in digital format by Maricopa County GIS Department.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

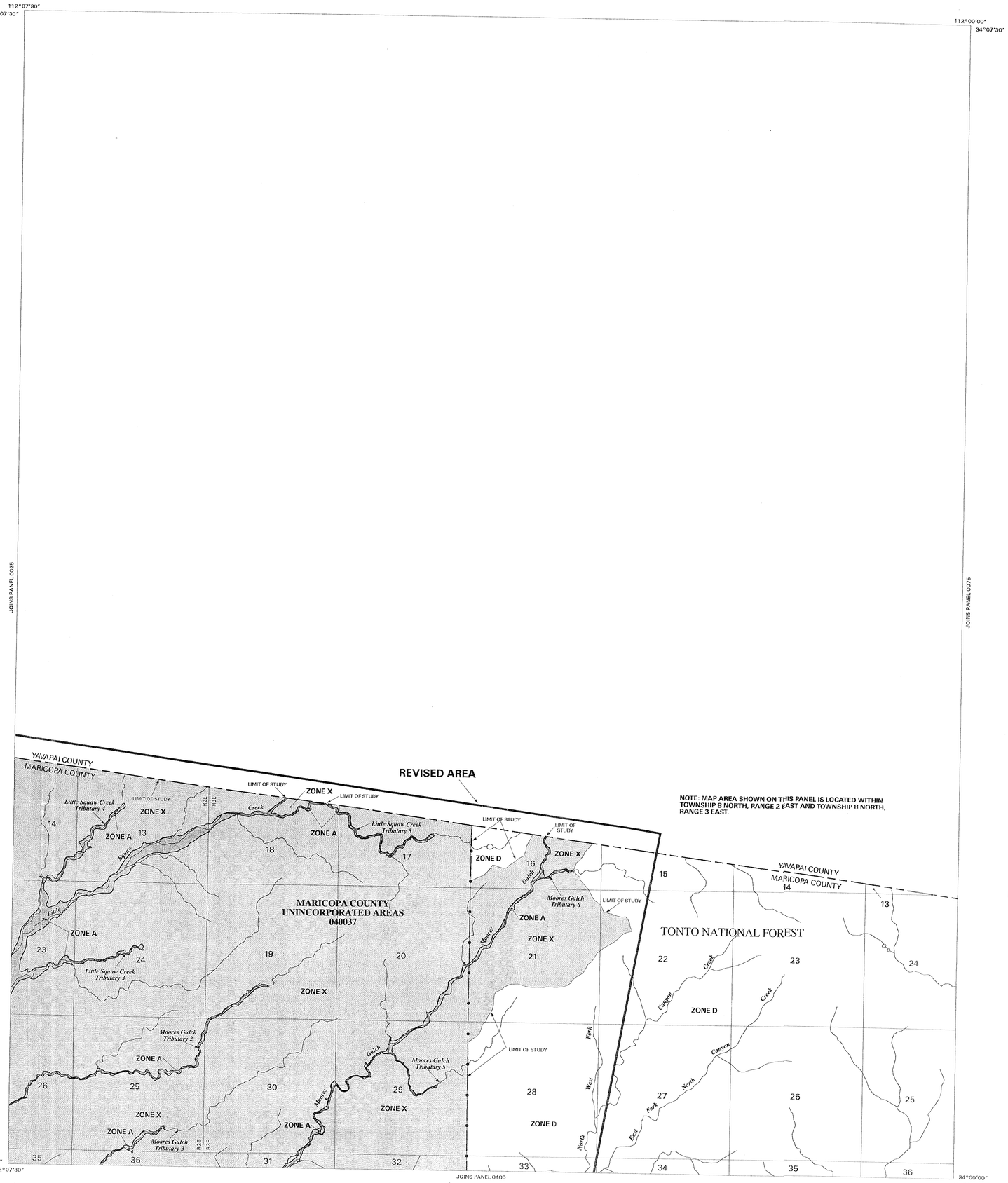
Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

An accompanying Flood Insurance Study report, Letters of Map Revision or Letters of Map Amendment revising portions of this panel, and digital versions of this PANEL may be available. Contact the **FEMA Map Service Center** at the following phone numbers and Internet address for infomation on all related products available from FEMA;

Phone: 800-358-9616
FAX: 800-358-9620
www.fema.gov/msc

If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA-MAP** (1-877-336-2627) or visit the FEMA website at www.fema.gov.

This map reflects more detailed and up-to-date stream channel configurations than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study report may reflect stream channel distances that differ from what is shown on this map.



NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 8 NORTH, RANGE 2 EAST AND TOWNSHIP 8 NORTH, RANGE 3 EAST.

RBF CONSULTING
DEC 22 2003
RECEIVED

LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD EVENT

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water surface elevation of the 1% annual chance flood.

ZONE A No base flood elevations determined.

ZONE AE Base flood elevations determined.

ZONE AH Flood depths of 1 to 3 feet (usually areas of ponding); base flood elevations determined.

ZONE AO Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.

ZONE AR Area of special flood hazard formerly protected from the 1% annual chance flood event by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood event.

ZONE A99 Area to be protected from 1% annual chance flood event by a Federal flood protection system under construction; no base flood elevations determined.

ZONE V Coastal flood zone with velocity hazard (wave action); no base flood elevations determined.

ZONE VE Coastal flood zone with velocity hazard (wave action); base flood elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X Areas determined to be outside the 0.2% annual chance floodplain.

ZONE D Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

- Floodplain boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or velocities.
- 513 — Base Flood Elevation line and value; elevation in feet*
- (EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the National Geodetic Vertical Datum of 1929

- A — A — Cross Section Line
- 23 — 23 — Transect Line
- 97°07'30", 32°22'30" — Geographic coordinates referenced to the North American Datum of 1927 (NAD 27)
- 4276000M — 1000-meter Universal Transverse Mercator grid values, zone 12
- 600000 FT — 5000-foot grid ticks
- DX5510 — Bench mark (see explanation in Notes to Users section of this FIRM panel).
- M1.5 — River Mile

MAP REPOSITORY
Refer to Repository Listing on Index Map

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
APRIL 15, 1988

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
Map revised July 19, 2001 to update corporate limits, to change base flood elevations, to add base flood elevations, to add Special Flood Hazard Areas, to change Special Flood Hazard Areas, to change zone designations, to update map format, to add roads and road names, and to incorporate previously issued Letters of Map Revision.

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at (800) 638-6620.

MAP SCALE 1" = 2000'
1000 0 2000 4000 FEET
600 0 600 1200 METERS

NFIP NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0050E

FIRM
FLOOD INSURANCE RATE MAP
MARICOPA COUNTY, ARIZONA
AND INCORPORATED AREAS

PANEL 50 OF 4350
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
MARICOPA COUNTY, UNINCORPORATED AREAS	040037	0050	E

REVISED TO REFLECT LOMR DATED JAN 19 2004

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER 04013C0050E

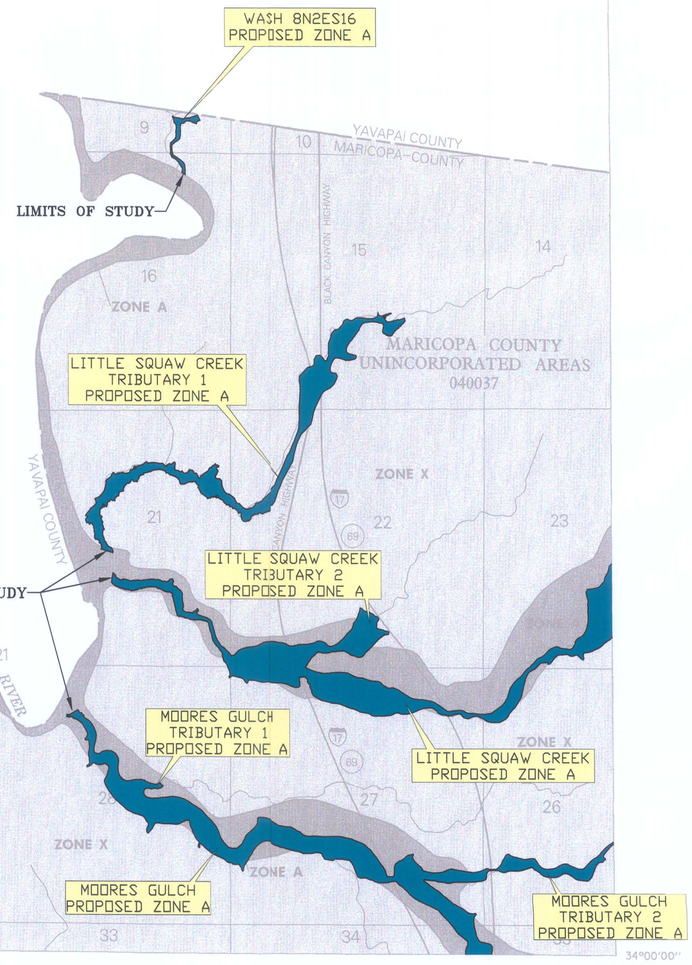
MAP REVISED: JULY 19, 2001

Federal Emergency Management Agency

B C D E F

1 2 3 4 5 6

112°15'00" 34°07'30" 112°07'30" 34°07'30"



NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 8 NORTH, RANGE 2 EAST.

JOINS PANEL 0050

JOINS PANEL 0375

34°00'00" 112°15'00" 34°00'00" 112°07'30"

LEGEND

To obtain more detailed information in areas where Base Flood Elevations (BFEs)and /or floodways have been determined, users are encouraged to consult the Flood Profiles and Floodway Data tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations and therefore may not exactly reflect the flood elevation data presented in the FIS. BFEs shown on the FIRM are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS should be utilized in conjunction with the FIRM for purposes of construction and /or floodplain management.

ERM elevations listed on this map were obtained and/or developed to establish vertical control for determination of flood elevations and floodplain boundaries portrayed on this map. Users should be aware that these ERM elevations may have changed since the publication of this map. To obtain up-to-date elevation information on National Geodetic Survey (NGS) ERMs shown on this map, please contact the Information Services Branch of the NGS at (301) 713-3242, or visit their website at www.ngs.noaa.gov. Map users should seek verification of non-NGS ERM monument elevations when using these elevations for construction or floodplain management purposes.

Coastal BFE's shown on this map may apply only landward of 0.0' NGVD. Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this community. Elevations shown in the Summary of Stillwater Elevations table should be used for construction, and /or floodplain management purposes when they are higher than the elevations shown on this FIRM.

LEGEND

SPECIAL FLOOD HAZARD AREAS INUNDATED BY 100-YEAR FLOOD

ZONE A No base flood elevations determined.

ZONE AE Base flood elevations determined.

ZONE AH Flood depths of 1 to 3 feet (usually areas of ponding); base flood elevations determined.

ZONE AO Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.

ZONE A99 To be protected from 100-year flood by Federal flood protection system under construction ; no base flood elevations determined.

ZONE V Coastal flood with velocity hazard (wave action); no base flood elevations determined.

ZONE VE Coastal flood with velocity hazard (wave action); base flood elevations determined.

FLOODWAY AREAS IN ZONE AE

OTHER FLOOD AREAS

ZONE X Areas of 500-year flood; areas of 100-year flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 100-year flood.

OTHER AREAS

ZONE X Areas determined to be outside 500-year floodplain.

ZONE D Areas in which flood hazards are undetermined.

UNDEVELOPED COASTAL BARRIERS

Identified 1983 | Identified 1990 | Otherwise Protected Areas

Coastal barrier areas are normally located within or adjacent to Special Flood Hazard Areas.

Floodplain Boundary

Floodway Boundary

Zone D Boundary

Boundary Dividing Special Flood Hazard Zones, and Boundary Dividing Areas of Different Coastal Base Flood Elevations Within Special Flood Hazard Zones.

513 — Base Flood Elevation Line; Elevation in Feet. See Map Index for Elevation Datum.

D — D — Cross Section Line

(EL 987) — Base Flood Elevation in Feet Where Uniform Within Zone. See Map Index for Elevation Datum.

RM7 × M2 — Elevation Reference Mark

• River Mile

97°07'30", 32°22'30" — Horizontal Coordinates Based on North American Datum of 1927 (NAD 27) Projection

NOTES

This map is for use in administering the National Flood Insurance Program; it does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size, or all planimetric features outside Special Flood Hazard Areas. The community map repository should be consulted for more detailed data on BFE's, and for any information on floodway delineations, prior to use of this map for property purchase or construction purposes.

Areas of Special Flood Hazard (100-year flood) include Zones A, AE, A1-A30, AH, AO, A99, V, VE and V1-V30.

Certain areas not in Special Flood Hazard Areas may be protected by flood control structures.

Boundaries of the floodways were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the Federal Emergency Management Agency.

Floodway widths in some areas may be too narrow to show to scale. Refer to Floodway Data Table where floodway width is shown at V20 inch.

Corporate limits shown are current as of the date of this map. The user should contact appropriate community officials to determine if corporate limits have changed subsequent to the issuance of this map.

This map may incorporate approximate boundaries of Coastal Barrier Resource System Units and /or Otherwise Protected Areas established under the Coastal Barrier Improvement Act of 1990 (PL 101-591).

For community map revision history prior to countywide mapping, see Section 6.0 of the Flood Insurance Study Report.

For adjoining map panels and base map source see separately printed Map Index.

MAP REPOSITORY
Refer to Repository Listing on Map Index

EFFECTIVE DATE OF
COUNTYWIDE FLOOD INSURANCE RATE MAP:
APRIL 15, 1988

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL:

Map revised July 19, 2001 to update corporate limits, to change base flood elevations, to add base flood elevations, to add Special Flood Hazard Areas, to change Special Flood Hazard Areas, to change zone designations, to update map format, to add roads and road names, and to incorporate previously issued Letters of Map Revision.

To determine if flood insurance is available, contact an insurance agent or call the National Flood Insurance Program at (800) 638-6620.

APPROXIMATE SCALE IN FEET
2000 0 2000

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

MARICOPA COUNTY, ARIZONA AND INCORPORATED AREAS

PANEL 25 OF 4350
(SEE MAP INDEX FOR PANELS NOT PRINTED)

CONTAINS: COMMUNITY	NUMBER	PANEL	SUFFIX
MARICOPA COUNTY, UNINCORPORATED AREAS	040037	0025	E

PROPOSED ZONE A FLOODPLAINS

MAP NUMBER
04013C0025 E

MAP REVISED:
JULY 19, 2001

Federal Emergency Management Agency

NATIONAL FLOOD INSURANCE PROGRAM

FEMA MAP COORDINATION CONTRACTOR

OCT 30 2003

Mr. Richard P. Harris, P.E., CFM
Project Manager
Engineering Division
Flood Control District of Maricopa County
2801 West Durango Street
Phoenix, AZ 85009-6399

IN REPLY REFER TO:
Case No.: 03-09-1312P
Community: Maricopa County, AZ
Community No.: 040037

316-INTc

Dear Mr. Harris:

This is in regard to your July 8, 2003, request that the Department of Homeland Security's Federal Emergency Management Agency (FEMA) issue a Letter of Map Revision for the above-referenced community. In our letter to you dated July 31, 2003, we indicated we were reviewing the data submitted in support of your request and, within 60 days of the date of that letter, we would notify you if we needed additional data or if we encountered delays. Because we have encountered such delays, we will need additional time to complete our review. Therefore, we will inform you of our findings within 30 days of the date of this letter.

If you have general questions about your request, FEMA policy, or the National Flood Insurance Program, please call the FEMA Map Assistance Center, toll free, at 1-877-FEMA MAP (1-877-336-2627). If you have specific questions concerning your request, please call the Revisions Coordinator for your State, Pernille Buch-Pedersen, who may be reached at (703) 317-6224.

Sincerely,

Andrea L. Ryon

Andrea L. Ryon, P.E., Director
Engineering Division
Michael Baker Jr., Inc.

cc: The Honorable Fulton Brock
Chairman, Maricopa County
Board of Supervisors

Ms. Shanna Yager, CFM
Principal
Floodplain Administration
Flood Control District of Maricopa County

Mr. Brian Cosson
NFIP Coordinator
Arizona Department of Water Resources

Mr. Paul Sclafani
Project Manager
RBF Consulting, Inc.

3601 Eisenhower Avenue, Alexandria, Virginia 22304-6425 PH: 703.960.8800 FX: 703.960.9125

Michael Baker Jr., Inc., under contract with the FEDERAL EMERGENCY MANAGEMENT AGENCY, is a Map Coordination Contractor for the National Flood Insurance Program

Received Aug 04 2003

NATIONAL FLOOD INSURANCE PROGRAM
FEMA MAP COORDINATION CONTRACTOR

July 31, 2003

Mr. Richard P. Harris, P.E., C.F.M.
Project Manager
Engineering Division
Flood Control District of Maricopa County
2801 West Durango Street
Phoenix, AZ 85009-6399

IN REPLY REFER TO:
Case No.: 03-09-1312P
Community: Maricopa County, AZ
Community No.: 040037

316-ACK.FRQ

Dear Mr. Harris:

This responds to your letter dated July 28, 2003, concerning a July 8, 2003, request that the Federal Emergency Management Agency (FEMA) issue a conditional revision to the Flood Insurance Rate Map (FIRM) for Maricopa County, Arizona and Incorporated Areas. Pertinent information about the request is listed below.

Identifier:	Approximate Zone A Floodplain Delineation Study of Upper Agua Fria River, Watersheds 3 and 4 (Moores Gulch and Little Squaw Creek)
Flooding Sources:	Moores Gulch; Moores Gulch Tributaries 1, 2, 3, 4, 5, and 6; Little Squaw Creek; Little Squaw Creek Tributaries 1, 2, 3, and 4; and Wash 8N2ES16
FIRM Panel(s) Affected:	04013C0025 E, 0050 E, 0375 F, and 0400 G

We have completed an inventory of the items that you submitted. We have received the data and the review required to begin a detailed technical review of your request. If additional data are required, we will inform you within 60 days of the date of this letter.

When you write us about your request, please include the case number referenced above in your letter.

If you have general questions about your request, FEMA policy, or the National Flood Insurance Program, please call the FEMA Map Assistance Center, toll free, at 1-877-FEMA MAP (1-877-336-2627). If you have specific questions concerning your request, please call the Revisions Coordinator for your State, Pernille Buch-Pedersen, who may be reached at (703) 317-6224.

Sincerely,

Andrea L. Ryon

Andrea L. Ryon, P.E., Director
Engineering Division
Michael Baker Jr., Inc.

cc: Ms. Terri Miller
Executive Consultant
Mitigation Section
Arizona Division of Emergency Management

Mr. Paul Sclafani
Project Manager
RBF Consulting, Inc.

3601 Eisenhower Avenue, Alexandria, Virginia 22304-6425 PH: 703.960.8800 FX: 703.960.9125

Michael Baker Jr., Inc., under contract with the FEDERAL EMERGENCY MANAGEMENT AGENCY, is a Map Coordination Contractor for the National Flood Insurance Program

NATIONAL FLOOD INSURANCE PROGRAM
FEMA MAP COORDINATION CONTRACTOR

July 17, 2003

Mr. Richard P. Harris, P.E., C.F.M.
Project Manager
Engineering Division
Flood Control District of Maricopa County
2801 West Durango Street
Phoenix, AZ 85009-6399

IN REPLY REFER TO:
Case No.: 03-09-1312 P
Community: Maricopa County, AZ
Community No.: 040037

316-ACK.FRQ

Dear Mr. Harris:

This responds to your request dated July 8, 2003, that the Federal Emergency Management Agency (FEMA) issue a conditional revision to the Flood Insurance Rate Map (FIRM) for Maricopa County, Arizona and Incorporated Areas. Pertinent information about the request is listed below.

Identifier:	Approximate Zone A Floodplain Delineation Study of Upper Agua Fria River, Watersheds 3 and 4 (Moores Gulch and Little Squaw Creek)
Flooding Sources:	Moores Gulch; Moores Gulch Tributaries 1, 2, 3, 4, 5, and 6; Little Squaw Creek; Little Squaw Creek Tributaries 1, 2, 3, and 4; and Wash 8N2ES16
FIRM Panel(s) Affected:	04013C0025 E, 0050 E, 0375 F, and 0400 G

We have completed an inventory of the items that you submitted. The items identified below are required before we can begin a detailed review of your request.

Please provide either as-built plans or records of survey of all project elements, certified by a registered professional engineer or land surveyor, respectively. The documents should include characteristics such as the following: invert elevations, length and material, size and dimension of each element, deck/roadway elevations, pier dimensions, wingwall dimensions, and skew.

All required items are to be submitted to us at the address shown at the bottom of this page. If all required items are not submitted within 90 days of the date of this letter, we will treat any subsequent request as an original submittal, and it will be subject to all submittal/payment procedures.

If you are unable to meet the 90-day deadline for submittal of required items, and would like FEMA to continue processing your request, you must request an extension of the deadline. This request must be submitted to us in writing and must provide (1) the reason why the data cannot be submitted within the requested timeframe, and (2) a new date for the submittal of the data. FEMA receives a very large volume of requests and cannot maintain inactive requests for an indefinite period of time. Therefore, the fees will be forfeited for any request for which neither the requested data nor a written extension request is received within 90 days.

When you write us about your request, please include the case number referenced above in your letter.

3601 Eisenhower Avenue, Alexandria, Virginia 22304-6425 PH: 703.960.8800 FX: 703.960.9125

If you have general questions about your request, FEMA policy, or the National Flood Insurance Program, please call the FEMA Map Assistance Center, toll free, at 1-877-FEMA MAP (1-877-336-2627). If you have specific questions concerning your request, please call the Revisions Coordinator for your State, Pernille Buch-Pedersen, who may be reached at (703) 317-6224.

Sincerely,

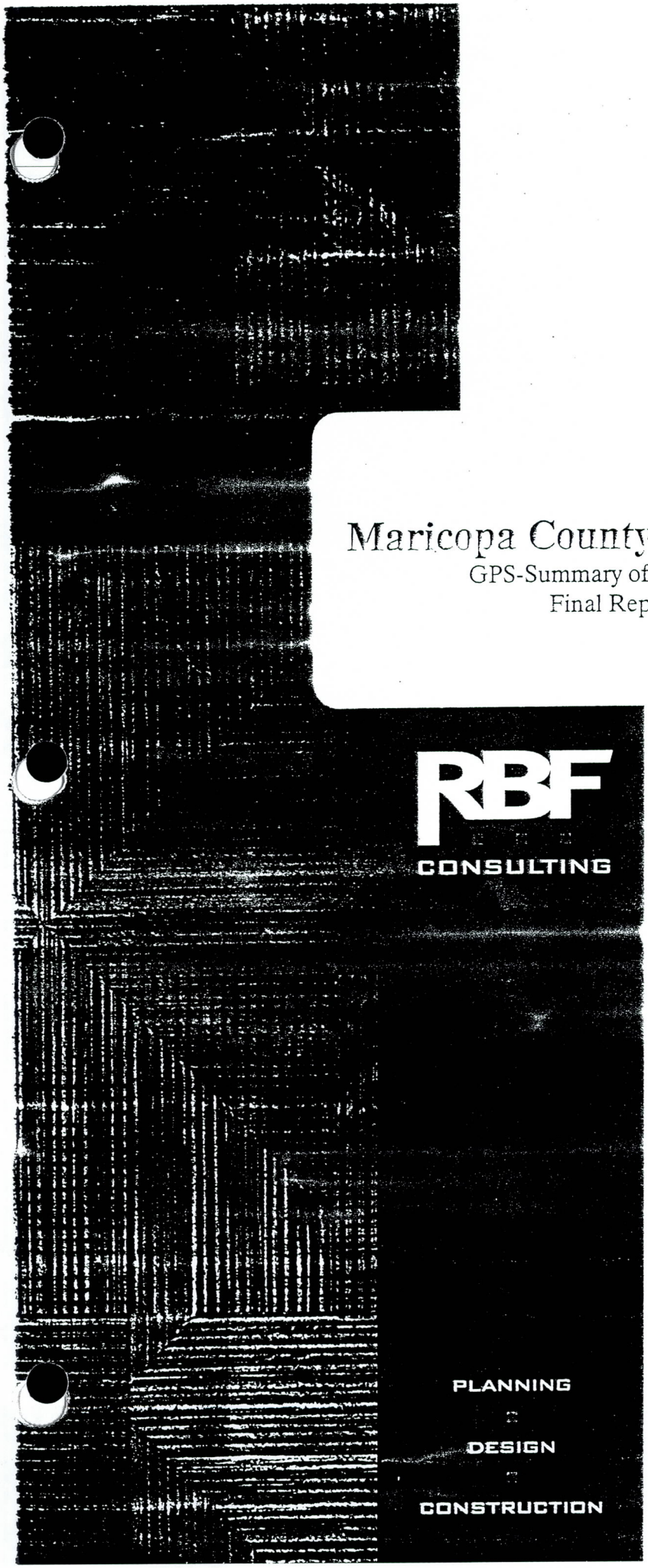
Andrea L. Ryon, P.E., Director
Engineering Division
Michael Baker Jr., Inc.

cc: Ms. Terri Miller
Executive Consultant
Mitigation Section
Arizona Division of Emergency Management

Mr. Paul Sclafani
Project Manager
RBF Consulting, Inc.

C.1 Survey Field Notes for Aerial Mapping Control

Mapping was not performed as a part of this job. Existing elevation data in the form of a Digital Elevation Model (DEM) and breaklines provided by Maricopa County was used in this report. The DEM was produced from the Maricopa County Ortho-Photo project. A copy of the narrative from the survey report for that project follows. The information in the report appendix is provided on a CD at the end of this report.



Maricopa County Ortho-photo

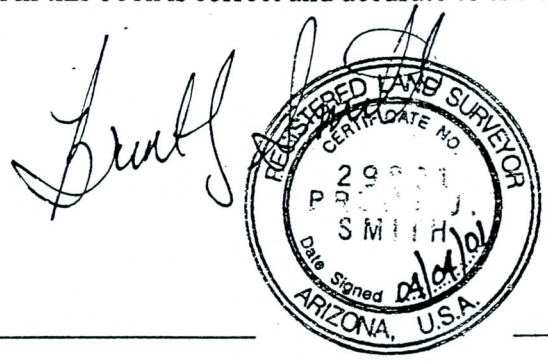
GPS-Summary of Procedure
Final Report

RBF
CONSULTING

PLANNING
DESIGN
CONSTRUCTION

SURVEYOR'S CERTIFICATION

This survey was conducted under my direction during the months of November 2000 through March 2001. The information in this book is correct and accurate to the best of my knowledge and belief.



Brent J. Smith, R.L.S. AZ.#29891 Date

Maricopa County Ortho-photo
Summary of Procedure
Report

Procedure Outline:

I **Control** - set control throughout project
II **Observation** - collected data from ground stations
III **Compilation** - interpret the raw data for usable output
IV **Translation** - translate the output to format required for implementation

Procedure Specifics:

I. Control - Aerial targets were set throughout the project for reference to facilitate the orthographic correction of the photos. Most of the points were set on existing GDACS points to give reference to existing data. The location of non-GDACS points were established through RTK GPS or static GPS observation.

II. Observation- During the flight there were two GPS units on the ground collecting the satellite data for the duration of the flight days. One unit on a central BASE station, and the other unit location ranging between 5 other stations based on flight area that day. The observation days were in December 2000,on the 16th, 17th, 18th, 27th, 28th, and the 30th. The observation days were in January 2001,on the 4th. The observation days in March were on the 13th, 14th and 15th.

III. Compilation - The data collected by the two ground units and the airborne unit were sent out to Fotoflight for processing. The information came from Fotoflight in latitude and longitude and elevation in meters.

IV. Translation - Photo centers were converted to NAD 83 Arizona State Plane coordinates in International feet.

Appendix - Table of Contents

Appendix A:

GPS Observation Logs (including location maps)

Day 1 : 12/16/00 Observation logs for 1HD1 and 4HT3.
Day 2 : 12/17/00 Observation logs for 1HD1 and 4HT3.
Day 3 : 12/18/00 Observation logs for 1HD1 and 3GI1.
Day 4 : 12/27/00 Observation logs for 1HD1 and 3GI1.
Day 5 : 12/28/00 Observation logs for 1HD1 and 3GI1.
Day 6 : 12/30/00 Observation logs for 1HD1 and 3GI1.
Day 7 : 01/04/01 Observation logs for 1HD1 and 1LM2.
Day 8 : 03/13/01 Observation logs for 1HD1 and 1FN1.
Day 9 : 03/14/01 Observation logs for 1HD1 and 1FN1.
Day 10: 03/15/01 Observation logs for 1HD1 and 1FN1.

Appendix B:

Data on the location of the center of each photograph taken and separated by the days of observation. Files with the extension ".lat", contain the Latitude, Longitude and Elevation as prepared by Fotoflight. Files with the extension ".xls" have the Arizona State plane coordinates in NAD 83.

Day 1 : 121600.xls and 121600.lat
Day 2 : 121700.xls and 121700.lat
Day 3 : 121800.xls and 121800.lat
Day 4 : 122700.xls and 122700.lat
Day 5 : 122800.xls and 122800.lat
Day 6 : 123000.xls and 123000.lat
Day 7 : 010401.xls and 010401.lat
Day 8 : 031301.xls and 031301.lat
Day 9 : 031401.xls and 031401.lat
Day 10: 031501.xls and 031501.lat

NOTE: On the attached CD, the raw data files (.raw & .dat) files are also included.

Appendix C:

Complete listing of panel points used in this project.
(filename panels.xls)

Appendix D:

Complete listing of GDACS check points (filename orthochecks.xls) including the standard deviations. (filename results_1.wb3)

C.2 Survey Field Notes for Hydrologic Modeling

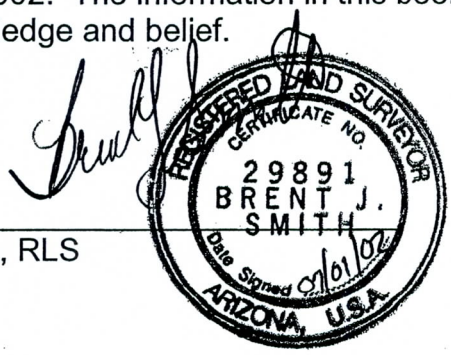
Field reconnaissance notes for sub-basin boundary verification and estimation of physical parameters is included in Appendix E. Additional survey was not required for this study because Approximate methods are being used to delineate Zone A Floodplains. Therefore, there are no survey field notes.

C.3 Survey Field Notes for Hydraulic Modeling

Field survey was performed to set elevation reference monuments and to survey hydraulic structures. The survey was conducted by RBF Consulting under the supervision of Brent J. Smith, R.L.S. The following pages are copies of the field notes.

Surveyor's Certificate

This survey was conducted under my direction during the months of March 2002 and June 2002. The information in this book is correct and accurate to the best of my knowledge and belief.



Brent Smith, RLS

07/01/02
Date

SURVEY SUMMARY

The scope of this project was to set 37 elevation reference marks (ERM's) along the upper Agua Fria river and its tributaries and perform a structure survey of all pipes, bridges, and culverts affecting the area. RBF Consulting performed this work under the direction of Brent Smith, RLS between March and June of 2002.

All work was referenced to the North American Datum 1983 (NAD83) epoch 1992. All elevations were referenced to North American Vertical Datum 1988 (NAVD88). Control monuments were recovered from the Maricopa county Department of Transportation GDACS network and the National Geodetic Survey (NGS).

Horizontal control

In the area encompassed by this project we recovered 4 GDACS control monuments with coordinates published by the Maricopa County Department of Transportation (MCDOT). These points were observed by MCDOT between 1998 and 2000. This was a part of their Geodetic Densification and Cadastral Survey (GDACS) project. The horizontal positions of these monuments have been accepted by the National Geodetic Survey (NGS) and given a horizontal order of B. The published values are related to NAD83 (1992)

Vertical control

The same monuments that were used for horizontal control have a vertical component provided by MCDOT. The elevations were established by determining an ellipsoidal height by GPS observation and referencing this to NAVD88. The orthometric height was then determined using a high-resolution geoid model (geoid 99) with precise GPS observation and processing techniques. The NGS publishes these results as Third Order Class II ellipsoidal heights. Since this is not given a vertical order additional vertical control was used to verify vertical tolerance of minimum third accuracy order. Measurements were made to two additional NGS benchmarks to verify vertical control.

Equipment

All GPS work was preformed using Trimble 4000 series receivers (4000ssi, 4700, 4800). Compact L1/L2 antennas with ground planes were used where external antennas were needed. All antennas used collect L1/L2 and p-code. These antennas are designed to help eliminate multipath and unwanted noise from the observation data. Trimmark II radios were used for RTK work. Trimble Geomatics Office version 1.5 software was used to process field data. This

allowed us to analyze the quality of both the field measurements and the network. The structures were located with the use of a Geodimeter 600 robotic total station theodolite using conventional survey methods.

Outline of survey procedures

Structure surveys

The structures were mapped using the geodimeter 600 from control points established using GPS RTK methods. This ensured all of the structures would relate to the project control network. An as built sketch was made of the structure and photos were taken. Please reference the Structure Survey Book for this project.

Elevation reference monument (ERM) surveys

The ERM's were set in locations determined by the Maricopa County Flood Control District. The locations and elevations were then determined though GPS static survey methods. At each monument three photos were taken and a sketch map was made to depict the monument and a route to its location. Please reference the ERM Survey Book for this project.

Static methods

Where static survey methods were used we designed survey procedures to minimize errors and give us confidence in our results. Fixed height tripods or bipods were used for all observations to eliminate antenna height errors. One GPS "base" receiver was set up to collect data over a control point. A second "rover" receiver was then taken to each ERM where it collected data for 15 minutes. The base receiver was then moved to another control point and each of the ERMs were observed a second time for another 15 minutes. The use of these independent measurements confirmed the quality of our fieldwork and provided data for a stronger final adjustment. Observation logs were filled out for each session. These logs included the height of the antenna, the start and end time of the session, the receiver serial number, and the name of the field personnel. The data was then processed with the use of Trimble Geomatics Office software so that we could analyze the quality of both the fieldwork and the data the receiver collected.

RTK methods

Where RTK survey methods were used we chose a field procedure that would minimize human error and inaccurate data associated with RTK GPS measurements. A base station receiver was set up on a fixed height tripod on a

control point. A radio link was then set up to broadcast its location to a second (rover) receiver. The rover would then gain initialization "on the fly". This means that it has determined it's differential position from the base receiver. The rover receivers were set up on fixed height poles with bipods. A 90 second measurement was taken on another control point to verify that the setup is correct and that the RTK results are consistent with our static measurements. Each point located with RTK was then measured for ninety seconds. The receiver was then forced to physically loose lock with the satellites and then re-initialize at least 40ft. from where it gained initialization the first time. This forces it to use a different set of data to solve for its position. The monument was then measured for another ninety seconds. The results of the two measurements were then compared for quality assurance.

RBF
CONSULTING

July 8, 2003

JN 45-100648

Flood Control District of Maricopa County
2801 West Durango Street
Phoenix, AZ 85009
Subject: **Upper Agua Fria Watershed Zone A Flood Plain Delineation Study**

Elevation Reference Monuments for this study were surveyed using Static GPS Methods from Maricopa County Department of Transportation Monuments 1PD5, NR22 and 1NF2. Positions and elevations submitted are NAD 1983/92 and NAVD 1988 based on the above referenced monuments.

Accuracy of the horizontal positions is Third Order Class I, (FGCC 1984) relative accuracy of 1 part in 10,000. Accuracy of the elevations is Third Order, (FGCC 1984) relative accuracy of 2.0mm x square root of distance in kilometers between points.

Brent J. Smith, RLS 29891

REGISTERED LAND SURVEYOR
CERTIFICATE NO.
29891
BRENT J
SMITH
Date Signed 07/08/03
ARIZONA U.S.A.

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Offices located throughout California, Arizona & Nevada ■ www.RBF.com

printed on recycled paper

45-100648.002 Upper Agua Fria ERMs
NAD 83/NAVD 88
RBF Consulting 6/11/2002

Watershed 3

Station	NORTHING	EASTING	ELEVATION	DESCRIPTION
1PD5	1104494.946	630307.2599	2108.57	FOUND AT LAT. N-34°02'8.93" LONG. W-112°08'48.19"
UAF1	1104502.509	634161.6313	2130.65	SET FCDMC BRASS CAP AT LAT. N-34°02'09" LONG. W-112°08'02"
UAF2	1104872.571	644175.2528	2315.71	FOUND AT LAT. N-34°02'13" LONG. W-112°06'03"
UAF3	1105552.047	646840.7053	2411.21	FOUND AT LAT. N-34°02'20" LONG. W-112°05'32"
UAF4	1102609.161	639212.9543	2233.08	SET FCDMC BRASS CAP AT LAT. N-34°01'50" LONG. W-112°07'02"
UAF5	1102625.139	642076.8907	2285.69	FOUND AT LAT. N-34°01'50" LONG. W-112°06'28"
UAF6	1099893.005	625571.3332	1867.52	SET FCDMC BRASS CAP AT LAT. N-34°01'23" LONG. W-112°09'44"
UAF7	1099748.348	629164.6739	2004.45	SET FCDMC BRASS CAP AT LAT. N-34°01'22" LONG. W-112°09'01"
UAF8	1099929.841	636674.3075	2121.49	SET FCDMC BRASS CAP AT LAT. N-34°01'24" LONG. W-112°07'32"
UAF9	1097364.700	625985.1871	1880.75	SET FCDMC BRASS CAP AT LAT. N-34°00'58" LONG. W-112°09'39"
UAF10	1096802.502	628762.3369	1980.14	SET FCDMC BRASS CAP AT LAT. N-34°00'53" LONG. W-112°09'06"
UAF11	1096396.811	633019.545	1985.99	SET FCDMC BRASS CAP AT LAT. N-34°00'49" LONG. W-112°08'15"
UAF12	1097780.302	635393.7259	2054.68	SET FCDMC BRASS CAP AT LAT. N-34°01'02" LONG. W-112°07'48"
UAF13	1095174.727	626475.7918	1882.93	SET FCDMC BRASS CAP AT LAT. N-34°00'36" LONG. W-112°09'33"
UAF14	1094674.414	628586.4339	1904.10	SET FCDMC BRASS CAP AT LAT. N-34°00'32" LONG. W-112°09'08"
UAF15	1093045.670	631391.0145	1937.10	SET FCDMC BRASS CAP AT LAT. N-34°00'15" LONG. W-112°08'35"
UAF16	1091453.418	634064.9232	2001.08	SET FCDMC BRASS CAP AT LAT. N-34°00'00" LONG. W-112°08'03"
UAF17	1090298.131	636373.9742	2064.25	SET FCDMC BRASS CAP AT LAT. N-33°59'48" LONG. W-112°07'35"
UAF18	1094687.141	639193.5118	2243.48	SET FCDMC BRASS CAP AT LAT. N-34°00'32" LONG. W-112°07'02"
UAF19	1093876.418	642298.8339	2402.85	SET FCDMC BRASS CAP AT LAT. N-33°00'24" LONG. W-112°06'25"
UAF20	1094850.469	649697.8562	2420.10	SET FCDMC BRASS CAP AT LAT. N-34°00'24" LONG. W-112°04'58"
UAF21	1090248.523	639007.0253	2098.20	SET FCDMC BRASS CAP AT LAT. N-33°59'48" LONG. W-112°07'04"
UAF22	1089462.907	641792.9618	2173.28	SET FCDMC BRASS CAP AT LAT. N-33°59'40" LONG. W-112°06'31"
UAF23	1089625.038	644218.1984	2216.93	SET FCDMC BRASS CAP AT LAT. N-33°59'42" LONG. W-112°06'03"
UAF24	1091072.217	647165.7883	2289.25	SET FCDMC BRASS CAP AT LAT. N-33°59'56" LONG. W-112°05'28"
UAF28	1088053.021	630045.3256	2001.70	SET FCDMC BRASS CAP AT LAT. N 33°59'26" LONG W. 112°08'51"

45-100648.002 Upper Agua Fria ERMs
Adjusted positions and ellipsoid heights

Watershed 3

Station	Latitude	Longitude	Ellip Ht	Geoid Ht
1PD5	34-02-08.935320	112-08-48.189900	2015.8482	-92.7218
UAF1	34-02-09.093464	112-08-02.387174	2038.0465	-92.5987
UAF2	34-02-12.948897	112-06-03.399277	2223.5297	-92.185
UAF3	34-02-19.717425	112-05-31.738067	2319.1689	-92.0395
UAF4	34-01-50.464227	112-07-02.316254	2140.5999	-92.4835
UAF5	34-01-50.676524	112-06-28.285385	2193.3285	-92.3617
UAF6	34-01-23.298640	112-09-44.337377	1774.4642	-93.0542
UAF7	34-01-21.950745	112-09-01.638860	1911.4949	-92.956
UAF8	34-01-23.906925	112-07-32.417154	2028.7979	-92.6899
UAF9	34-00-58.295435	112-09-39.348488	1787.6028	-93.1503
UAF10	34-00-52.797794	112-09-06.338895	1887.0531	-93.0902
UAF11	34-00-48.877990	112-08-15.751083	1893.0258	-92.9654
UAF12	34-01-02.614961	112-07-47.579379	1961.8561	-92.824
UAF13	34-00-36.641131	112-09-33.458169	1789.7034	-93.2267
UAF14	34-00-31.740181	112-09-08.370527	1810.9211	-93.182
UAF15	34-00-15.689230	112-08-35.010472	1843.9409	-93.1562
UAF16	33-59-59.994015	112-08-03.206983	1907.9519	-93.1243
UAF17	33-59-48.612135	112-07-35.751069	1971.1688	-93.0837
UAF18	34-00-32.089572	112-07-02.362837	2150.686	-92.7984
UAF19	34-00-24.127530	112-06-25.454825	2310.1443	-92.701
UAF20	34-00-33.891401	112-04-57.578028	2327.7846	-92.3175
UAF21	33-59-48.173608	112-07-04.474657	2005.2113	-92.9842
UAF22	33-59-40.454197	112-06-31.365977	2080.3747	-92.9008
UAF23	33-59-42.102232	112-06-02.563326	2124.1408	-92.7889
UAF24	33-59-56.470554	112-05-27.581926	2196.655	-92.5953
UAF28	33-59-26.266068	112-08-50.862300	1908.3138	-93.3878

45-100648.002 Upper Agua Fria ERMs
Station Coordinate Error Ellipses
Confidence Region = 95%

Watershed 3

Station	Semi-Major	Semi-Minor	Azimuth of	Elev
1PD5	0	0	0-00	0
UAF1	0.04414	0.03876	168-08	0.05174
UAF2	0.04174	0.04062	119-47	0.05524
UAF3	0.04677	0.04435	141-34	0.07149
UAF4	0.04052	0.03941	6-31	0.0484
UAF5	0.04115	0.03868	31-00	0.04914
UAF6	0.03687	0.03632	3-13	0.04603
UAF7	0.03747	0.03445	6-39	0.04708
UAF8	0.04105	0.04044	106-32	0.04711
UAF9	0.04146	0.03916	16-00	0.05246
UAF10	0.04397	0.04004	160-14	0.04661
UAF11	0.04031	0.03872	18-23	0.04358
UAF12	0.04179	0.04055	119-32	0.0487
UAF13	0.04038	0.03811	19-55	0.04301
UAF14	0.04408	0.04092	175-12	0.05409
UAF15	0.04647	0.04154	166-29	0.05145
UAF16	0.04084	0.04027	10-08	0.04364
UAF17	0.03439	0.03353	9-20	0.03809
UAF18	0.04763	0.04085	171-49	0.05631
UAF19	0.04217	0.03952	148-35	0.04973
UAF20	0.05277	0.04639	135-25	0.08945
UAF21	0.04408	0.04256	32-51	0.05357
UAF22	0.04697	0.04556	59-29	0.07453
UAF23	0.04653	0.04499	133-02	0.06977
UAF24	0.04878	0.04558	179-00	0.06849
UAF28	0.06144	0.05286	153-07	0.0797

Book _____ Page _____

RBF CONSULTING

MULTIPLE OBSERVATION GPS LOG SHEET

Job No.	Date	Day	Job Name
45-100648	5-14-02	134	UPPER AGUA FRIA

Observer	Equip. No.	Antenna Type	Antenna Meas. Technique
WILLIS/WASHICKO		Compact L1L2 w/GP | wo/GP | L1L2 Geo w/GP (4000) | Other	Edge of GP (Base) | Phase Center | Other

Station No.	Name	Start Time	Stop Time	H.I.(m)	Description
File Name / Monument Location / Target Offset / Notes					
UAF 37	B.M.	8:47 AM	9:08 AM	5.90	2½" BRASS CAP UAF 37
UAF 37 134 1 (UAF134)	SW COR. SEC. 2 .50 MILE± IN FROM TABLE MESA RD.				NEW WAY PT. 38 N 33-58-32 W 112-07-48
UAF36	B.M	9.42 AM	9:57 AM	5.90	2½" BRASS CAP UAF 36
AF36 1342	ELY SIDE SEC. 3 1 MILE FROM TABLE MESA UP A SMALL HILL 200' ± FROM DIRT RD.				NEW WAY PT 40 N 33-58-45 W 112-08-15
UAF35	B.M.	10:15 AM	10:31 AM	5.90	2½" BRASS CAP UAF 35
AF35 1343	1.5 MILES ± FROM TABLE MESA RD.				NEW WAY PT #41 N 33-59-06 W 112-08-40
UAF28	B.M	10:50 AM	11:05 AM	5.90	2½" BRASS CAP UAF 28
AF28 1344	2.0 MILES NLY TABLE MESA RD.				NEW WAY PT # 42 N33-59.26 W 112-08-51
UAF30	B.M.	11:28 AM	11:43 AM	5.90	2 1/2" BRASS CAP UAF 30
AF30 1345	750' NRTH OF END OF SIDE DIRT RD.				NEW WAY PT. #102 N33-59.13 W112-09-39
UAF26	BM	12:25 PM	12:40 PM	5.90	2 1/2" BRASS CAP UAF26
AF26 1346	SWLY OF ℄ SEC. 32 800' ±				NEW WAY PT #104 N33-59-33 W112-10-37
UAF27	B M	1:20 PM	1:35 PM	5.90	2½ BRASS CAP UAF27 WAY PT #106 N33-59-37 W 112-10-11
AF27 1347	375' SLY OF DIRT RD. NEAR ELY 1/4 COR. SEC 32				DID NOT FIND 1/4 COR. JUST APPROX.
UAF34	B M	2:31 PM	2:46 PM	5.90	2½" BRASS CAP UAF 34
AF34 1347	400' ± WLY OF DIRT RD -				NEW WAY PT. #107 N33-58-48 W 112-10-40

Book _____ Page _____

RBF CONSULTING

MULTIPLE OBSERVATION GPS LOG SHEET

Job No.	Date	Day	Job Name
45-100648	5-14-02	134	UPPER AGUA FRIA

Observer	Equip. No.	Antenna Type	Antenna Meas. Technique
PAUL	1022	Compact L1L2 w/GP | wo/GP | L1L2 Geo w/GP | 4400 | Other	Edge of GP | Base | Phase Center | Other

Station No.	Name	Start Time	Stop Time	H.I.(m)	Description
1PD5	GDACS	7:43 AM 14:43 UTC	3:25 pm	2	BASE

File Name / Monument Location / Target Offset / Notes

1PD5134B (6.562F)

"CONTAMINATED FILE?"

Book _____ Page _____

Sheet _____ of _____

RBF CONSULTING

MULTIPLE OBSERVATION GPS LOG SHEET

Job No. 45100648	Date 5-15-02	Day 135	Job Name AUGUA FRIA
Observer KLEIN	**Equip. No.** 4800	**Antenna Type** Compact L1L2 w/GP | wo/GP | L1L2 Geo w/GP | (4800) | Other	**Antenna Meas. Technique** Edge of GP | Base | Phase Center | Other

This Unit is the: ☐ Base ☑ Rover **RTK File Name:**

Station No. / File Name / Monument Location / Target Offset / Notes	Name	Start Time	Stop Time	H.I.(m)	Description
UAF 29	BM.	8:02 AM	8:17 AM	5.90FT.	2½" BRASS DISC UAF 29
AF291351 / 600' SOUTH OF OFF OF ROAD DUE SOUTH					NEW WAY PT# 108 N33-59-14 W112-11-13
UAF 25	B.M.	9:00 AM	9:15 AM	5.90F	2½" BRASS DISC UAF 25
AF251352 / SW COR OF MAIN PROP. LITTLE GRAND CANYON RANCH					NEW WAY PT#109 N33-59-18 W112-11-34
UAF 33	B M	9:40 AM	9:55 AM	5.90 FT	2½ BRASS DISC UAF 33
AF331353 / .45 MILES± FROM SPLIT OF DIRT RDS 40'± ELY OF ℄					NEW WAY PT# 110 N 33-58-39 W112-11-01
UAF 32	B. M.	10:22 AM	10:38 AM	5.90 FT	2½" BRASS DISC UAF 32
AF321354 /					NEW WAY PT#111 N33-58-40 W112-11-34
UAF 31	BM	11:17 A.M	11:34 AM	5.90 FT	2½" BRASS DISC UAF 31
AF311355 / UPPER ARM PLEASANT LAICE IS DUE NORTH 1000'±					NEW WAY PT# 112 N33-58-14 W112-11-54
UAF 15	BM	12:28 pm	12:43 pm	5.90 FT	NEW WAY PT# 113 N 34-00-16 W 112-08-35
AF151356 / I 17 SOUTH IS DUE EAST 800'±					2½" BRASS CAP U.A.F 15
UAF 16	B.M.	1:23 pm	1:39 pm	5.90 FT	2½" BRASS CAP UAF 16
AF161358 / 50'± WEST OF N'LY BRIDGE ABUT I 17 NORTHBOUND OVER MOORE GULCH / MON IS UP .30'±					NEW WAY PT#114 N 34-00-00 W 112-08-03
UAF 21	B.M	2:01 pm	2:16 pm	5.90FT	2½ BRASSCAP UAF 21
AF211359 / 1 MILE± EAST FROM I 17 NORTHBOUND BRIDGE					NEWWAY PT # 123 N33-59-48 W112-07-04
NOTE SESSION 7 WAS ABORTED					
UAF 22	B.M.	2:27 pm	2:42 pm	5.90 FT	2½" BRASS DISC UAF 22
F2213510 / ½ MILE FURTHER EAST OF UAF 21 ALONG SAME ROCKY ROAD					NEW WAY PT#151 N 33-59-41 W112-06-31
UAF 23	B.M.	2:56 pm	3:11 pm	5.90 FT	2½" BRASS DISC. UAF 23
F2313511 / 2 MILES EAST OF I-17 ALONG ROCKY ROAD THROUGH MOORE GULCH					NEW WAY PT #152 N 33-59-42 W 112-06-03

"CONTAMINATED FILE?"

Book _____ Page _____

Sheet _____ of _____

RBF CONSULTING

MULTIPLE OBSERVATION GPS LOG SHEET

Job No.	Date	Day	Job Name
45-100648	5-17-2002	135	UPPER AGUA FRIA

Observer	Equip. No.	Antenna Type	Antenna Meas. Technique
KLEIN	1022	Compact L1L2 w/GP | wo/GP | L1L2 Geo w/GP | 4800 | Other	Edge of GP | Base | Phase Center | Other

This Unit is the: ☑ Base ☐ Rover | RTK File Name:

Station No.	Name	Start Time	Stop Time	H.I.(m)	Description
File Name / Monument Location / Target Offset / Notes					
1PD5135B	GDACS	13:43 UTC		2.0m	BASE
				6.562 FT.	

"GOOD SESSIONS"

Book _____ Page _____

Sheet _____ of _____

RBF CONSULTING

MULTIPLE OBSERVATION GPS LOG SHEET

Job No.	Date	Day	Job Name
100648	5-17-02	137	UPPER AGUA FRIA

Observer	Equip. No.	Antenna Type	Antenna Meas. Technique
WASHCKO	(UNIT TO IRVINE) 3982	Compact L1L2 w/GP | wo/GP | L1L2 Geo w/GP (4800) Other	Bottom of GP (Base) Phase Center | Other

This Unit is the: [X] Base [ ] Rover | RTK File Name: N/A

Station No.	Name	Start Time	Stop Time	H.I.(m)	Description
File Name / ~~Monument Location~~ / ~~Target Offset~~ / ~~Notes~~					
UAF29 ✓	UAF29	8:19 A.M	8:34	5.906	2½" BRASS CAP STAMPED UAF29
AF291371					
UAF25 ✓	UAF25	8:46 A.M	9:01	5.906	2½" BRASS CAP STAMPED UAF25
AF251372					
UAF33 ✓	UAF33	9:21	9:36	5.906	2½" BRASS CAP STAMPED UAF33
AF331373					
UAF32 ✓	UAF32	9:59	10:15	5.906	2½" BRASS CAP STAMPED UAF32
AF321374					
UAF31 ✓	UAF31	10:39	10:57	5.906	2½" BRASS CAP STAMPED UAF31
AF311375					
UAF15	UAF15	11:34	11:50	5.906	2½" BRASS CAP STAMPED UAF15
AF151376					
UAF16	UAF16	12:13	12:29	5.906	2½" BRASS CAP STAMPED UAF16
AF151377					
UAF17 ✓	UAF17	12:38	12:53	5.906	2½" BRASS CAP STAMPED UAF17
AF171378					
UAF21 ✓	UAF21	1:02	1:18	5.906	2½" BRASS CAP STAMPED UAF21
AF211379					
UAF22 ✓	UAF22	1:35	1:50	5.906	2½" BRASS CAP STAMPED UAF22
F2213710					
UAF23 ✓	UAF23	1:56	2:11	5.906	2½" BRASS CAP STAMPED UAF23
F2315711					

'D NOT
PORT

Book _____ Page _____

Sheet _____ of _____

RBF CONSULTING

MULTIPLE OBSERVATION GPS LOG SHEET

Job No.	Date	Day	Job Name
45-100648	5-21-2002	141	UPPER AGUA FRIA

Observer	Equip. No.	Antenna Type	Antenna Meas. Technique
KLEIN, HAYNES	3702	Compact L1L2 w/GP | wo/GP | L1L2 Geo w/GP (4800) | Other	Edge of GP (Base) | Phase Center | Other

This Unit is the:	RTK File Name:
☐ Base ☑ Rover	

Station No. / File Name / Monument Location / Target Offset / Notes	Name	Start Time	Stop Time	H.I.(m)	Description
UAF 6	BM	8:27 AM	8:42AM	5.90FT	2½" BRASS DISC UAF 6 UP.30
UAF61411	OBSERVED W/EDGE OF G.P. ANT NOT BOTTOM OF MOUNT				NEW WAY PT #172 N 34-01-24 W 112-09-44
UAF 1	BM	11:01 AM	11:17AM	5.90FT	2½" BRASS DISC - UAF 1 UP.10'
UAF11412	SHOT WITH BOTTOM ANT. MOUNT				NEW WAY PT # 174 W34-02-09 W 112-08-02
UAF 7	B.M.	12:17 PM	12:32PM	5.90FT	2½" BRASS DISC UAF 7 FLUSH
UAF71413	@ 6MIN MARK RECIEVER WENT DOWN BUT CAME BACK UP				NEW WAY PT #175 N 34-01-22 W112-09-01
UAF 37	B.M.	12:56pm	1:11PM	5.90 FT	2½" BRASS DISC FLUSH STAMPED UAF 37
AF371415	ALL MONS ARE SET IN AN 24" ALUM. PIPE (TYP.)				WAY PT # 38
(SESSION 4 BAT. ON ROVER DIED)					
UAF 36	BM	1:18 PM	1:33PM	5.90FT	2½" BRASS DISC UP.10'± STAMPED UAF 36
AF361416					WAY PT # 40
UAF 35		1:40 PM	1:55PM	5.90FT	2½" BRASS DISC UP.10'± STAMPED UAF 35
AF351417					WAY PT # 41
UAF 28	B.M.	2:02 PM	2:17PM	5.90FT	2½" BRASS DISC UP.10'± STAMPED UAF 28
AF281418					WAY PT # 42
UAF 27	B.M.	2:27 PM	2:42PM	5.90FT	2½ BRASS DISC UP.10'± STAMPED UAF 27
AF271419					WAY PT #106
UAF 26	B.M.	3:02 PM	3:17PM	5.90FT	2½" BRASS DISC UP.20'± STAMPED UAF 26
F26141 10					WAY PT #104
UAF 30	B.M	3:37 PM	3:52PM	5.90FT	2½" BRASS DISC - UP.10'± STAMPED UAF 30
F30141 11					WAY PT #102

Book _____ Page _____

Sheet _____ of _____

RBF CONSULTING

MULTIPLE OBSERVATION GPS LOG SHEET

Job No. 45-100648	Date 5-22-2002	Day 142	Job Name UPPER AGUA FRIA
Observer KLEIN, HAYNES	**Equip. No.** 3702	**Antenna Type** Compact L1L2 w/GP | wo/GP | L1L2 Geo w/GP (4800) | Other	**Antenna Meas. Technique** Edge of GP | (Base) | Phase Center | Other

This Unit is the: ☐ Base ☑ Rover | RTK File Name:

Station No.	Name	Start Time	Stop Time	H.I.(m)	Description
File Name / Monument Location / Target Offset / Notes					
UAF 34	B.M.	7:42 AM	7:57 AM	5.90 FT	2 1/2" BRASS DISC STAMPED UAF 34
~~AF341422~~	~~FILE NOT FD~~ at 142341.dat				WAY PT #107
UAF 33	BM	8:20 AM	8:35 AM	5.90 FT	2 1/2" BRASS DISC STAMPED UAF 33
AF331422					WAY PT # 110
UAF 32	B.M.	8:48 AM	9:03 AM	5.90 FT	2 1/2" BRASS DISC UP.10'± STAMPED UAF 32
AF321423					WAY PT # 111
UAF 31	BM	9:23 AM	9:38 AM	5.90 FT	2 1/2" BRASS DISC UP.10'± STAMPED UAF 31
AF311424					WAY PT #112
UAF 29	B.M.	10:02 AM	10:17 AM	5.90 FT	2 1/2" BRASS DISC UP.10'± STAMPED U.A.F 29
AF291425					WAY PT #108
UAF 25	B.M.	10:32 AM	10:47 AM	5.90 FT	2 1/2" BRASS DISC UP.20'± STAMPED UAF 25
AF251426					WAY PT # 109
UAF 14	BM	11:13 AM	11:18 AM	5.90 FT	2 1/2" BRASS DISC UP.10'± STAMPED UAF 14
AF141427					WAY PT
UAF 13	BM	11:35 AM	11:50 AM	5.90 FT	2 1/2" BRASS DISC UP.10'± STAMPED UAF 13
AF131428					WAY PT 114
UAF 9	BM	11:59 AM	12:14 PM	5.90 FT	2 1/2" BLO CAP, 521 UP 1.0'± 1917 4 528
UAF01429					WAY PT -
UAF 6	BM	12:28 PM	VOID	5.90 FT	2 1/2" BRASS DISC UP.10'± STAMPED UAF 6
AF61428 10	"WIND GUST DISTURBED SET UP"				WAY PT
UAF 6	BM	12:41 PM	12:56 PM	5.90 FT	2 1/2" BRASS DISC UP.40'± STAMPED UAF 6
AF61428 11					WAY PT -
UAF 1	BM	2:05 PM	2:20 PM	5.90 FT	2 1/2" BRASS DISC UP.10'± STAMPED UAF 1
AF111428 12					WAY PT #174
UAF 7	BM	2:52 PM	3:07 PM	5.90 FT	2 1/2" BRASS DISC STAMPED UAF 7
AF71428 13					WAY PT #175

BOOK_____ PAGE_____ EF 2.3

JOB No: 45-1006408

CLIENT: MARICOPA CO. FLOOD CONTROL DIST.

TOPOGRAPHY COVER SHEET

PARTY CHIEF: KLEIN

CREW: WILLIS, WASHICKO

DATE: 5-15-2002

RBF CONSULTING
PLANNING DESIGN CONSTRUCTION
16605 N 28th Avenue Suite 100 Phoenix Arizona 85053
(602) 467-2200 Fax (602) 467-2201

FILE NAME: ~~1005135~~ 13

POINT RANGE: _____

PURPOSE OF SURVEY:

(T) EARTH QUANTITY TOPO
- ☐ ALLUVIAL REMOVAL
- ☐ WET ALLUVIAL REMOVAL
- ☐ BUTTRESS/KEYWAY REMOVAL
- ☐ LAND SLIDE REMOVAL
- ☐ OVER-EXCAVATION
- ☐ STOCK PILE

(A) AS-CONSTRUCTED TOPO
- ☐ ROUGH GRADE VERIFICATION
- ☐ PRECISE GRADE VERIFICATION
- ☐ IMPROVEMENT VERIFICATION

(E) EXISTING SITE TOPO
- ☐ AERIAL PROFILE CHECK
- ☐ FOR DESIGN

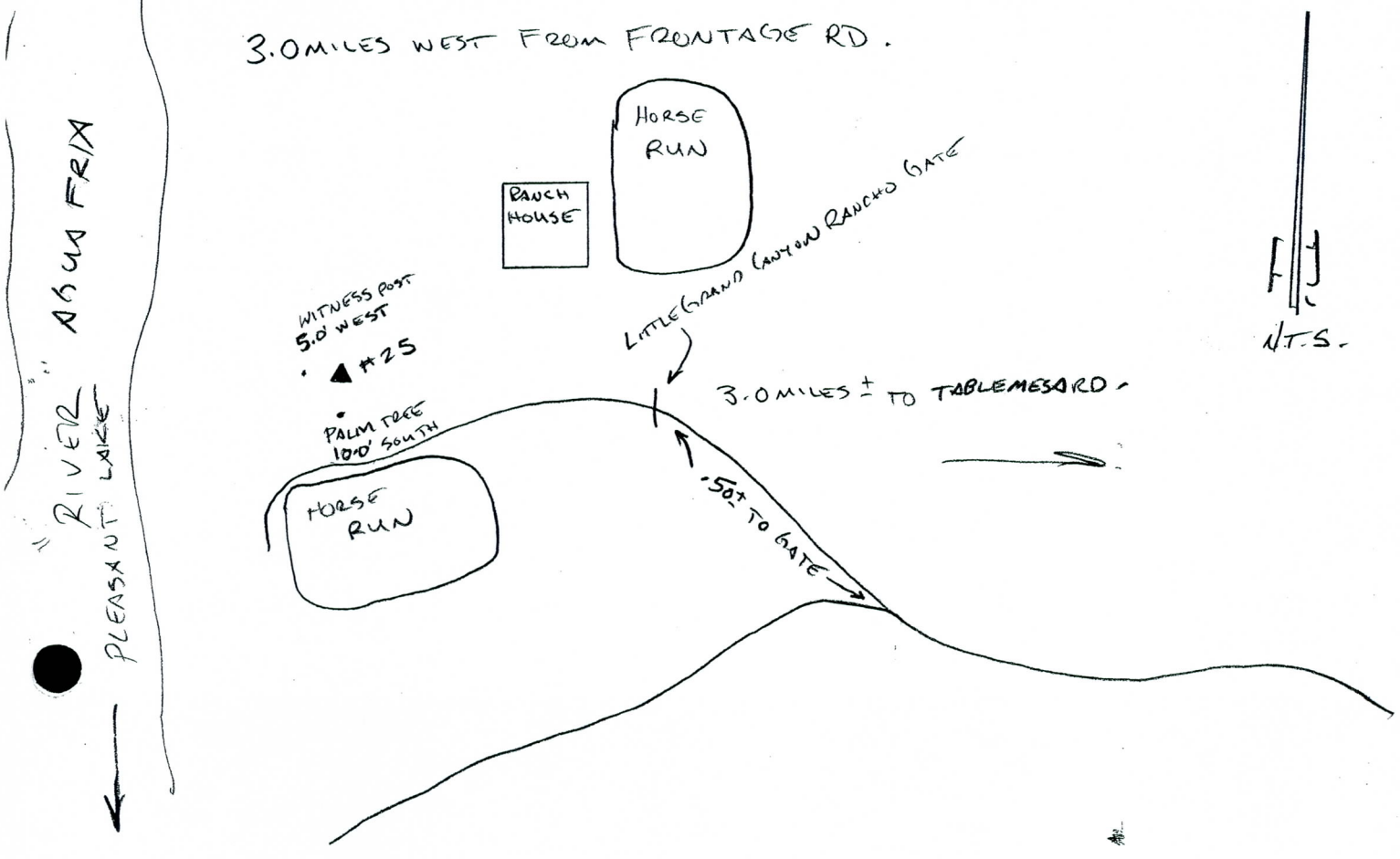
(S) SUBDRAIN LOCATION

(G) GIS

DESCRIPTION: SETTING FLOOD CONTROL BENCH MARKS (U.A.F.)

BASIS OF HORIZONTAL CONTROL: ☐ IMPERIAL ☐ METRIC ~~WAY PT. #109~~ N 33-59-18 W 112-11-34

PROJECT BENCH MARK & DATUM: _____



BOOK_____ PAGE_____

JOB No: 45-100648

CLIENT: MARICOPA Co. FLOOD CONTROL DIST.

TOPOGRAPHY COVER SHEET

PARTY CHIEF: KLEIN

CREW: WILLIS, WASHICKO

DATE: 5-14-2002

RBF CONSULTING
PLANNING DESIGN CONSTRUCTION
16605 N 28th Avenue Suite 100 Phoenix Arizona 85053
(602) 467-2200 Fax (602) 467-2201

FILE NAME: ~~IPDS1348~~

POINT RANGE: _____

PURPOSE OF SURVEY:

(T) EARTH QUANTITY TOPO
- ☐ ALLUVIAL REMOVAL
- ☐ WET ALLUVIAL REMOVAL
- ☐ BUTTRESS/KEYWAY REMOVAL
- ☐ LAND SLIDE REMOVAL
- ☐ OVER-EXCAVATION
- ☐ STOCK PILE

(A) AS-CONSTRUCTED TOPO
- ☐ ROUGH GRADE VERIFICATION
- ☐ PRECISE GRADE VERIFICATION
- ☐ IMPROVEMENT VERIFICATION

(E) EXISTING SITE TOPO
- ☐ AERIAL PROFILE CHECK
- ☐ FOR DESIGN

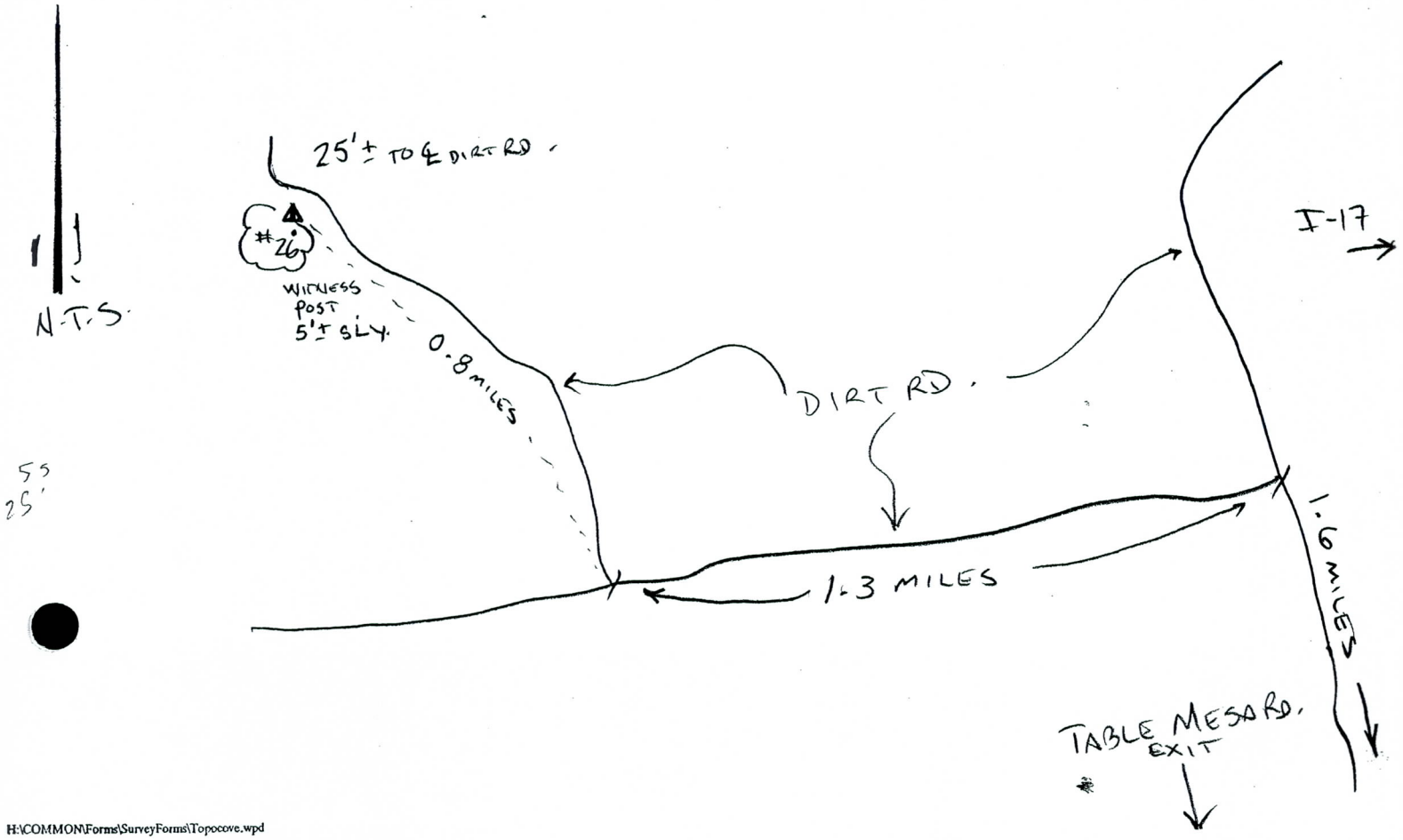
(S) SUBDRAIN LOCATION

(G) GIS

DESCRIPTION: SETTING FLOOD CONTROL BENCH MARKS (U.A.F.)

BASIS OF HORIZONTAL CONTROL: ☐ IMPERIAL ☐ METRIC ~~WAY PT #104~~ N 33-59-33 W 112-10-37

PROJECT BENCH MARK & DATUM: _____



BOOK_____ PAGE_____ ~~158~~ 2

JOB No: 45100648

CLIENT: MARICOPA CO FLOOD CONTROL DIST.

TOPOGRAPHY COVER SHEET

PARTY CHIEF: KLEIN

CREW: WILLIS, WASHICKO

DATE: 5-14-2002

RBF CONSULTING
PLANNING DESIGN CONSTRUCTION
16605 N 28th Avenue Suite 100 Phoenix Arizona 85053
(602) 467-2200 Fax (602) 467-2201

FILE NAME: ~~TP051348~~

POINT RANGE: _____

PURPOSE OF SURVEY:

(T) EARTH QUANTITY TOPO
- ☐ ALLUVIAL REMOVAL
- ☐ WET ALLUVIAL REMOVAL
- ☐ BUTTRESS/KEYWAY REMOVAL
- ☐ LAND SLIDE REMOVAL
- ☐ OVER-EXCAVATION
- ☐ STOCK PILE

(A) AS-CONSTRUCTED TOPO
- ☐ ROUGH GRADE VERIFICATION
- ☐ PRECISE GRADE VERIFICATION
- ☐ IMPROVEMENT VERIFICATION

(E) EXISTING SITE TOPO
- ☐ AERIAL PROFILE CHECK
- ☐ FOR DESIGN

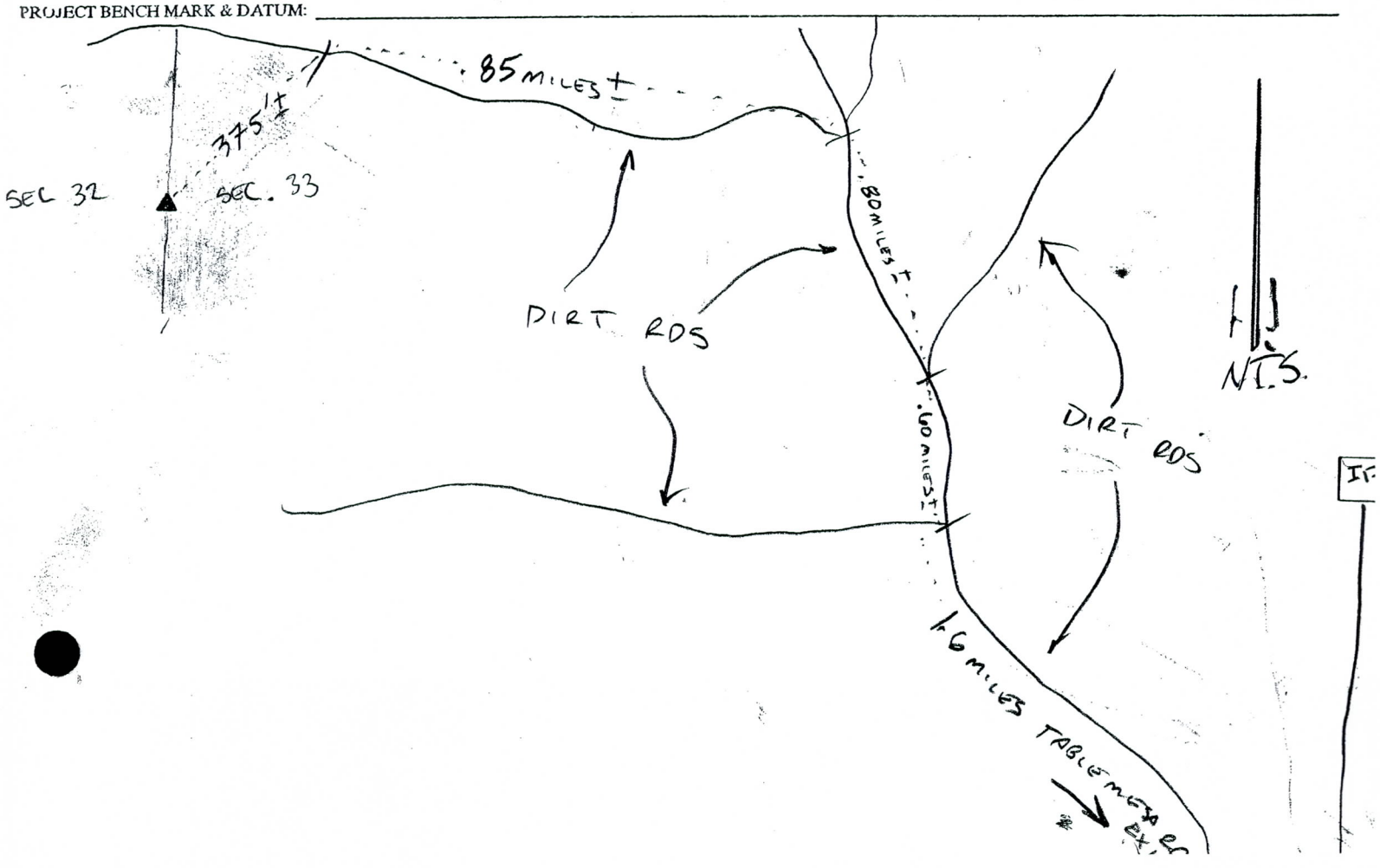
(S) SUBDRAIN LOCATION

(G) GIS

DESCRIPTION: SETTING FLOOD CONTROL BENCH MARKS (U.A.F.)

BASIS OF HORIZONTAL CONTROL: ☐ IMPERIAL ☐ METRIC ~~WAY PT. #106~~ N33-59-37 W112-10-11

PROJECT BENCH MARK & DATUM: _____



BOOK_____ PAGE_____

JOB No: 45-100648

CLIENT: MARICOPA CO. FLOOD CONTROL DIST.

TOPOGRAPHY COVER SHEET

PARTY CHIEF: KLEIN

CREW: WILLIS, WASHICKO

DATE: 5-14-2002

RBF CONSULTING
PLANNING DESIGN CONSTRUCTION
16605 N 28th Avenue Suite 100 Phoenix Arizona 85053
(602) 467-2200 Fax (602) 467-2201

FILE NAME: TPD5134B

POINT RANGE: _____

PURPOSE OF SURVEY:

(T) EARTH QUANTITY TOPO
- ☐ ALLUVIAL REMOVAL
- ☐ WET ALLUVIAL REMOVAL
- ☐ BUTTRESS/KEYWAY REMOVAL
- ☐ LAND SLIDE REMOVAL
- ☐ OVER-EXCAVATION
- ☐ STOCK PILE

(A) AS-CONSTRUCTED TOPO
- ☐ ROUGH GRADE VERIFICATION
- ☐ PRECISE GRADE VERIFICATION
- ☐ IMPROVEMENT VERIFICATION

(E) EXISTING SITE TOPO
- ☐ AERIAL PROFILE CHECK
- ☐ FOR DESIGN

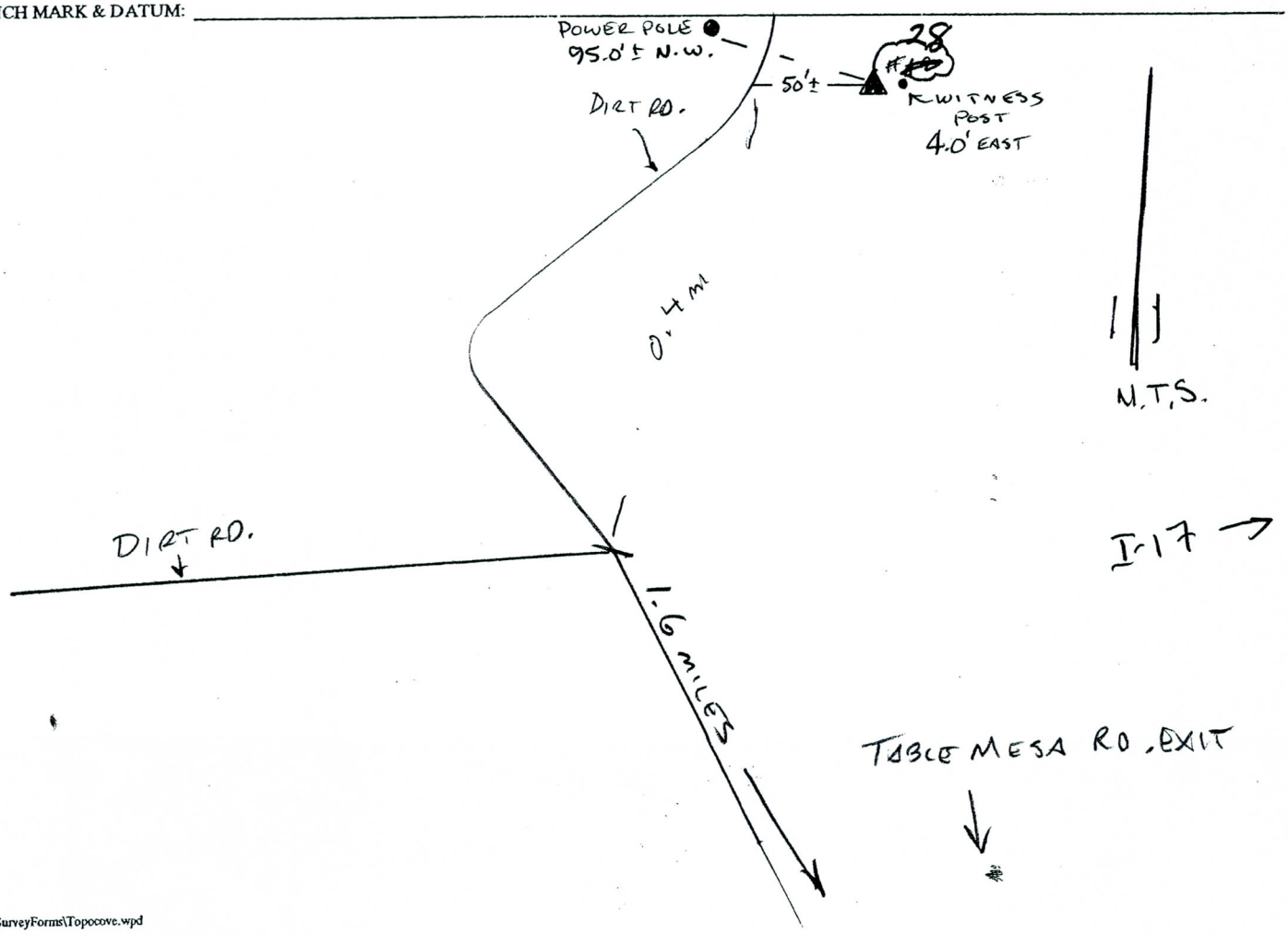
(S) SUBDRAIN LOCATION

(G) GIS

DESCRIPTION: SETTING FLOOD CONTROL BENCHMARKS (U.A.F.)

BASIS OF HORIZONTAL CONTROL: ☐ IMPERIAL ☐ METRIC WAY PT. 42 N 33-59-26 W 112-08-51

PROJECT BENCH MARK & DATUM: _____



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~~Log~~ 29

BOOK_____ PAGE_____

JOB No: 45-100648

CLIENT: MARICOPA CO FLOOD CONTROL DIST.

TOPOGRAPHY COVER SHEET

PARTY CHIEF: KLEIN

CREW: WILLIS, WASHICKO

DATE: 5-15-2002

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PLANNING DESIGN CONSTRUCTION
16605 N 28th Avenue Suite 100 Phoenix Arizona 85053
(602) 467-2200 Fax (602) 467-2201

FILE NAME: ~~1PDS135B~~

POINT RANGE: _____

PURPOSE OF SURVEY:

(F) EARTH QUANTITY TOPO
- ☐ ALLUVIAL REMOVAL
- ☐ WET ALLUVIAL REMOVAL
- ☐ BUTTRESS/KEYWAY REMOVAL
- ☐ LAND SLIDE REMOVAL
- ☐ OVER-EXCAVATION
- ☐ STOCK PILE

(S) SUBDRAIN LOCATION

(A) AS-CONSTRUCTED TOPO
- ☐ ROUGH GRADE VERIFICATION
- ☐ PRECISE GRADE VERIFICATION
- ☐ IMPROVEMENT VERIFICATION

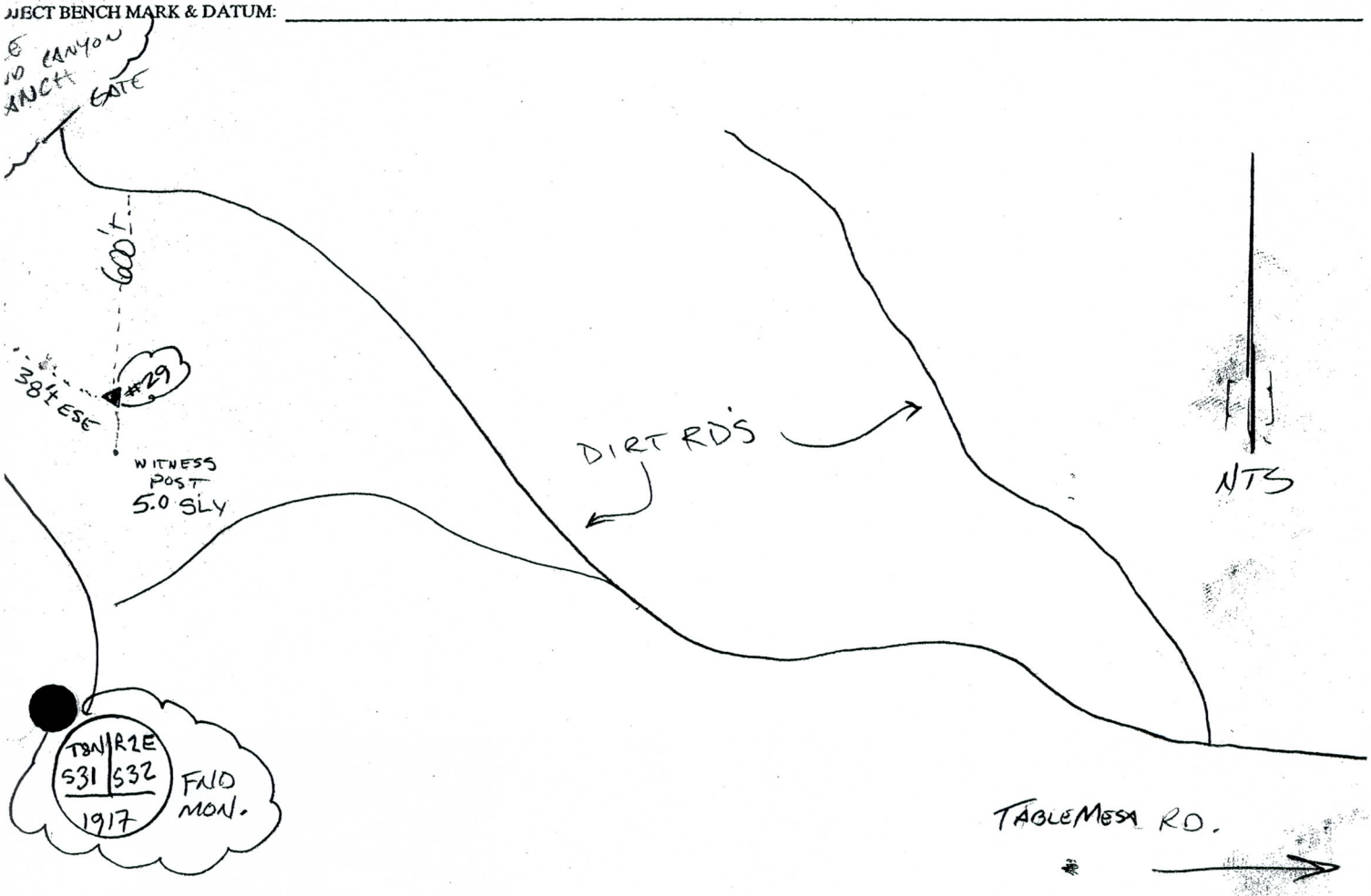
(E) EXISTING SITE TOPO
- ☐ AERIAL PROFILE CHECK
- ☐ FOR DESIGN

(G) GIS

DESCRIPTION: SETTING FLOOD CONTROL BENCH MARKS (U.A.F.)

HORIZONTAL CONTROL : ☐ IMPERIAL ☐ METRIC ~~WASH PI #108~~ N/33-59-14 W/112-11-13

PROJECT BENCH MARK & DATUM: _____



BOOK_____ PAGE ~~102~~ 30

JOB No: 45-101648

LIENT: MARICOPA CO. FLOOD CONTROL DIST.

TOPOGRAPHY COVER SHEET

ARTY CHIEF: KLEIN

REW: WILLIS, WASHICKO

ATE: 5-14-2002

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16605 N 28th Avenue Suite 100 Phoenix Arizona 85053
(602) 467-2200 Fax (602) 467-2201

E NAME: ~~IPA5134B~~ POINT RANGE:

POSE OF SURVEY:

) EARTH QUANTITY TOPO
- ☐ ALLUVIAL REMOVAL
- ☐ WET ALLUVIAL REMOVAL
- ☐ BUTTRESS/KEYWAY REMOVAL
- ☐ LAND SLIDE REMOVAL
- ☐ OVER-EXCAVATION
- ☐ STOCK PILE

(A) AS-CONSTRUCTED TOPO
- ☐ ROUGH GRADE VERIFICATION
- ☐ PRECISE GRADE VERIFICATION
- ☐ IMPROVEMENT VERIFICATION

(E) EXISTING SITE TOPO
- ☐ AERIAL PROFILE CHECK
- ☐ FOR DESIGN

SUBDRAIN LOCATION

(G) GIS

CRIPTION: SETTING FLOOD CONTROL BENCH MARKS (U.A.F.)

RIZONTAL CONTROL : ☐ IMPERIAL ☐ METRIC ~~WAY PT-#102~~ N33-59-13 W112-09-39

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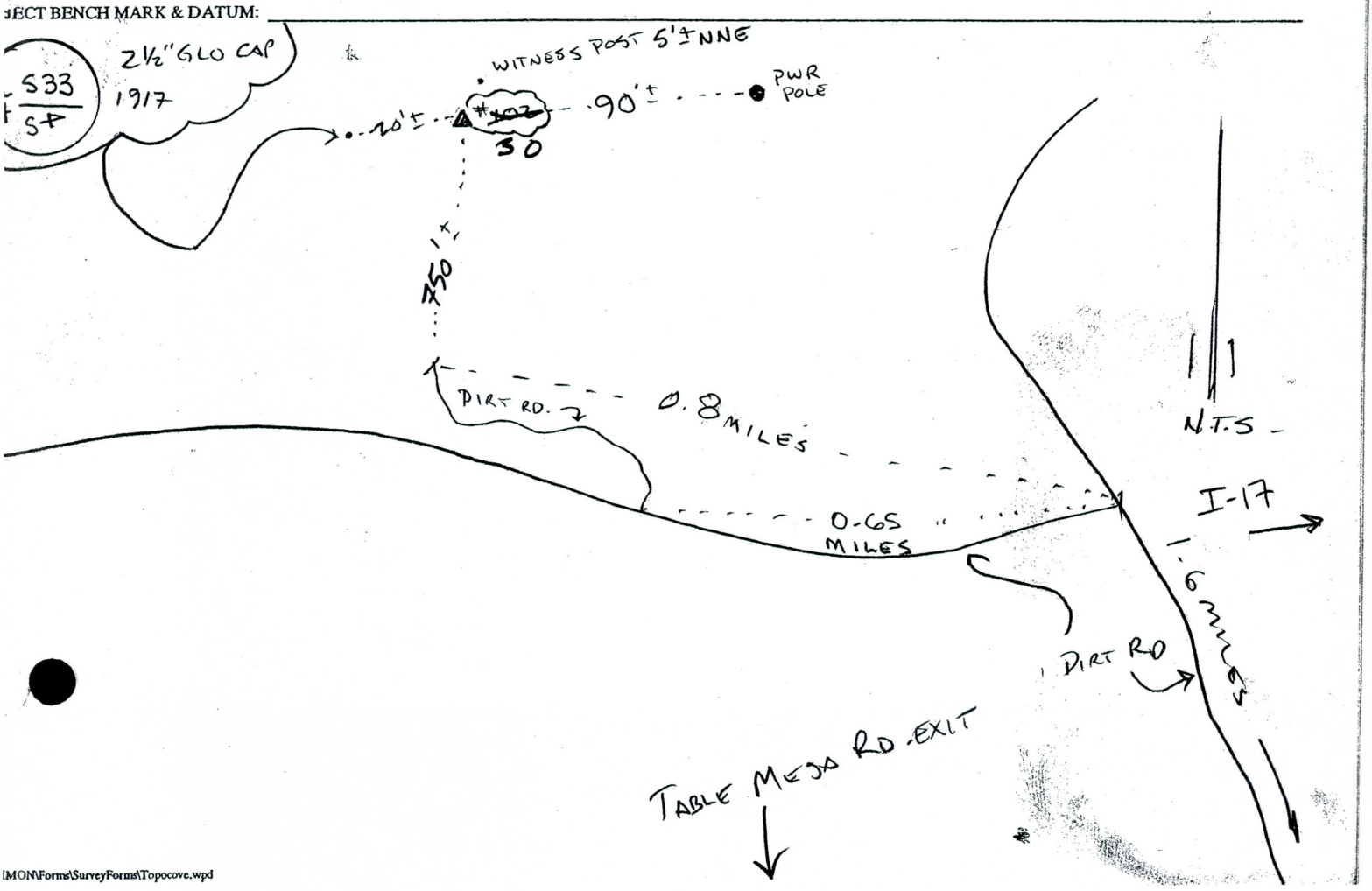

BOOK_____ PAGE ~~42~~ 31

JOB No: 45-100648

IENT: MARICOPA Co. FLOOD CONTROL DIST.

TOPOGRAPHY COVER SHEET

RTY CHIEF: KLEIN

EW: WILLIS, WASHICKO

TE: 5-15-2002

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PLANNING DESIGN CONSTRUCTION
16605 N 28th Avenue Suite 100 Phoenix Arizona 85053
(602) 467-2200 Fax (602) 467-2201

NAME: 1PD5135B

POINT RANGE: _____

POSE OF SURVEY:

EARTH QUANTITY TOPO
- ☐ ALLUVIAL REMOVAL
- ☐ WET ALLUVIAL REMOVAL
- ☐ BUTTRESS/KEYWAY REMOVAL
- ☐ LAND SLIDE REMOVAL
- ☐ OVER-EXCAVATION
- ☐ STOCK PILE

SUBDRAIN LOCATION

(A) AS-CONSTRUCTED TOPO
- ☐ ROUGH GRADE VERIFICATION
- ☐ PRECISE GRADE VERIFICATION
- ☐ IMPROVEMENT VERIFICATION

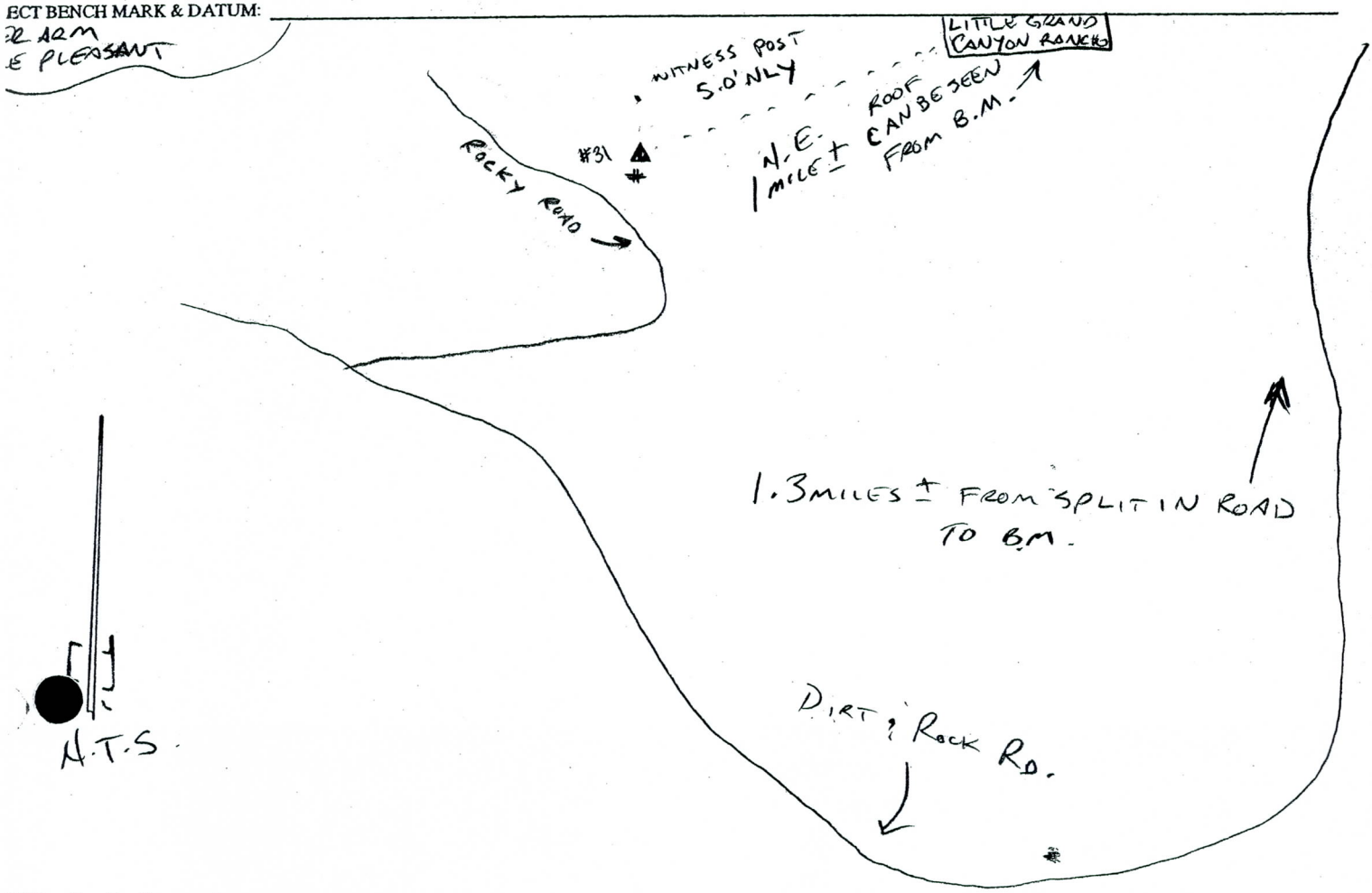
(E) EXISTING SITE TOPO
- ☐ AERIAL PROFILE CHECK
- ☐ FOR DESIGN

(G) GIS

RIPTION: SETTING FLOOD CONTROL BENCH MARKS (U.S.F.)

IZONTAL CONTROL : ☐ IMPERIAL ☐ METRIC WAYPT # ~~42~~ N33-58-14 W112-11-54

ECT BENCH MARK & DATUM: _____



BOOK_____ PAGE_____ # 32

JOB No: 45-1006448

ENT: MARICOPA CO. FLOOD CONTROL DIST.

TOPOGRAPHY COVER SHEET

TY CHIEF: KLEIN

W: WILLIS, WASAICKO

E: 5-15-2002

RBF CONSULTING
PLANNING DESIGN CONSTRUCTION
16605 N 28th Avenue Suite 100 Phoenix Arizona 85053
(602) 467-2200 Fax (602) 467-2201

IAME: ~~APD5135B~~

POINT RANGE: _____

)SE OF SURVEY:

EARTH QUANTITY TOPO
- ☐ ALLUVIAL REMOVAL
- ☐ WET ALLUVIAL REMOVAL
- ☐ BUTTRESS/KEYWAY REMOVAL
- ☐ LAND SLIDE REMOVAL
- ☐ OVER-EXCAVATION
- ☐ STOCK PILE

SUBDRAIN LOCATION

(A) AS-CONSTRUCTED TOPO
- ☐ ROUGH GRADE VERIFICATION
- ☐ PRECISE GRADE VERIFICATION
- ☐ IMPROVEMENT VERIFICATION

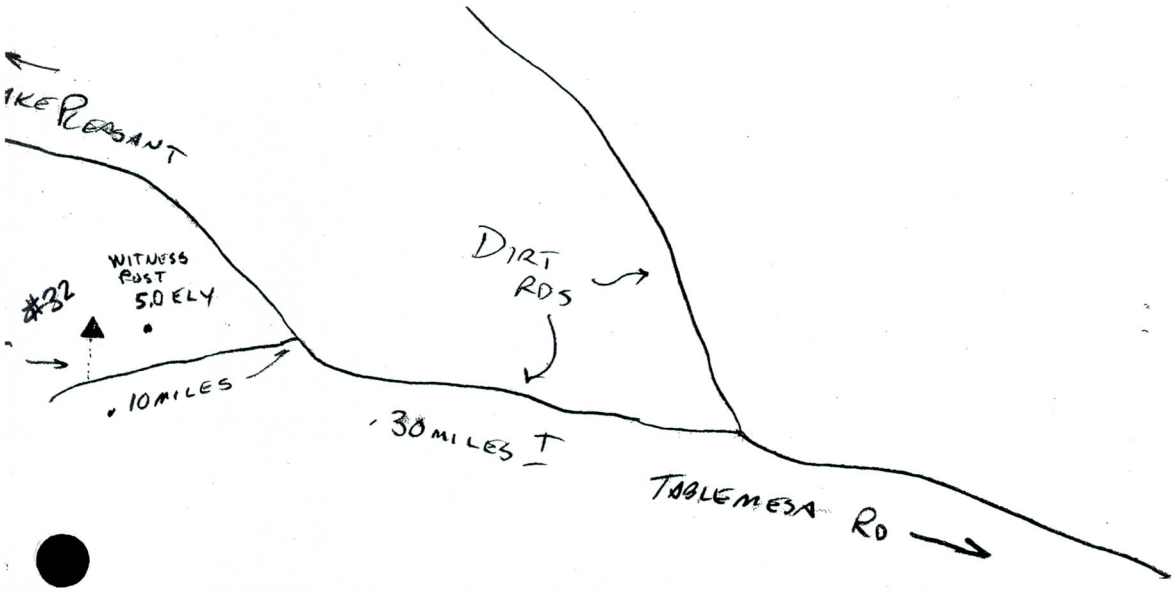
(E) EXISTING SITE TOPO
- ☐ AERIAL PROFILE CHECK
- ☐ FOR DESIGN

(G) GIS

IPTION: SETTING FLOOD CONTROL BENCHMARKS (U.A.F.)

)F H ZONTAL CONTROL : ☐ IMPERIAL ☐ METRIC ~~WAY PT. #HH~~ N 33-58-40 W 112-11-34

CT BENCH MARK & DATUM: _____



#33

BOOK_____ PAGE_____

JOB No: 45-100648

LIENT: MARICOPA CO. FLOOD CONTROL DIST.

TOPOGRAPHY COVER SHEET

ARTY CHIEF: KLEIN

REW: WILLIS, WASHICKO

ATE: 5-15-2002

RBF CONSULTING
PLANNING DESIGN CONSTRUCTION
16605 N 28th Avenue Suite 100 Phoenix Arizona 85053
(602) 467-2200 Fax (602) 467-2201

E NAME: ~~1~~ PDS135B

POINT RANGE: _____

POSE OF SURVEY:

) EARTH QUANTITY TOPO
- ☐ ALLUVIAL REMOVAL
- ☐ WET ALLUVIAL REMOVAL
- ☐ BUTTRESS/KEYWAY REMOVAL
- ☐ LAND SLIDE REMOVAL
- ☐ OVER-EXCAVATION
- ☐ STOCK PILE

(A) AS-CONSTRUCTED TOPO
- ☐ ROUGH GRADE VERIFICATION
- ☐ PRECISE GRADE VERIFICATION
- ☐ IMPROVEMENT VERIFICATION

(E) EXISTING SITE TOPO
- ☐ AERIAL PROFILE CHECK
- ☐ FOR DESIGN

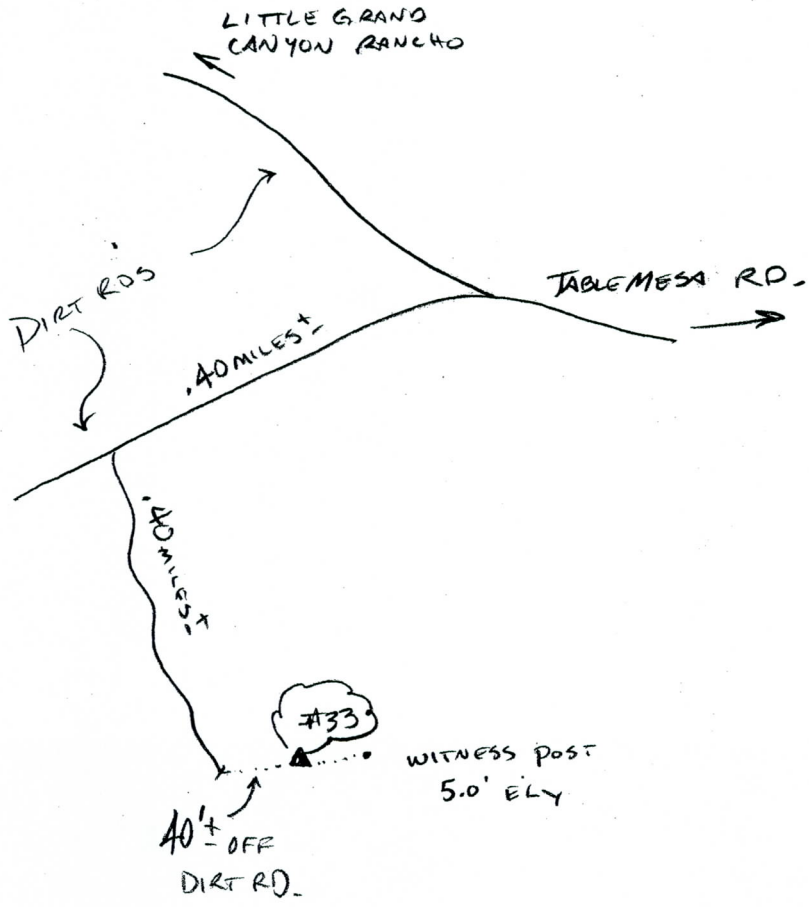
SUBDRAIN LOCATION

(G) GIS

CRIPTION: SETTING FLOOD CONTROL BENCH MARKS (U.A.F.)

RIZONTAL CONTROL: ☐ IMPERIAL ☐ METRIC WAY ~~PT #110~~ N 33-58-39 W112-11-01

JECT BENCH MARK & DATUM: _____



~~107~~ 34

BOOK_____ PAGE_____

JOB No: 45-100648

LIENT: MARICOPA CO. FLOOD CONTROL DIST.

TOPOGRAPHY COVER SHEET

ARTY CHIEF: KLEIN

REW: WILLIS, WASHICKO

ATE: 5-14-2002

RBF CONSULTING
PLANNING DESIGN CONSTRUCTION
16605 N 28th Avenue Suite 100 Phoenix Arizona 85053
(602) 467-2200 Fax (602) 467-2201

E NAME: ~~1PD5134B~~ POINT RANGE: 1

POSE OF SURVEY:

) EARTH QUANTITY TOPO
- ☐ ALLUVIAL REMOVAL
- ☐ WET ALLUVIAL REMOVAL
- ☐ BUTTRESS/KEYWAY REMOVAL
- ☐ LAND SLIDE REMOVAL
- ☐ OVER-EXCAVATION
- ☐ STOCK PILE

SUBDRAIN LOCATION

(A) AS-CONSTRUCTED TOPO
- ☐ ROUGH GRADE VERIFICATION
- ☐ PRECISE GRADE VERIFICATION
- ☐ IMPROVEMENT VERIFICATION

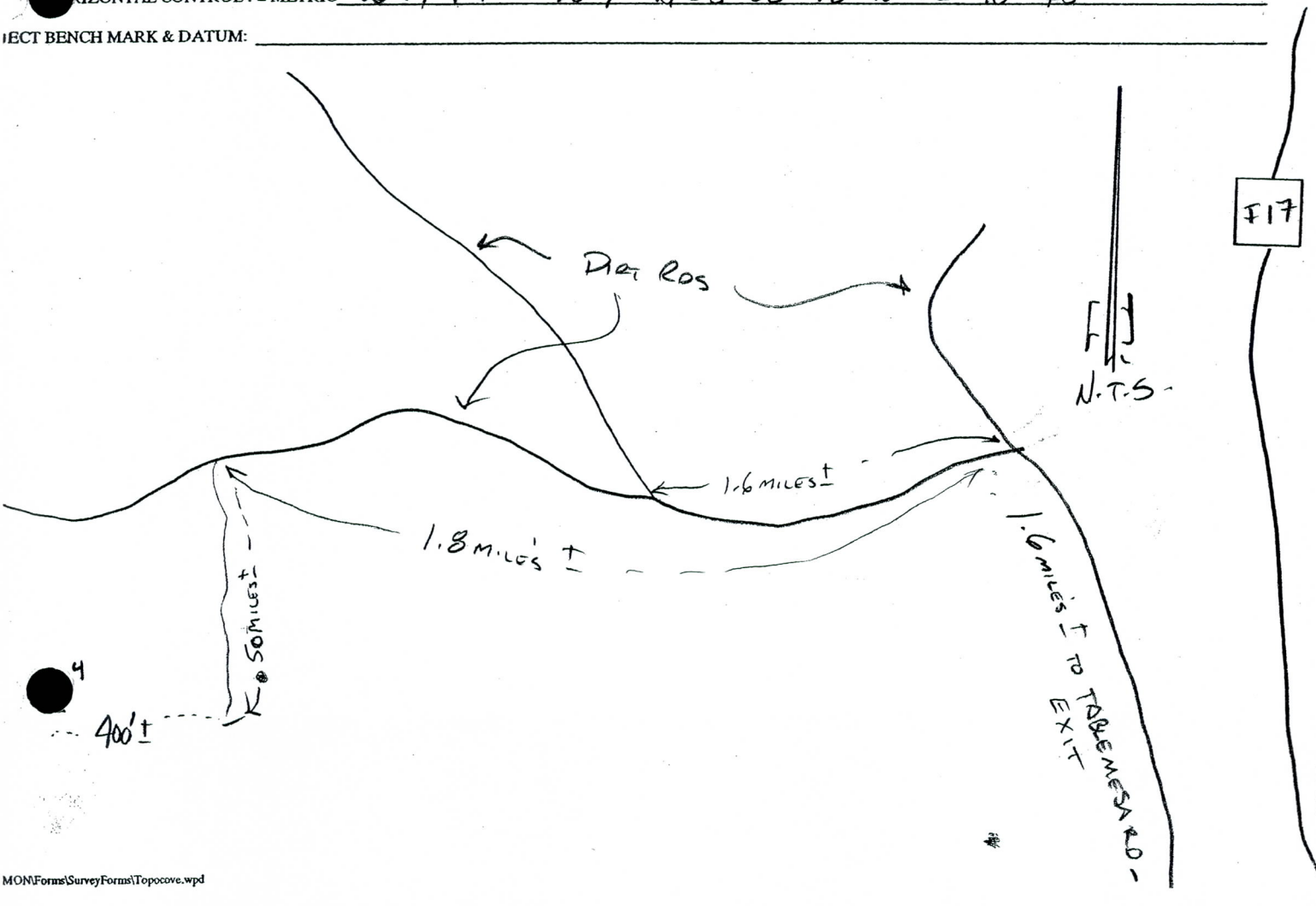
(E) EXISTING SITE TOPO
- ☐ AERIAL PROFILE CHECK
- ☐ FOR DESIGN

(G) GIS

CRIPTION: SETTING FLOOD CONTROL BENCH MARKS (U.A.F.)

☐ IMPERIAL
RIZONTAL CONTROL : ☐ METRIC ~~WAYPT #107~~ 33-58-48 W 112-10-40

JECT BENCH MARK & DATUM:



BOOK_____ PAGE_____

JOB No: 45-100648

IENT: MARICOPA CO. FLOOD CONTROL DIST.

TOPOGRAPHY COVER SHEET

RTY CHIEF: KLEIN

EW: WILLIS, WASHICKO

TE: 5-14-2002

RBF CONSULTING
PLANNING DESIGN CONSTRUCTION
16605 N 28th Avenue Suite 100 Phoenix Arizona 85053
(602) 467-2200 Fax (602) 467-2201

NAME: ~~APD5134B~~

POINT RANGE: _____

OSE OF SURVEY:

EARTH QUANTITY TOPO
- ☐ ALLUVIAL REMOVAL
- ☐ WET ALLUVIAL REMOVAL
- ☐ BUTTRESS/KEYWAY REMOVAL
- ☐ LAND SLIDE REMOVAL
- ☐ OVER-EXCAVATION
- ☐ STOCK PILE

(A) AS-CONSTRUCTED TOPO
- ☐ ROUGH GRADE VERIFICATION
- ☐ PRECISE GRADE VERIFICATION
- ☐ IMPROVEMENT VERIFICATION

(E) EXISTING SITE TOPO
- ☐ AERIAL PROFILE CHECK
- ☐ FOR DESIGN

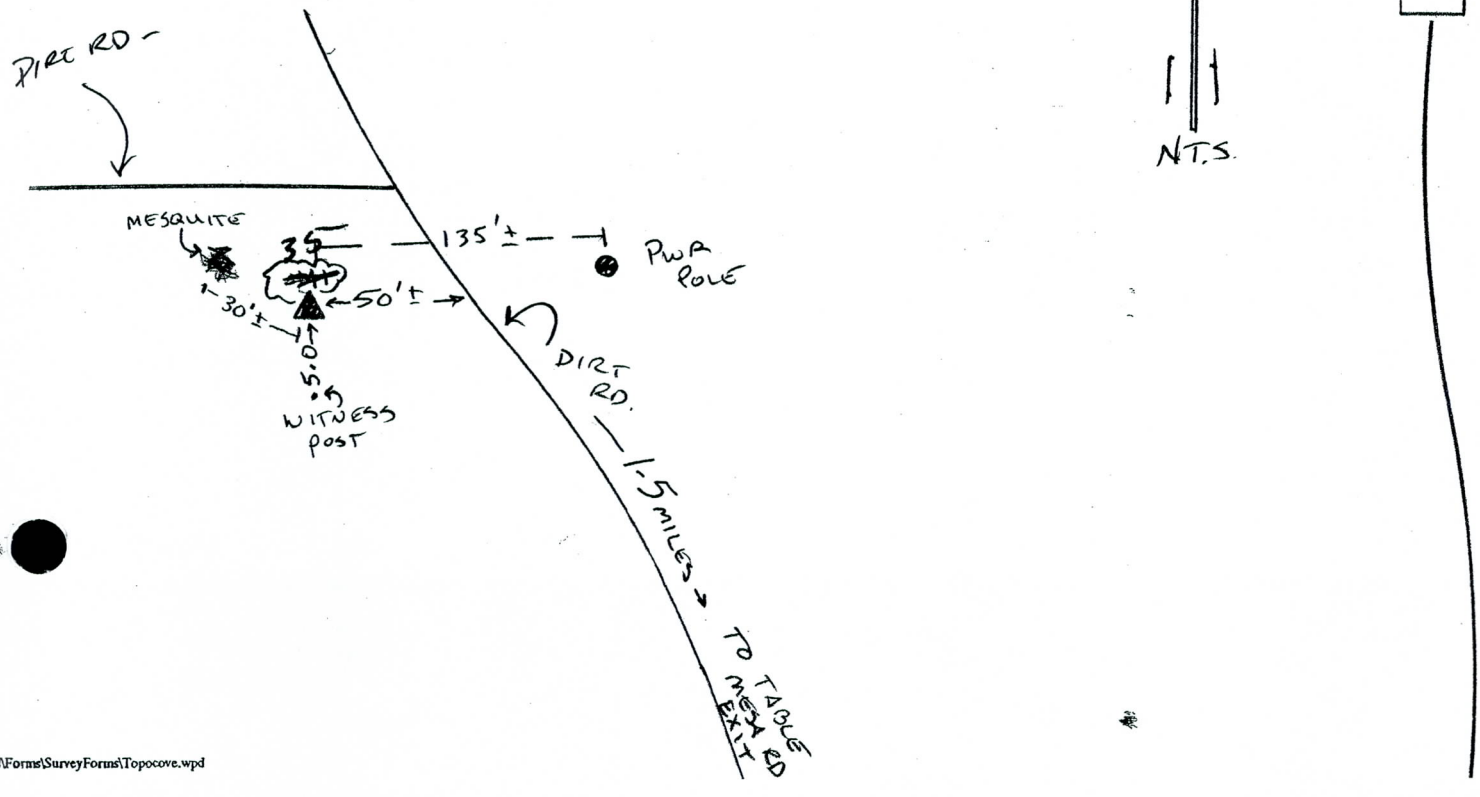
SUBDRAIN LOCATION

(G) GIS

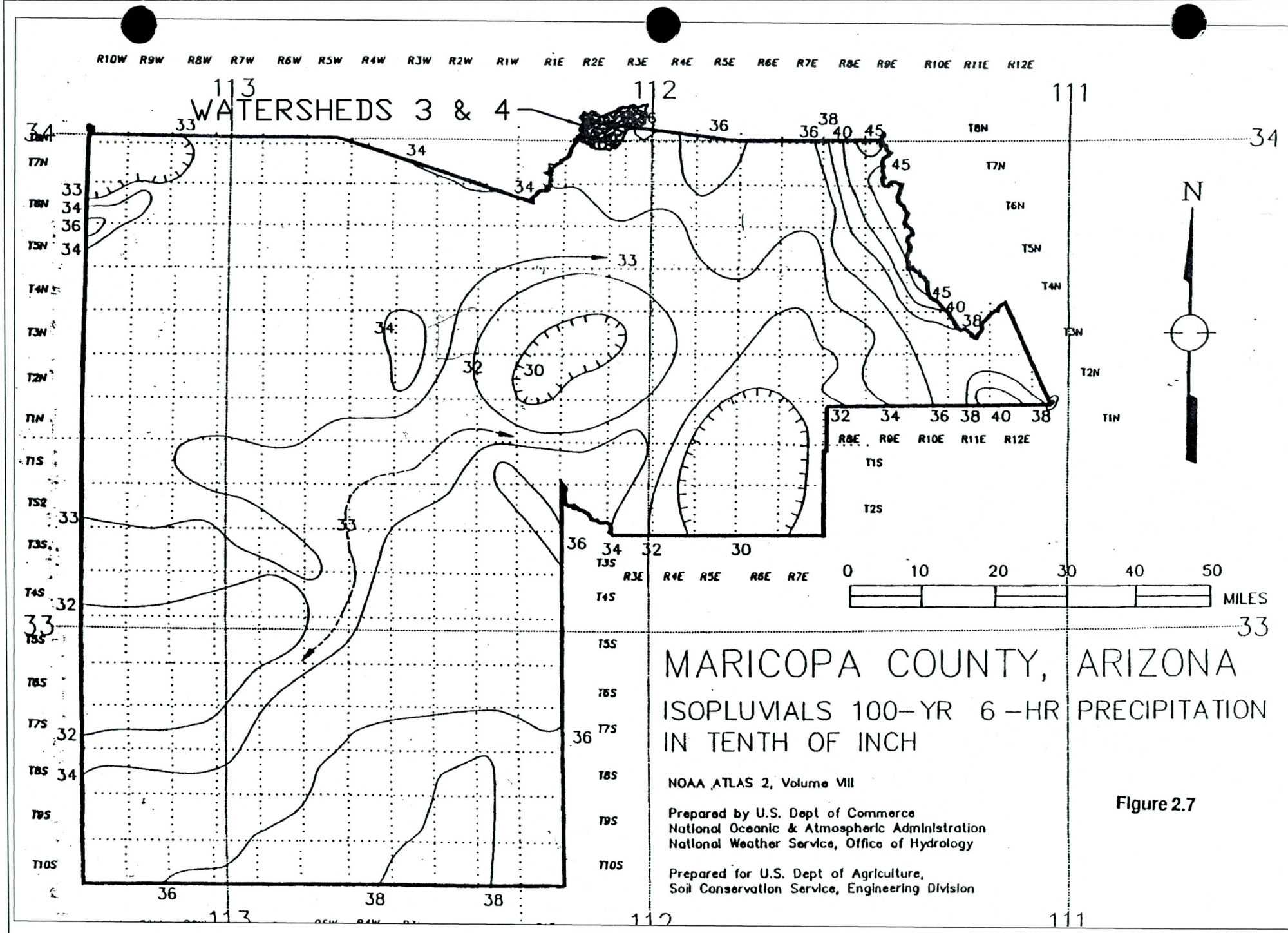
RIPTION: SETTING FLOOD CONTROL BENCH MARK (U.A.F.)

ZONTAL CONTROL : ☐ IMPERIAL ☐ METRIC ~~WAM PT. 41~~ N. 35-59-06 W 112-08-40

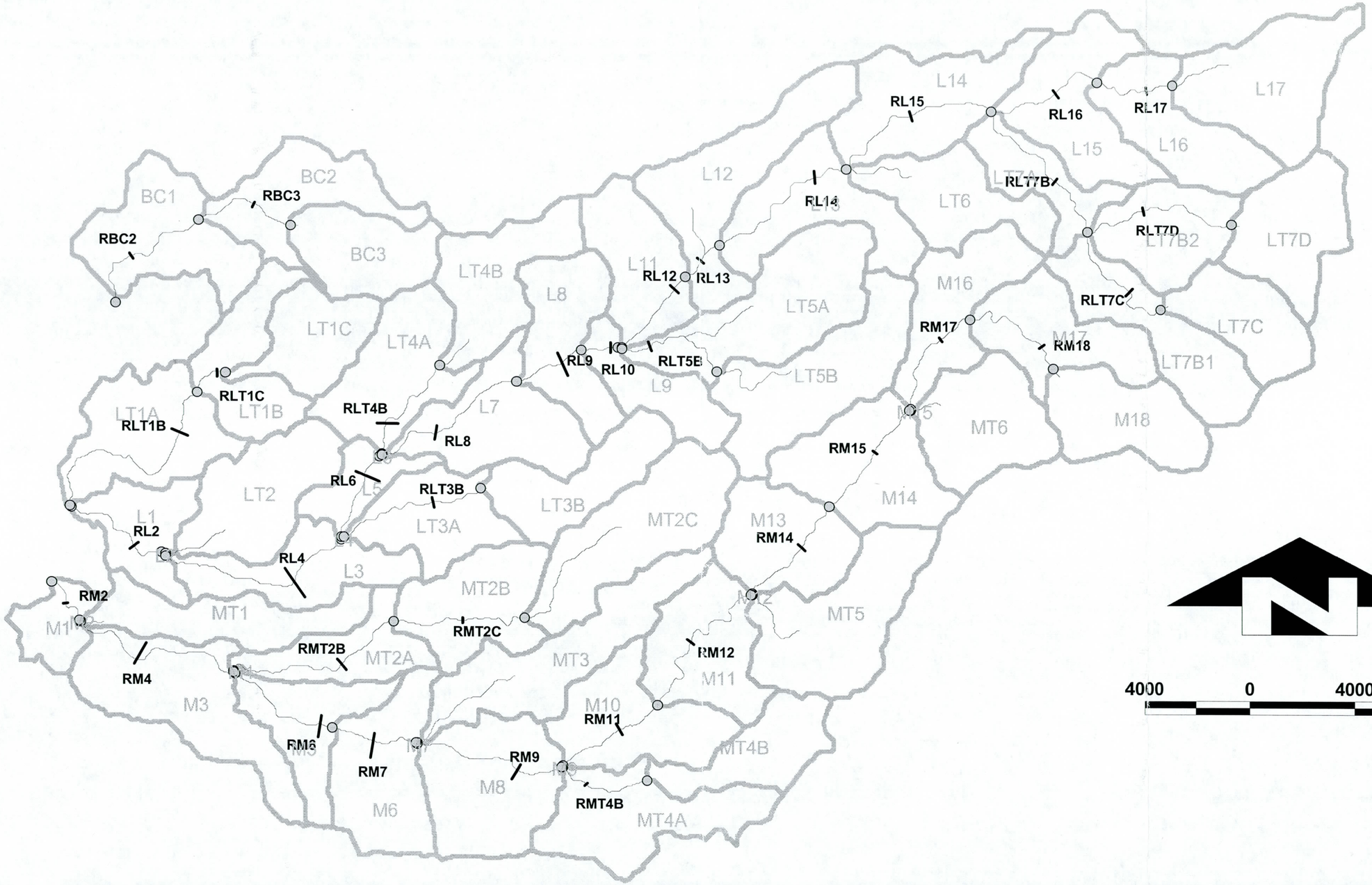
ECT BENCH MARK & DATUM: _____



D.1 Precipitation Data


WATERSHEDS 3 & 4
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,
Soil Conservation Service, Engineering Division
N
0 10 20 30 40 50
MILES
Figure 2.7

D.2 Physical Parameter Calculations



LOCATION OF CROSS SECTIONS
NORMAL DEPTH ROUTING
WATERSHED 3 & 4

Moores Gulch
Lag Time Calculations

Basin Name	Max Flow Distance	Max Flow Slope	Centroid Stream Distance	Kn	C	Lag		0.1*Lag	0.15*lag	0.25*lag
	mi.	ft./mi.	mi.			Hours	Min.			
M1	0.83	275	0.41	0.045	0.9	0.20	12	1	2	3
M3	2.79	210	1.50	0.045	0.9	0.56	34	3	5	8
M5	1.56	268	0.72	0.045	0.9	0.33	20	2	3	5
M6	1.55	496	0.83	0.045	0.9	0.30	18	2	3	5
M8	1.44	449	0.58	0.045	0.9	0.26	16	2	2	4
M10	1.60	623	0.65	0.045	0.9	0.27	16	2	2	4
M11	1.64	469	0.68	0.045	0.9	0.29	17	2	3	4
M13	1.25	776	0.48	0.045	0.9	0.21	13	1	2	3
M14	1.35	952	0.42	0.045	0.9	0.20	12	1	2	3
M16	1.97	625	0.98	0.045	0.9	0.34	20	2	3	5
M17	1.83	757	0.76	0.045	0.9	0.29	17	2	3	4
M18	1.61	1081	0.82	0.045	0.9	0.26	16	2	2	4
MT1	2.65	135	1.18	0.045	0.9	0.55	33	3	5	8
MT2A	1.80	200	1.02	0.045	0.9	0.41	25	2	4	6
MT2B	1.56	325	0.74	0.045	0.9	0.32	19	2	3	5
MT2C	2.28	407	1.19	0.045	0.9	0.42	25	3	4	6
MT3	2.99	333	1.46	0.045	0.9	0.52	31	3	5	8
MT4A	1.90	849	0.72	0.045	0.9	0.28	17	2	3	4
MT4B	1.67	654	0.95	0.045	0.9	0.31	19	2	3	5
MT5	2.12	773	0.94	0.045	0.9	0.33	20	2	3	5
MT6	1.39	1020	0.77	0.045	0.9	0.25	15	1	2	4

Use NMIN = 2 min

Little Squaw Creek
Lag Time Calculations

Basin Name	Max Flow Distance	Max Flow Slope		Centroid Stream Distance	Kn	C	Lag Time		0.1*Lag	0.15*Lag	0.25*Lag
	mi	ft/ft	ft/mi	mi			hours	minutes			
L1	1.32	0.0294	155	0.57	0.045	0.9	0.31	19	2	3	5
L3	2.30	0.0387	204	1.15	0.045	0.9	0.47	28	3	4	7
L5	1.21	0.0432	228	0.42	0.045	0.9	0.25	15	1	2	4
L7	2.02	0.0624	330	0.91	0.045	0.9	0.38	23	2	3	6
L8	1.34	0.0891	470	0.60	0.045	0.9	0.26	15	2	2	4
L9	1.49	0.1181	624	0.74	0.045	0.9	0.28	17	2	2	4
L11	1.54	0.0905	478	0.80	0.045	0.9	0.30	18	2	3	5
L12	2.41	0.0822	434	1.06	0.045	0.9	0.40	24	2	4	6
L13	2.31	0.0738	390	0.96	0.045	0.9	0.39	23	2	4	6
L14	2.15	0.0652	344	0.86	0.045	0.9	0.37	22	2	3	6
L15	1.56	0.1175	620	0.57	0.045	0.9	0.25	15	2	2	4
L16	1.78	0.2071	1094	0.84	0.045	0.9	0.28	17	2	2	4
L17	1.71	0.1960	1035	0.60	0.045	0.9	0.24	15	1	2	4
LT1A	2.03	0.0327	173	0.84	0.045	0.9	0.41	25	2	4	6
LT1B	1.62	0.0513	271	0.52	0.045	0.9	0.29	17	2	3	4
LT1C	1.50	0.0326	172	0.78	0.045	0.9	0.36	22	2	3	5
LT2	1.87	0.0500	264	0.92	0.045	0.9	0.38	23	2	3	6
LT3A	1.83	0.0535	282	0.82	0.045	0.9	0.36	22	2	3	5
LT3B	2.20	0.0783	413	1.12	0.045	0.9	0.40	24	2	4	6
LT4A	1.56	0.0674	356	0.70	0.045	0.9	0.30	18	2	3	5
LT4B	1.97	0.0833	440	0.91	0.045	0.9	0.35	21	2	3	5
LT5A	2.40	0.0780	412	1.27	0.045	0.9	0.44	26	3	4	7
LT5B	2.50	0.0643	339	0.96	0.045	0.9	0.42	25	2	4	6
LT6	1.99	0.1101	581	0.94	0.045	0.9	0.34	20	2	3	5
LT7A	1.64	0.1092	577	0.70	0.045	0.9	0.28	17	2	3	4
LT7B1	2.10	0.1781	940	1.10	0.045	0.9	0.34	20	2	3	5
LT7B2	1.56	0.1713	904	0.70	0.045	0.9	0.25	15	2	2	4
LT7C	1.30	0.2942	1553	0.64	0.045	0.9	0.21	12	1	2	3
LT7D	1.04	0.2696	1424	0.51	0.045	0.9	0.18	11	1	2	3

Use NMIN = 2 minutes

Wash 8N2ES21
Lag Time Calculations

Basin Name	Area	Max Flow Distance	Max Flow Slope	Centroid Stream	Kn	C	Lag Time		0.1*Lag	0.15*Lag	0.25*Lag
	sq. mi	mi	ft/mi	mi			Hours	Minutes			
BC1	0.78	1.83	220	0.83	0.045	0.9	0.378601	23	2	3	6
BC2	0.64	2.05	353	0.88	0.045	0.9	0.370344	22	2	3	6
BC3	0.56	1.51	410	0.57	0.045	0.9	0.271434	16	2	2	4

Use NMIN = 2 min

```
21,"Transportation",0.1,80,75,"normal"
22,"Vacant",0.35,0,20,"dry"
23,"Vacant",0.35,0,25,"dry"
25,"Vacant",0.35,0,35,"dry"
26,"Vacant",0.35,0,40,"dry"
```

Input Coverage Name -> Draiinage
Input Coverage Attribute -> Basin Name

Overlay Coverage Name -> Land Use
Overlay Coverage Attribute -> Land Use

Overlay Areas and Percentages

Basin M1 - Land Use 22 - 0.18 sq mi. - 88.89%
Basin M1 - Land Use 23 - 0.02 sq mi. - 11.11%
Basin M10 - Land Use 24 - 0.51 sq mi. - 79.31%
Basin M10 - Land Use 25 - 0.13 sq mi. - 20.69%
Basin M11 - Land Use 24 - 0.24 sq mi. - 39.29%
Basin M11 - Land Use 25 - 0.38 sq mi. - 60.71%
Basin M13 - Land Use 24 - 0.04 sq mi. - 8.70%
Basin M13 - Land Use 25 - 0.42 sq mi. - 82.61%
Basin M13 - Land Use 26 - 0.04 sq mi. - 8.70%
Basin M14 - Land Use 25 - 0.31 sq mi. - 40.00%
Basin M14 - Land Use 26 - 0.47 sq mi. - 60.00%
Basin M16 - Land Use 25 - 0.04 sq mi. - 6.90%
Basin M16 - Land Use 26 - 0.60 sq mi. - 93.10%
Basin M17 - Land Use 26 - 0.55 sq mi. - 100.00%
Basin M18 - Land Use 26 - 0.58 sq mi. - 100.00%
Basin M3 - Land Use 21 - 0.11 sq mi. - 14.29%
Basin M3 - Land Use 22 - 0.49 sq mi. - 62.86%
Basin M3 - Land Use 23 - 0.18 sq mi. - 22.86%
Basin M5 - Land Use 21 - 0.07 sq mi. - 18.75%
Basin M5 - Land Use 22 - 0.02 sq mi. - 6.25%
Basin M5 - Land Use 23 - 0.24 sq mi. - 68.75%
Basin M5 - Land Use 24 - 0.02 sq mi. - 6.25%
Basin M6 - Land Use 23 - 0.33 sq mi. - 55.56%
Basin M6 - Land Use 24 - 0.22 sq mi. - 37.04%
Basin M6 - Land Use 25 - 0.04 sq mi. - 7.41%
Basin M8 - Land Use 23 - 0.18 sq mi. - 22.86%
Basin M8 - Land Use 24 - 0.58 sq mi. - 74.29%
Basin M8 - Land Use 25 - 0.02 sq mi. - 2.86%
Basin MT1 - Land Use 21 - 0.22 sq mi. - 38.46%
Basin MT1 - Land Use 22 - 0.18 sq mi. - 30.77%
Basin MT1 - Land Use 23 - 0.18 sq mi. - 30.77%
Basin MT2A - Land Use 21 - 0.07 sq mi. - 17.65%
Basin MT2A - Land Use 22 - 0.02 sq mi. - 5.88%
Basin MT2A - Land Use 23 - 0.20 sq mi. - 52.94%
Basin MT2A - Land Use 24 - 0.09 sq mi. - 23.53%
Basin MT2B - Land Use 24 - 0.53 sq mi. - 100.00%
Basin MT2C - Land Use 24 - 0.18 sq mi. - 20.51%
Basin MT2C - Land Use 25 - 0.64 sq mi. - 74.36%
Basin MT2C - Land Use 26 - 0.04 sq mi. - 5.13%
Basin MT3 - Land Use 23 - 0.07 sq mi. - 8.11%
Basin MT3 - Land Use 24 - 0.44 sq mi. - 54.05%
Basin MT3 - Land Use 25 - 0.31 sq mi. - 37.84%
Basin MT4A - Land Use 24 - 0.31 sq mi. - 43.75%
Basin MT4A - Land Use 25 - 0.35 sq mi. - 50.00%
Basin MT4A - Land Use 26 - 0.04 sq mi. - 6.25%
Basin MT4B - Land Use 24 - 0.02 sq mi. - 5.26%
Basin MT4B - Land Use 25 - 0.18 sq mi. - 42.11%
Basin MT4B - Land Use 26 - 0.20 sq mi. - 47.37%
Basin MT5 - Land Use 25 - 0.27 sq mi. - 31.58%
Basin MT5 - Land Use 26 - 0.58 sq mi. - 68.42%
Basin MT6 - Land Use 26 - 0.64 sq mi. - 100.00%

Input Coverage Name -> Drainage
Input Coverage Attribute -> Basin Name

Overlay Coverage Name -> Land Use Coverage
Overlay Coverage Attribute -> Land Use

Overlay Areas and Percentages

Basin L1 - Land Use 21 - 1.25 sq mi. - 27.78%
Basin L1 - Land Use 22 - 3.00 sq mi. - 66.67%
Basin L1 - Land Use 23 - 0.25 sq mi. - 5.56%
Basin L11 - Land Use 24 - 2.25 sq mi. - 36.00%
Basin L11 - Land Use 25 - 3.50 sq mi. - 56.00%
Basin L11 - Land Use 26 - 0.50 sq mi. - 8.00%
Basin L12 - Land Use 24 - 1.00 sq mi. - 11.43%
Basin L12 - Land Use 25 - 4.50 sq mi. - 51.43%
Basin L12 - Land Use 26 - 2.75 sq mi. - 31.43%
Basin L13 - Land Use 25 - 3.25 sq mi. - 46.43%
Basin L13 - Land Use 26 - 3.75 sq mi. - 53.57%
Basin L14 - Land Use 25 - 0.50 sq mi. - 6.06%
Basin L14 - Land Use 26 - 7.50 sq mi. - 90.91%
Basin L15 - Land Use 26 - 7.75 sq mi. - 100.00%
Basin L16 - Land Use 26 - 6.50 sq mi. - 100.00%
Basin L17 - Land Use 26 - 8.00 sq mi. - 100.00%
Basin L3 - Land Use 21 - 1.75 sq mi. - 29.17%
Basin L3 - Land Use 23 - 3.50 sq mi. - 58.33%
Basin L3 - Land Use 24 - 0.75 sq mi. - 12.50%
Basin L5 - Land Use 23 - 2.00 sq mi. - 88.89%
Basin L5 - Land Use 24 - 0.25 sq mi. - 11.11%
Basin L7 - Land Use 23 - 0.25 sq mi. - 3.33%
Basin L7 - Land Use 24 - 7.00 sq mi. - 93.33%
Basin L7 - Land Use 25 - 0.25 sq mi. - 3.33%
Basin L8 - Land Use 24 - 5.25 sq mi. - 87.50%
Basin L8 - Land Use 25 - 0.75 sq mi. - 12.50%
Basin L9 - Land Use 24 - 1.00 sq mi. - 26.67%
Basin L9 - Land Use 25 - 2.25 sq mi. - 60.00%
Basin L9 - Land Use 26 - 0.50 sq mi. - 13.33%
Basin LT1A - Land Use 21 - 1.25 sq mi. - 16.13%
Basin LT1A - Land Use 22 - 3.00 sq mi. - 38.71%
Basin LT1A - Land Use 23 - 3.50 sq mi. - 45.16%
Basin LT1B - Land Use 23 - 4.00 sq mi. - 76.19%
Basin LT1B - Land Use 24 - 1.25 sq mi. - 23.81%
Basin LT1C - Land Use 23 - 3.00 sq mi. - 75.00%
Basin LT1C - Land Use 24 - 1.00 sq mi. - 25.00%
Basin LT2 - Land Use 21 - 2.00 sq mi. - 28.57%
Basin LT2 - Land Use 23 - 3.50 sq mi. - 50.00%
Basin LT2 - Land Use 24 - 1.50 sq mi. - 21.43%
Basin LT3A - Land Use 23 - 1.50 sq mi. - 27.27%
Basin LT3A - Land Use 24 - 4.00 sq mi. - 72.73%
Basin LT3B - Land Use 24 - 2.25 sq mi. - 39.13%
Basin LT3B - Land Use 25 - 3.25 sq mi. - 56.52%
Basin LT3B - Land Use 26 - 0.25 sq mi. - 4.35%
Basin LT4A - Land Use 23 - 1.75 sq mi. - 22.58%
Basin LT4A - Land Use 24 - 6.00 sq mi. - 77.42%
Basin LT4B - Land Use 24 - 5.50 sq mi. - 84.62%
Basin LT4B - Land Use 25 - 1.00 sq mi. - 15.38%
Basin LT5A - Land Use 24 - 0.50 sq mi. - 5.71%
Basin LT5A - Land Use 25 - 5.25 sq mi. - 60.00%
Basin LT5A - Land Use 26 - 3.00 sq mi. - 34.29%
Basin LT5B - Land Use 25 - 1.25 sq mi. - 13.51%
Basin LT5B - Land Use 26 - 8.00 sq mi. - 86.49%
Basin LT6 - Land Use 25 - 0.25 sq mi. - 4.55%
Basin LT6 - Land Use 26 - 5.25 sq mi. - 95.45%
Basin LT7A - Land Use 26 - 4.00 sq mi. - 100.00%
Basin LT7B1 - Land Use 26 - 7.00 sq mi. - 100.00%
Basin LT7B2 - Land Use 26 - 5.25 sq mi. - 100.00%
Basin LT7C - Land Use 26 - 5.00 sq mi. - 100.00%
Basin LT7D - Land Use 26 - 6.00 sq mi. - 100.00%

Input Coverage Name -> DRAINAGE
Input Coverage Attribute -> Basin Name

Overlay Coverage Name -> Land Use
Overlay Coverage Attribute -> Land Use

Overlay Areas and Percentages

Basin 13B - Land Use 21 - 0.04 sq mi. - 6.25%
Basin 13B - Land Use 22 - 0.04 sq mi. - 6.25%
Basin 13B - Land Use 23 - 0.60 sq mi. - 84.38%
Basin 13B - Land Use 24 - 0.02 sq mi. - 3.13%
Basin BC2 - Land Use 23 - 0.18 sq mi. - 30.77%
Basin BC2 - Land Use 24 - 0.38 sq mi. - 65.38%
Basin BC2 - Land Use 25 - 0.02 sq mi. - 3.85%
Basin BC3 - Land Use 23 - 0.02 sq mi. - 5.56%
Basin BC3 - Land Use 24 - 0.35 sq mi. - 88.89%
Basin BC3 - Land Use 25 - 0.02 sq mi. - 5.56%

```
8,"Carrizo gravelly loamy sand",1.20,0.00,100
16,"Gilman loam",0.25,0.00,100
24,"Pimer clay loam",0.04,0.00,100
26,"Pinal gravelly loam, 1 to 3 percent slopes",0.40,0.00,100
28,"Pinamt very gravelly loam, 0 to 1 percent slopes",0.40,0.00,100
31,"Rillito gravelly loam, 1 to 3 percent slopes",0.40,0.00,100
33,"Rough broken land",0.40,20.00,100
34,"Tremant gravelly loam, 1 to 3 percent slopes",0.10,0.00,100
36,"Valencia sandy loam",0.40,0.00,100
37,"Vecont clay",0.01,0.00,100
39,"Lakes, ponds, reservoirs - perennial",0.00,0.00,100
40,"Antho sandy loams",0.41,0.00,100
41,"Antho gravelly sandy loams",0.41,0.00,100
45,"Anthony-Arizo complex",0.62,0.00,100
61,"Contine clay loam",0.04,0.00,100
63,"continental clay loam, 0 to 3 percent slopes",0.02,0.00,100
66,"Continental-Mohave complex, 1 to 7 percent slopes",0.01,0.00,100
72,"Eba very gravelly loam, 1 to 8 percent slopes",0.23,0.00,100
93,"Gila fine sandy loams",0.29,0.00,100
96,"Gilman clay loam",0.06,0.00,100
103,"Gran-Wickenburg-Rock outcrop complex, low precipitation, 10 to 65  percent slopes",0.14,25.00,100
104,"Greyeagle-Continental-Nickel association, 1 to 40 percent slopes",0.19,0.00,100
105,"Greyeagle-Suncity Variant complex, 1 to 7 percent slopes",0.23,0.00,100
111,"Lehmans-Rock outcrop complex, 8 to 65 percent slopes",0.09,30.00,100
126,"Mohave complex",0.04,0.00,100
542,"Eba-Pinaleno (STATSGO AZ042)", 0.20,0.00,100
549,"Gran-Rock Outcrop-Lehmans (STATSGO AZ049)",0.08,0.00,100
675,"Quintana (STATSGO AZ175)",1.30,0.00,100
```

Input Coverage Name -> Drainage
Input Coverage Attribute -> Basin Name

Overlay Coverage Name -> Soil Type
Overlay Coverage Attribute -> SCS Soil

Overlay Areas and Percentages

Basin M1 - SCS Soil 31 - 0.14 sq mi. - 66.67%
Basin M1 - SCS Soil 34 - 0.05 sq mi. - 22.22%
Basin M1 - SCS Soil 93 - 0.02 sq mi. - 11.11%
Basin M10 - SCS Soil 104 - 0.02 sq mi. - 3.45%
Basin M10 - SCS Soil 31 - 0.42 sq mi. - 62.07%
Basin M10 - SCS Soil 41 - 0.12 sq mi. - 17.24%
Basin M10 - SCS Soil 72 - 0.05 sq mi. - 6.90%
Basin M10 - SCS Soil 8 - 0.07 sq mi. - 10.34%
Basin M11 - SCS Soil 104 - 0.07 sq mi. - 11.11%
Basin M11 - SCS Soil 31 - 0.39 sq mi. - 62.96%
Basin M11 - SCS Soil 72 - 0.09 sq mi. - 14.81%
Basin M11 - SCS Soil 8 - 0.07 sq mi. - 11.11%
Basin M13 - SCS Soil 31 - 0.12 sq mi. - 21.74%
Basin M13 - SCS Soil 549 - 0.09 sq mi. - 17.39%
Basin M13 - SCS Soil 72 - 0.26 sq mi. - 47.83%
Basin M13 - SCS Soil 8 - 0.07 sq mi. - 13.04%
Basin M14 - SCS Soil 41 - 0.02 sq mi. - 3.23%
Basin M14 - SCS Soil 549 - 0.51 sq mi. - 70.97%
Basin M14 - SCS Soil 72 - 0.19 sq mi. - 25.81%
Basin M16 - SCS Soil 549 - 0.42 sq mi. - 72.00%
Basin M16 - SCS Soil 675 - 0.16 sq mi. - 28.00%
Basin M17 - SCS Soil 549 - 0.60 sq mi. - 100.00%
Basin M18 - SCS Soil 549 - 0.51 sq mi. - 100.00%
Basin M3 - SCS Soil 111 - 0.14 sq mi. - 16.22%
Basin M3 - SCS Soil 33 - 0.02 sq mi. - 2.70%
Basin M3 - SCS Soil 34 - 0.14 sq mi. - 16.22%
Basin M3 - SCS Soil 37 - 0.02 sq mi. - 2.70%
Basin M3 - SCS Soil 41 - 0.07 sq mi. - 8.11%
Basin M3 - SCS Soil 8 - 0.09 sq mi. - 10.81%
Basin M3 - SCS Soil 93 - 0.37 sq mi. - 43.24%
Basin M5 - SCS Soil 34 - 0.12 sq mi. - 25.00%
Basin M5 - SCS Soil 41 - 0.28 sq mi. - 60.00%
Basin M5 - SCS Soil 8 - 0.05 sq mi. - 10.00%
Basin M5 - SCS Soil 93 - 0.02 sq mi. - 5.00%
Basin M6 - SCS Soil 41 - 0.44 sq mi. - 73.08%
Basin M6 - SCS Soil 8 - 0.05 sq mi. - 7.69%
Basin M6 - SCS Soil 93 - 0.12 sq mi. - 19.23%
Basin M8 - SCS Soil 31 - 0.02 sq mi. - 3.33%
Basin M8 - SCS Soil 41 - 0.49 sq mi. - 70.00%
Basin M8 - SCS Soil 72 - 0.02 sq mi. - 3.33%
Basin M8 - SCS Soil 8 - 0.09 sq mi. - 13.33%
Basin M8 - SCS Soil 93 - 0.07 sq mi. - 10.00%
Basin MT1 - SCS Soil 111 - 0.09 sq mi. - 19.05%
Basin MT1 - SCS Soil 34 - 0.07 sq mi. - 14.29%
Basin MT1 - SCS Soil 37 - 0.26 sq mi. - 52.38%
Basin MT1 - SCS Soil 63 - 0.05 sq mi. - 9.52%
Basin MT1 - SCS Soil 93 - 0.02 sq mi. - 4.76%
Basin MT2A - SCS Soil 37 - 0.21 sq mi. - 60.00%
Basin MT2A - SCS Soil 41 - 0.12 sq mi. - 33.33%
Basin MT2A - SCS Soil 93 - 0.02 sq mi. - 6.67%
Basin MT2B - SCS Soil 111 - 0.05 sq mi. - 8.00%
Basin MT2B - SCS Soil 31 - 0.02 sq mi. - 4.00%
Basin MT2B - SCS Soil 37 - 0.02 sq mi. - 4.00%
Basin MT2B - SCS Soil 41 - 0.21 sq mi. - 36.00%
Basin MT2B - SCS Soil 63 - 0.28 sq mi. - 48.00%
Basin MT2C - SCS Soil 31 - 0.30 sq mi. - 30.95%
Basin MT2C - SCS Soil 41 - 0.19 sq mi. - 19.05%
Basin MT2C - SCS Soil 63 - 0.09 sq mi. - 9.52%
Basin MT2C - SCS Soil 72 - 0.33 sq mi. - 33.33%
Basin MT2C - SCS Soil 8 - 0.07 sq mi. - 7.14%
Basin MT3 - SCS Soil 31 - 0.58 sq mi. - 71.43%
Basin MT3 - SCS Soil 37 - 0.19 sq mi. - 22.86%
Basin MT3 - SCS Soil 41 - 0.05 sq mi. - 5.71%
Basin MT4A - SCS Soil 104 - 0.35 sq mi. - 57.69%
Basin MT4A - SCS Soil 31 - 0.05 sq mi. - 7.69%
Basin MT4A - SCS Soil 41 - 0.09 sq mi. - 15.38%
Basin MT4A - SCS Soil 72 - 0.12 sq mi. - 19.23%
Basin MT4B - SCS Soil 104 - 0.35 sq mi. - 78.95%
Basin MT4B - SCS Soil 31 - 0.05 sq mi. - 10.53%
Basin MT4B - SCS Soil 72 - 0.05 sq mi. - 10.53%
Basin MT5 - SCS Soil 104 - 0.23 sq mi. - 25.64%
Basin MT5 - SCS Soil 31 - 0.12 sq mi. - 12.82%
Basin MT5 - SCS Soil 549 - 0.44 sq mi. - 48.72%
Basin MT5 - SCS Soil 8 - 0.05 sq mi. - 5.13%
Basin MT5 - SCS Soil 93 - 0.07 sq mi. - 7.69%
Basin MT6 - SCS Soil 549 - 0.60 sq mi. - 100.00%

Input Coverage Name -> Drainage
Input Coverage Attribute -> Basin Name

Overlay Coverage Name -> Soil Type
Overlay Coverage Attribute -> SCS Soil

Overlay Areas and Percentages

Basin L1 - SCS Soil 31 - 1.00 sq mi. - 22.22%
Basin L1 - SCS Soil 34 - 0.75 sq mi. - 16.67%
Basin L1 - SCS Soil 63 - 1.00 sq mi. - 22.22%
Basin L1 - SCS Soil 8 - 0.50 sq mi. - 11.11%
Basin L1 - SCS Soil 93 - 1.25 sq mi. - 27.78%
Basin L11 - SCS Soil 542 - 3.75 sq mi. - 60.00%
Basin L11 - SCS Soil 675 - 2.25 sq mi. - 36.00%
Basin L11 - SCS Soil 8 - 0.25 sq mi. - 4.00%
Basin L12 - SCS Soil 542 - 2.50 sq mi. - 28.57%
Basin L12 - SCS Soil 675 - 5.75 sq mi. - 65.71%
Basin L13 - SCS Soil 542 - 0.75 sq mi. - 10.71%
Basin L13 - SCS Soil 675 - 6.25 sq mi. - 89.29%
Basin L14 - SCS Soil 675 - 8.00 sq mi. - 96.97%
Basin L15 - SCS Soil 549 - 4.75 sq mi. - 61.29%
Basin L15 - SCS Soil 675 - 3.00 sq mi. - 38.71%
Basin L16 - SCS Soil 549 - 5.25 sq mi. - 80.77%
Basin L16 - SCS Soil 675 - 1.25 sq mi. - 19.23%
Basin L17 - SCS Soil 549 - 8.00 sq mi. - 100.00%
Basin L3 - SCS Soil 111 - 1.00 sq mi. - 16.67%
Basin L3 - SCS Soil 34 - 0.50 sq mi. - 8.33%
Basin L3 - SCS Soil 37 - 1.00 sq mi. - 16.67%
Basin L3 - SCS Soil 41 - 0.25 sq mi. - 4.17%
Basin L3 - SCS Soil 61 - 0.75 sq mi. - 12.50%
Basin L3 - SCS Soil 63 - 1.25 sq mi. - 20.83%
Basin L3 - SCS Soil 8 - 0.25 sq mi. - 4.17%
Basin L3 - SCS Soil 93 - 0.50 sq mi. - 8.33%
Basin L3 - SCS Soil 96 - 0.50 sq mi. - 8.33%
Basin L5 - SCS Soil 111 - 0.50 sq mi. - 22.22%
Basin L5 - SCS Soil 34 - 0.25 sq mi. - 11.11%
Basin L5 - SCS Soil 93 - 1.25 sq mi. - 55.56%
Basin L5 - SCS Soil 96 - 0.25 sq mi. - 11.11%
Basin L7 - SCS Soil 34 - 1.25 sq mi. - 16.67%
Basin L7 - SCS Soil 37 - 2.00 sq mi. - 26.67%
Basin L7 - SCS Soil 39 - 0.75 sq mi. - 10.00%
Basin L7 - SCS Soil 41 - 2.25 sq mi. - 30.00%
Basin L7 - SCS Soil 72 - 0.25 sq mi. - 3.33%
Basin L7 - SCS Soil 8 - 0.75 sq mi. - 10.00%
Basin L7 - SCS Soil 93 - 0.25 sq mi. - 3.33%
Basin L8 - SCS Soil 34 - 1.50 sq mi. - 25.00%
Basin L8 - SCS Soil 37 - 0.50 sq mi. - 8.33%
Basin L8 - SCS Soil 41 - 1.25 sq mi. - 20.83%
Basin L8 - SCS Soil 542 - 2.25 sq mi. - 37.50%
Basin L8 - SCS Soil 549 - 0.25 sq mi. - 4.17%
Basin L8 - SCS Soil 8 - 0.25 sq mi. - 4.17%
Basin L9 - SCS Soil 34 - 0.75 sq mi. - 20.00%
Basin L9 - SCS Soil 37 - 1.00 sq mi. - 26.67%
Basin L9 - SCS Soil 41 - 0.75 sq mi. - 20.00%
Basin L9 - SCS Soil 72 - 1.25 sq mi. - 33.33%
Basin LT1A - SCS Soil 111 - 0.50 sq mi. - 6.45%
Basin LT1A - SCS Soil 31 - 3.25 sq mi. - 41.94%
Basin LT1A - SCS Soil 61 - 0.75 sq mi. - 9.68%
Basin LT1A - SCS Soil 63 - 3.25 sq mi. - 41.94%
Basin LT1B - SCS Soil 61 - 0.50 sq mi. - 9.52%
Basin LT1B - SCS Soil 63 - 0.75 sq mi. - 14.29%
Basin LT1B - SCS Soil 72 - 1.75 sq mi. - 33.33%
Basin LT1B - SCS Soil 93 - 2.25 sq mi. - 42.86%
Basin LT1C - SCS Soil 105 - 0.50 sq mi. - 12.50%
Basin LT1C - SCS Soil 111 - 1.50 sq mi. - 37.50%
Basin LT1C - SCS Soil 72 - 0.25 sq mi. - 6.25%
Basin LT1C - SCS Soil 93 - 1.75 sq mi. - 43.75%
Basin LT2 - SCS Soil 111 - 0.50 sq mi. - 7.14%
Basin LT2 - SCS Soil 37 - 0.25 sq mi. - 3.57%
Basin LT2 - SCS Soil 61 - 1.50 sq mi. - 21.43%
Basin LT2 - SCS Soil 63 - 3.50 sq mi. - 50.00%
Basin LT2 - SCS Soil 8 - 0.50 sq mi. - 7.14%
Basin LT2 - SCS Soil 93 - 0.75 sq mi. - 10.71%
Basin LT3A - SCS Soil 111 - 0.25 sq mi. - 4.55%
Basin LT3A - SCS Soil 34 - 0.50 sq mi. - 9.09%
Basin LT3A - SCS Soil 41 - 1.75 sq mi. - 31.82%
Basin LT3A - SCS Soil 63 - 2.00 sq mi. - 36.36%
Basin LT3A - SCS Soil 93 - 1.00 sq mi. - 18.18%
Basin LT3B - SCS Soil 34 - 0.25 sq mi. - 4.35%
Basin LT3B - SCS Soil 37 - 1.00 sq mi. - 17.39%
Basin LT3B - SCS Soil 39 - 0.25 sq mi. - 4.35%
Basin LT3B - SCS Soil 41 - 2.50 sq mi. - 43.48%
Basin LT3B - SCS Soil 63 - 0.50 sq mi. - 8.70%
Basin LT3B - SCS Soil 72 - 0.25 sq mi. - 4.35%
Basin LT3B - SCS Soil 93 - 1.00 sq mi. - 17.39%
Basin LT4A - SCS Soil 111 - 3.00 sq mi. - 38.71%
Basin LT4A - SCS Soil 37 - 3.50 sq mi. - 45.16%
Basin LT4A - SCS Soil 41 - 0.50 sq mi. - 6.45%
Basin LT4A - SCS Soil 72 - 0.25 sq mi. - 3.23%
Basin LT4A - SCS Soil 8 - 0.25 sq mi. - 3.23%
Basin LT4A - SCS Soil 93 - 0.25 sq mi. - 3.23%
Basin LT4B - SCS Soil 37 - 1.50 sq mi. - 23.08%
Basin LT4B - SCS Soil 542 - 0.50 sq mi. - 7.69%
Basin LT4B - SCS Soil 549 - 4.00 sq mi. - 61.54%
Basin LT4B - SCS Soil 675 - 0.25 sq mi. - 3.85%
Basin LT4B - SCS Soil 93 - 0.25 sq mi. - 3.85%
Basin LT5A - SCS Soil 26 - 0.25 sq mi. - 2.86%
Basin LT5A - SCS Soil 41 - 1.75 sq mi. - 20.00%
Basin LT5A - SCS Soil 542 - 0.25 sq mi. - 2.86%
Basin LT5A - SCS Soil 675 - 6.50 sq mi. - 74.29%
Basin LT5B - SCS Soil 41 - 2.25 sq mi. - 24.32%
Basin LT5B - SCS Soil 549 - 0.25 sq mi. - 2.70%
Basin LT5B - SCS Soil 675 - 3.75 sq mi. - 40.54%
Basin LT5B - SCS Soil 72 - 3.00 sq mi. - 32.43%
Basin LT6 - SCS Soil 549 - 1.00 sq mi. - 18.18%

Basin LT6 - SCS Soil 675 - 4.50 sq mi. - 81.82%
Basin LT7A - SCS Soil 549 - 3.25 sq mi. - 81.25%
Basin LT7A - SCS Soil 675 - 0.75 sq mi. - 18.75%
Basin LT7B1 - SCS Soil 549 - 7.00 sq mi. - 100.00%
Basin LT7B2 - SCS Soil 549 - 5.25 sq mi. - 100.00%
Basin LT7C - SCS Soil 549 - 5.00 sq mi. - 100.00%
Basin LT7D - SCS Soil 549 - 6.00 sq mi. - 100.00%

Input Coverage Name -> DRAINAGE
Input Coverage Attribute -> Basin Name

Overlay Coverage Name -> Soil Type
Overlay Coverage Attribute -> SCS Soil

Overlay Areas and Percentages

Basin 13B - SCS Soil 16 - 0.04 sq mi. - 6.25%
Basin 13B - SCS Soil 542 - 0.51 sq mi. - 71.88%
Basin 13B - SCS Soil 549 - 0.07 sq mi. - 9.38%
Basin 13B - SCS Soil 72 - 0.09 sq mi. - 12.50%
Basin BC2 - SCS Soil 542 - 0.51 sq mi. - 88.46%
Basin BC2 - SCS Soil 549 - 0.07 sq mi. - 11.54%
Basin BC3 - SCS Soil 542 - 0.29 sq mi. - 72.22%
Basin BC3 - SCS Soil 549 - 0.11 sq mi. - 27.78%

D.3 Hydrograph Routing Data

NSTPS Calculations for Normal Depth Routing

Moores Gulch

Reach	Length Ft.	Slope Ft./Ft.	Velocity Ft./Sec	Time Min	NMIN Min	NSTPS
RM2	2295	0.01768	11.541	3	3	1
RM4	7420	0.01405	7.109	17	3	6
RM6	4756	0.01747	7.623	10	3	3
RM7	3639	0.01872	8.01	8	3	3
RM9	6023	0.01962	8.266	12	3	4
RM11	4614	0.02097	7.555	10	3	3
RM12	7632	0.0276	12.615	10	3	3
RM14	4985	0.02823	12.232	7	3	2
RM15	5167	0.03273	12.431	7	3	2
RM17	4907	0.05738	14.16	6	3	2
RM18	5144	0.0800	11.07	8	3	3
RMT2B	7796	0.0295	8.366	16	3	5
RMT2C	5798	0.0393	11.376	8	3	3
RMT4B	3498	0.0416	10.412	6	3	2

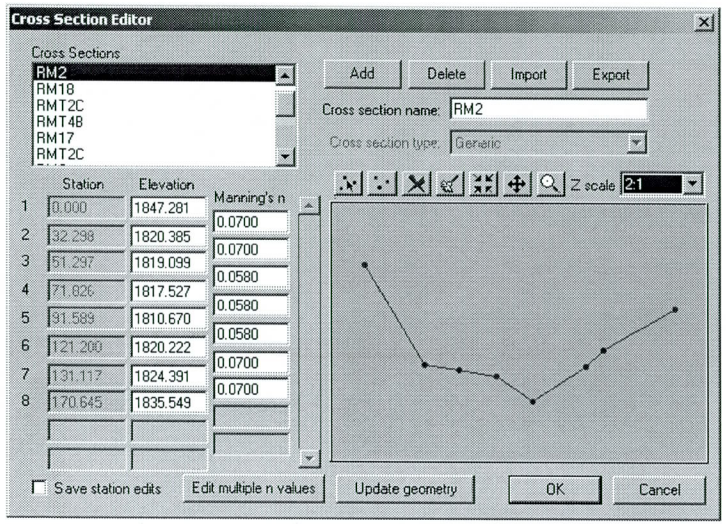
NSTPS Calculations for Normal Depth Routing Little Squaw Creek

Reach	Length Ft.	Slope Ft./Ft.	Velocity Ft./Sec	Time Min	NMIN Min	NSTPS
RL2	4673	0.0189	14	5	2	3
RL4	8237	0.0193	8	17	2	9
RL6	3643	0.0184	8	8	2	4
RL8	6667	0.0202	9	13	2	6
RL9	3019	0.0209	9	6	2	3
RL10	1478	0.0264	11	2	2	1
RL12	3791	0.0322	12	5	2	3
RL13	1974	0.0354	13	3	2	1
RL14	6706	0.0442	13	9	2	4
RL15	7280	0.0359	13	10	2	5
RL16	4972	0.0452	9	9	2	5
RL17	3414	0.0755	13	5	2	2
RLT1B	9734	0.0215	8	21	2	10
RLT1C	1642	0.0215	16	2	2	1
RLT3B	6271	0.0281	10	11	2	5
RLT4B	4856	0.0192	6	15	2	7
RLT5B	4915	0.0614	13	6	2	3
RLT7B	6841	0.0422	12	10	2	5
RLT7C	5450	0.0807	12	7	2	4
RLT7D	6738	0.1133	16	7	2	4

Normal Depth NSTPS Calculations for Normal Depth Routing 8N2ES21

Reach	Length Ft.	Slope Ft./Ft.	Velocity Ft./Sec	Time Min	NMIN Min	NSTPS	
Rtenm	Length	Slope					
RBC2	4320	0.0152	7.11		10	2	5
RBC3	5902	0.0245	6.674		15	2	7

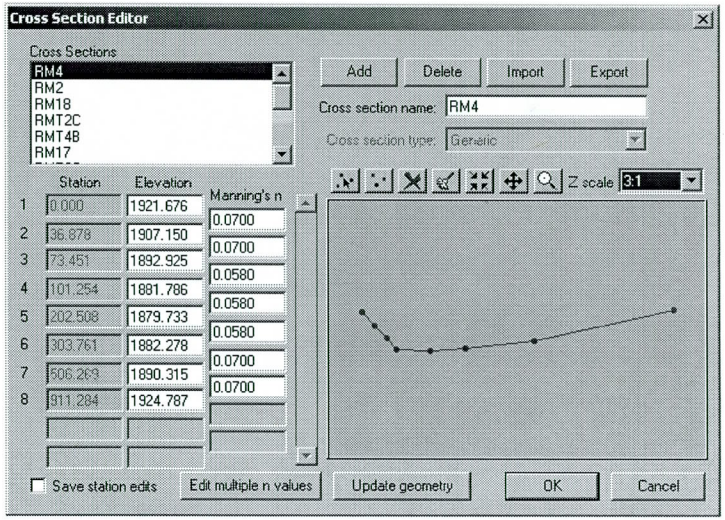
Routing Reach RM2 (Moores Gulch)



Calculated Values

Longitudinal Slope: 0.01768 ft/ft
Flow: 8878.000 cfs
Depth: 14.269 ft
Area of Flow: 769.234 sq ft
Wetted Perimeter: 111.558 ft
Average Velocity: 11.541 fps
Top Width (T): 106.232 ft
Froude Number: 0.756
Critical Depth: 12.891 ft
Critical Velocity: 14.161 fps
Critical Slope: 0.03187
Manning's Roughness: 0.06219

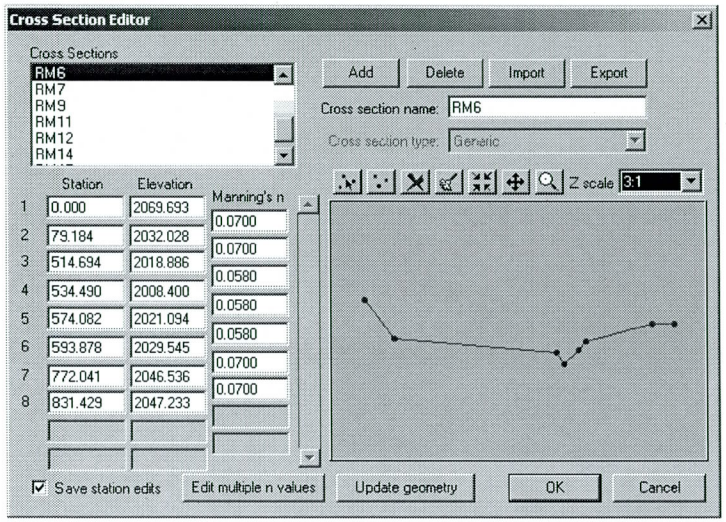
Routing Reach RM4 (Moores Gulch)



Calculated Values

Longitudinal Slope: 0.01405 ft/ft
Flow: 8401.000 cfs
Depth: 6.099 ft
Area of Flow: 1181.727 sq ft
Wetted Perimeter: 303.046 ft
Average Velocity: 7.109 fps
Top Width (T): 302.143 ft
Froude Number: 0.633
Critical Depth: 4.896 ft
Critical Velocity: 10.021 fps
Critical Slope: 0.03662
Manning's Roughness: 0.06155

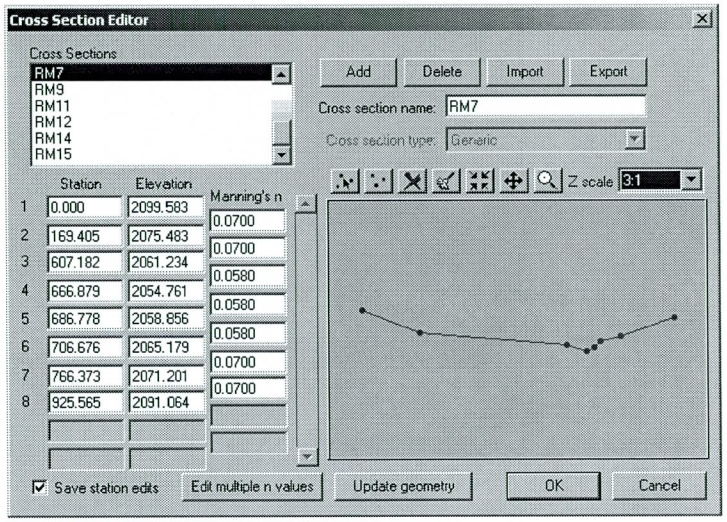
Routing Reach RM6 (Moores Gulch)



Calculated Values

Longitudinal Slope: 0.01747 ft/ft
Flow: 7242.000 cfs
Depth: 15.320 ft
Area of Flow: 950.009 sq ft
Wetted Perimeter: 230.933 ft
Average Velocity: 7.623 fps
Top Width (T): 225.732 ft
Froude Number: 0.655
Critical Depth: 13.849 ft
Critical Velocity: 11.035 fps
Critical Slope: 0.04144
Manning's Roughness: 0.06633

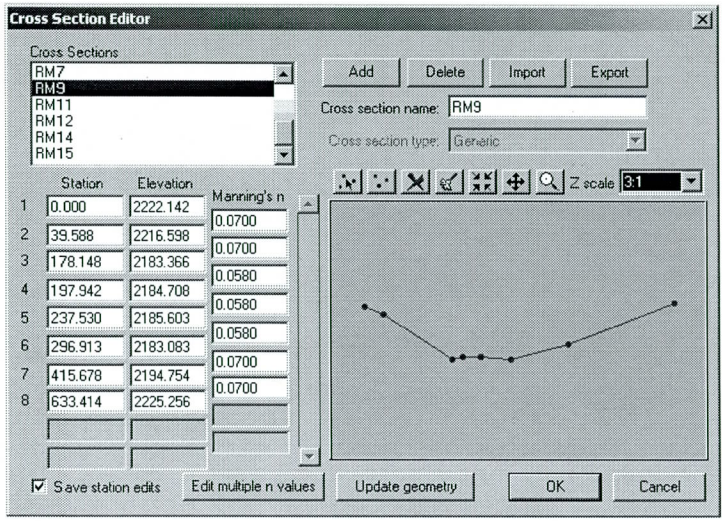
Routing Reach RM7 (Moores Gulch)



Calculated Values

Longitudinal Slope: 0.01872 ft/ft
Flow: 7244.000 cfs
Depth: 10.450 ft
Area of Flow: 904.425 sq ft
Wetted Perimeter: 223.824 ft
Average Velocity: 8.010 fps
Top Width (T): 222.010 ft
Froude Number: 0.699
Critical Depth: 9.273 ft
Critical Velocity: 10.864 fps
Critical Slope: 0.03854
Manning's Roughness: 0.06457

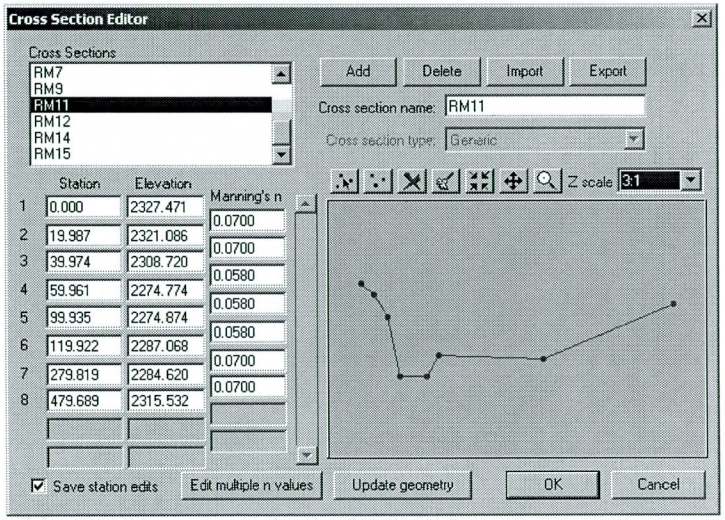
Routing Reach RM9 (Moores Gulch)



Calculated Values

Longitudinal Slope: 0.01962 ft/ft
Flow: 6753.000 cfs
Depth: 6.141 ft
Area of Flow: 816.964 sq ft
Wetted Perimeter: 206.780 ft
Average Velocity: 8.266 fps
Top Width (T): 205.677 ft
Froude Number: 0.731
Critical Depth: 5.303 ft
Critical Velocity: 10.394 fps
Critical Slope: 0.03830
Manning's Roughness: 0.06310

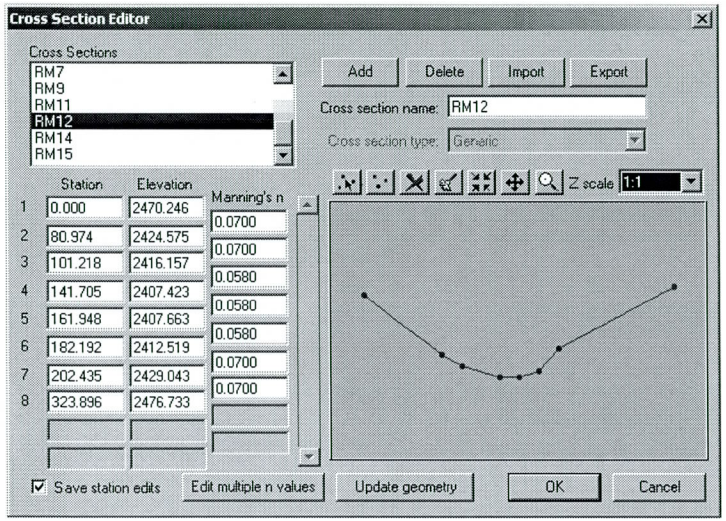
Routing Reach RM11 (Moores Gulch)



Calculated Values

Longitudinal Slope: 0.02097 ft/ft
Flow: 5801.000 cfs
Depth: 11.838 ft
Area of Flow: 767.861 sq ft
Wetted Perimeter: 219.429 ft
Average Velocity: 7.555 fps
Top Width (T): 209.195 ft
Froude Number: 0.695
Critical Depth: 8.079 ft
Critical Velocity: 14.784 fps
Critical Slope: 0.02993
Manning's Roughness: 0.06583

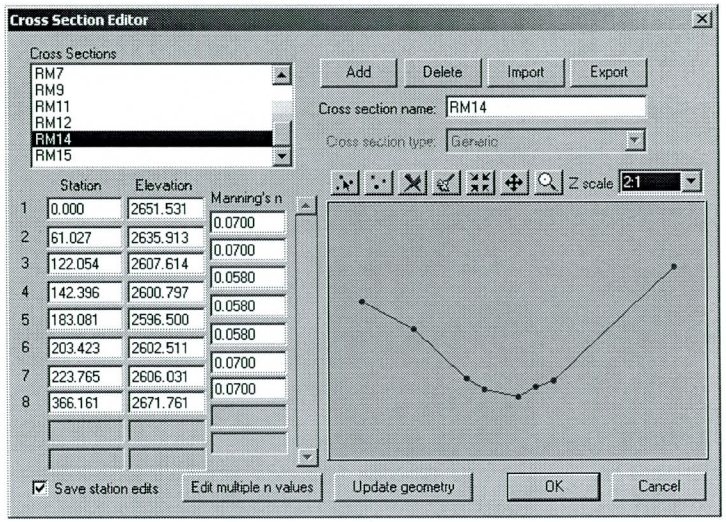
Routing Reach RM12 (Moores Gulch)



Calculated Values

Longitudinal Slope: 0.0276 ft/ft
Flow: 5553.000 cfs
Depth: 8.235 ft
Area of Flow: 440.202 sq ft
Wetted Perimeter: 85.082 ft
Average Velocity: 12.615 fps
Top Width (T): 82.510 ft
Froude Number: 0.962
Critical Depth: 8.081 ft
Critical Velocity: 12.988 fps
Critical Slope: 0.02993
Manning's Roughness: 0.05870

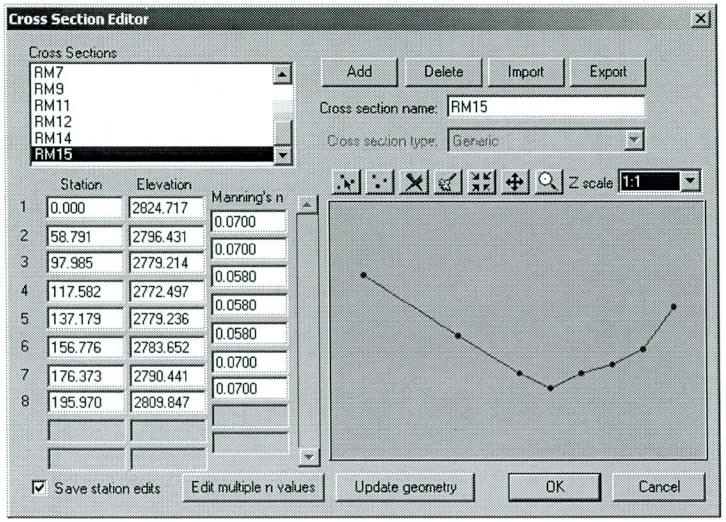
Routing Reach RM14 (Moores Gulch)



Calculated Values

Longitudinal Slope: 0.02823 ft/ft
Flow: 4310.000 cfs
Depth: 10.880 ft
Area of Flow: 352.368 sq ft
Wetted Perimeter: 70.629 ft
Average Velocity: 12.232 fps
Top Width (T): 67.049 ft
Froude Number: 0.940
Critical Depth: 10.621 ft
Critical Velocity: 12.856 fps
Critical Slope: 0.03212
Manning's Roughness: 0.05976

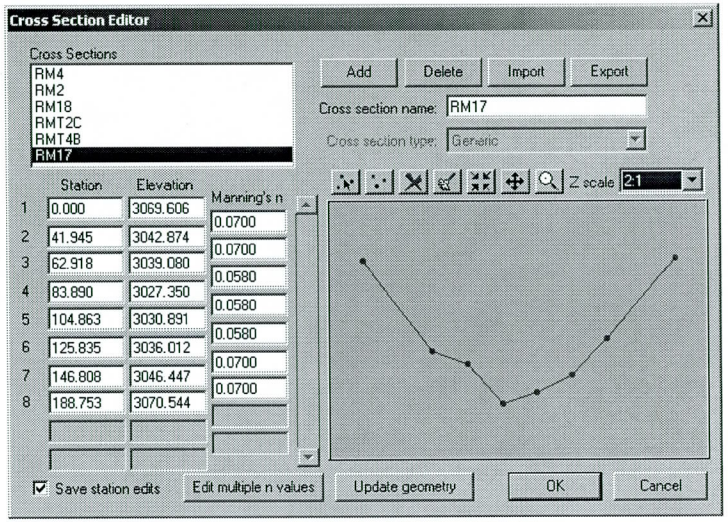
Routing Reach RM15 (Moores Gulch)



Calculated Values

Longitudinal Slope: 0.03273 ft/ft
Flow: 3596.000 cfs
Depth: 9.890 ft
Area of Flow: 289.271 sq ft
Wetted Perimeter: 63.663 ft
Average Velocity: 12.431 fps
Top Width (T): 60.401 ft
Froude Number: 1.001
Critical Depth: 9.894 ft
Critical Velocity: 12.421 fps
Critical Slope: 0.03266
Manning's Roughness: 0.05949

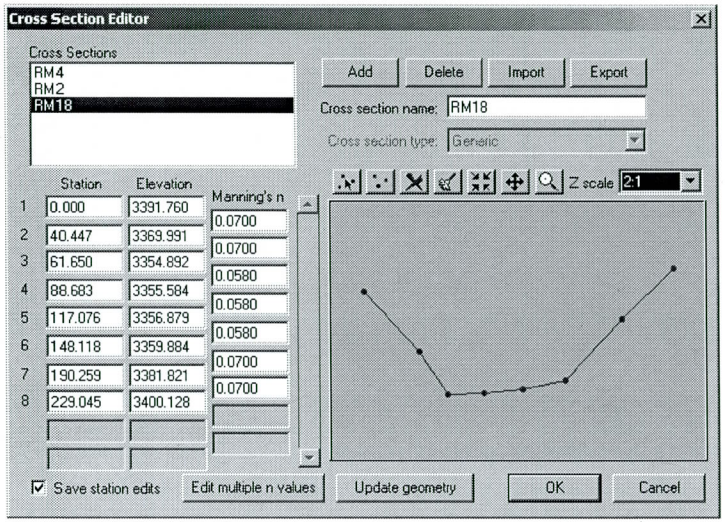
Routing Reach RM17 (Moores Gulch)



Calculated Values

Longitudinal Slope: 0.05738 ft/ft
Flow: 2447.000 cfs
Depth: 6.891 ft
Area of Flow: 172.808 sq ft
Wetted Perimeter: 49.507 ft
Average Velocity: 14.160 fps
Top Width (T): 47.011 ft
Froude Number: 1.302
Critical Depth: 7.699 ft
Critical Velocity: 11.503 fps
Critical Slope: 0.03268
Manning's Roughness: 0.05800

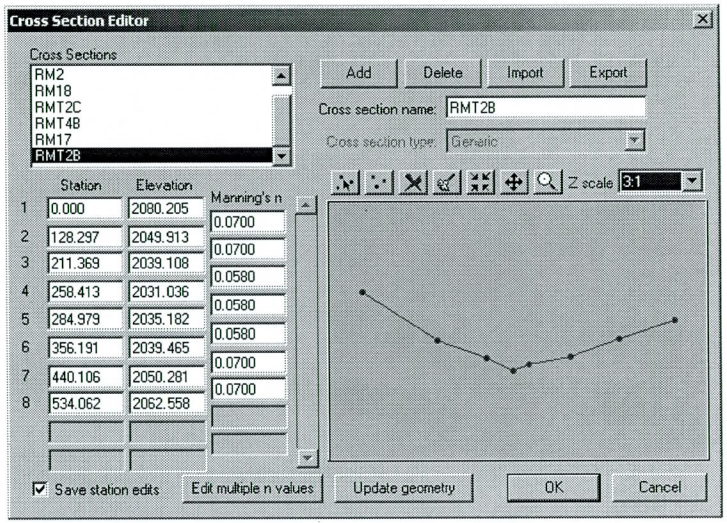
Routing Reach RM18 (Moores Gulch)



Calculated Values

Longitudinal Slope: 0.0800 ft/ft
Flow: 1550.000 cfs
Depth: 3.134 ft
Area of Flow: 140.015 sq ft
Wetted Perimeter: 72.772 ft
Average Velocity: 11.070 fps
Top Width (T): 71.677 ft
Froude Number: 1.396
Critical Depth: 3.666 ft
Critical Velocity: 8.620 fps
Critical Slope: 0.03900
Manning's Roughness: 0.05889

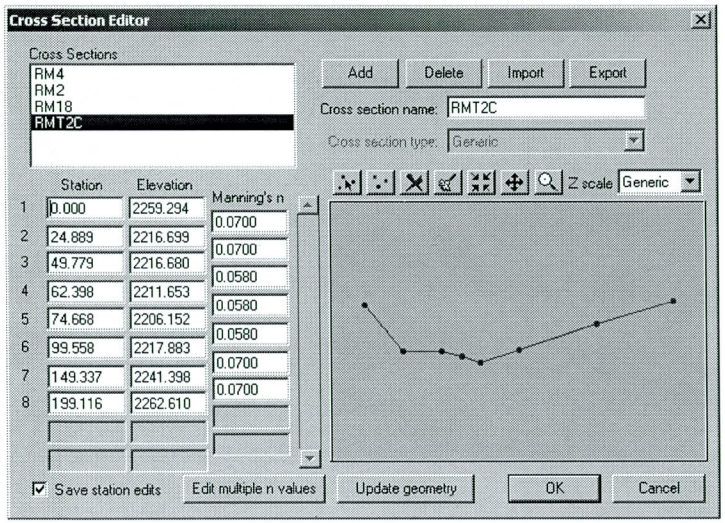
Routing Reach RMT2B (Moores Gulch, Tributary 2)



Calculated Values

Longitudinal Slope: 0.0295 ft/ft
Flow: 2116.000 cfs
Depth: 6.160 ft
Area of Flow: 252.928 sq ft
Wetted Perimeter: 96.878 ft
Average Velocity: 8.366 fps
Top Width (T): 95.971 ft
Froude Number: 0.908
Critical Depth: 5.950 ft
Critical Velocity: 9.072 fps
Critical Slope: 0.03615
Manning's Roughness: 0.05800

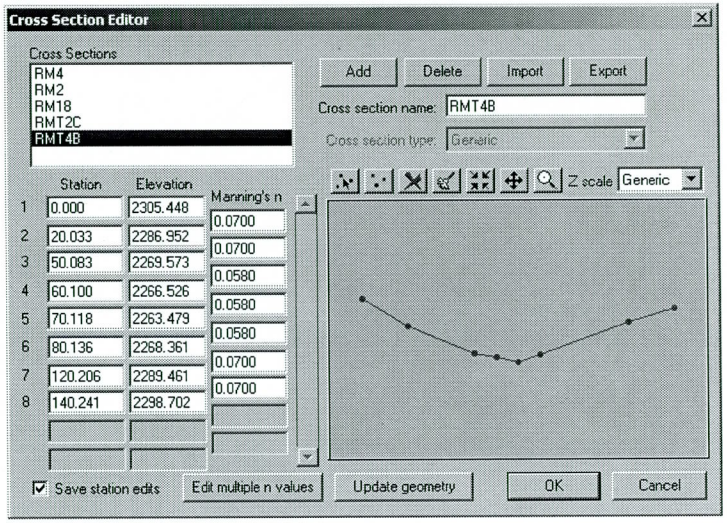
Routing Reach RMT2C (Moores Gulch, Tributary 2)



Calculated Values

Longintudinal Slope: 0.03927 ft/ft
Flow: 1370.000 cfs
Depth: 7.423 ft
Area of Flow: 120.430 sq ft
Wetted Perimeter: 36.053 ft
Average Velocity: 11.376 fps
Top Width (T): 32.845 ft
Froude Number: 1.047
Critical Depth: 7.560 ft
Critical Velocity: 10.963 fps
Critical Slope: 0.03561
Manning's Roughness: 0.05800

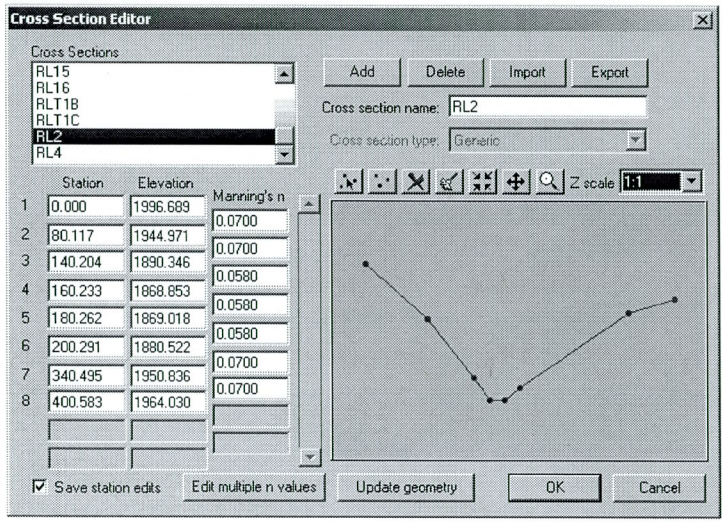
Routing Reach RMT4B (Moores Gulch, Tributary 4)



Calculated Values

Longitudinal Slope: 0.0416 ft/ft
Flow: 1039.000 cfs
Depth: 6.117 ft
Area of Flow: 99.790 sq ft
Wetted Perimeter: 34.784 ft
Average Velocity: 10.412 fps
Top Width (T): 32.440 ft
Froude Number: 1.046
Critical Depth: 6.223 ft
Critical Velocity: 10.064 fps
Critical Slope: 0.03794
Manning's Roughness: 0.05893

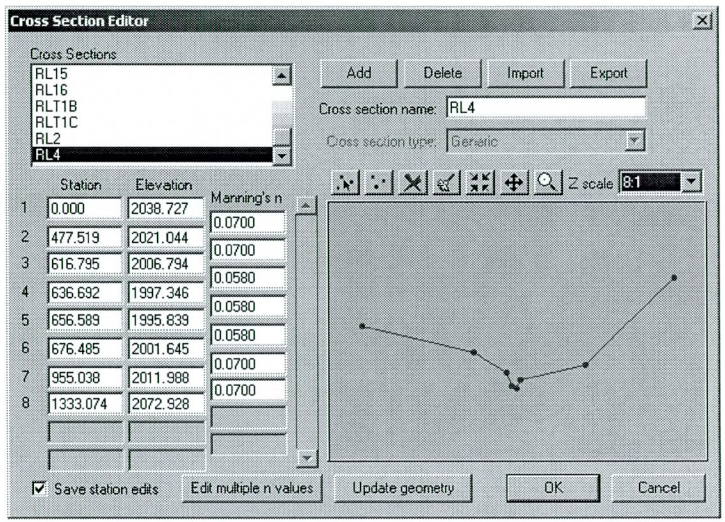
Routing Reach RL2 (Little Squaw Creek)



Calculated Values

Longitudinal Slope: 0.01915 ft/ft
Flow: 8198.000 cfs
Depth: 14.658 ft
Area of Flow: 576.013 sq ft
Wetted Perimeter: 69.830 ft
Average Velocity: 14.232 fps
Top Width (T): 59.677 ft
Froude Number: 0.807
Critical Depth: 13.095 ft
Critical Velocity: 16.858 fps
Critical Slope: 0.02955
Manning's Roughness: 0.05915

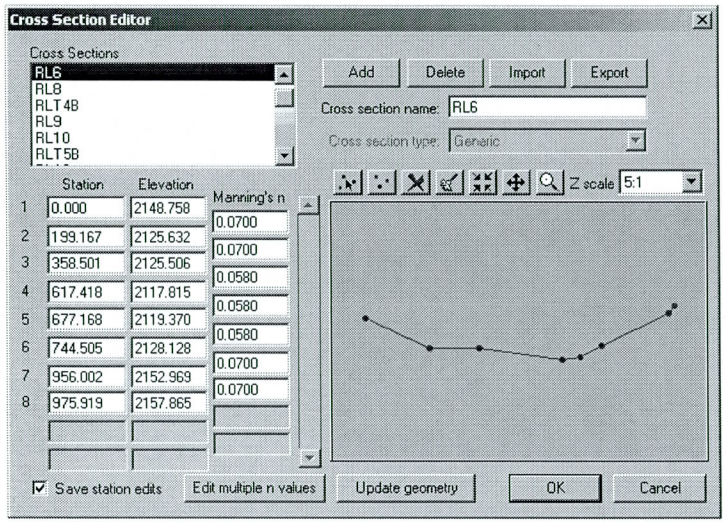
Routing Reach RL4 (Little Squaw Creek)



Calculated Values

Longitudinal Slope: 0.01927 ft/ft
Flow: 8009.000 cfs
Depth: 6.020 ft
Area of Flow: 1000.063 sq ft
Wetted Perimeter: 297.167 ft
Average Velocity: 8.008 fps
Top Width (T): 296.768 ft
Froude Number: 0.769
Critical Depth: 5.358 ft
Critical Velocity: 9.856 fps
Critical Slope: 0.03383
Manning's Roughness: 0.05800

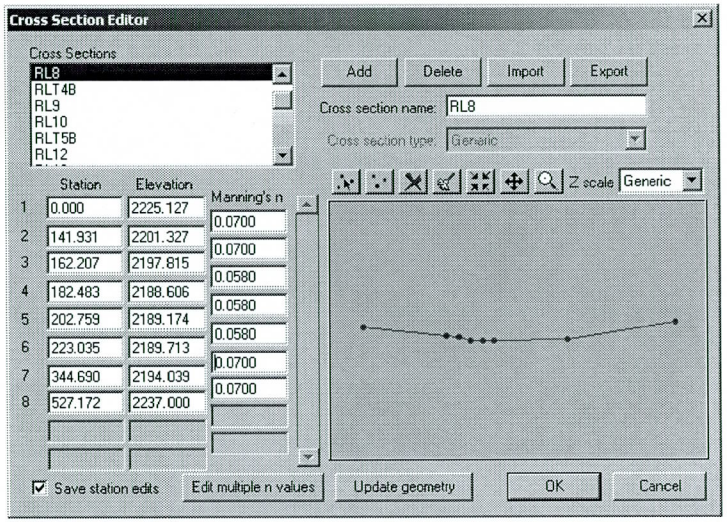
Routing Reach RL6 (Little Squaw Creek)



Calculated Values

Longitudinal Slope: 0.01839 ft/ft
Flow: 7781.000 cfs
Depth: 6.007 ft
Area of Flow: 996.000 sq ft
Wetted Perimeter: 296.599 ft
Average Velocity: 7.812 fps
Top Width (T): 296.201 ft
Froude Number: 0.751
Critical Depth: 5.290 ft
Critical Velocity: 9.796 fps
Critical Slope: 0.03396
Manning's Roughness: 0.05800

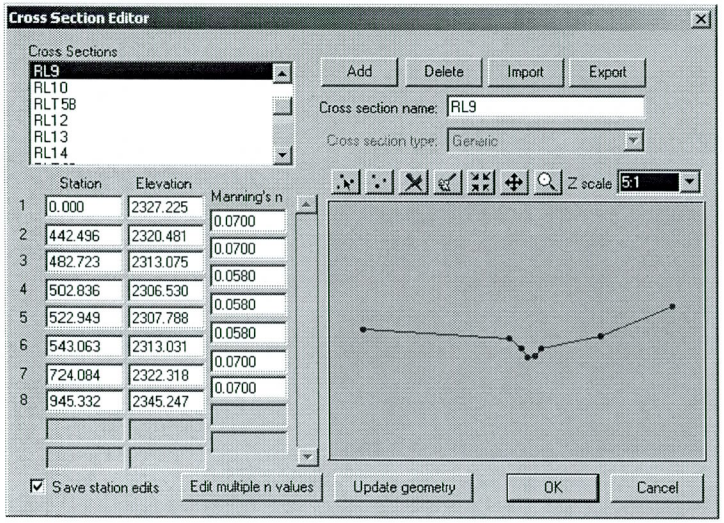
Routing Reach RL8 (Little Squaw Creek)



Calculated Values

Longitudinal Slope: 0.01993 ft/ft
Flow: 7161.000 cfs
Depth: 7.332 ft
Area of Flow: 835.655 sq ft
Wetted Perimeter: 188.318 ft
Average Velocity: 8.569 fps
Top Width (T): 186.419 ft
Froude Number: 0.713
Critical Depth: 6.372 ft
Critical Velocity: 10.856 fps
Critical Slope: 0.04186
Manning's Roughness: 0.06629

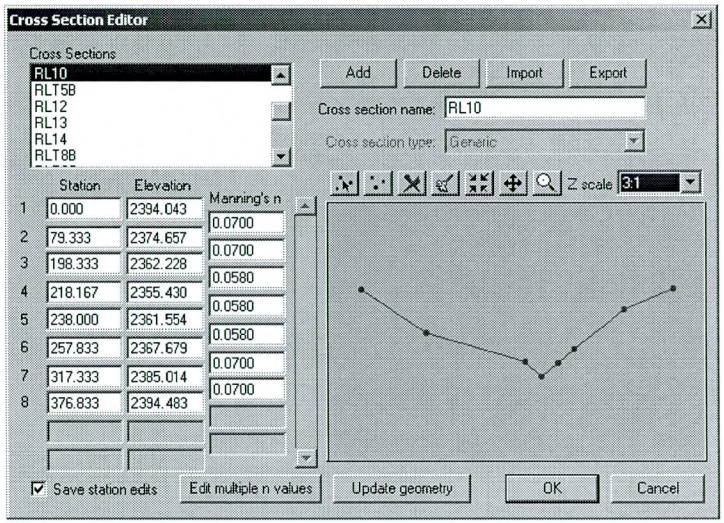
Routing Reach RL9 (Little Squaw Creek)



Calculated Values

Longitudinal Slope: 0.02055 ft/ft
Flow: 7053.000 cfs
Depth: 11.264 ft
Area of Flow: 804.923 sq ft
Wetted Perimeter: 181.141 ft
Average Velocity: 8.762 fps
Top Width (T): 178.839 ft
Froude Number: 0.728
Critical Depth: 10.104 ft
Critical Velocity: 11.485 fps
Critical Slope: 0.03916
Manning's Roughness: 0.06589

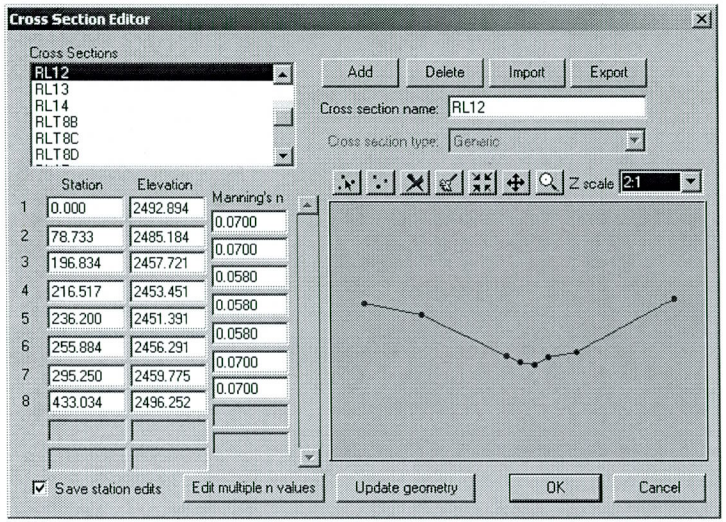
Routing Reach RL10 (Little Squaw Creek)



Calculated Values

Longitudinal Slope: 0.02638 ft/ft
Flow: 6910.000 cfs
Depth: 12.736 ft
Area of Flow: 616.660 sq ft
Wetted Perimeter: 121.385 ft
Average Velocity: 11.206 fps
Top Width (T): 118.025 ft
Froude Number: 0.864
Critical Depth: 12.120 ft
Critical Velocity: 12.645 fps
Critical Slope: 0.03555
Manning's Roughness: 0.06382

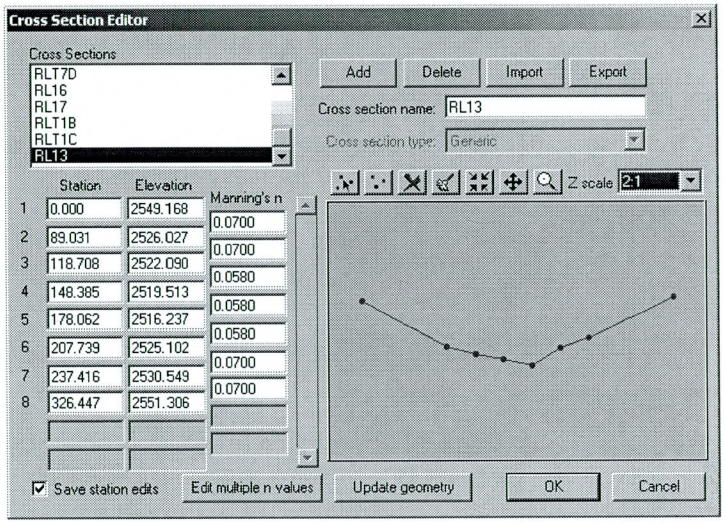
Routing Reach RL12 (Little Squaw Creek)



Calculated Values

Longitudinal Slope: 0.0322 ft/ft
Flow: 6488.000 cfs
Depth: 9.572 ft
Area of Flow: 554.778 sq ft
Wetted Perimeter: 118.694 ft
Average Velocity: 11.695 fps
Top Width (T): 116.847 ft
Froude Number: 0.946
Critical Depth: 9.377 ft
Critical Velocity: 12.192 fps
Critical Slope: 0.03623
Manning's Roughness: 0.06391

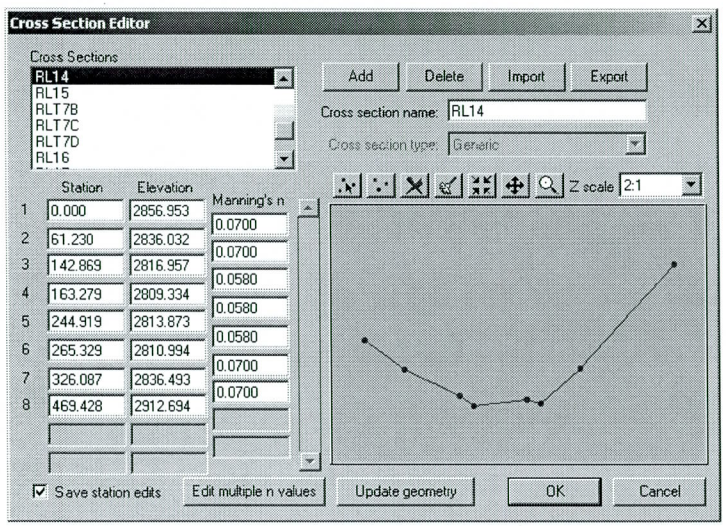
Routing Reach RL13 (Little Squaw Creek)



Calculated Values

Longitudinal Slope: 0.0354 ft/ft
Flow: 6460.000 cfs
Depth: 8.901 ft
Area of Flow: 511.868 sq ft
Wetted Perimeter: 113.991 ft
Average Velocity: 12.620 fps
Top Width (T): 112.199 ft
Froude Number: 1.041
Critical Depth: 9.051 ft
Critical Velocity: 12.214 fps
Critical Slope: 0.03265
Manning's Roughness: 0.06046

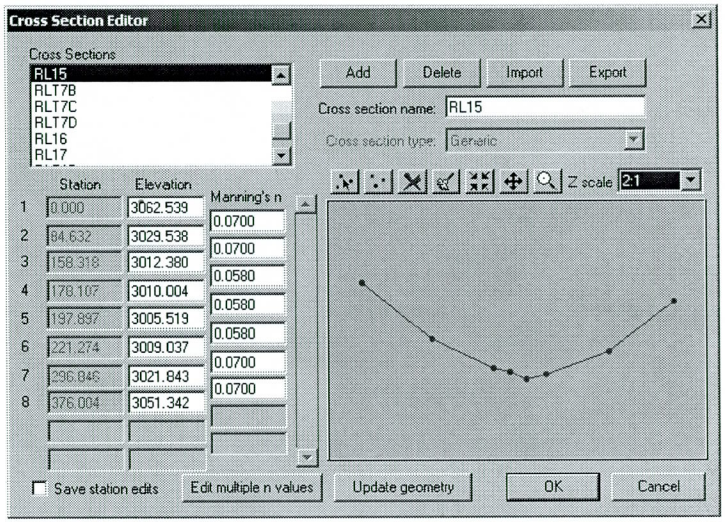
Routing Reach RL14 (Little Squaw Creek)



Calculated Values

Longitudinal Slope: 0.0442 ft/ft
Flow: 6534.000 cfs
Depth: 6.561 ft
Area of Flow: 507.292 sq ft
Wetted Perimeter: 133.796 ft
Average Velocity: 12.880 fps
Top Width (T): 131.296 ft
Froude Number: 1.155
Critical Depth: 6.969 ft
Critical Velocity: 11.641 fps
Critical Slope: 0.03233
Manning's Roughness: 0.05914

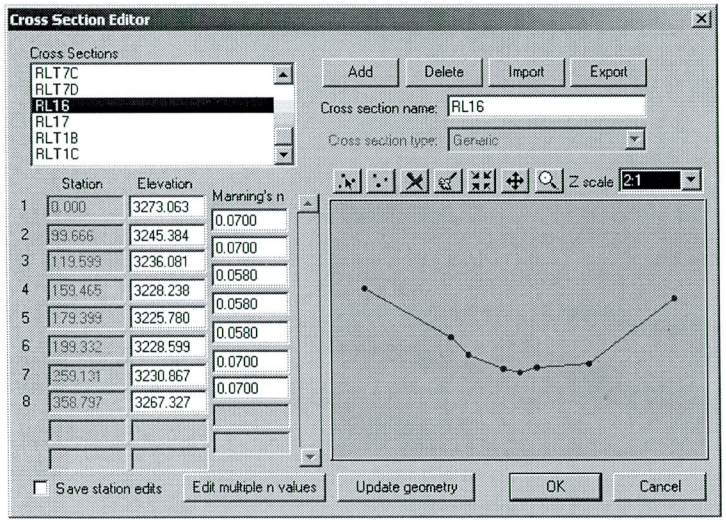
Routing Reach RL15 (Little Squaw Creek)



Calculated Values

Longitudinal Slope: 0.0329 ft/ft
Flow: 6565.000 cfs
Depth: 9.526 ft
Area of Flow: 523.684 sq ft
Wetted Perimeter: 111.572 ft
Average Velocity: 12.536 fps
Top Width (T): 109.853 ft
Froude Number: 1.012
Critical Depth: 9.570 ft
Critical Velocity: 12.421 fps
Critical Slope: 0.03504
Manning's Roughness: 0.06313

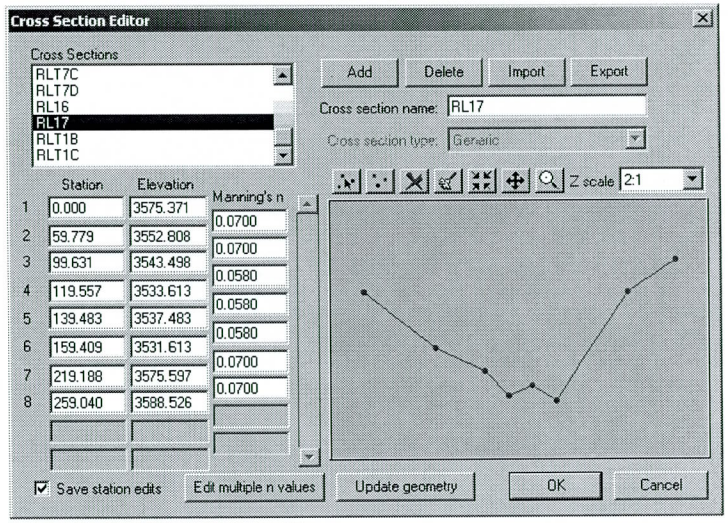
Routing Reach RL16 (Little Squaw Creek)



Calculated Values

Longitudinal Slope: 0.0452 ft/ft
Flow: 2724.000 cfs
Depth: 5.629 ft
Area of Flow: 297.998 sq ft
Wetted Perimeter: 118.065 ft
Average Velocity: 9.141 fps
Top Width (T): 117.268 ft
Froude Number: 1.011
Critical Depth: 5.648 ft
Critical Velocity: 9.074 fps
Critical Slope: 0.04417
Manning's Roughness: 0.06424

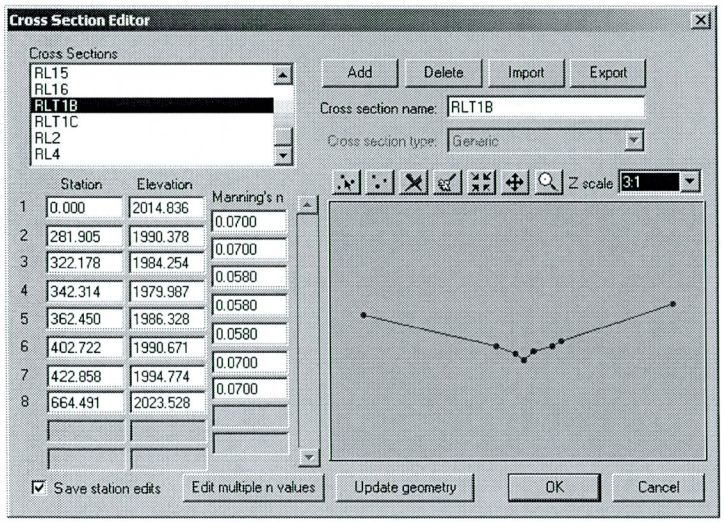
Routing Reach RL17 (Little Squaw Creek)



Calculated Values

Longitudinal Slope: 0.0755 ft/ft
Calculated Values
Flow: 1936.000 cfs
Depth: 6.188 ft
Area of Flow: 153.439 sq ft
Wetted Perimeter: 60.937 ft
Average Velocity: 12.617 fps
Top Width (T): 56.706 ft
Froude Number: 1.352
Critical Depth: 6.820 ft
Critical Velocity: 10.195 fps
Critical Slope: 0.03928
Manning's Roughness: 0.06006

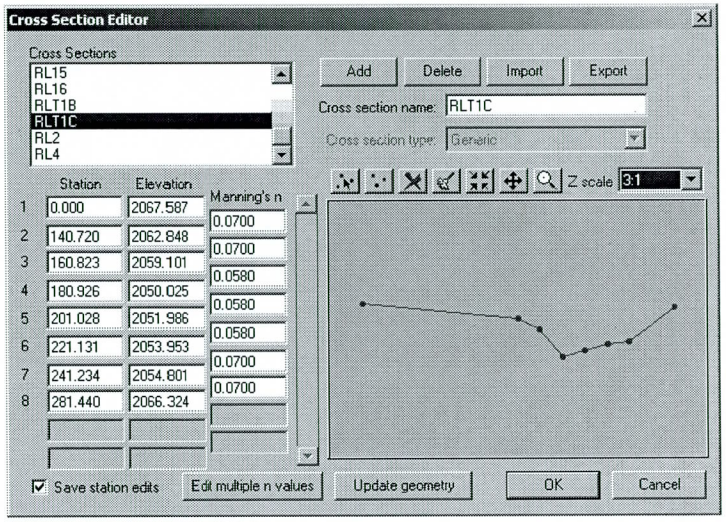
Routing Reach RLT1B (Little Squaw Creek Tributary 1)



Calculated Values

Longitudinal Slope: 0.0215 ft/ft
Calculated Values
Flow: 1907.000 cfs
Depth: 7.638 ft
Area of Flow: 245.935 sq ft
Wetted Perimeter: 76.208 ft
Average Velocity: 7.754 fps
Top Width (T): 74.462 ft
Froude Number: 0.752
Critical Depth: 6.830 ft
Critical Velocity: 9.986 fps
Critical Slope: 0.03864
Manning's Roughness: 0.06153

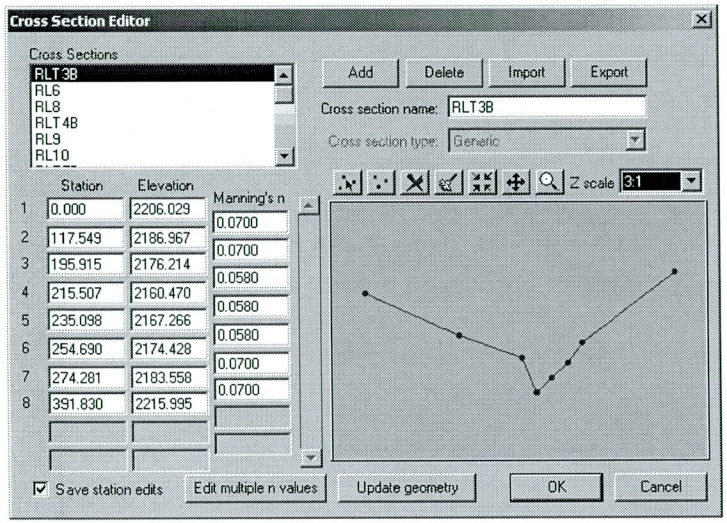
Routing Reach RLT1C (Little Squaw Creek Tributary 1)



Calculated Values

Longitudinal Slope: 0.0215 ft/ft
Flow: 1062.000 cfs
Depth: 3.242 ft
Area of Flow: 65.493 sq ft
Wetted Perimeter: 41.236 ft
Average Velocity: 16.215 fps
Top Width (T): 40.380 ft
Froude Number: 2.244
Critical Depth: 4.551 ft
Critical Velocity: 8.071 fps
Critical Slope: 0.04325
Manning's Roughness: 0.05800

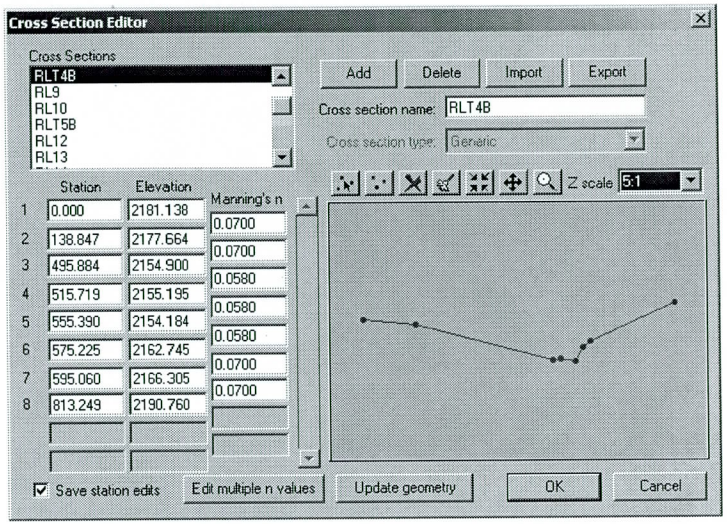
Routing Reach RLT3B (Little Squaw Creek Tributary 3)



Calculated Values

Longitudinal Slope: 0.0281 ft/ft
Flow: 1072.000 cfs
Depth: 7.388 ft
Area of Flow: 112.599 sq ft
Wetted Perimeter: 34.254 ft
Average Velocity: 9.521 fps
Top Width (T): 30.403 ft
Froude Number: 0.872
Critical Depth: 6.995 ft
Critical Velocity: 10.617 fps
Critical Slope: 0.03765
Manning's Roughness: 0.05800

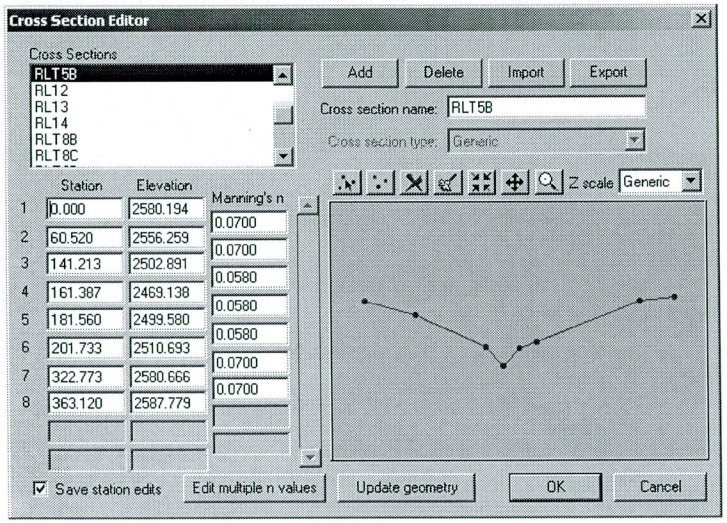
Routing Reach RLT4B (Little Squaw Creek Tributary 4)



Calculated Values

Longitudinal: 0.0192 ft/ft
Flow: 1376.000 cfs
Depth: 3.509 ft
Area of Flow: 246.992 sq ft
Wetted Perimeter: 112.260 ft
Average Velocity: 5.571 fps
Top Width (T): 111.431 ft
Froude Number: 0.659
Critical Depth: 2.881 ft
Critical Velocity: 7.620 fps
Critical Slope: 0.04629
Manning's Roughness: 0.06269

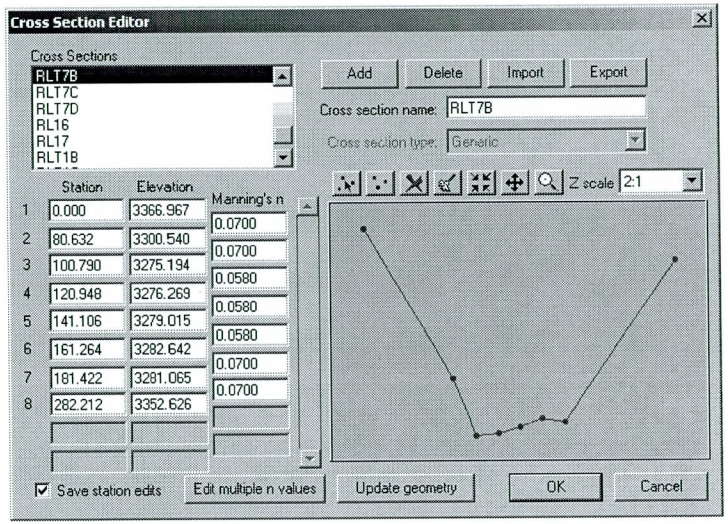
Routing Reach RLT5B (Little Squaw Creek Tributary 5)



Calculated Values

Longitudinal Slope: 0.0614 ft/ft
Flow: 1130.000 cfs
Depth: 11.541 ft
Area of Flow: 83.935 sq ft
Wetted Perimeter: 27.290 ft
Average Velocity: 13.463 fps
Top Width (T): 14.546 ft
Froude Number: 0.988
Critical Depth: 11.484 ft
Critical Velocity: 13.597 fps
Critical Slope: 0.06305
Manning's Roughness: 0.05800

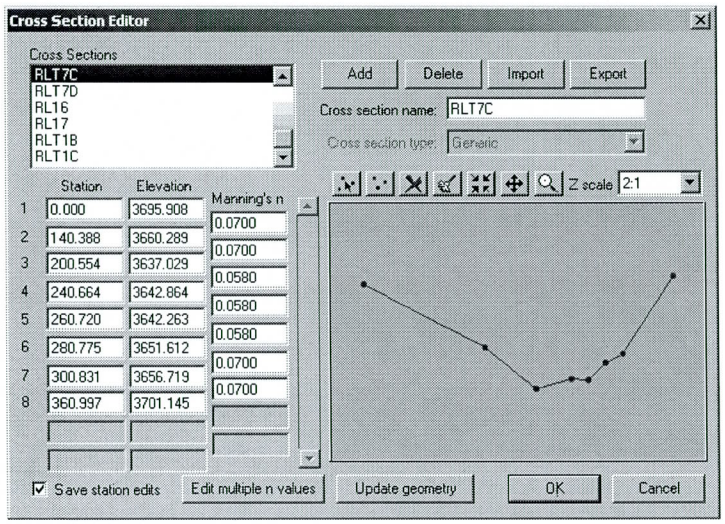
Routing Reach RLT7B (Little Squaw Creek Tributary 7)



Calculated Values

Longitudinal Slope: 0.0422 ft/ft
Flow: 3988.000 cfs
Depth: 7.748 ft
Area of Flow: 343.032 sq ft
Wetted Perimeter: 94.372 ft
Average Velocity: 11.626 fps
Top Width (T): 89.436 ft
Froude Number: 1.046
Critical Depth: 7.868 ft
Critical Velocity: 11.270 fps
Critical Slope: 0.03828
Manning's Roughness: 0.06224

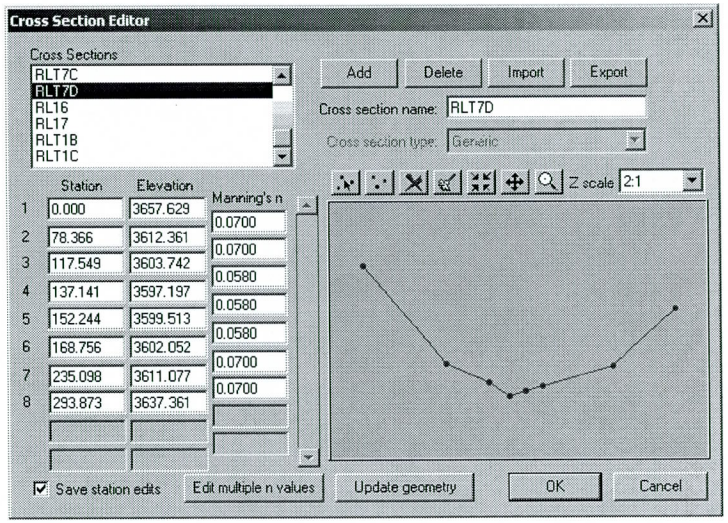
Routing Reach RLT7C (Little Squaw Creek Tributary 7)



Calculated Values

Longitudinal Slope: 0.0807 ft/ft
Flow: 1477.000 cfs
Depth: 5.003 ft
Area of Flow: 118.418 sq ft
Wetted Perimeter: 48.630 ft
Average Velocity: 12.473 fps
Top Width (T): 47.334 ft
Froude Number: 1.390
Critical Depth: 5.912 ft
Critical Velocity: 8.519 fps
Critical Slope: 0.04168
Manning's Roughness: 0.06142

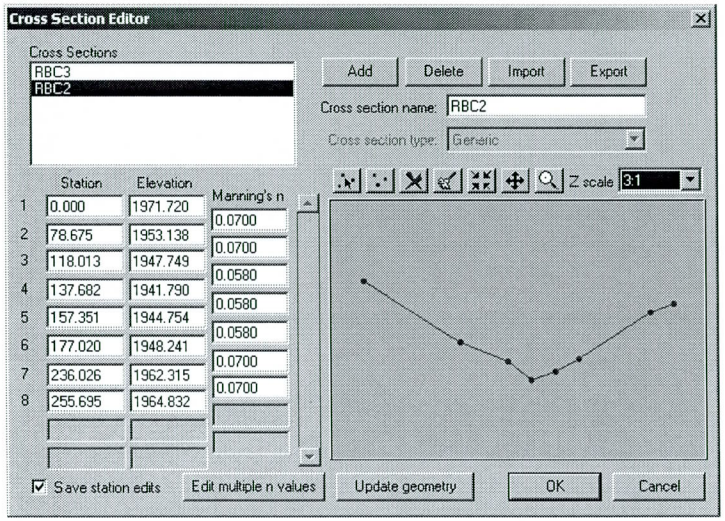
Routing Reach RLT7D (Little Squaw Creek Tributary 7)



Calculated Values

Longitudinal Slope: 0.11331 ft/ft
Flow: 1963.000 cfs
Depth: 5.104 ft
Area of Flow: 123.904 sq ft
Wetted Perimeter: 49.948 ft
Average Velocity: 15.843 fps
Top Width (T): 48.730 ft
Froude Number: 1.751
Critical Depth: 6.389 ft
Critical Velocity: 10.063 fps
Critical Slope: 0.03699
Manning's Roughness: 0.05845

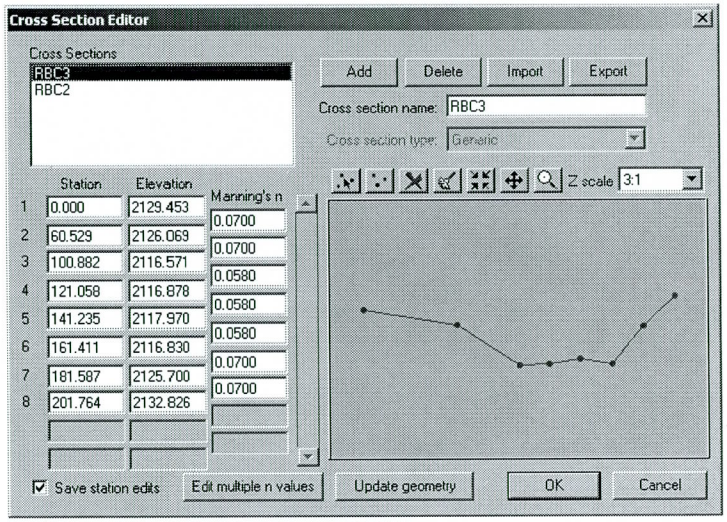
Routing Reach RBC2 (WASH 8N2ES21)



Calculated Values

Longitudinal Slope: 0.0152 ft/ft
Flow: 1947.000 cfs
Depth: 7.509 ft
Area of Flow: 273.828 sq ft
Wetted Perimeter: 76.396 ft
Average Velocity: 7.110 fps
Top Width (T): 74.754 ft
Froude Number: 0.655
Critical Depth: 6.314 ft
Critical Velocity: 10.101 fps
Critical Slope: 0.03486
Manning's Roughness: 0.06051

Routing Reach RBC3 (WASH 8N2ES21)



Calculated Values

Longitudinal Slope: 0.0245 ft/ft
Flow: 1266.000 cfs
Depth: 3.218 ft
Area of Flow: 189.700 sq ft
Wetted Perimeter: 81.992 ft
Average Velocity: 6.674 fps
Top Width (T): 80.932 ft
Froude Number: 0.768
Critical Depth: 2.812 ft
Critical Velocity: 8.045 fps
Critical Slope: 0.04318
Manning's Roughness: 0.06113

D.4 Reservoir Routing Data

D.5 Flow Splits and Diversions Data

(This report does not consider these items)

D.6 Hydrologic Calculations

HEC-1 Output File
Moores Gulch

```
1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*             JUN  1998                 *
*           VERSION 4.1                 *
*                                       *
*  RUN DATE   22FEB03  TIME  13:43:44   *
*                                       *
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*****************************************
*                                       *
*    U.S. ARMY CORPS OF ENGINEERS       *
*    HYDROLOGIC ENGINEERING CENTER      *
*          609 SECOND STREET            *
*       DAVIS, CALIFORNIA 95616         *
*           (916) 756-1104              *
*                                       *
*****************************************
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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
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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

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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10
   1          ID  Moores Gulch, Upper Agua Fria Watershed, Zone A Delineation Study
   2          ID  By RBF Consulting for FCD of Maricopa Co., 2/22/03, FCD 2000C020
   3          ID  HEC-1 created using WMS 6.2.  For additional notes and details see WMS Files
              *DIAGRAM
   4          IT       2  1JAN94       0     300
   5          IO       5
   6          IN      15  1JAN94       0
   7          JD    3.55  0.0001
              * Pattern 1
   8          PC     0.0     0.8     1.6     2.5     3.3     4.1     5.0     5.8     6.6     7.4
   9          PC     8.7     9.9    11.8    13.8    21.6    37.7    83.4    91.1    93.1    95.0
  10          PC    96.2    97.2    98.3    99.1   100.0
  11          IN      15  1JAN94       0
  12          JD    3.53     0.5
              * Pattern 1
  13          PC     0.0     0.8     1.6     2.5     3.3     4.1     5.0     5.8     6.6     7.4
  14          PC     8.7     9.9    11.8    13.8    21.6    37.7    83.4    91.1    93.1    95.0
  15          PC    96.2    97.2    98.3    99.1   100.0
  16          IN      15  1JAN94       0
  17          JD    3.46     2.8
              * Pattern 2
  18          PC     0.0     0.9     1.6     2.5     3.4     4.2     5.1     5.9     6.7     7.6
  19          PC     8.7    10.0    12.0    16.3    25.2    45.1    69.4    83.7    90.0    93.8
  20          PC    95.0    96.3    97.5    98.8   100.0
  21          IN      15  1JAN94       0
  22          JD    3.28    16.0
              * Pattern 3
  23          PC     0.0     1.5     2.0     3.0     4.8     6.3     7.6     9.0    10.5    11.9
  24          PC    13.5    15.2    17.5    22.2    30.4    47.2    67.0    79.6    86.8    91.2
  25          PC    94.6    96.0    97.3    98.7   100.0
  26          IN      15  1JAN94       0
  27          JD    2.84    90.0
              * Pattern 4
  28          PC     0.0     2.4     4.3     5.9     7.8     9.8    11.9    14.1    16.2    18.6
  29          PC    21.2    23.9    27.1    32.1    40.8    51.5    62.7    73.5    81.4    86.4
  30          PC    90.7    93.0    95.4    97.7   100.0

  31          KK     MT1
  32          KM      MOORE GULCH, TRIBUTARY 1, PEAK FLOW FOR FLOODPLAIN DELINEATION
  33          BA  0.5994
  34          LG    0.24   0.179  10.164   0.041  40.867
              * MT1
  35          UI     0.0   61.16   61.16   61.16   84.66  175.82  227.69  281.32  359.23   390.6
  36          UI  431.36  464.15  501.59  581.99  697.03  717.39  486.07  426.63  385.03  362.67
  37          UI  344.71  323.92  302.83  287.83  268.41  250.49  237.05  214.89  196.19  176.69
  38          UI  161.24  149.64  145.28  140.66  129.98  127.32  100.47  100.47   84.62   78.14
  39          UI   78.14   69.88   66.98   66.98   61.45   46.89   46.89   46.89   46.89   41.37
  40          UI   29.93   29.93   29.93   29.93   29.93   29.93   29.93   19.55   11.72   11.72
  41          UI   11.72   11.72   11.72   11.72   11.72   11.72   11.72   11.72   11.72   11.72
  42          UI   11.72   11.72   11.72   11.72   11.72   11.72   11.72
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1 HEC-1 INPUT PAGE 2

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  43          KK    RMT1   CNAME   CPMT1
  44          RN    RMT1

  45          KK    MT4B
  46          KM      MOORE GULCH, TRIBUTARY 4, REACH 2, PEAK FLOW FOR FLOODPLAIN DELINEATION
  47          BA   0.494
  48          LG    0.35   0.365   5.146   0.281     0.0
              * MT4B
  49          UI     0.0   88.94   88.94  239.23  385.24  540.73  637.82   733.9  970.98  870.03
  50          UI  605.96  526.06  476.27  428.65  381.51  340.72  290.17   241.7  215.79  200.75
  51          UI  178.92  146.12  117.94  110.65   97.41   90.95   68.19   68.19   57.93   43.53
  52          UI   43.53   43.53   42.96   17.05   17.05   17.05   17.05   17.05   17.05   17.05
  53          UI   17.05   17.05   17.05   17.05
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54          KK   RMT4B   CNAME  CPMT4B
55          RS       2    FLOW     0.0     0.0
56          RC    0.07   0.058    0.07 3931.55  0.0416     0.0
            * RMT4B
57          RX     0.0   20.03   50.08    60.1   70.12   80.14  120.21  140.24
58          RY  2305.4 2286.95 2269.57 2266.53 2263.48 2268.36 2289.46  2298.7

59          KK    MT4A
60          BA  0.7803
61          LG    0.35    0.35   4.793   0.311     0.0
            * MT4A
62          UI     0.0  154.54  167.58  498.37  774.35 1013.26 1188.85 1513.45  1670.6 1082.73
63          UI  920.66  822.49  736.06  643.01  561.34  461.94   391.4  360.78  325.88  255.28
64          UI  209.32  190.14  169.26  145.14  118.48  118.48   78.84   75.63   75.63   75.63
65          UI   32.84   29.62   29.62   29.62   29.62   29.62   29.62   29.62   29.62   29.62

66          KK  CPMT4A   CNAME   RMT4A
67          KM       MOORE GULCH, TRIBUTARY 4, REACH 1, PEAK FLOW FOR FLOODPLAIN DELINEATION
68          HC       2

69          KK     M18
70          BA  0.6385
71          LG    0.35    0.32     7.6   0.107     0.0
            * M18
72          UI     0.0  136.31  183.88  472.99  753.51  950.54 1137.35 1552.74 1098.72  847.53
73          UI  750.44  660.08  576.53  497.92  402.92  342.17  310.56  267.88  215.16  174.18
74          UI  155.34  144.78  104.51  104.51   76.73   66.71   66.71   65.56   26.13   26.13
75          UI   26.13   26.13   26.13   26.13   26.13   26.13   26.13

76          KK    RM18   CNAME   CPM18
77          RS       3    FLOW     0.0     0.0
78          RC    0.07   0.058    0.07 5144.03    0.08     0.0
            * RM18
79          RX     0.0   40.45   61.65   88.68  117.08  148.12  190.26  229.04
80          RY  3391.7 3369.99 3354.89 3355.58 3356.88 3359.88 3381.82 3400.13
1                                        HEC-1 INPUT                                    PAGE  3
LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

81          KK     M17
82          BA  0.6521
83          LG    0.35    0.32     7.6   0.107     0.0
            * M17
84          UI     0.0  127.78  133.52  408.59  629.66  830.68  975.19 1221.89 1418.41  914.26
85          UI  769.42  690.82  614.86  541.46  474.86  397.61   327.8  301.58  274.36  222.17
86          UI  182.72  162.42  139.95  130.19   97.96   97.96   74.75   62.53   62.53   62.53
87          UI   39.06   24.49   24.49   24.49   24.49   24.49   24.49   24.49   24.49   24.49
88          UI     0.0

89          KK   CPM17   CNAME    RM17
90          HC       2

91          KK    RM17   CNAME   CPM17
92          RS       2    FLOW     0.0     0.0
93          RC    0.07   0.058    0.07  4907.0  0.0574     0.0
            * RM17
94          RX     0.0   41.95   62.92   83.89  104.86  125.83  146.81  188.75
95          RY  3069.6 3042.87 3039.08 3027.35 3030.89 3036.01 3046.45 3070.54

96          KK     M16
97          BA   0.652
98          LG    0.35    0.39   5.776   0.202     0.0
            * M16
99          UI     0.0  109.76  109.76  253.83  435.48  619.91  743.33  847.52 1027.84 1291.77
100         UI  872.11  704.21  636.19  574.94  523.35  466.73  421.68  360.76  304.96  272.02
101         UI  254.06   231.8  190.16  164.29  140.25  128.23  120.22  102.18   84.15   84.15
102         UI   68.93   53.71   53.71   53.71   53.71   27.57   21.04   21.04   21.04   21.04
103         UI   21.04   21.04   21.04   21.04   21.04   21.04   21.04

104         KK   CPM16   CNAME    RM16
105         KM       MOORE GULCH, REACH 10, PEAK FLOW FOR FLOODPLAIN DELINEATION
106         HC       2

107         KK     MT6
108         KM       MOORE GULCH, TRIBUTARY 6, PEAK FLOW FOR FLOODPLAIN DELINEATION
109         BA  0.6959
110         LG    0.35    0.32     7.6   0.107     0.0
            * MT6
111         UI     0.0   156.2  236.75  577.07  911.14 1135.45 1410.08 1725.77 1097.76   916.7
112         UI  805.41  706.27  608.78  504.06  401.27  366.72  322.06  253.77  199.59  179.63
113         UI  164.66  119.76  119.76   81.85   76.44   76.44   60.16   29.94   29.94   29.94
114         UI   29.94   29.94   29.94   29.94   29.94     0.0

115         KK    RMT6   CNAME   CPMT6
116         RN    RMT6

117         KK     M15 DUMMY BASIN FOR WMS MODELING PURPOSES
118         BA   0.002
119         LG    0.35    0.32     7.6   0.102     0.0
            * DUMMY UNIT HYDROGRAPH FOR WMS PURPOSES
120         UI     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
121         UI     0.0     0.0
1                                        HEC-1 INPUT                                    PAGE  4
LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

122         KK   CPM15   CNAME    RM15
123         HC       3

124         KK    RM15   CNAME   CPM15
125         KM       CONCENTRATION POINT FOR FLOOD ROUTING
126         RS       2    FLOW     0.0     0.0
127         RC    0.07   0.058    0.07  5167.0  0.0327     0.0
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                * RM15
128             RX     0.0   58.79   97.98  117.58  137.18  156.78  176.37  195.97
129             RY  2824.7 2796.43 2779.21  2772.5 2779.24 2783.65 2790.44 2809.85

130             KK     M14
131             BA  0.8239
132             LG    0.35   0.356   6.879   0.139     0.0
                * M14
133             UI     0.0  231.17  530.92 1169.71 1639.68 2193.14  2210.7  1432.9 1214.46 1024.08
134             UI  845.03  646.56   547.3  457.25  342.64  280.19  245.59  177.23   158.0  113.12
135             UI  113.12   80.09   44.31   44.31   44.31   44.31   44.31   44.31     0.0

136             KK   CPM14   CNAME    RM14
137             KM      MOORE GULCH, REACH 9, PEAK FLOW FOR FLOODPLAIN DELINEATION
138             HC       2

139             KK    RM14   CNAME   CPM14
140             RS       2    FLOW     0.0     0.0
141             RC    0.07   0.058    0.07  4985.0  0.0282     0.0
                * RM14
142             RX     0.0   61.03  122.05   142.4  183.08  203.42  223.76  366.16
143             RY  2651.5 2635.91 2607.61  2600.8  2596.5 2602.51 2606.03 2671.76

144             KK     M13
145             BA  0.6554
146             LG    0.35    0.35   4.612   0.332     0.0
                * M13
147             UI     0.0  165.06  308.18  724.41 1073.36 1323.66 1844.74 1251.45  981.31  847.01
148             UI  727.82  614.47  482.57   402.8   360.2   283.9  217.42  190.16  165.33  126.54
149             UI  113.76   80.77   80.77   74.03   31.64   31.64   31.64   31.64   31.64   31.64
150             UI   31.64     0.0

151             KK   CPM13   CNAME    RM13
152             KM      MOORE GULCH, REACH 8, PEAK FLOW FOR FLOODPLAIN DELINEATION
153             HC       2

154             KK     MT5
155             KM      MOORE GULCH, TRIBUTARY 5, PEAK FLOW FOR FLOODPLAIN DELINEATION
156             BA  0.9521
157             LG    0.35   0.392   6.152   0.182     0.0
                * MT5
158             UI     0.0  164.51  164.51  398.64  677.22  962.46  1138.6 1292.93 1635.66 1856.67
159             UI  1211.2  1018.7  929.62  832.58  755.99  672.38   595.9  506.31  425.02  393.12
160             UI  364.09  318.64  270.27  211.43  203.43  180.18  170.47  126.13  126.13  114.42
161             UI   80.51   80.51   80.51   80.51   47.34   31.53   31.53   31.53   31.53   31.53
162             UI   31.53   31.53   31.53   31.53   31.53   31.53
1                                      HEC-1 INPUT                                          PAGE  5
LINE            ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

163             KK    RMT5   CNAME   CPMT5
164             RN    RMT5

165             KK     M12 DUMMY BASIN FOR WMS MODELING PURPOSES
166             BA   0.002
167             LG     0.0     0.0     0.0     1.2     0.0
                * DUMMY UNIT HYDROGRAPH FOR WMS PURPOSES
168             UI     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
169             UI     0.0     0.0

170             KK   CPM12   CNAME    RM12
171             HC       3

172             KK    RM12   CNAME   CPM12
173             KM      CONCENTRATION POINT FOR FLOOD ROUTING
174             RS       3    FLOW     0.0     0.0
175             RC    0.07   0.058    0.07  7632.0  0.0276     0.0
                * RM12
176             RX     0.0   80.97  101.22  141.71  161.95  182.19  202.44   323.9
177             RY  2470.2 2424.57 2416.16 2407.42 2407.66 2412.52 2429.04 2476.73

178             KK     M11
179             BA  0.6974
180             LG    0.35    0.35    4.02   0.428     0.0
                * M11
181             UI     0.0  138.12  149.78  445.42  692.08  905.61 1062.54 1352.66 1493.12   967.7
182             UI  822.85  735.11  657.86  574.69   501.7  412.86  349.82  322.45  291.26  228.16
183             UI  187.08  169.94  151.28  129.72  105.89  105.89   70.47   67.59   67.59   67.59
184             UI   29.35   26.47   26.47   26.47   26.47   26.47   26.47   26.47   26.47   26.47

185             KK   CPM11   CNAME    RM11
186             KM      MOORE GULCH, REACH 7, PEAK FLOW FOR FLOODPLAIN DELINEATION
187             HC       2

188             KK    RM11   CNAME   CPM11
189             RS       3    FLOW     0.0     0.0
190             RC    0.07   0.058    0.07  4614.0   0.021     0.0
                * RM11
191             RX     0.0   19.99   39.97   59.96   99.94  119.92  279.82  479.69
192             RY  2327.4 2321.09 2308.72 2274.77 2274.87 2287.07 2284.62 2315.53

193             KK     M10
194             BA   0.721
195             LG    0.35    0.35   3.942   0.441     0.0
                * M10
196             UI     0.0   150.6  191.85  507.35  812.52 1033.39  1217.4 1676.92 1324.47  964.34
197             UI  850.07  750.38   658.8  574.86  480.28   387.4  355.13  321.24  253.37  204.35
198             UI   183.3  164.94  133.29  115.46  106.21    73.7    73.7    73.7   54.28   28.86
199             UI   28.86   28.86   28.86   28.86   28.86   28.86   28.86   28.86
1                                      HEC-1 INPUT                                          PAGE  6
LINE            ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

200             KK   CPM10   CNAME    RM10
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201          KM       MOORE GULCH, REACH 6, PEAK FLOW FOR FLOODPLAIN DELINEATION
202          HC         2

203          KK       M9 DUMMY BASIN FOR WMS MODELING PURPOSES
204          BA    0.002
205          LG      0.0      0.0      0.0    0.555      0.0
             * DUMMY UNIT HYDROGRAPH FOR WMS PURPOSES
206          UI      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0
207          UI      0.0      0.0

208          KK     CPM9    CNAME      RM9
209          HC        3

210          KK      RM9    CNAME     CPM9
211          KM       CONCENTRATION POINT FOR ROUTING PURPOSES
212          RS        4     FLOW      0.0      0.0
213          RC     0.07    0.058     0.07   6023.0   0.0196      0.0
             * RM9
214          RX      0.0    39.59   178.15   197.94   237.53   296.91   415.68   633.41
215          RY   2222.1   2216.6 2183.37 2184.71   2185.6 2183.08 2194.75 2225.26

216          KK       M8
217          BA   0.8588
218          LG     0.35     0.35    3.856     0.43      0.0
             * M8
219          UI      0.0   180.72   234.94   615.17    982.8 1247.27 1477.59 2028.41 1546.24 1142.52
220          UI   1011.3   892.08   781.03   679.51   561.68   460.97   423.09   377.65    296.9    236.2
221          UI   215.09   197.93   150.43   138.55   118.51    88.44    88.44    88.44    54.01    34.64
222          UI    34.64    34.64    34.64    34.64    34.64    34.64    34.64      0.0

223          KK     CPM8    CNAME      RM8
224          KM       MOORE GULCH, REACH 5, PEAK FLOW FOR FLOODPLAIN DELINEATION
225          HC         2

226          KK      MT3
227          KM       MOORE GULCH, TRIBUTARY 3, PEAK FLOW FOR FLOODPLAIN DELINEATION
228          BA   0.8746
229          LG     0.35     0.39    5.808    0.164      0.0
             * MT3
230          UI      0.0     94.2     94.2     94.2   165.75   284.79   376.77   480.49    571.6   629.84
231          UI   693.86    744.6   845.87  1014.89  1139.17   803.43   668.19   598.82   559.19   530.12
232          UI   495.12   463.47   439.94   405.79   377.88   354.33   319.33   292.79    250.1   237.61
233          UI   228.46   216.66   205.17   196.97   160.48   154.76    131.5   120.37   120.37   105.53
234          UI   103.17   103.17    85.21    72.22    72.22    72.22    72.22    48.93     46.1     46.1
235          UI     46.1     46.1     46.1     46.1     30.8    18.06    18.06    18.06    18.06    18.06
236          UI    18.06    18.06    18.06    18.06    18.06    18.06    18.06    18.06    18.06    18.06
237          UI    18.06    18.06    18.06
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1                                    HEC-1 INPUT

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

238          KK     RMT3    CNAME    CPMT3
239          RN     RMT3

240          KK       M7 DUMMY BASIN FOR WMS MODELING PURPOSES
241          BA    0.002
242          LG     0.35     0.35     2.45      1.2      0.0
             * DUMMY UNIT HYDROGRAPH FOR WMS PURPOSES
243          UI      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0
244          UI      0.0      0.0

245          KK     CPM7    CNAME      RM7
246          HC        3

247          KK      RM7    CNAME     CPM7
248          KM       COMBINE HYDROGRAPHS FOR FLOOD ROUTING
249          RS        3     FLOW      0.0      0.0
250          RC     0.07    0.058     0.07   3639.0   0.0187      0.0
             * RM7
251          RX      0.0   169.41   607.18   666.88   686.78   706.68   766.37   925.57
252          RY   2099.5 2075.48 2061.23 2054.76 2058.86 2065.18   2071.2 2091.06

253          KK       M6
254          BA   0.7478
255          LG     0.35     0.35     4.05    0.397      0.0
             * M6
256          UI      0.0   139.88   139.88   411.94   643.44   875.26   1031.2   1224.7 1625.89 1146.49
257          UI   891.74   798.82   712.28   639.79   564.91   491.77   406.24   351.73   325.62    295.1
258          UI   234.81    196.1   177.71    153.2   146.31   107.24   107.24    89.78    68.45    68.45
259          UI    68.45    59.29    26.81    26.81    26.81    26.81    26.81    26.81    26.81    26.81
260          UI    26.81    26.81      0.0

261          KK     CPM6    CNAME      RM6
262          KM       MOORE GULCH, REACH 4, PEAK FLOW FOR FLOODPLAIN DELINEATION
263          HC         2

264          KK      RM6    CNAME     CPM6
265          RS        3     FLOW      0.0      0.0
266          RC     0.07    0.058     0.07   4756.0   0.0175      0.0
             * RM6
267          RX      0.0    79.18   514.69   534.49   574.08   593.88   772.04   831.43
268          RY   2069.6 2032.03 2018.89   2008.4 2021.09 2029.55 2046.54 2047.23

269          KK       M5
270          BA   0.5285
271          LG    0.271    0.318    4.354    0.379   25.356
             * M5
272          UI      0.0    90.81    90.81   217.89   370.91   527.32   625.59    710.8    890.5 1039.89
273          UI   675.55    566.9   516.17   463.34   421.01   374.33    332.1   286.17   236.39   218.39
274          UI   203.07   180.63   149.19   120.83   114.51    99.46    98.44    69.62    69.62    67.24
275          UI    44.44    44.44    44.44    44.44    31.22    17.41    17.41    17.41    17.41    17.41
276          UI    17.41    17.41    17.41    17.41    17.41    17.41
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1                                    HEC-1 INPUT

LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10
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277          KK    CPM5   CNAME     RM5
278          KM      MOORE GULCH, REACH 3, PEAK FLOW FOR FLOODPLAIN DELINEATION
279          KM      OUTLET LOCATED DOWNSTREAM OF THE SOUTHBOUND LANES OF INTERSTATE 17
280          HC       2

281          KK    MT2C
282          KM      MOORE GULCH, TRIBUTARY 2, PEAK FLOW FOR FLOODPLAIN DELINEATION
283          BA  0.9418
284          LG    0.35    0.35   4.858   0.285     0.0
             * MT2C
285          UI     0.0  124.82  124.82  143.15  366.28  507.17  675.51  793.93  896.73  984.69
286          UI  1157.8 1474.49 1219.25   899.2  786.67  729.66  674.16  622.58   582.9  522.86
287          UI  488.81   437.1  386.79  329.98   307.1  291.9   274.9  257.09  205.06  191.79
288          UI  159.49  159.39  136.71  136.71  122.88   95.7    95.7    95.7   77.48   61.08
289          UI   61.08   61.08   61.08   61.08   40.43  23.92   23.92   23.92   23.92   23.92
290          UI   23.92   23.92   23.92   23.92   23.92  23.92   23.92   23.92   23.92     0.0

291          KK   RMT2C   CNAME  CPMT2C
292          RS       3    FLOW     0.0     0.0
293          RC    0.07   0.058    0.07 5797.94  0.0393     0.0
             * RMT2C
294          RX     0.0   24.89   49.78    62.4   74.67   99.56  149.34  199.12
295          RY  2259.2  2216.7 2216.68 2211.65 2206.15 2217.88  2241.4 2262.61

296          KK    MT2B
297          BA   0.676
298          LG    0.35   0.358   6.847   0.112     7.2
             * MT2B
299          UI     0.0  119.79  119.79  309.16  505.12  722.48  846.16  969.87 1258.25 1251.26
300          UI  838.96  721.06   655.4  589.48  528.38  471.67  404.56  340.36  299.05  278.07
301          UI  252.85  204.32  173.62  153.07  135.14   131.2   98.73   91.84   91.84   59.45
302          UI   58.62   58.62   58.62   40.43   22.96   22.96   22.96   22.96   22.96   22.96
303          UI   22.96   22.96   22.96   22.96     0.0

304          KK  CPMT2B   CNAME   RMT2B
305          KM      MOORE GULCH, TRIBUTARY 2, REACH 2, PEAK FLOW FOR FLOODPLAIN DELINEATION
306          HC       2

307          KK   RMT2B   CNAME  CPMT2B
308          RS       3    FLOW     0.0     0.0
309          RC    0.07   0.058    0.07  7796.0  0.0295     0.0
             * RMT2B
310          RX     0.0   128.3  211.37  258.41  284.98  356.19  440.11  534.06
311          RY  2080.2 2049.91 2039.11 2031.04 2035.18 2039.46 2050.28 2062.56

312          KK    MT2A
313          BA  0.4779
314          LG   0.299   0.343    6.44   0.149  18.276
             * MT2A
315          UI     0.0   65.21   65.21   85.04  198.43  271.72  367.72  423.55  480.98  529.32
316          UI  645.48  783.34  552.01  444.56  395.82  370.12  339.21  314.55  288.51  263.41
317          UI  239.37  211.59   182.5  164.79  155.42  147.27  136.36  111.74   104.4   83.33
318          UI   83.33   72.69   71.42   64.93    50.0    50.0    50.0   39.12   31.91   31.91
319          UI   31.91   31.91   31.91   16.34    12.5    12.5    12.5    12.5    12.5    12.5
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

320          UI    12.5    12.5    12.5    12.5    12.5    12.5    12.5    12.5

321          KK  CPMT2A   CNAME   RMT2A
322          KM      MOORE GULCH, TRIBUTARY 2, REACH 1, PEAK FLOW FOR FLOODPLAIN DELINEATION
323          KM      OUTLET LOCATED DOWNSTREAM OF SOUTHBOUND LANES OF INTERSTATE 17
324          HC       2

325          KK      M4 DUMMY BASIN FOR WMS MODELING PURPOSES
326          BA   0.002
327          LG     0.1     0.3    2.45     1.2    80.0
             * DUMMY UNIT HYDROGRAPH FOR WMS PURPOSES
328          UI     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
329          UI     0.0     0.0

330          KK    CPM4   CNAME     RM4
331          HC       3

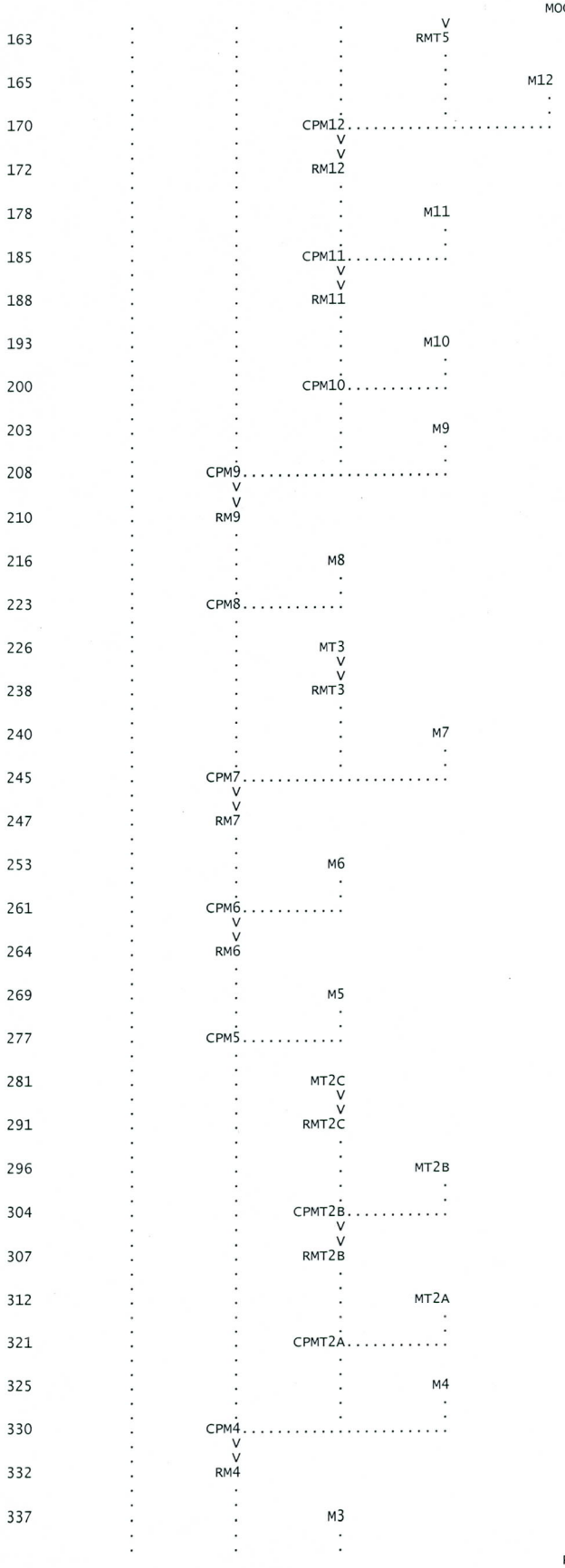
332          KK      RM4   CNAME    CPM4
333          RS        6    FLOW     0.0     0.0
334          RC    0.07   0.058    0.07  7420.0  0.0141     0.0
             * RM4
335          RX     0.0   36.88   73.45  101.25  202.21  303.76  506.27  911.28
336          RY  1921.6 1907.15 1892.93 1881.79 1879.73 1882.28 1890.32 1924.79

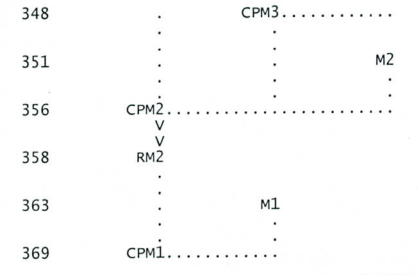
337          KK      M3
338          BA   0.956
339          LG   0.295   0.343   5.248   0.241  21.272
             * M3
340          UI     0.0   94.67   94.67   94.67  110.65  272.18  338.41  414.44  534.27   590.0
341          UI  651.41   704.4  752.14  849.71 1004.52 1162.74  884.03  701.13   625.4  576.64
342          UI  551.32  520.55  487.14  461.97  439.82   406.1  381.69  362.75  324.99   298.4
343          UI  267.56  247.89  231.64  224.27  217.74  201.31  197.95  157.23  155.53  135.48
344          UI  120.97  120.97  111.98  103.69  103.69  103.69   74.14   72.58   72.58   72.58
345          UI   72.58   50.27   46.33   46.33   46.33   46.33   46.33   46.33   46.33   22.09
346          UI   18.15   18.15   18.15   18.15   18.15   18.15   18.15   18.15   18.15   18.15
347          UI   18.15   18.15   18.15   18.15   18.15   18.15   18.15   18.15   18.15     0.0

348          KK    CPM3   CNAME     RM3
349          KM      MOORE GULCH, REACH 2, PEAK FLOW FOR FLOODPLAIN DELINEATION
350          HC       2

351          KK      M2 DUMMY BASIN FOR WMS MODELING PURPOSES
352          BA   0.002
353          LG    0.35    0.35    2.45     1.2     0.0
             * DUMMY UNIT HYDROGRAPH FOR WMS PURPOSES
354          UI     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
```

```
355          UI     0.0     0.0
356          KK    CPM2   CNAME     RM2
357          HC       3
1                                    HEC-1 INPUT                                                    PAGE 10
LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10
358          KK     RM2   CNAME    CPM2
359          RS       1    FLOW     0.0      0.0
360          RC    0.07   0.058    0.07   2295.0  0.0177      0.0
             * RM2
361          RX     0.0    32.3    51.3    71.83   91.59   121.2  131.12  170.65
362          RY  1847.2 1820.39  1819.1 1817.53 1810.67 1820.22 1824.39 1835.55
363          KK      M1
364          BA   0.272
365          LG    0.35    0.35   4.545   0.301   1.796
             * M1
366          UI     0.0   79.22   194.6  419.49  577.97  816.36  662.26  469.75   396.9  331.05
367          UI  266.28  201.58  176.36  139.18  103.07   88.27   69.02   60.73   39.92   38.76
368          UI   33.32   15.18   15.18   15.18   15.18   15.18   15.18     0.0
369          KK    CPM1   CNAME      61
370          KM      MOORE GULCH, PEAK FLOW FOR FLOODPLAIN DELINEATION
371          HC       2
372          ZZ
1
          SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE     (V) ROUTING          (--->) DIVERSION OR PUMP FLOW
   NO.     (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW
    31        MT1
                V
                V
    43        RMT1
                .
                .
    45          .       MT4B
                .          V
                .          V
    54          .      RMT4B
                .          .
                .          .
    59          .          .        MT4A
                .          .          .
                .          .          .
    66          .     CPMT4A..........
                .          .
                .          .
    69          .          .         M18
                .          .          V
                .          .          V
    76          .          .        RM18
                .          .          .
                .          .          .
    81          .          .          .         M17
                .          .          .          .
                .          .          .          .
    89          .          .       CPM17..........
                .          .          V
                .          .          V
    91          .          .        RM17
                .          .          .
                .          .          .
    96          .          .          .         M16
                .          .          .          .
                .          .          .          .
   104          .          .       CPM16..........
                .          .          .
                .          .          .
   107          .          .          .         MT6
                .          .          .          V
                .          .          .          V
   115          .          .          .        RMT6
                .          .          .          .
                .          .          .          .
   117          .          .          .          .         M15
                .          .          .          .          .
                .          .          .          .          .
   122          .          .       CPM15.........................
                .          .          V
                .          .          V
   124          .          .        RM15
                .          .          .
                .          .          .
   130          .          .          .         M14
                .          .          .          .
                .          .          .          .
   136          .          .       CPM14..........
                .          .          V
                .          .          V
   139          .          .        RM14
                .          .          .
                .          .          .
   144          .          .          .         M13
                .          .          .          .
                .          .          .          .
   151          .          .       CPM13..........
                .          .          .
                .          .          .
   154          .          .          .         MT5
                .          .          .          V
```


163
RMT5
165
M12
170
CPM12
172
RM12
178
M11
185
CPM11
188
RM11
193
M10
200
CPM10
203
M9
208
CPM9
210
RM9
216
M8
223
CPM8
226
MT3
238
RMT3
240
M7
245
CPM7
247
RM7
253
M6
261
CPM6
264
RM6
269
M5
277
CPM5
281
MT2C
291
RMT2C
296
MT2B
304
CPMT2B
307
RMT2B
312
MT2A
321
CPMT2A
325
M4
330
CPM4
332
RM4
337
M3



(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*             JUN  1998                 *
*           VERSION 4.1                 *
*                                       *
*  RUN DATE   22FEB03  TIME  13:43:44   *
*                                       *
*****************************************
```

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

Moores Gulch, Upper Agua Fria Watershed, Zone A Delineation Study
By RBF Consulting for FCD of Maricopa Co., 2/22/03, FCD 2000C020
HEC-1 created using WMS 6.2. For additional notes and details see WMS Files

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

   IT         HYDROGRAPH TIME DATA
                    NMIN           2  MINUTES IN COMPUTATION INTERVAL
                   IDATE      1JAN94  STARTING DATE
                   ITIME        0000  STARTING TIME
                      NQ         300  NUMBER OF HYDROGRAPH ORDINATES
                  NDDATE      1JAN94  ENDING DATE
                  NDTIME        0958  ENDING TIME
                   ICENT          19  CENTURY MARK

                COMPUTATION INTERVAL      .03 HOURS
                    TOTAL TIME BASE    9.97 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

 7 JD         INDEX STORM NO. 1
                    STRM        3.55  PRECIPITATION DEPTH
                    TRDA         .00  TRANSPOSITION DRAINAGE AREA

 8 PI          PRECIPITATION PATTERN
                .11    .11    .11    .11    .11    .11    .11    .11    .11    .11
                .11    .11    .11    .11    .11    .12    .12    .12    .12    .12
                .12    .12    .11    .11    .11    .11    .11    .11    .11    .11
                .11    .11    .11    .11    .11    .11    .11    .11    .12    .12
                .12    .12    .12    .12    .12    .11    .11    .11    .11    .11
                .11    .11    .11    .11    .11    .11    .11    .11    .11    .11
                .11    .11    .11    .11    .11    .11    .11    .14    .17    .17
                .17    .17    .17    .17    .17    .16    .16    .16    .16    .16
                .16    .16    .21    .25    .25    .25    .25    .25    .25    .25
                .27    .27    .27    .27    .27    .27    .27    .65   1.04   1.04
               1.04   1.04   1.04   1.04   1.04   2.15   2.15   2.15   2.15   2.15
               2.15   2.15   4.12   6.09   6.09   6.09   6.09   6.09   6.09   6.09
               1.03   1.03   1.03   1.03   1.03   1.03   1.03    .65    .27    .27
                .27    .27    .27    .27    .27    .25    .25    .25    .25    .25
                .25    .25    .21    .16    .16    .16    .16    .16    .16    .16
                .13    .13    .13    .13    .13    .13    .13    .14    .15    .15
                .15    .15    .15    .15    .15    .11    .11    .11    .11    .11
                .11    .11    .11    .12    .12    .12    .12    .12    .12    .12

12 JD         INDEX STORM NO. 2
                    STRM        3.53  PRECIPITATION DEPTH
                    TRDA         .50  TRANSPOSITION DRAINAGE AREA

13 PI          PRECIPITATION PATTERN
                .11    .11    .11    .11    .11    .11    .11    .11    .11    .11
                .11    .11    .11    .11    .11    .12    .12    .12    .12    .12
                .12    .12    .11    .11    .11    .11    .11    .11    .11    .11
                .11    .11    .11    .11    .11    .11    .11    .11    .12    .12
                .12    .12    .12    .12    .12    .11    .11    .11    .11    .11
                .11    .11    .11    .11    .11    .11    .11    .11    .11    .11
                .11    .11    .11    .11    .11    .11    .11    .14    .17    .17
                .17    .17    .17    .17    .17    .16    .16    .16    .16    .16
                .16    .16    .21    .25    .25    .25    .25    .25    .25    .25
                .27    .27    .27    .27    .27    .27    .27    .65   1.04   1.04
               1.04   1.04   1.04   1.04   1.04   2.15   2.15   2.15   2.15   2.15
               2.15   2.15   4.12   6.09   6.09   6.09   6.09   6.09   6.09   6.09
               1.03   1.03   1.03   1.03   1.03   1.03   1.03    .65    .27    .27
                .27    .27    .27    .27    .27    .25    .25    .25    .25    .25
                .25    .25    .21    .16    .16    .16    .16    .16    .16    .16
```

.13	.13	.13	.13	.13	.13	.13	.14	.15	.15
.15	.15	.15	.15	.15	.11	.11	.11	.11	.11
.11	.11	.11	.12	.12	.12	.12	.12	.12	.12

17 JD INDEX STORM NO. 3
STRM 3.46 PRECIPITATION DEPTH
TRDA 2.80 TRANSPOSITION DRAINAGE AREA

18 PI PRECIPITATION PATTERN

.12	.12	.12	.12	.12	.12	.12	.11	.09	.09
.09	.09	.09	.09	.09	.12	.12	.12	.12	.12
.12	.12	.12	.12	.12	.12	.12	.12	.12	.12
.11	.11	.11	.11	.11	.11	.11	.11	.12	.12
.12	.12	.12	.12	.12	.11	.11	.11	.11	.11
.11	.11	.11	.11	.11	.11	.11	.11	.11	.11
.12	.12	.12	.12	.12	.12	.12	.13	.15	.15
.15	.15	.15	.15	.15	.17	.17	.17	.17	.17
.17	.17	.22	.27	.27	.27	.27	.27	.27	.27
.57	.57	.57	.57	.57	.57	.57	.88	1.19	1.19
1.19	1.19	1.19	1.19	1.19	2.65	2.65	2.65	2.65	2.65
2.65	2.65	2.95	3.24	3.24	3.24	3.24	3.24	3.24	3.24
1.91	1.91	1.91	1.91	1.91	1.91	1.91	1.37	.84	.84
.84	.84	.84	.84	.84	.51	.51	.51	.51	.51
.51	.51	.33	.16	.16	.16	.16	.16	.16	.16
.17	.17	.17	.17	.17	.17	.17	.17	.16	.16
.16	.16	.16	.16	.16	.17	.17	.17	.17	.17
.17	.17	.17	.16	.16	.16	.16	.16	.16	.16

22 JD INDEX STORM NO. 4
STRM 3.28 PRECIPITATION DEPTH
TRDA 16.00 TRANSPOSITION DRAINAGE AREA

23 PI PRECIPITATION PATTERN

.20	.20	.20	.20	.20	.20	.20	.13	.07	.07
.07	.07	.07	.07	.07	.13	.13	.13	.13	.13
.13	.13	.19	.24	.24	.24	.24	.24	.24	.24
.20	.20	.20	.20	.20	.20	.20	.19	.17	.17
.17	.17	.17	.17	.17	.19	.19	.19	.19	.19
.19	.19	.19	.20	.20	.20	.20	.20	.20	.20
.19	.19	.19	.19	.19	.19	.19	.20	.21	.21
.21	.21	.21	.21	.21	.23	.23	.23	.23	.23
.23	.23	.27	.31	.31	.31	.31	.31	.31	.31
.63	.63	.63	.63	.63	.63	.63	.86	1.09	1.09
1.09	1.09	1.09	1.09	1.09	2.24	2.24	2.24	2.24	2.24
2.24	2.24	2.44	2.64	2.64	2.64	2.64	2.64	2.64	2.64
1.68	1.68	1.68	1.68	1.68	1.68	1.68	1.32	.96	.96
.96	.96	.96	.96	.96	.59	.59	.59	.59	.59
.59	.59	.52	.45	.45	.45	.45	.45	.45	.45
.19	.19	.19	.19	.19	.19	.19	.18	.17	.17
.17	.17	.17	.17	.17	.19	.19	.19	.19	.19
.19	.19	.18	.17	.17	.17	.17	.17	.17	.17

27 JD INDEX STORM NO. 5
STRM 2.84 PRECIPITATION DEPTH
TRDA 90.00 TRANSPOSITION DRAINAGE AREA

28 PI PRECIPITATION PATTERN

.32	.32	.32	.32	.32	.32	.32	.29	.25	.25
.25	.25	.25	.25	.25	.21	.21	.21	.21	.21
.21	.21	.23	.25	.25	.25	.25	.25	.25	.25
.27	.27	.27	.27	.27	.27	.27	.27	.28	.28
.28	.28	.28	.28	.28	.29	.29	.29	.29	.29
.29	.29	.29	.28	.28	.28	.28	.28	.28	.28
.32	.32	.32	.32	.32	.32	.32	.33	.35	.35
.35	.35	.35	.35	.35	.36	.36	.36	.36	.36
.36	.36	.39	.43	.43	.43	.43	.43	.43	.43
.67	.67	.67	.67	.67	.67	.67	.91	1.16	1.16
1.16	1.16	1.16	1.16	1.16	1.43	1.43	1.43	1.43	1.43
1.43	1.43	1.46	1.49	1.49	1.49	1.49	1.49	1.49	1.49
1.44	1.44	1.44	1.44	1.44	1.44	1.44	1.25	1.05	1.05
1.05	1.05	1.05	1.05	1.05	.67	.67	.67	.67	.67
.67	.67	.62	.57	.57	.57	.57	.57	.57	.57
.31	.31	.31	.31	.31	.31	.31	.31	.32	.32
.32	.32	.32	.32	.32	.31	.31	.31	.31	.31
.31	.31	.31	.31	.31	.31	.31	.31	.31	.31

WARNING EXCESS AT PONDING LESS THAN ZERO FOR PERIOD. EXCESS SET TO ZERO

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	MT1	1109.	4.33	188.	114.	114.	.60		
+	ROUTED TO	RMT1	1109.	4.33	188.	114.	114.	.60		
+	HYDROGRAPH AT	MT4B	1038.	4.17	91.	55.	55.	.49		
+	ROUTED TO	RMT4B	994.	4.23	91.	55.	55.	.49		
+	HYDROGRAPH AT	MT4A	1526.	4.13	136.	82.	82.	.78		
+	2 COMBINED AT	CPMT4A	2017.	4.20	210.	126.	126.	1.27		
+	HYDROGRAPH AT	M18	1550.	4.13	140.	84.	84.	.64		

+	ROUTED TO	RM18	1491.	4.20	140.	84.	84.	.64
+	HYDROGRAPH AT	M17	1501.	4.13	143.	86.	86.	.65
+	2 COMBINED AT	CPM17	2447.	4.20	271.	163.	163.	1.29
+	ROUTED TO	RM17	2369.	4.27	271.	163.	163.	1.29
+	HYDROGRAPH AT	M16	1274.	4.17	124.	75.	75.	.65
+	2 COMBINED AT	CPM16	2977.	4.27	376.	226.	226.	1.94
+	HYDROGRAPH AT	MT6	1691.	4.13	152.	91.	91.	.70
+	ROUTED TO	RMT6	1691.	4.13	152.	91.	91.	.70
+	HYDROGRAPH AT	M15	0.	.00	0.	0.	0.	.00
+	3 COMBINED AT	CPM15	3671.	4.23	508.	306.	306.	2.64
+	ROUTED TO	RM15	3589.	4.30	508.	306.	306.	2.64
+	HYDROGRAPH AT	M14	2055.	4.10	167.	100.	100.	.82
+	2 COMBINED AT	CPM14	4355.	4.27	644.	388.	388.	3.46
+	ROUTED TO	RM14	4279.	4.37	644.	388.	388.	3.46
+	HYDROGRAPH AT	M13	1523.	4.10	115.	69.	69.	.66
+	2 COMBINED AT	CPM13	4735.	4.33	722.	435.	435.	4.12
+	HYDROGRAPH AT	MT5	1726.	4.17	178.	107.	107.	.95
+	ROUTED TO	RMT5	1726.	4.17	178.	107.	107.	.95
+	HYDROGRAPH AT	M12	0.	.00	0.	0.	0.	.00
+	3 COMBINED AT	CPM12	5589.	4.30	854.	514.	514.	5.07
+	ROUTED TO	RM12	5496.	4.43	854.	514.	514.	5.07
+	HYDROGRAPH AT	M11	1342.	4.13	113.	68.	68.	.70
+	2 COMBINED AT	CPM11	5872.	4.40	922.	555.	555.	5.77
+	ROUTED TO	RM11	5813.	4.50	922.	555.	555.	5.77
+	HYDROGRAPH AT	M10	1415.	4.13	115.	69.	69.	.72
+	2 COMBINED AT	CPM10	6101.	4.47	989.	596.	596.	6.49
+	HYDROGRAPH AT	M9	0.	.00	0.	0.	0.	.00
+	3 COMBINED AT	CPM9	6875.	4.43	1129.	680.	680.	7.77
+	ROUTED TO	RM9	6735.	4.57	1129.	680.	680.	7.77
+	HYDROGRAPH AT	M8	1619.	4.13	136.	82.	82.	.86
+	2 COMBINED AT	CPM8	6920.	4.53	1206.	726.	726.	8.63
+	HYDROGRAPH AT	MT3	1251.	4.33	172.	103.	103.	.87
+	ROUTED TO	RMT3	1251.	4.33	172.	103.	103.	.87
+	HYDROGRAPH AT	M7	0.	.00	0.	0.	0.	.00
+	3 COMBINED AT	CPM7	7487.	4.53	1324.	797.	797.	9.50
	ROUTED TO							

+	RM7	7414.	4.63	1324.	797.	797.	9.50
+ HYDROGRAPH AT	M6	1390.	4.17	124.	75.	75.	.75
+ 2 COMBINED AT	CPM6	7567.	4.60	1392.	838.	838.	10.25
+ ROUTED TO	RM6	7405.	4.77	1392.	838.	838.	10.25
+ HYDROGRAPH AT	M5	1141.	4.17	122.	74.	74.	.53
+ 2 COMBINED AT	CPM5	7548.	4.73	1471.	888.	888.	10.78
+ HYDROGRAPH AT	MT2C	1403.	4.23	165.	99.	99.	.94
+ ROUTED TO	RMT2C	1356.	4.37	165.	99.	99.	.94
+ HYDROGRAPH AT	MT2B	1476.	4.17	154.	93.	93.	.68
+ 2 COMBINED AT	CPMT2B	2161.	4.27	301.	181.	181.	1.62
+ ROUTED TO	RMT2B	1976.	4.50	301.	181.	181.	1.62
+ HYDROGRAPH AT	MT2A	962.	4.23	116.	70.	70.	.48
+ 2 COMBINED AT	CPMT2A	2396.	4.47	401.	242.	242.	2.10
+ HYDROGRAPH AT	M4	0.	.00	0.	0.	0.	.00
+ 3 COMBINED AT	CPM4	8803.	4.73	1761.	1066.	1066.	12.88
+ ROUTED TO	RM4	8634.	4.90	1760.	1066.	1066.	12.88
+ HYDROGRAPH AT	M3	1326.	4.37	215.	130.	130.	.96
+ 2 COMBINED AT	CPM3	8993.	4.90	1907.	1158.	1158.	13.83
+ HYDROGRAPH AT	M2	0.	.00	0.	0.	0.	.00
+ 3 COMBINED AT	CPM2	9360.	4.90	2058.	1254.	1254.	14.44
+ ROUTED TO	RM2	9327.	4.93	2058.	1254.	1254.	14.44
+ HYDROGRAPH AT	M1	751.	4.10	52.	31.	31.	.27
+ 2 COMBINED AT	CPM1	9321.	4.93	2089.	1273.	1273.	14.71

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

HEC-1 Output File
Little Squaw Creek

```
1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*             JUN  1998                 *
*          VERSION 4.1                  *
*                                       *
*  RUN DATE   11MAR03  TIME  10:48:09   *
*                                       *
*****************************************
```

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

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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

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

   1          ID  Little Squaw Creek, Upper Agua Fria Watershed Zone A Floodplain Delineation
   2          ID  RBF Consulting for the FCD of Maricopa County, 3/11/2003
   3          ID  FCD2000C020, HEC-1 Created using WMS 6.1.  See WMS Files for more notes
              *DIAGRAM
   4          IT       2  1JAN94        0     300
   5          IO       5
   6          IN      15  1JAN94        0
   7          JD    3.55  0.0001
              * Pattern 1
   8          PC     0.0     0.8     1.6     2.5     3.3     4.1     5.0     5.8     6.6     7.4
   9          PC     8.7     9.9    11.8    13.8    21.6    37.7    83.4    91.1    93.1    95.0
  10          PC    96.2    97.2    98.3    99.1   100.0
  11          IN      15  1JAN94        0
  12          JD    3.53     0.5
              * Pattern 1
  13          PC     0.0     0.8     1.6     2.5     3.3     4.1     5.0     5.8     6.6     7.4
  14          PC     8.7     9.9    11.8    13.8    21.6    37.7    83.4    91.1    93.1    95.0
  15          PC    96.2    97.2    98.3    99.1   100.0
  16          IN      15  1JAN94        0
  17          JD    3.46     2.8
              * Pattern 2
  18          PC     0.0     0.9     1.6     2.5     3.4     4.2     5.1     5.9     6.7     7.6
  19          PC     8.7    10.0    12.0    16.3    25.2    45.1    69.4    83.7    90.0    93.8
  20          PC    95.0    96.3    97.5    98.8   100.0
  21          IN      15  1JAN94        0
  22          JD    3.28    16.0
              * Pattern 3
  23          PC     0.0     1.5     2.0     3.0     4.8     6.3     7.6     9.0    10.5    11.9
  24          PC    13.5    15.2    17.5    22.2    30.4    47.2    67.0    79.6    86.8    91.2
  25          PC    94.6    96.0    97.3    98.7   100.0
  26          IN      15  1JAN94        0
  27          JD    2.84    90.0
              * Pattern 4
  28          PC     0.0     2.1     3.5     5.1     7.1     8.7    10.5    12.5    14.3    16.0
  29          PC    17.9    20.1    23.2    28.1    36.4    50.0    65.8    77.3    84.1    88.8
  30          PC    92.7    94.5    96.4    98.2   100.0

  31          KK    LT1C
  32          BA  0.5028
  33          LG    0.35   0.382   5.624   0.207   5.752
              * LT1C
  34          UI     0.0   76.95   76.95  144.76  264.74  383.47   481.5  553.27  618.67  769.48
  35          UI   905.2  592.09  496.49  451.71  413.38  376.93  343.69  310.64  278.58  244.29
  36          UI  203.75  188.28   177.1  162.66  137.45  122.48   98.32   96.08   84.28   84.28
  37          UI   62.79   58.99   58.99   47.26   37.66   37.66   37.66   37.66   28.95   14.75
  38          UI   14.75   14.75   14.75   14.75   14.75   14.75   14.75   14.75   14.75   14.75
  39          UI   14.75     0.0

  40          KK   RLT1C   CNAME  CPLT1C
  41          RS       1    FLOW     0.0     0.0
  42          RC    0.07   0.058    0.07 1642.12  0.0215     0.0
              * RLT1C
  43          RX     0.0  140.72  160.82  180.93  201.03  221.13  241.23  281.44
  44          RY  2067.5 2062.85  2059.1 2050.03 2051.99 2053.95  2054.8 2066.32
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1 HEC-1 INPUT PAGE 2

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

  45          KK    LT1B
  46          BA  0.5662
```

```
 47          LG   0.338   0.376   6.316    0.16   3.927
             * LT1B
 48          UI     0.0  112.14   121.6  361.62  561.88  735.24  862.65 1098.18 1212.22  785.65
 49          UI  668.05  596.82   534.1  466.58  407.32  335.19  284.01  261.79  236.47  185.23
 50          UI  151.89  137.97  122.82  105.32   85.97   85.97   57.21   54.88   54.88   54.88
 51          UI   23.83   21.49   21.49   21.49   21.49   21.49   21.49   21.49   21.49   21.49

 52          KK  CPLT1B   CNAME   RLT1B
 53          HC       2

 54          KK   RLT1B   CNAME  CPLT1B
 55          RS      10    FLOW     0.0     0.0
 56          RC    0.07   0.058    0.07 9733.58  0.0215     0.0
             * RLT1B
 57          RX     0.0   281.9  322.18  342.31  362.45  402.72  422.86  664.49
 58          RY  2014.8 1990.38 1984.25 1979.99 1986.33 1990.67 1994.77 2023.53

 59          KK    LT1A
 60          BA  0.8116
 61          LG   0.291   0.323   6.672   0.139  20.151
             * LT1A
 62          UI     0.0   109.3   109.3  134.92  327.34  450.42  605.34  703.41  796.72  872.65
 63          UI  1053.2 1310.87  984.65  764.67  672.82  629.08  579.05  534.85  493.93  450.55
 64          UI  414.64  364.13  320.06  282.51  265.44   251.4   231.4  204.06  179.57  149.64
 65          UI  139.67  129.69  119.71  119.71   88.29    83.8    83.8   80.01   53.49   53.49
 66          UI   53.49   53.49   53.49   45.35   20.95   20.95   20.95   20.95   20.95   20.95
 67          UI   20.95   20.95   20.95   20.95   20.95   20.95   20.95   20.95     0.0

 68          KK  CPLT1A   CNAME   RLT1A
 69          HC       2

 70          KK   RLT1A   CNAME  CPLT1A
 71          RN   RLT1A

 72          KK     LT2
 73          BA  0.7286
 74          LG   0.274   0.228   9.178   0.059  24.749
             * LT2
 75          UI     0.0  106.66  106.66  177.65  351.11  490.63   646.0  739.44  824.15  968.58
 76          UI  1253.4  998.43  746.44  652.23  606.08  552.34   509.1  463.03  421.17  377.33
 77          UI  326.86  279.54  260.43  245.32  225.58  193.38  174.84  136.29  136.29  117.98
 78          UI  116.82   98.42   81.77   81.77   79.55   52.19   52.19   52.19   52.19   52.19
 79          UI   30.92   20.44   20.44   20.44   20.44   20.44   20.44   20.44   20.44   20.44
 80          UI   20.44   20.44   20.44   20.44

 81          KK    RLT2   CNAME   CPLT2
 82          RN    RLT2
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 83          KK     LT3B
 84          BA    0.579
 85          LG    0.35   0.388   6.232   0.161     0.0
             * LT3B
 86          UI     0.0   81.23   81.23  117.78  255.32  346.25  475.78  543.34  608.95   684.8
 87          UI  856.44   934.4  619.18  527.04  479.94  445.15  408.32  379.94  339.74  316.88
 88          UI  276.97  242.96  211.41  197.79  186.82  171.88  149.46  133.44  107.35  103.79
 89          UI   93.11   88.96   83.63   62.27   62.27   62.27   48.76   39.75   39.75   39.75
 90          UI   39.75   39.75   16.54   15.57   15.57   15.57   15.57   15.57   15.57   15.57
 91          UI   15.57   15.57   15.57   15.57   15.57   15.57

 92          KK   RLT3B   CNAME  CPLT3B
 93          RS       5    FLOW     0.0     0.0
 94          RC    0.07   0.058    0.07 6270.84  0.0283     0.0
             * RLT3B
 95          RX     0.0  117.55  195.91  215.51   235.1  254.69  274.28  391.83
 96          RY  2206.0 2186.97 2176.21 2160.47 2167.27 2174.43 2183.56 2215.99

 97          KK     LT3A
 98          BA   0.5785
 99          LG    0.35    0.39   6.196   0.162    1.87
             * LT3A
100          UI     0.0   88.54   88.54  166.56   304.6   441.2   554.0  636.57  711.82  885.32
101          UI  1041.4  681.24  571.24  519.71  475.62  433.68  395.43  357.41  320.52  281.07
102          UI  234.42  216.63  203.76  187.16  158.14  140.93  113.13  110.54   96.97   96.97
103          UI   72.24   67.88   67.88   54.37   43.33   43.33   43.33   43.33   33.31   16.97
104          UI   16.97   16.97   16.97   16.97   16.97   16.97   16.97   16.97   16.97   16.97
105          UI   16.97     0.0

106          KK  CPLT3A   CNAME   RLT3A
107          HC       2

108          KK     LT4B
109          BA   0.6676
110          LG    0.35   0.314   7.725    0.09     0.0
             * LT4B
111          UI     0.0  107.09  107.09  224.76  394.05  571.07  693.66   798.9  918.83 1195.15
112          UI  1062.4   749.1  650.28  597.78  540.73  495.07  442.64  397.02  345.71   290.4
113          UI  263.28  247.03  226.06  187.95  164.98  136.83  129.19  117.29  110.71    82.1
114          UI    82.1   80.96    52.4    52.4    52.4    52.4   49.04   20.53   20.53   20.53
115          UI   20.53   20.53   20.53   20.53   20.53   20.53   20.53   20.53   20.53

116          KK   RLT4B   CNAME  CPLT4B
117          RS       7    FLOW     0.0     0.0
118          RC    0.07   0.058    0.07  4856.2  0.0192     0.0
             * RLT4B
119          RX     0.0  138.85  495.88  515.72  555.39  575.23  595.06  813.25
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 120          RY  2181.1 2177.66  2154.9  2155.2 2154.18 2162.74  2166.3 2190.76
1                                        HEC-1 INPUT                                    PAGE  4

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

 121          KK    LT4A
 122          BA  0.7463
 123          LG    0.35   0.262   9.145   0.053   4.709
              * LT4A
 124          UI     0.0  139.93  139.93  414.18  645.87  877.03  1033.6 1229.49 1627.11 1137.04
 125          UI  889.42  797.69  710.04  637.88  563.29  488.58  404.08  350.83  324.93   294.0
 126          UI  232.17   193.8   176.5  153.25  143.86  107.28  107.28   87.47   68.48   68.48
 127          UI   68.48   56.39   26.82   26.82   26.82   26.82   26.82   26.82   26.82   26.82
 128          UI   26.82   26.82

 129          KK  CPLT4A   CNAME   RLT4A
 130          HC       2

 131          KK    LT7D
 132          BA  0.6652
 133          LG    0.35    0.32     7.6   0.107     0.0
              * LT7D
 134          UI     0.0  203.61  541.77 1144.35 1550.47 2215.58 1440.19  1144.5  953.37  779.53
 135          UI  592.75  483.39  397.05  292.13  238.61  194.57   156.1  112.34   99.64   88.12
 136          UI   39.02   39.02   39.02   39.02   39.02   39.02

 137          KK   RLT7D   CNAME  CPLT7D
 138          RS       4    FLOW     0.0     0.0
 139          RC    0.07   0.058    0.07  6738.1  0.1133     0.0
              * RLT7D
 140          RX     0.0   78.37  117.55  137.14  152.24  168.76   235.1  293.87
 141          RY  3657.6 3612.36 3603.74  3597.2 3599.51 3602.05 3611.08 3637.36

 142          KK    LT7C
 143          BA  0.5114
 144          LG    0.35    0.32     7.6   0.107     0.0
              * LT7C
 145          UI     0.0  139.29  301.54  681.41  964.52 1250.63 1431.89  899.68  759.31   645.7
 146          UI  539.02  423.06  343.01  303.59  233.73  177.98  154.63  124.16  106.79    77.2
 147          UI   68.16   68.16   32.46    26.7    26.7    26.7    26.7    26.7    26.7     0.0

 148          KK   RLT7C   CNAME  CPLT7C
 149          RS       4    FLOW     0.0     0.0
 150          RC    0.07   0.058    0.07  5449.9  0.0807     0.0
              * RLT7C
 151          RX     0.0  140.39  200.55  240.66  260.72  280.77  300.83   361.0
 152          RY  3695.9 3660.29 3637.03 3642.86 3642.26 3651.61 3656.72 3701.15

 153          KK   LT7B2
 154          BA  0.5968
 155          LG    0.35    0.32     7.6   0.107     0.0
              * LT7B2
 156          UI     0.0  133.96  203.03   494.9  781.39  973.75 1209.28 1480.01  941.44  786.16
 157          UI  690.72  605.69  522.09  432.28  344.12   314.5   276.2  217.63  171.17  154.05
 158          UI  141.22   102.7   102.7    70.2   65.55   65.55    51.6   25.68   25.68   25.68
 159          UI   25.68   25.68   25.68   25.68   25.68     0.0
1                                        HEC-1 INPUT                                    PAGE  5

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

 160          KK   LT7B1
 161          BA  0.7169
 162          LG    0.35    0.32     7.6   0.107     0.0
              * LT7B1
 163          UI     0.0   118.0   118.0  261.25  452.51  648.87  783.52  895.12  1057.3 1382.58
 164          UI  1029.1  788.64  697.34  638.15  577.66  522.45  468.53   413.8   349.5  302.08
 165          UI  280.69  260.53  230.04  193.86  155.79  149.86  129.24  129.24   94.56   90.47
 166          UI   90.47   63.44   57.74   57.74   57.74   57.09   22.62   22.62   22.62   22.62
 167          UI   22.62   22.62   22.62   22.62   22.62   22.62   22.62   22.62

 168          KK  CPLT7B   CNAME   RLT7B
 169          HC       4

 170          KK   RLT7B   CNAME  CPLT7B
 171          RS       5    FLOW     0.0     0.0
 172          RC    0.07   0.058    0.07 6841.85  0.0608     0.0
              * RLT7B
 173          RX     0.0   80.63  100.79  120.95  141.11  161.26  181.42  282.21
 174          RY  3366.9 3300.54 3275.19 3276.27 3279.01 3282.64 3281.07 3352.63

 175          KK     L17
 176          BA  0.8743
 177          LG    0.35    0.32     7.6   0.107     0.0
              * L17
 178          UI     0.0  196.25  297.44  725.01 1144.72 1426.53 1771.57 2168.19 1379.18 1151.71
 179          UI  1011.8  887.33  764.85  633.28  504.13  460.73  404.62  318.82  250.76  225.68
 180          UI  206.88  150.46  150.46  102.84   96.04   96.04   75.59   37.61   37.61   37.61
 181          UI   37.61   37.61   37.61   37.61   37.61     0.0

 182          KK    RL17   CNAME   CPL17
 183          RS       2    FLOW     0.0     0.0
 184          RC    0.07   0.058    0.07 3414.17  0.0755     0.0
              * RL17
 185          RX     0.0   59.78   99.63  119.56  139.48  159.41  219.19  259.04
 186          RY  3575.3 3552.81  3543.5 3533.61 3537.48 3531.61  3575.6 3588.53

 187          KK     L16
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188          BA  0.6669
189          LG    0.35    0.39     6.2   0.177     0.0
             * L16
190          UI     0.0  132.08  143.23  425.94  661.81   866.0 1016.07  1293.5 1427.82  925.38
191          UI  786.86  702.96  629.09  549.56  479.76  394.81  334.52  308.35  278.52  218.18
192          UI   178.9   162.5  144.66  124.05  101.26  101.26   67.38   64.64   64.64   64.64
193          UI   28.07   25.32   25.32   25.32   25.32   25.32   25.32   25.32   25.32   25.32

194          KK   CPL16   CNAME    RL16
195          HC       2

196          KK    RL16   CNAME   CPL16
197          RS       5    FLOW     0.0     0.0
198          RC    0.07   0.058    0.07 4972.53  0.0452     0.0
             * RL16
199          RX     0.0   99.67   119.6  159.47   179.4  199.33  259.13   358.8
200          RY  3273.0 3245.38 3236.08 3228.24 3225.78  3228.6 3230.87 3267.33
```



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

201          KK     L15
202          BA  0.7752
203          LG    0.35    0.35   4.743   0.305     0.0
             * L15
204          UI     0.0   170.6  247.53   615.4  974.91 1219.35 1487.69 1942.24 1244.72 1023.68
205          UI  902.46  793.64  687.37  576.98  465.37   407.7  370.14  296.94  235.99  207.59
206          UI  186.85  146.07  130.79  110.33   83.49   83.49   83.49   40.98    32.7    32.7
207          UI    32.7    32.7    32.7    32.7    32.7    32.7

208          KK    LT7A
209          BA   0.431
210          LG    0.35    0.38   5.407   0.233     0.0
             * LT7A
211          UI     0.0   85.44   92.87  275.66  428.55  560.47  657.57  837.97  921.75  597.91
212          UI  508.61  454.23  406.64   354.9   310.0  254.69  216.19  199.31  179.94  140.64
213          UI  115.29  104.88   93.57   79.79    65.5    65.5   43.17   41.81   41.81   41.81
214          UI   17.63   16.38   16.38   16.38   16.38   16.38   16.38   16.38   16.38   16.38

215          KK   CPL15   CNAME    RL15
216          HC       4

217          KK    RL15   CNAME   CPL15
218          RS       5    FLOW     0.0     0.0
219          RC    0.07   0.058    0.07  7280.5  0.0359     0.0
             * RL15
220          RX     0.0   84.63   158.0  178.11   197.9  221.27  296.85   376.0
221          RY  3062.5 3029.54 3012.38  3010.0 3005.52 3009.04 3021.84 3051.34

222          KK     LT6
223          BA  0.6113
224          LG    0.35    0.35   3.212   0.722     0.0
             * LT6
225          UI     0.0  102.91  102.91  237.98   408.3  581.22  696.93  794.62  963.68 1211.14
226          UI  817.67  660.25  596.48  539.05  490.68  437.59  395.36  338.24  285.92  255.04
227          UI  238.21  217.33  178.29  154.04   131.5  120.23  112.71    95.8    78.9    78.9
228          UI   64.63   50.36   50.36   50.36   50.36   25.85   19.72   19.72   19.72   19.72
229          UI   19.72   19.72   19.72   19.72   19.72   19.72   19.72

230          KK     L14
231          BA  0.8243
232          LG    0.35    0.35    2.35     1.3     0.0
             * L14
233          UI     0.0   124.8   124.8  228.33  424.93  610.46  773.35  889.84  990.57 1219.07
234          UI  1480.7 1005.48  822.79  737.73  679.91  619.79  568.58  513.38  461.35  404.26
235          UI  343.07  310.14  291.43  270.12  237.16  205.04  165.45  159.47  139.72  136.69
236          UI  114.87   95.68   95.68    88.9   61.07   61.07   61.07   61.07   61.07   25.05
237          UI   23.92   23.92   23.92   23.92   23.92   23.92   23.92   23.92   23.92   23.92
238          UI   23.92   23.92
```



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

239          KK   CPL14   CNAME    RL14
240          HC       3

241          KK    RL14   CNAME   CPL14
242          RS       4    FLOW     0.0     0.0
243          RC    0.07   0.058    0.07  6706.0  0.0442     0.0
             * RL14
244          RX     0.0   61.23  142.87  163.28  244.92  265.33  326.09  469.43
245          RY  2856.9 2836.03 2816.96 2809.33 2813.87 2810.99 2836.49 2912.69

246          KK     L13
247          BA  0.7545
248          LG    0.35    0.35   2.637   1.049     0.0
             * L13
249          UI     0.0  110.51  110.51  184.36  363.99  508.86  669.54  766.54  854.27 1004.44
250          UI  1299.5 1032.19  772.56  675.44  627.64   571.9  527.14  479.22  436.18  390.54
251          UI  337.78   289.4  269.65  254.18  233.45  199.74   180.6  141.21  141.21  121.95
252          UI  121.04   101.4   84.73   84.73   81.88   54.08   54.08   54.08   54.08   54.08
253          UI   31.36   21.18   21.18   21.18   21.18   21.18   21.18   21.18   21.18   21.18
254          UI   21.18   21.18   21.18   21.18

255          KK   CPL13   CNAME    RL13
256          HC       2
```

```
257          KK    RL13   CNAME   CPL13
258          RS       1    FLOW     0.0     0.0
259          RC    0.07   0.058    0.07 1974.64  0.0354     0.0
             * RL13
260          RX     0.0   89.03  118.71  148.38  178.06  207.74  237.42  326.45
261          RY  2549.1 2526.03 2522.09 2519.51 2516.24  2525.1 2530.55 2551.31

262          KK     L12
263          BA  0.8923
264          LG    0.35    0.35   2.962   0.838     0.0
             * L12
265          UI     0.0  124.56  124.56  177.36  389.29  528.82  723.89  829.62  930.26  1041.1
266          UI  1300.6 1456.78  956.87  817.02  738.54  687.38   630.4  584.59  527.11  488.25
267          UI  433.57  378.62  326.89  304.77  287.14  266.74  236.35  204.63  170.83  159.16
268          UI  146.15  136.42   134.8    95.5    95.5    95.5   80.94   60.95   60.95   60.95
269          UI   60.95   60.95   33.03   23.87   23.87   23.87   23.87   23.87   23.87   23.87
270          UI   23.87   23.87   23.87   23.87   23.87   23.87     0.0

271          KK   CPL12   CNAME    RL12
272          HC       2

273          KK    RL12   CNAME   CPL12
274          RS       3    FLOW     0.0     0.0
275          RC    0.07   0.058    0.07 3790.81  0.0322     0.0
             * RL12
276          RX     0.0   78.73  196.83  216.52   236.2  255.88  295.25  433.03
277          RY  2492.8 2485.18 2457.72 2453.45 2451.39 2456.29 2459.78 2496.25
```



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

278          KK     L11
279          BA  0.6253
280          LG    0.35    0.35   4.188   0.405     0.0
             * L11
281          UI     0.0   116.8   116.8  342.78  536.02  730.03   859.9 1020.16 1356.73   962.8
282          UI  746.81  667.83  596.19  535.45  472.75  412.55  340.52  294.28  272.36   247.1
283          UI  197.62  165.09  149.12  127.92  123.59   89.55   89.55   76.31   57.16   57.16
284          UI   57.16   51.17   22.39   22.39   22.39   22.39   22.39   22.39   22.39   22.39
285          UI   22.39   22.39     0.0

286          KK   CPL11   CNAME    RL11
287          HC       2

288          KK    LT5B
289          BA  0.9493
290          LG    0.35    0.35   3.547    0.57     0.0
             * LT5B
291          UI     0.0  128.92  128.92  164.89  390.04  535.03  722.26  834.54  946.81 1040.22
292          UI  1263.8 1551.4 1114.87  884.88  786.45  735.36  675.01  625.82  573.95  525.48
293          UI  477.95   422.3  366.77  328.43  309.33  294.27  269.55   228.0  211.79  165.48
294          UI  164.73  147.02  141.19  134.87   98.84   98.84   98.84   83.45   63.09   63.09
295          UI   63.09   63.09   63.09   39.91   24.71   24.71   24.71   24.71   24.71   24.71
296          UI   24.71   24.71   24.71   24.71   24.71   24.71   24.71   24.71

297          KK   RLT5B   CNAME  CPLT5B
298          RS       3    FLOW     0.0     0.0
299          RC    0.07   0.058    0.07 4915.04  0.0608     0.0
             * RLT5B
300          RX     0.0   60.52  141.21  161.39  181.56  201.73  322.77  363.12
301          RY  2580.1 2556.26 2502.89 2469.14 2499.58 2510.69 2580.67 2587.78

302          KK    LT5A
303          BA   0.979
304          LG    0.35    0.35   2.892    0.86     0.0
             * LT5A
305          UI     0.0  124.55  124.55  124.55  347.84  475.06  636.18  767.67  866.54  952.36
306          UI  1071.7 1317.38 1475.78  983.72  840.04  754.04   709.5   654.9   608.6  564.58
307          UI   515.6  482.99  424.37  380.25  329.26  305.55  291.52  276.05  260.41  207.74
308          UI  200.47  159.14  159.14  143.02  136.41  136.41   98.35   95.48   95.48   95.48
309          UI   62.34   60.95   60.95   60.95   60.95   60.95   33.52   23.87   23.87   23.87
310          UI   23.87   23.87   23.87   23.87   23.87   23.87   23.87   23.87   23.87   23.87
311          UI   23.87   23.87

312          KK  CPLT5A   CNAME   RLT5A
313          HC       2

314          KK     L10 DUMMY BASIN FOR WMS MODELING PURPOSES
315          BA   0.002
316          LG     0.0     0.0     0.0     1.2     0.0
             * DUMMY UNIT HYDROGRAPH
317          UI     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
```



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

318          KK   CPL10   CNAME    RL10
319          HC       3

320          KK    RL10   CNAME   CPL10
321          RS       1    FLOW     0.0     0.0
322          RC    0.07   0.058    0.07  1478.0  0.0264     0.0
             * RL10
323          RX     0.0   79.33  198.33  218.17   238.0  257.83  317.33  376.83
324          RY  2394.0 2374.66 2362.23 2355.43 2361.55 2367.68 2385.01 2394.48

325          KK      L9
```

```
326          BA  0.4169
327          LG    0.35   0.375   6.499   0.157     0.0
             * L9
328          UI     0.0   82.57   89.54  266.27  413.72  541.37  635.18  808.61  892.57  578.48
329          UI  491.89  439.44  393.26  343.55  299.91  246.81  209.12  192.76  174.11  136.39
330          UI  111.84  101.59   90.43   77.55    63.3    63.3   42.12   40.41   40.41   40.41
331          UI   17.55   15.83   15.83   15.83   15.83   15.83   15.83   15.83   15.83   15.83

332          KK    CPL9   CNAME     RL9
333          HC       2

334          KK     RL9   CNAME    CPL9
335          RS       3    FLOW     0.0     0.0
336          RC    0.07   0.058    0.07 3019.11  0.0209     0.0
             * RL9
337          RX     0.0   442.5  482.72  502.84  522.95  543.06  724.08  945.33
338          RY  2327.2 2320.48 2313.07 2306.53 2307.79 2313.03 2322.32 2345.25

339          KK      L8
340          BA   0.643
341          LG    0.35    0.39   5.712     0.2     0.0
             * L8
342          UI     0.0  144.33  218.75  533.21  841.88 1049.13 1302.89 1594.58 1014.32  847.02
343          UI  744.19  652.58  562.51  465.75  370.76  338.84  297.58  234.48  184.42  165.98
344          UI  152.15  110.65  110.65   75.63   70.63   70.63   55.59   27.66   27.66   27.66
345          UI   27.66   27.66   27.66   27.66   27.66     0.0

346          KK    CPL8   CNAME     RL8
347          HC       2

348          KK     RL8   CNAME    CPL8
349          RS       6    FLOW     0.0     0.0
350          RC    0.07   0.058    0.07  6667.4  0.0199     0.0
             * RL8
351          RX     0.0  141.93  162.21  182.48  202.76  223.04  344.39  527.17
352          RY  2225.1 2201.33 2197.82 2188.61 2189.17 2189.71 2194.04  2237.0

353          KK      L7
354          BA  0.7425
355          LG    0.35   0.358   6.839   0.121     0.0
             * L7
356          UI     0.0  108.69  108.69  181.04  357.81  499.99  658.32  753.55  839.87  987.05
357          UI  1277.3 1017.48  760.68  664.68  617.64  562.88  518.82  471.86   429.2  384.53
```



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

358          UI   333.1  284.87  265.39   250.0  229.88  197.07  178.17  138.89  138.89  120.24
359          UI  119.05   100.3   83.33   83.33   81.07   53.19   53.19   53.19   53.19   53.19
360          UI   31.51   20.83   20.83   20.83   20.83   20.83   20.83   20.83   20.83   20.83
361          UI   20.83   20.83   20.83   20.83

362          KK    CPL7   CNAME     RL7
363          HC       2

364          KK      L6 DUMMY BASIN FOR WMS MODELING PURPOSES
365          BA   0.002
366          LG    0.35    0.35    2.45     1.2     0.0
             * DUMMY UNIT HYDROGRAPH
367          UI     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0

368          KK    CPL6   CNAME     RL6
369          HC       3

370          KK     RL6   CNAME    CPL6
371          RS       4    FLOW     0.0     0.0
372          RC    0.07   0.058    0.07  3643.0  0.0184     0.0
             * RL6
373          RX     0.0  199.17   358.5  617.42  677.17  744.51   956.0  975.92
374          RY  2148.7 2125.63 2125.51 2117.82 2119.37 2128.13 2152.97 2157.86

375          KK      L5
376          BA  0.2875
377          LG    0.35    0.38   5.396   0.218   2.952
             * L5
378          UI     0.0   66.33   106.3  252.83  400.05   491.8  631.85  690.28  443.62  379.34
379          UI  330.61  286.34  245.43  196.14  165.04  147.99  123.03   96.74   82.44   72.65
380          UI   58.29   50.86   42.22   32.46   32.46   31.69   12.71   12.71   12.71   12.71
381          UI   12.71   12.71   12.71   12.71     0.0

382          KK    CPL5   CNAME     RL5
383          HC       2

384          KK      L4 DUMMY BASIN FOR WMS MODELING PURPOSES
385          BA   0.002
386          LG    0.35    0.35    2.45     1.2     0.0
             * DUMMY UNIT HYDROGRAPH
387          UI     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0

388          KK    CPL4   CNAME     RL4
389          HC       3

390          KK     RL4   CNAME    CPL4
391          RS       9    FLOW     0.0     0.0
392          RC    0.07   0.058    0.07  8236.8  0.0193     0.0
             * RL4
393          RX     0.0  477.52  616.79  636.69  656.59  676.49  955.04 1333.07
394          RY  2038.7 2021.04 2006.79 1997.35 1995.84 2001.65 2011.99 2072.93
```

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

 395          KK      L3
 396          BA  0.6207
 397          LG   0.269    0.27   7.353   0.114  31.465
              * L3
 398          UI     0.0   74.52   74.52   74.52  182.74  260.85  341.43  441.26  491.49   548.5
 399          UI  592.52   694.2  856.57  800.55  562.39  490.83  445.81  422.18  391.37  364.77
 400          UI  341.94  311.18  292.08  263.84  236.66  205.53  189.17  179.97  171.39  158.72
 401          UI  146.79  122.42  114.07   95.22   95.22   84.57   81.61   81.61    61.1   57.13
 402          UI   57.13   57.13    44.1   36.47   36.47   36.47   36.47   36.47   35.59   14.28
 403          UI   14.28   14.28   14.28   14.28   14.28   14.28   14.28   14.28   14.28   14.28
 404          UI   14.28   14.28   14.28   14.28   14.28     0.0

 405          KK    CPL3   CNAME     RL3
 406          HC       2

 407          KK      L2 DUMMY BASIN FOR WMS MODELING PURPOSES
 408          BA   0.002
 409          LG     0.1     0.3    2.45     1.2    80.0
              * DUMMY UNIT HYDROGRAPH
 410          UI     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0

 411          KK    CPL2   CNAME     RL2
 412          HC       3

 413          KK     RL2   CNAME    CPL2
 414          RS       3    FLOW     0.0     0.0
 415          RC    0.07   0.058    0.07 4673.32  0.0189     0.0
              * RL2
 416          RX     0.0   80.12   140.2  160.23  180.26  200.29   340.5  400.58
 417          RY  1996.6 1944.97 1890.35 1868.85 1869.02 1880.52 1950.84 1964.03

 418          KK      L1
 419          BA  0.4708
 420          LG   0.254   0.286    6.81   0.142  31.023
              * L1
 421          UI     0.0   83.43   83.43  215.32  351.79  503.17  589.31  675.47  876.31  871.44
 422          UI   584.3  502.18  456.45  410.54  367.99   328.5  281.75  237.05  208.27  193.66
 423          UI   176.1   142.3  120.92   106.6   94.12   91.37   68.76   63.96   63.96   41.41
 424          UI   40.83   40.83   40.83   28.16   15.99   15.99   15.99   15.99   15.99   15.99
 425          UI   15.99   15.99   15.99   15.99     0.0

 426          KK    CPL1   CNAME     RL1
 427          HC       2

 428          KK     RL1   CNAME    CPL1
 429          RN     RL1
 430          ZZ
```

1

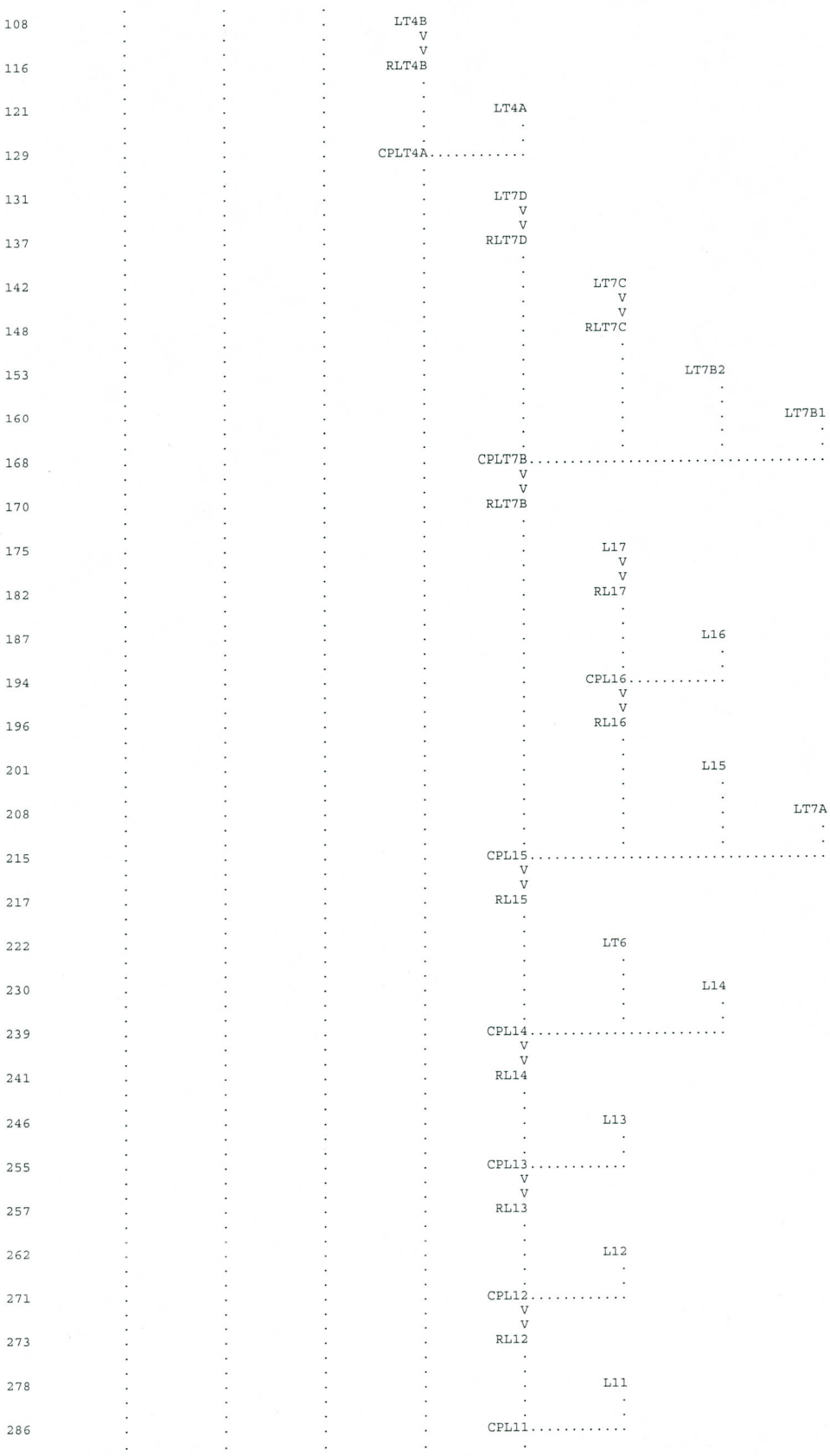
SCHEMATIC DIAGRAM OF STREAM NETWORK

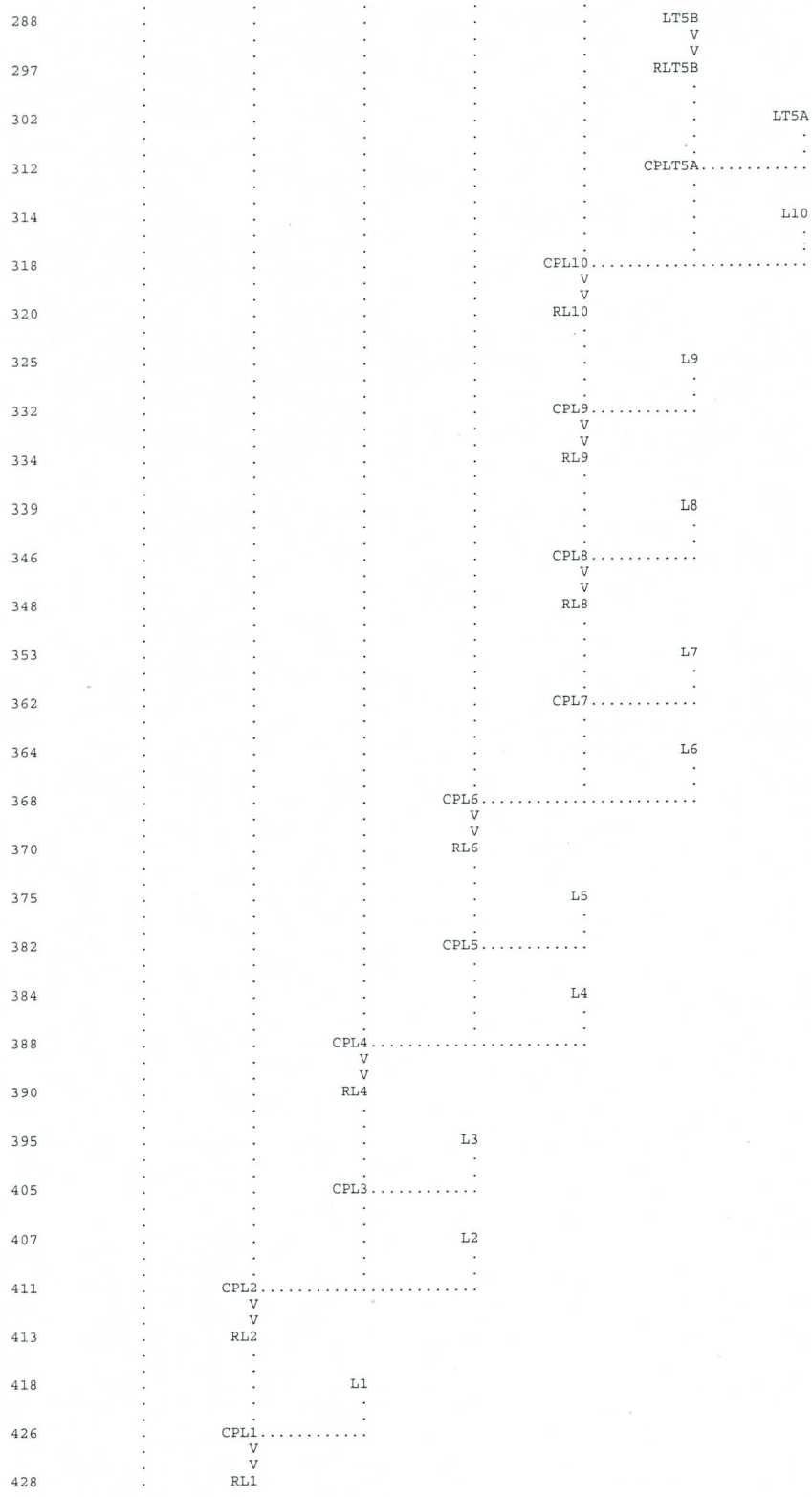
INPUT LINE NO.

(V) ROUTING (---->) DIVERSION OR PUMP FLOW

(.) CONNECTOR (<----) RETURN OF DIVERTED OR PUMPED FLOW

```
 31        LT1C
             V
             V
 40       RLT1C
             .
             .
 45          .        LT1B
             .          .
             .          .
 52       CPLT1B.............
             V
             V
 54       RLT1B
             .
             .
 59          .        LT1A
             .          .
             .          .
 68       CPLT1A.............
             V
             V
 70       RLT1A
             .
             .
 72          .         LT2
             .           V
             .           V
 81          .        RLT2
             .          .
             .          .
 83          .          .        LT3B
             .          .          V
             .          .          V
 92          .          .       RLT3B
             .          .          .
             .          .          .
 97          .          .          .        LT3A
             .          .          .          .
             .          .          .          .
106          .          .      CPLT3A.............
             .          .          .
```


108
LT4B
116
RLT4B
121
LT4A
129
CPLT4A
131
LT7D
137
RLT7D
142
LT7C
148
RLT7C
153
LT7B2
160
LT7B1
168
CPLT7B
170
RLT7B
175
L17
182
RL17
187
L16
194
CPL16
196
RL16
201
L15
208
LT7A
215
CPL15
217
RL15
222
LT6
230
L14
239
CPL14
241
RL14
246
L13
255
CPL13
257
RL13
262
L12
271
CPL12
273
RL12
278
L11
286
CPL11



(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1*****************************************
 *                                       *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
 *             JUN  1998                 *
 *          VERSION 4.1                  *
```

```
*****************************************
*                                       *
*    U.S. ARMY CORPS OF ENGINEERS       *
*    HYDROLOGIC ENGINEERING CENTER      *
*          609 SECOND STREET            *
```

```
*                                       *
*  RUN DATE   11MAR03  TIME  10:48:09    *
*                                       *
*****************************************
```


```
*        DAVIS, CALIFORNIA 95616        *
*           (916) 756-1104              *
*                                       *
*****************************************
```


Little Squaw Creek, Upper Agua Fria Watershed Zone A Floodplain Delineation
RBF Consulting for the FCD of Maricopa County, 3/11/2003
FCD2000C020, HEC-1 Created using WMS 6.1. See WMS Files for more notes

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

    IT          HYDROGRAPH TIME DATA
                     NMIN           2  MINUTES IN COMPUTATION INTERVAL
                     IDATE      1JAN94  STARTING DATE
                     ITIME        0000  STARTING TIME
                     NQ            300  NUMBER OF HYDROGRAPH ORDINATES
                     NDDATE     1JAN94  ENDING DATE
                     NDTIME       0958  ENDING TIME
                     ICENT          19  CENTURY MARK

                   COMPUTATION INTERVAL      .03 HOURS
                      TOTAL TIME BASE     9.97 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

  7 JD          INDEX STORM NO. 1
                     STRM        3.55  PRECIPITATION DEPTH
                     TRDA         .00  TRANSPOSITION DRAINAGE AREA

  8 PI            PRECIPITATION PATTERN
                    .11       .11       .11       .11       .11       .11       .11       .11       .11       .11
                    .11       .11       .11       .11       .11       .12       .12       .12       .12       .12
                    .12       .12       .11       .11       .11       .11       .11       .11       .11       .11
                    .11       .11       .11       .11       .11       .11       .11       .11       .12       .12
                    .12       .12       .12       .12       .12       .11       .11       .11       .11       .11
                    .11       .11       .11       .11       .11       .11       .11       .11       .11       .11
                    .11       .11       .11       .11       .11       .11       .11       .14       .17       .17
                    .17       .17       .17       .17       .17       .16       .16       .16       .16       .16
                    .16       .16       .21       .25       .25       .25       .25       .25       .25       .25
                    .27       .27       .27       .27       .27       .27       .27       .65      1.04      1.04
                   1.04      1.04      1.04      1.04      1.04      2.15      2.15      2.15      2.15      2.15
                   2.15      2.15      4.12      6.09      6.09      6.09      6.09      6.09      6.09      6.09
                   1.03      1.03      1.03      1.03      1.03      1.03      1.03       .65       .27       .27
                    .27       .27       .27       .27       .27       .25       .25       .25       .25       .25
                    .25       .25       .21       .16       .16       .16       .16       .16       .16       .16
                    .13       .13       .13       .13       .13       .13       .13       .14       .15       .15
                    .15       .15       .15       .15       .15       .11       .11       .11       .11       .11
                    .11       .11       .11       .12       .12       .12       .12       .12       .12       .12

 12 JD          INDEX STORM NO. 2
                     STRM        3.53  PRECIPITATION DEPTH
                     TRDA         .50  TRANSPOSITION DRAINAGE AREA

 13 PI            PRECIPITATION PATTERN
                    .11       .11       .11       .11       .11       .11       .11       .11       .11       .11
                    .11       .11       .11       .11       .11       .12       .12       .12       .12       .12
                    .12       .12       .11       .11       .11       .11       .11       .11       .11       .11
                    .11       .11       .11       .11       .11       .11       .11       .11       .12       .12
                    .12       .12       .12       .12       .12       .11       .11       .11       .11       .11
                    .11       .11       .11       .11       .11       .11       .11       .11       .11       .11
                    .11       .11       .11       .11       .11       .11       .11       .14       .17       .17
                    .17       .17       .17       .17       .17       .16       .16       .16       .16       .16
                    .16       .16       .21       .25       .25       .25       .25       .25       .25       .25
                    .27       .27       .27       .27       .27       .27       .27       .65      1.04      1.04
                   1.04      1.04      1.04      1.04      1.04      2.15      2.15      2.15      2.15      2.15
                   2.15      2.15      4.12      6.09      6.09      6.09      6.09      6.09      6.09      6.09
                   1.03      1.03      1.03      1.03      1.03      1.03      1.03       .65       .27       .27
                    .27       .27       .27       .27       .27       .25       .25       .25       .25       .25
                    .25       .25       .21       .16       .16       .16       .16       .16       .16       .16
                    .13       .13       .13       .13       .13       .13       .13       .14       .15       .15
                    .15       .15       .15       .15       .15       .11       .11       .11       .11       .11
                    .11       .11       .11       .12       .12       .12       .12       .12       .12       .12

 17 JD          INDEX STORM NO. 3
                     STRM        3.46  PRECIPITATION DEPTH
                     TRDA        2.80  TRANSPOSITION DRAINAGE AREA

 18 PI            PRECIPITATION PATTERN
                    .12       .12       .12       .12       .12       .12       .12       .11       .09       .09
                    .09       .09       .09       .09       .09       .12       .12       .12       .12       .12
                    .12       .12       .12       .12       .12       .12       .12       .12       .12       .12
                    .11       .11       .11       .11       .11       .11       .11       .11       .12       .12
                    .12       .12       .12       .12       .12       .11       .11       .11       .11       .11
                    .11       .11       .11       .11       .11       .11       .11       .11       .11       .11
                    .12       .12       .12       .12       .12       .12       .12       .13       .15       .15
```

.15	.15	.15	.15	.15	.17	.17	.17	.17	.17
.17	.17	.22	.27	.27	.27	.27	.27	.27	.27
.57	.57	.57	.57	.57	.57	.57	.88	1.19	1.19
1.19	1.19	1.19	1.19	1.19	2.65	2.65	2.65	2.65	2.65
2.65	2.65	2.95	3.24	3.24	3.24	3.24	3.24	3.24	3.24
1.91	1.91	1.91	1.91	1.91	1.91	1.91	1.37	.84	.84
.84	.84	.84	.84	.84	.51	.51	.51	.51	.51
.51	.51	.33	.16	.16	.16	.16	.16	.16	.16
.17	.17	.17	.17	.17	.17	.17	.17	.16	.16
.16	.16	.16	.16	.16	.17	.17	.17	.17	.17
.17	.17	.17	.16	.16	.16	.16	.16	.16	.16

22 JD INDEX STORM NO. 4
STRM 3.28 PRECIPITATION DEPTH
TRDA 16.00 TRANSPOSITION DRAINAGE AREA

23 PI PRECIPITATION PATTERN

.20	.20	.20	.20	.20	.20	.20	.13	.07	.07
.07	.07	.07	.07	.07	.13	.13	.13	.13	.13
.13	.13	.19	.24	.24	.24	.24	.24	.24	.24
.20	.20	.20	.20	.20	.20	.20	.19	.17	.17
.17	.17	.17	.17	.17	.19	.19	.19	.19	.19
.19	.19	.19	.20	.20	.20	.20	.20	.20	.20
.19	.19	.19	.19	.19	.19	.19	.20	.21	.21
.21	.21	.21	.21	.21	.23	.23	.23	.23	.23
.23	.23	.27	.31	.31	.31	.31	.31	.31	.31
.63	.63	.63	.63	.63	.63	.63	.86	1.09	1.09
1.09	1.09	1.09	1.09	1.09	2.24	2.24	2.24	2.24	2.24
2.24	2.24	2.44	2.64	2.64	2.64	2.64	2.64	2.64	2.64
1.68	1.68	1.68	1.68	1.68	1.68	1.68	1.32	.96	.96
.96	.96	.96	.96	.96	.59	.59	.59	.59	.59
.59	.59	.52	.45	.45	.45	.45	.45	.45	.45
.19	.19	.19	.19	.19	.19	.19	.18	.17	.17
.17	.17	.17	.17	.17	.19	.19	.19	.19	.19
.19	.19	.18	.17	.17	.17	.17	.17	.17	.17

27 JD INDEX STORM NO. 5
STRM 2.84 PRECIPITATION DEPTH
TRDA 90.00 TRANSPOSITION DRAINAGE AREA

28 PI PRECIPITATION PATTERN

.28	.28	.28	.28	.28	.28	.28	.23	.19	.19
.19	.19	.19	.19	.19	.21	.21	.21	.21	.21
.21	.21	.24	.27	.27	.27	.27	.27	.27	.27
.21	.21	.21	.21	.21	.21	.21	.23	.24	.24
.24	.24	.24	.24	.24	.27	.27	.27	.27	.27
.27	.27	.25	.24	.24	.24	.24	.24	.24	.24
.23	.23	.23	.23	.23	.23	.23	.24	.25	.25
.25	.25	.25	.25	.25	.29	.29	.29	.29	.29
.29	.29	.35	.41	.41	.41	.41	.41	.41	.41
.65	.65	.65	.65	.65	.65	.65	.88	1.11	1.11
1.11	1.11	1.11	1.11	1.11	1.81	1.81	1.81	1.81	1.81
1.81	1.81	1.96	2.11	2.11	2.11	2.11	2.11	2.11	2.11
1.53	1.53	1.53	1.53	1.53	1.53	1.53	1.22	.91	.91
.91	.91	.91	.91	.91	.63	.63	.63	.63	.63
.63	.63	.57	.52	.52	.52	.52	.52	.52	.52
.24	.24	.24	.24	.24	.24	.24	.25	.25	.25
.25	.25	.25	.25	.25	.24	.24	.24	.24	.24
.24	.24	.24	.24	.24	.24	.24	.24	.24	.24

WARNING EXCESS AT PONDING LESS THAN ZERO FOR PERIOD. EXCESS SET TO ZERO
WARNING EXCESS AT PONDING LESS THAN ZERO FOR PERIOD. EXCESS SET TO ZERO

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	LT1C	1005.	4.20	104.	62.	62.	.50		
+	ROUTED TO	RLT1C	973.	4.27	104.	62.	62.	.50		
+	HYDROGRAPH AT	LT1B	1311.	4.13	119.	72.	72.	.57		
+	2 COMBINED AT	CPLT1B	1849.	4.20	210.	127.	127.	1.07		
+	ROUTED TO	RLT1B	1710.	4.47	210.	127.	127.	1.07		
+	HYDROGRAPH AT	LT1A	1484.	4.23	198.	120.	120.	.81		
+	2 COMBINED AT	CPLT1A	2462.	4.40	390.	236.	236.	1.88		
+	ROUTED TO	RLT1A	2462.	4.40	390.	236.	236.	1.88		
+	HYDROGRAPH AT	LT2	1540.	4.20	205.	124.	124.	.73		
+	ROUTED TO	RLT2	1540.	4.20	205.	124.	124.	.73		

+ HYDROGRAPH AT	LT3B	1071.	4.23	117.	70.	70.	.58
+ ROUTED TO	RLT3B	1031.	4.37	117.	70.	70.	.58
+ HYDROGRAPH AT	LT3A	1135.	4.20	118.	71.	71.	.58
+ 2 COMBINED AT	CPLT3A	1716.	4.30	222.	134.	134.	1.16
+ HYDROGRAPH AT	LT4B	1393.	4.20	151.	91.	91.	.67
+ ROUTED TO	RLT4B	1331.	4.37	151.	91.	91.	.67
+ HYDROGRAPH AT	LT4A	1731.	4.17	188.	113.	113.	.75
+ 2 COMBINED AT	CPLT4A	2332.	4.23	329.	198.	198.	1.41
+ HYDROGRAPH AT	LT7D	1868.	4.10	145.	87.	87.	.67
+ ROUTED TO	RLT7D	1805.	4.17	145.	87.	87.	.67
+ HYDROGRAPH AT	LT7C	1477.	4.10	113.	68.	68.	.51
+ ROUTED TO	RLT7C	1403.	4.20	113.	68.	68.	.51
+ HYDROGRAPH AT	LT7B2	1509.	4.13	131.	79.	79.	.60
+ HYDROGRAPH AT	LT7B1	1465.	4.17	156.	94.	94.	.72
+ 4 COMBINED AT	CPLT7B	3979.	4.17	504.	303.	303.	2.49
+ ROUTED TO	RLT7B	3925.	4.23	504.	303.	303.	2.49
+ HYDROGRAPH AT	L17	1998.	4.13	188.	113.	113.	.87
+ ROUTED TO	RL17	1966.	4.17	188.	113.	113.	.87
+ HYDROGRAPH AT	L16	1441.	4.13	130.	78.	78.	.67
+ 2 COMBINED AT	CPL16	2769.	4.17	302.	182.	182.	1.54
+ ROUTED TO	RL16	2689.	4.27	302.	182.	182.	1.54
+ HYDROGRAPH AT	L15	1622.	4.13	136.	82.	82.	.78
+ HYDROGRAPH AT	LT7A	979.	4.13	83.	50.	50.	.43
+ 4 COMBINED AT	CPL15	6648.	4.23	911.	549.	549.	5.24
+ ROUTED TO	RL15	6551.	4.37	911.	549.	549.	5.24
+ HYDROGRAPH AT	LT6	976.	4.17	84.	50.	50.	.61
+ HYDROGRAPH AT	L14	872.	4.20	78.	47.	47.	.82
+ 3 COMBINED AT	CPL14	6855.	4.33	959.	577.	577.	6.67
+ ROUTED TO	RL14	6791.	4.40	959.	577.	577.	6.67
+ HYDROGRAPH AT	L13	893.	4.23	83.	50.	50.	.75
+ 2 COMBINED AT	CPL13	6884.	4.40	979.	589.	589.	7.43
+ ROUTED TO	RL13	6847.	4.43	979.	589.	589.	7.43
+ HYDROGRAPH AT	L12	1053.	4.23	105.	63.	63.	.89

2 COMBINED AT	CPL12	7042.	4.43	1017.	612.	612.	8.32
ROUTED TO	RL12	6981.	4.50	1017.	612.	612.	8.32
HYDROGRAPH AT	L11	1210.	4.17	104.	63.	63.	.63
2 COMBINED AT	CPL11	7212.	4.50	1073.	646.	646.	8.95
HYDROGRAPH AT	LT5B	1226.	4.23	132.	79.	79.	.95
ROUTED TO	RLT5B	1197.	4.33	132.	79.	79.	.95
HYDROGRAPH AT	LT5A	1039.	4.27	112.	67.	67.	.98
2 COMBINED AT	CPLT5A	1699.	4.30	207.	125.	125.	1.93
HYDROGRAPH AT	L10	0.	.00	0.	0.	0.	.00
3 COMBINED AT	CPL10	7736.	4.50	1170.	704.	704.	10.88
ROUTED TO	RL10	7680.	4.53	1170.	704.	704.	10.88
HYDROGRAPH AT	L9	985.	4.13	85.	51.	51.	.42
2 COMBINED AT	CPL9	7898.	4.50	1225.	737.	737.	11.29
ROUTED TO	RL9	7802.	4.60	1225.	737.	737.	11.29
HYDROGRAPH AT	L8	1489.	4.13	123.	74.	74.	.64
2 COMBINED AT	CPL8	8001.	4.57	1299.	782.	782.	11.94
ROUTED TO	RL8	7730.	4.73	1299.	782.	782.	11.94
HYDROGRAPH AT	L7	1387.	4.20	157.	94.	94.	.74
2 COMBINED AT	CPL7	8027.	4.73	1409.	848.	848.	12.68
HYDROGRAPH AT	L6	0.	.00	0.	0.	0.	.00
3 COMBINED AT	CPL6	8779.	4.73	1664.	1003.	1003.	14.09
ROUTED TO	RL6	8633.	4.83	1664.	1003.	1003.	14.09
HYDROGRAPH AT	L5	724.	4.13	58.	35.	35.	.29
2 COMBINED AT	CPL5	8643.	4.83	1698.	1023.	1023.	14.38
HYDROGRAPH AT	L4	0.	.00	0.	0.	0.	.00
3 COMBINED AT	CPL4	9053.	4.83	1843.	1110.	1110.	15.54
ROUTED TO	RL4	8838.	5.03	1842.	1110.	1110.	15.54
HYDROGRAPH AT	L3	1176.	4.27	171.	103.	103.	.62
2 COMBINED AT	CPL3	9036.	5.03	1968.	1190.	1190.	16.16
HYDROGRAPH AT	L2	0.	.00	0.	0.	0.	.00
3 COMBINED AT	CPL2	9209.	5.03	2122.	1286.	1286.	16.89
ROUTED TO	RL2	9158.	5.10	2122.	1286.	1286.	16.89
HYDROGRAPH AT	L1	1150.	4.17	127.	77.	77.	.47

+	2 COMBINED AT	CPL1	9190.	5.10	2209.	1341.	1341.	17.36
+	ROUTED TO	RL1	9190.	5.10	2209.	1341.	1341.	17.36

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

HEC-1 Output File
Wash 8N2ES16

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1****************************************
 *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
 *             JUN  1998                *
 *           VERSION 4.1                *
 *                                      *
 *  RUN DATE   11MAR03  TIME  11:09:23  *
 *                                      *
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*                                      *
*    U.S. ARMY CORPS OF ENGINEERS      *
*    HYDROLOGIC ENGINEERING CENTER     *
*          609 SECOND STREET           *
*        DAVIS, CALIFORNIA 95616       *
*          (916) 756-1104              *
*                                      *
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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
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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

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

   1          ID  Wash 8N2ES16, Upper Agua Fria Watershed Zone A Floodplain Delineation
   2          ID  RBF Consulting, for the FCD of Maricopa County, 3/11/03, FCD 2000C020
   3          ID  HEC-1 created using WMS 6.1, For additional notes and details see WMS Files
              *DIAGRAM
   4          IT       2  1JAN94       0     300
   5          IO       5
   6          IN      15  1JAN94       0
   7          JD    3.55  0.0001
              * Pattern 1
   8          PC     0.0     0.8     1.6     2.5     3.3     4.1     5.0     5.8     6.6     7.4
   9          PC     8.7     9.9    11.8    13.8    21.6    37.7    83.4    91.1    93.1    95.0
  10          PC    96.2    97.2    98.3    99.1   100.0
  11          IN      15  1JAN94       0
  12          JD    3.53     0.5
              * Pattern 1
  13          PC     0.0     0.8     1.6     2.5     3.3     4.1     5.0     5.8     6.6     7.4
  14          PC     8.7     9.9    11.8    13.8    21.6    37.7    83.4    91.1    93.1    95.0
  15          PC    96.2    97.2    98.3    99.1   100.0
  16          IN      15  1JAN94       0
  17          JD    3.46     2.8
              * Pattern 2
  18          PC     0.0     0.9     1.6     2.5     3.4     4.2     5.1     5.9     6.7     7.6
  19          PC     8.7    10.0    12.0    16.3    25.2    45.1    69.4    83.7    90.0    93.8
  20          PC    95.0    96.3    97.5    98.8   100.0

  21          KK     BC3
  22          BA  0.5628
  23          LG    0.35   0.397   5.945   0.185     0.0
              * BC3
  24          UI     0.0  118.43  153.96  403.14  644.06  817.38  968.32 1329.28  1013.3  748.73
  25          UI  662.76  584.61  511.83   445.3  368.09  302.09  277.26  247.49  194.57  154.79
  26          UI  140.95  129.71   98.58    90.8   77.66   57.96   57.96   57.96   35.39    22.7
  27          UI    22.7    22.7    22.7    22.7    22.7    22.7    22.7     0.0

  28          KK    RBC3   CNAME   CPBC3
  29          RS       7    FLOW     0.0     0.0
  30          RC    0.07   0.058    0.07 4319.83  0.0152     0.0
              * RBC3
  31          RX     0.0   78.67  118.01  137.68  157.35  177.02  236.03  255.69
  32          RY  1971.7 1953.14 1947.75 1941.79 1944.75 1948.24 1962.32 1964.83

  33          KK     BC2
  34          BA  0.6351
  35          LG    0.35    0.38     5.5   0.217     0.0
              * BC2
  36          UI     0.0   96.92   96.92  180.98  332.51  480.58  604.87  695.18  776.65  962.68
  37          UI  1143.2  755.27  629.04  570.02  522.66  476.54  435.23  393.27  352.89  309.39
  38          UI  259.61  237.82  223.94  206.21  176.12  156.87  123.84  122.42  106.15  106.15
  39          UI   81.83   74.31   74.31    62.1   47.43   47.43   47.43   47.43   39.67   18.58
  40          UI   18.58   18.58   18.58   18.58   18.58   18.58   18.58   18.58   18.58   18.58
  41          UI   18.58     0.0
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1 HEC-1 INPUT PAGE 2

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

  42          KK   CPBC2   CNAME    RBC2
  43          HC       2

  44          KK    RBC2   CNAME   CPBC2
  45          RS       5    FLOW     0.0     0.0
  46          RC    0.07   0.058    0.07 5902.39  0.0245     0.0
              * RBC2
  47          RX     0.0   78.67  118.01  137.68  157.35  177.02  236.03  255.69
  48          RY  1971.7 1953.14 1947.75 1941.79 1944.75 1948.24 1962.32 1964.83

  49          KK     BC1
  50          BA   0.784
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          51          LG   0.346    0.38   5.628   0.208   1.372
                      * BC1
          52          UI     0.0  114.77  114.77  191.16   377.8  527.94  695.12  795.66  886.82 1042.22
          53          UI  1348.7 1074.35   803.2  701.83  652.16  594.34  547.81  498.24  453.19  406.02
          54          UI  351.72  300.79  280.23  263.97  242.73  208.09  188.13  146.65  146.65  126.96
          55          UI   125.7   105.9   87.99   87.99   85.6   56.16   56.16   56.16   56.16   56.16
          56          UI   33.27    22.0    22.0    22.0    22.0    22.0    22.0    22.0    22.0    22.0
          57          UI    22.0    22.0    22.0    22.0

          58          KK   CPBC1   CNAME    RBC1
          59          KM            WASH 8N2ES21, REACH 1, PEAK FLOW FOR FLOODPLAIN DELINEATION
          60          HC       2
          61          ZZ
1
                 SCHEMATIC DIAGRAM OF STREAM NETWORK

 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

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

    21         BC3
               V
               V
    28        RBC3
              .
              .
    33        .          BC2
              .            .
              .            .
    42       CPBC2.............
               V
               V
    44        RBC2
              .
              .
    49        .          BC1
              .            .
              .            .
    58       CPBC1.............

 (***) RUNOFF ALSO COMPUTED AT THIS LOCATION
1*****************************************
 *                                       *
 *    FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
 *                JUN  1998              *
 *             VERSION 4.1               *
 *                                       *
 *  RUN DATE   11MAR03  TIME  11:09:23   *
 *                                       *
 *****************************************

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

                        Wash 8N2ES16, Upper Agua Fria Watershed Zone A Floodplain Delineation
                        RBF Consulting, for the FCD of Maricopa County, 3/11/03, FCD 2000C020
                        HEC-1 created using WMS 6.1, For additional notes and details see WMS Files

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

      IT          HYDROGRAPH TIME DATA
                         NMIN          2  MINUTES IN COMPUTATION INTERVAL
                        IDATE      1JAN94  STARTING DATE
                        ITIME        0000  STARTING TIME
                           NQ         300  NUMBER OF HYDROGRAPH ORDINATES
                       NDDATE      1JAN94  ENDING DATE
                       NDTIME        0958  ENDING TIME
                       ICENT          19  CENTURY MARK

                     COMPUTATION INTERVAL      .03 HOURS
                         TOTAL TIME BASE     9.97 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

    7 JD            INDEX STORM NO. 1
                          STRM       3.55  PRECIPITATION DEPTH
                          TRDA        .00  TRANSPOSITION DRAINAGE AREA

    8 PI              PRECIPITATION PATTERN
                       .11     .11     .11     .11     .11     .11     .11     .11     .11     .11
                       .11     .11     .11     .11     .11     .12     .12     .12     .12     .12
                       .12     .12     .11     .11     .11     .11     .11     .11     .11     .11
                       .11     .11     .11     .11     .11     .11     .11     .11     .12     .12
                       .12     .12     .12     .12     .12     .11     .11     .11     .11     .11
                       .11     .11     .11     .11     .11     .11     .11     .11     .11     .11
                       .11     .11     .11     .11     .11     .11     .11     .14     .17     .17
                       .17     .17     .17     .17     .17     .16     .16     .16     .16     .16
                       .16     .16     .21     .25     .25     .25     .25     .25     .25     .25
                       .27     .27     .27     .27     .27     .27     .27     .65    1.04    1.04
                      1.04    1.04    1.04    1.04    1.04    2.15    2.15    2.15    2.15    2.15
                      2.15    2.15    4.12    6.09    6.09    6.09    6.09    6.09    6.09    6.09
                      1.03    1.03    1.03    1.03    1.03    1.03    1.03     .65     .27     .27
                       .27     .27     .27     .27     .27     .25     .25     .25     .25     .25
                       .25     .25     .21     .16     .16     .16     .16     .16     .16     .16
                       .13     .13     .13     .13     .13     .13     .13     .14     .15     .15
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.15	.15	.15	.15	.15	.11	.11	.11	.11	.11
.11	.11	.11	.12	.12	.12	.12	.12	.12	.12

12 JD INDEX STORM NO. 2
STRM 3.53 PRECIPITATION DEPTH
TRDA .50 TRANSPOSITION DRAINAGE AREA

13 PI PRECIPITATION PATTERN

.11	.11	.11	.11	.11	.11	.11	.11	.11	.11
.11	.11	.11	.11	.11	.12	.12	.12	.12	.12
.12	.12	.11	.11	.11	.11	.11	.11	.11	.11
.11	.11	.11	.11	.11	.11	.11	.11	.12	.12
.12	.12	.12	.12	.12	.11	.11	.11	.11	.11
.11	.11	.11	.11	.11	.11	.11	.11	.11	.11
.11	.11	.11	.11	.11	.11	.11	.14	.17	.17
.17	.17	.17	.17	.17	.16	.16	.16	.16	.16
.16	.16	.21	.25	.25	.25	.25	.25	.25	.25
.27	.27	.27	.27	.27	.27	.27	.65	1.04	1.04
1.04	1.04	1.04	1.04	1.04	2.15	2.15	2.15	2.15	2.15
2.15	2.15	4.12	6.09	6.09	6.09	6.09	6.09	6.09	6.09
1.03	1.03	1.03	1.03	1.03	1.03	1.03	.65	.27	.27
.27	.27	.27	.27	.27	.25	.25	.25	.25	.25
.25	.25	.21	.16	.16	.16	.16	.16	.16	.16
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.11	.11	.11	.12	.12	.12	.12	.12	.12	.12

17 JD INDEX STORM NO. 3
STRM 3.46 PRECIPITATION DEPTH
TRDA 2.80 TRANSPOSITION DRAINAGE AREA

18 PI PRECIPITATION PATTERN

.12	.12	.12	.12	.12	.12	.12	.11	.09	.09
.09	.09	.09	.09	.09	.12	.12	.12	.12	.12
.12	.12	.12	.12	.12	.12	.12	.12	.12	.12
.11	.11	.11	.11	.11	.11	.11	.11	.12	.12
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.11	.11	.11	.11	.11	.11	.11	.11	.11	.11
.12	.12	.12	.12	.12	.12	.12	.13	.15	.15
.15	.15	.15	.15	.15	.17	.17	.17	.17	.17
.17	.17	.22	.27	.27	.27	.27	.27	.27	.27
.57	.57	.57	.57	.57	.57	.57	.88	1.19	1.19
1.19	1.19	1.19	1.19	1.19	2.65	2.65	2.65	2.65	2.65
2.65	2.65	2.95	3.24	3.24	3.24	3.24	3.24	3.24	3.24
1.91	1.91	1.91	1.91	1.91	1.91	1.91	1.37	.84	.84
.84	.84	.84	.84	.84	.51	.51	.51	.51	.51
.51	.51	.33	.16	.16	.16	.16	.16	.16	.16
.17	.17	.17	.17	.17	.17	.17	.17	.16	.16
.16	.16	.16	.16	.16	.17	.17	.17	.17	.17
.17	.17	.17	.16	.16	.16	.16	.16	.16	.16

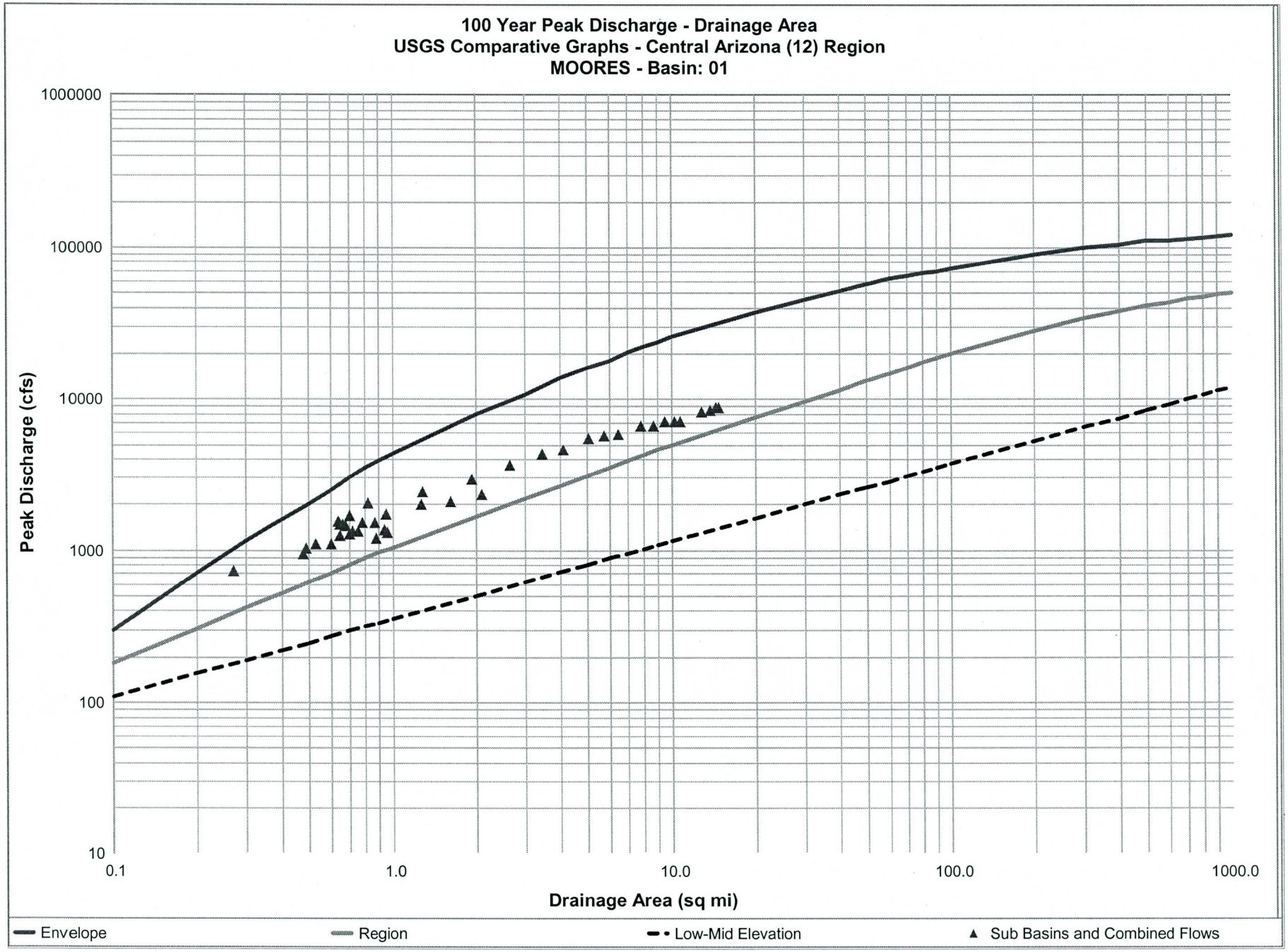
1

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	BC3	1313.	4.13	110.	66.	66.	.56		
+	ROUTED TO	RBC3	1250.	4.27	110.	66.	66.	.56		
+	HYDROGRAPH AT	BC2	1174.	4.20	121.	73.	73.	.64		
+	2 COMBINED AT	CPBC2	1980.	4.27	216.	130.	130.	1.20		
+	ROUTED TO	RBC2	1903.	4.37	216.	130.	130.	1.20		
+	HYDROGRAPH AT	BC1	1353.	4.20	149.	90.	90.	.78		
+	2 COMBINED AT	CPBC1	2549.	4.33	340.	205.	205.	1.98		

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

Verification of Peak Flows
Regression Equation Analysis


100 Year Peak Discharge - Drainage Area
USGS Comparative Graphs - Central Arizona (12) Region
MOORES - Basin: 01
1000000
100000
10000
1000
100
10
Peak Discharge (cfs)
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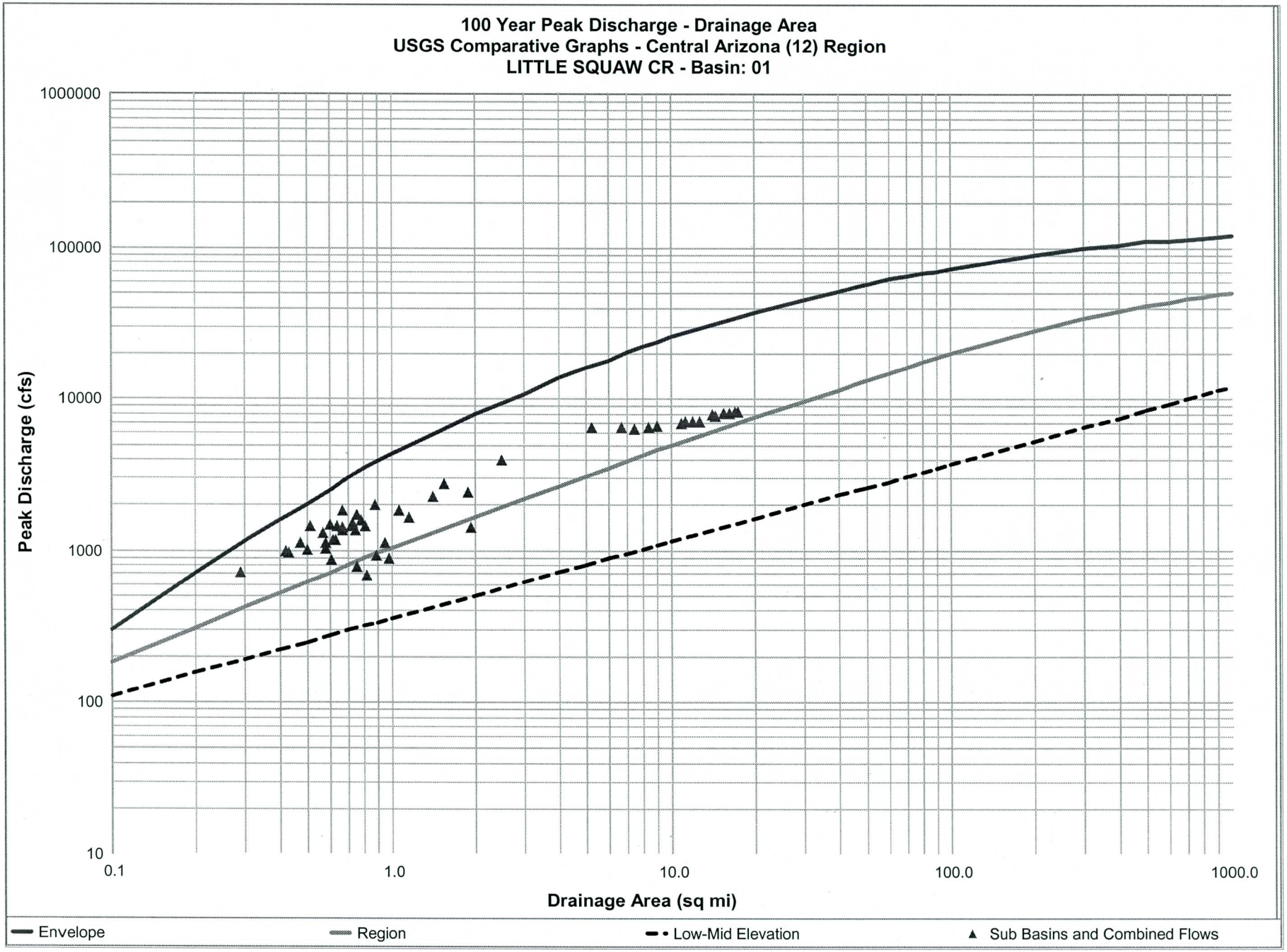
1.0
10.0
100.0
1000.0
Drainage Area (sq mi)
Envelope
Region
Low-Mid Elevation
Sub Basins and Combined Flows


100 Year Peak Discharge - Drainage Area
USGS Comparative Graphs - Central Arizona (12) Region
LITTLE SQUAW CR - Basin: 01
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Peak Discharge (cfs)
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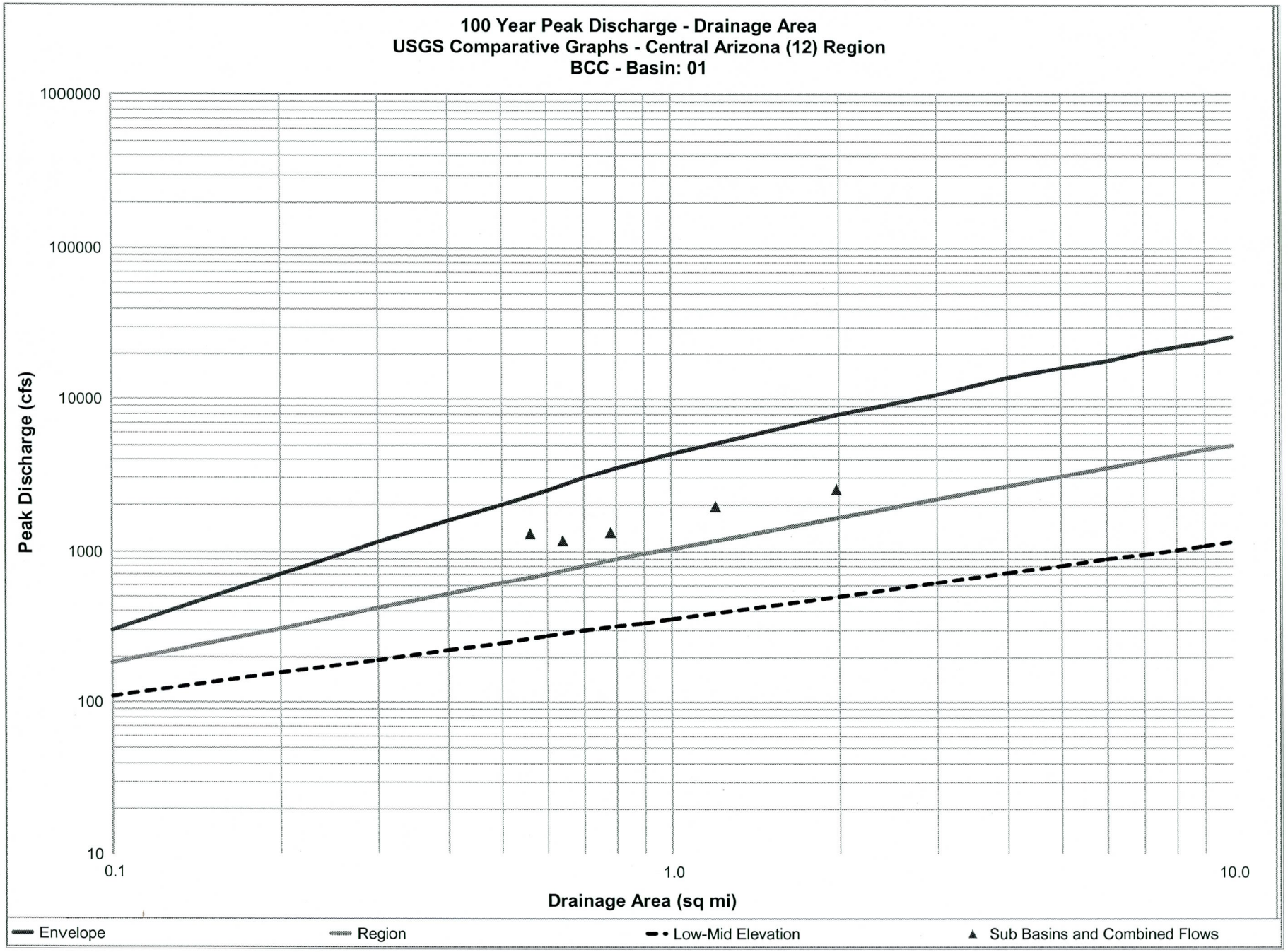
Drainage Area (sq mi)
Envelope
Region
Low-Mid Elevation
Sub Basins and Combined Flows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USGS Comparative Graphs - Central Arizona (12) Region
BCC - Basin: 01
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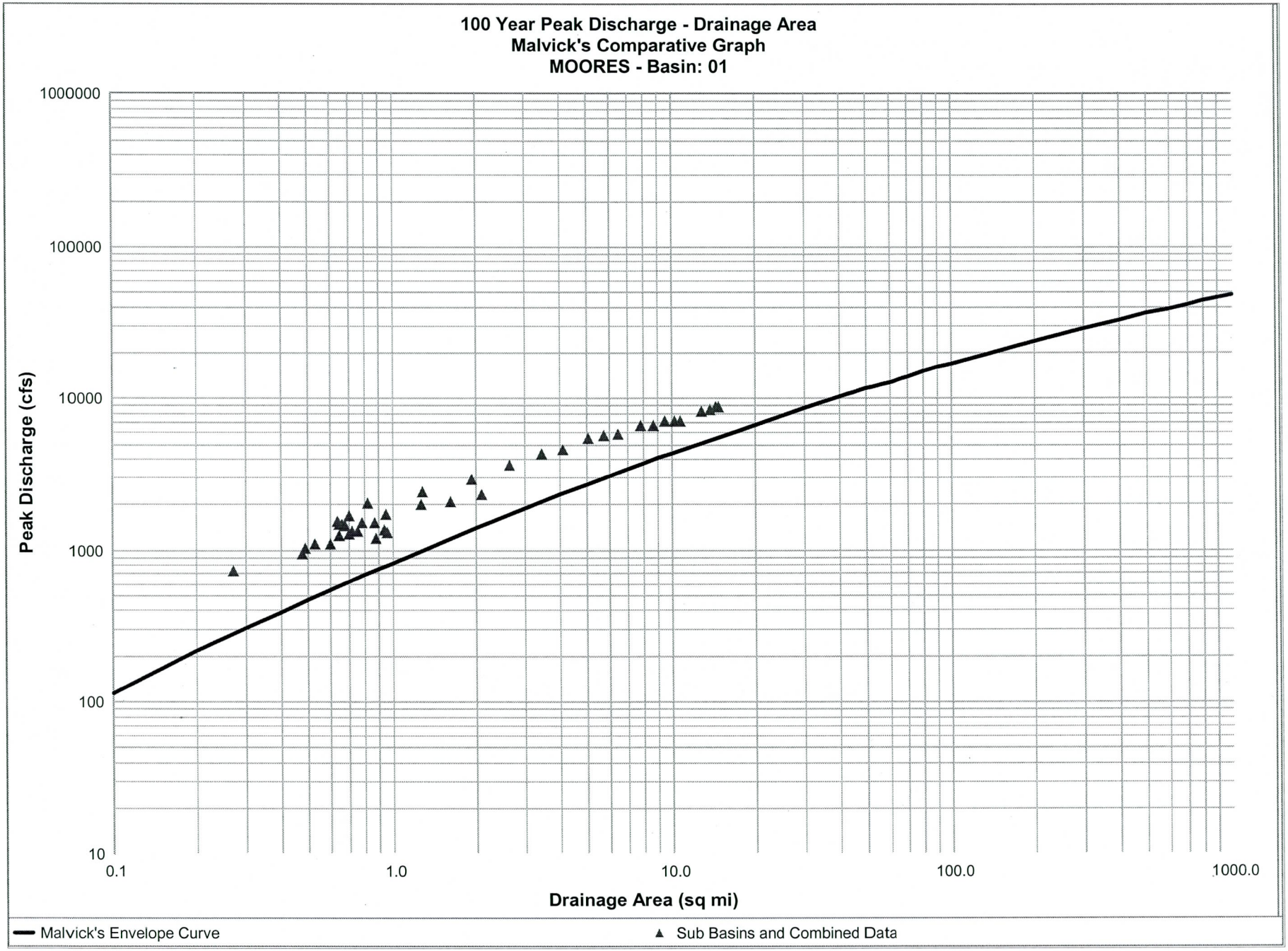
10000
1000
100
10
Peak Discharge (cfs)
0.1
1.0
10.0
Drainage Area (sq mi)
Envelope
Region
Low-Mid Elevation
Sub Basins and Combined Flows


100 Year Peak Discharge - Drainage Area
Malvick's Comparative Graph
MOORES - Basin: 01
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100000
10000
1000
100
10
Peak Discharge (cfs)
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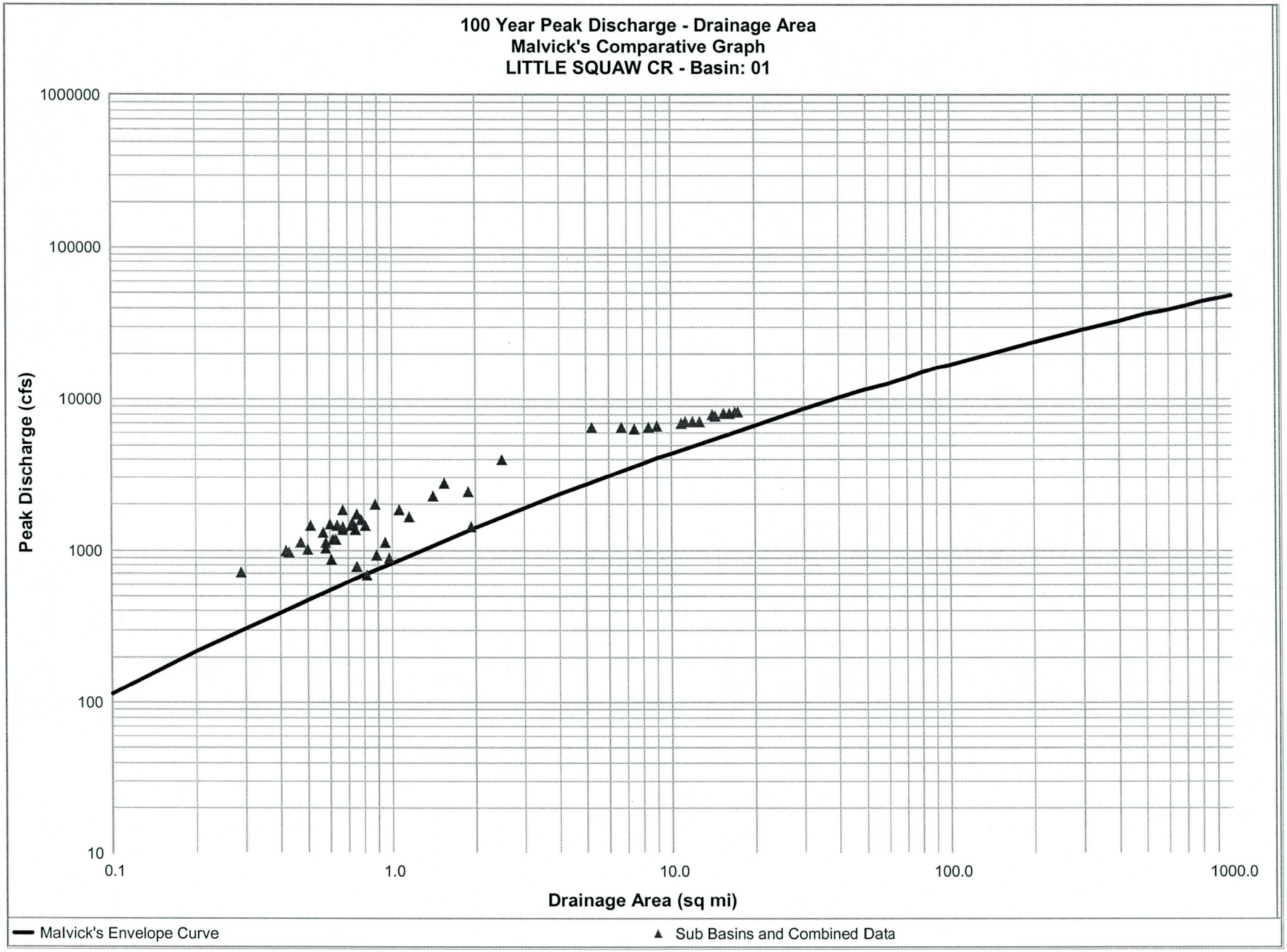
1.0
10.0
100.0
1000.0
Drainage Area (sq mi)
Malvick's Envelope Curve
Sub Basins and Combined Data


100 Year Peak Discharge - Drainage Area
Malvick's Comparative Graph
LITTLE SQUAW CR - Basin: 01
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1000
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10
Peak Discharge (cfs)
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1.0
10.0
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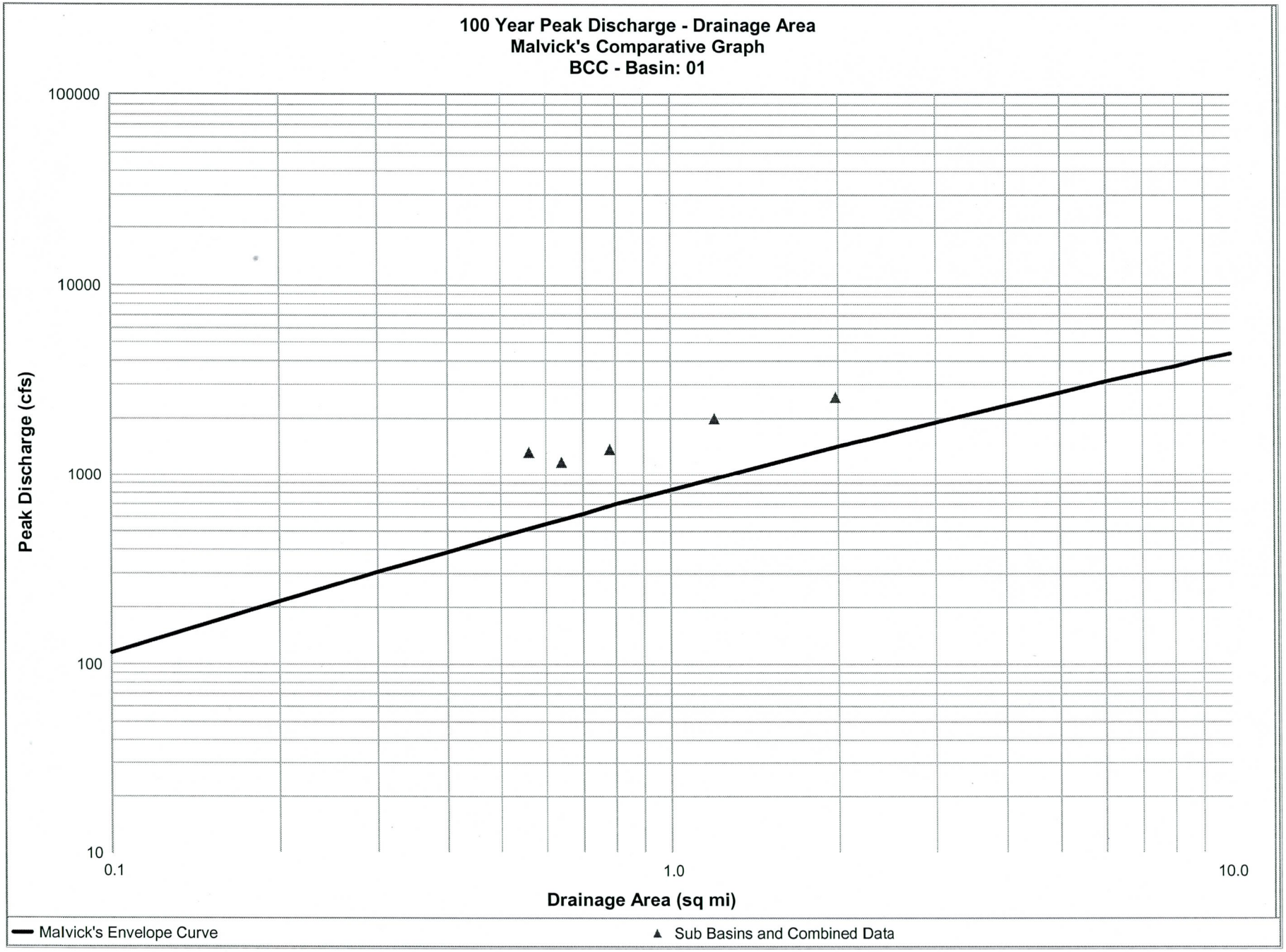
Drainage Area (sq mi)
Malvick's Envelope Curve
Sub Basins and Combined Data


100 Year Peak Discharge - Drainage Area
Malvick's Comparative Graph
BCC - Basin: 01
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10000
1000
100
10
Peak Discharge (cfs)
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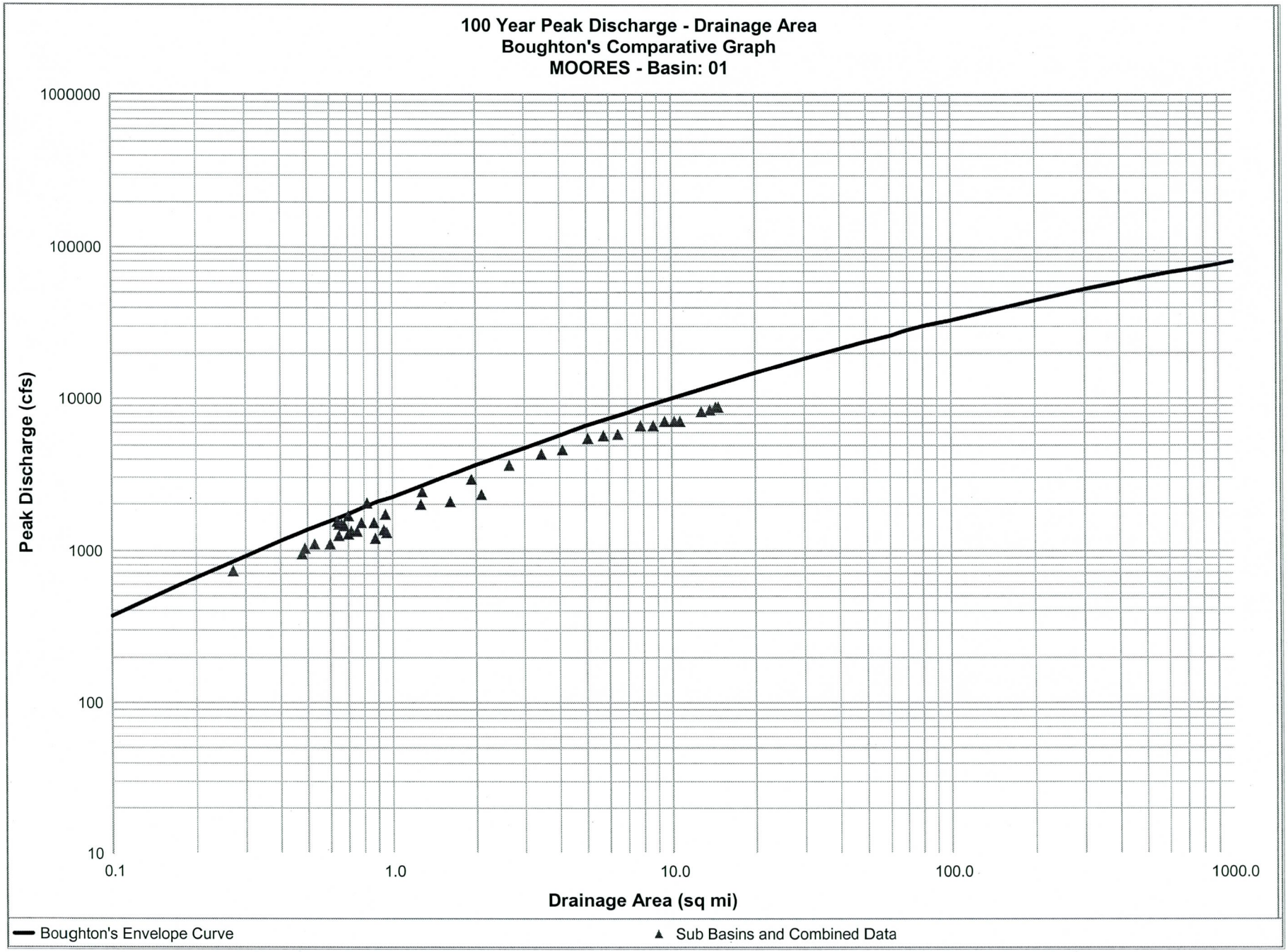
1.0
10.0
Drainage Area (sq mi)
Malvick's Envelope Curve
Sub Basins and Combined Data


100 Year Peak Discharge - Drainage Area
Boughton's Comparative Graph
MOORES - Basin: 01
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100000
10000
1000
100
10
Peak Discharge (cfs)
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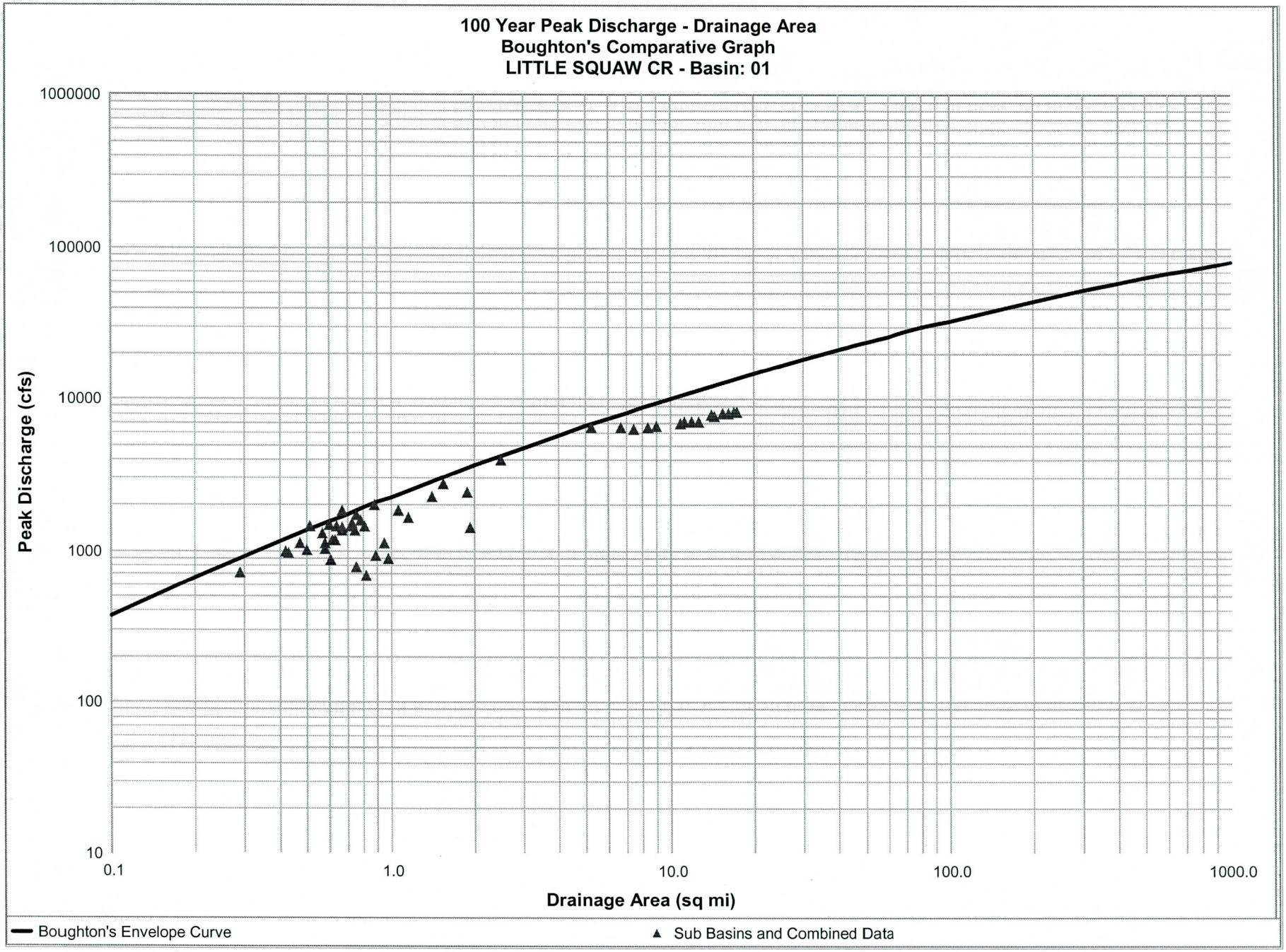
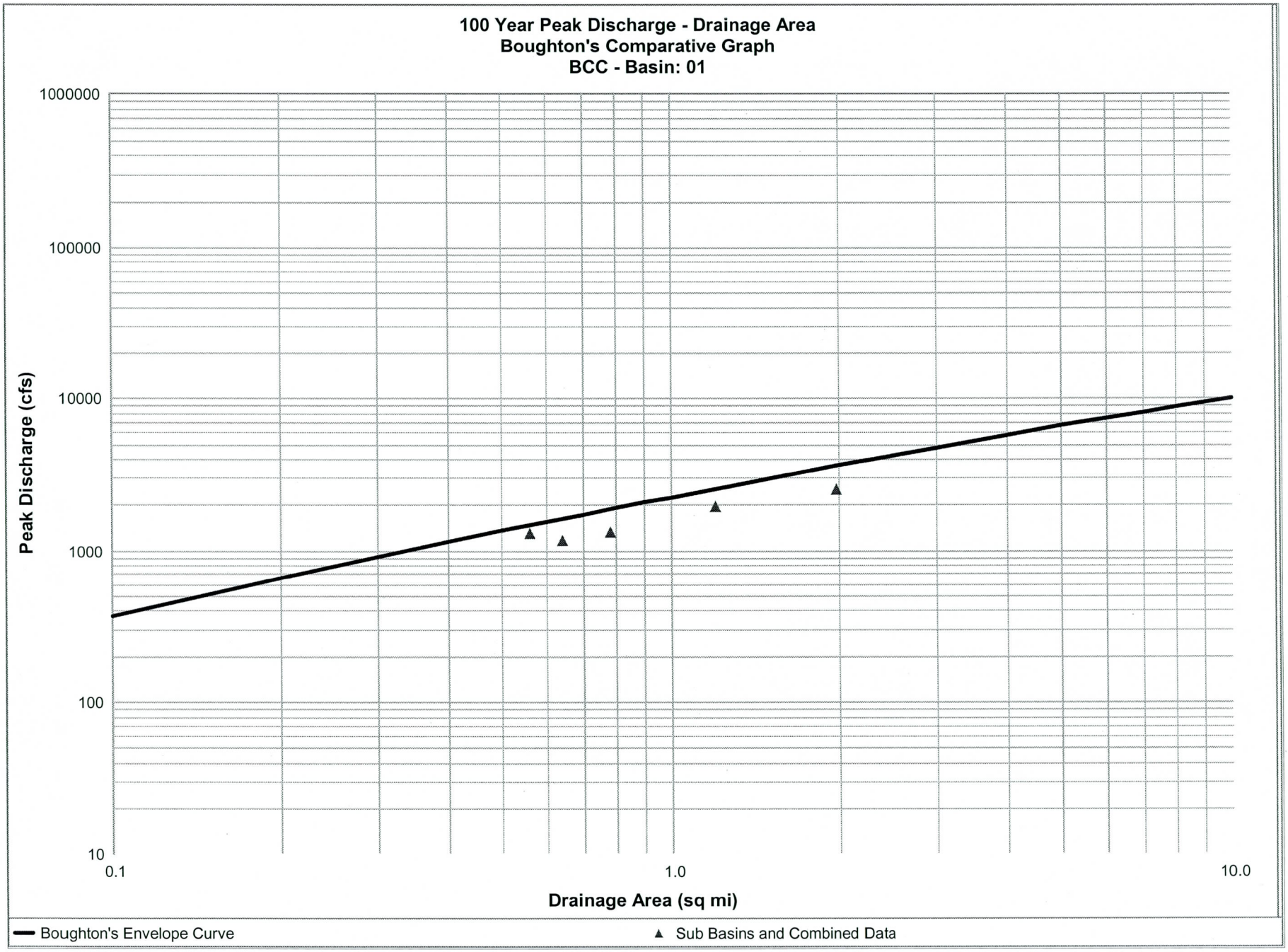
1.0
10.0
100.0
1000.0
Drainage Area (sq mi)
Boughton's Envelope Curve
Sub Basins and Combined Data


100 Year Peak Discharge - Drainage Area
Boughton's Comparative Graph
LITTLE SQUAW CR - Basin: 01
1000000
100000
10000
1000
100
10
Peak Discharge (cfs)
0.1
1.0
10.0
100.0
1000.0
Drainage Area (sq mi)
Boughton's Envelope Curve
Sub Basins and Combined Data


100 Year Peak Discharge - Drainage Area
Boughton's Comparative Graph
BCC - Basin: 01
1000000
100000
10000
1000
100
10
Peak Discharge (cfs)
0.1
1.0
10.0
Drainage Area (sq mi)
Boughton's Envelope Curve
Sub Basins and Combined Data

E.1 Roughness Coefficient Estimation

E.1 Field Reconnaissance and Roughness Coefficient Estimation

E.1.1 Field Reconnaissance

The project team visited Watersheds 3 and 4 on October 22, 2001. The purpose of the field trip was to observe the watershed and floodplain conditions, obtain photographic documentation, and estimate Manning's n values. The aerial photographs and USGS maps show that there is little development in Watersheds 3 and 4 that will affect the hydrologic and floodplain conditions. This was verified by the field visit. Table E.1-1 lists the washes that the project team attempted to visit, and photograph numbers that correspond to the listed wash. Figures E.1-1 and E.1-2 show the location of the photographs on the USGS topographic maps, and the photographs are on the following pages.

Table E.1-1- List of the Washes the Corresponding Photographs

Wash Name	Photograph Numbers
Moore Gulch	1-6, 19-25
Little Squaw Creek	9-11, 14-18
Little Squaw Creek, Tributary 1	7, 8, 12, & 13
8N2ES16	Not Accessible

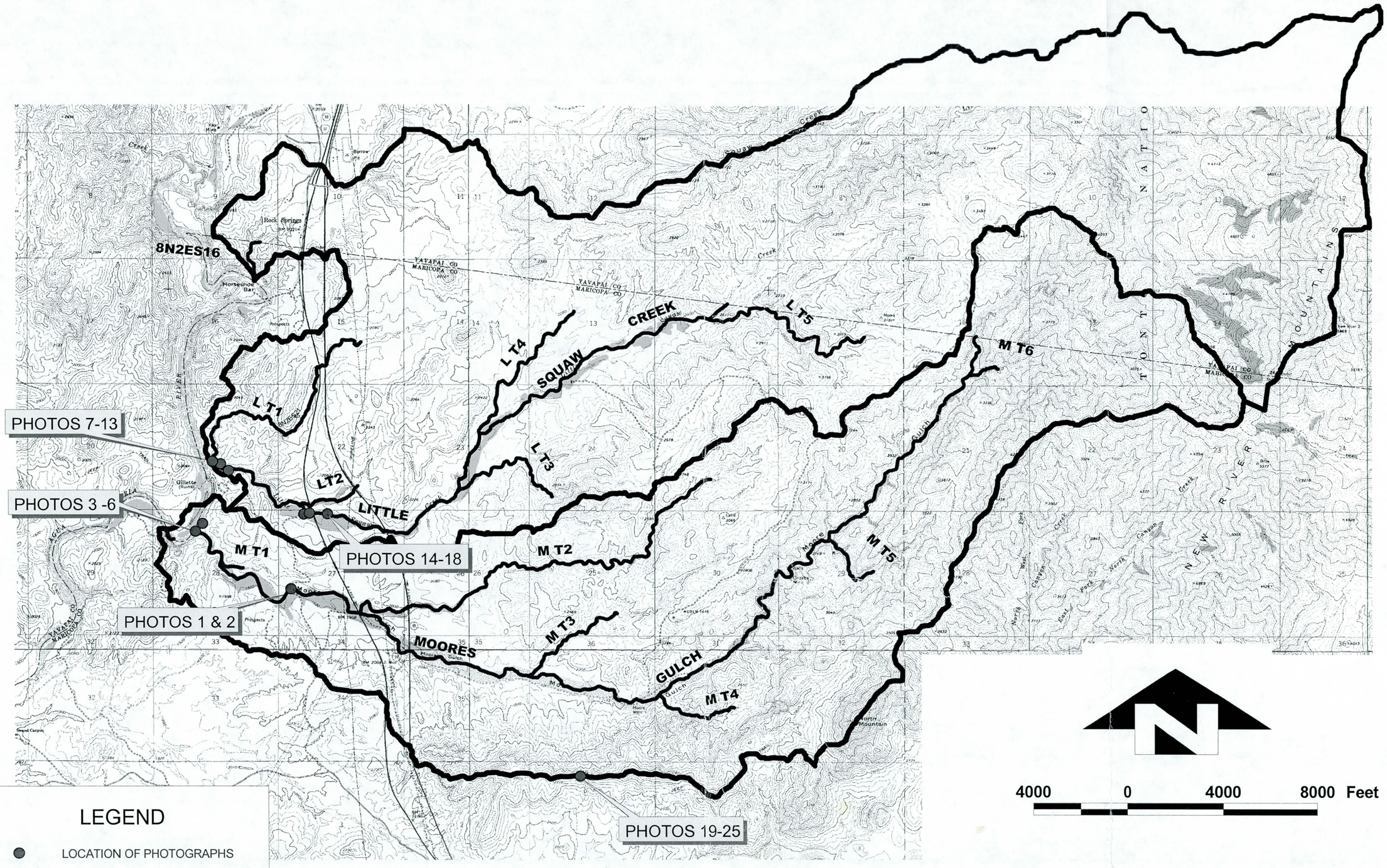


FIGURE E.1-1 - LOCATION OF PHOTOGRAPHS

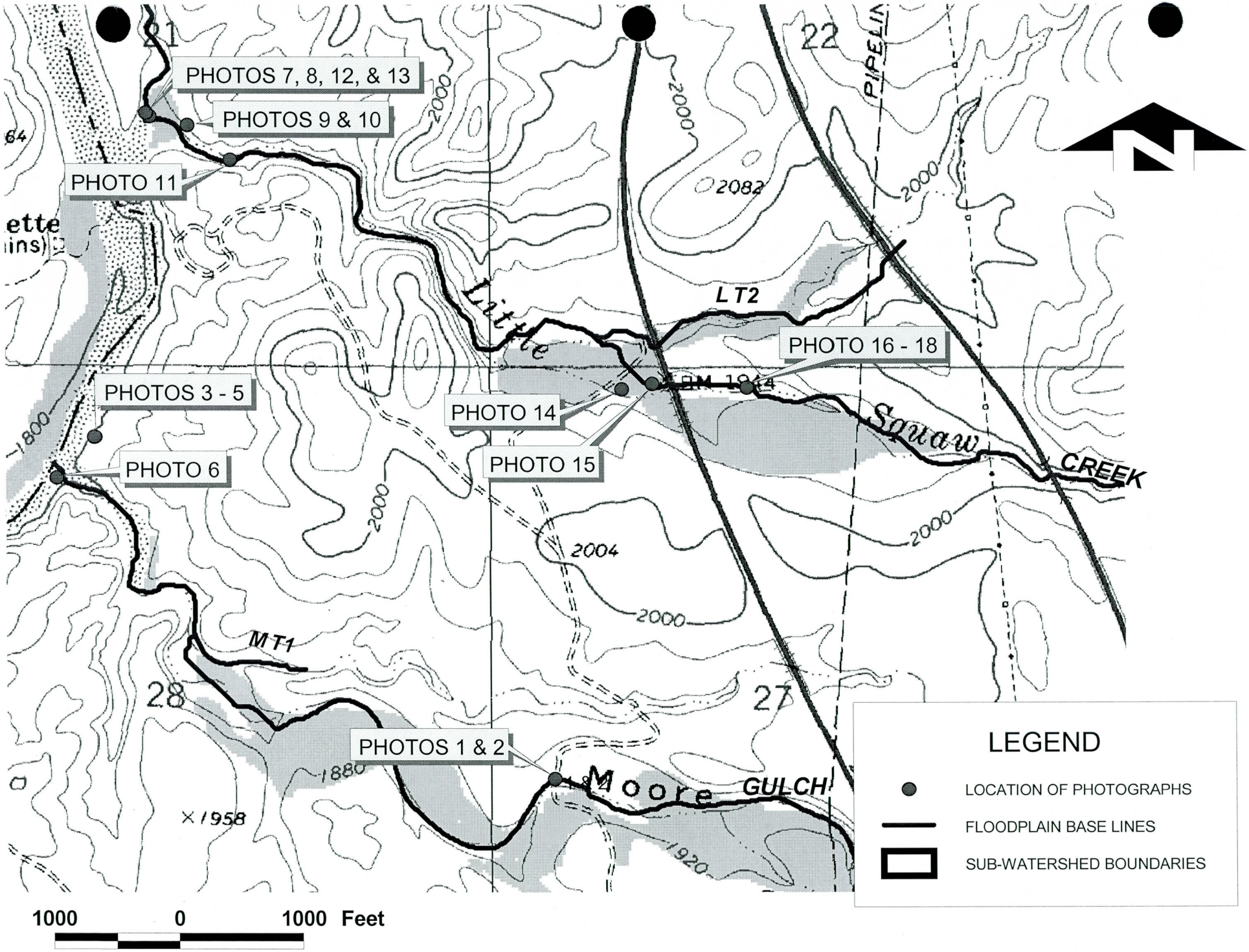
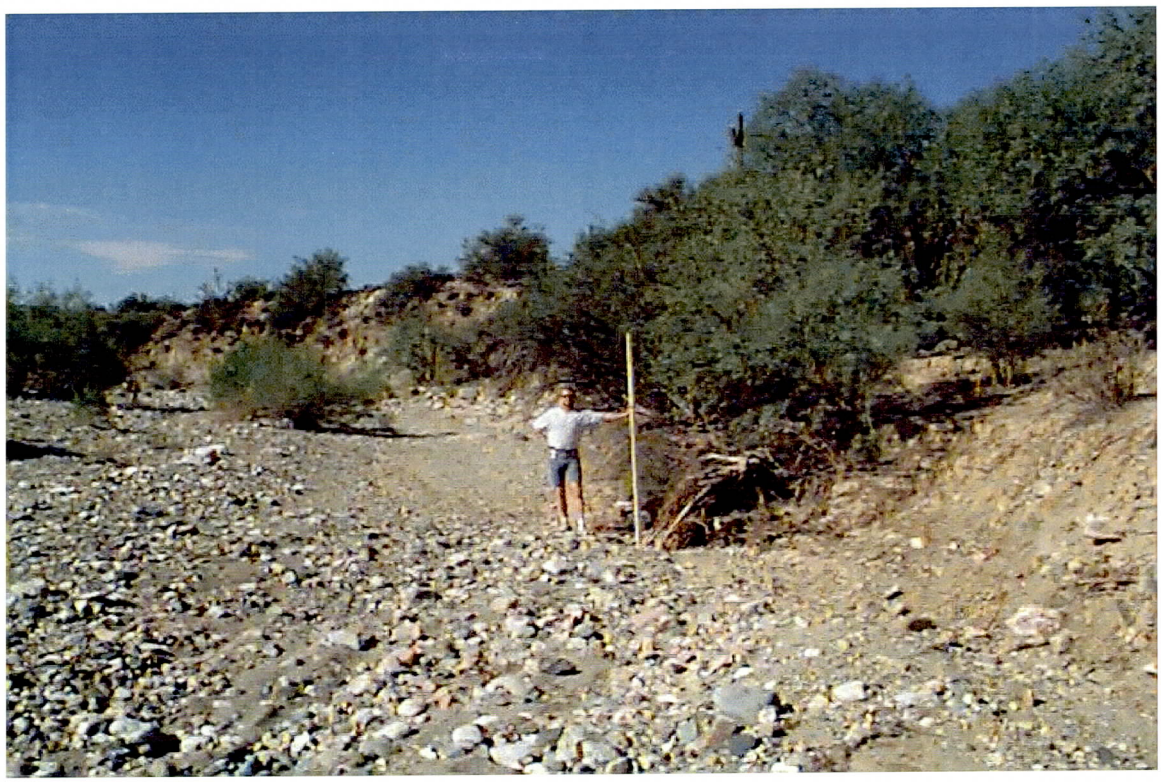


FIGURE E.1-2 - DETAILED PHOTOGRAPH LOCATIONS



Photograph 1 - Looking Downstream at Moore Gulch
Wash: Moore Gulch

Photograph 2 - Looking Upstream at Moore Gulch
Wash: Moore Gulch

Photograph 3 - Agua Fria River Upstream of Confluence with Moore Gulch

Photograph 4 - Agua Fria River Upstream of Confluence with Moore Gulch
River: Agua Fria River

Photograph 5 - Agua Fria River Upstream of Confluence with Moore Gulch
River: Agua Fria River

Photograph 6 - Looking Upstream at Moore Gulch from Confluence of Moore Gulch and Agua Fria River
Wash: Moore Gulch

Photograph 7- At confluence with the Agua Fria River, looking upstream
Wash: Little Squaw Creek, Tributary 1

Photograph 8- At confluence with the Agua Fria River, looking upstream
Wash: Little Squaw Creek, Tributary 1

Photograph 9- At Confluence with Agua Fria River, looking upstream
Wash: Little Squaw Creek

Photograph 10- Near confluence with Agua Fria River, looking upstream
Wash: Little Squaw Creek

Photograph 11- Upstream of confluence with Agua Fria River, looking upstream
Wash: Little Squaw Creek

Photograph 12- Looking upstream, just upstream of confluence with Agua Fria
Wash: Little Squaw Creek, Tributary 1

Photograph 13- At the bend in the wash, looking downstream
Wash: Little Squaw Creek, Tributary 1

Photograph 14- Looking at the wash banks, looking downstream.
Wash: Little Squaw Creek

Photograph 15- Looking east (upstream) at the southbound Interstate 17 crossing
Wash: Little Squaw Creek

Photograph 16- Looking at the gabions at the Interstate 17 bridge
Wash: Little Squaw Creek

Photograph 17- Looking upstream at the right bank
Wash: Little Squaw Creek

Photograph 18- Looking upstream along the channel bottom
Wash: Little Squaw Creek

Photograph 19 - Panorama of Moore Gulch Looking Northwest from Ridge

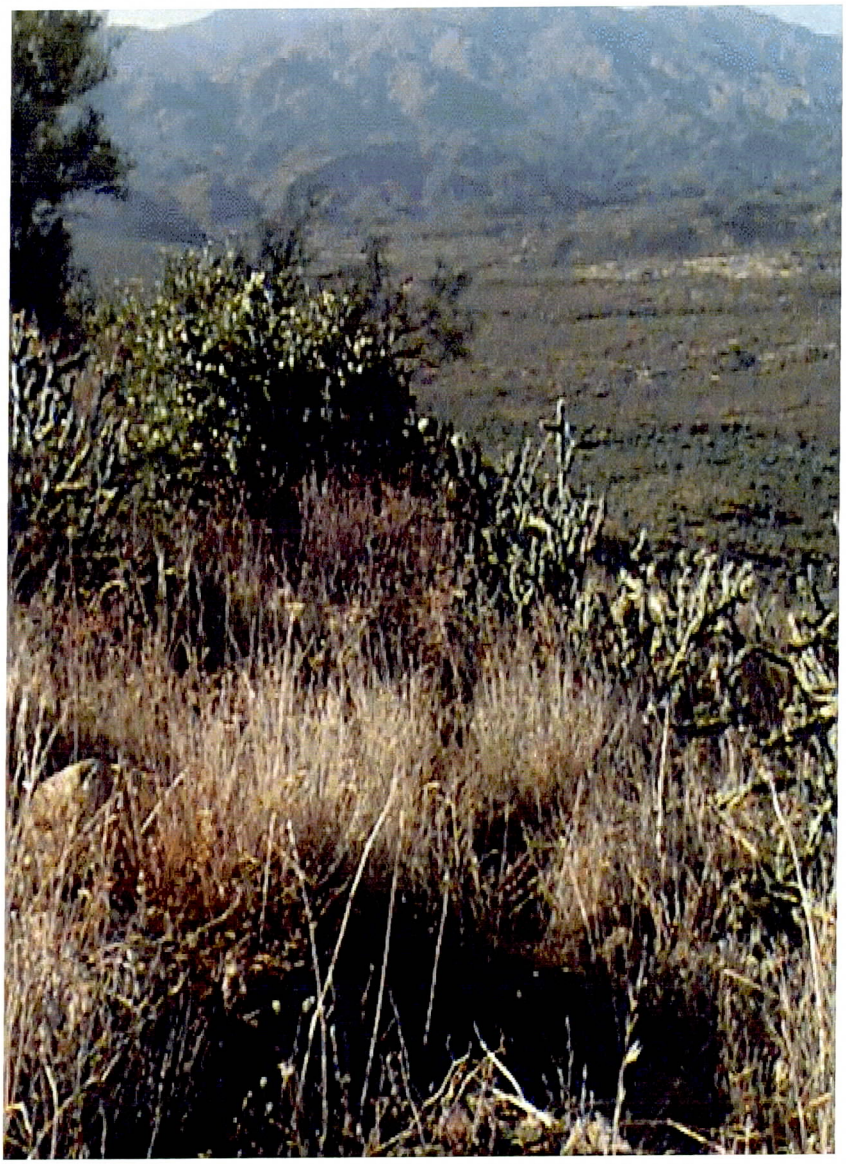
Photograph 20 - Panorama of Moore Gulch Looking North from Ridge

Photograph 21 - Panorama of Moore Gulch Looking North from Ridge

Photograph 22 - Panorama of Moore Gulch Looking Northeast from Ridge

Photograph 23 - Panorama of Moore Gulch Looking Northeast from Ridge

Photograph 24 - Panorama of Moore Gulch Looking Northwest from Ridge



Photograph 25 - Panorama of Moore Gulch Looking Northwest

E.1.2- Manning's "n" Determination

The procedure used to determine Manning's "n" values is outlined in the USGS publication "Estimated Manning's Roughness Coefficients for Stream Channels and Floodplains in Maricopa County, Arizona" (April 1991). 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.

FEMA 37, "Guidelines and Specifications for Study Contractors", recommends that one n-value be selected for each stream or wash when performing Zone A delineations, and that the cross sections used be kept to a minimum, preferably 1 or 2 per stream (pg. 6-2). For this reason the n_4 value and m multiplier were included in the calculation. Manning's "n" values were determined for both the overbank floodplains and the channels.

The Manning's "n" values for the washes that were inaccessible were estimated based by comparing the SCS soils maps, aerial photographs, and the surrounding conditions. Table E.1-2 lists the Manning's "n" calculations.

Table E.1-2- Manning's "n" Calculations for Watershed 3

Wash Name	Location	n_b	n_1	n_2	n_3	n_4	m	n
Moore Gulch	Channel	0.040	0.003	0.002	0.002	0.003	1.15	**0.058**
	Overbanks	0.040	0.000	0.000	0.030	0.000	n/a	**0.070**
Moore Gulch Tributary 1 (MT1)	Channel	0.040	0.003	0.002	0.002	0.003	1.15	**0.058**
	Overbanks	0.040	0.000	0.000	0.030	0.000	n/a	**0.070**
Moore Gulch Tributary 2 (MT2)	Channel	0.040	0.003	0.002	0.002	0.003	1.15	**0.058**
	Overbanks	0.040	0.000	0.000	0.040	0.000	n/a	**0.070**
Moore Gulch Tributary 3 (MT3)	Channel	0.040	0.003	0.002	0.002	0.003	1.15	**0.058**
	Overbanks	0.030	0.000	0.000	0.040	0.000	n/a	**0.070**
Moore Gulch Tributary 4 (MT4)	Channel	0.040	0.003	0.002	0.002	0.003	1.15	**0.058**
	Overbanks	0.030	0.000	0.000	0.040	0.000	n/a	**0.070**

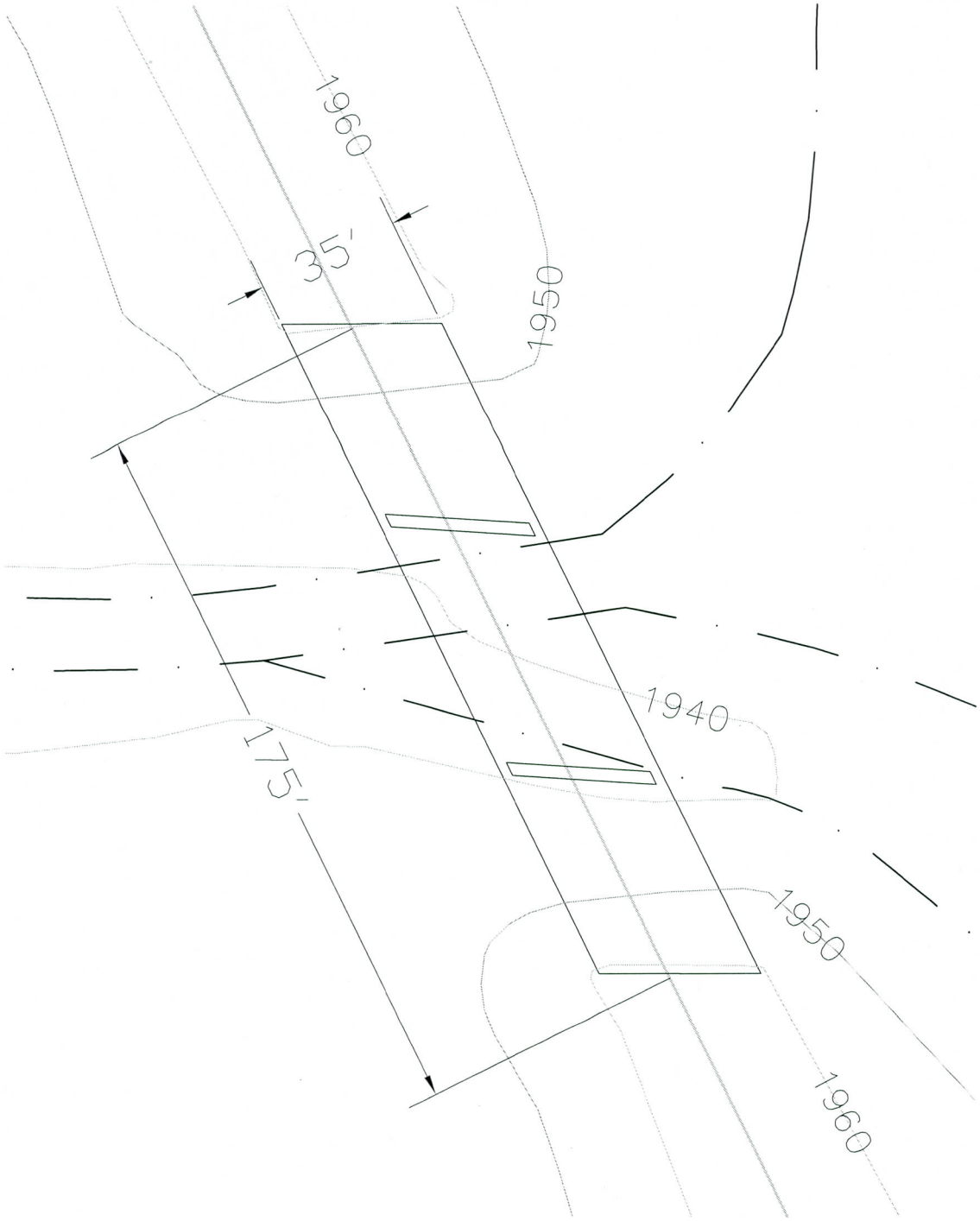
Table E.1-2- Manning's "n" Calculations for Watershed 3

Wash Name	Location	n_b	n_1	n_2	n_3	n_4	m	n
Moore Gulch Tributary 5 (MT5)	Channel	0.040	0.003	0.002	0.002	0.003	1.15	**0.058**
	Overbanks	0.030	0.000	0.000	0.040	0.000	n/a	**0.070**
Moore Gulch Tributary 6 (MT6)	Channel	0.040	0.003	0.002	0.002	0.003	1.15	**0.058**
	Overbanks	0.030	0.000	0.000	0.040	0.000	n/a	**0.070**
Little Squaw Creek and Tributaries	Channel	0.040	0.003	0.002	0.002	0.003	1.15	**0.058**
	Overbanks	0.030	0.000	0.000	0.040	0.000	n/a	**0.070**
Little Squaw Creek, Tributary 1 (LT1)	Channel	0.040	0.003	0.002	0.002	0.003	1.15	**0.058**
	Overbanks	0.030	0.000	0.000	0.040	0.000	n/a	**0.070**
8N2ES16	Channel	0.040	0.003	0.002	0.002	0.003	1.15	**0.058**
	Overbanks	0.030	0.000	0.000	0.040	0.000	n/a	**0.070**

E.2 Cross Section Plots (See Hydraulic Calculations)
E.3 Expansion and Contraction Coefficients (Not Considered)

E.4 Analysis of Structures

BRIDGE
MOORES GULCH–R.S. 1.837



FLOWLINE

STRUCTURE

SCALE 1" = 40'

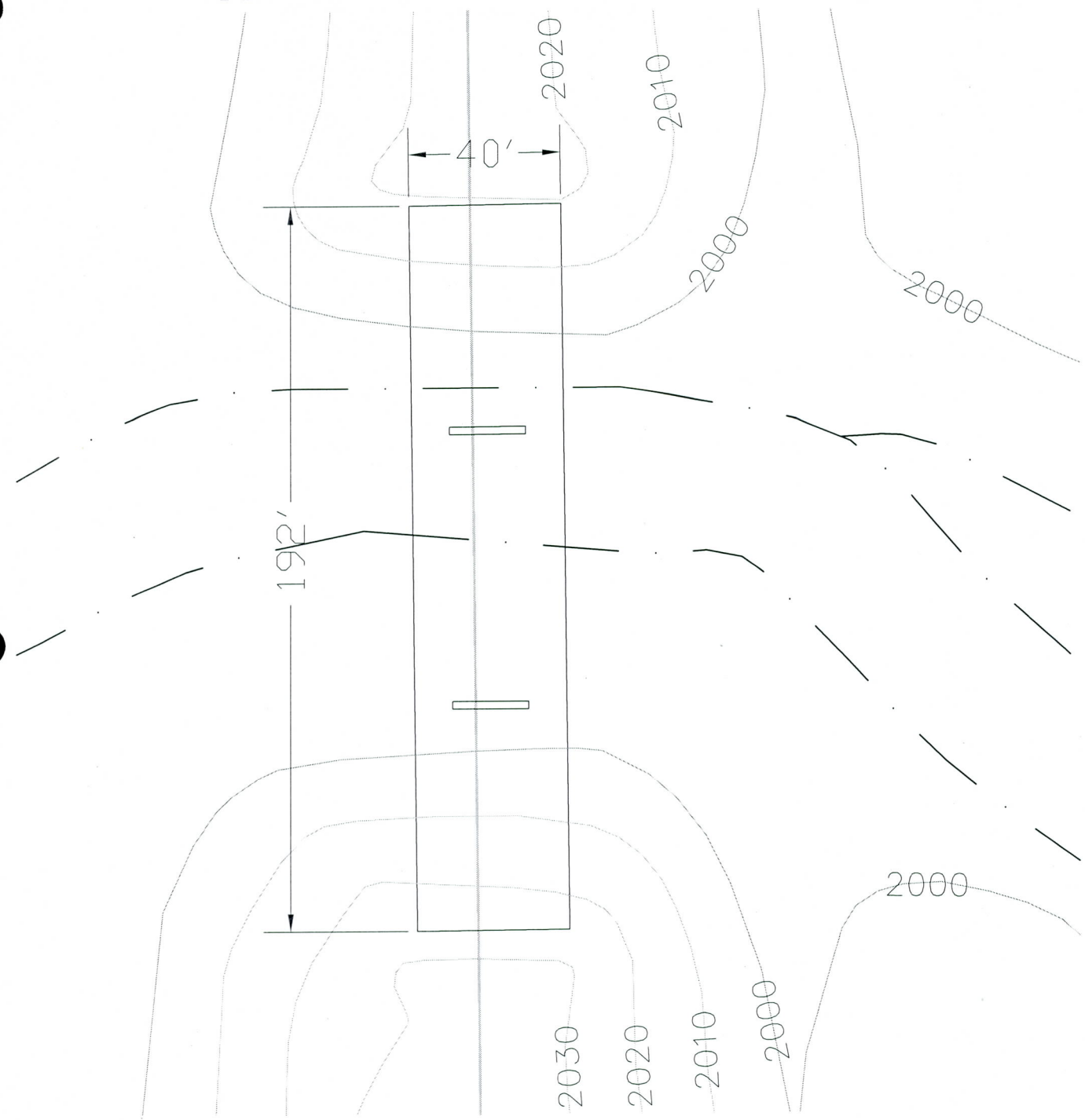
0 40 80 120

RBF CONSULTING

PLANNING
DESIGN
CONSTRUCTION

H:\PDATA\45100648\DWG\WS3AND4\0648–STRUCTURE–3.DWG FWITTIE 4/21/03 9:12 am

BRIDGE
MOORES GULCH–R.S. 2.417



FLOWLINE

STRUCTURE

SCALE 1" = 40'

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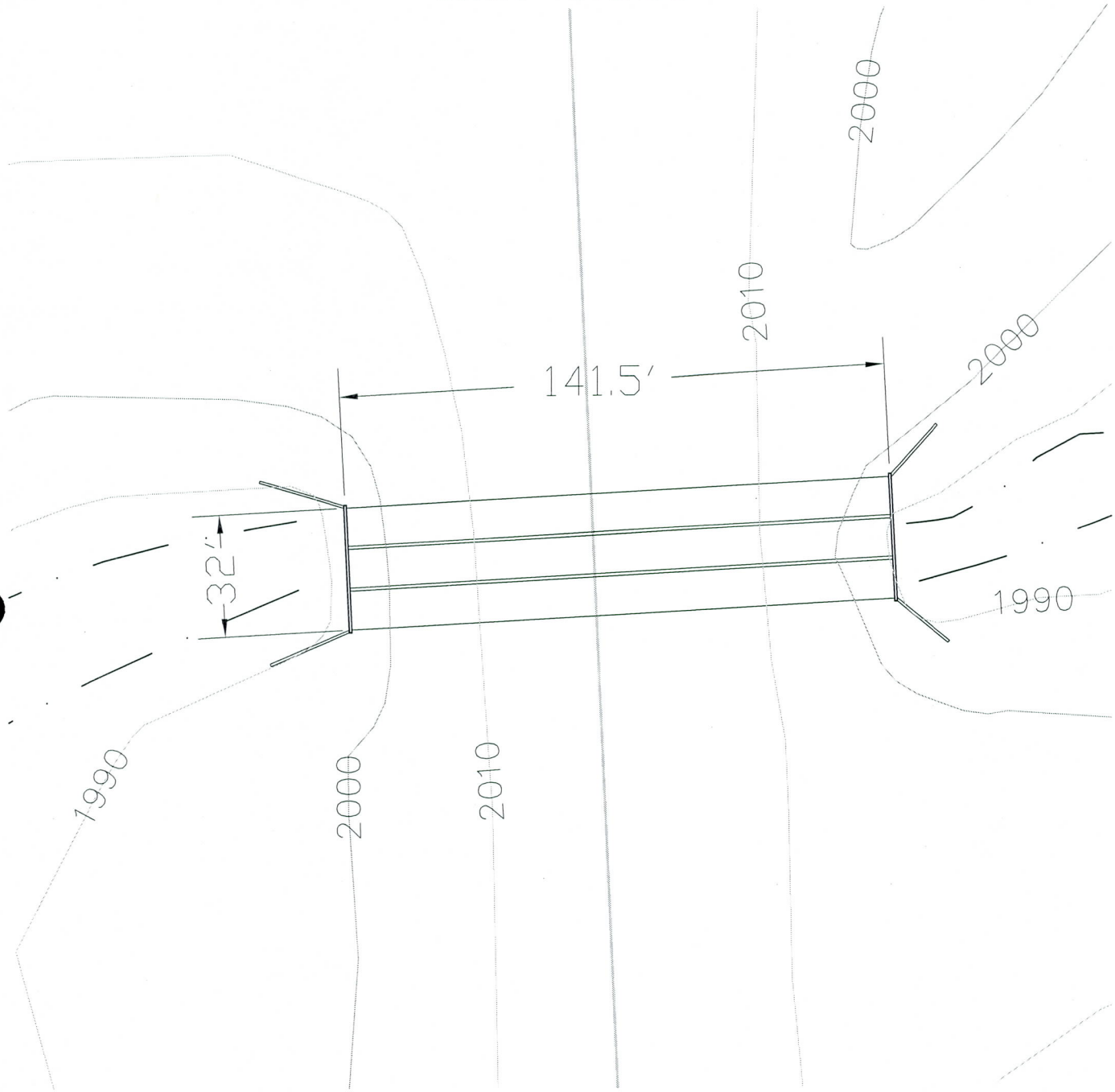
RBF CONSULTING

PLANNING
DESIGN
CONSTRUCTION

H:\PDATA\45100648\DWG\WS3AND4\0648–STRUCTURE–3.DWG FWITTIE 4/21/03 9:13 am

3-10'x10'x141.5' CBC
MOORES GULCH TRIBUTARY 2
R.S. 0.521



FLOWLINE

STRUCTURE

SCALE 1" = 40'

0 40 80 120

RBF CONSULTING

PLANNING
DESIGN
CONSTRUCTION

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Culvert Designer/Analyzer Report
Moores Gulch, Tributary 2, Structure F

Analysis Component			
Storm Event	Design	Discharge	2,396.00 cfs

Peak Discharge Method: User-Specified			
Design Discharge	2,396.00 cfs	Check Discharge	0.00 cfs

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	1,985.16 ft

Name	Description	Discharge	HW Elev	Velocity
Culvert-1	3-10 x 10 ft Box	2,396.00 cfs	1,993.84 ft	20.85 ft/s
Weir	Not Considered	N/A	N/A	N/A

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Culvert Designer/Analyzer Report
Moores Gulch, Tributary 2, Structure F

Component:Culvert-1

Culvert Summary			
Computed Headwater Elevation	1,993.84 ft	Discharge	2,396.00 cfs
Inlet Control HW Elev	1,993.50 ft	Tailwater Elevation	1,985.16 ft
Outlet Control HW Elev	1,993.84 ft	Control Type	Outlet Control
Headwater Depth/ Height	1.02		

Grades			
Upstream Invert	1,983.64 ft	Downstream Invert	1,980.56 ft
Length	141.50 ft	Constructed Slope	0.021767 ft/ft

Hydraulic Profile			
Profile	S2	Depth, Downstream	3.83 ft
Slope Type	Steep	Normal Depth	3.08 ft
Flow Regime	Supercritical	Critical Depth	5.83 ft
Velocity Downstream	20.85 ft/s	Critical Slope	0.003835 ft/ft

Section			
Section Shape	Box	Mannings Coefficient	0.013
Section Material	Concrete	Span	10.00 ft
Section Size	10 x 10 ft	Rise	10.00 ft
Number Sections	3		

Outlet Control Properties			
Outlet Control HW Elev	1,993.84 ft	Upstream Velocity Head	2.92 ft
Ke	0.50	Entrance Loss	1.46 ft

Inlet Control Properties			
Inlet Control HW Elev	1,993.50 ft	Flow Control	Unsubmerged
Inlet Type	90 and 15 ° wingwall flares	Area Full	300.0 ft²
K	0.06100	HDS 5 Chart	8
M	0.75000	HDS 5 Scale	2
C	0.04000	Equation Form	1
Y	0.80000		

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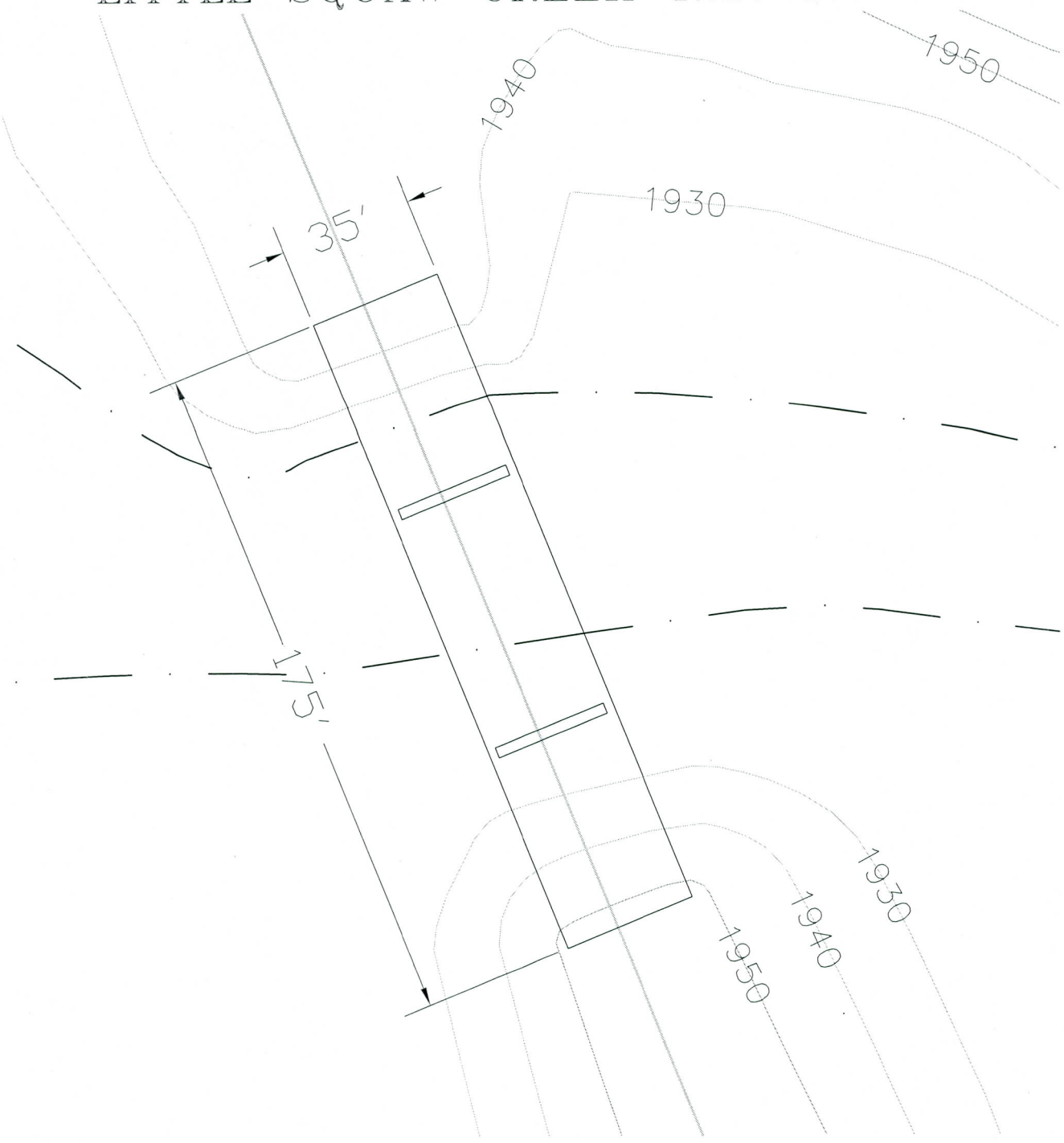
BRIDGE
LITTLE SQUAW CREEK–R.S. 1.070



FLOWLINE

STRUCTURE

SCALE 1" = 40'

0 40 80 120

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CONSTRUCTION

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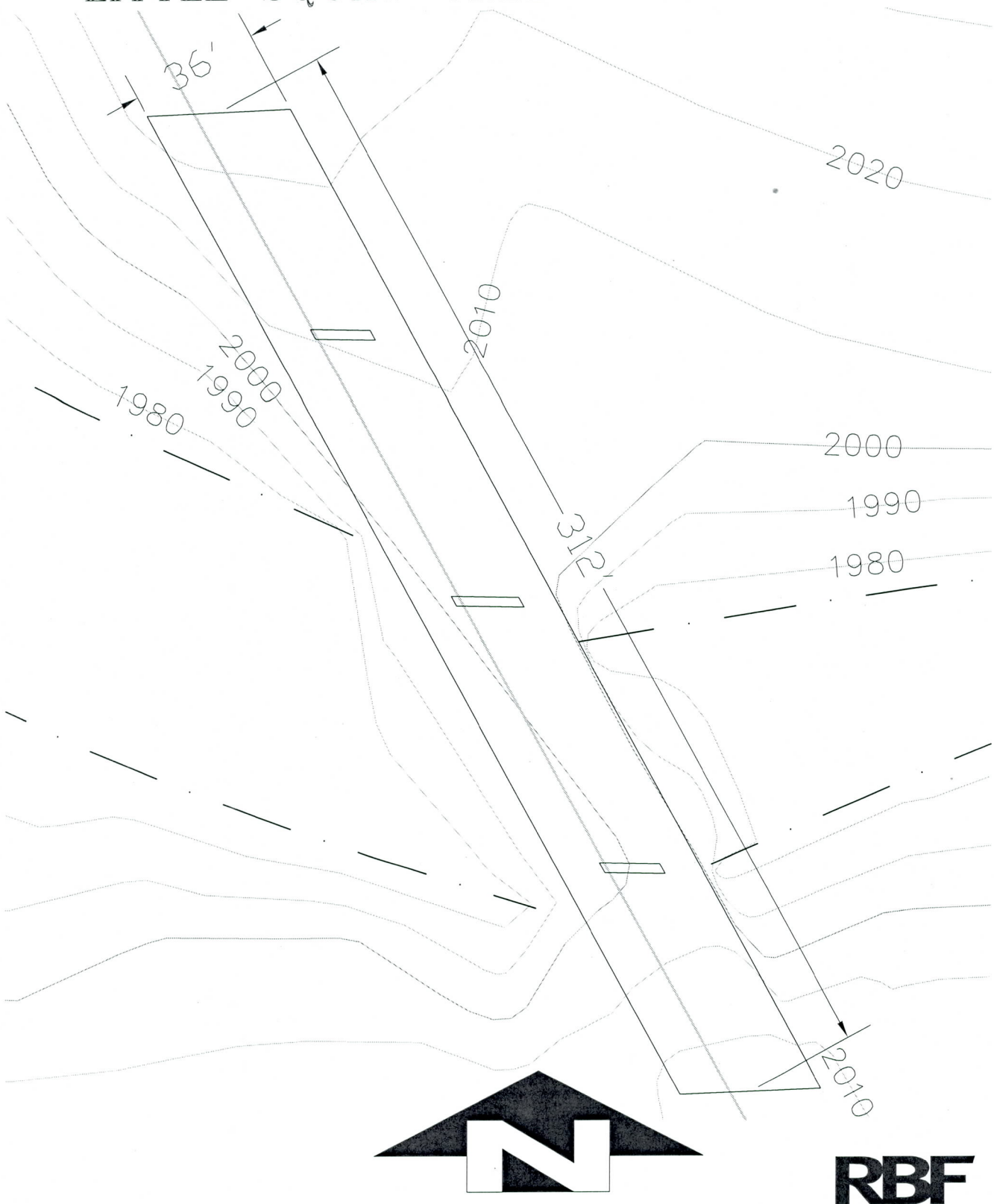
BRIDGE
LITTLE SQUAW CREEK–R.S. 1.689



RBF CONSULTING

PLANNING
DESIGN
CONSTRUCTION

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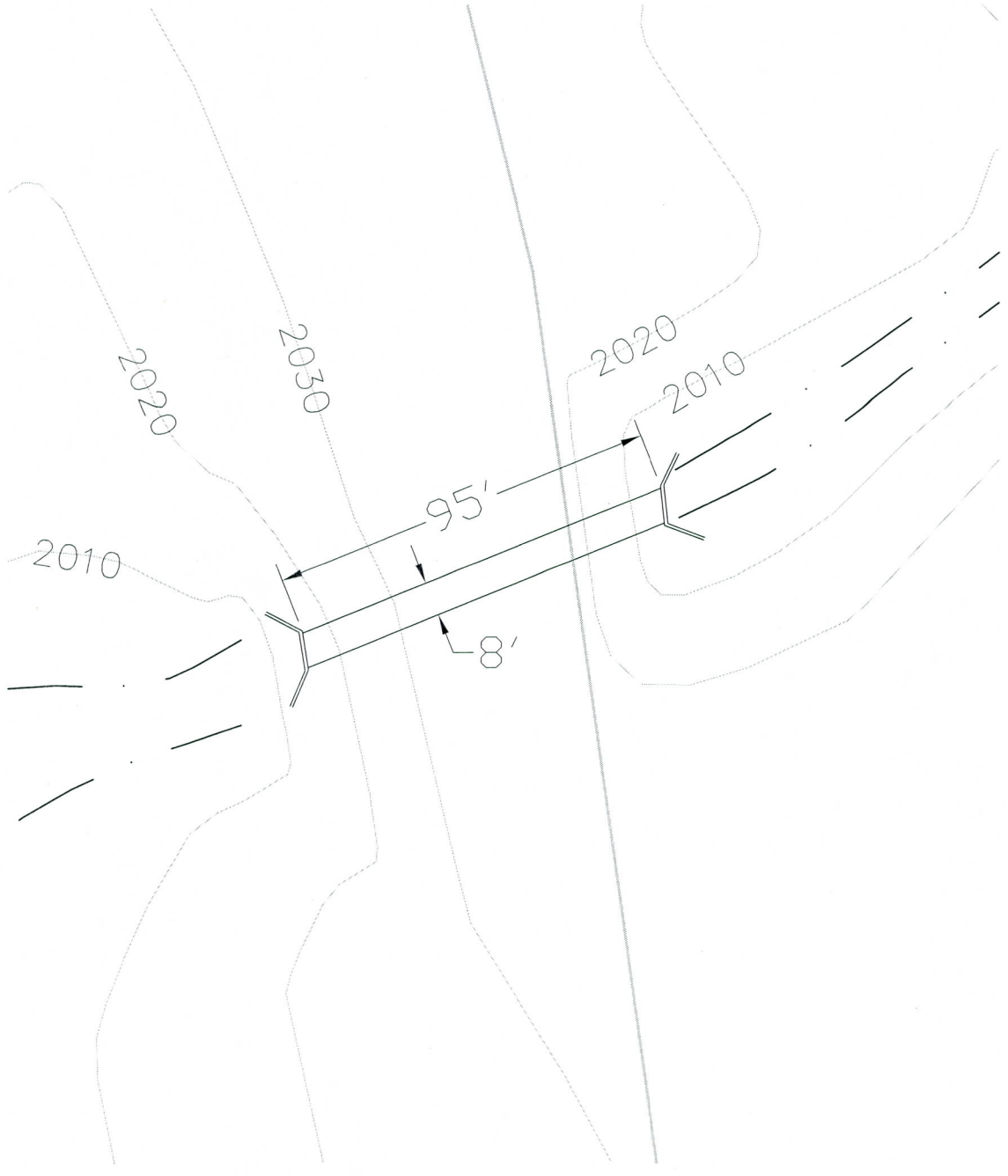
1-8'x7'x95' CBC
LITTLE SQUAW CREEK TRIBUTARY 1
R.S. 1.856



FLOWLINE

STRUCTURE

SCALE 1" = 40'

0 40 80 120

RBF CONSULTING

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DESIGN
CONSTRUCTION

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Culvert Designer/Analyzer Report
LSC, Trib 1, Structure A

Analysis Component			
Storm Event	Design	Discharge	2,347.00 cfs

Peak Discharge Method: User-Specified			
Design Discharge	2,347.00 cfs	Check Discharge	0.00 cfs

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	2,009.00 ft

Name	Description	Discharge	HW Elev	Velocity
Culvert-1	1-8 x 7 ft Box	1,186.12 cfs	2,029.33 ft	31.25 ft/s
Weir	Roadway	1,160.46 cfs	2,029.33 ft	N/A
Total	----------	2,346.58 cfs	2,029.33 ft	N/A

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Culvert Designer/Analyzer Report
LSC, Trib 1, Structure A

Component:Culvert-1

Culvert Summary			
Computed Headwater Elevation	2,029.33 ft	Discharge	1,186.12 cfs
Inlet Control HW Elev	2,029.33 ft	Tailwater Elevation	2,009.00 ft
Outlet Control HW Elev	2,026.92 ft	Control Type	Inlet Control
Headwater Depth/ Height	2.74		

Grades			
Upstream Invert	2,010.16 ft	Downstream Invert	2,002.43 ft
Length	93.00 ft	Constructed Slope	0.083118 ft/ft

Hydraulic Profile			
Profile	S2	Depth, Downstream	4.74 ft
Slope Type	Steep	Normal Depth	3.10 ft
Flow Regime	Supercritical	Critical Depth	7.00 ft
Velocity Downstream	31.25 ft/s	Critical Slope	0.014940 ft/ft

Section			
Section Shape	Box	Mannings Coefficient	0.013
Section Material	Concrete	Span	8.00 ft
Section Size	8 x 7 ft	Rise	7.00 ft
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev	2,026.92 ft	Upstream Velocity Head	6.97 ft
Ke	0.40	Entrance Loss	2.79 ft

Inlet Control Properties			
Inlet Control HW Elev	2,029.33 ft	Flow Control	Submerged
Inlet Type	45 ° wingwall flare, d=0.0430	Area Full	56.0 ft²
K	0.51000	HDS 5 Chart	9
M	0.66700	HDS 5 Scale	1
C	0.03090	Equation Form	2
Y	0.80000		

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Culvert Designer/Analyzer Report
LSC, Trib 1, Structure A

Component:Weir

Hydraulic Component(s): Roadway					
Discharge	1,160.46	cfs	Allowable HW Elevation	2,029.33	ft
Roadway Width	35.00	ft	Overtopping Coefficient	3.03	US
Low Point	2,025.80	ft	Headwater Elevation	2,029.33	ft
Discharge Coefficient (Cr)	3.03		Submergence Factor (Kt)	1.00	
Tailwater Elevation	2,009.00	ft			

Sta (ft)	Elev (ft)
0.00	2,025.80
51.00	2,026.99
107.00	2,028.43
159.00	2,029.70
210.00	2,031.16
262.00	2,032.71
314.00	2,033.86
364.00	2,035.01

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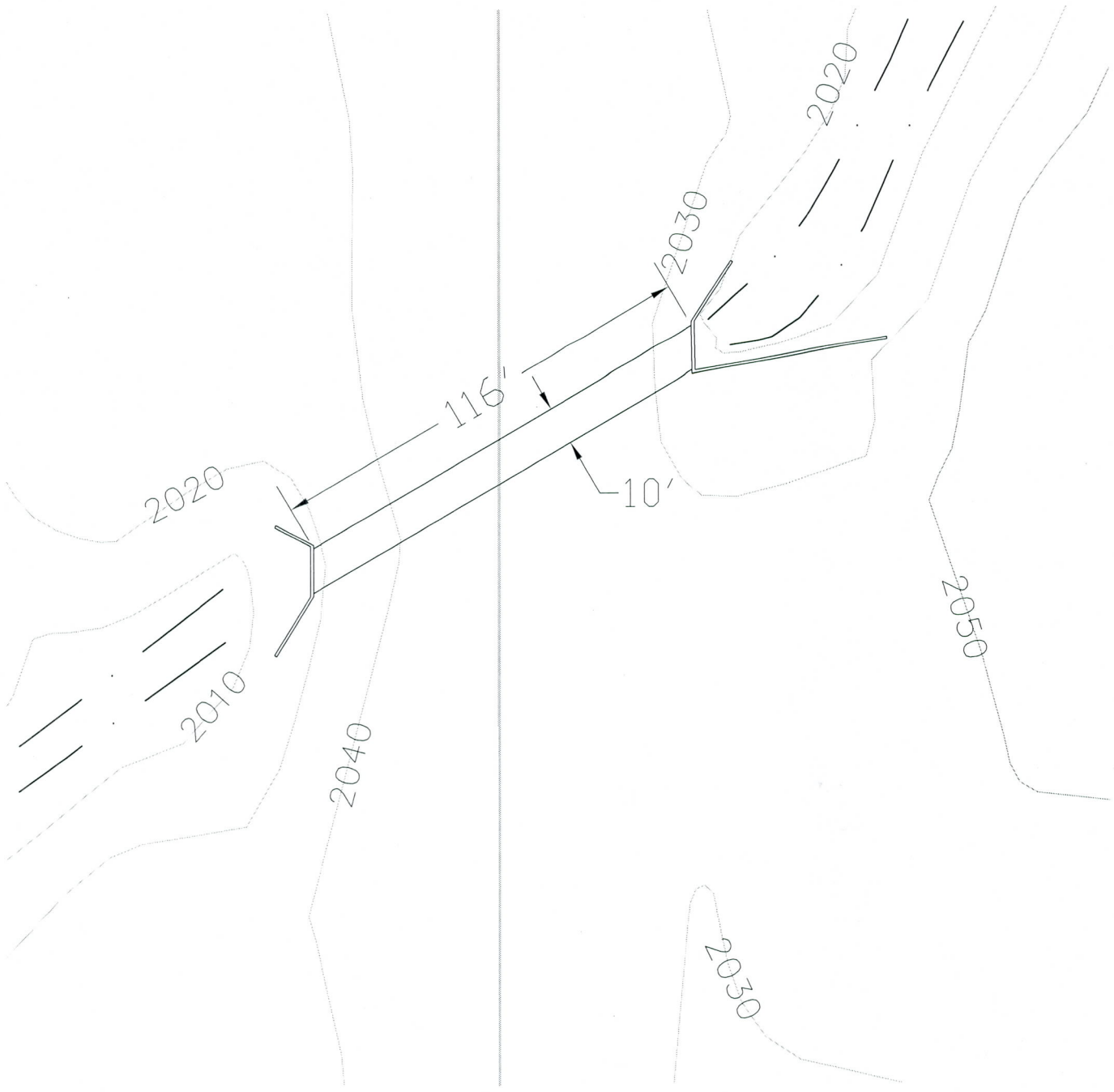
1-10'x10'x116' CBC
LITTLE SQUAW CREEK TRIBUTARY 1
R.S. 1.909



FLOWLINE

STRUCTURE

SCALE 1" = 40'

0 40 80 120

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CONSTRUCTION

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Culvert Designer/Analyzer Report
LSC, Trib 1, Structure B

Analysis Component			
Storm Event	Design	Discharge	2,347.00 cfs

Peak Discharge Method: User-Specified			
Design Discharge	2,347.00 cfs	Check Discharge	0.00 cfs

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	2,027.67 ft

Name	Description	Discharge	HW Elev	Velocity
Culvert-1	1-10 x 10 ft Box	1,872.73 cfs	2,042.54 ft	25.33 ft/s
Weir	Roadway	474.67 cfs	2,042.54 ft	N/A
Total	----------	2,347.40 cfs	2,042.54 ft	N/A

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Culvert Designer/Analyzer Report
LSC, Trib 1, Structure B

Component:Culvert-1

Culvert Summary			
Computed Headwater Elevation	2,042.54 ft	Discharge	1,872.73 cfs
Inlet Control HW Elev	2,042.54 ft	Tailwater Elevation	2,027.67 ft
Outlet Control HW Elev	2,038.82 ft	Control Type	Inlet Control
Headwater Depth/ Height	2.19		

Grades			
Upstream Invert	2,020.64 ft	Downstream Invert	2,017.67 ft
Length	116.00 ft	Constructed Slope	0.025603 ft/ft

Hydraulic Profile			
Profile	S2	Depth, Downstream	7.39 ft
Slope Type	Steep	Normal Depth	5.42 ft
Flow Regime	Supercritical	Critical Depth	10.00 ft
Velocity Downstream	25.33 ft/s	Critical Slope	0.007911 ft/ft

Section			
Section Shape	Box	Mannings Coefficient	0.013
Section Material	Concrete	Span	10.00 ft
Section Size	10 x 10 ft	Rise	10.00 ft
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev	2,038.82 ft	Upstream Velocity Head	5.45 ft
Ke	0.50	Entrance Loss	2.73 ft

Inlet Control Properties			
Inlet Control HW Elev	2,042.54 ft	Flow Control	Submerged
Inlet Type	90 and 15 ° wingwall flares	Area Full	100.0 ft²
K	0.06100	HDS 5 Chart	8
M	0.75000	HDS 5 Scale	2
C	0.04000	Equation Form	1
Y	0.80000		

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Culvert Designer/Analyzer Report
LSC, Trib 1, Structure B

Component:Weir

Hydraulic Component(s): Roadway			
Discharge	474.67 cfs	Allowable HW Elevation	2,042.54 ft
Roadway Width	35.00 ft	Overtopping Coefficient	3.01 US
Low Point	2,041.09 ft	Headwater Elevation	2,042.54 ft
Discharge Coefficient (Cr)	3.01	Submergence Factor (Kt)	1.00
Tailwater Elevation	2,027.67 ft		

Sta (ft)	Elev (ft)
0.00	2,041.09
55.00	2,041.35
107.00	2,041.72
161.00	2,042.29
206.00	2,042.90
258.00	2,043.90
308.00	2,044.81

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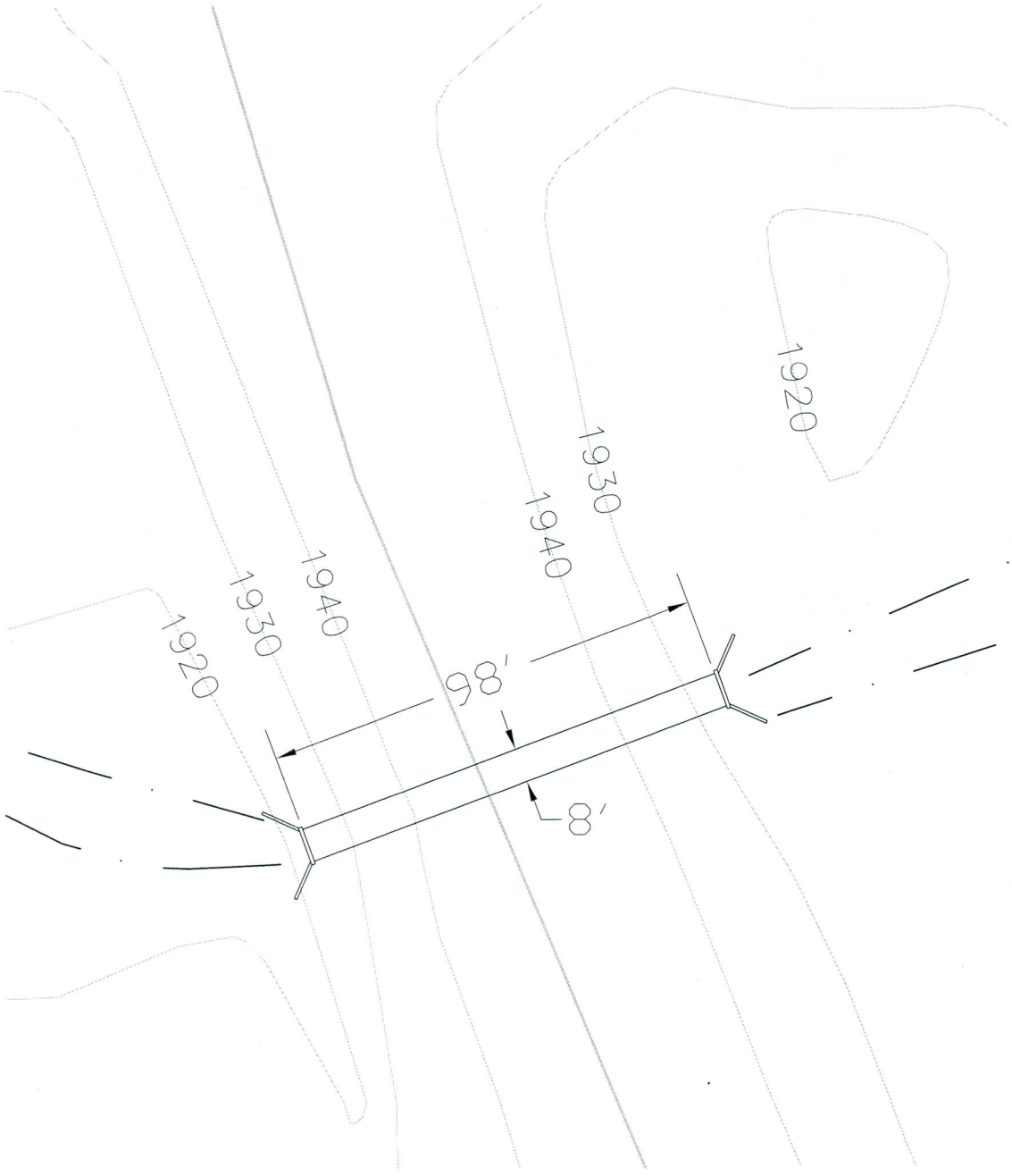
1-8'x4'x98' CBC
LITTLE SQUAW CREEK TRIBUTARY 2
R.S. 0.234



FLOWLINE

STRUCTURE

SCALE 1" = 40'

0 40 80 120

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CONSTRUCTION

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Culvert Designer/Analyzer Report
LSC, Trib 2, Structure Q

Analysis Component			
Storm Event	Design	Discharge	1,540.00 cfs

Peak Discharge Method: User-Specified			
Design Discharge	1,540.00 cfs	Check Discharge	0.00 cfs

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	1,922.00 ft

Name	Description	Discharge	HW Elev	Velocity
Culvert-1	1-8 x 7 ft Box	1,438.10 cfs	1,943.76 ft	25.68 ft/s
Weir	Roadway	101.95 cfs	1,943.76 ft	N/A
Total	----------	1,540.05 cfs	1,943.76 ft	N/A

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Culvert Designer/Analyzer Report
LSC, Trib 2, Structure Q

Component:Culvert-1

Culvert Summary			
Computed Headwater Elevation	1,943.76 ft	Discharge	1,438.10 cfs
Inlet Control HW Elev	1,943.76 ft	Tailwater Elevation	1,922.00 ft
Outlet Control HW Elev	1,939.93 ft	Control Type	Inlet Control
Headwater Depth/ Height	3.70		

Grades			
Upstream Invert	1,917.83 ft	Downstream Invert	1,916.43 ft
Length	97.85 ft	Constructed Slope	0.014308 ft/ft

Hydraulic Profile			
Profile	Pressure	Depth, Downstream	7.00 ft
Slope Type	N/A	Normal Depth	N/A ft
Flow Regime	N/A	Critical Depth	7.00 ft
Velocity Downstream	25.68 ft/s	Critical Slope	0.021962 ft/ft

Section			
Section Shape	Box	Mannings Coefficient	0.013
Section Material	Concrete	Span	8.00 ft
Section Size	8 x 7 ft	Rise	7.00 ft
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev	1,939.93 ft	Upstream Velocity Head	10.25 ft
Ke	0.40	Entrance Loss	4.10 ft

Inlet Control Properties			
Inlet Control HW Elev	1,943.76 ft	Flow Control	Submerged
Inlet Type	45 ° wingwall flare, d=0.0430	Area Full	56.0 ft²
K	0.51000	HDS 5 Chart	9
M	0.66700	HDS 5 Scale	1
C	0.03090	Equation Form	2
Y	0.80000		

Culvert Designer/Analyzer Report
LSC, Trib 2, Structure Q

Component:Weir

Hydraulic Component(s): Roadway					
Discharge	101.95	cfs	Allowable HW Elevation	1,943.76	ft
Roadway Width	35.00	ft	Overtopping Coefficient	2.95	US
Low Point	1,943.31	ft	Headwater Elevation	1,943.76	ft
Discharge Coefficient (Cr)	2.95		Submergence Factor (Kt)	1.00	
Tailwater Elevation	1,922.00	ft			

Sta (ft)	Elev (ft)
0.00	1,943.49
50.00	1,943.31
100.00	1,943.35
146.00	1,943.56
180.00	1,943.66
232.00	1,943.91
288.00	1,944.66
321.00	1,945.52

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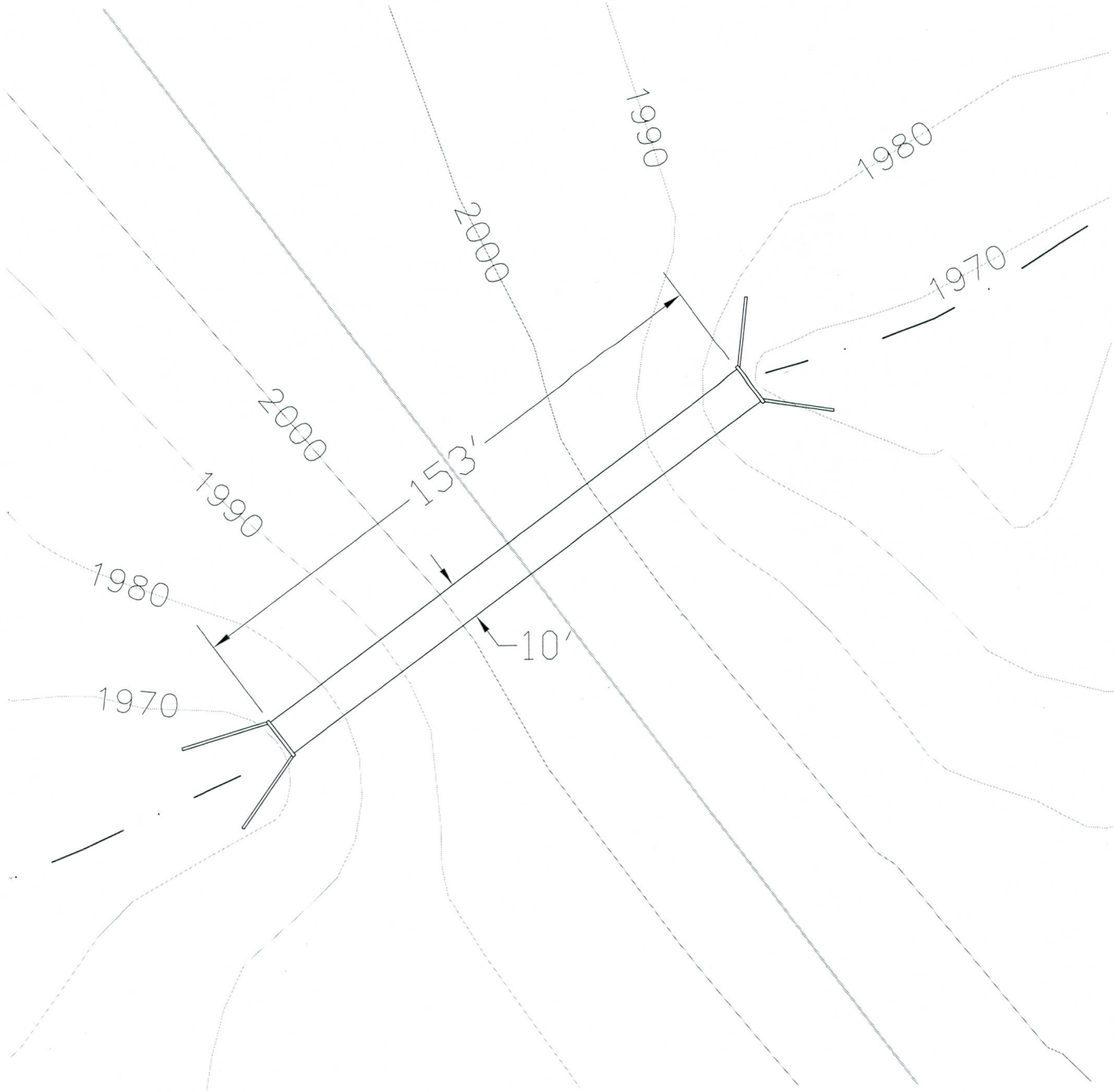
1-10'x10'x153' CBC
LITTLE SQUAW CREEK TRIBUTARY 2
R.S. 0.650



FLOWLINE

STRUCTURE

SCALE 1" = 40'

0 40 80 120

RBF CONSULTING

PLANNING
DESIGN
CONSTRUCTION

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Culvert Designer/Analyzer Report
LSC, Trib 2, Structure S

Analysis Component			
Storm Event	Design	Discharge	1,540.00 cfs

Peak Discharge Method: User-Specified			
Design Discharge	1,540.00 cfs	Check Discharge	0.00 cfs

Tailwater properties: Irregular Channel			
Slope	0.053064 ft/ft	Mannings Coefficient	0.058

Roughness Segments

Start Station (ft)	End Station (ft)	Mannings Coefficient
0.00	45.00	0.070
45.00	105.00	0.058
105.00	193.00	0.070

Natural Channel Points

Station (ft)	Elevation (ft)
0.00	1,980.00
45.00	1,970.00
61.00	1,963.79
105.00	1,970.00
193.00	1,980.00

Tailwater conditions for Design Storm.			
Discharge	1,540.00 cfs	Depth	5.34 ft
Velocity	11.17 ft/s		

Name	Description	Discharge	HW Elev	Velocity
Culvert-1	1-10 x 10 ft Box	1,540.07 cfs	1,980.66 ft	20.56 ft/s
Weir	Roadway	0.00 cfs	1,980.66 ft	N/A
Total	----------	1,540.07 cfs	1,980.66 ft	N/A

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Culvert Designer/Analyzer Report
LSC, Trib 2, Structure S

Component:Culvert-1

Culvert Summary			
Computed Headwater Elevation	1,980.66 ft	Discharge	1,540.07 cfs
Inlet Control HW Elev	1,980.58 ft	Tailwater Elevation	1,969.13 ft
Outlet Control HW Elev	1,980.66 ft	Control Type	Outlet Control
Headwater Depth/ Height	1.54		

Grades			
Upstream Invert	1,965.30 ft	Downstream Invert	1,963.79 ft
Length	153.00 ft	Constructed Slope	0.009869 ft/ft

Hydraulic Profile			
Profile	S2	Depth, Downstream	7.49 ft
Slope Type	Steep	Normal Depth	6.72 ft
Flow Regime	Supercritical	Critical Depth	9.03 ft
Velocity Downstream	20.56 ft/s	Critical Slope	0.004681 ft/ft

Section			
Section Shape	Box	Mannings Coefficient	0.013
Section Material	Concrete	Span	10.00 ft
Section Size	10 x 10 ft	Rise	10.00 ft
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev	1,980.66 ft	Upstream Velocity Head	4.52 ft
Ke	0.40	Entrance Loss	1.81 ft

Inlet Control Properties			
Inlet Control HW Elev	1,980.58 ft	Flow Control	Submerged
Inlet Type	45 ° wingwall flare, d=0.0430	Area Full	100.0 ft²
K	0.51000	HDS 5 Chart	9
M	0.66700	HDS 5 Scale	1
C	0.03090	Equation Form	2
Y	0.80000		

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Culvert Designer/Analyzer Report
LSC, Trib 2, Structure S

Component:Weir

Hydraulic Component(s): Roadway			
Discharge	0.00 cfs	Allowable HW Elevation	1,980.66 ft
Roadway Width	35.00 ft	Overtopping Coefficient	2.90 US
Low Point	1,999.66 ft	Headwater Elevation	N/A ft
Discharge Coefficient (Cr)	2.90	Submergence Factor (Kt)	1.00
Tailwater Elevation	1,969.13 ft		

Sta (ft)	Elev (ft)
0.00	1,999.66
51.00	1,999.77
102.00	2,000.04
150.00	2,000.49
200.00	2,001.00
254.00	2,001.73
298.00	2,002.50

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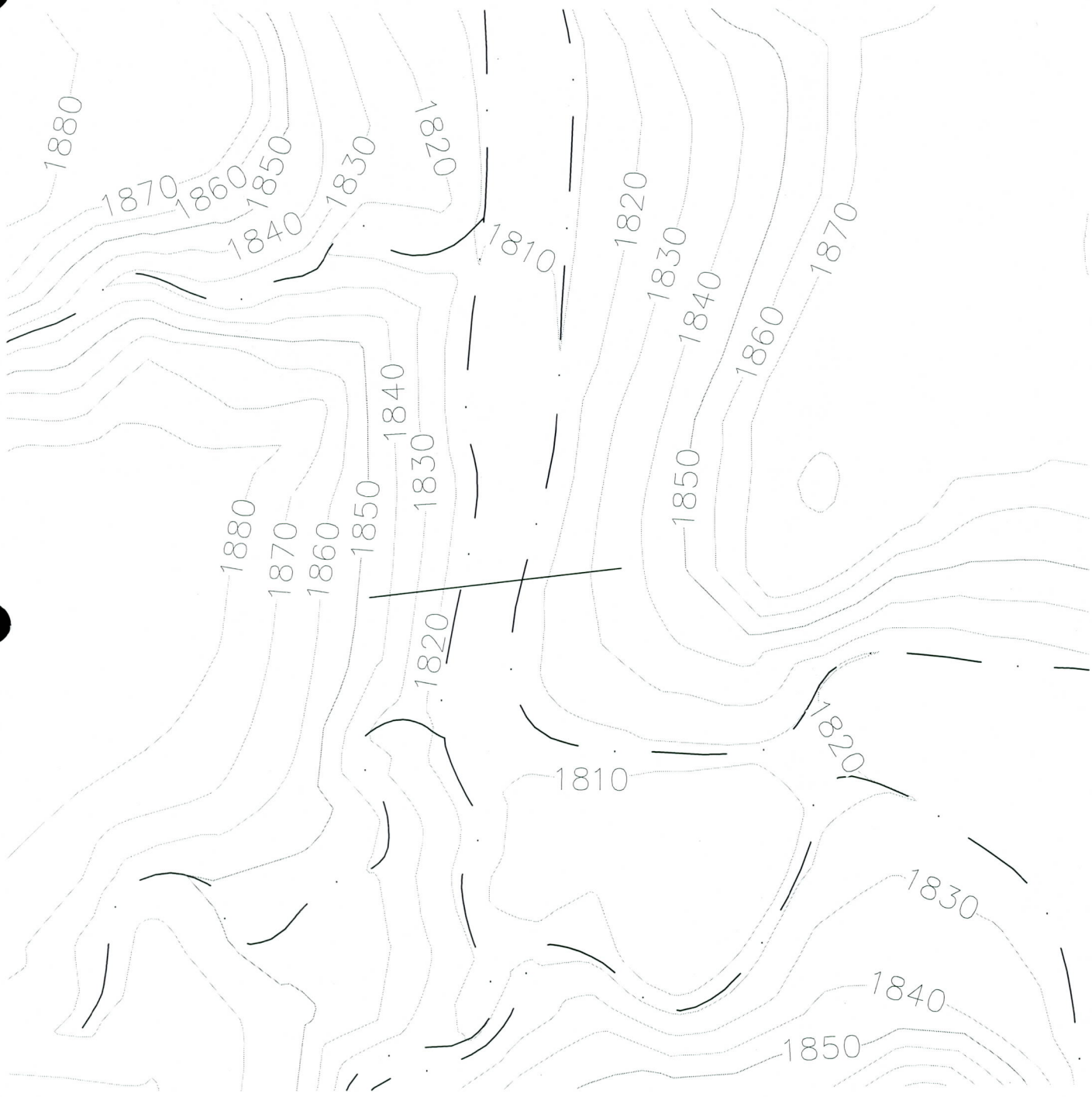
E.5 Hydraulic Calculations

MOORES GULCH, REACH 1
R.S. 0.216



FLOWLINE

CROSS SECTION

SCALE: 1" = 100'

0 100 200 300

RBF CONSULTING

PLANNING
DESIGN
CONSTRUCTION

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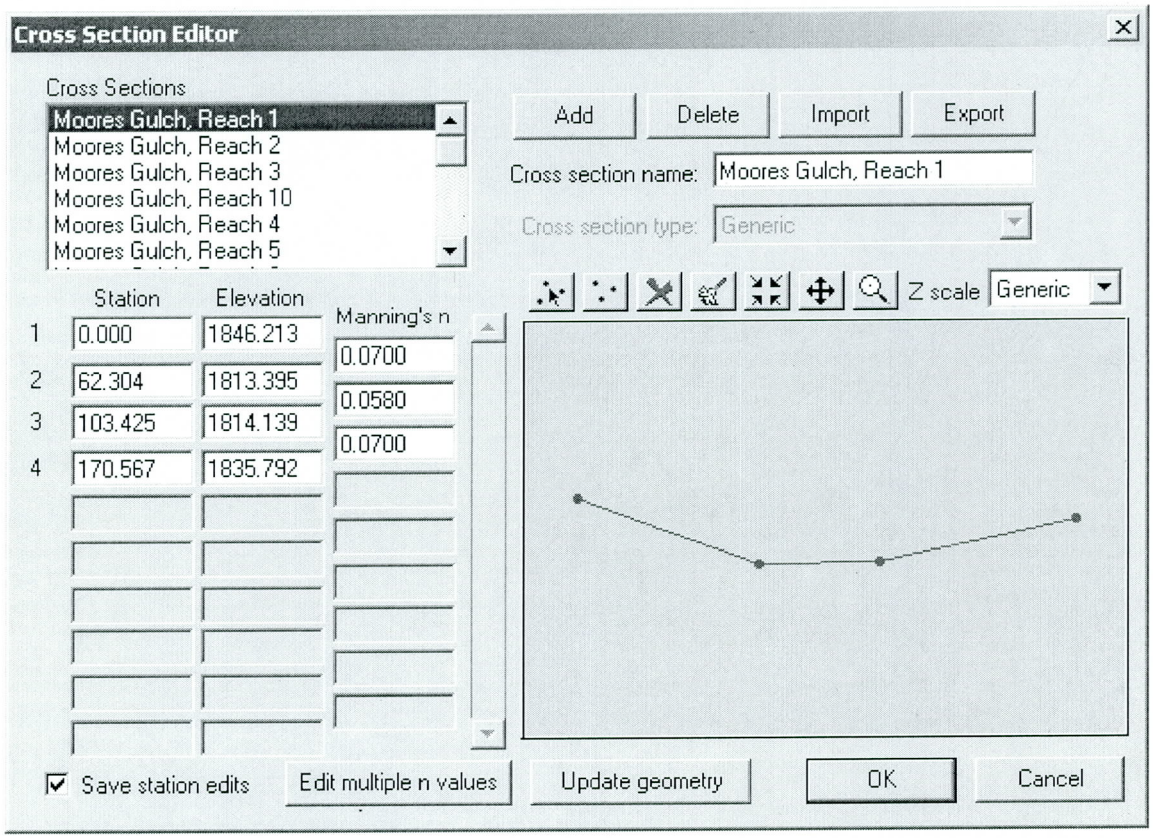
Moores Gulch, Reach 1
RS. 0.216



Calculated Values

Longitudinal Slope: 0.01768 ft/ft
Flow: 9321.000 cfs
Depth: 11.748 ft
Area of Flow: 786.520 sq ft
Wetted Perimeter: 102.187 ft
Average Velocity: 11.851 fps
Top Width (T): 97.545 ft
Froude Number: 0.735
Critical Depth: 9.967 ft
Critical Velocity: 15.016 fps
Critical Slope: 0.03359
Manning's Roughness: 0.06517

MOORES GULCH, REACH 2
R.S. 0.988

FLOWLINE

CROSS SECTION

SCALE: 1" = 100'

0 100 200 300

RBF CONSULTING

PLANNING
DESIGN
CONSTRUCTION

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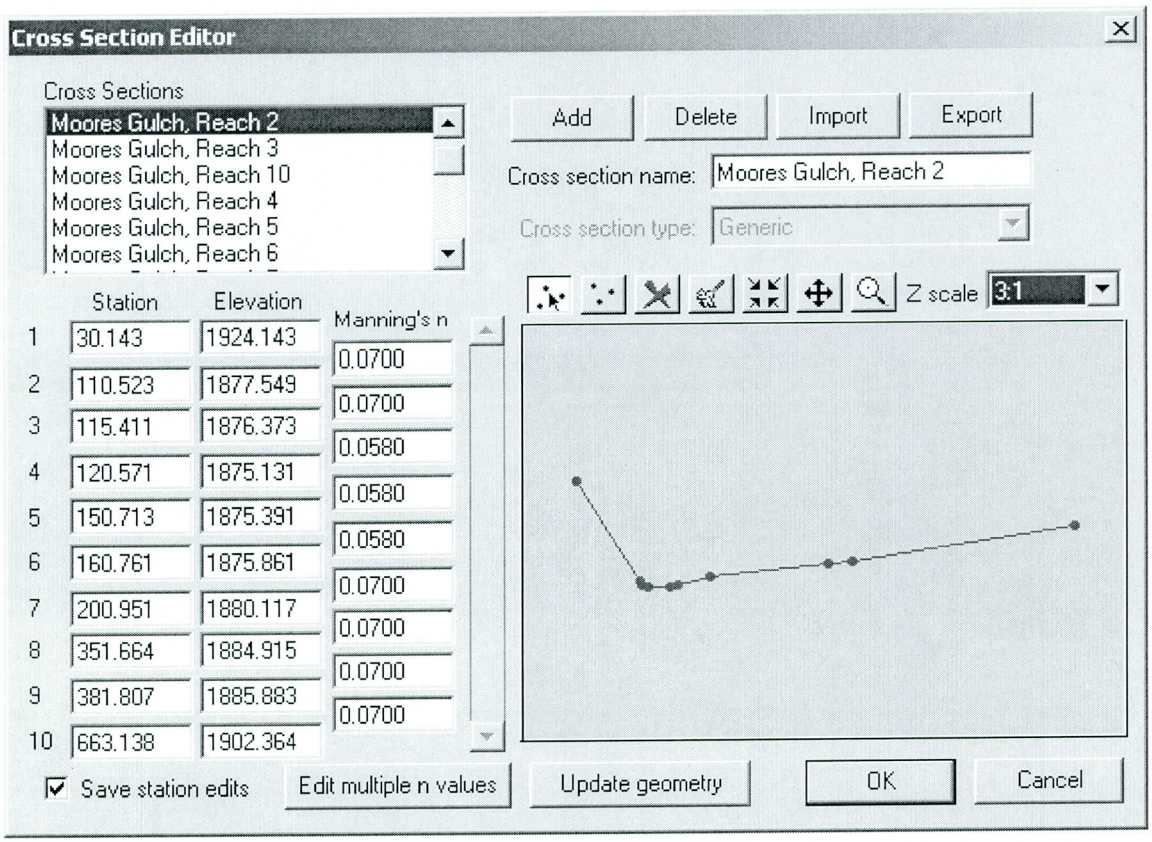
Moores Gulch, Reach 2
RS 0.988



Calculated Values

Longitudinal Slope: 0.01405 ft/ft
Flow: 8993.000 cfs
Depth: 10.062 ft
Area of Flow: 1247.759 sq ft
Wetted Perimeter: 270.058 ft
Average Velocity: 7.207 fps
Top Width (T): 267.908 ft
Froude Number: 0.589
Critical Depth: 8.164 ft
Critical Velocity: 11.241 fps
Critical Slope: 0.04218
Manning's Roughness: 0.06798

MOORES GULCH, REACH 3
R.S. 2.681

FLOWLINE

CROSS SECTION

SCALE: 1" = 100'

0 100 200 300

RBF CONSULTING

PLANNING
DESIGN
CONSTRUCTION

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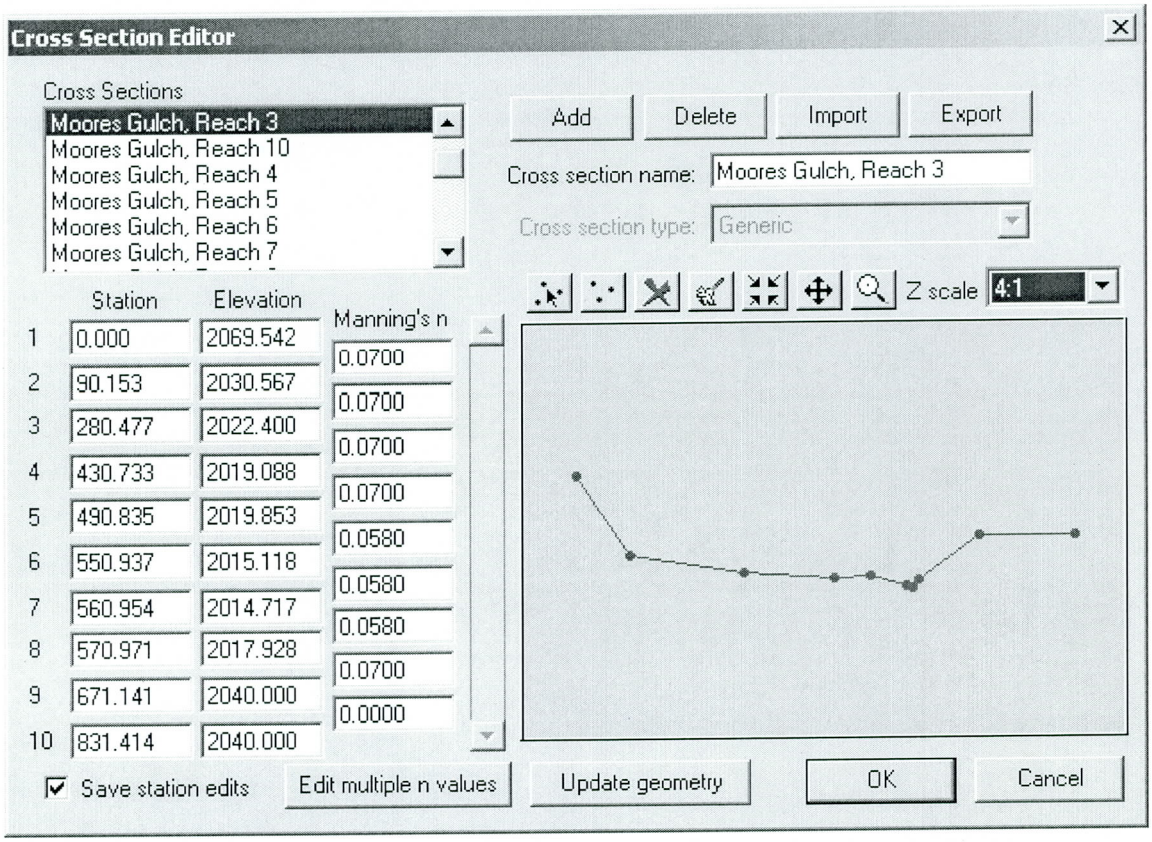
Moores Gulch, Reach 3
RS 2.681



Calculated Values

Longitudinal Slope: 0.01747 ft/ft
Flow: 7548.000 cfs
Depth: 8.408 ft
Area of Flow: 1134.142 sq ft
Wetted Perimeter: 332.293 ft
Average Velocity: 6.655 fps
Top Width (T): 330.974 ft
Froude Number: 0.634
Critical Depth: 7.365 ft
Critical Velocity: 9.376 fps
Critical Slope: 0.04645
Manning's Roughness: 0.06708

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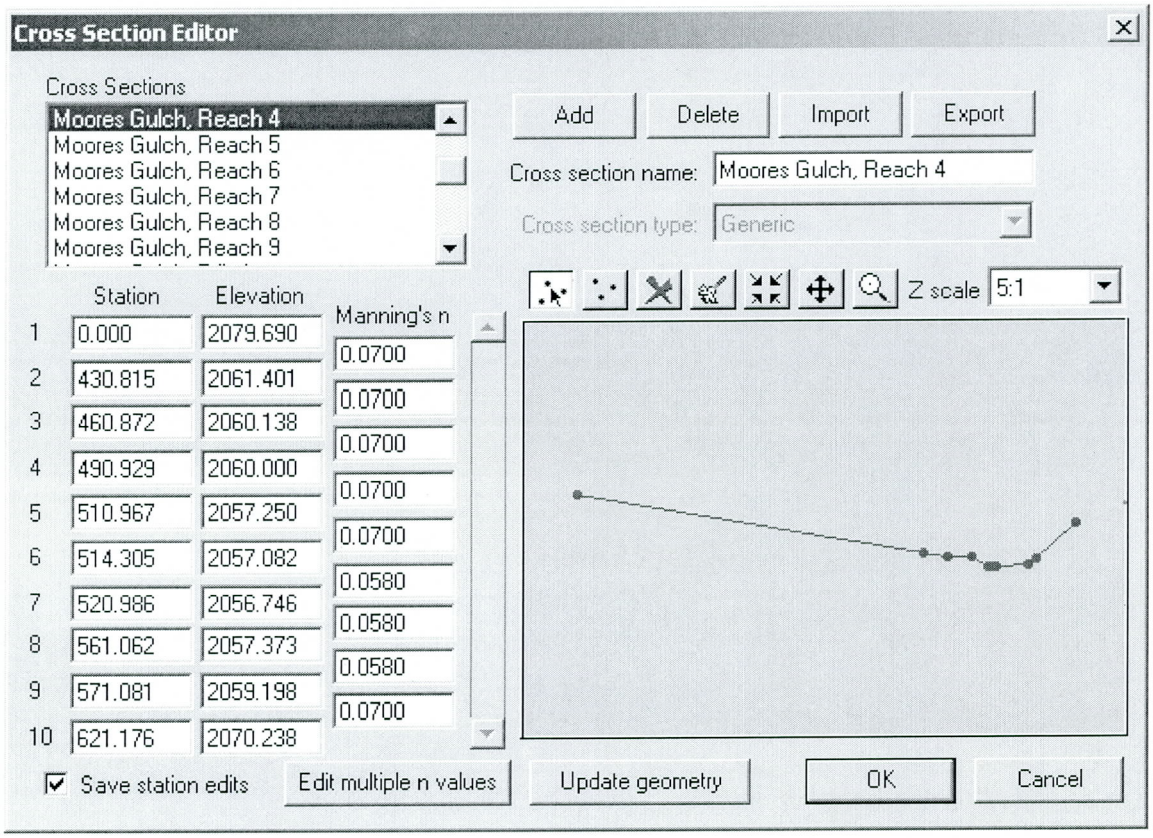
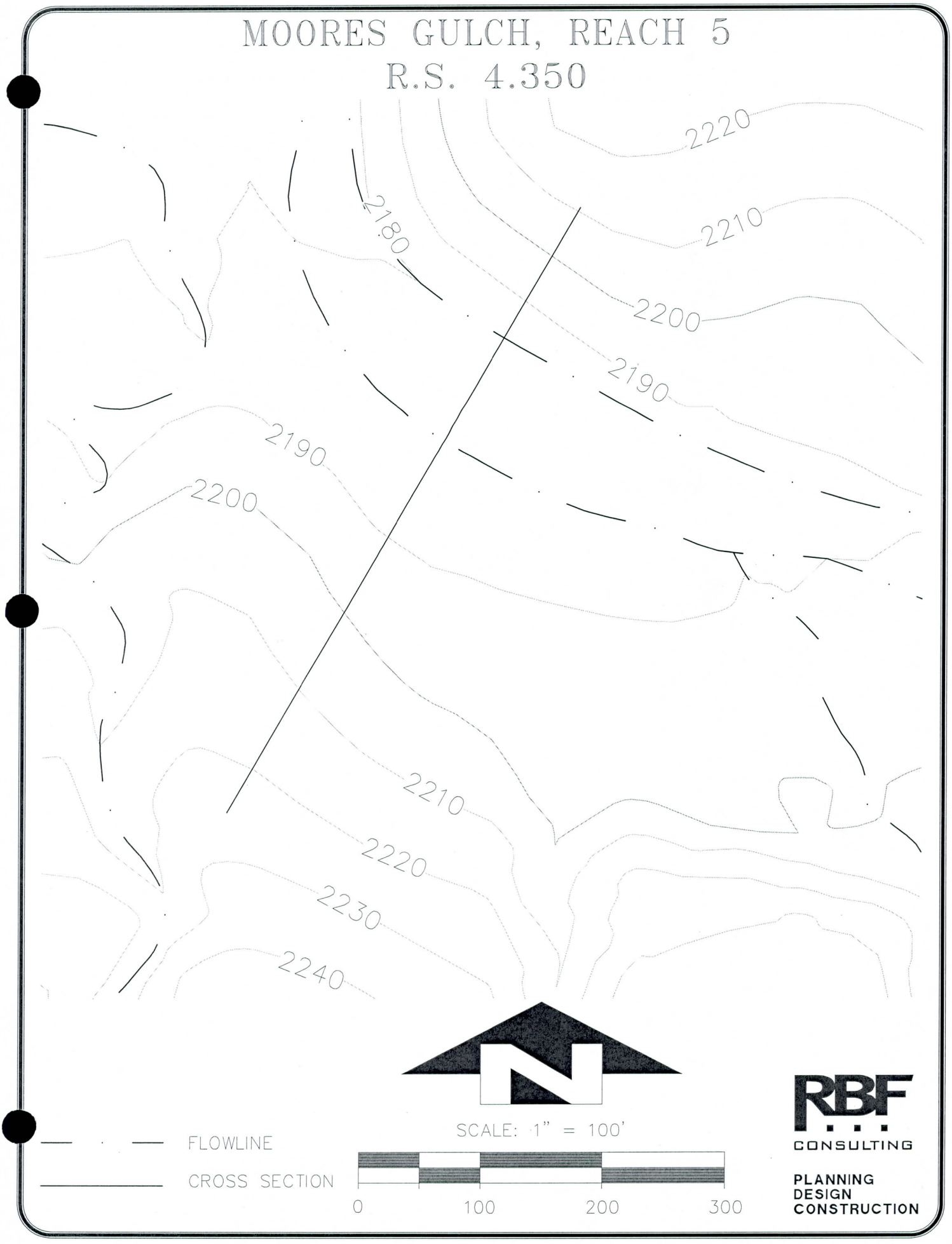
Moores Gulch, Reach 4
RS 3.112



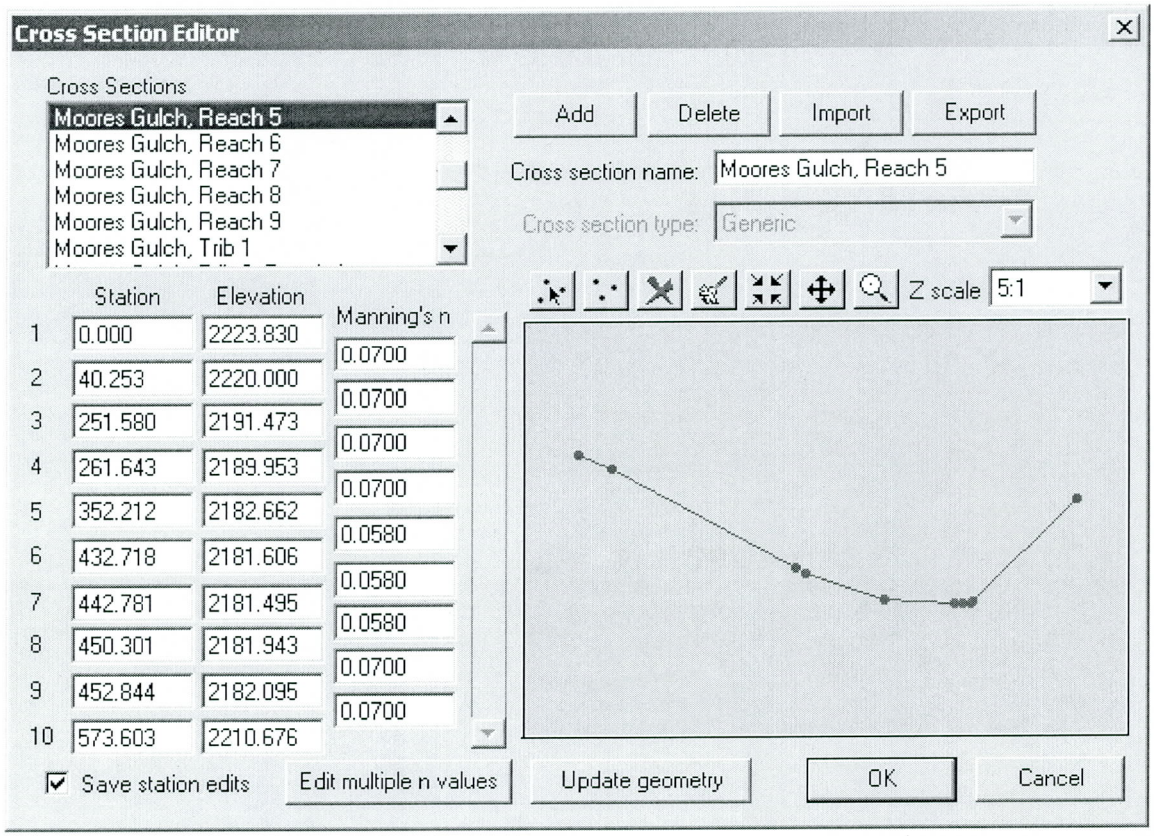
Calculated Values

Longitudinal Slope: 0.01872 ft/ft
Flow: 7567.000 cfs
Depth: 7.749 ft
Area of Flow: 974.301 sq ft
Wetted Perimeter: 238.216 ft
Average Velocity: 7.767 fps
Top Width (T): 237.177 ft
Froude Number: 0.675
Critical Depth: 6.565 ft
Critical Velocity: 10.612 fps
Critical Slope: 0.04271
Manning's Roughness: 0.06713



H:\PDATA\45100648\DWG\WS3AND4\0648-X-SECS-EX-SHT9.DWG WKING 4/22/03 10:17 pm

Moores Gulch, Reach 5
RS 4.350



Calculated Values

Longitudinal Slope: 0.01962 ft/ft
Flow: 6920.000 cfs
Depth: 6.264 ft
Area of Flow: 804.352 sq ft
Wetted Perimeter: 188.760 ft
Average Velocity: 8.603 fps
Top Width (T): 187.868 ft
Froude Number: 0.733
Critical Depth: 5.324 ft
Critical Velocity: 10.897 fps
Critical Slope: 0.03771
Manning's Roughness: 0.06376

MOORES GULCH, REACH 6
R.S. 5.218

FLOWLINE

CROSS SECTION

SCALE: 1" = 100'

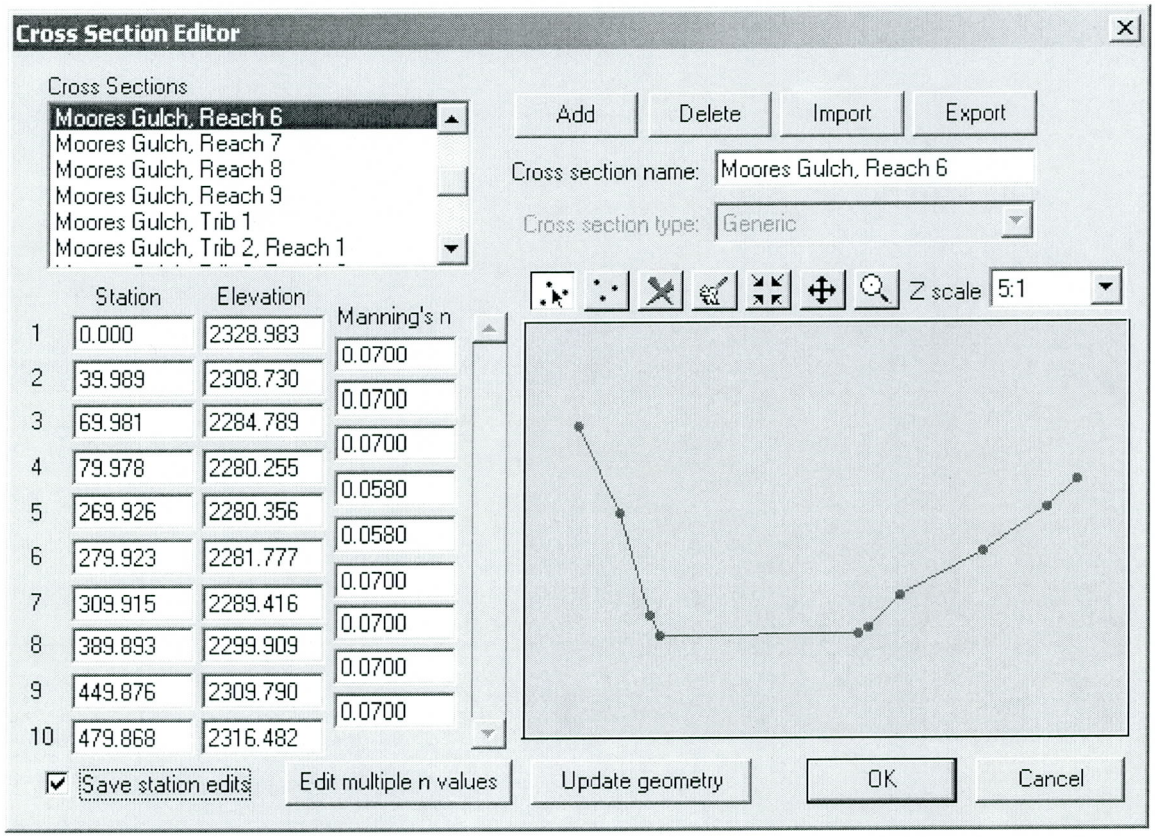
0 100 200 300

RBF CONSULTING

PLANNING
DESIGN
CONSTRUCTION

H:\PDATA\45100648\DWG\WS3AND4\0648-X-SECS-EX-SHT9.DWG WKING 4/22/03 10:18 pm

Moores Gulch, Reach 6
RS 5.218

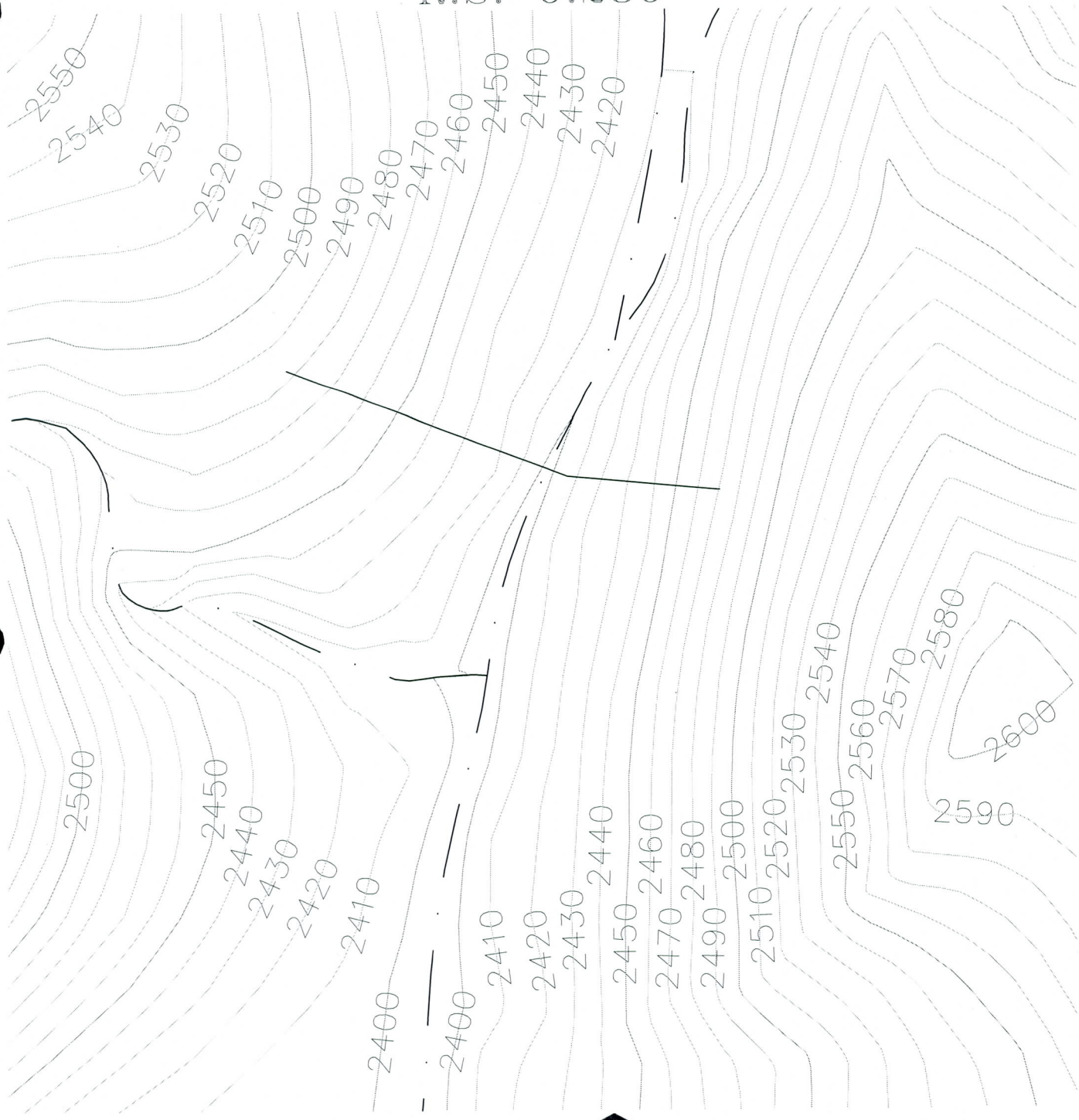


Calculated Values

Longitudinal Slope: 0.02097 ft/ft
Flow: 6101.000 cfs
Depth: 3.662 ft
Area of Flow: 738.361 sq ft
Wetted Perimeter: 217.586 ft
Average Velocity: 8.263 fps
Top Width (T): 216.426 ft
Froude Number: 0.788
Critical Depth: 3.144 ft
Critical Velocity: 9.730 fps
Critical Slope: 0.03521
Manning's Roughness: 0.05897

MOORES GULCH, REACH 7

R.S. 6.280



FLOWLINE

CROSS SECTION

SCALE: 1" = 100'

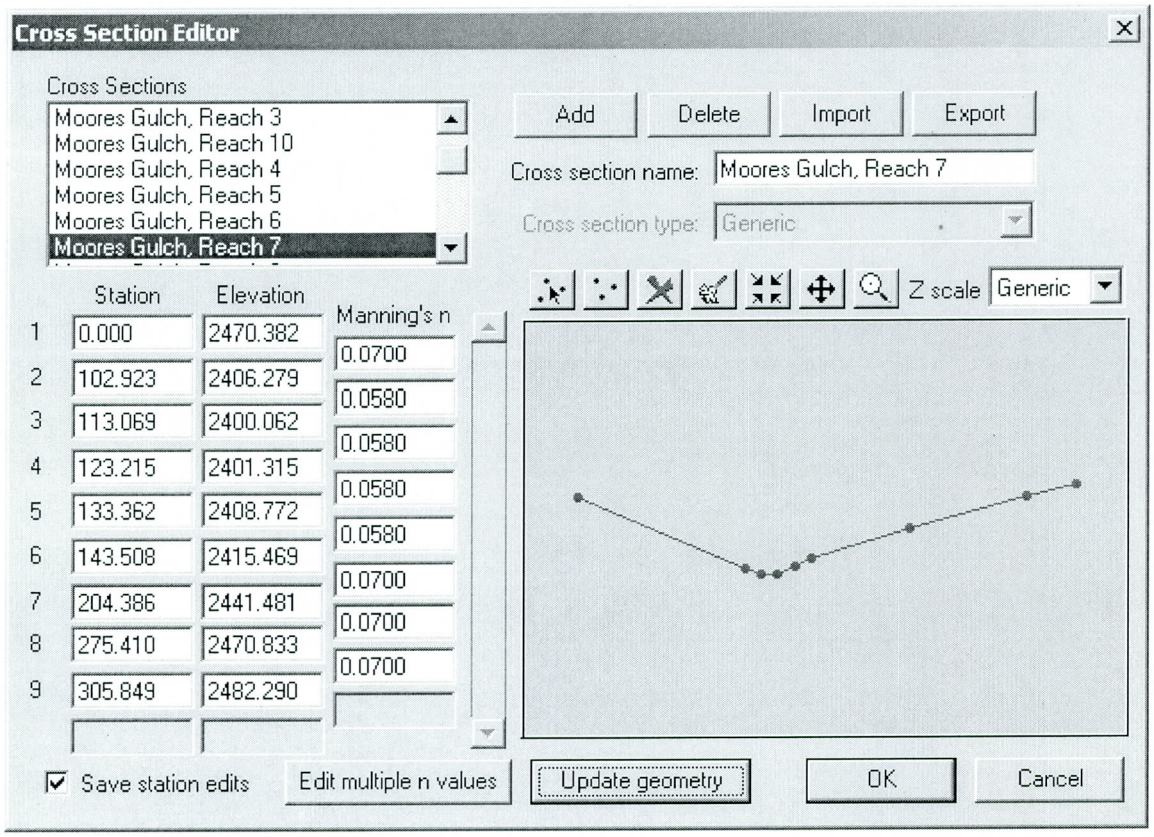
0 100 200 300

RBF CONSULTING

PLANNING
DESIGN
CONSTRUCTION

H:\PDATA\45100648\DWG\WS3AND4\0648-X-SECS-EX-SHT7.DWG WKING 4/22/03 10:10 pm

Moores Gulch, Reach 7
RS 6.280



Calculated Values

Longitudinal Slope: 0.0276 ft/ft
Flow: 5872.000 cfs
Depth: 13.873 ft
Area of Flow: 401.055 sq ft
Wetted Perimeter: 58.567 ft
Average Velocity: 14.641 fps
Top Width (T): 50.552 ft
Froude Number: 0.916
Critical Depth: 13.328 ft
Critical Velocity: 15.701 fps
Critical Slope: 0.03312
Manning's Roughness: 0.06097

MOORES GULCH, REACH 8
R.S. 7.631

N

SCALE: 1" = 100'

FLOWLINE

CROSS SECTION

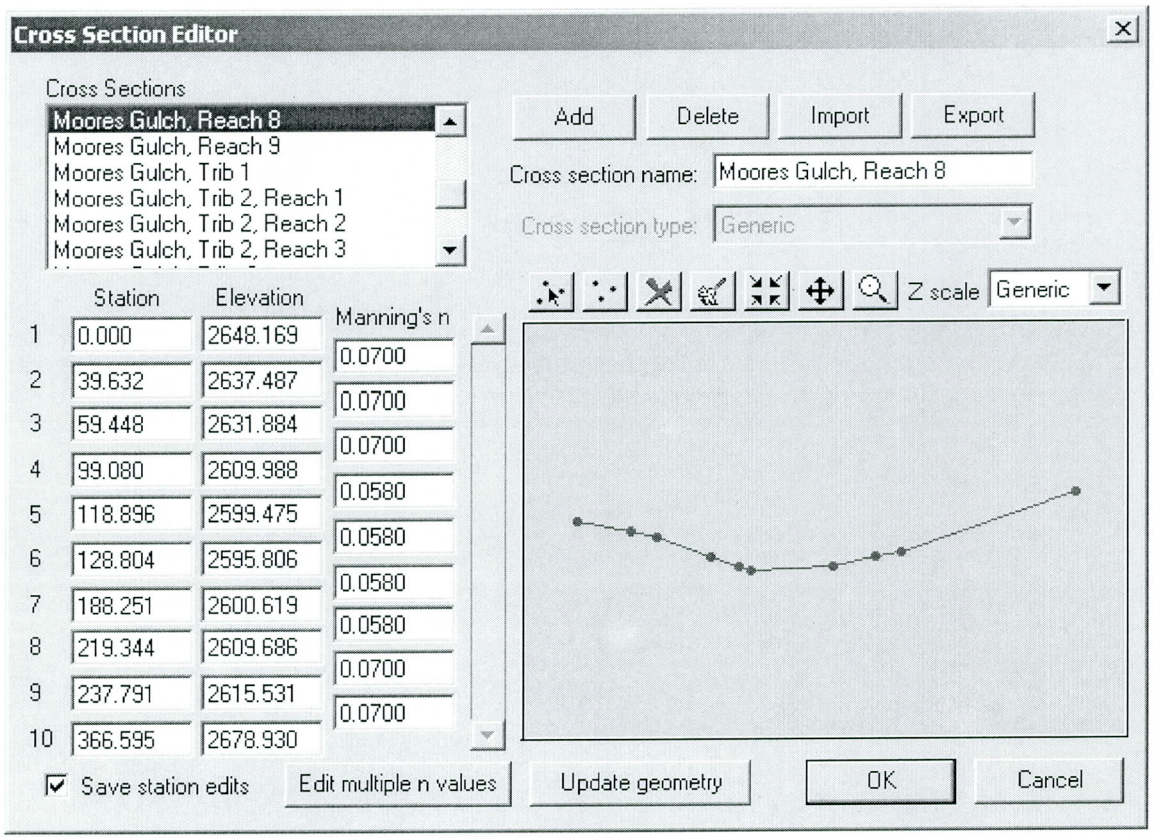
0 100 200 300

RBF CONSULTING

PLANNING
DESIGN
CONSTRUCTION

H:\PDATA\45100648\DWG\WS3AND4\0648-X-SECS-EX-SHT7.DWG WKING 4/22/03 10:11 pm

Moores Gulch, Reach 8
RS 7.631



Calculated Values

Longitudinal Slope: 0.02823 ft/ft
Flow: 4735.000 cfs
Depth: 7.693 ft
Area of Flow: 401.831 sq ft
Wetted Perimeter: 89.084 ft
Average Velocity: 11.784 fps
Top Width (T): 86.819 ft
Froude Number: 0.965
Critical Depth: 7.574 ft
Critical Velocity: 12.094 fps
Critical Slope: 0.03048
Manning's Roughness: 0.05800

MOORES GULCH, REACH 9
R.S. 8.666

FLOWLINE

CROSS SECTION

SCALE: 1" = 100'

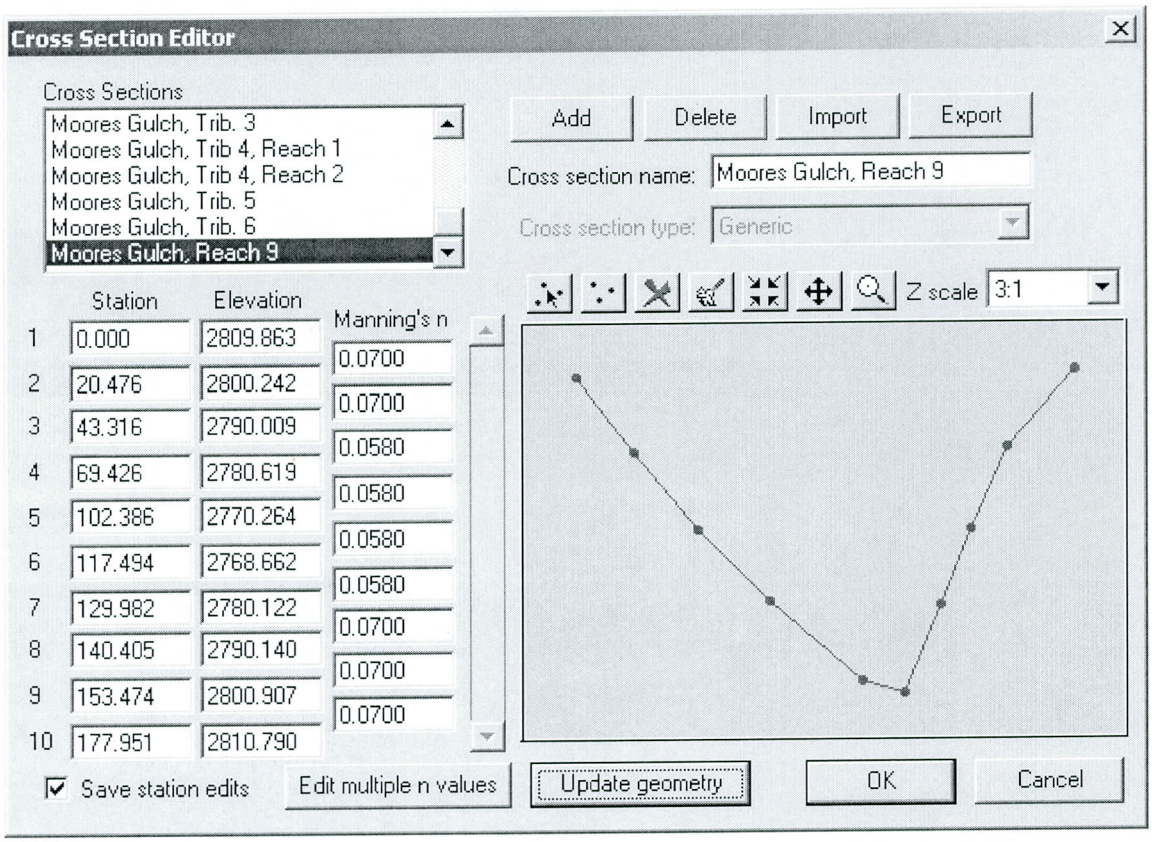
0 100 200 300

RBF CONSULTING

PLANNING
DESIGN
CONSTRUCTION

H:\PDATA\45100648\DWG\WS3AND4\0648-X-SECS-EX-SHT7.DWG WKING 4/22/03 10:11 pm

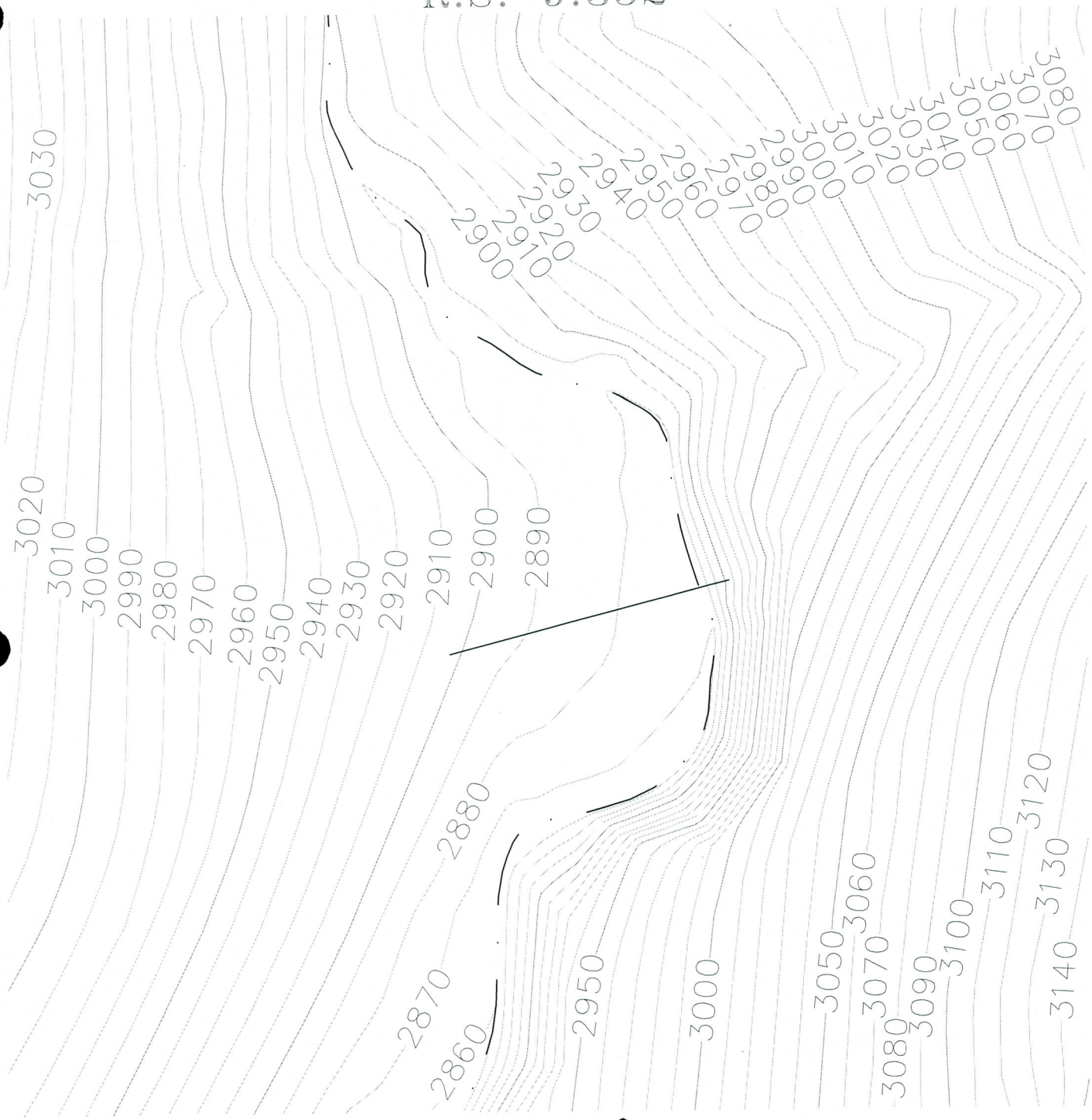
Moores Gulch, Reach 9
RS 8.666



Calculated Values

Longitudinal Slope: 0.03273 ft/ft
Calculated Values
Flow: 4355.000 cfs
Depth: 10.052 ft
Area of Flow: 308.445 sq ft
Wetted Perimeter: 58.252 ft
Average Velocity: 14.119 fps
Top Width (T): 52.958 ft
Froude Number: 1.031
Critical Depth: 10.194 ft
Critical Velocity: 13.783 fps
Critical Slope: 0.03067
Manning's Roughness: 0.05800

MOORES GULCH, REACH 10
R.S. 9.352



SCALE: 1" = 100'

FLOWLINE

CROSS SECTION

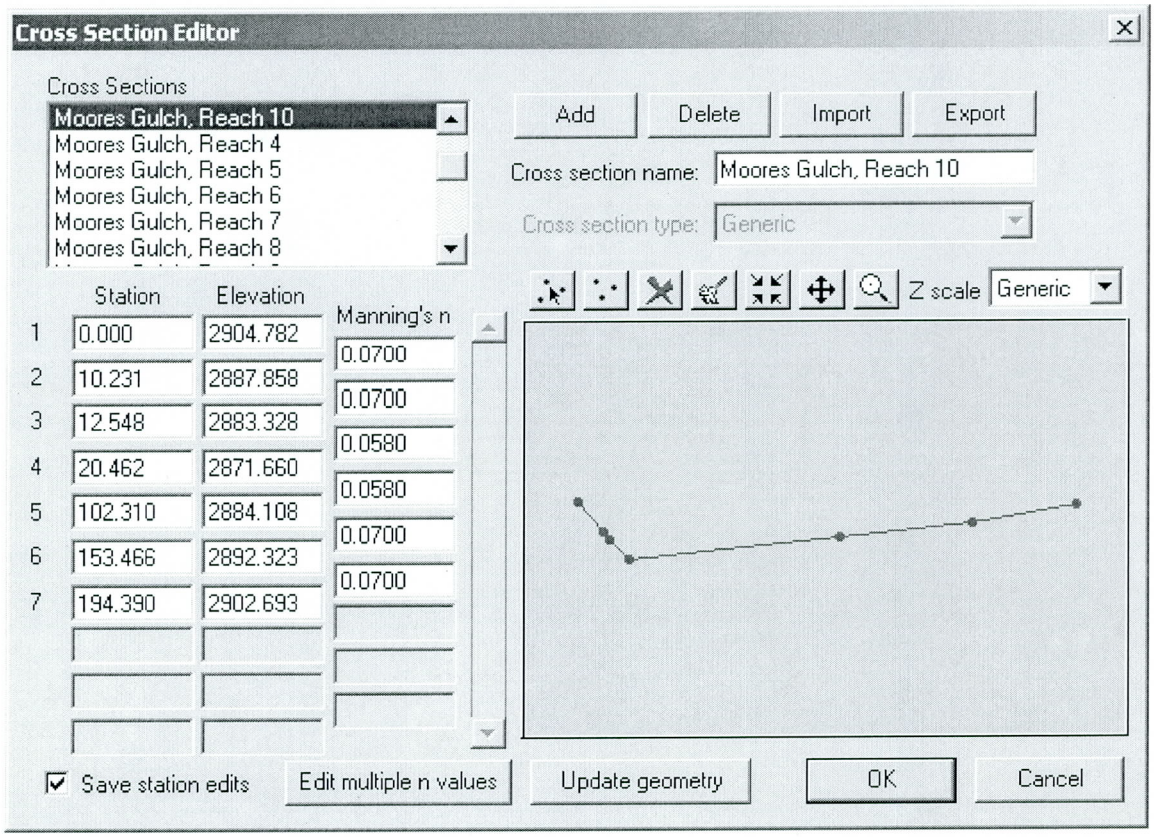
0 100 200 300

RBF CONSULTING

PLANNING
DESIGN
CONSTRUCTION

H:\PDATA\45100648\DWG\WS3AND4\0648-X-SECS-EX-SHT4.DWG WKING 4/22/03 10:03 pm

Moores Gulch, Reach 10
RS 9.352



Calculated Values

Longitudinal Slope: 0.05738 ft/ft
Flow: 2977.000 cfs
Depth: 7.601 ft
Area of Flow: 209.551 sq ft
Wetted Perimeter: 59.740 ft
Average Velocity: 14.207 fps
Top Width (T): 55.136 ft
Froude Number: 1.284
Critical Depth: 8.401 ft
Critical Velocity: 11.630 fps
Critical Slope: 0.03365
Manning's Roughness: 0.05800

MOORES GULCH, TRIBUTARY 1
R.S. 0.104

SCALE: 1" = 100'

FLOWLINE

CROSS SECTION

0 100 200 300

RBF CONSULTING

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DESIGN
CONSTRUCTION

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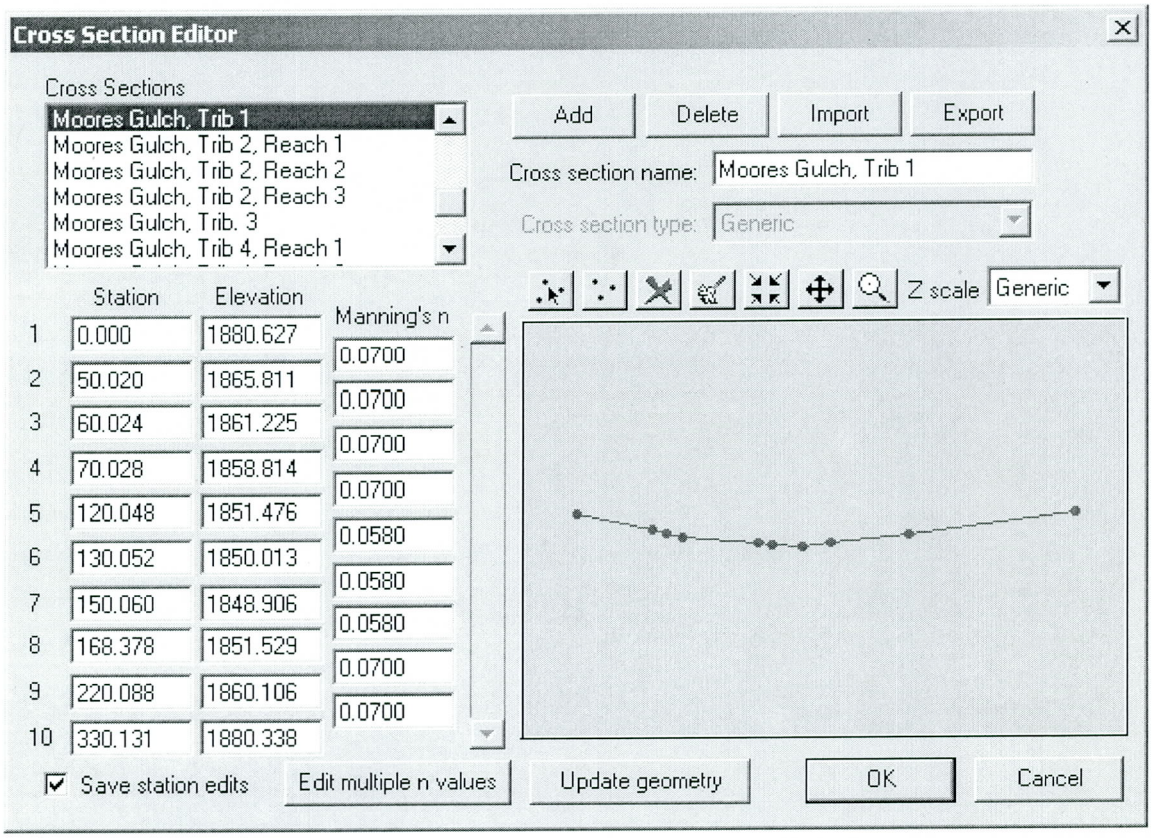
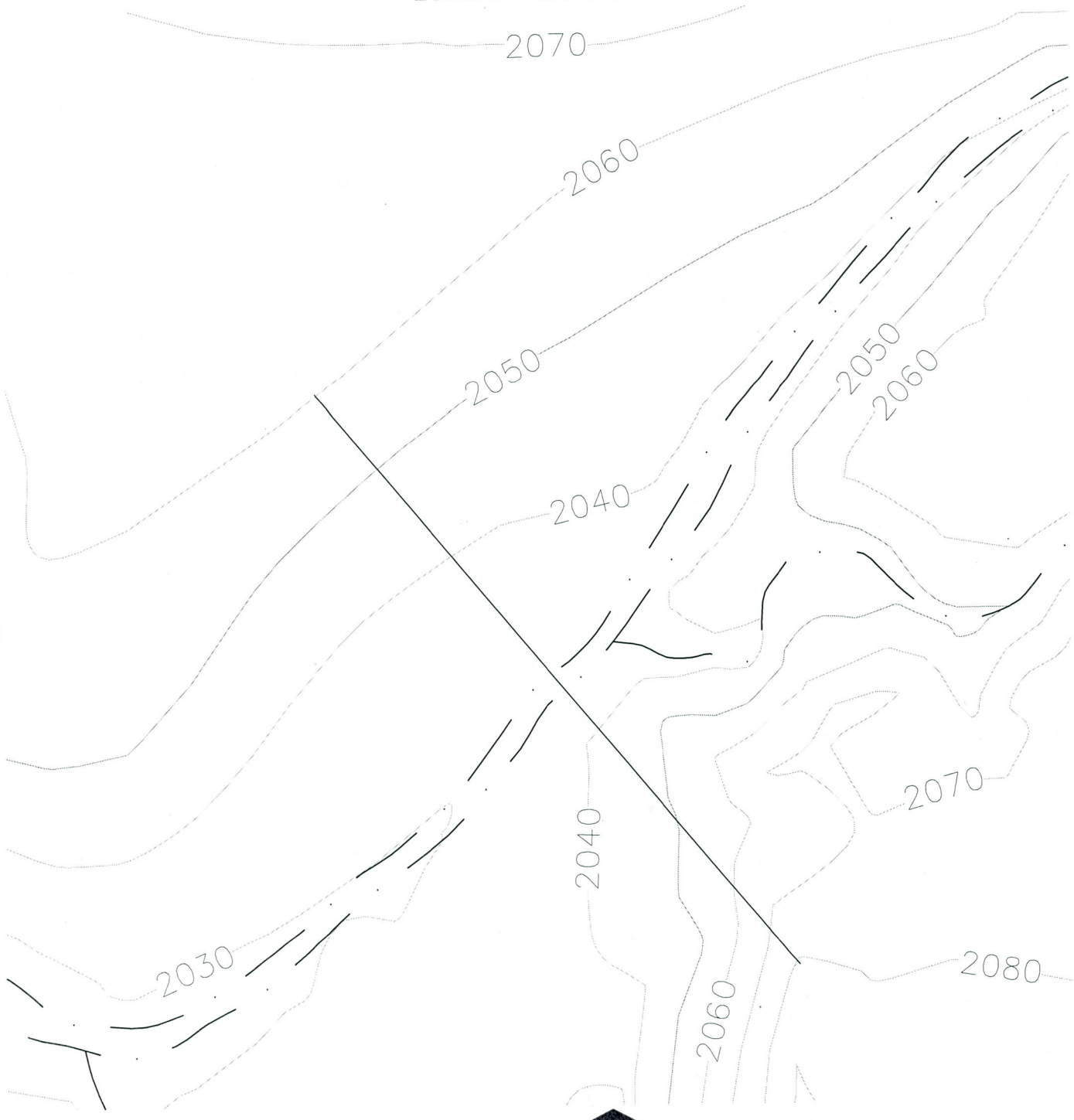
Moores Gulch, Tributary 1
RS 0.104



Calculated Values

Longitudinal Slope: 0.027118 ft/ft
Flow: 1109.000 cfs
Depth: 4.085 ft
Area of Flow: 158.199 sq ft
Wetted Perimeter: 68.027 ft
Average Velocity: 7.010 fps
Top Width (T): 67.473 ft
Froude Number: 0.807
Critical Depth: 3.709 ft
Critical Velocity: 8.291 fps
Critical Slope: 0.04201
Manning's Roughness: 0.06142

MOORES GULCH, TRIBUTARY 2, REACH 1
R.S. 1.005



FLOWLINE

CROSS SECTION

SCALE: 1" = 100'

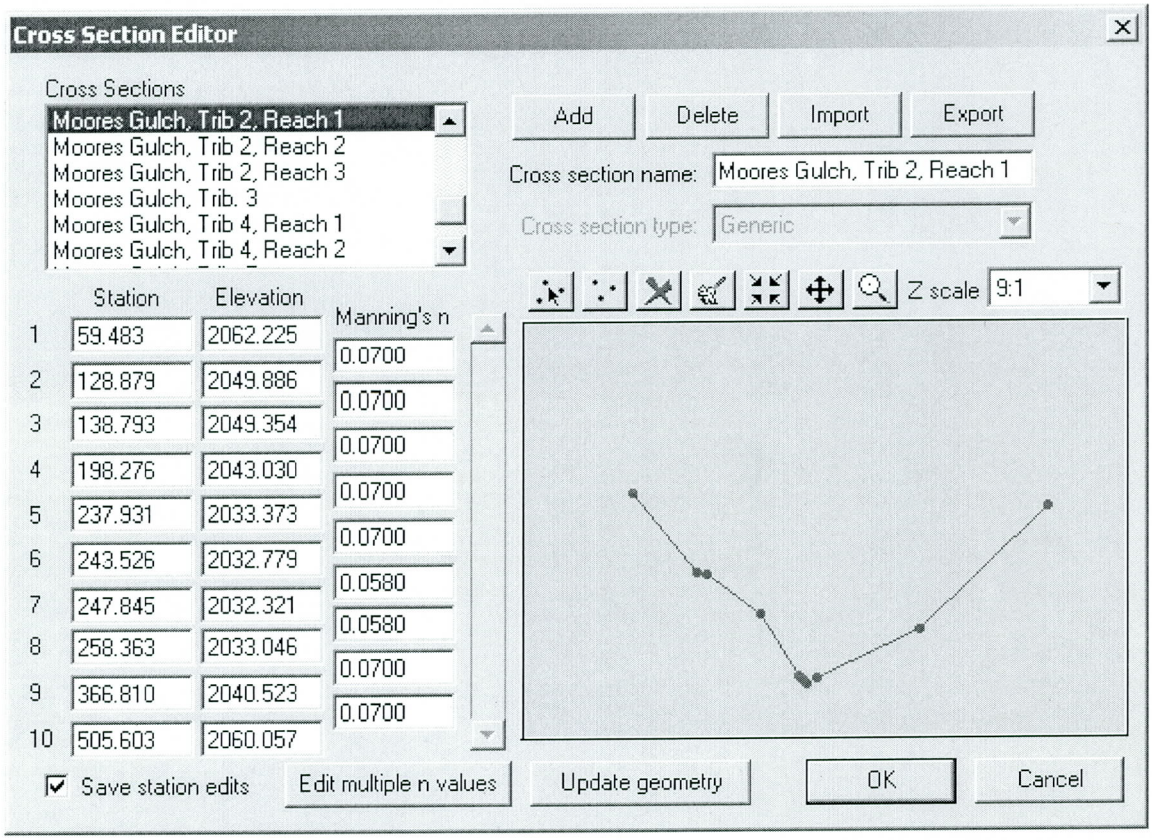
0 100 200 300

RBF CONSULTING

PLANNING
DESIGN
CONSTRUCTION

H:\PDATA\45100648\DWG\WS3AND4\0648-X-SECS-EX-SHT8.DWG WKING 4/22/03 10:16 pm

Moores Gulch, Tributary 2, Reach 1
RS 1.005



Calculated Values

Longitudinal Slope: 0.0295 ft/ft
Flow: 2396.000 cfs
Depth: 5.566 ft
Area of Flow: 316.421 sq ft
Wetted Perimeter: 109.959 ft
Average Velocity: 7.572 fps
Top Width (T): 109.170 ft
Froude Number: 0.784
Critical Depth: 5.029 ft
Critical Velocity: 9.197 fps
Critical Slope: 0.04937
Manning's Roughness: 0.06838

MOORES GULCH, TRIBUTARY 2, REACH 2
R.S. 2.185

SCALE: 1" = 100'

FLOWLINE

CROSS SECTION

0 100 200 300

RBF CONSULTING

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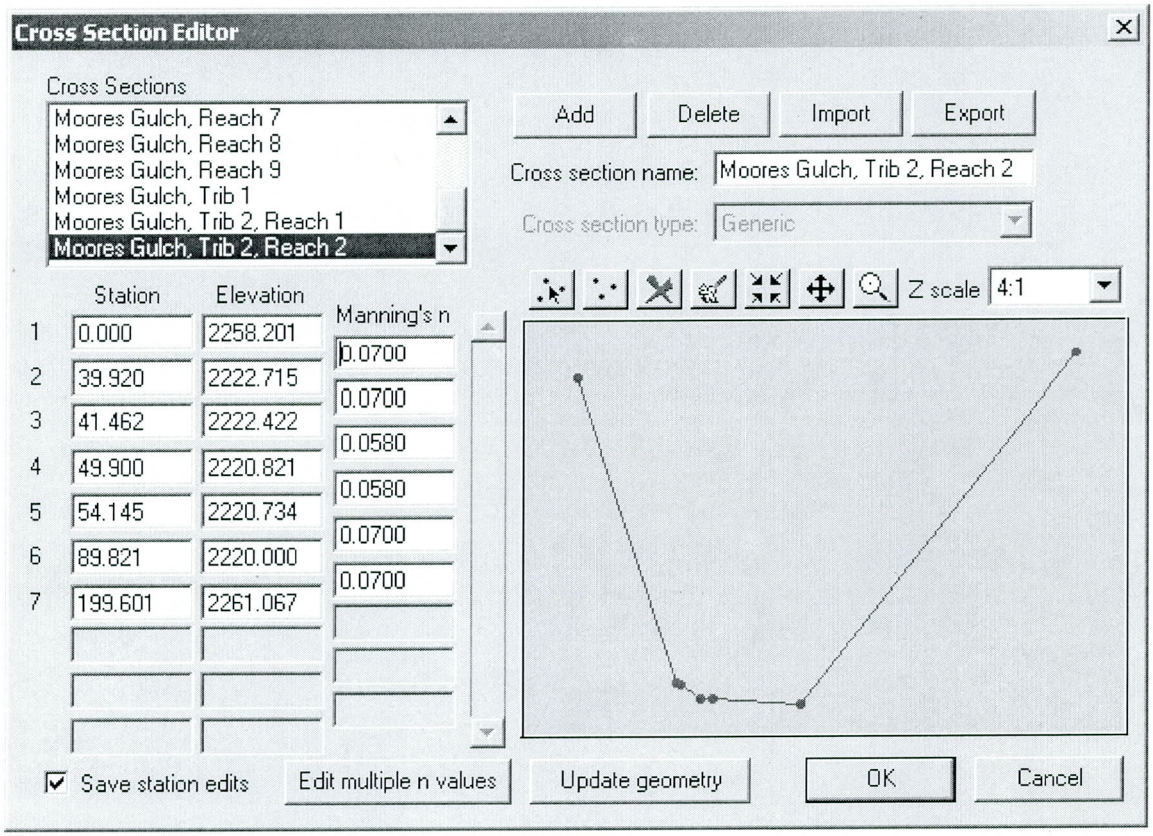
CONSTRUCTION

H:\PDATA\45100648\DWG\WS3AND4\0648-X-SECS-EX-SHT6.DWG WKING 4/22/03 10:09 pm

Moores Gulch, Tributary 2, Reach 2
RS 2.185



Calculated Values

Longitudinal Slope: 0.03927 ft/ft
Flow: 2161.000 cfs
Depth: 4.521 ft
Area of Flow: 220.751 sq ft
Wetted Perimeter: 65.711 ft
Average Velocity: 9.789 fps
Top Width (T): 64.020 ft
Froude Number: 0.929
Critical Depth: 4.344 ft
Critical Velocity: 10.318 fps
Critical Slope: 0.04603
Manning's Roughness: 0.06766

MOORES GULCH, TRIBUTARY 2, REACH 3
R.S. 3.165

N

SCALE: 1" = 100'

FLOWLINE

CROSS SECTION

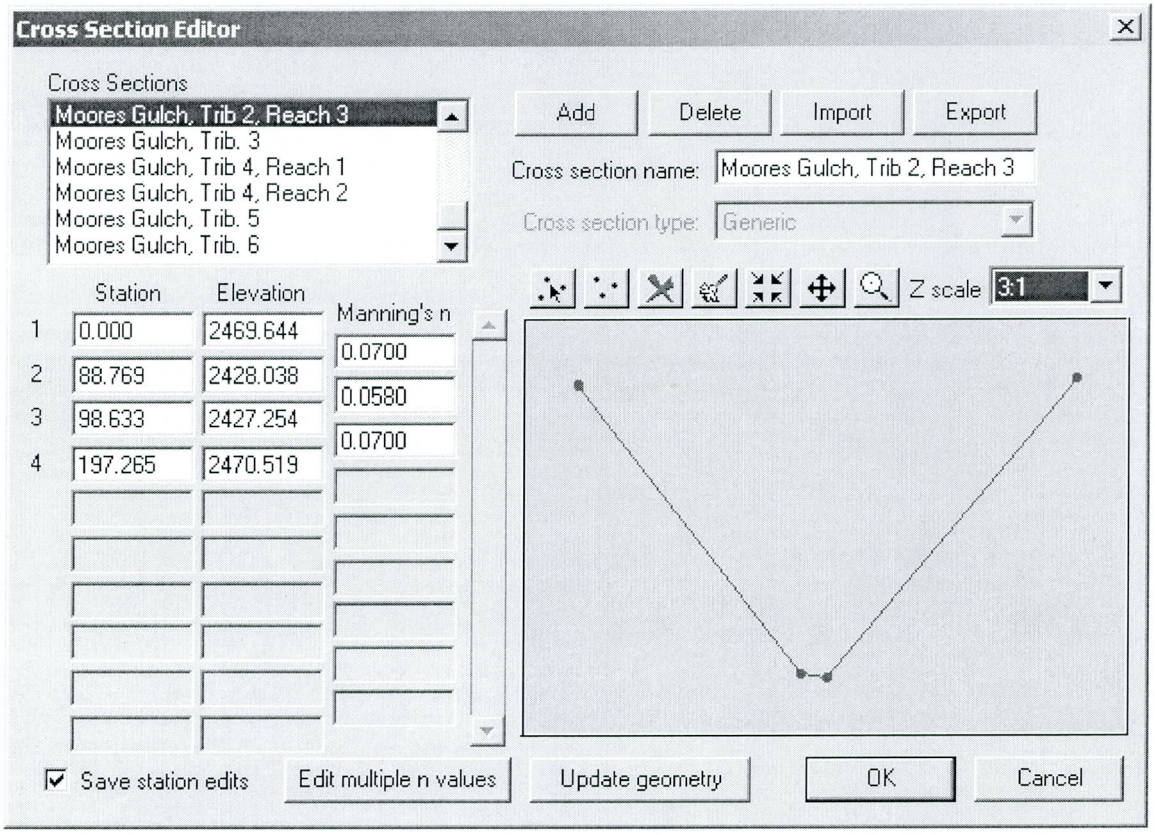
0 100 200 300

RBF CONSULTING

PLANNING
DESIGN
CONSTRUCTION

H:\PDATA\45100648\DWG\WS3AND4\0648-X-SECS-EX-SHT6.DWG WKING 4/22/03 10:10 pm

Moores Gulch, Tributary 2, Reach 3
RS 3.165



Calculated Values

Longitudinal Slope: 0.044529 ft/ft
Flow: 1403.000 cfs
Depth: 6.151 ft
Area of Flow: 130.670 sq ft
Wetted Perimeter: 37.855 ft
Average Velocity: 10.737 fps
Top Width (T): 35.339 ft
Froude Number: 0.984
Critical Depth: 6.104 ft
Critical Velocity: 10.874 fps
Critical Slope: 0.04603
Manning's Roughness: 0.06686

MOORES GULCH, TRIBUTARY 3
R.S. 0.476

SCALE: 1" = 100'

FLOWLINE

CROSS SECTION

0 100 200 300

RBF CONSULTING

PLANNING
DESIGN
CONSTRUCTION

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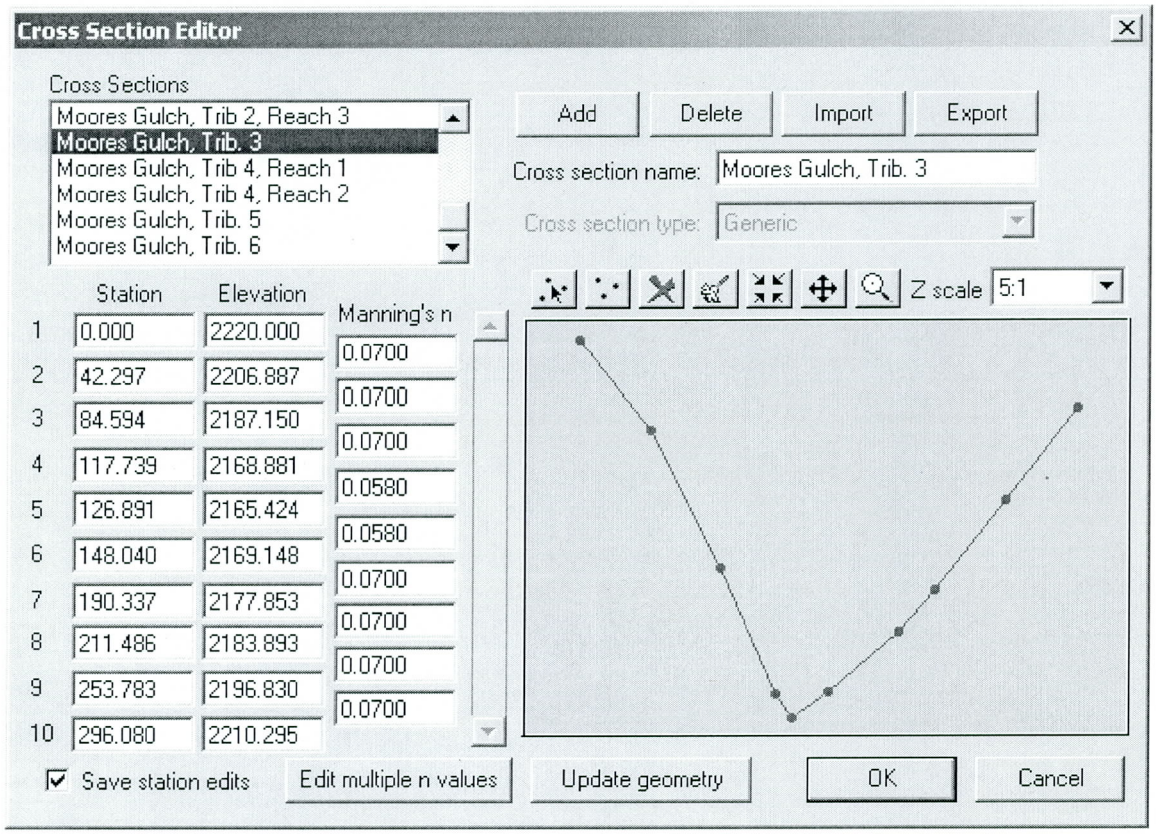
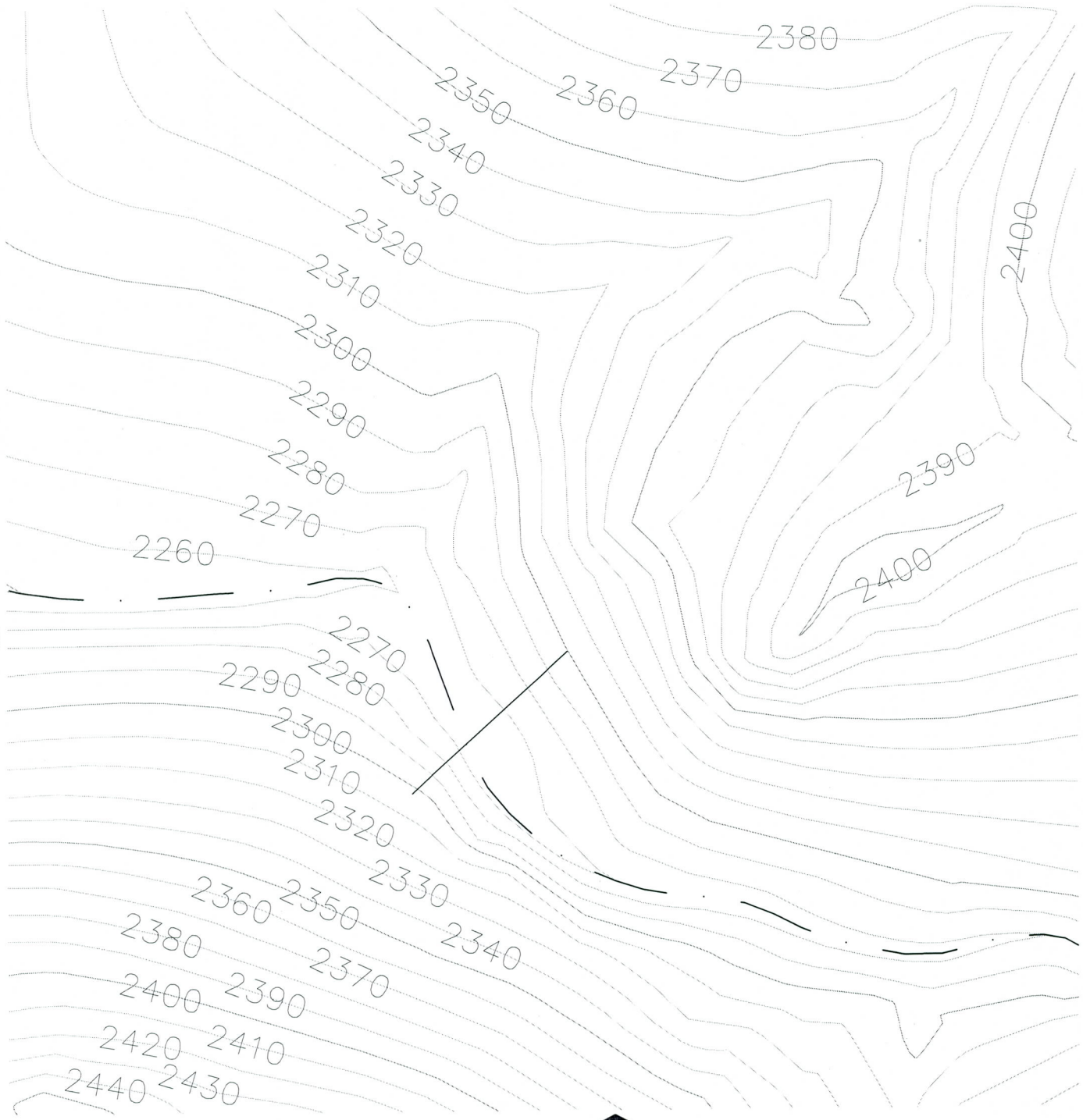
Moores Gulch, Tributary 3
RS 0.476



Calculated Values

Longitudinal Slope: 0.0335946 ft/ft
Flow: 1251.000 cfs
Depth: 5.843 ft
Area of Flow: 137.934 sq ft
Wetted Perimeter: 46.714 ft
Average Velocity: 9.070 fps
Top Width (T): 44.928 ft
Froude Number: 0.912
Critical Depth: 5.626 ft
Critical Velocity: 9.749 fps
Critical Slope: 0.04052
Manning's Roughness: 0.06197

MOORES GULCH, TRIBUTARY 4, REACH 1
R.S. 0.238



FLOWLINE

CROSS SECTION

SCALE: 1" = 100'

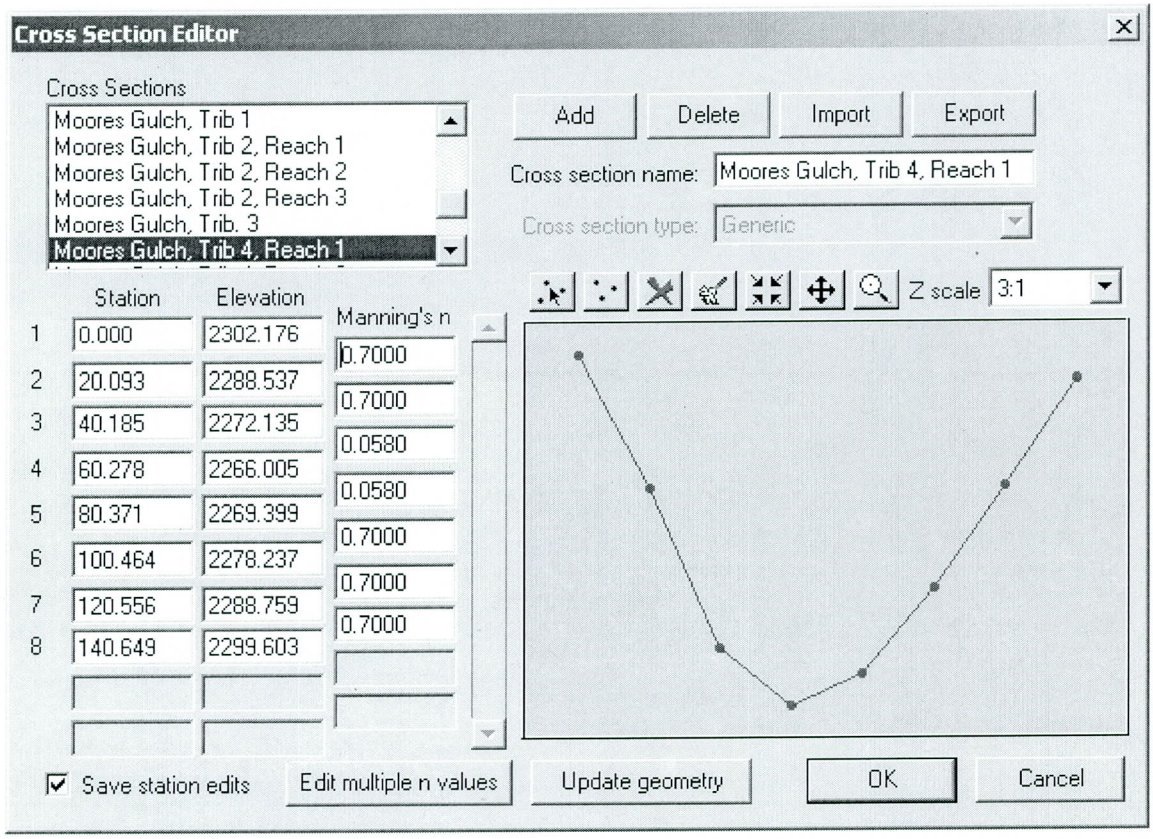
0 100 200 300

RBF CONSULTING

PLANNING
DESIGN
CONSTRUCTION

H:\PDATA\45100648\DWG\WS3AND4\0648-X-SECS-EX-SHT9.DWG WKING 4/22/03 10:17 pm

Moores Gulch, Tributary 4, Reach 1
RS 0.238



Calculated Values

Longitudinal Slope: 0.0416 ft/ft
Flow: 2017.000 cfs
Depth: 13.710 ft
Area of Flow: 611.057 sq ft
Wetted Perimeter: 78.510 ft
Average Velocity: 3.301 fps
Top Width (T): 72.388 ft
Froude Number: 0.200
Critical Depth: 6.624 ft
Critical Velocity: 11.050 fps
Critical Slope: 0.28633
Manning's Roughness: 0.36159

MOORES GULCH, TRIBUTARY 4, REACH 2
R.S. 0.729

SCALE: 1" = 100'

FLOWLINE

CROSS SECTION

0 100 200 300

RBF CONSULTING

PLANNING
DESIGN
CONSTRUCTION

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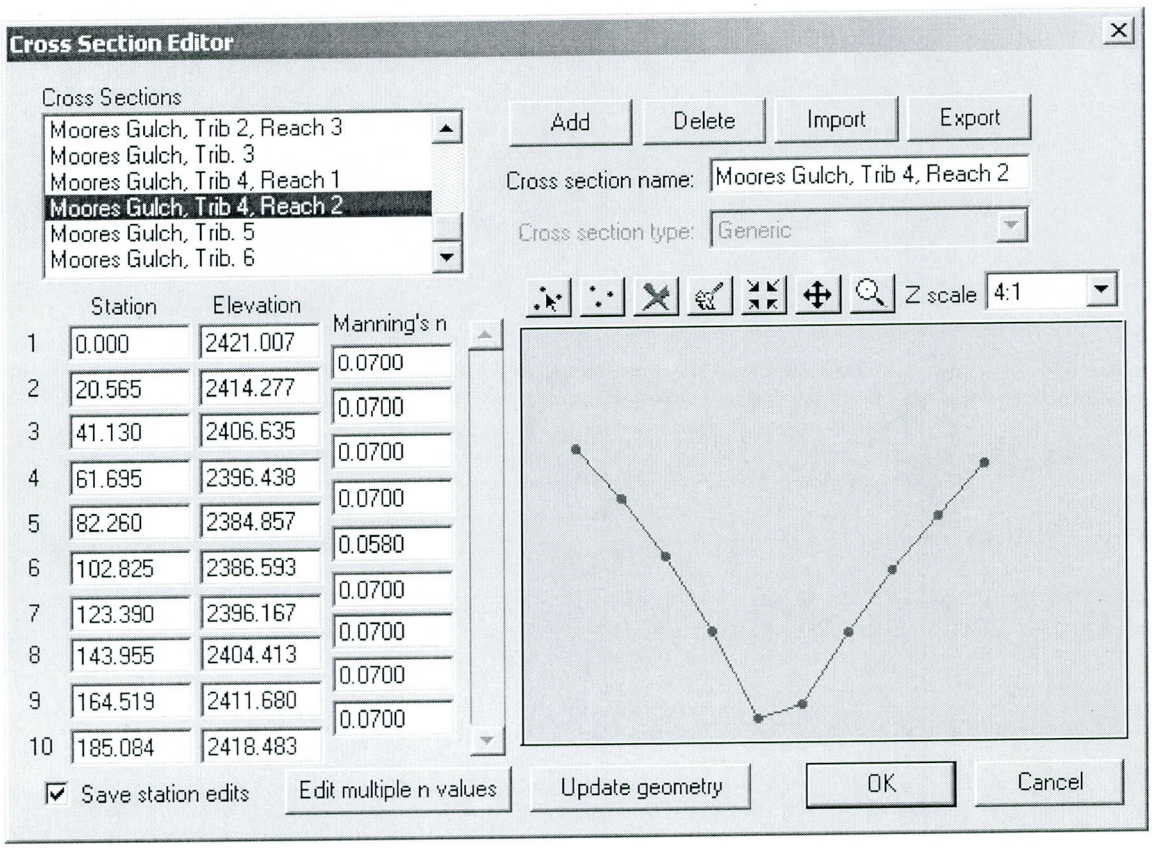
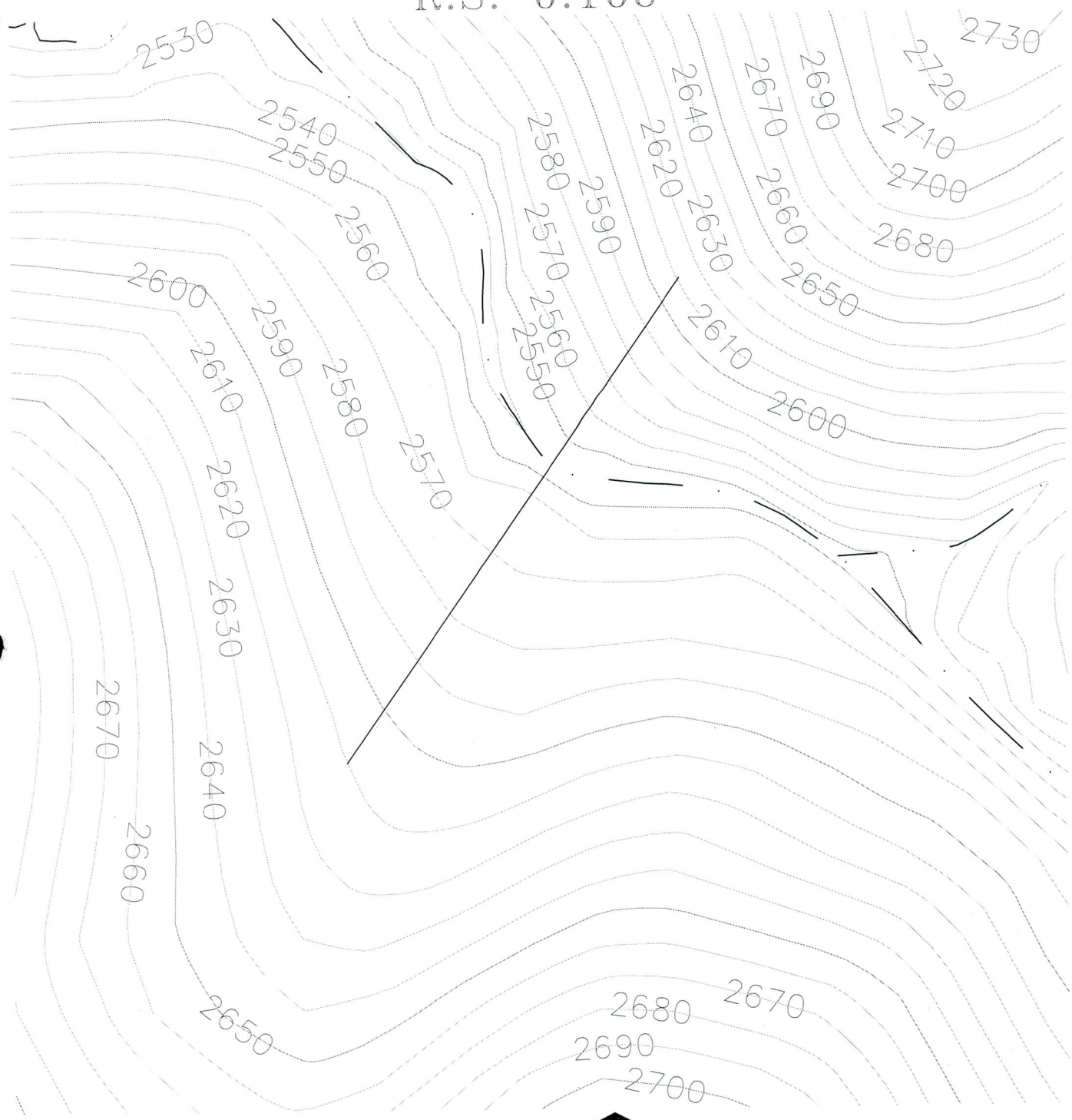
Moores Gulch, Tributary 4, Reach 2
RS 0.729



Calculated Values

Longitudinal Slope: 0.0478205 ft/ft
Flow: 1038.000 cfs
Depth: 4.522 ft
Area of Flow: 101.646 sq ft
Wetted Perimeter: 36.456 ft
Average Velocity: 10.212 fps
Top Width (T): 34.580 ft
Froude Number: 1.050
Critical Depth: 4.631 ft
Critical Velocity: 9.847 fps
Critical Slope: 0.04322
Manning's Roughness: 0.06321

MOORES GULCH, TRIBUTARY 5
R.S. 0.106



SCALE: 1" = 100'

FLOWLINE

CROSS SECTION

0 100 200 300

RBF CONSULTING

PLANNING
DESIGN
CONSTRUCTION

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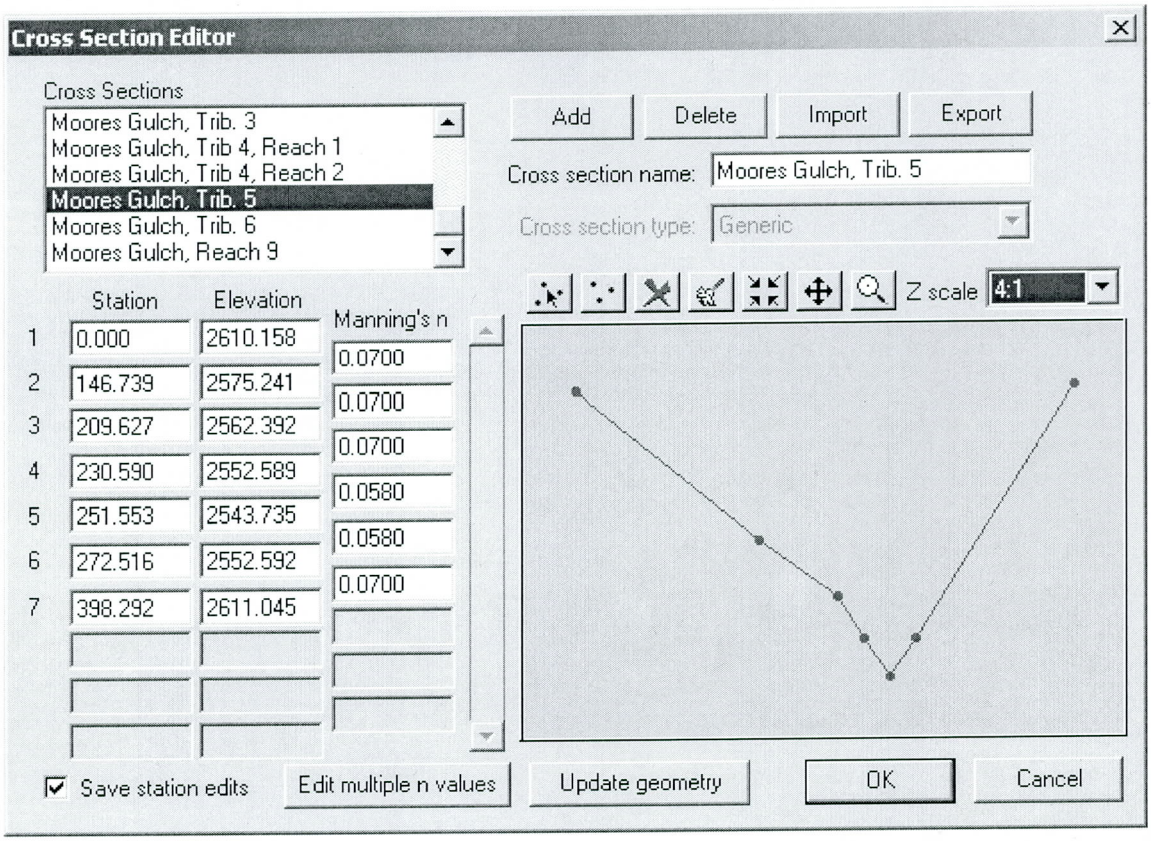
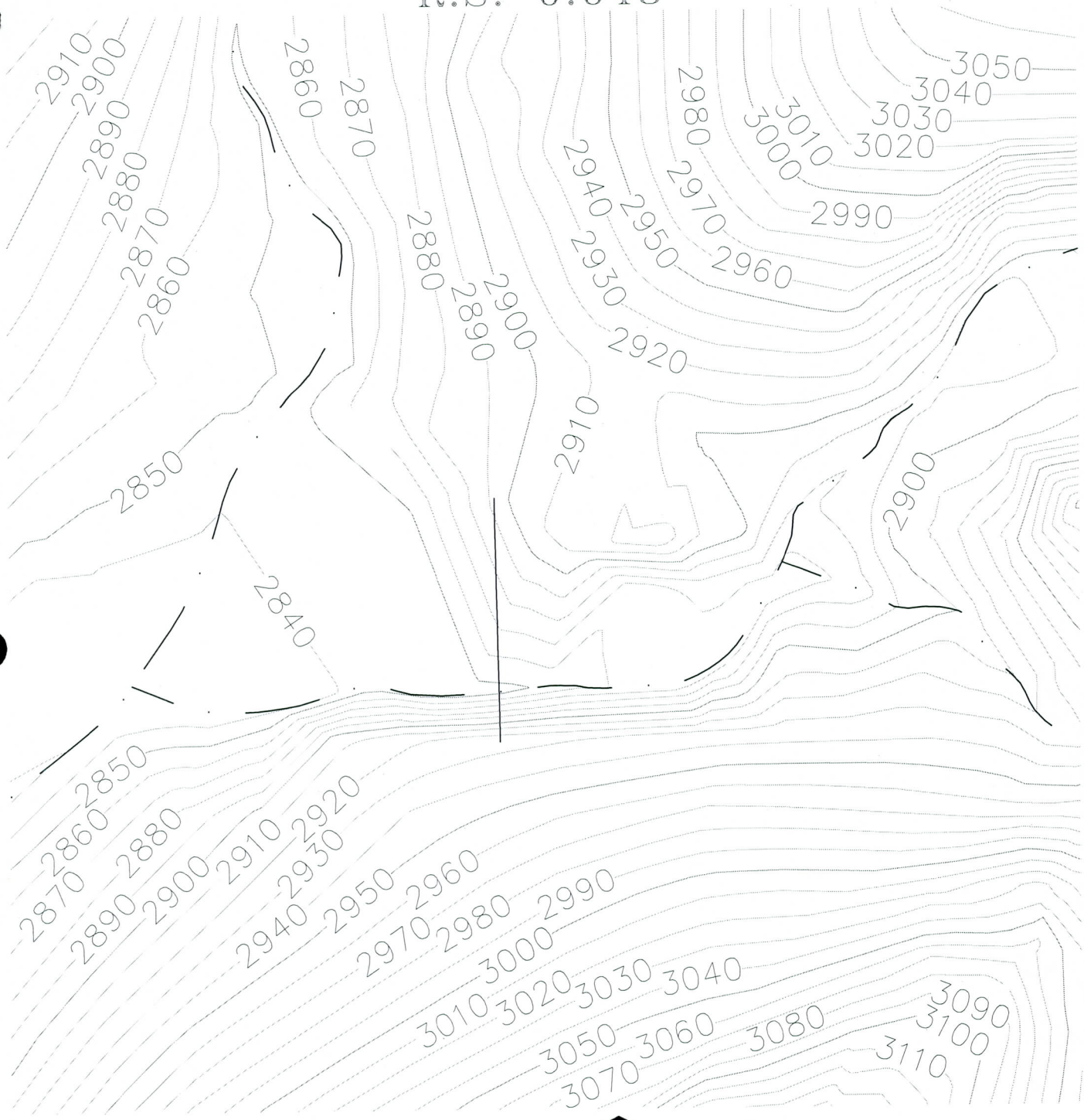
Moores Gulch, Tributary 5
RS 0.106



Calculated Values

Longitudinal Slope: 0.0429229 ft/ft
Calculated Values
Flow: 1726.000 cfs
Depth: 7.681 ft
Area of Flow: 139.670 sq ft
Wetted Perimeter: 39.478 ft
Average Velocity: 12.358 fps
Top Width (T): 36.366 ft
Froude Number: 1.111
Critical Depth: 8.012 ft
Critical Velocity: 11.358 fps
Critical Slope: 0.03427
Manning's Roughness: 0.05800

MOORES GULCH, TRIBUTARY 6
R.S. 0.048



N

SCALE: 1" = 100'

0 100 200 300

FLOWLINE

CROSS SECTION

RBF CONSULTING

PLANNING
DESIGN
CONSTRUCTION

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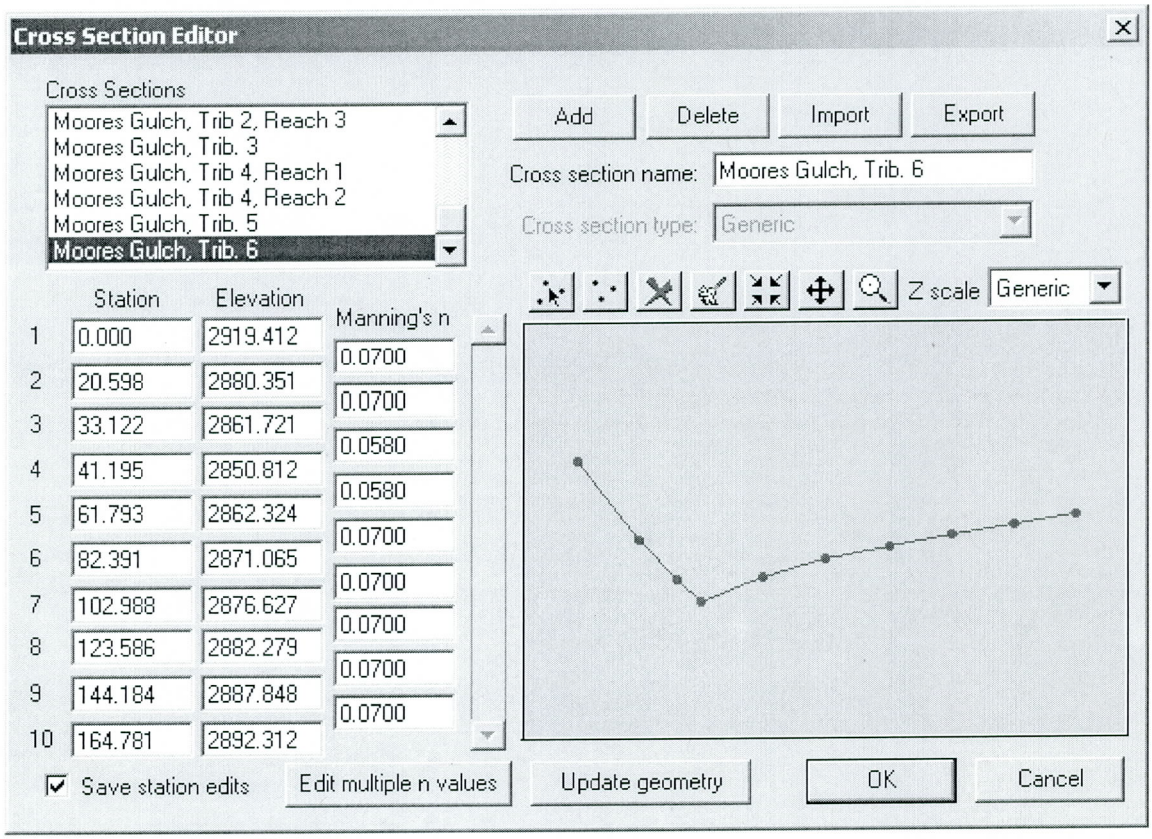
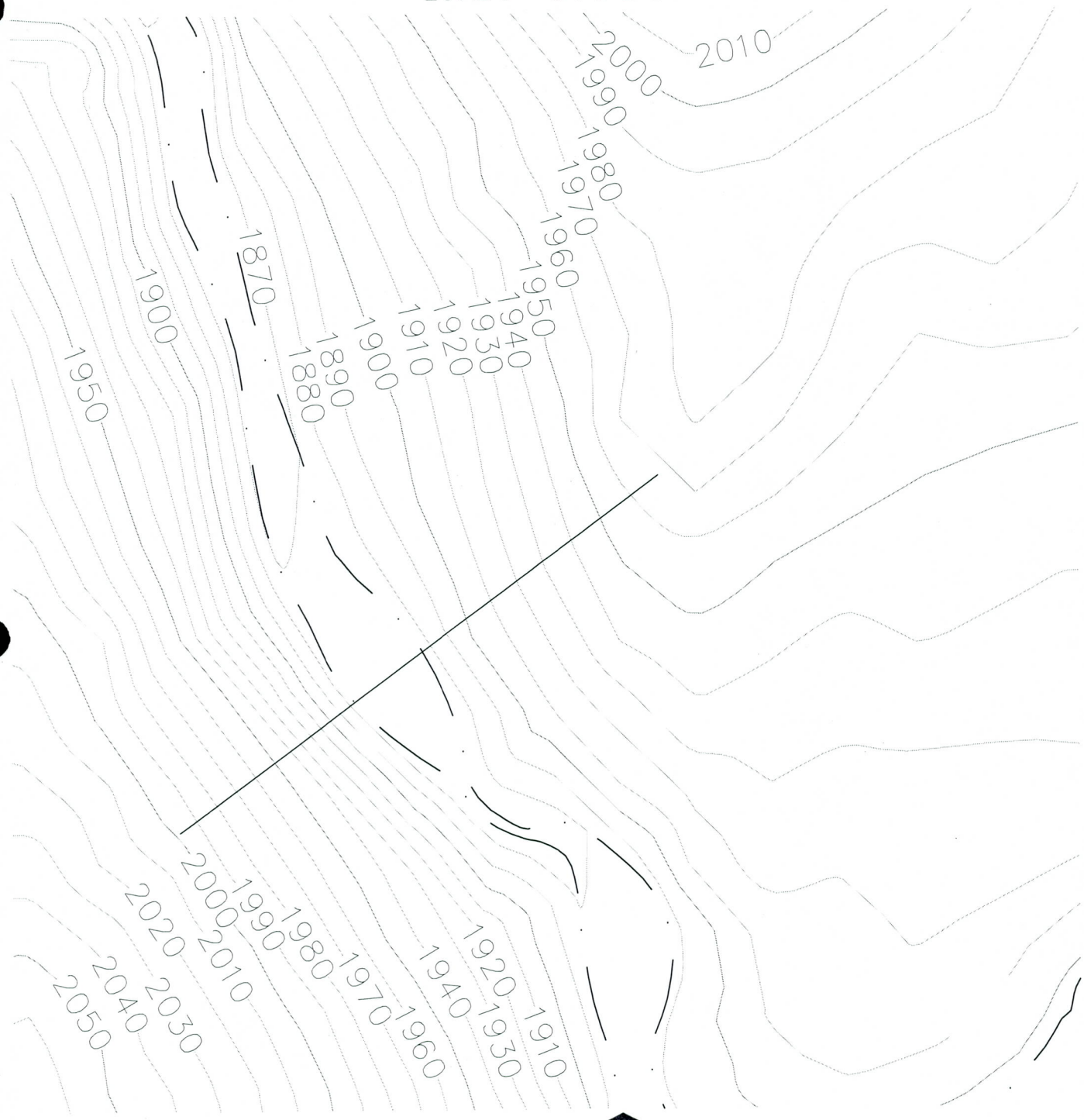
Moores Gulch, Tributary 6
RS 0.048



Calculated Values

Longitudinal Slope: 0.0371705 ft/ft
Flow: 1691.000 cfs
Depth: 10.368 ft
Area of Flow: 135.932 sq ft
Wetted Perimeter: 34.148 ft
Average Velocity: 12.440 fps
Top Width (T): 26.223 ft
Froude Number: 0.963
Critical Depth: 10.212 ft
Critical Velocity: 12.822 fps
Critical Slope: 0.04029
Manning's Roughness: 0.05800

LITTLE SQUAW CREEK, REACH 1
R.S. 0.655



FLOWLINE

CROSS SECTION

SCALE: 1" = 100'

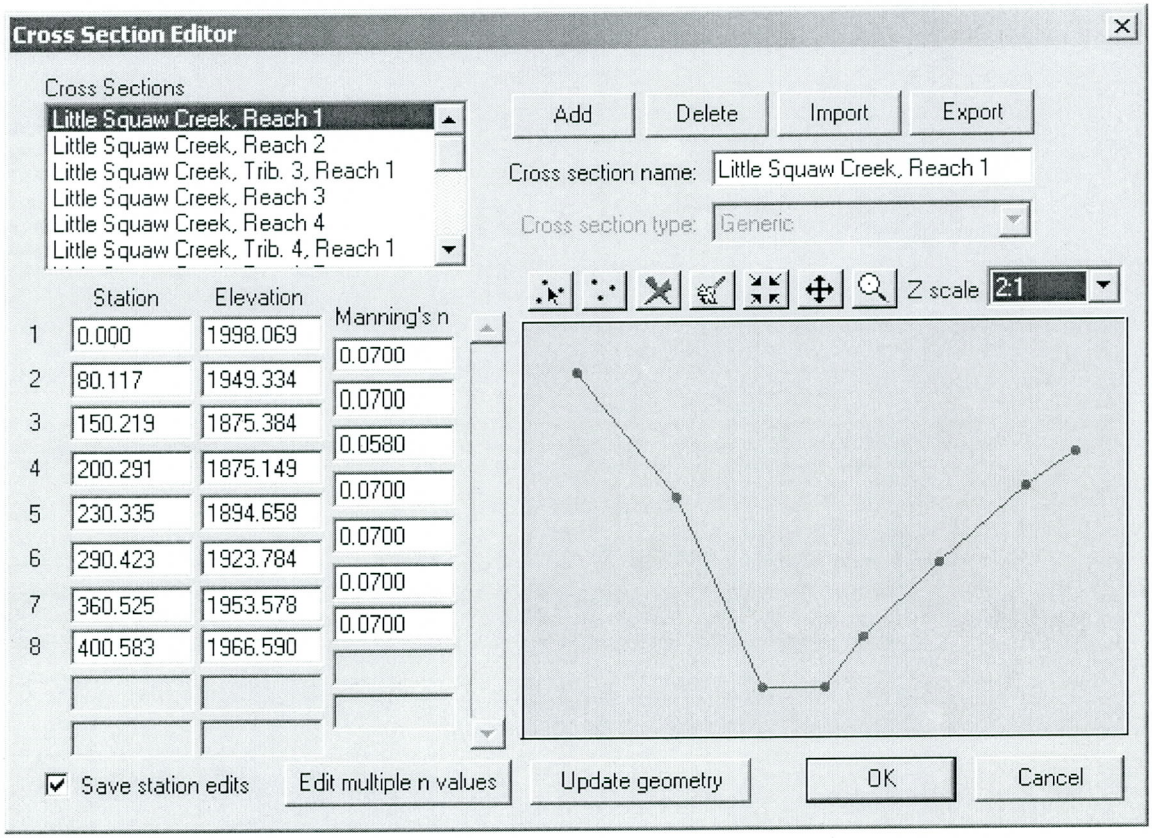
0 100 200 300

RBF CONSULTING

PLANNING
DESIGN
CONSTRUCTION

H:\PDATA\45100648\DWG\WS3AND4\0648-X-SECS-EX-SHT5.DWG WKING 4/22/03 10:06 pm

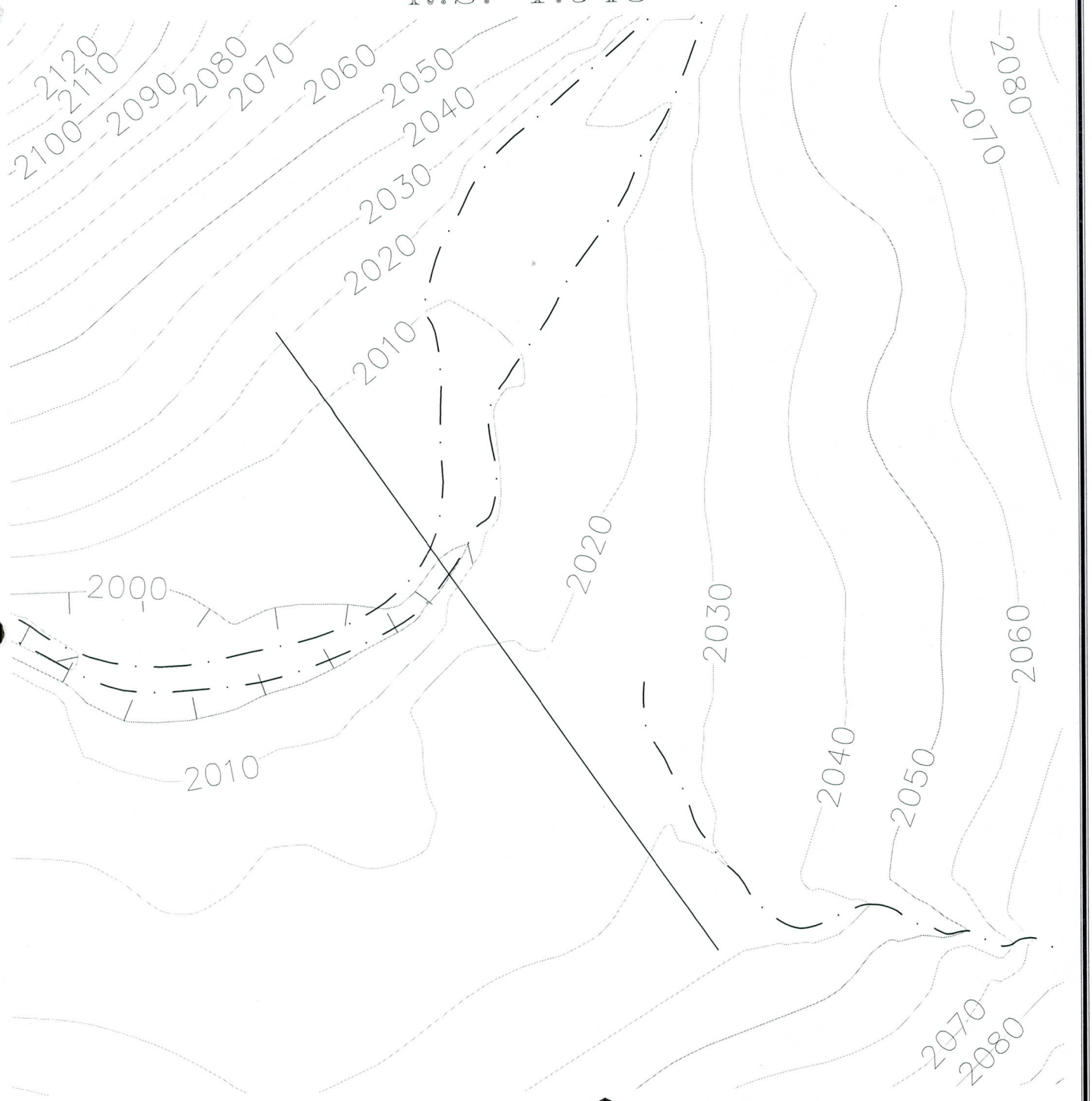
Little Squaw Creek, Reach 1
R.S. 0.655



Calculated Values

Longitudinal Slope: 0.01915 ft/ft
Flow: 9190.000 cfs
Depth: 11.000 ft
Area of Flow: 693.052 sq ft
Wetted Perimeter: 85.106 ft
Average Velocity: 13.260 fps
Top Width (T): 77.219 ft
Froude Number: 0.780
Critical Depth: 9.465 ft
Critical Velocity: 15.916 fps
Critical Slope: 0.03205
Manning's Roughness: 0.06294

LITTLE SQUAW CREEK, REACH 2
R.S. 1.943



FLOWLINE

CROSS SECTION

SCALE: 1" = 200'

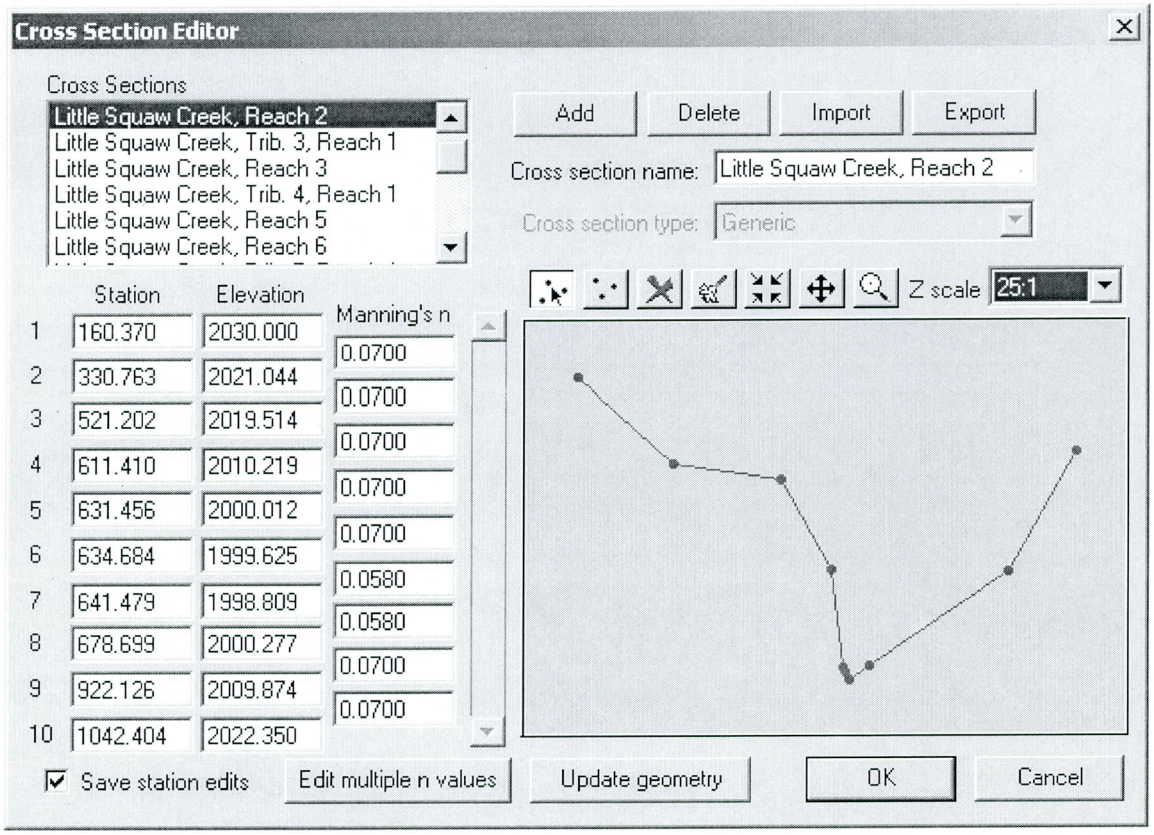
0 200 400 600

RBF CONSULTING

PLANNING
DESIGN
CONSTRUCTION

H:\PDATA\45100648\DWG\WS3AND4\0648-X-SECS-EX-SHT6.DWG WKING 4/22/03 10:08 pm

Little Squaw Creek, Reach 2
R.S. 1.943



Calculated Values

Longitudinal Slope: 0.01927 ft/ft
Flow: 9036.000 cfs
Depth: 8.709 ft
Area of Flow: 1098.393 sq ft
Wetted Perimeter: 247.693 ft
Average Velocity: 8.227 fps
Top Width (T): 245.648 ft
Froude Number: 0.686
Critical Depth: 7.457 ft
Critical Velocity: 11.123 fps
Critical Slope: 0.04267
Manning's Roughness: 0.06786

LITTLE SQUAW CREEK, REACH 3
R.S. 2.994

FLOWLINE

CROSS SECTION

SCALE: 1" = 100'

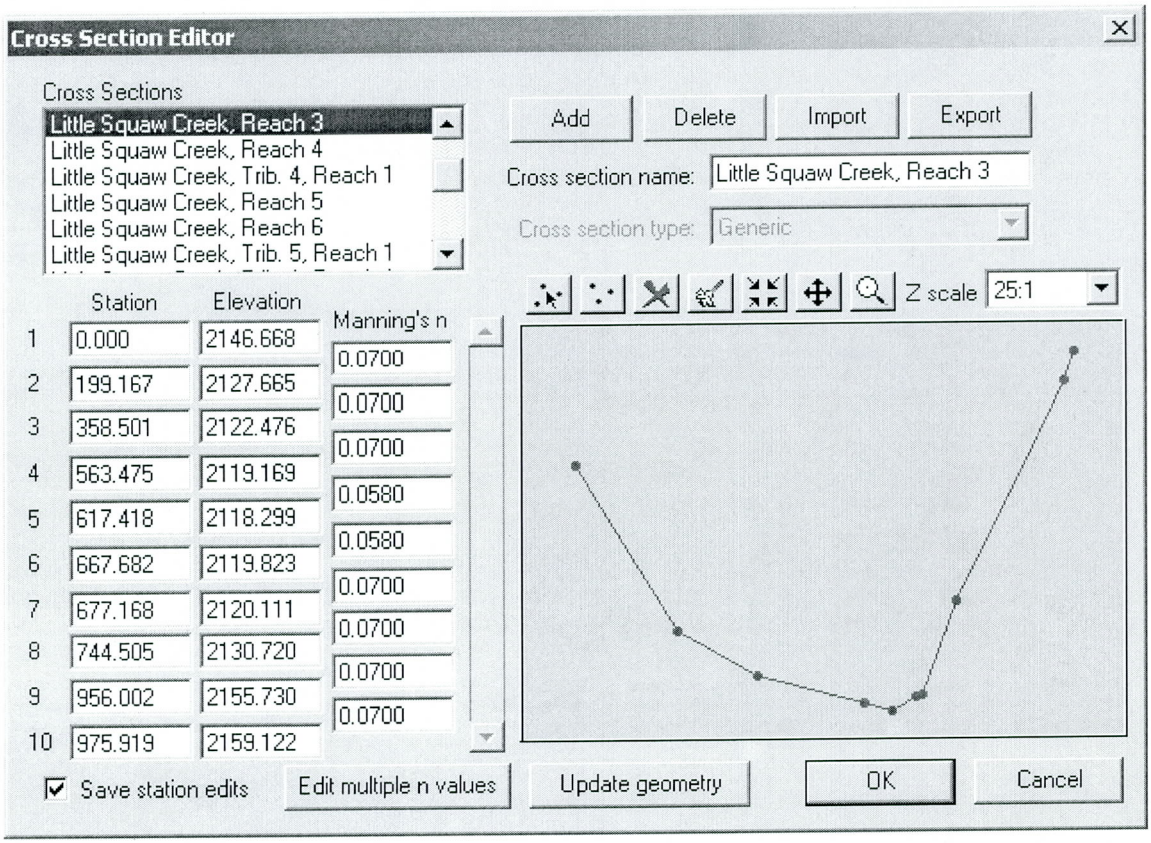
0 100 200 300

RBF CONSULTING

PLANNING
DESIGN
CONSTRUCTION

H:\PDATA\45100648\DWG\WS3AND4\0648-X-SECS-EX-SHT6.DWG WKING 4/22/03 10:08 pm

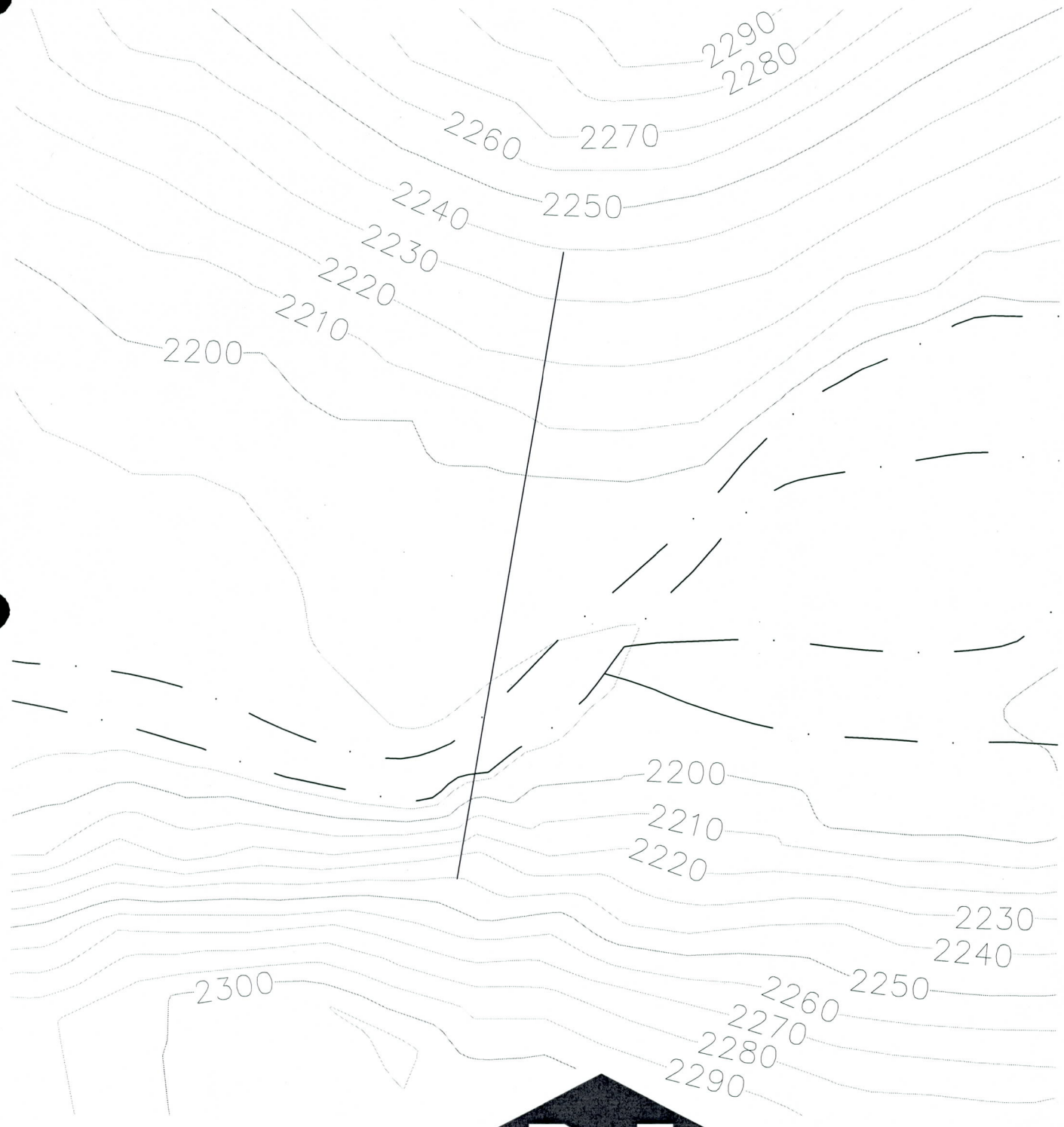
Little Squaw Creek, Reach 3
R.S. 2.944



Calculated Values

Longitudinal Slope: 0.01839 ft/ft
Flow: 8643.000 cfs
Depth: 5.652 ft
Area of Flow: 1286.333 sq ft
Wetted Perimeter: 388.699 ft
Average Velocity: 6.719 fps
Top Width (T): 388.313 ft
Froude Number: 0.651
Critical Depth: 4.707 ft
Critical Velocity: 9.236 fps
Critical Slope: 0.04636
Manning's Roughness: 0.06678

LITTLE SQUAW CREEK, REACH 4
R.S. 3.640



FLOWLINE

CROSS SECTION

SCALE: 1" = 100'

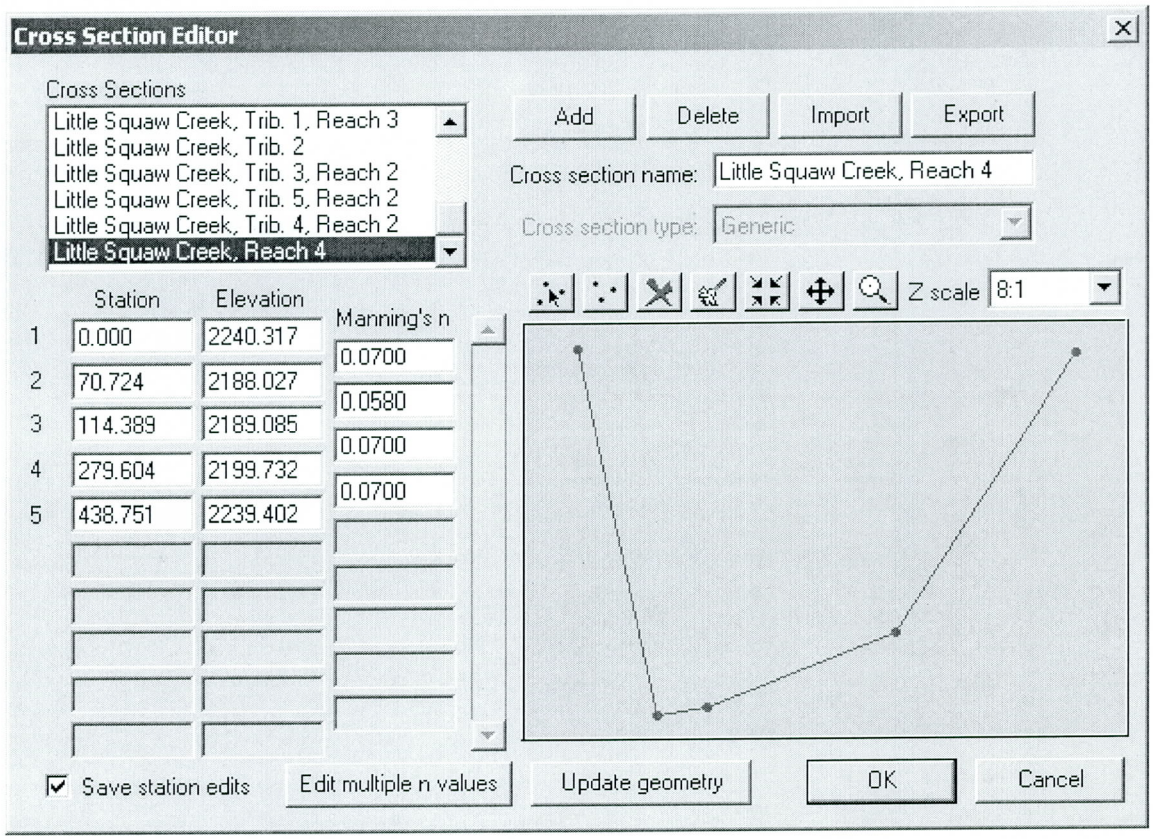
0 100 200 300

RBF CONSULTING

PLANNING
DESIGN
CONSTRUCTION

H:\PDATA\45100648\DWG\WS3AND4\0648-X-SECS-EX-SHT3.DWG WKING 4/22/03 10:00 pm

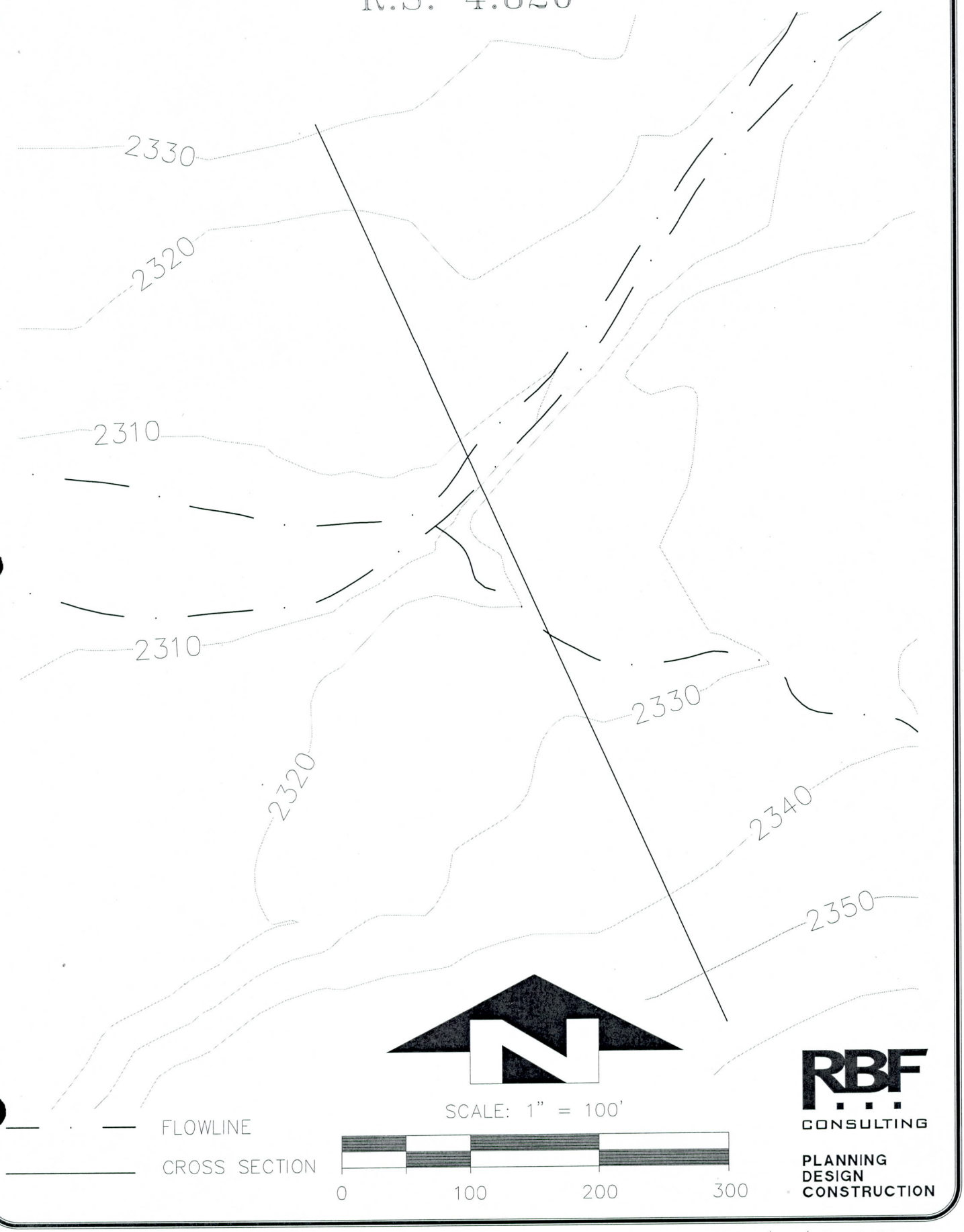
Little Squaw Creek, Reach 4
R.S. 3.640



Calculated Values

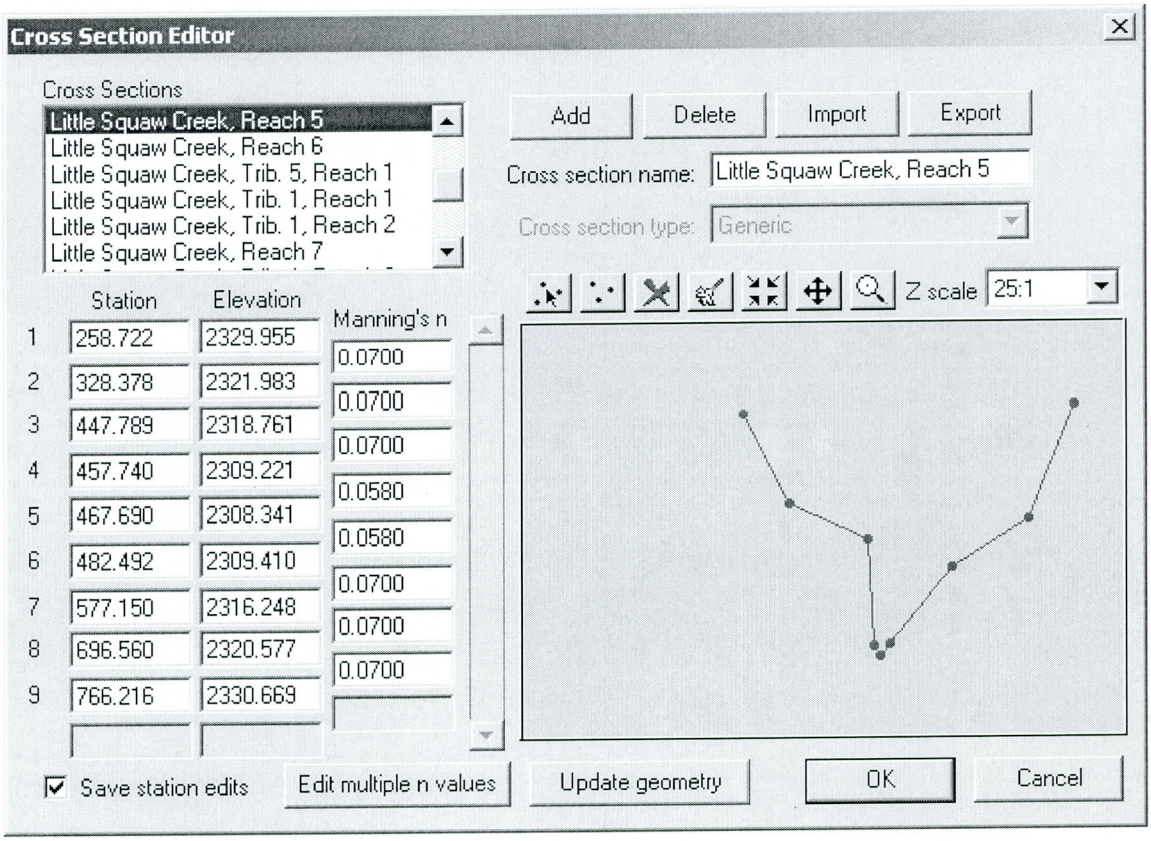
Longitudinal Slope: 0.01993 ft/ft
Flow: 8027.000 cfs
Depth: 8.831 ft
Area of Flow: 883.978 sq ft
Wetted Perimeter: 179.395 ft
Average Velocity: 9.081 fps
Top Width (T): 176.222 ft
Froude Number: 0.714
Critical Depth: 7.583 ft
Critical Velocity: 11.854 fps
Critical Slope: 0.04039
Manning's Roughness: 0.06708

LITTLE SQUAW CREEK, REACH 5
R.S. 4.820



H:\PDATA\45100648\DWG\WS3AND4\0648-X-SECS-EX-SHT3.DWG WKING 4/22/03 10:01 pm

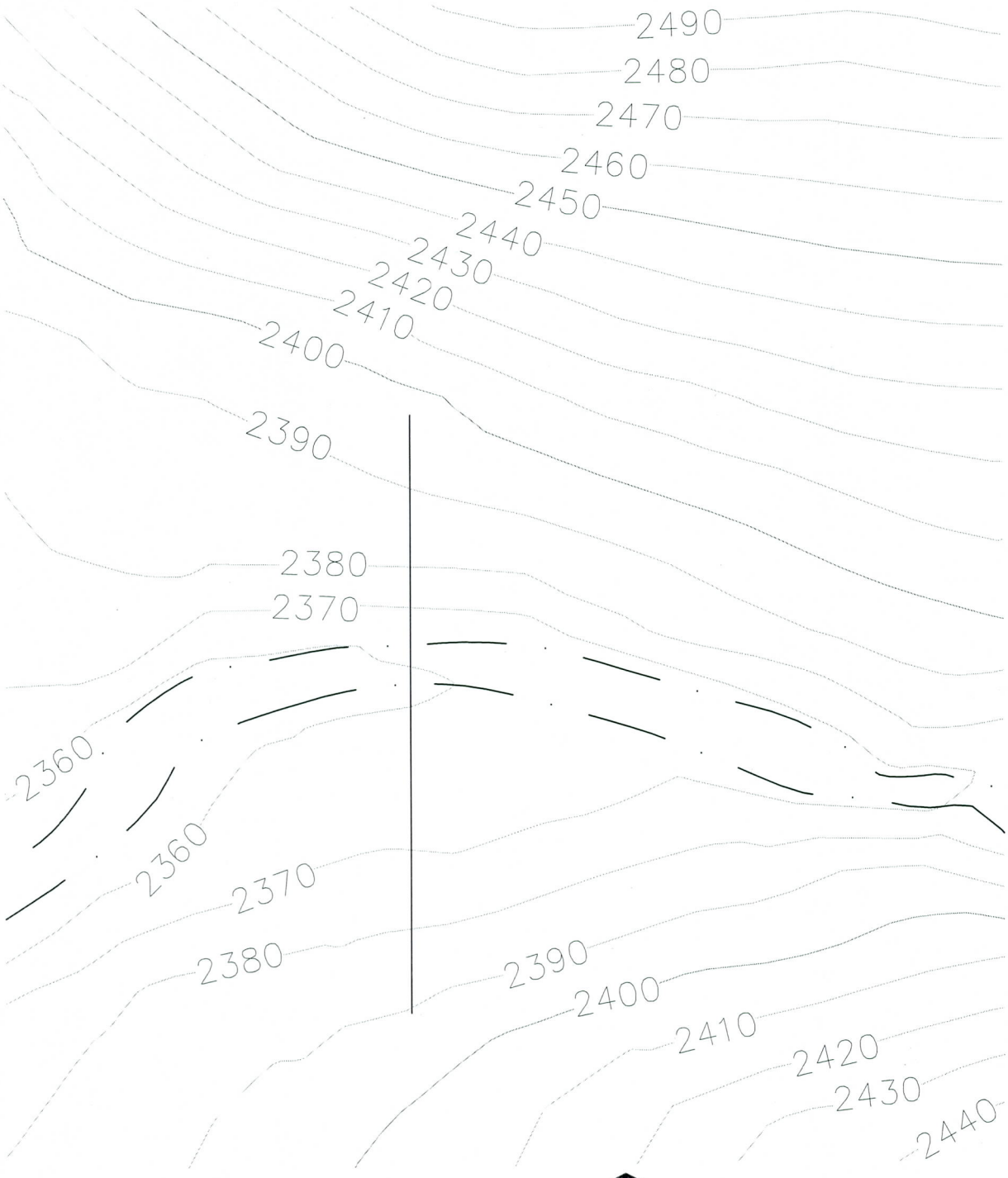
Little Squaw Creek, Reach 5
R.S. 4.820



Calculated Values

Longitudinal Slope: 0.02055 ft/ft
Flow: 8001.000 cfs
Depth: 10.339 ft
Area of Flow: 925.711 sq ft
Wetted Perimeter: 200.534 ft
Average Velocity: 8.643 fps
Top Width (T): 196.365 ft
Froude Number: 0.702
Critical Depth: 8.926 ft
Critical Velocity: 11.823 fps
Critical Slope: 0.04254
Manning's Roughness: 0.06851

LITTLE SQUAW CREEK, REACH 6
R.S. 5.239



FLOWLINE

CROSS SECTION

SCALE: 1" = 100'

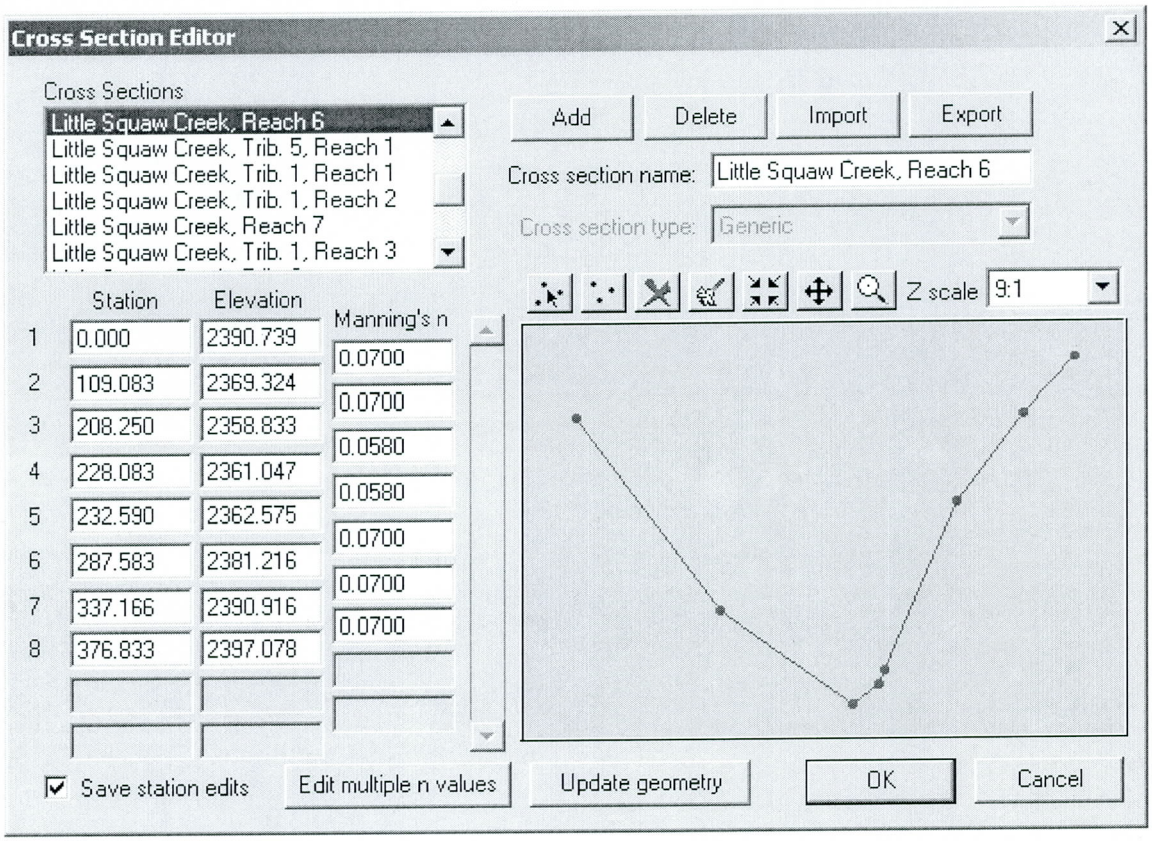
0 100 200 300

RBF CONSULTING

PLANNING
DESIGN
CONSTRUCTION

H:\PDATA\45100648\DWG\WS3AND4\0648-X-SECS-EX-SHT3.DWG WKING 4/22/03 10:01 pm

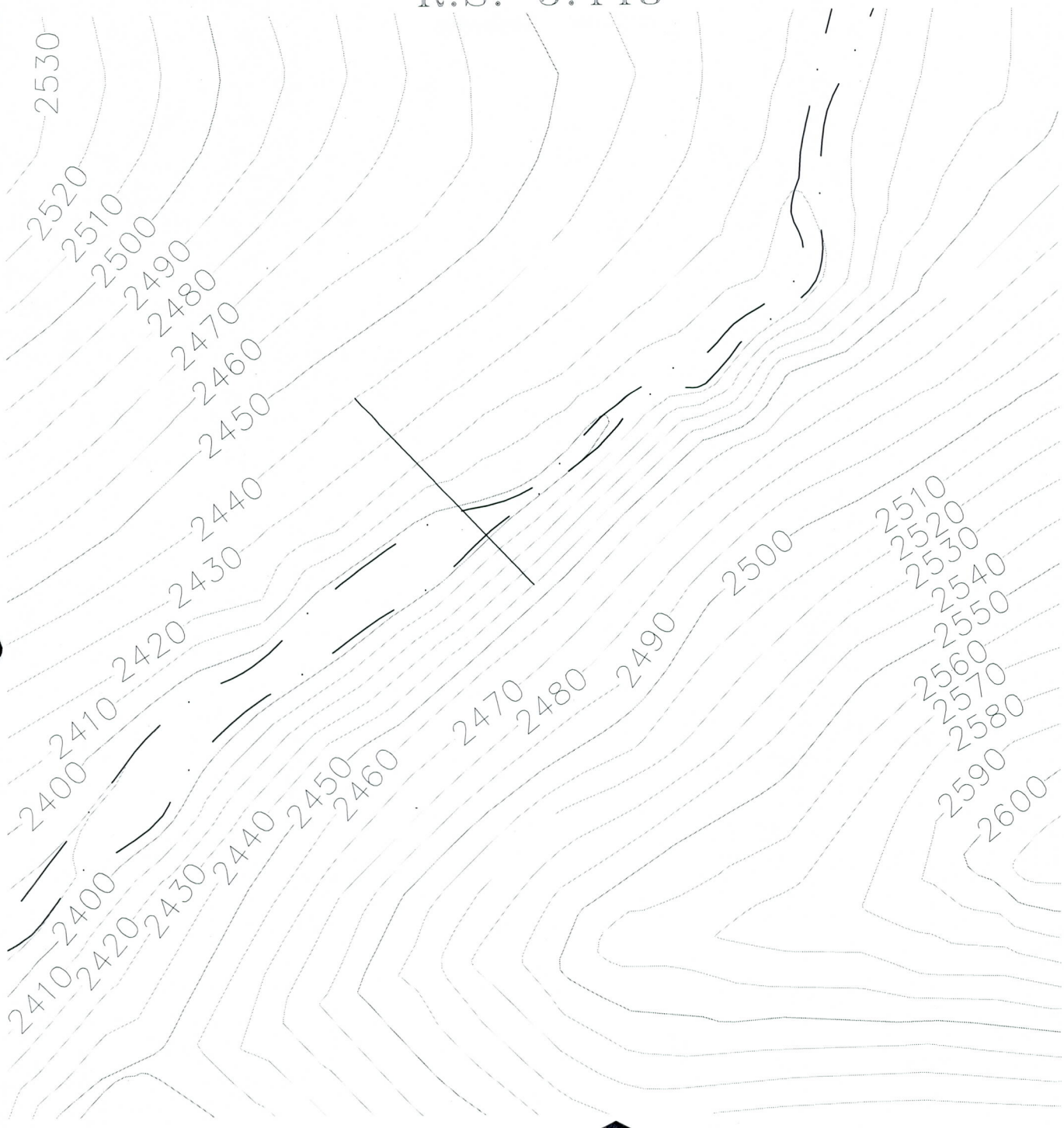
Little Squaw Creek, Reach 6
R.S. 5.239



Calculated Values

Longitudinal Slope: 0.02638 ft/ft
Flow: 7898.000 cfs
Depth: 9.945 ft
Area of Flow: 730.878 sq ft
Wetted Perimeter: 138.566 ft
Average Velocity: 10.806 fps
Top Width (T): 136.643 ft
Froude Number: 0.823
Critical Depth: 9.151 ft
Critical Velocity: 12.611 fps
Critical Slope: 0.03974
Manning's Roughness: 0.06786

LITTLE SQUAW CREEK, REACH 7
R.S. 5.448



SCALE: 1" = 100'

FLOWLINE

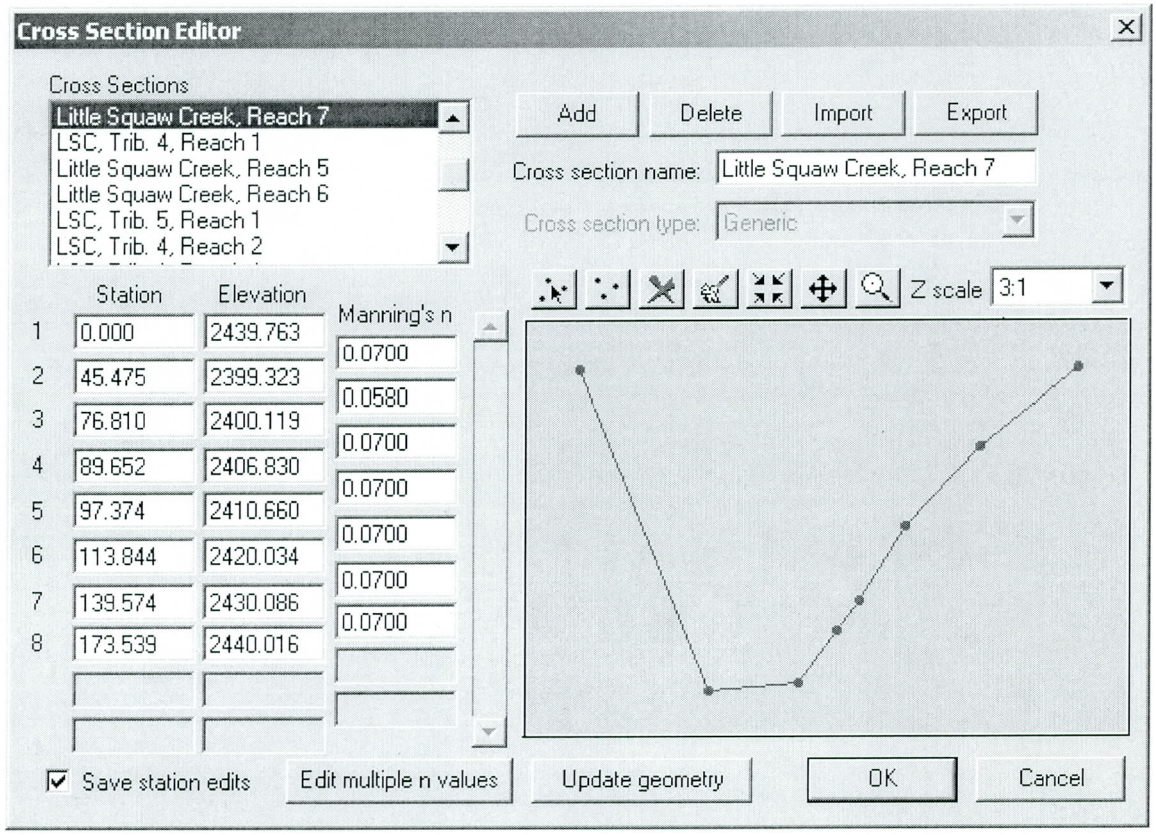
CROSS SECTION

RBF CONSULTING

PLANNING
DESIGN
CONSTRUCTION

H:\PDATA\45100648\DWG\WS3AND4\0648-X-SECS-EX-SHT4.DWG WKING 4/22/03 10:02 pm

Little Squaw Creek, Reach 7
R.S. 5.448



Calculated Values

Longitudinal Slope: 0.0322 ft/ft
Flow: 7212.000 cfs
Depth: 10.651 ft
Area of Flow: 478.475 sq ft
Wetted Perimeter: 68.937 ft
Average Velocity: 15.073 fps
Top Width (T): 62.492 ft
Froude Number: 0.960
Critical Depth: 10.414 ft
Critical Velocity: 15.551 fps
Critical Slope: 0.03504
Manning's Roughness: 0.06454

LITTLE SQUAW CREEK, TRIBUTARY 1, REACH 1
R.S. 1.538

N

SCALE: 1" = 100'

FLOWLINE

CROSS SECTION

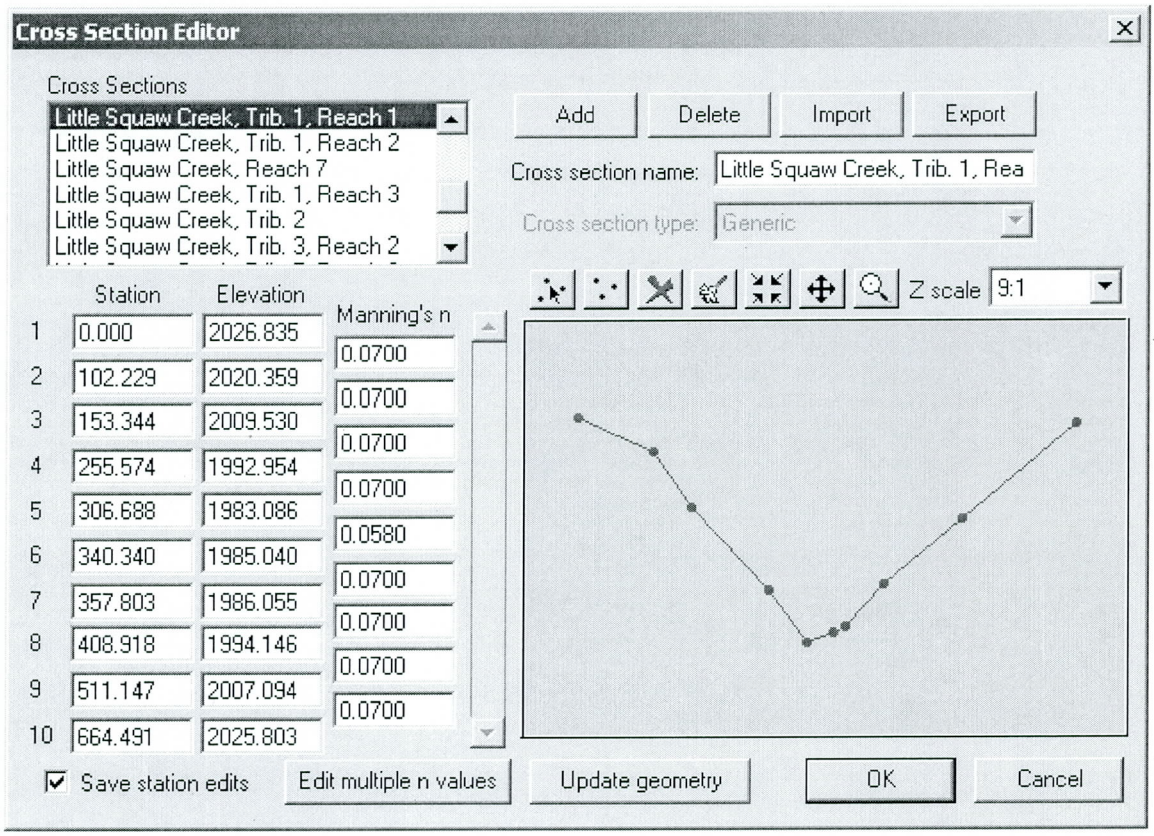
0 100 200 300

RBF CONSULTING

PLANNING
DESIGN
CONSTRUCTION

H:\PDATA\45100648\DWG\WS3AND4\0648-X-SECS-EX-SHT2.DWG WKING 4/22/03 9:56 pm

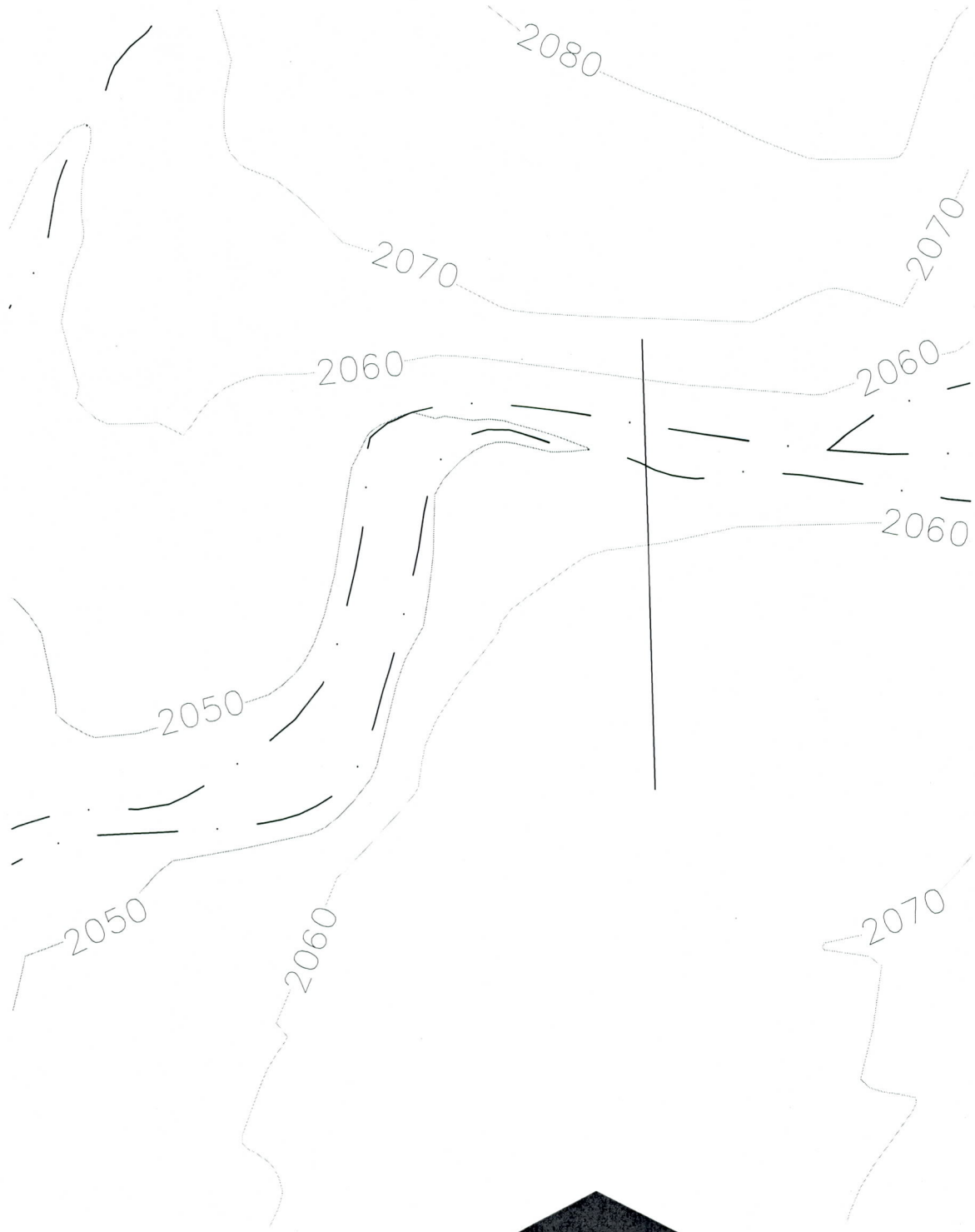
Little Squaw Creek, Tributary 1, Reach 1
R.S. 1.538



Calculated Values

Longitudinal Slope: 0.0215 ft/ft
Flow: 2462.000 cfs
Depth: 5.800 ft
Area of Flow: 333.044 sq ft
Wetted Perimeter: 99.907 ft
Average Velocity: 7.392 fps
Top Width (T): 99.044 ft
Froude Number: 0.710
Critical Depth: 4.990 ft
Critical Velocity: 9.596 fps
Critical Slope: 0.04435
Manning's Roughness: 0.06595

LITTLE SQUAW CREEK, TRIBUTARY 1, REACH 2
R.S. 2.225



SCALE: 1" = 100'

FLOWLINE

CROSS SECTION

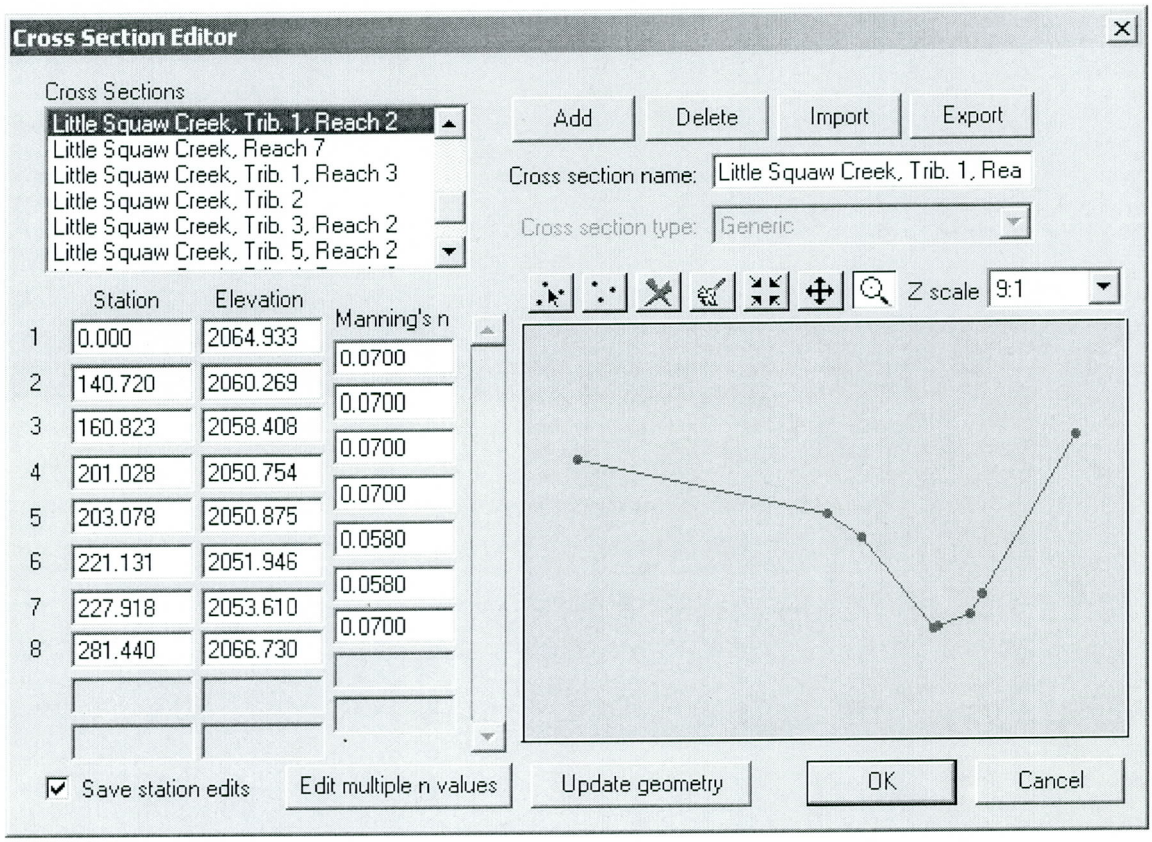
0 100 200 300

RBF CONSULTING

PLANNING
DESIGN
CONSTRUCTION

H:\PDATA\45100648\DWG\WS3AND4\0648-X-SECS-EX-SHT2.DWG WKING 4/22/03 9:56 pm

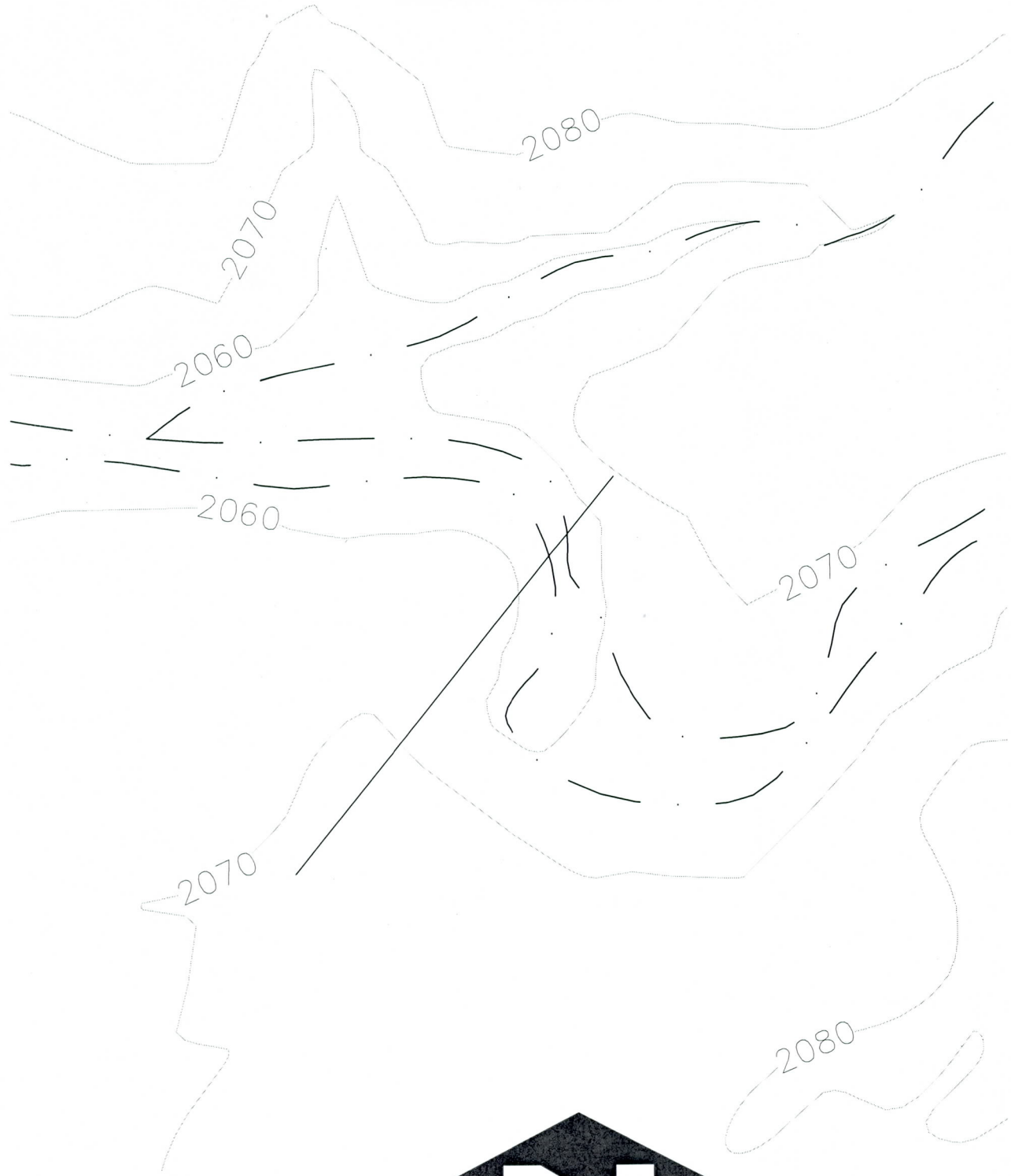
Little Squaw Creek, Tributary 1, Reach 2
R.S. 2.225



Calculated Values

Longitudinal Slope: 0.0215 ft/ft
Flow: 1849.000 cfs
Depth: 5.930 ft
Area of Flow: 245.354 sq ft
Wetted Perimeter: 71.744 ft
Average Velocity: 7.536 fps
Top Width (T): 70.577 ft
Froude Number: 0.712
Critical Depth: 5.067 ft
Critical Velocity: 9.838 fps
Critical Slope: 0.04370
Manning's Roughness: 0.06581

LITTLE SQUAW CREEK, TRIBUTARY 1, REACH 3
R.S. 2.307



SCALE: 1" = 100'

FLOWLINE

CROSS SECTION

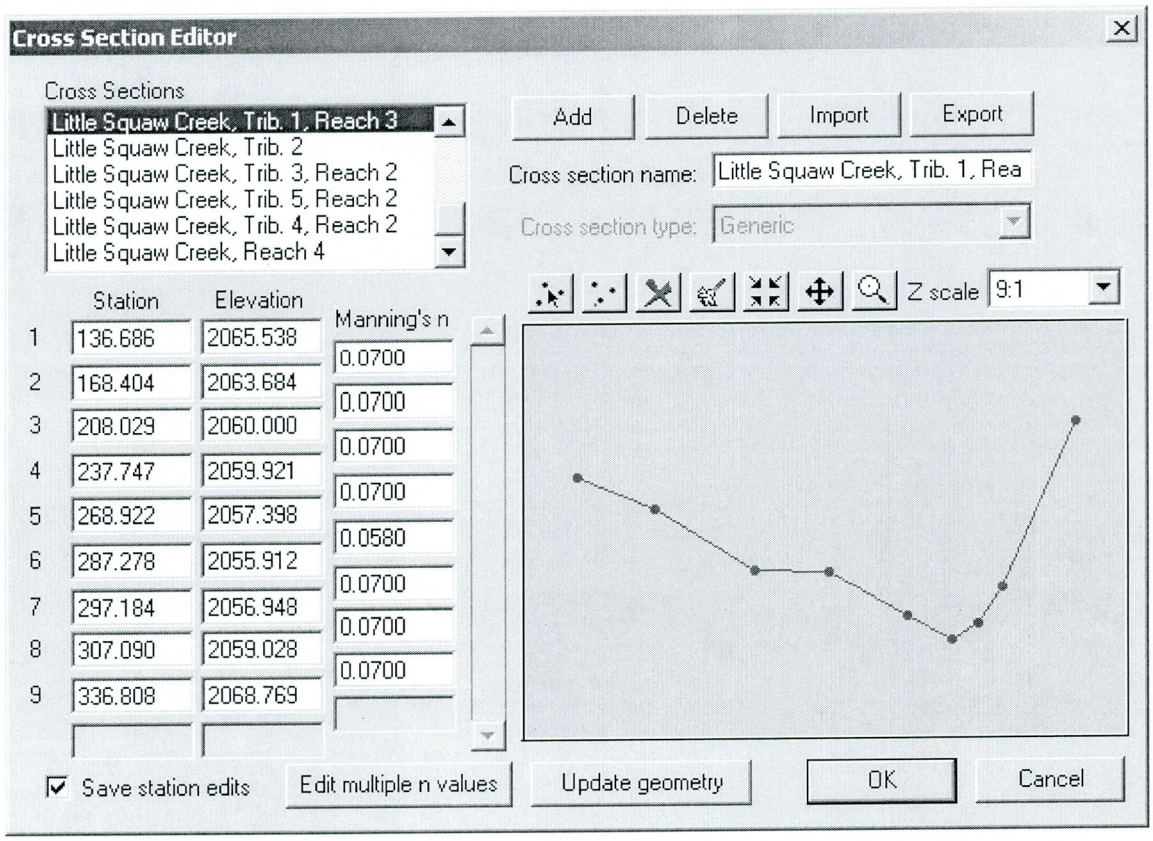
0 100 200 300

RBF CONSULTING

PLANNING
DESIGN
CONSTRUCTION

H:\PDATA\45100648\DWG\WS3AND4\0648-X-SECS-EX-SHT2.DWG WKING 4/22/03 9:57 pm

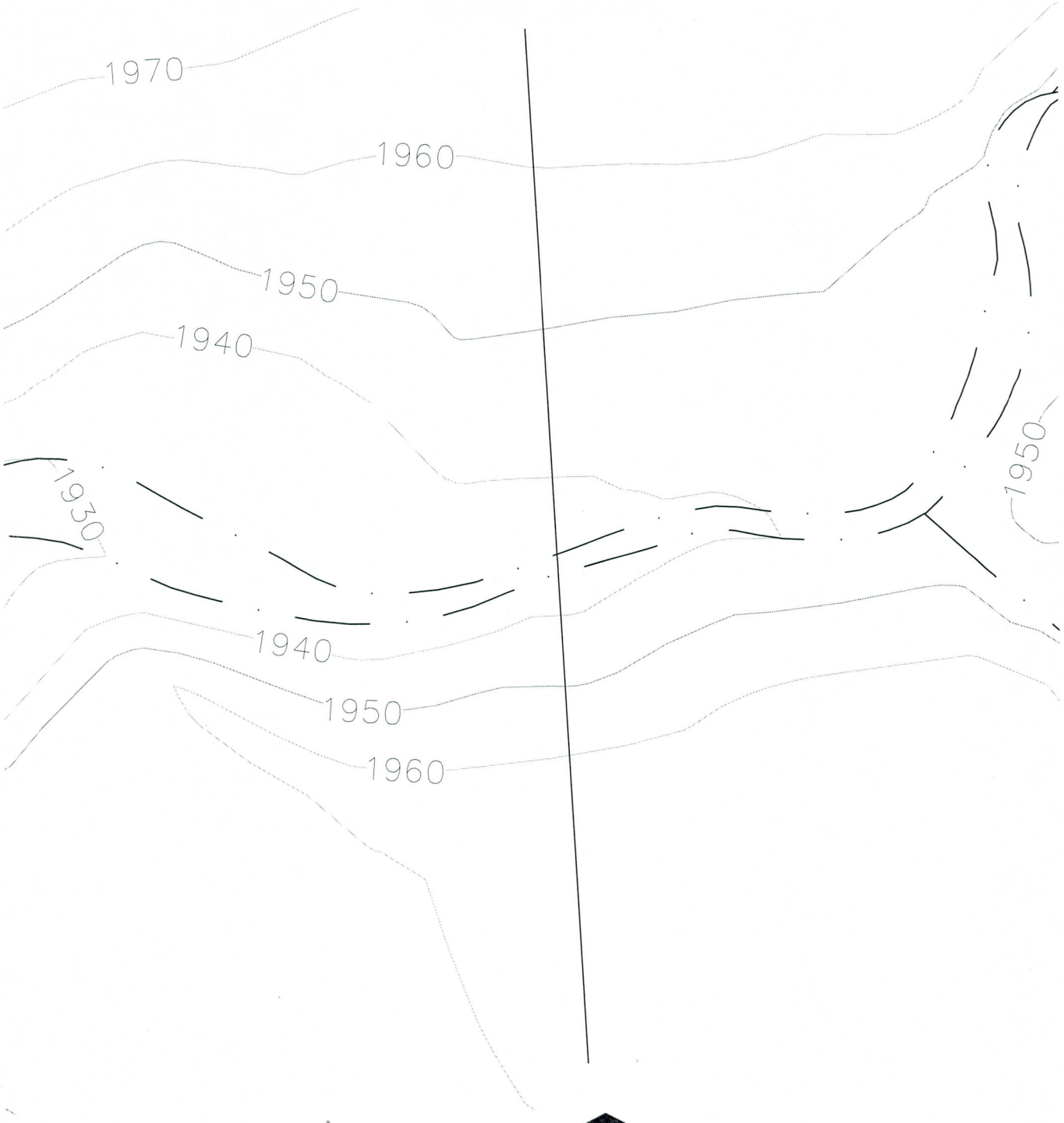
Little Squaw Creek, Tributary 1, Reach 3
R.S. 2.307



Calculated Values

Longitudinal Slope: 0.0215 ft/ft
Flow: 1005.000 cfs
Depth: 4.503 ft
Area of Flow: 204.683 sq ft
Wetted Perimeter: 108.433 ft
Average Velocity: 4.910 fps
Top Width (T): 107.760 ft
Froude Number: 0.628
Critical Depth: 3.622 ft
Critical Velocity: 7.881 fps
Critical Slope: 0.05233
Manning's Roughness: 0.06796

LITTLE SQUAW CREEK, TRIBUTARY 2
R.S. 0.393



SCALE: 1" = 100'

FLOWLINE

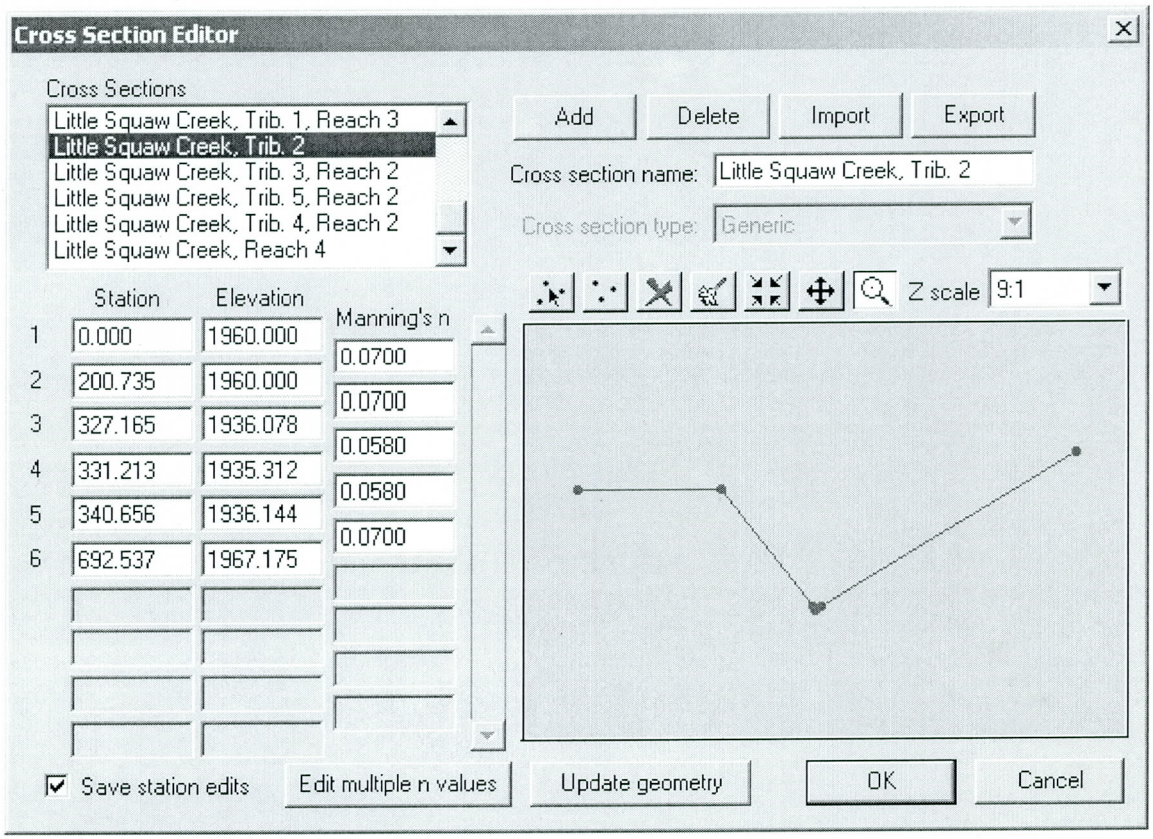
CROSS SECTION

RBF CONSULTING

PLANNING
DESIGN
CONSTRUCTION

H:\PDATA\45100648\DWG\WS3AND4\0648-X-SECS-EX-SHT5.DWG WKING 4/22/03 10:06 pm

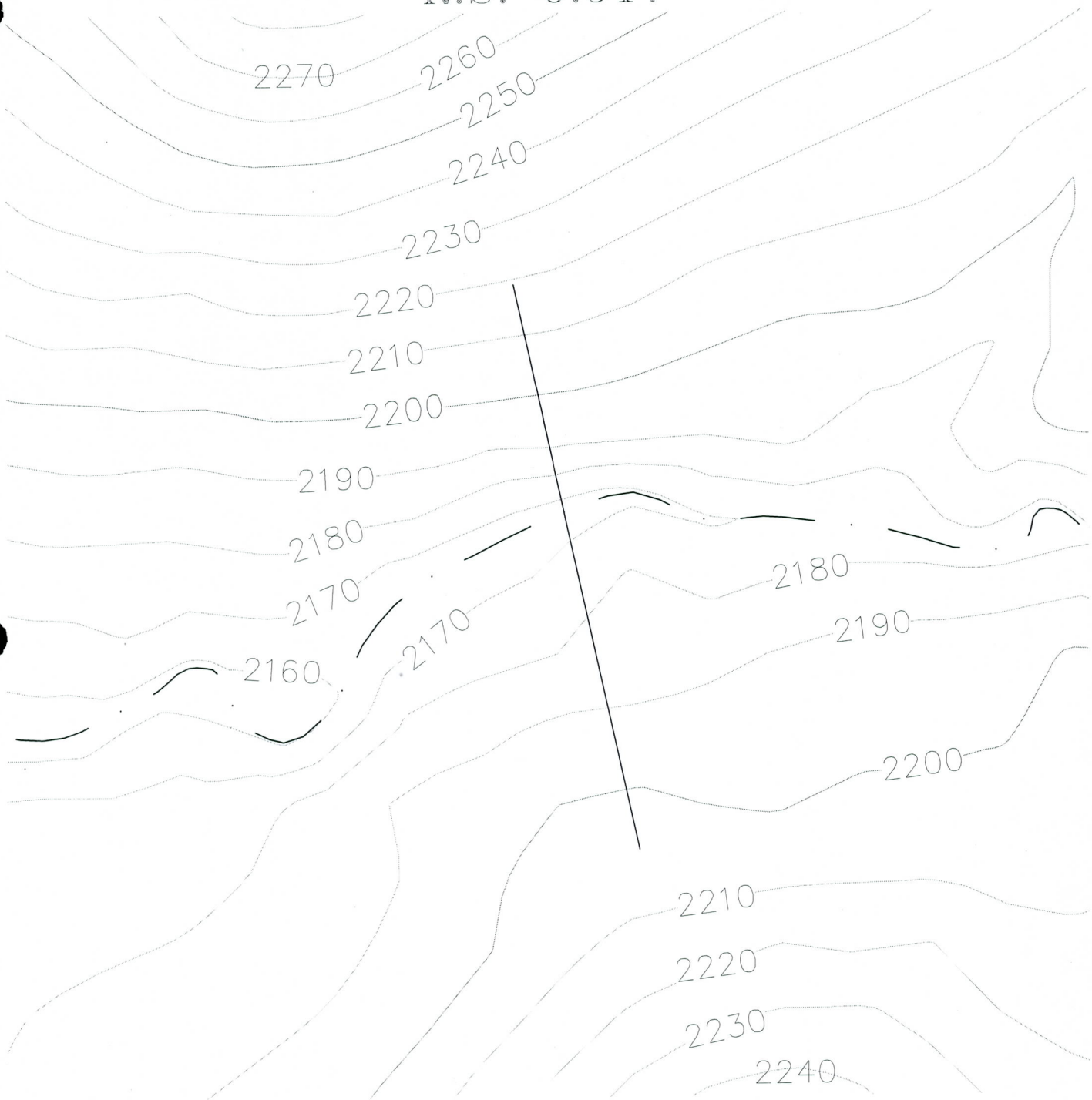
Little Squaw Creek, Tributary 2
R.S. 0.393



Calculated Values

Longitudinal Slope: 0.0207 ft/ft
Flow: 1540.000 cfs
Depth: 5.497 ft
Area of Flow: 251.174 sq ft
Wetted Perimeter: 92.143 ft
Average Velocity: 6.131 fps
Top Width (T): 91.386 ft
Froude Number: 0.652
Critical Depth: 4.632 ft
Critical Velocity: 8.636 fps
Critical Slope: 0.05110
Manning's Roughness: 0.06823

LITTLE SQUAW CREEK, TRIBUTARY 3, REACH 1
R.S. 0.917



SCALE: 1" = 100'

FLOWLINE

CROSS SECTION

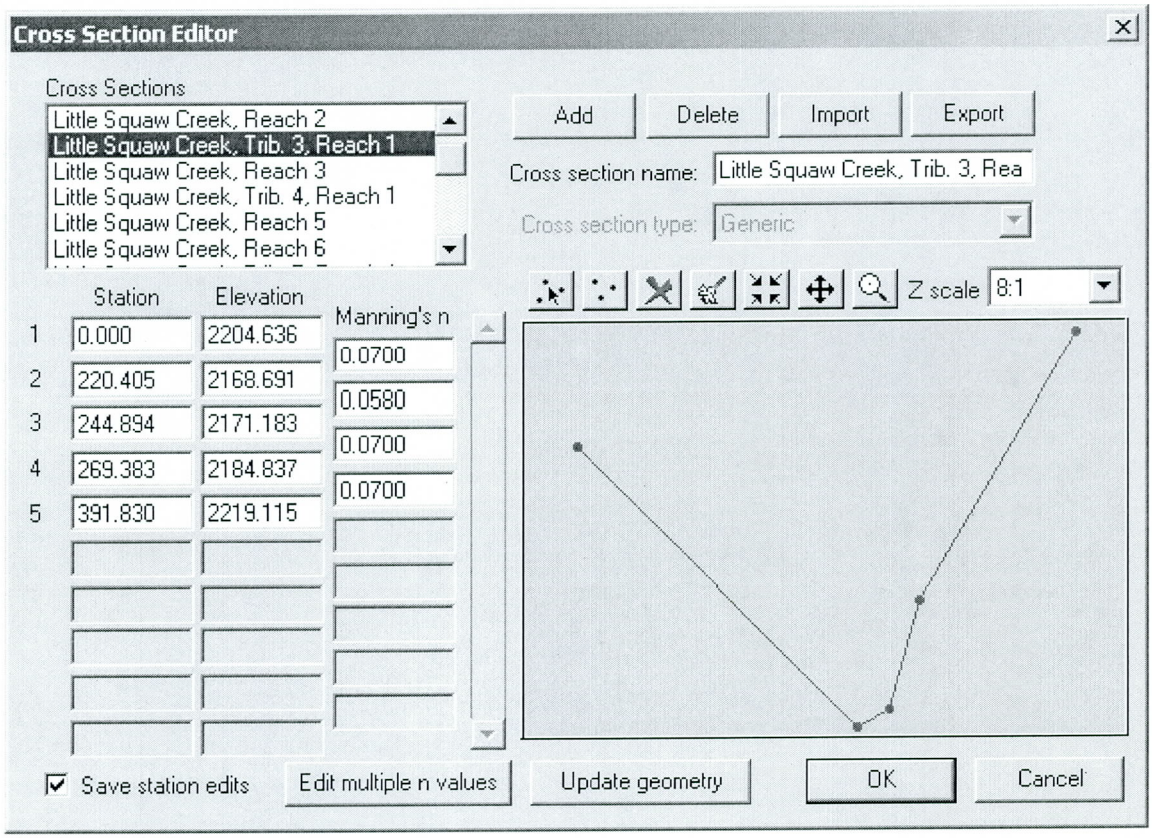
0 100 200 300

RBF CONSULTING

PLANNING
DESIGN
CONSTRUCTION

H:\PDATA\45100648\DWG\WS3AND4\0648-X-SECS-EX-SHT6.DWG WKING 4/22/03 10:09 pm

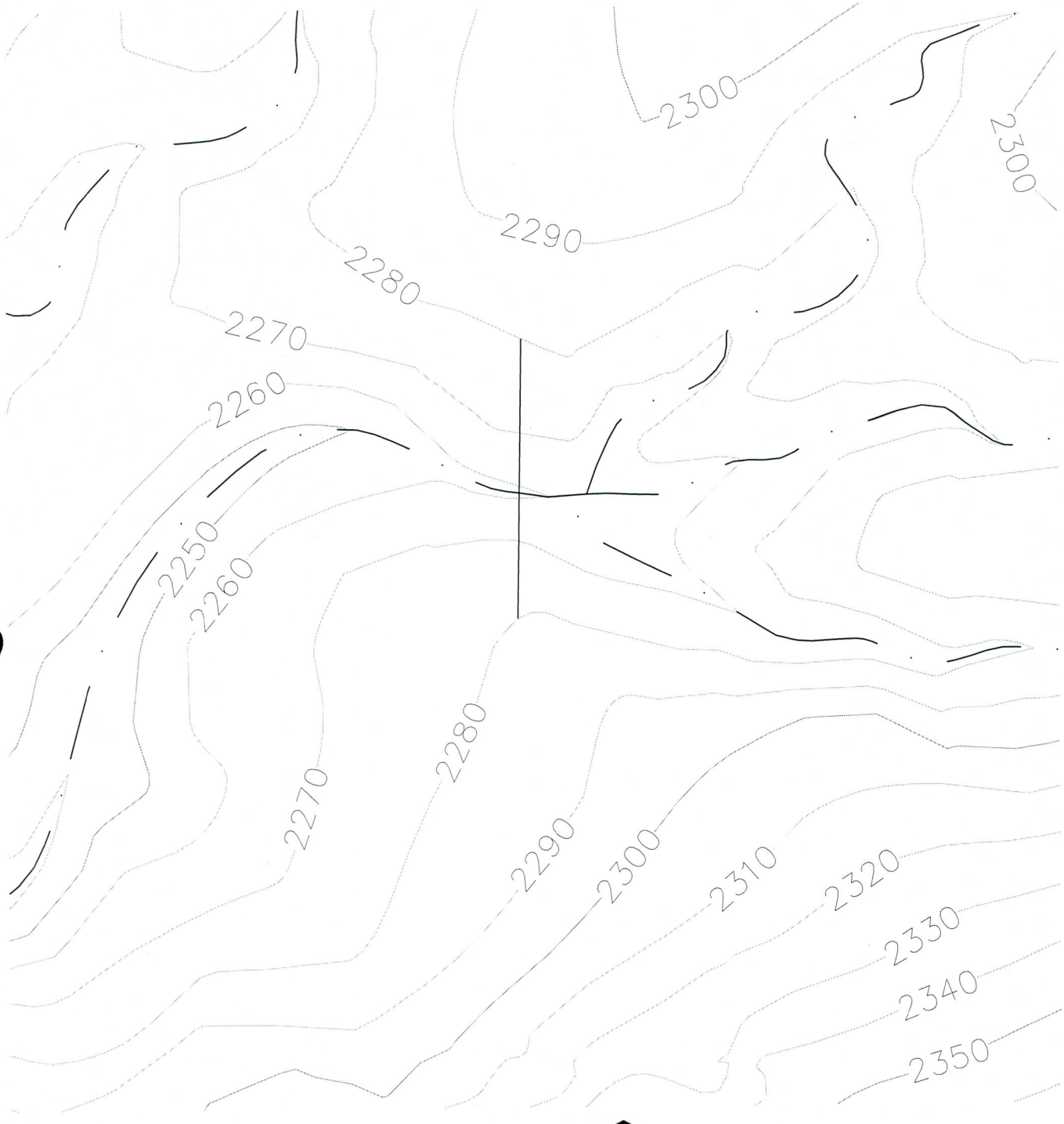
Little Squaw Creek, Tributary 3, Reach 1
R.S. 0.917



Calculated Values

Longitudinal Slope: 0.0281 ft/ft
Flow: 1716.000 cfs
Depth: 5.545 ft
Area of Flow: 207.928 sq ft
Wetted Perimeter: 65.337 ft
Average Velocity: 8.253 fps
Top Width (T): 63.968 ft
Froude Number: 0.807
Critical Depth: 5.035 ft
Critical Velocity: 9.733 fps
Critical Slope: 0.04413
Manning's Roughness: 0.06548

LITTLE SQUAW CREEK, TRIBUTARY 3, REACH 2
R.S. 1.420



SCALE: 1" = 100'

FLOWLINE

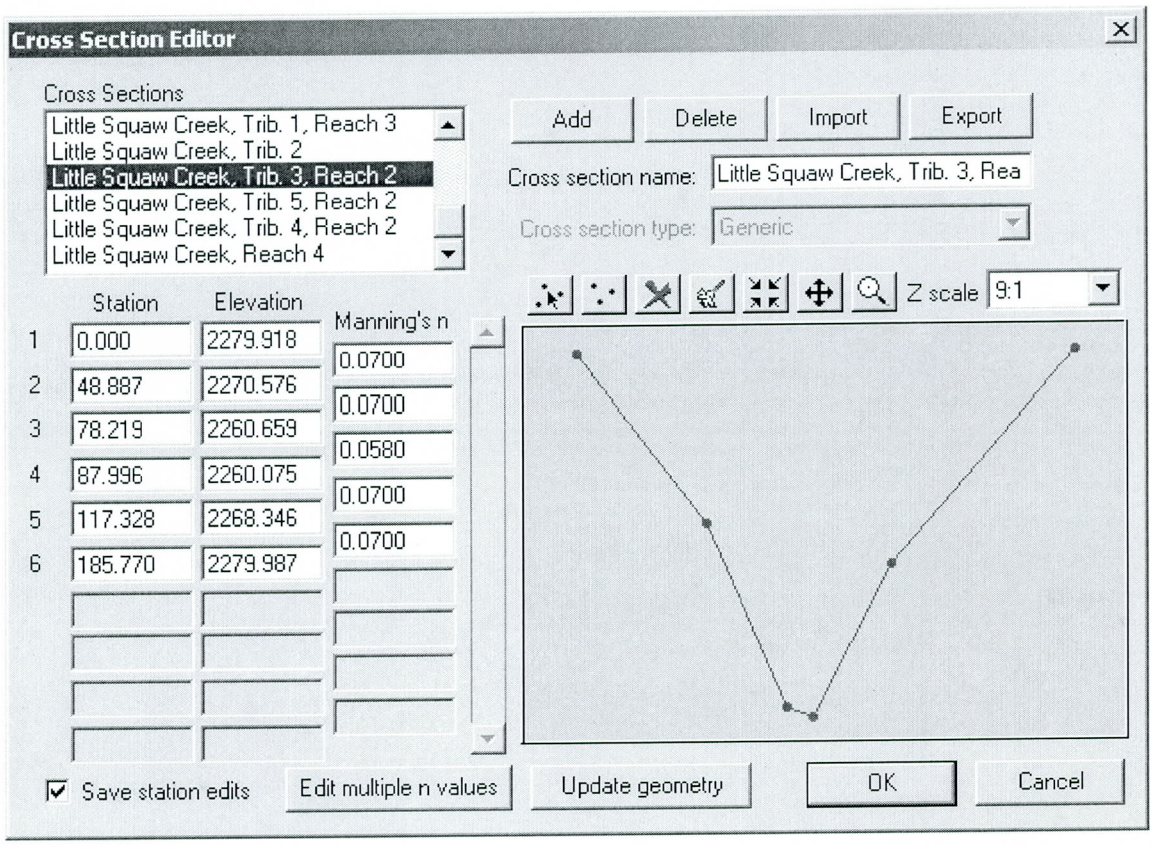
CROSS SECTION

RBF CONSULTING

PLANNING
DESIGN
CONSTRUCTION

H:\PDATA\45100648\DWG\WS3AND4\0648-X-SECS-EX-SHT6.DWG WKING 4/22/03 10:09 pm

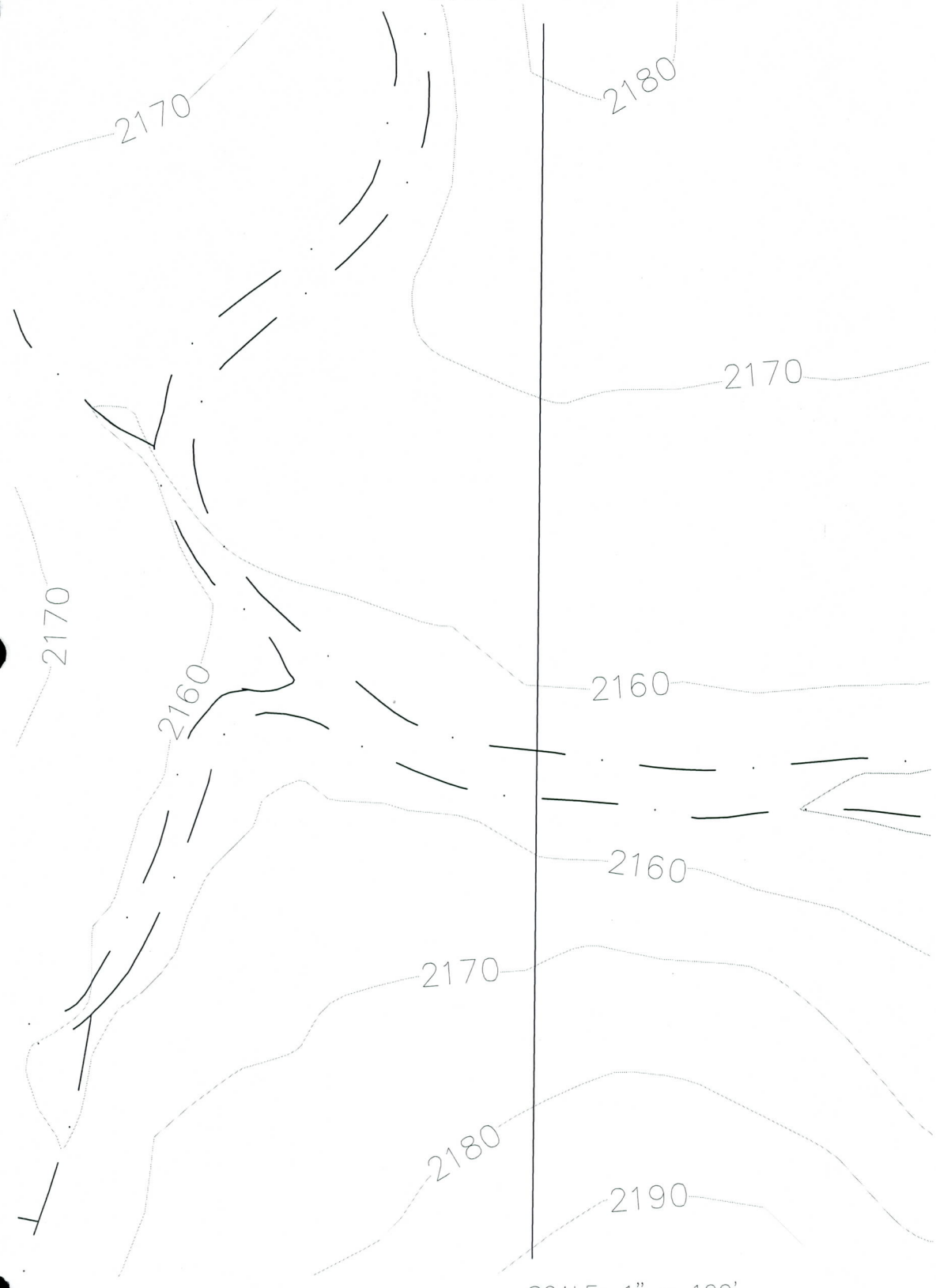
Little Squaw Creek, Tributary 3, Reach 2
R.S. 1.420



Calculated Values

Longitudinal Slope: 0.0560 ft/ft
Flow: 1071.000 cfs
Depth: 4.663 ft
Area of Flow: 105.894 sq ft
Wetted Perimeter: 39.711 ft
Average Velocity: 10.114 fps
Top Width (T): 38.378 ft
Froude Number: 1.073
Critical Depth: 4.819 ft
Critical Velocity: 9.566 fps
Critical Slope: 0.04829
Manning's Roughness: 0.06704

LITTLE SQUAW CREEK, TRIBUTARY 4, REACH 1
R.S. 0.541



FLOWLINE

CROSS SECTION

SCALE: 1" = 100'

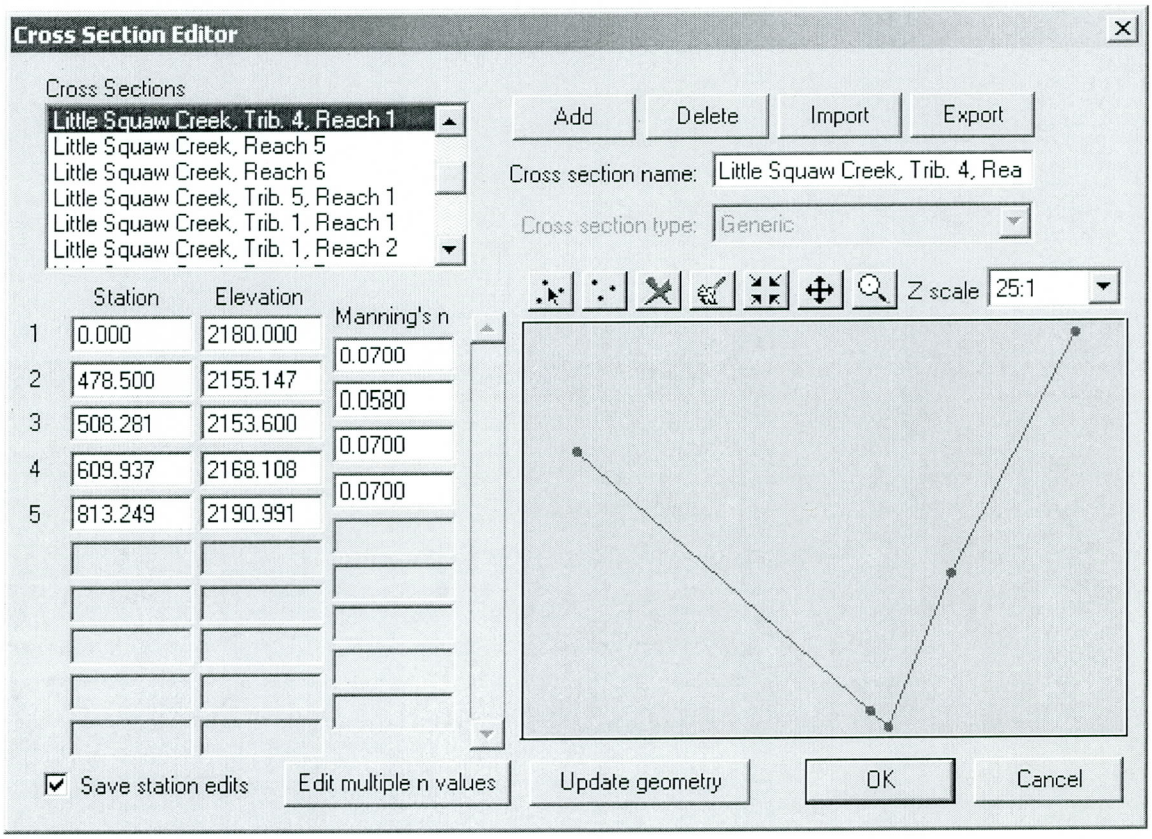
0 100 200 300

RBF CONSULTING

PLANNING
DESIGN
CONSTRUCTION

H:\PDATA\45100648\DWG\WS3AND4\0648-X-SECS-EX-SHT3.DWG WKING 4/22/03 10:00 pm

Little Squaw Creek, Tributary 4, Reach 1
R.S. 0.541



Calculated Values

Longitudinal Slope: 0.0192 ft/ft
Flow: 2332.000 cfs
Depth: 5.460 ft
Area of Flow: 391.376 sq ft
Wetted Perimeter: 143.901 ft
Average Velocity: 5.958 fps
Top Width (T): 143.372 ft
Froude Number: 0.636
Critical Depth: 4.554 ft
Critical Velocity: 8.563 fps
Critical Slope: 0.04976
Manning's Roughness: 0.06751

LITTLE SQUAW CREEK, TRIBUTARY 4, REACH 2
R.S. 1.568

FLOWLINE

CROSS SECTION

SCALE: 1" = 100'

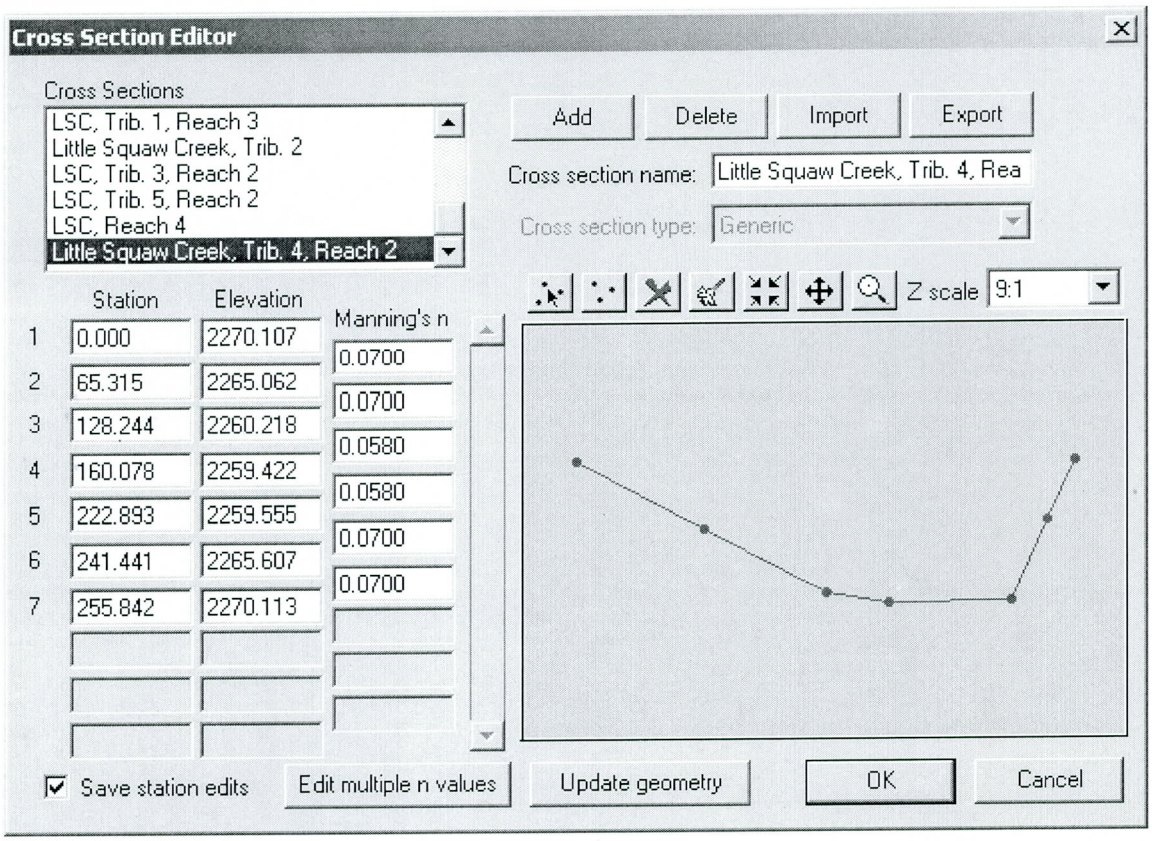
0 100 200 300

RBF CONSULTING

PLANNING
DESIGN
CONSTRUCTION

H:\PDATA\45100648\DWG\WS3AND4\0648-X-SECS-EX-SHT3.DWG WKING 4/22/03 10:01 pm

Little Squaw Creek, Tributary 4, Reach 2
R.S. 1.568



Calculated Values

Longitudinal Slope: 0.0205 ft/ft
Flow: 1393.000 cfs
Depth: 2.524 ft
Area of Flow: 250.218 sq ft
Wetted Perimeter: 124.881 ft
Average Velocity: 5.567 fps
Top Width (T): 124.424 ft
Froude Number: 0.692
Critical Depth: 2.037 ft
Critical Velocity: 7.273 fps
Critical Slope: 0.04486
Manning's Roughness: 0.06090

LITTLE SQUAW CREEK, TRIBUTARY 5, REACH 1
R.S. 0.244

SCALE: 1" = 100'

FLOWLINE

CROSS SECTION

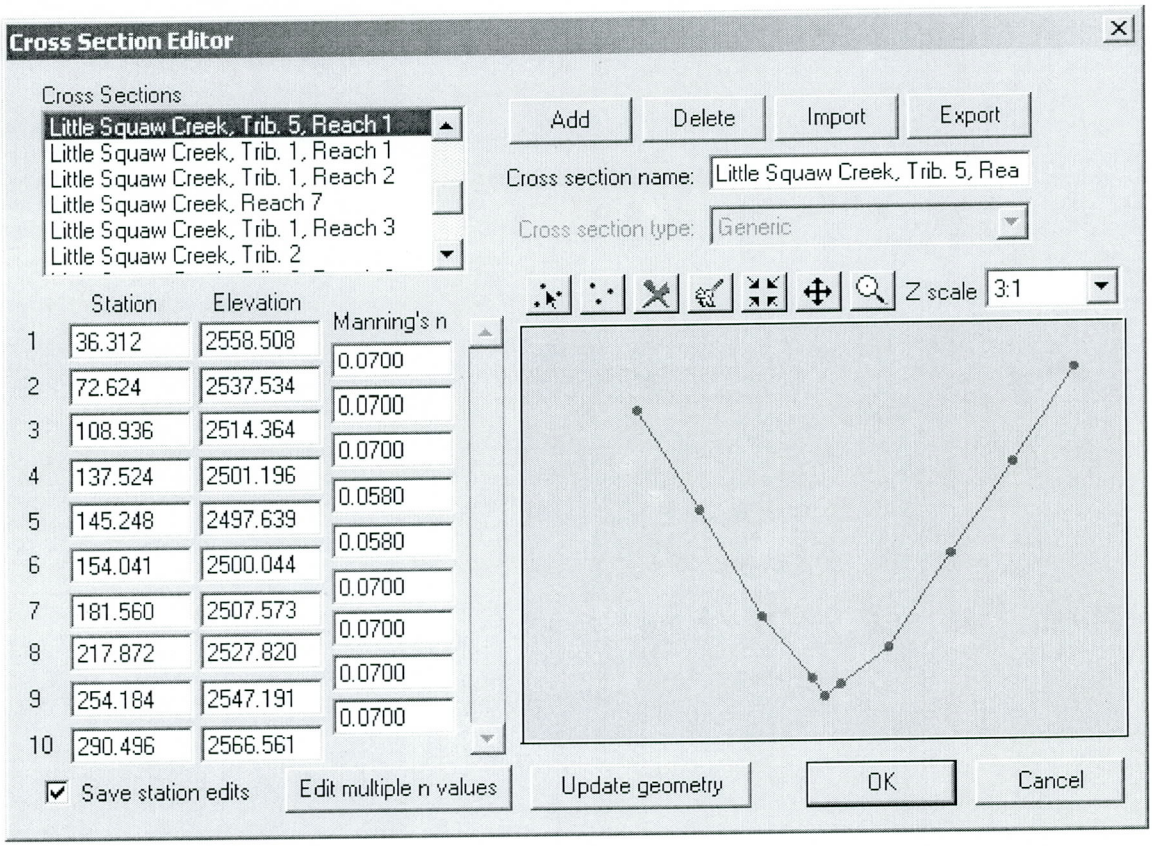
0 100 200 300

RBF CONSULTING

PLANNING
DESIGN
CONSTRUCTION

H:\PDATA\45100648\DWG\WS3AND4\0648-X-SECS-EX-SHT4.DWG WKING 4/22/03 10:02 pm

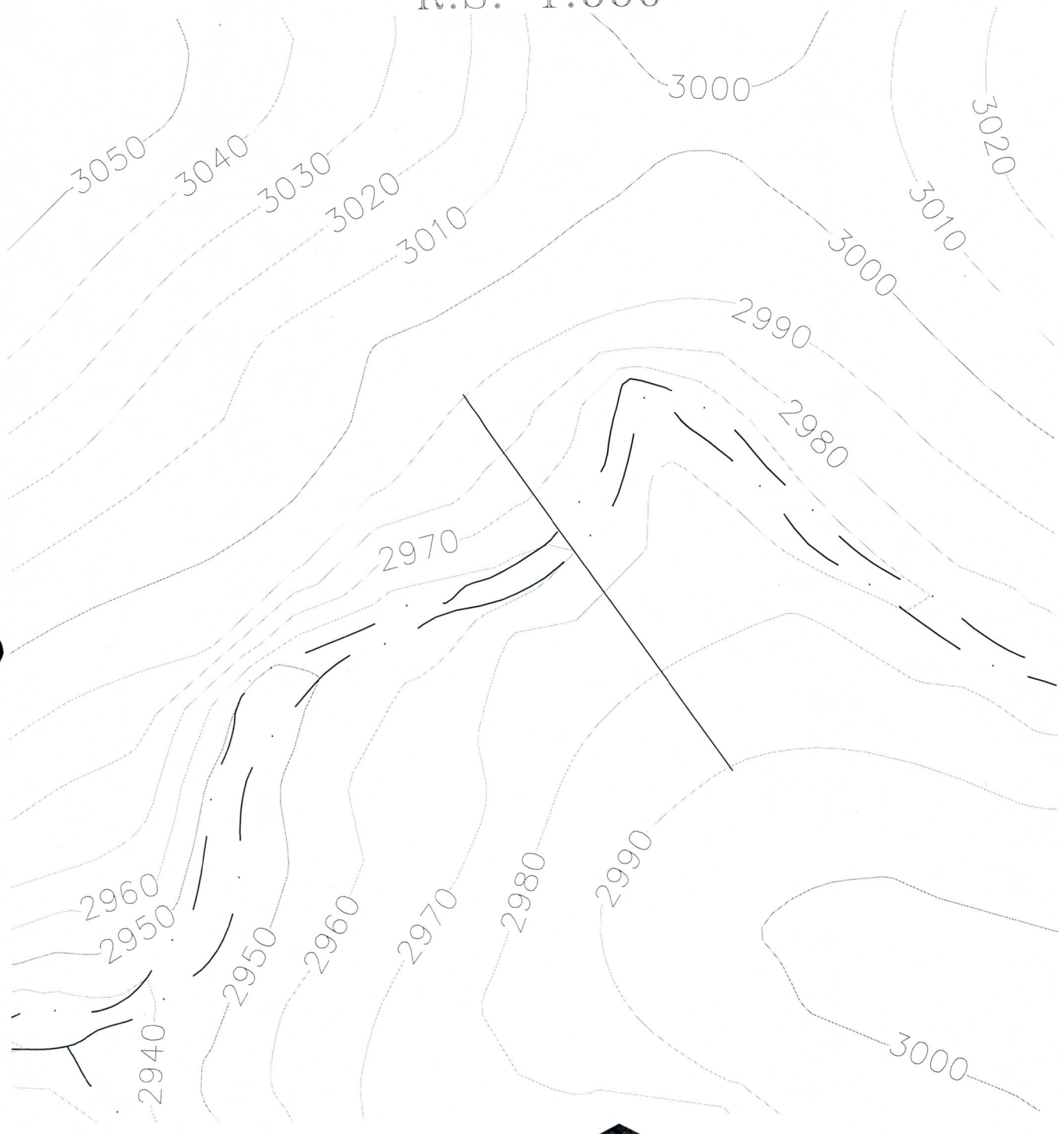
Little Squaw Creek, Tributary 5, Reach 1
R.S. 0.244



Calculated Values

Longitudinal Slope: 0.0614 ft/ft
Flow: 1699.000 cfs
Depth: 6.855 ft
Area of Flow: 136.873 sq ft
Wetted Perimeter: 42.360 ft
Average Velocity: 12.413 fps
Top Width (T): 39.936 ft
Froude Number: 1.182
Critical Depth: 7.328 ft
Critical Velocity: 10.862 fps
Critical Slope: 0.04344
Manning's Roughness: 0.06501

LITTLE SQUAW CREEK, TRIBUTARY 5, REACH 2
R.S. 1.660



SCALE: 1" = 100'

FLOWLINE

CROSS SECTION

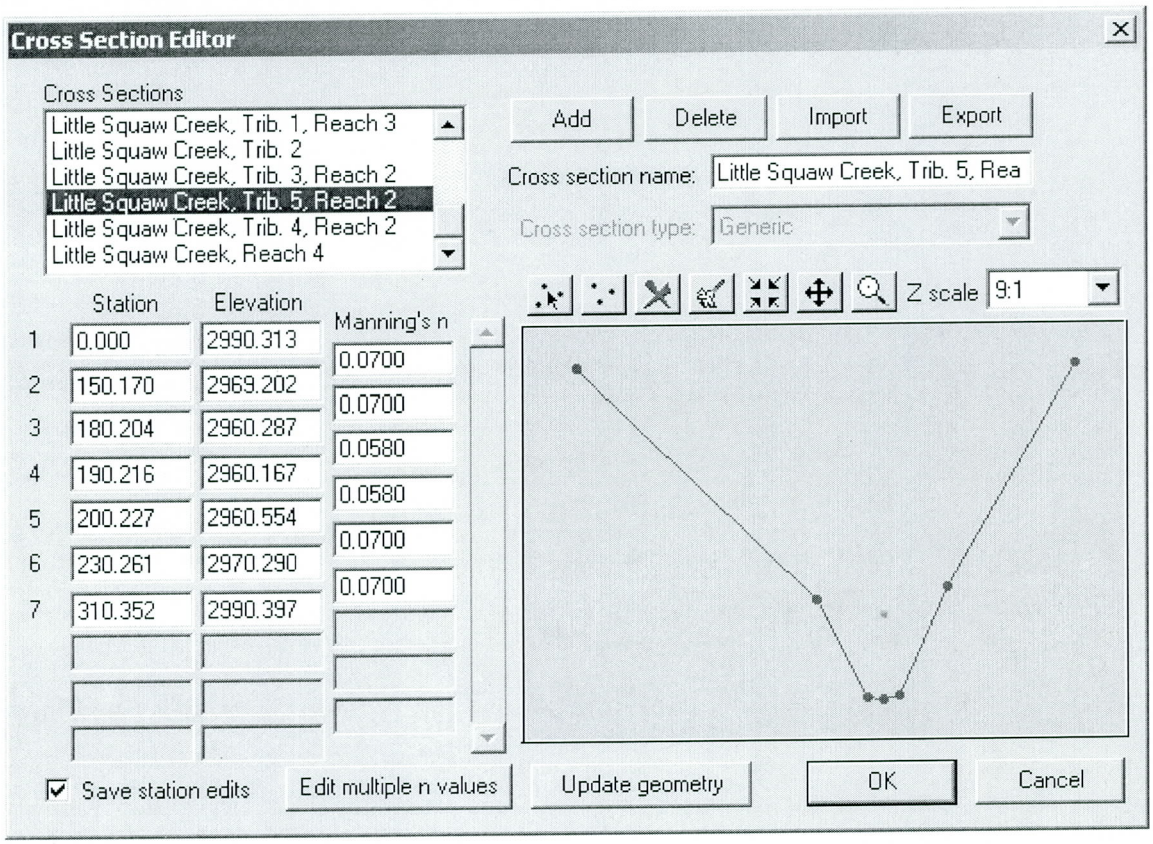
0 100 200 300

RBF CONSULTING

PLANNING
DESIGN
CONSTRUCTION

H:\PDATA\45100648\DWG\WS3AND4\0648-X-SECS-EX-SHT4.DWG WKING 4/22/03 10:03 pm

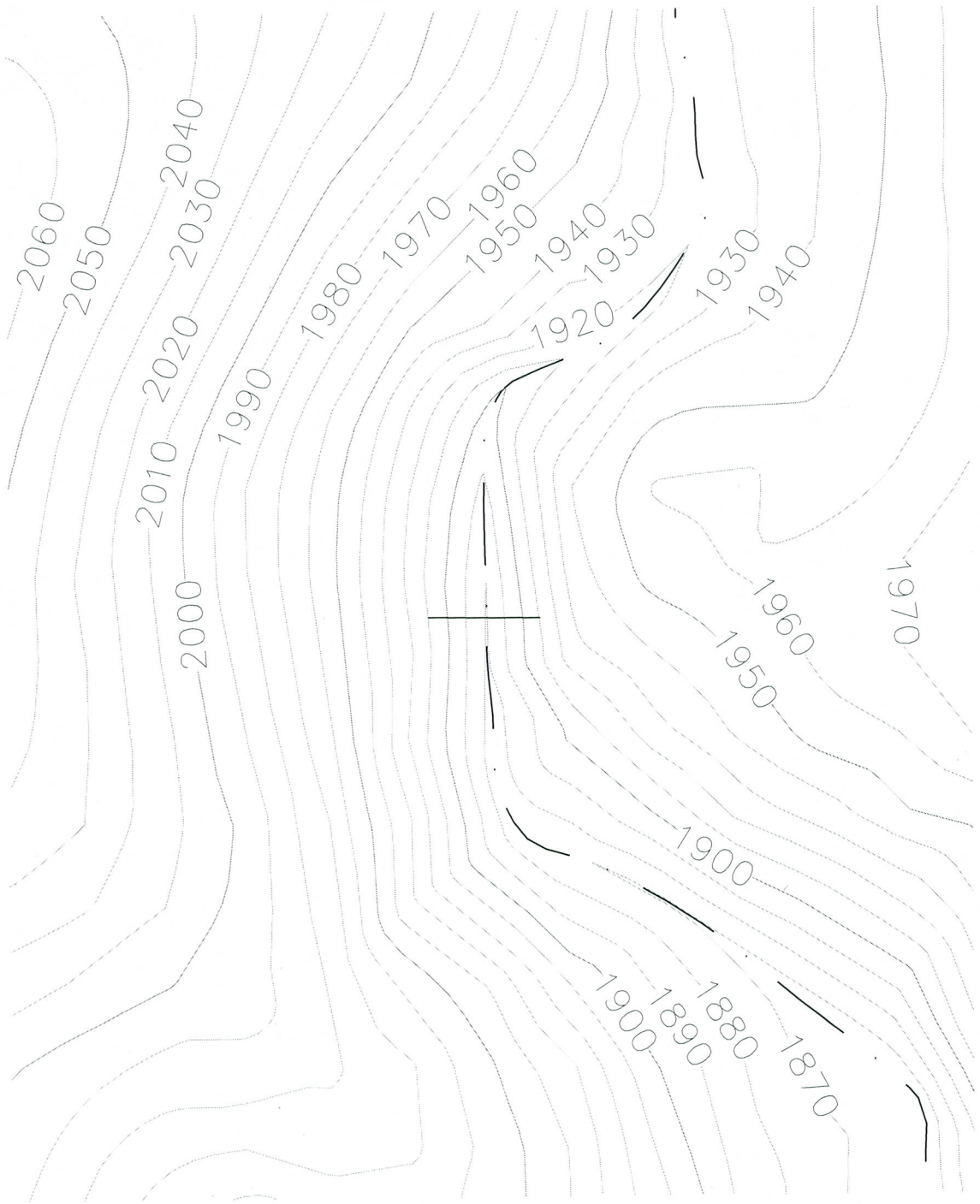
Little Squaw Creek, Tributary 5, Reach 2
R.S. 1.660



Calculated Values

Longitudinal Slope: 0.0725 ft/ft
Flow: 1226.000 cfs
Depth: 3.626 ft
Area of Flow: 106.950 sq ft
Wetted Perimeter: 42.856 ft
Average Velocity: 11.463 fps
Top Width (T): 41.826 ft
Froude Number: 1.263
Critical Depth: 4.112 ft
Critical Velocity: 9.576 fps
Critical Slope: 0.04446
Manning's Roughness: 0.06439

WASH 8N2ES16
R.S. 0.203



SCALE: 1" = 100'

FLOWLINE

CROSS SECTION

0 100 200 300

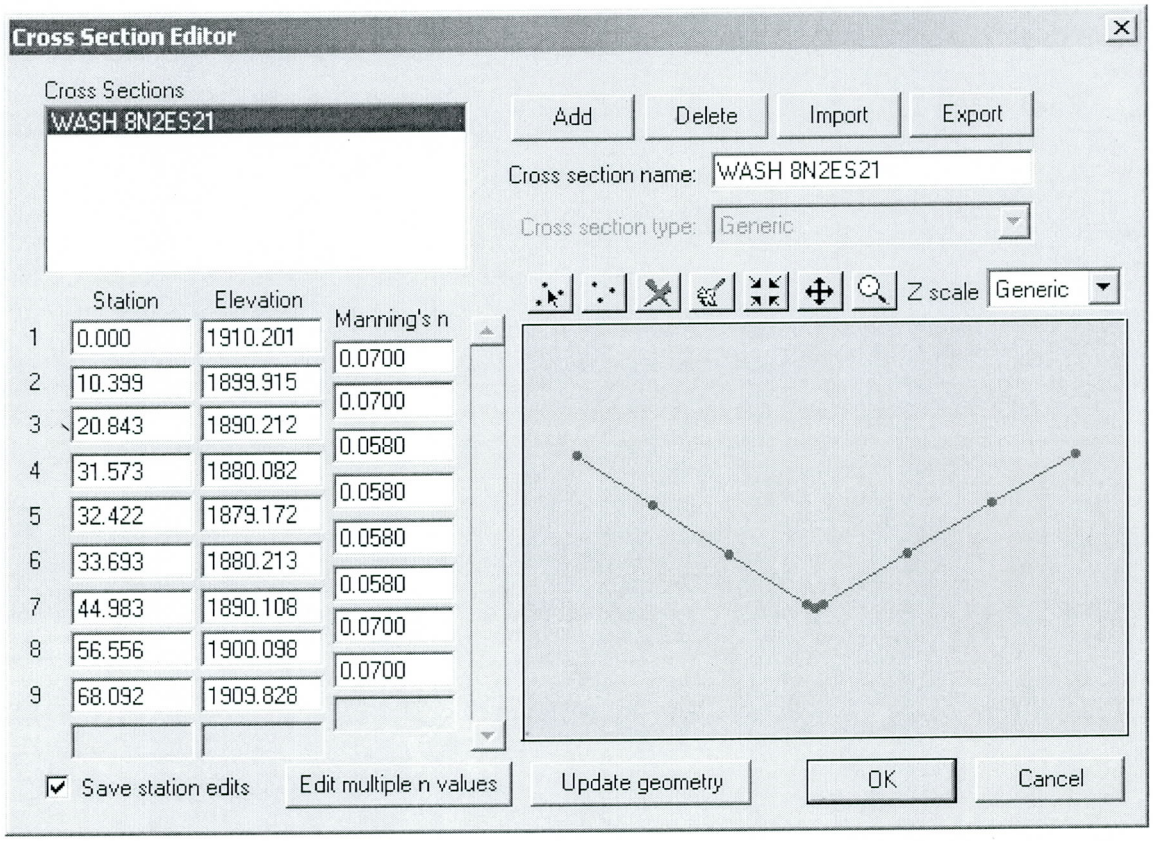
RBF CONSULTING

PLANNING
DESIGN
CONSTRUCTION

H:\PDATA\45100648\DWG\WS3AND4\0648-X-SECS-EX-SHT2.DWG WKING 4/22/03 9:55 pm

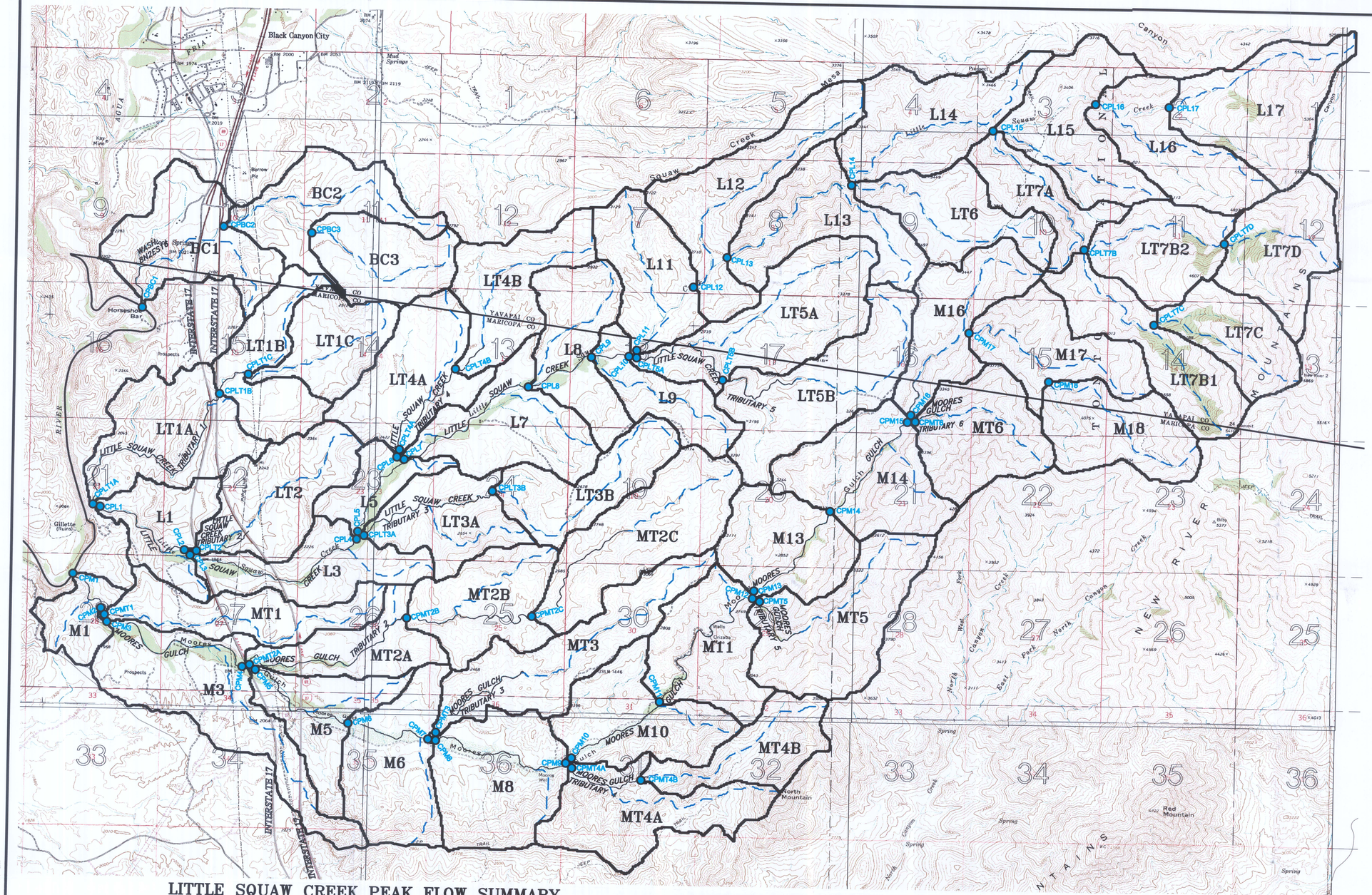
Wash 8N2ES16

RS 0.203



Calculated Values

Longitudinal Slope: 0.041287 ft/ft
Flow: 2549.000 cfs
Depth: 12.763 ft
Area of Flow: 178.862 sq ft
Wetted Perimeter: 37.984 ft
Average Velocity: 14.251 fps
Top Width (T): 28.111 ft
Froude Number: 0.996
Critical Depth: 12.741 ft
Critical Velocity: 14.301 fps
Critical Slope: 0.04165
Manning's Roughness: 0.05968



LEGEND

- CONCENTRATION POINT
- CPL17 — CONFLUENCE NAME
- DELINEATED WASHES
- LONGEST FLOW PATH
- SUB-BASIN BOUNDARIES
- MT2C — SUB-BASIN NAME
- 35 — SECTION NUMBER

MOORES GULCH PEAK FLOW SUMMARY

I.D.	Q_{100} CFS	I.D.	Q_{100} CFS
CPM1	9321	M10	1415
M1	751	CPM11	5872
CPM2	9360	M11	1342
CPM3	8993	CPM12	5589
M3	1326	CPMT5	1726
CPM4	8803	CPM13	4735
CPMT2A	2396	M13	1523
MT2A	962	CPM14	4355
CPMT2B	2161	M14	2055
MT2B	1476	CPM15	3671
CPMT2C	1403	CPMT6	1691
CPM5	7548	CPM16	2977
M5	1141	M16	1274
CPM6	7567	CPM17	2447
M6	1390	M17	1501
CPM7	7487	CPM18	1550
CPMT3	1251	CPMT4A	2017
CPM8	6920	MT4A	1526
M8	1619	CPMT4B	1038
CPM9	6875	CPMT1	1109
CPM10	6101		

LITTLE SQUAW CREEK PEAK FLOW SUMMARY

I.D.	Q_{100} CFS	I.D.	Q_{100} CFS	I.D.	Q_{100} CFS	I.D.	Q_{100} CFS	I.D.	Q_{100} CFS
CPL1	9190	CPL8	8001	L12	1053	CPL17	1998	CPLT3B	1071
L1	1150	L8	1489	CPL13	6884	CPLT7B	3979	CPLT2	1540
CPL2	9209	CPL9	7898	L13	893	LT7B1	1465	CPLT1A	2462
CPL3	9036	L9	985	CPL14	6855	LT7B2	1509	LT1A	1484
L3	1176	CPL10	7736	L14	872	CPLT7C	1477	CPLT1B	1849
CPL4	9053	CPLT5A	1699	LT6	976	CPLT7D	1868	LT1B	1311
CPL5	8643	LT5A	1039	CPL15	6648	CPLT4A	2332	CPLT1C	1005
L5	724	CPLT5B	1226	LT7A	979	LT4A	1731		
CPL6	8779	CPL11	7212	L15	1622	CPLT4B	1393		
CPL7	8027	L11	1210	CPL16	2769	CPLT3A	1716		
L7	1387	CPL12	7042	L16	1441	LT3A	1135		

WASH 8N2ES16 PEAK FLOW SUMMARY

I.D.	Q_{100} CFS
CPBC1	2549
BC1	1353
CPBC2	1980
BC2	1174
CPBC3	1313

SCALE: 1" = 2,000'

0 2,000 4,000 6,000

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

Registered Professional Engineer (Civil)
CERTIFICATE NO.
39722
PAUL
SCLAFANI
Date Signed 10/1/03
ARIZONA, U.S.A.

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

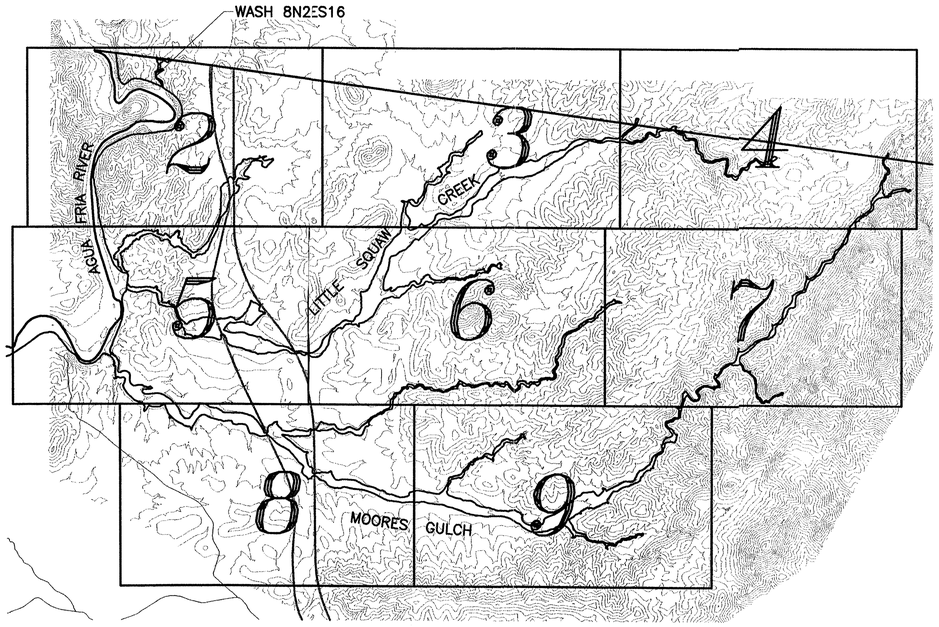
UPPER AGUA FRIA WATERSHED
ZONE A FLOODPLAIN DELINEATION STUDY
MOORES GULCH, LITTLE SQUAW CREEK, & WASH 8N2ES16 (WATERSHEDS 3 & 4)
SUB-BASIN BOUNDARIES
EXHIBIT 1

RBF JN 45-100648

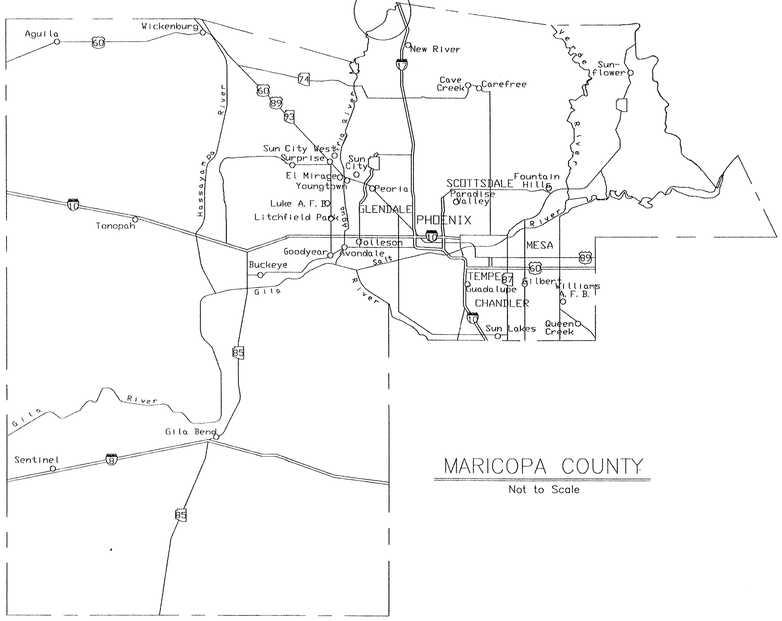
H:\PDATA\45100648\DWG\WS3AND4\0648HYDRO-COLOR.DWG FWITTIE 10/1/03 10:59 am

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

SUB WATERSHEDS 3 & 4
UPPER AGUA FRIA WATERSHED
ZONE A FLOODPLAIN DELINEATION STUDY
CONTRACT F.C.D. 2000C020



PROJECT LOCATION



MARICOPA COUNTY
Not to Scale

STUDY AREA MAP
AND SHEET INDEX

SHEET INDEX
SHEET 2–9 FLOOD DELINEATION STUDY

3000' 0' 3000' 6000'
SCALE: 1"= 3000 FEET
FLIGHT DATES:
12/16/2000–03/15/2001

THIS MAP WAS PREPARED FROM MARICOPA COUNTY DIGITAL TERRAIN MODELS (DTM) PREPARED FROM AERIAL PHOTOGRAPHS FLOWN IN DECEMBER 2000–MARCH 2001.

LANDATA AIRBORNE SYSTEMS

GROUND CONTROL SURVEY DATA PROVIDED BY RBF CONSULTING

HYDROLOGY & HYDRAULICS
RBF CONSULTING
16605 N 28TH AVENUE, SUITE 100
PHOENIX, ARIZONA, 85053
(602)467–2200

AERIAL PHOTOGRAPHY
LANDATA AIRBORNE SYSTEMS

CONTOUR INTERVAL: 10 FEET

GROUND CONTROL
RBF CONSULTING
16605 N 28TH AVENUE, SUITE 100
PHOENIX, ARIZONA, 85053
(602)467–2200

THE SURVEY CONTROL FOR THE AERIAL TOPOGRAPHY WAS DONE UNDER MY DIRECTION AND SUPERVISION DURING THE MONTH OF DECEMBER 2000.

REGISTERED LAND SURVEYOR 29891 BRENT J. SMITH ARIZONA, U.S.A.

BRENT J. SMITH, R.L.S. 29891

NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

UPPER AGUA FRIA WATERSHED
SUB WATERSHEDS 3 & 4
ZONE A
FLOODPLAIN DELINEATION STUDY
F.C.D. CONTRACT NO. 2000C020

Registered Professional Engineer (Civil) CERTIFICATE NO. 38779 WILLIAM J. KING 5-28-03 ARIZONA, U.S.A.

RBF CONSULTING — PLANNING ■ DESIGN ■ CONSTRUCTION
16605 NORTH 28th AVENUE, SUITE 100 PHOENIX, ARIZONA 85053-4466
PHONE 602.467.2200 • FAX 602.467.2571 • www.RBF.com

	BY	DATE
DESIGN	WJK	05/28/03
DESIGN CHK.	NEF	05/28/03
PLANS	FBW	05/28/03
PLANS CHK.	WJK	05/28/03

SHEET 1 OF 9

RBF JN 45–100648

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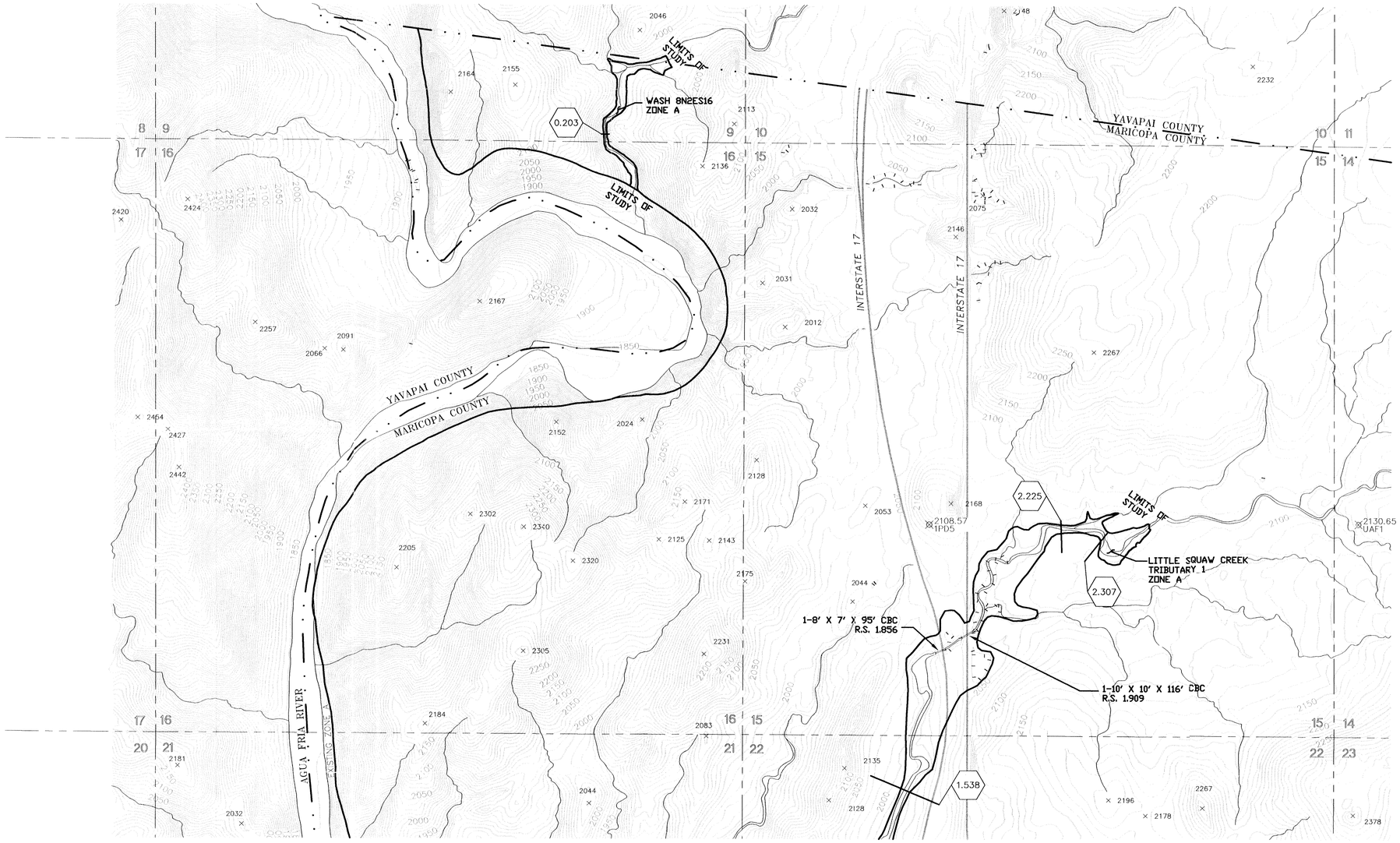


500' 0' 500' 1000'

SCALE: 1"= 500 FEET

FLIGHT DATES:
12/16/2000-03/15/2001

LEGEND

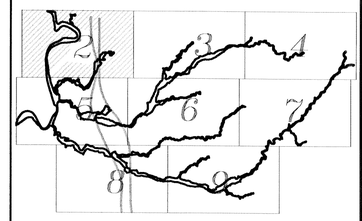
100-YR FLOODPLAIN BOUNDARY	
SECTION LINE	
CORPORATE LIMITS	Corporate Limits
COUNTY, PARISH, STATE OR INTERNATIONAL BOUNDARY	County Boundary
SECTION NUMBERS	32
ZONE DESIGNATIONS	ZONE A
ELEVATION REFERENCE MARK	⊗1758.96 UAF 32
CROSS SECTION	0.1000 (CROSS SECTION UNDER WHICH DESIGNATION)
TOPOGRAPHICAL DEPRESSIONS	

ELEVATION REFERENCE MARKS

NOTE: ALL ELEVATIONS ARE BASED ON NORTH AMERICA VERTICAL DATUM OF 1988. TO CONVERT TO 1929 NGVD, SUBTRACT 2.27 FEET.

I.D. NUMBER	ELEVATION (FT)	DESCRIPTION/LOCATION
UAF 1	2130.65	SET FCDMC BRASS CAP AT LAT. N-34°02'09" LONG. W-112°08'02"
1PD 5	2108.57	FOUND AT LAT. N-34°02'8.93" LONG. W-112°08'48.19"

NOTES



NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

UPPER AGUA FRIA WATERSHED
SUB WATERSHEDS 3 & 4
ZONE A
FLOODPLAIN DELINEATION STUDY
F.C.D. CONTRACT NO. 2000C020

Registered Professional Engineer Certificate No. 38779 WILLIAM J. KING Date Signed 5-28-03

RBF CONSULTING — PLANNING ■ DESIGN ■ CONSTRUCTION
7600 NORTH 16th AVENUE, SUITE 150 PHOENIX, ARIZONA 85021-1976
602.957.2200 • FAX 602.957.2205 • www.RBF.com

	BY	DATE
DESIGN	WJK	05/28/03
DESIGN CHK.	NEF	05/28/03
PLANS	FBW	05/28/03
PLANS CHK.	WJK	05/28/03

SHEET 2 OF 9

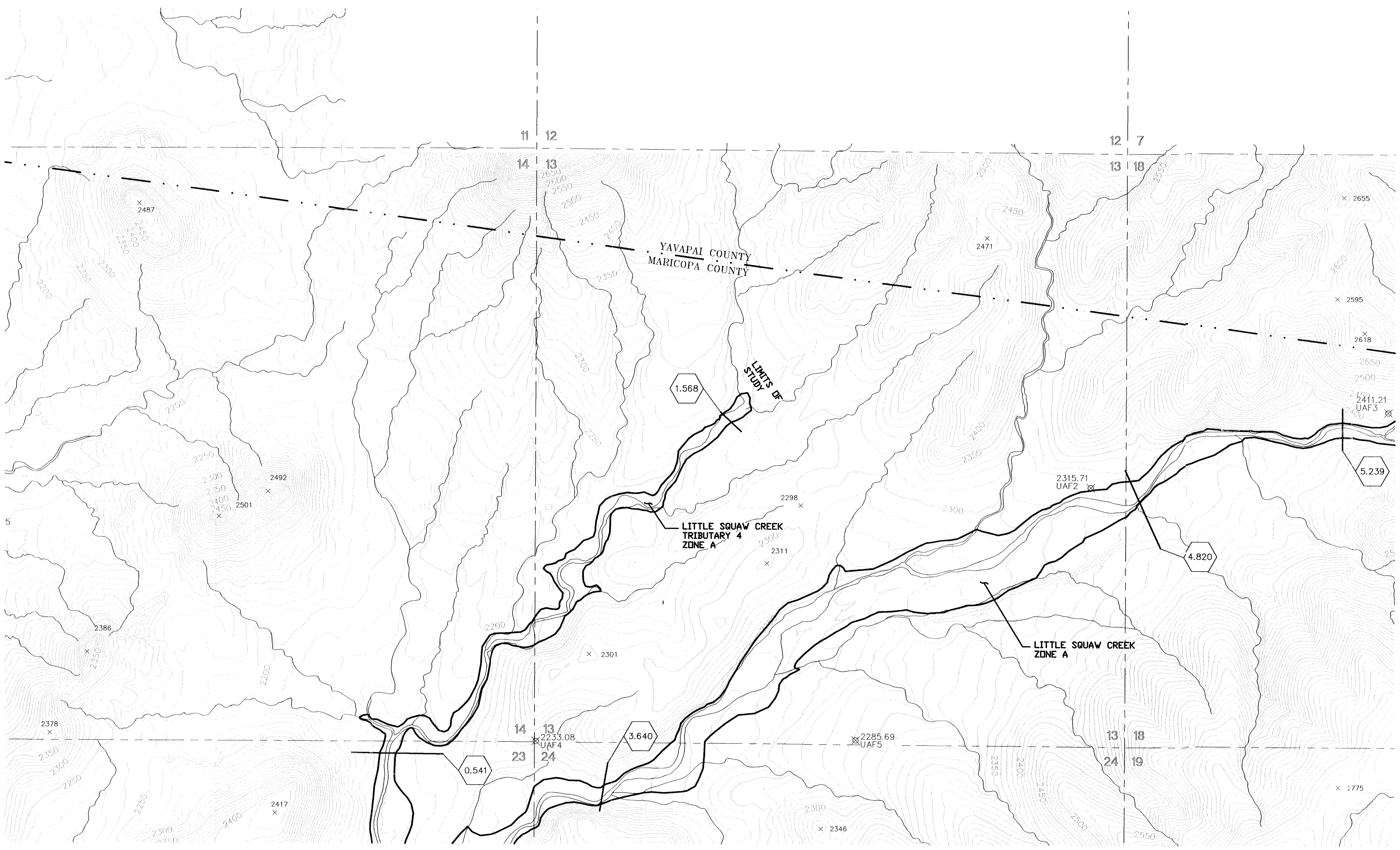
H:\PDATA\45100648\DWG\MS3AND4\WORK STUDY MAPS\0648FPW02.DWG FWITTE 5/27/03 2:22 pm

THIS MAP WAS PREPARED FROM MARICOPA COUNTY DIGITAL TERRAIN MODELS (DTM) PREPARED FROM AERIAL PHOTOGRAPHS FLOWN IN DECEMBER 2000-MARCH 2001.

LANDATA AIRBORNE SYSTEMS

GROUND CONTROL SURVEY DATA PROVIDED BY RBF CONSULTING

RBF JN 45-100648



LEGEND

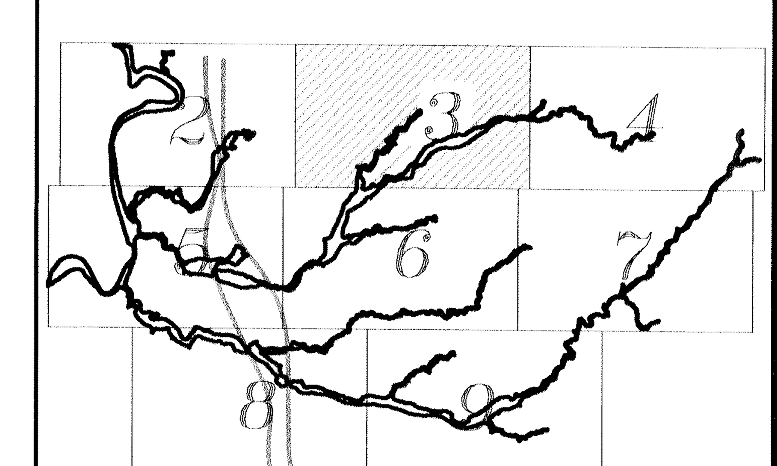
100-YR FLOODPLAIN BOUNDARY	
SECTION LINE	
CORPORATE LIMITS	Corporate Limits
COUNTY, PARISH, STATE OR INTERNATIONAL BOUNDARY	County Boundary
SECTION NUMBERS	32
ZONE DESIGNATIONS	ZONE A
ELEVATION REFERENCE MARK	1758.96 UAF32
CROSS SECTION	CROSS SECTION RIVER MILE DESIGNATION 0.1000
TOPOGRAPHICAL DEPRESSIONS	

ELEVATION REFERENCE MARKS

NOTE: ALL ELEVATIONS ARE BASED ON NORTH AMERICA VERTICAL DATUM OF 1988.
TO CONVERT TO 1929 NGVD, SUBTRACT 2.27 FEET.

I.D. NUMBER	ELEVATION (FT)	DESCRIPTION/LOCATION
UAF 4	2233.08	SET FCDMC BRASS CAP AT LAT. N-34°01'50" LONG. W-112°07'02"
UAF 5	2285.69	FOUND AT LAT. N-34°01'50" LONG. W-112°06'28"
UAF 2	2315.71	FOUND AT LAT. N-34°02'13" LONG. W-112°06'03"
UAF 3	2411.21	FOUND AT LAT. N-34°02'20" LONG. W-112°05'32"

NOTES



NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

UPPER AGUA FRIA WATERSHED
SUB WATERSHEDS 3 & 4
ZONE A
FLOODPLAIN DELINEATION STUDY
F.C.D. CONTRACT NO. 2000C020

Registered Professional Engineer (Civil) CERTIFICATE NO. 38779 WILLIAM J. KING ARIZONA U.S.A. Date Signed 6-2-03

RBF CONSULTING — PLANNING ■ DESIGN ■ CONSTRUCTION
16605 NORTH 28th AVENUE, SUITE 100
PHOENIX, ARIZONA 85032-2882
602.467.2200 • FAX 602.467.2201 • www.RBF.com

	BY	DATE
DESIGN	WJK	05/28/03
DESIGN CHK.	NEF	05/28/03
PLANS	FBW	05/28/03
PLANS CHK.	WJK	05/28/03

SHEET 3 OF 9

N

500' 0' 500' 1000'
SCALE: 1" = 500 FEET
FLIGHT DATES:
12/16/2000-03/15/2001

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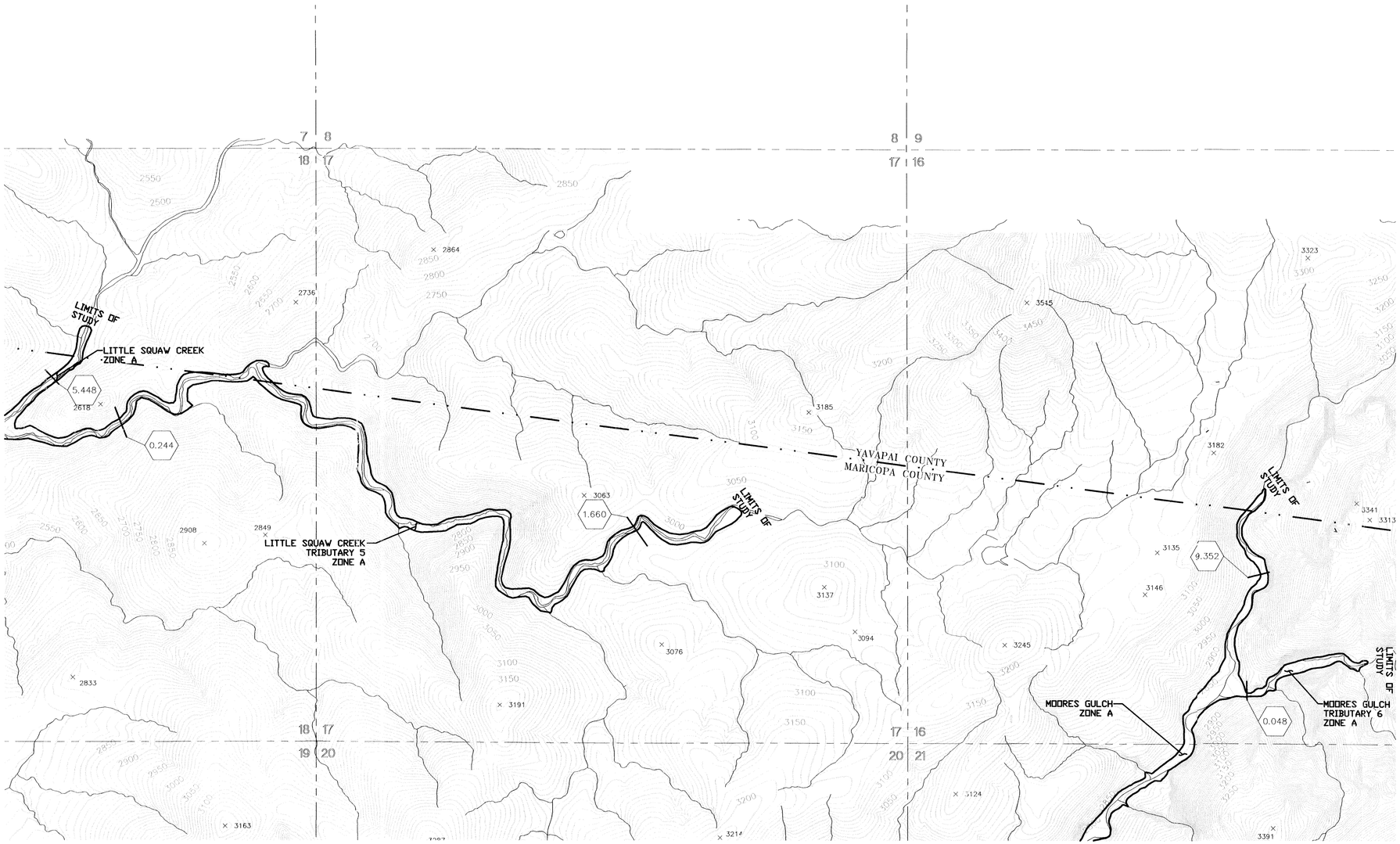
THIS MAP WAS PREPARED FROM MARICOPA COUNTY DIGITAL TERRAIN MODELS (DTM) PREPARED FROM AERIAL PHOTOGRAPHS FLOWN IN DECEMBER 2000-MARCH 2001.

LANDATA AIRBORNE SYSTEMS

GROUND CONTROL SURVEY DATA PROVIDED BY RBF CONSULTING

RBF JN 45-100648



500' 0' 500' 1000'

SCALE: 1"= 500 FEET

FLIGHT DATES:
12/16/2000-03/15/2001

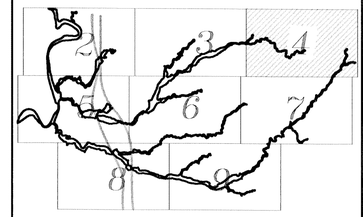
LEGEND

100-YR FLOODPLAIN BOUNDARY	
SECTION LINE	
CORPORATE LIMITS	Corporate Limits
COUNTY, PARISH, STATE OR INTERNATIONAL BOUNDARY	County Boundary
SECTION NUMBERS	32
ZONE DESIGNATIONS	ZONE A
ELEVATION REFERENCE MARK	⊠ 1758.96 BAF 32
CROSS SECTION	0.1000 (CROSS SECTION INDEX NO. / DESIGNATION)
TOPOGRAPHICAL DEPRESSIONS	

ELEVATION REFERENCE MARKS

NOTE: ALL ELEVATIONS ARE BASED ON NORTH AMERICA VERTICAL DATUM OF 1988.
TO CONVERT TO 1929 NGVD, SUBTRACT 2.27 FEET.

NOTES



NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

UPPER AGUA FRIA WATERSHED
SUB WATERSHEDS 3 & 4
ZONE A
FLOODPLAIN DELINEATION STUDY
F.C.D. CONTRACT NO. 2000C020

Registered Professional Engineer
CERTIFICATE NO.
38779
WILLIAM J. KING
Date Signed 5-28-03

RBF CONSULTING — PLANNING ■ DESIGN ■ CONSTRUCTION
7600 NORTH 16th AVENUE, SUITE 150
PHOENIX, ARIZONA 85021-1251
602.957.1155 • FAX 602.957.1237 • www.RBF.com

	BY	DATE
DESIGN	WJK	05/28/03
DESIGN CHK.	NEF	05/28/03
PLANS	FBW	05/28/03
PLANS CHK.	WJK	05/28/03

SHEET 4 OF 9

THIS MAP WAS PREPARED FROM MARICOPA COUNTY DIGITAL TERRAIN MODELS (DTM) PREPARED FROM AERIAL PHOTOGRAPHS FLOWN IN DECEMBER 2000-MARCH 2001.

LANDATA AIRBORNE SYSTEMS

GROUND CONTROL SURVEY DATA PROVIDED BY RBF CONSULTING

RBF JN 45-100648

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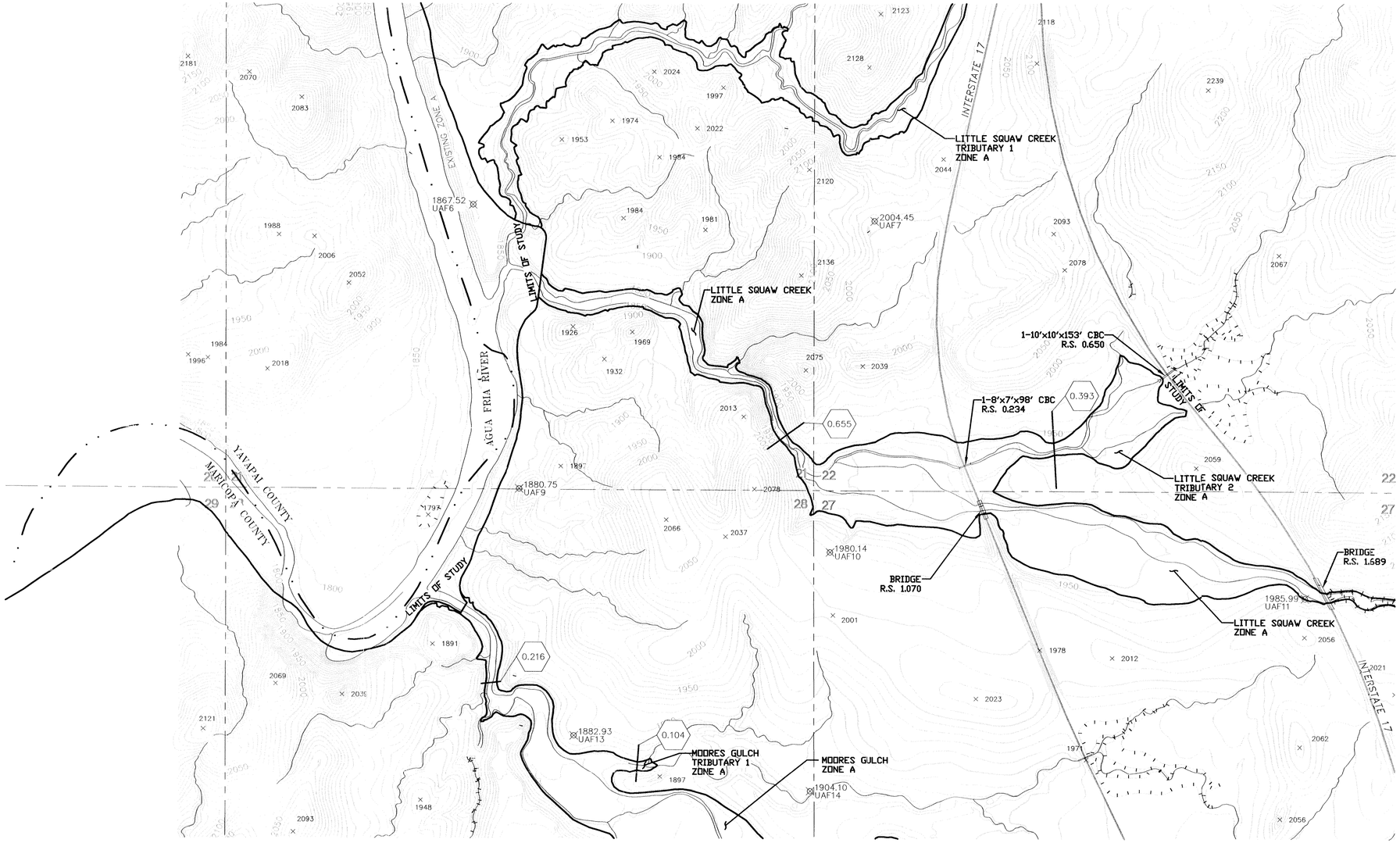


LEGEND

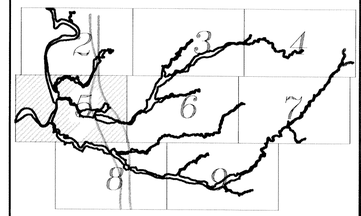
100-YR FLOODPLAIN BOUNDARY	
SECTION LINE	
CORPORATE LIMITS	Corporate Limits
COUNTY, PARISH, STATE OR INTERNATIONAL BOUNDARY	County Boundary
SECTION NUMBERS	32
ZONE DESIGNATIONS	ZONE A
ELEVATION REFERENCE MARK	1758.96 UAF 32
CROSS SECTION	0.1000 (CROSS SECTION INDEX AND DESIGNATION)
TOPOGRAPHICAL DEPRESSIONS	

ELEVATION REFERENCE MARKS

NOTE: ALL ELEVATIONS ARE BASED ON NORTH AMERICA VERTICAL DATUM OF 1988. TO CONVERT TO 1929 NGVD, SUBTRACT 2.27 FEET.

I.D. NUMBER	ELEVATION (FT)	DESCRIPTION/LOCATION
UAF 6	1867.52	SET FCDMC BRASS CAP AT LAT. N-34°01'23" LONG. W-112°09'44"
UAF 7	2004.45	SET FCDMC BRASS CAP AT LAT. N-34°01'22" LONG. W-112°09'01"
UAF 9	1880.75	SET FCDMC BRASS CAP AT LAT. N-34°00'58" LONG. W-112°09'39"
UAF 10	1980.14	SET FCDMC BRASS CAP AT LAT. N-34°00'53" LONG. W-112°09'06"
UAF 11	1985.99	SET FCDMC BRASS CAP AT LAT. N-34°00'49" LONG. W-112°08'15"
UAF 13	1882.93	SET FCDMC BRASS CAP AT LAT. N-34°00'36" LONG. W-112°09'33"
UAF 14	1904.10	SET FCDMC BRASS CAP AT LAT. N-34°00'32" LONG. W-112°09'08"

NOTES



NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

UPPER AGUA FRIA WATERSHED
SUB WATERSHEDS 3 & 4
ZONE A
FLOODPLAIN DELINEATION STUDY
F.C.D. CONTRACT NO. 2000C020

Registered Professional Engineer (Civil) CERTIFICATE NO. 38779 WILLIAM J. KING Date Signed 5-28-03 State of Arizona

RBF CONSULTING — PLANNING • DESIGN • CONSTRUCTION
7255 N. 16th St., Suite 100, Phoenix, AZ 85020
602.957.2291 • FAX 602.957.2277 • www.RBF.com

	BY	DATE
DESIGN	WJK	05/28/03
DESIGN CHK.	NEF	05/28/03
PLANS	FBW	05/28/03
PLANS CHK.	WJK	05/28/03

SHEET 5 OF 9

500' 0' 500' 1000'
SCALE: 1"= 500 FEET
FLIGHT DATES:
12/16/2000-03/15/2001

THIS MAP WAS PREPARED FROM MARICOPA COUNTY DIGITAL TERRAIN MODELS (DTM) PREPARED FROM AERIAL PHOTOGRAPHS FLOWN IN DECEMBER 2000-MARCH 2001.

LANDATA AIRBORNE SYSTEMS

GROUND CONTROL SURVEY DATA PROVIDED BY RBF CONSULTING

RBF JN 45-100648

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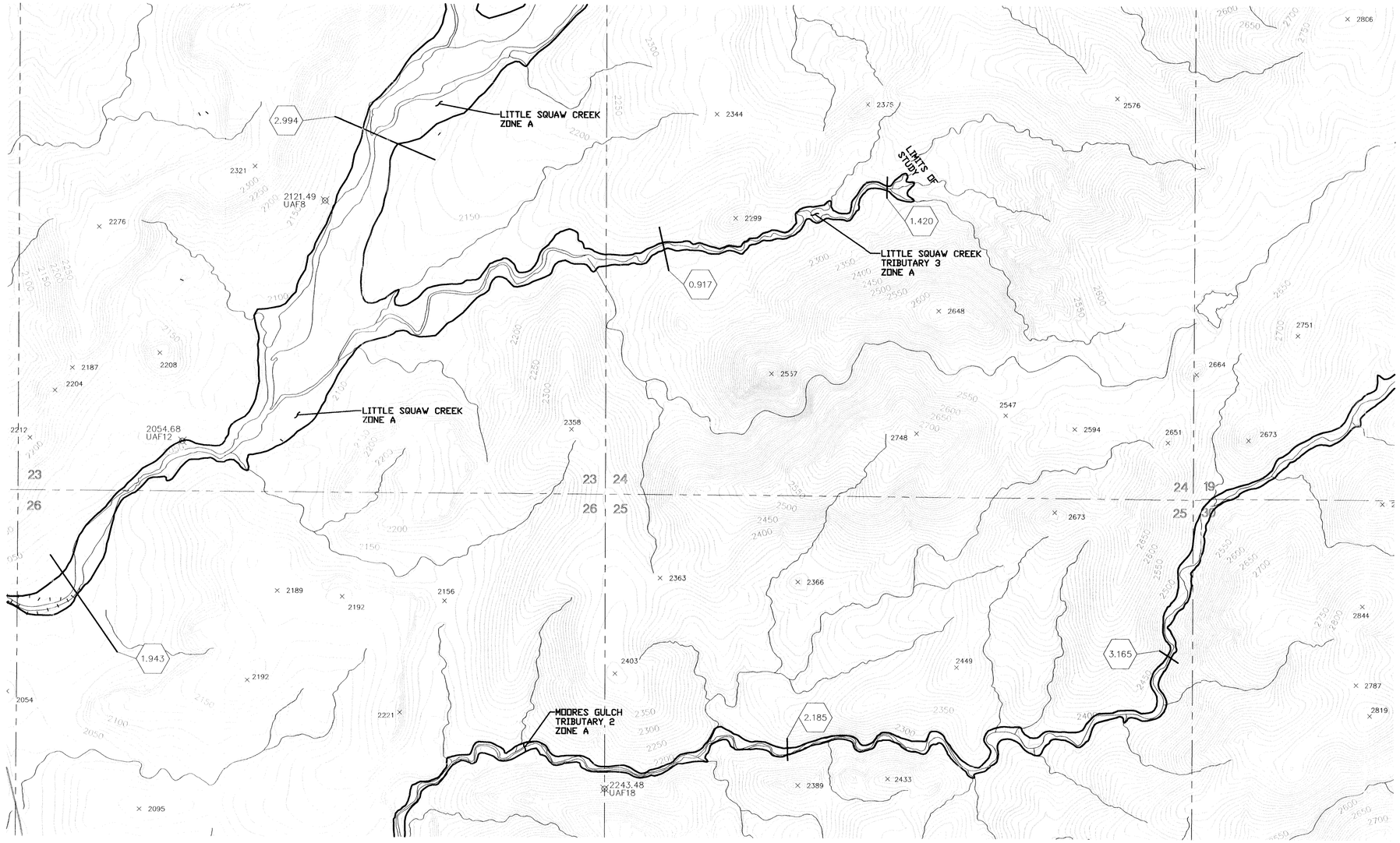


LEGEND

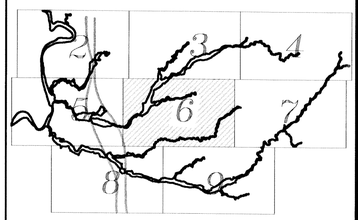
100-YR FLOODPLAIN BOUNDARY	
SECTION LINE	
CORPORATE LIMITS	Corporate Limits
COUNTY, PARISH, STATE OR INTERNATIONAL BOUNDARY	County Boundary
SECTION NUMBERS	32
ZONE DESIGNATIONS	ZONE A
ELEVATION REFERENCE MARK	1758.96 UAF 32
CROSS SECTION	0.100 (CROSS SECTION AND R.M.S. DESIGNATION)
TOPOGRAPHICAL DEPRESSIONS	

ELEVATION REFERENCE MARKS

NOTE: ALL ELEVATIONS ARE BASED ON NORTH AMERICA VERTICAL DATUM OF 1988. TO CONVERT TO 1929 NGVD, SUBTRACT 2.27 FEET.

I.D. NUMBER	ELEVATION (FT)	DESCRIPTION/LOCATION
UAF 8	2121.49	SET FCDMC BRASS CAP AT LAT. N-34°01'24" LONG. W-112°07'32"
UAF 12	2054.68	SET FCDMC BRASS CAP AT LAT. N-34°01'02" LONG. W-112°07'48"
UAF 18	2243.48	SET FCDMC BRASS CAP AT LAT. N-34°00'32" LONG. W-112°07'02"

NOTES



NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

UPPER AGUA FRIA WATERSHED
SUB WATERSHEDS 3 & 4
ZONE A
FLOODPLAIN DELINEATION STUDY
F.C.D. CONTRACT NO. 2000C020

Registered Professional Engineer (Civil) CERTIFICATE NO. 38779 WILLIAM J. KING

RBF CONSULTING — PLANNING ■ DESIGN ■ CONSTRUCTION
7600 NORTH 16th AVENUE, SUITE 102, PHOENIX, ARIZONA 85021-2951
602.957.2200 • FAX 602.957.2277 • www.RBF.com

	BY	DATE
DESIGN	WJK	05/28/03
DESIGN CHK.	NEF	05/28/03
PLANS	FBW	05/28/03
PLANS CHK.	WJK	05/28/03

SHEET 6 OF 9

500' 0' 500' 1000'
SCALE: 1"= 500 FEET
FLIGHT DATES:
12/16/2000-03/15/2001

THIS MAP WAS PREPARED FROM MARICOPA COUNTY DIGITAL TERRAIN MODELS (DTM) PREPARED FROM AERIAL PHOTOGRAPHS FLOWN IN DECEMBER 2000-MARCH 2001.

LANDATA AIRBORNE SYSTEMS

GROUND CONTROL SURVEY DATA PROVIDED BY RBF CONSULTING

RBF JN 45-100648

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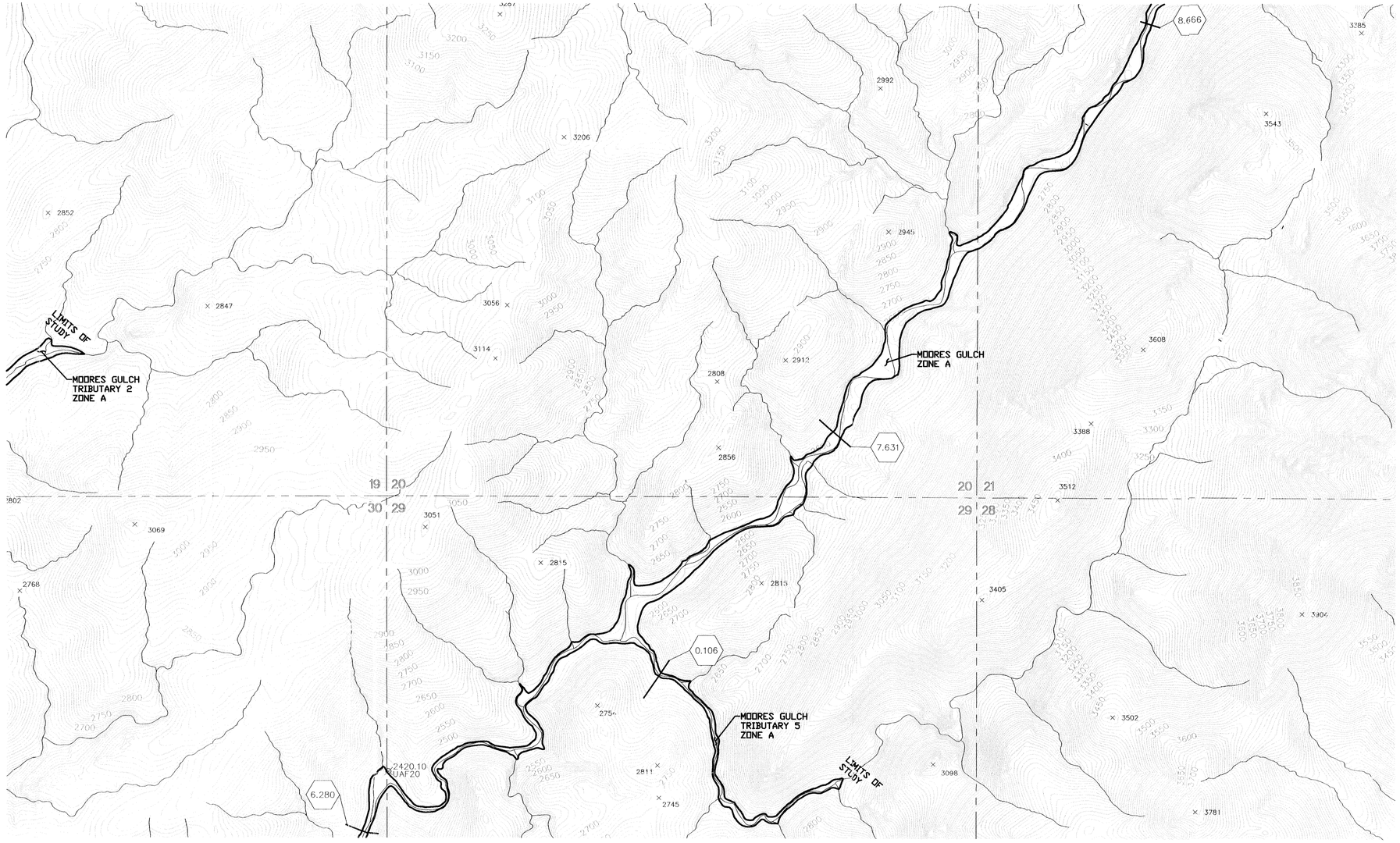


500' 0' 500' 1000'

SCALE: 1"= 500 FEET

FLIGHT DATES:
12/16/2000–03/15/2001

LEGEND

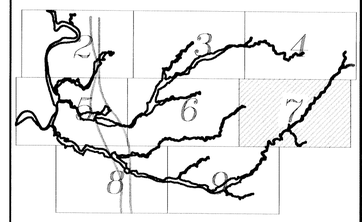
100-YR FLOODPLAIN BOUNDARY	
SECTION LINE	
CORPORATE LIMITS	Corporate Limits
COUNTY, PARISH, STATE OR INTERNATIONAL BOUNDARY	County Boundary
SECTION NUMBERS	32
ZONE DESIGNATIONS	ZONE A
ELEVATION REFERENCE MARK	⊠ 1758.96 UAF 32
CROSS SECTION	0.1000 (CROSS SECTION DESIGNATION / BASE FLOOD ELEVATION)
TOPOGRAPHICAL DEPRESSIONS	

ELEVATION REFERENCE MARKS

NOTE: ALL ELEVATIONS ARE BASED ON NORTH AMERICA VERTICAL DATUM OF 1988. TO CONVERT TO 1929 NGVD, SUBTRACT 2.27 FEET.

I.D. NUMBER	ELEVATION (FT)	DESCRIPTION/LOCATION
UAF 20	2420.10	SET FCDMC BRASS CAP AT LAT. N-34°00'24" LONG. W-112°04'58"

NOTES



NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

UPPER AGUA FRIA WATERSHED
SUB WATERSHEDS 3 & 4
ZONE A
FLOODPLAIN DELINEATION STUDY
F.C.D. CONTRACT NO. 2000C020

Registered Professional Engineer (Civil) CERTIFICATE NO. 38779 WILLIAM J. KING Date Signed 5-28-03

RBF CONSULTING — PLANNING ■ DESIGN ■ CONSTRUCTION
7600 NORTH 16th AVENUE, SUITE 150, PHOENIX, ARIZONA 85021-2916
602.457.2200 • FAX 602.457.2211 • www.RBF.com

	BY	DATE
DESIGN	WJK	05/28/03
DESIGN CHK.	NEF	05/28/03
PLANS	FBW	05/28/03
PLANS CHK.	WJK	05/28/03

SHEET 7 OF 9

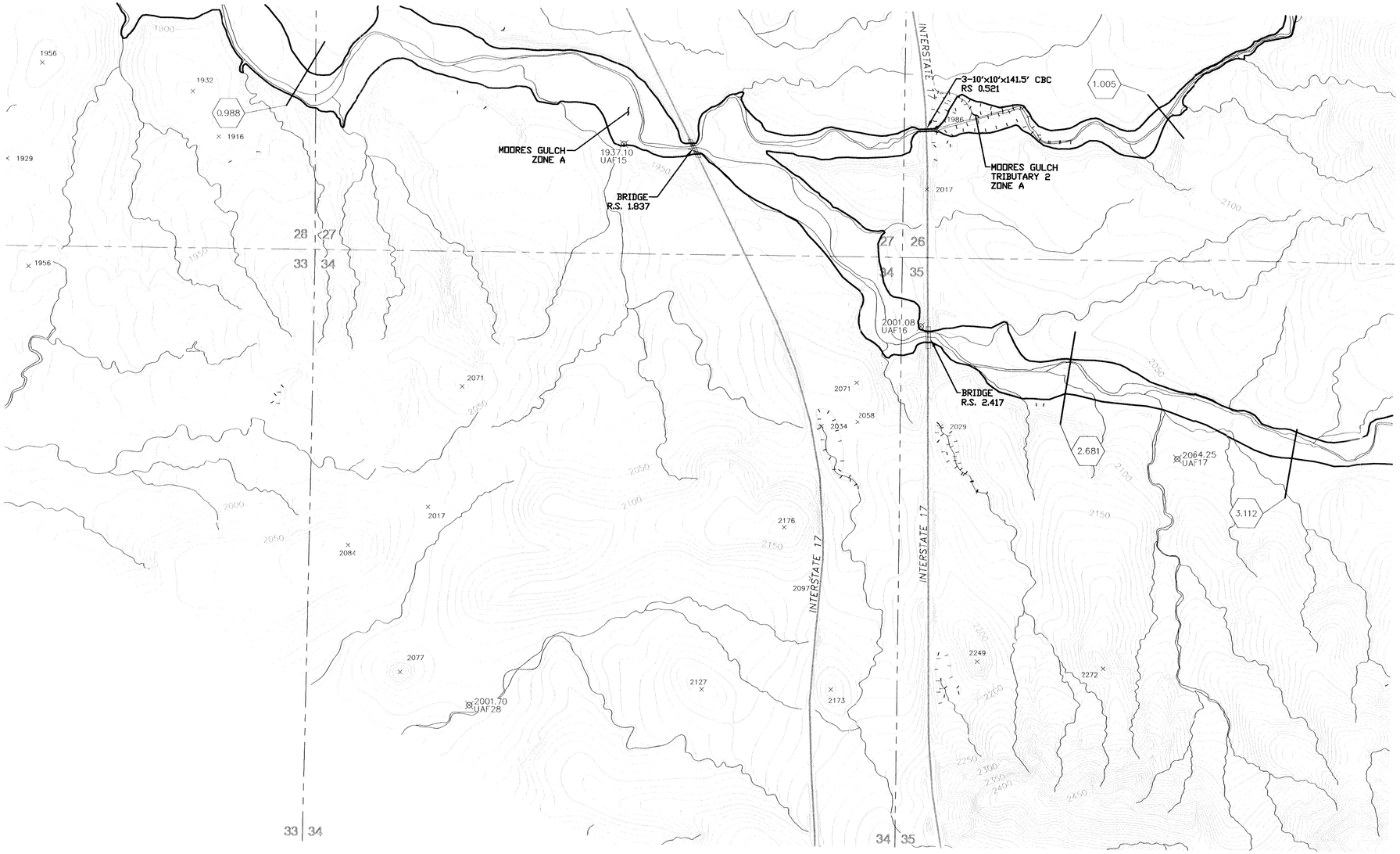
THIS MAP WAS PREPARED FROM MARICOPA COUNTY DIGITAL TERRAIN MODELS (DTM) PREPARED FROM AERIAL PHOTOGRAPHS FLOWN IN DECEMBER 2000–MARCH 2001.

LANDATA AIRBORNE SYSTEMS

GROUND CONTROL SURVEY DATA PROVIDED BY RBF CONSULTING

RBF JN 45-100648

H:\PDATA\45100648\DWG\WS3AND4\WORK STUDY MAPS\0648FPM07.DWG FWTTIE 5/28/03 3:08 pm



LEGEND

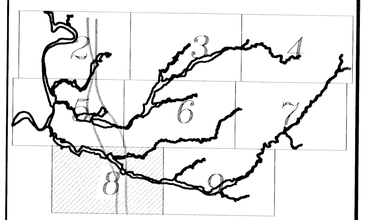
100-YR FLOODPLAIN BOUNDARY	
SECTION LINE	
CORPORATE LIMITS	Corporate Limits
COUNTY, PARISH, STATE OR INTERNATIONAL BOUNDARY	County Boundary
SECTION NUMBERS	32
ZONE DESIGNATIONS	ZONE A
ELEVATION REFERENCE MARK	⊠1758.96 UAF 32
CROSS SECTION	(0.1000) CROSS SECTION IDENTIFICATION AND DISCHARGE
TOPOGRAPHICAL DEPRESSIONS	

ELEVATION REFERENCE MARKS

NOTE: ALL ELEVATIONS ARE BASED ON NORTH AMERICA VERTICAL DATUM OF 1988. TO CONVERT TO 1929 NGVD, SUBTRACT 2.27 FEET.

I.D. NUMBER	ELEVATION (FT)	DESCRIPTION/LOCATION
UAF 28	2001.70	SET FCDMC BRASS CAP AT LAT. N-33°59'26" LONG. W-112°08'51"
UAF 15	1937.10	SET FCDMC BRASS CAP AT LAT. N-34°00'15" LONG. W-112°08'35"
UAF 16	2001.08	SET FCDMC BRASS CAP AT LAT. N-34°00'00" LONG. W-112°08'03"
UAF 17	2064.25	SET FCDMC BRASS CAP AT LAT. N-33°59'48" LONG. W-112°07'35"

NOTES



NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

UPPER AGUA FRIA WATERSHED
SUB WATERSHEDS 3 & 4
ZONE A
FLOODPLAIN DELINEATION STUDY
F.C.D. CONTRACT NO. 2000C020

Registered Professional Engineer Certificate No. 38779 WILLIAM J. KING Date Signed 5-28-03

RBF CONSULTING — PLANNING • DESIGN • CONSTRUCTION
7600 NORTH 16th AVENUE, SUITE 103
PHOENIX, ARIZONA 85021-1976
602.957.2200 • FAX 602.957.2220 • www.RBF.com

	BY	DATE
DESIGN	WJK	05/28/03
DESIGN CHK.	NEF	05/28/03
PLANS	FBW	05/28/03
PLANS CHK.	WJK	05/28/03

SHEET 8 OF 9

N

500' 0' 500' 1000'
SCALE: 1"= 500 FEET
FLIGHT DATES:
12/16/2000-03/15/2001

THIS MAP WAS PREPARED FROM MARICOPA COUNTY DIGITAL TERRAIN MODELS (DTM) PREPARED FROM AERIAL PHOTOGRAPHS FLOWN IN DECEMBER 2000-MARCH 2001.

LANDATA AIRBORNE SYSTEMS

GROUND CONTROL SURVEY DATA PROVIDED BY RBF CONSULTING

RBF JN 45-100648

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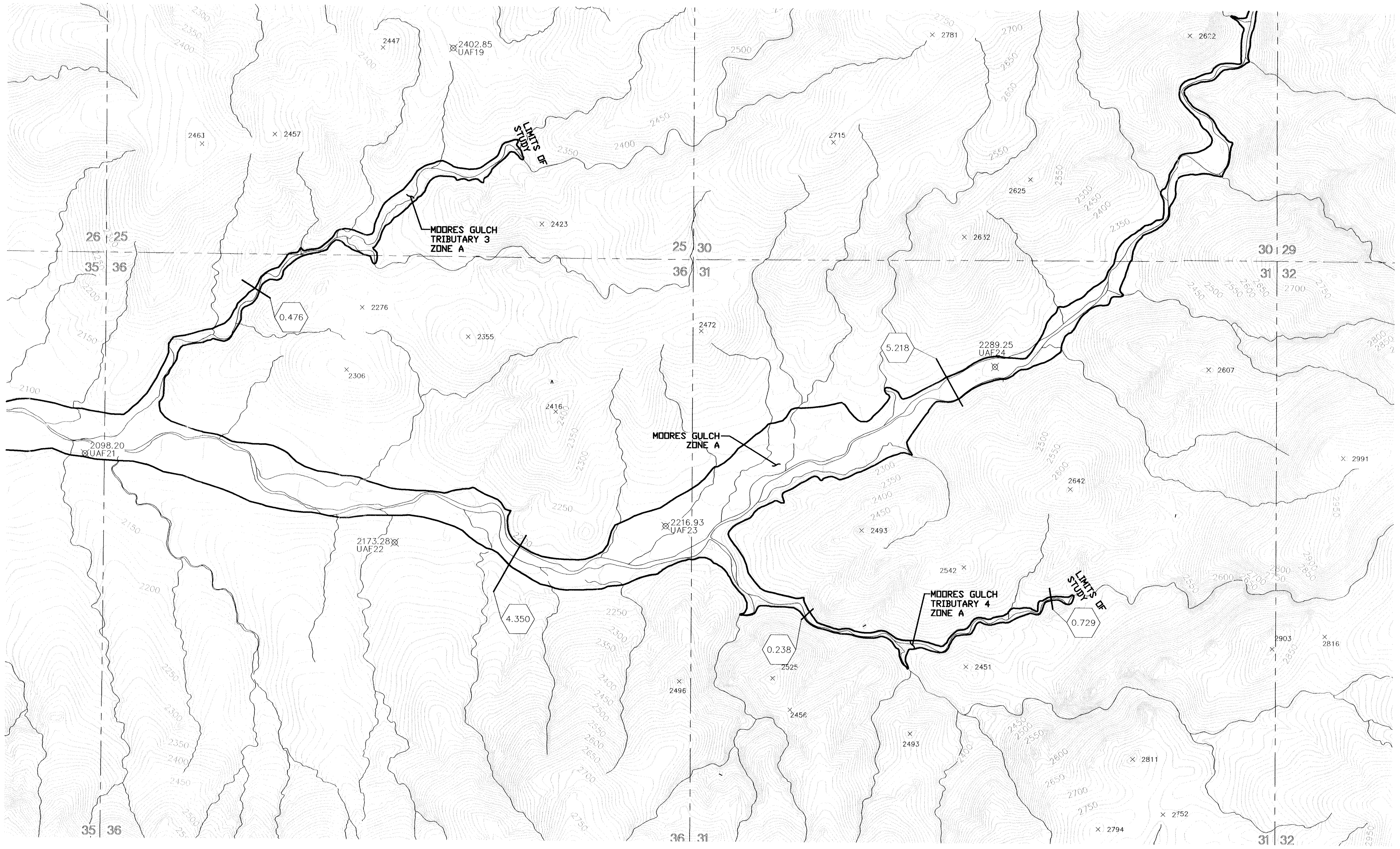


LEGEND

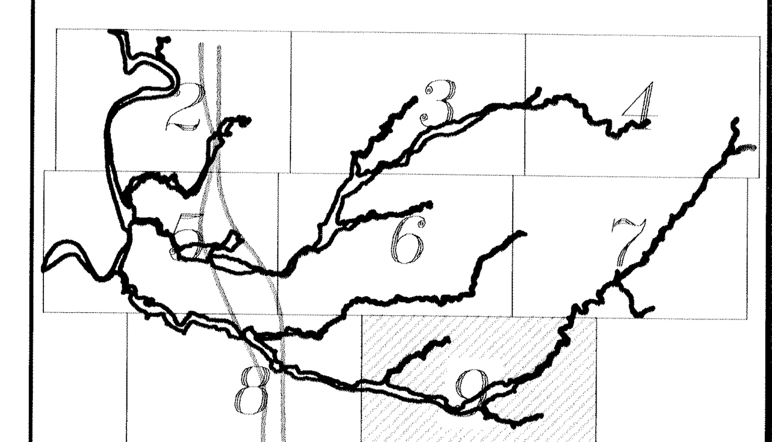
100-YR FLOODPLAIN BOUNDARY	
SECTION LINE	
CORPORATE LIMITS	Corporate Limits
COUNTY, PARISH, STATE OR INTERNATIONAL BOUNDARY	County Boundary
SECTION NUMBERS	32
ZONE DESIGNATIONS	ZONE A
ELEVATION REFERENCE MARK	1758.96 UAF32
CROSS SECTION	CROSS SECTION RIVER MILE DESIGNATION 0.1000
TOPOGRAPHICAL DEPRESSIONS	

ELEVATION REFERENCE MARKS

NOTE: ALL ELEVATIONS ARE BASED ON NORTH AMERICA VERTICAL DATUM OF 1988.
TO CONVERT TO 1929 NGVD, SUBTRACT 2.27 FEET.

I.D. NUMBER	ELEVATION (FT)	DESCRIPTION/LOCATION
UAF 19	2402.85	SET FCDMC BRASS CAP AT LAT. N-33°00'24" LONG. W-112°06'25"
UAF 21	2098.20	SET FCDMC BRASS CAP AT LAT. N-33°59'48" LONG. W-112°07'04"
UAF 22	2173.28	SET FCDMC BRASS CAP AT LAT. N-33°59'40" LONG. W-112°06'31"
UAF 23	2216.93	SET FCDMC BRASS CAP AT LAT. N-33°59'42" LONG. W-112°06'03"
UAF 24	2289.25	SET FCDMC BRASS CAP AT LAT. N-33°59'56" LONG. W-112°05'28"

NOTES



NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

UPPER AGUA FRIA WATERSHED
SUB WATERSHEDS 3 & 4
ZONE A
FLOODPLAIN DELINEATION STUDY
F.C.D. CONTRACT NO. 2000C020

Registered Professional Engineer (Civil) CERTIFICATE NO. 38779 WILLIAM J. KING Date Signed 5-28-03 ARIZONA, U.S.A.

RBF CONSULTING — PLANNING ■ DESIGN ■ CONSTRUCTION
16605 NORTH 28th AVENUE, SUITE 100
PHOENIX, ARIZONA 85032-2692
602.467.2200 • FAX 602.467.2201 • www.RBF.com

	BY	DATE
DESIGN	WJK	05/28/03
DESIGN CHK.	NEF	05/28/03
PLANS	FBW	05/28/03
PLANS CHK.	WJK	05/28/03

SHEET 9 OF 9

N
500' 0' 500' 1000'
SCALE: 1"= 500 FEET
FLIGHT DATES:
12/16/2000-03/15/2001

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THIS MAP WAS PREPARED FROM MARICOPA COUNTY DIGITAL TERRAIN MODELS (DTM) PREPARED FROM AERIAL PHOTOGRAPHS FLOWN IN DECEMBER 2000-MARCH 2001.

LANDATA AIRBORNE SYSTEMS

GROUND CONTROL SURVEY DATA PROVIDED BY RBF CONSULTING

RBF JN 45-100648

DIGITAL FILES FOR
UPPER AGUA FRIA WATERSHED (WATERSHED UU)
ZONE A FLOODPLAIN DELINEATION STUDY
WATERSHED NO. 3 & 4 (EAST LAKE PLEASANT)
CONTRACT FCD 2000CO20

Unincorporated Maricopa County, Arizona
June 06, 2003
RBF Consulting, JN 45-100648

A PROBLEM WAS ENCOUNTERED USING THE WATERSHED MODELING SYSTEM (WMS V6.1) TO RUN THE HEC-1 MODEL FOR MOORE'S GULCH. AFTER OPENING THE MOORES.WPR FILE (WMS PROJECT FILE) ONE OF THE UNIT HYDROGRAPH RECORDS WAS DUPLICATED THROUGHOUT THE HEC-1 INPUT FILE. IN ORDER TO REMEDY THIS PROBLEM THE MOORES.HC1 FILE WAS READ IN SEPARATELY, WHICH PROPERLY ASSIGNED THE APPROPRIATE UNIT HYDROGRAPHS TO THEIR RESPECTIVE BASINS.

NOTE: AFTER READING IN THE *.HC1 FILE THE USER MUST VERIFY THAT THE JD CARDS HAVE NOT BEEN DUPLICATED AND THAT THEIR RAINFALL PATTERNS ARE PROPERLY ASSIGNED. STORMS 1 AND 2 SHOULD USE RAINFALL PATTERN 1 WHILE STORMS 3,4, AND 5 SHOULD USE PATTERNS 2, 3, AND 4, RESPECTIVELY.

THIS PROBLEM IS CURRENTLY BEING INVESTIGATED BY EMS-I AND EMRL, THE DISTRIBUTORS AND DEVELOPERS OF WMS.

MOORES GULCH, MOORES GULCH TRIBUTARY 1, MOORES GULCH TRIBUTARY 2, MOORES GULCH TRIBUTARY 3, MOORES GULCH TRIBUTARY 4, MOORES GULCH TRIBUTARY 5, MOORES GULCH TRIBUTARY 6, LITTLE SQUAW CREEK, LITTLE SQUAW CREEK TRIBUTARY 1, LITTLE SQUAW CREEK TRIBUTARY 2, LITTLE SQUAW CREEK TRIBUTARY 3, LITTLE SQUAW CREEK TRIBUTARY 4, LITTLE SQUAW CREEK TRIBUTARY 5, AND 8N2ES16, WHICH ARE TRIBUTARIES TO THE AGUA FRIA RIVER.

THIS CD CONTAINS THE DIGITAL FILES USED IN THE FLOODPLAIN DELINEATION STUDY IDENTIFIED ABOVE. BOTH THE HYDROLOGIC AND HYDRAULIC CALCULATIONS ARE PROVIDED ON THIS CD. THE HYDROLOGY WAS PERFORMED USING ArcView 3.2a, WMS 6.1, HEC-1, AND THE NFF EQUATIONS, AS OUTLINED IN THE TECHNICAL DATA NOTEBOOK (TDN). HYDRAULIC CALCULATIONS AND FLOODPLAIN DELINEATION WERE PERFORMED USING WMS 6.1 AND FLOWMASTER, AS OUTLINED IN THE TDN.

THE FILES ON THIS CD MATCHED THE INFORMATION IN THE TECHNICAL DATA NOTEBOOK AT THE TIME OF THE CD'S CREATION PRIOR TO SUBMISSION TO FEMA. ANY PERSON USING THESE FILES NEEDS TO VERIFY THAT THEY MATCH THE FEMA APPROVED FLOODPLAIN DELINEATION. RBF CONSULTING DOES NOT ACCEPT ANY RESPONSIBILITY FOR THE USE OF THESE FILES IF THE DELINEATION CHANGES AS A RESULT OF FEMA REVIEW.

8N2ES16

- 8N2ES16.wpr — WMS project file
- 8N2ES16.ini — WMS project settings and initialization file
- 8N2ES16.tre — WMS tree file, which stores sub-basin parameters (can be loaded independent from other files)
- 8N2ES16.map — WMS map file, which contains feature points, arcs, and polygons (can be loaded independent from other files)

- 8N2ES16.lsf — WMS land use and soil type specification file. Stores rainfall loss parameters.
- 8N2ES16.fac — WMS flow accumulation file
- 8N2ES16.fdr — WMS flow direction file
- 8N2ES16.gdm — WMS DEM file
- 8N2ES16.basin — WMS Basin IDs file
- Summary of Soils.txt — Text file which contains soil type and XKSAT information. Imported into WMS.
- Summary of Land Use.txt — Text file which contains land use information. Imported into WMS

- 8N2ES16.hc1 — HEC-1 input file.
- 8N2ES16.out — HEC-1 output file.

Floodplain

- 8N2ES16FP.wpr — WMS project file
- 8N2ES16FP.ini — WMS project settings and initialization file
- 8N2ES16FP.tre — WMS tree file, which stores sub-basin parameters (can be loaded independent from other files)
- 8N2ES16FP.map — WMS map file, which contains feature points, arcs, and polygons (can be loaded independent from other files)
- 8N2ES16FP.lsf — WMS land use and soil type specification file. Stores rainfall loss parameters.
- 8N2ES16FP.sdat — WMS ASCII dataset file that contains watersurface elevation data. Used with *.xy files (2D Scatter Data).
- 8N2ES16FP.tin — WMS TIN file
- 8N2ES16FP.tdat — WMS ASCII dataset file that contains flood depth information. Used with *.tin files (WMS TIN files).
- 8N2ES16FP.xy — WMS 2D scatter data that contains the floodplain stage along the washes being delineated.
- 8N2ES16.stg — WMS stage file
- 8N2ES16.shp — Shape file of Floodplain
- 8N2ES16.shx — Shape file of Floodplain
- 8N2ES16.dbf — Shape file database file
- 8N2ES16.doc — Word Document showing floodplain calculations

Routing

- 8N2ES16route.xls — Excel file containing routing reach data
- RBC2.ser — Routing Reach data in WMS
- RBC3.ser — Routing Reach data in WMS

UnitHydrographs

- BC1.ser — Basin BC1 unit hydrograph time series
- BC2.ser — Basin BC2 unit hydrograph time series
- BC3.ser — Basin BC3 unit hydrograph time series
- bcclagtim.xls — Excel file containing lag time information

LSC

- lsc.wpr — WMS project file
- lsc.ini — WMS project settings and initialization file

- lsc.tre — WMS tree file, which stores sub-basin parameters (can be loaded independent from other files)
- lsc.map — WMS map file, which contains feature points, arcs, and polygons (can be loaded independent from other files)
- lsc.lsf — WMS land use and soil type specification file. Stores rainfall loss parameters.
- lsc.fac — WMS flow accumulation file
- lsc.fdr — WMS flow direction file
- lsc.gdm — WMS DEM file
- lsc.basin — WMS Basin IDs file
- Summary of Soils.txt — Text file which contains soil type and XKSAT information. Imported into WMS.
- Summary of Land Use.txt — Text file which contains land use information. Imported into WMS
- lsc.hc1 — HEC-1 input file.
- lsc.out — HEC-1 output file.
- lsc.sol — WMS hydrograph file

Floodplain

- LSCFP.wpr — WMS project file
- LSCFP.ini — WMS project settings and initialization file
- LSCFP.tre — WMS tree file, which stores sub-basin parameters (can be loaded independent from other files)
- LSCFP.map — WMS map file, which contains feature points, arcs, and polygons (can be loaded independent from other files)
- LSCFP.lsf — WMS land use and soil type specification file. Stores rainfall loss parameters.
- LSCFP.sdat — WMS ASCII dataset file that contains watersurface elevation data. Used with *.xy files (2D Scatter Data).
- LSCFP.tin — WMS TIN file
- LSCFP.tdat — WMS ASCII dataset file that contains flood depth information. Used with *.tin files (WMS TIN files).
- LSCFP.xy — WMS 2D scatter data that contains the floodplain stage along the washes being delineated.
- LSCSTAGE.stg — WMS stage file
- Bridges.FM2 — Flowmaster file of bridge analysis
- Calculated Values.doc — Word document with floodplain cross sections and values

Routing

- lscroute.xls — Excel file containing routing reach data
- Normal Depth Routing.Doc — Word document with routing reaches and calculations
- RL10.ser — Routing Reach data in WMS
- RL12.ser — Routing Reach data in WMS
- RL13.ser — Routing Reach data in WMS
- RL14.ser — Routing Reach data in WMS
- RL15.ser — Routing Reach data in WMS
- RL16.ser — Routing Reach data in WMS
- RL17.ser — Routing Reach data in WMS
- RL2.ser — Routing Reach data in WMS
- RL4.ser — Routing Reach data in WMS
- RL6.ser — Routing Reach data in WMS
- RL8.ser — Routing Reach data in WMS

- RL9.ser — Routing Reach data in WMS
- RLT1B.ser — Routing Reach data in WMS
- RLT1C.ser — Routing Reach data in WMS
- RLT1B.ser — Routing Reach data in WMS
- RLT3B.ser — Routing Reach data in WMS
- RLT4B.ser — Routing Reach data in WMS
- RLT5B.ser — Routing Reach data in WMS
- RLT7B.ser — Routing Reach data in WMS
- RLT7C.ser — Routing Reach data in WMS
- RLT7D.ser — Routing Reach data in WMS

UnitHydrographs

- Basin Lag time Calculations.doc — Word document with lag time calculations
- Basintc.txt — Text file of time of concentrations
- L1.ser — Basin L1 unit hydrograph time series
- L10.ser — Basin L10 unit hydrograph time series
- L11.ser — Basin L11 unit hydrograph time series
- L12.ser — Basin L12 unit hydrograph time series
- L13.ser — Basin L13 unit hydrograph time series
- L14.ser — Basin L14 unit hydrograph time series
- L15.ser — Basin L15 unit hydrograph time series
- L16.ser — Basin L16 unit hydrograph time series
- L17.ser — Basin L17 unit hydrograph time series
- L3.ser — Basin L3 unit hydrograph time series
- L5.ser — Basin L5 unit hydrograph time series
- L7.ser — Basin L7 unit hydrograph time series
- L8.ser — Basin L8 unit hydrograph time series
- L9.ser — Basin L9 unit hydrograph time series
- LT1A.ser — Basin LT1A unit hydrograph time series
- LT1B.ser — Basin LT1B unit hydrograph time series
- LT1C.ser — Basin LT1C unit hydrograph time series
- LT2.ser — Basin LT2 unit hydrograph time series
- LT2A.ser — Basin LT2A unit hydrograph time series
- LT2B.ser — Basin LT2B unit hydrograph time series
- LT3A.ser — Basin LT3A unit hydrograph time series
- LT3B.ser — Basin LT3B unit hydrograph time series
- LT4A.ser — Basin LT4A unit hydrograph time series
- LT4B.ser — Basin LT4B unit hydrograph time series
- LT5A.ser — Basin LT5A unit hydrograph time series
- LT5B.ser — Basin LT5B unit hydrograph time series
- LT6.ser — Basin LT6 unit hydrograph time series
- LT7A.ser — Basin LT7A unit hydrograph time series
- LT7B1.ser — Basin LT7B1 unit hydrograph time series
- LT7B2.ser — Basin LT7B2 unit hydrograph time series
- LT7C.ser — Basin LT7C unit hydrograph time series
- LT7D.ser — Basin LT7D unit hydrograph time series

MOORES

- moores.wpr — WMS project file
- moores.ini — WMS project settings and initialization file

- moores.tre — WMS tree file, which stores sub-basin parameters (can be loaded independent from other files)
- moores.map — WMS map file, which contains feature points, arcs, and polygons (can be loaded independent from other files)
- moores.lsf — WMS land use and soil type specification file. Stores rainfall loss parameters.
- moores.fac — WMS flow accumulation file
- moores.fdr — WMS flow direction file
- moores.gdm — WMS DEM file
- moores.basin — WMS Basin IDs file
- Summary of Soils.txt — Text file which contains soil type and XKSAT information. Imported into WMS.
- Summary of Land Use.txt — Text file which contains land use information. Imported into WMS
- moores.hc1 — HEC-1 input file.
- moores.out — HEC-1 output file.
- Moores.sol — WMS hydrograph file

Floodplain

- mgfp3.wpr — WMS project file
- mgfp3.ini — WMS project settings and initialization file
- mgfp3.tre — WMS tree file, which stores sub-basin parameters (can be loaded independent from other files)
- mgfp3.map — WMS map file, which contains feature points, arcs, and polygons (can be loaded independent from other files)
- mgfp3.lsf — WMS land use and soil type specification file. Stores rainfall loss parameters.
- mgfp3.sdat — WMS ASCII dataset file that contains watersurface elevation data. Used with *.xy files (2D Scatter Data).
- mgfp3.tin — WMS TIN file
- mgfp3.tdat — WMS ASCII dataset file that contains flood depth information. Used with *.tin files (WMS TIN files).
- mgfp3.xy — WMS 2D scatter data that contains the floodplain stage along the washes being delineated.
- mgstage.stg — WMS stage file
- county.shp — County boundary shape file
- floodplain.shp — Floodplain shape file
- mgcrossection.shp — Moores Gulch cross sections
- mooresbasin.shp — Moores Gulch basin shape file

Routing

- rm11.ser — Routing Reach data in WMS
- rm12.ser — Routing Reach data in WMS
- rm14.ser — Routing Reach data in WMS
- rm15.ser — Routing Reach data in WMS
- rm17.ser — Routing Reach data in WMS
- rm18.ser — Routing Reach data in WMS
- rm2.ser — Routing Reach data in WMS
- rm4.ser — Routing Reach data in WMS
- rm6.ser — Routing Reach data in WMS
- rm7.ser — Routing Reach data in WMS
- rm9.ser — Routing Reach data in WMS
- RMT2B.ser — Routing Reach data in WMS

- RMT2C.ser — Routing Reach data in WMS
- RMT4B.ser — Routing Reach data in WMS

UnitHydrographs

- M1.ser — Basin M1 unit hydrograph time series
- M10.ser — Basin M10 unit hydrograph time series
- M11.ser — Basin M11 unit hydrograph time series
- M13.ser — Basin M13 unit hydrograph time series
- M14.ser — Basin M14 unit hydrograph time series
- M16.ser — Basin M16 unit hydrograph time series
- M17.ser — Basin M17 unit hydrograph time series
- M18.ser — Basin M18 unit hydrograph time series
- M3.ser — Basin M3 unit hydrograph time series
- M5.ser — Basin M5 unit hydrograph time series
- M6.ser — Basin M6 unit hydrograph time series
- M8.ser — Basin M8 unit hydrograph time series
- MT1.ser — Basin MT1 unit hydrograph time series
- MT2A.ser — Basin MT2A unit hydrograph time series
- MT2B.ser — Basin MT2B unit hydrograph time series
- MT3.ser — Basin MT3 unit hydrograph time series
- MT4A.ser — Basin MT4A unit hydrograph time series
- MT4B.ser — Basin MT4B unit hydrograph time series
- MT5.ser — Basin MT5 unit hydrograph time series
- MT6.ser — Basin MT6 unit hydrograph time series
- lagtime.xls — Excel file containing lag time information
- lag time calculations.doc — Word document with lag time calculations