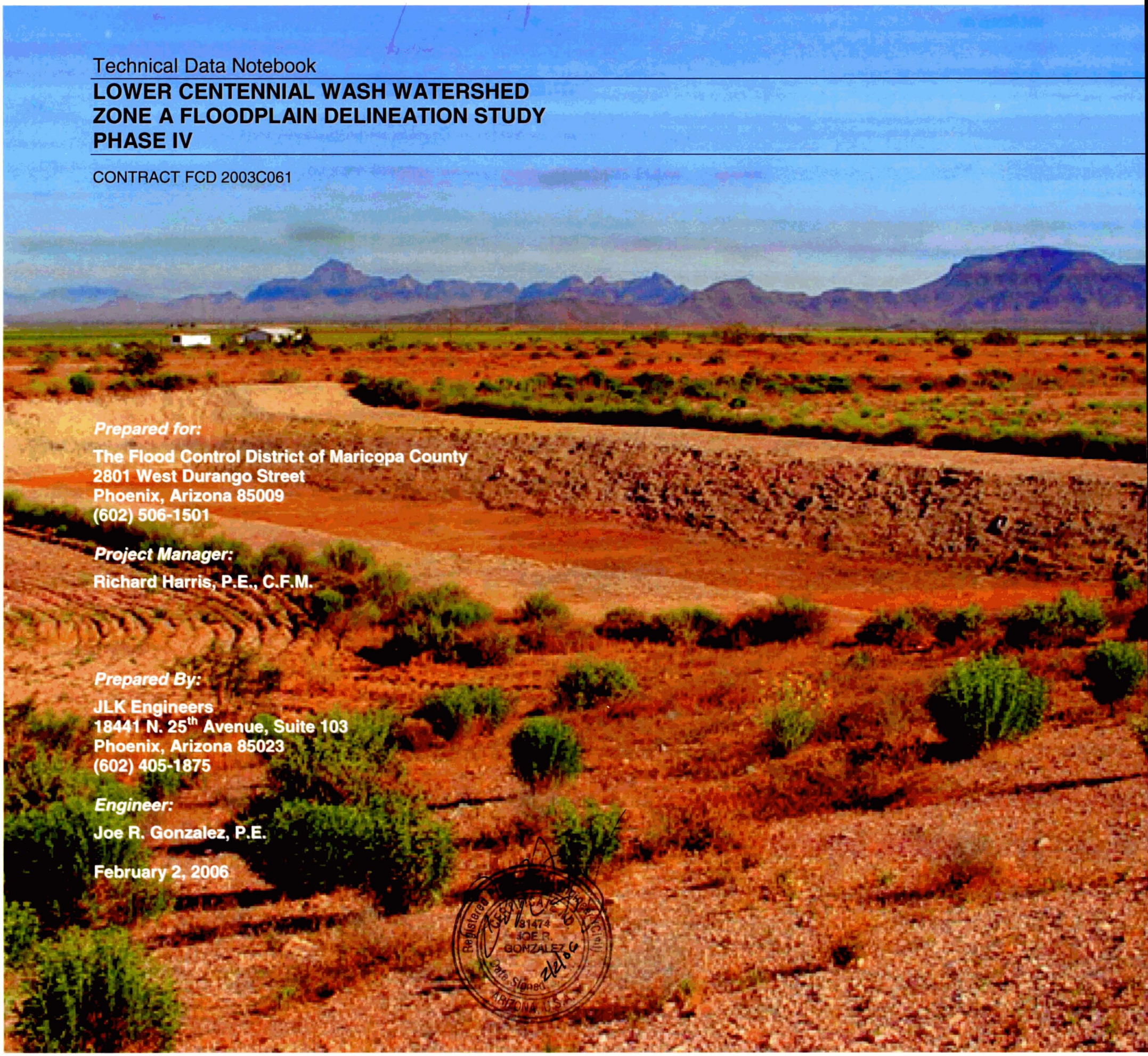
Technical Data Notebook

LOWER CENTENNIAL WASH WATERSHED ZONE A FLOODPLAIN DELINEATION STUDY PHASE IV

CONTRACT FCD 2003C061



Prepared for:

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

Project Manager:

Richard Harris, P.E., C.F.M.

Prepared By:

JLK Engineers
18441 N. 25th Avenue, Suite 103
Phoenix, Arizona 85023
(602) 405-1875

Engineer:

Joe R. Gonzalez, P.E.

February 2, 2006

Registered Professional Engineer (Civil) 31474 JOE R. GONZALEZ Date Signed 2/2/06 ARIZONA U.S.A.

Federal Emergency Management Agency

Washington, D.C. 20472

JUL 2 8 2006

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

IN REPLY REFER TO:
Case No.: 06-09-B579P
Community Name: Maricopa County, AZ
Community No.: 040037
Effective Date of This Revision: AUG 2 8 2006

The Honorable Mary Rose Wilcox
Chairman, Maricopa County
Board of Supervisors
County Administration Building
301 West Jefferson, 10th Floor
Phoenix, AZ 85003

Dear Ms. Wilcox:

The Flood Insurance Study report and Flood Insurance Rate Map for your community have been revised by this Letter of Map Revision (LOMR). Please use the enclosed annotated map panel(s) revised by this LOMR for floodplain management purposes and for all flood insurance policies and renewals issued in your community.

Additional documents are enclosed which provide information regarding this LOMR. Please see the List of Enclosures below to determine which documents are included. Other attachments specific to this request may be included as referenced in the Determination Document. If you have any questions regarding floodplain management regulations for your community or the National Flood Insurance Program (NFIP) in general, please contact the Consultation Coordination Officer for your community. If you have any technical questions regarding this LOMR, please contact the Director, Federal Insurance and Mitigation Division of the Department of Homeland Security's Federal Emergency Management Agency (FEMA) in Oakland, California, at (510) 627-7175, or the FEMA Map Assistance Center toll free at 1-877-336-2627 (1-877-FEMA MAP). Additional information about the NFIP is available on our website at http://www.fema.gov/nfip.

Sincerely,

Michael B. Godesky, Project Engineer
Engineering Management Section
Mitigation Division

For: Doug Bellomo, P.E., Acting Chief
Engineering Management Section
Mitigation Division

List of Enclosures:

Letter of Map Revision Determination Document
Annotated Flood Insurance Rate Map
Annotated Flood Insurance Study Report

cc: Mr. Richard P. Harris, P.E., CFM
Project Manager
Planning and Project Management Division
Flood Control District of Maricopa County

Ms. Lynn M. Thomas, P.E., CFM
Technical Supervisor
Flood Control District of Maricopa County

Mr. Timothy S. Phillips, P.E.
Chief Engineer and General Manager
Flood Control District of Maricopa County

Mr. Joe Gonzalez, P.E.
JLK Engineers

Mr. Ted Collins, CFM
Principal Floodplain Coordinator
Flood Control District of Maricopa County

Mr. Brian Cosson, CFM
NFIP Coordinator
Office of Dam Safety and Flood Mitigation
Arizona Department of Water Resources

 | Issue Date: JUL 28 2006 | Effective Date: AUG 28 2006 | Case No.: 06-09-B579P | LOMR-APP

Federal Emergency Management Agency

Washington, D.C. 20472

LETTER OF MAP REVISION DETERMINATION DOCUMENT

COMMUNITY AND REVISION INFORMATION		PROJECT DESCRIPTION	BASIS OF REQUEST
COMMUNITY	Maricopa County Arizona (Unincorporated Areas)	NO PROJECT	HYDRAULIC ANALYSIS HYDROLOGIC ANALYSIS NEW TOPOGRAPHIC DATA
	COMMUNITY NO.: 040037		
IDENTIFIER	Lower Centennial Wash Watershed Zone A Floodplain Delineation Study, Phase IV	APPROXIMATE LATITUDE & LONGITUDE: 33.625, -113.125 SOURCE: FIRM Panel DATUM: NAD 83	

ANNOTATED MAPPING ENCLOSURES			ANNOTATED STUDY ENCLOSURES
TYPE: FIRM*	NO.: 04013C1450 G	DATE: September 30, 2005	DATE OF EFFECTIVE FLOOD INSURANCE STUDY: September 30, 2005 SUMMARY OF DISCHARGES TABLE: 3
TYPE: FIRM	NO.: 04013C1475 G	DATE: September 30, 2005	
TYPE: FIRM	NO.: 04013C1950 G	DATE: September 30, 2005	

Enclosures reflect changes to flooding sources affected by this revision.
* FIRM - Flood Insurance Rate Map; ** FBFM - Flood Boundary and Floodway Map; *** FHBM - Flood Hazard Boundary Map

FLOODING SOURCE(S) & REVISED REACH(ES)

Multiple Tributaries of Centennial Wash -- Lower Centennial Wash Watershed Zone A

SUMMARY OF REVISIONS

Flooding Source	Effective Flooding	Revised Flooding	Increases	Decreases
Multiple Tributaries of Centennial Wash	Zone X (unshaded)	Zone A	YES	NONE

* BFEs - Base Flood Elevations

DETERMINATION

This document provides the determination from the Department of Homeland Security's Federal Emergency Management Agency (FEMA) regarding a request for a Letter of Map Revision (LOMR) for the area described above. Using the information submitted, we have determined that a revision to the flood hazards depicted in the Flood Insurance Study (FIS) report and/or National Flood Insurance Program (NFIP) map is warranted. This document revises the effective NFIP map, as indicated in the attached documentation. Please use the enclosed annotated map panels revised by this LOMR for floodplain management purposes and for all flood insurance policies and renewals in your community.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Assistance Center toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMR Depot, 3601 Eisenhower Avenue, Alexandria, VA 22304. Additional Information about the NFIP is available on our website at http://www.fema.gov/nfip.

Michael B. Godesky, Project Engineer
Engineering Management Section
Mitigation Division

Federal Emergency Management Agency

Washington, D.C. 20472

LETTER OF MAP REVISION DETERMINATION DOCUMENT (CONTINUED)

COMMUNITY INFORMATION

APPLICABLE NFIP REGULATIONS/COMMUNITY OBLIGATION

We have made this determination pursuant to Section 206 of the Flood Disaster Protection Act of 1973 (P.L. 93-234) and in accordance with the National Flood Insurance Act of 1968, as amended (Title XIII of the Housing and Urban Development Act of 1968, P.L. 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 NFIP criteria. These criteria, including adoption of the FIS report and FIRM, and the modifications made by this LOMR, are the minimum requirements for continued NFIP participation and do not supersede more stringent State/Commonwealth or local requirements to which the regulations apply.

COMMUNITY REMINDERS

We based this determination on the 1-percent-annual-chance flood discharges computed in the submitted hydrologic model. Future development of projects upstream could cause increased flood discharges, which could cause increased flood hazards. A comprehensive restudy of your community's flood hazards would consider the cumulative effects of development on flood discharges subsequent to the publication of the FIS report for your community and could, therefore, establish greater flood hazards in this area.

Your community must regulate all proposed floodplain development and ensure that permits required by Federal and/or State/Commonwealth law have been obtained. State/Commonwealth or community officials, based on knowledge of local conditions and in the interest of safety, may set higher standards for construction or may limit development in floodplain areas. If your State/Commonwealth or community has adopted more restrictive or comprehensive floodplain management criteria, those criteria take precedence over the minimum NFIP requirements.

We will not print and distribute this LOMR to primary users, such as local insurance agents or mortgage lenders; instead, the community will serve as a repository for the new data. We encourage you to disseminate the information in this LOMR by preparing a news release for publication in your community's newspaper that describes the revision and explains how your community will provide the data and help interpret the NFIP maps. In that way, interested persons, such as property owners, insurance agents, and mortgage lenders, can benefit from the information.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Assistance Center toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMR Depot, 3601 Eisenhower Avenue, Alexandria, VA 22304. Additional Information about the NFIP is available on our website at http://www.fema.gov/nfip.

Michael B. Godesky, Project Engineer
Engineering Management Section
Mitigation Division

Federal Emergency Management Agency

Washington, D.C. 20472

LETTER OF MAP REVISION
DETERMINATION DOCUMENT (CONTINUED)

We have designated a Consultation Coordination Officer (CCO) to assist your community. The CCO will be the primary liaison between your community and FEMA. For information regarding your CCO, please contact:

Ms. Sally M. Ziolkowski
Director, Federal Insurance and Mitigation Division
Federal Emergency Management Agency, Region IX
1111 Broadway Street, Suite 1200
Oakland, CA 94607-4052
(510) 627-7175

STATUS OF THE COMMUNITY NFIP MAPS

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 panel(s) and FIS report warrant physical revision and republication in the future, we will incorporate the modifications made by this LOMR at that time.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Assistance Center toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMR Depot, 3601 Eisenhower Avenue, Alexandria, VA 22304. Additional Information about the NFIP is available on our website at http://www.fema.gov/nfip.

Michael B. Godesky, Project Engineer
Engineering Management Section
Mitigation Division

Federal Emergency Management Agency

Washington, D.C. 20472

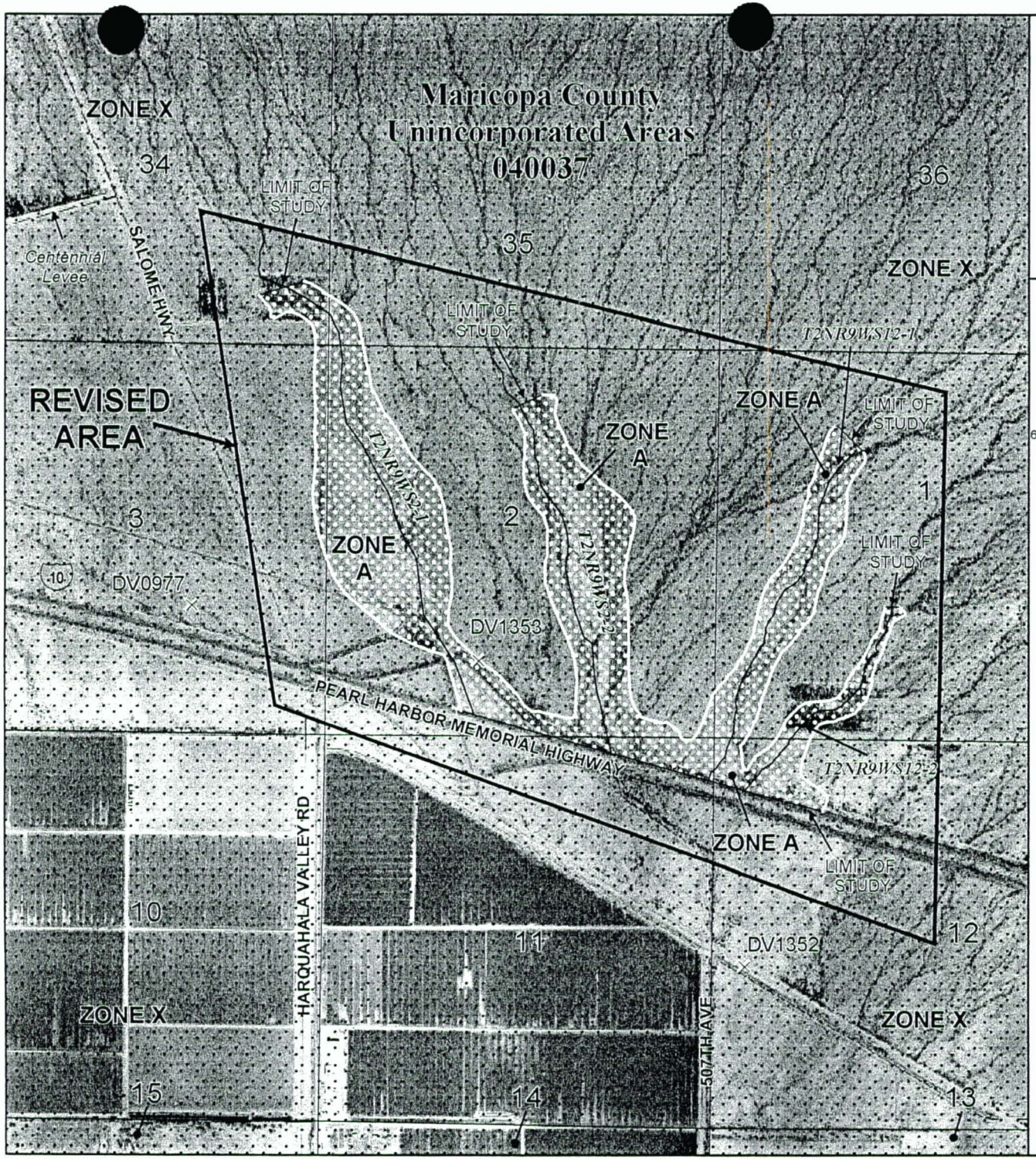
LETTER OF MAP REVISION DETERMINATION DOCUMENT (CONTINUED)

PUBLIC NOTIFICATION OF REVISION

This revision will become effective 30 days from the date of this letter. Any requests to review or alter this determination should be made within 30 days and must be based on scientific or technical data.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Assistance Center toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMR Depot, 3601 Eisenhower Avenue, Alexandria, VA 22304. Additional information about the NFIP is available on our website at http://www.fema.gov/nfip.

Michael B. Godesky, Project Engineer
Engineering Management Section
Mitigation Division



Legend

- 1% annual chance (100-Year) Floodplain
- 1% annual chance (100-Year) Floodway
- 0.2% annual chance (500-Year) Floodplain

MAP SCALE 1" = 2000'

1,000 500 0 1,000 2,000 3,000 4,000 Feet

600 300 0 600 1,200 Meters

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1450G

FIRM

FLOOD INSURANCE RATE MAP

MARICOPA COUNTY, ARIZONA

AND INCORPORATED AREAS

PANEL 1450 OF 4350

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
MARICOPA COUNTY	040037	1450	G

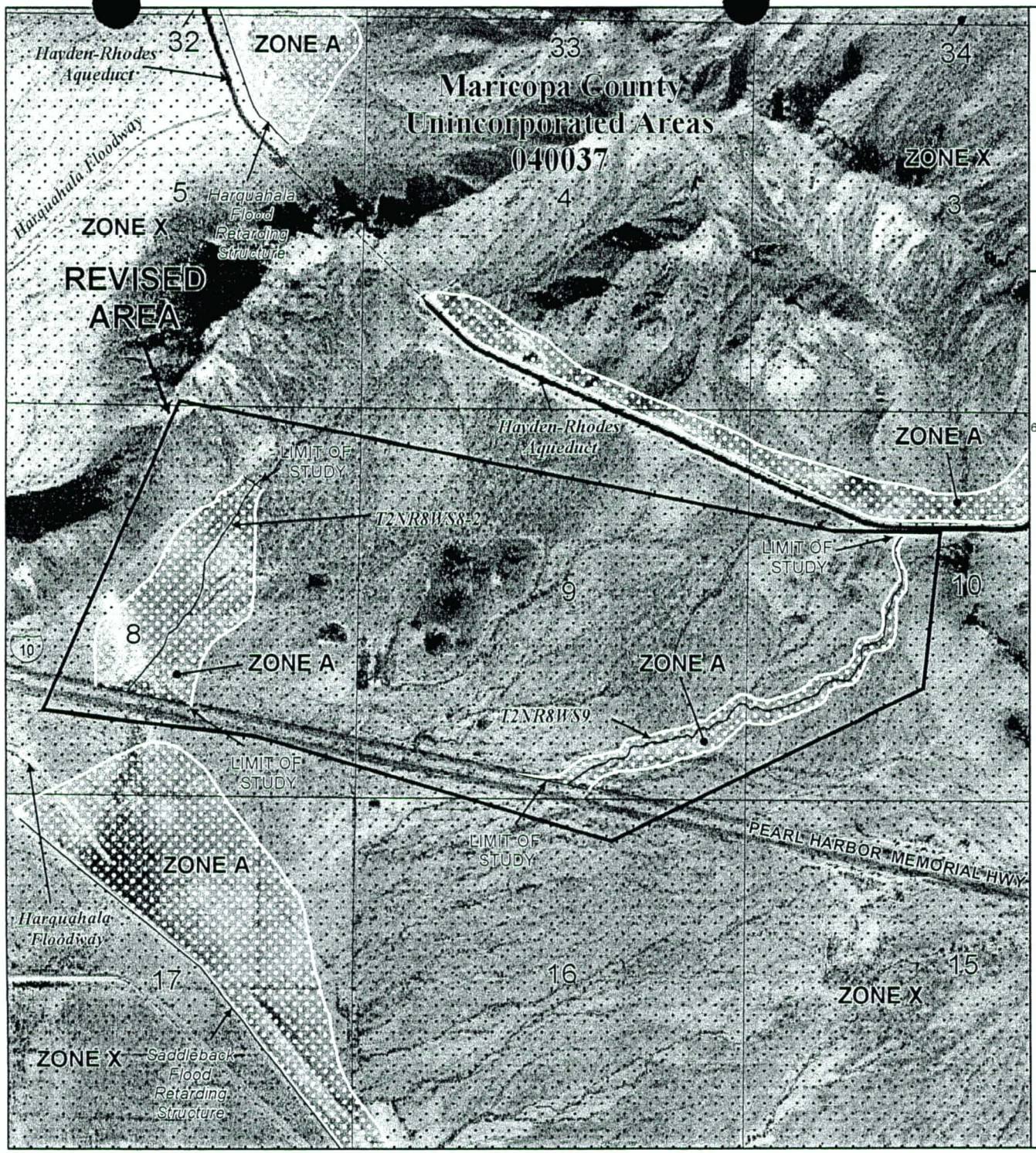
SUPERSEDES TO REFLECT LOMR EFFECTIVE AUG 28 2006

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
04013C1450G

MAP REVISED:
SEPTEMBER 30, 2005

Federal Emergency Management Agency



Legend

- 1% annual chance (100-Year) Floodplain
- 1% annual chance (100-Year) Floodway
- 0.2% annual chance (500-Year) Floodplain

MAP SCALE 1" = 2000'

1,000 500 0 1,000 2,000 3,000 4,000 Feet

600 300 0 600 1,200 Meters

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1475G

FIRM

FLOOD INSURANCE RATE MAP

MARICOPA COUNTY, ARIZONA

AND INCORPORATED AREAS

PANEL 1475 OF 4350

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
MARICOPA COUNTY	040037	1475	G

REVISED TO REFLECT LOMR EFFECTIVE AUG 28 2006

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
04013C1475G

MAP REVISED:
SEPTEMBER 30, 2005

Federal Emergency Management Agency

Table 3. Summary of Discharges (Cont'd)

Flooding Source and Location	Drainage Area (Square Miles)	Peak Discharges (cfs) 10-Year[1]	50-Year[1]	100-Year	500-Year[1]
Lower Centennial Wash Watershed					
T2NR9WS2-1					
At Pearl Harbor Memorial Highway	3.36	N/A	N/A	2,398	N/A
T2NR9WS2-2					
At Pearl Harbor Memorial Highway	2.98	N/A	N/A	2,183	N/A
T2NR9WS12-1					
At Pearl Harbor Memorial Highway	1.38	N/A	N/A	1,418	N/A
T2NR9WS12-2					
At Pearl Harbor Memorial Highway	1.50	N/A	N/A	1,494	N/A
T2NR8WS8-2					
At Pearl Harbor Memorial Highway	1.53	N/A	N/A	2,164	N/A
T2NR8WS9					
At Pearl Harbor Memorial Highway	1.08	N/A	N/A	1,441	N/A
T1NR8WS34					
At confluence with Saddleback Outlet Channel	1.07	N/A	N/A	1,429	N/A
T1NR8WS8					
At confluence with Saddleback Outlet Channel	2.68	N/A	N/A	2,721	N/A
T1NR8WS8 Tributary 1					
Approximately 3.7 miles upstream Centennial Wash	0.85	N/A	N/A	1,273	N/A
T1NR8WS17					
At confluence with Saddleback Outlet Channel	1.80	N/A	N/A	1,556	N/A
T1NR8WS20					
At confluence with Saddleback Outlet Channel	2.01	N/A	N/A	2,131	N/A
T1NR8WS20 Tributary 1					
At confluence with T1NR8WS20	0.63	N/A	N/A	1,213	N/A
T1NR8WS29-1					
At confluence with Centennial Wash Left Over Bank	2.09	N/A	N/A	1,729	N/A
T1NR8WS29-1 Tributary 1					
At confluence with T1NR8WS29-1	0.23	N/A	N/A	260	N/A
T1NR8WS29-2					
At confluence with Centennial Wash Left Over Bank	11.35	N/A	N/A	7,891	N/A

REVISED TO
REFLECT LOMR
EFFECTIVE AUG 28 2006

[1]Not computed

NATIONAL FLOOD INSURANCE PROGRAM

FEMA NATIONAL SERVICE PROVIDER

July 13, 2006

Mr. Joe R. Gonzalez, P.E.
JLK Engineers
18441 N. 25th Avenue, Suite 103
Phoenix, AZ 85023

IN REPLY REFER TO:
Case No.: 06-09-B579P
Community: Maricopa County
Community No.: 040037

316-ACK

Dear Mr. Gonzalez:

This responds to your request dated March 17, 2006, that the Department of Homeland Security's Federal Emergency Management Agency (FEMA) issue a revision to the Flood Insurance Rate Map (FIRM) for Maricopa County, Arizona and Incorporated Areas. Pertinent information about the request is listed below.

Identifier:	Lower Centennial Wash Watershed
Flooding Source:	Multiple Tributaries of Centennial Wash
FIRM Panel(s) Affected:	04013C1450 G, 1475 G, 1950 G

We have completed an inventory of the items you submitted. Our review of the submitted data indicates we have the minimum data required to perform a detailed technical review of your request. If additional data are required or if delays are encountered, we will inform you within 60 days of the date of this letter.

As you may know, FEMA has implemented a procedure to recover costs associated with reviewing and processing requests for modifications to published flood information and maps. However, because your request 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 Special Flood Hazard Area, no fees will be assessed for our review.

Please direct questions concerning your request to us at the address shown at the bottom of this page. For identification purposes, please include the case number referenced above on all correspondence.

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).

3601 Eisenhower Avenue, Alexandria, VA 22304-6425 PH:1-877-FEMA MAP FX: 703.960.9125

If you have specific questions concerning your request, please call the Revisions Coordinator for your State, Mr. Mounir Boudjemaa, MS who may be reached at (703) 960-8800, ext. 3012.

Sincerely,

Sheila M. Norlin, CFM
National LOMC Manager
Michael Baker Jr., Inc.

cc: Mr. Richard P. Harris, P.E., CFM
Project Manager
Flood Control District of Maricopa County

Ms. Lynn M. Thomas, P.E., C.F.M.
Technical Supervisor
Flood Control District of Maricopa County

Mr. Timothy S. Phillips, P.E.
Chief Engineer & General Manager
Flood Control District of Maricopa County

Mr. Ted Collins, CFM
Principal Floodplain Coordinator
Flood Control District of Maricopa County

Mr. Brian Cosson, CFM
NFIP Coordinator
Arizona Department of Water Resources

JLK Engineers
Transportation • Drainage • Public Works
18441 N. 25th Avenue • Suite 103
Phoenix, AZ 85023
(602) 288-6528 • (602) 288-6530 fax

National Flood Insurance Program
U.S. Department of Homeland Security
500 C Street, SW
Washington, DC 20472
Attn: Sheila M. Norlin

May 29, 2006

RE: Lower Centennial Watershed Tributaries
Zone A Floodplain Delineation Study - Phase IV
Case No. 06-09-B579P
Community No. 040037

Dear Ms. Norlin,

The following is a summary of the responses to your review letter dated May 2, 2006. I have been in contact with Ms. Edie Vinson-Wright to discuss the five (5) review comments. The following responses and enclosed data is a result of our phone conversations. I have attached documents that will be replaced in the Technical Data Notebook (TDN) for this project. The following are responses to the review comments.

Item 1

The wash TINR8WS29-2 that is being referred to is the Saddleback Diversion Channel (SDC) which is a Flood Control District of Maricopa County (FCDMC) channel located approximately 3.6 miles south of I-10. The ADOT culvert analysis being referred to in the TDN is for the culverts along I-10. The calculated discharges along the SDC (wash TINR8WS29-2) are from the basins directly east of the wash and it includes a spillway discharge of 1340 cfs at the inlet. The summary of results are tabulated in Table 7.1 which been updated and is attached for further review.

Item 2

The peak flows in washes T1NR8WS29-1 REACH 1 TRUBUTARY 1 and T1NR8WS29-1 REACH 2 were prorated based on watershed area. The peak flow for Sub-Basin B134 was used for establishing flows to these washes. The areas tributary to these washes, within Sub-Basin B134, were used for prorating flows to each wash. This is discussed in Section 4.2.1 (sheet 4-1) of the TDN.

Item 3

The contour that is being referred to is a man-made pit which is approximately eight (8) foot deep. As discussed in one of our phone conversations with Ms. Wright, the floodplain has been revised to include the entire pit as shown in the enclosed Work Study Map. The floodplain shown is based on a more detailed 2 foot topographic CAD file provided by FCDMC.

Item 4

As discussed in one of our phone conversations with Ms. Wright, the combined flows from Sub-Basins B149, B148, B147 and areas in between were compared to flow capacity of culverts at Stations 4303+12, 4305+96, 4308+80, 4322+70, 4327+70, and 4333+30. Results indicate that the combined peak runoff is 7,694 cfs compared to the total capacity of the culverts which is 10,417 cfs. The floodplain has been revised and the headwater elevations based on capacity of the culverts were used to establish the floodplain at these locations. The revised summary of the culvert analysis is listed in the enclosed Table 5.3 (sheet 5-15). In addition, the floodplain has been revised and is shown in the enclosed Work Study Maps 4 and 5.

Item 5

The structure that is being referred to in this review comment is a spillway structure. There are no basins in the SDC within the project limits. The reduction of flow being referred to involve the peak flows at catchpoints CP135 and CP133A for the 6-hour storm. The reduction of flows is a result of combining hydrographs and the different time to peaks at these locations. This does not occur for the 24-hour storm. In addition, the flows from the 24-hour storm are larger at these concentration points and were used to establish the floodplain at these locations.

The above information and enclosed documents address the review comments in your letter dated May 2, 2006 and will allow for further review of this project. If you have any questions, please call me at (602) 288-6528

Sincerely,

Joe R. Gonzalez, P.E.
Principal

Attachments
CC: Edie Vinson-Wright, FEMA
Richard Harris, FCDMC
Nathan Ford, RBF

NATIONAL FLOOD INSURANCE PROGRAM

FEMA NATIONAL SERVICE PROVIDER

May 2, 2006

Mr. Joe R. Gonzalez, P.E.
JLK Engineers
18441 North 25th Avenue, Suite 103
Phoenix, AZ 85023

IN REPLY REFER TO:
Case No.: 06-09-B579P
Community: Maricopa County, AZ
Community No.: 040037

316-AD

Dear Mr. Gonzalez:

This is in regard to your request dated February 17, 2006, that the Department of Homeland Security's Federal Emergency Management Agency (FEMA) issue a revision to the Flood Insurance Rate Map (FIRM) for Maricopa County, Arizona and Incorporated Areas. Pertinent information about the request is listed below.

Identifier:	Lower Centennial Wash Watershed
Flooding Source:	Multiple Tributaries of Centennial Wash
FIRM Panel(s) Affected:	04013C1450 G, 1475 G, and 1950 G

The data required to complete our review, which must be submitted within 90 days of the date of this letter, are listed on the enclosed summary.

If we do not receive the required data within 90 days, we will suspend our processing of your request. Any data submitted after 90 days will be treated as an original submittal and will be subject to all submittal/payment procedures, including the flat review and processing fee for requests of this type established by the current fee schedule. A copy of the notice summarizing the current fee schedule, which was published in the *Federal Register,* is enclosed for your information.

FEMA receives a very large volume of requests and cannot maintain inactive requests for an indefinite period of time. In addition, as a result of the aftermath of recent hurricanes, many FEMA employees have been deployed to assist in disaster relief efforts. Therefore, we are unable to grant extensions for the submission of required data/fee for revision requests. If a requester is informed by letter that additional data are required to complete our review of a request, the data/fee **must** be submitted within 90 days of the date of the letter. Any fees already paid will be forfeited for any request for which the requested data are not received within 90 days.

We will continue to work expeditiously to review all submittals in accordance with National Flood Insurance Program (NFIP) regulations, and will aim to meet the regulatory timeframe for the review of all requests. However, requesters should be aware that delays may occur in the review process because of the current emergency situation. We appreciate the patience and cooperation of all requesters as FEMA assists in hurricane relief efforts.

If you have general questions about your request, FEMA policy, or the NFIP, 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, Mr. Craig Kennedy, CFM, who may be reached at (703) 960-8800, ext. 3091.

Sincerely,

Sheila M. Norlin, CFM
National LOMC Manager
Michael Baker Jr., Inc.

Enclosures

cc: Mr. Richard P. Harris, P.E., CFM
Project Manager
Planning and Project Management Division
Flood Control District of Maricopa County

Ms. Lynn M. Thomas, P.E., CFM
Technical Supervisor
Flood Control District of Maricopa County

Mr. Timothy S. Phillips, P.E.
Chief Engineer and General Manager
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Mr. Ted Collins, CFM
Principal Floodplain Coordinator
Flood Control District of Maricopa County

Mr. Brian Cosson, CFM
NFIP Coordinator
Office of Dam Safety and Flood Mitigation
Arizona Department of Water Resources

NATIONAL FLOOD INSURANCE PROGRAM

FEMA NATIONAL SERVICE PROVIDER

Summary of Additional Data Required to Support a
Letter of Map Revision

Case No.: 06-09-B579P

Requester: Mr. Joe R. Gonzalez, P.E.

Community: Maricopa County, AZ

Community No.: 040037

The issues listed below must be addressed before we can continue the review of your request.

1. A detailed review of the submitted data revealed that the Arizona Department of Transportation (ADOT) analysis used to develop discharges along T1NR8WS29-2 were not provided. Please provide the ADOT analysis and a summary of the discharges to be used for the delineation of the Special Flood Hazard Areas, the areas that would be inundated by the flood having a 1-percent chance of being equaled or exceeded in any given year (base flood), designated Zone A for the entire study.

2. A detailed review of the submitted data revealed that the graph and equations used to prorate the discharges generated by HEC-1 for Subbasin 134 were not provided. Please provide the logarithmic graph and equation used to prorate the discharge for Subbasin 134.

3. A detailed review of the flooding shown along T2NR9WS12-2 revealed a change in elevation of 10 feet, based on the 10-foot contour interval of the map, in the middle of the studied reach. However the flood boundary defined for this reach does not indicate whether the change is a depression or elevation, which affects the appropriate floodplain boundary delineation along this reach. Please review the attached copy of the reach with the highlighted contour interval, clarify what the change in elevation is, and revise the floodplain boundary delineation along this reach.

4. A detailed review of the culvert analyses revealed that the discharges used to evaluate the capacity of the reinforced-concrete box culverts along Interstate Highway 10, located at Stations 4303+12, 4305+96, and 4308+80, appear to be too low to assess the culverts' ability to handle the combined flows from T2NR9WS2-1, T2NR9WS2-2, and T2NR9WS12-1, as suggested by the floodplain boundary delineation. The same problem appears to exist with regard to the culverts at Stations 4322+17, 4327+70, and 4333+00 with the combined flows from T2NR9WS2-1, T2NR9WS2-2, T2NR9WS12-1, and T2NR9WS12-2. Please revise the analyses for these culverts to show the maximum flow capacity of the culverts compared to the estimated combined base flood discharges determined for the washes.

5. A detailed review of the topographic data on the map entitled "Sheet 11, Lower Centennial Watershed Phase IV Zone A Floodplain Delineation Study, F.C.D. Contract No. 2003C061," prepared by your firm, dated February 2006, and the data on "Sheet 2, Lower Centennial Phase IV – Figure 4.1 Sub-Basin Boundary W/Aerial," prepared by your firm, dated October 2005, depicts a structure of some type and an apparent basin along T1NR8WS29-2 where the discharge value at the point of concentration, CP134, was determined. The detailed review also revealed that the discharges along this reach were modified to account for a reduction in flow in the downstream direction. Please provide detailed information on the structure, an analysis of the apparent storage basin adjacent to this structure, and the effects this structure and basin may have on the flow along T1NR8WS29-2.

Please send the required data directly to us at the address shown at the bottom of this page. For identification purposes, please include the case number referenced above on all correspondence.

3601 Eisenhower Avenue, Alexandria, VA 22304-6425 PH:1-877-FEMA MAP FX: 703.960.9125

Federal Emergency Management Agency

Washington, D.C. 20472

FEE SCHEDULE FOR PROCESSING REQUESTS FOR MAP CHANGES

This notice contains the fee schedule for processing certain types of requests for changes to National Flood Insurance Program (NFIP) maps. The fee schedule allows FEMA to further reduce the expenses to the NFIP by more fully recovering the costs associated with processing conditional and final map change requests. The fee schedule for map changes is effective for all requests dated October 30, 2005, or later and supersedes the fee schedule that was established on September 1, 2002.

To develop the fee schedule for conditional and final map change requests, FEMA evaluated the actual costs of reviewing and processing requests for Conditional Letters of Map Amendment (CLOMAs), Conditional Letters of Map Revision – Based on Fill (CLOMR-Fs), Conditional Letters of Map Revision (CLOMRs), Letters of Map Revision – Based on Fill (LOMR-Fs), Letters of Map Revision (LOMRs), and Physical Map Revisions (PMRs).

Based on our review of actual cost data for Fiscal Years 2004 and 2005, FEMA has established the following review and processing fees, which are to be submitted with all requests that are not otherwise exempted under 44 CFR 72.5.

Fee Schedule for Requests for CLOMAs, CLOMR-Fs, and LOMR-Fs

Request for single-lot/single-structure CLOMA and CLOMR-F	$500
Request for single-lot/single structure LOMR-F	$425
Request for single-lot/single-structure LOMR-F based on as-built information (CLOMR-F previously issued by us)	$325
Request for multiple-lot/multiple-structure CLOMA	$700
Request for multiple-lot/multiple-structure CLOMR-F and LOMR-F	$800
Request for multiple-lot/multiple-structure LOMR-F based on as-built information (CLOMR-F previously issued)	$700

Fee Schedule for Requests for CLOMRs

Request based on new hydrology, bridge, culvert, channel, or combination of any of these	$4,000
Request based on levee, berm, or other structural measure	$5,000

Fee Schedule for Requests for LOMRs and PMRs

Requesters must submit the review and processing fees shown below with requests for LOMRs and PMRs that are not based on structural measures or alluvial fans.

Request based on bridge, culvert, channel, or combination thereof	$4,400
Request based on levee, berm, or other structural measure	$6,000
Request based on as-built information submitted as follow-up to CLOMR	$4,000

Fees for CLOMRs, LOMRs, and PMRs Based on Structural Measures on Alluvial Fans

FEMA has revised the initial fee for requests for CLOMRs and LOMRs based on structural measures on alluvial fans to $5,600. FEMA will also continue to recover the remainder of the review and processing costs by invoicing the requester before issuing a determination letter, consistent with current practice. The prevailing private-sector labor rate charged to FEMA ($60 per hour) will be used to calculate the total reimbursable fees.

Payment Submission Requirements

Requesters must make fee payments for non-exempt requests before we render services. This payment must be in the form of a check or money order or by credit card payment. Please make all checks and money orders in U.S. funds payable to the *National Flood Insurance Program.* We will deposit all fees collected to the National Flood Insurance Fund, which is the source of funding for providing this service.

NATIONAL FLOOD INSURANCE PROGRAM

FEMA NATIONAL SERVICE PROVIDER

March 24, 2006

Mr. Joe R. Gonzalez, P.E.
JLK Engineers
18411 North 25th Avenue, Suite 103
Phoenix, AZ 85023

IN REPLY REFER TO:
Case No.: 06-09-B579P
Community: Maricopa County, AZ
Community No.: 040037

316-ACK

Dear Mr. Gonzalez:

This responds to your request dated February 17, 2006, concerning a Letter of Map Revision (LOMR) request that the Department of Homeland Security's Federal Emergency Management Agency (FEMA) issue a revision to the Flood Insurance Rate Map (FIRM) for Maricopa County, Arizona and Incorporated Areas. Pertinent information about the request is listed below.

Identifier:	Lower Centennial Wash Watershed
Flooding Source:	Multiple Tributaries of Centennial Wash
FIRM Panel(s) Affected:	04013C1450 G, 1475 G, 1950 G

We have completed an inventory of the items you submitted. Our review of the submitted data indicates we have the minimum data required to perform a detailed technical review of your request. If additional data are required or if delays are encountered, we will inform you within 60 days of the date of this letter.

As you may know, FEMA has implemented a procedure to recover costs associated with reviewing and processing requests for modifications to published flood information and maps. However, because your request 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 Special Flood Hazard Area, no fees will be assessed for our review.

Please direct questions concerning your request to us at the address shown at the bottom of this page. For identification purposes, please include the case number referenced above on all correspondence.

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, Mr. Craig Kennedy, CFM, who may be reached at (703) 960-8800, ext. 3091.

Sincerely,

Sheila M. Norlin, CFM
National LOMC Manager
Michael Baker Jr., Inc.

cc: Mr. Richard P. Harris, P.E., CFM
Project Manager
Planning and Project Management Division
Flood Control District of Maricopa County

Ms. Lynn M. Thomas, P.E., CFM
Technical Supervisor
Flood Control District of Maricopa County

Mr. Timothy S. Phillips, P.E.
Chief Engineer & General Manager
Flood Control District of Maricopa County

Mr. Ted Collins, CFM
Principal Floodplain Coordinator
Flood Control District of Maricopa County

Mr. Brian Cosson, CFM
NFIP Coordinator
Arizona Department of Water Resources

Phase IV

NATIONAL FLOOD INSURANCE PROGRAM

FEMA NATIONAL SERVICE PROVIDER

FLOOD CONTROL DISTRICT
RECEIVED
MAY 8 '06
CH & GM | FINANCE
PIO | LANDS
ADMIN | O & M
REG | P & PM
ENG | FILE
CONTRACTS
ROUTING

May 2, 2006

Mr. Joe R. Gonzalez, P.E.
JLK Engineers
18441 North 25th Avenue, Suite 103
Phoenix, AZ 85023

IN REPLY REFER TO:
Case No.: 06-09-B579P
Community: Maricopa County, AZ
Community No.: 040037

316-AD

Dear Mr. Gonzalez:

This is in regard to your request dated February 17, 2006, that the Department of Homeland Security's Federal Emergency Management Agency (FEMA) issue a revision to the Flood Insurance Rate Map (FIRM) for Maricopa County, Arizona and Incorporated Areas. Pertinent information about the request is listed below.

Identifier:	Lower Centennial Wash Watershed
Flooding Source:	Multiple Tributaries of Centennial Wash
FIRM Panel(s) Affected:	04013C1450 G, 1475 G, and 1950 G

The data required to complete our review, which must be submitted within 90 days of the date of this letter, are listed on the enclosed summary.

If we do not receive the required data within 90 days, we will suspend our processing of your request. Any data submitted after 90 days will be treated as an original submittal and will be subject to all submittal/payment procedures, including the flat review and processing fee for requests of this type established by the current fee schedule. A copy of the notice summarizing the current fee schedule, which was published in the *Federal Register,* is enclosed for your information.

FEMA receives a very large volume of requests and cannot maintain inactive requests for an indefinite period of time. In addition, as a result of the aftermath of recent hurricanes, many FEMA employees have been deployed to assist in disaster relief efforts. Therefore, we are unable to grant extensions for the submission of required data/fee for revision requests. If a requester is informed by letter that additional data are required to complete our review of a request, the data/fee **must** be submitted within 90 days of the date of the letter. Any fees already paid will be forfeited for any request for which the requested data are not received within 90 days.

We will continue to work expeditiously to review all submittals in accordance with National Flood Insurance Program (NFIP) regulations, and will aim to meet the regulatory timeframe for the review of all requests. However, requesters should be aware that delays may occur in the review process because of the current emergency situation. We appreciate the patience and cooperation of all requesters as FEMA assists in hurricane relief efforts.

3601 Eisenhower Avenue, Alexandria, VA 22304-6425 PH:1-877-FEMA MAP FX: 703.960.9125

If you have general questions about your request, FEMA policy, or the NFIP, 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, Mr. Craig Kennedy, CFM, who may be reached at (703) 960-8800, ext. 3091.

Sincerely,

Sheila M. Norlin, CFM
National LOMC Manager
Michael Baker Jr., Inc.

Enclosures

cc: Mr. Richard P. Harris, P.E., CFM
Project Manager
Planning and Project Management Division
Flood Control District of Maricopa County

Ms. Lynn M. Thomas, P.E., CFM
Technical Supervisor
Flood Control District of Maricopa County

Mr. Timothy S. Phillips, P.E.
Chief Engineer and General Manager
Flood Control District of Maricopa County

Mr. Ted Collins, CFM
Principal Floodplain Coordinator
Flood Control District of Maricopa County

Mr. Brian Cosson, CFM
NFIP Coordinator
Office of Dam Safety and Flood Mitigation
Arizona Department of Water Resources

NATIONAL FLOOD INSURANCE PROGRAM

FEMA NATIONAL SERVICE PROVIDER

Summary of Additional Data Required to Support a
Letter of Map Revision

Case No.: 06-09-B579P

Requester: Mr. Joe R. Gonzalez, P.E.

Community: Maricopa County, AZ

Community No.: 040037

The issues listed below must be addressed before we can continue the review of your request.

1. A detailed review of the submitted data revealed that the Arizona Department of Transportation (ADOT) analysis used to develop discharges along T1NR8WS29-2 were not provided. Please provide the ADOT analysis and a summary of the discharges to be used for the delineation of the Special Flood Hazard Areas, the areas that would be inundated by the flood having a 1-percent chance of being equaled or exceeded in any given year (base flood), designated Zone A for the entire study.

2. A detailed review of the submitted data revealed that the graph and equations used to prorate the discharges generated by HEC-1 for Subbasin 134 were not provided. Please provide the logarithmic graph and equation used to prorate the discharge for Subbasin 134.

3. A detailed review of the flooding shown along T2NR9WS12-2 revealed a change in elevation of 10 feet, based on the 10-foot contour interval of the map, in the middle of the studied reach. However the flood boundary defined for this reach does not indicate whether the change is a depression or elevation, which affects the appropriate floodplain boundary delineation along this reach. Please review the attached copy of the reach with the highlighted contour interval, clarify what the change in elevation is, and revise the floodplain boundary delineation along this reach.

4. A detailed review of the culvert analyses revealed that the discharges used to evaluate the capacity of the reinforced-concrete box culverts along Interstate Highway 10, located at Stations 4303+12, 4305+96, and 4308+80, appear to be too low to assess the culverts' ability to handle the combined flows from T2NR9WS2-1, T2NR9WS2-2, and T2NR9WS12-1, as suggested by the floodplain boundary delineation. The same problem appears to exist with regard to the culverts at Stations 4322+17, 4327+70, and 4333+00 with the combined flows from T2NR9WS2-1, T2NR9WS2-2, T2NR9WS12-1, and T2NR9WS12-2. Please revise the analyses for these culverts to show the maximum flow capacity of the culverts compared to the estimated combined base flood discharges determined for the washes.

5. A detailed review of the topographic data on the map entitled "Sheet 11, Lower Centennial Watershed Phase IV Zone A Floodplain Delineation Study, F.C.D. Contract No. 2003C061," prepared by your firm, dated February 2006, and the data on "Sheet 2, Lower Centennial Phase IV – Figure 4.1 Sub-Basin Boundary W/Aerial," prepared by your firm, dated October 2005, depicts a structure of some type and an apparent basin along T1NR8WS29-2 where the discharge value at the point of concentration, CP134, was determined. The detailed review also revealed that the discharges along this reach were modified to account for a reduction in flow in the downstream direction. Please provide detailed information on the structure, an analysis of the apparent storage basin adjacent to this structure, and the effects this structure and basin may have on the flow along T1NR8WS29-2.

Please send the required data directly to us at the address shown at the bottom of this page. For identification purposes, please include the case number referenced above on all correspondence.

3601 Eisenhower Avenue, Alexandria, VA 22304-6425 PH:1-877-FEMA MAP FX: 703.960.9125

Flood Control District
of Maricopa County

INTEROFFICE MEMORANDUM

Date: February 17, 2006

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

From: Richard P. Harris, P.E., CFM

Subject: Lower Centennial Phase IV Floodplain Study and Maps

The floodplain study for the Lower Centennial Phase IV is ready for use as the best available technical information. The study will be sent to FEMA for review and processing within two weeks after the date of this memo. FEMA forms within the TDN will require signatures before the TDN can be sent.

The background on the study includes the following:

> The study includes New Hydrology and 24.1 linear-miles of Previously Unmapped Zone A delineations. The topographic basis for the study is 10-foot contour interval mapping in NAVD88 vertical datum, by Landata Airborne Systems Inc., flown in December of 2000. The study-consultant was RBF Consulting. The District's project manager and reviewer for the floodplain delineations was Richard P. Harris.

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

Richard P. Harris Project Manager Date: 02/17/06	3/6/06 Timothy S. Phillips, P.E. Date: Chief Engineer and General Manager
2/22/06 Flood Delineation Branch Manager Date:	Assistant Project Manager Date:
2/1/06 Hydrology/Hydraulics Branch Manager Date:	Assistant Project Manager Date:
3-2-06 Regulatory Division Manager Date:	Assistant Project Manager Date:
PPM Division Manager Date:	Assistant Project Manager Date:
File Copies: 1. _____ 2. _____	YES ☐ GIS Posted (Pending Floodplain Only) Date: N/A ☑ No County Permits in this area Date: 02/17/06

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

Lower Centennial Wash Watershed
Zone A Floodplain Delineation Study
Phase IV

Property of
Flood Control District of MC Library
Please Return to
2801 W. Durango
Phoenix, AZ 85009

Technical Data Notebook

LOWER CENTENNIAL WASH WATERSHED ZONE A FLOODPLAIN DELINEATION STUDY PHASE IV

CONTRACT FCD 2003C061

Prepared for:
Flood Control District of Maricopa County
2801 W. Durango Street
Phoenix, Arizona 85009
Phone No: (602) 506-1501

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

Prepared By:
JLK Engineers
18441 N. 25th Ave, Suite 103
Phoenix, AZ 85023
Phone No: (602) 405-1875

Engineer:
Joe R. Gonzalez, P.E.

February 2, 2006

Registered Professional Engineer (Civil)
CERTIFICATE NO.
31474
JOE R.
GONZALEZ
Date Signed 2/2/06
ARIZONA, U.S.A.

Lower Centennial Wash Watershed
Zone A Floodplain Delineation Study
Phase IV

Table of Contents

Section 1 Introduction 1-1

1.1 Purpose of Study 1-1
1.2 Authority of the Study 1-1
1.3 Site Location and Description 1-1
1.4 Methodology 1-2
1.4.1 Hydrology 1-2
1.4.2 Hydraulics and Floodplain Delineation 1-2
1.5 Summary of Results 1-2

Section 2 FEMA Forms 2-1

2.1 Study Documentation Abstract for FEMA Submittals 2-1

Section 3 Mapping and Survey Information 3-1

3.1 Field Survey Information 3-1
3.2 Mapping 3-1

Section 4 Hydrology 4-1

4.1 Method Description 4-1
4.2 Parameter Estimation 4-1
4.2.1 Drainage Area Boundaries 4-1
4.2.2 Watershed Work Maps 4-2
4.2.3 Gage Data 4-2
4.2.4 Statistical Parameters 4-3
4.2.5 Precipitation Values 4-3
4.2.6 Physical Parameters 4-3
4.3 Calibration 4-10
4.4 Final Results 4-11

Section 5 Hydraulics 5-1

5.1 Method Description 5-1
5.2 Work Study Maps 5-1
5.3 Parameter Estimation 5-2
5.3.1 Roughness Coefficients 5-2
5.4 Cross Section Description 5-2
5.5 Modeling Considerations 5-2
5.6 Floodway Modeling 5-2
5.7 Problems Encountered During the Study 5-3
5.8 Calibration 5-3
5.9 Final Results 5-3

Lower Centennial Wash Watershed
Zone A Floodplain Delineation Study
Phase IV

Section 6 Erosion and Sediment Transport.....6-1

Section 7 Draft FIS Report Data.....7-1

7.1 Summary of Discharges.....7-1
7.2 Floodway Data and Flood Profiles.....7-2
7.3 Annotated FIRMS.....7-3

Appendix A References

A.1 Data Collection Summary
A.2 Referenced Documents

Appendix B General Documentation and Correspondence

B.1 Meeting Minutes or Reports
B.2 General Correspondence
B.3 Contract Documents
B.4 FEMA Correspondence
B.5 Public Information

Appendix C Survey Field Notes

Appendix D Hydrologic Analysis Supporting Documentation

D.1 Precipitation Data
D.2 Physical Parameter Calculations
D.3 Hydrograph Routing Data
D.4 Reservoir Routing Data
D.5 Flow Splits and Diversion Data
D.6 Hydrologic Calculations

Appendix E Hydraulic Analysis Supporting Documentation

E.1 Roughness Coefficient Estimation
E.2 Cross Section Plots
E.3 Expansion and Contraction Coefficients
E.4 Analysis of RCBC Structures
E.5 Hydraulic Calculations
E.6 Flood Delineation Maps
E.7 RCBC Structures As-Built Plans

Lower Centennial Wash Watershed
Zone A Floodplain Delineation Study
Phase IV

List of Figures

Figure 1.1 – Location Exhibit 1-3
Figure 1.2 – Geomorphology Exhibit 1-4
Figure 4.1 – Sub-Basin Boundaries W/Aerial 4-13
Figure 4.2 – Sub-Basin Boundaries W/Topo 4-14
Figure 4.3 – Prorated Basins 4-15
Figure 4.4 – Soils Map 4-16
Figure 4.5 – Land Use Map 4-17
Figure 4.6 – HEC-1 Model Results 4-18
Annotated FIRMS 7-3
N-Value Photo Locations E.1

List of Tables

Table 4.1 – List of Rain Gages in Phase IV 4-2
Table 4.3 – Soils Characteristics Used to Compute Green-Amp Parameters 4-4
Table 4.4 – Land Use Characteristics Used to Compute Green-Amp Parameters 4-6
Table 4.5 – Green-Amp Parameters 4-6
Table 4.6 – Sub-Basin Lag Time Summary 4-8
Table 4.7 – Channel Routing Parameters for Normal Depth Routing 4-10
Table 4.8 – Hydrologic Analysis Results 4-11
Table 5.1 – Results of Hydraulic Calculations 5-4
Table 5.2 – Hydraulic Calculations Used in Floodplain Mapping 5-8
Table 5.3 – Summary of Culvert Hydraulic Calculations 5-12
Table 7.1 – Summary of Discharges 7-1

Section 1 Introduction

1.1 Purpose of Study

The purpose of this study is to delineate the 100-year Zone A floodplains for Phase IV of the Lower Centennial Wash Watershed. The goal is to delineate floodplains before development occurs to improve upon floodplain management and minimize losses due to flooding.

1.2 Authority of the Study

JLK Engineers is a subconsultant to RBF Consulting who is contracted by the Flood Control District of Maricopa County to perform the study based on existing 10 foot contour interval topographic mapping. JLK Engineers is contracted to perform the study for Phase IV. The main contacts, addresses, and other information about both the Flood Control District of Maricopa County and JLK Engineers 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., CFM

JLK Engineers

Address:	18441 N. 25th Avenue, Suite 103 Phoenix, Arizona 85023
Phone:	(602) 405-1875
Project Manager:	Joe R. Gonzalez, P.E.

1.3 Site Location and Description

Lower Centennial Wash Watershed is located in the western part of Maricopa County. A Phase IV was created during contract negotiations. Phase IV was taken from Phase III which includes 24.1 miles of washes. Phase IV is located east of the Centennial Wash, north and south of Interstate 10 Freeway along the Harquahala Flood Retarding Structure and above the Saddleback Diversion Channel. This report discusses the floodplain delineation of the 24.1 miles of washes. These washes drain into the Centennial Wash and are classified as desert washes with mild slopes. The washes south of the Interstate 10 Freeway drain into the Saddleback Diversion Channel, which drains into the Lower Centennial Wash. These washes have been named according to the Township, Range, and Section where they join with Centennial Wash according to Maricopa County requirements. See Figure 1.1 for the location on Phase IV and the proposed floodplains being delineated as part of this study.

1.4 Methodology

1.4.1 Hydrology

The U.S. Army Corps of Engineers HEC-1 software package, version 4.1, dated June 1988, as outlined in Section 4 of this report was used to determine peak flows for both the 100-year 6-hour and 100-year 24-hour storms. The WMS 7.1, Watershed Modeling System, distributed by Environmental Modeling System-Incorporated (EMS-1) was utilized to establish HEC-1 model parameters. The Flood Control District of Maricopa County provided JLK Engineers with a digital elevation model (DEM) that contains points on 10 foot grid elements. WMS analyzed the DEM, NRCS 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 generated by the HEC-1 model were then compared to three (3) regional regression equations. A more detailed explanation of the hydrologic methodology and results are provided in Section 4.

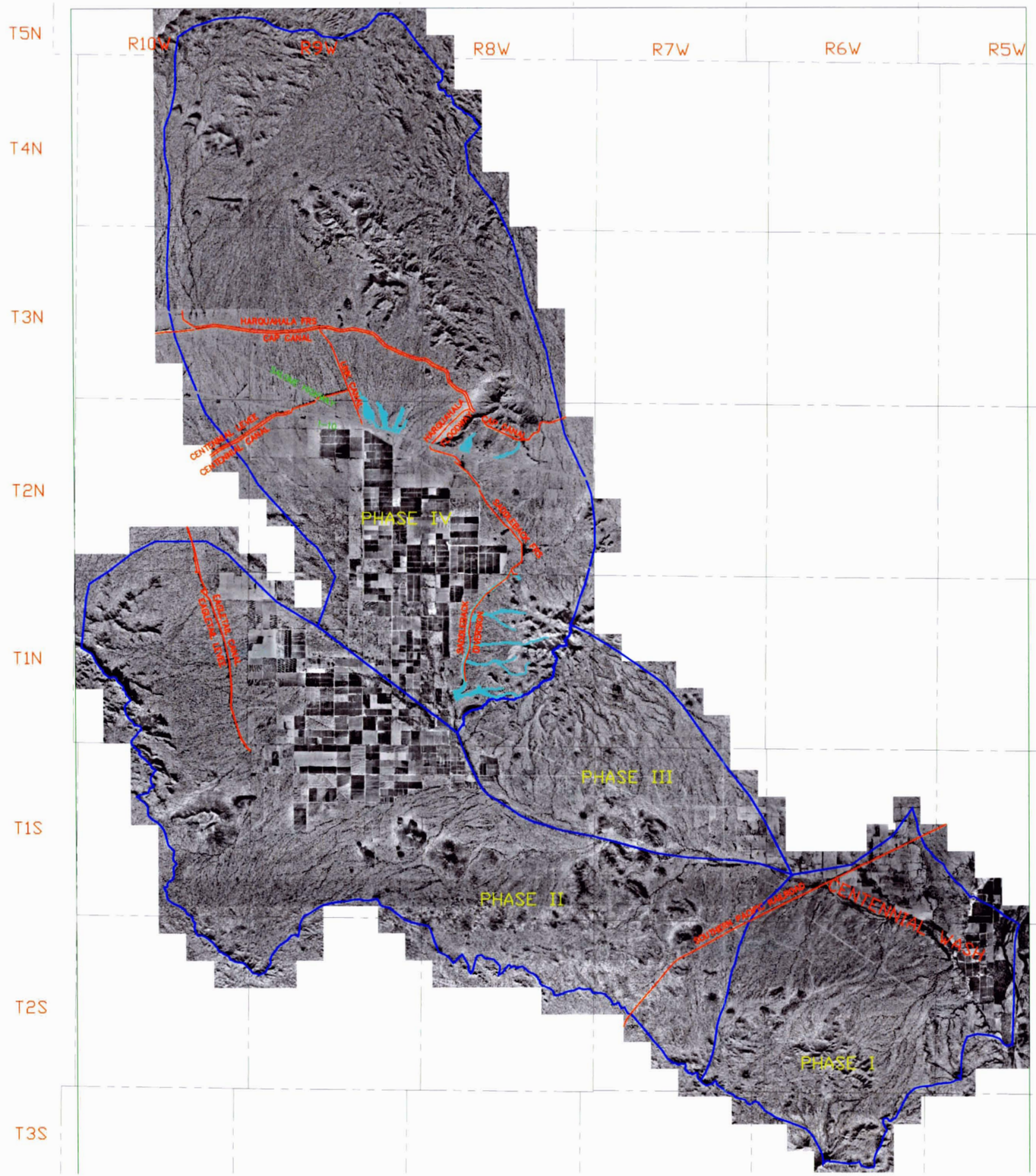
1.4.2 Hydraulics and Floodplain Delineation

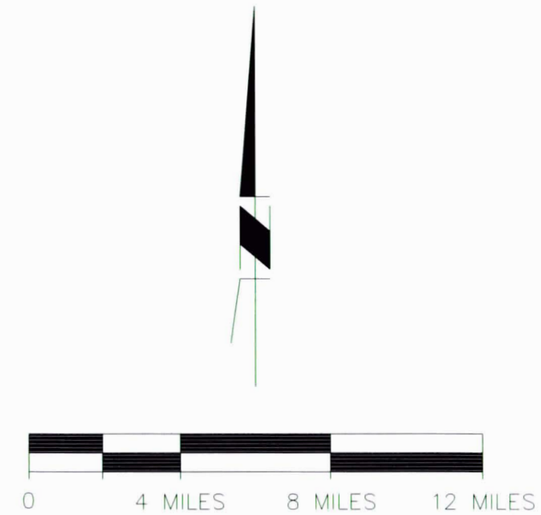
A geomorphic assessment was produced as a guideline for study reach selection and to help identify areas where approximate analysis would not be sufficiently complex to accurately predict floodplain boundaries. The geomorphic assessment is a separate document titled *Lower Centennial Wash Watershed Zone A Delineation Study, Low Level Geomorphic Assessment* prepared by Earth Consultants International in 2005 for RBF Consulting and the Flood Control District of Maricopa County. Generally active fan and alluvial plain areas were avoided as shown on Figure 1.2, "Lower Centennial Wash Watershed Geomorphology".

Both the normal depth and critical depths of the peak flow rates were calculated for each wash. The normal depth was used to delineate the Zone A floodplain if it was subcritical flow and critical depth was used to map the floodplain when supercritical flow was indicated in the calculations as a conservative measure. Manning's equation was used to determine normal depth. 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. The floodplain has been delineated using the calculated normal depth or critical depth.

1.5 Summary of Results

The study resulted in the delineation of approximately 24.1 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.





LEGEND

- TOWNSHIP & RANGE LINES
- PHASE BOUNDARY
- PROPOSED FLOODPLAIN

LOWER CENTENNIAL
PHASE IV– FIGURE 1.1
LOCATION EXHIBIT

JLK Engineers
Transportation Drainage Public Works
18441 N. 25th Ave., Suite 103
Phoenix, AZ 85023
Tel 602-405-1875
Fax 602-288-5781

Registered Professional Engineer (Civil) 31474 JOE R. GONZALEZ Date Signed ARIZONA U.S.A.

LAYOUT	DRAFTED	CHECKED
JRG	NZ	PTG

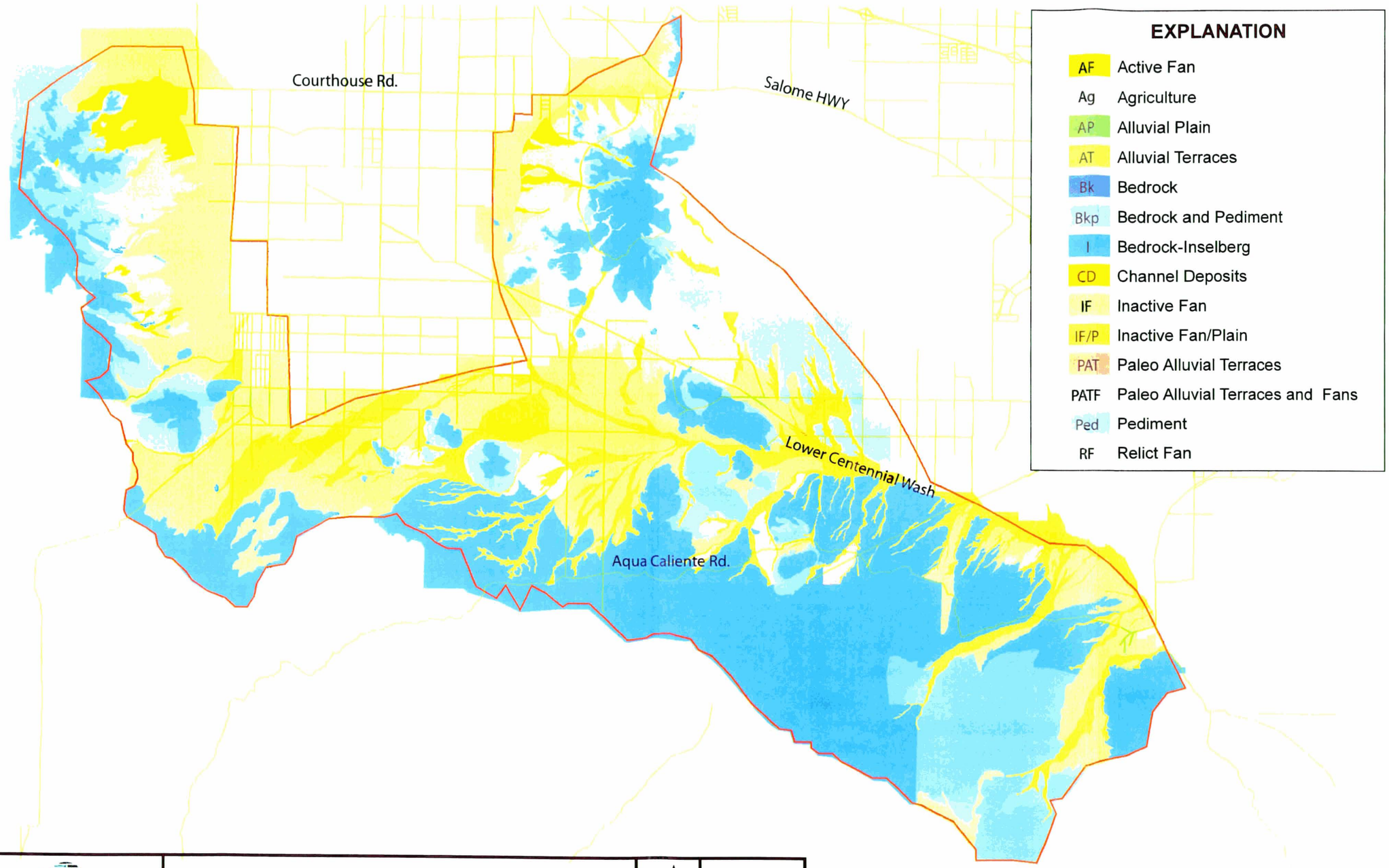
DRAWING SCALE(S): 1 INCH = 4 MILES

ORIGINAL PLAN DATE: OCT./2005

LATEST REVISION:

PROJECT NUMBER: FCDMC0501

SHEET NO. 1 OF 1 SHEETS



Earth Consultants International

Project Number: 2407
Date: April 2005

Lower Centennial Wash Watershed Geomorphology Overview & Roadways.

N

Figure 1.2

Section 2 FEMA Forms

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 Contact Address Phone Internal Reference #	JLK Engineers Joe R. Gonzalez, P.E. 18441 N. 25th Avenue, Suite 103 Phoenix, Arizona 85023 (602) 405-1875 RBF05001							
2.1.3	FEMA Technical Review Contractor Contact Address Phone Internal Reference #	Michael Baker, Jr., Inc Craig Kennedy 3601 Eisenhower Ave, Suite 130 Alexandria, VA 22304 703-960-8800 X 3091							
2.1.4	FEMA Regional Reviewer Phone	Michael Baker, Jr., Inc. 703-960-8800							
2.1.5	State NFIP Coordinator Phone	Arizona Department of Water Resources 602-771-8500							
2.1.6	Local Technical Reviewer Phone	Flood Control District of Maricopa County (602) 506-1501							
2.1.7	Reach Description	Wash T1NR8WS29-2, T1NR8WS29-1, T1NR8WS29-1 Tributary 1, T1NR8WS20, T1NR8WS20 Tributary 1, T1NR8WS17, T1NR8WS8, T1NR8WS8 Tributary 1, T2NR8WS34, T2NR8WS9, T2NR8WS8-2, T2NR9WS12-2, T2NR9WS12-1, T2NR9WS2-2, T2NR9WS2-1 are desert washes that all drain into Centennial Wash.							
2.1.8	USGS Quad Sheet Original photo date Latest photo revision date	Arlington Arizona 1960 1981	Gillespie Arizona 1960 1981	Spring Mtn Arizona 1972	Woolsey Peak Arizona 1972				
2.1.9	Unique Conditions and Problems								
2.1.10	Coordination of Q's Discharges (Agency, Date, Comments)								

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
	See attache sheet for affected panels				

2. Flooding Source:

3. Project Name/Identifier:

4. FEMA zone designations affected: (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/fhm/frm_fees.shtm **for Fee Amounts and Exemptions.**

D. SIGNATURE

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

Name: Richard P. Harris, P.E., CFM	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: 03/06/06

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: Timothy S. Phillips, P.E., Chief Engineer and General Manager		Telephone No.: 302-506-1501
Community Name: Maricopa County	Community Official's Signature (required):	Date: 3/6/06

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: Joe R. Gonzalez	License No.: 31474	Expiration Date: 6/30/06
Company Name: JLK Engineers	Telephone No.: 602-405-1875	Fax No.: 602-288-5781
Signature:		Date: 12/21/05

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

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

Seal (Optional)

The following NFIP map panels affected for all impacted communities are:

Community No.	Community Name	State	Map No.	Panel No.	Effective Date
040037	Maricopa County	AZ	04013C	1450G	9/30/05
040037	Maricopa County	AZ	04013C	1475G	9/30/05
040037	Maricopa County	AZ	04013C	1950G	9/30/05

Panel 1450G Flooding Source: Wash T2NR9WS2-1, Wash T2NR9WS2-2, Wash T2NR9WS12-1, Wash T2NR9WS12-2.

Panel 1475G Flooding Source: Wash T2NR8WS8-1, Wash T2NR8WS9.

Panel 1950G Flooding Source: Wash T2NR8WS34, Wash T1NR8WS8, Wash T1NR8WS8 Tributary 1, Wash T1NR8WS17, Wash T1NR8WS20, Wash T1NR8WS20 Tributary 1, Wash T1NR8WS29-1, Wash T1NR8WS29-1 Tributary 1, Wash T1NR8WS29-2.

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: T1NR8WS29-2
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)
Wash T1NR8WS29-2 (CP133)	11.59	Not Studied	

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

☐ Statistical Analysis of Gage Records ☒ Precipitation/Runoff Model [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/fhm/en_modl.shtm.

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 [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/fhm/frm_soft.shtm. 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/fhm/en_modl.shtm.

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: T1NR8WS29-1
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)
Wash T1NR8WS29-1 (B133)	2.09	Not Studied	

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

☐ Statistical Analysis of Gage Records ☒ Precipitation/Runoff Model [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/fhm/en_modl.shtm.

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 [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/fhm/frm_soft.shtm. 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/fhm/en_modl.shtm.

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: T1NR8WS29-1 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)
Wash T1NR8WS29-1 (B134)	0.23	Not Studied	

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

☐ Statistical Analysis of Gage Records ☒ Precipitation/Runoff Model [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/fhm/en_modl.shtm.

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 [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/fhm/frm_soft.shtm. 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/fhm/en_modl.shtm.

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

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Flooding Source: T1NR8WS20
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)
Wash T1NR8WS20 (B135)	2.01	Not Studied	

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

☐ Statistical Analysis of Gage Records ☒ Precipitation/Runoff Model [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/fhm/en_modl.shtm.

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 [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/fhm/frm_soft.shtm. 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/fhm/en_modl.shtm.

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: T1NR8WS20 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)
Wash T1NR8WS20 (B137)	0.63	Not Studied	

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

☐ Statistical Analysis of Gage Records ☒ Precipitation/Runoff Model [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/fhm/en_modl.shtm.

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 [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/fhm/frm_soft.shtm. 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/fhm/en_modl.shtm.

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: T1NR8WS17
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)
Wash T1NR8WS17 (B138)	1.80	Not Studied	

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

☐ Statistical Analysis of Gage Records ☒ Precipitation/Runoff Model [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/fhm/en_modl.shtm.

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 [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/fhm/frm_soft.shtm. 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/fhm/en_modl.shtm.

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: T1NR8WS8
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)
Wash T1NR8WS8 (B140)	2.68	Not Studied	

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

☐ Statistical Analysis of Gage Records ☒ Precipitation/Runoff Model [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/fhm/en_modl.shtm.

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 [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/fhm/frm_soft.shtm. 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.

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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: T1NR8WS8 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)
Wash T1NR8WS8 (B141)	0.85	Not Studied	

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

☐ Statistical Analysis of Gage Records ☒ Precipitation/Runoff Model [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/fhm/en_modl.shtm.

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 [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/fhm/frm_soft.shtm. 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/fhm/en_modl.shtm.

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: T2NR8WS34
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)
Wash T2NR8WS34 (B143)	1.07	Not Studied	

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

☐ Statistical Analysis of Gage Records ☒ Precipitation/Runoff Model [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/fhm/en_modl.shtm.

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 [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/fhm/frm_soft.shtm. 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/fhm/en_modl.shtm.

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: T2NR8WS9
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)
Wash T2NR8WS9 (B144)	1.08	Not Studied	

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

☐ Statistical Analysis of Gage Records ☒ Precipitation/Runoff Model [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/fhm/en_modl.shtm.

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 [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/fhm/frm_soft.shtm. 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/fhm/en_modl.shtm.

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: T2NR8WS8-2
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)
Wash T2NR8WS8-2 (B145)	1.53	Not Studied	

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

☐ Statistical Analysis of Gage Records ☒ Precipitation/Runoff Model [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/fhm/en_modl.shtm.

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 [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/fhm/frm_soft.shtm. 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/fhm/en_modl.shtm.

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: T2NR9WS12-2
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)
Wash T2NR8WS12-2 (B146)	1.50	Not Studied	

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

☐ Statistical Analysis of Gage Records ☒ Precipitation/Runoff Model [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/fhm/en_modl.shtm.

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 [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/fhm/frm_soft.shtm. 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/fhm/en_modl.shtm.

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: T2NR9WS12-1
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)
Wash T2NR8WS12-1 (B147)	1.38	Not Studied	

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

☐ Statistical Analysis of Gage Records ☒ Precipitation/Runoff Model [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/fhm/en_modl.shtm.

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 [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/fhm/frm_soft.shtm. 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/fhm/en_modl.shtm.

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: T2NR9WS2-2
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)
Wash T2NR8WS2-2 (B148)	2.98	Not Studied	

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

☐ Statistical Analysis of Gage Records ☒ Precipitation/Runoff Model [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/fhm/en_modl.shtm.

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 [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/fhm/frm_soft.shtm. 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/fhm/en_modl.shtm.

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: T2NR9WS2-1
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)
Wash T2NR8WS2-1 (B149)	3.36	Not Studied	

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

☐ Statistical Analysis of Gage Records ☒ Precipitation/Runoff Model [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/fhm/en_modl.shtm.

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 [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/fhm/frm_soft.shtm. 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.

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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: T2NR9WS2-1, T2NR9WS2-2
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: T2NR9WS2-1, T2NR9WS2-2 3-10'x7' RCBC STA 4303+12**

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

   Location of Structure:

   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: T2NR9WS2-1, T2NR9WS2-2

Name of Structure: T2NR9WS2-1, T2NR9WS2-2 3-10'x7' RCBC STA 4303+12

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):
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.

Pages 3-10 Do Not Apply

D. DAM

Flooding Source:

Name of Structure:

1. This request is for (check one): ☐ Existing dam ☐ New dam ☐ Modification of existing dam
2. The dam was designed by (check one): ☐ Federal agency ☐ State agency ☐ Local government agency

   ☐ Private organization Name of the agency or organization:
3. Does the project involve revised hydrology? ☐ Yes ☐ No

   If Yes, complete the Riverine Hydrology & Hydraulics Form (Form 2).
4. Does the submittal include debris/sediment yield analysis? ☐ Yes ☐ No

   If yes, then fill out Section F (Sediment Transport).
   If No, then attach your explanation for why debris/sediment analysis was not considered.
5. Does the Base Flood Elevation behind the dam or downstream of the dam change?

   ☐ Yes ☐ No If Yes, complete the Riverine Hydrology & Hydraulics Form (Form 2) and complete the table below.

Stillwater Elevation Behind the Dam

FREQUENCY (% annual chance)	FIS	REVISED
10-year (10%)		
50-year (2%)		
100-year (1%)		
500-year (0.2%)		
Normal Pool Elevation		

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

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: T2NR9WS2-1, T2NR9WS2-2
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: T2NR9WS2-1, T2NR9WS2-2 3-10'x7' RCBC STA 4305+96**

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

   Location of Structure:

   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: T2NR9WS2-1, T2NR9WS2-2

Name of Structure: T2NR9WS2-1, T2NR9WS2-2 3-10'x7' RCBC STA 4305+96

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):
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.

Pages 3-10 Do Not Apply

D. DAM

Flooding Source:

Name of Structure:

1. This request is for (check one): ☐ Existing dam ☐ New dam ☐ Modification of existing dam
2. The dam was designed by (check one): ☐ Federal agency ☐ State agency ☐ Local government agency

   ☐ Private organization Name of the agency or organization:
3. Does the project involve revised hydrology? ☐ Yes ☐ No

   If Yes, complete the Riverine Hydrology & Hydraulics Form (Form 2).
4. Does the submittal include debris/sediment yield analysis? ☐ Yes ☐ No

   If yes, then fill out Section F (Sediment Transport).
   If No, then attach your explanation for why debris/sediment analysis was not considered.
5. Does the Base Flood Elevation behind the dam or downstream of the dam change?

   ☐ Yes ☐ No If Yes, complete the Riverine Hydrology & Hydraulics Form (Form 2) and complete the table below.

   Stillwater Elevation Behind the Dam

FREQUENCY (% annual chance)	FIS	REVISED
10-year (10%)		
50-year (2%)		
100-year (1%)		
500-year (0.2%)		
Normal Pool Elevation		

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

FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE STRUCTURES FORM

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Flooding Source: T2NR9WS2-1, T2NR9WS2-2
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: T2NR9WS2-1, T2NR9WS2-2 3-10'x7' RCBC STA 4308+80**

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

   Location of Structure:

   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: T2NR9WS2-1, T2NR9WS2-2

Name of Structure: T2NR9WS2-1, T2NR9WS2-2 3-10'x7' RCBC STA 4308+80

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):
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.

Pages 3-10 Do Not Apply

D. DAM

Flooding Source:

Name of Structure:

1. This request is for (check one): ☐ Existing dam ☐ New dam ☐ Modification of existing dam
2. The dam was designed by (check one): ☐ Federal agency ☐ State agency ☐ Local government agency

   ☐ Private organization Name of the agency or organization:
3. Does the project involve revised hydrology? ☐ Yes ☐ No

   If Yes, complete the Riverine Hydrology & Hydraulics Form (Form 2).
4. Does the submittal include debris/sediment yield analysis? ☐ Yes ☐ No

   If yes, then fill out Section F (Sediment Transport).
   If No, then attach your explanation for why debris/sediment analysis was not considered.
5. Does the Base Flood Elevation behind the dam or downstream of the dam change?

   ☐ Yes ☐ No If Yes, complete the Riverine Hydrology & Hydraulics Form (Form 2) and complete the table below.

Stillwater Elevation Behind the Dam

FREQUENCY (% annual chance)	FIS	REVISED
10-year (10%)		
50-year (2%)		
100-year (1%)		
500-year (0.2%)		
Normal Pool Elevation		

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

FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE STRUCTURES FORM

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Flooding Source: T2NR9WS12-1, T2NR9WS12-2
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: T2NR9WS12-1, T2NR9WS12-2 3-10'x6' RCBC STA 4322+17

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

Location of Structure:

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: T2NR9WS12-1, T2NR9WS12-2

Name of Structure: T2NR9WS12-1, T2NR9WS12-2 3-10'x6' RCBC STA 4322+17

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):
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.

Pages 3-10 Do Not Apply

D. DAM

Flooding Source:

Name of Structure:

1. This request is for (check one): ☐ Existing dam ☐ New dam ☐ Modification of existing dam
2. The dam was designed by (check one): ☐ Federal agency ☐ State agency ☐ Local government agency

   ☐ Private organization Name of the agency or organization:
3. Does the project involve revised hydrology? ☐ Yes ☐ No

   If Yes, complete the Riverine Hydrology & Hydraulics Form (Form 2).
4. Does the submittal include debris/sediment yield analysis? ☐ Yes ☐ No

   If yes, then fill out Section F (Sediment Transport).
   If No, then attach your explanation for why debris/sediment analysis was not considered.
5. Does the Base Flood Elevation behind the dam or downstream of the dam change?

   ☐ Yes ☐ No If Yes, complete the Riverine Hydrology & Hydraulics Form (Form 2) and complete the table below.

Stillwater Elevation Behind the Dam

FREQUENCY (% annual chance)	FIS	REVISED
10-year (10%)		
50-year (2%)		
100-year (1%)		
500-year (0.2%)		
Normal Pool Elevation		

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

FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE STRUCTURES FORM

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Flooding Source: T2NR9WS12-1, T2NR9WS12-2
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: T2NR9WS12-1, T2NR9WS12-2 3-10'x5' RCBC STA 4327+70

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

Location of Structure:

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: T2NR9WS12-1, T2NR9WS12-2

Name of Structure: T2NR9WS12-1, T2NR9WS12-2 3-10'x5' RCBC STA 4327+70

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):
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.

Pages 3-10 Do Not Apply

D. DAM

Flooding Source:

Name of Structure:

1. This request is for (check one): ☐ Existing dam ☐ New dam ☐ Modification of existing dam
2. The dam was designed by (check one): ☐ Federal agency ☐ State agency ☐ Local government agency

   ☐ Private organization Name of the agency or organization:
3. Does the project involve revised hydrology? ☐ Yes ☐ No

   If Yes, complete the Riverine Hydrology & Hydraulics Form (Form 2).
4. Does the submittal include debris/sediment yield analysis? ☐ Yes ☐ No

   If yes, then fill out Section F (Sediment Transport).
   If No, then attach your explanation for why debris/sediment analysis was not considered.
5. Does the Base Flood Elevation behind the dam or downstream of the dam change?

   ☐ Yes ☐ No If Yes, complete the Riverine Hydrology & Hydraulics Form (Form 2) and complete the table below.

Stillwater Elevation Behind the Dam

FREQUENCY (% annual chance)	FIS	REVISED
10-year (10%)		
50-year (2%)		
100-year (1%)		
500-year (0.2%)		
Normal Pool Elevation		

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

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Flooding Source: T2NR9WS12-1, T2NR9WS12-2
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: T2NR9WS12-1, T2NR9WS12-2 3-10'x4' RCBC STA 4333+30**

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

   Location of Structure:

   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: T2NR9WS12-1, T2NR9WS12-2

Name of Structure: T2NR9WS12-1, T2NR9WS12-2 3-10'x4' RCBC STA 4333+30

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):
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.

Pages 3-10 Do Not Apply

D. DAM

Flooding Source:

Name of Structure:

1. This request is for (check one): ☐ Existing dam ☐ New dam ☐ Modification of existing dam
2. The dam was designed by (check one): ☐ Federal agency ☐ State agency ☐ Local government agency

   ☐ Private organization Name of the agency or organization:
3. Does the project involve revised hydrology? ☐ Yes ☐ No

   If Yes, complete the Riverine Hydrology & Hydraulics Form (Form 2).
4. Does the submittal include debris/sediment yield analysis? ☐ Yes ☐ No

   If yes, then fill out Section F (Sediment Transport).
   If No, then attach your explanation for why debris/sediment analysis was not considered.
5. Does the Base Flood Elevation behind the dam or downstream of the dam change?

   ☐ Yes ☐ No If Yes, complete the Riverine Hydrology & Hydraulics Form (Form 2) and complete the table below.

Stillwater Elevation Behind the Dam

FREQUENCY (% annual chance)	FIS	REVISED
10-year (10%)		
50-year (2%)		
100-year (1%)		
500-year (0.2%)		
Normal Pool Elevation		

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

FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE STRUCTURES FORM

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Flooding Source: T2NR8WS8-2
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: T2NR8WS8-2 3-10'x4' RCBC STA 4448+80**

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

   Location of Structure:

   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: T2NR8WS8-2

Name of Structure: T2NR8WS8-2 3-10'x4' RCBC STA 4448+80

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):
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.

Pages 3-10 Do Not Apply

D. DAM

Flooding Source:

Name of Structure:

1. This request is for (check one): ☐ Existing dam ☐ New dam ☐ Modification of existing dam
2. The dam was designed by (check one): ☐ Federal agency ☐ State agency ☐ Local government agency

   ☐ Private organization Name of the agency or organization:
3. Does the project involve revised hydrology? ☐ Yes ☐ No

   If Yes, complete the Riverine Hydrology & Hydraulics Form (Form 2).
4. Does the submittal include debris/sediment yield analysis? ☐ Yes ☐ No

   If yes, then fill out Section F (Sediment Transport).
   If No, then attach your explanation for why debris/sediment analysis was not considered.
5. Does the Base Flood Elevation behind the dam or downstream of the dam change?

   ☐ Yes ☐ No If Yes, complete the Riverine Hydrology & Hydraulics Form (Form 2) and complete the table below.

Stillwater Elevation Behind the Dam

FREQUENCY (% annual chance)	FIS	REVISED
10-year (10%)		
50-year (2%)		
100-year (1%)		
500-year (0.2%)		
Normal Pool Elevation		

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

FEDERAL EMERGENCY MANAGEMENT AGENCY

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Flooding Source: T2NR8WS8-2
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: T2NR8WS8-2 3-10'x4' RCBC STA 4451+90**

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

   Location of Structure:

   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: T2NR8WS8-2

Name of Structure: T2NR8WS8-2 3-10'x4' RCBC STA 4451+90

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):
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.

Pages 3-10 Do Not Apply

D. DAM

Flooding Source:

Name of Structure:

1. This request is for (check one): ☐ Existing dam ☐ New dam ☐ Modification of existing dam
2. The dam was designed by (check one): ☐ Federal agency ☐ State agency ☐ Local government agency

   ☐ Private organization Name of the agency or organization:
3. Does the project involve revised hydrology? ☐ Yes ☐ No

   If Yes, complete the Riverine Hydrology & Hydraulics Form (Form 2).
4. Does the submittal include debris/sediment yield analysis? ☐ Yes ☐ No

   If yes, then fill out Section F (Sediment Transport).
   If No, then attach your explanation for why debris/sediment analysis was not considered.
5. Does the Base Flood Elevation behind the dam or downstream of the dam change?

   ☐ Yes ☐ No If Yes, complete the Riverine Hydrology & Hydraulics Form (Form 2) and complete the table below.

Stillwater Elevation Behind the Dam

FREQUENCY (% annual chance)	FIS	REVISED
10-year (10%)		
50-year (2%)		
100-year (1%)		
500-year (0.2%)		
Normal Pool Elevation		

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

FEDERAL EMERGENCY MANAGEMENT AGENCY

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Flooding Source: T2NR8WS9
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: T2NR8WS9 2-10'x4' RCBC STA 4507+87**

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

   Location of Structure:

   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: T2NR8WS9

Name of Structure: T2NR8WS9 2-10'x4' RCBC STA 4507+87

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):
   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.

Pages 3-10 Do Not Apply

D. DAM

Flooding Source:

Name of Structure:

1. This request is for (check one): ☐ Existing dam ☐ New dam ☐ Modification of existing dam
2. The dam was designed by (check one): ☐ Federal agency ☐ State agency ☐ Local government agency

   ☐ Private organization Name of the agency or organization:
3. Does the project involve revised hydrology? ☐ Yes ☐ No

   If Yes, complete the Riverine Hydrology & Hydraulics Form (Form 2).
4. Does the submittal include debris/sediment yield analysis? ☐ Yes ☐ No

   If yes, then fill out Section F (Sediment Transport).
   If No, then attach your explanation for why debris/sediment analysis was not considered.
5. Does the Base Flood Elevation behind the dam or downstream of the dam change?

   ☐ Yes ☐ No If Yes, complete the Riverine Hydrology & Hydraulics Form (Form 2) and complete the table below.

Stillwater Elevation Behind the Dam

FREQUENCY (% annual chance)	FIS	REVISED
10-year (10%)		
50-year (2%)		
100-year (1%)		
500-year (0.2%)		
Normal Pool Elevation		

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

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Flooding Source: T2NR8WS9
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: T2NR8WS9 10'x5' RCBC STA 4513+00

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

Location of Structure:

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: T2NR8WS9

Name of Structure: T2NR8WS9 10'x5' RCBC STA 4513+00

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):
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.

D. DAM

Flooding Source:

Name of Structure:

1. This request is for (check one): ☐ Existing dam ☐ New dam ☐ Modification of existing dam
2. The dam was designed by (check one): ☐ Federal agency ☐ State agency ☐ Local government agency

   ☐ Private organization Name of the agency or organization:
3. Does the project involve revised hydrology? ☐ Yes ☐ No

   If Yes, complete the Riverine Hydrology & Hydraulics Form (Form 2).
4. Does the submittal include debris/sediment yield analysis? ☐ Yes ☐ No

   If yes, then fill out Section F (Sediment Transport).
   If No, then attach your explanation for why debris/sediment analysis was not considered.
5. Does the Base Flood Elevation behind the dam or downstream of the dam change?

   ☐ Yes ☐ No If Yes, complete the Riverine Hydrology & Hydraulics Form (Form 2) and complete the table below.

Stillwater Elevation Behind the Dam

FREQUENCY (% annual chance)	FIS	REVISED
10-year (10%)		
50-year (2%)		
100-year (1%)		
500-year (0.2%)		
Normal Pool Elevation		

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

Section 3 Mapping and Survey Information

3.1 Field Survey Information

There was no field survey performed on Phase IV.

3.2 Mapping

JLK Engineers used existing digital elevations models (DEM) and digital terrain models (DTM) provided by the Flood Control District of Maricopa County. Stewart Geo Technologies, Inc. created the DTM from digital ortho-photos that were created as part of the Maricopa County Ortho-photo project in 2000 and 2001. The coordinate system is based on NAD 83, Arizona State Plane –Central Zone. The vertical coordinate system is NAVD 88.

Section 4 Hydrology

4.1 Method Description

The purpose of the hydrologic analysis is to provide peak flow data for the Zone A floodplain delineation of all washes in the Lower Centennial Wash watershed that have a drainage area of at least one-half square mile. Peak flows for the 100-year 6-hour and 100-year 24-hour storm were computed using the Army Corp of Engineers' Flood Hydrograph Package HEC-1, version 4.1, dated June 1998. Environmental Modeling Systems Incorporated's (EMS-1) Watershed Modeling System version 7.1 (WMS) 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 (FCDMC).

4.2 Parameter Estimation

Hydrologic parameters were estimated using the FCDMC's methodology, as outlined in Volume 1 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

The washes to be delineated were first identified based on their size and tributary area. These are washes that could potentially have a significant amount of flow. Drainage area boundaries were drawn using both topographic mapping and aerial photography. The basin boundaries were first drawn in AutoCAD and plotted for review and approval by the Flood Control District prior to hydrologic analysis. The approved basin boundaries were then exported out of AutoCAD as shape files and imported into the WMS model. Whenever there is a discrepancy between the topographic mapping and aerial photography, use of the aerial photography was emphasized in the delineation.

The drainage sub-basins delineation is shown on **FIGURE 4.1** with the aerial photography and **FIGURE 4.2** with the topography. The sub-basins and their concentrations points have corresponding numbers. The numbering system used to identify the sub-basins begins with the letter B and 3 digits with the smallest number in the most downstream end of the watershed. Washes that split or join together were given special attention. These were discussed with FCDMC before final delineation was submitted. There are two separate areas for the Phase IV study. It was identified as Watershed 1 and 2. Watershed 1 (Sub-basins B133-B143) is located south of the I-10 Freeway east of the Saddleback Diversion Channel. There was an additional wash within Sub-basin B134 that would be delineated. The flows to this additional wash were prorated based on watershed area within Sub-basin B134. The prorated basins are shown in **FIGURE 4.3**.

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B144-B149) is located north of the I-10 Freeway near the Salome Highway. This watershed lies between the Harquahala Flood Retarding Structure and the I-10 Freeway. The Harquahala Diversion Channel is located within the watershed.

Watershed 1 is mainly undeveloped upland desert and is bounded by mountainous terrain upstream. The downstream boundary is the Saddleback Diversion Channel.

Watershed 2 is also mainly undeveloped upland desert. The major feature of this watershed is the Harquahala Flood Retarding Structure that bounds it to the north. The I-10 Freeway bounds the watershed to the south.

4.2.2 Watershed Work Maps

FIGURE 4.3 shows the sub-basin boundaries, confluence or concentration points, and routing reaches. Each basin is labeled with a "B" and a number. The numbering for the basins starts at the most downstream confluence with Centennial Wash. The basin numbers increase going upstream. The left branch is numbered before the right branch. In other words, the numbering continues upstream on the left branch until that branch is complete and then the numbering resumes on the right branch. 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 4.4 shows the watershed boundaries overlain on top of the soil map units, according to the Gila Bend – Ajo Area and Maricopa County Central Part Soil Surveys. Figure 4.5 shows the land use designation for Phase IV.

4.2.3 Gage Data

Table 4.1 lists the rain gage locations within Phase IV.

Table 4.1 – List of Rain Gages in Phase IV

Gage I.D.	Name	Installation Date	Type	Location
5060	G & F Woolsey Peak	6/25/2003	Precip	8 Miles SW of Gillespie Dam
5075	Cruff Wash	5/14/2002	Precip	6 Miles W of Agua Caliente Rd. and Old US 80
5095	Webb Mountain	5/22/2002	Precip	4 Miles W of Agua Caliente and Old US 80

4.2.4 Statistical Parameters

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

4.2.5 Precipitation Values

The National Oceanic and Atmospheric Administration (NOAA) Atlas II was used to obtain a 100-year 24-hour and 6-hour point precipitation values for Phase IV of 4.1 inches and 3.3 inches, respectively. Because of the varying sizes of the sub-basins and large watershed within the study area, both the 100-yr 6-hour and the 100-year 24-hour storm were analyzed.

HEC-1's JD record option was used to reduce point precipitation values using the depth-area reduction factors from the DDM.

4.2.6 Physical Parameters

Rainfall Losses

The Green – Ampt infiltration equations were used within HEC-1 to estimate rainfall losses according to the procedures outlined in the DDM. The Flood Control District of Maricopa County DDMS, Version 2.1.0 program was used to calculate the logarithmic area averages of the hydraulic conductivities of each map unit within the sub-basin. This program also selects the wetting front capillary suction (PSIF) and soil moisture deficit (DTHETA) using the average XKSAT value. After the PSIF and DTHETA are calculated the XKSAT value was adjusted for vegetative cover. The data was then exported as a text file and later imported into the WMS.

A GIS based soil map of data from the SCS (Now NRCS) Soil Survey of Aguila-Carefree Area, Parts of Maricopa County and Pinal Counties, Arizona, issued April 1986, Maricopa County, Arizona, Central part, issued September 1977 and Gila Bend – Ajo Area, Arizona, Parts of Maricopa and Pima Counties, issued May 1997 was obtained from the FCDMC for input into WMS. This data was used to obtain soils information inside of Maricopa County.

A table relating the Map Unit numbers to the XKSAT values was obtained from the FCDMC. Table 4.3 lists the map unit values that were input into WMS to compute the rainfall losses. The various soil types are also shown in **FIGURE 4.4**.

TABLE 4.3-SOILS CHARACTERISTICS USED TO COMPUTE GREEN-AMPT PARAMETERS

SOIL ID	DESCRIPTION	XKSAT (in/hr)	% IMPERVIOUS	% EFFECTIVE
AbA	ANTHOSANDY LOAM, 0 TO 1 PERCENT SLOPES	0.38	0.0	100
AdA	ANTHO GRAVELLY SANDY LOAM, 0 TO 1 PERCENT SLOPES	0.40	0.0	100
Ae	ANTHO-BRIOS SANDY LOAMS	0.39	0.0	100
AfB	ANTHO-CARRIZO COMPLEX, 1 TO 3 PERCENT SLOPES	0.40	0.0	100
AGB	ANTHO-CARRIZO COMPLEX, 0 TO 3 PERCENT SLOPES	0.40	0.0	100
AL	ANTHO ASSOCIATION	0.40	0.0	100
AM	ANTHO-VALENCIA ASSOCIATION	0.39	0.0	100
Bs	BRIOS SANDY LOAM	0.39	0.0	100
CO	CHERIONO-ROCK OUTCROP COMPLEX	0.29	20.0	100
CV	COOLIDGE-LAVEN ASSOCIATION	0.39	0.0	100
Ge	GILMAN FINE SANDY LOAM	0.26	0.0	100
GM	GILMAN-ANTHO ASSOCIATION	0.29	0.0	100
GWD	GIUNSIGHT-PINAL COMPLEX, 1 TO 10 PERCENT SLOPES	0.35	0.0	100
GYD	GUNSIGHT-RILLITO COMPLEX, 0 TO 10 PERCENT SLOPES	0.26	0.0	100
HLC	HARQUA-GUNSIGHT COMPLEX, 0 TO 5 PERCENT SLOPES	0.14	0.0	100
Ma	MARIPO SANDY LOAM	0.40	0.0	100
PT	PINAL GRAVELLY LOAM	0.40	0.0	100

TABLE 4.3-SOILS CHARACTERISTICS USED TO COMPUTE GREEN-AMPT PARAMETERS (continued)

SOIL ID	DESCRIPTION	XKSAT (in/hr)	% IMPERVIOUS	% EFFECTIVE
RhB	RILLITO-HARQUA COMPLEX, 1 TO 3 PERCENT SLOPES	0.23	0.0	100
RS	ROCK OUTCROP-CHERIONI COMPLEX	0.40	65.0	100
TB	TORRIFLUVENTS	0.40	0.0	100
TrA	TREMANT-RILLITO COMPLEX, 0 TO 1 PERCENT SLOPES	0.11	0.0	100
Va	VALENCIA SANDY LOAM	0.39	0.0	100
Vb	VALENCIA SANDY LOAM, SALINE ALKALI	0.39	0.0	100
2	ANTHO GRAVELLY SANDY LOAMS	0.41	0.0	100
4	ANTHO-CARRIZO-MARIPO COMPLEX, LOW PRECIPITATION	0.58	0.0	100
20	CHUCKAWALLA-GUNSIGHT COMPLEX, LOW PRECIPITATION, 1 TO 8 PERCENT SLOPES	0.19	0.0	100
52	GACHADO-LOMITAS-ROCK OUTCROP COMPLEX, 7 TO 55 PERCENT SLOPES	0.16	20.0	100
59	GILMAN-MOMLI-DENURE COMPLEX, LOW PRECIPITATION	0.34	0.0	100
69	GUNSIGHT-CIPRIANO COMPLEX, LOW PRECIPITATION, 1 TO 7 PERCENT SLOPES	0.63	0.0	100
92	MOMOLI-CARRIZO COMPLEX, LOW PRECIPITATION	0.93	0.0	100

The FCDMC provided land use data in shape file (GIS) format based on Maricopa Association of Governments (MAG) Data. Table 4.4 lists the land use data that was imported into WMS to help determine rainfall losses. The land use data provides initial abstraction calculations, percent vegetation, which is used to adjust the XKSAT parameter and percent impervious. The land use areas are also shown in **FIGURE 4.5**.

TABLE 4.4-BASIN LAND USE CHARACTERISTICS USED TO COMPUTE GREEN-AMPT PARAMETERS

LAND USE ID	DESCRIPTION	INITIAL ABSTRACTION, Ia (in)	% IMPERVIOUS	% VEGETATION	SOIL CONDITION
610	TRANSPORTATION (INCLUDES RAILROADS, RAILYARDS, TRANSIT CENTERS AND FREEWAYS)	0.05	90	0.00	DRY
740	WATER	0.00	0	0.00	WET
900	VACANT (EXISTING LAND USE DATA BASE ONLY)	0.35	0	25.00	DRY

The values listed in Table 4.3 and 4.4 were used in WMS to calculate the Green-Ampt parameters for each sub-basin according to the FCDMC's methodology as outlined in the DDM. The results are listed in Table 4.5.

TABLE 4.5-GREEN-AMPT PARAMETERS

BASIN	Ia (in)	DTHETA (in)	PSIF (in)	XKSAT (in/hr)	RTIMP (%)
	(in)	(in)	(in)	(in/hr)	(%)
B133	0.35	0.35	4.55	0.35	9
B134	0.35	0.35	4.35	0.40	33
B135	0.35	0.35	4.70	0.31	0
B136	0.35	0.35	4.10	0.46	37
B137	0.35	0.35	4.20	0.43	10
B138	0.35	0.35	4.55	0.35	3
B139	0.35	0.35	4.00	0.47	61
B140	0.35	0.35	4.50	0.36	0

TABLE 4.5-GREEN-AMPT PARAMETERS (continued)

BASIN	Ia (in)	DTHETA (in)	PSIF (in)	XKSAT (in/hr)	RTIMP (%)
	(in)	(in)	(in)	(in/hr)	(%)
B142	0.35	0.35	4.50	0.36	37
B143	0.35	0.35	4.35	0.40	16
B144	0.34	0.34	4.30	0.41	29
B145	0.33	0.34	4.40	0.38	31
B146	0.34	0.34	4.15	0.44	0
B147	0.34	0.34	3.95	0.48	2
B148	0.34	0.35	3.55	0.62	0
B149	0.34	0.34	4.25	0.42	1

Unit Hydrograph Procedure

The S-Graph procedure was used to obtain the unit hydrographs for Phase IV because the total drainage area for Phase IV is greater than 10 square miles. Lag time is calculated using the following equation from the DDM (pg 5-24):

$$Lag = C*(L*L_{ca}/S^{p})^{m}$$

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

L = length of the longest 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 = $24k_n$, Coefficient that relates the watershed roughness.

C was obtained from Figure 5.11 of Appendix K in the DDM. The k_n value used (0.03) was obtained from Table 5.4 in the DDM. P is equal to 0.5, and m is equal to 0.38 according to the U.S. Army Corps of Engineers' equations. Table 4.6 summarizes the Lag Time calculations.

TABLE 4.6-SUB-BASIN LAG TIME SUMMARY

BASIN	L	Lca	*Slope	Lag	Lag
	(miles)	(mile)	(ft/mi)	(hrs)	(min)
B133	1.54	0.65	67.2	0.3	18
B134	3.83	1.94	148.4	0.60	36
B135	1.79	1.02	100.3	0.38	23
B136	2.69	1.40	171.5	0.45	27
B137	1.38	0.58	132.5	0.26	16
B138	2.14	1.24	66.6	0.47	28
B139	1.53	0.83	17.6	0.46	27
B140	1.43	0.86	81.6	0.34	20
B141	2.01	1.12	128.7	0.39	23
B142	3.25	1.23	166.1	0.46	28
B143	2.16	1.00	96.9	0.40	24
B144	2.84	1.69	173.6	0.49	29
B145	2.30	1.24	139.4	0.42	25
B146	2.87	1.08	54.9	0.52	31
B147	2.99	0.93	54.1	0.50	30
B148	3.06	1.22	49.9	0.57	34
B149	3.77	1.52	37.2	0.70	42

*Slope is adjusted per Equation 2-4 of the ADOT Highway Drainage Design Manual Hydrology, See Table 4.7

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 Phase IV was selected to be 5 minutes.

The S-Graph chosen to create the unit hydrographs for each model is the Phoenix Mountain S-Graph, as shown in the DDM. 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

In addition to the Saddleback Diversion Channel, there are four basins that required routing. Normal depth routing was performed in HEC-1 for these reaches. The cross-sections were created using RX and RY cards and data from the topography and As-Built plans. The channel slopes were adjusted using Equation 2-4 of the ADOT Highway Drainage Design Manual Hydrology, which adjusts the slope for a basin with varying slopes within the basin.

Saddleback Diversion Channel

There are four basins with reaches that are tributary to the Saddleback Diversion Channel that are not being delineated. Peak flows for these basins were determined using the HEC-1 model. Concentration points were assigned along the Saddleback Diversion Channel for these basins as shown in **FIGURE 4.6**. These basins are included in order to determine a peak flow for the Saddleback Diversion Channel. In addition to the flows tributary to the channel, a base flow of 1340 cfs was added at the upstream end for the hydraulic analysis of the Saddleback Diversion Channel. This flow was taken from the Saddleback Stage-Discharge Relation chart attached in **APPENDIX E.5** and applied as directed by the District.

TABLE 4.7-CHANNEL ROUTING PARAMETERS FOR NORMAL DEPTH ROUTING

			6 HOUR		24 HOUR	
Reach	Reach Length (ft)	Slope (ft/ft)	Lag (min)	NSTPS	Lag (min)	NSTPS
SADDLEBACK DIVERSION CHANNEL						
133A	3,623	0.0022	10	2	5	1
135	3,490	0.0022	5	1	10	2
135A	1,665	0.0022	5	1	5	1
138	1,450	0.0022	5	1	5	1
138A	3,326	0.0020	10	2	10	2
140	1,960	0.0020	5	1	5	1
140A	7,905	0.0018	25	5	25	5
143	3,505	0.0021	10	2	10	2
SUB BASINS						
134	5,121	0.0096	10	2	15	3
136	5,861	0.0139	10	2	15	3
139	11,299	0.0223	20	4	25	5
141	3,960	0.0111	5	1	10	2

4.3 Calibration

Recorded data for calibration was not available for Phase IV.

4.4 Final Results

Table 4.8 lists the results of the hydrologic analysis for the sub basins.

TABLE 4.8-HYDROLOGIC ANALYSIS RESULTS

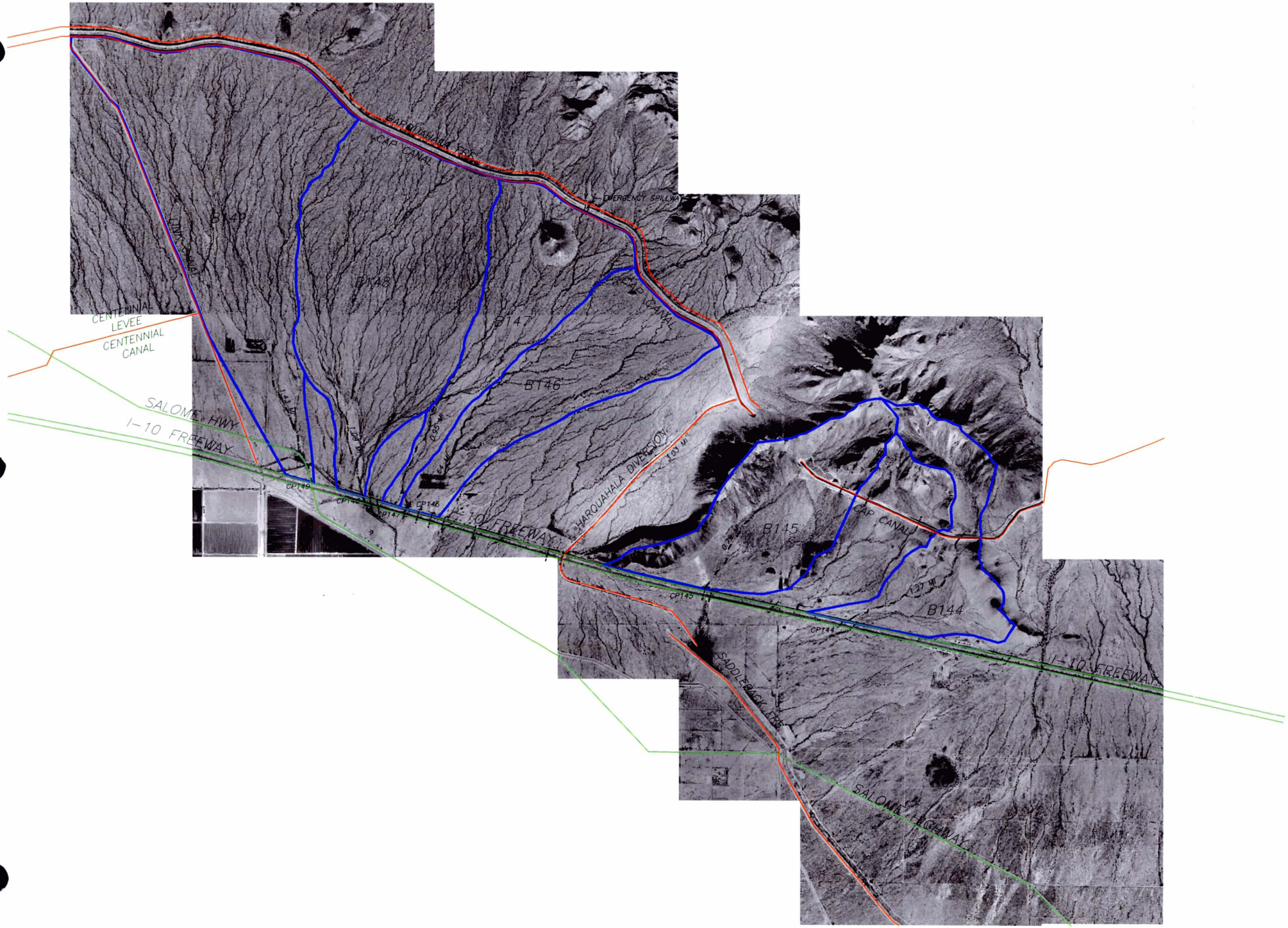
Drainage ID	Area (sq mi)	Peak Discharge (cfs)		Unit Peak (cfs/sq mi)	
		24-HR	6-HR	24-HR	6-HR
*B134	1.18	1137	1279	964	1084
*B134	0.24	231	260	963	1083
B134R	1.42	1264	1425	890	1004
B133	0.67	927	1179	1384	1760
CP133B	2.09	1513	1729	724	827
B133R	11.35	6551	5529	577	487
B137	0.63	930	1213	1476	1925
B136	1.00	1160	1377	1160	1377
CP136	1.63	1973	2070	1210	1270
B136R	1.63	1768	1854	1085	1137
B135	0.38	462	632	1216	1663
CP135B	2.01	2084	2131	1037	1060
B135R	8.64	5428	4718	628	546
B139	0.69	885	1145	1283	1659
B139R	0.69	707	932	1025	1351
B138	1.11	1129	1289	1017	1161
CP138B	1.80	1322	1556	734	864
B138R	6.15	4171	3860	678	628
B142	0.99	1463	1743	1478	1761
B141	0.85	1055	1273	1241	1498
CP141	1.84	2455	2573	1334	1398
B141R	1.84	2350	2404	1277	1307

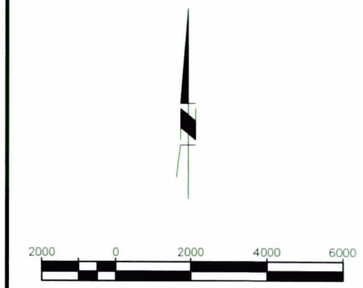
*Prorated Basin

TABLE 4.8-HYDROLOGIC ANALYSIS RESULTS (continued)

Drainage ID	Area (sq mi)	Peak Discharge (cfs)		Unit Peak (cfs/sq mi)	
		24-HR	6-HR	24-HR	6-HR
B140	0.60	748	988	1247	1647
CP140B	2.44	2864	2784	1174	1141
B140R	4.11	2972	2908	723	708
B143	1.07	1254	1429	1172	1336
B143R	1.07	1041	1252	973	1170
B149	3.36	2398	2269	714	675
B149R	3.36	2398	2269	714	675
B148	2.98	2183	1917	733	643
B148R	2.98	2183	1917	733	643
B147	1.38	1287	1418	933	1028
B147R	1.38	1287	1418	933	1028
B146	1.5	1378	1494	919	996
B146R	1.5	1378	1494	919	996
B145	1.53	1987	2164	1299	1414
B145R	1.53	1987	2164	1299	1414
B144	1.08	1219	1441	1129	1334
B144R	1.08	1219	1441	1129	1334

The HEC-1 results are also shown in **FIGURE 4.6** and the HEC-1 model runs follow. A regional regression equation was also determined for the sub basins and is included in this report. Separate graphs were calculated for the 100-year 6-hour storm and the 100-year 24-hour storm.





LEGEND

B133	SUB-BASIN ID
	SUB-BASIN BOUNDARY
CP133	SUB-BASIN CATCH POINT
	SUB-BASIN THALWAG
	CULVERT

LOWER CENTENNIAL
PHASE IV – FIGURE 4.1
SUB-BASIN BOUNDARIES W/AERIAL

JLK Engineers
Transportation Drainage Public Works
18441 N. 25th Ave., Suite 103
Phoenix, AZ 85023
Tel 602-405-1875
Fax 602-288-5781

Registered Professional Engineer (Civil) CERTIFICATE NO. 31474 JOE R. GONZALEZ Date Signed ARIZONA U.S.A.

LAYOUT	DRAFTED	CHECKED
JRG	NZ	PTG

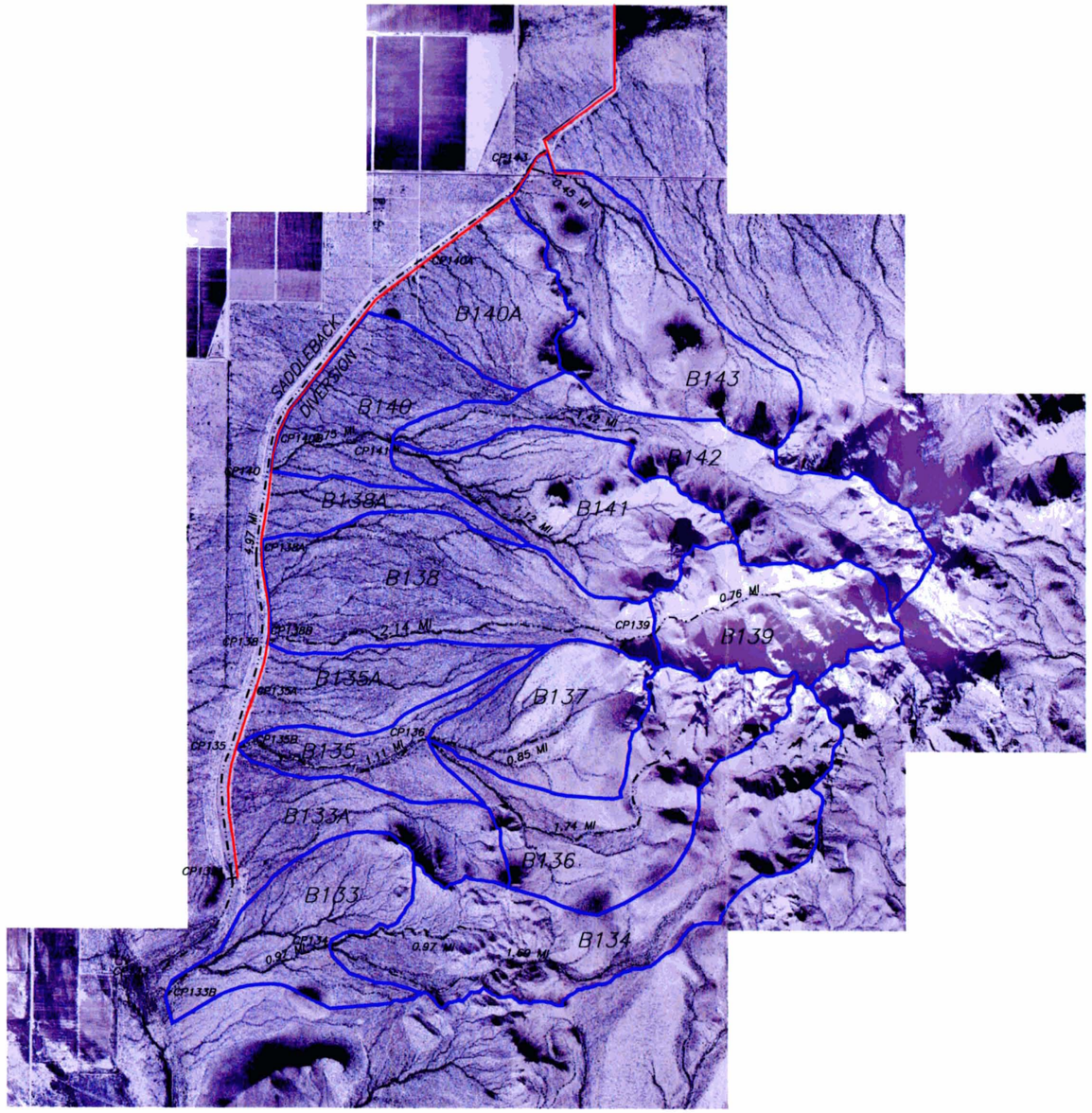
DRAWING SCALE(S)

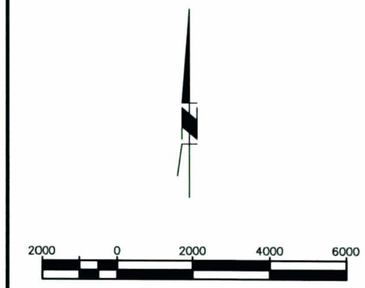
ORIGINAL PLAN DATE OCT./2005

LATEST REVISION

PROJECT NUMBER FCDMC0501

SHEET NO. 1 OF 2 SHEETS





LEGEND

B133	SUB-BASIN ID
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—·—·—	SUB-BASIN THALWAG
- - - - - -	CULVERT

LOWER CENTENNIAL
PHASE IV – FIGURE 4.1
SUB-BASIN BOUNDARIES W/AERIAL

JLK Engineers
Transportation Drainage Public Works
18441 N. 25th Ave., Suite 103
Phoenix, AZ 85023
Tel 602-405-1875
Fax 602-288-5781

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JRG	NZ	PTG

DRAWING SCALE(S)

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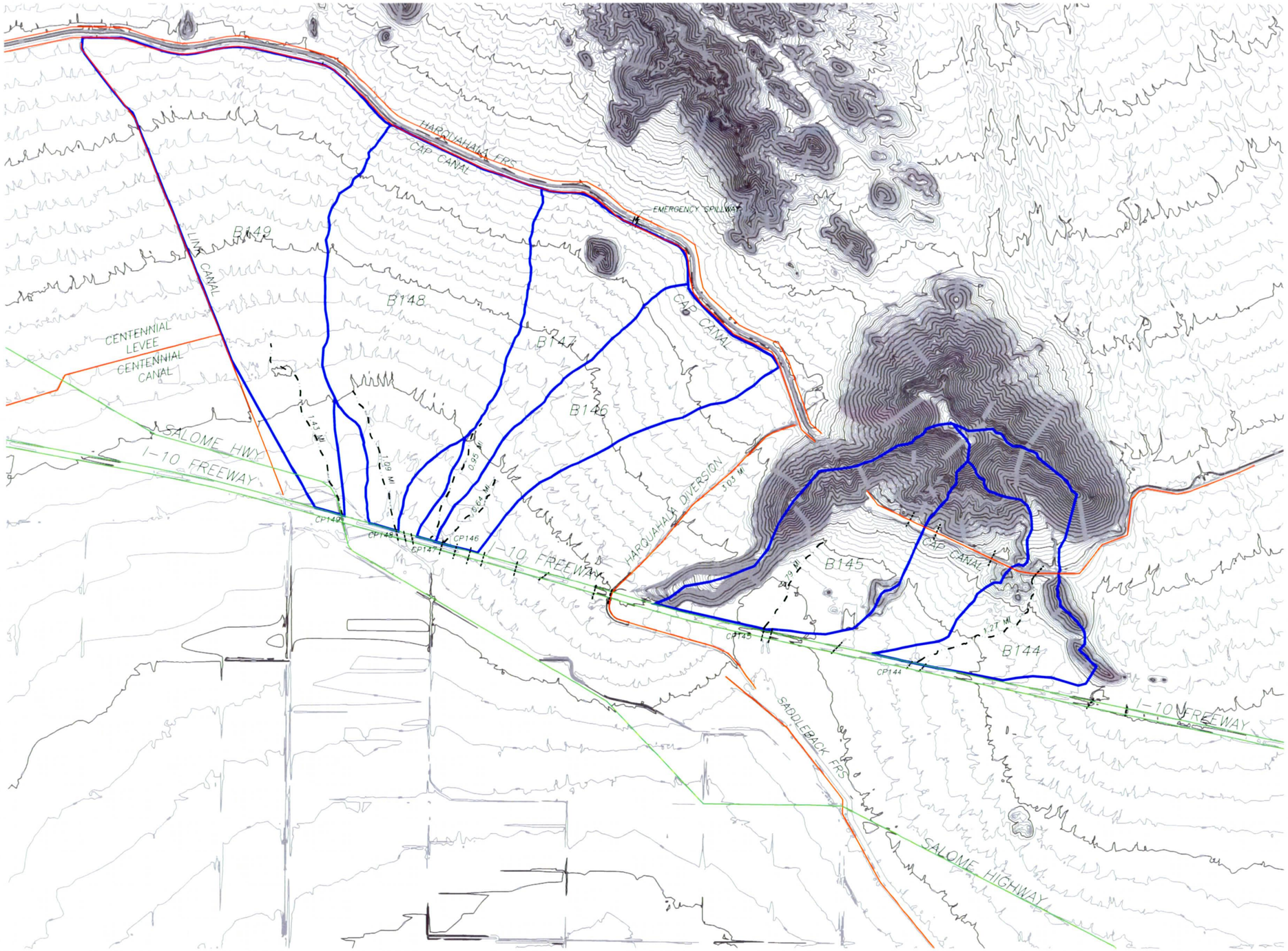
PROJECT NUMBER FCDMC0501

SHEET NO. 2 OF 2 SHEETS



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LEGEND

B133	SUB-BASIN ID
	SUB-BASIN BOUNDARY
CP133	SUB-BASIN CATCH POINT
	SUB-BASIN THALWAG
	CULVERT

LOWER CENTENNIAL
PHASE IV - FIGURE 4.2
SUB-BASIN BOUNDARIES W/TOPO

JLK Engineers
Transportation Drainage Public Works
18441 N. 25th Ave., Suite 103
Phoenix, AZ 85023
Tel 602-405-1875
Fax 602-288-5781

Registered Professional Engineer (Civil) CERTIFICATE 31474 JOE R. GONZALEZ Date Signed ARIZONA U.S.A.

LAYOUT	DRAFTED	CHECKED
JRG	NZ	PTG

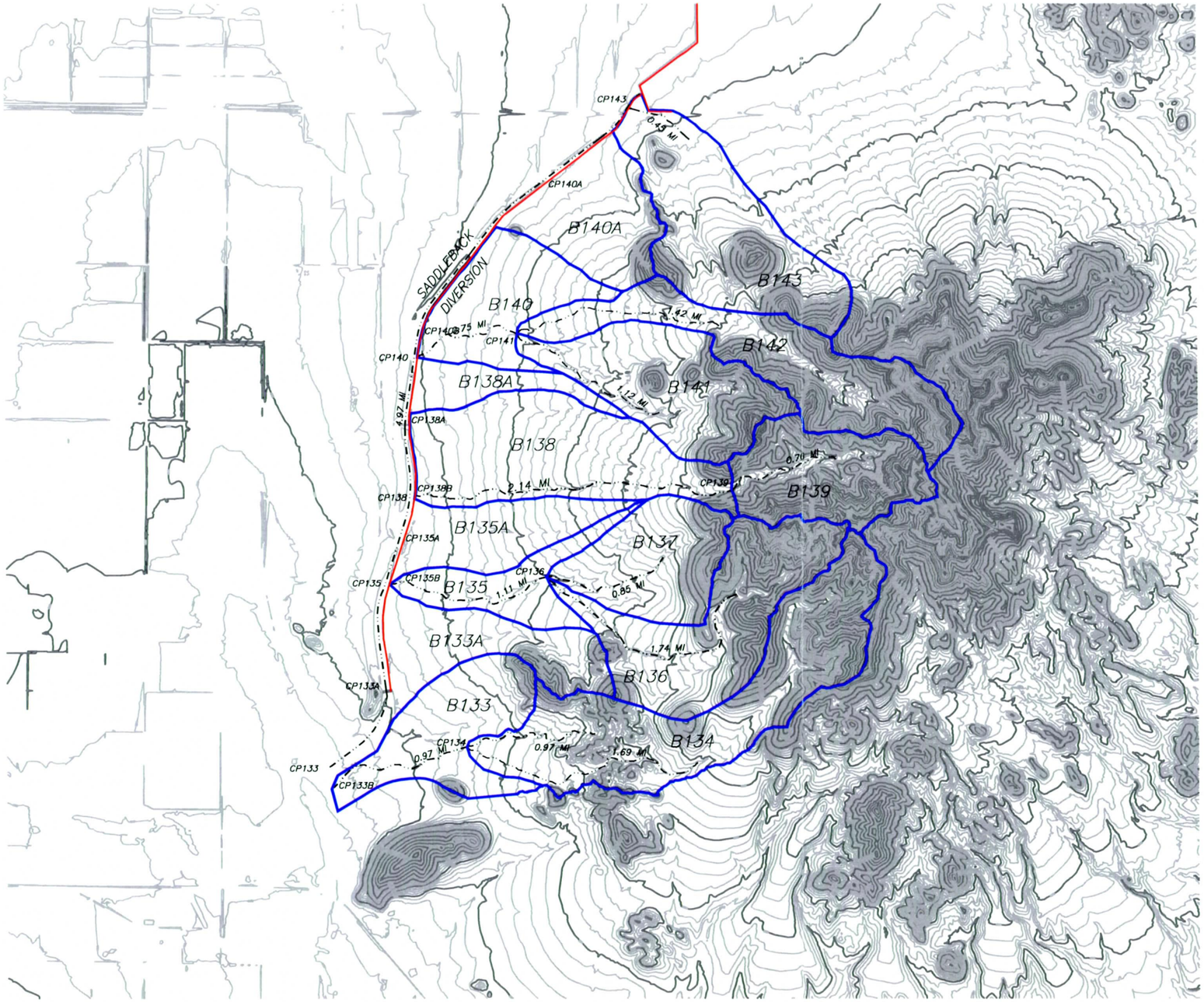
DRAWING SCALE(S)

ORIGINAL PLAN DATE OCT./2005

LATEST REVISION

PROJECT NUMBER FCDMC0501

SHEET NO. 1 OF 2 SHEETS



2000 0 2000 4000 6000

LEGEND

B133	SUB-BASIN ID
	SUB-BASIN BOUNDARY
CP133	SUB-BASIN CATCH POINT
	SUB-BASIN THALWAG
	CULVERT

LOWER CENTENNIAL
PHASE IV – FIGURE 4.2
SUB-BASIN BOUNDARIES W/TOPO

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Transportation Drainage Public Works
18441 N. 25th Ave., Suite 103
Phoenix, AZ 85023
Tel 602-405-1875
Fax 602-288-5781

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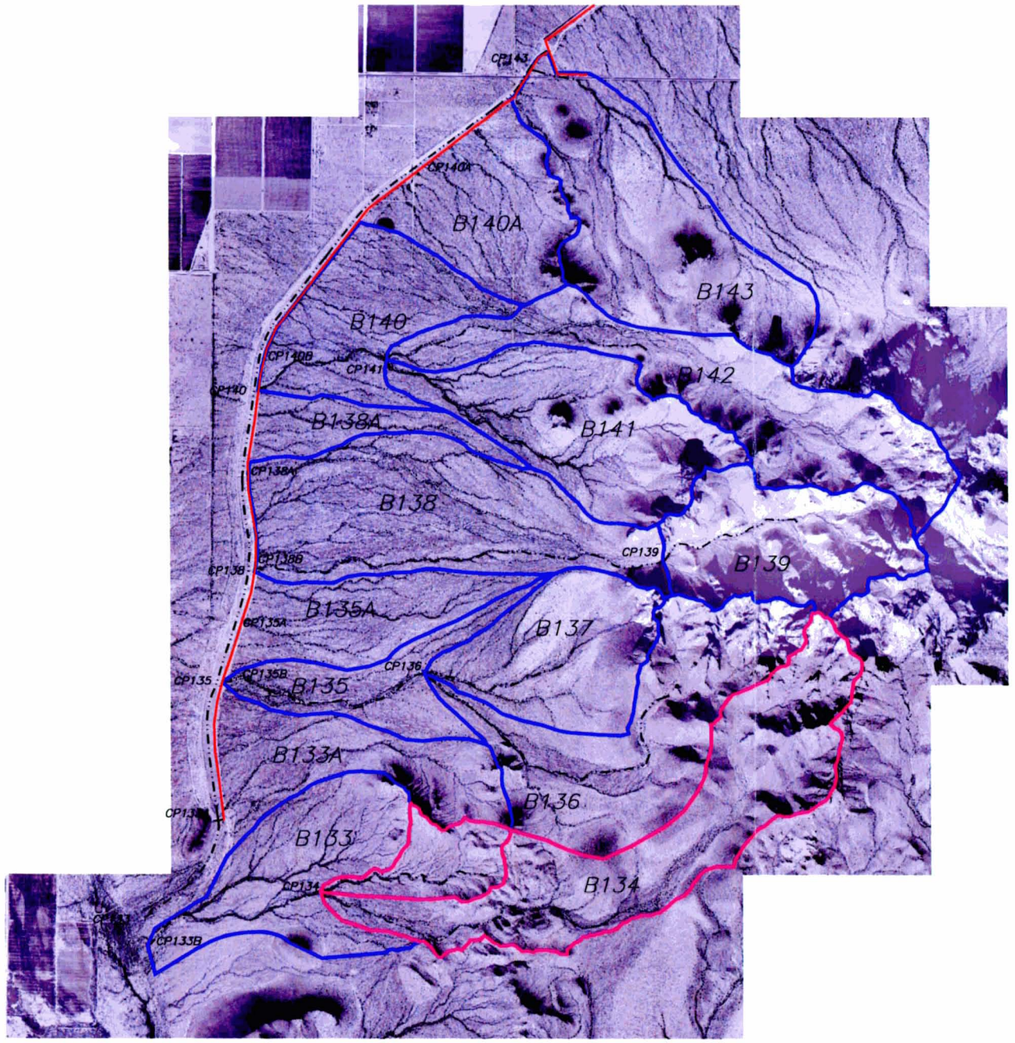
PROJECT NUMBER FCDMC0501

SHEET NO. 2 OF 2 SHEETS

31474 JOE R. GONZALEZ ARIZONA U.S.A.



2000 0 2000 4000 6000

LEGEND

B133	SUB–BASIN ID
	SUB–BASIN BOUNDARY
	SUB–BASIN THALWAG
	PRORATED BASINS

LOWER CENTENNIAL
PHASE IV – FIGURE 4.3
PRORATED BASINS

JLK Engineers
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18441 N. 25th Ave., Suite 103
Phoenix, AZ 85023
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Fax 602–288–5781

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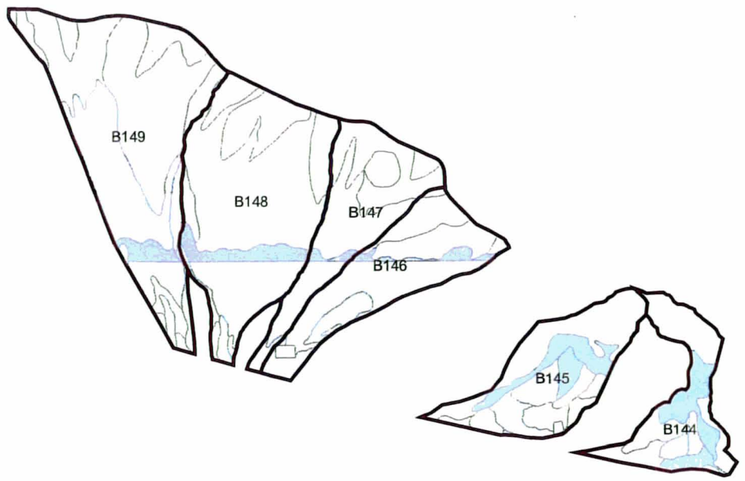
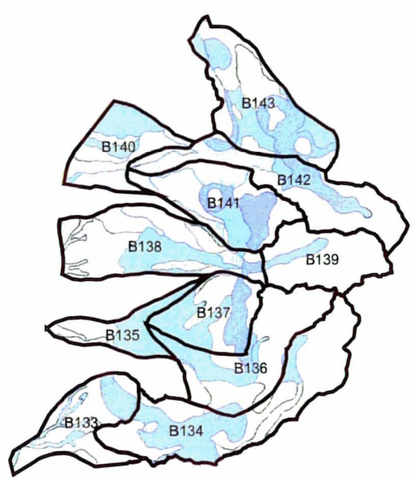
31474 JOSE R. GONZALEZ Registered Professional Engineer (Civil) ARIZONA U.S.A.

LOWER CENTENNIAL WASH WATERSHED
ZONE A FLOODPLAIN DELINEATION STUDY
PHASE IV-SOILS MAP
FIGURE 4.4





Legend

B145 PHASE IV-BASINS

SOILS

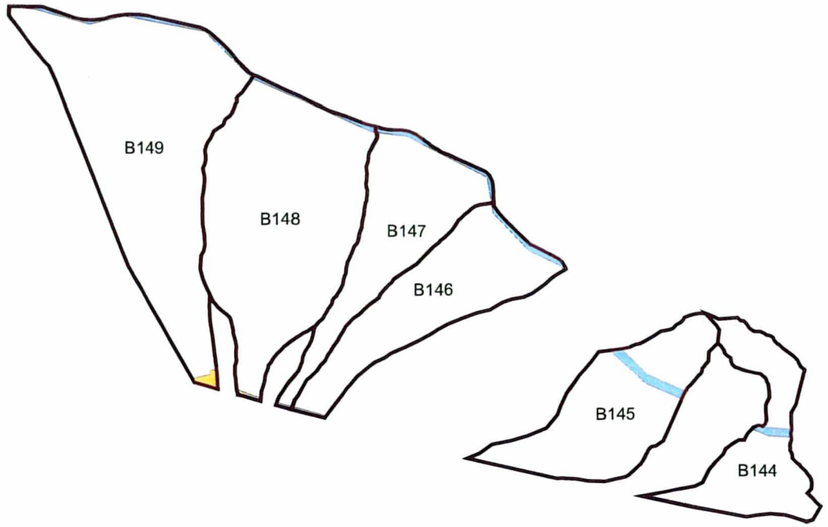
- Rock outcrop-Cherioni complex
- Antho association
- Antho gravelly sandy loam, 0 to 1 percent slopes
- Antho gravelly sandy loams
- Antho-Brios sandy loams
- Antho-Carrizo complex, 0 to 3 percent slopes
- Antho-Carrizo complex, 1 to 3 percent slopes
- Antho-Carrizo-Maripo complex, low precipitation
- Antho-Valencia association
- Anthosandy loam, 0 to 1 percent slopes
- Borrow pit
- Brios sandy loam
- Cheriono-Rock outcrop complex
- Chuckawalla-Gunsight complex, low precipitation, 1 to 8 percent slopes
- Coolidge-Laveen association
- Gachado-Lomitas-Rock outcrop complex, 7 to 55 percent slopes
- Gilman fine sandy loam
- Gilman-Antho association
- Gilman-Momoli-Denure complex, low precipitation
- Gunsight-Cipriano complex, low precipitation, 1 to 7 percent slopes
- Gunsight-Pinal complex, 1 to 10 percent slopes
- Gunsight-Rillito complex, 0 to 10 percent slopes
- Harqua-Gunsight complex, 0 to 5 percent slopes
- Maripo sandy loam
- Momoli-Carrizo complex, low precipitation
- Pinal gravelly loam
- Rillito loam, 0 to 1 percent slopes
- Rillito-Harqua complex, 1 to 3 percent slopes
- Torrifluvents
- Tremant-Rillito complex, 0 to 1 percent slopes
- Valencia sandy loam
- Valencia sandy loam, saline-alkali

N

0 0.5 1 2 3 4 Miles

JLK ENGINEERS

LOWER CENTENNIAL WASH WATERSHED
ZONE A FLOODPLAIN DELINEATION STUDY
PHASE IV-LAND USE MAP
FIGURE 4.5

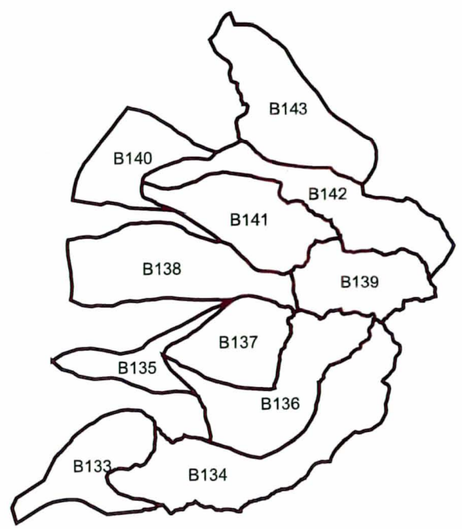


Legend

B145 PHASE IV-BASINS

LAND USES

- Transportation (Includes railroads, railyards, transit centers and freeways)
- Vacant (Existing land use database only)
- Water



N

0 0.5 1 2 3 4 Miles

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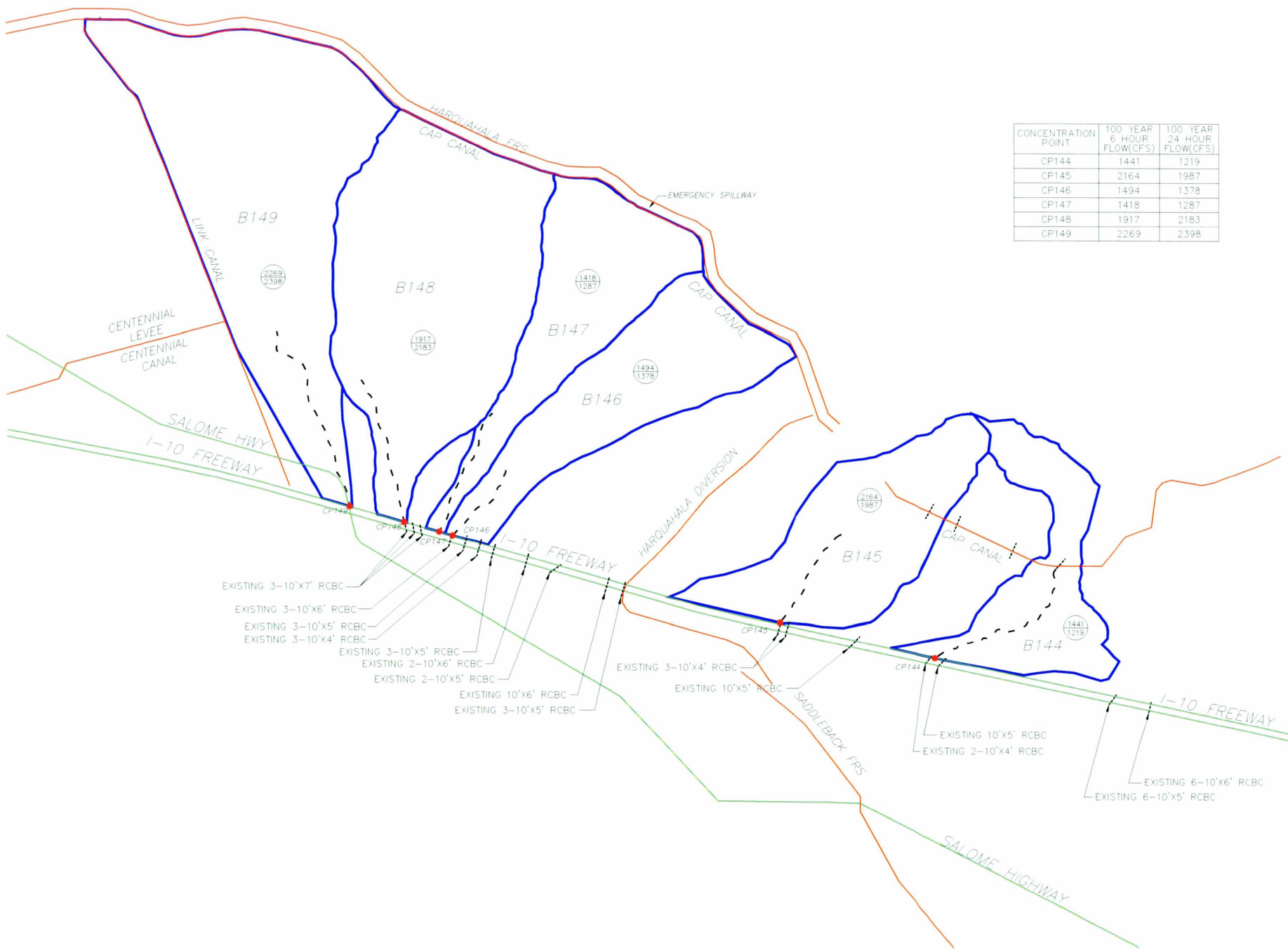

CONCENTRATION POINT	100 YEAR 6 HOUR FLOW(CFS)	100 YEAR 24 HOUR FLOW(CFS)
CP144	1441	1219
CP145	2164	1987
CP146	1494	1378
CP147	1418	1287
CP148	1917	2183
CP149	2269	2398

2000 0 2000 4000 6000

LEGEND

B133	SUB-BASIN ID
	SUB-BASIN BOUNDARY
CP133	SUB-BASIN CATCH POINT
	SUB-BASIN THALWAG
	CULVERT
B134R	REACH ID
	CONCENTRATION POINT
6HR/24HR	BASIN PEAK FLOW
6HR-24HR	ROUTING FLOW

LOWER CENTENNIAL
PHASE IV - FIGURE 4.6
HEC-1 MODEL RESULTS

JLK Engineers
Transportation Drainage Public Works
18441 N. 25th Ave., Suite 103
Phoenix, AZ 85023
Tel 602-405-1875
Fax 602-288-5781

Registered Professional Engineer (Civil) CERTIFICATE NO. 31474 JOE R. GONZALEZ Date Signed ARIZONA U.S.A.

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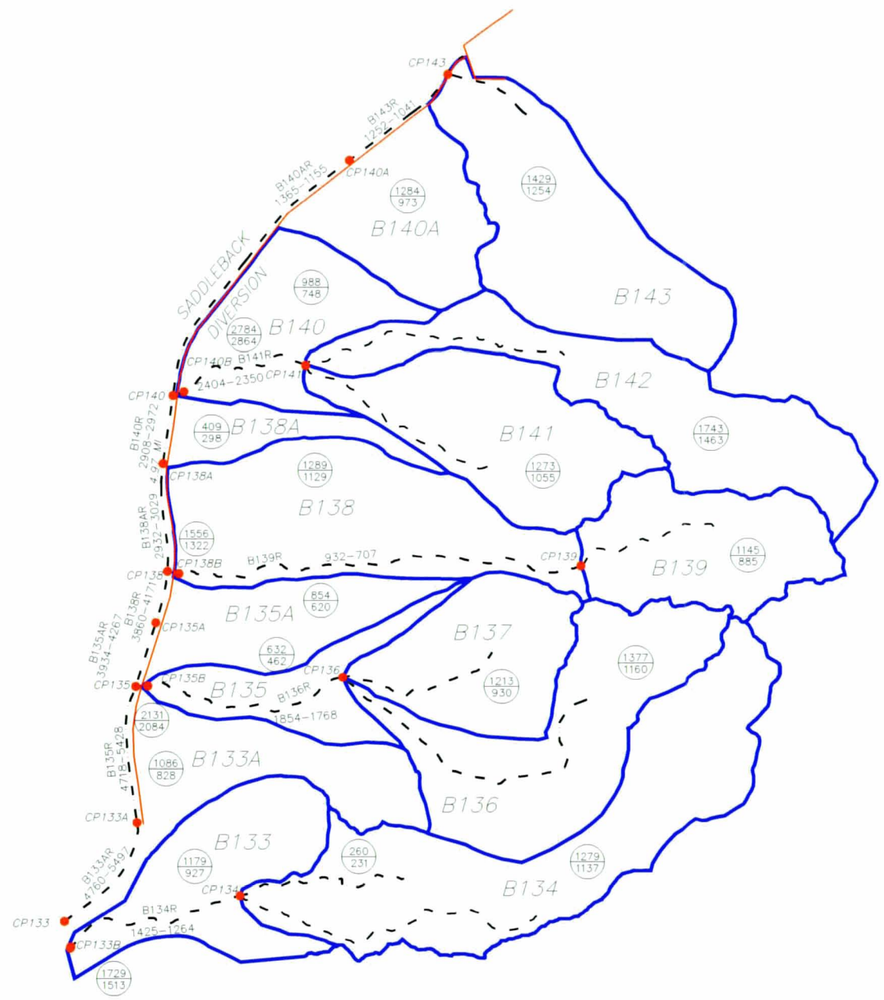

CONCENTRATION POINT	100 YEAR 6 HOUR FLOW(CFS)	100 YEAR 24 HOUR FLOW(CFS)
CP133	5529	6551
CP133A	4822	5570
CP133B	1729	1513
CP134	1539	1368
CP135	4865	5514
CP135A	3961	4314
CP135B	2131	2084
CP136	2070	1936
CP138	3880	4206
CP138A	2979	3114
CP138B	1556	1322
CP139	1145	885
CP140	2954	3035
CP140A	1564	1356
CP140B	2784	2864
CP141	2573	2455
CP143	1429	1254

SADDLEBACK DIVERSION CHANNEL*
WITH OUTFALL FLOW Q=1340 cfs

CONCENTRATION POINT	100 YEAR 6 HOUR FLOW(CFS)	100 YEAR 24 HOUR FLOW(CFS)
CP133	6869	7891
CP135	6205	6854
CP138	5220	5546
CP140	4294	4375
CP143	2769	2594

*Used for Hydraulic Analysis

ROUTED FLOWS	100 YEAR 6 HOUR FLOW(CFS)	100 YEAR 24 HOUR FLOW(CFS)
B133AR	4760	5497
B135R	4718	5428
B135AR	3934	4267
B138R	3860	4171
B138AR	2932	3029
B140R	2908	2972
B140AR	1365	1155
B143R	1252	1041
B134R	1425	1264
B136R	1854	1768
B139R	932	707
B141R	2404	2350

2000 0 2000 4000 6000

LEGEND

B133	SUB-BASIN ID
	SUB-BASIN BOUNDARY
CP133	SUB-BASIN CATCH POINT
	SUB-BASIN THALWAG
	CULVERT
B134R	REACH ID
	CONCENTRATION POINT
6HR/24HR	BASIN PEAK FLOW
6HR-24HR	ROUTING FLOW

LOWER CENTENNIAL
PHASE IV – FIGURE 4.6
HEC-1 MODEL RESULTS

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Fax 602-288-5781

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Section 5 Hydraulics

5.1. Method Description

All of the washes delineated in this study are desert washes. Environmental Modeling Systems Incorporated's (EMS-I) Watershed Modeling System (WMS) version 7.1 was used to create cross sections from the existing elevation data provided by the Flood Control District. WMS was used to obtain cross sections and calculate both the normal and critical depths for each cross section. Locations of the cross sections are shown on the Works Study Maps. Floodplain boundaries were then delineated utilizing the cross section data and topographic contour lines provided by the Flood Control District.

The name for each wash was determined by the location (Township Range and Section) of the wash discharge point into the existing Centennial Wash floodplain. Tributaries were numbered in a clockwise fashion from the wash discharge point. Similarly, reaches were numbered in a clockwise fashion from the tributary discharge point. River stationing was reset for each wash tributary and reach, except for the main branch of each wash, which was stationed continuously.

The floodplain delineation used the larger flow between the 100-year 6-hour and 100-year 24-hour storm at the confluence with Centennial Wash, Saddleback Diversion Channel and Interstate 10 Freeway. The storm that produced the larger flow was then used for the washes connected to that concentration point with Centennial Wash, Saddleback Diversion Channel and Interstate 10 Freeway.

In cases where the upstream flow was higher than the downstream flow, the flow at each cross section was linearly interpolated by length between the two nearest concentration points. The flow for these smaller basins was determined using the regression equation developed in Phase IV by the detailed hydrology. Table 5.2 shows the results used in the floodplain mapping including the flow and how it was determined.

5.2. Work Study Maps

Work Study Maps that show the floodplain delineation 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 boundaries, and the cross sections used in the delineation. The half-size copies of the Work Study Maps are included in **APPENDIX E.6**.

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 a description of how the roughness coefficients were obtained is provided in **APENDIX E.1**.

5.4 Cross Section Description

Cross sections were located at approximately half-mile intervals along the washes. Additionally, cross sections were located near confluences and at particular strategic locations. Some locations were less than ideal due to mapping issues, which are discussed in Section 5.7. The cross sections are oriented left to right looking upstream.

The cross sections were imported into WMS and placed over the Digital Elevation Model (DEM). Tools within WMS were then used to cut the cross sections and weed out any unnecessary points. The peak flows listed in Table 5.1 were then used in WMS's channel calculator to calculate both critical depth and normal depth at each cross section. The flows generated by the 100-year 6-hour and 100-year 24-hour storms were compared at the downstream outlet of each wash. The storm that produced the higher flow at that location was utilized to produce flows for all cross sections of the wash. If flow was supercritical, then critical depth was used to plot the floodplain boundaries. A plot of each cross section and the normal and critical depth calculation results are provided in Appendix E.5.

5.5 Modeling Considerations

The analysis in this study only generates approximate Zone A delineations. There are other modeling considerations that are required for a detailed study that were not considered in this report.

5.6 Floodway Modeling

This study only generates approximate Zone A delineations, floodways were not modeled.

5.7 Problems Encountered During the Study

Certain anomalies were present in the topographic data provided by the FCDMC, which made it difficult to cut truly representative cross sections in many locations. Due to the same problem, the data suggests (in many locations) an improper location for the thalweg of some washes. Utilizing the aerial photography provided by the FCDMC to assist in the thalweg location rectified this problem. As for the cross sections, trouble areas were avoided. Trouble areas were rectified by adjusting section locations and intensified aerial photo interpretations.

There are several existing culverts in watersheds north of the Interstate 10 Freeway and are shown in the Work Study Maps. As a conservative approach, the metering of flows for the existing culverts along the CAP Canal was not considered. The area north of the CAP Canal was considered as part of the watershed.

In addition, the existing culverts along the Interstate 10 Freeway were analyzed in order to establish a floodplain north of the freeway. Only the culverts that fall within the sub-basins were analyzed in this study. As-built information was obtained from ADOT and is attached in **APPENDIX E.7**. The HAESTAD Culvert Master software program was used to determine the headwater elevations at the inlets of the culverts. The higher of the 100-year 6-hour and 100- year 24-hour storm flows were used for the calculations. The calculated peak flows from tributary basins were distributed amongst the culverts based on cross sectional areas of the reinforced concrete box culverts (RCBC). The headwater elevations were calculated for the peak flows and culvert capacity. The higher of the two calculated headwater elevations was used to establish a floodplain. A summary of the culvert analysis results are listed in Table 5.3.

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 to determine which will be used for floodplain mapping. 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, as a conservative measure. Table 5.2 lists the values used to map the floodplain.

Table 5.1-Results of Hydraulic Calculations

Wash	R.S. (mile)	Peak Q (cfs)	Normal Depth Calculations				Critical Depth Calculations		
			Depth (ft)	Top Width (ft)	Average Velocity (ft/sec)	Froude No.	Depth (ft)	Top Width (ft)	Average Velocity (ft/sec)
T1NR8WS29-2 Reach 1	0.110	7805	3.0	871	4.5	0.57	2.3	748	7.0
T1NR8WS29-2 Reach 1	0.589	7432	2.9	419	6.8	0.74	2.4	413	8.3
T1NR8WS29-2 Reach 1	1.203	6953	4.7	338	5.4	0.49	3.2	317	8.9
T1NR8WS29-2 Reach 2	1.730	5996	4.8	316	5.2	0.48	3.3	294	8.7
T1NR8WS29-2 Reach 3	2.212	5188	4.6	272	4.8	0.42	2.6	242	8.8
T1NR8WS29-2 Reach 3	2.665	4592	4.6	272	4.8	0.42	2.6	242	8.8
T1NR8WS29-2 Reach 4	3.165	4127	4.8	207	4.7	0.40	2.7	184	9.0
T1NR8WS29-2 Reach 4	3.675	3750	6.0	177	4.8	0.41	3.7	154	9.2
T1NR8WS29-2 Reach 4	4.176	3379	7.7	454	2.6	0.28	3.8	106	10.1
T1NR8WS29-2 Reach 4	4.674	3010	8.7	128	4.8	0.38	4.9	75	10.9
T1NR8WS29-1 Reach 1	0.028	1729	1.9	563	2.8	0.47	1.4	516	4.8
T1NR8WS29-1 Reach 1	0.496	1729	2.1	390	3.4	0.53	1.6	334	5.5
T1NR8WS29-1 Reach 1	0.937	1729	1.2	1152	2.1	0.46	0.8	1039	3.8
T1NR8WS29-1 Reach 2	1.464	1279	2.6	307	4.7	0.87	2.6	299	5.2
T1NR8WS29-1 Reach 2	2.025	1279	2.8	97	8.7	1.24	3.0	102	7.4
T1NR8WS29-1 Reach 2	2.520	1279	2.6	89	8.3	1.11	2.7	92	7.7
T1NR8WS29-1 Reach 1 Tributary 1	0.093	260	1.0	204	2.7	0.68	0.8	184	3.6

Table 5.1-Results of Hydraulic Calculations (continued)

Wash	R.S. (mile)	Peak Q (cfs)	Normal Depth Calculations				Critical Depth Calculations		
			Depth (ft)	Top Width (ft)	Average Velocity (ft/sec)	Froude No.	Depth (ft)	Top Width (ft)	Average Velocity (ft/sec)
T1NR8WS29-1 Reach 1 Tributary 1	0.570	260	1.2	87	5.1	1.19	1.3	93	4.5
T1NR8WS29-1 Reach 1 Tributary 1	0.941	260	0.7	129	5.3	1.49	0.9	136	3.9
T1NR8WS20 Reach 1	0.028	2131	4.2	580	3.3	0.55	3.7	388	5.6
T1NR8WS20 Reach 1	0.555	2131	3.2	179	6.9	0.92	3.1	171	7.4
T1NR8WS20 Reach 1	1.025	2131	2.0	224	7.1	1.07	2.1	229	6.7
T1NR8WS20 Reach 2	1.501	1377	2.9	109	8.4	1.20	3.1	118	7.2
T1NR8WS20 Reach 2	2.017	1377	3.4	80	9.0	1.15	3.6	84	8.1
T1NR8WS20 Reach 2	2.485	1377	2.3	133	8.5	1.36	2.6	141	6.8
T1NR8WS20 Reach 1 Tributary 1	0.065	1213	2.4	145	7.1	1.16	2.5	153	6.4
T1NR8WS20 Reach 1 Tributary 1	0.771	1213	2.0	104	9.1	1.42	2.4	116	7.0
T1NR8WS17 Reach 1	0.028	1556	1.6	542	3.8	0.77	1.4	507	4.6
T1NR8WS17 Reach 1	0.555	1556	1.4	237	7.7	1.46	1.7	270	5.7
T1NR8WS17 Reach 1	1.003	1556	3.3	102	8.4	1.10	3.4	106	7.8
T1NR8WS17 Reach 1	1.504	1556	2.1	379	4.6	0.87	2.0	365	5.2
T1NR8WS17 Reach 1	2.012	1556	2.7	71	11.5	1.48	3.3	81	8.5
T1NR8WS17 Reach 2	2.495	1145	2.7	151	7.4	1.29	2.9	153	6.2
T1NR8WS8 Reach 1	0.028	2784	2.7	828	3.3	0.58	2.2	507	5.6

Table 5.1-Results of Hydraulic Calculations (continued)

Wash	R.S. (mile)	Peak Q (cfs)	Normal Depth Calculations				Critical Depth Calculations		
			Depth (ft)	Top Width (ft)	Average Velocity (ft/sec)	Froude No.	Depth (ft)	Top Width (ft)	Average Velocity (ft/sec)
T1NR8WS8 Reach 1	0.732	2784	2.2	291	6.5	0.95	2.1	289	6.8
T1NR8WS8 Reach 1 Tributary 1	1.001	1273	2.1	126	7.1	1.06	2.2	128	6.9
T1NR8WS8 Reach 1 Tributary 1	1.630	1273	27.0	77	9.1	1.20	2.9	82	7.9
T1NR8WS8 Reach 2	0.092	1743	3.1	131	8.0	1.09	3.2	137	7.4
T1NR8WS8 Reach 2	0.651	1743	1.9	452	4.1	0.74	1.7	421	5.1
T1NR8WS8 Reach 2	1.301	1743	2.6	104	11.1	1.58	3.2	124	7.7
T2NR8WS34 Reach 1	0.019	1429	2.3	254	4.2	0.64	1.9	223	5.9
T2NR8WS34 Reach 1	0.393	1429	2.0	239	4.9	0.78	1.8	213	6.0
T2NR8WS9 Reach 1	0.028	1441	2.4	243	4.0	0.58	1.9	218	6.0
T2NR8WS9 Reach 1	0.628	1441	1.8	288	4.6	0.79	1.6	266	5.6
T2NR8WS9 Reach 1	1.119	1441	2.8	138	7.6	1.14	2.9	145	6.0
T2NR8WS8 Reach 1	0.019	2164	1.3	980	2.6	0.50	1.0	811	4.4
T2NR8WS8 Reach 1	0.140	2164	1.5	1408	2.1	0.44	1.1	959	4.2
T2NR8WS8 Reach 1	0.607	2164	1.8	333	5.4	0.87	1.7	312	6.1
T2NR9WS12-2 Reach 1	2.012	1494	2.1	615	2.5	0.44	1.5	407	4.9
T2NR9WS12-2 Reach 1	2.495	1494	1.8	193	6.2	0.99	1.7	193	6.3
T2NR9WS12-1 Reach 1	0.028	1418	2.5	792	2.2	0.43	1.9	392	4.9

Table 5.1-Results of Hydraulic Calculations (continued)

Wash	R.S. (mile)	Peak Q (cfs)	Normal Depth Calculations				Critical Depth Calculations		
			Depth (ft)	Top Width (ft)	Average Velocity (ft/sec)	Froude No.	Depth (ft)	Top Width (ft)	Average Velocity (ft/sec)
T2NR9WS12-1 Reach 1	0.482	1418	2.5	792	2.2	0.43	1.9	392	4.9
T2NR9WS12-1 Reach 1	0.926	1418	2.8	671	2.3	0.41	2.3	589	4.3
T2NR9WS2-2 Reach 1	0.028	2183	2.4	763	2.1	0.31	1.5	514	5.2
T2NR9WS2-2 Reach 1	0.500	2183	1.6	1210	2.1	0.39	1.1	975	4.2
T2NR9WS2-2 Reach 1	0.897	2183	1.3	489	4.6	0.80	1.2	463	5.3
T2NR9WS2-1 Reach 1	0.028	2398	3.1	561	2.0	0.25	1.2	365	6.0
T2NR9WS2-1 Reach 1	0.204	2398	1.5	889	2.7	0.47	0.9	678	4.8
T2NR9WS2-1 Reach 1	0.571	2398	1.5	1686	1.7	0.32	0.9	1236	4.0
T2NR9WS2-1 Reach 1	1.138	2398	1.7	456	4.5	0.72	1.4	392	5.8

Table 5.2-Hydraulic Calculations Used in Floodplain Mapping

Wash	R.S. (mile)	Peak Q (cfs)	Depth Used	Depth (ft)	Top Width (ft)	Average Velocity (ft/sec)
T1NR8WS29-2 Reach 1	0.110	7805 *(L)	Subcritical	3.0	871	4.5
T1NR8WS29-2 Reach 1	0.589	7432 *(L)	Subcritical	2.9	419	6.8
T1NR8WS29-2 Reach 1	1.203	6953 *(L)	Subcritical	4.7	338	5.4
T1NR8WS29-2 Reach 2	1.730	5996 *(L)	Subcritical	4.8	316	5.2
T1NR8WS29-2 Reach 3	2.212	5188 *(L)	Subcritical	4.6	272	4.8
T1NR8WS29-2 Reach 3	2.665	4592 *(L)	Subcritical	4.6	272	4.8
T1NR8WS29-2 Reach 4	3.165	4127 *(L)	Subcritical	4.8	207	4.7
T1NR8WS29-2 Reach 4	3.675	3750 *(L)	Subcritical	6.0	177	4.8
T1NR8WS29-2 Reach 4	4.176	3379 *(L)	Subcritical	7.7	454	2.6
T1NR8WS29-2 Reach 4	4.674	3010 *(L)	Subcritical	8.7	128	4.8
T1NR8WS29-1 Reach 1	0.028	1729	Subcritical	1.9	563	2.8
T1NR8WS29-1 Reach 1	0.496	1729	Subcritical	2.1	390	3.4
T1NR8WS29-1 Reach 1	0.937	1729	Subcritical	1.2	1152	2.1
T1NR8WS29-1 Reach 2	1.464	1279	Subcritical	2.6	307	4.7
T1NR8WS29-1 Reach 2	2.025	1279	Critical	3.0	102	7.4
T1NR8WS29-1 Reach 2	2.520	1279	Critical	2.7	92	7.7
T1NR8WS29-1 Reach 1 Tributary 1	0.093	260 (P)	Subcritical	1.0	204	2.7

Table 5.2-Hydraulic Calculations Used in Floodplain Mapping (continued)

Wash	R.S. (mile)	Peak Q (cfs)	Depth Used	Depth (ft)	Top Width (ft)	Average Velocity (ft/sec)
T1NR8WS29-1 Reach 1 Tributary 1	0.570	260 (P)	Critical	1.3	93	4.5
T1NR8WS29-1 Reach 1 Tributary 1	0.941	260 (P)	Critical	0.9	136	3.9
T1NR8WS20 Reach 1	0.028	2131	Subcritical	4.2	580	3.3
T1NR8WS20 Reach 1	0.555	2131	Subcritical	3.2	179	6.9
T1NR8WS20 Reach 1	1.025	2131	Critical	2.1	229	6.7
T1NR8WS20 Reach 2	1.501	1377	Critical	3.1	118	7.2
T1NR8WS20 Reach 2	2.017	1377	Critical	3.6	84	8.1
T1NR8WS20 Reach 2	2.485	1377	Critical	2.6	141	6.8
T1NR8WS20 Reach 1 Tributary 1	0.065	1213	Critical	2.5	153	6.4
T1NR8WS20 Reach 1 Tributary 1	0.771	1213	Critical	2.4	116	7.0
T1NR8WS17 Reach 1	0.028	1556	Subcritical	1.6	542	3.8
T1NR8WS17 Reach 1	0.555	1556	Critical	1.7	270	5.7
T1NR8WS17 Reach 1	1.003	1556	Critical	3.4	106	7.8
T1NR8WS17 Reach 1	1.504	1556	Subcritical	2.1	379	4.6
T1NR8WS17 Reach 1	2.012	1556	Critical	3.3	81	8.5
T1NR8WS17 Reach 2	2.495	1145	Critical	2.9	153	6.2
T1NR8WS8 Reach 1	0.028	2784	Subcritical	2.7	828	3.3

Table 5.2-Hydraulic Calculations Used in Floodplain Mapping (continued)

Wash	R.S. (mile)	Peak Q (cfs)	Depth Used	Depth (ft)	Top Width (ft)	Average Velocity (ft/sec)
T1NR8WS8 Reach 1	0.732	2784	Subcritical	2.2	293	6.5
T1NR8WS8 Reach 1 Tributary 1	1.001	1273	Critical	2.2	128	6.9
T1NR8WS8 Reach 1 Tributary 1	1.630	1273	Critical	2.9	82	7.9
T1NR8WS8 Reach 2	0.092	1743	Critical	3.2	137	7.4
T1NR8WS8 Reach 2	0.651	1743	Subcritical	1.9	452	4.1
T1NR8WS8 Reach 2	1.301	1743	Critical	3.2	124	7.7
T2NR8WS34 Reach 1	0.019	1429	Subcritical	2.3	254	4.2
T2NR8WS34 Reach 1	0.393	1429	Subcritical	2.0	239	4.9
T2NR8WS9 Reach 1	0.028	1441	Subcritical	2.4	243	4.0
T2NR8WS9 Reach 1	0.628	1441	Subcritical	1.8	288	4.6
T2NR8WS9 Reach 1	1.119	1441	Critical	2.9	145	6.0
T2NR8WS8 Reach 1	0.019	2164	Subcritical	1.3	980	2.6
T2NR8WS8 Reach 1	0.140	2164	Subcritical	1.5	1408	2.1
T2NR8WS8 Reach 1	0.607	2164	Subcritical	1.8	333	5.4
T2NR9WS12-2 Reach 1	2.012	1494	Subcritical	2.1	615	2.5
T2NR9WS12-2 Reach 1	2.495	1494	Subcritical	1.8	193	6.2
T2NR9WS12-1 Reach 1	0.028	1418	Subcritical	2.5	792	2.2

Table 5.2-Hydraulic Calculations Used in Floodplain Mapping (continued)

Wash	R.S. (mile)	Peak Q (cfs)	Depth Used	Depth (ft)	Top Width (ft)	Average Velocity (ft/sec)
T2NR9WS12-1 Reach 1	0.482	1418	Subcritical	2.5	792	2.2
T2NR9WS12-1 Reach 1	0.926	1418	Subcritical	2.8	671	2.3
T2NR9WS2-2 Reach 1	0.028	1917	Subcritical	2.3	730	2.0
T2NR9WS2-2 Reach 1	0.500	1917	Subcritical	1.5	1173	2.0
T2NR9WS2-2 Reach 1	0.897	1917	Subcritical	1.2	474	4.4
T2NR9WS2-1 Reach 1	0.028	2398	Subcritical	3.1	561	2.0
T2NR9WS2-1 Reach 1	0.204	2398	Subcritical	1.5	889	2.7
T2NR9WS2-1 Reach 1	0.571	2398	Subcritical	1.5	1686	1.7
T2NR9WS2-1 Reach 1	1.138	2398	Subcritical	1.7	456	4.5

(L) Indicates that the flow was linearly interpolated by length between the nearest two concentration point flows.
(P) Indicates that the flow was prorated using the basin area and the equation developed from the basins within Phase IV.
* Includes an additional 1340 cfs from the Saddleback Diversion Channel outfall. (See Section 5.1 and Figure 4.6)

Table 5.3-Summary of Culvert Hydraulic Calculations

ADOT AS-BUILT STATION	CULVERT	INVERT ELEVATION	ROAD ELEVATION	*Q (cfs)	HW ELEVATION
4303+12	3-10'x7'x62.5'	1212.08	1221.2	1586	1219.8
4305+96	3-10'x7'x60.5'	1212.08	1221.0	1586	1219.8
4308+80	3-10'x7'x60.5'	1212.08	1221.2	1586	1219.8
4322+17	3-10'x6'x51.8'	1215.06	1223.5	**1400	1222.0
4327+70	3-10'x5'x50.0'	1216.66	1224.0	**1120	1222.8
4333+30	3-10'x4'x53.0'	1218.61	1224.8	**810	1223.6
4448+80	3-10'x4'x63.5'	1191.00	1198.0	1082	1197.5
4451+90	3-10'x4'x58.0'	1191.00	1197.5	1082	1197.5
4507+87	2-10'x4'x72.0'	1223.9	1230.9	921	1232.4
4513+00	10'x5'x64.8'	1227.50	1234.6	520	1235.8

*Flows were distributed based on cross sectional area of culverts.

**The higher calculated flows from the ADOT as-built plans were used to establish a more conservative floodplain.

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 (Mi^2)	Peak 100-Year Discharge (cfs)
Wash T1NR8WS29-2 (Confluence with Centennial Wash)	11.35	7891
Wash T1NR8WS29-1 (Confluence with Centennial Wash)	2.09	1729
Wash T1NR8WS29-1 Tributary 1 (1.0 miles upstream of Centennial Wash)	0.23	260
Wash T1NR8WS20 (1.4 miles upstream of Centennial Wash)	2.01	2131
Wash T1NR8WS20 Tributary 1 (2.5 miles upstream of Centennial Wash)	0.63	1213
Wash T1NR8WS17 (2.0 miles upstream of Centennial Wash)	1.80	1556
Wash T1NR8WS8 (2.9 miles upstream of Centennial Wash)	2.44	2864
Wash T1NR8WS8 Tributary 1 (3.7 miles upstream of Centennial Wash)	0.85	1273
Wash T2NR8WS34 (5.1 miles upstream of Centennial Wash)	1.07	1429
Wash T2NR8WS9 (10.2 miles upstream of Centennial Wash)	1.08	1441
Wash T2NR8WS8-2 (10.4 miles upstream of Centennial Wash)	1.53	2164
Wash T2NR9WS12-2 (12.5 miles upstream of Centennial Wash)	1.50	1494
Wash T2NR9WS12-1 (12.7 miles upstream of Centennial Wash)	1.38	1418
Wash T2NR9WS2-2 (12.9 miles upstream of Centennial Wash)	2.98	2183
Wash T2NR9WS2-1 (13.3 miles upstream of Centennial Wash)	3.36	2398

7.2 Floodway Data and Flood Profiles

There are no floodway data or flood profiles because this is a Zone A Approximate Floodplain Study.

NOTES TO USERS

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Coastal Base Flood Elevations shown on this map apply only landward of 0.0' National Geodetic Vertical Datum of 1929 (NGVD 29). 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 jurisdiction. 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 for this jurisdiction.

The **projection** used in the preparation of this map was *Arizona State Plane Zone 3176 (central Arizona)*. The **horizontal datum** was *NAD83, GRS80 spheroid*. Differences in datum, spheroid, projection or State Plane 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 this FIRM.

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Spatial Reference System Division
National Geodetic Survey, NOAA
Silver Spring Metro Center
1315 East-West Highway
Silver Spring, Maryland 20910
(310) 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 its website at http://www.ngs.noaa.gov.

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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 (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map.

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.

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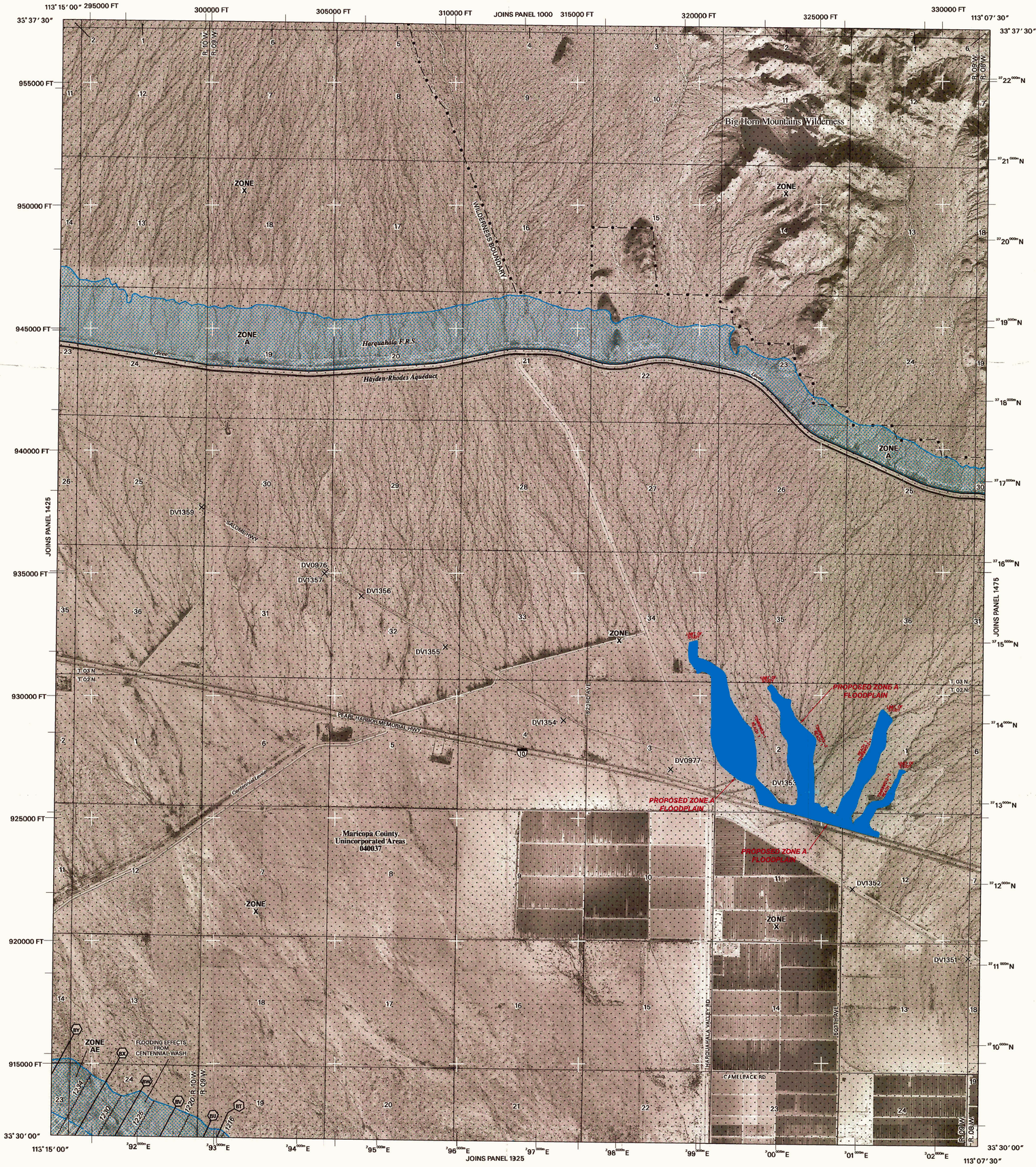

LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

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	Special Flood Hazard Area formerly protected from the 1% annual chance flood 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.
ZONE A99	Area to be protected from 1% annual chance flood 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.

1% annual chance floodplain boundary

0.2% annual chance floodplain boundary

Floodway boundary

Zone D boundary

CBRS and OPA boundary

Boundary dividing Special Flood Hazard Area Zones, and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood 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
(2)- - - -(2)	Transect line
112° 07′ 08″, 33° 25′ 41″	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere.
4376000m E	1000-meter Universal Transverse Mercator grid tick values zone 12.
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×DV2313	Bench mark (see explanation in Notes to Users section of this FIRM panel)
• M1.5	River Mile

MAP REPOSITORY

Refer to Repositories 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 4, 1991, July 19, 2001

September 30, 2005 - 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 add roads and road names, to incorporate previously issued Letters of Map Revision, and to incorporate previously issued Letters of Map Amendment.

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 1-800-638-6620.

MAP SCALE 1" = 2000'

1000 0 2000 4000 FEET

600 0 600 1200 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1450G

FIRM
FLOOD INSURANCE RATE MAP
MARICOPA COUNTY, ARIZONA
AND INCORPORATED AREAS

PANEL 1450 OF 4350

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
MARICOPA COUNTY	040037	1450	G

PROPOSED ZONE A FLOODPLAIN

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
04013C1450G

MAP REVISED

PROPOSED MAP REVISION

Federal Emergency Management Agency

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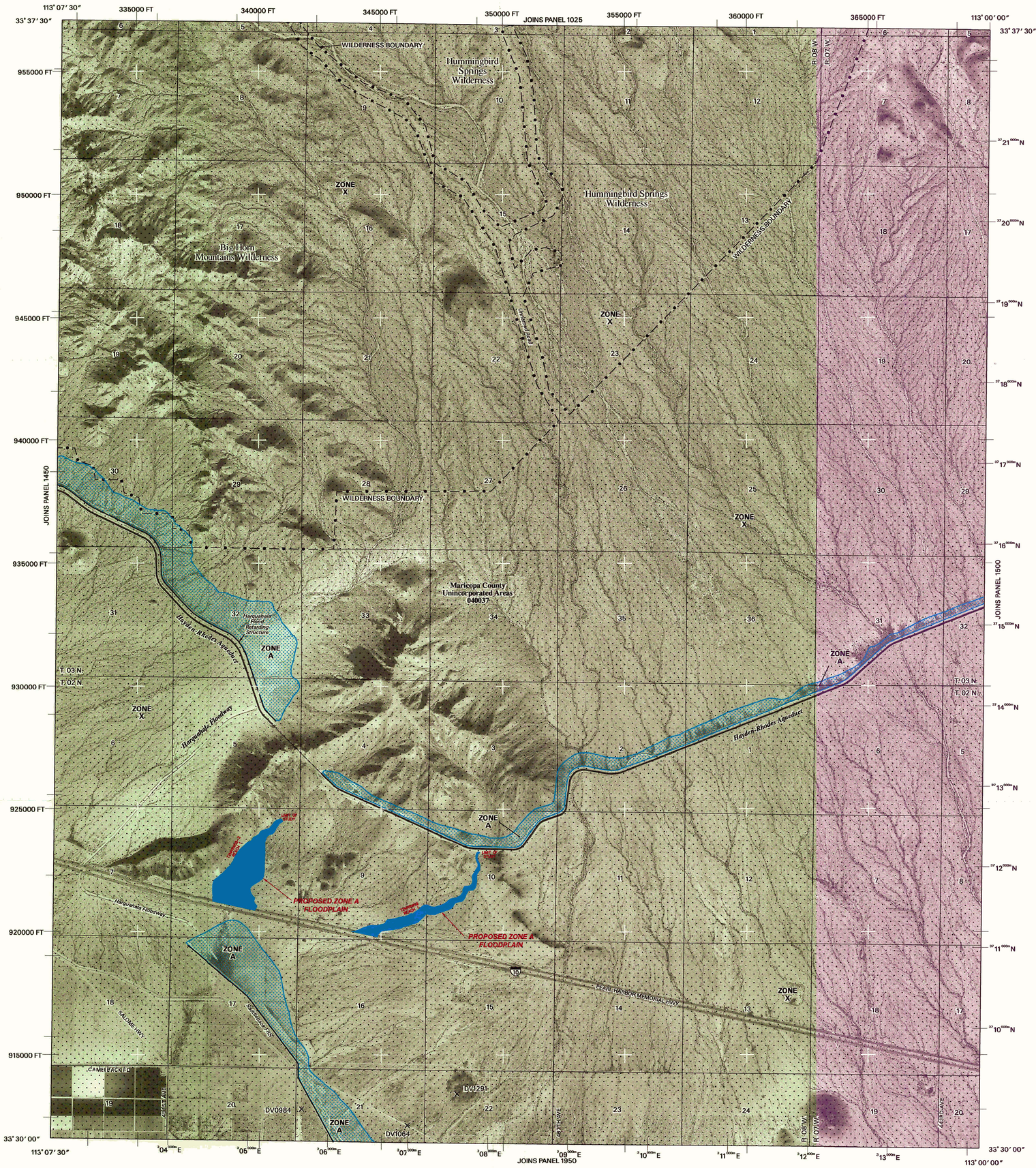

LEGEND

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	0.2% annual chance floodplain boundary
	Floodway boundary
	Zone D boundary
	CBRS and OPA boundary
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April 15, 1988

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NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1475G

FIRM
FLOOD INSURANCE RATE MAP
MARICOPA COUNTY, ARIZONA
AND INCORPORATED AREAS

PANEL 1475 OF 4350

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
MARICOPA COUNTY	040037	1475	G

PROPOSED ZONE A FLOODPLAIN

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MAP NUMBER
04013C1475G

MAP REVISED

PROPOSED MAP REVISION

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 Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles, Floodway Data and/or Summary of Stillwater Elevations 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 report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' National Geodetic Vertical Datum of 1929 (NGVD 29). 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 jurisdiction. 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 for this jurisdiction.

The **projection** used in the preparation of this map was *Arizona State Plane Zone 3176 (central Arizona)*. The **horizontal datum** was *NAD83, GRS80 spheroid*. Differences in datum, spheroid, projection or State Plane 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 this 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 http://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
(310) 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 its website at http://www.ngs.noaa.gov.

Base map information shown on this FIRM was derived from multiple sources. Base map files were provided in digital format by Maricopa County. Orthophoto images were produced at a scale of 1:8000 using HARN for control. Aerial photography is dated December 2000 to December 2002.

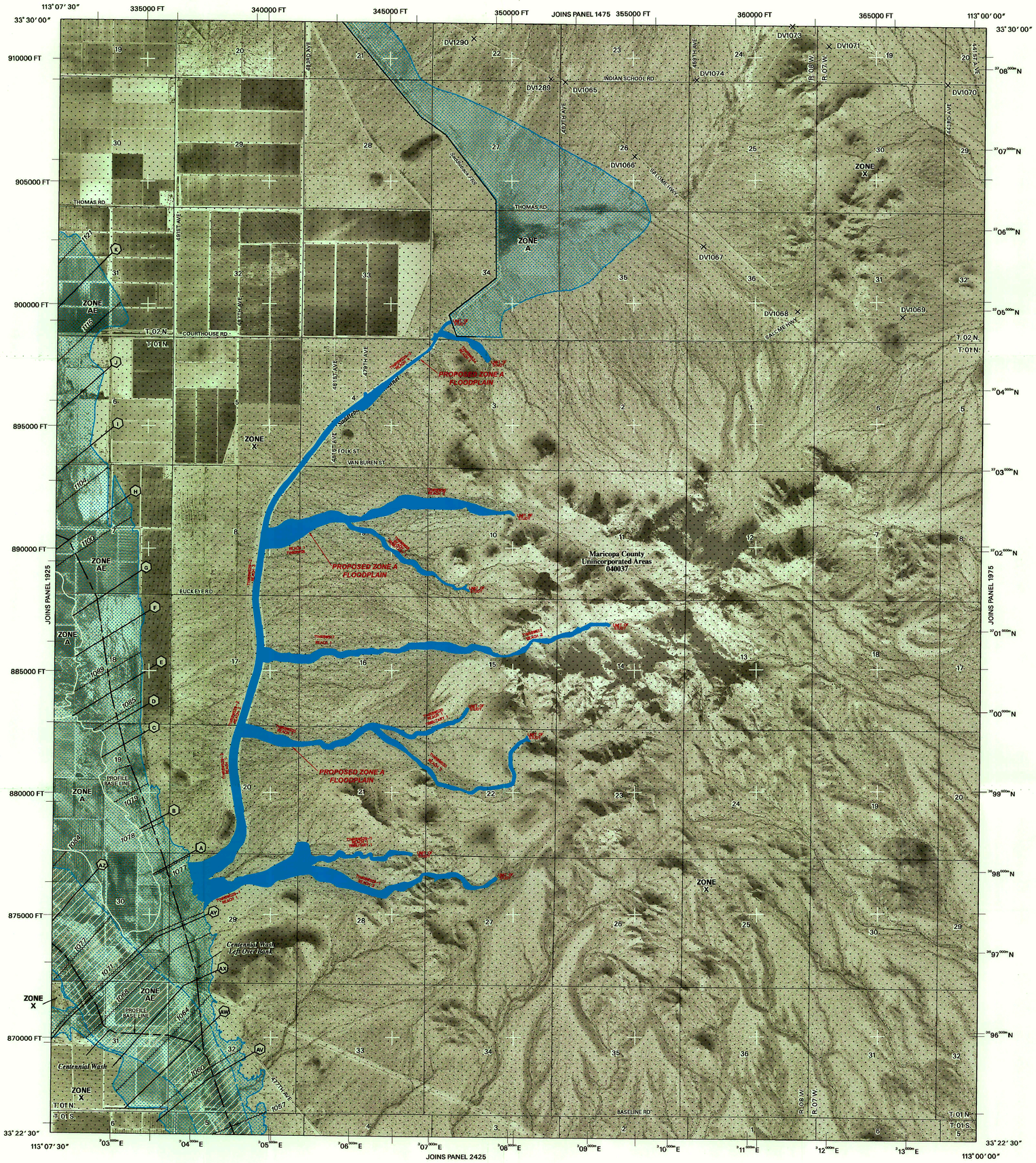
This map reflects more detailed and up-to-date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map.

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.

Contact the **FEMA Map Service Center** at 1-800-358-9616 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study report, and/or digital versions of this map. The FEMA Map Service Center may also be reached by Fax at 1-800-358-9620 and its website at http://www.msc.fema.gov/.

If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMAMAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/.



LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

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	Special Flood Hazard Area formerly protected from the 1% annual chance flood 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.
ZONE A99	Area to be protected from 1% annual chance flood 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.

1% annual chance floodplain boundary

0.2% annual chance floodplain boundary

Floodway boundary

Zone D boundary

CBRS and OPA boundary

Boundary dividing Special Flood Hazard Area Zones, and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood 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
(2)- - - -(2)	Transect line
112° 07′ 08″, 33° 25′ 41″	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere.
43 76000m E	1000-meter Universal Transverse Mercator grid tick values zone 12.
875000 FT	5000-foot grid tick values: Arizona State Plane coordinate system, central zone (FIPSZONE 3176) NAD83 (Transverse Mercator)
× DV2313	Bench mark (see explanation in Notes to Users section of this FIRM panel)
• M1.5	River Mile

MAP REPOSITORY
Refer to Repositories 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 4, 1991, July 19, 2001

September 30, 2005 - 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 add roads and road names, to incorporate previously issued Letters of Map Revision, and to incorporate previously issued Letters of Map Amendment.

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 1-800-638-6620.

MAP SCALE 1" = 2000'

1000 0 2000 4000 FEET

600 0 600 1200 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1950G

FIRM
FLOOD INSURANCE RATE MAP
MARICOPA COUNTY, ARIZONA
AND INCORPORATED AREAS

PANEL 1950 OF 4350

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
MARICOPA COUNTY	040037	1950	G

PROPOSED ZONE A FLOODPLAIN

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
04013C1950G

MAP REVISED

PROPOSED MAP REVISION

Federal Emergency Management Agency

Appendix A References

A.1 Data Collection Summary

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

Lower Centennial Wash Watershed Zone A Delineation Study Low Level Geomorphic Assessment, Earth Consultants International, May 2005.

Lower Centennial Wash Watershed Zone A Delineation Study Structure Survey, A-Team Professional Services, 2005, Phoenix, Arizona.

Motamedi, Amir, and John Holmes, *Table of Saturated Hydraulic Conductivity (XKSAT) Estimated Values Green and Ampt Parameters of the Soil Survey of Gila Bend – Ajo Area, Arizona Parts of Maricopa and Pima Counties*, January 23, 2004, Phoenix, Arizona.

Soil Survey of Gila Bend-Ajo, Arizona, Parts of Maricopa and Pima Counties, United States Department of Agriculture, Natural Resources Conservation Service, May 1997.

Soil Survey of Maricopa County, Arizona Central Part, United States Department of Agriculture, Soil Conservation Service, September 1977.

A.2 Referenced Documents

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

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

Appendix B General Documentation and Correspondence

B.1 Meeting Minutes or Reports

RBF CONSULTING

FCDMC FCD 2003C061
RBF JN 45-101952

Lower Centennial Wash Tributaries Flood Delineation Study
Meeting Minutes

DATE: June 23, 2004
TIME: 10:00 AM
LOCATION: Flood Control District of Maricopa County
SUBJECT: Kickoff Meeting

Date Prepared: July 1, 2004 **Prepared by:** Paul Sclafani

Attendees	Company	Email Address	Phone #	Fax #
Stone E. Wahl	A-Team	stoney@ateam.net	602-615-6243	602-906-0019
Thomas Rockwell	ECI	trockwel@cox.net or trockwell@geology.sdsu.edu	714-412-2666	619-594-4372
Jeri Young	ECI	jeri.young@asu.edu or jeriy@imap3.asu.edu	480-966-8801	c/o 619-594-4372
Ted L. Collins	FCDMC	tlc@mail.maricopa.gov	602-506-4874	602-506-7346
Mike Duncan	FCDMC	mwd@mail.maricopa.gov	602-506-4732	602-506-4601
Kathryn Gross	FCDMC	kag@mail.maricopa.gov	602-506-4837	602-506-4601
Richard Harris	FCDMC	rph@mail.maricopa.gov	602-506-1501	602-506-2903
Kevin LaValle	FCDMC	kal@mail.maricopa.gov	602-506-2954	
Melissa Lempke	FCDMC	mgl@mail.maricopa.gov	602-506-0612	602-506-4389
Steven Tucker	FCDMC	SLT@mail.maricopa.gov	602-506-4872	602-506-4601
Portia Gonzalez	JLK Engin	pgonzalez@jlkengineers.com	602-288-6529	602-288-6539
Nathan Ford	RBF	nford@rbf.com	602-467-2200	602-467-2201
Paul Sclafani	RBF	psclafani@rbf.com	602-467-2200	602-467-2201

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The following summarizes the substantive items discussed or issues resolved at the above meeting to the best of the writer's memory. Participants are encouraged to review these notes and respond to Paul Sclafani within one week if any discrepancies exist. If no comments are received by this time, it will be assumed that these notes accurately reflect the content of the meeting.

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Summary of Discussion Topics:

1. Coordination Activities

   A. Project Schedule

      1. The Notice to Proceed date was 06-07-04.
      2. The FEMA submittal package must be ready within 520 days.
      3. There is a minimum of 120 days for District review in the 520-day project development time limit. If possible, please allow more than 120 days for District reviews.
      4. 420 days have been allotted for obtaining FEMA approval following project development.
      5. All work must be completed within 940 days, including FEMA review related information requests. The Consultant has updated the Project Schedule as called for in Task 1.1.
      6. THERE WILL BE NO TIME EXTENSIONS. EVERY TASK MUST BE COMPLETED ON TIME.
         - Update schedule monthly
         - Written request for extensions

   B. Coordination Meetings

      1. In order to keep this project moving along, and on schedule, regular coordination meetings will be held approximately every 4 weeks (Task 1.2). Unless a schedule is change is requested and approved by the District, these meetings will occur every third Tuesday around 10 a.m. at the District office. However, coordination meetings do not always have to be face-to-face, telephone coordination meetings can be held.
      2. Milestone meetings are called for in the Scope when certain specific tasks are completed. These meetings will almost always be handled in person.
      3. Please remember that the consultant (RBF) has been tasked with keeping minutes of any meeting (Task 1.2).

   C. Estimated Monthly Billings

      1. For budgeting purposes we need an estimate of the total dollar amount that will be invoiced for each month (Task 1.3). This estimate will be updated quarterly per the contract.

D. Billing and Progress Reports

1. A progress report is supposed to be submitted 5 days before the submittal of a monthly invoice (Task 1.4). Sample progress reports have been provided.
    - Forward progress reports to subs
    - Include % completed for the task
    - Right-of-way letter from Survey
    - Right-of-way Entry for geomorphology
    - Notice of intent

2. Within invoices I like to see an indication of the amount of work completed for each sub-task as a percent for each task during the month, and the total amount completed so far (earned value concept). We can only pay for items that have been completed. All invoices are now being looked at very closely. If the work isn't 100% done, please don't bill for 100%. The same can also be said about any other percentage level too.
3. The next month's work plan.
4. MBE/WBE stuff.
    - Fill out form every month.

E. Legal Ad

1. The District is responsible for placing the legal ads (Task 1.5). Sample ads will be provided by PIO staff to me, and I will forward them on to you for modification before posting.

F. Study Notification/Right of Entry Letter

1. RBF is responsible for notifying the property owners about the survey (Task 1.6). The District can provide a sample to RBF for modification. Once the study reaches have been selected and approved, the District's GIS can provide RBF with a mailing list of potentially affected properties.

G. Coordination Meetings With Others

1. None are foreseen at present. However, there may be a request for meetings by larger affected entities such as the CAP or the local irrigation companies. If this occurs, the consultant will be expected to assist in preparations and attend the meeting(s).

H. Public Meeting

1. No public meetings are called for in the scope.

I. Performance Evaluations

1. Evaluation forms will be provided at a later time by the District.

3. Data Collection

A. Other Studies that cover the area

1. Centennial Wash FDS
2. Design studies for District Structures
   - Harquahala diversion channel
3. Geologic Mapping by AZGS
4. Adjacent studies such as Tiger Wash and Palo Verde
5. Palo Verde Development Plan
6. Railroads
   - Southern Pacific
7. Irrigation Companies
   - Names and mailing addresses
8. CAP
   - Locally and differences
9. Others
   - Compare results to Palo Verde report and Luke Wash

4. Field Surveying

A. All new survey is to be done on 1988 NAVD and 1983 NAD. Structure survey should follow graphic format defined by the District's chief surveyor (CD to be transmitted to RBF). All survey data must be transferred to the District per contract format (section 4.2) for review and approval before the District will authorize payment. Survey Control will be based upon the County's GDACS system.
   - Grid international feet

B. The final floodplain mapping scale will use a scale of 1"=500 feet (unless otherwise agreed upon later), and a contour interval of 10 feet.

C. All survey submittals must be prepared using the authority requirements called for in the SOW.

D. Optional survey must be authorized in writing by the District prior to activity.

5. Hydrology

A. HEC-1 will be used along with the Districts methodology (computer programs).
   - DDMSW

B. The 100-year 6-hour and 100-year 24-hour events will be modeled.

C. The primary factor to consider when choosing concentration points and sub basins is what is needed for the delineation.

E. The hydrology report must have a table listing the peak discharge at each sub basin and concentration point. A cfs/sq. mi. check can be added to this table. It is also a good idea to compare the hydrologic results with enveloping curves relative to adjacent studies, and possibly some regression equations.

F. Four Meetings and Two field trips will be scheduled and performed at regular intervals.

G. There is an optional sub-task 5.5.1.4 that may be exercised for locations identified as split-flow, in order to better estimate local hydraulic and hydrologic conditions. This option must be authorized in writing by the District.
   - ESI may want to have input

H. Digital Deliverables of the Hydrologic analysis should begin as soon as the Hydrologic modeling is approved.

I. Hydrologic Verification
   - Graph it on log – log
   - Show results in a form that you can come up with equations

6. Floodplain Delineation

A. HEC-RAS may be used for the hydraulic modeling. If it is, the most current version is 3.1.1. What alternative methodologies might be used? Care should be taken using different methodologies to identify critical depth areas for delineation purposes.
   - Plot stream profiles
   - Cut section @ grade breaks
   - 1 mi vs. ¼ mi
   - Compute critical depth if HEC-RAS not used.

B. There are six specific steps called for when District approval must be obtained.

C. N value report and method. The District will provide a copy of the recommended guideline.

D. If HEC-RAS is used, the Consultant (RBF) is to run FEMA's Check-RAS program.

E. Geomorphic Assessment. What will GIS deliverables need to consist of?

F. Methodology for generating cross section geometry must be coordinated with the District.

G. FP Boundary GIS deliverable needed for study map quality checking. Data tables to list wash name, section ID, flow quantity, flow depth, flow velocity, flow top width, Manning's roughness average value.

7. Low Level Geomorphic Assessment

A. The District has provided Geologic Mapping and Stereo Photos to RBF
B. The District has provided RBF with a copy of the 2003 (or later) version of the Piedmont Flood Hazard Assessment Manual.
C. A technical Memorandum of the Assessment will be prepared separately for District review and approval. A copy will also be placed in the project TDN.

8. Deliverables/HIS

A. Survey and development information is to be submitted before the study is submitted to FEMA.
B. It might be permissible to also submit the hydrologic data to FEMA before the study is submitted to FEMA in total. Doing this will depend upon if we feel the likelihood of the hydrology being changed by FEMA is low.
    - Coordinator to be informed of all floodplain delineations but the final document is to eventually be reviewed by Michael Baker, the FEMA reviewer.
C. Please work with our GIS people. Too many studies in the past have spent too much time going back and forth because the consultant wasn't working with our GIS people. Priority must be given to getting the GIS completed and approved. In the past we have had some foot dragging by the consultants on getting this task completed.
    - Marc Brewer in charge of database

D. There are three times that deliverables are called for.
    1. Prior to FEMA submittal
    2. For the FEMA submittal
    3. After FEMA approval

9. Other General Stuff

A. Every drawing must have either the last date it was revised, or the date it was printed on it. Because towards the end of the project minor revisions are impossible to spot.
B. Title pages of drawings and reports shall include at a minimum the name of the study, the District's contract number, date last revised (even if minor), name of the consultant(s), consultant's address, consultant's phone number.
C. All reports and drawings must be sealed and signed by persons of appropriate registration.
D. Please use a clear plastic sheet as the inside cover in all notebooks. If you don't, the first sheet ends up sticking to the notebook, and will eventually end up being ripped out.
E. Make generous use of headers and footers in the reports, especially in the hydrology and hydraulics printouts. Items to consider are: contract name & number, consultant's name, print date, event being modeled.

- Set up border template

RBF CONSULTING

FCDMC FCD 2003C061
RBF JN 45-101952

Lower Centennial Wash Tributaries Flood Delineation Study
Meeting Minutes

DRAFT

DATE: August 18, 2004
TIME: 10 AM
LOCATION: Flood Control District of Maricopa County
SUBJECT: Progress Meeting

Date Prepared: August 26, 2004 **Prepared by:** Paul Sclafani

Attendees	Company	Email Address	Phone #	Fax #
Jeri Young	ECI	jeri.young@asu.edu or jeriy@imap3.asu.edu	480-966-8801	c/o 619-594-4372
Kathryn Gross	FCDMC	kag@mail.maricopa.gov	602-506-4837	602-506-4601
Richard Harris	FCDMC	rph@mail.maricopa.gov	602-506-1501	602-506-2903
Nathan Ford	RBF	nford@rbf.com	602-467-2200	602-467-2201
Paul Sclafani	RBF	psclafani@rbf.com	602-467-2200	602-467-2201

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Summary of Discussion Topics:

1. Data Collection Report and Progress
   - Include the site visit with report
   - Richard will get back with us with comments to the report
   - Since we are using the County's soils information, we should not reference SSURGO in the report
   - There is an irrigation line floating in mid-air, include link canal in drawing
   - We need to get overall image of the aerial for 2003

2. Geomorphology Schedule and Tasks
   - If there is information that we did not have that we needed, let Katherine know.

3. Overall Schedule
   - Get list of locations that need to be surveyed
     - Shape file

4. Reach Lengths Identified to be Studied
   - Jeri needs a copy of the reach lengths
   - Closer to existing farm land is higher priority
   - Pick out 150 mi get started right away, then get 100 for optional, Jeri's in-active alluvial fan will be AO optional
   - What is land ownership SE Phase 1; is it State Land?
   - It may be important to map area south of Centennial Level since it has a water supply
   - Send the shape files of the reaches to Richard

5. Possibility To Obtain An Overall Aerial Of Study Area That Is Not To The Level Of Detail As What Was Provided.
   - No comments.

6. Upcoming Month's Goals
   - See Progress report for July

7. Anything Else From Others
   - No comments.

DRAFT

RBF CONSULTING

FCDMC FCD 2003C061
RBF JN 45-101952

Lower Centennial Wash Tributaries Flood Delineation Study
Meeting Minutes

DRAFT

DATE: September 16, 2004
TIME: 10 AM
LOCATION: Flood Control District of Maricopa County
SUBJECT: Progress Meeting

Date Prepared: September 16, 2004 **Prepared by:** Paul Sclafani

Attendees	Company	Email Address	Phone #	Fax #
Jeri Young	ECI	jeri.young@asu.edu or jeriy@imap3.asu.edu	480-966-8801	c/o 619-594-4372
Kathryn Gross	FCDMC	kag@mail.maricopa.gov	602-506-4837	602-506-4601
Richard Harris	FCDMC	rph@mail.maricopa.gov	602-506-1501	602-506-2903
Nathan Ford	RBF	nford@rbf.com	602-467-2200	602-467-2201
Paul Sclafani	RBF	psclafani@rbf.com	602-467-2200	602-467-2201

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H:\PDATA\45101952\Admin\minutes\Progress Mtg 091604.doc

Summary of Discussion Topics:

1. Data Collection Report
   - The final version of the report is nearly done but Richard needs to take one last look at it before we print out the final version.
   - The pictures need to be notated as to where they were taken.
   - Include all of the Watermaster pictures.

2. Geomorphology Progress
   - The areas of significant concern consist of the area at the southeast portion of phase 2 and the area just upstream of the Eagletail levee. The areas in Phase 1, south and north of the Lower Centennial Wash look o.k. The other areas in Phase 3 haven't been assessed yet.
   - Jeri is planning to head out to the site on Monday.
   - We may want to focus our attention on the area that is north of Lower Centennial Wash on the eastern side of the watershed. This area has a greater potential to develop.
   - Paul needs to call the irrigation district to let them know you are going out there.
   - The Eagletail levee was originally built by the SCS and until recently been maintained by FCD. The irrigation district is now assuming maintenance.

3. Reach Lengths Identified to be Studied
   - The areas in Phase 1 appear to be clear to begin hydrology. Final determination on Phases 2 and 3 have yet been completed.

4. Schedule
   - RBF is going to get started on the hydrology in Phase 1 on Monday.

5. Status of the general aerial, covering the larger area.
   - Eric has been rather busy and is still working on burning the CD.

6. Upcoming Month's Goals
   - Continue with geomorphic assessment.
   - Begin the hydrology and developing reach lengths.
   - Layout the structures that need to be surveyed.
   - The reach names should include the Township and Range.
   - The basin names should indicate the major watershed that it's located in .
   - Richard needs to look at the cross section locations before we compute the hydraulics.

7. Anything Else From Others
   - No comments.

DRAFT

RBF CONSULTING

FCDMC FCD 2003C061
RBF JN 45-101952

Lower Centennial Wash Tributaries Flood Delineation Study
Meeting Minutes

DRAFT

DATE: November 2, 2004
TIME: 2:30 PM
LOCATION: Flood Control District of Maricopa County
SUBJECT: Subbasin Delineation Meeting

Date Prepared: November 2, 2004 **Prepared by:** **Anthony D. Barry**

Attendees	Company	Email Address	Phone #	Fax #
Steven Tucker	FCDMC	st@mail.maricopa.gov	602-506-1501	602-506-2903
Richard Harris	FCDMC	rph@mail.maricopa.gov	602-506-1501	602-506-2903
Nathan Ford	RBF	nford@rbf.com	602-467-2200	602-467-2201
Anthony D. Barry	RBF	Abarry@rbf.com	602-467-2200	602-467-2201

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H:\PDATA\45101952\Admin\minutes\Subbasin Mtg 110204.doc

Summary of Discussion Topics:

1. SUBBASINN DELINEATION / HYDROLOGY

- Subbasins should be larger at top of watershed where the terrain is more mountainous and less habitable. Subbasins at the bottom of the watershed in flatter zones should be smaller.
- Flows for areas between concentration points will be "prorated".
- The S-Graph hydrograph will be used.

2. TOPO DATA

- USGS DTM data will be used.
- Exhibits should be created to compare basins created using FCDMC 10' topo to basins created using USGS DTM data utilizing the same concentration points for a sample area.
- Because of the differences in datum when using the USGS data, the GDAC conversion should be noted.
- John Stock will be consulted as to how best to proceed with the issue of the flawed FCDMC 10' topo.
- A request maybe sent, depending on the outcome, to make a slight change in the contract under the task that states that FCDMC will provide the topo.
- It was suggested by Steven Tucker that we should make a small scale comparison between the USGS DTM and the Maricopa County

DRAFT

FCD 2003C061

Lower Centennial Wash Tributaries Flood Delineation Study
Progress Meeting

November 17, 2004

Agenda

1. **Phase Boundaries and Reach Lengths**

   - JLK is going to do an approximate study similar to what we (RBF) is doing on Phase 1.

2. **Survey Request Exhibit**

   - Railroad is owned by Union Pacific, not the Southern Pacific. The label needs to be changed.

   - If we need to change the funding of the study around because there isn't as much survey then we need to submit a request and have some sort of backup.

3. **Phase 1 Basin Delineations**

   - Richard asked about small areas directly adjacent to Lower Centennial Wash and why they weren't delineated. This was done because the contributory drainage area is not large enough to warrant delineation.

4. **Basin Nomenclature**

   - The basin nomenclature looks o.k. but Steve said the Letter "B" doesn't really indicate location. It was explained that the the names are constrained by the model which only allows 6 letters. In the end Steve was satisfied with our naming convention.

5. **Upcoming Month's Goals**

   - Include our methodology for the Hydrology in a special problems section of our TDN and in the next progress report.

   - Steve reviewed the basin areas and after going over them in the meeting he is comfortable with the basin delineation for Phase 1. At that time he approved the basin delineation, thus releasing RBF to continue with the hydrologic parameters.

   - The next month goals involve working on the hydrology for Phase 1 and begin the basin delineation for Phase 2.

Site Visit July 13, 2004
Sunny and Hot, no rain or moisture in the past few weeks.

This site visit consisted of driving the structures with Charlie (maintenance manager), Richard, Kathryn, Mike, Nathan, Anthony, and Paul. The pictures for this site visit are located in:

H:\PDATA\45101952\Images\Site Visit 7-13-04-Structures

- Contactr Tom Wrinkly about inspection reports
- Steve Watters would hav data on the Wayne Rain Gauge in the area – however it may not be in service.
- It may be necessary to contact the El Paso Natural Gas Line
- Delmonte has some gauge information at 623-925-0900 or 602-708-6297
- The trapezoidal section of the diversion channel is maintained by mowing out the brush.
- The diversion channel has a consistent cross section, there are inlet spillways every 50-100 feet apart.
- The saddleback flood retarding structure has significant potholing in the top the structure. A study is currently being done by AMEC. The vegetative overshoots are closed because of longitudinal cracking at the toe of the dam.
- There is a 60" water ling on the upstream side shoots out of the dam at the saddleback dam. This is the only drainage reaching the Saddleback channel.

FCD 2003C061

Lower Centennial Wash Tributaries Flood Delineation Study
Intermediate Meeting

December 28, 2004

Meeting Minutes

Purpose
The purpose of this meeting is to clarify some of our methodology for computing the hydrology parameters before we complete the preliminary draft of the hydrology report.

1. Clarify which soils data to use when two soils survey meet within the study area.

   a. The original NRCS Study didn't have any XKSAT values. FCD added XKSAT in 1997.

   b. Bing recalled that there was something wrong with the Gila Bend data. Amir performed a study on the XKSAT and compared the Gila Bend to the original values used. He found that corresponding values of the XKSAT based on the new description of the soils for the Gila Bend soils survey, are higher, sometimes significantly so, than the values used in the previous study.

      The computations performed to develop the new XKSAT values were found in a report titled "Saturated hydraulic Conductivity *(XKSAT) Estimated Values Green and Ampt Parameters of the Soil Survey of the Gila Bend-Ajo Area, Arizona, Parts of Maricopa and Pima Counties" written in January 23, 2004 by Amir Motamedi and John Holmes.

   c. Based on the confusing nature of the data, Bing and Steven will look into what direction the County wants to take and give a recommendation. Amir will be consulted as to what the result of his study produced.

2. Other minor hydrology parameter questions.

   a. There was a question regarding the Passive open space definition in the percent vegetation table. Based on this table the recommended percent vegetation was 90 percent. This seems high based on visual inspection of an aerial photography.

   b. Steven explained that the prescribed percent vegetation was not meant to be definitive, but only a guide and that he would accept variations of the recommended values. After looking at the aerial photograph he roughly suggested that a percentage around 20-30 percent might be more appropriate.

   c. RBF chose the Phoenix Mountain S-Graph distribution from the Maricopa County's Hydrology manual. Steven agreed that this was the appropriate distribution to use.

The Kn values listed in the Maricopa County Hydrology manual for Foothills are to be used for the hydrology.

d. Steven recommended that we use the same Kn value for the 100-year 6-hour and the 100-year 24-hour storms.

3. Representative cross sections for the hydrology.

   a. Ordinarily a representative cross section would be selected for each routing reach. However, because of irregularities with the topographic data, there were only a few locations where the cross sections seemed reasonable. Therefore, representative cross sections, cut in locations where the topo is accurate, will be used to represent the routing reaches for the drainage areas throughout Phase 1.

4. Change order for the survey sub-consultant.

   a. We will submit the change order for the revision to the survey scope. The amount that A-Team proposed looked o.k. but Richard recommended that we follow the same format as the previous proposal, including hourly and overhead rates.

FCD 2003C061

Lower Centennial Wash Tributaries Flood Delineation Study
Intermediate Meeting

December 26, 2004

Agenda

Sign In Sheet

	Name	Organization	Phone Number	E-Mail
1.	Paul Sclafani	RBF Consulting	602-467-2200	psclafani@rbf.com
2.	Nathan Ford	RBF Consulting	602-467-2200	nford@rbf.com
3.	Richard Harris	FCDMC	602-506-4582	rph@mail.maricopa.gov
4.	Mike Duncan	FCDMC	602-506-4732	mwd@mail.maricopa.gov
5.	Steven Tucker	FCDMC	602-506-4872	slt@mail.maricopa.gov
6.	Bing Zhao	FCDMC	602-506-3293	biz@mail.maricopa.gov

FCD 2003C061

Lower Centennial Wash Tributaries Flood Delineation Study
Progress Meeting

January 7, 2005

Meeting Minutes

1. **Progress report.**
   - This item was discussed. Richard asked for a change order to be added for the next months item.
2. **Submit the rough draft of the hydrology section.**
   - Discussed the regression analysis.
3. **Submit the rough draft of the geomorphology.**
   - Plotting and digital size to be investigated.
   - The scale on all of the exhibits should be English.
   - Add folder with a copy of soils report.
   - Include study area boundary on all of the exihibits.
4. **Number of cross sections for the hydraulic analysis.**
   - Place the cross sections every ½ mile.
5. **Hydraulic analysis methodology.**
   - Compute the depth using Manning's equation in WMS.
   - Compute the normal and the critical depth and use the greater of the two.
6. **Who is reviewing the hydraulics.**
   - Richard is reviewing the hydraulic analysis.
7. **Change order for the survey.**
   - Exercise Optional task.
8. **What is the timeframe for the hydrology review and geomorphology review.**
   - The hydrology should be reviewed in 3 weeks.
   - The geomorphology should be reviewed in 3 weeks.

FCD 2003C061

Lower Centennial Wash Tributaries Flood Delineation Study
Progress Meeting

January 7, 2005

Sign In Sheet

	Name	Organization	Phone Number	E-Mail
1.	Paul Sclafani	RBF Consulting	602-467-2200	psclafani@rbf.com
2.	Nathan Ford	RBF Consulting	602-467-2200	nford@rbf.com
3.	Kathryn Gross	FCDMC	602-506-4837	kag@mail.maricopa.gov
4.	Jeri Young	ECI	480-966-8801	Jeri.young@asu.edu
5.	Mike Duncan	FCDMC		mwd@mail.maricopa.gov
6.	Richard Harris	FCDMC	602-506-4528	rph@mail.maricopa.gov

FCD 2003C061
Lower Centennial Wash Tributaries Flood Delineation Study
Progress Meeting

February 2, 2005

Minutes

1. Hydraulic cross section submittal.
Submitted:

a. Printouts of all of the cross sections.
b. Preliminary set of hydraulic cross sections (18 sheets).

The following comments are based on things that Richard had commented before in the past, they are not based on a review of any submittal by RBF.

- Ground Control- RBF may have done the ground control in the area. Dan Mardock may have that information, at Flood Control, John Stock is the best source for this information.
- Add the township and range on the Sheet breakout on the cover page.
- The location map shows the project in relation to Maricopa County as a whole, add a map that shows local culture in the area.
- Administrative floodways should be delineated along the same stream lengths as the Zone A floodplains.
- Richard suggested that we may want to put the drainage areas in red to assist reviewers decipher which subbasins the channels are located. This will be investigated but it seems that the utility of doing this may be limited since FEMA won't see it and ultimately may be a source of confusion or errors.
- Make sure that all of the street labels are located directly on top of the corresponding street.
- The leaders labeling the floodplain should point to the Zone A boundary not to the inside of the shading.
- Include with the base mapping icons locating schools, churches, culverts, bridges, railroads, etc.
- In the index diagram (the one that's on the right hand side of each sheet) add the township and range.
- Add the GDACs points.
- Include the peak discharge that is used at each cross section.
- Extend the thalwag's of the delineated streams down to the thalwag of Lower Centennial.
- Richard still needs to email the thalwag of Lower Centennial to RBF.
- Add the match lines on the edges of each sheet.
- RBF will use the latest FCD logo on plan sets.

2. Review hydrology comments.
Received:

First round of comments and mark-up report from Steven Tucker.

- There was a discussion about increasing the power of the best-fit equation. In the end the linear best-fit line appeared adequate and highly representative of the data.
- Add label to graphs showing that the equations represent certain size drainage areas.
- Round the cfs/mi^2 (csm) amount to the nearest whole number.
- Steve will provide an approval of the hydrology report once the changes have been made and reviewed.

3. Change Order.

Received:

Two copies of the change order form from Sharon McGuire to be signed by Scott Larson.

- The change order looked o.k., RBF will sign both copies and send both copies back to FCD.
- In order to exercise the option, RBF will send a letter to Richard spelling out the option that is to be excercised.

4. Miscellaneous discussion

- RBF will coordinate with Richard and Jerri to set up a meeting next Tuesday for the Geomorphology review.
- RBF will formally request the shape file for the Lower Centennial thalwag.

FCD 2003C061

Lower Centennial Wash Tributaries Flood Delineation Study
Progress Meeting

February 2, 2005

Sign In Sheet

	Name	Organization	Phone Number	E-Mail
1.	Paul Sclafani	RBF Consulting	602-467-2200	psclafani@rbf.com
2.	Nathan Ford	RBF Consulting	602-467-2200	nford@rbf.com
3.	Richard Harris	FCDMC	602-506-4528	rph@mail.maricopa.gov
4.	Steven Tucker	FCDMC	602-506-4877	slt@mail.maricopa.gov
5.				

FCD 2003C061

Lower Centennial Wash Tributaries Flood Delineation Study
Progress Meeting

February 15, 2005

Minutes

1. **Progress of Change Order.**

2. **Geomorphology Review.**

   - Put streams on Jerri's delineations
   - Put Jerri's study in an appendix in the TDN
   - Put copy of the Geomorphology in all Phases
   - Get hard copy of the geology reports to Jerry

FCD 2003C061

Lower Centennial Wash Tributaries Flood Delineation Study
Progress Meeting

February 15, 2005

Sign In Sheet

	Name	Organization	Phone Number	E-Mail
1.	Paul Sclafani	RBF Consulting	602-467-2200	psclafani@rbf.com
2.	Jeri Young	Earth Consultants		
3.	Richard Harris	FCDMC	602-506-1501	rph@mail.maricopa.com
4.	Kathryn Gross	FCDMC		
5.				

FCD 2003C061

Lower Centennial Wash Tributaries Flood Delineation Study
Progress Meeting

March 3, 2005

Minutes

1. **Cross Sections**

- Possibly Ground survey. This option depends in large part with the accessibility to the area and if there are reasonably accurate bench marks within 6 miles of the sections. A coarser version would include using a hand level, but lack of good access may still make this not possible.

- Duplicating next downstream section to a point upstream. This seems like a second choice, unless what geometry you cut at the point of interest compares at say, 80% of the points in the downstream section.

- Theoretical rectangular or trapezoidal sections. This option seems the least favorable since geometry might be entirely assumed. If this option were to be considered, we would first want to look at the flow top-width given a flow depth in a section with vertical end extension of no more than 1'. I might add this must be based upon the greater in-channel flow depths of critical depth or normal depth. A look at section geometry cut from the USGS DTM would be useful to start.

2. **Optional Task Letter**

- Add display of additional stream delineation miles

3. **Invoice**

4. **Other Topics**

- We will need to receive to review the GIS Hydrologic Deliverable. We will need:

  1. GIS shape files drnpthpt.shp, drnpthln.shp, and drnbsn.shp.
  2. Hard and electronic copies of the sub watershed/watershed map(s).
  3. HEC-1 input and output data files

- Add the shape file to the request for optional task authorization showing the additional stream length delineation.

FCD 2003C061

Lower Centennial Wash Tributaries Flood Delineation Study
Progress Meeting

March 3, 2005

Sign In Sheet

	Name	Organization	Phone Number	E-Mail
1.	Paul Sclafani	RBF Consulting	602-467-2200	psclafani@rbf.com
2.	Nathan Ford	RBF Consulting	602-467-2200	nford@rbf.com
3.	Richard Harris	FCDMC	602-506-1501	rph@mail.maricopa.gov
4.	Mike Duncan	FCDMC	602-506-4732	mwd@mail.maricopa.gov
5.				

FCD 2003C061

Lower Centennial Wash Tributaries Flood Delineation Study
Progress Meeting

March 16, 2005

Meeting Minutes

1. **Additional section placement criteria.**

   - For the most part additional cross sections were added using USGS map. As you move closer to Lower Centennial though the terrain flattens out and the channel becomes less defined. In this region, USGS may not be suitable.
   - If additional detail or information is necessary then field survey may be required.
   - The roughness coefficients are going to be determined using field investigation during the week of March 21, 2005.
   - Special Problems: The USGS DEM coordinates do not match the Flood Control District topo, we are going to adjust the section information obtained from USGS vertically to match the Flood Control District coordinates.

2. **GIS Hydrologic Deliverable Materials.**

   - We need to create one CD of the submittal for the subconsultant review.
   - Include 2 hard copies of the information.
   - We'll need to check all drainage areas and that the polygons are closed.
   - Richard will email us the comments, it will take one month for the review from the time the NTP is issued.

3. **Administrative Floodway determination method.**

   a. HEC-RAS: Too costly and confusing during the review process. Not considered.

   b. Eliminate end points to one foot of rise: Mike has done something like this in the past, however, it may still be significant effort to meet the floodway requirements.

   c. Floodway = Floodplain: Too restrictive.

   d. Critical Depth: Not accurate and some of the floodplain is already at critical depth.

   e. Bank Stations: Not restrictive enough regarding developments.

   f. Check State Standards.

g. Use Percentage of flow as Floodway discharge: This was suggested by Portia as something that she used in the past. It seems appropriate and the most logical option. Check with Mike regarding the viability of this option. What percentage is to be used. Check Riverside county where this method was used before.

4. **Geomorphic Analysis (coming soon)**

- Double check the formatting soas to fit in the TDN appropriately.

5. **JLK's upcoming analysis.**

- Take a look at the countrou map to see if errors exist within the area that Portia is covering.
- We need to obtain the flows/hydrographs coming out of the structures in Portias area. Check with Joe Tram.
- Portia needs to develop the workplan including 2 weeks for the RBF Review and a **week** for Richard review.

FCD 2003C061

Lower Centennial Wash Tributaries Flood Delineation Study
Progress Meeting

March 16, 2005

Sign In Sheet

	Name	Organization	Phone Number	E-Mail
1.	Paul Sclafani	RBF Consulting	602-467-2200	psclafani@rbf.com
2.	Nathan Ford	RBF Consulting	602-467-2200	nford@rbf.com
3.	Richard Harris	FCDMC	602-506-1202	rph@mail.maricopa.gov
4.	Portia Gonzalez	JLK	602-288-6528	pgonzalez@jlkengineers.com
5.				

FCD 2003C061

Lower Centennial Wash Tributaries Flood Delineation Study
Progress Meeting

April 19, 2005

Minutes

1. **Project Update**

   a. RBF will submit basin delineation for Phase 2 on Monday, April 25, 2005

   b. RBF will update the project forecast and forward it on to Richard, some of the FEMA review money needs to be added to previous months

2. **Current Invoice**

   a. Richard suggested that RBF needs to bill to 40 percent of the job by the end of May

   b. The current invoice looks o.k.

3. **Status of Draft Survey Report**

   a. Survey notes need to be included in the submittal, and they need to be sealed

   b. The coordinates need to be included on the photos

   c. Mike Duncan asked if the crossings have guide dikes

4. **Status of Earth Consultant Study**

   a. RBF needs to provide Jeri with the geology reports that FCD provided.

   b. SCS should be changed to NRCS wherever applicable.

   c. ECI will provide shape files to RBF and FCD.

   d. The title Lower Centennial Wash needs to be changed to Lower Centennial Wash Watershed Zone A Delineation Study wherever it occurs in order to match the original contract.

   e. Township and Range lines should be added to the exhibit index. RBF has these shape files that were obtained originally from FCD.

   f. Add the Contour lines to the exhibits at an appropriate scale to display contours, use a lighter shade so they are not so prominent. Also show geologic units on all relevant displays

g. ECI needs to make 4 total copies, 2 for FCD and 2 for RBF. A draft Final deliverable will be provided by May 1st.

h. Jeri will send Kathryn her responses to the earlier comments and questions via email.

i. Kathryn will provide comments on the draft report submitted at the meeting by 4/27/05.

5. **Status of JLK's Progress**

a. Mike asked if JLK needs soil coverage. This needs to be determined for sure but it's likely that there is enough coverage.

b. Hydrograph from the Harquahala FRS and also into the Diversion channel

1. JLK thought that the hydrograph can be obtained through another study, they will continue to research it. Otherwise to use the maximum outlet capacity as a "make do" hydrograph per recommendation by Joe Tram of the District..

2. JLK's work schedule was received and approved by the District.

6. **Channel Capacity Issues**

a. If there is breakout, it may be necessary and indeed more accurate to bend the cross section so it captures the upstream slope.

b. Alternatively we can extend the cross section out until there is one-foot depth and map the floodplain to that point.

c. Some of the areas may need to be Zone AO 'more discussion on this may be necessary.

d. It was agreed and decided that RBF will survey the cross sections in questions and compare to the aerial topography to verify it's accuracy. Once that is done RBF will bring in the work map and the cross section comparison into FCD.

7. **Optional Authorization**

a. A request to authorize the optional additional 100 miles was submitted to FCD.

8. **Floodway Determination**

a. For right now we are not considering floodway.

9. **Schedule**

a. Richard requested that Phase 2 hydrology needs to be completed by July 2005

b. Richard requested that Phase 3 hydrology needs to be completed by September 2005

c. The hydraulics for Phase 1 should be done by the middle of May

FCD 2003C061

Lower Centennial Wash Tributaries Flood Delineation Study
Progress Meeting

April 19, 2005

Sign In Sheet

	Name	Organization	Phone Number	E-Mail
1.	Paul Sclafani	RBF Consulting	602-467-2200	psclafani@rbf.com
2.	Nathan Ford	RBF Consulting	602-467-2200	nford@rbf.com
3.	Richard Harris	FCDMC	602-506-1501	rph@mail.maricopa.gov
4.	Mike Duncan	FCDMC	602-506-4732	mwd@mail.maricopa.gov
5.	Portia Gonzalez	JLK	602-288-6528	pgonzalez@jlkengineers.com
6.	Jeri J. Young	ECI	480-966-8801	jeri.young@asu.edu
7.	Kathryn Gross	FCDMC	602-506-4837	kag@mail.maricopa.gov
8.	Steven Tucker	FCDMC	602-506-4872	slt@mail.maricopa.gov

FCD 2003C061

Lower Centennial Wash Tributaries Flood Delineation Study
Progress Meeting

May 18, 2005

Meeting Minutes

1. **Project Update**

2. **Current Invoice**

   The April invoice was given to Richard.

3. **Kathryn's comments on Geomorphology**

   a. The digital submittal was created for version 9.0. This needs to be converted to version 3.2.

   b. The date on the exhibits need to be updated and sent back to FCD.

4. **Status of JLK's Progress**

   a. Portia needs to call Tom Wrinkley and get the rating curve for the outlet structures within her area.

5. **Phase 2 Hydrology – Basin Delineations**

   a. Review of Steven Tucker Comments

   b. B64 needs to be field verified for possible overtop of road/berm into the farm area. Site visit to be conducted Monday May 23.

   c. Basin names need to be renumbered to not duplicate names in other phases of Lower Centennial.

   d. Washes to be delineated need to be submitted for informational purposes only with the basin delineation.

6. **Phase 1 Hydraulics – Floodplain Delineation**

   a. RBF needs to supply Richard with the following items

      i. Shape files of the cross sections (both full cross sections and the cross sections trimmed to the width of the floodplain.

      ii. Shape file of the floodplain as closed polygons.

      iii. Summary table of the topwidths, critical depth, and chosen depth.

7. **Schedule**

a. The hydraulic submittal was delivered 12 days ahead of schedule.

b. The Phase 2 hydrology will begin as soon as the basin delineation issues are resolved.

c. The Phase 3 basin delineation is nearly complete and will be submitted by next meeting.

d. The Phase 1 TDN will be submitted by next meeting.

8. Other Issues

a. RBF needs to update the on-call folder with the FCD to make sure it represents current information regarding the GIS capability. Make sure you say GIS capability for the Hydrology Information System (HIS) development.

FCD 2003C061

Lower Centennial Wash Tributaries Flood Delineation Study
Progress Meeting

May 18, 2005

Sign In Sheet

	Name	Organization	Phone Number	E-Mail
1.	Paul Sclafani	RBF Consulting	602-467-2200	psclafani@rbf.com
2.	Nathan Ford	RBF Consulting	602-467-2200	nford@rbf.com
3.	Richard Harris	FCDMC	602-506-1501	rph@mail.maricopa.gov
4.	Portia Gonzalez	JLK	602-288-6528	pgonzalez@jlkengineers.com

FCD 2003C061

Lower Centennial Wash Tributaries Flood Delineation Study
Progress Meeting

June 22, 2005

Meeting Minutes

1. **Project Update**
   a. Covered monthly progress and next month's objectives
2. **Current Invoice-Submitted**
3. **Phase 1 TDN-Submitted**
   a. Print out full size plots and include 11x17 plots of floodplain delineation for Richard's review.
   b. For future reference, add legend to annotated FIRM for the annotations.
   c. Include a CD with the digital information (i.e. computer models).
4. **Phase 2 Hydrology Report-Submitted**
   a. We may want to compare the Phase I regression results to the Phase II regression results.
5. **Phase 3 Basin Delineation**
   a. Send a PDF of the basin delineation to Richard and Steven.
   b. Delineation looks good, based on Steven's review, we can continue with the Phase III hydrology.
6. **Geomorphology Report-Submitted**
7. **Status of JLK's Progress (Phase 4 Boundary)**
   a. 90% plot of the basin delineation was presented to Richard and Steven, 100% plot should be done by Tuesday next week 6/28/05.
   b. The final basin delineation plot should be at 1"=2000' to match what has been done on Phase I, II, and III. This may warrant breaking it up into two sheets.
   c. The basin delineation plot will need to have the culverts and the overshoots labeled.
   d. Using Phase IV designation for JLK's hydrology will work with the County; we will need to make sure the formatting of their report matches Phase I, II, and III.
8. **Schedule-Submitted**
9. **Other Issues**
   a. Need to submit to Richard a shape file with an outline of the phases.

FCD 2003C061

Lower Centennial Wash Tributaries Flood Delineation Study
Progress Meeting

June 22, 2005

Sign In Sheet

	Name	Organization	Phone Number	E-Mail
1.	Paul Sclafani	RBF Consulting	602-467-2200	psclafani@rbf.com
2.	Nathan Ford	RBF Consulting	602-467-2200	nford@rbf.com
3.	Richard Harris	FCDMC	602-506-1501	rph@mail.maricopa.gov
4.	Steven Tucker	FCDMC	602-506-1501	slt@mail.maricopa.gov
5.	Portia Gonzalez	JLK	602-288-6528	pgonzalez@jlkengineers.com
6.	Joe Gonzalez	JLK	602-288-6528	jgonzalez@jlkengineers.com

FCD 2003C061

Lower Centennial Wash Tributaries Flood Delineation Study
Progress Meeting

July 18, 2005

Minutes

1. **Project Update**

2. **Phase 1 TDN – Response to Comments**

   - Richard will look it over then give the copy back with more comments or for final copy and seal. RBF will provide 2 sealed copies of the TDN along with sealed mylars after the final review.

3. **Survey Report**

   - Upon initial review the final report looks good.

4. **Phase 4 Update**

   - The routing submittal and the parameter submittal is planned for this Friday July 22, 2005.

5. **Schedule**

   - RBF needs to provide a timeframe for the digital submittal of the Geomorphic investigation.

6. **Other Issues**

FCD 2003C061

Lower Centennial Wash Tributaries Flood Delineation Study
Progress Meeting

July 18, 2005

Sign In Sheet

	Name	Organization	Phone Number	E-Mail
1.	Paul Sclafani	RBF Consulting	602-467-2200	psclafani@rbf.com
2.	Nathan Ford	RBF Consulting	602-467-2200	nford@rbf.com
3.	Richard Harris	FCDMC	602-506-1501	rph@mail.maricopa.gov
4.	Portia Gonzalez	JLK	602-288-6528	pgonzalez@jlkengineers.com
5.	Steven Tucker	FCDMC	602-506-1501	slt@mail.maricopa.gov

FCD 2003C061

Lower Centennial Wash Tributaries Flood Delineation Study
Progress Meeting

August 24, 2005

Minutes

1. **Project Update**

   - Survey is complete, survey report was placed in the library.
   - Phase III and IV Hydrology reports were submitted to Steven Tucker

2. **Phase 1 TDN**

   - Submitted to FEMA

3. **Phase II Cross Sections**

   - Steven stated that he would use the same scale on all the profile plots. Richard requested the cross sections be provided to him including the reach and cross section name and the layout from ArcMap in lieu of revising the profile plots.

4. **Phase III Hydrology Report**

   - Was submitted to Steven

5. **Phase IV Update**

   - Hydrology Report Was submitted to Steven

6. **Schedule**

   - Phase III and IV Hydrology reports will be reviewed in 3 weeks from the meeting date. Phase II cross sections will be reviewed sometime next week.

7. **Other Issues**

   - Need to work out Geomorphic GIS submittal with ECI

FCD 2003C061

Lower Centennial Wash Tributaries Flood Delineation Study
Progress Meeting

August 24, 2005

Sign In Sheet

	Name	Organization	Phone Number	E-Mail
1.	Nathan Ford	RBF Consulting	602-467-2200	nford@rbf.com
2.	Richard Harris	FCDMC	602-506-1501	rph@mail.maricopa.gov
4.	Joe Gonzalez	JLK	602-288-6528	jgonzalez@jlkengineers.com
5.	Steven Tucker	FCDMC	602-506-1501	slt@mail.maricopa.gov

FCD 2003C061

Lower Centennial Wash Tributaries Flood Delineation Study
Progress Meeting

September 19, 2005

Minutes

1. **Project Update**

   - Phase II floodplain delineation has started.

2. **Phase II Cross Sections**

   - Additional cross sections were added based on the review comments

3. **Phase III Hydrology Report Comments**

   - Comments were submitted at this meeting. Steven stated that the comments were minor and the Phase III Hydrology was approved. He stated that this project has "fun hydrology and beautiful reports".

   - A summary of the hydrology results will be included in an addendum. This will be an additional work under RBF's on-call contract. The comments received from Phase III that impact Phase I and Phase II will be made in the addendum (the scale of the graphs).

4. **Phase IV Update**

   - Need to request the thalwegs shapefile from Eric Feldman. Kevin LaValle should have the thalwegs as a result of the DFIRM effort.

5. **Schedule**

   - Both RBF and JLK need to provide revised schedules to Richard.

FCD 2003C061

Lower Centennial Wash Tributaries Flood Delineation Study
Progress Meeting

Sept 19, 2005

Sign In Sheet

	Name	Organization	Phone Number	E-Mail
1.	Nathan Ford	RBF Consulting	602-467-2200	nford@rbf.com
2.	Richard Harris	FCDMC	602-506-1501	rph@mail.maricopa.gov
4.	Joe Gonzalez	JLK	602-288-6528	jgonzalez@jlkengineers.com
5.	Steven Tucker	FCDMC	602-506-1501	slt@mail.maricopa.gov

FCD 2003C061

Lower Centennial Wash Tributaries Flood Delineation Study
Progress Meeting

October 19, 2005

Minutes

1. **Project Update**

RBF is making good progress and is ahead of schedule. Preliminary Phase II Floodplain and Phase III n value report were submitted for review.

2. **Geomorphology Review Comments Update**

Jeri should respond early next week.

3. **Phase II Preliminary Floodplain Boundary Submittal**

Richard requested the cross section output and Table 5.2 be provided to aid in the checking of the floodplain.

4. **Phase IV Update**

Phase IV n value report is approved. Joe to provide Richard with cross sections tomorrow. Possible AO Zones located within Phase IV.

5. **FEMA Update (Phase I TDN Submittal)**

Delay due to budget constraints and hurricane relief efforts.

FCD 2003C061

Lower Centennial Wash Tributaries Flood Delineation Study
Progress Meeting

October 19, 2005

Sign In Sheet

	Name	Organization	Phone Number	E-Mail
1.	Nathan Ford	RBF Consulting	602-467-2200	nford@rbf.com
2.	Anthony Barry	RBF Consulting	602-467-2200	abarry@rbf.com
3.	Richard Harris	FCDMC	602-506-1501	rph@mail.maricopa.gov
4.	Joe Gonzalez	JLK	602-288-6528	jgonzalez@jlkengineers.com

FCD 2003C061

Lower Centennial Wash Tributaries Flood Delineation Study
Progress Meeting

November 17, 2005

Minutes

1. **Project Update**

RBF is making good progress. Richard told Tim Murphy that Phase II TDN would be submitted at the end of January.

2. **Phase I – FEMA Comments**

Richard will call Craig Kennedy since John Buflod has not returned his phone calls. RBF to send all ten pages for the two railroad trestles to John. State that pages 3-10 are not applicable. Mention that the FCDMC does not need to pay the review fee.

3. **Phase II Comment Update**

Need to include the response to comments with the TDN submittal. Copy Phase I title block. Add thalweg and remove contours under existing Centennial Wash floodplain delineation.

4. **Phase IV Update**

Match Figure 4.6 of Phase I. Richard to review JLK's submittal by close of business on Tuesday. Joe to stop by ADOT to obtain the as-built plans for the I-10 culverts.

FCD 2003C061

Lower Centennial Wash Tributaries Flood Delineation Study
Progress Meeting

Nov 17, 2005

Sign In Sheet

	Name	Organization	Phone Number	E-Mail
1.	Nathan Ford	RBF Consulting	602-467-2200	nford@rbf.com
2.	Anthony Barry	RBF Consulting	602-467-2200	abarry@rbf.com
3.	Richard Harris	FCDMC	602-506-1501	rph@mail.maricopa.gov
4.	Joe Gonzalez	JLK	602-288-6528	jgonzalez@jlkengineers.com

B.2 General Correspondence

JLK ENGINEERS

Drainage • Transportation • Public Works

TRANSMITTAL

To:

Richard Harris, P.E.
FCDMC
2801 W. Durango Street
Phoenix, AZ 85009

Date: June 16, 2006
Project: Lower Centennial Wash Watershed Flood Delineation Study
Subject: TDN Updates

WE ARE SENDING TO YOU: ☒ Attached or ☐ Under separate cover			
☐ Shop Drawings	☒ Prints	☒ Plans	☐ Samples
☐ Copy of letter	☐ Change Order	☒ Other	☐ Specifications

THESE ARE TRANSMITTED AS CHECKED BELOW:

☐ For Approval
☒ For your Use
☐ As requested
☐ For review and comment
☐ With submittal review action noted

Copies	Date	No.	Description
1	6/15/06	1	Phase IV TDN Updates

REMARKS:

Richard,

Enclosed are the latest updates to the TDN. The updates are based on the final GIS review for Phase IV. The post-its indicate the tab where the documents need to be replaced. Also, replace the Hydrology CD. Please call if you have any questions.

Joe R. Gonzalez

CC: Nathan Ford, RBF

18441 N. 25th Avenue · Suite 103 · Phoenix, AZ 85023
(602) 288-6528 · FAX (602) 288-6530

LOWER CENTENNIAL WASH WATERESHED DELINEATION STUDY, PHASE IV MAILING LIST

APN	LAV	IAV	TAV	OWNER_NAME	OWN_ADDR1	OWN_CITY	OWN_STATE	OWN_ZIP	EXEMPTION	USE_CODE	LOT_ACRES	BOOK	MAP	PARC	USE_CODE_D	USE_CODE_C	SALE_DATE	PARCEL	TAX_OWNER	TAX_CITY	TAX	TAX_ZIP	FLOOD_TAX	TAX_ADDR1	AREA	PERIMETER	ACRES
50658163B	3500	0	3500	FLOOD CONTROL DISTRICT OF MARICOPA COUNTY	2801W DURANGO ST	PHOENIX	AZ	85009	E	9600	18545.000	506	58	163B	COUNTY VACANT LAND	COUNTY OWNERSHIP	7171979	1279780	MARICOPA COUNTY FLOOD CONTROL DISTRIC	PHOENIX	AZ	850096356	0.00	2801 W DURANGO ST	18706.941	666.559	0.429
50658240	6500	0	6314	FLOOD CONTROL DISTRICT OF MARICOPA COUNTY	2801 W DURANGO ST	PHOENIX	AZ	850096399	E	9600	46565.000	506	58	240	COUNTY VACANT LAND	COUNTY OWNERSHIP	7091979	1280724	MARICOPA COUNTY FLOOD CONTROL DIST	PHOENIX	AZ	850096356	0.00	2801 W DURANGO ST	46684.390	911.914	1.072
50658228	6500	0	6314	FLOOD CONTROL DISTRICT OF MARICOPA COUNTY	2801W DURANGO ST	PHOENIX	AZ	85009	E	9600	46605.000	506	58	228	COUNTY VACANT LAND	COUNTY OWNERSHIP	8061979	1282206	FLOOD CONTROL DIST OF MARICOPA COUNTY	PHOENIX	AZ	850096214	0.00	3335 W DURANGO ST	46539.576	903.033	1.068
50618037D	114500	0	81772	HYSLOP TRAVIS	1975 E APACHE BLVD APT 211	TEMPE	AZ	85281		0004	6405106.000	506	18	037D	VACANT UNDETERMINED RURAL NON-SUBDIVIDED	VACANT_LAND	11012004	1283417	HYSLOP R TRAVIS	GLENDALE	AZ	853105885	24.08	22721 N 74TH DR	6260782.094	16677.193	143.728
50618040	41000	0	28996	ARIZONA STATE OF	205 S 17TH AVE RM 370	PHOENIX	AZ	850073212	E	9500	1199991.000	506	18	040	STATE VACANT LAND	STATE OWNERSHIP	6061972	1284959	ARIZONA STATE OF	MISSING CITY-			0.00	MISSING ADDRESS	706503.084	6385.819	16.219
50658205	8500	0	7841	FLOOD CONTROL DISTRICT OF MARICOPA COUNTY	2801W DURANGO ST	PHOENIX	AZ	85009	E	9600	70590.000	506	58	205	COUNTY VACANT LAND	COUNTY OWNERSHIP	7181979	1285107	FLOOD CONTROL DIST OF MARICOPA COUNTY	PHOENIX	AZ	850096214	0.00	3335 W DURANGO ST	46420.438	908.515	1.066
50658241	6500	0	6314	FLOOD CONTROL DISTRICT OF MARICOPA COUNTY	2801W DURANGO ST	PHOENIX	AZ	85009	E	9600	46565.000	506	58	241	COUNTY VACANT LAND	COUNTY OWNERSHIP	12101980	1287123	MARICOPA COUNTY FLOOD CONTROL DISTRIC	PHOENIX	AZ	850096356	0.00	2801 W DURANGO ST	46537.711	902.814	1.068
50658166	10000	0	8017	FLOOD CONTROL DISTRICT OF MARICOPA COUNTY	2801W DURANGO ST	PHOENIX	AZ	85009	E	9600	94336.613	506	58	166	COUNTY VACANT LAND	COUNTY OWNERSHIP	8061979	1287209	MARICOPA COUNTY FLOOD CONTROL DISTRIC	PHOENIX	AZ	850096356	0.00	2801 W DURANGO ST	94336.226	1220.729	2.166
50658229	6500	0	6314	FLOOD CONTROL DISTRICT OF MARICOPA COUNTY	2801W DURANGO ST	PHOENIX	AZ	85009	E	9600	46605.000	506	58	229	COUNTY VACANT LAND	COUNTY OWNERSHIP	8061979	1287547	FLOOD CONTROL DIST OF MARICOPA COUNTY	PHOENIX	AZ	850096214	0.00	3335 W DURANGO ST	46684.271	911.912	1.072
50658208	13000	0	11550	FLOOD CONTROL DISTRICT OF MARICOPA COUNTY	2801W DURANGO ST	PHOENIX	AZ	85009	E	9600	139820.000	506	58	208	COUNTY VACANT LAND	COUNTY OWNERSHIP	1301980	1289593	MARICOPA COUNTY FLOOD CONTROL DISTRIC	PHOENIX	AZ	850096356	0.00	2801 W DURANGO ST	139992.585	1532.521	3.214
50658168	6500	0	4860	FLOOD CONTROL DISTRICT OF MARICOPA COUNTY	2801W DURANGO ST	PHOENIX	AZ	85009	E	9600	47243.746	506	58	168	COUNTY VACANT LAND	COUNTY OWNERSHIP	8291979	1293875	MARICOPA COUNTY FLOOD CONTROL DISTRIC	PHOENIX	AZ	850096356	0.00	2801 W DURANGO ST	47243.746	915.636	1.085
50658147	6500	0	6500	FLOOD CONTROL DISTRICT OF MARICOPA COUNTY	2801W DURANGO ST	PHOENIX	AZ	85009	E	9600	47135.000	506	58	147	COUNTY VACANT LAND	COUNTY OWNERSHIP	1301980	1294432	FLOOD CONTROL DIST OF MARICOPA COUNTY	PHOENIX	AZ	850096214	0.00	3335 W DURANGO ST	47571.356	920.008	1.092
50658174B	2000	0	2000	FLOOD CONTROL DISTRICT OF MARICOPA COUNTY	2801W DURANGO ST	PHOENIX	AZ	85009	E	9600	7840.000	506	58	174B	COUNTY VACANT LAND	COUNTY OWNERSHIP	8131979	1295120	FLOOD CONTROL DIST OF MARICOPA COUNTY	PHOENIX	AZ	850096214	0.00	3335 W DURANGO ST	7852.622	437.228	0.180
50658230	6500	0	6314	FLOOD CONTROL DISTRICT OF MARICOPA COUNTY	2801W DURANGO ST	PHOENIX	AZ	85009	E	9600	46605.000	506	58	230	COUNTY VACANT LAND	COUNTY OWNERSHIP	6191981	1296847	FLOOD CONTROL DIST OF MARICOPA COUNTY	PHOENIX	AZ	850096214	0.00	3335 W DURANGO ST	46684.153	911.912	1.072
50658219	6500	0	6314	FLOOD CONTROL DISTRICT OF MARICOPA COUNTY	2801W DURANGO ST	PHOENIX	AZ	85009	E	9600	46595.000	506	58	219	COUNTY VACANT LAND	COUNTY OWNERSHIP	1241980	1297971	MARICOPA COUNTY FLOOD CONTROL DISTRIC	PHOENIX	AZ	850096356	0.00	2801 W DURANGO ST	46684.200	911.912	1.072
50658226	6500	0	6314	FLOOD CONTROL DISTRICT OF MARICOPA COUNTY	2801W DURANGO ST	PHOENIX	AZ	85009	E	9600	46585.000	506	58	226	COUNTY VACANT LAND	COUNTY OWNERSHIP	12101980	1298238	FLOOD CONTROL DIST OF MARICOPA COUNTY	PHOENIX	AZ	850096214	0.00	3335 W DURANGO ST	46684.432	911.915	1.072
50658217	6500	0	6314	FLOOD CONTROL DISTRICT OF MARICOPA COUNTY	2801W DURANGO ST	PHOENIX	AZ	85009	E	9600	46595.000	506	58	217	COUNTY VACANT LAND	COUNTY OWNERSHIP	1241980	1300377	MARICOPA COUNTY FLOOD CONTROL DISTRIC	PHOENIX	AZ	850096356	0.00	2801 W DURANGO ST	46684.197	911.912	1.072
50658146	6500	0	6500	FLOOD CONTROL DISTRICT OF MARICOPA COUNTY	2801W DURANGO ST	PHOENIX	AZ	85009	E	9600	47125.000	506	58	146	COUNTY VACANT LAND	COUNTY OWNERSHIP	12101980	1301653	FLOOD CONTROL DIST OF MARICOPA COUNTY	PHOENIX	AZ	850096214	0.00	3335 W DURANGO ST	47489.012	911.526	1.090
50658224	6500	0	6314	FLOOD CONTROL DISTRICT OF MARICOPA COUNTY	2801W DURANGO ST	PHOENIX	AZ	85009	E	9600	46585.000	506	58	224	COUNTY VACANT LAND	COUNTY OWNERSHIP	8291979	1302026	FLOOD CONTROL DIST OF MARICOPA COUNTY	PHOENIX	AZ	850096214	0.00	3335 W DURANGO ST	46624.289	911.515	1.070
506180298	1220	0	1220	HARQUAHALA VALLEY FARMS	PO BOX 519	REXBURG	ID	83440		4910	354230.000	506	18	029S	WASTE LAND	FALLOW LAND	5232001	1302097	HARQUAHALA VALLEY FARMS	REXBURG	ID	834400519	0.42	PO BOX 519	406911.612	3917.195	9.341
50658169B	1000	0	1000	FLOOD CONTROL DISTRICT OF MARICOPA COUNTY	2801W DURANGO ST	PHOENIX	AZ	85009	E	9600	3570.000	506	58	169B	COUNTY VACANT LAND	COUNTY OWNERSHIP	12101980	1304948	MARICOPA COUNTY FLOOD CONTROL DISTRIC	PHOENIX	AZ	850096356	0.00	2801 W DURANGO ST	3573.659	291.406	0.082
50658218	6500	0	6314	FLOOD CONTROL DISTRICT OF MARICOPA COUNTY	2801W DURANGO ST	PHOENIX	AZ	85009	E	9600	46595.000	506	58	218	COUNTY VACANT LAND	COUNTY OWNERSHIP	7121979	1305169	MARICOPA COUNTY FLOOD CONTROL DISTRIC	PHOENIX	AZ	850096356	0.00	2801 W DURANGO ST	46624.503	911.515	1.070
50658274	22500	0	16829	FLOOD CONTROL DISTRICT OF MARICOPA COUNTY	2801W DURANGO ST	PHOENIX	AZ	85009	E	9600	435600.000	506	58	274	COUNTY VACANT LAND	COUNTY OWNERSHIP	12251958	1309376	MARICOPA COUNTY FLOOD CONTROL DISTRIC	PHOENIX	AZ	850096356	0.00	2801 W DURANGO ST	435601.753	2640.010	10.000
50629003D	8000	0	7745	FLOOD CONTROL DISTRICT OF MARICOPA COUNTY	2801W DURANGO ST	PHOENIX	AZ	85009	E	9600	81905.950	506	29	003D	COUNTY VACANT LAND	COUNTY OWNERSHIP	9121979	1312035	FLOOD CONTROL DIST OF MARICOPA COUNTY	PHOENIX	AZ	850096214	0.00	3335 W DURANGO ST	81906.012	1389.578	1.880
50658145	6500	0	6500	FLOOD CONTROL DISTRICT OF MARICOPA COUNTY	2801W DURANGO ST	PHOENIX	AZ	85009	E	9600	47125.000	506	58	145	COUNTY VACANT LAND	COUNTY OWNERSHIP	12101980	1328456	FLOOD CONTROL DIST OF MARICOPA CO	PHOENIX	AZ	850096214	0.00	3335 W DURANGO ST	47016.245	905.342	1.079
50658156	6500	0	4860	FLOOD CONTROL DISTRICT OF MARICOPA COUNTY	2801W DURANGO ST	PHOENIX	AZ	85009	E	9600	46956.934	506	58	156	COUNTY VACANT LAND	COUNTY OWNERSHIP	1241980	1328458	FLOOD CONTROL DIST OF MARICOPA COUNTY	PHOENIX	AZ	850096214	0.00	3335 W DURANGO ST	46956.934	912.360	1.078
50658159	6500	0	4860	FLOOD CONTROL DISTRICT OF MARICOPA COUNTY	2801W DURANGO ST	PHOENIX	AZ	85009	E	9600	46948.162	506	58	159	COUNTY VACANT LAND	COUNTY OWNERSHIP	8091979	1328459	FLOOD CONTROL DIST OF MARICOPA COUNTY	PHOENIX	AZ	850096214	0.00	3335 W DURANGO ST	46948.162	911.872	1.078
50658160A	6000	0	6000	FAHRION RICHARD R & ANNA M	4911 116TH ST	EDMONTON				0013	40730.000	506	58	160A	VACANT RESIDENTIAL RURAL SUBDIVIDED	VACANT_LAND	12211977	1328460	REDIGER MELVIN K	TOLLESON	AZ	853530207	1.86	PO BOX 207	41255.400	841.772	0.947
50658204B	2500	0	2500	FLOOD CONTROL DISTRICT OF MARICOPA COUNTY	2801W DURANGO ST	PHOENIX	AZ	85009	E	9600	9845.000	506	58	204B	COUNTY VACANT LAND	COUNTY OWNERSHIP	12251958	1328469	FLOOD CONTROL DIST OF MARICOPA COUNTY	PHOENIX	AZ	850096214	0.00	3335 W DURANGO ST	9905.760	487.461	0.227
50658207	8500	0	7841	FLOOD CONTROL DISTRICT OF MARICOPA COUNTY	2801W DURANGO ST	PHOENIX	AZ	85009	E	9600	70590.000	506	58	207	COUNTY VACANT LAND	COUNTY OWNERSHIP	8061979	1328470	MARICOPA COUNTY FLOOD CONTROL DISTRIC	PHOENIX	AZ	850096356	0.00	2801 W DURANGO ST	46539.426	903.033	1.068
50658215	6500	0	6314	FLOOD CONTROL DISTRICT OF MARICOPA COUNTY	2801W DURANGO ST	PHOENIX	AZ	85009	E	9600	46595.000	506	58	215	COUNTY VACANT LAND	COUNTY OWNERSHIP	12101980	1328472	MARICOPA COUNTY FLOOD CONTROL DISTRIC	PHOENIX	AZ	850096356	0.00	2801 W DURANGO ST	46684.192	911.911	1.072
50658216	6500	0	6314	FLOOD CONTROL DISTRICT OF MARICOPA COUNTY	2801W DURANGO ST	PHOENIX	AZ	85009	E	9600	46595.000	506	58	216	COUNTY VACANT LAND	COUNTY OWNERSHIP	12101980	1328473	MARICOPA COUNTY FLOOD CONTROL DISTRIC	PHOENIX	AZ	850096356	0.00	2801 W DURANGO ST	46623.979	911.511	1.070
50658225	6500	0	6314	FLOOD CONTROL DISTRICT OF MARICOPA COUNTY	2801W DURANGO ST	PHOENIX	AZ	85009	E	9600	46585.000	506	58	225	COUNTY VACANT LAND	COUNTY OWNERSHIP	7061979	1328474	FLOOD CONTROL DIST OF MARICOPA COUNTY	PHOENIX	AZ	850096214	0.00	3335 W DURANGO ST	46684.508	911.916	1.072
50658157	6500	0	4860	FLOOD CONTROL DISTRICT OF MARICOPA COUNTY	2801W DURANGO ST	PHOENIX	AZ	85009	E	9600	46995.689	506	58	157	COUNTY VACANT LAND	COUNTY OWNERSHIP	8061979	1348689	FLOOD CONTROL DIST OF MARICOPA COUNTY	PHOENIX	AZ	850096214	0.00	3335 W DURANGO ST	46995.689	912.476	1.079
50658158	6500	0	4860	FLOOD CONTROL DISTRICT OF MARICOPA COUNTY	2801W DURANGO ST	PHOENIX	AZ	85009	E	9600	46909.096	506	58	158	COUNTY VACANT LAND	COUNTY OWNERSHIP	12101980	1348690	FLOOD CONTROL DIST OF MARICOPA COUNTY	PHOENIX	AZ	850096214	0.00	3335 W DURANGO ST	46909.096	911.754	1.077
50658165	6500	0	4860	FLOOD CONTROL DISTRICT OF MARICOPA COUNTY	2801W DURANGO ST	PHOENIX	AZ	85009	E	9600	47243.682	506	58	165	COUNTY VACANT LAND	COUNTY OWNERSHIP	12101980	1348691	MARICOPA COUNTY FLOOD CONTROL DISTRIC	PHOENIX	AZ	850096356	0.00	2801 W DURANGO ST	47243.682	915.635	1.085
50658206	8500	0	7841	FLOOD CONTROL DISTRICT OF MARICOPA COUNTY	2801 W DURANGO ST	PHOENIX	AZ	850096399	E	9600	70590.000	506	58	206	COUNTY VACANT LAND	COUNTY OWNERSHIP	7091979	1348695	MARICOPA COUNTY FLOOD CONTROL DISTRIC	PHOENIX	AZ	850096356	0.00	2801 W DURANGO ST	46273.746	899.411	1.062
50618016D	106500	0	44385	DITTA LLC/BEN FATTO LTD PART/EL MAREL LTD PAR	1223 S CLEARVIEW AVE STE 105	MESA	AZ	85208		0004	2023749.000	506	18	016D	VACANT UNDETERMINED RURAL NON-SUBDIVIDED	VACANT_LAND	3252005	1368384	FIVE ZERO SEVENTH AVE LLC	PARADISE VLY	AZ	852535262	13.40	5835 N CASA BLANCA DR	2024073.113	10744.317	46.466
50629066	142000	0	96625	FLOOD CONTROL DISTRICT OF MARICOPA COUNTY	2801W DURANGO ST	PHOENIX	AZ	85009	E	9600	9583200.000	506	29	066	COUNTY VACANT LAND	COUNTY OWNERSHIP	12251958	1368513	MARICOPA COUNTY FLOOD CONTROL DISTRIC	PHOENIX	AZ	850096356	0.00	2801 W DURANGO ST	9552236.415	15823.297	219.289
50630001A	113000	0	79250	ALWIN VICTORIA J A/OBIS TRUST/KONTEK TRUST	PO BOX 14513	SCOTTSDALE	AZ	85267		0004	6554038.000	506	30	001A	VACANT UNDETERMINED RURAL NON-SUBDIVIDED	VACANT_LAND	2171995	1368518	ALWIN VICTORIA J A/OBIS TRUST/KONTEK TRU	SCOTTSDALE	AZ	852674513	23.06	PO BOX 14513	6493915.834	13463.529	149.080
50658164	6500	0	4860	FLOOD CONTROL DISTRICT OF MARICOPA COUNTY	2801W DURANGO ST	PHOENIX	AZ	85009	E	9600	47181.238	506	58	164	COUNTY VACANT LAND	COUNTY OWNERSHIP	8061979	1369254	MARICOPA COUNTY FLOOD CONTROL DISTRIC	PHOENIX	AZ	850096356	0.00	2801 W DURANGO ST	47181.238	915.219	1.083
50658167	6500	0	4860	FLOOD CONTROL DISTRICT OF MARICOPA COUNTY	2801W DURANGO ST	PHOENIX	AZ	85009	E	9600	47095.197	506	58	167	COUNTY VACANT LAND	COUNTY OWNERSHIP	8011979	1369255	MARICOPA COUNTY FLOOD CONTROL DISTRIC	PHOENIX	AZ	850096356	0.00	2801 W DURANGO ST	47094.819	906.728	1.081
50658223B	7000	0	6314	FLOOD CONTROL DISTRICT OF MARICOPA COUNTY	2801 W DURANGO ST	PHOENIX	AZ	850096399	E	9600	50095.000	506	58	223B	COUNTY VACANT LAND	COUNTY OWNERSHIP	10231979	1369261	MARICOPA COUNTY FLOOD CONTROL DISTRIC	PHOENIX	AZ	850096356	0.00	2801 W DURANGO ST	49450.996	1014.513	1.135

JLK Engineers
Transportation • Drainage • Public Works
18441 N. 25th Avenue • Suite 103
Phoenix, AZ 85023
(602) 405-1875 • (602) 288-5781

February 1, 2006

Victoria Alwin
P.O. Box 14513
Scottsdale, Arizona 85267

RE: Lower Centennial Wash Watershed Study Results Notification

Dear Property Owner:

JLK Engineers, LLC has contracted with the Flood Control District of Maricopa County to perform an approximate Zone A Floodplain Delineation Study for tributaries to the Lower Centennial Wash. The purpose of this study is to determine flood related hazard zones and delineate areas that may be subject to inundations during a "100-year flood" event. According to records at the Maricopa County Assessor's office, you own one or more parcels of land within the predicted limits of the Floodplain Boundaries.

The study and resulting maps will be used for floodplain management purposes and submitted to the Federal Emergency Management Agency (FEMA) for flood insurance information and revisions to the Flood Rate Insurance Maps. The study should be available to the public for formal review and comment in approximately 12 to 15 months. In the interim if you have any questions regarding this study or if you have any information regarding flooding in your area, please contact Mr. Richard P. Harris, of the Flood Control District of Maricopa County at 602-506-4528, or Mr. Joe R. Gonzalez of JLK Engineers, LLC at 602-405-1875.

Sincerely,

Joe R. Gonzalez, P.E.
JLK Engineers, LLC

JLK Engineers
Transportation • Drainage • Public Works
18441 N. 25th Avenue • Suite 103
Phoenix, AZ 85023
(602) 405-1875 • (602) 288-5781

February 1, 2006

State of Arizona
207 South 17th Avenue
Room 310
Phoenix, Arizona 85007-3212

RE: Lower Centennial Wash Watershed Study Results Notification

Dear Property Owner:

JLK Engineers, LLC has contracted with the Flood Control District of Maricopa County to perform an approximate Zone A Floodplain Delineation Study for tributaries to the Lower Centennial Wash. The purpose of this study is to determine flood related hazard zones and delineate areas that may be subject to inundations during a "100-year flood" event. According to records at the Maricopa County Assessor's office, you own one or more parcels of land within the predicted limits of the Floodplain Boundaries.

The study and resulting maps will be used for floodplain management purposes and submitted to the Federal Emergency Management Agency (FEMA) for flood insurance information and revisions to the Flood Rate Insurance Maps. The study should be available to the public for formal review and comment in approximately 12 to 15 months. In the interim if you have any questions regarding this study or if you have any information regarding flooding in your area, please contact Mr. Richard P. Harris, of the Flood Control District of Maricopa County at 602-506-4528, or Mr. Joe R. Gonzalez of JLK Engineers, LLC at 602-405-1875.

Sincerely,

Joe R. Gonzalez, P.E.
JLK Engineers, LLC

JLK Engineers
Transportation • Drainage • Public Works
18441 N. 25th Avenue • Suite 103
Phoenix, AZ 85023
(602) 405-1875 • (602) 288-5781

February 1, 2006

Travis Hyslop
197 E. Apache Blvd
Apt. 211
Tempe, Arizona 85281

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February 1, 2006

Harquahala Valley Farms
P.O. Box 519
Rexburg , ID 83440

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Dear Property Owner:

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18441 N. 25th Avenue • Suite 103
Phoenix, AZ 85023
(602) 405-1875 • (602) 288-5781

February 1, 2006

Melvin K. Rediger
P.O. Box 207
Tolleson, Arizona 85353-0207

RE: Lower Centennial Wash Watershed Study Results Notification

Dear Property Owner:

JLK Engineers, LLC has contracted with the Flood Control District of Maricopa County to perform an approximate Zone A Floodplain Delineation Study for tributaries to the Lower Centennial Wash. The purpose of this study is to determine flood related hazard zones and delineate areas that may be subject to inundations during a "100-year flood" event. According to records at the Maricopa County Assessor's office, you own one or more parcels of land within the predicted limits of the Floodplain Boundaries.

The study and resulting maps will be used for floodplain management purposes and submitted to the Federal Emergency Management Agency (FEMA) for flood insurance information and revisions to the Flood Rate Insurance Maps. The study should be available to the public for formal review and comment in approximately 12 to 15 months. In the interim if you have any questions regarding this study or if you have any information regarding flooding in your area, please contact Mr. Richard P. Harris, of the Flood Control District of Maricopa County at 602-506-4528, or Mr. Joe R. Gonzalez of JLK Engineers, LLC at 602-405-1875.

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Transportation • Drainage • Public Works
18441 N. 25th Avenue • Suite 103
Phoenix, AZ 85023
(602) 405-1875 • (602) 288-5781

February 1, 2006

DITTA, LLC
1223 South Clearview Avenue
Suite 105
Mesa, Arizona 85208

RE: Lower Centennial Wash Watershed Study Results Notification

Dear Property Owner:

JLK Engineers, LLC has contracted with the Flood Control District of Maricopa County to perform an approximate Zone A Floodplain Delineation Study for tributaries to the Lower Centennial Wash. The purpose of this study is to determine flood related hazard zones and delineate areas that may be subject to inundations during a "100-year flood" event. According to records at the Maricopa County Assessor's office, you own one or more parcels of land within the predicted limits of the Floodplain Boundaries.

The study and resulting maps will be used for floodplain management purposes and submitted to the Federal Emergency Management Agency (FEMA) for flood insurance information and revisions to the Flood Rate Insurance Maps. The study should be available to the public for formal review and comment in approximately 12 to 15 months. In the interim if you have any questions regarding this study or if you have any information regarding flooding in your area, please contact Mr. Richard P. Harris, of the Flood Control District of Maricopa County at 602-506-4528, or Mr. Joe R. Gonzalez of JLK Engineers, LLC at 602-405-1875.

Sincerely,

Joe R. Gonzalez, P.E.
JLK Engineers, LLC

B.3 Contract Documents

EXHIBIT A

SCOPE OF WORK

CONTRACT FCD 2003C061

LOWER CENTENNIAL WATERSHED TRIBUTARIES
ZONE A FLOODPLAIN DELINEATION STUDY

EXHIBIT A

GENERAL SCOPE OF WORK

CONTRACT FCD 2003C061

LOWER CENTENNIAL WATERSHED TRIBUTARIES ZONE A FLOODPLAIN DELINEATION STUDY

GENERAL

The goal of this project is to delineate an estimated 250-miles of approximate Zone A 100-year floodplains within the Lower Centennial Watershed. The limits of the Lower Centennial Watershed 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 the DISTRICT's 10-foot contour mapping, existing United States Geological Survey (USGS) and/or other topographic mapping, 4) perform field surveys as required, 5) develop the 100-year peak discharges, 6) delineate the Zone A floodplains and optionally delineate approximate method floodways and alluvial fan landforms, 7) prepare a low level geomorphic assessment , 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 judgment in the development of the hydrologic data and hydraulic models. All work must meet Arizona Department of Water Resources (ADWR) and 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 to the DISTRICT's Consultant Guidelines dated December 1, 2003.

The floodplain delineation will be phased according to the sub-watershed identification as identified in Exhibit A.1 and prioritization presented in Table1 below.

Table 1: Sub-Watershed Prioritization

Sub-Watershed	Relative Priority	Area (sq.mi.)	Total Mileage	Optional 250 Floodway	Optional 100 Miles of Floodplain	Optional 80 square miles of Zone AO
Phase 1: East Basin	1	195	52	87	35	28
Phase 2: Southwest Basin	2	118	32	53	21	17
Phase 3: Northwest Basin	3	247	66	110	44	35
Totals		560	150	250	100	80

All work must be completed within nine hundred and forty (940) days from the Notice to Proceed (NTP). The FEMA submittal package must be completed within five hundred and twenty (520) days (which includes one hundred twenty (120) days for the DISTRICT review). The remaining four hundred and twenty (420) days are allotted for obtaining FEMA approval, and the completion of those tasks required after FEMA approval is obtained.

TASK 1 - COORDINATION

1.1 Within fourteen (14) calendar days of Notice to Proceed, the CONSULTANT will submit a project schedule to the DISTRICT's Project Manager showing coordination meetings and completion dates for each task identified in the Scope of Work (SOW). The CONSULTANT will update this project schedule when appropriate.

1.2 The CONSULTANT will 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, hydraulic, and geomorphic 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 twenty-one (21) days of Notice to Proceed. Thereafter, this estimate will be updated and submitted to the DISTRICT's Project Manager at least ten (10) days before the end of each quarter.

1.4 The CONSULTANT will submit monthly progress reports at least five (5) days before submittal of monthly invoices. The report shall be brief and should be no longer than two (2) typed pages. At a minimum, the monthly report shall contain the following:

a. A description of the work accomplished by task during the reporting month.
b. Percent (%) completed for the month and percent (%) cumulative completed for each task.
c. A brief description of the work to be accomplished in the following month.
d. A description of any problems encountered and a recommended solution.

1.5 The DISTRICT will be 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 two (2) weeks 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 DISTRICT will supply the CONSULTANT with the original affidavit of publication from each newspaper for each day that the ad ran.

1.6 The CONSULTANT will notify property owners located within close proximity of study watercourses by regular mail and obtain any necessary Rights of Entry for the study area, using a list of property owners furnished by the DISTRICT. The CONSULTANT will furnish the DISTRICT with a sample of the Notification/ Right of Entry letter and a list of expected mail recipients.

1.7 The CONSULTANT will coordinate with officials from the DISTRICT and any agencies affected during the course of the study. Towards the end of each study phase, the CONSULTANT will notify property owners located within close proximity of study watercourses by regular mail, if applicable, regarding the floodplain boundary delineations. A public meeting may be held after each phase to solicit public input. Organization of the public meeting will be the responsibility of the DISTRICT. The CONSULTANT will furnish the DISTRICT with a sample of the public meeting notification letter and a list of expected mail recipients.

1.8 The DISTRICT will provide any public notice beyond that described in Task 1.7.

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 coordinate with the CAP and other agencies to determine whether the levee diversion dikes are certified structures.

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, data necessary for geomorphologic analysis, 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 ninety (90) days of Notice to Proceed. Continued research may be necessary as the project proceeds.

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 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 delineation. GDACS control will be the basis of the field survey. This information should be reduced and compiled into an 11-inch x 17-inch (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.

4.2 Copies of the survey field books and office calculations must be included in the TDN. An Arizona Registered Land Surveyor (RLS) must seal the survey notes. 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 and additional hydraulic structures used for approximate floodplain delineations where the DISTRICT's 10-foot contour mapping or the USGS DEM data are not adequate. **This optional task is not authorized with the Notice to Proceed; it may be authorized in writing by the DISTRICT based upon specific need as determined by the DISTRICT during the contract period.**

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 or latest version). The

following themes are 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 doesn't fit one of the themes listed here, the DISTRICT's Project Manager shall be contacted to determine the appropriate theme for that data.

a. CORNERS (if any)
b. CTRL (Misc. Control Survey Pts.)
c. FPCTLFCD (ERMs))
d. STRCT (Structure)
e. PRJ (Project Boundary)

TASK 5 - HYDROLOGY

The CONSULTANT shall perform complete and detailed hydrologic analysis of the project area in order to fulfill the specific requirements identified in the SOW. The CONSULTANT shall follow the procedures outlined in the Drainage Design Manual for Maricopa County, Volume I Hydrology, *latest version*, for all hydrologic modeling and calculations and the SOW, General Requirements and Procedures. The Hydrologic modeling shall be completed for the 100-year, 6-hour and 100-year, 24-hour storm. Where diversion structures cannot be certified by FEMA, the hydrology analysis shall include an investigation of both with and without the diversion structures.

5.1 Existing Studies

The CONSULTANT shall research and give consideration to all existing hydrologic studies of the area and shall become familiar with the general hydrology of the area. The DISTRICT will provide the outflow hydrographs for the DISTRICT maintained structures.

5.2 Base Maps

The CONSULTANT shall develop the hydrologic base maps using the 10-ft contour interval topographic mapping supplied by the DISTRICT. An overall drainage basin map with sheet index will be prepared at a scale of 1"=2000 feet, or some other appropriate scale approved by the DISTRICT.

5.3 Watershed and Sub-basin Delineations

Using appropriate hydrologic judgment, sub-basins are to be identified that provide reasonable depiction of the watershed conditions. The sub-basins must be as homogeneous as possible, using watershed area, watershed type (mountainous and flat lands or urban and undeveloped areas), and time of concentration as criteria. Sub-basin breakdowns will be done in sufficient detail to provide peak discharges at structures, major road crossings, confluences, and at boundary lines. An appropriate time step and number of ordinates is to be selected that allows for complete calculation of the flood hydrograph without sacrificing resolution on the flood peak. All calculations or assumptions used in developing sub-basin and routing parameters shall be documented and made a part of the appendix for the hydrology report. The CONSULTANT will provide a WMS applicability matrix to be located within the Special Problems Section of the TDN.

5.4 HEC-1 Parameters

5.4.1 Rainfall Excess - The Green and Ampt methodology will be utilized for estimation of rainfall losses.

5.4.2 Unit Hydrograph - The Clark or S-graph method should be used. The choices in methodology will be to the discretion of the CONSULTANT, with approval from the DISTRICT.

5.4.3 Time of Concentration - The Time of Concentration and Lag times shall be adjusted for the appropriate return frequency using the Drainage Design Manual, Volume I.

5.4.4 HEC-1 Input Data - The DISTRICT's computer program DDMS or WMS shall be used to develop HEC-1 input data.

5.5 HEC-1 Modeling

The CONSULTANT shall use the U.S. Army Corps of Engineers computer program HEC-1, *latest version*, to develop an existing conditions hydrologic model for the study area.

5.5.1 HEC-1 Model for the 100-year peak runoff event will be developed for the study area to use in the development of a HEC-RAS Hydraulic model.

5.5.1.1 Channel Routing - The choice of methodology will be at the discretion of the CONSULTANT, with approval from the DISTRICT. Average cross sections will be developed utilizing the 10-ft contour interval mapping and field reconnaissance data. Sufficient field cross sections will be taken to ensure that routing reaches are reasonable and representative of field conditions. The HEC-1 routing parameters for the reaches modeled using HEC-RAS will be adjusted after the HEC-RAS cross sections are available. The resulting velocities and depths, for all reaches, must be assessed for realistic values.

5.5.1.2 Reservoir Routing - Detailed analysis of structures and ponding areas will be accomplished using the Modified Puls reservoir routing option of HEC-1. Stage versus discharge tables for hydraulic structures will be estimated using appropriate hydraulic methodology.

5.5.1.3 Split Flows –At locations of stable split flows a rating curve will be developed to define the split using normal depth in both branches of the downstream cross sections.

5.5.1.4 **(OPTIONAL)** For split flow locations judged to be unstable additional analysis will be done to identify and classify landforms in greater detail. **This optional task is not authorized with the Notice to Proceed; it may be authorized in writing by the DISTRICT based upon specific need as determined by the DISTRICT during the contract period**

5.6 Meetings and Field Visits

Five (5) meetings and three (3) field trips, associated with development of the hydrologic model for each phase, shall be held with DISTRICT staff at the following milestones:

5.6.1 One (1) field trip and kick off meeting at the start of the project to identify the critical points of the watershed and problem areas. This trip will be considered one of the three total trips.

5.6.2 Meeting No. 1: held as soon as basic data are gathered and the sub-basins have been delineated preliminarily. Sample HEC-1 parameter estimations should also be presented and discussed at this meeting. Four (4) days prior to this meeting a copy of the draft maps of the sub-basins must be delivered to the DISTRICT. The method for generating the peak discharges will also be agreed upon at this meeting. Potential locations for altering sub-basin boundaries will be discussed during this meeting.

5.6.3 Meeting No. 2: after the parameters have been estimated. A draft copy of the parameters must be delivered to the DISTRICT at least one (1) week prior to this meeting.

5.6.4 Meeting No. 3: after the preliminary HEC-1 results have been obtained and a draft report has been prepared. A copy of the draft report and a digital copy of the HEC-1 model must be delivered two (2) weeks prior to the meeting.

5.6.5 Meeting No. 4: review of final hydrology report and comments by the DISTRICT. A second field trip may be scheduled for the same day so the results can be related to conditions in the field.

5.7 Review and Approval

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

a. Watershed boundary maps, soil maps, and land use maps
b. HEC-1 parameter estimation
c. HEC-1 flow diagram and input parameters
d. HEC-1 results

5.8 The Hydrologic Report

5.8.1 The findings of the hydrologic study will be presented in Section 4 of the Technical Data Notebook and will be prepared in accordance with ADWR State Standards Attachment 1-97 (SSA 1-97). 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.

5.8.2 Tables and Figures for the Appendices:

5.8.2.1 (Schematic Map) Base Topographic maps(s) showing the sub-basins, schematic map for the HEC-1, routing reaches, order of combined hydrographs, major man-made structures such as pipes, levees, railroads,

or culverts, and references (i.e., street names, Township, Range, Section, etc.) at a scale to be agreed upon with DISTRICT Staff.

5.8.2.2 (Routing Map) Topographic base map showing the Tc flow path or lag flow paths, and routing reaches labeled at the same scale as the base map. Pertinent hydraulic data for each routing reach such as cross sections locations shall be included on the map.

5.8.2.3 (Soils Map) Soils map(s) at the same scale as the base map.

5.8.2.4 (Land Use Map) Land use map(s) at the same scale as the base map.

5.8.2.5 (Flow Map) Base topographic map showing the results of the study (i.e. peak flows, peak volumes for impoundments, etc) at major concentration points. The level of detail of this map is to be determined by each individual scope.

5.9 Digital Deliverables

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 Hydrologic data. However, for this study there may not be data for every theme identified, or the CONSULTANT might develop data for themes not listed. Therefore, only those themes, for which there are data, need to be completed. If the CONSULTANT has data that doesn't fit one of the themes listed here, the DISTRICT's Project Manager shall be contacted to determine the appropriate theme for that data.

a. DRNBSN (Drainage Basins)
b. PRJDAT (Project Identification)
c. DRNPTH (Drainage Flow Paths)

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's Guidelines and Specifications for Flood Hazard Mapping Partners, April 2003, and FIA Document 12, Appeals, Revisions, and Amendments to Flood Insurance Maps, December 1993, and FEMA 265, *Managing Floodplain Development in Approximate Zone A Areas*, April 1995.

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. Approximate floodway delineations.
f. Final hydraulics section of the TDN.

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 CONSULTANT will delineate 150-miles of Approximate Zone A floodplain boundaries based upon the final results of the hydrologic study as directed by the DISTRICT.

6.4 **(OPTIONAL)** The CONSULTANT will delineate an additional 100-miles of approximate Zone A delineation. **This optional task is not authorized with the Notice to Proceed; it may be authorized in writing by the DISTRICT based upon specific need as determined by the DISTRICT during the contract period**

6.5 **(OPTIONAL)** The CONSULTANT will delineate an additional eighty (80) square miles of approximate Zone AO per FEMA Guidelines. **This optional task is not authorized with the Notice to Proceed; it may be authorized in writing by the DISTRICT based upon specific need as determined by the DISTRICT during the contract period**

6.6 **(OPTIONAL)** The CONSULTANT will delineate administrative floodway boundaries for the 250-miles of Approximate Zone A delineations listed under Task 6.3. **This optional task is not authorized with the Notice to Proceed; it may be authorized in writing by the DISTRICT based upon specific need as determined by the DISTRICT during the contract period.**

6.7 Field Reconnaissance

6.7.1 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.

6.7.2 Manning's "n" values are to be determined using the methodology in the USGS report, *Estimating 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 watercourses. It is anticipated that between 15 and 25 typical reach types will be identified during the field reconnaissance.

6.7.3 Representative "n" values for each typical reach type will be selected. The reconnaissance report will present the determination of channel and over bank "n" values using captioned color photographs or color photocopies for each identified reach type in the project area, and the extents of the typical reach types shall be displayed on an aerial photo exhibit. 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 for channels, structures, and "n" value determinations 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.

6.8 Cross Sections

6.8.1 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 might include collecting the data directly off paper copies of the DISTRICT's 10-foot contour map orthophotos, , use of a computer program to develop the data from digital information, or from field surveys.

6.8.2 The cross section plots will at a minimum show computed water surface elevations and "n" values. All plots are to be accompanied by a legend. These plots should be available at all review levels.

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

6.10 The findings of the floodplain delineation study will be presented in Section 5 of the Technical Data Notebook and will be prepared in accordance with ADWR State Standards Attachment 1-97 (SSA 1-97). The report will be organized as specified by the DISTRICT standards, following SSA 1-97 format.

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

6.12 The CONSULTANT will provide work maps on either the DISTRICT's 10-foot Orthophotos, or, on monochrome USGS digital raster graphic quadrangle USGS maps (used as base 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 work map drawings will be 24-inch x 36-inch in size. The work map scale will be determined by the CONSULTANT, and will vary between 1"=400' and 1"=1000' scale, depending on the terrain and the floodplain widths. The DISTRICT's Project Manager must approve the horizontal scale to be used.

A cover sheet will be part of the work-study drawings and shall include 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 watercourse names and floodplain boundaries, approximate method floodway boundaries (if developed), piedmont surface land forms (if developed), a north arrow, scale, section corners, current streets and highway names, subdivision boundary names, Horizontal and Vertical Datum references (State Plane Coordinate System, NAD 83, and NAVD 88), any MCDOT's GDAC's monument labels located within individual sheet boundaries, major drainage features, corporate boundaries, hydraulic cross section lines, index map, peak discharges at every concentration points, and Section, Township, Range for each watercourse delineated.

6.13 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 doesn't fit one of the themes listed here, the DISTRICT's Project Manager shall be contacted to determine the appropriate theme for that data.

a.	PRJ (Project Boundary)	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.	FPBLN (Floodplain Baseline)

TASK 7 LOW LEVEL GEOMORPHIC ASSESSMENT

7.1 The CONSULTANT will perform a low level geomorphic assessment on the piedmont/alluvial plain surfaces within the area identified on Exhibit 1. The purpose of this geomorphic assessment is to identify locations where conventional riverine floodplain analysis is not appropriate. Example landforms not conducive to conventional riverine floodplain analysis are: active alluvial fans, unstable or complex distributary flow areas, and alluvial plains and piedmonts with expansive areas of unstable and/or shallow channels. The results of the analysis will be submitted in a technical memorandum including exhibits and digital delineations. Recommendations regarding what type of floodplain analysis should be applied to the identified landforms shall be presented with a focus toward the locations where the approximate floodplain delineations for this study should be performed.

7.2 Data Collection

7.2.1 The DISTRICT will provide:

- Digital black and white and color aerial photography,
- A digital copy of the DISTRICT's "Piedmont Flood Hazard Assessment Manual" (draft 2003), and
- Available geologic maps (OFR89-7, OFR92-03, OFR92-5, OFR94-17, OFR93-6, and OFR-93-12) from AZGS.

7.2.2 The DISTRICT shall obtain stereo photos for the CONSULTANT; as available.

7.3 The CONSULTANT will analyze and document all landforms and identify locations where conventional riverine floodplain analyses are not appropriate. The analysis will be based on identifying characteristics specific to each type of landform found in the study area based on soils, geology, topography, aerial photo interpretation (digital and stereoscopic) and limited fieldwork.

Specific landform characteristics to be identified by aerial photo interpretation and reconnaissance level fieldwork are: relative channel size, drainage pattern, drainage density, frequency and spacing of channel splits, surface color, and vegetative associations.

7.3.1 Specific landform characteristics to be identified by inspection of the topographic mapping are: degree of contour crenulations, degree of channel incision, presence of radial/curvilinear contour patterns, and contour spacing.

7.3.2 Chapters 2, 3, and applicable appendices of the DISTRICT's "Piedmont Flood Hazard Assessment Manual" (draft 2003) shall be used as a guide for defining the landform characteristics as well certain piedmont assessment methodologies.

7.3.3 Detailed geologic mapping may not be available for the entire analysis area. Where geologic data is lacking, the CONSULTANT will compare surfaces in the unmapped area with equivalent surfaces in the mapped areas in order to determine appropriate geologic units/age ranges for the unmapped areas using their professional judgment.

7.4 The results will be submitted to the DISTRICT in the form of a technical memorandum discussing the background, methods, sources of the data, and scale/level of detail of the analysis, results, and flood delineation method recommendations. The technical memorandum will be included in the final TDN.

7.4.1 The memorandum should discuss and document the characteristics each landform type identified, including piedmont landforms where riverine analysis is appropriate (relict and inactive alluvial fans). The relict and inactive fans can be discussed and documented in a more general fashion within the memorandum. Areas where any particular landform exhibited unique characteristics somewhat different from more representative landforms should be mentioned specifically within the discussions. A table relating landform characteristics and landform determinations should be included either within the memorandum text or as an appendix.

7.4.2 Exhibits shall be included as part of the technical memorandum. Exhibits shall be included as either 24-inch x 36-incb or 11-inch by 17-inch sheets to be determined based on which size shows an appropriate level of detail. The following are the minimum exhibits required:

- Study Area Map: One (1) exhibit shall show the landform delineations and their relation to the Lower Centennial project area.
- Study Overview Map: One (1) exhibit shall show the landform delineations within the geomorphic assessment study area with an aerial photo background. It is recommended that this exhibit be 2-inch x 36-inch.
- Geology Overlay Map: One (1) exhibit shall show the landform delineations within the geomorphic assessment study area with a geology background.
- Soils Overlay Map: One (1) exhibit shall show the landform delineations within the geomorphic assessment area with a soils background.
- Non-Riverine Landform Exhibits: More detailed exhibits shall be provided of the individual non-riverine landforms with either one (1) to two (2) landform delineations being shown on an 11-inch x 17-inch sheet or possibly three (3) to four (4) on an 24-inch x 36-inch sheet. All exhibits will have an aerial photo background.

7.4.3 The original AZGS Open File Reports shall be included as appendices to the technical memorandum.

7.5 The digital line work for the landforms identified shall also be provided to the DISTRICT with the following associated attribute data: landform id #, landform type, and scale of analysis. The CONSULTANT will need to coordinate with the DISTRICT's GIS branch to obtain specific format details.

7.6 Deliverables:

- Technical Memorandum including discussions, 11-inch x 17-inch landform exhibits, and AZGS Open File Reports in hard copy and digitally in WORD and PDF format.
- Digital polygon files in CAD format or Arc shape files with associated attribute information. The CONSULTANT will need to coordinate with the DISTRICT's GIS branch to obtain specific format details.

TASK 8 - DELIVERABLES

8.1 Both paper and electronic deliverables will be made at the completion of each task. In addition, the CONSULTANT will deliver the following items to the DISTRICT before delivering the FEMA submittal package:

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

8.1.2 Any hydrologically significant related data for the DISTRICT's Hydrologic Information System.

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

8.2 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:

8.2.1 Two (2) complete sets of 24-inch x 36-inch black line drawings with the topographic data and 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.

8.2.2 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.

8.3 Final Submittal: unless directed otherwise by the DISTRICT, all printed deliverable items shall be in color unless authorized otherwise by the DISTRICT. The CONSULTANT will submit two separate TDN's, one for each division established in Table 1 and shown in

Exhibit A. The following products are considered deliverables for the final submittal to the DISTRICT after FEMA approval is issued:

8.3.1 One (1) complete composite set of sealed non-erasable mylars with the topographic data and floodplain delineations shown. Two (2) complete sets of sealed blue line copies of the delineation exhibits. The sheets shall be 24-inch x 36-inch 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.

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

8.3.3 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.

8.3.4 The final TDN shall be delivered to the DISTRICT in PDF format.

RBF CONSULTING

February 10, 2005 JN: 45-101952

Richard P. Harris, P.E., C.F.M.
Senior Civil Engineer
Flood Delineation Branch
2801 West Durango Street
Phoenix, Arizona 85009

RE: Lower Centennial Survey Change Order Request (FCD 2033C061)

Dear Mr. Harris:

I would like to request a change order for survey tasks that were originally included in the scope for Lower Centennial. The amount that was negotiated at the beginning of the project was based on performing field survey for various structures in the Harquahala Valley. This survey would have included survey of the Westside/Eagletail Levee, Westside/Centennial Levee, Harquahala FRS, Saddleback FRS, Saddleback Diversion Channel, and railroad crossings. The amount that was negotiated was based on the assumption that this information was necessary to support the hydrology and floodplain delineation in this region. However, now that the phase boundaries are finalized and the stream lengths to be delineated are known, the scope relative to the necessary survey was re-evaluated. Of the original structures that were assumed necessary for field survey, only the railroad crossings fall within the actual study area. Therefore, a revised cost to do the remaining survey work was estimated by our sub-consultant, A-Team.

In addition, the original scope's assumption regarding the topography assumed that the automated procedures in WMS could be used for the hydrology modeling and hydraulic mapping. However, because of irregularities with the topography found during the analysis of Phase 1, as already noted in the meeting minutes and the progress updates, using the FCD topography required hand delineation of the drainage areas and the floodplain mapping which is more work then expected. Much of the hydrology analysis was effected by the topography irregularities and many of the procedures that were originally thought to be automated now have to be done by hand and compared back to aerial photography. This additional work will also apply to Phase 2 and Phase 3 of the project, which haven't been started yet. Table 1 following this report shows the tasks that are affected by this increase in effort along with a description of why there was an increase and the dollar amount of increase.

The amount shown roughly correlates to the amount of the reduction in survey task costs. Therefore I would like to transfer the difference in the original survey cost and the current survey cost to the hydrology and hydraulics tasks in the report as shown in Table 1. This additional money will be used primarily to offset the increase in effort because of the mapping irregularities and also to assist in future effort in coming up with the floodplain delineation for the hydraulic analysis. Table 2, attached, shows the increased man-hours for the affected tasks. Please feel free to contact me if you have any questions regarding this request.

Sincerely,
RBF Consulting

Paul Sclafani, P.E., C.F.M.

Attachments

CONSULTANT CHANGE ORDER - FCD APPROVAL
Flood Control District of Maricopa County (FCDMC)

Change Order Number:	1		
Date: 02/15/2005	Amount: $ -	File No:	XXXXX
Contract No:	FCD 2003C061	PCN No:	014.01.026
Consultant Name:	RBF Consulting		
Contract Title:	Lower Centennial FDS		
Initial Amount: $689,730.00	Contract Award Date: 06/02/2004	Total Previous Change Orders:	$0.00

By mutual agreement of the parties, the following contract change(s) are incorporated into the above-identified contract. All other contract terms and conditions remain unchanged.

Change order #1 authorizes a reallocation of $31,116.00 from Optional Task 4.3 - Field Survey for Cross Sections/Structures and a reallocation of $58,757.47 from Task 4.0 - Field Survey to Task 5.0 Hydrology and Task 6.0 Hydraulics, for a total reallocated amount of $89, 873.47 (see attachments). This reallocation will not result in any change to the original project cost.

With this Change Order, the total amount of this contract has increased 0%.

By reason of this proposed change 0 days extension of time will be allowed.

The contract completion date is:

The following financial information is submitted:

Initial Contract Amount	$	689,730.00
Amended Contract Amount w/ previous change orders	$	689,730.00
Current Change Order Request	$	-
Amended Contract Amount w/ current change order	***$***	***689,730.00***

FCDMC AUTHORIZATION LIMIT:	$	90,000.00
Total Requested Change Orders	$	-
Change Order Authorization Remaining	$	90,000.00

We, the undersigned Consultant, do hereby agree that upon execution of this change order that we will perform all work as identified above, and as may be described in attachment(s), and will accept the above specified amount(s) as full payment thereof.

Consultant Name: RBF Consulting

Consultant Address: 16605 North 28th Avenue, Suite 100
Phoenix, AZ 85053

Printed Name: Scott M. Larson, P.E., CFM

Title: Vice President Water Resources

Date: Feb 18, 2005

DISTRICT APPROVAL

I certify that this change is required to accomplish the overall task for which this contract is initiated.	Division Concurrence
02/15/05	2/15/05
Project Manager — Date	Division Manager — Date
I certify that funds are available to accomplish this Change Order.	I certify that this change is within the limits authorized by the County Procurement Code.
For MDA 2/17/05	2/17/05
Controller — Date	Contracts Branch Manager — Date
General Manager Approval	County Engineer Approval
2/17/05	N/A
Chief Engineer and General Manager — Date	County Engineer — Date

ORIGINAL TO: Contract File and Consultant **COPY TO: Controller, Project Manager, Construction Manager**

LOWER CENTENNIAL WATERSHED TRIBUTARIES ZONE A FLOODPLAIN DELINEATION STUDY PHASE IV

Conversations were held between RBF consulting and the Flood Control District of Maricopa County in July of 2005 which resulted in the creation of Phase IV. This was done to accommodate the subconsultant, JLK Engineering, with a separate phase to work upon, independently. In order to create Phase IV, what was previously referred to as Phase III was divided into the present Phase III and Phase IV.

B.4 FEMA Correspondence

Federal Emergency Management Agency

Washington, D.C. 20472

JUL 28 2006

FLOOD CONTROL DISTRICT
RECEIVED
AUG 07 '06

CH & GM	FINANCE
PIO	LANDS
ADMIN	O & M
REG	C&FM
ENG	FILE
CONTRACTS	
ROUTING	RPH

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

IN REPLY REFER TO:
Case No.: 06-09-B579P
Community Name: Maricopa County, AZ
Community No.: 040037
Effective Date of This Revision: AUG 28 2006

The Honorable Mary Rose Wilcox
Chairman, Maricopa County
Board of Supervisors
County Administration Building
301 West Jefferson, 10th Floor
Phoenix, AZ 85003

Dear Ms. Wilcox:

The Flood Insurance Study report and Flood Insurance Rate Map for your community have been revised by this Letter of Map Revision (LOMR). Please use the enclosed annotated map panel(s) revised by this LOMR for floodplain management purposes and for all flood insurance policies and renewals issued in your community.

Additional documents are enclosed which provide information regarding this LOMR. Please see the List of Enclosures below to determine which documents are included. Other attachments specific to this request may be included as referenced in the Determination Document. If you have any questions regarding floodplain management regulations for your community or the National Flood Insurance Program (NFIP) in general, please contact the Consultation Coordination Officer for your community. If you have any technical questions regarding this LOMR, please contact the Director, Federal Insurance and Mitigation Division of the Department of Homeland Security's Federal Emergency Management Agency (FEMA) in Oakland, California, at (510) 627-7175, or the FEMA Map Assistance Center toll free at 1-877-336-2627 (1-877-FEMA MAP). Additional information about the NFIP is available on our website at http://www.fema.gov/nfip.

Sincerely,

Michael B. Godesky, Project Engineer
Engineering Management Section
Mitigation Division

For: Doug Bellomo, P.E., Acting Chief
Engineering Management Section
Mitigation Division

List of Enclosures:

Letter of Map Revision Determination Document
Annotated Flood Insurance Rate Map
Annotated Flood Insurance Study Report

cc: Mr. Richard P. Harris, P.E., CFM
Project Manager
Planning and Project Management Division
Flood Control District of Maricopa County

Ms. Lynn M. Thomas, P.E., CFM
Technical Supervisor
Flood Control District of Maricopa County

Mr. Timothy S. Phillips, P.E.
Chief Engineer and General Manager
Flood Control District of Maricopa County

Mr. Joe Gonzalez, P.E.
JLK Engineers

Mr. Ted Collins, CFM
Principal Floodplain Coordinator
Flood Control District of Maricopa County

Mr. Brian Cosson, CFM
NFIP Coordinator
Office of Dam Safety and Flood Mitigation
Arizona Department of Water Resources

 | Issue Date: JUL 28 2006 | Effective Date: AUG 28 2006 | Case No.: 06-09-B579P | LOMR-APP

Federal Emergency Management Agency

Washington, D.C. 20472

LETTER OF MAP REVISION DETERMINATION DOCUMENT

COMMUNITY AND REVISION INFORMATION		PROJECT DESCRIPTION	BASIS OF REQUEST
COMMUNITY	Maricopa County Arizona (Unincorporated Areas)	NO PROJECT	HYDRAULIC ANALYSIS HYDROLOGIC ANALYSIS NEW TOPOGRAPHIC DATA
	COMMUNITY NO.: 040037		
IDENTIFIER	Lower Centennial Wash Watershed Zone A Floodplain Delineation Study, Phase IV	APPROXIMATE LATITUDE & LONGITUDE: 33.625, -113.125 SOURCE: FIRM Panel DATUM: NAD 83	

ANNOTATED MAPPING ENCLOSURES			ANNOTATED STUDY ENCLOSURES
TYPE: FIRM*	NO.: 04013C1450 G	DATE: September 30, 2005	DATE OF EFFECTIVE FLOOD INSURANCE STUDY: September 30, 2005 SUMMARY OF DISCHARGES TABLE: 3
TYPE: FIRM	NO.: 04013C1475 G	DATE: September 30, 2005	
TYPE: FIRM	NO.: 04013C1950 G	DATE: September 30, 2005	

Enclosures reflect changes to flooding sources affected by this revision.
* FIRM - Flood Insurance Rate Map; ** FBFM - Flood Boundary and Floodway Map; *** FHBM - Flood Hazard Boundary Map

FLOODING SOURCE(S) & REVISED REACH(ES)

Multiple Tributaries of Centennial Wash – Lower Centennial Wash Watershed Zone A

SUMMARY OF REVISIONS

Flooding Source	Effective Flooding	Revised Flooding	Increases	Decreases
Multiple Tributaries of Centennial Wash	Zone X (unshaded)	Zone A	YES	NONE

* BFEs - Base Flood Elevations

DETERMINATION

This document provides the determination from the Department of Homeland Security's Federal Emergency Management Agency (FEMA) regarding a request for a Letter of Map Revision (LOMR) for the area described above. Using the information submitted, we have determined that a revision to the flood hazards depicted in the Flood Insurance Study (FIS) report and/or National Flood Insurance Program (NFIP) map is warranted. This document revises the effective NFIP map, as indicated in the attached documentation. Please use the enclosed annotated map panels revised by this LOMR for floodplain management purposes and for all flood insurance policies and renewals in your community.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Assistance Center toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMR Depot, 3601 Eisenhower Avenue, Alexandria, VA 22304. Additional Information about the NFIP is available on our website at http://www.fema.gov/nfip.

Michael B. Godesky, Project Engineer
Engineering Management Section
Mitigation Division

106979 10.3.1.0609B579 102-I-C

Federal Emergency Management Agency

Washington, D.C. 20472

LETTER OF MAP REVISION DETERMINATION DOCUMENT (CONTINUED)

COMMUNITY INFORMATION

APPLICABLE NFIP REGULATIONS/COMMUNITY OBLIGATION

We have made this determination pursuant to Section 206 of the Flood Disaster Protection Act of 1973 (P.L. 93-234) and in accordance with the National Flood Insurance Act of 1968, as amended (Title XIII of the Housing and Urban Development Act of 1968, P.L. 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 NFIP criteria. These criteria, including adoption of the FIS report and FIRM, and the modifications made by this LOMR, are the minimum requirements for continued NFIP participation and do not supersede more stringent State/Commonwealth or local requirements to which the regulations apply.

COMMUNITY REMINDERS

We based this determination on the 1-percent-annual-chance flood discharges computed in the submitted hydrologic model. Future development of projects upstream could cause increased flood discharges, which could cause increased flood hazards. A comprehensive restudy of your community's flood hazards would consider the cumulative effects of development on flood discharges subsequent to the publication of the FIS report for your community and could, therefore, establish greater flood hazards in this area.

Your community must regulate all proposed floodplain development and ensure that permits required by Federal and/or State/Commonwealth law have been obtained. State/Commonwealth or community officials, based on knowledge of local conditions and in the interest of safety, may set higher standards for construction or may limit development in floodplain areas. If your State/Commonwealth or community has adopted more restrictive or comprehensive floodplain management criteria, those criteria take precedence over the minimum NFIP requirements.

We will not print and distribute this LOMR to primary users, such as local insurance agents or mortgage lenders; instead, the community will serve as a repository for the new data. We encourage you to disseminate the information in this LOMR by preparing a news release for publication in your community's newspaper that describes the revision and explains how your community will provide the data and help interpret the NFIP maps. In that way, interested persons, such as property owners, insurance agents, and mortgage lenders, can benefit from the information.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Assistance Center toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMR Depot, 3601 Eisenhower Avenue, Alexandria, VA 22304. Additional Information about the NFIP is available on our website at http://www.fema.gov/nfip.

Michael B. Godesky, Project Engineer
Engineering Management Section
Mitigation Division

Federal Emergency Management Agency

Washington, D.C. 20472

LETTER OF MAP REVISION DETERMINATION DOCUMENT (CONTINUED)

We have designated a Consultation Coordination Officer (CCO) to assist your community. The CCO will be the primary liaison between your community and FEMA. For information regarding your CCO, please contact:

Ms. Sally M. Ziolkowski
Director, Federal Insurance and Mitigation Division
Federal Emergency Management Agency, Region IX
1111 Broadway Street, Suite 1200
Oakland, CA 94607-4052
(510) 627-7175

STATUS OF THE COMMUNITY NFIP MAPS

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 panel(s) and FIS report warrant physical revision and republication in the future, we will incorporate the modifications made by this LOMR at that time.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Assistance Center toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMR Depot, 3601 Eisenhower Avenue, Alexandria, VA 22304. Additional Information about the NFIP is available on our website at http://www.fema.gov/nfip.

Michael B. Godesky, Project Engineer
Engineering Management Section
Mitigation Division

Federal Emergency Management Agency

Washington, D.C. 20472

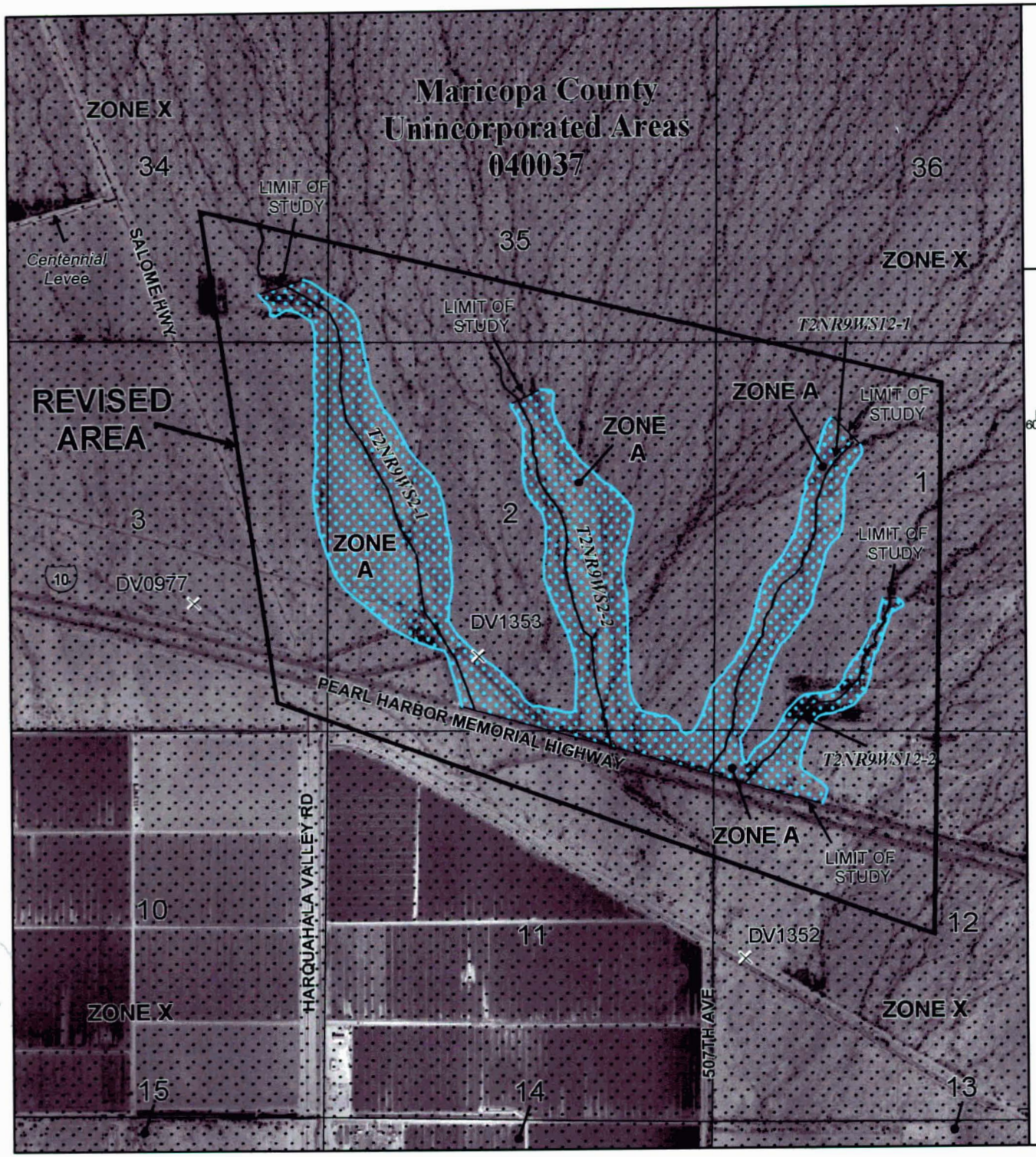
LETTER OF MAP REVISION DETERMINATION DOCUMENT (CONTINUED)

PUBLIC NOTIFICATION OF REVISION

This revision will become effective 30 days from the date of this letter. Any requests to review or alter this determination should be made within 30 days and must be based on scientific or technical data.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Assistance Center toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMR Depot, 3601 Eisenhower Avenue, Alexandria, VA 22304. Additional Information about the NFIP is available on our website at http://www.fema.gov/nfip.

Michael B. Godesky, Project Engineer
Engineering Management Section
Mitigation Division



Legend

- 1% annual chance (100-Year) Floodplain
- 1% annual chance (100-Year) Floodway
- 0.2% annual chance (500-Year) Floodplain

MAP SCALE 1" = 2000'

1,000 500 0 1,000 2,000 3,000 4,000 Feet

600 300 0 600 1,200 Meters

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1450G

FIRM

FLOOD INSURANCE RATE MAP

MARICOPA COUNTY, ARIZONA

AND INCORPORATED AREAS

PANEL 1450 OF 4350

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
MARICOPA COUNTY	040037	1450	G

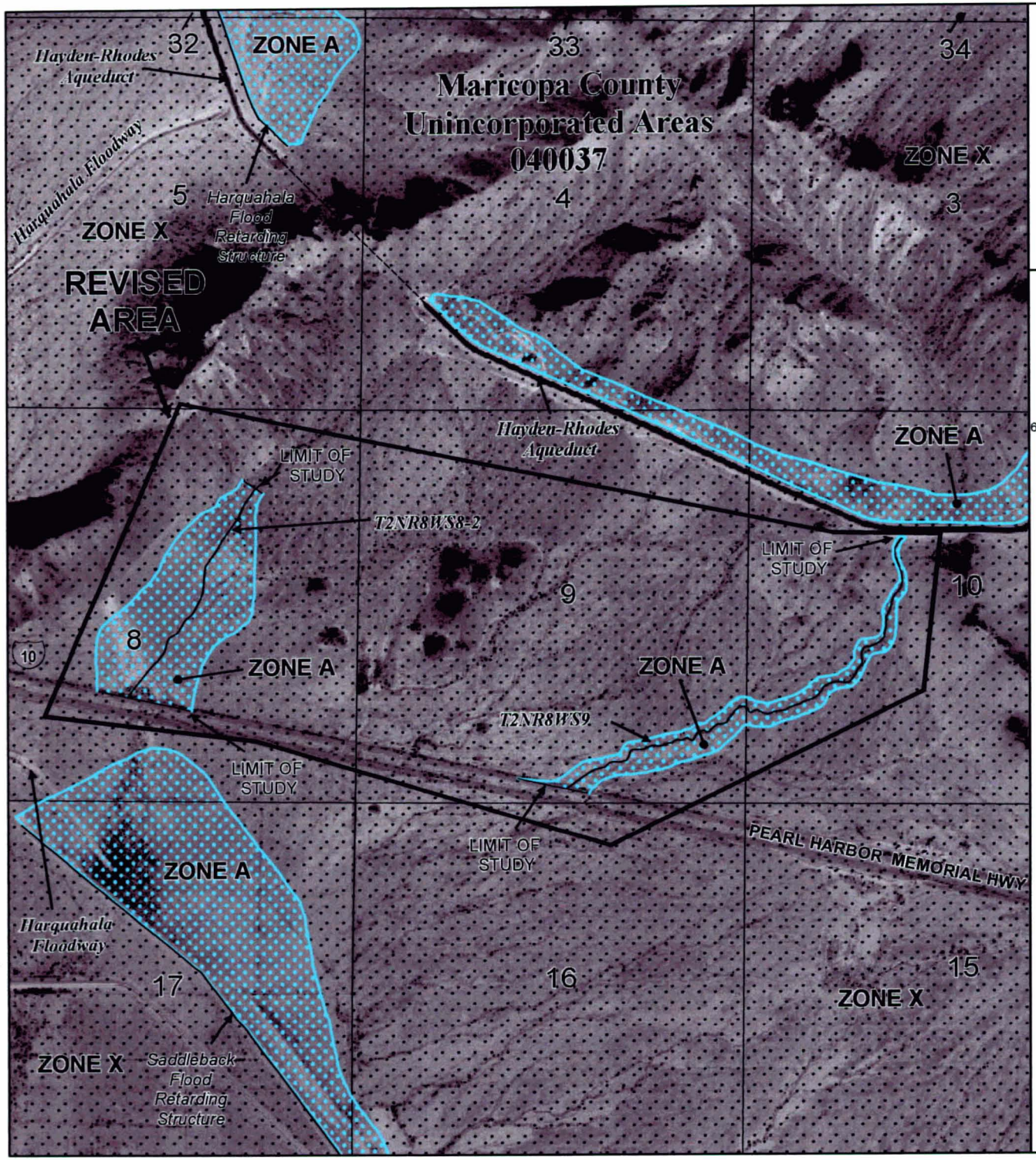
REVISED TO REFLECT LOMR EFFECTIVE AUG 28 2006

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 04013C1450G

MAP REVISED: SEPTEMBER 30, 2005

Federal Emergency Management Agency



Legend

- 1% annual chance (100-Year) Floodplain
- 1% annual chance (100-Year) Floodway
- 0.2% annual chance (500-Year) Floodplain

MAP SCALE 1" = 2000'

1,000 500 0 1,000 2,000 3,000 4,000 Feet

600 300 0 600 1,200 Meters

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1475G

FIRM
FLOOD INSURANCE RATE MAP
MARICOPA COUNTY, ARIZONA
AND INCORPORATED AREAS

PANEL 1475 OF 4350

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
MARICOPA COUNTY	040037	1475	G

REVISED TO REFLECT LOMR EFFECTIVE AUG 28 2006

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
04013C1475G

MAP REVISED:
SEPTEMBER 30, 2005

Federal Emergency Management Agency

Table 3. Summary of Discharges (Cont'd)

Flooding Source and Location	Drainage Area (Square Miles)	Peak Discharges (cfs) 10-Year[1]	50-Year[1]	100-Year	500-Year[1]
Lower Centennial Wash Watershed					
T2NR9WS2-1					
At Pearl Harbor Memorial Highway	3.36	N/A	N/A	2,398	N/A
T2NR9WS2-2					
At Pearl Harbor Memorial Highway	2.98	N/A	N/A	2,183	N/A
T2NR9WS12-1					
At Pearl Harbor Memorial Highway	1.38	N/A	N/A	1,418	N/A
T2NR9WS12-2					
At Pearl Harbor Memorial Highway	1.50	N/A	N/A	1,494	N/A
T2NR8WS8-2					
At Pearl Harbor Memorial Highway	1.53	N/A	N/A	2,164	N/A
T2NR8WS9					
At Pearl Harbor Memorial Highway	1.08	N/A	N/A	1,441	N/A
T1NR8WS34					
At confluence with Saddleback Outlet Channel	1.07	N/A	N/A	1,429	N/A
T1NR8WS8					
At confluence with Saddleback Outlet Channel	2.68	N/A	N/A	2,721	N/A
T1NR8WS8 Tributary 1					
Approximately 3.7 miles upstream Centennial Wash	0.85	N/A	N/A	1,273	N/A
T1NR8WS17					
At confluence with Saddleback Outlet Channel	1.80	N/A	N/A	1,556	N/A
T1NR8WS20					
At confluence with Saddleback Outlet Channel	2.01	N/A	N/A	2,131	N/A
T1NR8WS20 Tributary 1					
At confluence with T1NR8WS20	0.63	N/A	N/A	1,213	N/A
T1NR8WS29-1					
At confluence with Centennial Wash Left Over Bank	2.09	N/A	N/A	1,729	N/A
T1NR8WS29-1 Tributary 1					
At confluence with T1NR8WS29-1	0.23	N/A	N/A	260	N/A
T1NR8WS29-2					
At confluence with Centennial Wash Left Over Bank	11.35	N/A	N/A	7,891	N/A

REVISED TO
REFLECT LOMR
EFFECTIVE AUG 28 2006

[1]Not computed

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 Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles, Floodway Data tables and/or Summary of Stillwater Elevations 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 report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations (BFEs) shown on this map apply only land ward of 0.0' National Geodetic Vertical Datum of 1929 (NGVD 29). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations tables in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations tables 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 was Arizona State Plane Zone 3176 (central Arizona). The **horizontal** datum is NAD83, GRS80 spheroid. Differences in datum, spheroid, projection or State Plane 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:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3 #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282

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. Orthophoto images were produced at a scale of 1:6000 using HARN for control. Aerial photography is dated December 2000 to December 2002.

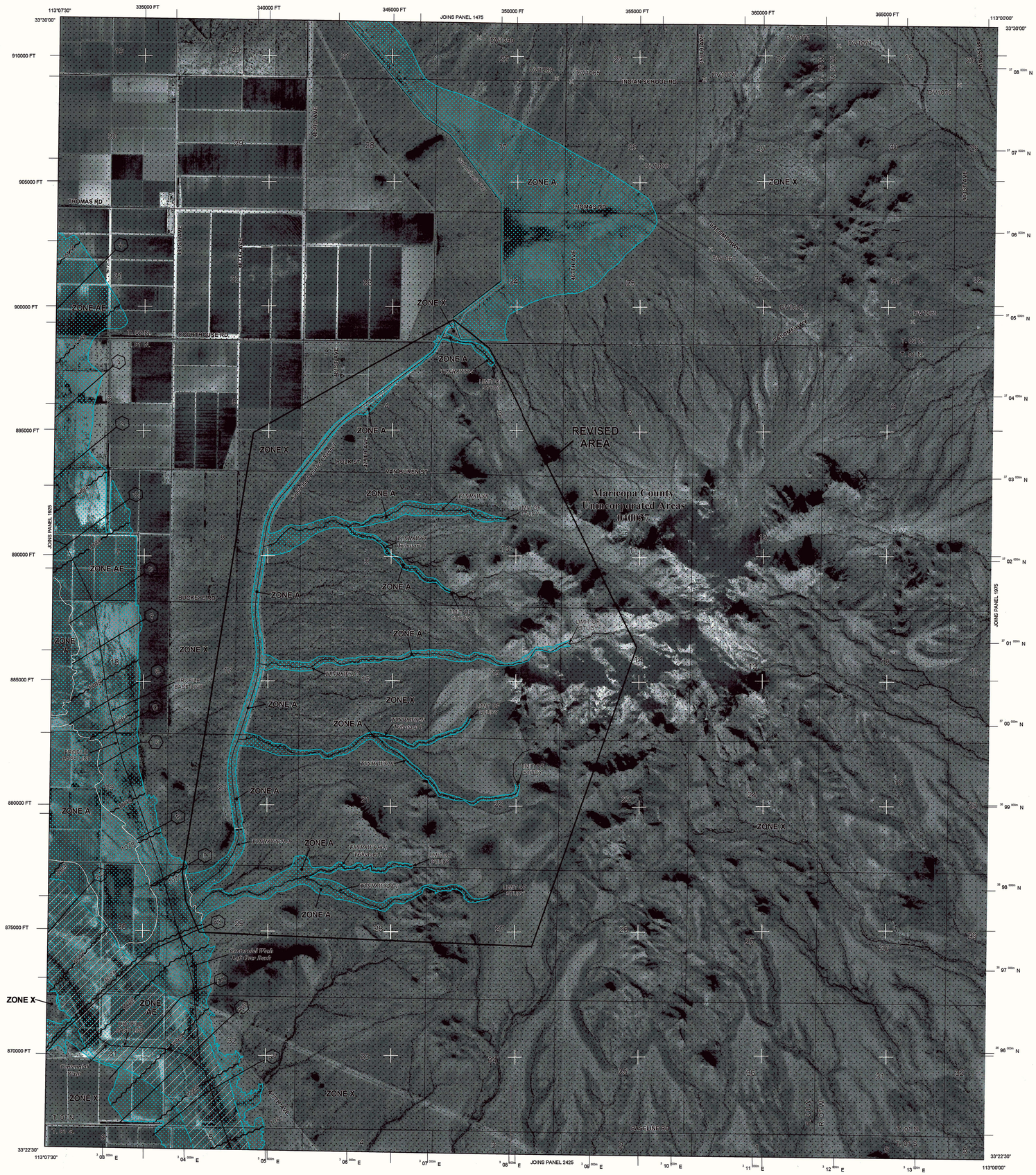
This map reflects more detailed and up-to-date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map.

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.

Contact the **FEMA Map Service Center** at 1-800-358-9616 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study report, and/or digital versions of this map. The FEMA Map Service Center may also be reached by Fax at 1-800-358-9620 and its website at www.msc.fema.gov/.

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 http://www.fema.gov/.



LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

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 elevation 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 of greater flood event.
ZONE A99	Areas 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.

	1% annual chance floodplain boundary
	0.2% annual chance 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 flood velocities.
513	Base Flood Elevations 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 (NGVD 29)

A — A	Cross Section line
23 - - - - - 23	Transect line
97°07'30", 32°22'30"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
4275000 M	1000-meter Universal Transverse Mercator grid ticks values, zone 12
6000000 FT	5000-foot grid ticks: Arizona State Plane coordinate system, central zone (FIPSZONE 0202), Transverse Mercator projection.
DX5510 ×	Bench mark (see explanation in Notes to Users section of this FIRM panel)
• M1.5	River Mile

MAP REPOSITORY
Refer to listing of Map Repositories 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 September 4, 1991 Decembre 3, 1993 September 30, 1995 July 19, 2001

September 30, 2005 - 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 add roads and road names, to incorporate previously issued Letters of Map Revision, and to incorporate previously issued Letters of Map Amendment.

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 1-800-638-6620.

MAP SCALE 1" = 2000'

1,000 500 0 1,000 2,000 3,000 4,000 Feet

600 300 0 600 1,200 Meters

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1950G

FIRM
FLOOD INSURANCE RATE MAP
MARICOPA COUNTY
ARIZONA
AND INCORPORATED AREAS

PANEL 1950 OF 4350

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
MARICOPA COUNTY	040037	1950	G

REVISED TO REFLECT LOMR EFFECTIVE AUG 28 2006

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
04013C1950G

MAP REVISED
SEPTEMBER 30, 2005

Federal Emergency Management Agency

FLOOD CONTROL DISTRICT
RECEIVED
AUG 07 '05

CH & GM	FERNANDEZ
PIO	CLAYSON
ADMIN	C & M
REG	P & PM
ENG	FILE
CONTRACTS	
ROUTING	

Phase IV

NATIONAL FLOOD INSURANCE PROGRAM

FEMA NATIONAL SERVICE PROVIDER

July 13, 2006

Mr. Joe R. Gonzalez, P.E.
JLK Engineers
18441 N. 25th Avenue, Suite 103
Phoenix, AZ 85023

IN REPLY REFER TO:
Case No.: 06-09-B579P
Community: Maricopa County
Community No.: 040037

316-ACK

Dear Mr. Gonzalez:

This responds to your request dated March 17, 2006, that the Department of Homeland Security's Federal Emergency Management Agency (FEMA) issue a revision to the Flood Insurance Rate Map (FIRM) for Maricopa County, Arizona and Incorporated Areas. Pertinent information about the request is listed below.

Identifier:	Lower Centennial Wash Watershed
Flooding Source:	Multiple Tributaries of Centennial Wash
FIRM Panel(s) Affected:	04013C1450 G, 1475 G, 1950 G

We have completed an inventory of the items you submitted. Our review of the submitted data indicates we have the minimum data required to perform a detailed technical review of your request. If additional data are required or if delays are encountered, we will inform you within 60 days of the date of this letter.

As you may know, FEMA has implemented a procedure to recover costs associated with reviewing and processing requests for modifications to published flood information and maps. However, because your request 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 Special Flood Hazard Area, no fees will be assessed for our review.

Please direct questions concerning your request to us at the address shown at the bottom of this page. For identification purposes, please include the case number referenced above on all correspondence.

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).

3601 Eisenhower Avenue, Alexandria, VA 22304-6425 PH:1-877-FEMA MAP FX: 703.960.9125

The Mapping on Demand Team, under contract with the Federal Emergency Management Agency, is the National Service Provider for the National Flood Insurance Program

If you have specific questions concerning your request, please call the Revisions Coordinator for your State, Mr. Mounir Boudjemaa, MS who may be reached at (703) 960-8800, ext. 3012.

Sincerely,

Sheila M. Norlin, CFM
National LOMC Manager
Michael Baker Jr., Inc.

cc: Mr. Richard P. Harris, P.E., CFM
Project Manager
Flood Control District of Maricopa County

Ms. Lynn M. Thomas, P.E., C.F.M.
Technical Supervisor
Flood Control District of Maricopa County

Mr. Timothy S. Phillips, P.E.
Chief Engineer & General Manager
Flood Control District of Maricopa County

Mr. Ted Collins, CFM
Principal Floodplain Coordinator
Flood Control District of Maricopa County

Mr. Brian Cosson, CFM
NFIP Coordinator
Arizona Department of Water Resources

JLK Engineers
Transportation • Drainage • Public Works
18441 N. 25th Avenue • Suite 103
Phoenix, AZ 85023
(602) 288-6528 • (602) 288-6530 fax

National Flood Insurance Program
U.S. Department of Homeland Security
500 C Street, SW
Washington, DC 20472
Attn: Sheila M. Norlin

May 29, 2006

RE: Lower Centennial Watershed Tributaries
Zone A Floodplain Delineation Study - Phase IV
Case No. 06-09-B579P
Community No. 040037

Dear Ms. Norlin,

The following is a summary of the responses to your review letter dated May 2, 2006. I have been in contact with Ms. Edie Vinson-Wright to discuss the five (5) review comments. The following responses and enclosed data is a result of our phone conversations. I have attached documents that will be replaced in the Technical Data Notebook (TDN) for this project. The following are responses to the review comments.

Item 1

The wash TINR8WS29-2 that is being referred to is the Saddleback Diversion Channel (SDC) which is a Flood Control District of Maricopa County (FCDMC) channel located approximately 3.6 miles south of I-10. The ADOT culvert analysis being referred to in the TDN is for the culverts along I-10. The calculated discharges along the SDC (wash TINR8WS29-2) are from the basins directly east of the wash and it includes a spillway discharge of 1340 cfs at the inlet. The summary of results are tabulated in Table 7.1 which been updated and is attached for further review.

Item 2

The peak flows in washes T1NR8WS29-1 REACH 1 TRUBUTARY 1 and T1NR8WS29-1 REACH 2 were prorated based on watershed area. The peak flow for Sub-Basin B134 was used for establishing flows to these washes. The areas tributary to these washes, within Sub-Basin B134, were used for prorating flows to each wash. This is discussed in Section 4.2.1 (sheet 4-1) of the TDN.

Item 3

The contour that is being referred to is a man-made pit which is approximately eight (8) foot deep. As discussed in one of our phone conversations with Ms. Wright, the floodplain has been revised to include the entire pit as shown in the enclosed Work Study Map. The floodplain shown is based on a more detailed 2 foot topographic CAD file provided by FCDMC.

Item 4

As discussed in one of our phone conversations with Ms. Wright, the combined flows from Sub-Basins B149, B148, B147 and areas in between were compared to flow capacity of culverts at Stations 4303+12, 4305+96, 4308+80, 4322+70, 4327+70, and 4333+30. Results indicate that the combined peak runoff is 7,694 cfs compared to the total capacity of the culverts which is 10,417 cfs. The floodplain has been revised and the headwater elevations based on capacity of the culverts were used to establish the floodplain at these locations. The revised summary of the culvert analysis is listed in the enclosed Table 5.3 (sheet 5-15). In addition, the floodplain has been revised and is shown in the enclosed Work Study Maps 4 and 5.

Item 5

The structure that is being referred to in this review comment is a spillway structure. There are no basins in the SDC within the project limits. The reduction of flow being referred to involve the peak flows at catchpoints CP135 and CP133A for the 6-hour storm. The reduction of flows is a result of combining hydrographs and the different time to peaks at these locations. This does not occur for the 24-hour storm. In addition, the flows from the 24-hour storm are larger at these concentration points and were used to establish the floodplain at these locations.

The above information and enclosed documents address the review comments in your letter dated May 2, 2006 and will allow for further review of this project. If you have any questions, please call me at (602) 288-6528

Sincerely,

Joe R. Gonzalez, P.E.
Principal

Attachments
CC: Edie Vinson-Wright, FEMA
Richard Harris, FCDMC
Nathan Ford, RBF

Phase IV

NATIONAL FLOOD INSURANCE PROGRAM

FEMA NATIONAL SERVICE PROVIDER

FLOOD CONTROL DISTRICT
RECEIVED
MAY 8 '06
CH & GM | FINANCE
PIO | LANDS
ADMIN | O & M
REG | P & PM
ENG | FILE
CONTRACTS
ROUTING

May 2, 2006

Mr. Joe R. Gonzalez, P.E.
JLK Engineers
18441 North 25th Avenue, Suite 103
Phoenix, AZ 85023

IN REPLY REFER TO:
Case No.: 06-09-B579P
Community: Maricopa County, AZ
Community No.: 040037

316-AD

Dear Mr. Gonzalez:

This is in regard to your request dated February 17, 2006, that the Department of Homeland Security's Federal Emergency Management Agency (FEMA) issue a revision to the Flood Insurance Rate Map (FIRM) for Maricopa County, Arizona and Incorporated Areas. Pertinent information about the request is listed below.

Identifier:	Lower Centennial Wash Watershed
Flooding Source:	Multiple Tributaries of Centennial Wash
FIRM Panel(s) Affected:	04013C1450 G, 1475 G, and 1950 G

The data required to complete our review, which must be submitted within 90 days of the date of this letter, are listed on the enclosed summary.

If we do not receive the required data within 90 days, we will suspend our processing of your request. Any data submitted after 90 days will be treated as an original submittal and will be subject to all submittal/payment procedures, including the flat review and processing fee for requests of this type established by the current fee schedule. A copy of the notice summarizing the current fee schedule, which was published in the *Federal Register,* is enclosed for your information.

FEMA receives a very large volume of requests and cannot maintain inactive requests for an indefinite period of time. In addition, as a result of the aftermath of recent hurricanes, many FEMA employees have been deployed to assist in disaster relief efforts. Therefore, we are unable to grant extensions for the submission of required data/fee for revision requests. If a requester is informed by letter that additional data are required to complete our review of a request, the data/fee **must** be submitted within 90 days of the date of the letter. Any fees already paid will be forfeited for any request for which the requested data are not received within 90 days.

We will continue to work expeditiously to review all submittals in accordance with National Flood Insurance Program (NFIP) regulations, and will aim to meet the regulatory timeframe for the review of all requests. However, requesters should be aware that delays may occur in the review process because of the current emergency situation. We appreciate the patience and cooperation of all requesters as FEMA assists in hurricane relief efforts.

602 405 1875

3601 Eisenhower Avenue, Alexandria, VA 22304-6425 PH:1-877-FEMA MAP FX: 703.960.9125

If you have general questions about your request, FEMA policy, or the NFIP, 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, Mr. Craig Kennedy, CFM, who may be reached at (703) 960-8800, ext. 3091.

Sincerely,

Sheila M. Norlin, CFM
National LOMC Manager
Michael Baker Jr., Inc.

Enclosures

cc: Mr. Richard P. Harris, P.E., CFM
Project Manager
Planning and Project Management Division
Flood Control District of Maricopa County

Ms. Lynn M. Thomas, P.E., CFM
Technical Supervisor
Flood Control District of Maricopa County

Mr. Timothy S. Phillips, P.E.
Chief Engineer and General Manager
Flood Control District of Maricopa County

Mr. Ted Collins, CFM
Principal Floodplain Coordinator
Flood Control District of Maricopa County

Mr. Brian Cosson, CFM
NFIP Coordinator
Office of Dam Safety and Flood Mitigation
Arizona Department of Water Resources

NATIONAL FLOOD INSURANCE PROGRAM

FEMA NATIONAL SERVICE PROVIDER

Summary of Additional Data Required to Support a
Letter of Map Revision

Case No.: 06-09-B579P

Requester: Mr. Joe R. Gonzalez, P.E.

Community: Maricopa County, AZ

Community No.: 040037

The issues listed below must be addressed before we can continue the review of your request.

1. A detailed review of the submitted data revealed that the Arizona Department of Transportation (ADOT) analysis used to develop discharges along T1NR8WS29-2 were not provided. Please provide the ADOT analysis and a summary of the discharges to ~~be used for~~ the delineation of the Special Flood Hazard Areas, the areas that would be inundated by the flood having a 1-percent chance of being equaled or exceeded in any given year (base flood), designated Zone A for the entire study. Saddleback

2. A detailed review of the submitted data revealed that the graph and equations used to prorate the discharges generated by HEC-1 for Subbasin 134 were not provided. Please provide the logarithmic graph and equation used to prorate the discharge for Subbasin 134. explained in TDN

3. A detailed review of the flooding shown along T2NR9WS12-2 revealed a change in elevation of 10 feet, based on the 10-foot contour interval of the map, in the middle of the studied reach. However the flood boundary defined for this reach does not indicate whether the change is a depression or elevation, which affects the appropriate floodplain boundary delineation along this reach. Please review the attached copy of the reach with the highlighted contour interval, clarify what the change in elevation is, and revise the floodplain boundary delineation along this reach. See sht 5 Fill in pit w/ FP

4. A detailed review of the culvert analyses revealed that the discharges used to evaluate the capacity of the reinforced-concrete box culverts along Interstate Highway 10, located at Stations 4303+12, 4305+96, and 4308+80, appear to be too low to assess the culverts' ability to handle the combined flows from T2NR9WS2-1, T2NR9WS2-2, and T2NR9WS12-1, as suggested by the floodplain boundary delineation. The same problem appears to exist with regard to the culverts at Stations 4322+17, 4327+70, and 4333+00 with the combined flows from T2NR9WS2-1, T2NR9WS2-2, T2NR9WS12-1, and T2NR9WS12-2. Please revise the analyses for these culverts to show the maximum flow capacity of the culverts compared to the estimated combined base flood discharges determined for the washes. Ask Luv to elaborate

5. A detailed review of the topographic data on the map entitled "Sheet 11, Lower Centennial Watershed Phase IV Zone A Floodplain Delineation Study, F.C.D. Contract No. 2003C061," prepared by your firm, dated February 2006, and the data on "Sheet 2, Lower Centennial Phase IV – Figure 4.1 Sub-Basin Boundary W/Aerial," prepared by your firm, dated October 2005, depicts a structure of some type and an apparent basin along T1NR8WS29-2 where the discharge value at the point of concentration, CP134, was determined. The detailed review also revealed that the discharges along this reach were modified to account for a reduction in flow in the downstream direction. Please provide detailed information on the structure, an analysis of the apparent storage basin adjacent to this structure, and the effects this structure and basin may have on the flow along T1NR8WS29-2.

Please send the required data directly to us at the address shown at the bottom of this page. For identification purposes, please include the case number referenced above on all correspondence.

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NATIONAL FLOOD INSURANCE PROGRAM

FEMA NATIONAL SERVICE PROVIDER

FLOOD CONTROL DISTRICT
RECEIVED
MAR 30 '06

CH & GM	FINANCE
PIO	LANDS
ADMIN	O & M
REG	P & PM
ENG	FILE
CONTRACTS	
ROUTING: RPH	

March 24, 2006

Mr. Joe R. Gonzalez, P.E.
JLK Engineers
18411 North 25th Avenue, Suite 103
Phoenix, AZ 85023

IN REPLY REFER TO:
Case No.: 06-09-B579P
Community: Maricopa County, AZ
Community No.: 040037

316-ACK

Dear Mr. Gonzalez:

This responds to your request dated February 17, 2006, concerning a Letter of Map Revision (LOMR) request that the Department of Homeland Security's Federal Emergency Management Agency (FEMA) issue a revision to the Flood Insurance Rate Map (FIRM) for Maricopa County, Arizona and Incorporated Areas. Pertinent information about the request is listed below.

Identifier:	Lower Centennial Wash Watershed
Flooding Source:	Multiple Tributaries of Centennial Wash
FIRM Panel(s) Affected:	04013C1450 G, 1475 G, 1950 G

We have completed an inventory of the items you submitted. Our review of the submitted data indicates we have the minimum data required to perform a detailed technical review of your request. If additional data are required or if delays are encountered, we will inform you within 60 days of the date of this letter.

As you may know, FEMA has implemented a procedure to recover costs associated with reviewing and processing requests for modifications to published flood information and maps. However, because your request 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 Special Flood Hazard Area, no fees will be assessed for our review.

Please direct questions concerning your request to us at the address shown at the bottom of this page. For identification purposes, please include the case number referenced above on all correspondence.

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

3601 Eisenhower Avenue, Alexandria, VA 22304-6425 PH:1-877-FEMA MAP FX: 703.960.9125

The Mapping on Demand Team, under contract with the Federal Emergency Management Agency, is the National Service Provider for the National Flood Insurance Program

have specific questions concerning your request, please call the Revisions Coordinator for your State, Mr. Craig Kennedy, CFM, who may be reached at (703) 960-8800, ext. 3091.

Sincerely,

Sheila M. Norlin, CFM
National LOMC Manager
Michael Baker Jr., Inc.

cc: Mr. Richard P. Harris, P.E., CFM
Project Manager
Planning and Project Management Division
Flood Control District of Maricopa County

Ms. Lynn M. Thomas, P.E., CFM
Technical Supervisor
Flood Control District of Maricopa County

Mr. Timothy S. Phillips, P.E.
Chief Engineer & General Manager
Flood Control District of Maricopa County

Mr. Ted Collins, CFM
Principal Floodplain Coordinator
Flood Control District of Maricopa County

Mr. Brian Cosson, CFM
NFIP Coordinator
Arizona Department of Water Resources

Flood Control District
of Maricopa County

Board of Directors
Fulton Brock, District 1
Don Stapley, District 2
Andrew Kunasek, District 3
Max Wilson, District 4
Mary Rose Wilcox, District 5

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

Property of
Flood Control District of MC Library
Please Return to
2801 W. Durango
Phoenix, AZ 85009

February 17, 2006

Mr. Craig Kennedy, Regional Manager
Baker Civil
3601 Eisenhower Avenue
Alexandria, Virginia 22304

Community:	Maricopa County, Arizona
Community Nos.:	040037
Flooding Sources:	Numerous Tributaries of Centennial Wash (see attached sheet from the TDN)
FIRM Panels Affected:	1450G, 1475G, and 1950G

Dear Mr. Kennedy:

I have enclosed a floodplain delineation study for portions of the above-listed Flooding Sources. This study was done to more accurately define and map potential flood hazard areas in advance of anticipated future development. The supporting Technical Data Notebook includes a copy of the work maps. Please review and process a Letter of Map Revision for the studied portions of these washes.

If you have any questions, please contact me at (602) 506-4528.

Sincerely,

Richard P. Harris

Richard P. Harris, P.E., CFM
Project Manager, Planning and Project Management Division

RPH/ag

Enclosure

The following NFIP map panels affected for all impacted communities are:

Community No.	Community Name	State	Map No.	Panel No.	Effective Date
040037	Maricopa County	AZ	04013C	1450G	9/30/05
040037	Maricopa County	AZ	04013C	1475G	9/30/05
040037	Maricopa County	AZ	04013C	1950G	9/30/05

Panel 1450G Flooding Source: Wash T2NR9WS2-1, Wash T2NR9WS2-2, Wash T2NR9WS12-1, Wash T2NR9WS12-2.

Panel 1475G Flooding Source: Wash T2NR8WS8-1, Wash T2NR8WS9.

Panel 1950G Flooding Source: Wash T2NR8WS34, Wash T1NR8WS8, Wash T1NR8WS8 Tributary 1, Wash T1NR8WS17, Wash T1NR8WS20, Wash T1NR8WS20 Tributary 1, Wash T1NR8WS29-1, Wash T1NR8WS29-1 Tributary 1, Wash T1NR8WS29-2.

Copies to: Mr. Ray Lenaburg
Floodplain Mapping Coordinator
FEMA Region IX
1111 Broadway
Suite 1200
Oakland, CA 94607-4052

Mr. Michael Godesky, P.E.
Project Engineer, Region IX
Hazards Study Branch, Mitigation Directorate
Federal Emergency Management Agency
500 C Street SW
Washington, D.C. 20472-0001

Mr. Brian Cosson
NFIP Coordinator
Arizona Department of Water Resources
3550 North Central Avenue
2nd Floor
Phoenix, AZ 85012-2105

Mr. Nathan Ford, P.E.
Project Manager
RBF Consulting, Inc.
16605 North 28th Avenue
Suite 100
Phoenix, AZ 85053-7550

B.5 Public Information

Paul Sclafani - FW: legal ads change..

From: Richard Harris - FCDX <rph@mail.maricopa.gov>
To: "'psclafani@rbf.com'" <psclafani@rbf.com>
Date: 6/25/2004 10:59 AM
Subject: FW: legal ads change..

FYI

-----Original Message-----
From: Melissa Lempke - FCDX
Sent: Friday, June 25, 2004 10:42 AM
To: Richard Harris - FCDX
Subject: legal ads change..

The adjustment has been made.

The ad will run in the AZ Business Gazette on the 8th and the 22nd and in the Wickenburg Sun on the 7th and the 21st.

Melissa Lempke
Public Information Officer
Flood Control District
Maricopa County
602-506-0612

ANNOUNCEMENT OF INTENT TO PERFORM FLOODPLAIN DELINEATION STUDY OF THE LOWER CENTENNIAL WASH WATERSHED

The Flood Control District of Maricopa County (FCDMC) has contracted with RBF Consulting, Inc. to perform an approximate Zone A floodplain delineation study of selected watercourses within the Lower Centennial Wash Watershed.

This study will examine and evaluate the flood hazard areas in the watershed to determine approximate floodplain limits. These floodplain limits will then be used to determine the flood insurance rates used by the Federal Emergency Management Agency (FEMA).

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 P. Harris, P.E., at the Flood Control District of Maricopa County, 2801 West Durango Street, Phoenix, AZ 85009, (602) 506-4528.

MARICOPA COUNTY FLOOD CONTROL DISTRICT
ANNOUNCEMENT OF INTENT TO PERFORM
DELINEATION STUDY OF THE
LOWER CENTENNIAL WASH WATERSHED

STATE OF ARIZONA

County of Maricopa

Kevin Cloe, being duly sworn. upon oath, deposes and says:
That he is the Publisher of

The Wickenburg Sun

A newspaper of general circulation in the County of Maricopa State of Arizona, published in Wickenburg, Arizona, and that the copy hereto attached is a true copy of the advertisement as published weekly in The Wickenburg Sun on the Dates following:

July 7 and July 21, 2004.

KEVIN CLOE
PUBLISHER

Sworn to before me this **7th** day of **July** A.D. **2004**

Beth Irene Gallant

Notary Public

OFFICIAL SEAL
BETH IRENE GALLANT
NOTARY PUBLIC - State of Arizona
MARICOPA COUNTY
My Comm. Expires Aug. 19, 2005

ANNOUNCEMENT OF INTENT TO PERFORM FLOODPLAIN DELINEATION STUDY OF THE LOWER CENTENNIAL WASH WATERSHED

The Flood Control District of Maricopa County (FCDMC) has contracted with RBF Consulting Inc. to perform an approximate Zone A floodplain delineation study of selected watercourses within the Lower Centennial Wash Watershed.

This study will examine and evaluate the flood hazard areas in the watershed to determine approximate floodplain limits. These floodplain limits will then be used to determine the flood insurance rates used by the Federal Emergency Management Agency (FEMA).

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 P. Harris, P.E., at the Flood Control District of Maricopa County, 2801 West Durango Street, Phoenix, AZ 85009, (602) 506-4528.

Published in The Wickenburg Sun on July 7 and July 21, 2004.

MC FLOOD CONTROL

Class 1

Arizona Business Gazette

PO BOX 194
Phoenix, Arizona 85001-0194
(602) 444-7300 FAX (602) 444-7364

STATE OF ARIZONA
COUNTY OF MARICOPA } SS.

Tabitha Antoniadis, being first duly sworn, upon oath deposes and says: That she is a legal advertising representative of the Arizona Business Gazette, a newspaper of general circulation in the county of Maricopa, State of Arizona, published weekly at Phoenix, Arizona, and that the copy hereto attached is a true copy of the advertisement published in the said paper on the dates indicated.

7/15/2004
7/22/2004

Sworn to before me this
22ND day of
JULY A.D. 2004

OFFICIAL SEAL
MARILYN GREENWOOD
NOTARY PUBLIC-ARIZONA
MARICOPA COUNTY
My Comm. Expires May 23, 2007

Notary Public

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Published: July 8, 22, 2004

Appendix C Survey Field Notes

No field survey was performed in Phase IV.

Appendix D Hydrologic Analysis Supporting Documentation

D.1 Precipitation Data

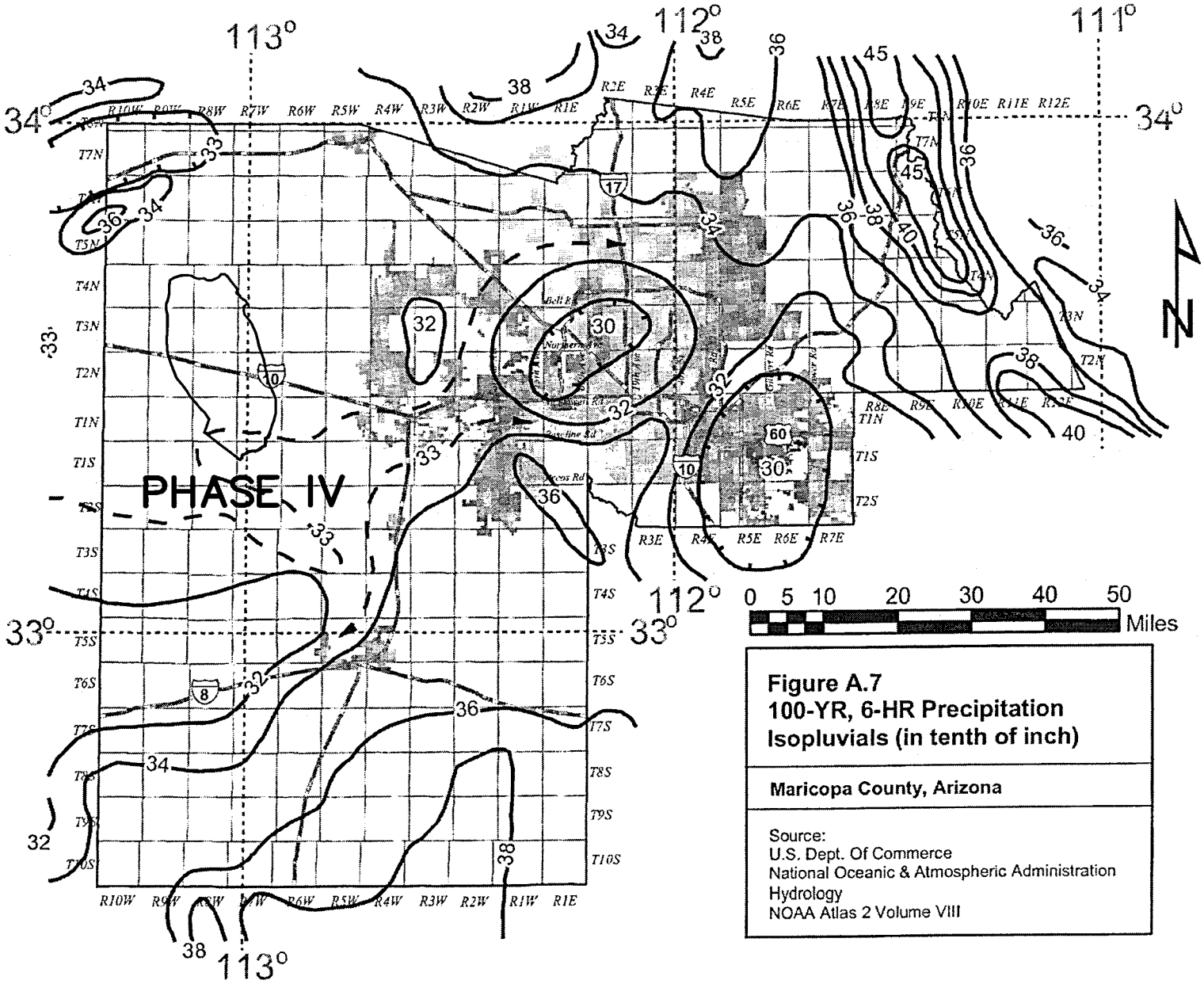

Figure A.7
100-YR, 6-HR Precipitation Isopluvials (in tenth of inch)

Maricopa County, Arizona

Source:
U.S. Dept. Of Commerce
National Oceanic & Atmospheric Administration
Hydrology
NOAA Atlas 2 Volume VIII

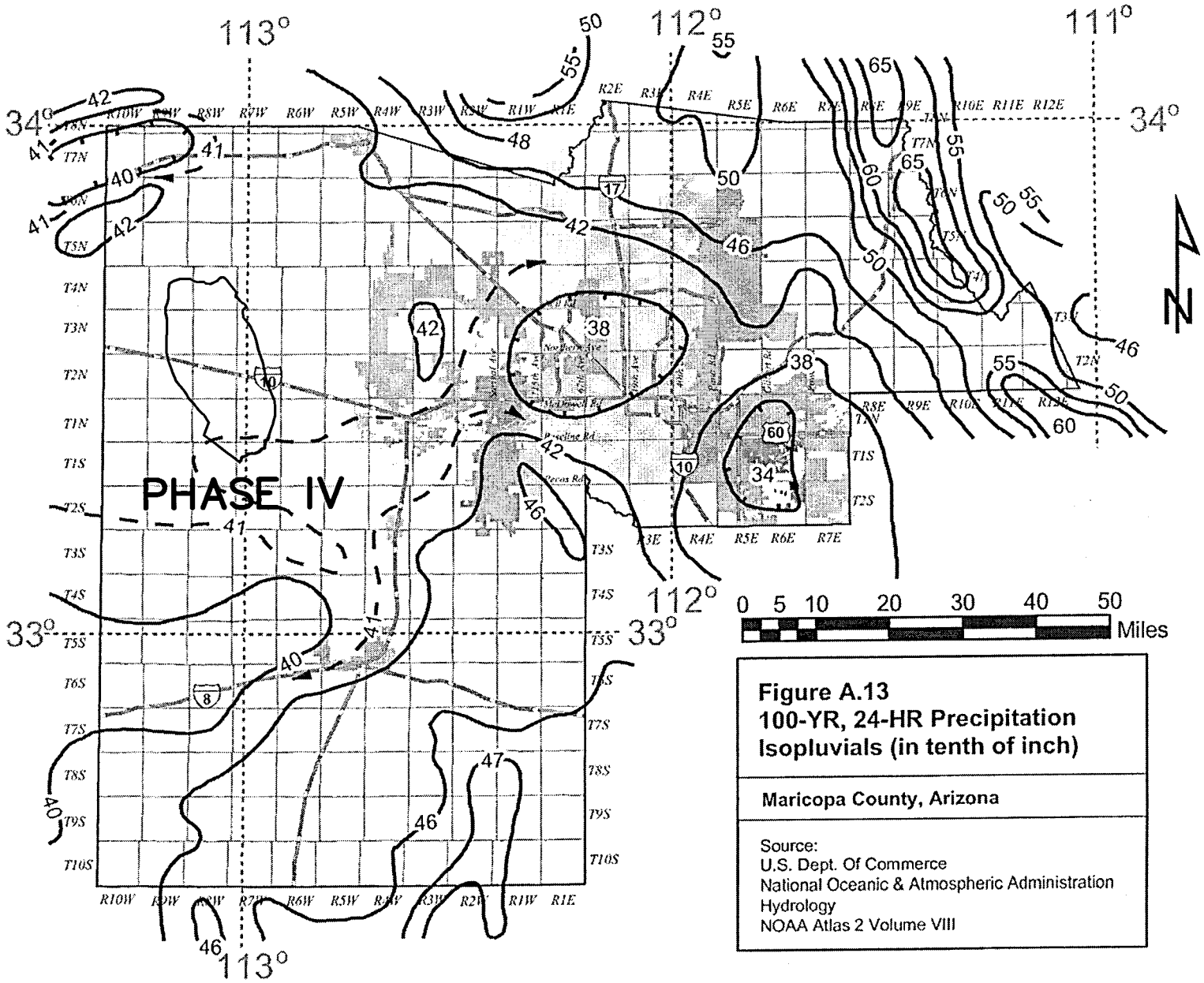

Figure A.13
100-YR, 24-HR Precipitation Isopluvials (in tenth of inch)

Maricopa County, Arizona

Source:
U.S. Dept. Of Commerce
National Oceanic & Atmospheric Administration
Hydrology
NOAA Atlas 2 Volume VIII

D.2 Physical Parameter Calculations

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110,"Rural Residential (<= 1/5 du per acre)",0.30,5,30,"normal"
120,"Estate Residential (1/5 du per acre to 1 du per acre)",0.30,5,30,"normal"
130,"Large Lot Residential - Single Family (1 du per acre to 2 du per
acre)",0.30,15,50,"normal"
140,"Medium Lot Residential - Single Family (2-4 du per acre)",0.25,30,50,"normal"
150,"Small Lot Residential - Single Family (4-6 du per acre)",0.25,30,50,"normal"
160,"Very Small Lot Residential - Single Family (>6 du per acre-includes mobile
home",0.25,40,50,"normal"
170,"Medium Density Residential - Muli Family (5-10 du per
acre)",0.25,45,50,"normal"
180,"High Density Residential - Multi Family (10-15 du per
acre)",0.25,45,50,"normal"
190,"Very High Density Residential - Multi Family (> 15 du per
acre)",0.25,45,50,"normal"
200,"General Commercial (Commercial where no detail available)",0.10,80,60,"normal"
210,"Specialty Commercial (<=50,000 sq. ft.)",0.10,80,65,"normal"
220,"Neighborhood Commercial (50,000 to 100,000 sq. ft.)",0.10,80,65,"normal"
230,"Community Commercial (100,000 to 500,000 sq. ft.)",0.10,80,75,"normal"
240,"Regional Commercial (500,000 to 1,000,000 sq. ft.)",0.10,80,65,"normal"
250,"Super-Regional Commercial (>= 1,000,000 sq. ft.)",0.10,80,70,"normal"
300,"General Industrial (Industrial where no detail available)",0.15,55,60,"normal"
310,"Warehouse/Distribution Centers",0.10,80,75,"normal"
320,"Industrial",0.15,55,60,"normal"
400,"Office General (Office where no detail available)",0.10,80,75,"normal"
410,"Office Low Rise (1-4 stories)",0.10,80,75,"normal"
420,"Office Mid Rise (5-12 stories)",0.10,80,75,"normal"
430,"Office High Rise (13 stories or more)",0.10,80,75,"normal"
510,"Tourist and Visitor Accommodations (Hotels, motels and
resorts)",0.10,80,75,"normal"
520,"Educational (Public schools, private schools and
universities)",0.29,45,80,"normal"
530,"Institutional (Includes hospitals and churches)",0.10,80,75,"normal"
540,"Cemeteries",0.10,5,90,"normal"
550,"Public Facilities (Includes community centers, power sub-stations, libraries,
ci",0.10,80,75,"normal"
560,"Special Events (Includes stadiums, sports complexes and
fairgrounds)",0.10,80,75,"normal"
570,"Other Employment - low (Proving grounds and land fills)",0.10,80,75,"normal"
580,"Other Employment - medium",0.10,80,75,"normal"
590,"Other Employment - high",0.10,80,75,"normal"
600,"General Transportation (Transportation where no detail
available)",0.10,80,75,"normal"
610,"Transportation (Includes railroads, railyards, transit centers and
freeways)",0.10,80,75,"normal"
620,"Airports (Includes public use airports)",0.15,55,60,"normal"
700,"General Open Space (Open space where no detail available)",0.10,5,90,"normal"
710,"Active Open Space (Includes parks)",0.10,5,90,"normal"
720,"Golf courses",0.10,5,90,"normal"
730,"Passive Open Space (Includes mountain preserves and washes)",0.10,0,20,"normal"
740,"Water",0.00,0,0,"wet"
750,"Agriculture",0.50,0,85,"normal"
810,"Business Park (Includes enclosed industrial, office or retail in a planned
envir",0.10,80,75,"normal"
900,"Vacant (Existing land use database only)",0.35,0,25,"dry"
```

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6532,"Agualt and Ripley soils, saline-sodic",0.00,0.00,100
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6536,"Carrizo-Momoli complex, 0 to 3 percent slopes",0.41,0.00,100
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64517,"Cellar-Rock outcrop complex, low precipitation, 10 to 70 percent slopes",0.44,15.00,100
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64520,"Chuckawalla-Gunsight complex, low precipitation, 1 to 8 percent slopes",0.19,0.00,100
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64559,"Gilman-Momoli-Denure complex, low precipitation",0.34,0.00,100
64560,"Glenbar loams",0.26,0.00,100
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65328,"Gilman very fine sandy loam, saline-sodic",0.00,0.00,100
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65331,"Growler-Momoli complex, 1 to 3 percent slopes",0.84,0.00,100
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65342,"Indio silt loam, saline-sodic",0.00,0.00,100
65343,"Lagunita-Vint complex",0.00,0.00,100
65344,"Mohall fine sandy loam",0.00,0.00,100
65345,"Mohall loam",0.28,0.00,100
65346,"Mohall loam, occasionally flooded",0.00,0.00,100
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65354,"Quilotosa-Rock outcrop complex, 15 to 55 percent slopes",0.31,25.00,100
65355,"Riverwash",0.00,0.00,100
65356,"Rock outcrop-Hyder complex. 25 to 65 percent slopes",0.35,40.0,100

65357,"Rositas-Denure loamy fine sands, 1 to 10 percent slopes",0.00,0.00,100
65358,"Schenco-Laposa-Rock outcrop complex, 10 to 55 percent slopes",0.16,20.00,100
65359,"Tremant gravelly fine sandy loam",0.00,0.00,100
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65362,"Vaiva-Quilotosa extremely stony sandy loams, 25 to 55 percent slopes",0.00,0.00,100
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65829,"Rillito-Gunsight complex, 3 to 15 percent slopes",0.00,0.00,100
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65836,"Why-Brios complex, 0 to 2 percent slopes",0.00,0.00,100
65837,"Yahana-Indio complex, saline-sodic, 0 to 3 percent slopes",0.00,0.00,100
65838,"Yahana silty clay loam, 0 to 2 percent slopes",0.00,0.00,100
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70316,"Delnorte-stagecoach complex, 1 to 20 percent slopes",0.00,0.00,100
70318,"Delthorny-garzona-rock outcrop complex, 15 to 60 percent slopes",0.00,0.00,100
70319,"Denure-momoli complex, 1 to 5 percent slopes",0.00,0.00,100
70323,"Gachado-lomitas-rock outcrop complex, 15 to 45 percent slopes",0.00,0.00,100
70324,"Gadsden silty clay loam, 0 to 1 percent slopes",0.00,0.00,100
70325,"Gilman very fine sandy loam, 0 to 1 percent slopes",0.00,0.00,100
70327,"Glenbar loam, 0 to 1 percent slopes",0.00,0.00,100
70328,"Glendale clay loam, 0 to 2 percent slopes, flooded",0.00,0.00,100
70329,"Glendale silt loam, 1 to 3 percent slopes",0.00,0.00,100
70330,"Glendale-pajarito complex, 1 to 3 percent slopes",0.00,0.00,100
70331,"Grabe-vado complex, 1 to 5 percent slopes",0.00,0.00,100
70332,"Granolite-rock outcrop complex, 15 to 65 percent slopes",0.00,0.00,100
70334,"Hantz clay loam, 0 to 1 percent slopes",0.00,0.00,100
70336,"Hickiwan-gunsight-momoli complex, 3 to 15 percent slopes",0.00,0.00,100
70340,"Lajitas-bosa-rock outcrop complex, 15 to 50 percent slopes",0.00,0.00,100
70343,"Mohall-pahaka complex, 1 to 3 percent slopes",0.00,0.00,100

70344,"Mohall-trix complex, 0 to 1 percent slopes",0.00,0.00,100
70345,"Nahda-stagecoach complex, 1 to 15 percent slopes",0.00,0.00,100
70347,"Pajarito-sahuarita complex, 1 to 3 percent slopes",0.00,0.00,100
70348,"Pantano-granolite complex, 5 to 25 percent slopes",0.00,0.00,100
70349,"Pinamt-momoli complex, 1 to 10 percent slopes",0.00,0.00,100
70355,"Sasco loam, 0 to 1 percent slopes",0.00,0.00,100
70360,"Vado-agustin complex, 1 to 8 percent slopes",0.00,0.00,100
70362,"Wintersburg loam, 0 to 1 percent slopes",0.00,0.00,100
70363,"Water",0.00,0.00,100
100103,"Sandy Clay Loam",0.12,0.00,100
100121,"Sandy Clay Loam",0.12,0.00,100
100126,"Sandy Loam",0.40,15.00,100
100301,"Sandy Loam",0.40,0.00,100
100303,"Sandy Loam",0.40,15.00,100
200239,"Sandy Loam",0.40,30.00,100
200292,"Sandy Loam",0.40,30.00,100
200300,"Sandy Clay Loam",0.06,0.00,100
200301,"Sandy Clay Loam",0.06,0.00,100
200352,"Sandy Loam",0.40,10.00,100
200381,"Sandy Loam",0.40,0.00,100
200382,"Sandy Loam",0.40,15.00,100
200390,"Sandy Clay Loam",0.06,0.00,100
200391,"Sandy Clay Loam",0.06,0.00,100
200400,"Sandy Clay Loam",0.06,0.00,100
200401,"Sandy Clay Loam",0.06,0.00,100
200402,"Sandy Loam",0.40,10.00,100
200415,"Sandy Loam",0.40,0.00,100
200416,"Sandy Clay Loam",0.06,0.00,100
200417,"Loam",0.25,20.00,100
200418,"Sandy Loam",0.40,0.00,100
200451,"Loam",0.25,0.00,100
200452,"Loam",0.25,20.00,100
300337,"Saucedo volcanics - includes rhyolite, latite, and andesite",0.00,0.00,100
645100,"Quilotosa-Vaiva-Rock outcrop complex, 20 to 65 percent slopes",0.40,20.00,100
645101,"Rillito loam, 0 to 3 percent slopes",0.28,0.00,100
645102,"Rillito gravelly loam, 1 to 8 percent slopes",0.40,0.00,100
645103,"Rock outcrop-Gachado complex, 5 to 55 percent slopes",0.10,65.00,100
645104,"Rock outcrop-Lehmans complex, 15 to 65 percent slopes",0.14,60.00,100
645105,"Rock outcrop-Lehmans complex, low precipitation, 15 to 65 percent slopes",0.14,60.00,100
645106,"Sal-Cipriano complex, 1 to 10 percent slopes",0.18,0.00,100
645107,"Sal-Cipriano complex, low precipitation, 1 to 10 percent slopes",0.18,0.00,100
645108,"Schenco-Rock outcrop complex, 3 to 25 percent slopes",0.31,30.00,100
645109,"Schenco-Rock outcrop complex, 25 to 60 percent slopes",0.35,35.00,100
645110,"Suncity-Cipriano complex, 1 to 7 percent slopes",0.13,0.00,100
645111,"Torriorthents, 15 to 40 percent slopes",0.40,0.00,100
645112,"Tremant gravelly sandy loams",0.39,0.00,100
645113,"Tremant gravelly loams",0.39,0.00,100
645114,"Tremant gravelly loams, low precipitation",0.39,0.00,100
645115,"Tremant-Antho complex, 1 to 5 percent slopes",0.39,0.00,100
645116,"Tremant-Gunsight-Rillito complex, 1 to 5 percent slopes",0.23,0.00,100
645117,"Tremant-Gunsight-Rillito complex, low precipitation, 1 to 5 percent slopes",0.23,0.00,100
645118,"Tremant-Rillito complex",0.42,0.00,100
645119,"Tremant-Suncity complex, 1 to 8 percent slopes",0.14,0.00,100
645120,"Tres Hermanos gravelly sandy loams",0.06,0.00,100
645121,"Tres Hermanos-Anthony complex, 1 to 5 percent slopes",0.12,0.00,100
645122,"Vado gravelly sandy loam, 1 to 5 percent slopes",0.33,0.00,100
645123,"Vaiva very gravelly loam, 1 to 20 percent slopes",0.37,0.00,100
645124,"Valencia sandy loams",0.39,0.00,100
645125,"Vint loamy fine sand",0.43,0.00,100

```
645999,"Blank/Unknown/Uncertain",0.00,0.00,100
651999,"Blank/Unknown/Uncertain",0.00,0.00,100
655999,"Blank/Unknown/Uncertain",0.00,0.00,100
999999,"Blank/Unknown/Uncertain",0.00,0.00,100
6512021,"Agualt loam",0.26,0.00,100
6512025,"Antho sandy loam, saline-alkali",0.39,0.00,100
6512029,"Antho-Brios sandy loams",0.39,0.00,100
6512042,"Antho association",0.40,0.00,100
6512044,"Antho-Valencia association",0.39,0.00,100
6512047,"Avonda clay loam",0.05,0.00,100
6512049,"Avondale clay loam",0.04,0.00,100
6512051,"Avondale clay loam, saline-alkali",0.04,0.00,100
6512228,"Beardsley loam",0.24,0.00,100
6512255,"Brios loamy sand",1.05,0.00,100
6512257,"Brios sandy loam",0.39,0.00,100
6512259,"Brios loam",0.25,0.00,100
6512423,"Carrizo gravelly sandy loam",0.40,0.00,100
6512430,"Carrizo and Brios soils",0.50,0.00,100
6512433,"Casa Grande Sandy loam",0.24,0.00,100
6512435,"Casa Grande loam",0.24,0.00,100
6512441,"Casa Grande complex",0.30,0.00,100
6512445,"Casa Grande-Leveen complex, alkali",0.26,0.00,100
6512447,"Cashion clay, saline-alkali",0.01,0.00,100
6512448,"Cheriono-Rock outcrop complex",0.29,20.00,100
6512451,"Coolidge sandy loam",0.40,0.00,100
6512457,"Coolidge-Tremant complex",0.19,0.00,100
6512462,"Coolidge-Laveen association",0.39,0.00,100
6512647,"Dune land",1.20,0.00,100
6512857,"Estrella loam",0.25,0.00,100
6512859,"Estrella loam, saline-alkali",0.25,0.00,100
6513220,"Gachado-Rock outcrop complex",0.10,40.00,100
6513223,"Gadsden clay loam",0.04,0.00,100
6513225,"Gadsden clay",0.01,0.00,100
6513227,"Gadsden clay, saline-alkali",0.01,0.00,100
6513229,"Gilman fine sandy loam",0.26,0.00,100
6513231,"Gilman fine sandy loam, saline-alkali",0.24,0.00,100
6513235,"Gilman loam, saline-alkali",0.24,0.00,100
6513242,"Gilman complex, saline-alkali",0.25,0.00,100
6513244,"Gilman-Antho association",0.29,0.00,100
6513246,"Gilman-Laveen association",0.25,0.00,100
6513251,"Gilman loam, clayey subsoil variant, moderately saline",0.24,0.00,100
6513255,"Glenbar loam",0.23,0.00,100
6513257,"Glenbar loam, saline-alkali",0.23,0.00,100
6513259,"Glenbar clay loam",0.04,0.00,100
6513261,"Glenbar clay loam, saline-alkali",0.04,0.00,100
6513263,"Glenbar clay",0.01,0.00,100
6513444,"Harqua-Laveen complex",0.15,0.00,100
6514221,"La Palma very fine sandy loam",0.26,0.00,100
6514223,"Laveen sandy loam",0.40,0.00,100
6514227,"Laveen loam, saline-alkali",0.25,0.00,100
6514229,"Laveen clay loam",0.04,0.00,100
6514231,"Laveen-Antho complex, saline-alkali",0.33,0.00,100
6514421,"Maripo sandy loam",0.40,0.00,100
6514449,"Mohall sandy loam",0.39,0.00,100
6514451,"Mohall loam",0.25,0.00,100
6514455,"Mohall clay loam",0.05,0.00,100
6514457,"Mohall clay",0.01,0.00,100
6514462,"Mohall-Laveen association",0.15,0.00,100
6515021,"Perryville sandy loam",0.40,0.00,100
6515023,"Perryville loam, saline-alkali",0.38,0.00,100
6515058,"Pinal gravelly loam",0.40,0.00,100
6515456," Rock outcrop-Cherioni complex",0.40,65.00,100
6515821,"Toltec loam",0.25,0.00,100
```

6515822,"Torrifluvents",0.40,0.00,100
6515825,"Torriorthents",0.40,0.00,100
6515826,"Torripsamments and Torrifluvents, frequently flooded",1.20,0.00,100
6515829,"Tremant loam",0.25,0.00,100
6515833,"Tremant clay loam",0.04,0.00,100
6515835,"Tremant gravelly clay loam",0.04,0.00,100
6515859,"Trix clay loam",0.04,0.00,100
6515861,"Tucson loam",0.25,0.00,100
6515865,"Tucson clay loam",0.05,0.00,100
6516221,"Valencia sandy loam",0.39,0.00,100
6516223,"Valencia sandy loam, saline-alkali",0.39,0.00,100
6516225,"Valencia gravelly sandy loam",0.39,0.00,100
6516229,"Vecont loam",0.25,0.00,100
6516231,"Vecont clay",0.01,0.00,100
6516233,"Vint loamy fine sand",0.91,0.00,100
6516235,"Vint fine sandy loam",0.27,0.00,100
6516241,"Vint loam",0.26,0.00,100
6516247,"Vint clay loam",0.04,0.00,100
6516255,"Vint-Carrizo complex",0.63,0.00,100
6516433,"Wintersburg complex",0.03,0.00,100
6552031,"Agualt fine sandy loam",0.25,0.00,100
6552033,"Agualt loam",0.25,0.00,100
6552045,"Alluvial land",1.20,0.00,100
6552063,"Avondale clay loam",0.04,0.00,100
6552421,"Carrizo gravelly loamy sand",1.20,0.00,100
6552423,"Carrizo fine sandy loam",0.25,0.00,100
6552425,"Cashion clay",0.01,0.00,100
6552449,"Contine clay loam",0.04,0.00,100
6552857,"Estrella loam",0.25,0.00,100
6553231,"Gilman fine sandy loam",0.25,0.00,100
6553245,"Gilman loam",0.25,0.00,100
6553247,"Glenbar clay loam",0.04,0.00,100
6553255,"Gravelly alluvial land",1.20,0.00,100
6554449,"Mohall sandy loam",0.40,0.00,100
6554463,"Mohall loam",0.25,0.00,100
6555045,"Pimer clay loam",0.04,0.00,100
6555049,"Pinal loam, moderately deep variant",0.25,0.00,100
6555449,"Rock land",0.25,65.00,100
6555461,"Rough broken land",0.40,20.00,100
6555867,"Trix clay loam",0.04,0.00,100
6556221,"Valencia sandy loam",0.40,0.00,100
6556229,"Vecont clay",0.01,0.00,100
6556231,"Vint loamy fine sand",1.20,0.00,100
65124202,"Calciorthids and Torriorthents, eroded",0.38,0.00,100
65132493,"Gilman,Antho and Glenbar soils, severely eroded",0.19,0.00,100
651202320,"Anthosandy loam, 0 to 1 percent slopes",0.38,0.00,100
651202322,"Antho sandy loam, 1 to 3 percent slopes",0.39,0.00,100
651202720,"Antho gravelly sandy loam, 0 to 1 percent slopes",0.40,0.00,100
651202722,"Antho gravelly sandy loam, 1 to 3 percent slopes",0.40,0.00,100
651203120,"Antho-Carrizo complex, 0 to 1 percent slopes",0.38,0.00,100
651203122,"Antho-Carrizo complex, 1 to 3 percent slopes",0.40,0.00,100
651203222,"Antho-Carrizo complex, 0 to 3 percent slopes",0.40,0.00,100
651203424,"Antho-Tremant complex, 1 to 5 percent slopes",0.38,0.00,100
651204122,"Antho-Tremant-Mohall complex, 1 to 5 percent slopes",0.27,0.00,100
651225036,"Borrow pit",0.00,0.00,100
651242926,"Carrizo-Ebon complex, 3 to 12 percent slopes",0.19,0.00,100
651245522,"Coolidge gravelly sandy loam, 1 to 3 percent slopes",0.40,0.00,100
651282326,"Ebon gravelly loam, 0 to 8 percent slopes",0.10,0.00,100
651285026,"Ebon-Pinamt complex, 0 to 10 percent slopes",0.12,0.00,100
651323320,"Gilman loan, 0 to 1 percent slopes",0.25,0.00,100
651323322,"Gilman loam, 1 to 3 percent slopes",0.26,0.00,100
651325036,"Gravel pit",0.00,0.00,100
651326426,"Gunsight-Pinal complex, 1 to 10 percent slopes",0.35,0.00,100

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651326720,"Gunsight-Rillito complex, 0 to 1 percent slopes",0.23,0.00,100
651326722,"Gunsight-Rillito complex, 1 to 3 percent slopes",0.24,0.00,100
651326826,"Gunsight-Rillito complex, 0 to 10 percent slopes",0.26,0.00,100
651342022,"Harqua complex, 0 to 3 percent slopes",0.07,0.00,100
651342024,"Harqua complex, 3 to 8 percent slopes",0.05,0.00,100
651344224,"Harqua-Gunsight complex, 0 to 5 percent slopes",0.14,0.00,100
651345522,"Harqua-Rillito complex, 1 to 3 percent slopes",0.12,0.00,100
651422520,"Laveen loam, 0 to 1 percent slopes",0.25,0.00,100
651422522,"Laveen loam, 1 to 3 percent slopes",0.25,0.00,100
651422862,"Man-made levee",0.00,0.00,100
651441064,"Waste stabilization pond",0.00,0.00,100
651445822,"Mohall-Tremant complex, 0 to 3 percent slopes",0.15,0.00,100
651502920,"Perryville gravelly loam, 0 to 1 percent slopes",0.37,0.00,100
651502922,"Perryville gravelly loam, 1 to 3 percent slopes",0.38,0.00,100
651505422,"Perryville-Rillito complex, 0 to 3 percent slopes",0.28,0.00,100
651505720,"Pinal loam, 0 to 1 percent slopes",0.25,0.00,100
651505722,"Pinal loam, 1 to 3 percent slopes",0.26,0.00,100
651506322,"Pinal-La Palma loams, 1 to 3 percent slopes",0.25,0.00,100
651506422,"Pinal-Suncity complex, 0 to 3 percent slopes",0.38,0.00,100
651506826,"Pinamt-Tremant complex, 1 to 10 percent slopes",0.20,0.00,100
651542120,"Rillito sandy loam, 0 to 1 percent slopes",0.39,0.00,100
651542122,"Rillito sandy loam, 1 to 3 percent slopes",0.39,0.00,100
651542320,"Rillito loam, 0 to 1 percent slopes",0.26,0.00,100
651542322,"Rillito loam, 1 to 3 percent slopes",0.25,0.00,100
651543522,"Rillito-Harqua complex, 1 to 3 percent slopes",0.23,0.00,100
651545128,"Rillito-Perryville complex, 5 to 20 percent slopes",0.29,0.00,100
651583120,"Tremant gravelly loam, 0 to 1 percent slopes",0.37,0.00,100
651583122,"Tremant gravelly loam 1 to 3 percent slopes",0.36,0.00,100
651585022,"Tremant complex, 0 to 3 percent slopes",0.12,0.00,100
651585520,"Tremant-Rillito complex, 0 to 1 percent slopes",0.11,0.00,100
651585522,"Tremant-Rillito complex, 1 to 3 percent slopes",0.13,0.00,100
651585624,"Tremant-Rillito complex, 0 to 5 percent slopes",0.14,0.00,100
653422862,"Man-made levee",0.00,0.00,100
655204720,"Antho sandy loam, 0 to 1 percent slopes",0.40,0.00,100
655204722,"Antho sandy loam, 1 to 3 percent slopes",0.40,0.00,100
655204922,"Antho gravelly sandy loam, 1 to 3 percent slopes",0.40,0.00,100
655242924,"Cavelt gravelly loam, 1 to 5 percent slopes",0.40,0.00,100
655325462,"Gravel pit",0.00,0.00,100
655422120,"Laveen loam, 0 to 1 percent slopes",0.25,0.00,100
655422122,"Laveen loam, 1 to 3 percent slopes",0.25,0.00,100
655422920,"Laveen clay loam, 0 to 1 percent slopes",0.04,0.00,100
655504720,"Pinal gravelly loam, 0 to 1 percent slopes",0.40,0.00,100
655504724,"Pinal gravelly loam, 1 to 3 percent slopes",0.40,0.00,100
655506320,"Pinamt very gravelly loam, 0 to 1 percent slopes",0.40,0.00,100
655506324,"Pinamt very gravelly loam, 3 to 5 percent slopes",0.40,0.00,100
655543720," Rillito gravelly loam, 0 to 1 percent slopes",0.40,0.00,100
655543722,"Rillito gravelly loam, 1 to 3 percent slopes",0.40,0.00,100
655585522,"Tremant gravelly loam, 1 to 3 percent slopes",0.10,0.00,100
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D.3 Hydrograph Routing Data

(See Tables 4.7 and 4.8 in **Section 4**)

D.4 Reservoir Routing Data

(This report does not include any reservoir routing data)

D.5 Flow Splits and Diversion Data

(This report does not include any flow splits and diversion data)

D.6 Hydrologic Calculations

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1****************************************
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*             MAY  1991                *
*          VERSION 4.0.1E              *
*                                      *
*  RUN DATE          TIME              *
*                                      *
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*                                      *
*   U.S. ARMY CORPS OF ENGINEERS       *
*   HYDROLOGIC ENGINEERING CENTER      *
*         609 SECOND STREET            *
*      DAVIS, CALIFORNIA 95616         *
*          (916) 551-1748              *
*                                      *
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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

HEC-1 INPUT PAGE 1

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

  1           ID  Lower Centennial Wash Watershed Zone A Delineation Study
  2           ID  JLK Engineers for FCDMC Contract 2003C061
  3           ID  Phase IV 100-YR 6-HR Aug 2005
  4           ID  Sub-Basins South of I-10 Freeway
  5           ID  Green & Ampt Rainfall Loss Method, S-Graph Unit Hydrograph
  6           ID  Normal Depth Channel Routing
              *DIAGRAM
  7           IT       5 01JAN94       0    2000
  8           IO       5
  9           IN      15 01JAN94       0
 10           JD     3.3     0.01
              * 6-hour distribution, pattern 1.0
 11           PC     0.0   0.008   0.016   0.025   0.033   0.041    0.05   0.058   0.066   0.074
 12           PC   0.087   0.099   0.118   0.138   0.216   0.377   0.834   0.911   0.931    0.95
 13           PC   0.962   0.972   0.983   0.991     1.0
 14           IN      15 01JAN94       0
 15           JD    3.28     0.5
              * 6-hour distribution, pattern 1.0
 16           PC     0.0   0.008   0.016   0.025   0.033   0.041    0.05   0.058   0.066   0.074
 17           PC   0.087   0.099   0.118   0.138   0.216   0.377   0.834   0.911   0.931    0.95
 18           PC   0.962   0.972   0.983   0.991     1.0
 19           IN      15 01JAN94       0
 20           JD   3.257     1.0
              * 6-hour distribution, pattern 1.4
 21           PC     0.0  0.0084   0.016   0.025  0.0334  0.0414  0.0504  0.0584  0.0664  0.0748
 22           PC   0.087  0.0994  0.1188   0.148  0.2304  0.4067  0.7778  0.8813  0.9186  0.9452
 23           PC  0.9572  0.9684  0.9798  0.9898     1.0
 24           IN      15 01JAN94       0
 25           JD   3.168     5.0
              * 6-hour distribution, pattern 2.3
 26           PC     0.0   0.011  0.0173  0.0267  0.0387   0.049  0.0593  0.0693  0.0797  0.0903
 27           PC   0.103  0.1173  0.1383  0.1827  0.2693   0.458   0.686  0.8233  0.8893  0.9293
 28           PC  0.9487   0.962  0.9743  0.9877     1.0
 29           IN      15 01JAN94       0
 30           JD   3.102    10.0
              * 6-hour distribution, pattern 2.7
 31           PC     0.0  0.0134  0.0189  0.0287  0.0443  0.0574  0.0694  0.0818  0.0949  0.1076
 32           PC  0.1223  0.1382  0.1604  0.2063  0.2902  0.4664  0.6764  0.8069  0.8765  0.9189
 33           PC  0.9471  0.9608  0.9735  0.9873     1.0
 34           IN      15 01JAN94       0
 35           JD   3.003    20.0
              * 6-hour distribution, pattern 3.1
 36           PC     0.0  0.0158   0.022  0.0329  0.0511  0.0663  0.0799  0.0948  0.1102  0.1246
 37           PC   0.141  0.1587  0.1828    0.23  0.3122  0.4758  0.6684  0.7929  0.8643  0.9087
 38           PC  0.9434   0.958  0.9718  0.9863     1.0
 39           IN      15 01JAN94       0
 40           JD   2.937    30.0
              * 6-hour distribution, pattern 3.4
 41           PC     0.0  0.0172  0.0256  0.0378  0.0565  0.0719  0.0868   0.103  0.1191  0.1342
 42           PC  0.1513  0.1702  0.1961  0.2439  0.3263  0.4824  0.6655  0.7875   0.858  0.9031
 43           PC   0.939  0.9544  0.9697  0.9851     1.0
 44           IN      15 01JAN94       0
 45           JD   2.871    40.0
              * 6-hour distribution, pattern 3.5
 46           PC     0.0  0.0182  0.0281  0.0413  0.0604  0.0759  0.0916  0.1088  0.1254   0.141
```

HEC-1 INPUT PAGE 2

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

 47           PC  0.1586  0.1783  0.2056  0.2537  0.3362   0.487  0.6636  0.7836  0.8535  0.8991
 48           PC  0.9358  0.9519  0.9682  0.9843     1.0
 49           IN      15 01JAN94       0
 50           JD    2.64   100.0
              * 6-hour distribution, pattern 4.1
 51           PC     0.0  0.0212  0.0355  0.0515  0.0715  0.0877   0.106  0.1261  0.1443  0.1618
 52           PC  0.1812  0.2036  0.2347  0.2837   0.367   0.501  0.6559  0.7704  0.8392  0.8864
 53           PC  0.9256   0.944  0.9633  0.9817     1.0
```

```
 54          KK    B143
 55          KM   S_Graph
 56          KO        0        0     0.0       1      22
 57          BA     1.07
 58          LG     0.35     0.35    4.35     0.4    16.0
             * S_Graph
 59          UI      0.0   150.11  501.73   973.3 1369.47 1349.43  872.41  710.64  562.16  409.33
 60          UI   337.91   250.12  183.91   150.6  115.08   80.12   73.46   47.36   28.77   28.77
 61          UI    28.77    28.77   28.77

 62          KK   B143R    CNAME   CP143
 63          KM   Curve
 64          KM   Curve
 65          KM   Curve
 66          KO        0        0     0.0       0      22
 67          RS        2     FLOW     0.0     0.0
 68          RC    0.035     0.03   0.035  3505.0  0.0021     0.0
             *  Curve
 69          RX      0.0     37.0    87.0   127.0   227.0   267.0   324.0   467.0
 70          RY     13.4     17.4    17.4    10.0    10.0    17.4    17.4    19.4

 71          KK   B140A
 72          KM   S_Graph
 73          KO        0        0     0.0       1      22
 74          BA      0.6
 75          LG     0.35     0.35     4.5    0.36     0.0
             * S_Graph
 76          UI      0.0   295.12 1058.44  1316.0  747.82  469.71  301.23  179.75  108.34   74.89
 77          UI    30.65    29.33   29.33

 78          KK  CP140A    CNAME  B140AR
 79          KO        0        0     0.0       0      22
 80          HC        2

 81          KK  B140AR    CNAME  CP140A
 82          KM   Curve
 83          KM   Curve
 84          KM   Curve
 85          KO        0        0     0.0       0      22
 86          RS        5     FLOW     0.0     0.0
 87          RC    0.035     0.03   0.035  7905.0  0.0018     0.0
             *  Curve
 88          RX      0.0     37.0    87.0   127.0   227.0   267.0   324.0   467.0
 89          RY     13.4     17.4    17.4    10.0    10.0    17.4    17.4    19.4
```

```
                                          HEC-1 INPUT                                                    PAGE   3

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

 90          KK    B142
 91          KM   S_Graph
 92          KO        0        0     0.0       1      22
 93          BA     0.99
 94          LG     0.35     0.35     4.5    0.36    37.0
             * S_Graph
 95          UI      0.0   150.05  397.07   839.5 1138.54 1629.49 1073.91  846.35  706.51   578.3
 96          UI    441.2    357.8  296.72  217.76  177.18   146.0  115.04   85.24   73.43    68.0
 97          UI    28.76    28.76   28.76   28.76   28.76   28.76     0.0

 98          KK    B141
 99          KM   S_Graph
100          KO        0        0     0.0       1      22
101          BA     0.85
102          LG     0.35     0.35     4.6    0.34    17.0
             * S_Graph
103          UI      0.0    122.3  428.48  809.69 1169.49 1018.58  690.08  557.79  434.62  315.38
104          UI   261.83   182.03  143.31  109.92   87.19   59.85   59.85   23.65   23.44   23.44
105          UI    23.44    23.44     0.0

106          KK    CP141    CNAME   B141R
107          KO        0        0     0.0       0      22
108          HC        2

109          KK   B141R    CNAME   CP141
110          KM   Curve
111          KM   Curve
112          KM   Curve
113          KO        0        0     0.0       0      22
114          RS        1     FLOW     0.0     0.0
115          RC    0.035    0.035   0.035  3960.0  0.0111     0.0
             *  Curve
116          RX      0.0     77.0   228.0   232.0   312.0   384.0   405.0   526.0
117          RY      5.0      4.2     3.0     1.5     0.0     1.3     3.1     5.2

118          KK     B140
119          KM   S_Graph
120          KO        0        0     0.0       1      22
121          BA      0.6
122          LG     0.35     0.35     4.5    0.36     0.0
             * S_Graph
123          UI      0.0   110.47  428.02  731.39  996.38  606.74  471.69   355.7  249.77  195.67
124          UI   133.71   102.34   75.92   49.45   47.09   18.98   18.98   18.98   18.98     0.0

125          KK  CP140B    CNAME     141
126          KO        0        0     0.0       0      22
127          HC        2

128          KK    CP140    CNAME   B140R
129          KO        0        0     0.0       0      22
130          HC        2
```

```
                                          HEC-1 INPUT                                                    PAGE   4

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

```
131          KK   B140R   CNAME   CP140
132          KM   Curve
133          KM   Curve
134          KM   Curve
135          KO       0       0     0.0       0      22
136          RS       1    FLOW     0.0     0.0
137          RC   0.035    0.03   0.035  1960.0   0.002     0.0
             *  Curve
138          RX     0.0    37.0    87.0   127.0   227.0   267.0   324.0   467.0
139          RY    13.4    17.4    17.4    10.0    10.0    17.4    17.4    19.4

140          KK   B138A
141          KM   S_Graph
142          KO       0       0     0.0       1      22
143          BA    0.24
144          LG    0.35    0.35    4.55    0.35     3.0
             * S_Graph
145          UI     0.0   37.86  150.89   263.2  386.95  248.73  192.46  150.37  107.73   84.95
146          UI   60.88   44.67   34.19   26.03   18.31   15.79    7.17    7.17    7.17    7.17
147          UI     0.0

148          KK  CP138A   CNAME  B138AR
149          KO       0       0     0.0       0      22
150          HC       2

151          KK  B138AR   CNAME  CP138A
152          KM   Curve
153          KM   Curve
154          KM   Curve
155          KO       0       0     0.0       0      22
156          RS       2    FLOW     0.0     0.0
157          RC   0.035    0.03   0.035  3326.0   0.002     0.0
             *  Curve
158          RX     0.0    37.0    87.0   127.0   227.0   267.0   324.0   467.0
159          RY    13.4    17.4    17.4    10.0    10.0    17.4    17.4    19.4

160          KK    B139
161          KM   S_Graph
162          KO       0       0     0.0       1      22
163          BA    0.69
164          LG    0.35    0.35     4.0    0.47    61.0
             * S_Graph
165          UI     0.0   84.17  222.75  470.94  638.69   914.1  602.44  474.78  396.34  324.41
166          UI   247.5  200.71  166.45  122.16   99.39    81.9   64.53   47.82   41.19   38.14
167          UI   16.13   16.13   16.13   16.13   16.13   16.13     0.0

168          KK   B139R   CNAME   CP139
169          KM   Curve
170          KM   Curve
171          KM   Curve
172          KM   Curve
173          KM   Curve
174          KO       0       0     0.0       0      22
175          RS       4    FLOW     0.0     0.0
```



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

176          RC   0.035   0.035   0.035 11299.0  0.0223     0.0
             *  Curve
177          RX     0.0    77.0   228.0   232.0   312.0   384.0   405.0   526.0
178          RY     5.0     4.2     3.0     1.5     0.0     1.3     3.1     5.2

179          KK    B138
180          KM   S_Graph
181          KO       0       0     0.0       1      22
182          BA    1.11
183          LG    0.35    0.35    4.55    0.35     3.0
             * S_Graph
184          UI     0.0  132.53  339.12   721.8  987.54 1416.56 1014.71  764.54  644.83  531.04
185          UI   411.0  326.16  283.86  205.46  163.57   142.8  101.61    88.3   64.85   64.85
186          UI    36.8    25.4    25.4    25.4    25.4    25.4    25.4

187          KK  CP138B   CNAME     139
188          KO       0       0     0.0       0      22
189          HC       2

190          KK   CP138   CNAME   B138R
191          KO       0       0     0.0       0      22
192          HC       2

193          KK   B138R   CNAME   CP138
194          KM   Curve
195          KM   Curve
196          KM   Curve
197          KO       0       0     0.0       0      22
198          RS       1    FLOW     0.0     0.0
199          RC   0.035    0.03   0.035  1450.0  0.0022     0.0
             *  Curve
200          RX     0.0    27.0    87.0   127.0   227.0   267.0   324.0   467.0
201          RY    13.4    17.4    17.4    10.0    10.0    17.4    17.4    19.4

202          KK   B135A
203          KM   S_Graph
204          KO       0       0     0.0       1      22
205          BA    0.48
206          LG    0.35    0.35     4.7    0.31     0.0
             * S_Graph
207          UI     0.0   88.37  342.41  585.11   797.1  485.39  377.36  284.56  199.81  156.53
208          UI  106.97   81.87   60.74   39.56   37.67   15.18   15.18   15.18   15.18     0.0

209          KK  CP135A   CNAME  B135AR
210          KO       0       0     0.0       0      22
```

```
211          HC       2

212          KK  B135AR   CNAME  CP135A
213          KM   Curve
214          KM   Curve
215          KM   Curve
216          KO       0       0     0.0       0      22
217          RS       1    FLOW     0.0     0.0
218          RC   0.035    0.03   0.035  1665.0  0.0022     0.0
             *  Curve
```



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

219          RX     0.0    37.0    87.0   127.0   227.0   267.0   324.0   467.0
220          RY    13.4    17.4    17.4    10.0    10.0    17.4    17.4    19.4

221          KK    B136
222          KM   S_Graph
223          KO       0       0     0.0       1      22
224          BA     1.0
225          LG    0.35    0.35     4.1    0.46    37.0
             * S_Graph
226          UI     0.0   124.7  341.08  716.56  966.55 1346.54  853.54   685.6  569.56  460.58
227          UI  344.41  288.76   229.9  168.63  140.58  108.31   93.18   61.02   61.02   41.27
228          UI    23.9    23.9    23.9    23.9    23.9     0.0

229          KK    B137
230          KM   S_Graph
231          KO       0       0     0.0       1      22
232          BA    0.63
233          LG    0.35    0.35     4.2    0.43    10.0
             * S_Graph
234          UI     0.0  212.24   796.1 1312.41  820.81  587.45  381.85  268.52  166.67  116.22
235          UI   74.23    53.2   26.06   26.06   26.06     0.0

236          KK   CP136   CNAME   B136R
237          KO       0       0     0.0       0      22
238          HC       2

239          KK   B136R   CNAME   CP136
240          KM   Curve
241          KM   Curve
242          KM   Curve
243          KO       0       0     0.0       0      22
244          RS       2    FLOW     0.0     0.0
245          RC   0.035   0.035   0.035  5861.0  0.0139     0.0
             *  Curve
246          RX     0.0    77.0   228.0   232.0   312.0   384.0   405.0   526.0
247          RY     5.0     4.2     3.0     1.5     0.0     1.3     3.1     5.2

248          KK    B135
249          KM   S_Graph
250          KO       0       0     0.0       1      22
251          BA    0.38
252          LG    0.35    0.35     4.7    0.31     0.0
             * S_Graph
253          UI     0.0   56.12  206.66  378.52  562.83  425.96  307.99  246.48  186.78  138.02
254          UI  110.91   77.96   62.75   44.57   34.49   27.46    20.7   10.76   10.76   10.76
255          UI   10.76   10.76

256          KK  CP135B   CNAME     136
257          KO       0       0     0.0       0      22
258          HC       2
```



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

259          KK   CP135   CNAME   B135R
260          KO       0       0     0.0       0      22
261          HC       2

262          KK   B135R   CNAME   CP135
263          KM   Curve
264          KM   Curve
265          KM   Curve
266          KO       0       0     0.0       0      22
267          RS       1    FLOW     0.0     0.0
268          RC   0.035    0.03   0.035  3490.0  0.0022     0.0
             *  Curve
269          RX     0.0    37.0    87.0   127.0   227.0   267.0   324.0   467.0
270          RY    13.4    17.4    17.4    10.0    10.0    17.4    17.4    19.4

271          KK   B133A
272          KM   S_Graph
273          KO       0       0     0.0       1      22
274          BA    0.62
275          LG    0.35    0.35    4.55    0.35     9.0
             * S_Graph
276          UI     0.0  132.53  504.52  858.64 1021.41  616.41  474.63  335.95   249.0  172.71
277          UI  126.41   89.64   63.09   53.21   25.14   20.84   20.84   20.84     0.0

278          KK  CP133A   CNAME  B133AR
279          KO       0       0     0.0       0      22
280          HC       2

281          KK  B133AR   CNAME  CP133A
282          KM   Curve
283          KM   Curve
284          KM   Curve
285          KO       0       0     0.0       0      22
286          RS       2    FLOW     0.0     0.0
287          RC   0.035    0.03   0.035  3623.0  0.0022     0.0
```

```
                    *  Curve
288                 RX     0.0    37.0    87.0   127.0   227.0   267.0   324.0   467.0
289                 RY    13.4    17.4    17.4    10.0    10.0    17.4    17.4    19.4

290                 KK    B134
291                 KM   S_Graph
292                 KO       0       0     0.0       1      22
293                 BA    1.42
294                 LG    0.35    0.35    4.35     0.4    33.0
                    * S_Graph
295                 UI     0.0  132.81  218.47  513.78  813.88  995.12  1300.1 1333.16  868.24  747.21
296                 UI   651.1  562.65  475.39  378.78  322.08  290.79  233.89  182.89  159.23  145.46
297                 UI  105.31  101.82   73.83   64.99   64.99   50.13   25.45   25.45   25.45   25.45
298                 UI   25.45   25.45   25.45   25.45     0.0
```

```
                                                HEC-1 INPUT                                                    PAGE  8

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


299                 KK   B134R   CNAME   CP134
300                 KM   Curve
301                 KM   Curve
302                 KM   Curve
303                 KM   Curve
304                 KM   Curve
305                 KO       0       0     0.0       0      22
306                 RS       2    FLOW     0.0     0.0
307                 RC   0.035   0.035   0.035  5121.6  0.0096     0.0
                    *  Curve
308                 RX     0.0    77.0   228.0   232.0   312.0   384.0   405.0   526.0
309                 RY     5.0     4.2     3.0     1.5     0.0     1.3     3.1     5.2

310                 KK    B133
311                 KM   S_Graph
312                 KO       0       0     0.0       1      22
313                 BA    0.67
314                 LG    0.35    0.35    4.55    0.35     9.0
                    * S_Graph
315                 UI     0.0  165.74  626.43 1082.95 1038.69  659.76  489.78  330.69  247.56  161.42
316                 UI  118.32   82.88   61.33   35.66   24.02   24.02   24.02     0.0

317                 KK  CP133B   CNAME     134
318                 KO       0       0     0.0       0      22
319                 HC       2

320                 KK   CP133   CNAME   B133R
321                 KO       0       0     0.0       0      22
322                 HC       2

323                 KK   B133R   CNAME   CP133
324                 KO       0       0     0.0       0      22
325                 RN   B133R
326                 ZZ
```

```
            SCHEMATIC DIAGRAM OF STREAM NETWORK
INPUT
 LINE     (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

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

   54       B143
               V
               V
   62      B143R
               .
               .
   71          .       B140A
               .           .
               .           .
   78     CP140A............
               V
               V
   81     B140AR
               .
               .
   90          .        B142
               .           .
               .           .
   98          .           .        B141
               .           .           .
               .           .           .
  106          .       CP141............
               .           V
               .           V
  109          .       B141R
               .           .
               .           .
  118          .           .        B140
               .           .           .
               .           .           .
  125          .      CP140B............
               .           .
               .           .
  128      CP140............
               V
               V
  131      B140R
               .
               .
  140          .       B138A
               .           .
               .           .
  148     CP138A............
               V
               V
```

```
151     B138AR
             .
             .
160          .        B139
             .          V
             .          V
168          .       B139R
             .          .
             .          .
179          .          .        B138
             .          .          .
             .          .          .
187          .     CP138B...........
             .          .
             .          .
190      CP138...........
             V
             V
193      B138R
             .
             .
202          .       B135A
             .          .
             .          .
209     CP135A...........
             V
             V
212     B135AR
             .
             .
221          .        B136
             .          .
             .          .
229          .          .        B137
             .          .          .
             .          .          .
236          .       CP136...........
             .          V
             .          V
239          .       B136R
             .          .
             .          .
248          .          .        B135
             .          .          .
             .          .          .
256          .     CP135B...........
             .          .
             .          .
259      CP135...........
             V
             V
262      B135R
             .
             .
271          .       B133A
             .          .
             .          .
278     CP133A...........
             V
             V
281     B133AR
             .
             .
290          .        B134
             .          V
             .          V
299          .       B134R
             .          .
             .          .
310          .          .        B133
             .          .          .
             .          .          .
317          .     CP133B...........
             .          .
             .          .
320      CP133...........
             V
             V
323      B133R
```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1****************************************
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*              MAY  1991               *
*            VERSION 4.0.1E            *
*                                      *
*  RUN DATE            TIME            *
*                                      *
****************************************
```

```
****************************************
*                                      *
*    U.S. ARMY CORPS OF ENGINEERS      *
*    HYDROLOGIC ENGINEERING CENTER     *
*          609 SECOND STREET           *
*       DAVIS, CALIFORNIA 95616        *
*           (916) 551-1748             *
*                                      *
****************************************
```

Lower Centennial Wash Watershed Zone A Delineation Study
JLK Engineers for FCDMC Contract 2003C061
Phase IV 100-YR 6-HR Aug 2005
Sub-Basins South of I-10 Freeway
Green & Ampt Rainfall Loss Method, S-Graph Unit Hydrograph
Normal Depth Channel Routing

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

```
IT          HYDROGRAPH TIME DATA
                 NMIN          5  MINUTES IN COMPUTATION INTERVAL
                IDATE     1JAN94  STARTING DATE
                ITIME       0000  STARTING TIME
                   NQ,      2000  NUMBER OF HYDROGRAPH ORDINATES
              NDDATE     7JAN94  ENDING DATE
              NDTIME       2235  ENDING TIME
               ICENT         19  CENTURY MARK

         COMPUTATION INTERVAL    0.08 HOURS
              TOTAL TIME BASE  166.58 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

10 JD       INDEX STORM NO. 1
                STRM        3.30  PRECIPITATION DEPTH
                TRDA        0.01  TRANSPOSITION DRAINAGE AREA

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

15 JD       INDEX STORM NO. 2
                STRM        3.28  PRECIPITATION DEPTH
                TRDA        0.50  TRANSPOSITION DRAINAGE AREA

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

20 JD       INDEX STORM NO. 3
                STRM        3.26  PRECIPITATION DEPTH
                TRDA        1.00  TRANSPOSITION DRAINAGE AREA

21 PI         PRECIPITATION PATTERN
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.01      0.01      0.01      0.01      0.01      0.01      0.03
                0.03      0.03      0.06      0.06      0.06      0.12      0.12      0.12      0.03      0.03
                0.03      0.01      0.01      0.01      0.01      0.01      0.01      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00

25 JD       INDEX STORM NO. 4
                STRM        3.17  PRECIPITATION DEPTH
                TRDA        5.00  TRANSPOSITION DRAINAGE AREA

26 PI         PRECIPITATION PATTERN
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.01      0.01      0.01      0.01      0.01      0.01      0.03
                0.03      0.03      0.06      0.06      0.06      0.08      0.08      0.08      0.05      0.05
                0.05      0.02      0.02      0.02      0.01      0.01      0.01      0.01      0.01      0.01
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00

30 JD       INDEX STORM NO. 5
                STRM        3.10  PRECIPITATION DEPTH
                TRDA       10.00  TRANSPOSITION DRAINAGE AREA

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

35 JD       INDEX STORM NO. 6
                STRM        3.00  PRECIPITATION DEPTH
                TRDA       20.00  TRANSPOSITION DRAINAGE AREA

36 PI         PRECIPITATION PATTERN
                0.01      0.01      0.01      0.00      0.00      0.00      0.00      0.00      0.00      0.01
                0.01      0.01      0.01      0.01      0.01      0.00      0.00      0.00      0.00      0.00
                0.00      0.01      0.01      0.01      0.00      0.00      0.00      0.01      0.01      0.01
                0.01      0.01      0.01      0.01      0.01      0.01      0.02      0.02      0.02      0.03
                0.03      0.03      0.05      0.05      0.05      0.06      0.06      0.06      0.04      0.04
                0.04      0.02      0.02      0.02      0.01      0.01      0.01      0.01      0.01      0.01
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00
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40 JD          INDEX STORM NO. 7
                    STRM        2.94  PRECIPITATION DEPTH
                    TRDA       30.00  TRANSPOSITION DRAINAGE AREA

41 PI            PRECIPITATION PATTERN
                   0.01       0.01       0.01       0.00       0.00       0.00       0.00       0.00       0.00       0.01
                   0.01       0.01       0.01       0.01       0.01       0.00       0.00       0.00       0.01       0.01
                   0.01       0.01       0.01       0.01       0.01       0.01       0.01       0.01       0.01       0.01
                   0.01       0.01       0.01       0.01       0.01       0.01       0.02       0.02       0.02       0.03
                   0.03       0.03       0.05       0.05       0.05       0.06       0.06       0.06       0.04       0.04
                   0.04       0.02       0.02       0.02       0.02       0.02       0.02       0.01       0.01       0.01
                   0.01       0.01       0.01       0.01       0.01       0.01       0.01       0.01       0.01       0.00
                   0.00       0.00

45 JD          INDEX STORM NO. 8
                    STRM        2.87  PRECIPITATION DEPTH
                    TRDA       40.00  TRANSPOSITION DRAINAGE AREA

46 PI            PRECIPITATION PATTERN
                   0.01       0.01       0.01       0.00       0.00       0.00       0.00       0.00       0.00       0.01
                   0.01       0.01       0.01       0.01       0.01       0.01       0.01       0.01       0.01       0.01
                   0.01       0.01       0.01       0.01       0.01       0.01       0.01       0.01       0.01       0.01
                   0.01       0.01       0.01       0.01       0.01       0.01       0.02       0.02       0.02       0.03
                   0.03       0.03       0.05       0.05       0.05       0.06       0.06       0.06       0.04       0.04
                   0.04       0.02       0.02       0.02       0.02       0.02       0.02       0.01       0.01       0.01
                   0.01       0.01       0.01       0.01       0.01       0.01       0.01       0.01       0.01       0.01
                   0.01       0.01

50 JD          INDEX STORM NO. 9
                    STRM        2.64  PRECIPITATION DEPTH
                    TRDA      100.00  TRANSPOSITION DRAINAGE AREA

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

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

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

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+	HYDROGRAPH AT	B143	1429.	4.25	179.	45.	15.	1.07		
+	ROUTED TO	B143R	1252.	4.42	178.	45.	15.	1.07		
+	HYDROGRAPH AT	B140A	1284.	4.17	91.	23.	8.	0.60		
+	2 COMBINED AT	CP140A	1564.	4.42	248.	62.	21.	1.67		
+	ROUTED TO	B140AR	1365.	4.75	247.	62.	21.	1.67		
+	HYDROGRAPH AT	B142	1743.	4.33	267.	67.	22.	0.99		
+	HYDROGRAPH AT	B141	1273.	4.25	154.	38.	13.	0.85		
+	2 COMBINED AT	CP141	2573.	4.33	397.	100.	33.	1.84		
+	ROUTED TO	B141R	2404.	4.42	395.	100.	33.	1.84		
+	HYDROGRAPH AT	B140	988.	4.25	91.	23.	8.	0.60		
+	2 COMBINED AT	CP140B	2784.	4.33	459.	116.	39.	2.44		
+	2 COMBINED AT	CP140	2954.	4.58	646.	165.	55.	4.11		
+	ROUTED TO	B140R	2908.	4.67	645.	165.	55.	4.11		
+	HYDROGRAPH AT	B138A	409.	4.25	39.	10.	3.	0.24		
+	2 COMBINED AT	CP138A	2979.	4.67	669.	171.	57.	4.35		
+	ROUTED TO	B138AR	2932.	4.75	668.	171.	57.	4.35		
+	HYDROGRAPH AT	B139	1145.	4.33	183.	46.	15.	0.69		

+	ROUTED TO	B139R	932.	4.67	181.	46.	15.	0.69
+	HYDROGRAPH AT	B138	1289.	4.33	162.	41.	14.	1.11
+	2 COMBINED AT	CP138B	1556.	4.42	325.	82.	27.	1.80
+	2 COMBINED AT	CP138	3880.	4.67	924.	237.	79.	6.15
+	ROUTED TO	B138R	3860.	4.75	924.	237.	79.	6.15
+	HYDROGRAPH AT	B135A	854.	4.25	78.	19.	6.	0.48
+	2 COMBINED AT	CP135A	3961.	4.75	969.	249.	83.	6.63
+	ROUTED TO	B135AR	3934.	4.75	968.	249.	83.	6.63
+	HYDROGRAPH AT	B136	1377.	4.33	208.	52.	17.	1.00
+	HYDROGRAPH AT	B137	1213.	4.17	102.	25.	8.	0.63
+	2 COMBINED AT	CP136	2070.	4.25	290.	73.	24.	1.63
+	ROUTED TO	B136R	1854.	4.42	289.	73.	24.	1.63
+	HYDROGRAPH AT	B135	632.	4.25	62.	15.	5.	0.38
+	2 COMBINED AT	CP135B	2131.	4.42	335.	84.	28.	2.01
+	2 COMBINED AT	CP135	4865.	4.67	1213.	312.	104.	8.64
+	ROUTED TO	B135R	4718.	4.83	1211.	312.	104.	8.64
+	HYDROGRAPH AT	B133A	1086.	4.25	105.	26.	9.	0.62
+	2 COMBINED AT	CP133A	4822.	4.75	1272.	328.	109.	9.26
+	ROUTED TO	B133AR	4760.	4.92	1271.	328.	109.	9.26
+	HYDROGRAPH AT	B134	1539.	4.42	282.	71.	24.	1.42
+	ROUTED TO	B134R	1425.	4.58	280.	71.	24.	1.42
+	HYDROGRAPH AT	B133	1179.	4.17	112.	28.	9.	0.67
+	2 COMBINED AT	CP133B	1729.	4.50	369.	93.	31.	2.09
+	2 COMBINED AT	CP133	5529.	4.83	1530.	397.	132.	11.35
+	ROUTED TO	B133R	5529.	4.83	1530.	397.	132.	11.35

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

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1****************************************
 *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
 *            MAY  1991                 *
 *          VERSION 4.0.1E              *
 *                                      *
 *  RUN DATE            TIME            *
 *                                      *
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*                                      *
*    U.S. ARMY CORPS OF ENGINEERS      *
*    HYDROLOGIC ENGINEERING CENTER     *
*          609 SECOND STREET           *
*       DAVIS, CALIFORNIA 95616        *
*           (916) 551-1748             *
*                                      *
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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

HEC-1 INPUT PAGE 1

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

   1          ID  Lower Centennial Wash Watershed Zone A Delineation Study
   2          ID  JLK Engineers for FCDMC Contract 2003C061
   3          ID  Phase IV 100-YR 24-HR Aug 2005
   4          ID  Sub-Basins South of I-10 Freeway
   5          ID  Green & Ampt Rainfall Loss Method, S-Graph Unit Hydrograph
   6          ID  Normal Depth Channel Routing
              *DIAGRAM
   7          IT       5 01JAN94       0    2000
   8          IO       5
   9          IN      15 01JAN94       0
  10          JD     4.1    0.01
              * 24-hour distribution
  11          PC     0.0   0.002   0.005   0.008   0.011   0.014   0.017    0.02   0.023   0.026
  12          PC   0.029   0.032   0.035   0.038   0.041   0.044   0.048   0.052   0.056    0.06
  13          PC   0.064   0.068   0.072   0.076    0.08   0.085    0.09   0.095     0.1   0.105
  14          PC    0.11   0.115    0.12   0.126   0.133    0.14   0.147   0.155   0.163   0.172
  15          PC   0.181   0.191   0.203   0.218   0.236   0.257   0.283   0.387   0.663   0.707
  16          PC   0.735   0.758   0.776   0.791   0.804   0.815   0.825   0.834   0.842   0.849
  17          PC   0.856   0.863   0.869   0.875   0.881   0.887   0.893   0.898   0.903   0.908
  18          PC   0.913   0.918   0.922   0.926    0.93   0.934   0.938   0.942   0.946    0.95
  19          PC   0.953   0.956   0.959   0.962   0.965   0.968   0.971   0.974   0.977    0.98
  20          PC   0.983   0.986   0.989   0.992   0.995   0.998     1.0
  21          IN      15 01JAN94       0
  22          JD   3.895    10.0
              * 24-hour distribution
  23          PC     0.0   0.002   0.005   0.008   0.011   0.014   0.017    0.02   0.023   0.026
  24          PC   0.029   0.032   0.035   0.038   0.041   0.044   0.048   0.052   0.056    0.06
  25          PC   0.064   0.068   0.072   0.076    0.08   0.085    0.09   0.095     0.1   0.105
  26          PC    0.11   0.115    0.12   0.126   0.133    0.14   0.147   0.155   0.163   0.172
  27          PC   0.181   0.191   0.203   0.218   0.236   0.257   0.283   0.387   0.663   0.707
  28          PC   0.735   0.758   0.776   0.791   0.804   0.815   0.825   0.834   0.842   0.849
  29          PC   0.856   0.863   0.869   0.875   0.881   0.887   0.893   0.898   0.903   0.908
  30          PC   0.913   0.918   0.922   0.926    0.93   0.934   0.938   0.942   0.946    0.95
  31          PC   0.953   0.956   0.959   0.962   0.965   0.968   0.971   0.974   0.977    0.98
  32          PC   0.983   0.986   0.989   0.992   0.995   0.998     1.0
  33          IN      15 01JAN94       0
  34          JD   3.764    20.0
              * 24-hour distribution
  35          PC     0.0   0.002   0.005   0.008   0.011   0.014   0.017    0.02   0.023   0.026
  36          PC   0.029   0.032   0.035   0.038   0.041   0.044   0.048   0.052   0.056    0.06
  37          PC   0.064   0.068   0.072   0.076    0.08   0.085    0.09   0.095     0.1   0.105
  38          PC    0.11   0.115    0.12   0.126   0.133    0.14   0.147   0.155   0.163   0.172
  39          PC   0.181   0.191   0.203   0.218   0.236   0.257   0.283   0.387   0.663   0.707
  40          PC   0.735   0.758   0.776   0.791   0.804   0.815   0.825   0.834   0.842   0.849
  41          PC   0.856   0.863   0.869   0.875   0.881   0.887   0.893   0.898   0.903   0.908
  42          PC   0.913   0.918   0.922   0.926    0.93   0.934   0.938   0.942   0.946    0.95
  43          PC   0.953   0.956   0.959   0.962   0.965   0.968   0.971   0.974   0.977    0.98
  44          PC   0.983   0.986   0.989   0.992   0.995   0.998     1.0
  45          IN      15 01JAN94       0
  46          JD   3.637    40.0
              * 24-hour distribution
  47          PC     0.0   0.002   0.005   0.008   0.011   0.014   0.017    0.02   0.023   0.026
  48          PC   0.029   0.032   0.035   0.038   0.041   0.044   0.048   0.052   0.056    0.06
  49          PC   0.064   0.068   0.072   0.076    0.08   0.085    0.09   0.095     0.1   0.105
  50          PC    0.11   0.115    0.12   0.126   0.133    0.14   0.147   0.155   0.163   0.172
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HEC-1 INPUT PAGE 2

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

  51          PC   0.181   0.191   0.203   0.218   0.236   0.257   0.283   0.387   0.663   0.707
  52          PC   0.735   0.758   0.776   0.791   0.804   0.815   0.825   0.834   0.842   0.849
  53          PC   0.856   0.863   0.869   0.875   0.881   0.887   0.893   0.898   0.903   0.908
  54          PC   0.913   0.918   0.922   0.926    0.93   0.934   0.938   0.942   0.946    0.95
  55          PC   0.953   0.956   0.959   0.962   0.965   0.968   0.971   0.974   0.977    0.98
  56          PC   0.983   0.986   0.989   0.992   0.995   0.998     1.0
  57          IN      15 01JAN94       0
  58          JD   3.514    80.0
```

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            * 24-hour distribution
 59         PC     0.0   0.002   0.005   0.008   0.011   0.014   0.017    0.02   0.023   0.026
 60         PC   0.029   0.032   0.035   0.038   0.041   0.044   0.048   0.052   0.056    0.06
 61         PC   0.064   0.068   0.072   0.076    0.08   0.085    0.09   0.095     0.1   0.105
 62         PC    0.11   0.115    0.12   0.126   0.133    0.14   0.147   0.155   0.163   0.172
 63         PC   0.181   0.191   0.203   0.218   0.236   0.257   0.283   0.387   0.663   0.707
 64         PC   0.735   0.758   0.776   0.791   0.804   0.815   0.825   0.834   0.842   0.849
 65         PC   0.856   0.863   0.869   0.875   0.881   0.887   0.893   0.898   0.903   0.908
 66         PC   0.913   0.918   0.922   0.926    0.93   0.934   0.938   0.942   0.946    0.95
 67         PC   0.953   0.956   0.959   0.962   0.965   0.968   0.971   0.974   0.977    0.98
 68         PC   0.983   0.986   0.989   0.992   0.995   0.998     1.0
 69         IN      15 01JAN94       0
 70         JD   3.448   120.0
            * 24-hour distribution
 71         PC     0.0   0.002   0.005   0.008   0.011   0.014   0.017    0.02   0.023   0.026
 72         PC   0.029   0.032   0.035   0.038   0.041   0.044   0.048   0.052   0.056    0.06
 73         PC   0.064   0.068   0.072   0.076    0.08   0.085    0.09   0.095     0.1   0.105
 74         PC    0.11   0.115    0.12   0.126   0.133    0.14   0.147   0.155   0.163   0.172
 75         PC   0.181   0.191   0.203   0.218   0.236   0.257   0.283   0.387   0.663   0.707
 76         PC   0.735   0.758   0.776   0.791   0.804   0.815   0.825   0.834   0.842   0.849
 77         PC   0.856   0.863   0.869   0.875   0.881   0.887   0.893   0.898   0.903   0.908
 78         PC   0.913   0.918   0.922   0.926    0.93   0.934   0.938   0.942   0.946    0.95
 79         PC   0.953   0.956   0.959   0.962   0.965   0.968   0.971   0.974   0.977    0.98
 80         PC   0.983   0.986   0.989   0.992   0.995   0.998     1.0
 81         IN      15 01JAN94       0
 82         JD   3.362   200.0
            * 24-hour distribution
 83         PC     0.0   0.002   0.005   0.008   0.011   0.014   0.017    0.02   0.023   0.026
 84         PC   0.029   0.032   0.035   0.038   0.041   0.044   0.048   0.052   0.056    0.06
 85         PC   0.064   0.068   0.072   0.076    0.08   0.085    0.09   0.095     0.1   0.105
 86         PC    0.11   0.115    0.12   0.126   0.133    0.14   0.147   0.155   0.163   0.172
 87         PC   0.181   0.191   0.203   0.218   0.236   0.257   0.283   0.387   0.663   0.707
 88         PC   0.735   0.758   0.776   0.791   0.804   0.815   0.825   0.834   0.842   0.849
 89         PC   0.856   0.863   0.869   0.875   0.881   0.887   0.893   0.898   0.903   0.908
 90         PC   0.913   0.918   0.922   0.926    0.93   0.934   0.938   0.942   0.946    0.95
 91         PC   0.953   0.956   0.959   0.962   0.965   0.968   0.971   0.974   0.977    0.98
 92         PC   0.983   0.986   0.989   0.992   0.995   0.998     1.0
 93         IN      15 01JAN94       0
 94         JD   3.305   300.0
            * 24-hour distribution
 95         PC     0.0   0.002   0.005   0.008   0.011   0.014   0.017    0.02   0.023   0.026
 96         PC   0.029   0.032   0.035   0.038   0.041   0.044   0.048   0.052   0.056    0.06
 97         PC   0.064   0.068   0.072   0.076    0.08   0.085    0.09   0.095     0.1   0.105
 98         PC    0.11   0.115    0.12   0.126   0.133    0.14   0.147   0.155   0.163   0.172
 99         PC   0.181   0.191   0.203   0.218   0.236   0.257   0.283   0.387   0.663   0.707
100         PC   0.735   0.758   0.776   0.791   0.804   0.815   0.825   0.834   0.842   0.849
101         PC   0.856   0.863   0.869   0.875   0.881   0.887   0.893   0.898   0.903   0.908
```



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

102         PC   0.913   0.918   0.922   0.926    0.93   0.934   0.938   0.942   0.946    0.95
103         PC   0.953   0.956   0.959   0.962   0.965   0.968   0.971   0.974   0.977    0.98
104         PC   0.983   0.986   0.989   0.992   0.995   0.998     1.0
105         IN      15 01JAN94       0
106         JD    3.21   500.0
            * 24-hour distribution
107         PC     0.0   0.002   0.005   0.008   0.011   0.014   0.017    0.02   0.023   0.026
108         PC   0.029   0.032   0.035   0.038   0.041   0.044   0.048   0.052   0.056    0.06
109         PC   0.064   0.068   0.072   0.076    0.08   0.085    0.09   0.095     0.1   0.105
110         PC    0.11   0.115    0.12   0.126   0.133    0.14   0.147   0.155   0.163   0.172
111         PC   0.181   0.191   0.203   0.218   0.236   0.257   0.283   0.387   0.663   0.707
112         PC   0.735   0.758   0.776   0.791   0.804   0.815   0.825   0.834   0.842   0.849
113         PC   0.856   0.863   0.869   0.875   0.881   0.887   0.893   0.898   0.903   0.908
114         PC   0.913   0.918   0.922   0.926    0.93   0.934   0.938   0.942   0.946    0.95
115         PC   0.953   0.956   0.959   0.962   0.965   0.968   0.971   0.974   0.977    0.98
116         PC   0.983   0.986   0.989   0.992   0.995   0.998     1.0

117         KK    B143
118         KO       0       0     0.0       1      22
119         BA    1.07
120         LG    0.35    0.35    4.35     0.4    16.0
            * S_Graph
121         UI     0.0  150.11  501.73   973.3 1369.47 1349.43  872.41  710.64  562.16  409.33
122         UI  337.91  250.12  183.91   150.6  115.08   80.12   73.46   47.36   28.77   28.77
123         UI   28.77   28.77   28.77

124         KK   B143R   CNAME   CP143
125         KM   Curve
126         KO       0       0     0.0       0      22
127         RS       2    FLOW     0.0     0.0
128         RC   0.035    0.03   0.035  3505.0  0.0021     0.0
            *  Curve
129         RX     0.0    37.0    87.0   127.0   227.0   267.0   324.0   467.0
130         RY    13.4    17.4    17.4    10.0    10.0    17.4    17.4    19.4

131         KK   B140A
132         KO       0       0     0.0       1      22
133         BA     0.6
134         LG    0.35    0.35     4.5    0.36     0.0
            * S_Graph
135         UI     0.0  295.12 1058.44  1316.0  747.82  469.71  301.23  179.75  108.34   74.89
136         UI   30.65   29.33   29.33

137         KK  CP140A   CNAME  B140AR
138         KO       0       0     0.0       0      22
139         HC       2

140         KK  B140AR   CNAME  CP140A
141         KM   Curve
142         KO       0       0     0.0       0      22
143         RS       5    FLOW     0.0     0.0
144         RC   0.035    0.03   0.035  7905.0  0.0018     0.0
            *  Curve
145         RX     0.0    37.0    87.0   127.0   227.0   267.0   324.0   467.0
```

```
146          RY    13.4    17.4    17.4    10.0    10.0    17.4    17.4    19.4
```



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

147          KK    B142
148          KO       0       0     0.0       1      22
149          BA    0.99
150          LG    0.35    0.35     4.5    0.36    37.0
             * S_Graph
151          UI     0.0  150.05  397.07   839.5 1138.54 1629.49 1073.91  846.35  706.51   578.3
152          UI   441.2   357.8  296.72  217.76  177.18   146.0  115.04   85.24   73.43    68.0
153          UI   28.76   28.76   28.76   28.76   28.76   28.76     0.0

154          KK    B141
155          KO       0       0     0.0       1      22
156          BA    0.85
157          LG    0.35    0.35     4.6    0.34    17.0
             * S_Graph
158          UI     0.0   122.3  428.48  809.69 1169.49 1018.58  690.08  557.79  434.62  315.38
159          UI  261.83  182.03  143.31  109.92   87.19   59.85   59.85   23.65   23.44   23.44
160          UI   23.44   23.44     0.0

161          KK   CP141   CNAME   B141R
162          KO       0       0     0.0       0      22
163          HC       2

164          KK   B141R   CNAME   CP141
165          KM   Curve
166          KO       0       0     0.0       0      22
167          RS       2    FLOW     0.0     0.0
168          RC   0.035   0.035   0.035  3960.0  0.0111     0.0
             *  Curve
169          RX     0.0    77.0   228.0   232.0   312.0   384.0   405.0   526.0
170          RY     5.0     4.2     3.0     1.5     0.0     1.3     3.1     5.2

171          KK    B140
172          KO       0       0     0.0       1      22
173          BA     0.6
174          LG    0.35    0.35     4.5    0.36     0.0
             * S_Graph
175          UI     0.0  110.47  428.02  731.39  996.38  606.74  471.69   355.7  249.77  195.67
176          UI  133.71  102.34   75.92   49.45   47.09   18.98   18.98   18.98   18.98     0.0

177          KK  CP140B   CNAME     141
178          KO       0       0     0.0       0      22
179          HC       2

180          KK   CP140   CNAME   B140R
181          KO       0       0     0.0       0      22
182          HC       2

183          KK   B140R   CNAME   CP140
184          KM   Curve
185          KO       0       0     0.0       0      22
186          RS       1    FLOW     0.0     0.0
187          RC   0.035    0.03   0.035  1960.0   0.002     0.0
             *  Curve
188          RX     0.0    37.0    87.0   127.0   227.0   267.0   324.0   467.0
```



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

189          RY    13.4    17.4    17.4    10.0    10.0    17.4    17.4    19.4

190          KK   B138A
191          KO       0       0     0.0       1      22
192          BA    0.24
193          LG    0.35    0.35    4.55    0.35     3.0
             * S_Graph
194          UI     0.0   37.86  150.89   263.2  386.95  248.73  192.46  150.37  107.73   84.95
195          UI   60.88   44.67   34.19   26.03   18.31   15.79    7.17    7.17    7.17    7.17
196          UI     0.0

197          KK  CP138A   CNAME  B138AR
198          KO       0       0     0.0       0      22
199          HC       2

200          KK  B138AR   CNAME  CP138A
201          KM   Curve
202          KO       0       0     0.0       0      22
203          RS       2    FLOW     0.0     0.0
204          RC   0.035    0.03   0.035  3326.0   0.002     0.0
             *  Curve
205          RX     0.0    37.0    87.0   127.0   227.0   267.0   324.0   467.0
206          RY    13.4    17.4    17.4    10.0    10.0    17.4    17.4    19.4

207          KK    B139
208          KO       0       0     0.0       1      22
209          BA    0.69
210          LG    0.35    0.35     4.0    0.47    61.0
             * S_Graph
211          UI     0.0   84.17  222.75  470.94  638.69   914.1  602.44  474.78  396.34  324.41
212          UI   247.5  200.71  166.45  122.16   99.39    81.9   64.53   47.82   41.19   38.14
213          UI   16.13   16.13   16.13   16.13   16.13   16.13     0.0

214          KK   B139R   CNAME   CP139
215          KM   Curve
216          KM   Curve
217          KO       0       0     0.0       0      22
218          RS       5    FLOW     0.0     0.0
219          RC   0.035   0.035   0.035 11299.0  0.0223     0.0
             *  Curve
```

```
220          RX     0.0    77.0   228.0   232.0   312.0   384.0   405.0   526.0
221          RY     5.0     4.2     3.0     1.5     0.0     1.3     3.1     5.2

222          KK    B138
223          KO       0       0     0.0       1      22
224          BA    1.11
225          LG    0.35    0.35    4.55    0.35     3.0
             * S_Graph
226          UI     0.0  132.53  339.12   721.8  987.54 1416.56 1014.71  764.54  644.83  531.04
227          UI   411.0  326.16  283.86  205.46  163.57   142.8  101.61    88.3   64.85   64.85
228          UI    36.8    25.4    25.4    25.4    25.4    25.4    25.4
```



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

229          KK  CP138B   CNAME     139
230          KO       0       0     0.0       0      22
231          HC       2

232          KK   CP138   CNAME   B138R
233          KO       0       0     0.0       0      22
234          HC       2

235          KK   B138R   CNAME   CP138
236          KM   Curve
237          KO       0       0     0.0       0      22
238          RS       1    FLOW     0.0     0.0
239          RC   0.035    0.03   0.035  1450.0  0.0022     0.0
             *  Curve
240          RX     0.0    27.0    87.0   127.0   227.0   267.0   324.0   467.0
241          RY    13.4    17.4    17.4    10.0    10.0    17.4    17.4    19.4
242          IN       0 01JAN94       0

243          KK   B135A
244          KO       0       0     0.0       1      22
245          BA    0.48
246          LG    0.35    0.35     4.7    0.31     0.0
             * S_Graph
247          UI     0.0   88.37  342.41  585.11   797.1  485.39  377.36  284.56  199.81  156.53
248          UI  106.97   81.87   60.74   39.56   37.67   15.18   15.18   15.18   15.18     0.0

249          KK  CP135A   CNAME  B135AR
250          KO       0       0     0.0       0      22
251          HC       2

252          KK  B135AR   CNAME  CP135A
253          KM   Curve
254          KO       0       0     0.0       0      22
255          RS       1    FLOW     0.0     0.0
256          RC   0.035    0.03   0.035  1665.0  0.0022     0.0
             *  Curve
257          RX     0.0    37.0    87.0   127.0   227.0   267.0   324.0   467.0
258          RY    13.4    17.4    17.4    10.0    10.0    17.4    17.4    19.4

259          KK    B136
260          KO       0       0     0.0       1      22
261          BA     1.0
262          LG    0.35    0.35     4.1    0.46    37.0
             * S_Graph
263          UI     0.0   124.7  341.08  716.56  966.55 1346.54  853.54   685.6  569.56  460.58
264          UI  344.41  288.76   229.9  168.63  140.58  108.31   93.18   61.02   61.02   41.27
265          UI    23.9    23.9    23.9    23.9    23.9     0.0

266          KK    B137
267          KO       0       0     0.0       1      22
268          BA    0.63
269          LG    0.35    0.35     4.2    0.43    10.0
             * S_Graph
270          UI     0.0  212.24   796.1 1312.41  820.81  587.45  381.85  268.52  166.67  116.22
```



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

271          UI   74.23    53.2   26.06   26.06   26.06     0.0

272          KK   CP136   CNAME   B136R
273          KO       0       0     0.0       0      22
274          HC       2

275          KK   B136R   CNAME   CP136
276          KM   Curve
277          KO       0       0     0.0       0      22
278          RS       3    FLOW     0.0     0.0
279          RC   0.035   0.035   0.035  5861.0  0.0139     0.0
             *  Curve
280          RX     0.0    77.0   228.0   232.0   312.0   384.0   405.0   526.0
281          RY     5.0     4.2     3.0     1.5     0.0     1.3     3.1     5.2

282          KK    B135
283          KO       0       0     0.0       1      22
284          BA    0.38
285          LG    0.35    0.35     4.7    0.31     0.0
             * S_Graph
286          UI     0.0   56.12  206.66  378.52  562.83  425.96  307.99  246.48  186.78  138.02
287          UI  110.91   77.96   62.75   44.57   34.49   27.46    20.7   10.76   10.76   10.76
288          UI   10.76   10.76

289          KK  CP135B   CNAME     136
290          KO       0       0     0.0       0      22
291          HC       2

292          KK   CP135   CNAME   B135R
293          KO       0       0     0.0       0      22
```

```
294          HC       2

295          KK   B135R   CNAME   CP135
296          KM   Curve
297          KO       0       0     0.0       0      22
298          RS       2    FLOW     0.0     0.0
299          RC   0.035    0.03   0.035  3490.0  0.0022     0.0
             *  Curve
300          RX     0.0    37.0    87.0   127.0   227.0   267.0   324.0   467.0
301          RY    13.4    17.4    17.4    10.0    10.0    17.4    17.4    19.4

302          KK   B133A
303          KO       0       0     0.0       1      22
304          BA    0.62
305          LG    0.35    0.35    4.55    0.35     9.0
             * S_Graph
306          UI     0.0  132.53  504.52  858.64 1021.41  616.41  474.63  335.95    249.0  172.71
307          UI  126.41   89.64   63.09   53.21   25.14   20.84   20.84   20.84     0.0

308          KK  CP133A   CNAME  B133AR
309          KO       0       0     0.0       0      22
310          HC       2
```



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

311          KK  B133AR   CNAME  CP133A
312          KM   Curve
313          KO       0       0     0.0       0      22
314          RS       2    FLOW     0.0     0.0
315          RC   0.035    0.03   0.035  3623.0  0.0022     0.0
             *  Curve
316          RX     0.0    37.0    87.0   127.0   227.0   267.0   324.0   467.0
317          RY    13.4    17.4    17.4    10.0    10.0    17.4    17.4    19.4

318          KK    B134
319          KO       0       0     0.0       1      22
320          BA    1.42
321          LG    0.35    0.35    4.35     0.4    33.0
             * S_Graph
322          UI     0.0  132.81  218.47  513.78  813.88  995.12 1300.1 1333.16  868.24  747.21
323          UI   651.1  562.65  475.39  378.78  322.08  290.79  233.89  182.89  159.23  145.46
324          UI  105.31  101.82   73.83   64.99   64.99   50.13   25.45   25.45   25.45   25.45
325          UI   25.45   25.45   25.45   25.45     0.0

326          KK   B134R   CNAME   CP134
327          KM   Curve
328          KM   Curve
329          KO       0       0     0.0       0      22
330          RS       3    FLOW     0.0     0.0
331          RC   0.035   0.035   0.035  5121.6  0.0096     0.0
             *  Curve
332          RX     0.0    77.0   228.0   232.0   312.0   384.0   405.0   526.0
333          RY     5.0     4.2     3.0     1.5     0.0     1.3     3.1     5.2

334          KK    B133
335          KO       0       0     0.0       1      22
336          BA    0.67
337          LG    0.35    0.35    4.55    0.35     9.0
             * S_Graph
338          UI     0.0  165.74  626.43 1082.95 1038.69  659.76  489.78  330.69  247.56  161.42
339          UI  118.32   82.88   61.33   35.66   24.02   24.02   24.02     0.0

340          KK  CP133B   CNAME     134
341          KO       0       0     0.0       0      22
342          HC       2

343          KK   CP133   CNAME   B133R
344          KO       0       0     0.0       0      22
345          HC       2

346          KK   B133R   CNAME   CP133
347          KO       0       0     0.0       0      22
348          RN   B133R
349          ZZ
```

```
             SCHEMATIC DIAGRAM OF STREAM NETWORK
INPUT
 LINE     (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

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

  117       B143
               V
               V
  124      B143R
               .
               .
  131          .        B140A
               .           .
               .           .
  137     CP140A............
               V
               V
  140     B140AR
               .
               .
  147          .         B142
               .           .
               .           .
  154          .           .         B141
               .           .           .
               .           .           .
  161          .       CP141............
```

```
                 .          V
                 .          V
164              .       B141R
                 .          .
171              .          .        B140
                 .          .          .
177              .      CP140B...........
                 .          .
180         CP140...........
                V
                V
183         B140R
                .
                .
190              .       B138A
                 .          .
197        CP138A...........
                V
                V
200        B138AR
                .
                .
207              .        B139
                 .          V
                 .          V
214              .       B139R
                 .          .
                 .          .
222              .          .        B138
                 .          .          .
229              .      CP138B...........
                 .          .
232         CP138...........
                V
                V
235         B138R
                .
                .
243              .       B135A
                 .          .
                 .          .
249        CP135A...........
                V
                V
252        B135AR
                .
                .
259              .        B136
                 .          .
                 .          .
266              .          .        B137
                 .          .          .
                 .          .          .
272              .       CP136...........
                 .          V
                 .          V
275              .       B136R
                 .          .
                 .          .
282              .          .        B135
                 .          .          .
                 .          .          .
289              .      CP135B...........
                 .          .
                 .          .
292         CP135...........
                V
                V
295         B135R
                .
                .
302              .       B133A
                 .          .
                 .          .
308        CP133A...........
                V
                V
311        B133AR
                .
                .
318              .        B134
                 .          V
                 .          V
326              .       B134R
                 .          .
                 .          .
334              .          .        B133
                 .          .          .
                 .          .          .
340              .      CP133B...........
                 .          .
                 .          .
343         CP133...........
                V
                V
346         B133R
```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

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1*************************************                    *************************************
*                                   *                    *                                   *
```

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*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*              MAY   1991               *
*            VERSION 4.0.1E             *
*                                       *
*  RUN DATE            TIME             *
*                                       *
*****************************************
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```
*    U.S. ARMY CORPS OF ENGINEERS      *
*    HYDROLOGIC ENGINEERING CENTER     *
*          609 SECOND STREET           *
*       DAVIS, CALIFORNIA 95616        *
*           (916) 551-1748             *
*                                      *
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                    Lower Centennial Wash Watershed Zone A Delineation Study
                    JLK Engineers for FCDMC Contract 2003C061
                    Phase IV 100-YR 24-HR Aug 2005
                    Sub-Basins South of I-10 Freeway
                    Green & Ampt Rainfall Loss Method, S-Graph Unit Hydrograph
                    Normal Depth Channel Routing

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

   IT        HYDROGRAPH TIME DATA
                  NMIN          5  MINUTES IN COMPUTATION INTERVAL
                 IDATE     1JAN94  STARTING DATE
                 ITIME       0000  STARTING TIME
                    NQ,      2000  NUMBER OF HYDROGRAPH ORDINATES
               NDDATE     7JAN94  ENDING DATE
               NDTIME       2235  ENDING TIME
                 ICENT         19  CENTURY MARK

            COMPUTATION INTERVAL    0.08 HOURS
                 TOTAL TIME BASE  166.58 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

10 JD        INDEX STORM NO. 1
                 STRM        4.10  PRECIPITATION DEPTH
                 TRDA        0.01  TRANSPOSITION DRAINAGE AREA

11 PI          PRECIPITATION PATTERN
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.01      0.00      0.01
                 0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.03      0.03
                 0.03      0.09      0.09      0.09      0.01      0.01      0.01      0.01      0.01      0.01
                 0.01      0.01      0.01      0.01      0.01      0.01      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00

22 JD        INDEX STORM NO. 2
                 STRM        3.89  PRECIPITATION DEPTH
                 TRDA       10.00  TRANSPOSITION DRAINAGE AREA

23 PI          PRECIPITATION PATTERN
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.01      0.00      0.01
                 0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.03      0.03
                 0.03      0.09      0.09      0.09      0.01      0.01      0.01      0.01      0.01      0.01
                 0.01      0.01      0.01      0.01      0.01      0.01      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
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                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00

34 JD        INDEX STORM NO. 3
                  STRM      3.76  PRECIPITATION DEPTH
                  TRDA     20.00  TRANSPOSITION DRAINAGE AREA

35 PI          PRECIPITATION PATTERN
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.01      0.00      0.01
                 0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.03      0.03
                 0.03      0.09      0.09      0.09      0.01      0.01      0.01      0.01      0.01      0.01
                 0.01      0.01      0.01      0.01      0.01      0.01      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00

46 JD        INDEX STORM NO. 4
                  STRM      3.64  PRECIPITATION DEPTH
                  TRDA     40.00  TRANSPOSITION DRAINAGE AREA

47 PI          PRECIPITATION PATTERN
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.01      0.00      0.01
                 0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.03      0.03
                 0.03      0.09      0.09      0.09      0.01      0.01      0.01      0.01      0.01      0.01
                 0.01      0.01      0.01      0.01      0.01      0.01      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00

58 JD        INDEX STORM NO. 5
                  STRM      3.51  PRECIPITATION DEPTH
                  TRDA     80.00  TRANSPOSITION DRAINAGE AREA

59 PI          PRECIPITATION PATTERN
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.01      0.00      0.01
                 0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.03      0.03
                 0.03      0.09      0.09      0.09      0.01      0.01      0.01      0.01      0.01      0.01
                 0.01      0.01      0.01      0.01      0.01      0.01      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                 0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
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       0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
       0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
       0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
       0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
       0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
       0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
       0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00

70 JD      INDEX STORM NO. 6
              STRM      3.45   PRECIPITATION DEPTH
              TRDA    120.00   TRANSPOSITION DRAINAGE AREA

71 PI        PRECIPITATION PATTERN
       0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
       0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
       0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
       0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
       0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
       0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
       0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
       0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
       0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
       0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
       0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
       0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
       0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.01    0.00    0.01
       0.01    0.01    0.01    0.01    0.01    0.01    0.01    0.01    0.03    0.03
       0.03    0.09    0.09    0.09    0.01    0.01    0.01    0.01    0.01    0.01
       0.01    0.01    0.01    0.01    0.01    0.01    0.00    0.00    0.00    0.00
       0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
       0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
       0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
       0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
       0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
       0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
       0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
       0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
       0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
       0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
       0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
       0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
       0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00

82 JD      INDEX STORM NO. 7
              STRM      3.36   PRECIPITATION DEPTH
              TRDA    200.00   TRANSPOSITION DRAINAGE AREA

83 PI        PRECIPITATION PATTERN
       0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
       0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
       0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
       0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
       0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
       0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
       0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
       0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
       0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
       0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
       0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
       0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
       0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.01    0.00    0.01
       0.01    0.01    0.01    0.01    0.01    0.01    0.01    0.01    0.03    0.03
       0.03    0.09    0.09    0.09    0.01    0.01    0.01    0.01    0.01    0.01
       0.01    0.01    0.01    0.01    0.01    0.01    0.00    0.00    0.00    0.00
       0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
       0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
       0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
       0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
       0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
       0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
       0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
       0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
       0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
       0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
       0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
       0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
       0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00

94 JD      INDEX STORM NO. 8
              STRM      3.31   PRECIPITATION DEPTH
              TRDA    300.00   TRANSPOSITION DRAINAGE AREA

95 PI        PRECIPITATION PATTERN
       0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
       0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
       0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
       0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
       0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
       0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
       0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
       0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
       0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
       0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
       0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
       0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
       0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.01    0.00    0.01
       0.01    0.01    0.01    0.01    0.01    0.01    0.01    0.01    0.03    0.03
       0.03    0.09    0.09    0.09    0.01    0.01    0.01    0.01    0.01    0.01
       0.01    0.01    0.01    0.01    0.01    0.01    0.00    0.00    0.00    0.00
       0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
       0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
       0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
       0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
       0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
       0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
       0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
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                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00

106 JD        INDEX STORM NO. 9
                STRM        3.21  PRECIPITATION DEPTH
                TRDA      500.00  TRANSPOSITION DRAINAGE AREA

107 PI          PRECIPITATION PATTERN
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.01      0.00      0.01
                0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.03      0.03
                0.03      0.09      0.09      0.09      0.01      0.01      0.01      0.01      0.01
                0.01      0.01      0.01      0.01      0.01      0.01      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
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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	B143	1254.	12.25	149.	42.	14.	1.07		
+	ROUTED TO	B143R	1041.	12.42	149.	42.	14.	1.07		
+	HYDROGRAPH AT	B140A	973.	12.17	68.	17.	6.	0.60		
+	2 COMBINED AT	CP140A	1356.	12.25	214.	59.	20.	1.67		
+	ROUTED TO	B140AR	1155.	12.75	214.	59.	20.	1.67		
+	HYDROGRAPH AT	B142	1463.	12.33	224.	70.	23.	0.99		
+	HYDROGRAPH AT	B141	1055.	12.25	124.	35.	12.	0.85		
+	2 COMBINED AT	CP141	2455.	12.25	345.	105.	35.	1.84		
+	ROUTED TO	B141R	2350.	12.42	345.	105.	35.	1.84		
+	HYDROGRAPH AT	B140	748.	12.25	67.	17.	6.	0.60		
+	2 COMBINED AT	CP140B	2864.	12.33	411.	121.	40.	2.44		
+	2 COMBINED AT	CP140	3035.	12.42	617.	178.	60.	4.11		
+	ROUTED TO	B140R	2972.	12.50	616.	178.	60.	4.11		
+	HYDROGRAPH AT	B138A	298.	12.25	29.	7.	2.	0.24		
+	2 COMBINED AT	CP138A	3114.	12.50	644.	185.	62.	4.35		
+	ROUTED TO	B138AR	3029.	12.67	643.	185.	62.	4.35		
+	HYDROGRAPH AT	B139	885.	12.33	155.	52.	17.	0.69		

+	ROUTED TO	B139R	707.	12.75	155.	52.	17.	0.69
+	HYDROGRAPH AT	B138	1129.	12.33	131.	34.	11.	1.11
+	2 COMBINED AT	CP138B	1322.	12.42	284.	85.	28.	1.80
+	2 COMBINED AT	CP138	4206.	12.67	920.	268.	90.	6.15
+	ROUTED TO	B138R	4171.	12.67	920.	268.	90.	6.15
+	HYDROGRAPH AT	B135A	620.	12.25	57.	14.	5.	0.48
+	2 COMBINED AT	CP135A	4314.	12.67	974.	282.	94.	6.63
+	ROUTED TO	B135AR	4267.	12.75	974.	282.	94.	6.63
+	HYDROGRAPH AT	B136	1160.	12.33	176.	55.	18.	1.00
+	HYDROGRAPH AT	B137	930.	12.17	79.	22.	7.	0.63
+	2 COMBINED AT	CP136	1973.	12.25	254.	77.	26.	1.63
+	ROUTED TO	B136R	1768.	12.42	253.	77.	26.	1.63
+	HYDROGRAPH AT	B135	462.	12.25	45.	11.	4.	0.38
+	2 COMBINED AT	CP135B	2084.	12.42	297.	87.	29.	2.01
+	2 COMBINED AT	CP135	5514.	12.58	1261.	366.	123.	8.64
+	ROUTED TO	B135R	5428.	12.75	1260.	366.	123.	8.64
+	HYDROGRAPH AT	B133A	828.	12.25	81.	22.	7.	0.62
+	2 COMBINED AT	CP133A	5570.	12.67	1337.	387.	130.	9.26
+	ROUTED TO	B133AR	5497.	12.83	1336.	387.	130.	9.26
+	HYDROGRAPH AT	B134	1368.	12.42	243.	75.	25.	1.42
+	ROUTED TO	B134R	1264.	12.58	243.	75.	25.	1.42
+	HYDROGRAPH AT	B133	927.	12.17	87.	24.	8.	0.67
+	2 COMBINED AT	CP133B	1513.	12.58	328.	98.	33.	2.09
+	2 COMBINED AT	CP133	6551.	12.75	1639.	478.	161.	11.35
+	ROUTED TO	B133R	6551.	12.75	1639.	478.	161.	11.35

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

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1****************************************
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*             MAY  1991                *
*          VERSION 4.0.1E              *
*                                      *
*  RUN DATE            TIME            *
*                                      *
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*                                      *
*    U.S. ARMY CORPS OF ENGINEERS      *
*    HYDROLOGIC ENGINEERING CENTER     *
*          609 SECOND STREET           *
*       DAVIS, CALIFORNIA 95616        *
*          (916) 551-1748              *
*                                      *
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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

HEC-1 INPUT PAGE 1

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

  1           ID  Lower Centennial Wash Watershed Zone A Delineation Study
  2           ID  JLK Engineers for FCDMC Contract 2003C061
  3           ID  Phase IV 100-YR 6-HR Aug 2005
  4           ID  Green & Ampt Rainfall Loss Method, S-Graph Unit Hydrograph
  5           ID  Normal Depth Channel Routing
              *DIAGRAM
  6           IT       5 01JAN94       0    2000
  7           IO       5
  8           IN      15 01JAN94       0
  9           JD     3.3    0.01
              * 6-hour distribution, pattern 1.0
 10           PC     0.0   0.008   0.016   0.025   0.033   0.041    0.05   0.058   0.066   0.074
 11           PC   0.087   0.099   0.118   0.138   0.216   0.377   0.834   0.911   0.931    0.95
 12           PC   0.962   0.972   0.983   0.991     1.0
 13           IN      15 01JAN94       0
 14           JD    3.28     0.5
              * 6-hour distribution, pattern 1.0
 15           PC     0.0   0.008   0.016   0.025   0.033   0.041    0.05   0.058   0.066   0.074
 16           PC   0.087   0.099   0.118   0.138   0.216   0.377   0.834   0.911   0.931    0.95
 17           PC   0.962   0.972   0.983   0.991     1.0
 18           IN      15 01JAN94       0
 19           JD   3.257     1.0
              * 6-hour distribution, pattern 1.4
 20           PC     0.0  0.0084   0.016   0.025  0.0334  0.0414  0.0504  0.0584  0.0664  0.0748
 21           PC   0.087  0.0994  0.1188   0.148  0.2304  0.4067  0.7778  0.8813  0.9186  0.9452
 22           PC  0.9572  0.9684  0.9798  0.9898     1.0
 23           IN      15 01JAN94       0
 24           JD   3.168     5.0
              * 6-hour distribution, pattern 2.3
 25           PC     0.0   0.011  0.0173  0.0267  0.0387   0.049  0.0593  0.0693  0.0797  0.0903
 26           PC   0.103  0.1173  0.1383  0.1827  0.2693   0.458   0.686  0.8233  0.8893  0.9293
 27           PC  0.9487   0.962  0.9743  0.9877     1.0
 28           IN      15 01JAN94       0
 29           JD   3.102    10.0
              * 6-hour distribution, pattern 2.7
 30           PC     0.0  0.0134  0.0189  0.0287  0.0443  0.0574  0.0694  0.0818  0.0949  0.1076
 31           PC  0.1223  0.1382  0.1604  0.2063  0.2902  0.4664  0.6764  0.8069  0.8765  0.9189
 32           PC  0.9471  0.9608  0.9735  0.9873     1.0
 33           IN      15 01JAN94       0
 34           JD   3.003    20.0
              * 6-hour distribution, pattern 3.1
 35           PC     0.0  0.0158   0.022  0.0329  0.0511  0.0663  0.0799  0.0948  0.1102  0.1246
 36           PC   0.141  0.1587  0.1828    0.23  0.3122  0.4758  0.6684  0.7929  0.8643  0.9087
 37           PC  0.9434   0.958  0.9718  0.9863     1.0
 38           IN      15 01JAN94       0
 39           JD   2.937    30.0
              * 6-hour distribution, pattern 3.4
 40           PC     0.0  0.0172  0.0256  0.0378  0.0565  0.0719  0.0868   0.103  0.1191  0.1342
 41           PC  0.1513  0.1702  0.1961  0.2439  0.3263  0.4824  0.6655  0.7875   0.858  0.9031
 42           PC   0.939  0.9544  0.9697  0.9851     1.0
 43           IN      15 01JAN94       0
 44           JD   2.871    40.0
              * 6-hour distribution, pattern 3.5
 45           PC     0.0  0.0182  0.0281  0.0413  0.0604  0.0759  0.0916  0.1088  0.1254   0.141
 46           PC  0.1586  0.1783  0.2056  0.2537  0.3362   0.487  0.6636  0.7836  0.8535  0.8991
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HEC-1 INPUT PAGE 2

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

 47           PC  0.9358  0.9519  0.9682  0.9843     1.0
 48           IN      15 01JAN94       0
 49           JD    2.64   100.0
              * 6-hour distribution, pattern 4.1
 50           PC     0.0  0.0212  0.0355  0.0515  0.0715  0.0877   0.106  0.1261  0.1443  0.1618
 51           PC  0.1812  0.2036  0.2347  0.2837   0.367   0.501  0.6559  0.7704  0.8392  0.8864
 52           PC  0.9256   0.944  0.9633  0.9817     1.0
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 53          KK    B149
             * S_Graph
 54          KO       0       0     0.0       1      22
 55          BA    3.36
 56          LG    0.34    0.34    4.25    0.42     1.0
             * S_Graph
 57          UI     0.0  269.36   303.7  883.55 1380.79 1818.38  2275.2 2486.72 2581.32 2476.87
 58          UI  2184.2 1774.16 1442.35 1173.92  956.34  777.17  622.37  509.56  417.14  324.21
 59          UI  285.49  197.16  184.38   178.3   65.56   65.56   65.56   65.56   65.56   65.56
 60          UI   65.56     0.0

 61          KK   CP149   CNAME   CP149
 62          KO       0       0     0.0       0      22
 63          RN   CP149

 64          KK    B148
             * S_Graph
 65          KO       0       0     0.0       1      22
 66          BA    2.98
 67          LG    0.34    0.35    3.55    0.62     0.0
             * S_Graph
 68          UI     0.0  293.38  528.15 1261.96 1899.68 2460.54 2752.34  2774.3 2495.07 1958.18
 69          UI  1519.8 1179.85  911.87   705.4  545.01  436.56  310.95  243.62  200.82   160.3
 70          UI    71.4    71.4    71.4    71.4    71.4    71.4

 71          KK   CP148   CNAME   CP148
 72          KO       0       0     0.0       0      22
 73          RN   CP148

 74          KK    B147
             * S_Graph
 75          KO       0       0     0.0       1      22
 76          BA    1.38
 77          LG    0.34    0.34    3.95    0.48     2.0
             * S_Graph
 78          UI     0.0  154.88  357.11  788.73 1158.53 1408.73 1475.35 1335.26 1022.59  763.46
 79          UI   573.9  426.59  315.79  246.97  169.58  127.88  106.02   64.48    37.7    37.7
 80          UI    37.7    37.7    37.7

 81          KK   CP147   CNAME   CP147
 82          KO       0       0     0.0       0      22
 83          RN   CP147
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 84          KK    B146
             * S_Graph
 85          KO       0       0     0.0       1      22
 86          BA     1.5
 87          LG    0.34    0.34    4.15    0.44     0.0
             * S_Graph
 88          UI     0.0  161.87  344.16  788.65 1161.47 1437.92 1551.27 1453.62 1163.45  876.21
 89          UI   667.1  502.42  376.82  285.86  217.32  168.59  110.81  110.81    42.8    39.4
 90          UI    39.4    39.4    39.4     0.0

 91          KK   CP146   CNAME   CP146
 92          KO       0       0     0.0       0      22
 93          RN   CP146

 94          KK    B145
             * S_Graph
 95          KO       0       0     0.0       1      22
 96          BA    1.53
 97          LG    0.33    0.34     4.4    0.38    31.0
             * S_Graph
 98          UI     0.0  204.42  643.84 1271.77 1776.57  1952.3  1737.4 1259.81  896.08  632.69
 99          UI  438.36  327.99  216.67  145.75  119.13   49.75   49.75   49.75   49.75     0.0

100          KK   CP145   CNAME   CP145
101          KO       0       0     0.0       0      22
102          RN   CP145

103          KK    B144
             * S_Graph
104          KO       0       0     0.0       1      22
105          BA    1.08
106          LG    0.34    0.34     4.3    0.41    29.0
             * S_Graph
107          UI     0.0  123.68  296.29  646.74  942.26 1136.66 1172.64 1036.75  780.34  582.65
108          UI  431.47  318.76  239.32  178.67  131.09   88.77   84.66    33.6    30.1    30.1
109          UI    30.1    30.1     0.0

110          KK   CP144   CNAME   CP144
111          KO       0       0     0.0       0      22
112          RN   CP144
113          ZZ
```

```
            SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE     (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

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

    53       B149
                V
                V
    61      CP149
             .
             .
    64       .        B148
             .           V
             .           V
    71       .       CP148
```

```
                .          .
                .          .
   74           .          .        B147
                .          .           V
                .          .           V
   81           .          .       CP147
                .          .           .
                .          .           .
   84           .          .           .       B146
                .          .           .          V
                .          .           .          V
   91           .          .           .      CP146
                .          .           .           .
                .          .           .           .
   94           .          .           .           .       B145
                .          .           .           .          V
                .          .           .           .          V
  100           .          .           .           .      CP145
                .          .           .           .           .
                .          .           .           .           .
  103           .          .           .           .           .        B144
                .          .           .           .           .           V
                .          .           .           .           .           V
  110           .          .           .           .           .       CP144
```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1****************************************                    ****************************************
*                                      *                    *                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                    *    U.S. ARMY CORPS OF ENGINEERS      *
*              MAY   1991              *                    *    HYDROLOGIC ENGINEERING CENTER     *
*            VERSION 4.0.1E            *                    *          609 SECOND STREET           *
*                                      *                    *       DAVIS, CALIFORNIA 95616        *
*  RUN DATE            TIME            *                    *          (916) 551-1748              *
*                                      *                    *                                      *
****************************************                    ****************************************
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                    Lower Centennial Wash Watershed Zone A Delineation Study
                    JLK Engineers for FCDMC Contract 2003C061
                    Phase IV 100-YR 6-HR Aug 2005
                    Green & Ampt Rainfall Loss Method, S-Graph Unit Hydrograph
                    Normal Depth Channel Routing

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

    IT        HYDROGRAPH TIME DATA
                     NMIN          5  MINUTES IN COMPUTATION INTERVAL
                    IDATE     1JAN94  STARTING DATE
                    ITIME       0000  STARTING TIME
                       NQ,      2000  NUMBER OF HYDROGRAPH ORDINATES
                   NDDATE     7JAN94  ENDING DATE
                   NDTIME       2235  ENDING TIME
                    ICENT         19  CENTURY MARK

              COMPUTATION INTERVAL    0.08 HOURS
                   TOTAL TIME BASE  166.58 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

  9 JD        INDEX STORM NO. 1
                   STRM        3.30  PRECIPITATION DEPTH
                   TRDA        0.01  TRANSPOSITION DRAINAGE AREA

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

 14 JD        INDEX STORM NO. 2
                   STRM        3.28  PRECIPITATION DEPTH
                   TRDA        0.50  TRANSPOSITION DRAINAGE AREA

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

 19 JD        INDEX STORM NO. 3
                   STRM        3.26  PRECIPITATION DEPTH
                   TRDA        1.00  TRANSPOSITION DRAINAGE AREA

 20 PI          PRECIPITATION PATTERN
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
```

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                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.01      0.01      0.01      0.01      0.01      0.01      0.03
                0.03      0.03      0.06      0.06      0.06      0.12      0.12      0.12      0.03      0.03
                0.03      0.01      0.01      0.01      0.01      0.01      0.01      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00

24 JD         INDEX STORM NO. 4
                STRM        3.17  PRECIPITATION DEPTH
                TRDA        5.00  TRANSPOSITION DRAINAGE AREA

25 PI           PRECIPITATION PATTERN
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.01      0.01      0.01      0.01      0.01      0.01      0.03
                0.03      0.03      0.06      0.06      0.06      0.08      0.08      0.08      0.05      0.05
                0.05      0.02      0.02      0.02      0.01      0.01      0.01      0.01      0.01      0.01
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00

29 JD         INDEX STORM NO. 5
                STRM        3.10  PRECIPITATION DEPTH
                TRDA       10.00  TRANSPOSITION DRAINAGE AREA

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

34 JD         INDEX STORM NO. 6
                STRM        3.00  PRECIPITATION DEPTH
                TRDA       20.00  TRANSPOSITION DRAINAGE AREA

35 PI           PRECIPITATION PATTERN
                0.01      0.01      0.01      0.00      0.00      0.00      0.00      0.00      0.00      0.01
                0.01      0.01      0.01      0.01      0.01      0.00      0.00      0.00      0.00      0.00
                0.00      0.01      0.01      0.01      0.00      0.00      0.00      0.01      0.01      0.01
                0.01      0.01      0.01      0.01      0.01      0.01      0.02      0.02      0.02      0.03
                0.03      0.03      0.05      0.05      0.05      0.06      0.06      0.06      0.04      0.04
                0.04      0.02      0.02      0.02      0.01      0.01      0.01      0.01      0.01      0.01
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00

39 JD         INDEX STORM NO. 7
                STRM        2.94  PRECIPITATION DEPTH
                TRDA       30.00  TRANSPOSITION DRAINAGE AREA

40 PI           PRECIPITATION PATTERN
                0.01      0.01      0.01      0.00      0.00      0.00      0.00      0.00      0.00      0.01
                0.01      0.01      0.01      0.01      0.01      0.00      0.00      0.00      0.01      0.01
                0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01
                0.01      0.01      0.01      0.01      0.01      0.01      0.02      0.02      0.02      0.03
                0.03      0.03      0.05      0.05      0.05      0.06      0.06      0.06      0.04      0.04
                0.04      0.02      0.02      0.02      0.02      0.02      0.02      0.01      0.01      0.01
                0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.00
                0.00      0.00

44 JD         INDEX STORM NO. 8
                STRM        2.87  PRECIPITATION DEPTH
                TRDA       40.00  TRANSPOSITION DRAINAGE AREA

45 PI           PRECIPITATION PATTERN
                0.01      0.01      0.01      0.00      0.00      0.00      0.00      0.00      0.00      0.01
                0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01
                0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01
                0.01      0.01      0.01      0.01      0.01      0.01      0.02      0.02      0.02      0.03
                0.03      0.03      0.05      0.05      0.05      0.06      0.06      0.06      0.04      0.04
                0.04      0.02      0.02      0.02      0.02      0.02      0.02      0.01      0.01      0.01
                0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01
                0.01      0.01

49 JD         INDEX STORM NO. 9
                STRM        2.64  PRECIPITATION DEPTH
                TRDA      100.00  TRANSPOSITION DRAINAGE AREA

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

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

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

                                    PEAK   TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN    MAXIMUM    TIME OF
        OPERATION        STATION    FLOW    PEAK                                           AREA     STAGE    MAX STAGE
+                                                        6-HOUR     24-HOUR     72-HOUR
        HYDROGRAPH AT
+                        B149       2269.   4.58         373.        93.         31.       3.36
```

+	ROUTED TO	CP149	2269.	4.58	373.	93.	31.	3.36
+	HYDROGRAPH AT	B148	1917.	4.50	260.	65.	22.	2.98
+	ROUTED TO	CP148	1917.	4.50	260.	65.	22.	2.98
+	HYDROGRAPH AT	B147	1418.	4.42	173.	43.	14.	1.38
+	ROUTED TO	CP147	1418.	4.42	173.	43.	14.	1.38
+	HYDROGRAPH AT	B146	1494.	4.42	185.	46.	15.	1.50
+	ROUTED TO	CP146	1494.	4.42	185.	46.	15.	1.50
+	HYDROGRAPH AT	B145	2164.	4.33	302.	76.	25.	1.53
+	ROUTED TO	CP145	2164.	4.33	302.	76.	25.	1.53
+	HYDROGRAPH AT	B144	1441.	4.42	211.	53.	18.	1.08
+	ROUTED TO	CP144	1441.	4.42	211.	53.	18.	1.08

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

```
1****************************************
 *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
 *              MAY   1991              *
 *           VERSION 4.0.1E             *
 *                                      *
 *  RUN DATE            TIME            *
 *                                      *
 ****************************************
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```
****************************************
*                                      *
*    U.S. ARMY CORPS OF ENGINEERS      *
*    HYDROLOGIC ENGINEERING CENTER     *
*          609 SECOND STREET           *
*       DAVIS, CALIFORNIA 95616        *
*          (916) 551-1748              *
*                                      *
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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

HEC-1 INPUT PAGE 1

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

  1           ID  Lower Centennial Wash Watershed Zone A Delineation Study
  2           ID  JLK Engineers for FCDMC Contract 2003C061
  3           ID  Phase IV 100-YR 24-HR Aug 2005
  4           ID  Sub Basins north of I-10 Freeway
  5           ID  Green & Ampt Rainfall Loss Method, S-Graph Unit Hydrograph
  6           ID  Normal Depth Channel Routing
              *DIAGRAM
  7           IT       5 01JAN94       0    2000
  8           IO       5
  9           IN      15 01JAN94       0
 10           JD     4.1    0.01
              * 24-hour distribution
 11           PC     0.0   0.002   0.005   0.008   0.011   0.014   0.017    0.02   0.023   0.026
 12           PC   0.029   0.032   0.035   0.038   0.041   0.044   0.048   0.052   0.056    0.06
 13           PC   0.064   0.068   0.072   0.076    0.08   0.085    0.09   0.095     0.1   0.105
 14           PC    0.11   0.115    0.12   0.126   0.133    0.14   0.147   0.155   0.163   0.172
 15           PC   0.181   0.191   0.203   0.218   0.236   0.257   0.283   0.387   0.663   0.707
 16           PC   0.735   0.758   0.776   0.791   0.804   0.815   0.825   0.834   0.842   0.849
 17           PC   0.856   0.863   0.869   0.875   0.881   0.887   0.893   0.898   0.903   0.908
 18           PC   0.913   0.918   0.922   0.926    0.93   0.934   0.938   0.942   0.946    0.95
 19           PC   0.953   0.956   0.959   0.962   0.965   0.968   0.971   0.974   0.977    0.98
 20           PC   0.983   0.986   0.989   0.992   0.995   0.998     1.0
 21           IN      15 01JAN94       0
 22           JD   3.895    10.0
              * 24-hour distribution
 23           PC     0.0   0.002   0.005   0.008   0.011   0.014   0.017    0.02   0.023   0.026
 24           PC   0.029   0.032   0.035   0.038   0.041   0.044   0.048   0.052   0.056    0.06
 25           PC   0.064   0.068   0.072   0.076    0.08   0.085    0.09   0.095     0.1   0.105
 26           PC    0.11   0.115    0.12   0.126   0.133    0.14   0.147   0.155   0.163   0.172
 27           PC   0.181   0.191   0.203   0.218   0.236   0.257   0.283   0.387   0.663   0.707
 28           PC   0.735   0.758   0.776   0.791   0.804   0.815   0.825   0.834   0.842   0.849
 29           PC   0.856   0.863   0.869   0.875   0.881   0.887   0.893   0.898   0.903   0.908
 30           PC   0.913   0.918   0.922   0.926    0.93   0.934   0.938   0.942   0.946    0.95
 31           PC   0.953   0.956   0.959   0.962   0.965   0.968   0.971   0.974   0.977    0.98
 32           PC   0.983   0.986   0.989   0.992   0.995   0.998     1.0
 33           IN      15 01JAN94       0
 34           JD   3.764    20.0
              * 24-hour distribution
 35           PC     0.0   0.002   0.005   0.008   0.011   0.014   0.017    0.02   0.023   0.026
 36           PC   0.029   0.032   0.035   0.038   0.041   0.044   0.048   0.052   0.056    0.06
 37           PC   0.064   0.068   0.072   0.076    0.08   0.085    0.09   0.095     0.1   0.105
 38           PC    0.11   0.115    0.12   0.126   0.133    0.14   0.147   0.155   0.163   0.172
 39           PC   0.181   0.191   0.203   0.218   0.236   0.257   0.283   0.387   0.663   0.707
 40           PC   0.735   0.758   0.776   0.791   0.804   0.815   0.825   0.834   0.842   0.849
 41           PC   0.856   0.863   0.869   0.875   0.881   0.887   0.893   0.898   0.903   0.908
 42           PC   0.913   0.918   0.922   0.926    0.93   0.934   0.938   0.942   0.946    0.95
 43           PC   0.953   0.956   0.959   0.962   0.965   0.968   0.971   0.974   0.977    0.98
 44           PC   0.983   0.986   0.989   0.992   0.995   0.998     1.0
 45           IN      15 01JAN94       0
 46           JD   3.637    40.0
              * 24-hour distribution
 47           PC     0.0   0.002   0.005   0.008   0.011   0.014   0.017    0.02   0.023   0.026
 48           PC   0.029   0.032   0.035   0.038   0.041   0.044   0.048   0.052   0.056    0.06
 49           PC   0.064   0.068   0.072   0.076    0.08   0.085    0.09   0.095     0.1   0.105
 50           PC    0.11   0.115    0.12   0.126   0.133    0.14   0.147   0.155   0.163   0.172
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HEC-1 INPUT PAGE 2

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

 51           PC   0.181   0.191   0.203   0.218   0.236   0.257   0.283   0.387   0.663   0.707
 52           PC   0.735   0.758   0.776   0.791   0.804   0.815   0.825   0.834   0.842   0.849
 53           PC   0.856   0.863   0.869   0.875   0.881   0.887   0.893   0.898   0.903   0.908
 54           PC   0.913   0.918   0.922   0.926    0.93   0.934   0.938   0.942   0.946    0.95
 55           PC   0.953   0.956   0.959   0.962   0.965   0.968   0.971   0.974   0.977    0.98
 56           PC   0.983   0.986   0.989   0.992   0.995   0.998     1.0
 57           IN      15 01JAN94       0
 58           JD   3.514    80.0
```

```
                * 24-hour distribution
 59             PC     0.0   0.002   0.005   0.008   0.011   0.014   0.017    0.02   0.023   0.026
 60             PC   0.029   0.032   0.035   0.038   0.041   0.044   0.048   0.052   0.056    0.06
 61             PC   0.064   0.068   0.072   0.076    0.08   0.085    0.09   0.095     0.1   0.105
 62             PC    0.11   0.115    0.12   0.126   0.133    0.14   0.147   0.155   0.163   0.172
 63             PC   0.181   0.191   0.203   0.218   0.236   0.257   0.283   0.387   0.663   0.707
 64             PC   0.735   0.758   0.776   0.791   0.804   0.815   0.825   0.834   0.842   0.849
 65             PC   0.856   0.863   0.869   0.875   0.881   0.887   0.893   0.898   0.903   0.908
 66             PC   0.913   0.918   0.922   0.926    0.93   0.934   0.938   0.942   0.946    0.95
 67             PC   0.953   0.956   0.959   0.962   0.965   0.968   0.971   0.974   0.977    0.98
 68             PC   0.983   0.986   0.989   0.992   0.995   0.998     1.0
 69             IN      15 01JAN94       0
 70             JD   3.448   120.0
                * 24-hour distribution
 71             PC     0.0   0.002   0.005   0.008   0.011   0.014   0.017    0.02   0.023   0.026
 72             PC   0.029   0.032   0.035   0.038   0.041   0.044   0.048   0.052   0.056    0.06
 73             PC   0.064   0.068   0.072   0.076    0.08   0.085    0.09   0.095     0.1   0.105
 74             PC    0.11   0.115    0.12   0.126   0.133    0.14   0.147   0.155   0.163   0.172
 75             PC   0.181   0.191   0.203   0.218   0.236   0.257   0.283   0.387   0.663   0.707
 76             PC   0.735   0.758   0.776   0.791   0.804   0.815   0.825   0.834   0.842   0.849
 77             PC   0.856   0.863   0.869   0.875   0.881   0.887   0.893   0.898   0.903   0.908
 78             PC   0.913   0.918   0.922   0.926    0.93   0.934   0.938   0.942   0.946    0.95
 79             PC   0.953   0.956   0.959   0.962   0.965   0.968   0.971   0.974   0.977    0.98
 80             PC   0.983   0.986   0.989   0.992   0.995   0.998     1.0
 81             IN      15 01JAN94       0
 82             JD   3.362   200.0
                * 24-hour distribution
 83             PC     0.0   0.002   0.005   0.008   0.011   0.014   0.017    0.02   0.023   0.026
 84             PC   0.029   0.032   0.035   0.038   0.041   0.044   0.048   0.052   0.056    0.06
 85             PC   0.064   0.068   0.072   0.076    0.08   0.085    0.09   0.095     0.1   0.105
 86             PC    0.11   0.115    0.12   0.126   0.133    0.14   0.147   0.155   0.163   0.172
 87             PC   0.181   0.191   0.203   0.218   0.236   0.257   0.283   0.387   0.663   0.707
 88             PC   0.735   0.758   0.776   0.791   0.804   0.815   0.825   0.834   0.842   0.849
 89             PC   0.856   0.863   0.869   0.875   0.881   0.887   0.893   0.898   0.903   0.908
 90             PC   0.913   0.918   0.922   0.926    0.93   0.934   0.938   0.942   0.946    0.95
 91             PC   0.953   0.956   0.959   0.962   0.965   0.968   0.971   0.974   0.977    0.98
 92             PC   0.983   0.986   0.989   0.992   0.995   0.998     1.0
 93             IN      15 01JAN94       0
 94             JD   3.305   300.0
                * 24-hour distribution
 95             PC     0.0   0.002   0.005   0.008   0.011   0.014   0.017    0.02   0.023   0.026
 96             PC   0.029   0.032   0.035   0.038   0.041   0.044   0.048   0.052   0.056    0.06
 97             PC   0.064   0.068   0.072   0.076    0.08   0.085    0.09   0.095     0.1   0.105
 98             PC    0.11   0.115    0.12   0.126   0.133    0.14   0.147   0.155   0.163   0.172
 99             PC   0.181   0.191   0.203   0.218   0.236   0.257   0.283   0.387   0.663   0.707
100             PC   0.735   0.758   0.776   0.791   0.804   0.815   0.825   0.834   0.842   0.849
101             PC   0.856   0.863   0.869   0.875   0.881   0.887   0.893   0.898   0.903   0.908
```



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

102             PC   0.913   0.918   0.922   0.926    0.93   0.934   0.938   0.942   0.946    0.95
103             PC   0.953   0.956   0.959   0.962   0.965   0.968   0.971   0.974   0.977    0.98
104             PC   0.983   0.986   0.989   0.992   0.995   0.998     1.0
105             IN      15 01JAN94       0
106             JD    3.21   500.0
                * 24-hour distribution
107             PC     0.0   0.002   0.005   0.008   0.011   0.014   0.017    0.02   0.023   0.026
108             PC   0.029   0.032   0.035   0.038   0.041   0.044   0.048   0.052   0.056    0.06
109             PC   0.064   0.068   0.072   0.076    0.08   0.085    0.09   0.095     0.1   0.105
110             PC    0.11   0.115    0.12   0.126   0.133    0.14   0.147   0.155   0.163   0.172
111             PC   0.181   0.191   0.203   0.218   0.236   0.257   0.283   0.387   0.663   0.707
112             PC   0.735   0.758   0.776   0.791   0.804   0.815   0.825   0.834   0.842   0.849
113             PC   0.856   0.863   0.869   0.875   0.881   0.887   0.893   0.898   0.903   0.908
114             PC   0.913   0.918   0.922   0.926    0.93   0.934   0.938   0.942   0.946    0.95
115             PC   0.953   0.956   0.959   0.962   0.965   0.968   0.971   0.974   0.977    0.98
116             PC   0.983   0.986   0.989   0.992   0.995   0.998     1.0

117             KK    B149
                * S_Graph
118             KO       0       0     0.0       1      22
119             BA    3.36
120             LG    0.34    0.34    4.25    0.42     1.0
                * S_Graph
121             UI     0.0  269.36   303.7  883.55 1380.79 1818.38  2275.2 2486.72 2581.32 2476.87
122             UI  2184.2 1774.16 1442.35 1173.92  956.34  777.17  622.37  509.56  417.14  324.21
123             UI  285.49  197.16  184.38   178.3   65.56   65.56   65.56   65.56   65.56   65.56
124             UI   65.56     0.0

125             KK   CP149   CNAME   CP149
126             KO       0       0     0.0       0      22
127             RN   CP149

128             KK    B148
                * S_Graph
129             KO       0       0     0.0       1      22
130             BA    2.98
131             LG    0.34    0.35    3.55    0.62     0.0
                * S_Graph
132             UI     0.0  293.38  528.15 1261.96 1899.68 2460.54 2752.34  2774.3 2495.07 1958.18
133             UI  1519.8 1179.85  911.87   705.4  545.01  436.56  310.95  243.62  200.82   160.3
134             UI    71.4    71.4    71.4    71.4    71.4    71.4

135             KK   CP148   CNAME   CP148
136             KO       0       0     0.0       0      22
137             RN   CP148

138             KK    B147
                * S_Graph
139             KO       0       0     0.0       1      22
140             BA    1.38
141             LG    0.34    0.34    3.95    0.48     2.0
                * S_Graph
142             UI     0.0  154.88  357.11  788.73 1158.53 1408.73 1475.35 1335.26 1022.59  763.46
143             UI   573.9  426.59  315.79  246.97  169.58  127.88  106.02   64.48    37.7    37.7
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 144          UI    37.7    37.7    37.7
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 145          KK   CP147   CNAME   CP147
 146          KO       0       0     0.0       0      22
 147          RN   CP147

 148          KK    B146
              * S_Graph
 149          KO       0       0     0.0       1      22
 150          BA     1.5
 151          LG    0.34    0.34    4.15    0.44     0.0
              * S_Graph
 152          UI     0.0  161.87  344.16  788.65 1161.47 1437.92 1551.27 1453.62 1163.45  876.21
 153          UI   667.1  502.42  376.82  285.86  217.32  168.59  110.81  110.81    42.8    39.4
 154          UI    39.4    39.4    39.4     0.0

 155          KK   CP146   CNAME   CP146
 156          KO       0       0     0.0       0      22
 157          RN   CP146

 158          KK    B145
              * S_Graph
 159          KO       0       0     0.0       1      22
 160          BA    1.53
 161          LG    0.33    0.34     4.4    0.38    31.0
              * S_Graph
 162          UI     0.0  204.42  643.84 1271.77 1776.57  1952.3  1737.4 1259.81  896.08  632.69
 163          UI  438.36  327.99  216.67  145.75  119.13   49.75   49.75   49.75   49.75     0.0

 164          KK   CP145   CNAME   CP145
 165          KO       0       0     0.0       0      22
 166          RN   CP145

 167          KK    B144
              * S_Graph
 168          KO       0       0     0.0       1      22
 169          BA    1.08
 170          LG    0.34    0.34     4.3    0.41    29.0
              * S_Graph
 171          UI     0.0  123.68  296.29  646.74  942.26 1136.66 1172.64 1036.75  780.34  582.65
 172          UI  431.47  318.76  239.32  178.67  131.09   88.77   84.66    33.6    30.1    30.1
 173          UI    30.1    30.1     0.0

 174          KK   CP144   CNAME   CP144
 175          KO       0       0     0.0       0      22
 176          RN   CP144
 177          ZZ
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                SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

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

   117        B149
                V
                V
   125       CP149
                .
                .
   128          .        B148
                .           V
                .           V
   135          .       CP148
                .           .
                .           .
   138          .           .        B147
                .           .           V
                .           .           V
   145          .           .       CP147
                .           .           .
                .           .           .
   148          .           .           .        B146
                .           .           .           V
                .           .           .           V
   155          .           .           .       CP146
                .           .           .           .
                .           .           .           .
   158          .           .           .           .        B145
                .           .           .           .           V
                .           .           .           .           V
   164          .           .           .           .       CP145
                .           .           .           .           .
                .           .           .           .           .
   167          .           .           .           .           .        B144
                .           .           .           .           .           V
                .           .           .           .           .           V
   174          .           .           .           .           .       CP144

 (***) RUNOFF ALSO COMPUTED AT THIS LOCATION
1*****************************************
 *                                       *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
 *             MAY   1991                *
 *           VERSION 4.0.1E              *
 *                                       *
 *  RUN DATE            TIME             *
 *                                       *
 *****************************************

 *****************************************
 *                                       *
 *    U.S. ARMY CORPS OF ENGINEERS       *
 *    HYDROLOGIC ENGINEERING CENTER      *
 *          609 SECOND STREET            *
 *       DAVIS, CALIFORNIA 95616         *
 *          (916) 551-1748               *
 *                                       *
 *****************************************
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                    Lower Centennial Wash Watershed Zone A Delineation Study
                    JLK Engineers for FCDMC Contract 2003C061
                    Phase IV 100-YR 24-HR Aug 2005
                    Sub Basins north of I-10 Freeway
                    Green & Ampt Rainfall Loss Method, S-Graph Unit Hydrograph
                    Normal Depth Channel Routing

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

   IT          HYDROGRAPH TIME DATA
                      NMIN           5  MINUTES IN COMPUTATION INTERVAL
                     IDATE      1JAN94  STARTING DATE
                     ITIME        0000  STARTING TIME
                        NQ,       2000  NUMBER OF HYDROGRAPH ORDINATES
                    NDDATE      7JAN94  ENDING DATE
                    NDTIME        2235  ENDING TIME
                     ICENT          19  CENTURY MARK

               COMPUTATION INTERVAL    0.08 HOURS
                    TOTAL TIME BASE  166.58 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

10 JD          INDEX STORM NO. 1
                      STRM        4.10  PRECIPITATION DEPTH
                      TRDA        0.01  TRANSPOSITION DRAINAGE AREA

11 PI            PRECIPITATION PATTERN
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.01      0.00      0.01
                   0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.03      0.03
                   0.03      0.09      0.09      0.09      0.01      0.01      0.01      0.01      0.01      0.01
                   0.01      0.01      0.01      0.01      0.01      0.01      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00

22 JD          INDEX STORM NO. 2
                      STRM        3.89  PRECIPITATION DEPTH
                      TRDA       10.00  TRANSPOSITION DRAINAGE AREA

23 PI            PRECIPITATION PATTERN
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.01      0.00      0.01
                   0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.03      0.03
                   0.03      0.09      0.09      0.09      0.01      0.01      0.01      0.01      0.01      0.01
                   0.01      0.01      0.01      0.01      0.01      0.01      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
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34 JD INDEX STORM NO. 3

STRM	3.76	PRECIPITATION DEPTH
TRDA	20.00	TRANSPOSITION DRAINAGE AREA

35 PI PRECIPITATION PATTERN

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01
0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.03	0.03
0.03	0.09	0.09	0.09	0.01	0.01	0.01	0.01	0.01	0.01
0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		

46 JD INDEX STORM NO. 4

STRM	3.64	PRECIPITATION DEPTH
TRDA	40.00	TRANSPOSITION DRAINAGE AREA

47 PI PRECIPITATION PATTERN

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01
0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.03	0.03
0.03	0.09	0.09	0.09	0.01	0.01	0.01	0.01	0.01	0.01
0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		

58 JD INDEX STORM NO. 5

STRM	3.51	PRECIPITATION DEPTH
TRDA	80.00	TRANSPOSITION DRAINAGE AREA

59 PI PRECIPITATION PATTERN

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01
0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.03	0.03
0.03	0.09	0.09	0.09	0.01	0.01	0.01	0.01	0.01	0.01
0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		

70 JD INDEX STORM NO. 6

STRM 3.45 PRECIPITATION DEPTH
TRDA 120.00 TRANSPOSITION DRAINAGE AREA

71 PI PRECIPITATION PATTERN

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01
0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.03	0.03
0.03	0.09	0.09	0.09	0.01	0.01	0.01	0.01	0.01	0.01
0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		

82 JD INDEX STORM NO. 7
STRM 3.36 PRECIPITATION DEPTH
TRDA 200.00 TRANSPOSITION DRAINAGE AREA

83 PI PRECIPITATION PATTERN

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01
0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.03	0.03
0.03	0.09	0.09	0.09	0.01	0.01	0.01	0.01	0.01	0.01
0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		

94 JD INDEX STORM NO. 8
STRM 3.31 PRECIPITATION DEPTH
TRDA 300.00 TRANSPOSITION DRAINAGE AREA

95 PI PRECIPITATION PATTERN

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01
0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.03	0.03
0.03	0.09	0.09	0.09	0.01	0.01	0.01	0.01	0.01	0.01
0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		

106 JD INDEX STORM NO. 9
STRM 3.21 PRECIPITATION DEPTH

TRDA 500.00 TRANSPOSITION DRAINAGE AREA

107 PI PRECIPITATION PATTERN

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01
0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.03	0.03
0.03	0.09	0.09	0.09	0.01	0.01	0.01	0.01	0.01	0.01
0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		

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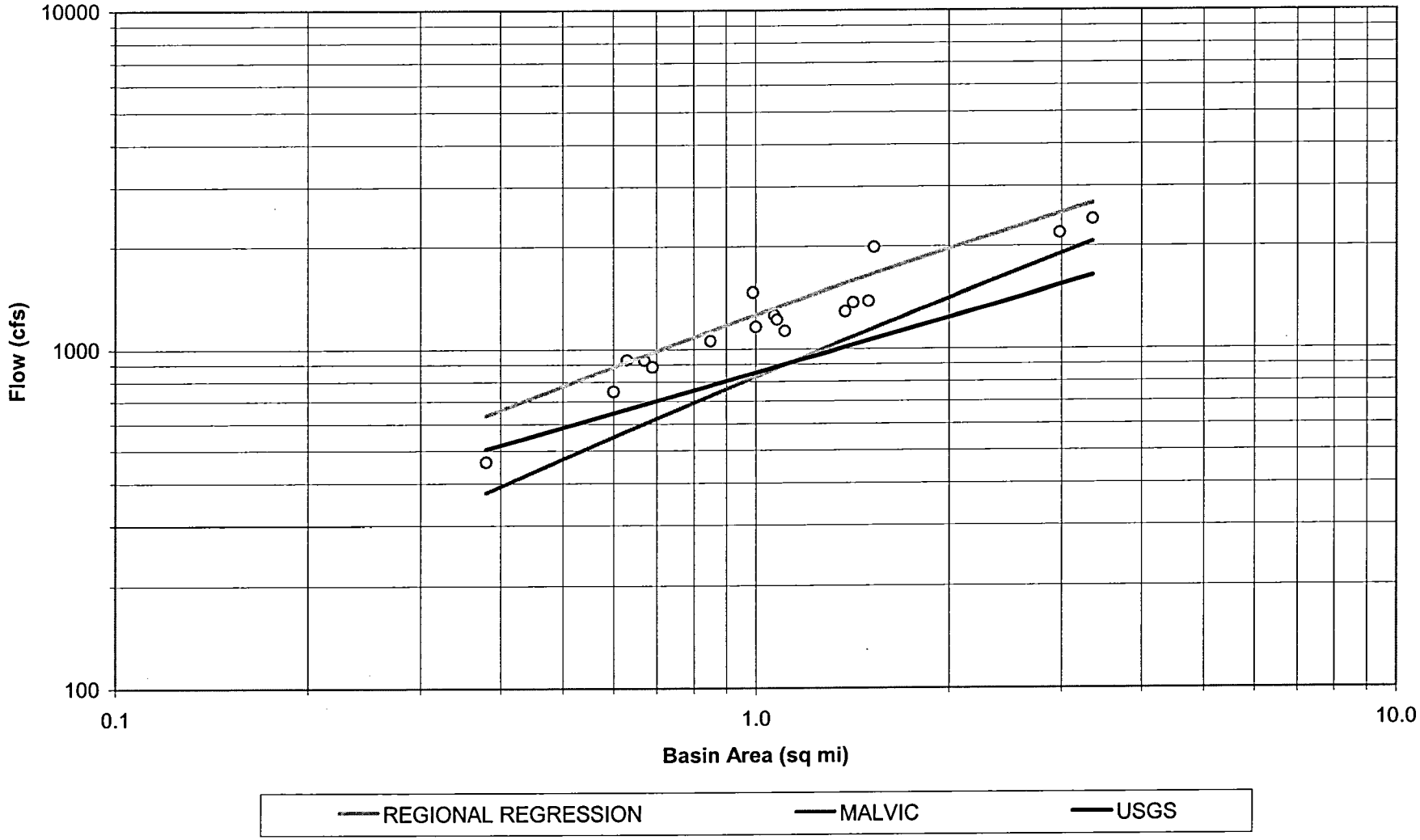
RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+	HYDROGRAPH AT	B149	2398.	12.58	361.	91.	30.	3.36		
+	ROUTED TO	CP149	2398.	12.58	361.	91.	30.	3.36		
+	HYDROGRAPH AT	B148	2183.	12.42	266.	66.	22.	2.98		
+	ROUTED TO	CP148	2183.	12.42	266.	66.	22.	2.98		
+	HYDROGRAPH AT	B147	1287.	12.42	147.	38.	13.	1.38		
+	ROUTED TO	CP147	1287.	12.42	147.	38.	13.	1.38		
+	HYDROGRAPH AT	B146	1378.	12.42	158.	39.	13.	1.50		
+	ROUTED TO	CP146	1378.	12.42	158.	39.	13.	1.50		
+	HYDROGRAPH AT	B145	1987.	12.33	259.	79.	26.	1.53		
+	ROUTED TO	CP145	1987.	12.33	259.	79.	26.	1.53		
+	HYDROGRAPH AT	B144	1219.	12.33	177.	54.	18.	1.08		
+	ROUTED TO	CP144	1219.	12.33	177.	54.	18.	1.08		

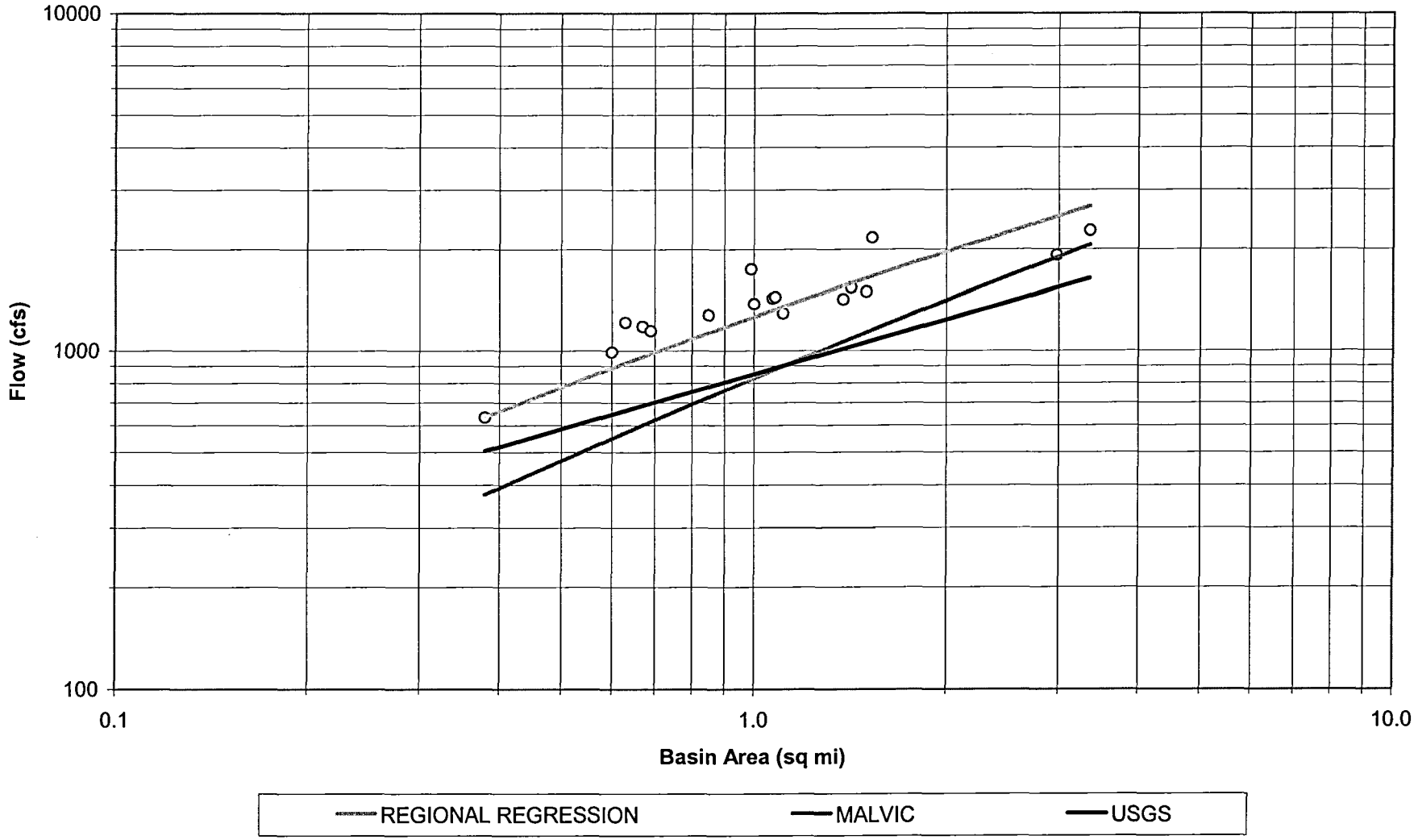
*** NORMAL END OF HEC-1 ***

SINGLE BASIN COMPARISON

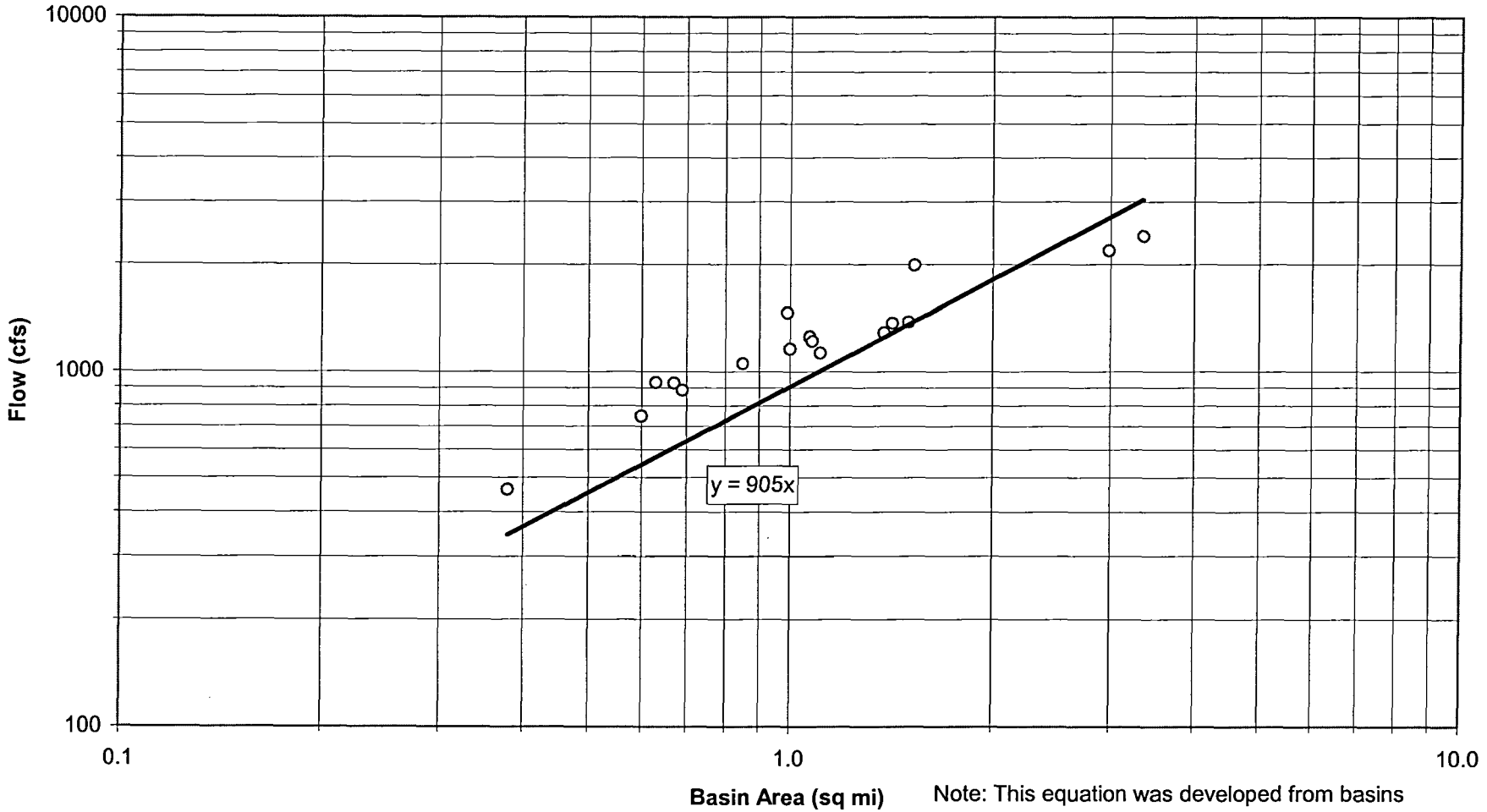
Lower Centennial Wash Watershed Phase IV
HEC-1 Single Basin Comparison
24-hr Storm



Lower Centennial Wash Watershed Phase IV
HEC-1 Single Basin Comparison
6-hr Storm

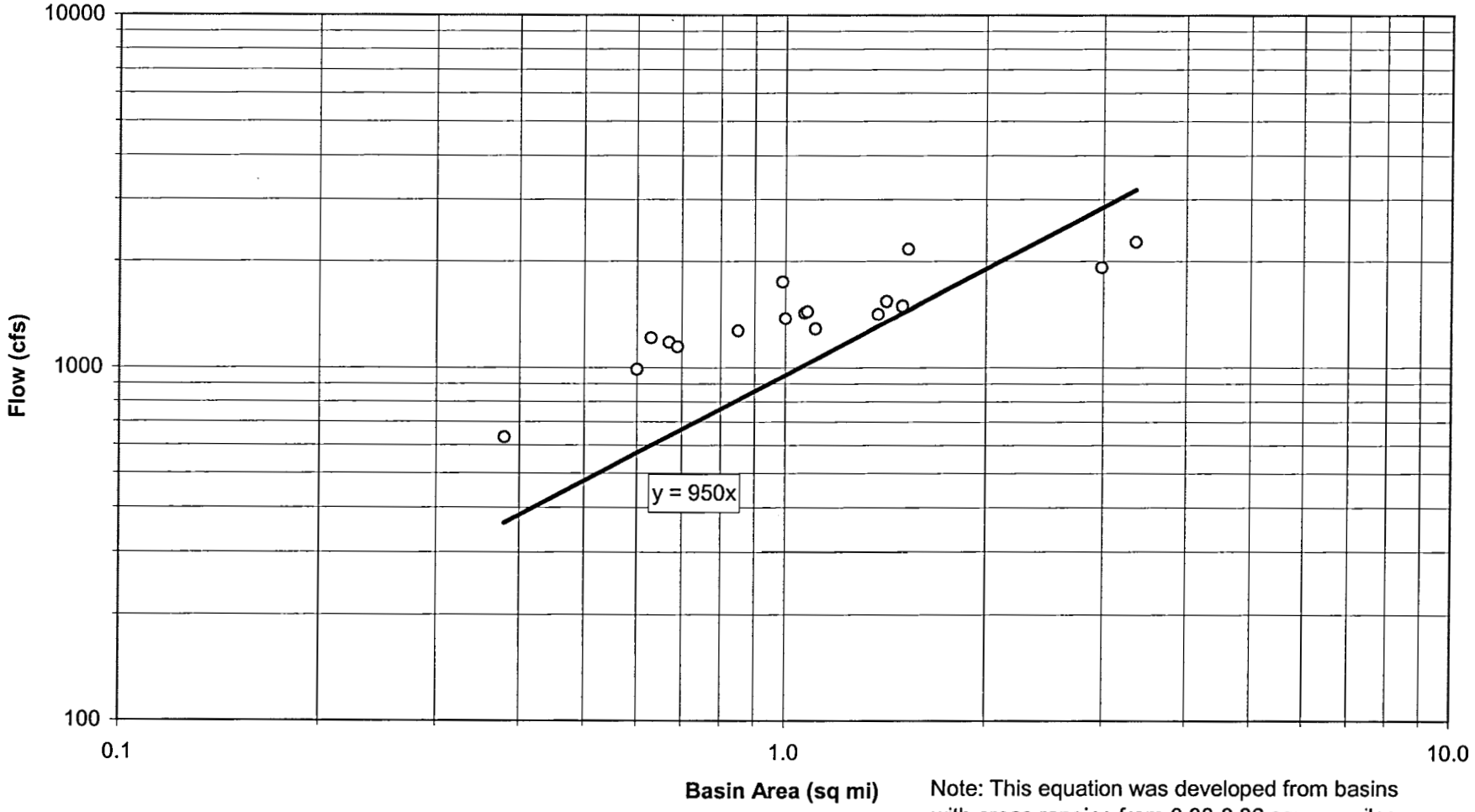


Lower Centennial Wash Watershed Phase IV
HEC-1 Single Basin Flow Equations
24-hr Storm



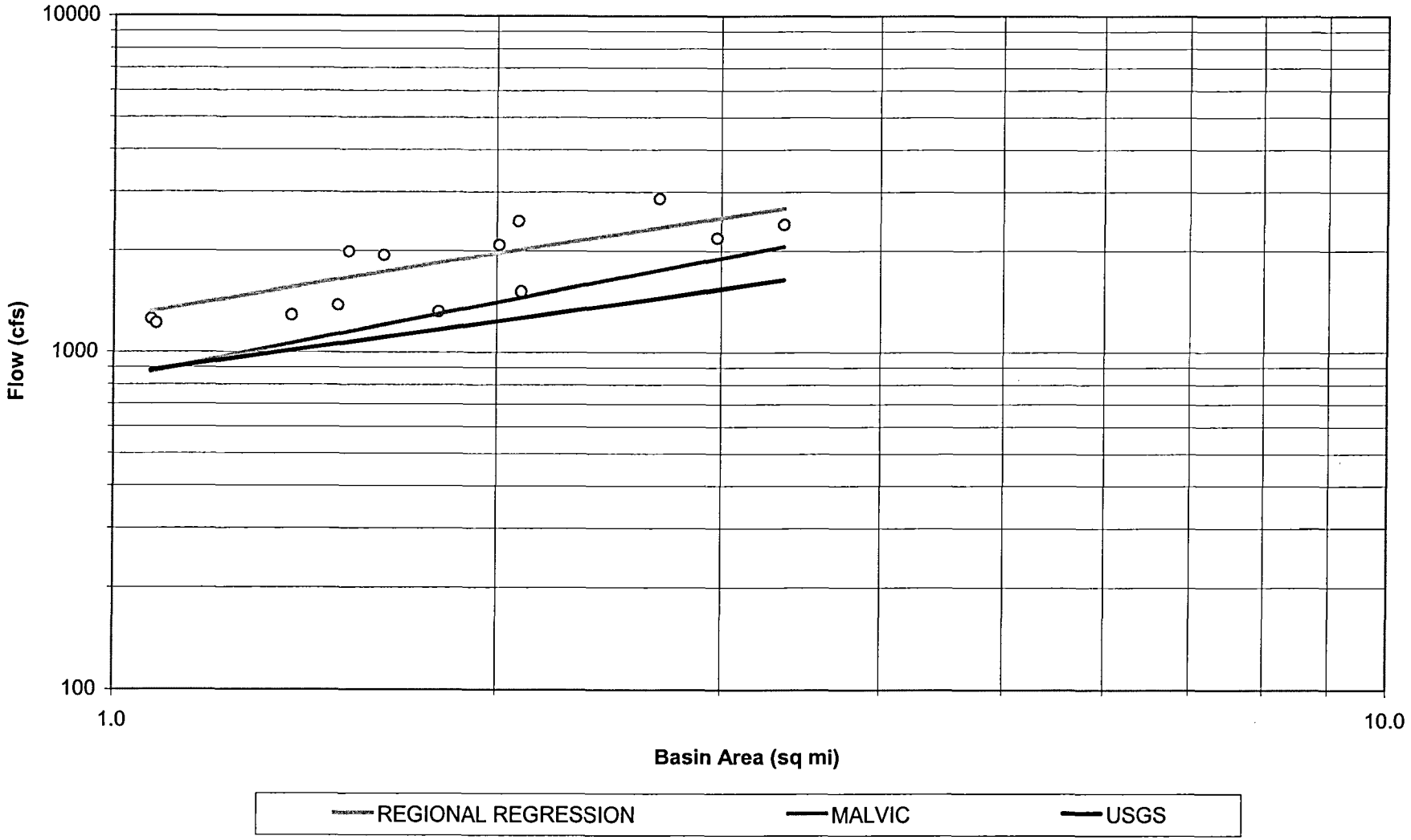
Note: This equation was developed from basins with areas ranging from 0.38-3.36 square miles

Lower Centennial Wash Watershed Phase IV
HEC-1 Single Basin Flow Equations
6-hr Storm

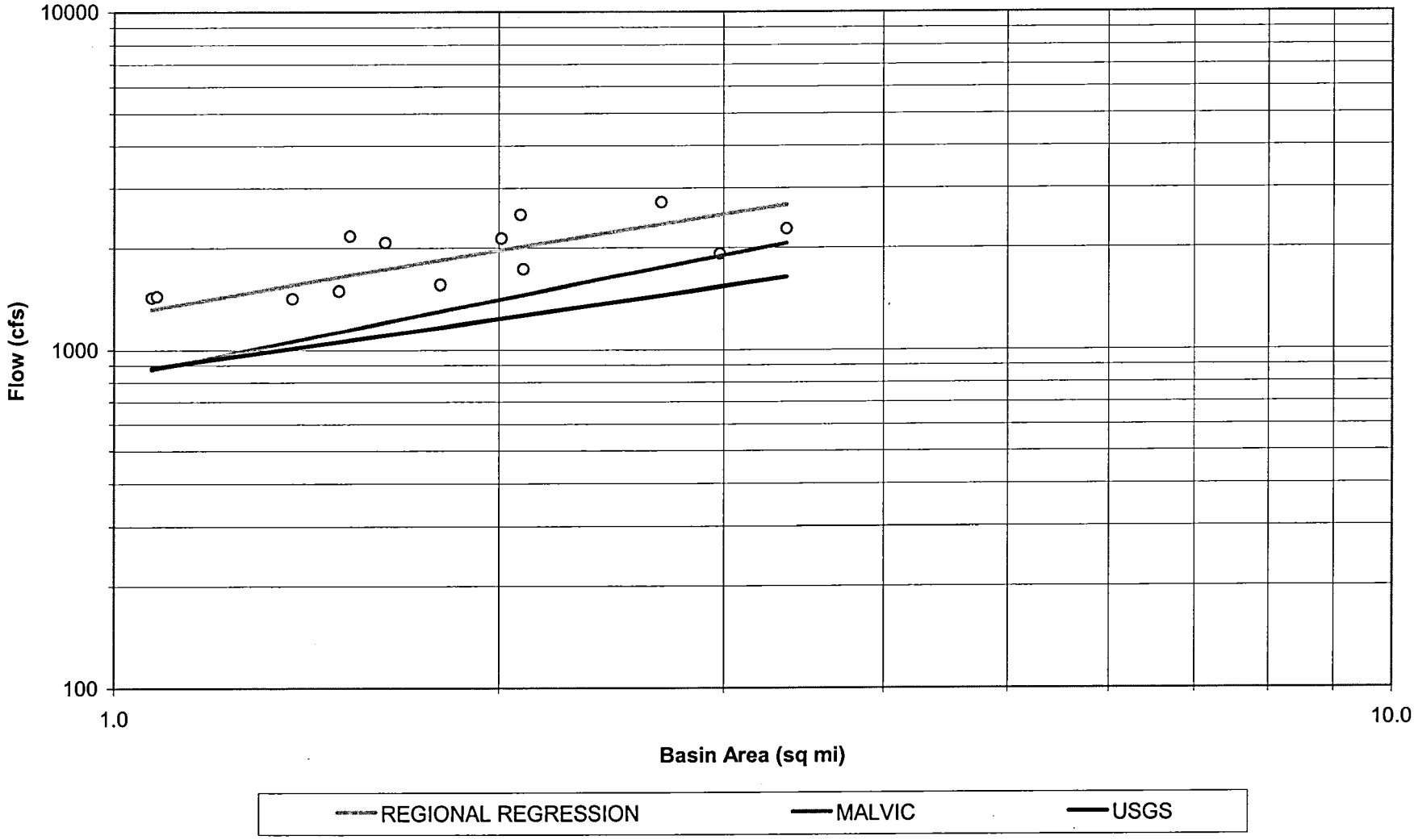


Note: This equation was developed from basins with areas ranging from 0.38-3.36 square miles

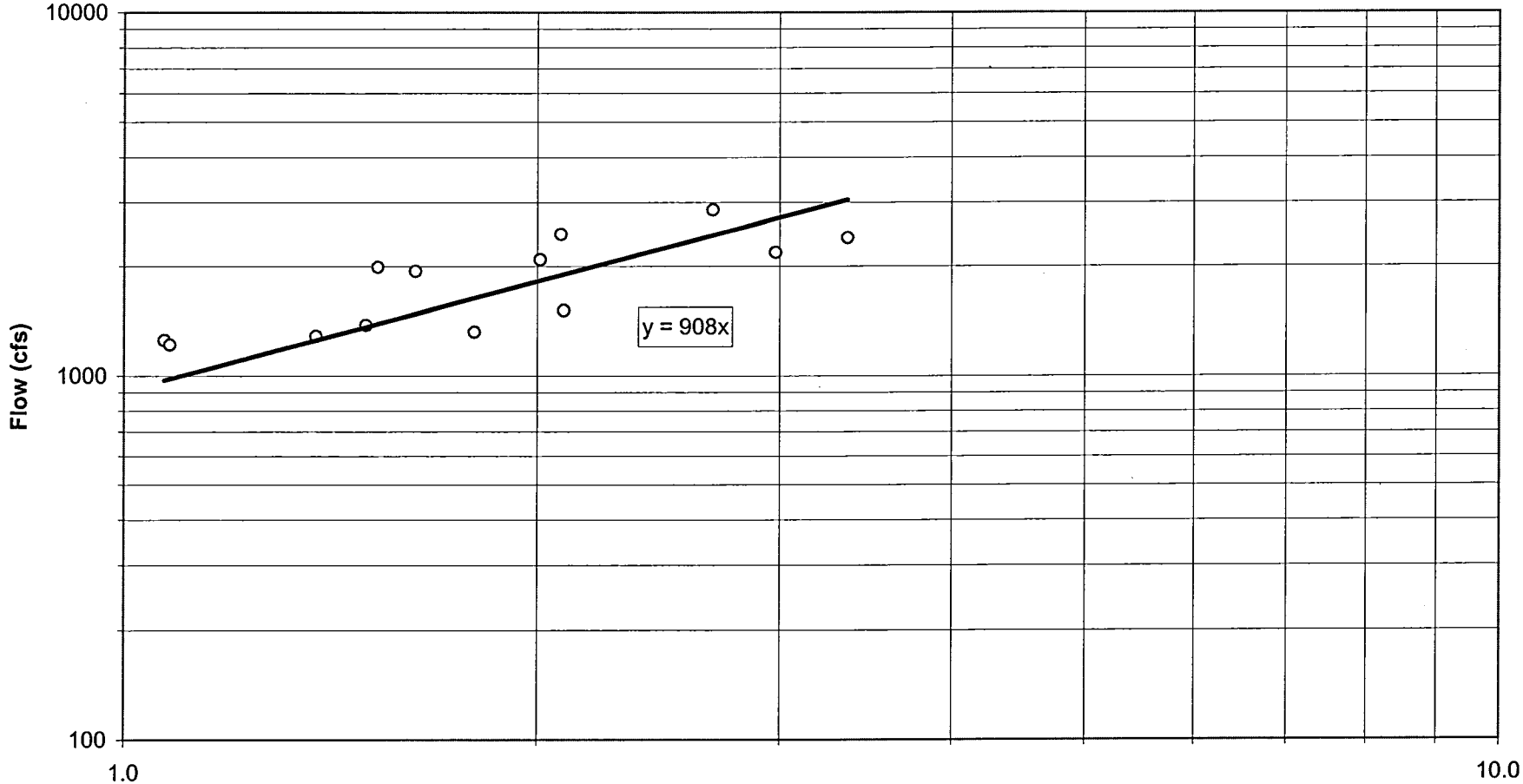
Lower Centennial Wash Watershed Phase IV
HEC-1 Concentration Point Comparison
24-hr Storm



Lower Centennial Wash Watershed Phase IV
HEC-1 Concentration Point Comparison
6-hr Storm

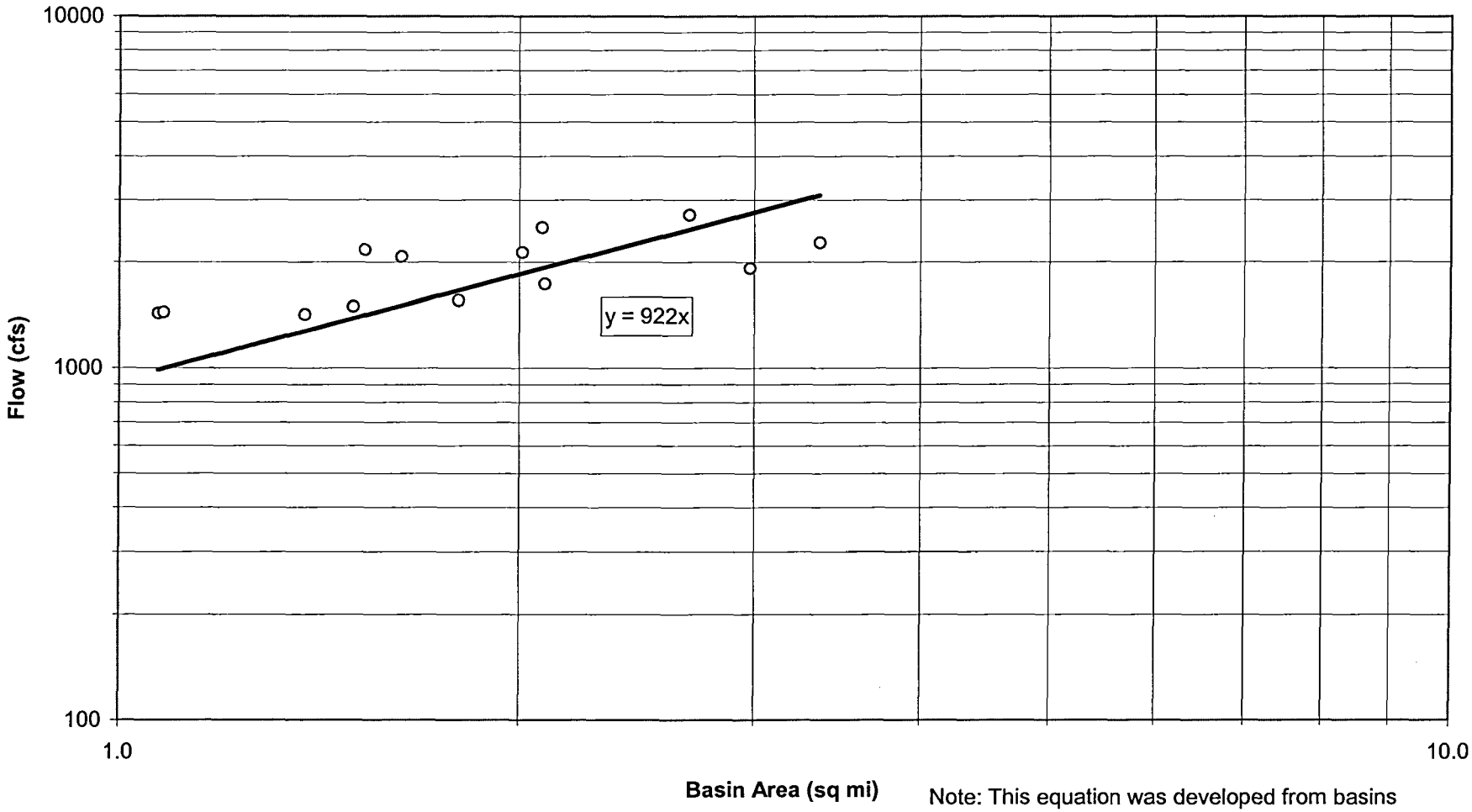


Lower Centennial Wash Watershed Phase IV
HEC-1 Concentration Point Flow Equations
24-hr Storm



Note: This equation was developed from basins with areas ranging from 1.07-3.36 square miles

Lower Centennial Wash Watershed Phase IV
HEC-1 Concentration Point Flow Equations
6-hr Storm



Note: This equation was developed from basins with areas ranging from 1.07-3.36 square miles

Appendix E Hydraulic Analysis Supporting Documentation

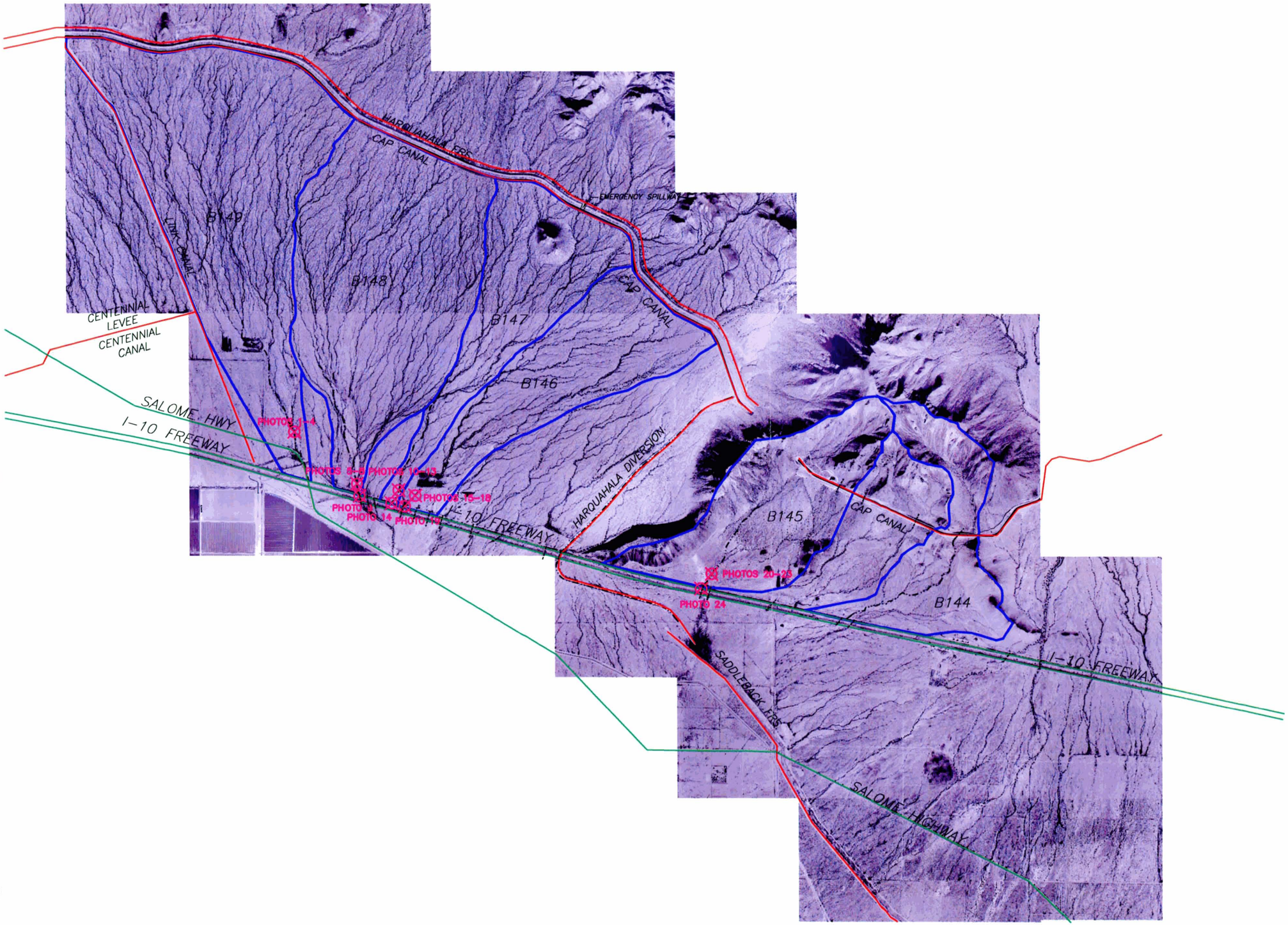
E.1 Roughness Coefficient Estimation

Lower Centennial Wash Watershed
Zone A Floodplain Delineation Study
Phase IV

Field Reconnaissance

The JLK Engineers Team visited Lower Centennial Phase IV on May 12, 2005 and September 20, 2005. The purpose of these site visits was to investigate the watershed and floodplain conditions, obtain photographs and estimate Manning's roughness coefficients, n. The aerial photographs and the USGS maps show that there is no development in Phase IV that will affect the hydrologic and floodplain, which was verified with the site visits. The table below shows the Latitude and Longitude coordinates for the photo locations. The following exhibit shows the locations of the photographs with their corresponding numbers.

PHOTO	LAT/LONG COORDINATES
1-4	N33 32 37.3 W 113 09 28.0
5-8	N33 32 16.4 W 113 08 57.8
9	N33 32 11.4 W 113 08 56.7
10-13	N33 32 13.9 W 113 08 37.6
14	N33 32 08.6 W 113 08 40.9
15-18	N33 32 11.8 W 113 08 29.6
19	N33 32 07.4 W 113 08 34.5
20-23	N33 31 41.3 W 113 06 05.2
24	N33 31 35.3 W 113 06 10.2
25-28	N33 27 49.3 W 113 04 08.7
29-32	N33 27 25.8 W 113 05 06.6
33-36	N33 26 34.5 W 113 05 44.1
37-40	N33 25 43.6 W 113 05 44.0
41-44	N33 25 43.1 W 113 05 53.1
45-49	N33 25 14.1 W 113 05 51.7
50-53	N33 24 50.4 W 113 06 04.4
54-58	N33 24 12.7 W 113 06 10.0



LEGEND

B133	SUB-BASIN ID
	SUB-BASIN BOUNDARY
	SUB-BASIN THALWAG
	CULVERT
	PHOTO # AND LOCATION

LOWER CENTENNIAL
PHASE IV
N-VALUE PHOTO LOCATIONS

JLK Engineers
Transportation Drainage Public Works
18441 N. 25th Ave., Suite 103
Phoenix, AZ 85023
Tel 602-405-1875
Fax 602-288-5781

LAYOUT	DRAFTED	CHECKED
JRG	NZ	PTG

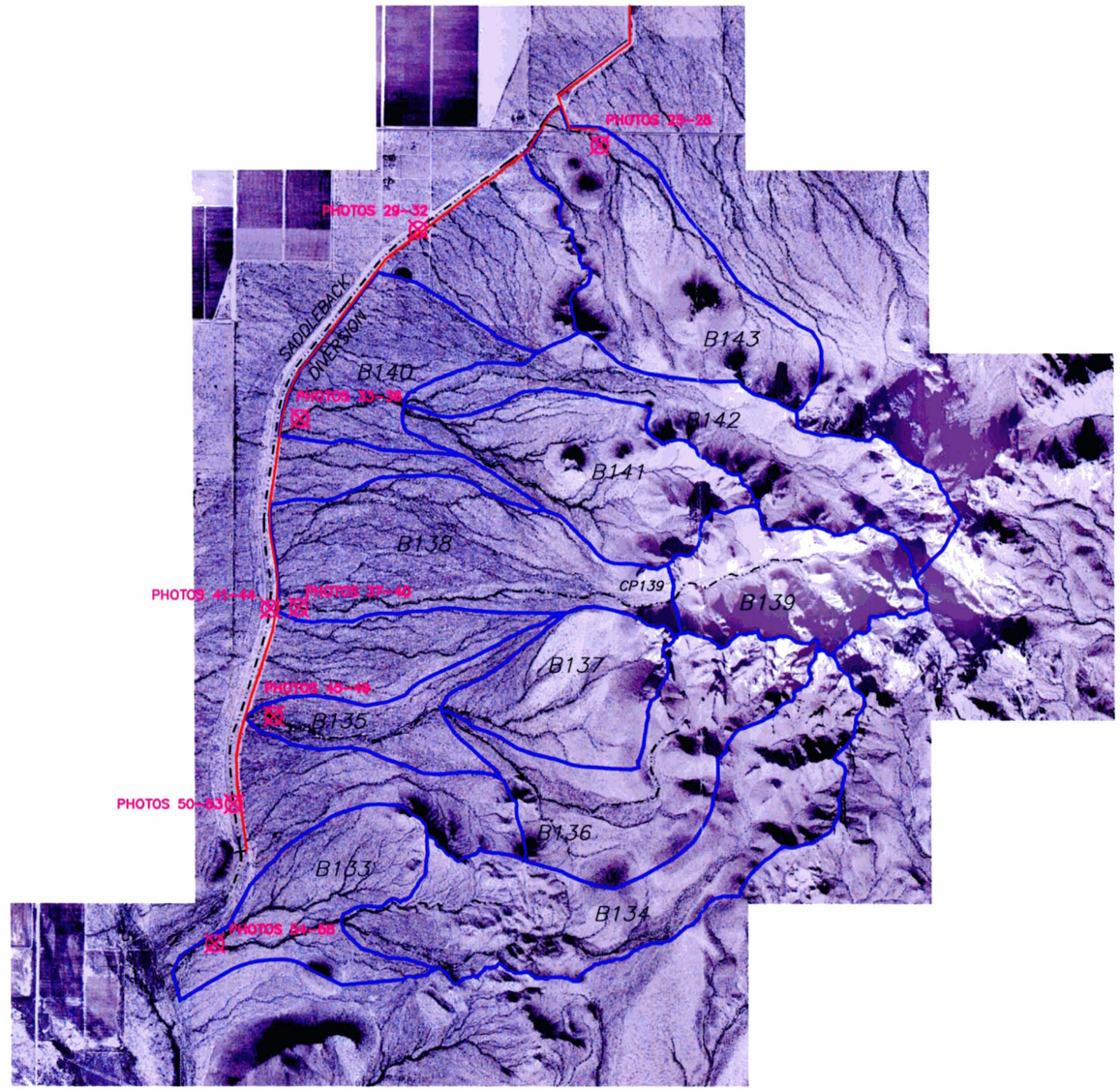
DRAWING SCALE(S)

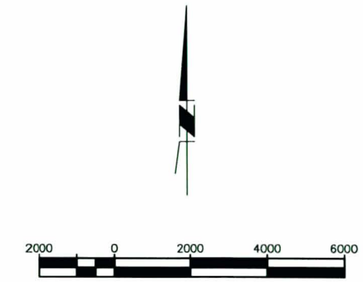
ORIGINAL PLAN DATE OCT./2005

LATEST REVISION

PROJECT NUMBER FCDMC0501

SHEET NO. 1 OF 2 SHEETS





LEGEND

B133	SUB-BASIN ID
	SUB-BASIN BOUNDARY
	SUB-BASIN THALWAG
	CULVERT
	PHOTO # AND LOCATION

LOWER CENTENNIAL
PHASE IV
N-VALUE PHOTO LOCATIONS

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Fax 602-288-5781

LAYOUT	DRAFTED	CHECKED
JRG	NZ	PTG

DRAWING SCALE(S)

ORIGINAL PLAN DATE OCT./2005

LATEST REVISION

PROJECT NUMBER FCDMC0501

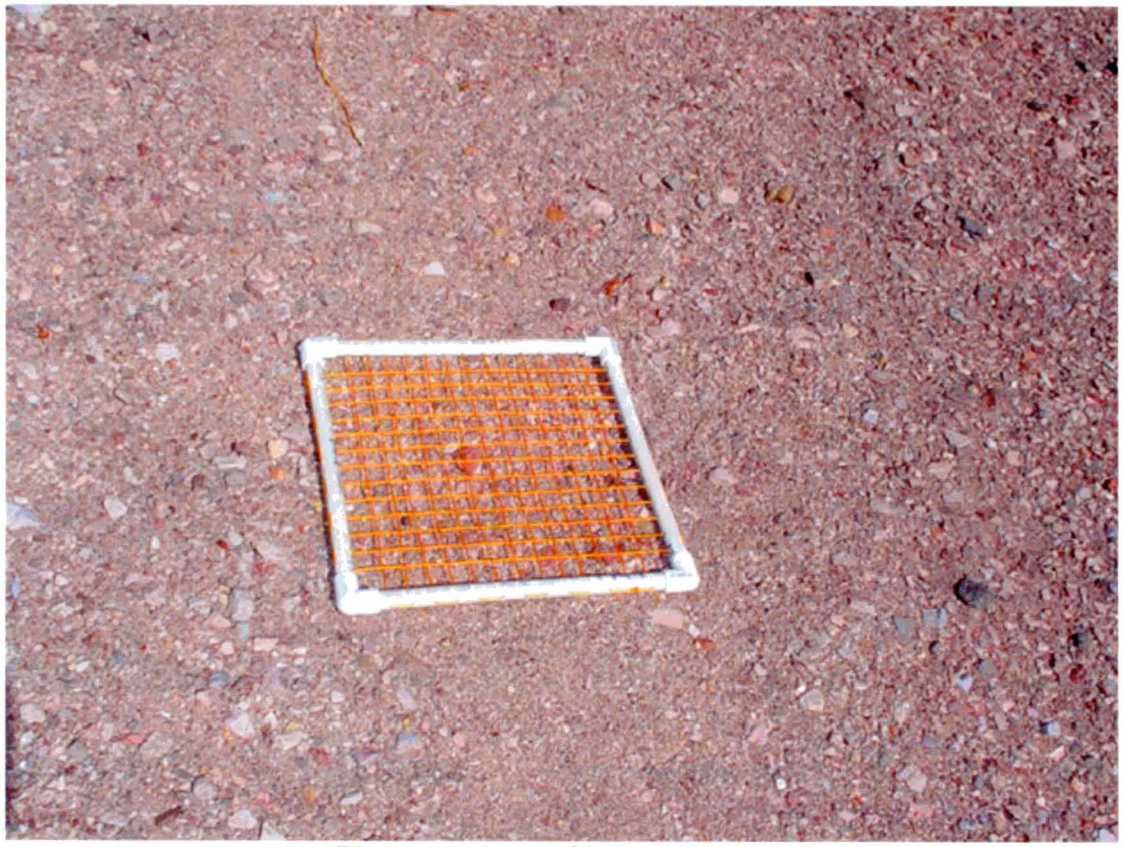
SHEET NO. 2 OF 2 SHEETS

Photograph 1 – Channel Bottom
Wash: T2NR9WS2-1 Reach 1

Photograph 2 – Looking Upstream at Channel
Wash: T2NR9WS2-1 Reach 1

Photograph 3 – Looking Upstream at Left Bank
Wash: T2NR9WS2-1 Reach 1

Photograph 4 – Looking Upstream at Right Bank
Wash: T2NR9WS2-1 Reach 1



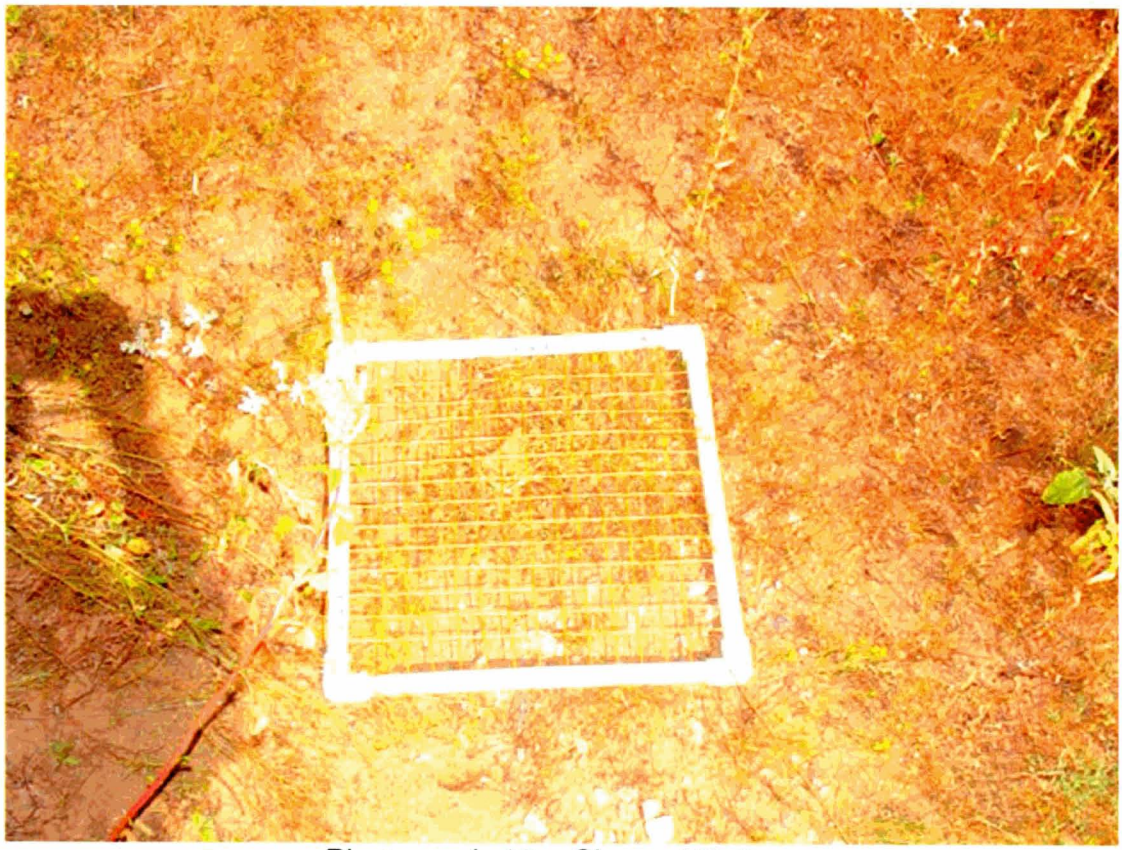
Photograph 5 – Channel Bottom
Wash: T2NR9WS2-2 Reach 1

Photograph 6 – Looking Upstream at Channel
Wash: T2NR9WS2-2 Reach 1

Photograph 7 – Looking Upstream at Left Bank
Wash: T2NR9WS2-2 Reach 1

Photograph 8 – Looking Upstream at Right Bank
Wash: T2NR9WS2-2 Reach 1

Photograph 9 – Looking Downstream at Culvert Crossing
Wash: T2NR9WS2-2 Reach 1



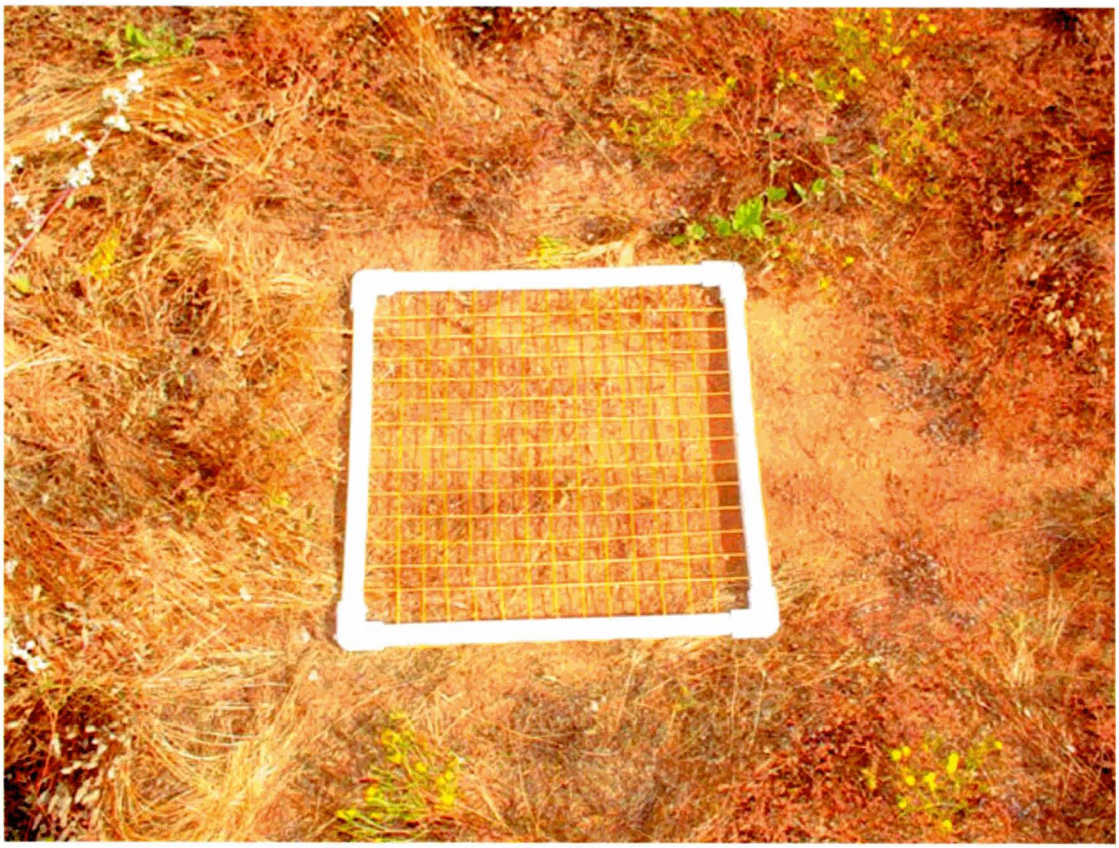
Photograph 10 – Channel Bottom
Wash: T2NR9WS12-1 Reach 1

Photograph 11 – Looking Upstream at Channel
Wash: T2NR9WS12-1 Reach 1

Photograph 12 – Looking Upstream at Left Bank
Wash: T2NR9WS12-1 Reach 1

Photograph 13 – Looking Upstream at Right Bank
Wash: T2NR9WS12-1 Reach 1

Photograph 14 – Looking Downstream at Culvert Crossing
Wash: T2NR9WS12-1 Reach 1



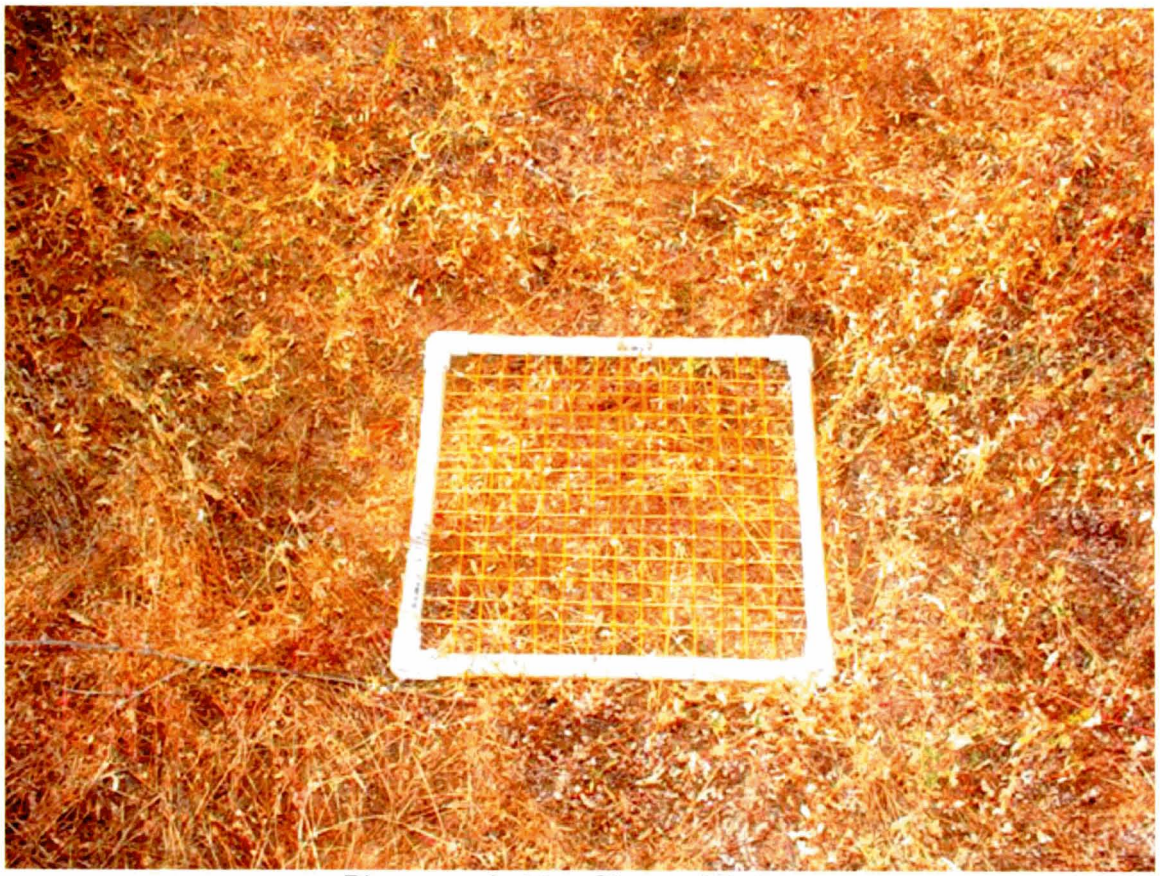
Photograph 15 – Channel Bottom
Wash: T2NR9WS12-2 Reach 1

Photograph 16 – Looking Upstream at Channel
Wash: T2NR9WS12-2 Reach 1

Photograph 17 – Looking Upstream at Left Bank
Wash: T2NR9WS12-2 Reach 1

Photograph 18 – Looking Upstream at Right Bank
Wash: T2NR9WS12-2 Reach 1

Photograph 19 – Looking Downstream at Culvert Crossing
Wash: T2NR9WS12-2 Reach 1



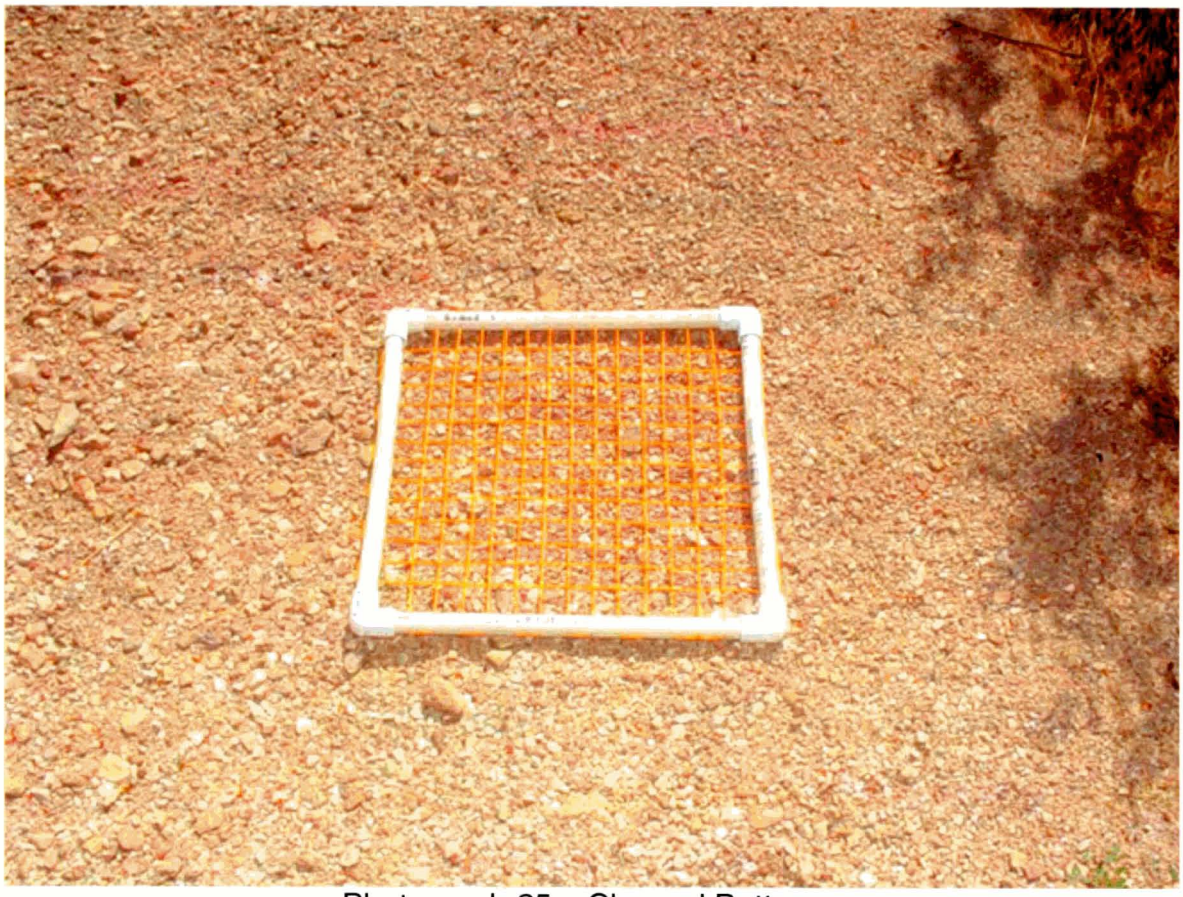
Photograph 20 – Channel Bottom
Wash: T2NR8WS8-2 Reach 1

Photograph 21 – Looking Upstream at Channel
Wash: T2NR8WS8-2 Reach 1

Photograph 22 – Looking Upstream at Left Bank
Wash: T2NR8WS8-2 Reach 1

Photograph 23 – Looking Upstream at Right Bank
Wash: T2NR8WS8-2 Reach 1

Photograph 24 – Looking Downstream at Culvert Crossing
Wash: T2NR8WS8-2 Reach 1

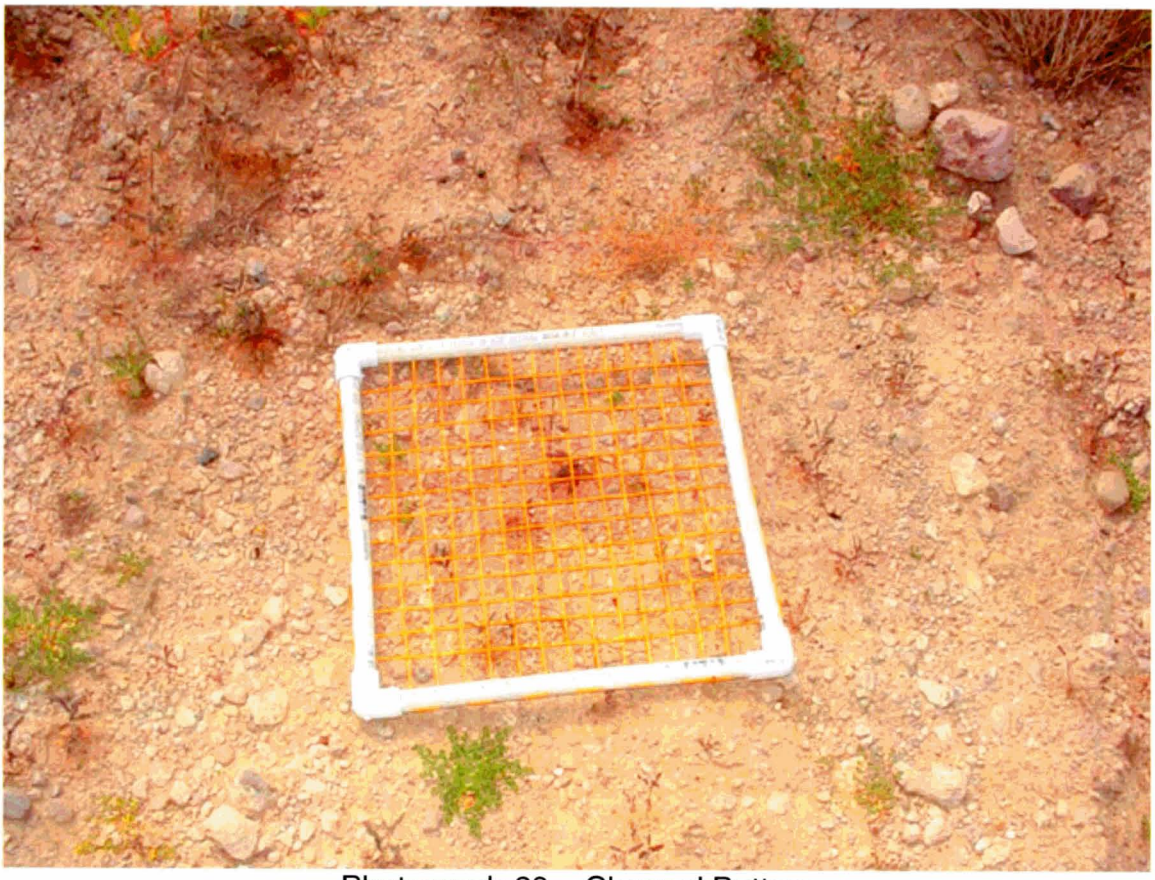


Photograph 25 – Channel Bottom
Wash: T2NR8WS34 Reach 1

Photograph 26 – Looking Upstream at Channel
Wash: T2NR8WS34 Reach 1

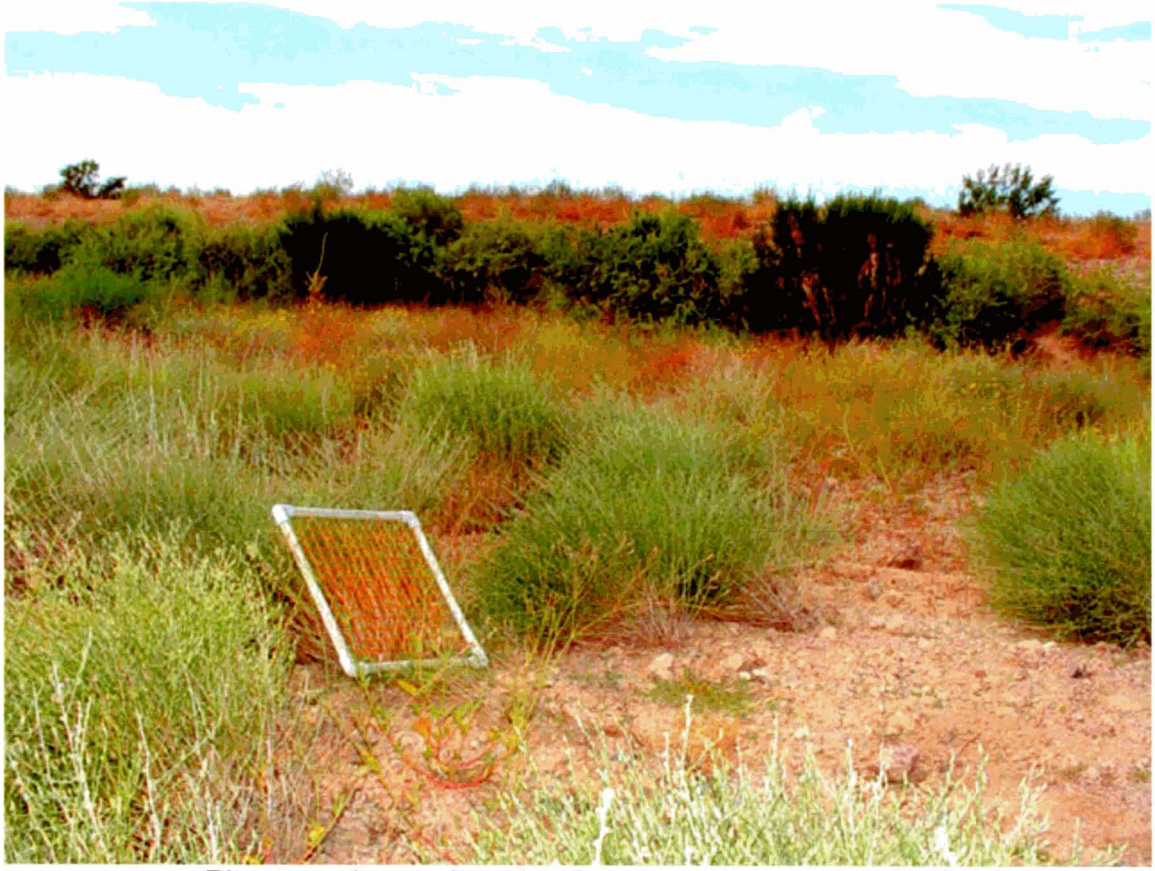
Photograph 27 – Looking Upstream at Left Bank
Wash: T2NR8WS34 Reach 1

Photograph 28 – Looking Upstream at Right Bank
Wash: T2NR8WS34 Reach 1

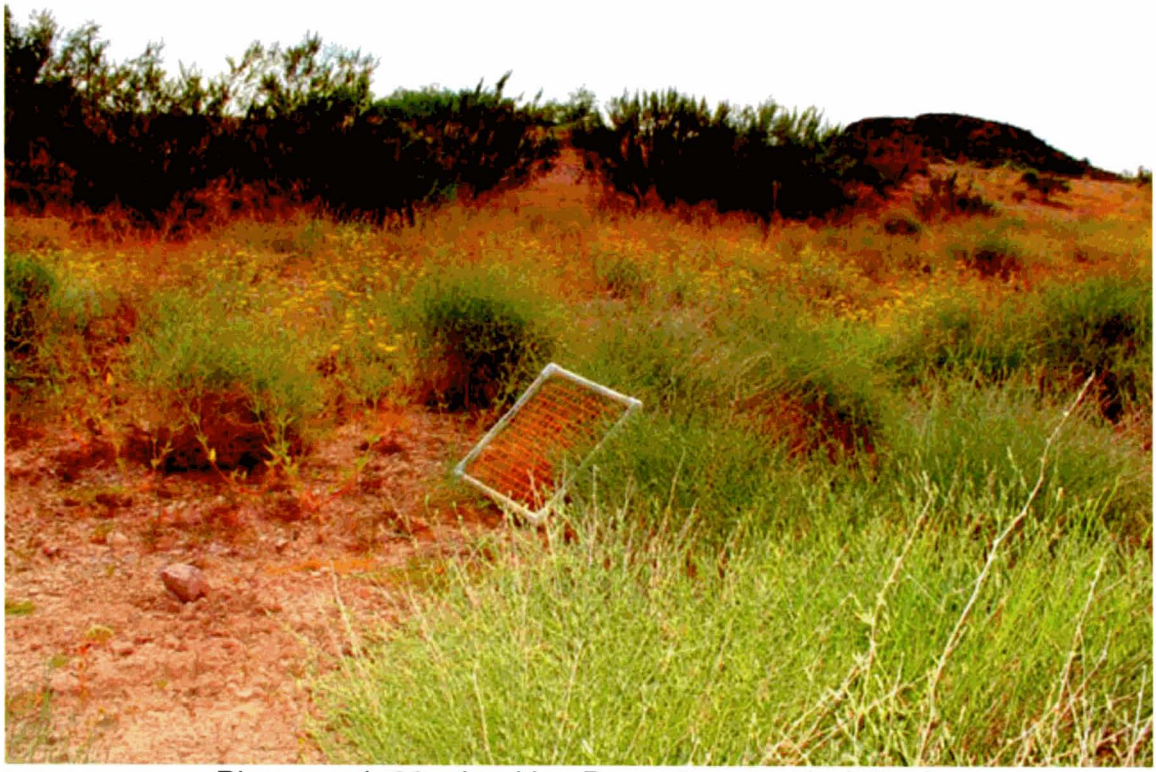


Photograph 29 – Channel Bottom
Wash: T1NR8WS29-2 Reach 4

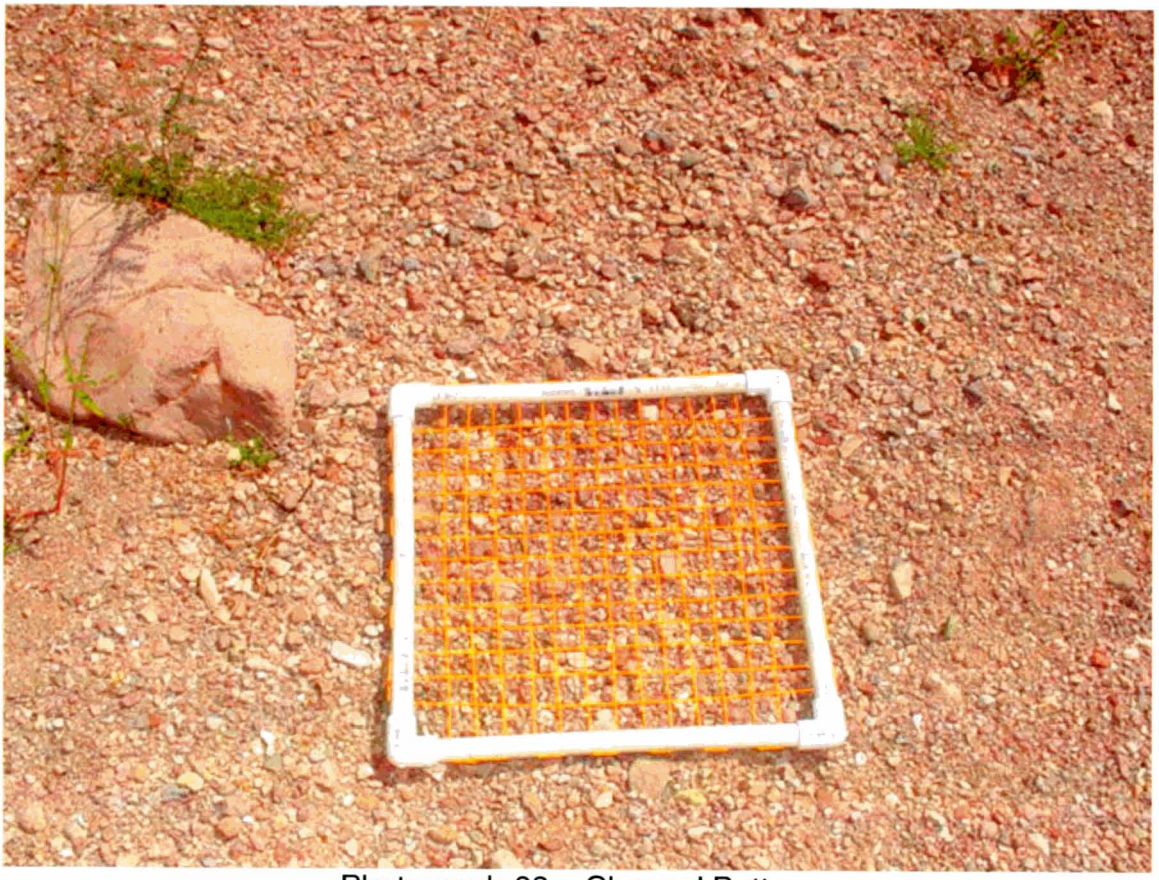
Photograph 30 – Looking Downstream at Channel
Wash: T1NR8WS29-2 Reach 4



Photograph 31 – Looking Downstream at Right Bank
Wash: T1NR8WS29-2 Reach 4



Photograph 32 – Looking Downstream at Left Bank
Wash: T1NR8WS29-2 Reach 4

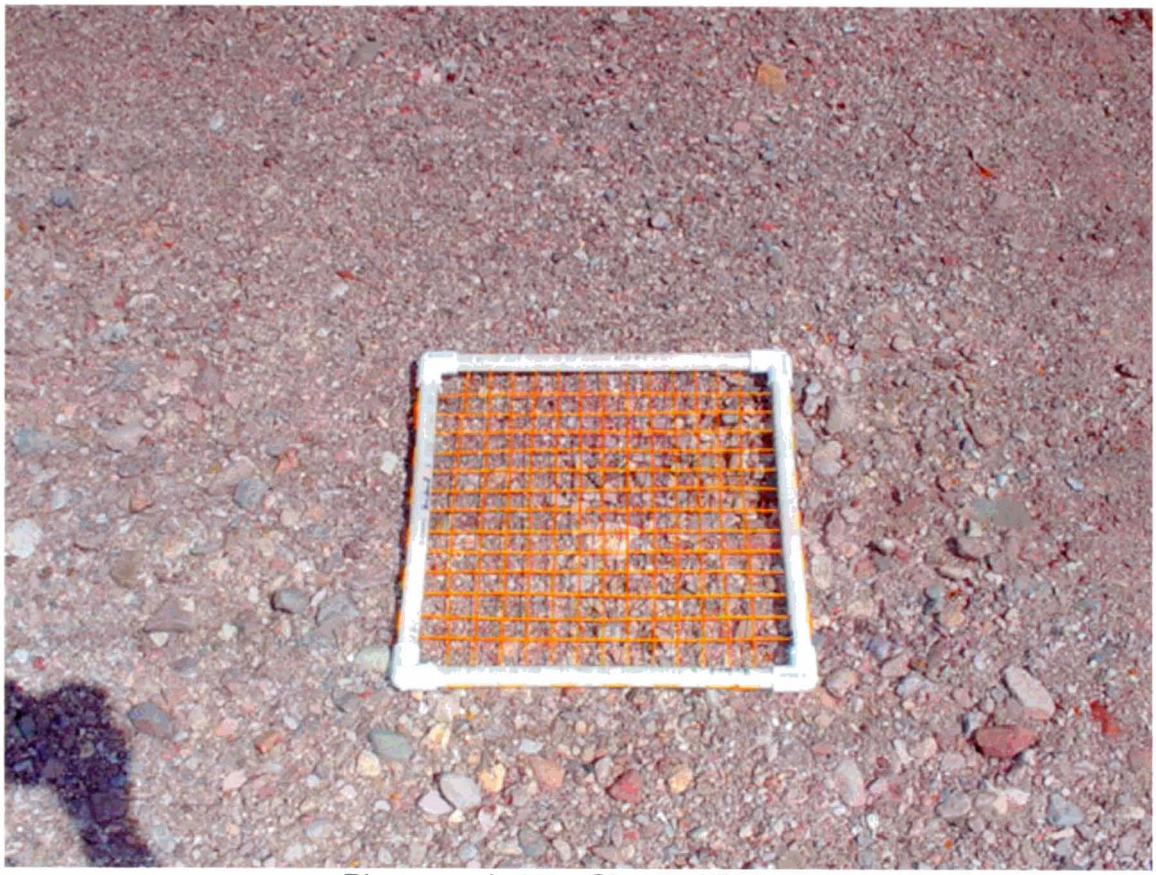


Photograph 33 – Channel Bottom
Wash: T1NR8WS8 Reach 1

Photograph 34 – Looking Upstream at Channel
Wash: T1NR8WS8 Reach 1

Photograph 35 – Looking Upstream at Left Bank
Wash: T1NR8WS8 Reach 1

Photograph 36 – Looking Upstream at Right Bank
Wash: T1NR8WS8 Reach 1

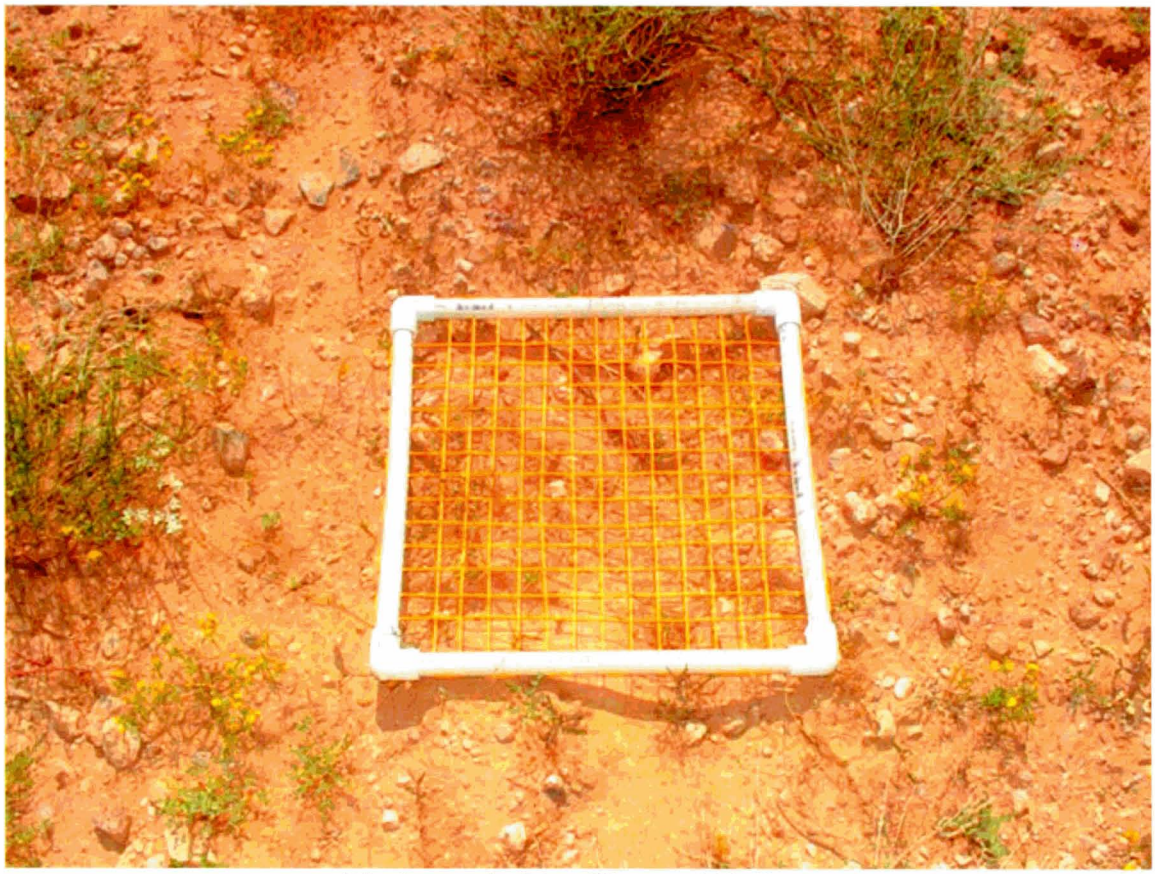


Photograph 37 – Channel Bottom
Wash: T1NR8WS17 Reach 1

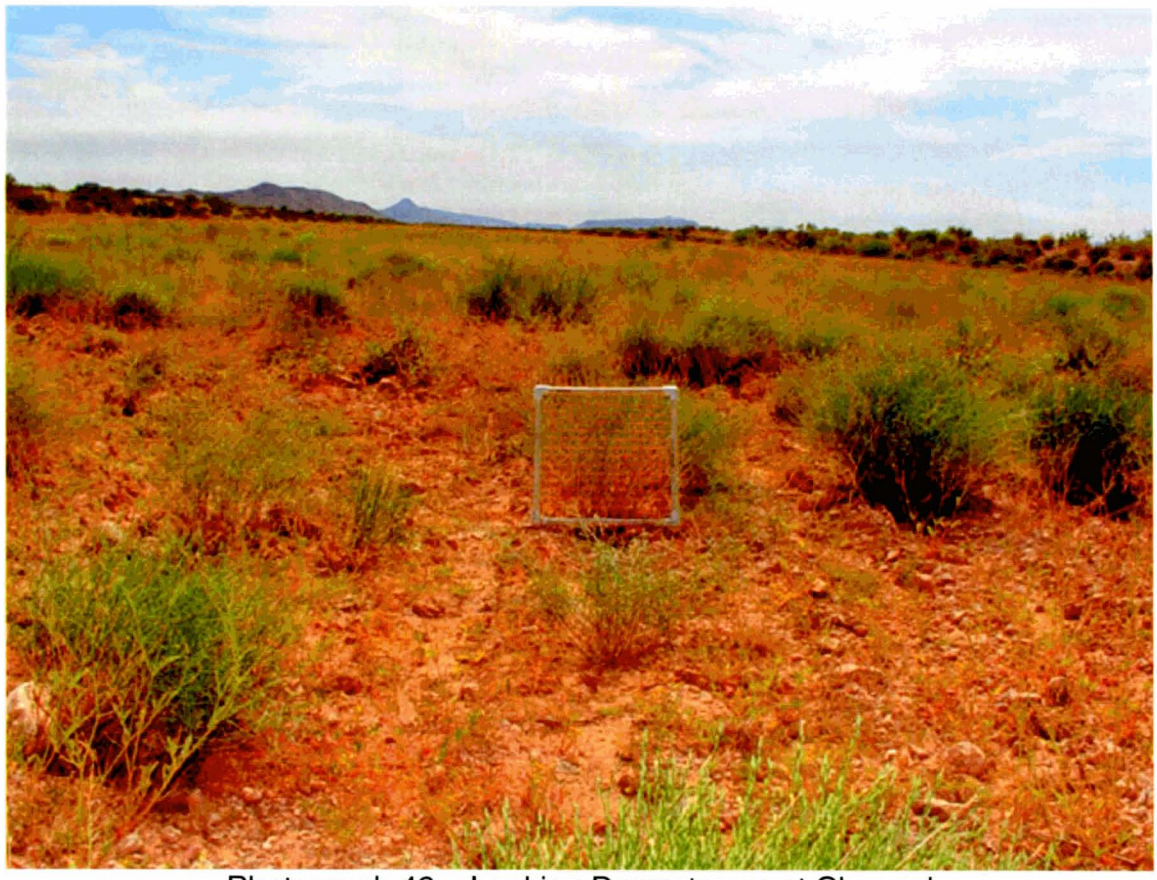
Photograph 38 – Looking Upstream at Channel
Wash: T1NR8WS17 Reach 1

Photograph 39 – Looking Upstream at Left Bank
Wash: T1NR8WS17 Reach 1

Photograph 40 – Looking Upstream at Right Bank
Wash: T1NR8WS17 Reach 1



Photograph 41 – Channel Bottom
Wash: T1NR8WS29-2 Reach 3



Photograph 42 – Looking Downstream at Channel
Wash: T1NR8WS29-2 Reach 3

Photograph 43 – Looking Downstream at Right Bank
Wash: T1NR8WS29-2 Reach 3

Photograph 44 – Looking Downstream at Left Bank
Wash: T1NR8WS29-2 Reach 3

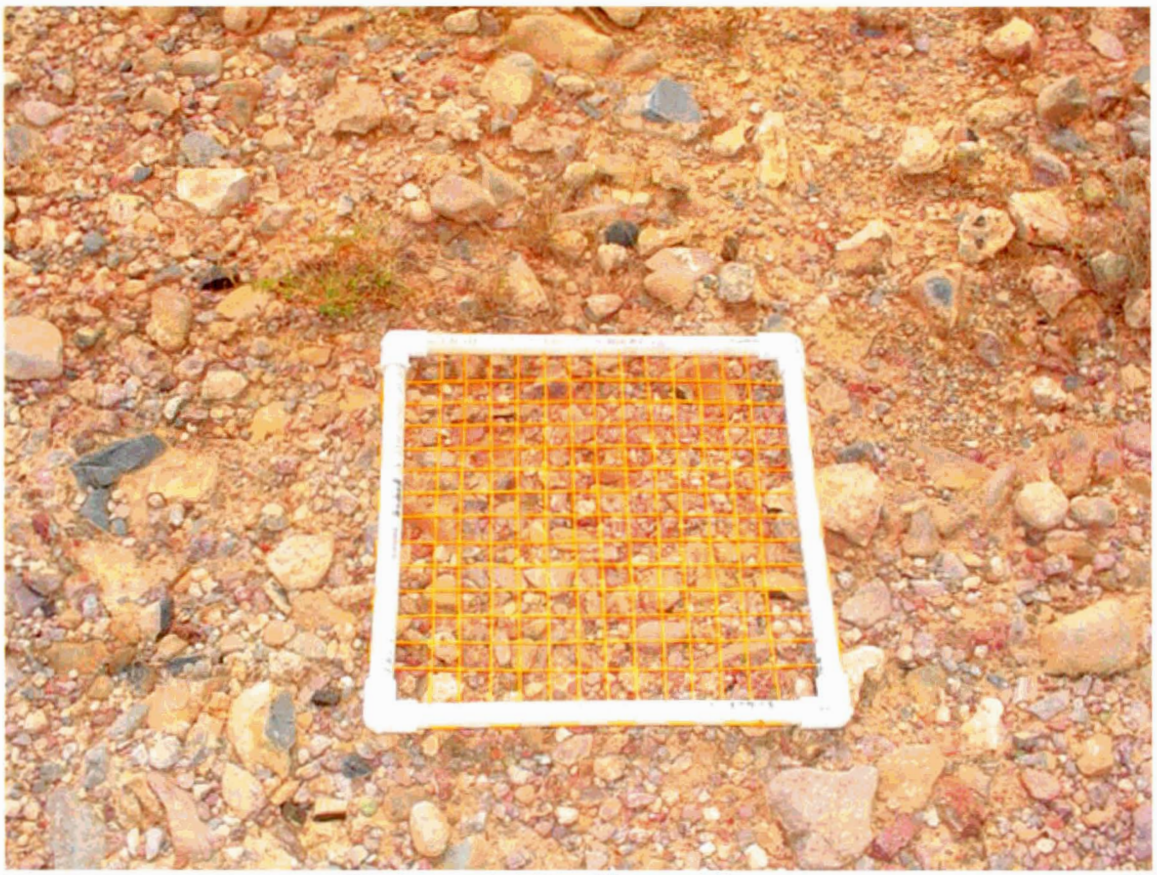
Photograph 45 – Channel Bottom
Wash: T1NR8WS20 Reach 1

Photograph 46 – Looking Upstream at Channel
Wash: T1NR8WS20 Reach 1

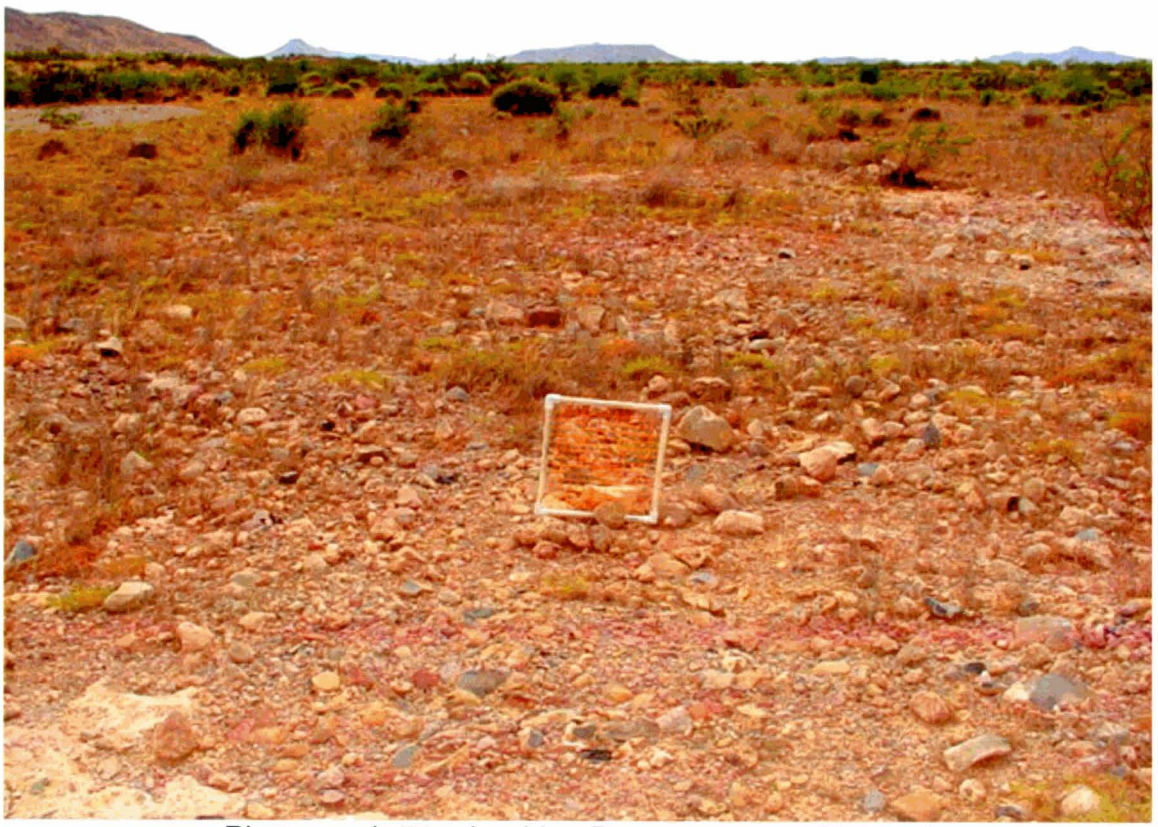
Photograph 47 – Looking Upstream at Left Bank
Wash: T1NR8WS20 Reach 1

Photograph 48 – Looking Upstream at Right Bank
Wash: T1NR8WS20 Reach 1

Photograph 49 – Looking Downstream at Channel
Wash: T1NR8WS20 Reach 1



Photograph 50 – Channel Bottom
Wash: T1NR8WS29-2 Reach 1



Photograph 51 – Looking Downstream at Channel
Wash: T1NR8WS29-2 Reach 1

Photograph 52 – Looking Downstream at Right Bank
Wash: T1NR8WS29-2 Reach 1

Photograph 53 – Looking Downstream at Left Bank
Wash: T1NR8WS29-2 Reach 1

Photograph 54 – Channel Bottom
Wash: T1NR8WS29-1 Reach 1

Photograph 55 – Looking Upstream at Channel
Wash: T1NR8WS29-1 Reach 1

Photograph 56 – Looking Upstream at Left Bank
Wash: T1NR8WS29-1 Reach 1

Photograph 57 – Looking Upstream at Right Bank
Wash: T1NR8WS29-1 Reach 1

Photograph 58 – Looking Downstream at Channel
Wash: T1NR8WS29-1 Reach 1

Lower Centennial Wash Watershed
Zone A Floodplain Delineation Study
Phase IV

Manning's "n" Value Determination

The procedure used to determine Manning's roughness coefficient, "n", is outlined in the USGS publication "Estimated Manning's Roughness Coefficients for Stream Channels and Flood Plains 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.

"Guidelines and Specifications for Flood Hazard Mapping Partners" (February 2002) recommends that the number of cross sections be minimized to one or two sections that are representative of the entire flooding source. In addition, Manning roughness coefficients should be estimated from field inspection and should be minimized by choosing values that are representative of the entire flooding source.

Based on the site visit the washes within Lower Centennial Phase IV are very similar with the exception of the washes north of I-10 freeway and east of the Harquahala Diversion Channel. The base n, n_b, is established by the size of the bed material of the channel. Material ranging from 0.08-2.5 inches is classified as gravel and the base n value ranges from 0.028-0.035. The value 0.030 was chosen for Lower Centennial Phase IV washes with the exception of the Saddleback Diversion Channel with larger gravel that had a n_b of 0.035. The degree of irregularity was smooth for the channel and minor (slightly eroded or scoured side slopes) for the overbanks. The n_1 value for the channel was 0.000 and for the overbanks was 0.003. The effect of obstruction in the channel is negligible (few scattered obstructions, less than 5% of the cross-sectional area) and minor (obstructions occupy 5%-15% of the cross sectional area) for the overbanks. The values of n_2 chosen were 0.002 for the channel and 0.010 for the overbanks. The majority of the channels were free of vegetation and the overbanks had medium (moderately dense stemmy grass, weeds, or tree seedlings, moderately dense brush) vegetation. The value of n_3 for the channel was 0.000 and 0.015 for the overbanks. The variation in channel cross section size and shape changes gradually so n_4 is 0.000. The degree of meandering is minor so a value of 1 was used for m. The Table below summarizes the Manning's roughness coefficients for Phase IV.

Wash Name	Location	n_b	n_1	n_2	n_3	n_4	m	n
T1SR8WS29-2	Channel	0.030	0.000	0.002	0.000	0.000	1.00	**0.032**
Reach 1	Overbanks	0.030	0.003	0.010	0.015	0.000	1.00	**0.058**
T1SR8WS29-2	Channel	0.030	0.000	0.002	0.000	0.000	1.00	**0.032**
Reach 2	Overbanks	0.030	0.003	0.010	0.015	0.000	1.00	**0.058**
T1SR8WS29-2	Channel	0.030	0.000	0.002	0.000	0.000	1.00	**0.032**
Reach 3	Overbanks	0.030	0.003	0.010	0.015	0.000	1.00	**0.058**
T1SR8WS29-2	Channel	0.030	0.000	0.002	0.000	0.000	1.00	**0.032**
Reach 4	Overbanks	0.030	0.003	0.010	0.015	0.000	1.00	**0.058**
T1SR8WS29-1	Channel	0.030	0.000	0.002	0.000	0.000	1.00	**0.032**
Reach 1	Overbanks	0.030	0.003	0.010	0.015	0.000	1.00	**0.058**
T1SR8WS29-1	Channel	0.030	0.000	0.002	0.000	0.000	1.00	**0.032**
Reach 2	Overbanks	0.030	0.003	0.010	0.015	0.000	1.00	**0.058**
T1SR8WS29-1	Channel	0.035	0.000	0.002	0.000	0.000	1.00	**0.037**
Reach 1 Tributary 1	Overbanks	0.035	0.003	0.010	0.015	0.000	1.00	**0.063**
T1SR8WS20	Channel	0.030	0.000	0.002	0.000	0.000	1.00	**0.032**
Reach 1	Overbanks	0.030	0.003	0.010	0.015	0.000	1.00	**0.058**
T1SR8WS20	Channel	0.030	0.000	0.002	0.000	0.000	1.00	**0.032**
Reach 2	Overbanks	0.030	0.003	0.010	0.015	0.000	1.00	**0.058**
T1SR8WS20	Channel	0.030	0.000	0.002	0.000	0.000	1.00	**0.032**
Reach 1 Tributary 1	Overbanks	0.030	0.003	0.010	0.015	0.000	1.00	**0.058**
T1SR8WS17	Channel	0.030	0.000	0.002	0.000	0.000	1.00	**0.032**
Reach 1	Overbanks	0.030	0.003	0.010	0.015	0.000	1.00	**0.058**
T1SR8WS17	Channel	0.035	0.000	0.002	0.000	0.000	1.00	**0.037**
Reach 2	Overbanks	0.035	0.003	0.010	0.015	0.000	1.00	**0.063**
T1SR8WS8	Channel	0.030	0.000	0.002	0.000	0.000	1.00	**0.032**
Reach 1	Overbanks	0.030	0.003	0.010	0.015	0.000	1.00	**0.058**
T1SR8WS8	Channel	0.030	0.000	0.002	0.000	0.000	1.00	**0.032**
Reach 2	Overbanks	0.030	0.003	0.010	0.015	0.000	1.00	**0.058**
T1SR8WS8	Channel	0.030	0.000	0.002	0.000	0.000	1.00	**0.032**
Reach 1 Tributary 1	Overbanks	0.030	0.003	0.010	0.015	0.000	1.00	**0.058**
T2SR8WS34	Channel	0.030	0.000	0.002	0.000	0.000	1.00	**0.032**
Reach 1	Overbanks	0.030	0.003	0.010	0.015	0.000	1.00	**0.058**
T2SR8WS9	Channel	0.030	0.000	0.002	0.000	0.000	1.00	**0.032**
Reach 1	Overbanks	0.030	0.003	0.010	0.015	0.000	1.00	**0.058**
T2SR8WS8-2	Channel	0.030	0.000	0.002	0.000	0.000	1.00	**0.032**
Reach 1	Overbanks	0.030	0.003	0.010	0.015	0.000	1.00	**0.058**
T2SR9WS12-2	Channel	0.030	0.000	0.002	0.000	0.000	1.00	**0.032**
Reach 1	Overbanks	0.030	0.003	0.010	0.015	0.000	1.00	**0.058**
T2SR9WS12-1	Channel	0.030	0.000	0.002	0.000	0.000	1.00	**0.032**
Reach 1	Overbanks	0.030	0.003	0.010	0.015	0.000	1.00	**0.058**
T2SR9WS2-2	Channel	0.030	0.000	0.002	0.000	0.000	1.00	**0.032**
Reach 1	Overbanks	0.030	0.003	0.010	0.015	0.000	1.00	**0.058**
T2SR9WS2-1	Channel	0.030	0.000	0.002	0.000	0.000	1.00	**0.032**
Reach 1	Overbanks	0.030	0.003	0.010	0.015	0.000	1.00	**0.058**

E.2 Cross Section Plots

(See E.5 Hydraulic Calculations)

E.3 Expansion and Contraction Coefficients

(This report does not include expansion and contraction coefficients)

Culvert Designer/Analyzer Report
4303+12 EXIST 3-10'x7' RCBC

alysis Component			
Storm Event	Design	Discharge	2,024.46 cfs

Peak Discharge Method: User-Specified			
Design Discharge	2,024.46 cfs	Check Discharge	0.00 cfs

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	N/A ft

Name	Description	Discharge	HW Elev	Velocity
Culvert-1	3-10 x 7 ft Box	2,024.46 cfs	1,221.20 ft	13.16 ft/s
Weir	Not Considered	N/A	N/A	N/A

Culvert Designer/Analyzer Report
4303+12 EXIST 3-10'x7' RCBC

Component:Culvert-1

Culvert Summary			
Computed Headwater Elevation	1,221.20 ft	Discharge	2,024.46 cfs
Inlet Control HW Elev	1,221.17 ft	Tailwater Elevation	N/A ft
Outlet Control HW Elev	1,221.20 ft	Control Type	Outlet Control
Headwater Depth/ Height	1.30		

Grades			
Upstream Invert	1,212.08 ft	Downstream Invert	1,211.84 ft
Length	62.50 ft	Constructed Slope	0.003840 ft/ft

Hydraulic Profile			
Profile	S2	Depth, Downstream	5.13 ft
Slope Type	Steep	Normal Depth	5.13 ft
Flow Regime	Supercritical	Critical Depth	5.21 ft
Velocity Downstream	13.16 ft/s	Critical Slope	0.003680 ft/ft

Section			
Section Shape	Box	Mannings Coefficient	0.013
Section Material	Concrete	Span	10.00 ft
Section Size	10 x 7 ft	Rise	7.00 ft
Number Sections	3		

Outlet Control Properties			
Outlet Control HW Elev	1,221.20 ft	Upstream Velocity Head	2.61 ft
Ke	0.50	Entrance Loss	1.30 ft

Inlet Control Properties			
Inlet Control HW Elev	1,221.17 ft	Flow Control	Transition
Inlet Type	90 and 15 ° wingwall flares	Area Full	210.0 ft²
K	0.06100	HDS 5 Chart	8
M	0.75000	HDS 5 Scale	2
C	0.04000	Equation Form	1
Y	0.80000		

Culvert Designer/Analyzer Report
4305+96 EXIST 3-10'x7' RCBC

Analysis Component			
Storm Event	Design	Discharge	1,958.23 cfs

Peak Discharge Method: User-Specified			
Design Discharge	1,958.23 cfs	Check Discharge	0.00 cfs

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	N/A ft

Name	Description	Discharge	HW Elev	Velocity
Culvert-1	3-10 x 7 ft Box	1,958.23 cfs	1,221.00 ft	13.00 ft/s
Weir	Not Considered	N/A	N/A	N/A

Culvert Designer/Analyzer Report
4305+96 EXIST 3-10'x7' RCBC

nponent:Culvert-1

Culvert Summary			
Computed Headwater Elevation	1,221.00 ft	Discharge	1,958.23 cfs
Inlet Control HW Elev	1,220.84 ft	Tailwater Elevation	N/A ft
Outlet Control HW Elev	1,221.00 ft	Control Type	Outlet Control
Headwater Depth/ Height	1.27		

Grades			
Upstream Invert	1,212.08 ft	Downstream Invert	1,211.85 ft
Length	60.50 ft	Constructed Slope	0.003802 ft/ft

Hydraulic Profile			
Profile	S2	Depth, Downstream	5.02 ft
Slope Type	Steep	Normal Depth	5.02 ft
Flow Regime	Supercritical	Critical Depth	5.10 ft
Velocity Downstream	13.00 ft/s	Critical Slope	0.003653 ft/ft

Section			
Section Shape	Box	Mannings Coefficient	0.013
Section Material	Concrete	Span	10.00 ft
Section Size	10 x 7 ft	Rise	7.00 ft
Number Sections	3		

utlet Control Properties			
Outlet Control HW Elev	1,221.00 ft	Upstream Velocity Head	2.55 ft
Ke	0.50	Entrance Loss	1.27 ft

Inlet Control Properties			
Inlet Control HW Elev	1,220.84 ft	Flow Control	Transition
Inlet Type	90 and 15 ° wingwall flares	Area Full	210.0 ft²
K	0.06100	HDS 5 Chart	8
M	0.75000	HDS 5 Scale	2
C	0.04000	Equation Form	1
Y	0.80000		

Culvert Designer/Analyzer Report
4308+80 EXIST 3-10'x7' RCBC

Analysis Component			
Storm Event	Design	Discharge	2,024.46 cfs

Peak Discharge Method: User-Specified			
Design Discharge	2,024.46 cfs	Check Discharge	0.00 cfs

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	N/A ft

Name	Description	Discharge	HW Elev	Velocity
Culvert-1	3-10 x 7 ft Box	2,024.46 cfs	1,221.20 ft	13.11 ft/s
Weir	Not Considered	N/A	N/A	N/A

Culvert Designer/Analyzer Report
4308+80 EXIST 3-10'x7' RCBC

Component:Culvert-1

Culvert Summary					
Computed Headwater Elevation	1,221.20	ft	Discharge	2,024.46	cfs
Inlet Control HW Elev	1,221.17	ft	Tailwater Elevation	N/A	ft
Outlet Control HW Elev	1,221.20	ft	Control Type	Outlet Control	
Headwater Depth/ Height	1.30				

Grades					
Upstream Invert	1,212.08	ft	Downstream Invert	1,211.85	ft
Length	60.50	ft	Constructed Slope	0.003802	ft/ft

Hydraulic Profile					
Profile	S2		Depth, Downstream	5.15	ft
Slope Type	Steep		Normal Depth	5.15	ft
Flow Regime	Supercritical		Critical Depth	5.21	ft
Velocity Downstream	13.11	ft/s	Critical Slope	0.003680	ft/ft

Section					
Section Shape	Box		Mannings Coefficient	0.013	
Section Material	Concrete		Span	10.00	ft
Section Size	10 x 7 ft		Rise	7.00	ft
Number Sections	3				

Outlet Control Properties					
Outlet Control HW Elev	1,221.20	ft	Upstream Velocity Head	2.61	ft
Ke	0.50		Entrance Loss	1.30	ft

Inlet Control Properties					
Inlet Control HW Elev	1,221.17	ft	Flow Control	Transition	
Inlet Type	90 and 15 ° wingwall flares		Area Full	210.0	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
4322+17 EXIST 3-10'x6' RCBC

alysis Component			
Storm Event	Design	Discharge	1,728.44 cfs

Peak Discharge Method: User-Specified			
Design Discharge	1,728.44 cfs	Check Discharge	0.00 cfs

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	N/A ft

Name	Description	Discharge	HW Elev	Velocity
Culvert-1	3-10 x 6 ft Box	1,728.44 cfs	1,223.50 ft	12.63 ft/s
Weir	Not Considered	N/A	N/A	N/A

Culvert Designer/Analyzer Report
4322+17 EXIST 3-10'x6' RCBC

Component:Culvert-1

Culvert Summary					
Computed Headwater Elevation	1,223.50	ft	Discharge	1,728.44	cfs
Inlet Control HW Elev	1,223.50	ft	Tailwater Elevation	N/A	ft
Outlet Control HW Elev	1,223.27	ft	Control Type	Inlet Control	
Headwater Depth/ Height	1.41				

Grades					
Upstream Invert	1,215.06	ft	Downstream Invert	1,214.86	ft
Length	51.75	ft	Constructed Slope	0.003865	ft/ft

Hydraulic Profile					
Profile	S2		Depth, Downstream	4.56	ft
Slope Type	Steep		Normal Depth	4.55	ft
Flow Regime	Supercritical		Critical Depth	4.69	ft
Velocity Downstream	12.63	ft/s	Critical Slope	0.003555	ft/ft

Section					
Section Shape	Box		Mannings Coefficient	0.013	
Section Material	Concrete		Span	10.00	ft
Section Size	10 x 6 ft		Rise	6.00	ft
Number Sections	3				

Outlet Control Properties					
Outlet Control HW Elev	1,223.27	ft	Upstream Velocity Head	2.35	ft
Ke	0.50		Entrance Loss	1.17	ft

Inlet Control Properties					
Inlet Control HW Elev	1,223.50	ft	Flow Control	Transition	
Inlet Type	90 and 15 ° wingwall flares		Area Full	180.0	ft²
K	0.06100		HDS 5 Chart	8	
M	0.75000		HDS 5 Scale	2	
C	0.04000		Equation Form	1	
Y	0.80000				

Culvert Designer/Analyzer Report
4327+70 EXIST 3-10'X5' RCBC

alysis Component			
Storm Event	Design	Discharge	1,372.62 cfs

Peak Discharge Method: User-Specified			
Design Discharge	1,372.62 cfs	Check Discharge	0.00 cfs

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	N/A ft

Name	Description	Discharge	HW Elev	Velocity
Culvert-1	3-10 x 5 ft Box	1,372.62 cfs	1,224.00 ft	11.77 ft/s
Weir	Not Considered	N/A	N/A	N/A

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Culvert Designer/Analyzer Report
4327+70 EXIST 3-10'X5' RCBC

Component:Culvert-1

Culvert Summary					
Computed Headwater Elevation	1,224.00	ft	Discharge	1,372.62	cfs
Inlet Control HW Elev	1,224.00	ft	Tailwater Elevation	N/A	ft
Outlet Control HW Elev	1,223.70	ft	Control Type	Inlet Control	
Headwater Depth/ Height	1.47				

Grades					
Upstream Invert	1,216.66	ft	Downstream Invert	1,216.47	ft
Length	50.00	ft	Constructed Slope	0.003800	ft/ft

Hydraulic Profile					
Profile	S2		Depth, Downstream	3.89	ft
Slope Type	Steep		Normal Depth	3.86	ft
Flow Regime	Supercritical		Critical Depth	4.02	ft
Velocity Downstream	11.77	ft/s	Critical Slope	0.003402	ft/ft

Section					
Section Shape	Box		Mannings Coefficient	0.013	
Section Material	Concrete		Span	10.00	ft
Section Size	10 x 5 ft		Rise	5.00	ft
Number Sections	3				

Outlet Control Properties					
Outlet Control HW Elev	1,223.70	ft	Upstream Velocity Head	2.01	ft
Ke	0.50		Entrance Loss	1.01	ft

Inlet Control Properties					
Inlet Control HW Elev	1,224.00	ft	Flow Control	Submerged	
Inlet Type	90 and 15 ° wingwall flares		Area Full	150.0	ft²
K	0.06100		HDS 5 Chart	8	
M	0.75000		HDS 5 Scale	2	
C	0.04000		Equation Form	1	
Y	0.80000				

Culvert Designer/Analyzer Report
4333+30 EXIST 3-10'x4' RCBC

nponent:Culvert-1

Culvert Summary			
Computed Headwater Elevation	1,224.80 ft	Discharge	1,039.52 cfs
Inlet Control HW Elev	1,224.80 ft	Tailwater Elevation	N/A ft
Outlet Control HW Elev	1,224.46 ft	Control Type	Inlet Control
Headwater Depth/ Height	1.55		

Grades			
Upstream Invert	1,218.61 ft	Downstream Invert	1,218.30 ft
Length	53.00 ft	Constructed Slope	0.005849 ft/ft

Hydraulic Profile			
Profile	S2	Depth, Downstream	2.94 ft
Slope Type	Steep	Normal Depth	2.72 ft
Flow Regime	Supercritical	Critical Depth	3.34 ft
Velocity Downstream	11.79 ft/s	Critical Slope	0.003259 ft/ft

Section			
Section Shape	Box	Mannings Coefficient	0.013
Section Material	Concrete	Span	10.00 ft
Section Size	10 x 4 ft	Rise	4.00 ft
Number Sections	3		

tlet Control Properties			
Outlet Control HW Elev	1,224.46 ft	Upstream Velocity Head	1.67 ft
Ke	0.50	Entrance Loss	0.84 ft

Inlet Control Properties			
Inlet Control HW Elev	1,224.80 ft	Flow Control	Submerged
Inlet Type	90 and 15 ° wingwall flares	Area Full	120.0 ft²
K	0.06100	HDS 5 Chart	8
M	0.75000	HDS 5 Scale	2
C	0.04000	Equation Form	1
Y	0.80000		

Culvert Designer/Analyzer Report
4333+30 EXIST 3-10'x4' RCBC

alysis Component			
Storm Event	Design	Discharge	1,039.52 cfs

Peak Discharge Method: User-Specified			
Design Discharge	1,039.52 cfs	Check Discharge	0.00 cfs

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	N/A ft

Name	Description	Discharge	HW Elev	Velocity
Culvert-1	3-10 x 4 ft Box	1,039.52 cfs	1,224.80 ft	11.79 ft/s
Weir	Not Considered	N/A	N/A	N/A

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Culvert Designer/Analyzer Report
4448+80 EXIST 3-10'x4' RCBC

nponent:Culvert-1

Culvert Summary					
Computed Headwater Elevation	1,198.00	ft	Discharge	1,170.39	cfs
Inlet Control HW Elev	1,198.00	ft	Tailwater Elevation	N/A	ft
Outlet Control HW Elev	1,197.24	ft	Control Type	Inlet Control	
Headwater Depth/ Height	1.75				

Grades					
Upstream Invert	1,191.00	ft	Downstream Invert	1,190.84	ft
Length	63.50	ft	Constructed Slope	0.002520	ft/ft

Hydraulic Profile					
Profile	M2		Depth, Downstream	3.62	ft
Slope Type	Mild		Normal Depth	N/A	ft
Flow Regime	Subcritical		Critical Depth	3.62	ft
Velocity Downstream	10.79	ft/s	Critical Slope	0.003315	ft/ft

Section					
Section Shape	Box		Mannings Coefficient	0.013	
Section Material	Concrete		Span	10.00	ft
Section Size	10 x 4 ft		Rise	4.00	ft
Number Sections	3				

utlet Control Properties					
Outlet Control HW Elev	1,197.24	ft	Upstream Velocity Head	1.58	ft
Ke	0.50		Entrance Loss	0.79	ft

Inlet Control Properties					
Inlet Control HW Elev	1,198.00	ft	Flow Control	Submerged	
Inlet Type	90 and 15 ° wingwall flares		Area Full	120.0	ft²
K	0.06100		HDS 5 Chart	8	
M	0.75000		HDS 5 Scale	2	
C	0.04000		Equation Form	1	
Y	0.80000				

Culvert Designer/Analyzer Report
4448+80 EXIST 3-10'x4' RCBC

Analysis Component			
Storm Event	Design	Discharge	1,170.39 cfs

Peak Discharge Method: User-Specified			
Design Discharge	1,170.39 cfs	Check Discharge	0.00 cfs

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	N/A ft

Name	Description	Discharge	HW Elev	Velocity
Culvert-1	3-10 x 4 ft Box	1,170.39 cfs	1,198.00 ft	10.79 ft/s
Weir	Not Considered	N/A	N/A	N/A

Culvert Designer/Analyzer Report
4451+90 EXIST 3-10'x4' RCBC

nponent:Culvert-1

Culvert Summary					
Computed Headwater Elevation	1,197.50	ft	Discharge	1,090.75	cfs
Inlet Control HW Elev	1,197.50	ft	Tailwater Elevation	N/A	ft
Outlet Control HW Elev	1,196.95	ft	Control Type	Inlet Control	
Headwater Depth/ Height	1.62				

Grades					
Upstream Invert	1,191.00	ft	Downstream Invert	1,190.86	ft
Length	58.00	ft	Constructed Slope	0.002414	ft/ft

Hydraulic Profile					
Profile	M2		Depth, Downstream	3.45	ft
Slope Type	Mild		Normal Depth	N/A	ft
Flow Regime	Subcritical		Critical Depth	3.45	ft
Velocity Downstream	10.54	ft/s	Critical Slope	0.003281	ft/ft

Section					
Section Shape	Box		Mannings Coefficient	0.013	
Section Material	Concrete		Span	10.00	ft
Section Size	10 x 4 ft		Rise	4.00	ft
Number Sections	3				

tlet Control Properties					
Outlet Control HW Elev	1,196.95	ft	Upstream Velocity Head	1.50	ft
Ke	0.50		Entrance Loss	0.75	ft

Inlet Control Properties					
Inlet Control HW Elev	1,197.50	ft	Flow Control	Submerged	
Inlet Type	90 and 15 ° wingwall flares		Area Full	120.0	ft²
K	0.06100		HDS 5 Chart	8	
M	0.75000		HDS 5 Scale	2	
C	0.04000		Equation Form	1	
Y	0.80000				

Culvert Designer/Analyzer Report
4451+90 EXIST 3-10'x4' RCBC

Analysis Component			
Storm Event	Design	Discharge	1,090.75 cfs

Peak Discharge Method: User-Specified			
Design Discharge	1,090.75 cfs	Check Discharge	0.00 cfs

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	N/A ft

Name	Description	Discharge	HW Elev	Velocity
Culvert-1	3-10 x 4 ft Box	1,090.75 cfs	1,197.50 ft	10.54 ft/s
Weir	Not Considered	N/A	N/A	N/A

Culvert Designer/Analyzer Report
4507+87 EXIST 2-10'x4' RCBC

nponent:Culvert-1

Culvert Summary					
Computed Headwater Elevation	1,230.90	ft	Discharge	780.65	cfs
Inlet Control HW Elev	1,230.90	ft	Tailwater Elevation	N/A	ft
Outlet Control HW Elev	1,230.23	ft	Control Type	Inlet Control	
Headwater Depth/ Height	1.75				

Grades					
Upstream Invert	1,223.90	ft	Downstream Invert	1,223.58	ft
Length	72.00	ft	Constructed Slope	0.004444	ft/ft

Hydraulic Profile					
Profile	S2		Depth, Downstream	4.00	ft
Slope Type	Steep		Normal Depth	N/A	ft
Flow Regime	Supercritical		Critical Depth	3.62	ft
Velocity Downstream	9.76	ft/s	Critical Slope	0.003315	ft/ft

Section					
Section Shape	Box		Mannings Coefficient	0.013	
Section Material	Concrete		Span	10.00	ft
Section Size	10 x 4 ft		Rise	4.00	ft
Number Sections	2				

utlet Control Properties					
Outlet Control HW Elev	1,230.23	ft	Upstream Velocity Head	1.81	ft
Ke	0.50		Entrance Loss	0.90	ft

Inlet Control Properties					
Inlet Control HW Elev	1,230.90	ft	Flow Control	Submerged	
Inlet Type	90 and 15 ° wingwall flares		Area Full	80.0	ft²
K	0.06100		HDS 5 Chart	8	
M	0.75000		HDS 5 Scale	2	
C	0.04000		Equation Form	1	
Y	0.80000				

Culvert Designer/Analyzer Report
4507+87 EXIST 2-10'x4' RCBC

Analysis Component			
Storm Event	Design	Discharge	780.65 cfs

Peak Discharge Method: User-Specified			
Design Discharge	780.65 cfs	Check Discharge	0.00 cfs

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	N/A ft

Name	Description	Discharge	HW Elev	Velocity
Culvert-1	2-10 x 4 ft Box	780.65 cfs	1,230.90 ft	9.76 ft/s
Weir	Not Considered	N/A	N/A	N/A

Culvert Designer/Analyzer Report
4507+87 EXIST 2-10'x4' RCBC

Analysis Component			
Storm Event	Design	Discharge	887.00 cfs

Peak Discharge Method: User-Specified			
Design Discharge	887.00 cfs	Check Discharge	0.00 cfs

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	N/A ft

Name	Description	Discharge	HW Elev	Velocity
Culvert-1	2-10 x 4 ft Box	887.00 cfs	1,232.01 ft	11.09 ft/s
Weir	Not Considered	N/A	N/A	N/A

Culvert Designer/Analyzer Report
4507+87 EXIST 2-10'x4' RCBC

Component:Culvert-1

Culvert Summary			
Computed Headwater Elevation	1,232.01 ft	Discharge	887.00 cfs
Inlet Control HW Elev	1,232.01 ft	Tailwater Elevation	N/A ft
Outlet Control HW Elev	1,230.79 ft	Control Type	Inlet Control
Headwater Depth/ Height	2.03		

Grades			
Upstream Invert	1,223.90 ft	Downstream Invert	1,223.58 ft
Length	72.00 ft	Constructed Slope	0.004444 ft/ft

Hydraulic Profile			
Profile	S2	Depth, Downstream	4.00 ft
Slope Type	Steep	Normal Depth	N/A ft
Flow Regime	Supercritical	Critical Depth	3.94 ft
Velocity Downstream	11.09 ft/s	Critical Slope	0.003384 ft/ft

Section			
Section Shape	Box	Mannings Coefficient	0.013
Section Material	Concrete	Span	10.00 ft
Section Size	10 x 4 ft	Rise	4.00 ft
Number Sections	2		

Outlet Control Properties			
Outlet Control HW Elev	1,230.79 ft	Upstream Velocity Head	1.97 ft
Ke	0.50	Entrance Loss	0.98 ft

Inlet Control Properties			
Inlet Control HW Elev	1,232.01 ft	Flow Control	Submerged
Inlet Type	90 and 15 ° wingwall flares	Area Full	80.0 ft²
K	0.06100	HDS 5 Chart	8
M	0.75000	HDS 5 Scale	2
C	0.04000	Equation Form	1
Y	0.80000		

Culvert Designer/Analyzer Report
4513+00 EXIST 10'x5' RCBC

Analysis Component			
Storm Event	Design	Discharge	554.00 cfs

Peak Discharge Method: User-Specified			
Design Discharge	554.00 cfs	Check Discharge	0.00 cfs

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	N/A ft

Name	Description	Discharge	HW Elev	Velocity
Culvert-1	1-10 x 5 ft Box	554.00 cfs	1,236.39 ft	13.84 ft/s
Weir	Not Considered	N/A	N/A	N/A

Culvert Designer/Analyzer Report
4513+00 EXIST 10'x5' RCBC

Component:Culvert-1

Culvert Summary			
Computed Headwater Elevation	1,236.39 ft	Discharge	554.00 cfs
Inlet Control HW Elev	1,236.39 ft	Tailwater Elevation	N/A ft
Outlet Control HW Elev	1,235.50 ft	Control Type	Inlet Control
Headwater Depth/ Height	1.78		

Grades			
Upstream Invert	1,227.50 ft	Downstream Invert	1,227.08 ft
Length	64.75 ft	Constructed Slope	0.006486 ft/ft

Hydraulic Profile			
Profile	S2	Depth, Downstream	4.00 ft
Slope Type	Steep	Normal Depth	3.66 ft
Flow Regime	Supercritical	Critical Depth	4.57 ft
Velocity Downstream	13.84 ft/s	Critical Slope	0.003526 ft/ft

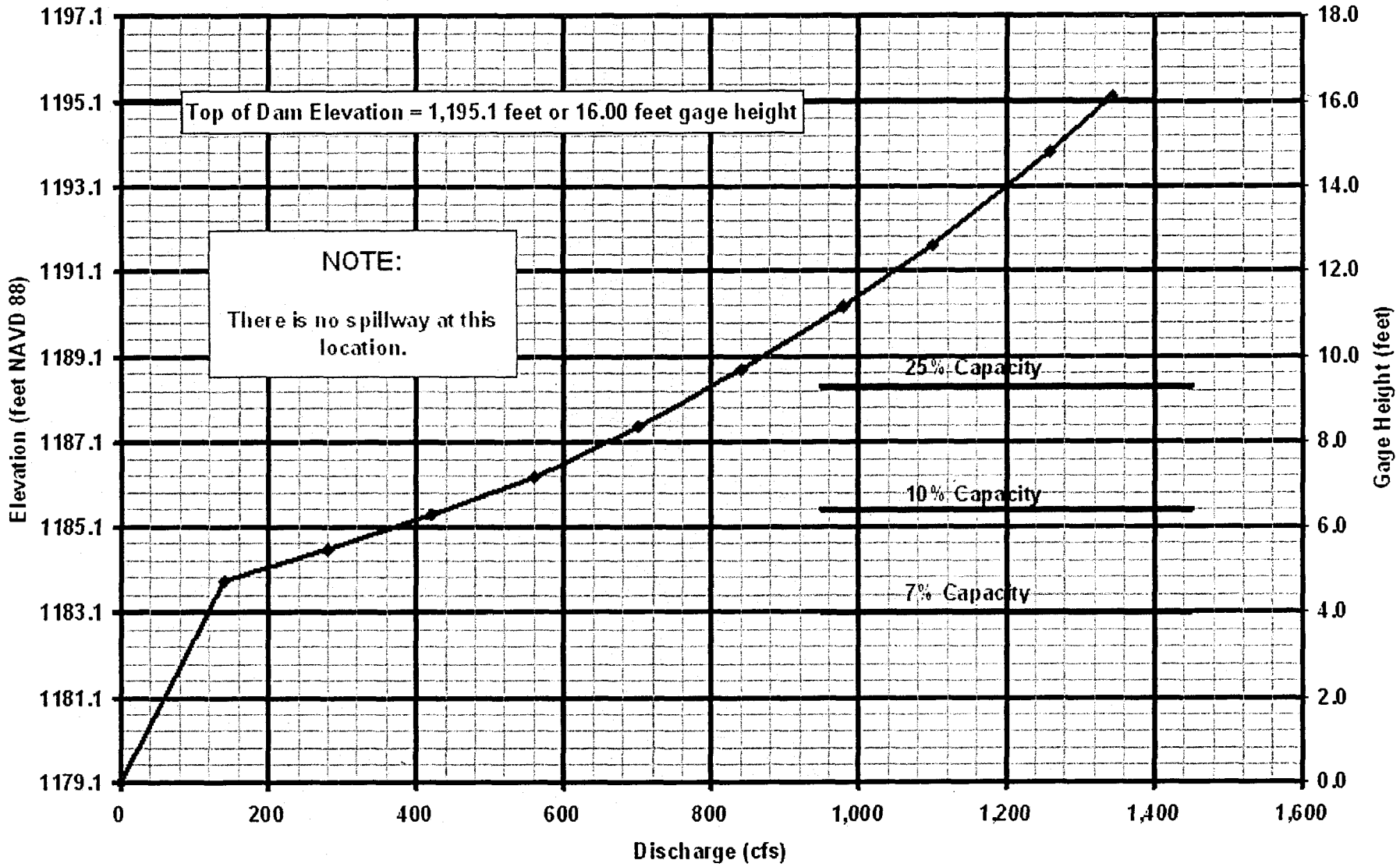
Section			
Section Shape	Box	Mannings Coefficient	0.013
Section Material	Concrete	Span	10.00 ft
Section Size	10 x 5 ft	Rise	5.00 ft
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev	1,235.50 ft	Upstream Velocity Head	2.28 ft
Ke	0.50	Entrance Loss	1.14 ft

Inlet Control Properties			
Inlet Control HW Elev	1,236.39 ft	Flow Control	Submerged
Inlet Type	90 and 15 ° wingwall flares	Area Full	50.0 ft²
K	0.06100	HDS 5 Chart	8
M	0.75000	HDS 5 Scale	2
C	0.04000	Equation Form	1
Y	0.80000		

E.5 Hydraulic Calculations

Saddleback FRS - Stage-Discharge Relation



LOWER CENTENNIAL
PHASE IV
CROSS SECTION EXHIBIT

JLK Engineers
Transportation Drainage Public Works
18441 N. 25th Ave. Suite 103
Phoenix, AZ 85023
Tel 602-405-1875
Fax 602-288-5781

Registered Professional Engineer (Civil) CERTIFICATE NO. 31474 JOE R. GONZALEZ Date Signed ARIZONA U.S.A.

LAYOUT	DRAFTED	CHECKED
JRG	NZ	PTG

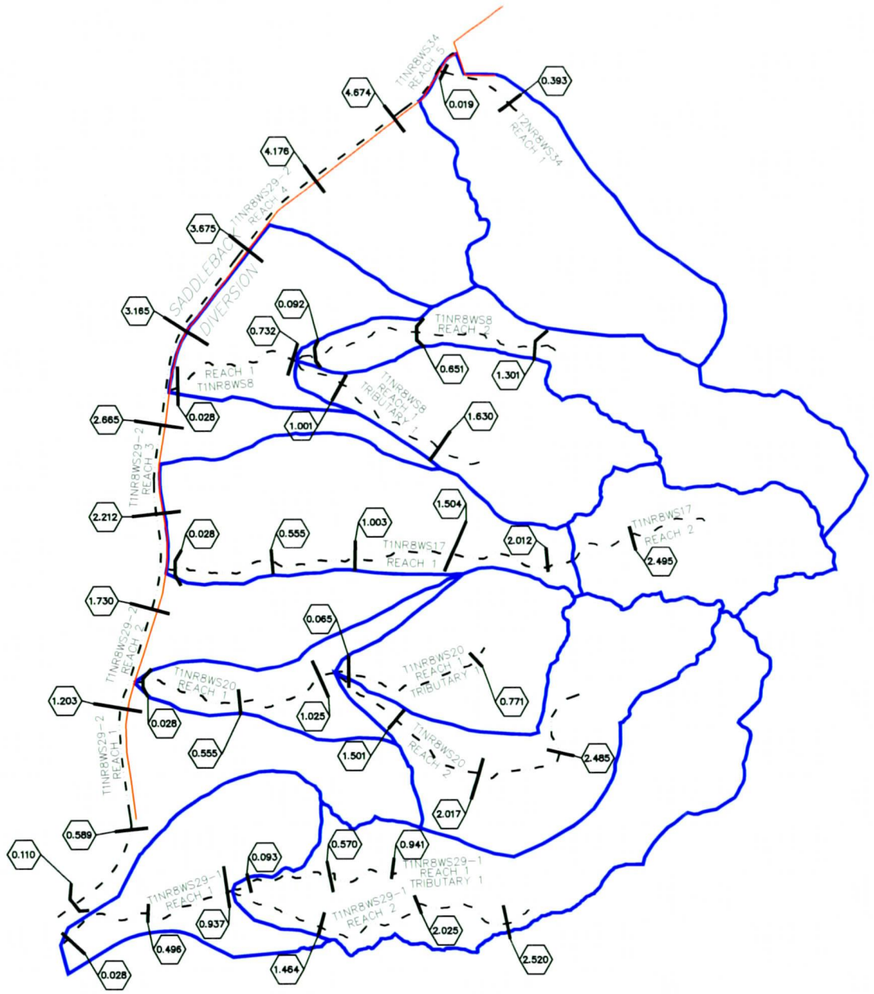
DRAWING SCALE(S)

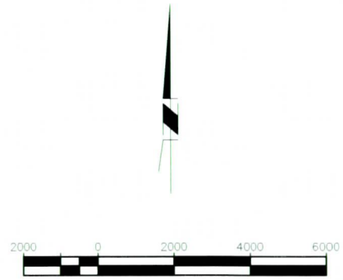
ORIGINAL PLAN DATE OCT./2005

LATEST REVISION

PROJECT NUMBER FCDMC0501

SHEET NO. 1 OF 2 SHEETS





LEGEND

- SUB-BASIN BOUNDARY
- SUB-BASIN THALWAG
- CULVERT
- 1.500 STATION RIVER MILE

LOWER CENTENNIAL
PHASE IV
CROSS SECTION EXHIBIT

JLK Engineers
Transportation Drainage Public Works
18441 N. 25th Ave., Suite 103
Phoenix, AZ 85023
Tel 602-405-1875
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Registered Professional Engineer (Civil) CERTIFICATE NO. 31474 JOE R. GONZALEZ Date Signed ARIZONA U.S.A.

LAYOUT	DRAFTED	CHECKED
JRG	NZ	PTG

DRAWING SCALE(S)

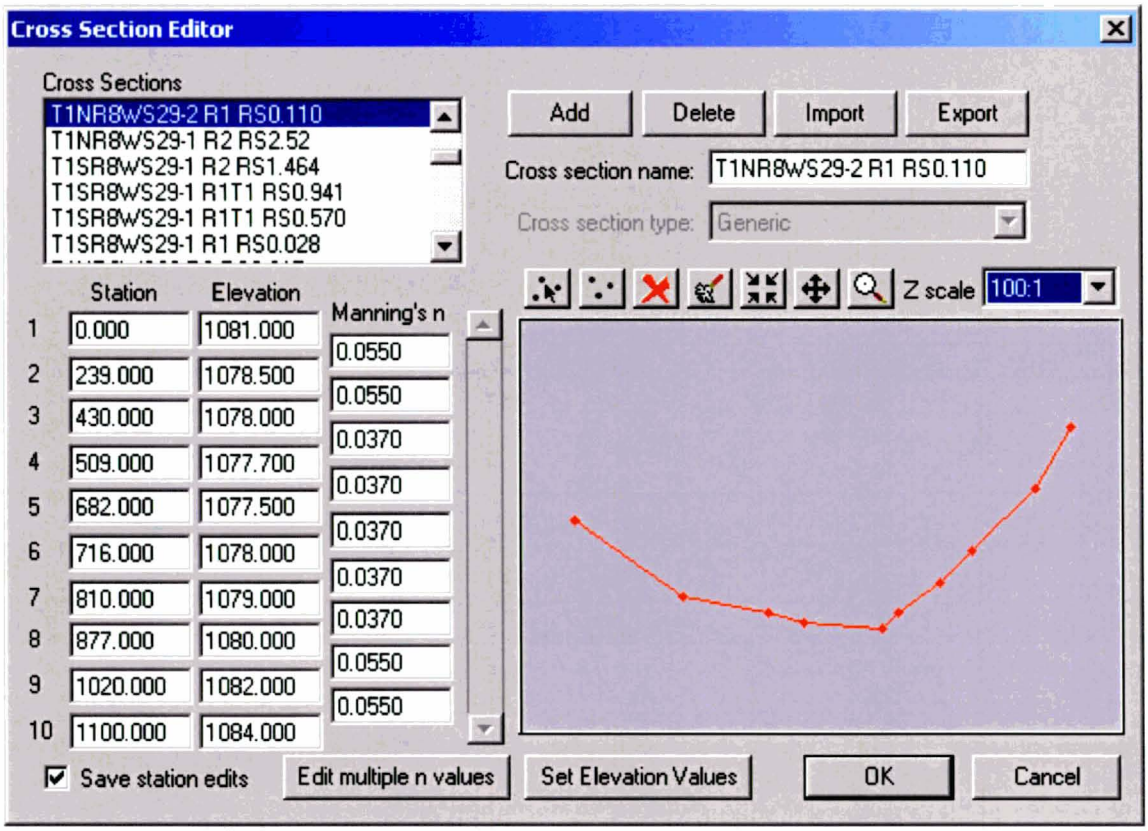
ORIGINAL PLAN DATE OCT./2005

LATEST REVISION

PROJECT NUMBER FCDMC0501

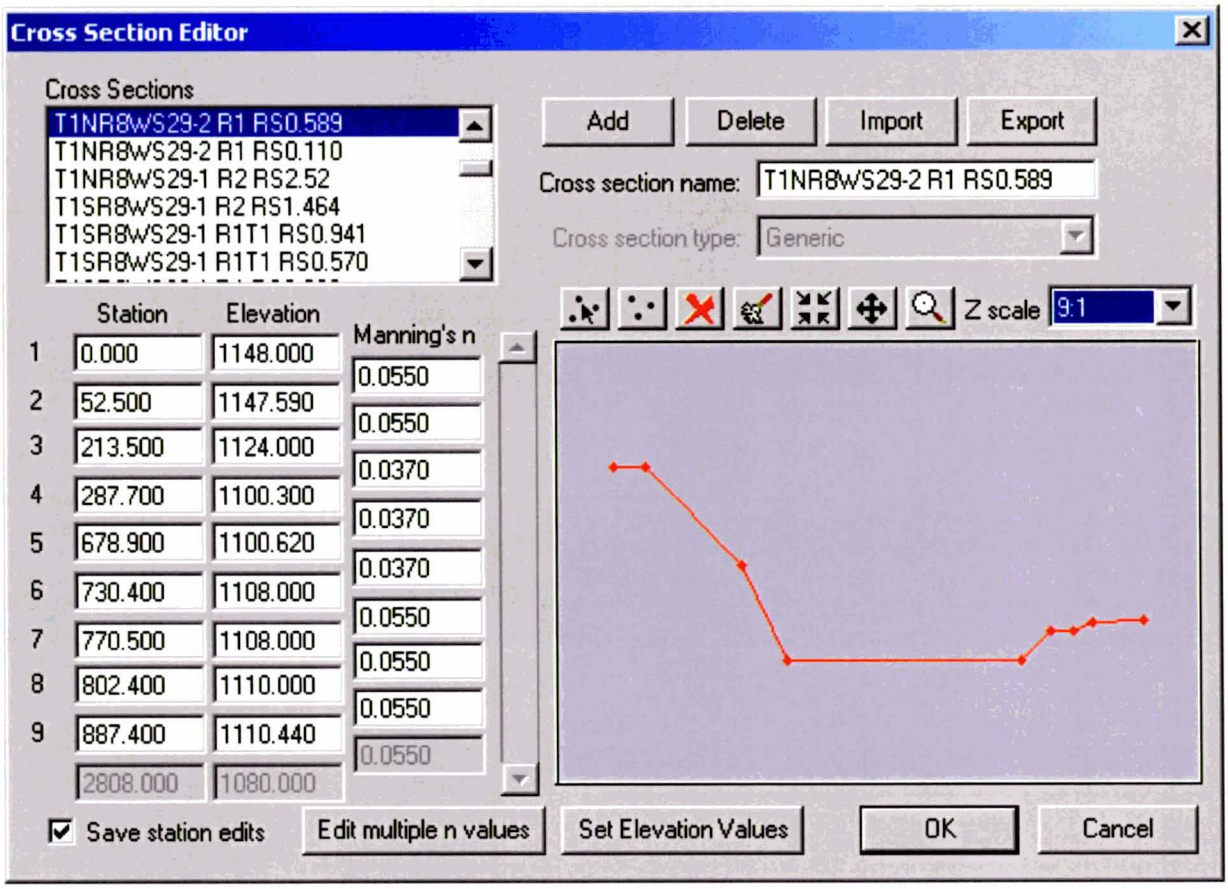
SHEET NO. 2 OF 2 SHEETS

SADDLEBACK DIVERSION CHANNEL
RS 0.110



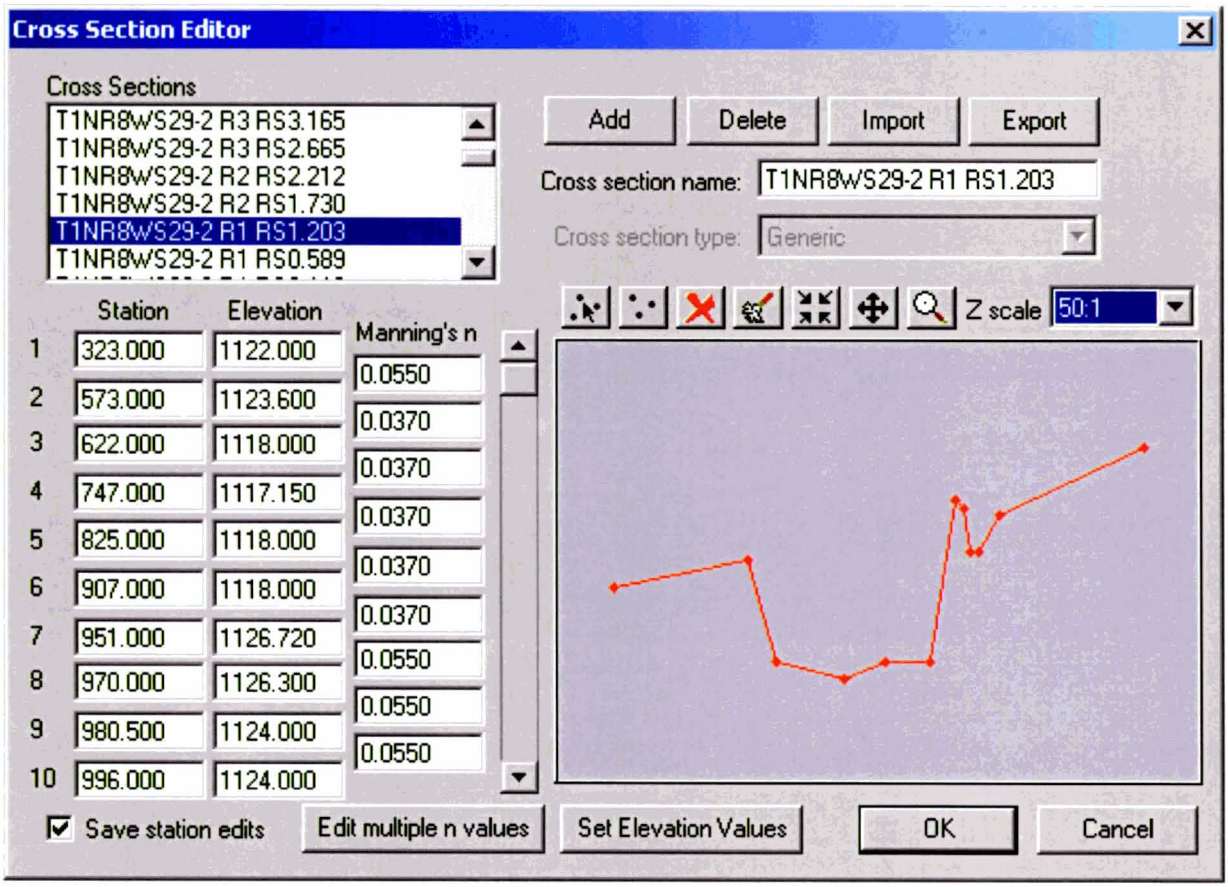
Calculated Values
Longitudinal Slope: 0.0078 ft/ft
Flow: 7805.000 cfs
Depth: 3.039 ft
Area of Flow: 1723.115 sq ft
Wetted Perimeter: 871.464 ft
Average Velocity: 4.530 fps
Top Width (T): 871.432 ft
Froude Number: 0.568
Critical Depth: 2.297 ft
Critical Velocity: 6.951 fps
Critical Slope: 0.02518
Critical Top Width: 748.470 ft

SADDLEBACK DIVERSION CHANNEL
RS 0.589



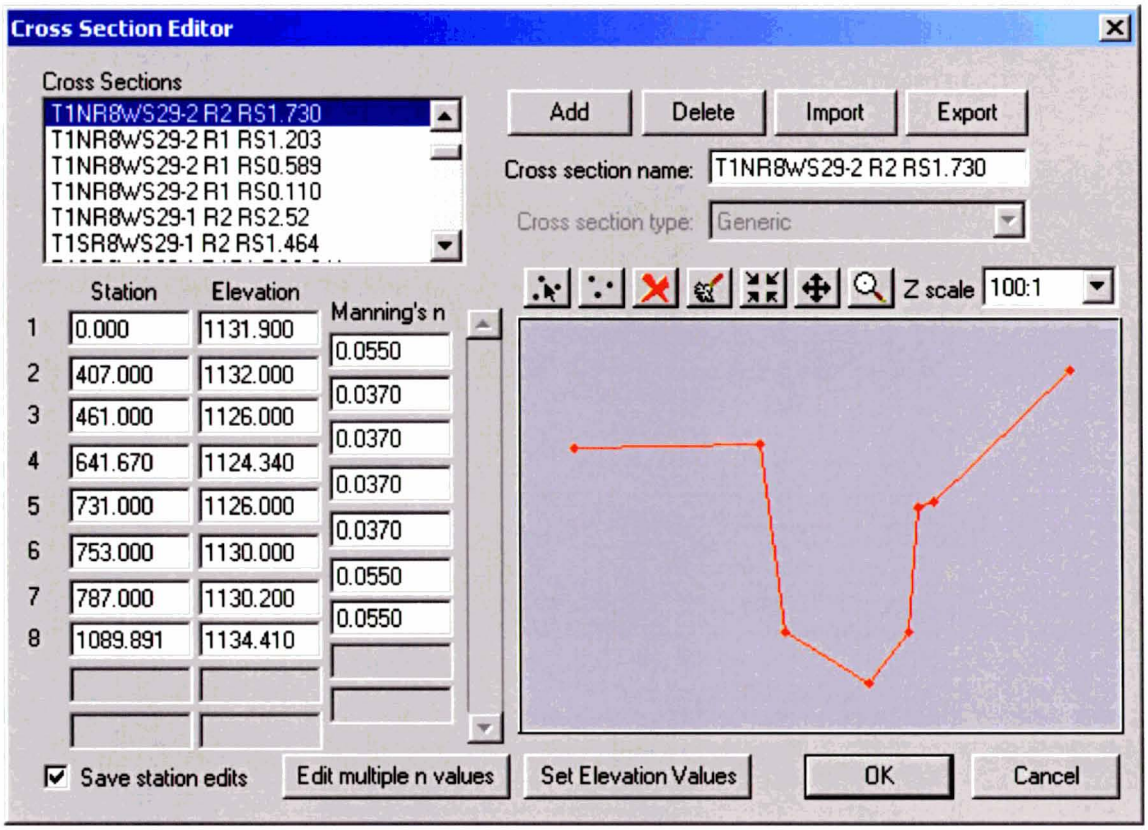
Calculated Values
Longitudinal Slope: 0.0078 ft/ft
Flow: 7432.000 cfs
Depth: 2.877 ft
Area of Flow: 1098.490 sq ft
Wetted Perimeter: 418.677 ft
Average Velocity: 6.766 fps
Top Width (T): 418.047 ft
Froude Number: 0.736
Critical Depth: 2.378 ft
Critical Velocity: 8.337 fps
Critical Slope: 0.01539
Critical Top Width: 413.010 ft

SADDLEBACK DIVERSION CHANNEL
RS 1.203



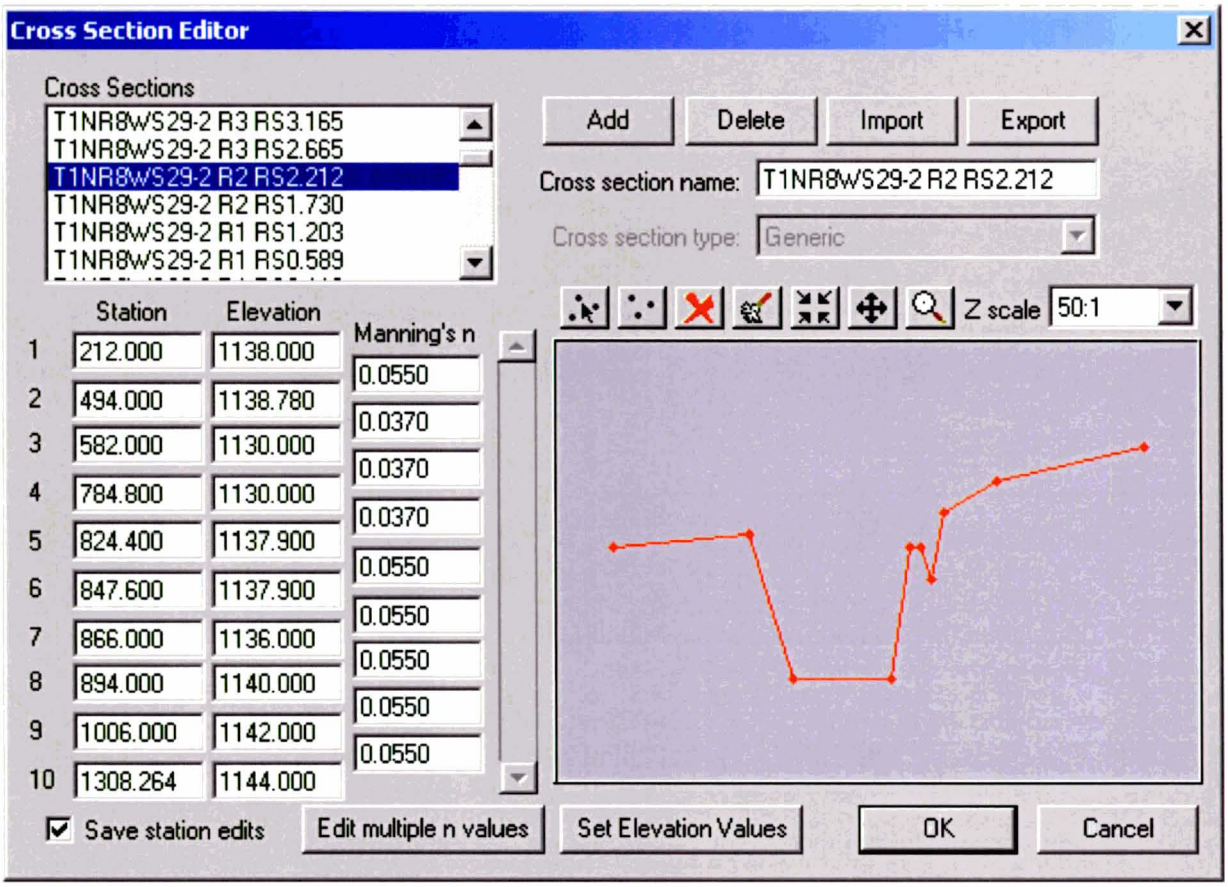
Calculated Values
Longitudinal Slope: 0.0030 ft/ft
Flow: 6953.000 cfs
Depth: 4.718 ft
Area of Flow: 1291.940 sq ft
Wetted Perimeter: 338.973 ft
Average Velocity: 5.382 fps
Top Width (T): 338.366 ft
Froude Number: 0.485
Critical Depth: 3.157 ft
Critical Velocity: 8.907 fps
Critical Slope: 0.01472
Critical Top Width: 316.833 ft

SADDLEBACK DIVERSION CHANNEL
RS 1.730



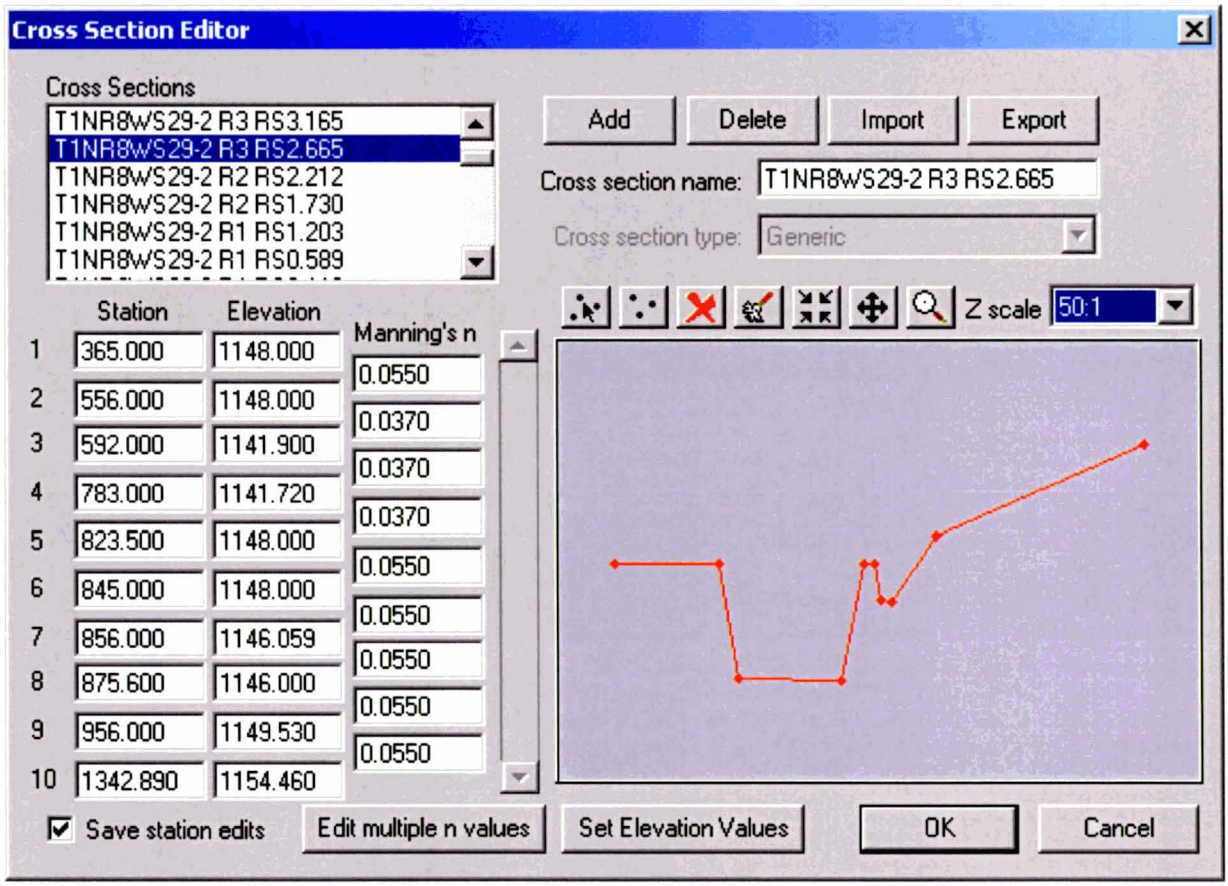
Calculated Values
Longitudinal Slope: 0.0030 ft/ft
Flow: 5996.000 cfs
Depth: 4.820 ft
Area of Flow: 1149.833 sq ft
Wetted Perimeter: 316.309 ft
Average Velocity: 5.215 fps
Top Width (T): 315.826 ft
Froude Number: 0.482
Critical Depth: 3.312 ft
Critical Velocity: 8.693 fps
Critical Slope: 0.01496
Critical Top Width: 293.947 ft

SADDLEBACK DIVERSION CHANNEL
RS 2.212



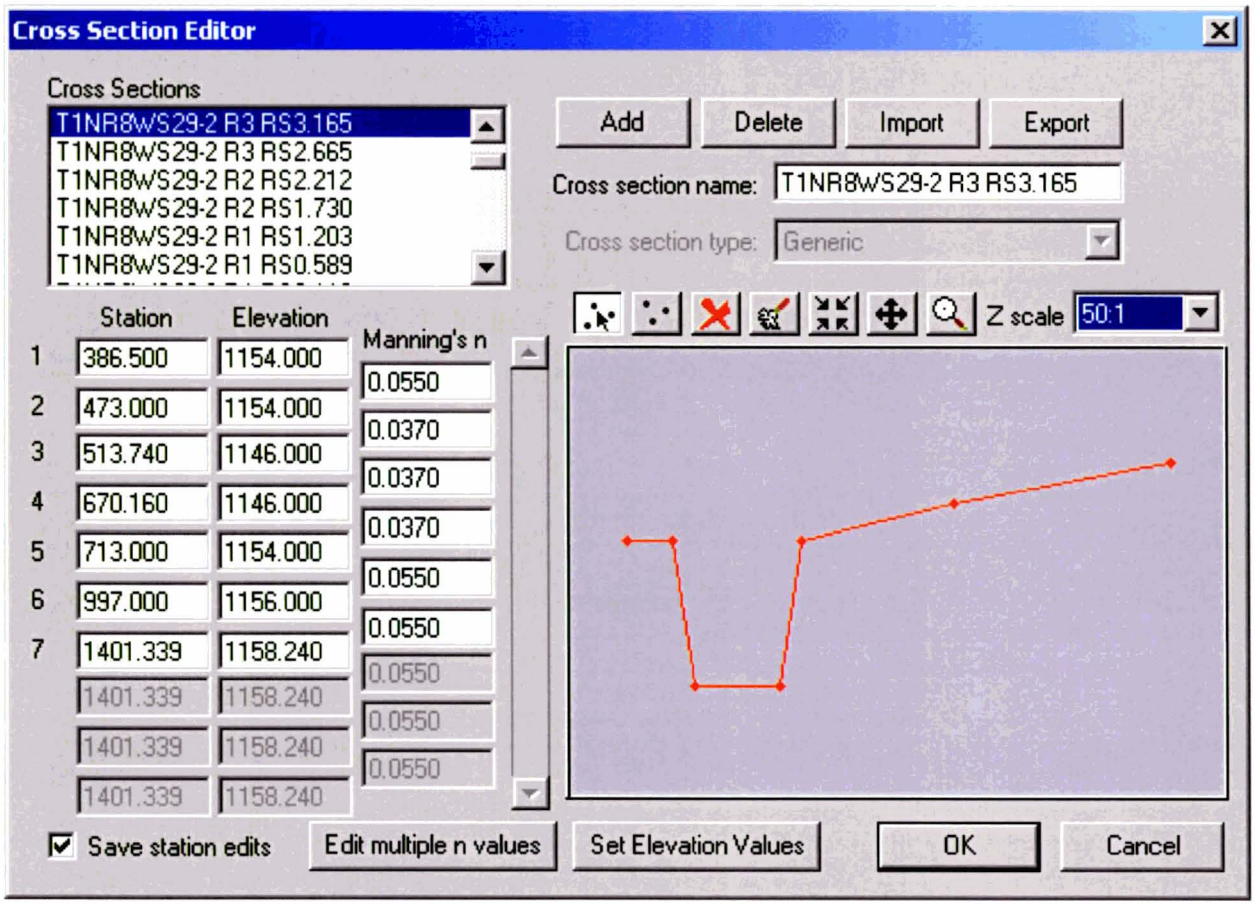
Calculated Values
Longitudinal Slope: 0.0022 ft/ft
Flow: 5188.000 cfs
Depth: 4.593 ft
Area of Flow: 1090.072 sq ft
Wetted Perimeter: 272.541 ft
Average Velocity: 4.759 fps
Top Width (T): 271.859 ft
Froude Number: 0.419
Critical Depth: 2.638 ft
Critical Velocity: 8.832 fps
Critical Slope: 0.01482
Critical Top Width: 242.470 ft

SADDLEBACK DIVERSION CHANNEL
RS 2.665



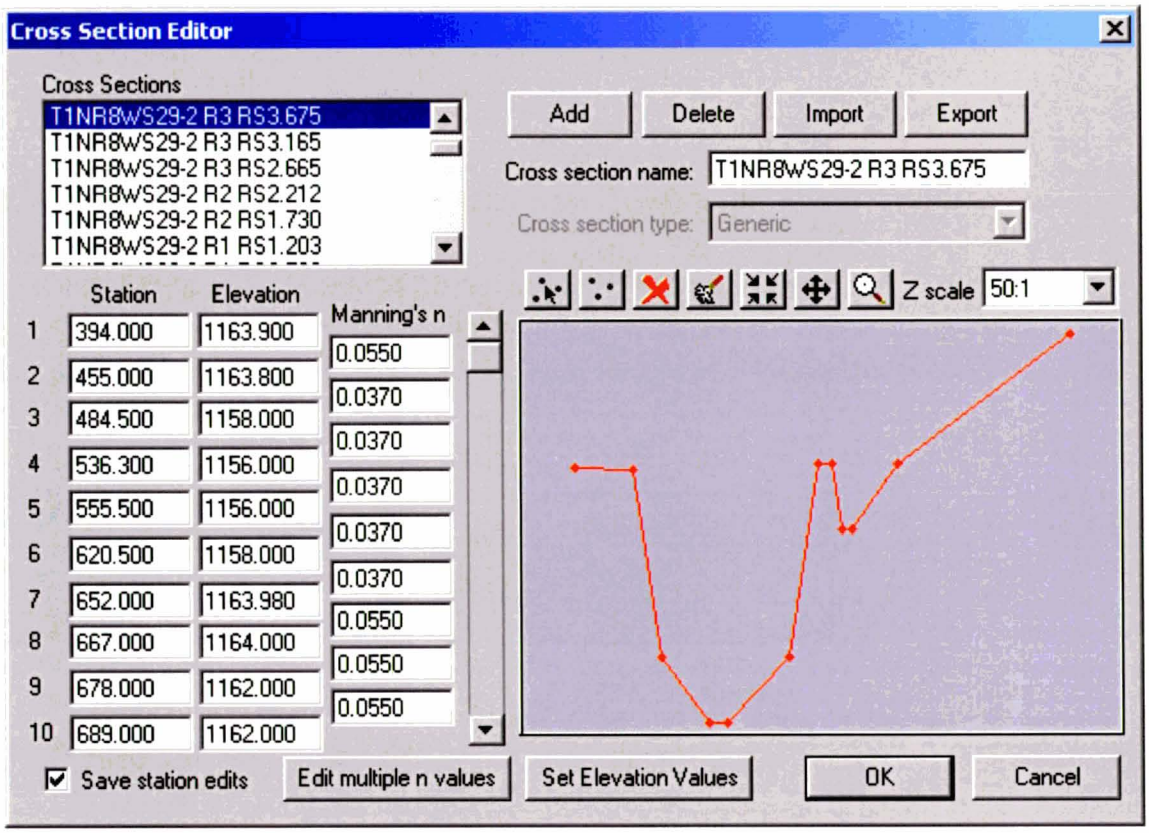
Calculated Values
Longitudinal Slope: 0.0022 ft/ft
Flow: 4592.000 cfs
Depth: 4.593 ft
Area of Flow: 1514.110 sq ft
Wetted Perimeter: 272.541 ft
Average Velocity: 4.759 fps
Top Width (T): 271.859 ft
Froude Number: 0.419
Critical Depth: 2.638 ft
Critical Velocity: 8.832 fps
Critical Slope: 0.01482
Critical Top Width: 242.470 ft

SADDLEBACK DIVERSION CHANNEL
RS 3.165



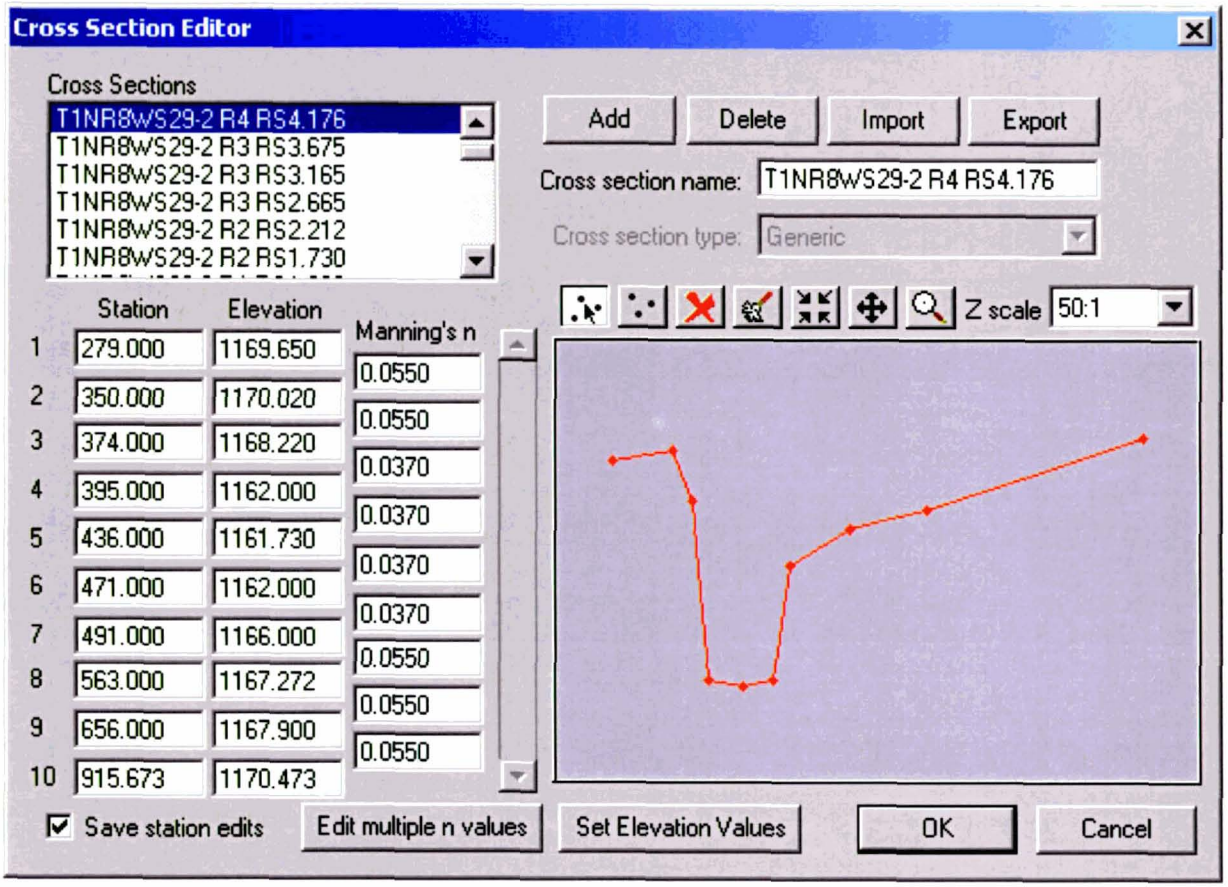
Calculated Values
Longitudinal Slope: 0.0020 ft/ft
Flow: 4127.000 cfs
Depth: 4.830 ft
Area of Flow: 877.373 sq ft
Wetted Perimeter: 207.798 ft
Average Velocity: 4.705 fps
Top Width (T): 206.881 ft
Froude Number: 0.403
Critical Depth: 2.701 ft
Critical Velocity: 8.962 fps
Critical Slope: 0.01469
Critical Top Width: 184.637 ft

SADDLEBACK DIVERSION CHANNEL
RS 3.675



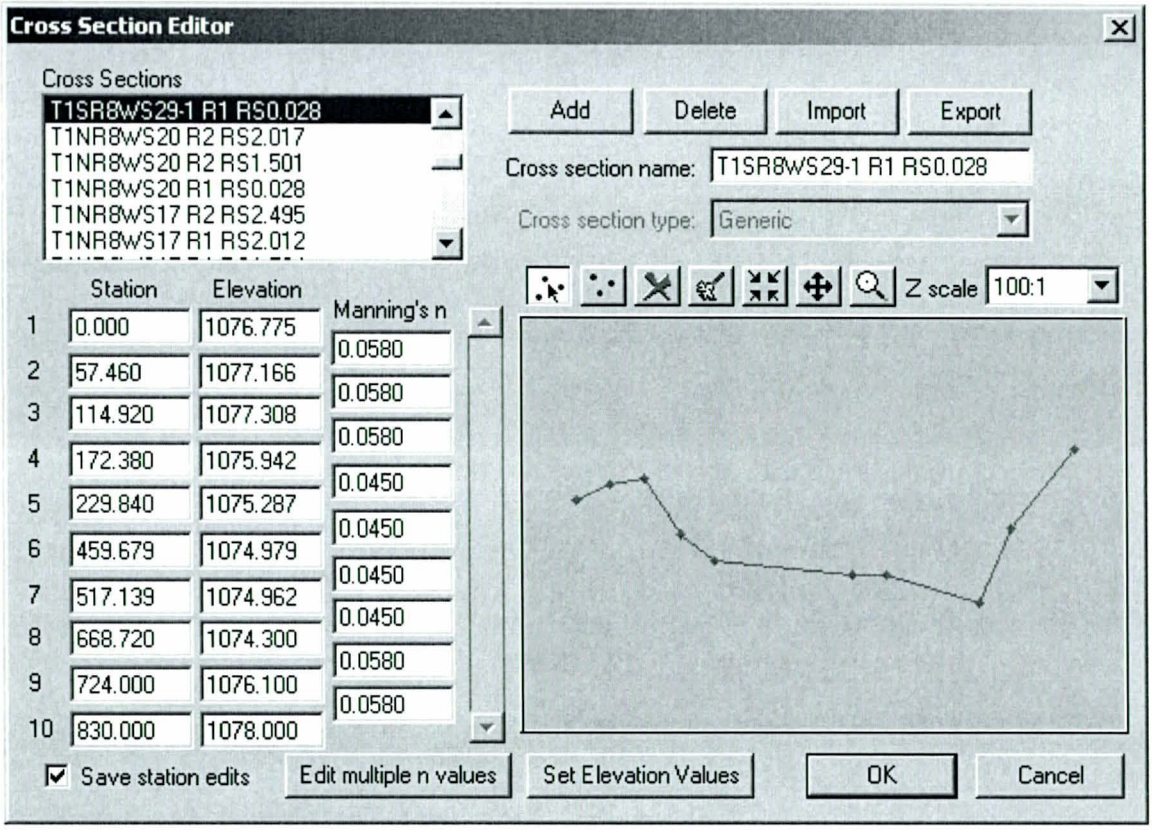
Calculated Values
Longitudinal Slope: 0.0020 ft/ft
Flow: 3750.000 cfs
Depth: 5.985 ft
Area of Flow: 779.370 sq ft
Wetted Perimeter: 178.092 ft
Average Velocity: 4.818 fps
Top Width (T): 177.260 ft
Froude Number: 0.405
Critical Depth: 3.737 ft
Critical Velocity: 9.226 fps
Critical Slope: 0.01441
Critical Top Width: 153.984 ft

SADDLEBACK DIVERSION CHANNEL
RS 4.176



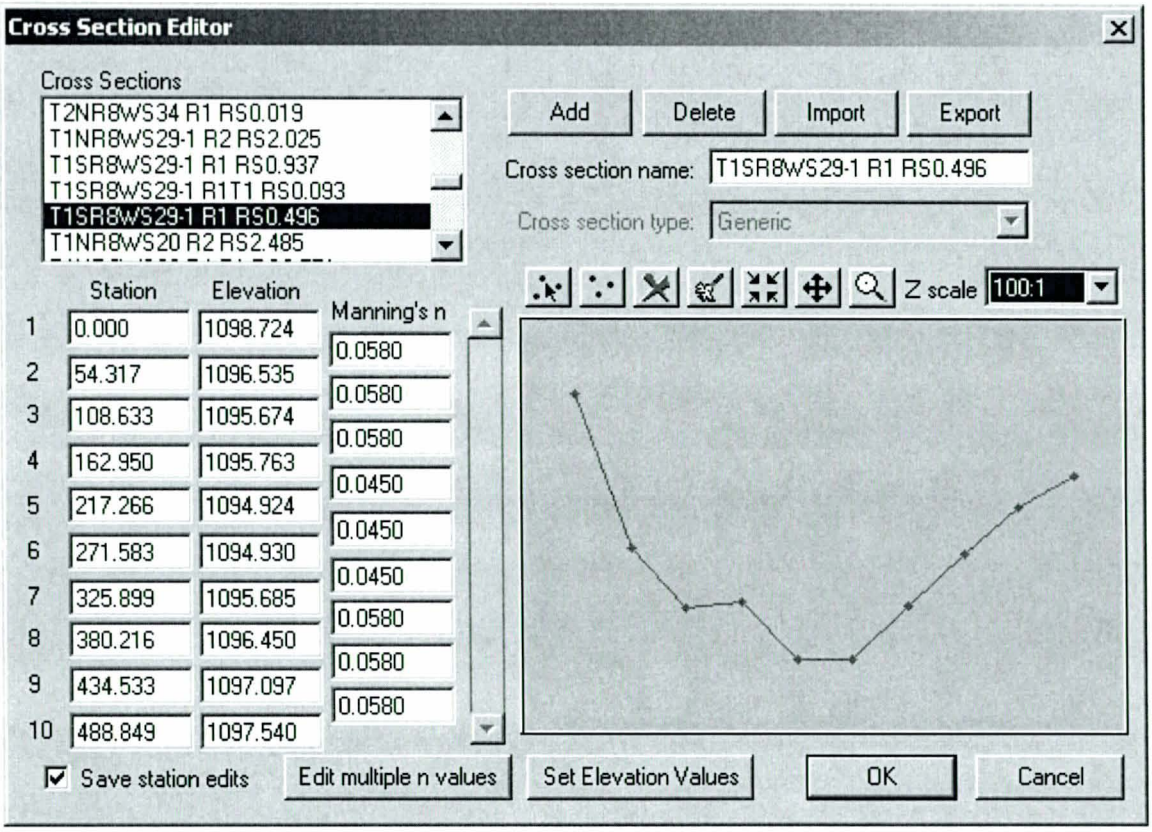
Calculated Values
Longitudinal Slope: 0.0020 ft/ft
Flow: 3379.000 cfs
Depth: 7.713 ft
Area of Flow: 1280.806 sq ft
Wetted Perimeter: 455.419 ft
Average Velocity: 2.638 fps
Top Width (T): 454.052 ft
Froude Number: 0.277
Critical Depth: 3.839 ft
Critical Velocity: 10.091 fps
Critical Slope: 0.01368
Critical Top Width: 105.896 ft

BASIN B133
RS 0.028



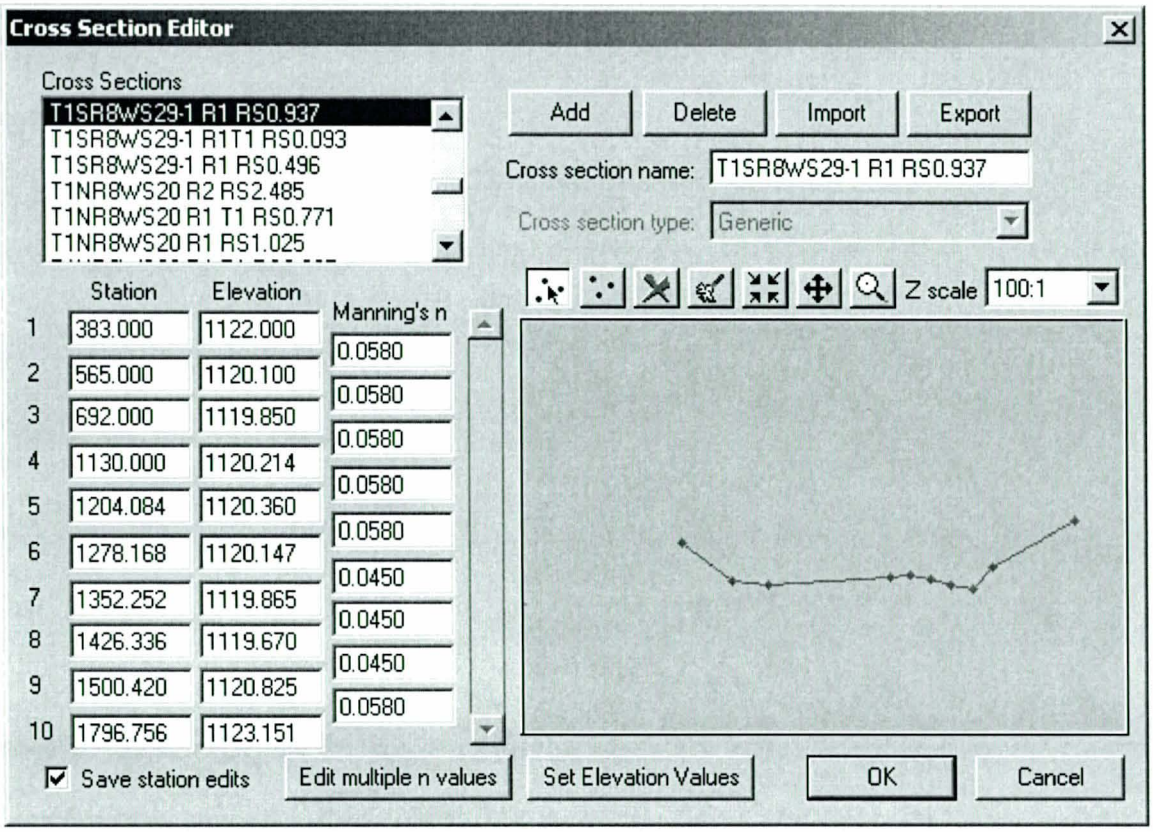
Calculated Values
Longitudinal Slope: 0.0068 ft/ft
Flow: 1729.000 cfs
Depth: 1.851 ft
Area of Flow: 616.635 sq ft
Wetted Perimeter: 563.288 ft
Average Velocity: 2.804 fps
Top Width (T): 563.250 ft
Froude Number: 0.472
Critical Depth: 1.383 ft
Critical Velocity: 4.760 fps
Critical Slope: 0.03461
Critical Top Width: 516.113 ft

BASIN B133
RS 0.496



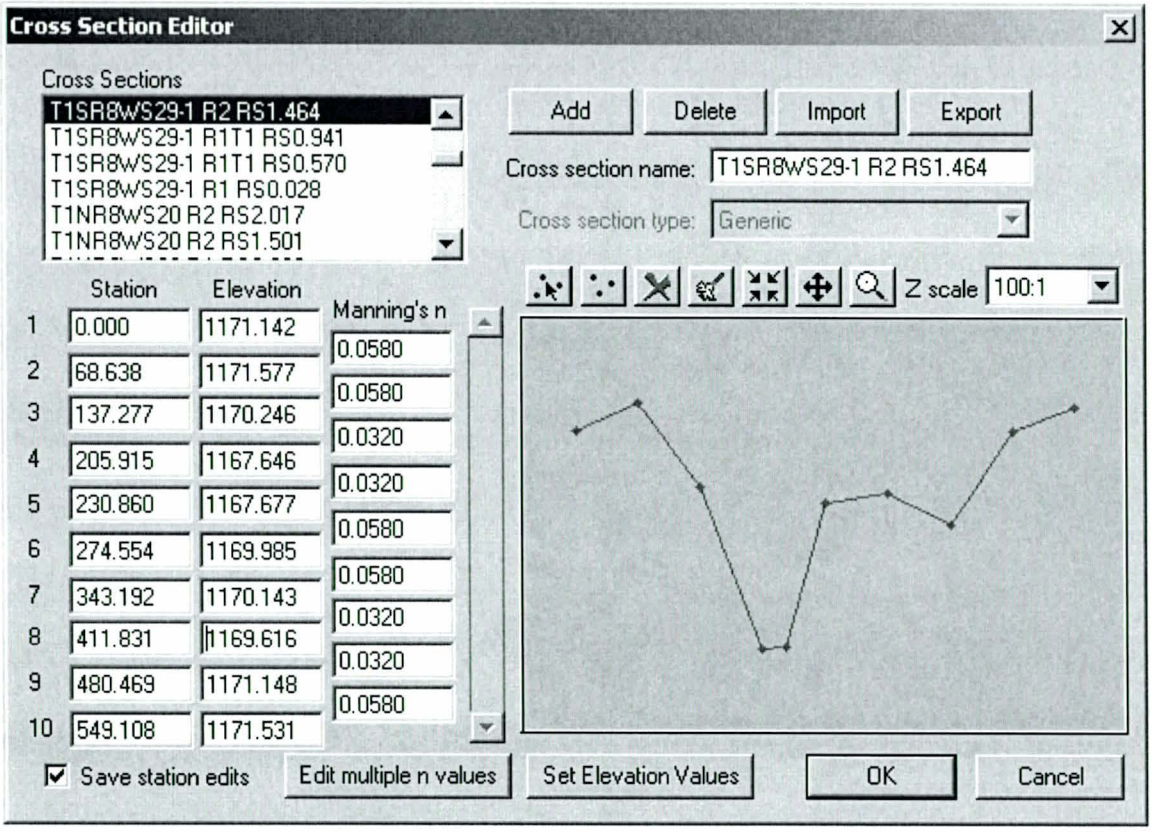
Calculated Values
Longitudinal Slope: 0.0105 ft/ft
Flow: 1729.000 cfs
Depth: 2.138 ft
Area of Flow: 502.947 sq ft
Wetted Perimeter: 390.496 ft
Average Velocity: 3.438 fps
Top Width (T): 390.458 ft
Froude Number: 0.534
Critical Depth: 1.617 ft
Critical Velocity: 5.505 fps
Critical Slope: 0.03949
Critical Top Width: 333.683 ft

BASIN B133
RS 0.937



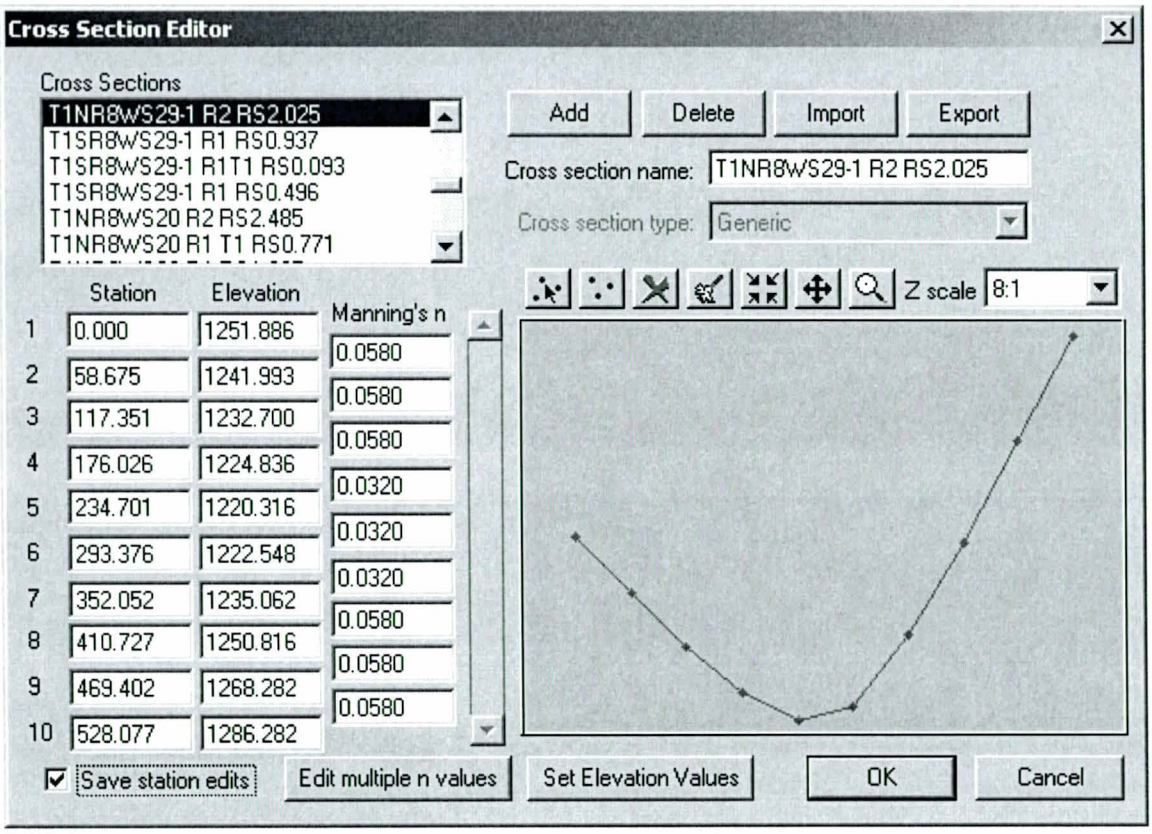
Calculated Values
Longitudinal Slope: 0.0105 ft/ft
Flow: 1729.000 cfs
Depth: 1.158 ft
Area of Flow: 800.873 sq ft
Wetted Perimeter: 1152.230 ft
Average Velocity: 2.159 fps
Top Width (T): 1152.218 ft
Froude Number: 0.456
Critical Depth: 0.846 ft
Critical Velocity: 3.770 fps
Critical Slope: 0.05861
Critical Top Width: 1039.119 ft

BASIN B134
RS 1.464



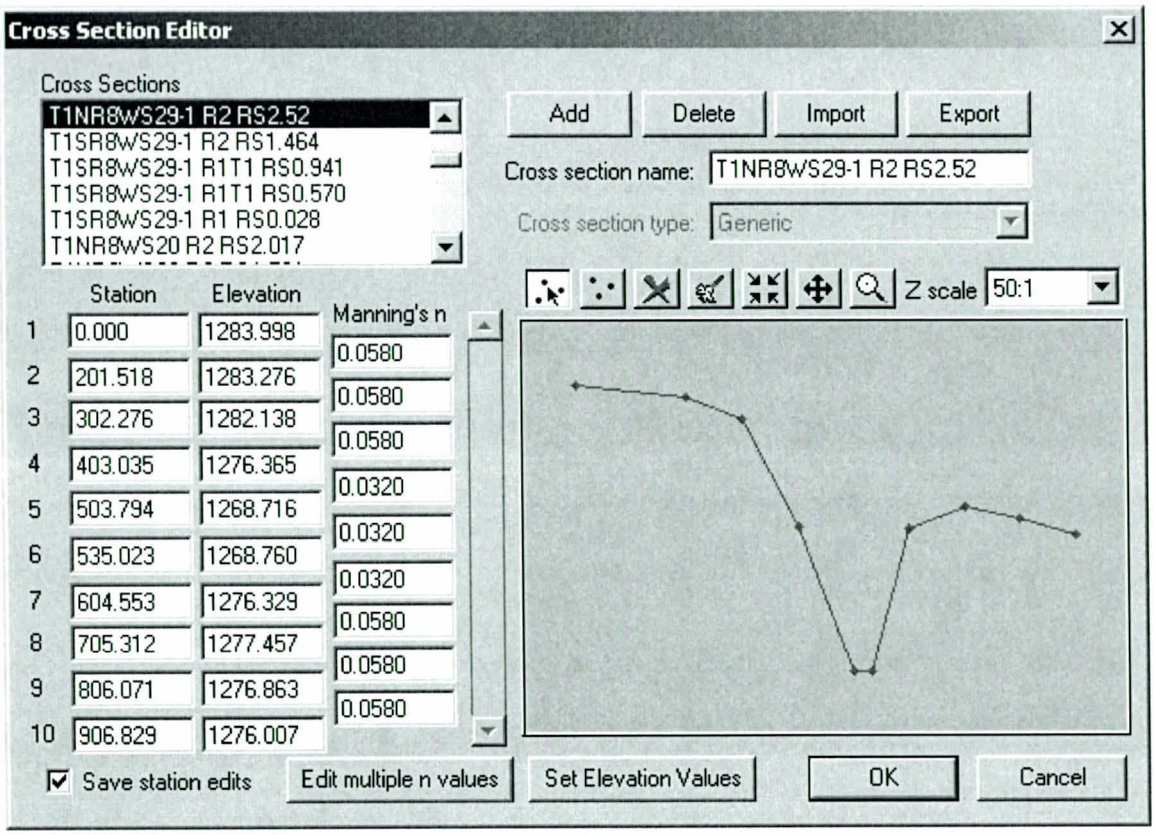
Calculated Values
Longitudinal Slope: 0.0199 ft/ft
Flow: 1279.000 cfs
Depth: 2.638 ft
Area of Flow: 273.681 sq ft
Wetted Perimeter: 306.572 ft
Average Velocity: 4.673 fps
Top Width (T): 306.451 ft
Froude Number: 0.871
Critical Depth: 2.553 ft
Critical Velocity: 5.162 fps
Critical Slope: 0.02695
Critical Top Width: 299.393 ft

BASIN B134
RS 2.025



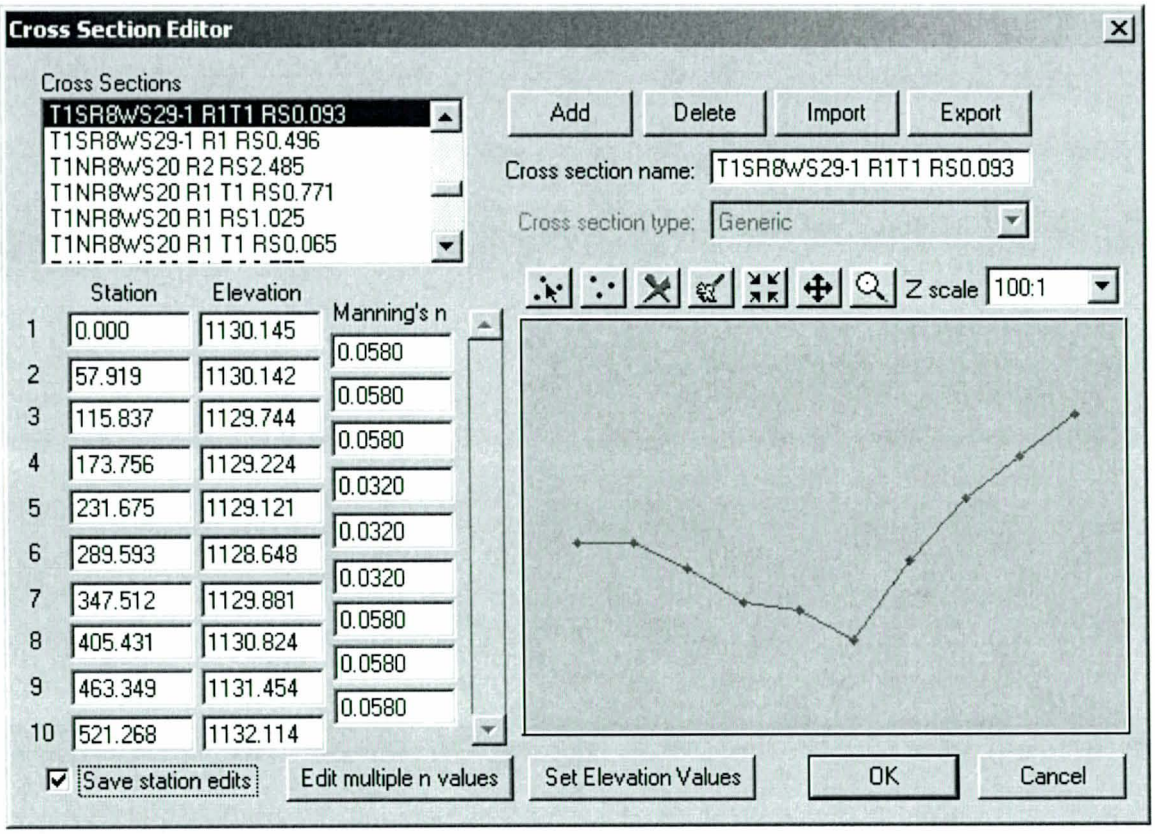
Calculated Values
Longitudinal Slope: 0.0198 ft/ft
Flow: 1279.000 cfs
Depth: 2.773 ft
Area of Flow: 147.827 sq ft
Wetted Perimeter: 97.416 ft
Average Velocity: 8.652 fps
Top Width (T): 97.210 ft
Froude Number: 1.236
Critical Depth: 3.025 ft
Critical Velocity: 7.399 fps
Critical Slope: 0.01248
Critical Top Width: 101.657 ft

BASIN B134
RS 2.520



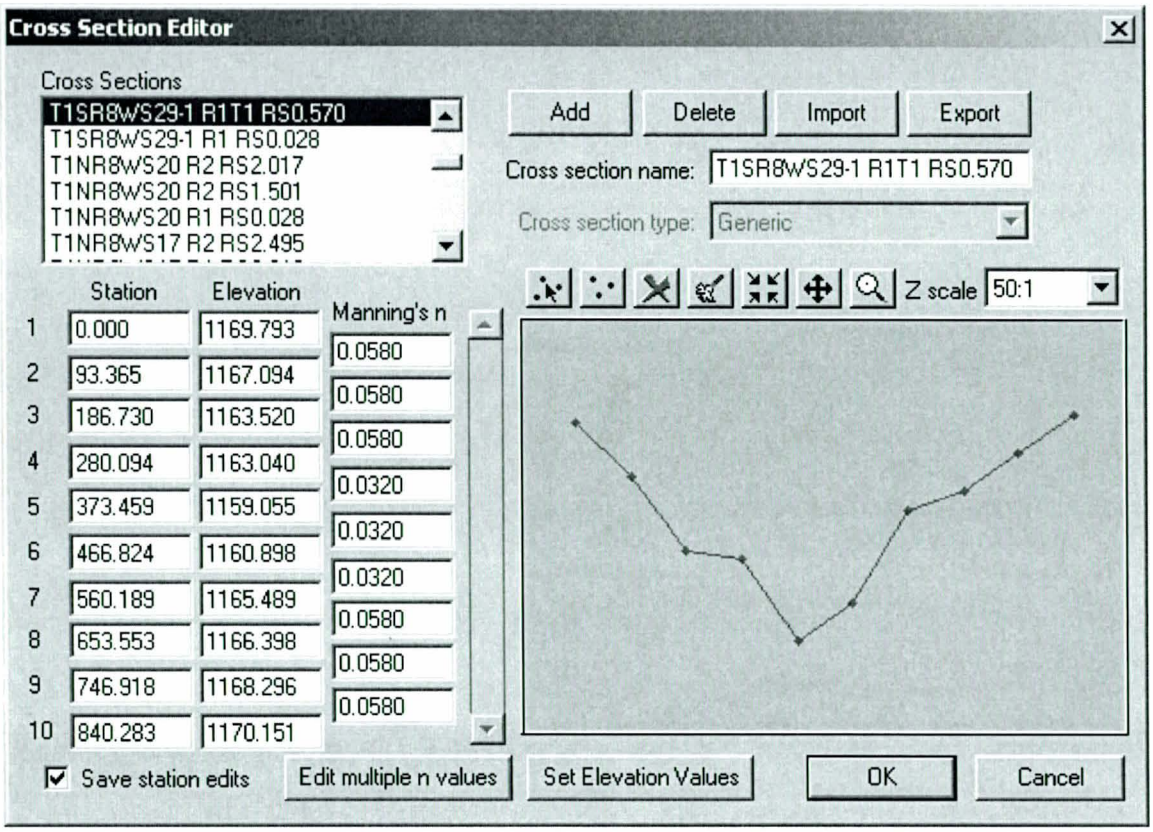
Calculated Values
Longitudinal Slope: 0.0152 ft/ft
Flow: 1279.000 cfs
Depth: 2.593 ft
Area of Flow: 154.365 sq ft
Wetted Perimeter: 89.024 ft
Average Velocity: 8.286 fps
Top Width (T): 88.787 ft
Froude Number: 1.107
Critical Depth: 2.734 ft
Critical Velocity: 7.651 fps
Critical Slope: 0.01221
Critical Top Width: 91.954 ft

BASIN B134
RS 0.093



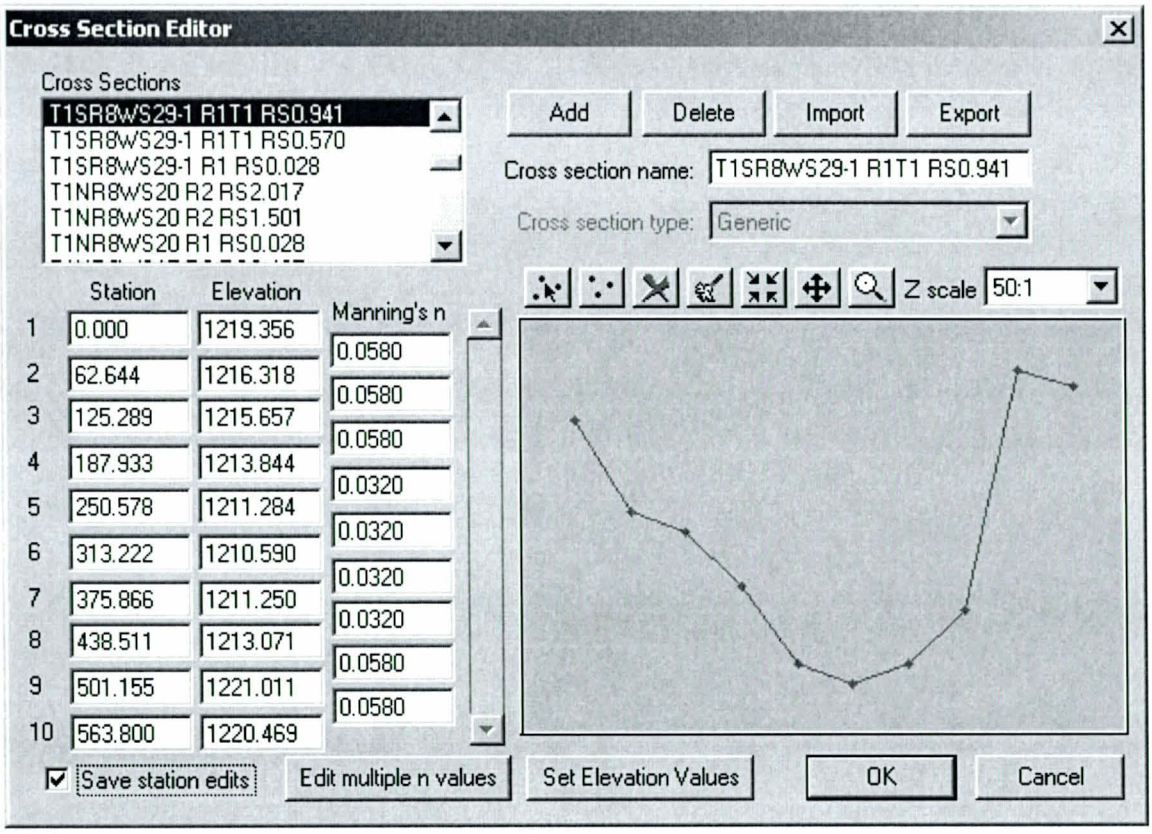
Calculated Values
Longitudinal Slope: 0.0119 ft/ft
Flow: 260.000 cfs
Depth: 0.965 ft
Area of Flow: 97.970 sq ft
Wetted Perimeter: 204.447 ft
Average Velocity: 2.654 fps
Top Width (T): 204.433 ft
Froude Number: 0.676
Critical Depth: 0.836 ft
Critical Velocity: 3.570 fps
Critical Slope: 0.02572
Critical Top Width: 183.950 ft

BASIN B134
RS 0.570



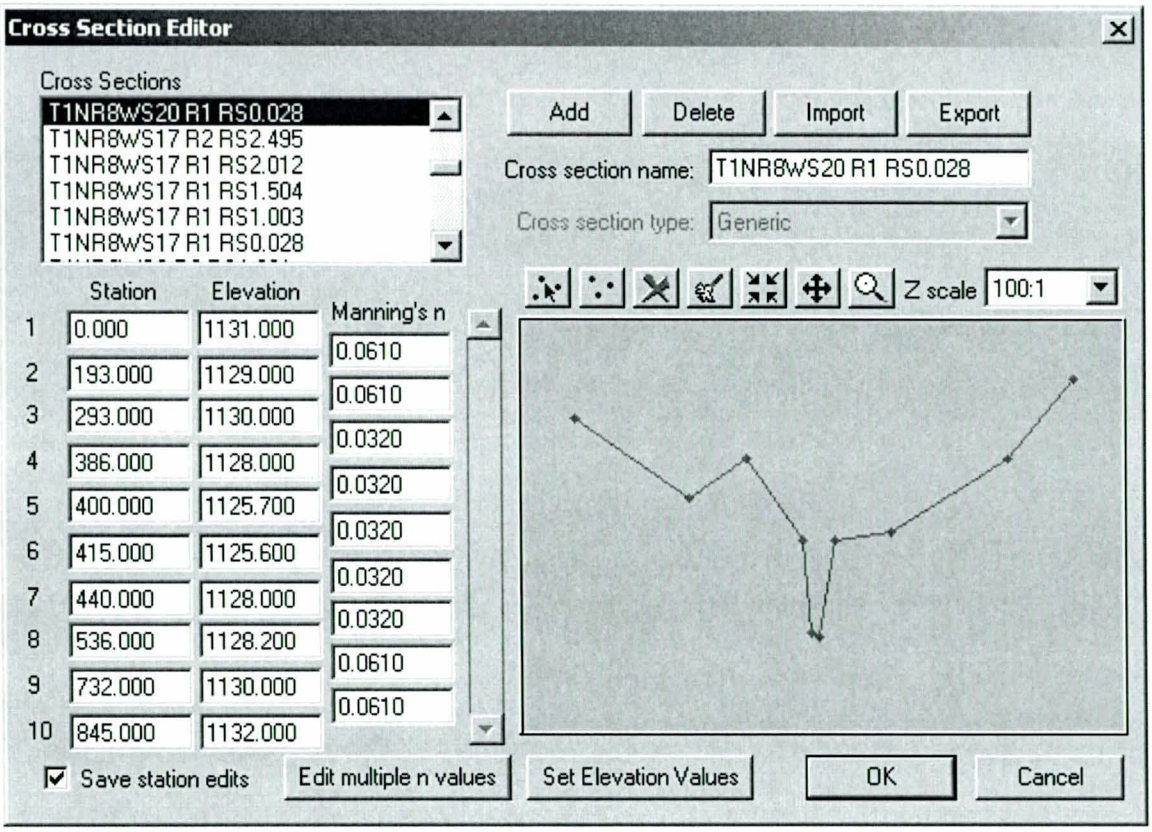
Calculated Values
Longitudinal Slope: 0.0250 ft/ft
Flow: 260.000 cfs
Depth: 1.168 ft
Area of Flow: 50.557 sq ft
Wetted Perimeter: 86.596 ft
Average Velocity: 5.143 fps
Top Width (T): 86.560 ft
Froude Number: 1.186
Critical Depth: 1.251 ft
Critical Velocity: 4.487 fps
Critical Slope: 0.01738
Critical Top Width: 92.668 ft

BASIN B134
RS 0.941



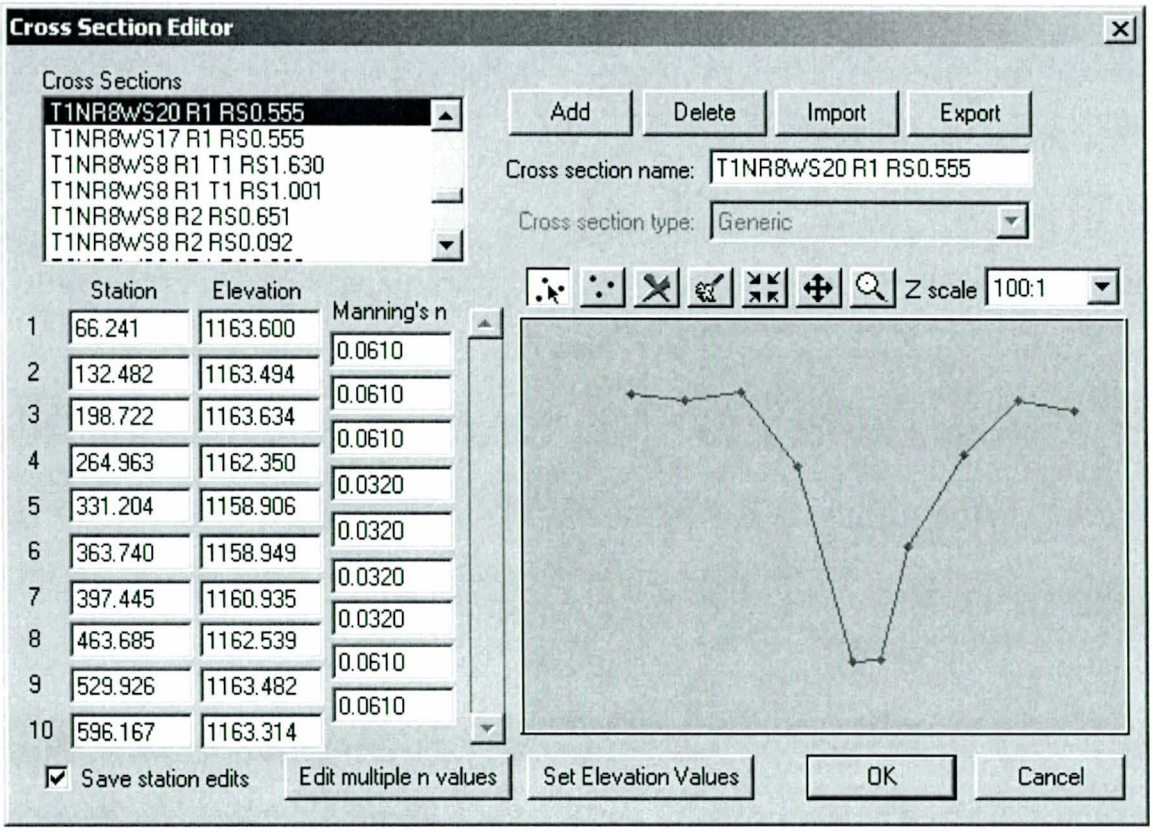
Calculated Values
Longitudinal Slope: 0.0455 ft/ft
Flow: 260.000 cfs
Depth: 0.733 ft
Area of Flow: 49.508 sq ft
Wetted Perimeter: 128.761 ft
Average Velocity: 5.252 fps
Top Width (T): 128.752 ft
Froude Number: 1.492
Critical Depth: 0.856 ft
Critical Velocity: 3.948 fps
Critical Slope: 0.01892
Critical Top Width: 136.018 ft

B135
RS 0.028



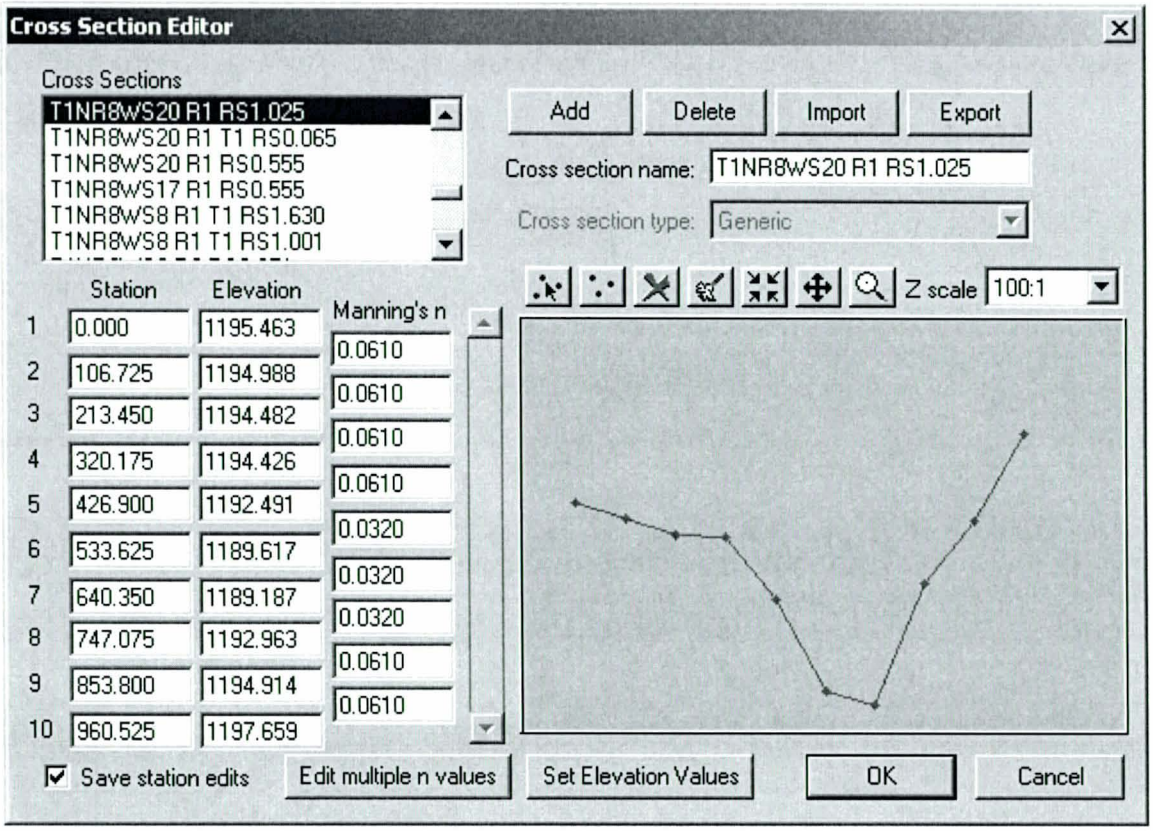
Calculated Values
Longitudinal Slope: 0.0104 ft/ft
Flow: 2131.000 cfs
Depth: 4.243 ft
Area of Flow: 644.081 sq ft
Wetted Perimeter: 580.664 ft
Average Velocity: 3.309 fps
Top Width (T): 580.325 ft
Froude Number: 0.553
Critical Depth: 3.697 ft
Critical Velocity: 5.612 fps
Critical Slope: 0.02999
Critical Top Width: 388.239 ft

B135
RS 0.555



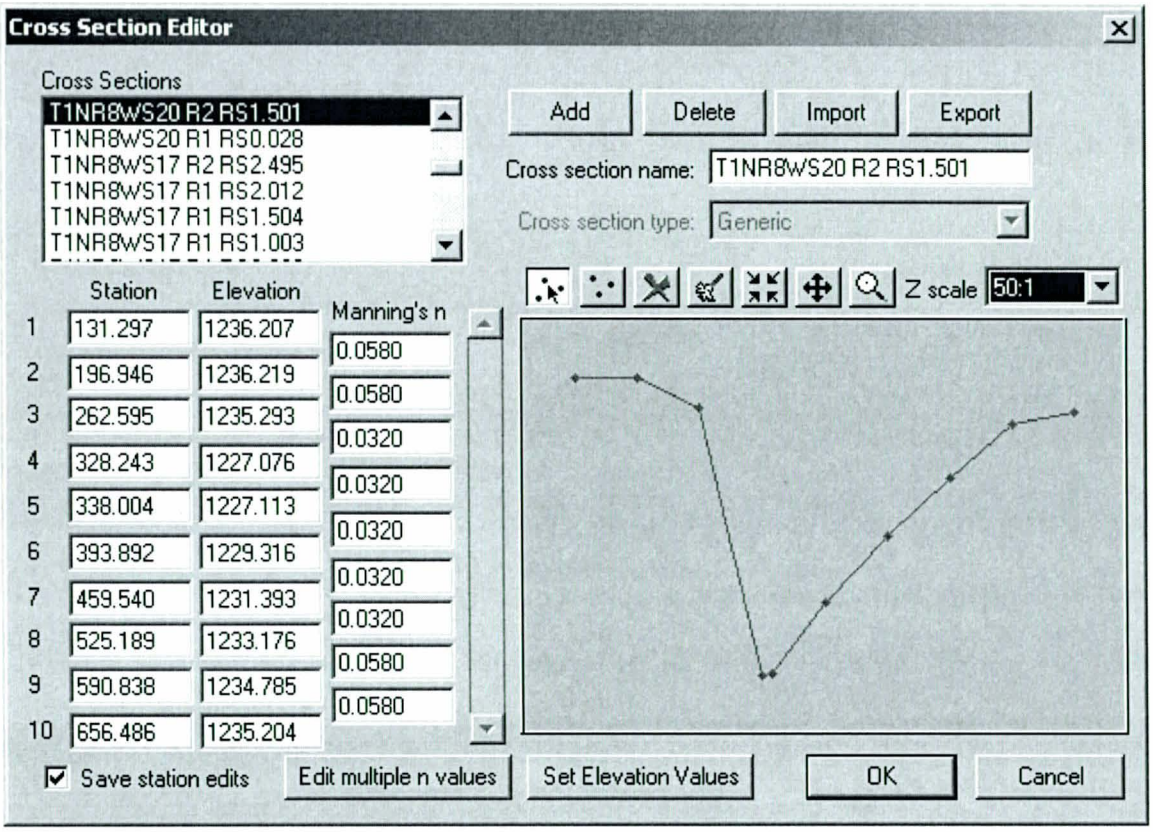
Calculated Values
Longitudinal Slope: 0.0121 ft/ft
Flow: 2131.000 cfs
Depth: 3.242 ft
Area of Flow: 310.622 sq ft
Wetted Perimeter: 178.868 ft
Average Velocity: 6.860 fps
Top Width (T): 178.711 ft
Froude Number: 0.917
Critical Depth: 3.119 ft
Critical Velocity: 7.372 fps
Critical Slope: 0.01249
Critical Top Width: 171.248 ft

B135
RS 1.025



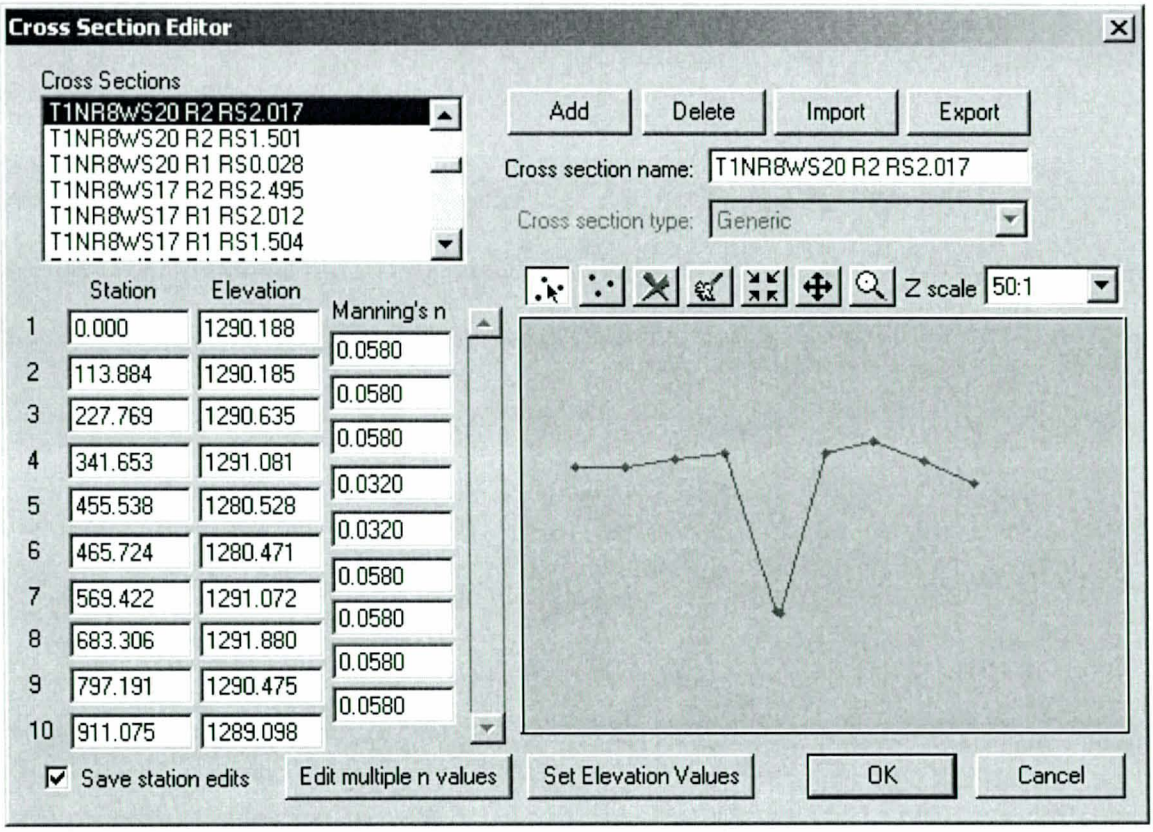
Calculated Values
Longitudinal Slope: 0.0155 ft/ft
Flow: 2131.000 cfs
Depth: 2.040 ft
Area of Flow: 301.645 sq ft
Wetted Perimeter: 224.217 ft
Average Velocity: 7.065 fps
Top Width (T): 224.158 ft
Froude Number: 1.073
Critical Depth: 2.114 ft
Critical Velocity: 6.692 fps
Critical Slope: 0.01331
Critical Top Width: 229.013 ft

B136
RS 1.501



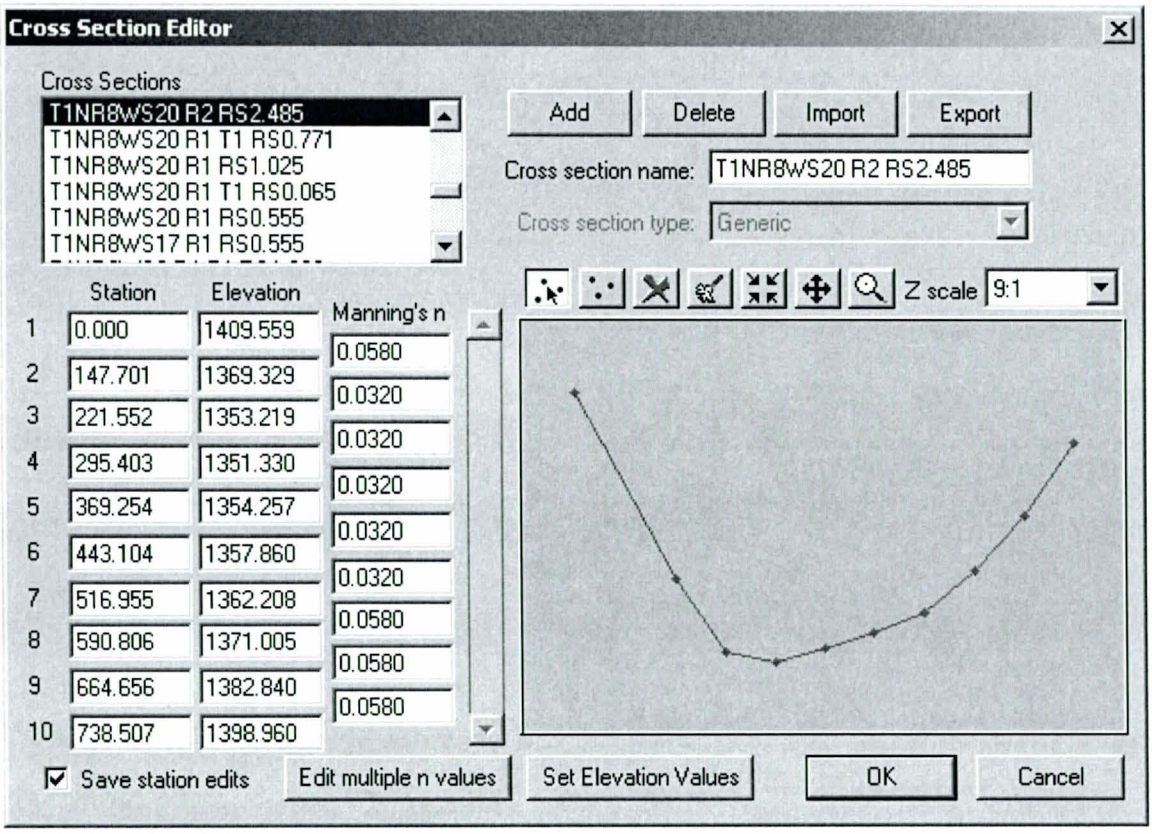
Calculated Values
Longitudinal Slope: 0.0187 ft/ft
Flow: 1377.000 cfs
Depth: 2.876 ft
Area of Flow: 164.388 sq ft
Wetted Perimeter: 108.946 ft
Average Velocity: 8.377 fps
Top Width (T): 108.713 ft
Froude Number: 1.200
Critical Depth: 3.109 ft
Critical Velocity: 7.217 fps
Critical Slope: 0.01269
Critical Top Width: 117.938 ft

B136
RS 2.017



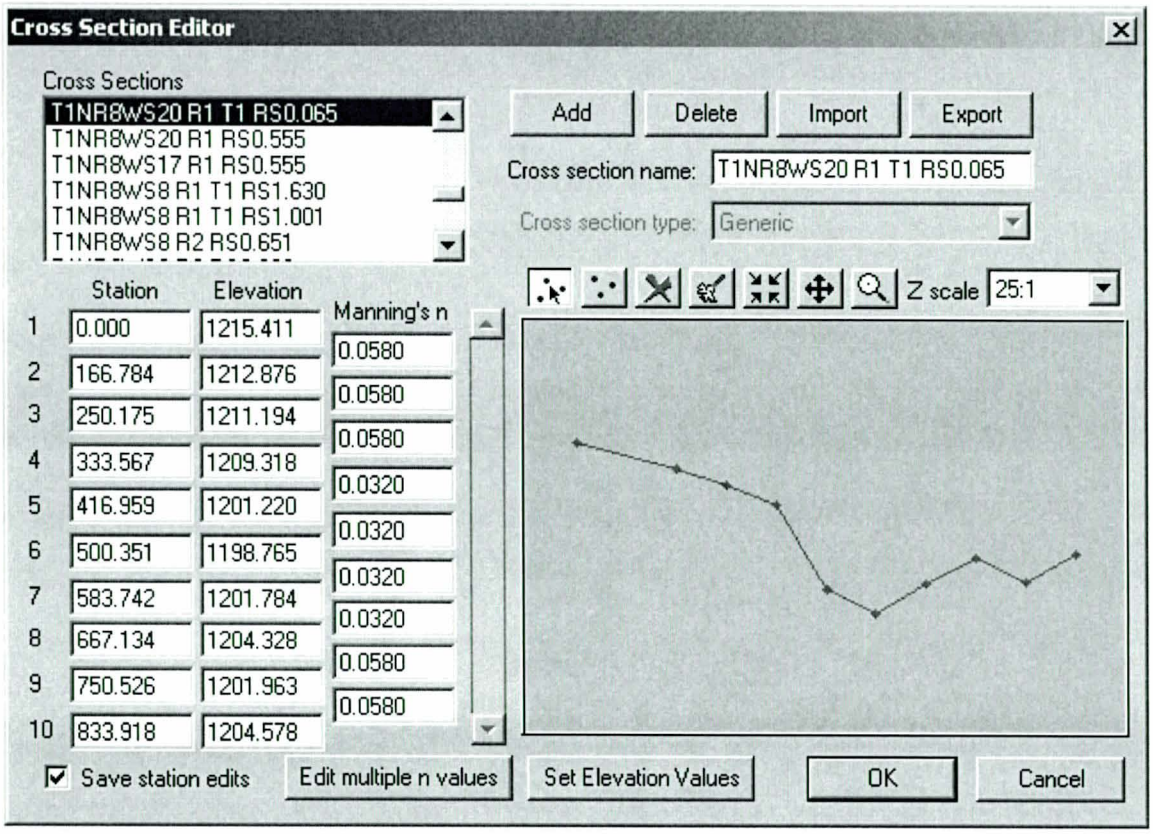
Calculated Values
Longitudinal Slope: 0.0287 ft/ft
Flow: 1377.000 cfs
Depth: 3.416 ft
Area of Flow: 152.452 sq ft
Wetted Perimeter: 80.179 ft
Average Velocity: 9.032 fps
Top Width (T): 79.850 ft
Froude Number: 1.152
Critical Depth: 3.638 ft
Critical Velocity: 8.069 fps
Critical Slope: 0.02130
Critical Top Width: 84.412 ft

B136
RS 2.485



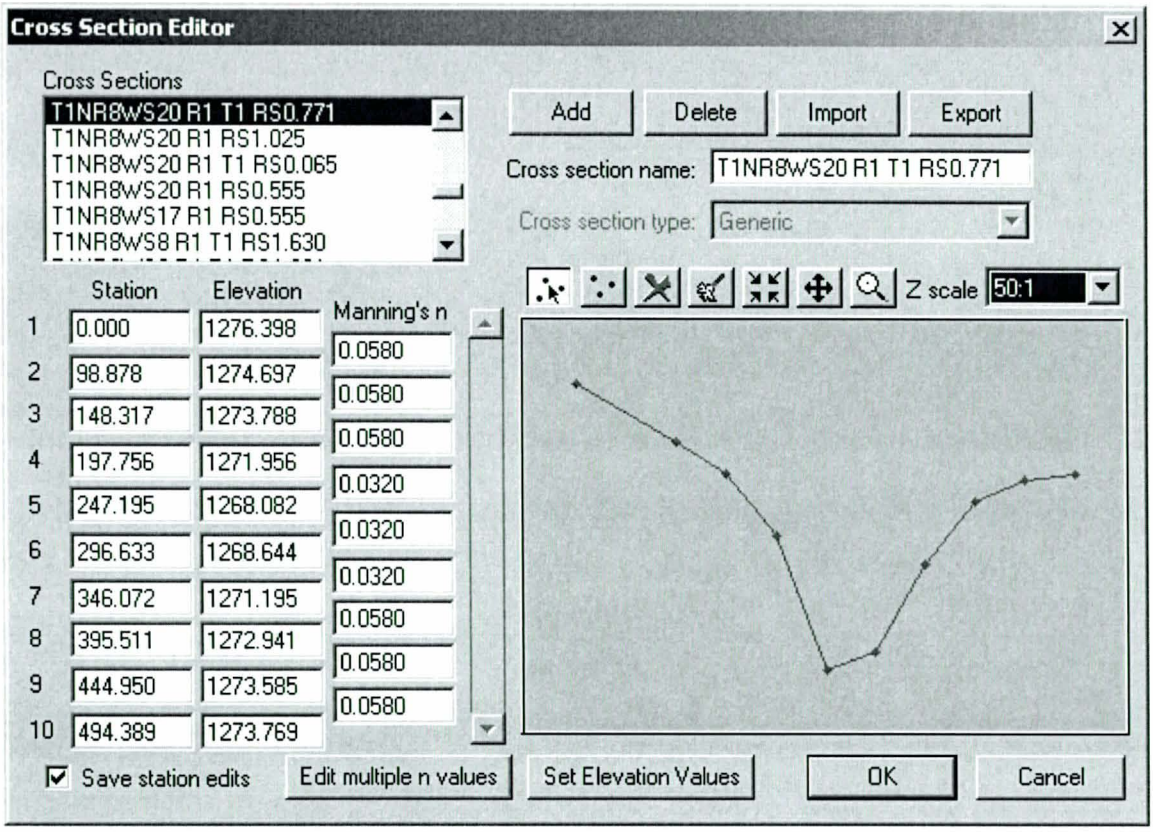
Calculated Values
Longitudinal Slope: 0.0256 ft/ft
Flow: 1377.000 cfs
Depth: 2.260 ft
Area of Flow: 161.874 sq ft
Wetted Perimeter: 132.672 ft
Average Velocity: 8.507 fps
Top Width (T): 132.563 ft
Froude Number: 1.357
Critical Depth: 2.558 ft
Critical Velocity: 6.793 fps
Critical Slope: 0.01319
Critical Top Width: 141.448 ft

B137
RS 0.065



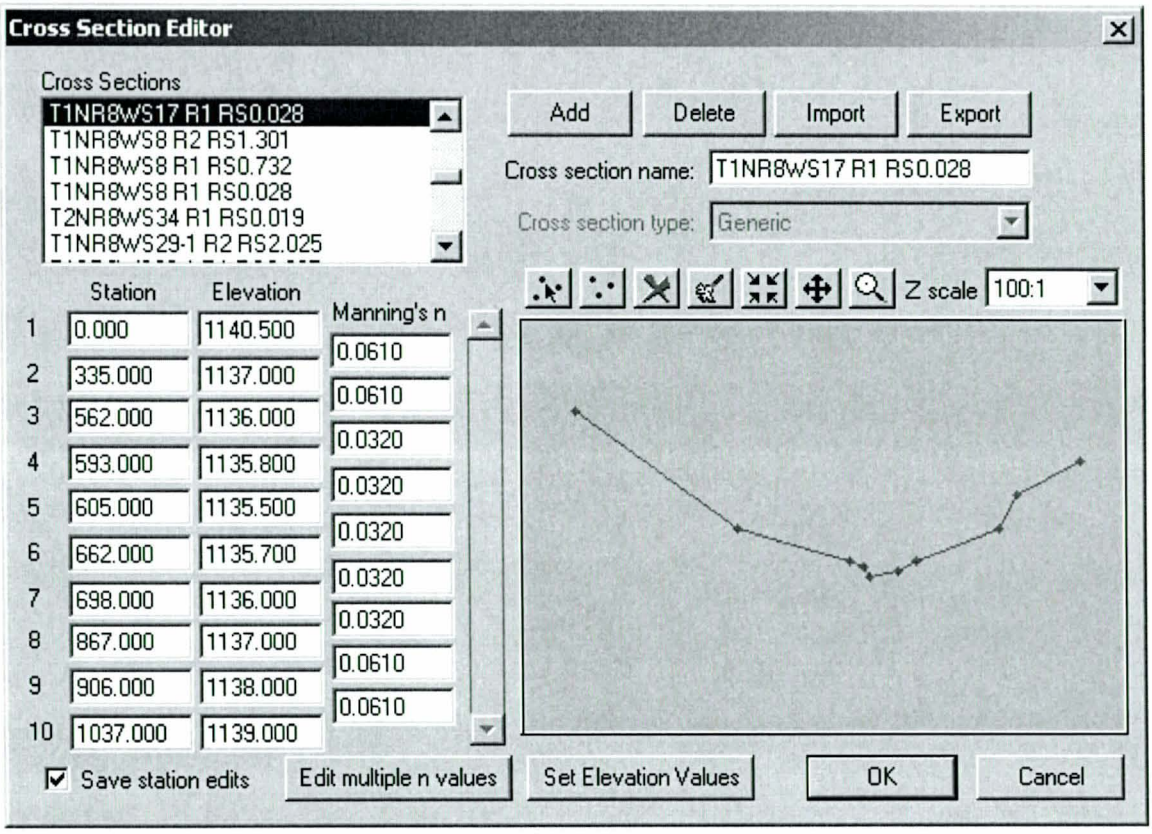
Calculated Values
Longitudinal Slope: 0.0188 ft/ft
Flow: 1213.000 cfs
Depth: 2.353 ft
Area of Flow: 170.541 sq ft
Wetted Perimeter: 145.028 ft
Average Velocity: 7.113 fps
Top Width (T): 144.951 ft
Froude Number: 1.156
Critical Depth: 2.491 ft
Critical Velocity: 6.350 fps
Critical Slope: 0.01379
Critical Top Width: 152.570 ft

B137
RS 0.771



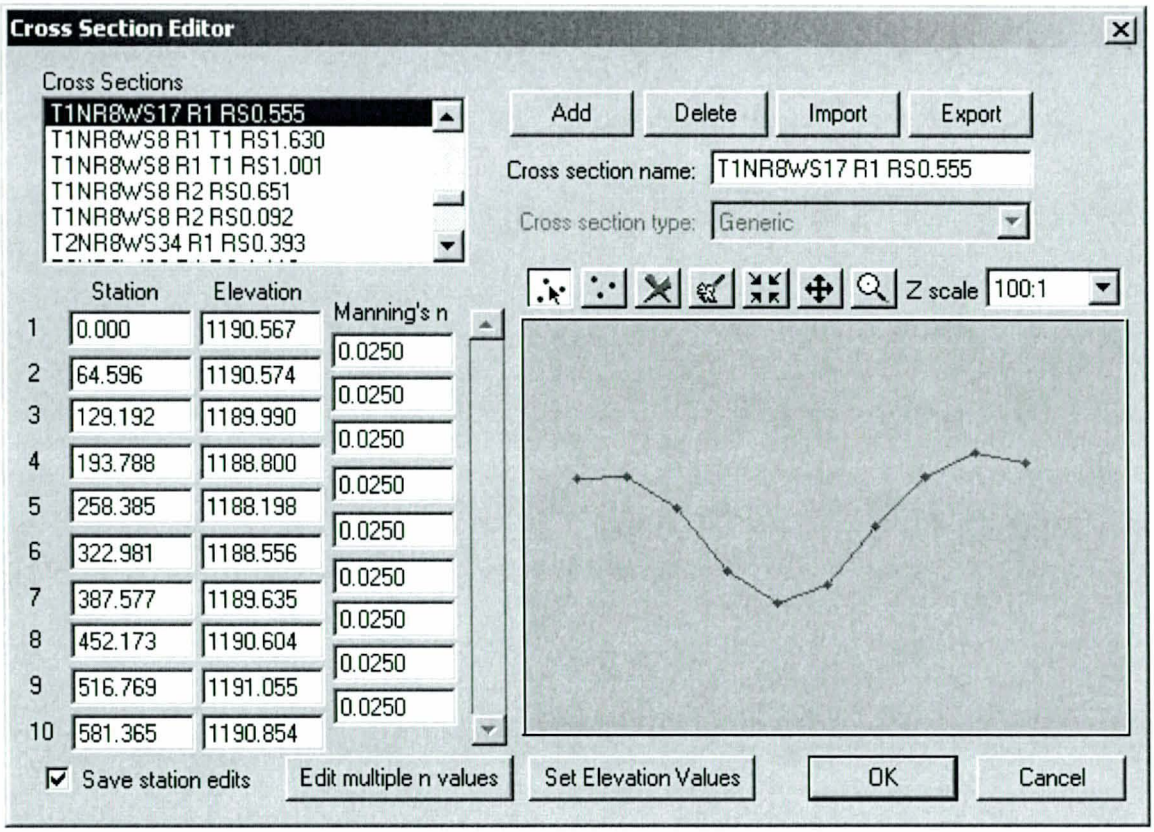
Calculated Values
Longitudinal Slope: 0.0276 ft/ft
Flow: 1213.000 cfs
Depth: 2.023 ft
Area of Flow: 132.895 sq ft
Wetted Perimeter: 103.685 ft
Average Velocity: 9.128 fps
Top Width (T): 103.565 ft
Froude Number: 1.420
Critical Depth: 2.400 ft
Critical Velocity: 6.963 fps
Critical Slope: 0.01298
Critical Top Width: 115.676 ft

B138
RS 0.028



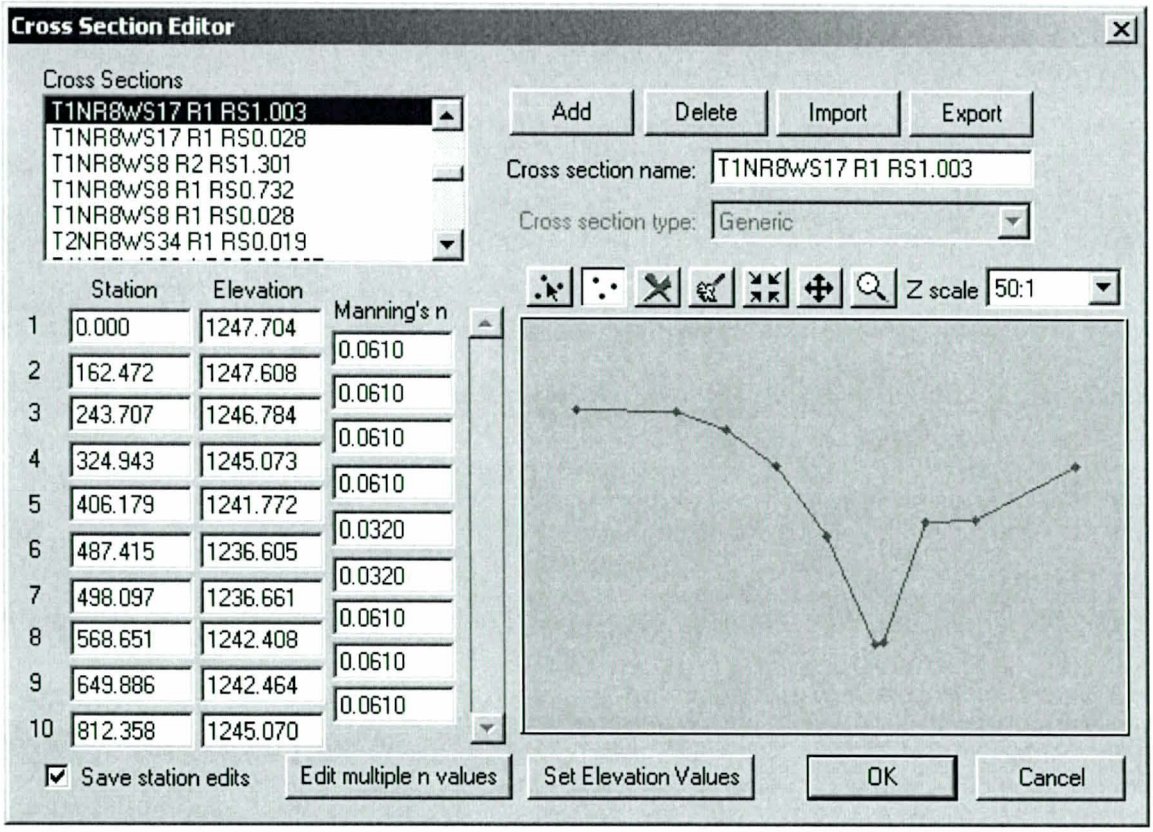
Calculated Values
Longitudinal Slope: 0.0190 ft/ft
Flow: 1556.000 cfs
Depth: 1.573 ft
Area of Flow: 408.548 sq ft
Wetted Perimeter: 541.810 ft
Average Velocity: 3.809 fps
Top Width (T): 541.798 ft
Froude Number: 0.773
Critical Depth: 1.437 ft
Critical Velocity: 4.624 fps
Critical Slope: 0.03243
Critical Top Width: 506.861 ft

B138
RS 0.555



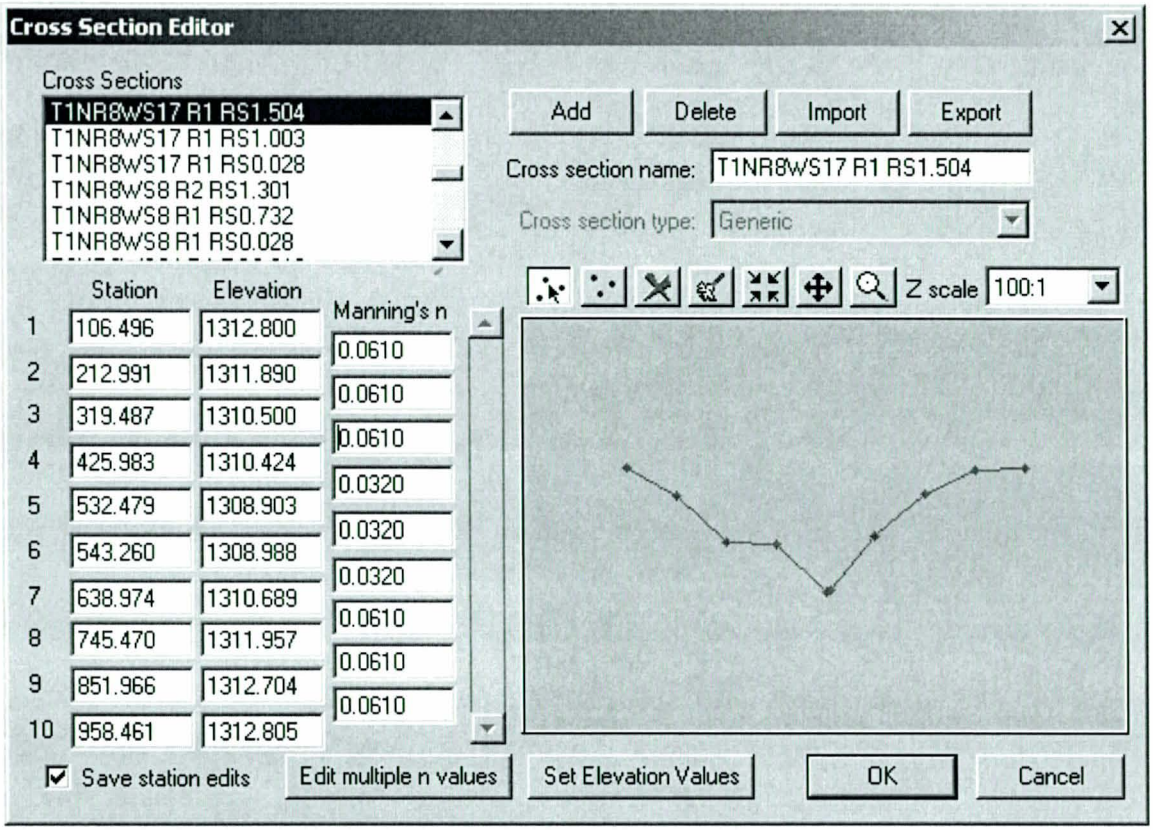
Calculated Values
Longitudinal Slope: 0.0203 ft/ft
Flow: 1556.000 cfs
Depth: 1.414 ft
Area of Flow: 202.936 sq ft
Wetted Perimeter: 236.524 ft
Average Velocity: 7.667 fps
Top Width (T): 236.504 ft
Froude Number: 1.459
Critical Depth: 1.689 ft
Critical Velocity: 5.706 fps
Critical Slope: 0.00903
Critical Top Width: 269.681 ft

B138
RS 1.003



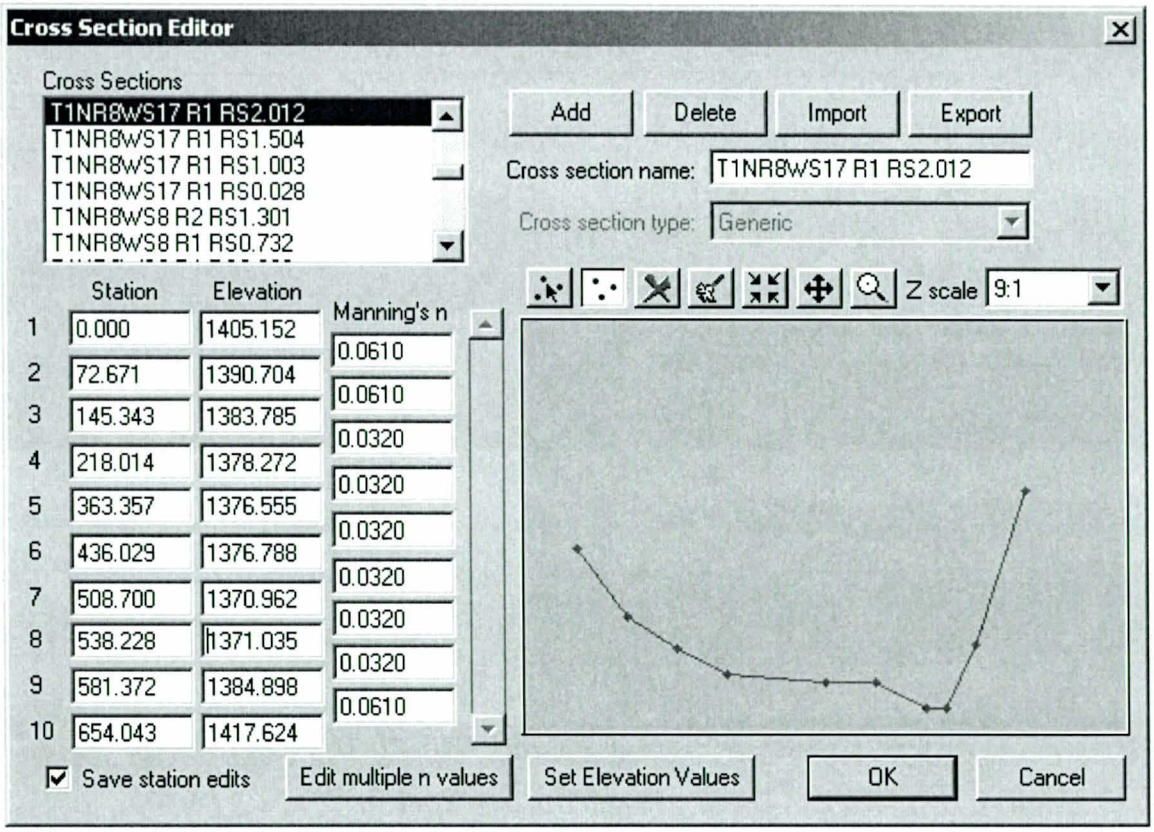
Calculated Values
Longitudinal Slope: 0.0272 ft/ft
Flow: 1556.000 cfs
Depth: 3.299 ft
Area of Flow: 185.006 sq ft
Wetted Perimeter: 102.582 ft
Average Velocity: 8.411 fps
Top Width (T): 102.345 ft
Froude Number: 1.102
Critical Depth: 3.442 ft
Critical Velocity: 7.781 fps
Critical Slope: 0.02215
Critical Top Width: 106.362 ft

B138
RS 1.504



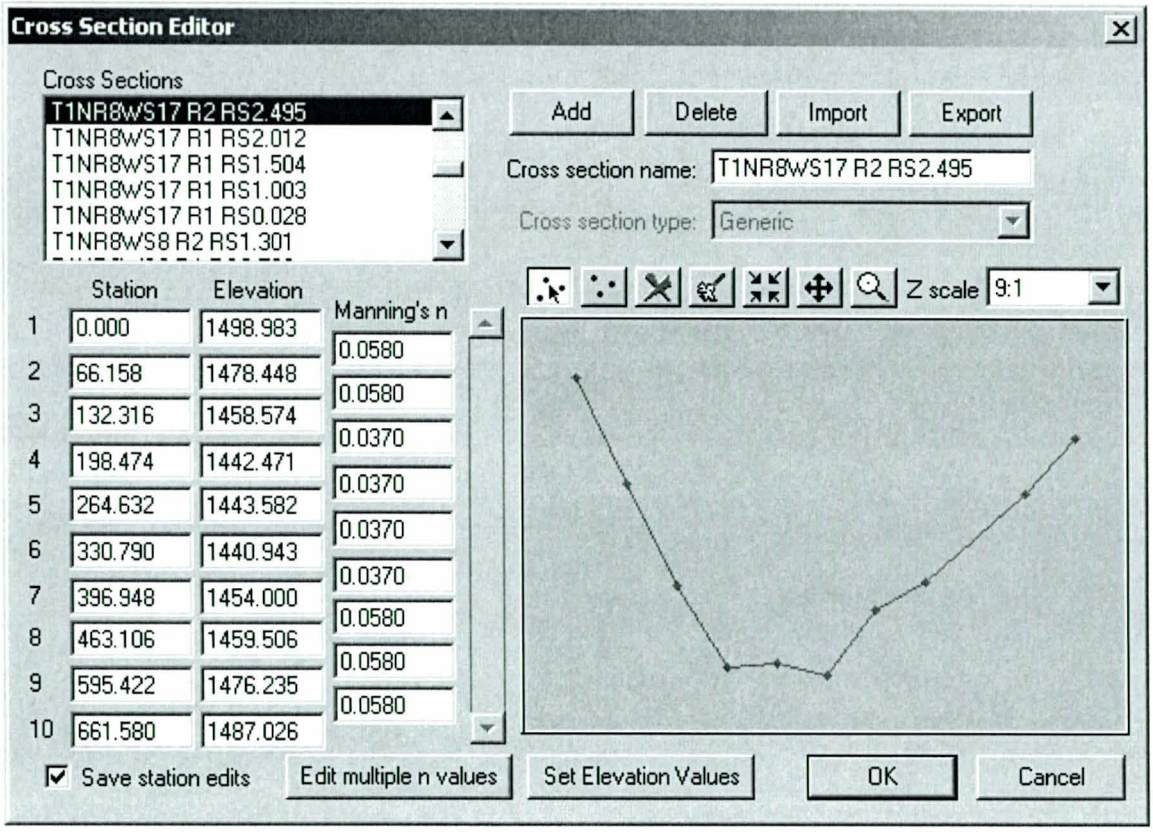
Calculated Values
Longitudinal Slope: 0.0227 ft/ft
Flow: 1556.000 cfs
Depth: 2.070 ft
Area of Flow: 336.126 sq ft
Wetted Perimeter: 379.527 ft
Average Velocity: 4.629 fps
Top Width (T): 379.496 ft
Froude Number: 0.867
Critical Depth: 1.977 ft
Critical Velocity: 5.161 fps
Critical Slope: 0.02999
Critical Top Width: 364.551 ft

B138
RS 2.012



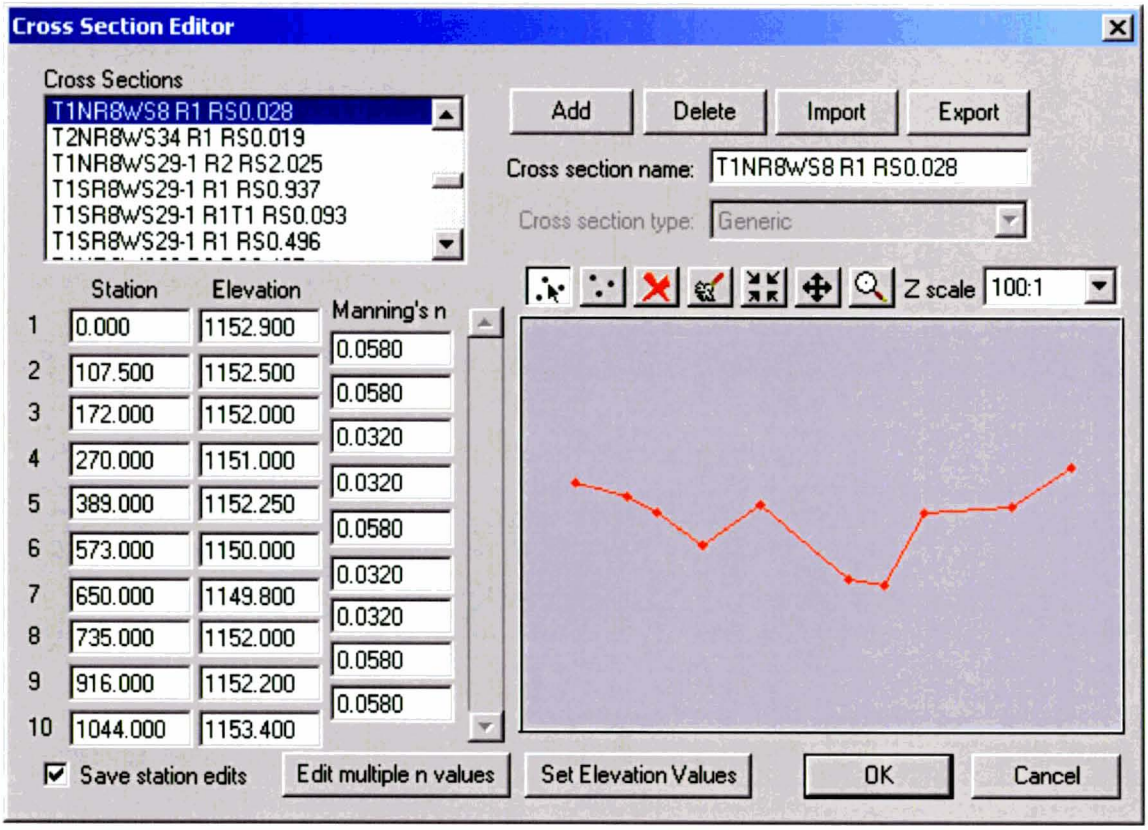
Calculated Values
Longitudinal Slope: 0.0263 ft/ft
Flow: 1556.000 cfs
Depth: 2.706 ft
Area of Flow: 135.314 sq ft
Wetted Perimeter: 72.005 ft
Average Velocity: 11.499 fps
Top Width (T): 71.484 ft
Froude Number: 1.473
Critical Depth: 3.328 ft
Critical Velocity: 8.514 fps
Critical Slope: 0.01145
Critical Top Width: 81.170 ft

B139
RS 2.495



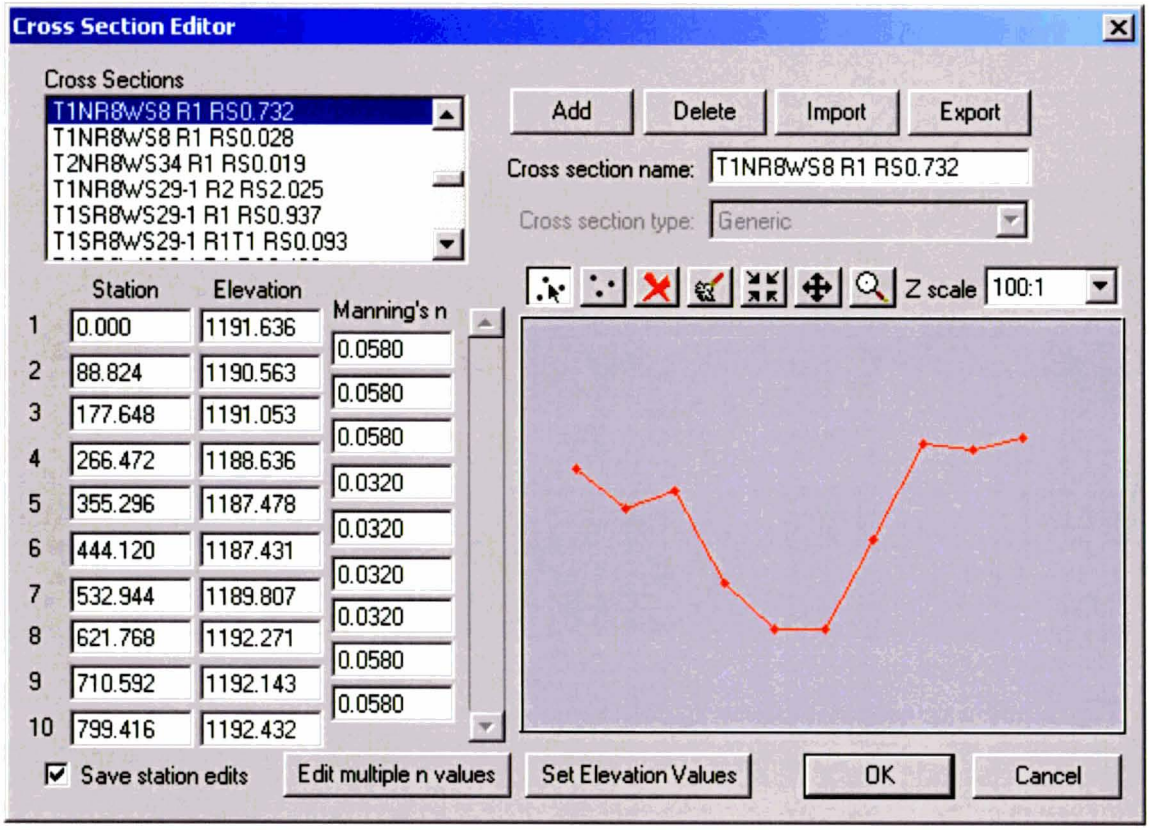
Calculated Values
Longitudinal Slope: 0.0327 ft/ft
Flow: 1145.000 cfs
Depth: 2.710 ft
Area of Flow: 154.862 sq ft
Wetted Perimeter: 151.370 ft
Average Velocity: 7.394 fps
Top Width (T): 150.901 ft
Froude Number: 1.286
Critical Depth: 2.901 ft
Critical Velocity: 6.228 fps
Critical Slope: 0.01875
Critical Top Width: 152.654 ft

B140
RS 0.028



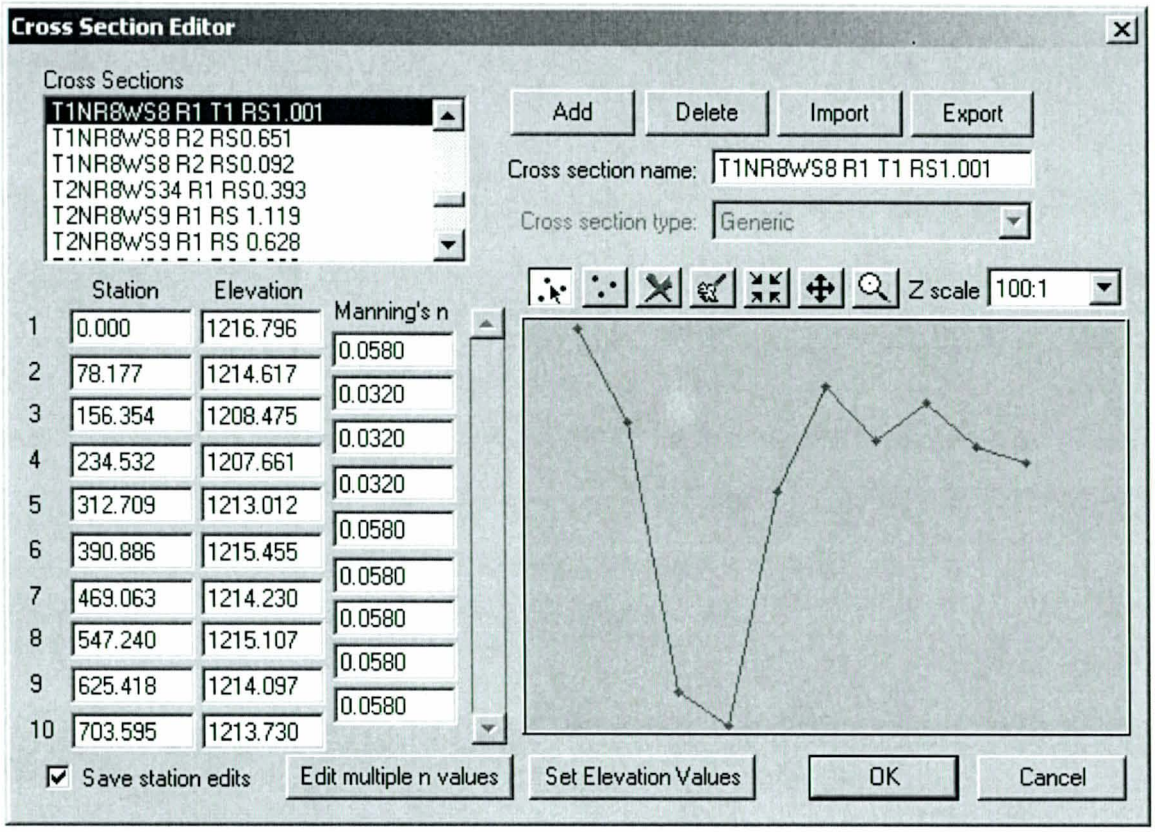
Calculated Values
Longitudinal Slope: 0.0102 ft/ft
Flow: 2784.000 cfs
Depth: 2.650 ft
Area of Flow: 843.310 sq ft
Wetted Perimeter: 828.885 ft
Average Velocity: 3.301 fps
Top Width (T): 828.828 ft
Froude Number: 0.577
Critical Depth: 2.162 ft
Critical Velocity: 5.613 fps
Critical Slope: 0.02365
Critical Top Width: 506.912 ft

B140
RS 0.732



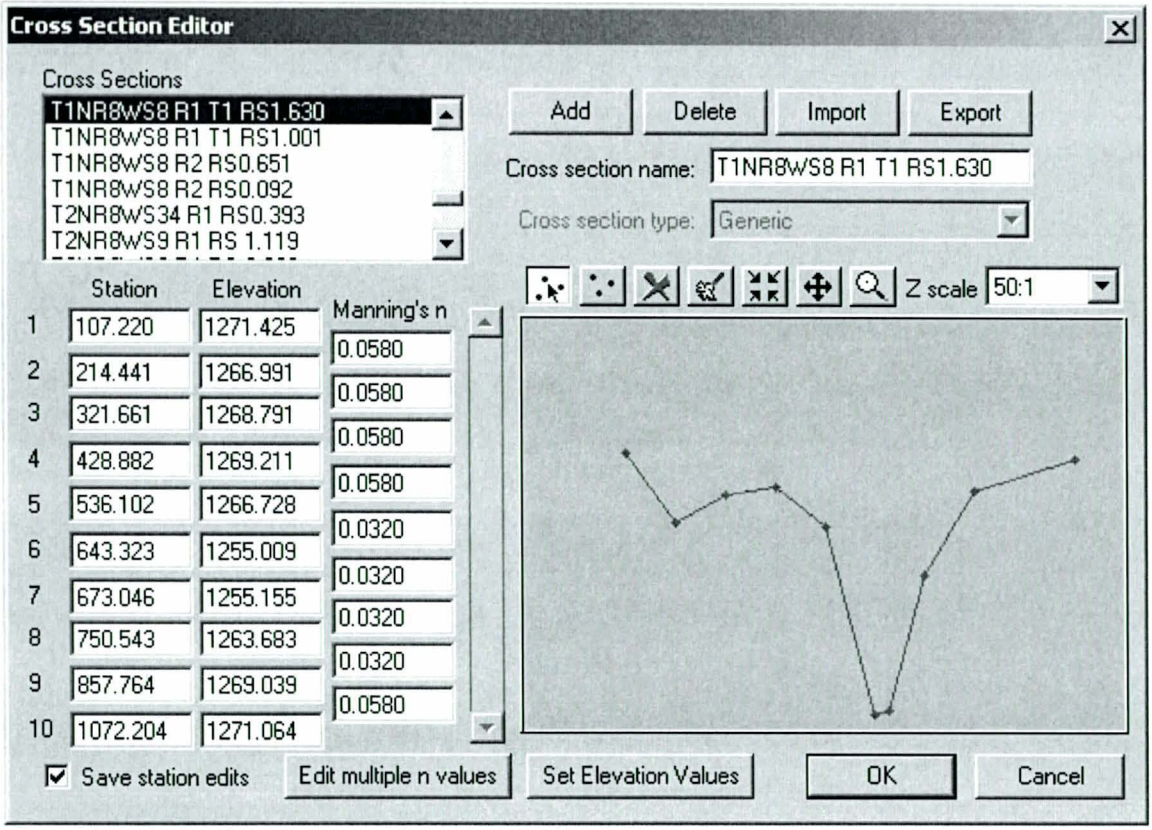
Calculated Values
Longitudinal Slope: 0.0141 ft/ft
Flow: 2784.000 cfs
Depth: 2.156 ft
Area of Flow: 428.729 sq ft
Wetted Perimeter: 293.228 ft
Average Velocity: 6.494 fps
Top Width (T): 293.179 ft
Froude Number: 0.946
Critical Depth: 2.095 ft
Critical Velocity: 6.772 fps
Critical Slope: 0.01575
Critical Top Width: 288.693 ft

B141
RS 1.001



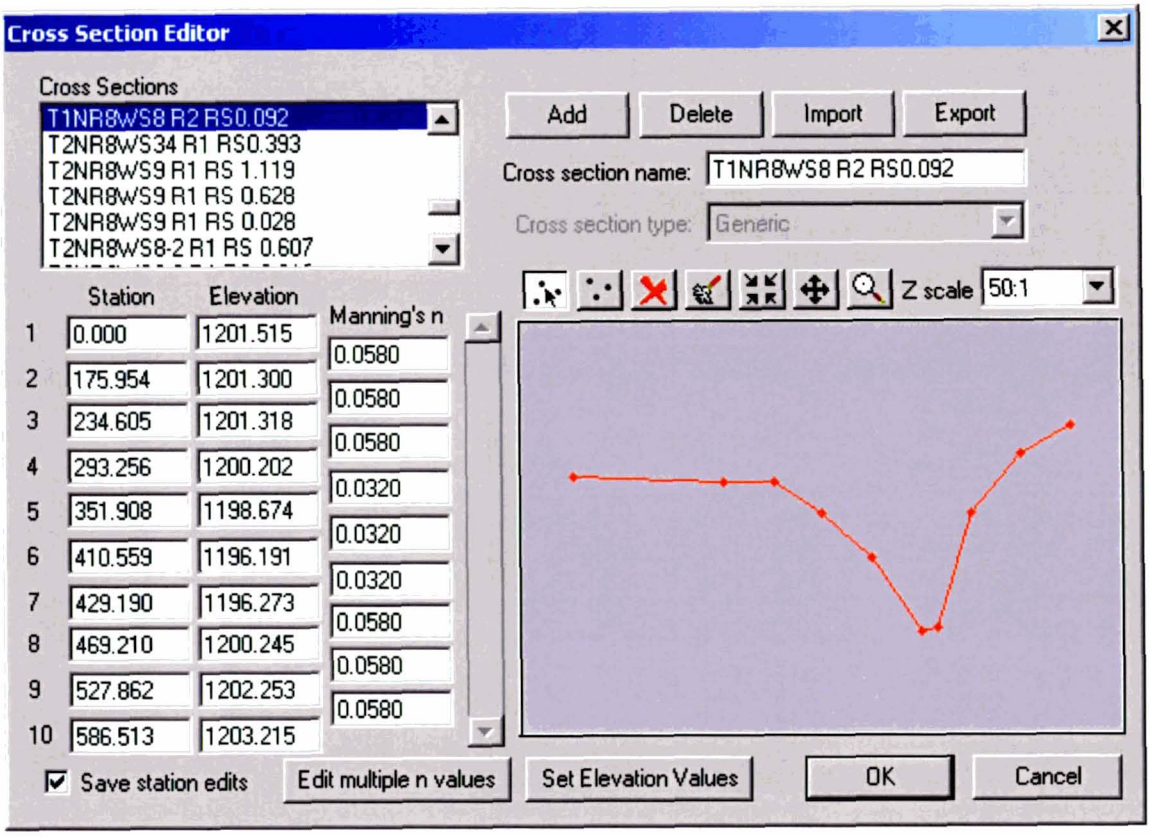
Calculated Values
Longitudinal Slope: 0.0148 ft/ft
Flow: 1273.000 cfs
Depth: 2.126 ft
Area of Flow: 178.331 sq ft
Wetted Perimeter: 126.060 ft
Average Velocity: 7.138 fps
Top Width (T): 125.932 ft
Froude Number: 1.057
Critical Depth: 2.185 ft
Critical Velocity: 6.850 fps
Critical Slope: 0.01312
Critical Top Width: 127.554 ft

B141
RS 1.630



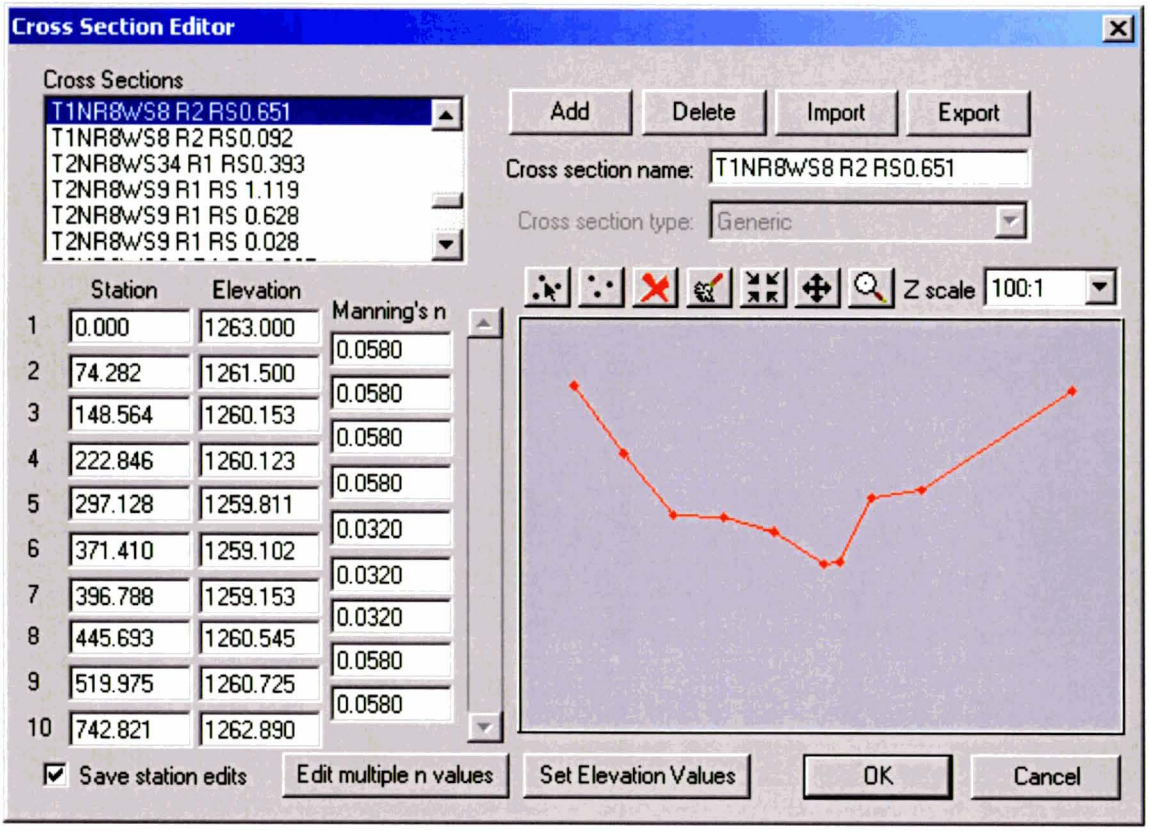
Calculated Values
Longitudinal Slope: 0.0176 ft/ft
Flow: 1273.000 cfs
Depth: 2.678 ft
Area of Flow: 139.376 sq ft
Wetted Perimeter: 77.520 ft
Average Velocity: 9.134 fps
Top Width (T): 77.235 ft
Froude Number: 1.198
Critical Depth: 2.943 ft
Critical Velocity: 7.935 fps
Critical Slope: 0.01194
Critical Top Width: 82.057 ft

B142
RS 0.092



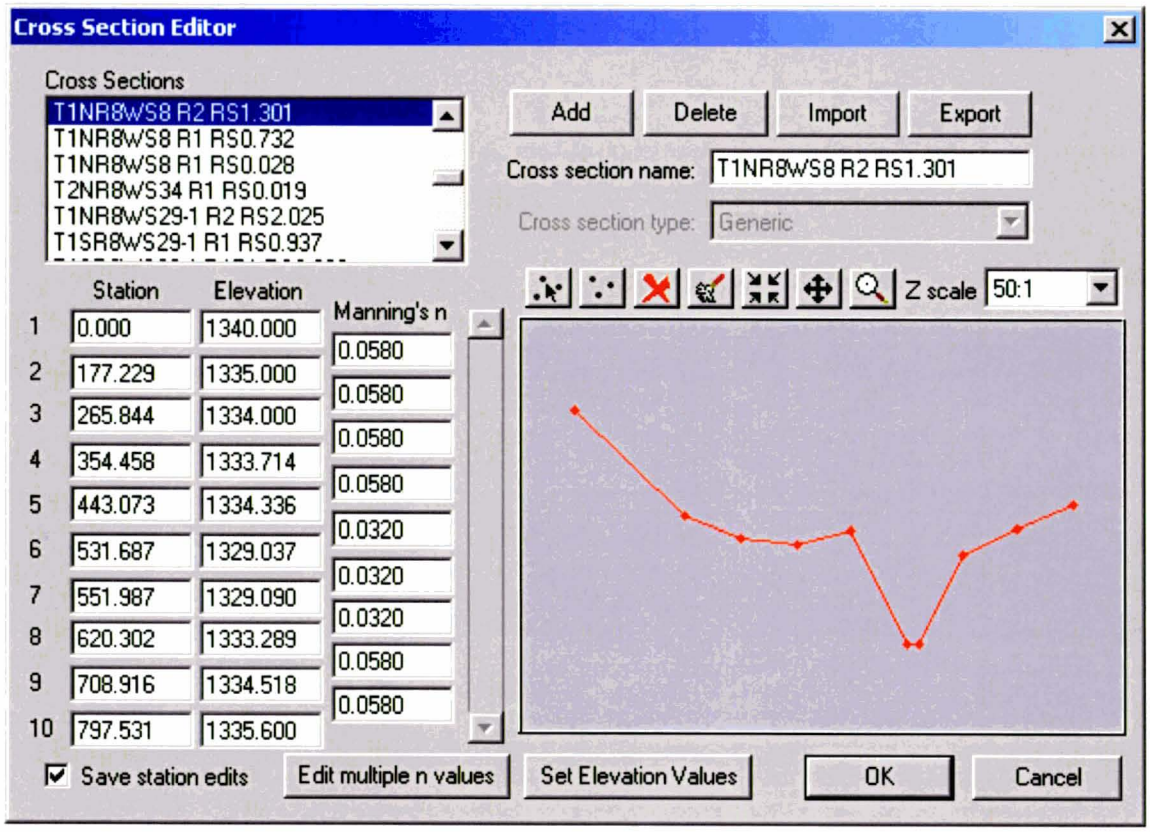
Calculated Values
Longitudinal Slope: 0.0210 ft/ft
Flow: 1743.000 cfs
Depth: 3.096 ft
Area of Flow: 218.658 sq ft
Wetted Perimeter: 131.394 ft
Average Velocity: 7.971 fps
Top Width (T): 131.184 ft
Froude Number: 1.088
Critical Depth: 3.215 ft
Critical Velocity: 7.427 fps
Critical Slope: 0.01755
Critical Top Width: 136.971 ft

B142
RS 0.651



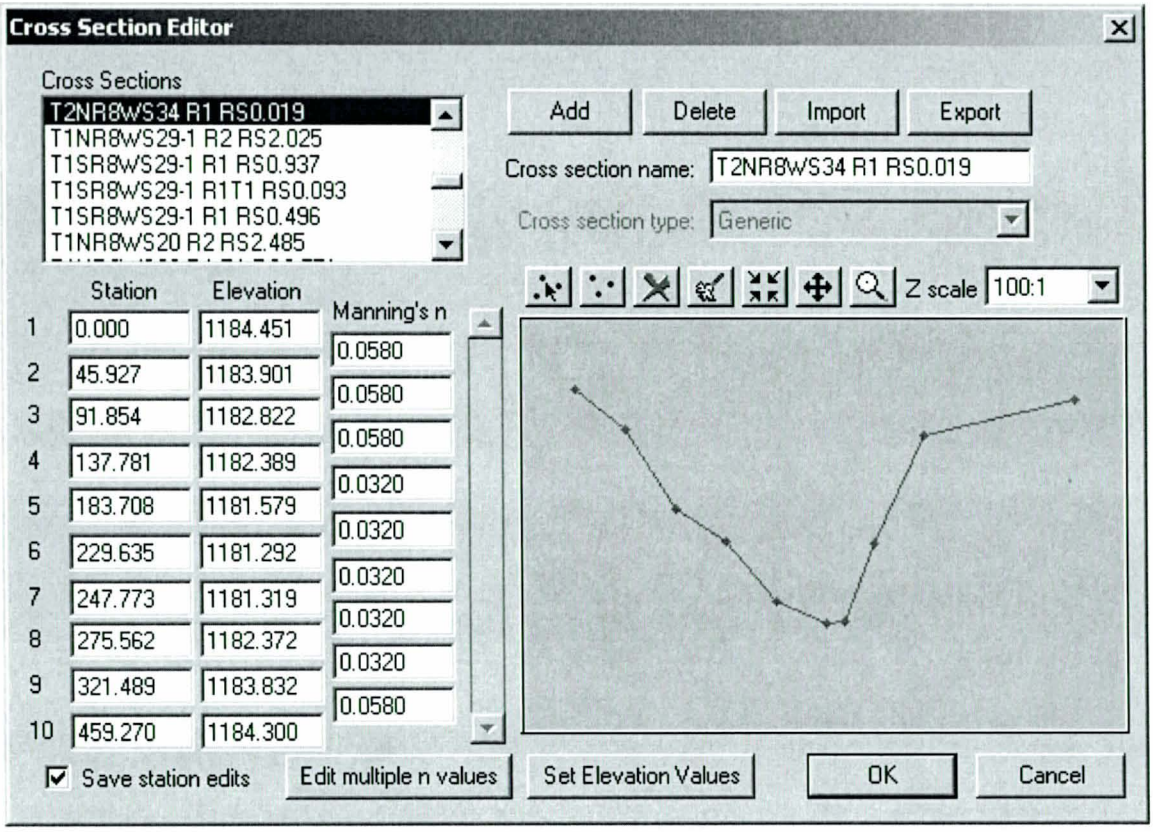
Calculated Values
Longitudinal Slope: 0.0198 ft/ft
Flow: 1743.000 cfs
Depth: 1.936 ft
Area of Flow: 427.248 sq ft
Wetted Perimeter: 452.500 ft
Average Velocity: 4.080 fps
Top Width (T): 452.466 ft
Froude Number: 0.740
Critical Depth: 1.739 ft
Critical Velocity: 5.107 fps
Critical Slope: 0.03711
Critical Top Width: 421.373 ft

B142
RS 1.301



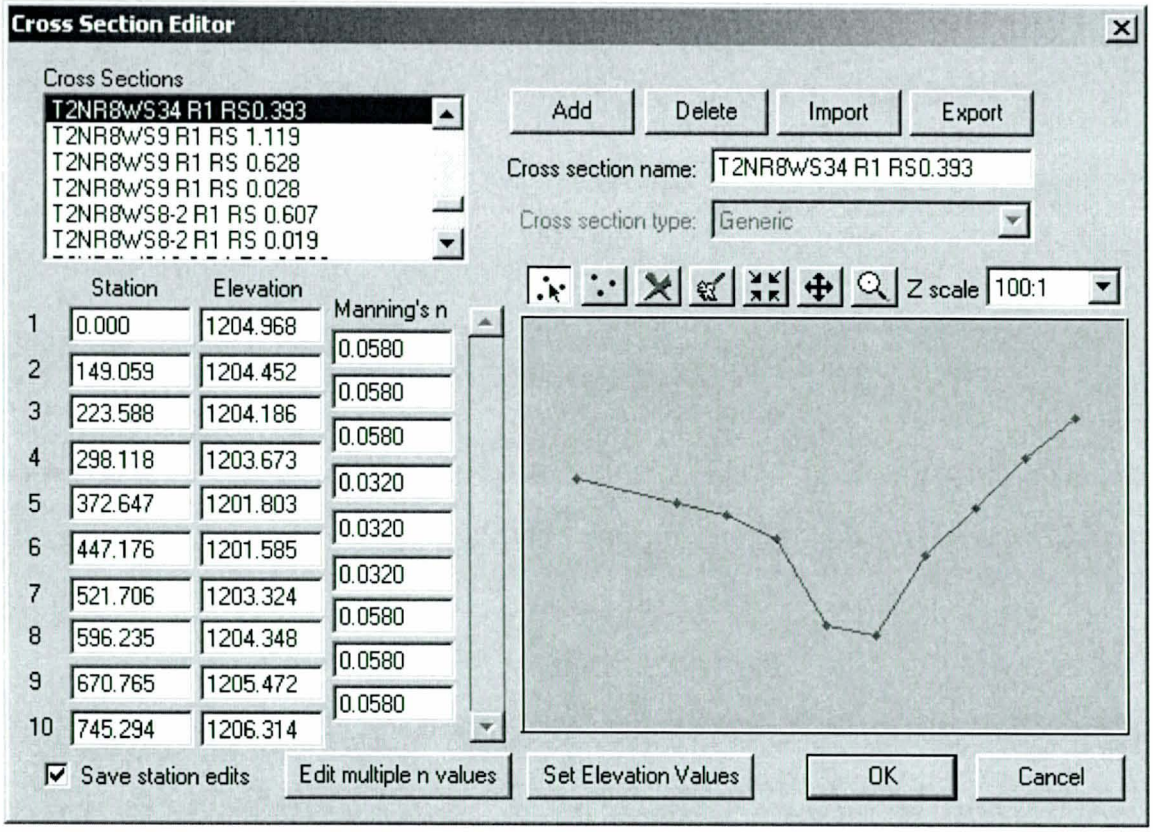
Calculated Values
Longitudinal Slope: 0.0324 ft/ft
Flow: 1743.000 cfs
Depth: 2.564 ft
Area of Flow: 157.720 sq ft
Wetted Perimeter: 104.167 ft
Average Velocity: 11.051 fps
Top Width (T): 104.014 ft
Froude Number: 1.582
Critical Depth: 3.172 ft
Critical Velocity: 7.676 fps
Critical Slope: 0.01217
Critical Top Width: 124.073 ft

B143
RS 0.019



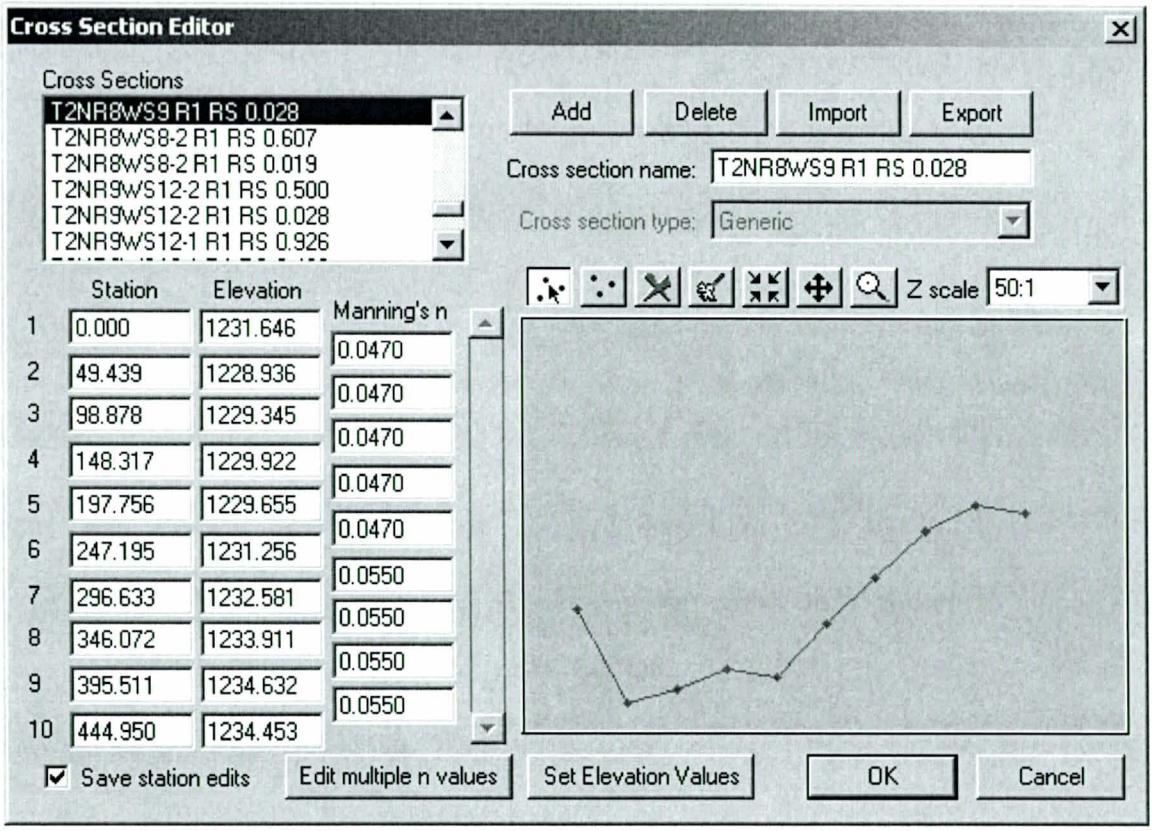
Calculated Values
Longitudinal Slope: 0.0086 ft/ft
Flow: 1429.000 cfs
Depth: 2.284 ft
Area of Flow: 340.192 sq ft
Wetted Perimeter: 253.743 ft
Average Velocity: 4.201 fps
Top Width (T): 253.685 ft
Froude Number: 0.639
Critical Depth: 1.872 ft
Critical Velocity: 5.908 fps
Critical Slope: 0.02153
Critical Top Width: 223.169 ft

B143
RS 0.393



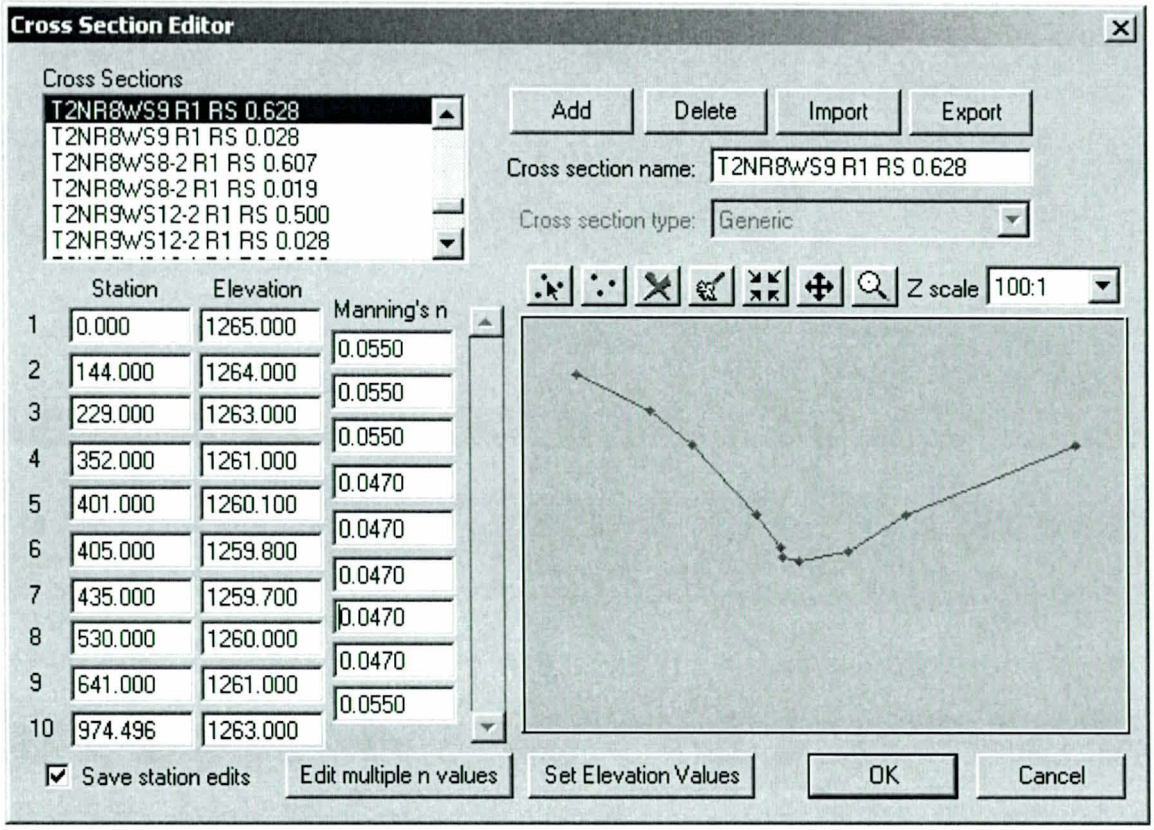
Calculated Values
Longitudinal Slope: 0.0097 ft/ft
Flow: 1429.000 cfs
Depth: 2.000 ft
Area of Flow: 291.047 sq ft
Wetted Perimeter: 239.155 ft
Average Velocity: 4.910 fps
Top Width (T): 239.110 ft
Froude Number: 0.784
Critical Depth: 1.766 ft
Critical Velocity: 6.003 fps
Critical Slope: 0.01452
Critical Top Width: 212.691 ft

B144
RS 0.028



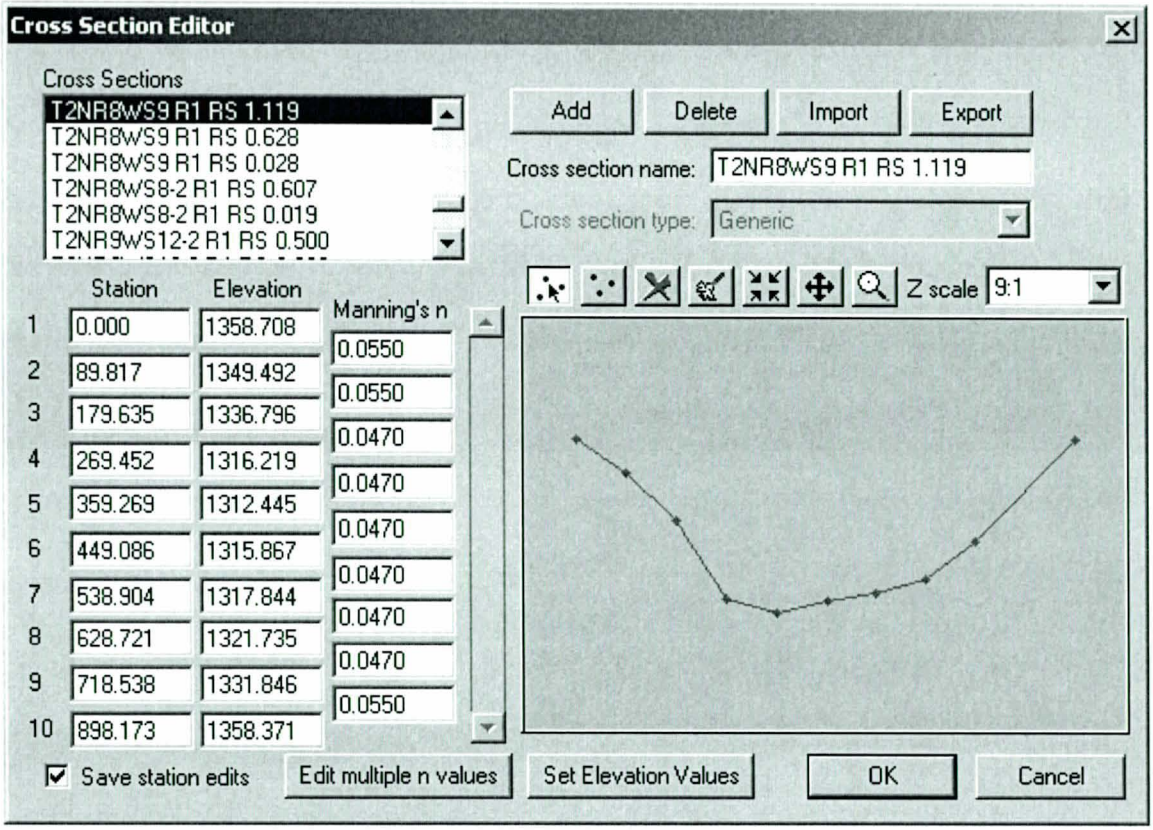
Calculated Values
Longitudinal Slope: 0.0095 ft/ft
Flow: 1441.000 cfs
Depth: 2.377 ft
Area of Flow: 359.839 sq ft
Wetted Perimeter: 243.350 ft
Average Velocity: 4.005 fps
Top Width (T): 243.252 ft
Froude Number: 0.580
Critical Depth: 1.862 ft
Critical Velocity: 5.975 fps
Critical Slope: 0.03097
Critical Top Width: 217.569 ft

B144
RS 0.628



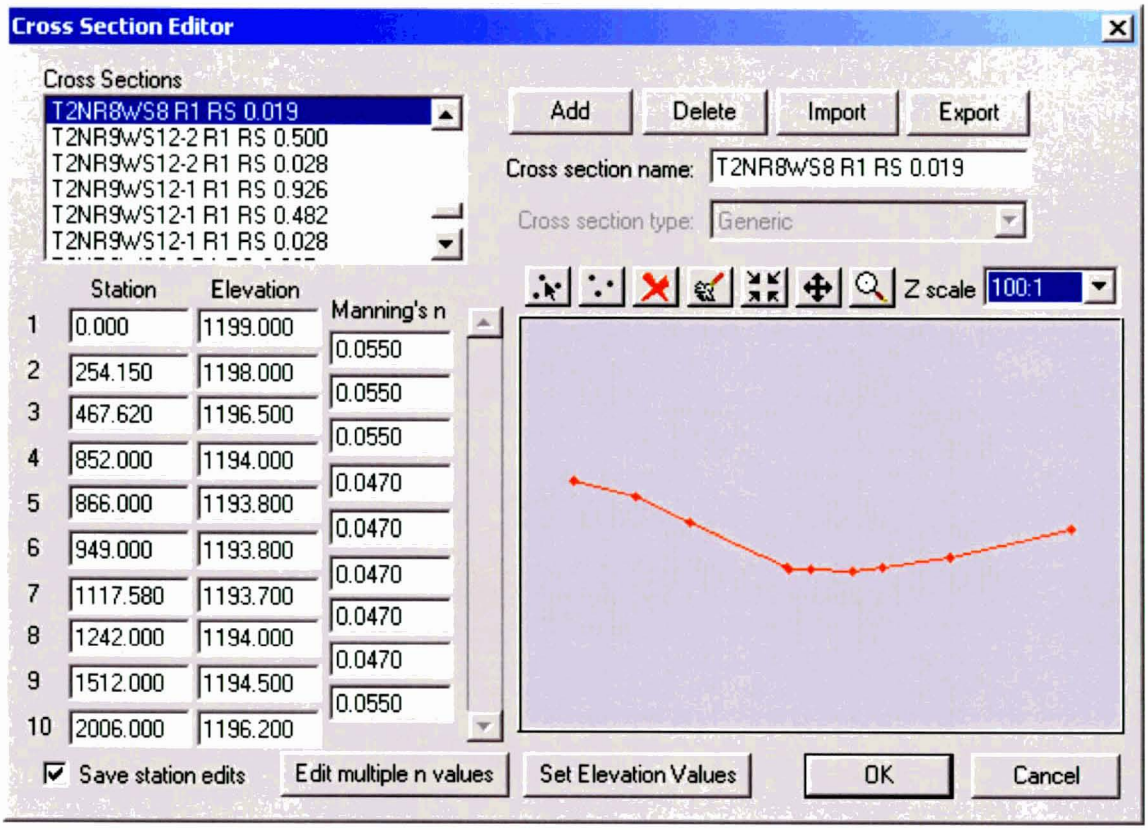
Calculated Values
Longitudinal Slope: 0.0193 ft/ft
Flow: 1441.000 cfs
Depth: 1.840 ft
Area of Flow: 311.013 sq ft
Wetted Perimeter: 288.239 ft
Average Velocity: 4.633 fps
Top Width (T): 288.204 ft
Froude Number: 0.786
Critical Depth: 1.648 ft
Critical Velocity: 5.588 fps
Critical Slope: 0.03237
Critical Top Width: 265.936 ft

B144
RS 1.119



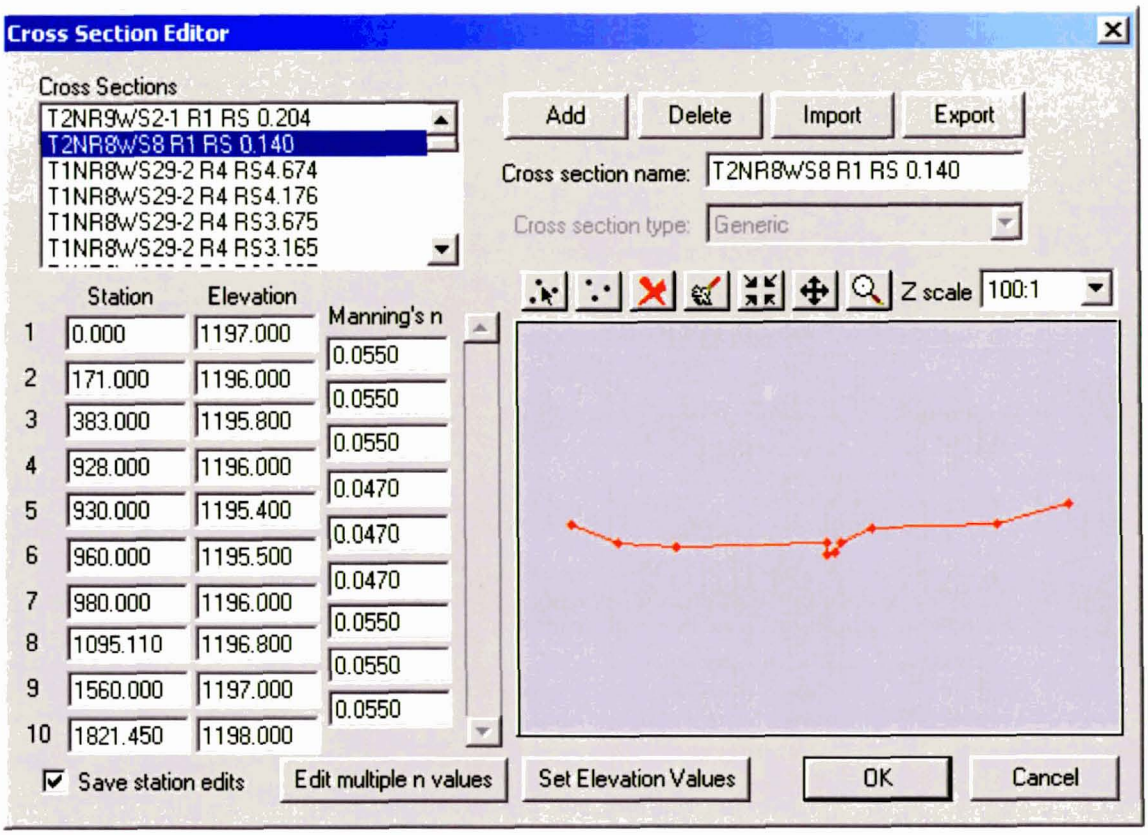
Calculated Values
Longitudinal Slope: 0.0373 ft/ft
Flow: 1441.000 cfs
Depth: 2.757 ft
Area of Flow: 190.133 sq ft
Wetted Perimeter: 138.058 ft
Average Velocity: 7.579 fps
Top Width (T): 137.947 ft
Froude Number: 1.138
Critical Depth: 2.903 ft
Critical Velocity: 6.836 fps
Critical Slope: 0.02833
Critical Top Width: 145.250 ft

B145
RS 0.019



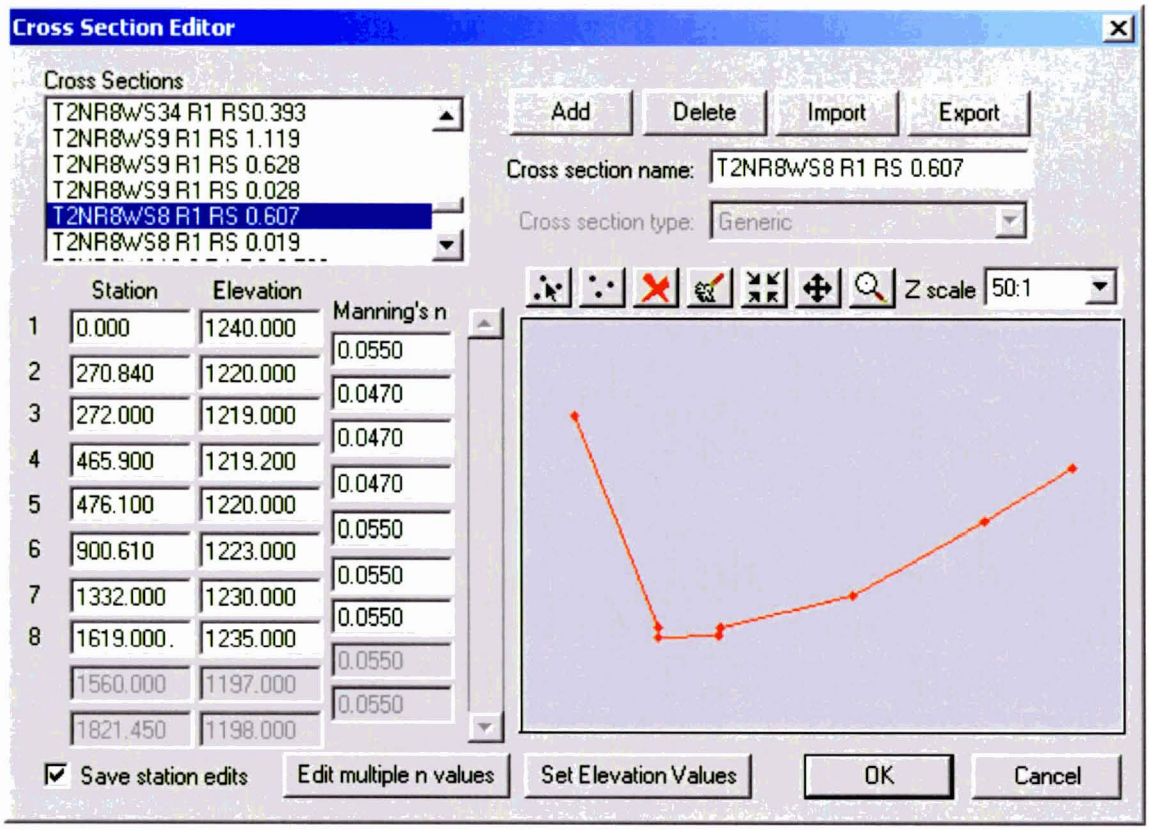
Calculated Values
Longitudinal Slope: 0.0094 ft/ft
Flow: 2164.000 cfs
Depth: 1.347 ft
Area of Flow: 830.116 sq ft
Wetted Perimeter: 979.956 ft
Average Velocity: 2.607 fps
Top Width (T): 979.949 ft
Froude Number: 0.499
Critical Depth: 0.968 ft
Critical Velocity: 4.412 fps
Critical Slope: 0.04034
Critical Top Width: 811.478 ft

B145
RS 0.140



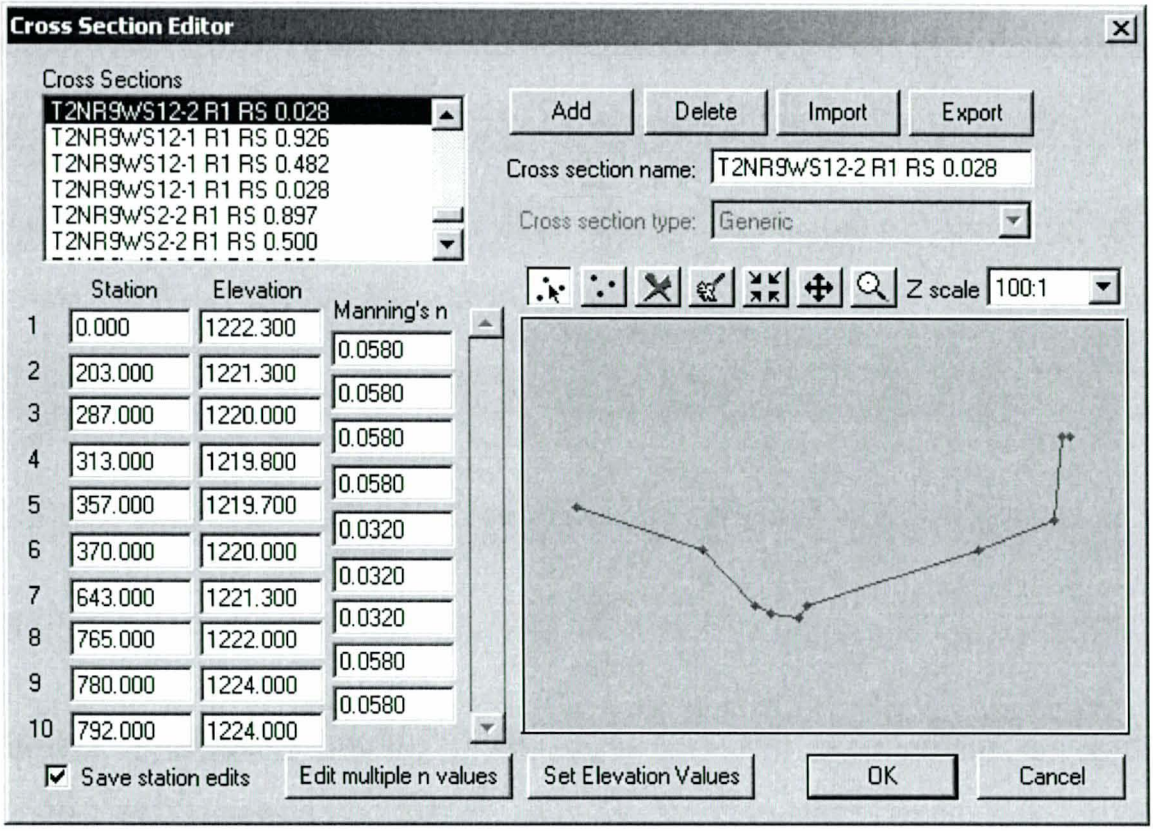
Calculated Values
Longitudinal Slope: 0.0081 ft/ft
Flow: 2164.000 cfs
Depth: 1.539 ft
Area of Flow: 1017.708 sq ft
Wetted Perimeter: 1408.534 ft
Average Velocity: 2.126 fps
Top Width (T): 1408.433 ft
Froude Number: 0.441
Critical Depth: 1.076 ft
Critical Velocity: 4.173 fps
Critical Slope: 0.05301
Critical Top Width: 958.892 ft

B145
RS 0.607



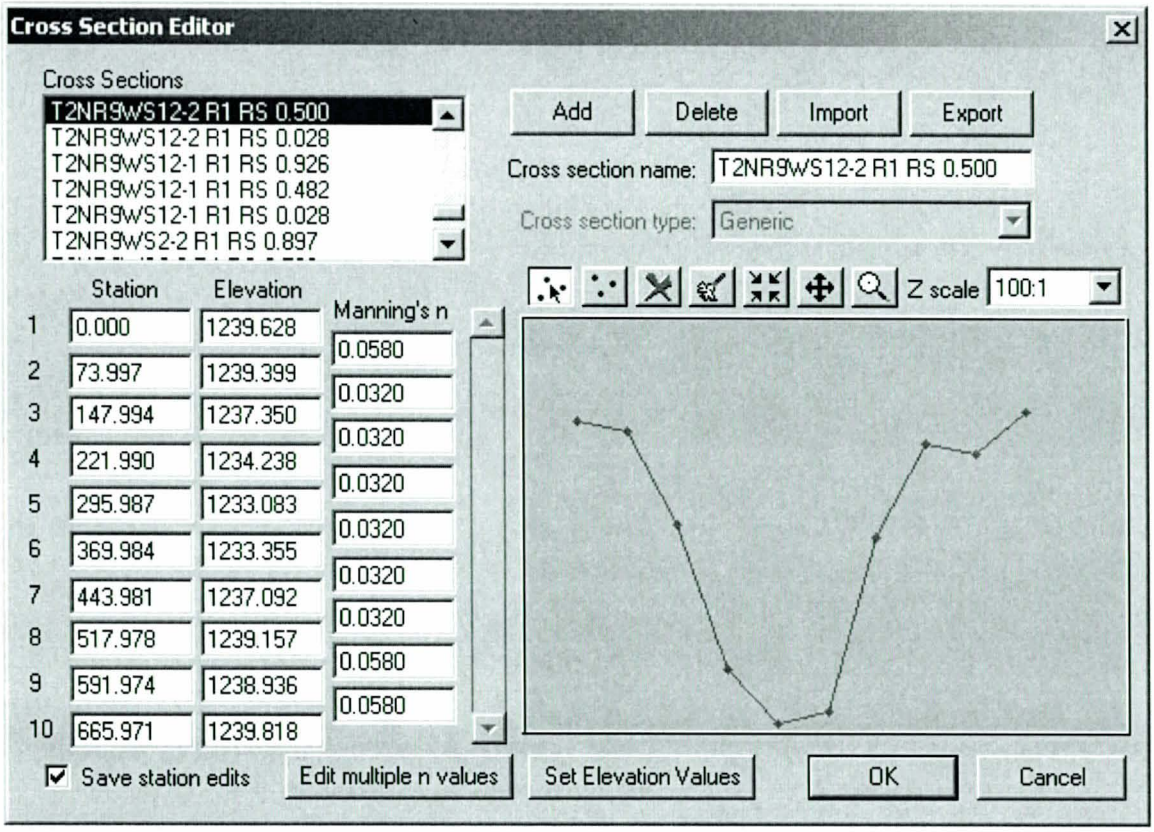
Calculated Values
Longitudinal Slope: 0.0257 ft/ft
Flow: 2164.000 cfs
Depth: 1.824 ft
Area of Flow: 401.092 sq ft
Wetted Perimeter: 333.524 ft
Average Velocity: 5.395 fps
Top Width (T): 333.088 ft
Froude Number: 0.866
Critical Depth: 1.686 ft
Critical Velocity: 6.069 fps
Critical Slope: 0.03436
Critical Top Width: 311.663 ft

B146
RS 0.028



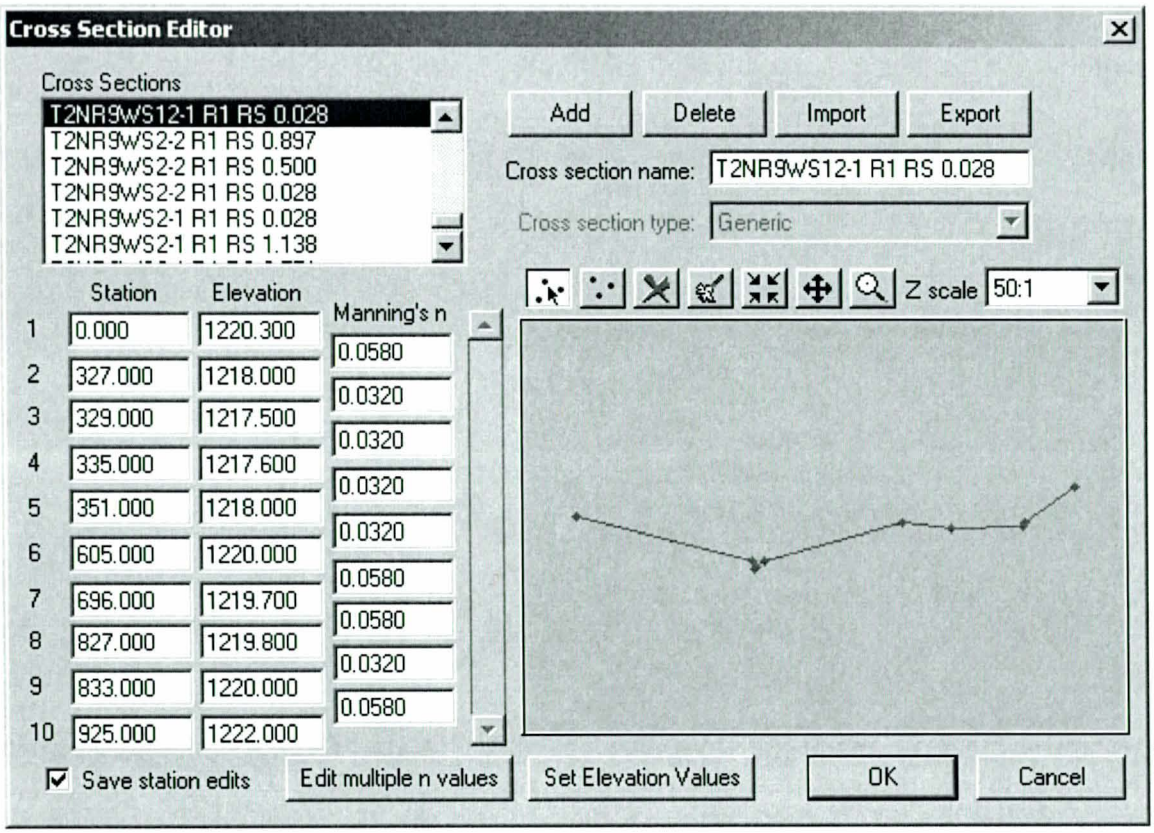
Calculated Values
Longitudinal Slope: 0.0052 ft/ft
Flow: 1494.000 cfs
Depth: 2.064 ft
Area of Flow: 600.471 sq ft
Wetted Perimeter: 615.201 ft
Average Velocity: 2.488 fps
Top Width (T): 615.181 ft
Froude Number: 0.444
Critical Depth: 1.479 ft
Critical Velocity: 4.908 fps
Critical Slope: 0.02731
Critical Top Width: 406.851 ft

B146
RS 0.500



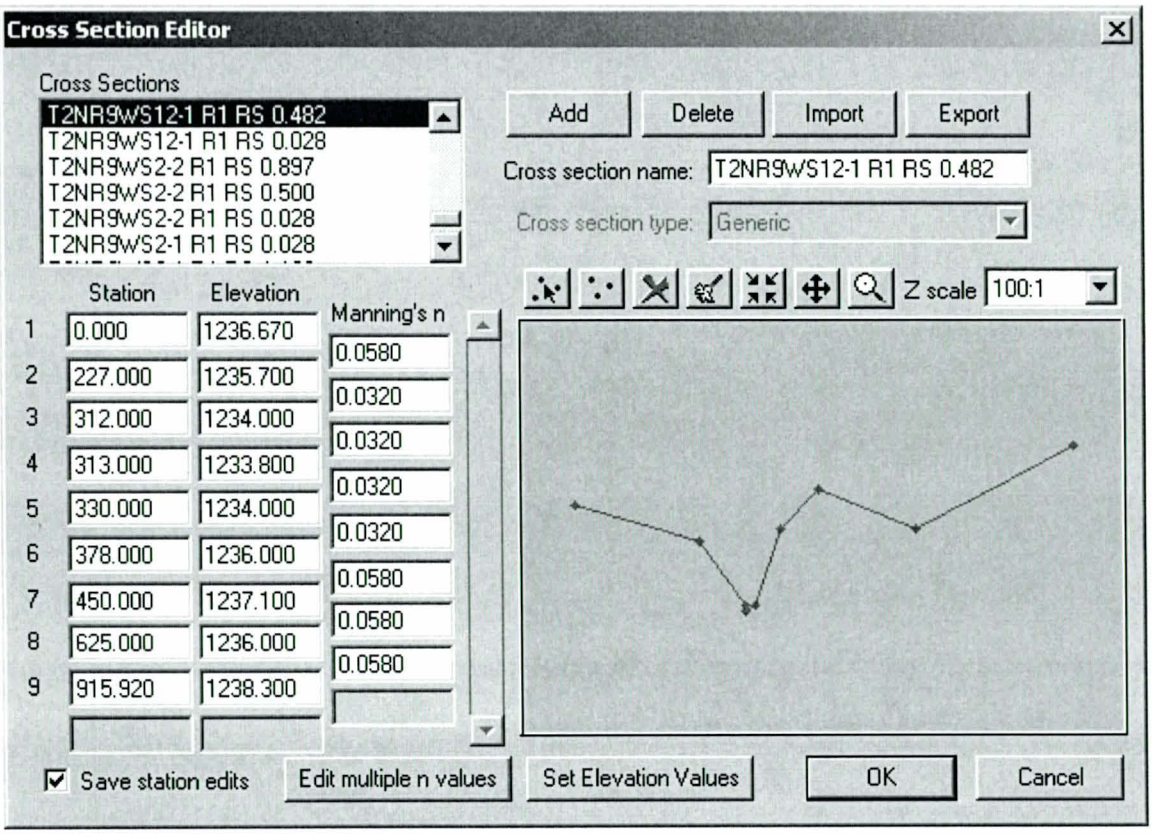
Calculated Values
Longitudinal Slope: 0.0134 ft/ft
Flow: 1494.000 cfs
Depth: 1.791 ft
Area of Flow: 239.950 sq ft
Wetted Perimeter: 193.268 ft
Average Velocity: 6.226 fps
Top Width (T): 193.207 ft
Froude Number: 0.985
Critical Depth: 1.777 ft
Critical Velocity: 6.298 fps
Critical Slope: 0.01386
Critical Top Width: 192.592 ft

B147
RS 0.028



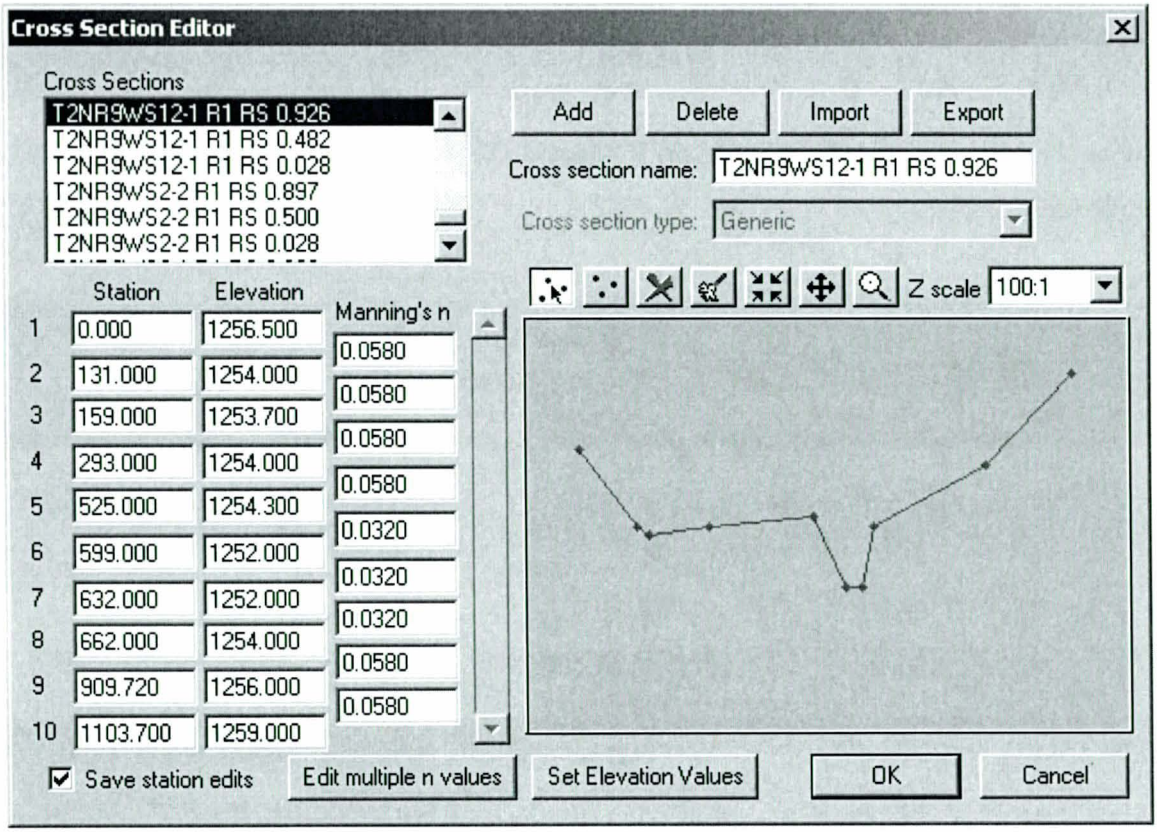
Calculated Values
Longitudinal Slope: 0.0067 ft/ft
Flow: 1418.000 cfs
Depth: 2.510 ft
Area of Flow: 647.466 sq ft
Wetted Perimeter: 792.270 ft
Average Velocity: 2.190 fps
Top Width (T): 792.183 ft
Froude Number: 0.427
Critical Depth: 1.866 ft
Critical Velocity: 4.885 fps
Critical Slope: 0.03230
Critical Top Width: 391.659 ft

B147
RS 0.482



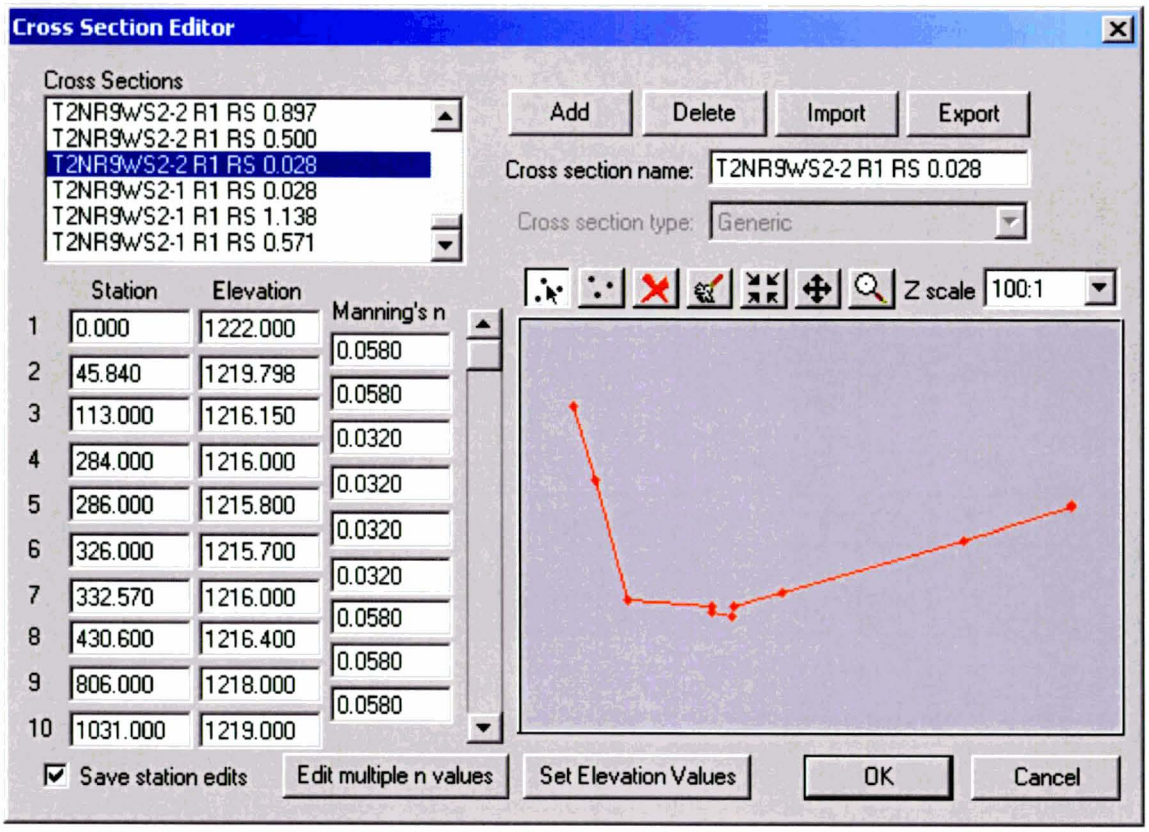
Calculated Values
Longitudinal Slope: 0.0081 ft/ft
Flow: 1418.000 cfs
Depth: 2.510 ft
Area of Flow: 410.783 sq ft
Wetted Perimeter: 792.270 ft
Average Velocity: 2.190 fps
Top Width (T): 792.183 ft
Froude Number: 0.427
Critical Depth: 1.866 ft
Critical Velocity: 4.885 fps
Critical Slope: 0.03230
Critical Top Width: 391.659 ft

B147
RS 0.926



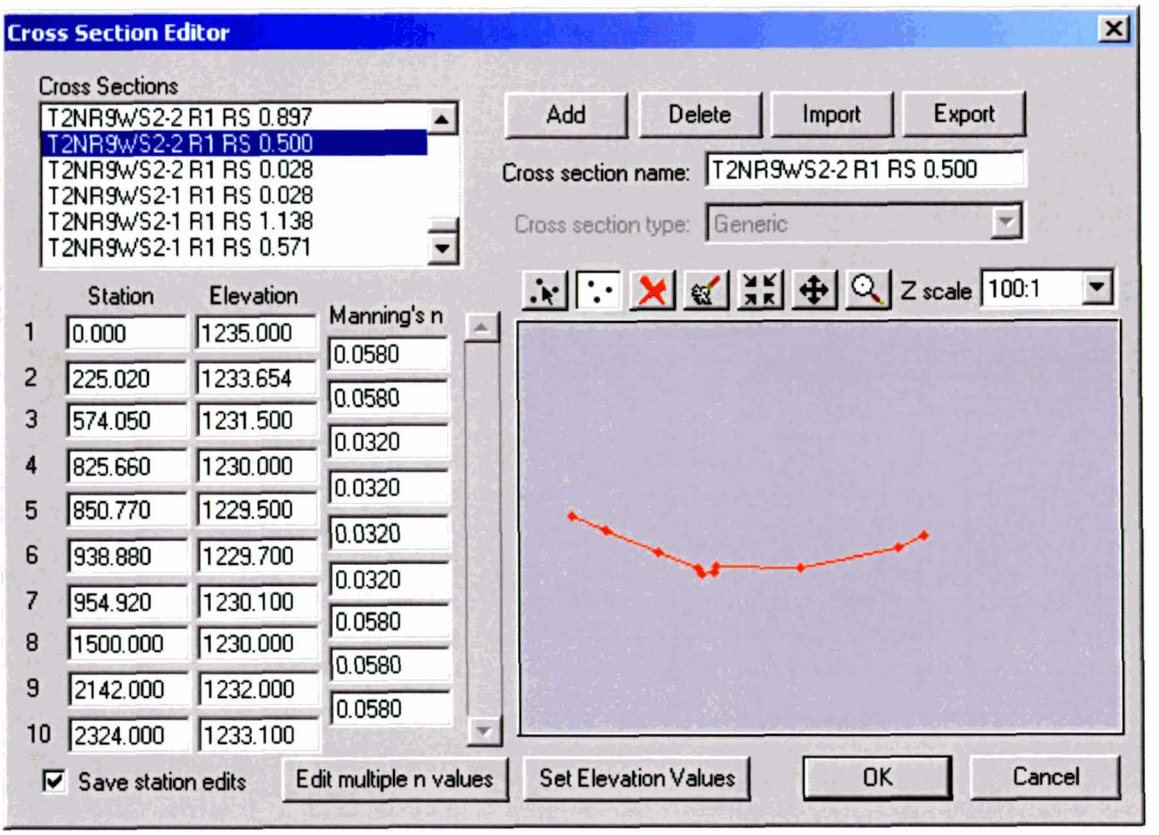
Calculated Values
Longitudinal Slope: 0.0070 ft/ft
Flow: 1418.000 cfs
Depth: 2.796 ft
Area of Flow: 627.231 sq ft
Wetted Perimeter: 671.501 ft
Average Velocity: 2.261 fps
Top Width (T): 671.386 ft
Froude Number: 0.412
Critical Depth: 2.329 ft
Critical Velocity: 4.264 fps
Critical Slope: 0.04737
Critical Top Width: 588.964 ft

B148
RS 0.028



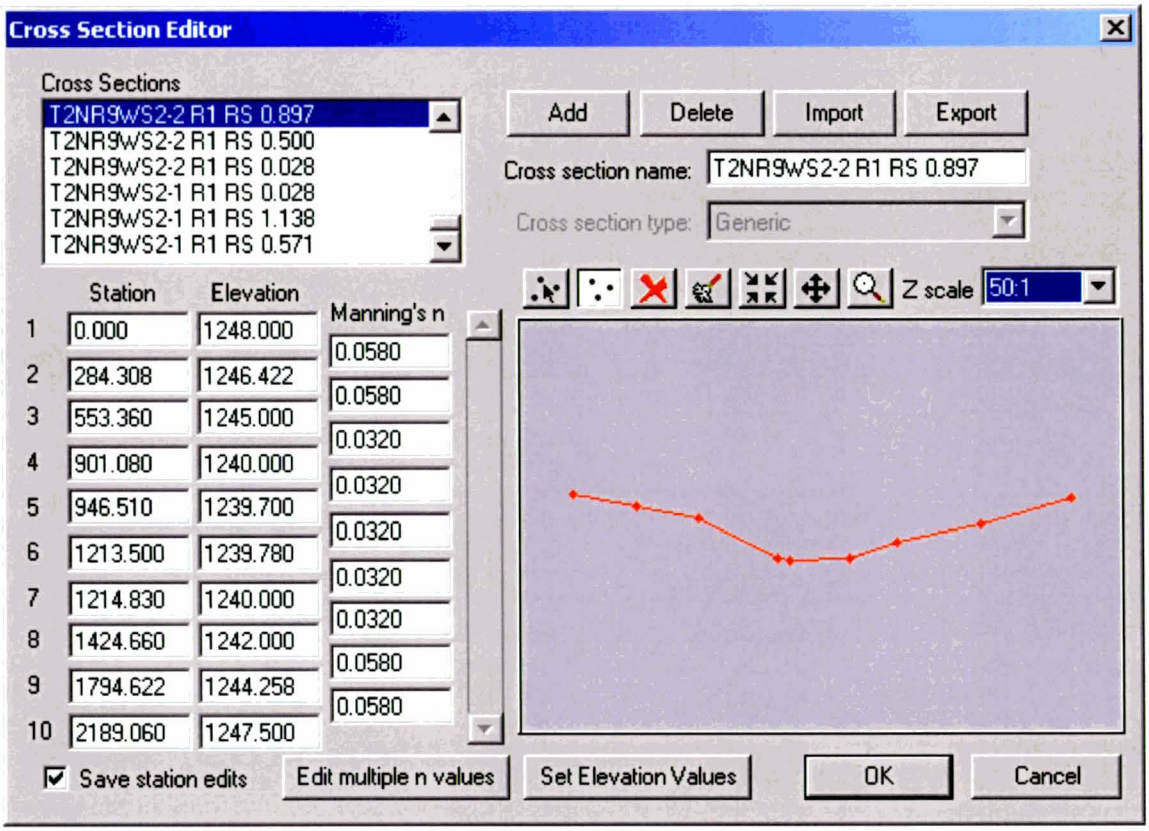
Calculated Values
Longitudinal Slope: 0.0032 ft/ft
Flow: 2183.000 cfs
Depth: 2.446 ft
Area of Flow: 1054.221 sq ft
Wetted Perimeter: 762.576 ft
Average Velocity: 2.071 fps
Top Width (T): 762.500 ft
Froude Number: 0.310
Critical Depth: 1.459 ft
Critical Velocity: 5.151 fps
Critical Slope: 0.03403
Critical Top Width: 514.244 ft

B148
RS 0.500



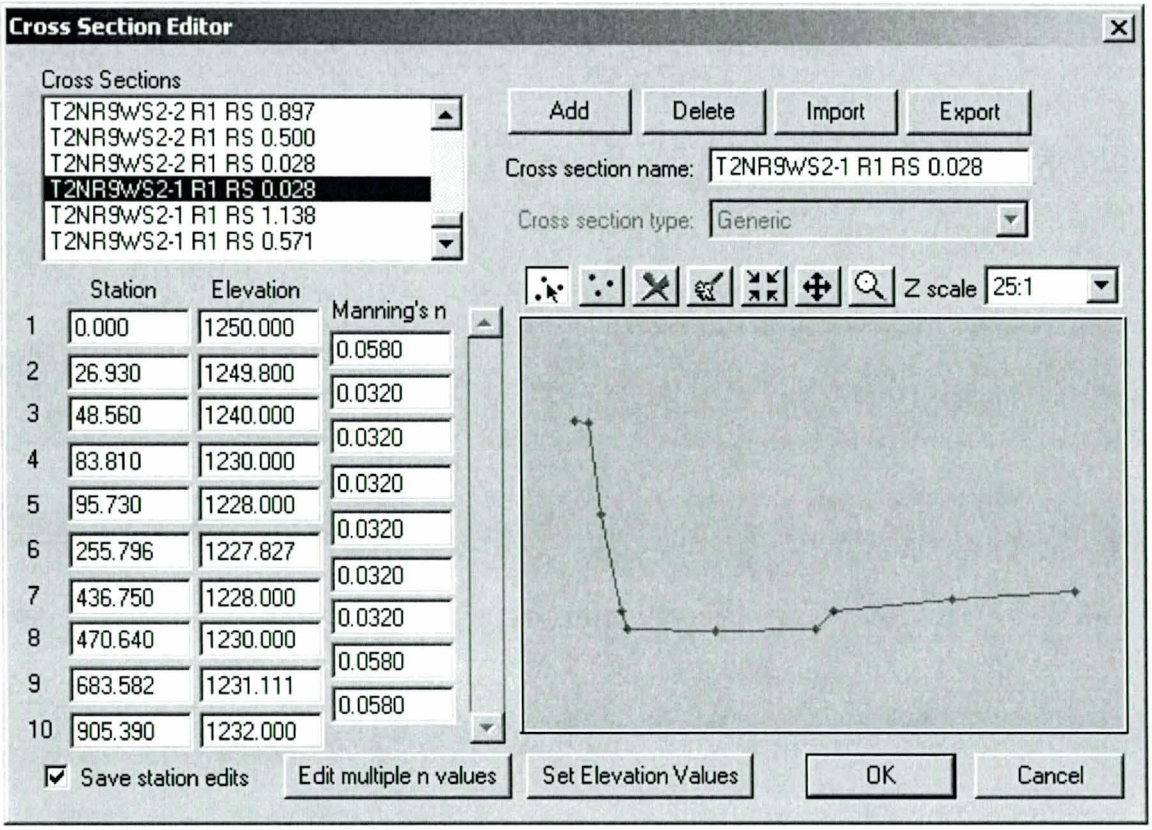
Calculated Values
Longitudinal Slope: 0.0062 ft/ft
Flow: 2183.000 cfs
Depth: 1.597 ft
Area of Flow: 1049.276 sq ft
Wetted Perimeter: 1210.332 ft
Average Velocity: 2.080 fps
Top Width (T): 1210.317 ft
Froude Number: 0.394
Critical Depth: 1.117 ft
Critical Velocity: 4.161 fps
Critical Slope: 0.04786
Critical Top Width: 975.727 ft

B148
RS 0.897



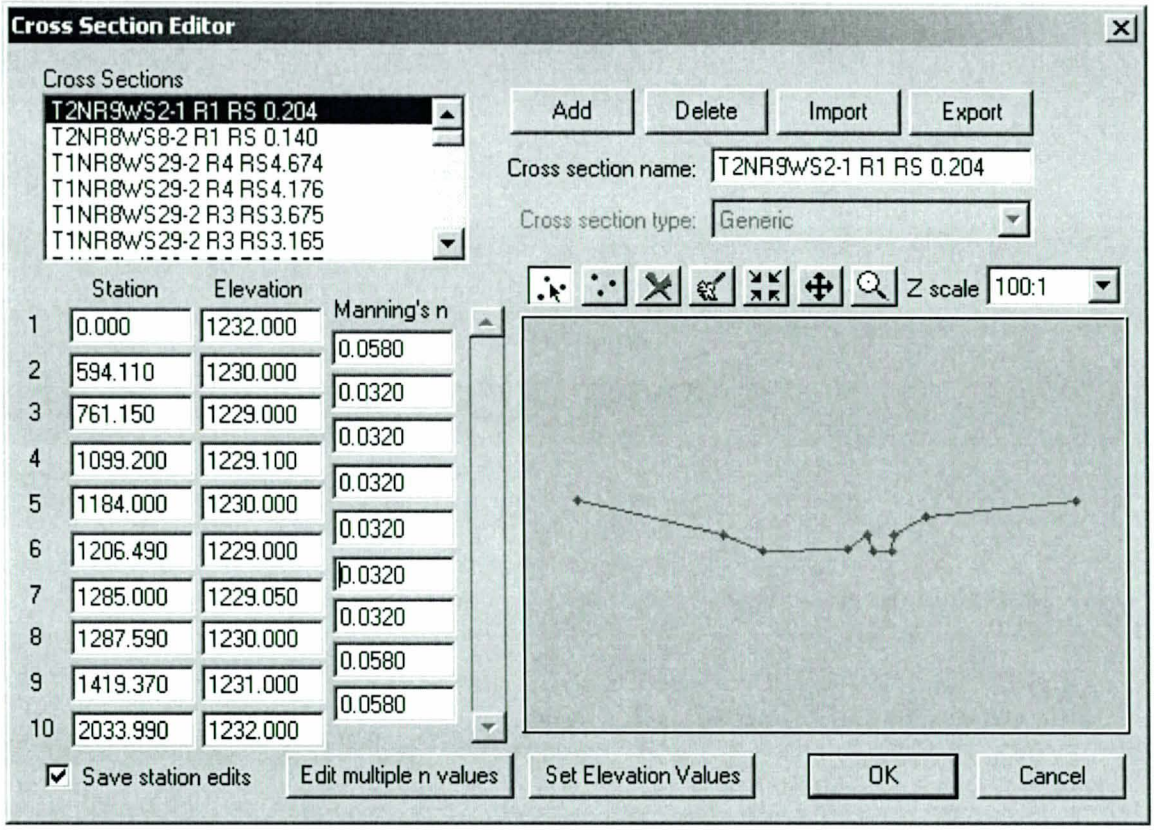
Calculated Values
Longitudinal Slope: 0.0098 ft/ft
Flow: 2183.000 cfs
Depth: 1.305 ft
Area of Flow: 479.730 sq ft
Wetted Perimeter: 489.087 ft
Average Velocity: 4.550 fps
Top Width (T): 489.056 ft
Froude Number: 0.810
Critical Depth: 1.157 ft
Critical Velocity: 5.334 fps
Critical Slope: 0.01548
Critical Top Width: 463.243 ft

B149
RS 0.028



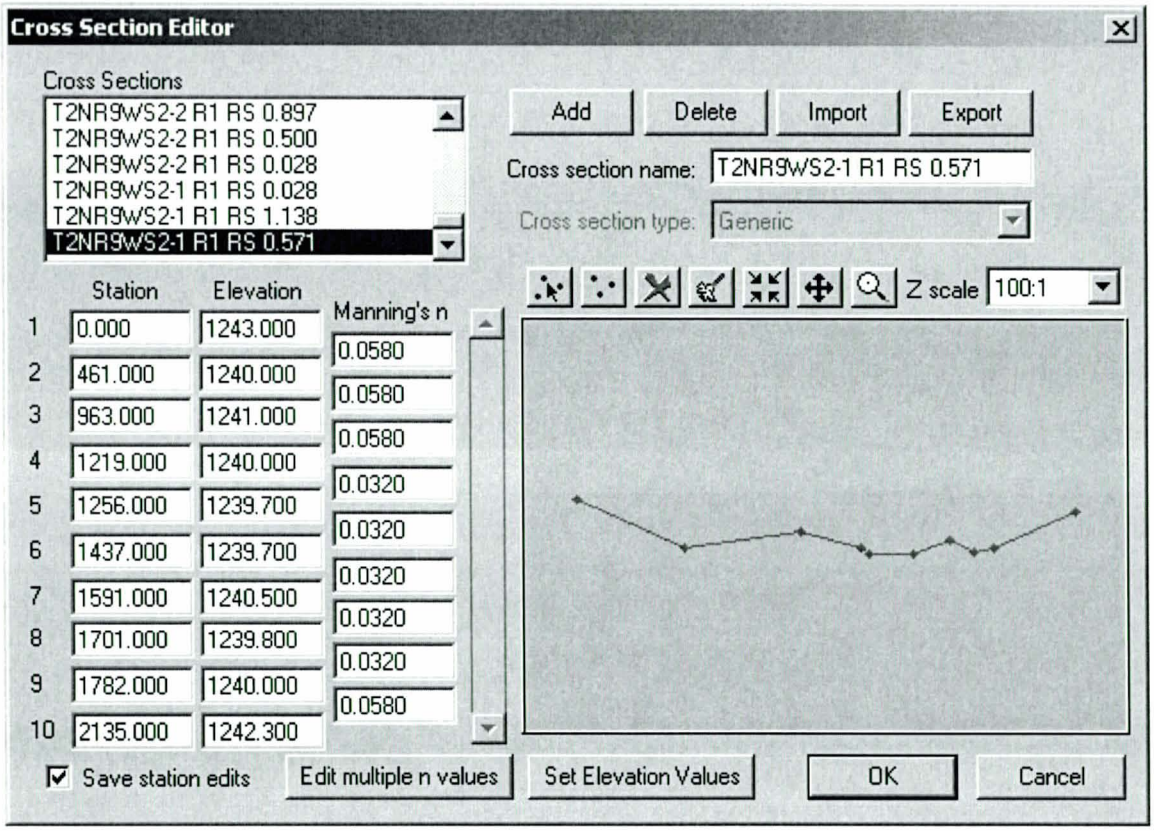
Calculated Values
Longitudinal Slope: 0.0011 ft/ft
Flow: 2398.000 cfs
Depth: 3.066 ft
Area of Flow: 1180.509 sq ft
Wetted Perimeter: 561.491 ft
Average Velocity: 2.031 fps
Top Width (T): 561.138 ft
Froude Number: 0.247
Critical Depth: 1.230 ft
Critical Velocity: 5.957 fps
Critical Slope: 0.01438
Critical Top Width: 365.213 ft

B149
RS 0.204



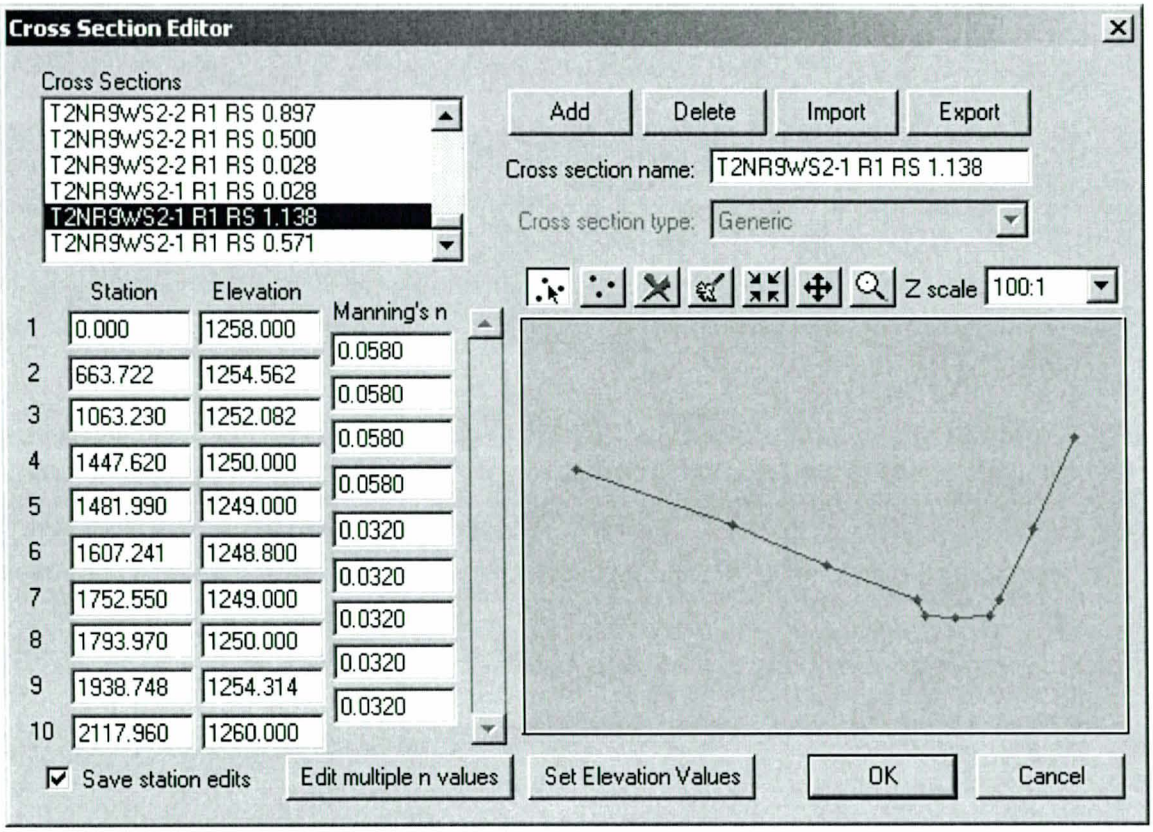
Calculated Values
Longitudinal Slope: 0.0046 ft/ft
Flow: 2398.000 cfs
Depth: 1.456 ft
Area of Flow: 892.713 sq ft
Wetted Perimeter: 889.254 ft
Average Velocity: 2.686 fps
Top Width (T): 889.053 ft
Froude Number: 0.472
Critical Depth: 0.946 ft
Critical Velocity: 4.847 fps
Critical Slope: 0.01650
Critical Top Width: 677.963 ft

B149
RS 0.571



Calculated Values
Longitudinal Slope: 0.0037 ft/ft
Flow: 2398.000 cfs
Depth: 1.490 ft
Area of Flow: 1445.890 sq ft
Wetted Perimeter: 1686.405 ft
Average Velocity: 1.658 fps
Top Width (T): 1686.389 ft
Froude Number: 0.316
Critical Depth: 0.932 ft
Critical Velocity: 3.968 fps
Critical Slope: 0.03922
Critical Top Width: 1235.959 ft

B149
RS 1.138

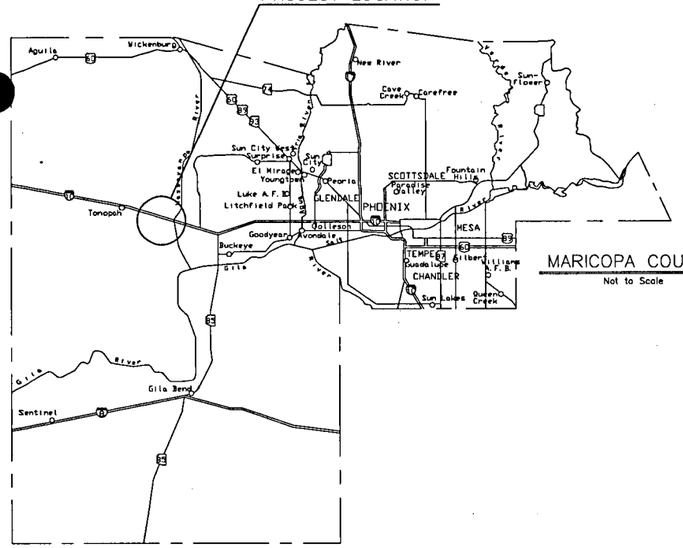


Calculated Values
Longitudinal Slope: 0.0111 ft/ft
Flow: 2398.000 cfs
Depth: 1.703 ft
Area of Flow: 537.547 sq ft
Wetted Perimeter: 456.221 ft
Average Velocity: 4.461 fps
Top Width (T): 456.186 ft
Froude Number: 0.724
Critical Depth: 1.407 ft
Critical Velocity: 5.821 fps
Critical Slope: 0.01934
Critical Top Width: 391.566 ft

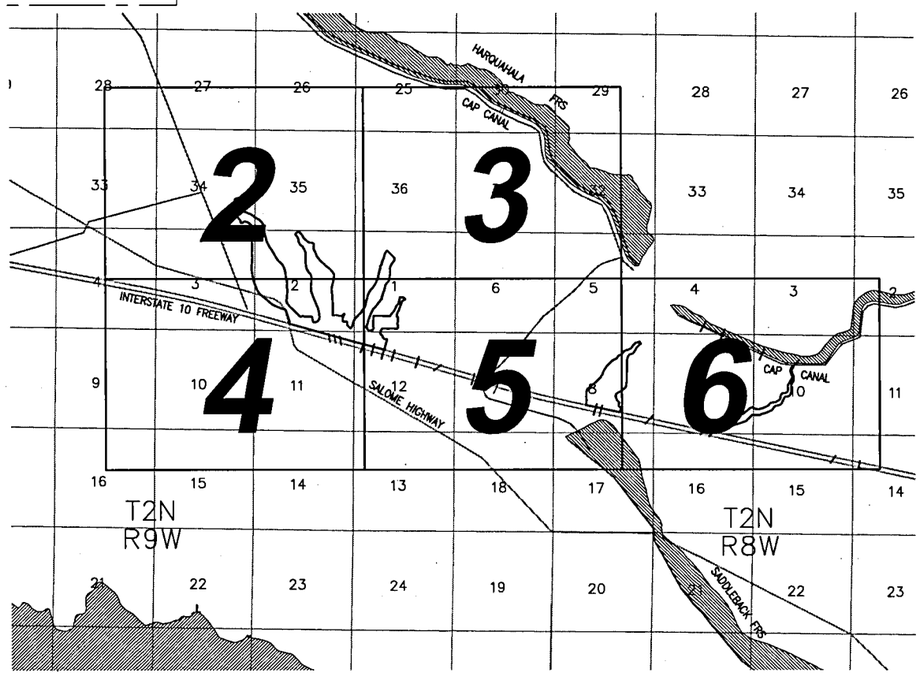
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

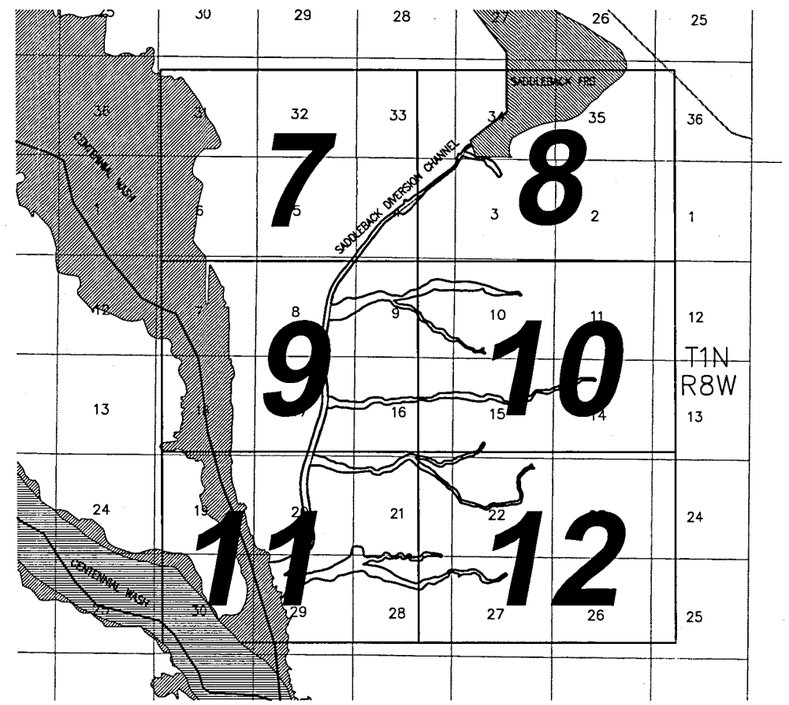
LOWER CENTENNIAL WATERSHED PHASE IV ZONE A FLOODPLAIN DELINEATION STUDY CONTRACT F.C.D. 2003C061

PROJECT LOCATION



MARICOPA COUNTY
Not to Scale





LEGEND

- 100-YR FLOODPLAIN BOUNDARY
- EXISTING CENTENNIAL WASH FLOODWAY
- EXISTING CENTENNIAL WASH ZONE AE FLOODPLAIN
- EXISTING FLOOD PLAIN
- ROAD

HYDROLOGY & HYDRAULICS
JLK ENGINEERS
921 W. UNIVERSITY DRIVE, UNIT 1015
MESA, ARIZONA, 85201
(480)655-7483

AERIAL PHOTOGRAPHY
STEWART GEO TECHNOLOGIES, INC.
DECEMBER 2000
CONTOUR INTERVAL: 10 FEET

DATUM
HORIZONTAL: NORTH AMERICAN DATUM 1983
VERTICAL: NORTH AMERICAN VERTICAL DATUM 1988

STUDY AREA MAP AND SHEET INDEX

SHEET INDEX
SHEET 2-12 FLOOD DELINEATION STUDY

NOTES
THIS MAP WAS PREPARED FROM MARICOPA COUNTY DIGITAL TERRAIN MODELS (DTM) PREPARED FROM AERIAL PHOTOGRAPHS FLOWN ON DECEMBER 17, 2000 BY STEWART GEO TECHNOLOGIES, INC.

NO.	BY	DESCRIPTION	APP'D	DATE

REVISIONS

LOWER CENTENNIAL WATERSHED PHASE IV - ZONE A FLOODPLAIN DELINEATION STUDY F.C.D. CONTRACT NO. 2003C061

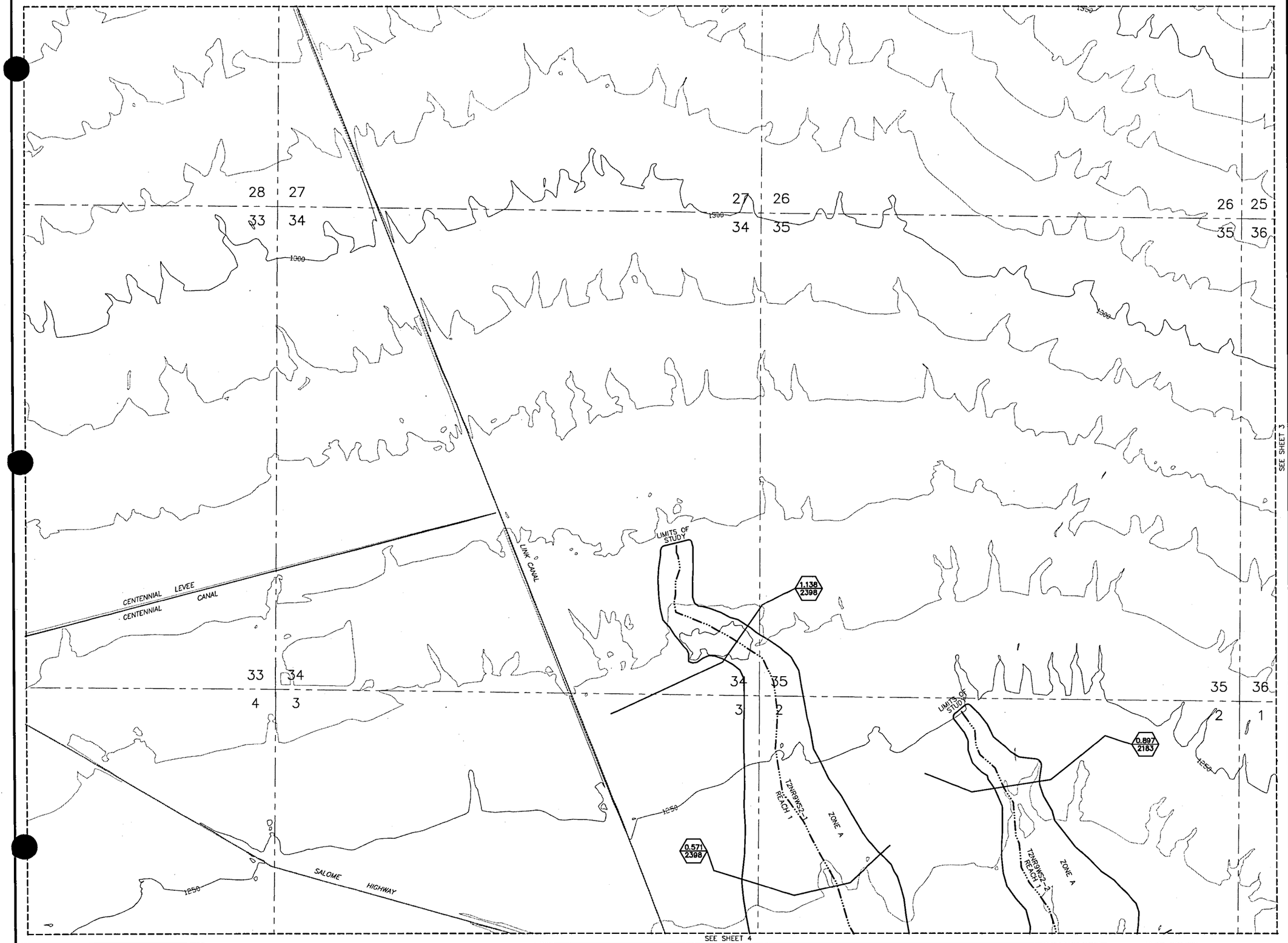
JLK Engineers
Transportation Drainage Public Works
18441 N. 25th Ave., Ste 103
Phoenix, AZ 85023
Tel 602-258-6528
Fax 602-258-5781

LAYOUT	DRAFTED	CHECKED
JRG	NZ	PTG

DRAWING SCALE(S) 1" = 4000'
ORIGINAL PLAN DATE DEC/2005
LATEST REVISION FEB/2006
PROJECT NUMBER RBF05001
SHEET NO. 1 OF 12 SHEETS

4000' 0' 4000' 8000'
SCALE: 1 INCH = 4000 FEET
FLIGHT DATE:
DECEMBER 17, 2000

Flood Control District of Maricopa County



LEGEND

THALWEG	
CENTENNIAL WASH THALWEG	
100-YR FLOODPLAIN BOUNDARY	
SECTION LINE	
MATCH LINE	
SECTION NUMBERS	32
ZONE DESIGNATIONS	ZONE A
CROSS SECTION (STATION RIVER MILE / REGULATORY DISCHARGE (cfs))	0.528 / 1152
EXISTING CENTENNIAL WASH FLOODWAY	
EXISTING CENTENNIAL WASH ZONE AE FLOODPLAIN	
EXISTING FLOOD PLAIN	
ROAD	
STRUCTURES	

NOTES

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2	3	
4	5	6

7	8
9	10
11	12

500' 0' 500' 100'

SCALE: 1 INCH = 500 FEET
FLIGHT DATE:
DECEMBER 17, 2000

NO.	BY	DESCRIPTION	APP'D	DATE

REVISIONS

LOWER CENTENNIAL WATERSHED
PHASE IV – ZONE A
FLOODPLAIN DELINEATION STUDY
F.C.D. CONTRACT NO. 2003C061

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18441 N. 25th Ave., Ste 103
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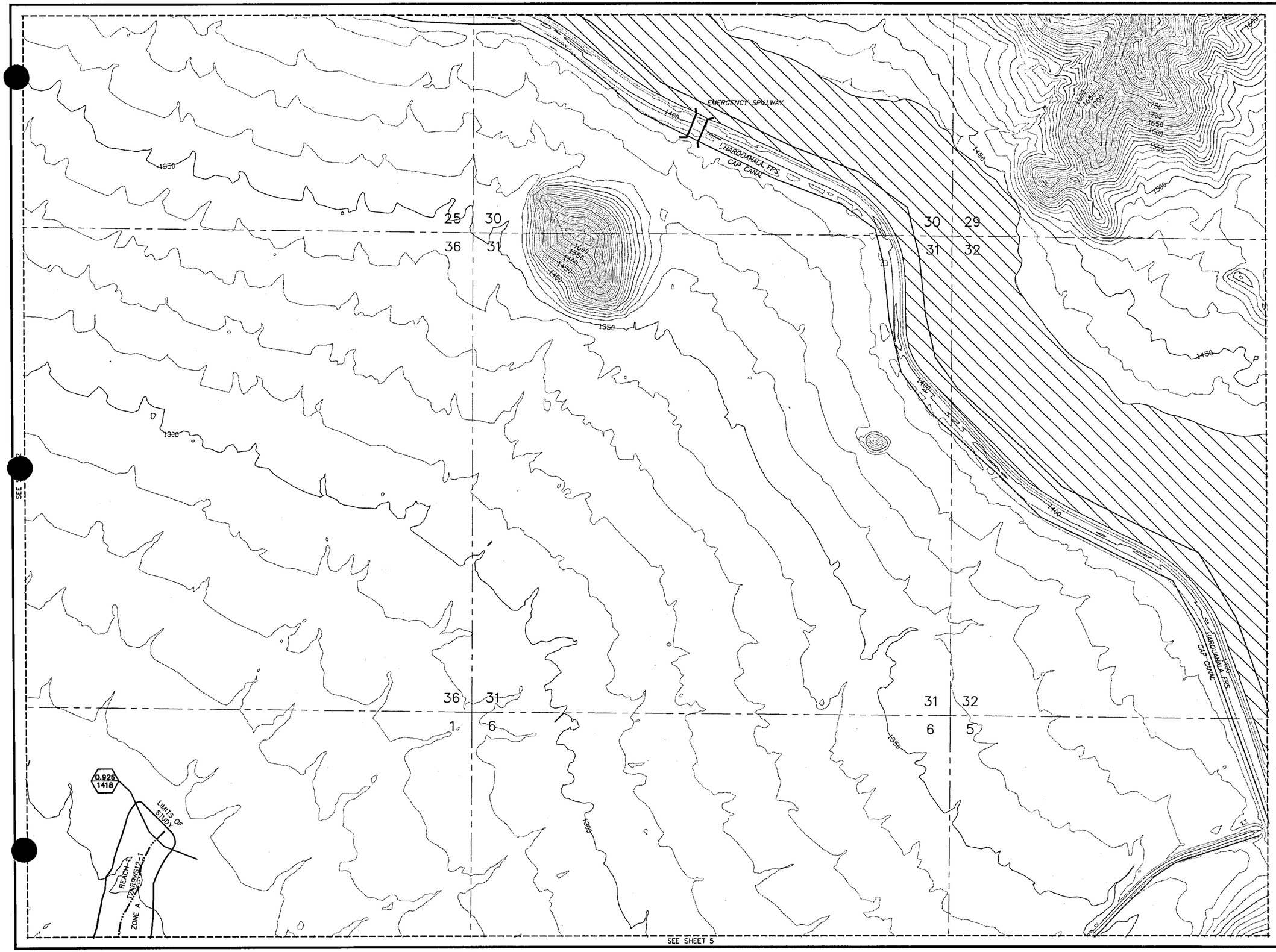
Fax 602-288-6781

REGISTERED PROFESSIONAL ENGINEER (CIVIL) 31474 JOE R. GONZALEZ 2/10/06 ARIZONA U.S.A.

LAYOUT	DRAFTED	CHECKED
JRG	NZ	PTG

DRAWING SCALE(S)	1" = 500'
ORIGINAL PLAN DATE	DEC/2005
LATEST REVISION	FEB/2006
PROJECT NUMBER	RBF05001

SHEET NO. 2 OF 12 SHEETS



LEGEND

THALWEG
CENTENNIAL WASH THALWEG
100-YR FLOODPLAIN BOUNDARY
SECTION LINE
MATCH LINE
SECTION NUMBERS — 32
ZONE DESIGNATIONS — ZONE A
CROSS SECTION — STATION RIVER MILE 0.528 / REGULATORY DISCHARGE (cfs) 1152
EXISTING CENTENNIAL WASH FLOODWAY
EXISTING CENTENNIAL WASH ZONE AE FLOODPLAIN
EXISTING FLOOD PLAIN
ROAD
STRUCTURES

NOTES

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2	3	
4	5	6

7	8
9	10
11	12

500' 0' 500' 100'
SCALE: 1 INCH = 500 FEET
FLIGHT DATE:
DECEMBER 17, 2000

NO.	BY	DESCRIPTION	APP'D	DATE

REVISIONS

LOWER CENTENNIAL WATERSHED
PHASE IV – ZONE A
FLOODPLAIN DELINEATION STUDY
F.C.D. CONTRACT NO. 2003C061

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Phoenix, AZ 85023
Tel 602-288-6528
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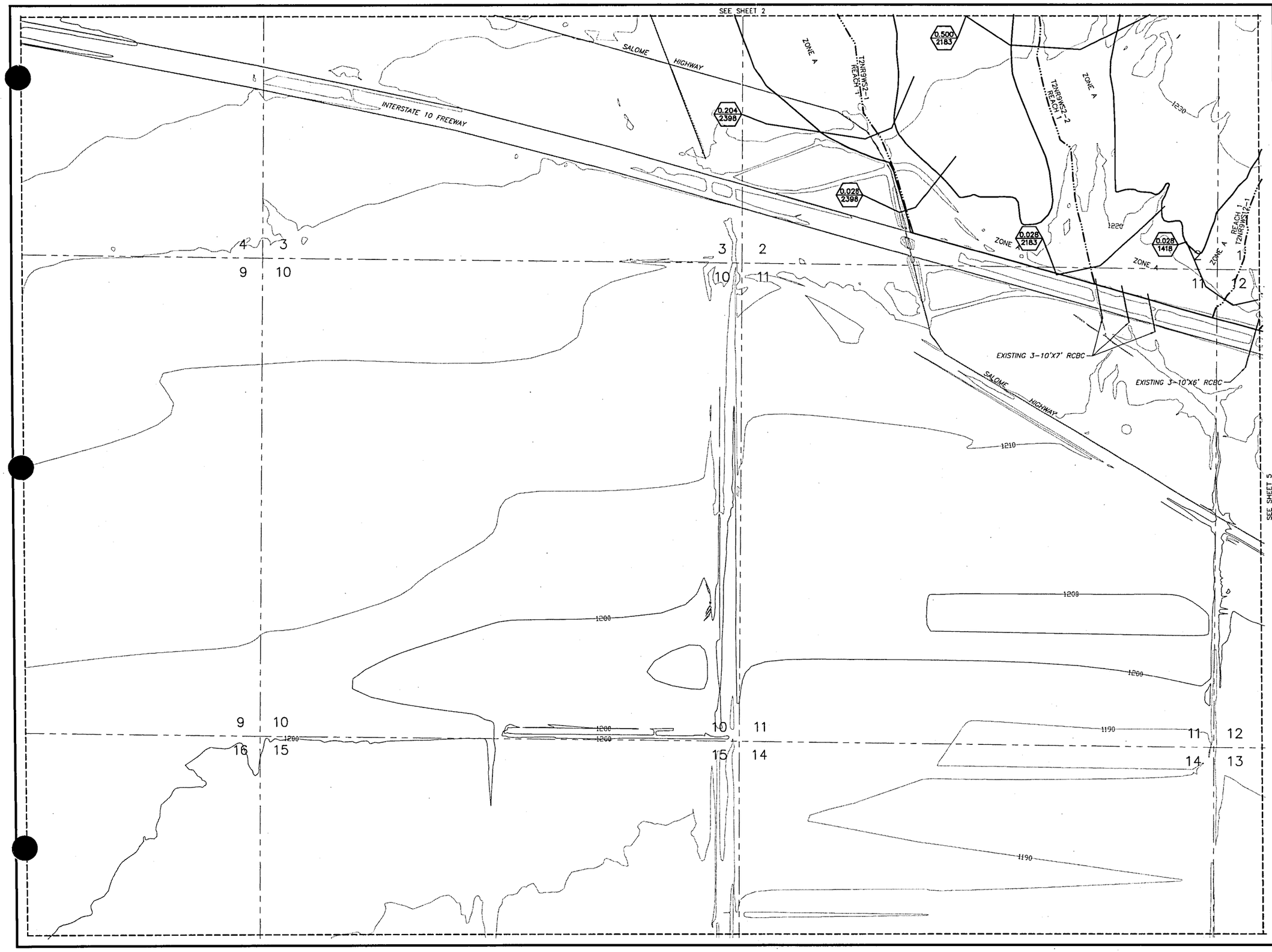
REGISTERED PROFESSIONAL ENGINEER (CIVIL) 31474 JOE R. GONZALEZ Date Signed 2/10/06 ARIZONA U.S.A.

LAYOUT	DRAFTED	CHECKED
JRG	NZ	PTG

DRAWING SCALE(S): 1" = 500'
ORIGINAL PLAN DATE: DEC/2005
LATEST REVISION: FEB/2006
PROJECT NUMBER: RBF05001
SHEET NO. 3 OF 12 SHEETS



LEGEND

THALWEG	
CENTENNIAL WASH THALWEG	
100-YR FLOODPLAIN BOUNDARY	
SECTION LINE	
MATCH LINE	
SECTION NUMBERS	32
ZONE DESIGNATIONS	ZONE A
CROSS SECTION (STATION RIVER MILE / REGULATORY DISCHARGE (cfs))	0.528 / 1152
EXISTING CENTENNIAL WASH FLOODWAY	
EXISTING CENTENNIAL WASH ZONE AE FLOODPLAIN	
EXISTING FLOOD PLAIN	
ROAD	
STRUCTURES	

NOTES

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2	3	
4	5	6

7	8
9	10
11	12

500' 0' 500' 100'

SCALE: 1 INCH = 500 FEET
FLIGHT DATE:
DECEMBER 17, 2000

NO.	BY	DESCRIPTION	APP'D	DATE

REVISIONS

LOWER CENTENNIAL WATERSHED
PHASE IV – ZONE A
FLOODPLAIN DELINEATION STUDY
F.C.D. CONTRACT NO. 2003C061

JLK Engineers
Transportation Drainage Public Works
18441 N. 25th Ave., Ste 103
Phoenix, AZ 85023
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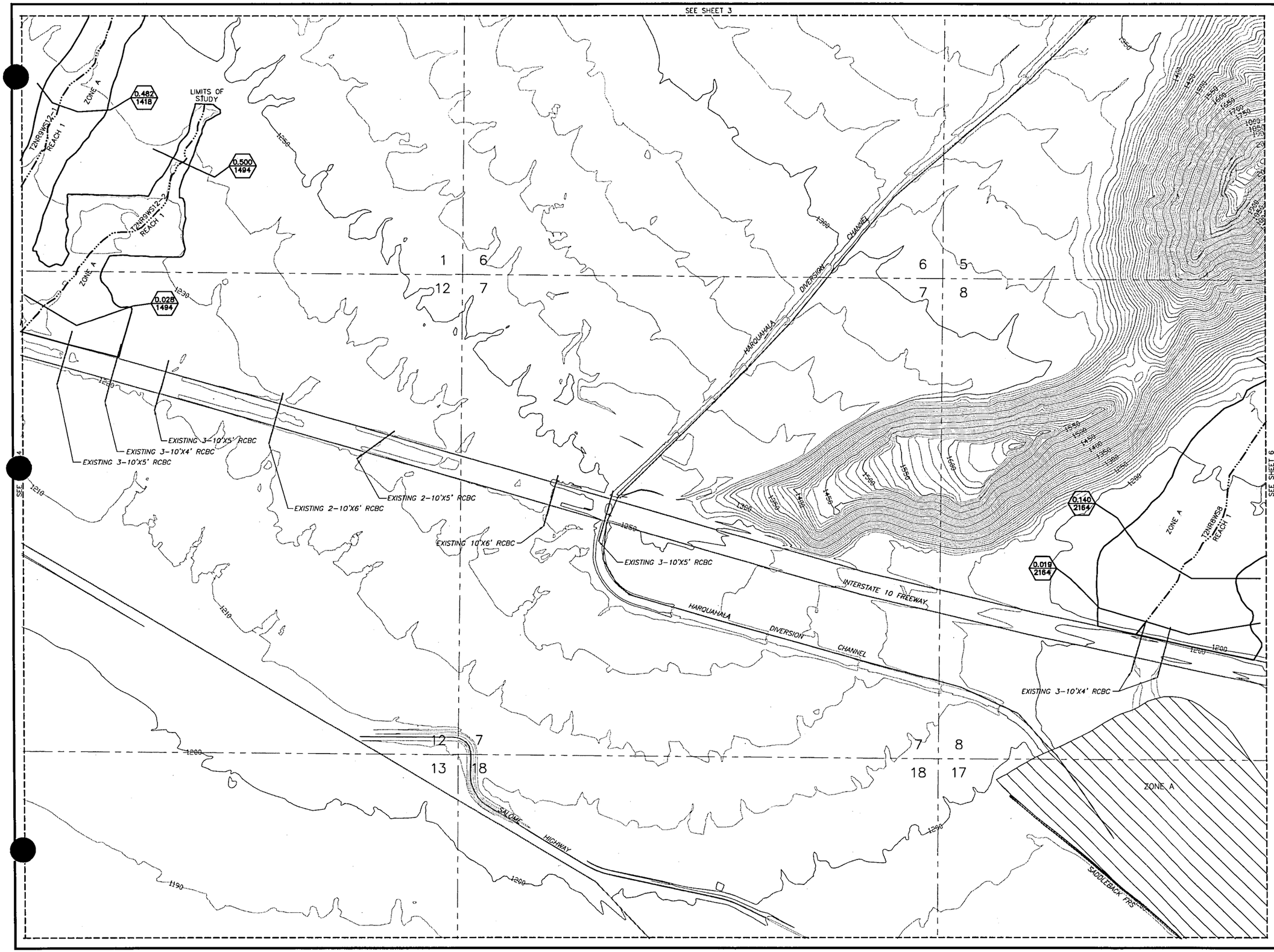
REGISTERED PROFESSIONAL ENGINEER (CIVIL) 31474 JOE R GONZALEZ 2/10/06 ARIZONA U.S.A.

LAYOUT	DRAFTED	CHECKED
JRG	NZ	PTG

DRAWING SCALE(S): 1" = 500'
ORIGINAL PLAN DATE: DEC/2005
LATEST REVISION: FEB/2006
PROJECT NUMBER: RBF05001
SHEET NO. 4 OF 12 SHEETS



LEGEND

THALWEG	
CENTENNIAL WASH THALWEG	
100-YR FLOODPLAIN BOUNDARY	
SECTION LINE	
MATCH LINE	
SECTION NUMBERS	32
ZONE DESIGNATIONS	ZONE A
CROSS SECTION — STATION RIVER MILE / REGULATORY DISCHARGE (cfs)	0.528 / 1152
EXISTING CENTENNIAL WASH FLOODWAY	
EXISTING CENTENNIAL WASH ZONE AE FLOODPLAIN	
EXISTING FLOOD PLAIN	
ROAD	
STRUCTURES	

NOTES

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2	3	
4	5	6

7	8
9	10
11	12

500' 0' 500' 100'

SCALE: 1 INCH = 500 FEET
FLIGHT DATE:
DECEMBER 17, 2000

NO.	BY	DESCRIPTION	APP'D	DATE

REVISIONS

LOWER CENTENNIAL WATERSHED
PHASE IV – ZONE A
FLOODPLAIN DELINEATION STUDY
F.C.D. CONTRACT NO. 2003C061

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18441 N. 25th Ave., Ste 103
Phoenix, AZ 85023
Tel 602-258-6528
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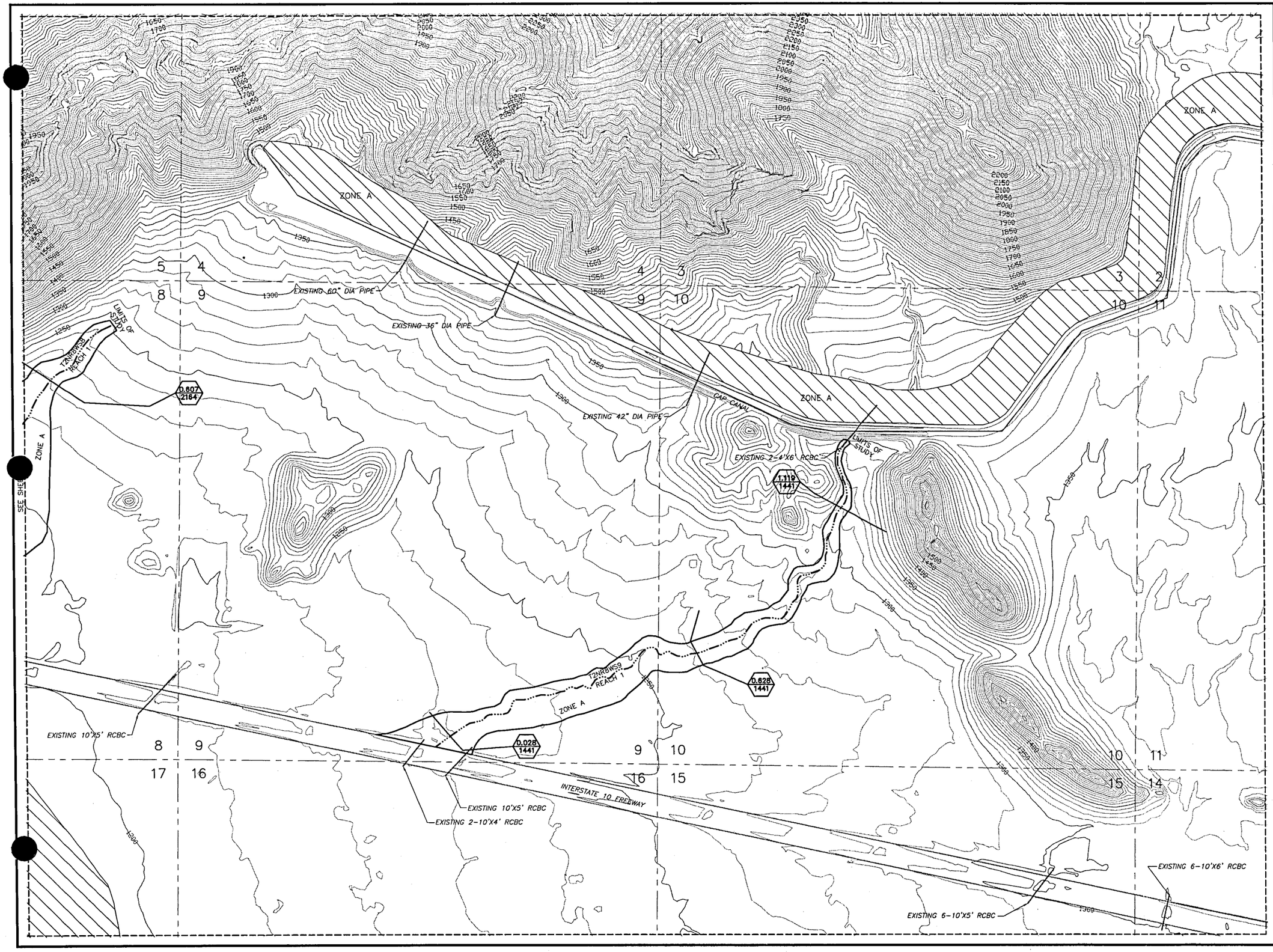
31474 JOE R. GONZALEZ ARIZONA U.S.A.

LAYOUT	DRAFTED	CHECKED
JRG	NZ	PTG

DRAWING SCALE(S): 1" = 500'
ORIGINAL PLAN DATE: DEC/2005
LATEST REVISION: FEB/2006
PROJECT NUMBER: RBF05001
SHEET NO. 5 OF 12 SHEETS



LEGEND

THALWEG	
CENTENNIAL WASH THALWEG	
100-YR FLOODPLAIN BOUNDARY	
SECTION LINE	
MATCH LINE	
SECTION NUMBERS	32
ZONE DESIGNATIONS	ZONE A
CROSS SECTION (STATION RIVER MILE / REGULATORY DISCHARGE (cfs))	0.528 / 1152
EXISTING CENTENNIAL WASH FLOODWAY	
EXISTING CENTENNIAL WASH ZONE AE FLOODPLAIN	
EXISTING FLOOD PLAIN	
ROAD	
STRUCTURES	

NOTES

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2	3	
4	5	6

7	8
9	10
11	12

500' 0' 500' 100'

SCALE: 1 INCH = 500 FEET
FLIGHT DATE:
DECEMBER 17, 2000

NO.	BY	DESCRIPTION	APP'D	DATE

REVISIONS

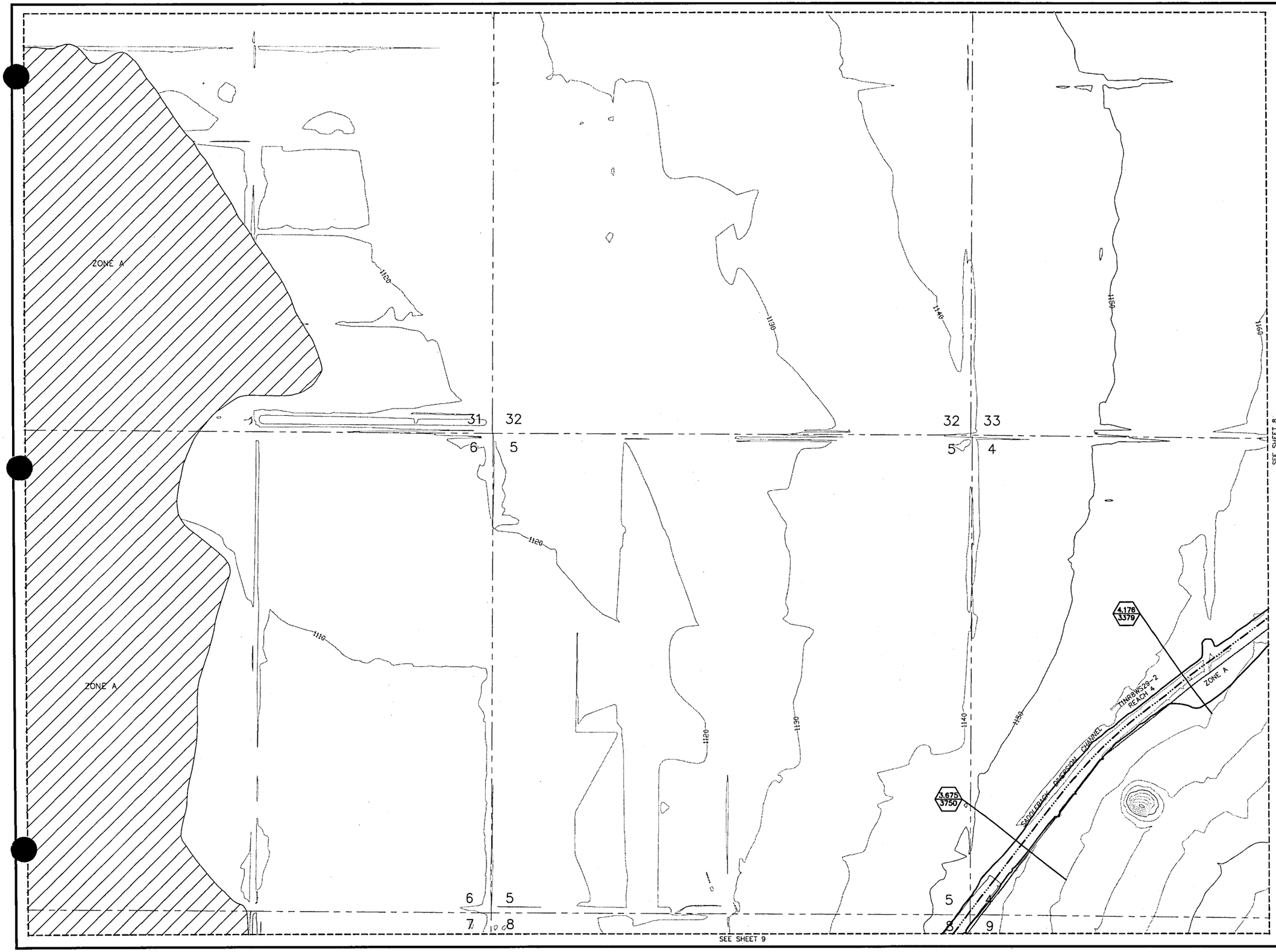
LOWER CENTENNIAL WATERSHED
PHASE IV – ZONE A
FLOODPLAIN DELINEATION STUDY
F.C.D. CONTRACT NO. 2003C061

JLK Engineers
Transportation Drainage Public Works
18441 N. 25th Ave., Ste 103
Phoenix, AZ 85023
Tel 602-288-6528
Fax 602-288-6781

31474 JOE R GONZALEZ 2/10/06 ARIZONA U.S.A.

LAYOUT	DRAFTED	CHECKED
JRG	NZ	PTG

DRAWING SCALE(S): 1" = 500'
ORIGINAL PLAN DATE: DEC/2005
LATEST REVISION: FEB/2006
PROJECT NUMBER: RBF05001
SHEET NO. 6 OF 12 SHEETS



LEGEND

THALWEG	
CENTENNIAL WASH THALWEG	
100-YR FLOODPLAIN BOUNDARY	
SECTION LINE	
MATCH LINE	
SECTION NUMBERS	32
ZONE DESIGNATIONS	ZONE A
CROSS SECTION (STATION RIVER MILE / REGULATORY DISCHARGE (cfs))	0.528 / 1152
EXISTING CENTENNIAL WASH FLOODWAY	
EXISTING CENTENNIAL WASH ZONE AE FLOODPLAIN	
EXISTING FLOOD PLAIN	
ROAD	
STRUCTURES	

NOTES

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2	3	
4	5	6

7	8
9	10
11	12

500' 0' 500' 100'

SCALE: 1 INCH = 500 FEET
FLIGHT DATE:
DECEMBER 17, 2000

NO.	BY	DESCRIPTION	APP'D	DATE

REVISIONS

LOWER CENTENNIAL WATERSHED
PHASE IV – ZONE A
FLOODPLAIN DELINEATION STUDY
F.C.D. CONTRACT NO. 2003C061

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Transportation Drainage Public Works
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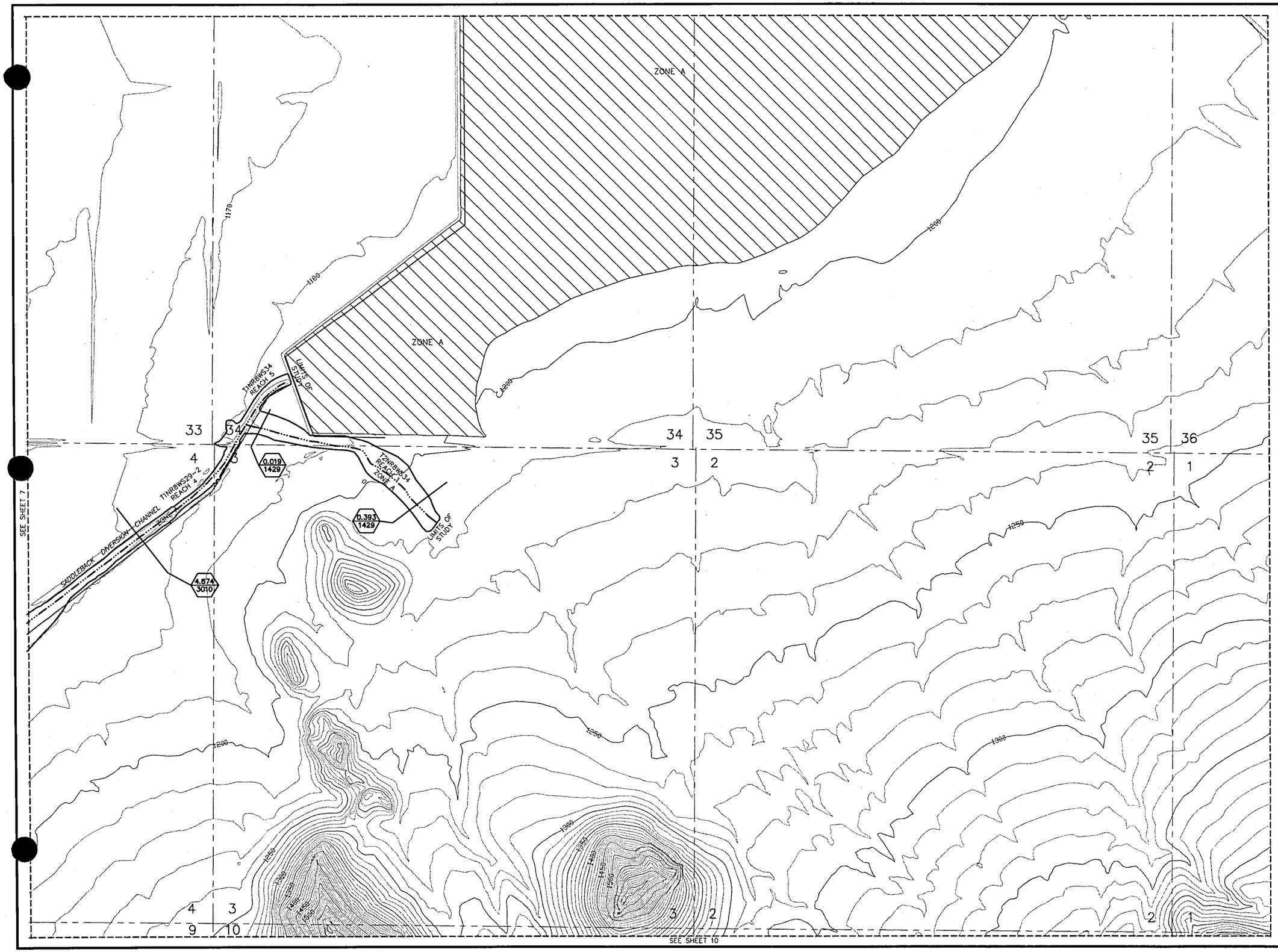
REGISTERED PROFESSIONAL ENGINEER (CIVIL) 31474 JOE R GONZALEZ ARIZONA U.S.A. 7/10/06

LAYOUT	DRAFTED	CHECKED
JRG	NZ	PTG

DRAWING SCALE(S): 1" = 500'
ORIGINAL PLAN DATE: DEC/2005
LATEST REVISION: FEB/2006
PROJECT NUMBER: RBF05001

SHEET NO. 7 OF 12 SHEETS



LEGEND

THALWEG	
CENTENNIAL WASH THALWEG	
100-YR FLOODPLAIN BOUNDARY	
SECTION LINE	
MATCH LINE	
SECTION NUMBERS	32
ZONE DESIGNATIONS	ZONE A
CROSS SECTION (STATION RIVER MILE / REGULATORY DISCHARGE (cfs))	0.528 / 1152
EXISTING CENTENNIAL WASH FLOODWAY	
EXISTING CENTENNIAL WASH ZONE AE FLOODPLAIN	
EXISTING FLOOD PLAIN	
ROAD	
STRUCTURES	

NOTES

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2	3	
4	5	6

7	8
9	10
11	12

500' 0' 500' 100'

SCALE: 1 INCH = 500 FEET
FLIGHT DATE:
DECEMBER 17, 2000

NO.	BY	DESCRIPTION	APP'D	DATE

REVISIONS

LOWER CENTENNIAL WATERSHED
PHASE IV – ZONE A
FLOODPLAIN DELINEATION STUDY
F.C.D. CONTRACT NO. 2003C061

JLK Engineers
Transportation Drainage Public Works
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Tel 602-288-6528
Fax 602-288-5781

REGISTERED PROFESSIONAL ENGINEER (CIVIL) 31474 JOE R. GONZALEZ 2/10/06 ARIZONA U.S.A.

LAYOUT	DRAFTED	CHECKED
JRG	NZ	PTG

DRAWING SCALE(S): 1" = 500'
ORIGINAL PLAN DATE: DEC/2005
LATEST REVISION: FEB/2006
PROJECT NUMBER: RBF05001

SHEET NO. 8 OF 12 SHEETS

LEGEND

THALWEG	
CENTENNIAL WASH THALWEG	
100-YR FLOODPLAIN BOUNDARY	
SECTION LINE	
MATCH LINE	
SECTION NUMBERS	32
ZONE DESIGNATIONS	ZONE A
CROSS SECTION (STATION RIVER MILE / REGULATORY DISCHARGE (cfs))	0.528 / 1152
EXISTING CENTENNIAL WASH FLOODWAY	
EXISTING CENTENNIAL WASH ZONE AE FLOODPLAIN	
EXISTING FLOOD PLAIN	
ROAD	
STRUCTURES	

NOTES

THIS MAP WAS PREPARED FROM MARICOPA COUNTY DIGITAL TERRAIN MODELS (DTM) PREPARED FROM AERIAL PHOTOGRAPHS FLOWN ON DECEMBER 17, 2000 BY STEWART GEO TECHNOLOGIES, INC.

2	3	
4	5	6

7	8
9	10
11	12

500' 0' 500' 100'

SCALE: 1 INCH = 500 FEET
FLIGHT DATE:
DECEMBER 17, 2000

NO.	BY	DESCRIPTION	APP'D	DATE

REVISIONS

LOWER CENTENNIAL WATERSHED
PHASE IV – ZONE A
FLOODPLAIN DELINEATION STUDY
F.C.D. CONTRACT NO. 2003C061

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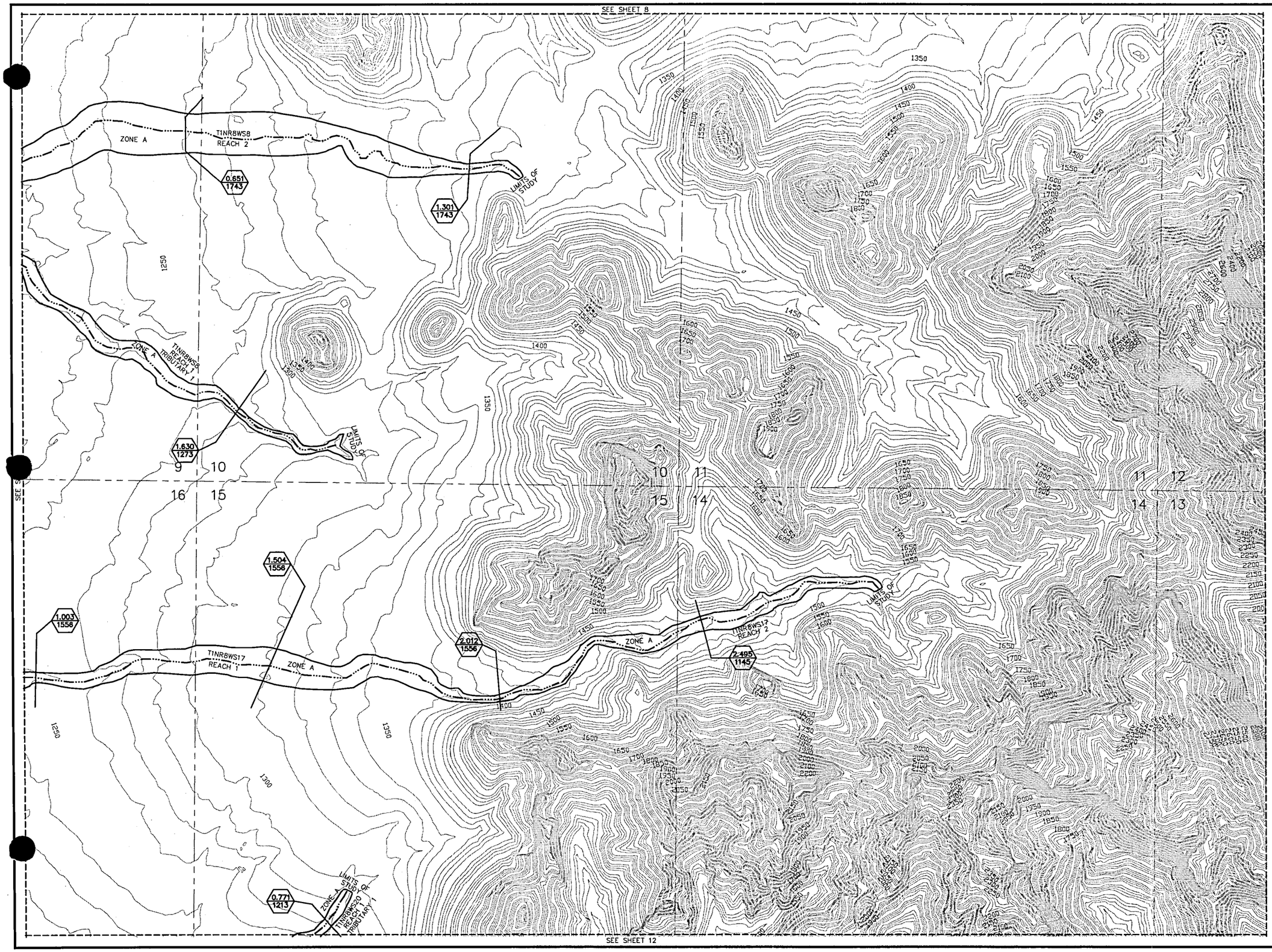
31474 JOE R. GONZALEZ 2/10/06 REGISTERED PROFESSIONAL ENGINEER (CIVIL) ARIZONA U.S.A.

LAYOUT	DRAFTED	CHECKED
JRG	NZ	PTG

DRAWING SCALE(S): 1" = 500'
ORIGINAL PLAN DATE: DEC/2005
LATEST REVISION: FEB/2006
PROJECT NUMBER: RBF05001
SHEET NO. 9 OF 12 SHEETS



LEGEND

THALWEG	
CENTENNIAL WASH THALWEG	
100-YR FLOODPLAIN BOUNDARY	
SECTION LINE	
MATCH LINE	
SECTION NUMBERS	32
ZONE DESIGNATIONS	ZONE A
CROSS SECTION (STATION RIVER MILE / REGULATORY DISCHARGE (cfs))	0.528 / 1152
EXISTING CENTENNIAL WASH FLOODWAY	
EXISTING CENTENNIAL WASH ZONE AE FLOODPLAIN	
EXISTING FLOOD PLAIN	
ROAD	
STRUCTURES	

NOTES

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2	3	
4	5	6

7	8
9	10
11	12

500' 0' 500' 100'

SCALE: 1 INCH = 500 FEET
FLIGHT DATE:
DECEMBER 17, 2000

NO.	BY	DESCRIPTION	APP'D	DATE

REVISIONS

LOWER CENTENNIAL WATERSHED
PHASE IV – ZONE A
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F.C.D. CONTRACT NO. 2003C061

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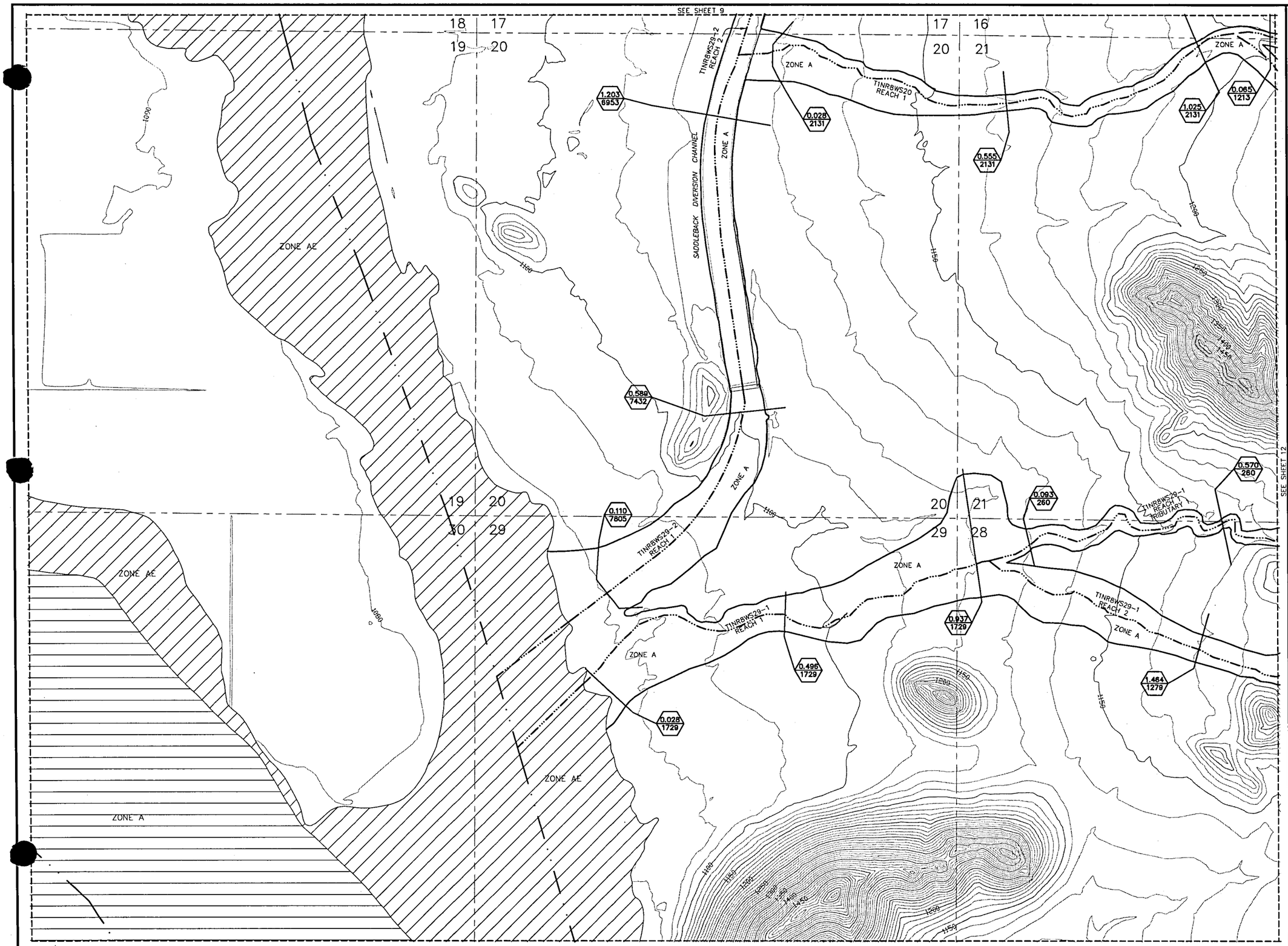
LAYOUT	DRAFTED	CHECKED
JRG	NZ	PTG

DRAWING SCALE(S): 1" = 500'
ORIGINAL PLAN DATE: DEC/2005
LATEST REVISION: FEB/2006
PROJECT NUMBER: RBF05001
SHEET NO. 10 OF 12 SHEETS



LEGEND

THALWEG
CENTENNIAL WASH THALWEG
100-YR FLOODPLAIN BOUNDARY
SECTION LINE
MATCH LINE
SECTION NUMBERS — 32
ZONE DESIGNATIONS — ZONE A
CROSS SECTION — STATION RIVER MILE 0.528 / REGULATORY DISCHARGE (cfs) 1152
EXISTING CENTENNIAL WASH FLOODWAY
EXISTING CENTENNIAL WASH ZONE AE FLOODPLAIN
EXISTING FLOOD PLAIN
ROAD
STRUCTURES

NOTES

THIS MAP WAS PREPARED FROM MARICOPA COUNTY DIGITAL TERRAIN MODELS (DTM) PREPARED FROM AERIAL PHOTOGRAPHS FLOWN ON DECEMBER 17, 2000 BY STEWART GEO TECHNOLOGIES, INC.

2	3	
4	5	6

7	8
9	10
11	12

500' 0' 500' 100'
SCALE: 1 INCH = 500 FEET
FLIGHT DATE:
DECEMBER 17, 2000

NO.	BY	DESCRIPTION	APP'D	DATE

REVISIONS

LOWER CENTENNIAL WATERSHED
PHASE IV – ZONE A
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F.C.D. CONTRACT NO. 2003C061

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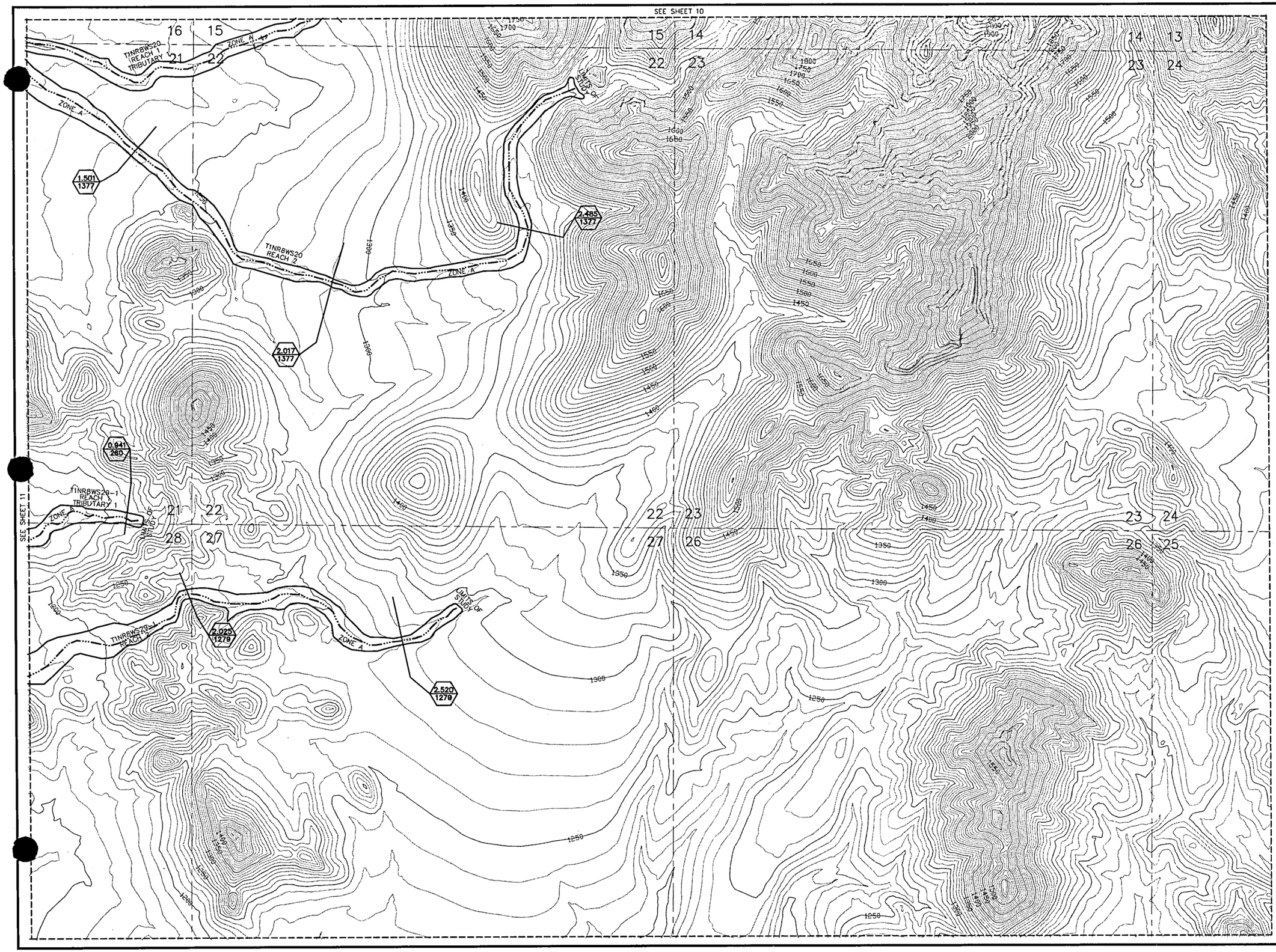
Fax 602-288-5781

LAYOUT	DRAFTED	CHECKED
JRG	NZ	PTG

DRAWING SCALE(S): 1" = 500'
ORIGINAL PLAN DATE: DEC/2005
LATEST REVISION: FEB/2006
PROJECT NUMBER: RBF05001
SHEET NO. 11 OF 12 SHEETS



LEGEND

THALWEG	
CENTENNIAL WASH THALWEG	
100-YR FLOODPLAIN BOUNDARY	
SECTION LINE	
MATCH LINE	
SECTION NUMBERS	32
ZONE DESIGNATIONS	ZONE A
CROSS SECTION (STATION RIVER MILE / REGULATORY DISCHARGE (cfs))	0.528 / 1152
EXISTING CENTENNIAL WASH FLOODWAY	
EXISTING CENTENNIAL WASH ZONE AE FLOODPLAIN	
EXISTING FLOOD PLAIN	
ROAD	
STRUCTURES	

NOTES

THIS MAP WAS PREPARED FROM MARICOPA COUNTY DIGITAL TERRAIN MODELS (DTM) PREPARED FROM AERIAL PHOTOGRAPHS FLOWN ON DECEMBER 17, 2000 BY STEWART GEO TECHNOLOGIES, INC.

2	3	
4	5	6

7	8
9	10
11	12

500' 0' 500' 100'

SCALE: 1 INCH = 500 FEET
FLIGHT DATE:
DECEMBER 17, 2000

NO.	BY	DESCRIPTION	APP'D	DATE

REVISIONS

LOWER CENTENNIAL WATERSHED
PHASE IV – ZONE A
FLOODPLAIN DELINEATION STUDY
F.C.D. CONTRACT NO. 2003C061

JLK Engineers
Transportation Drainage Public Works
15441 N. 25th Ave., Ste 103
Phoenix, AZ 85023
Tel 602-288-6528
Fax 602-288-5781

REGISTERED PROFESSIONAL ENGINEER (CIVIL) 31474 JOE R. GONZALEZ 2/10/06 ARIZONA U.S.A.

LAYOUT	DRAFTED	CHECKED
JRG	NZ	PTG

DRAWING SCALE(S)	1" = 500'
ORIGINAL PLAN DATE	DEC/2005
LATEST REVISION	FEB/2006
PROJECT NUMBER	RBF05001

SHEET NO. 12 OF 12 SHEETS

B.P.R. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS B
7	ARIZ.	I-10-2(7)	1	6	

STATE OF ARIZONA
STATE HIGHWAY DEPARTMENT

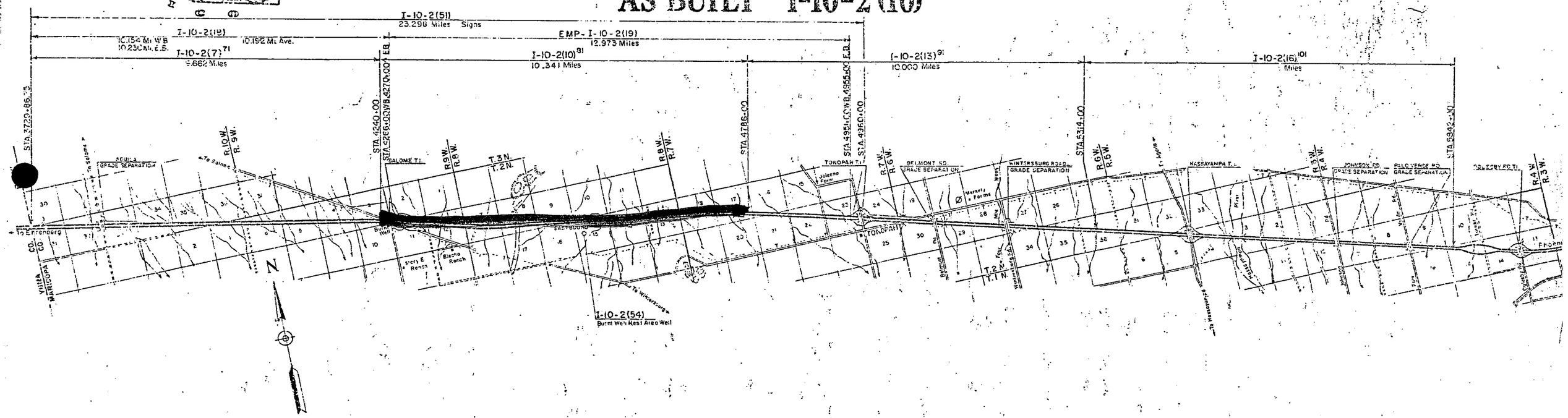
PLAN AND PROFILE OF PROPOSED

STATE HIGHWAY

EHRENBERG — PHOENIX

MARICOPA COUNTY

AS BUILT I-10-2 (10)



ARIZONA STATE HIGHWAY COMMISSION
APPROVED: WM. N. PRICE
STATE HIGHWAY ENGINEER

APPROVED DATE
CHIEF DEPUTY STATE ENGINEER

APPROVED DATE
DEPUTY STATE ENGINEER

US DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

APPROVED DATE
DIVISION ENGINEER

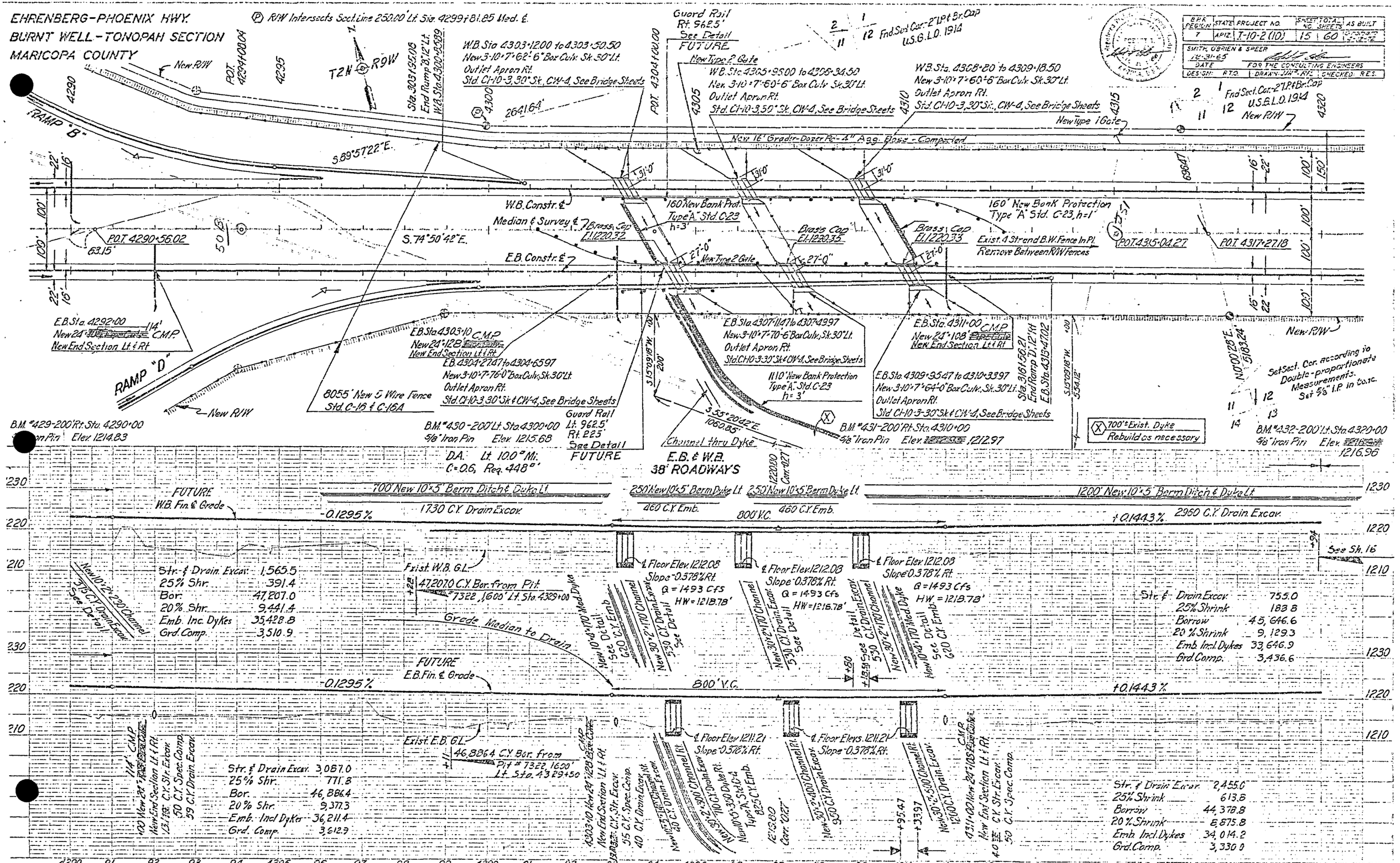
SCALE 2" = 1 Mile

PDF
DATE 7-04 DISK 50

EHRENBERG-PHOENIX HWY.
BURNT WELL-TONOPAH SECTION
MARICOPA COUNTY

BRK REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
7	ARIZ.	I-10-2 (10)	15	60	

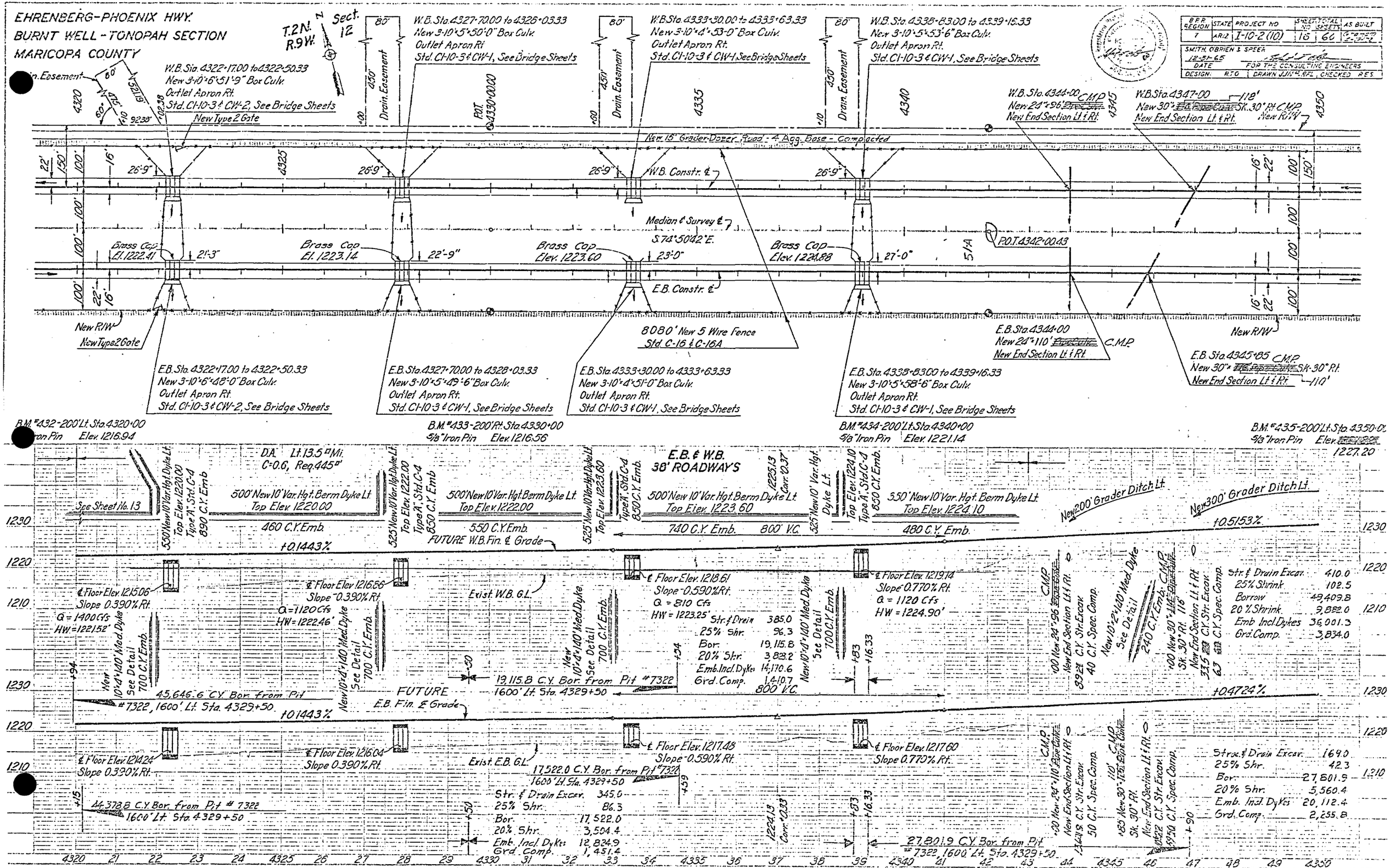
SMITH, OBRIEN & SPEEP
12-31-65
DATE
FOR THE CONSULTING ENGINEERS
DES'GN: R.T.O. DRAWN: J.H.F. R.F. CHECKED: R.E.S.



EHRENBERG-PHOENIX HWY.
BURNT WELL - TONOPAH SECTION
MARICOPA COUNTY

BPR REGION	STATE	PROJECT NO	SHEET NO	TOTAL SHEETS	AS BUILT
7	ARIZ	I-10-2 (10)	16	66	

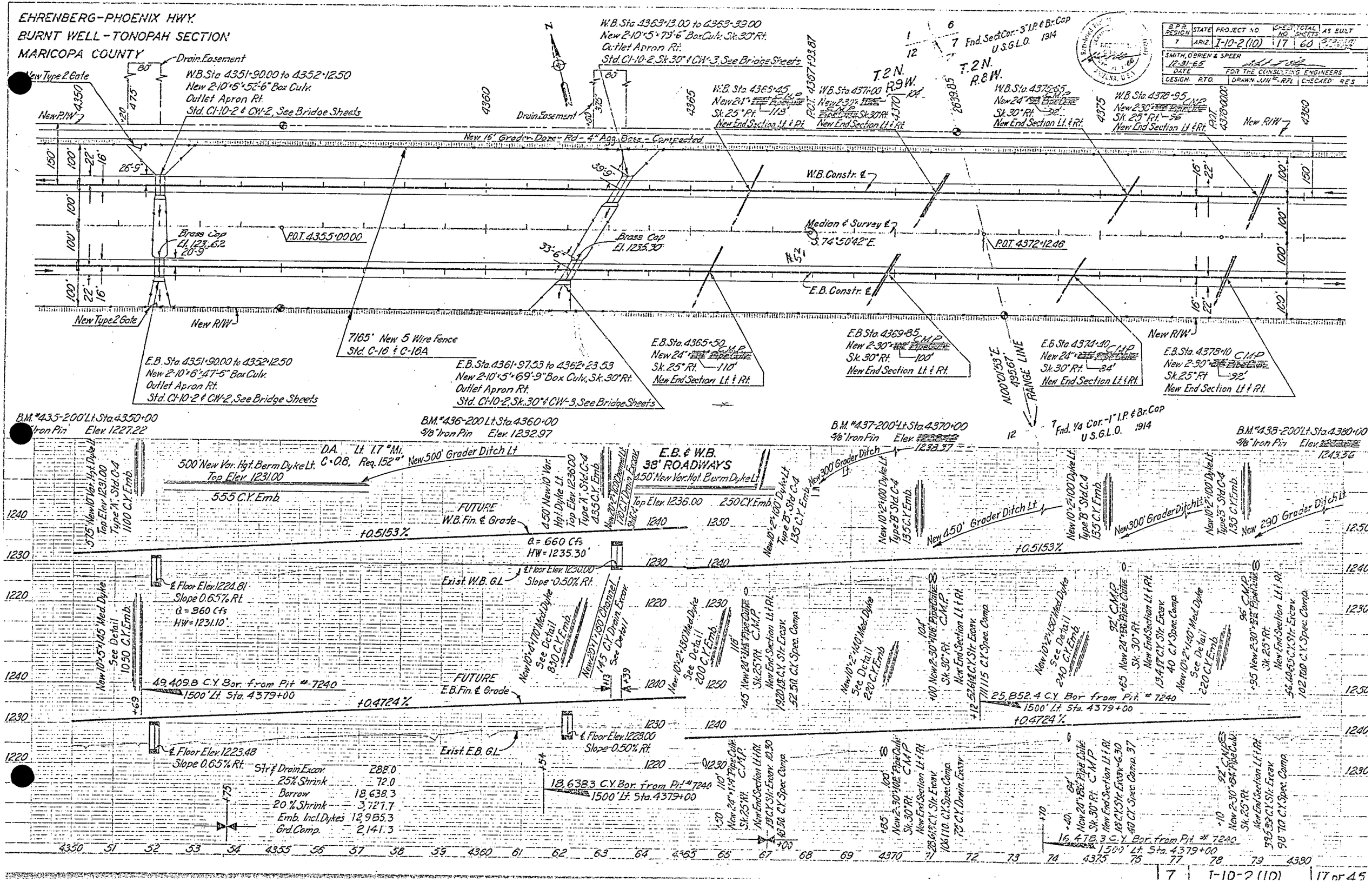
SMITH, OBRIEN & SPEER
12-31-65 — DATE — FOR THE CONSULTING ENGINEERS
DESIGN: R.T.G. | DRAWN J.J.K. R.F.L. | CHECKED R.E.S.



EHRENBERG-PHOENIX HWY.
BURNT WELL-TONOPAH SECTION
MARICOPA COUNTY

2P.R. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
7	ARIZ.	I-10-2(10)	17	60	

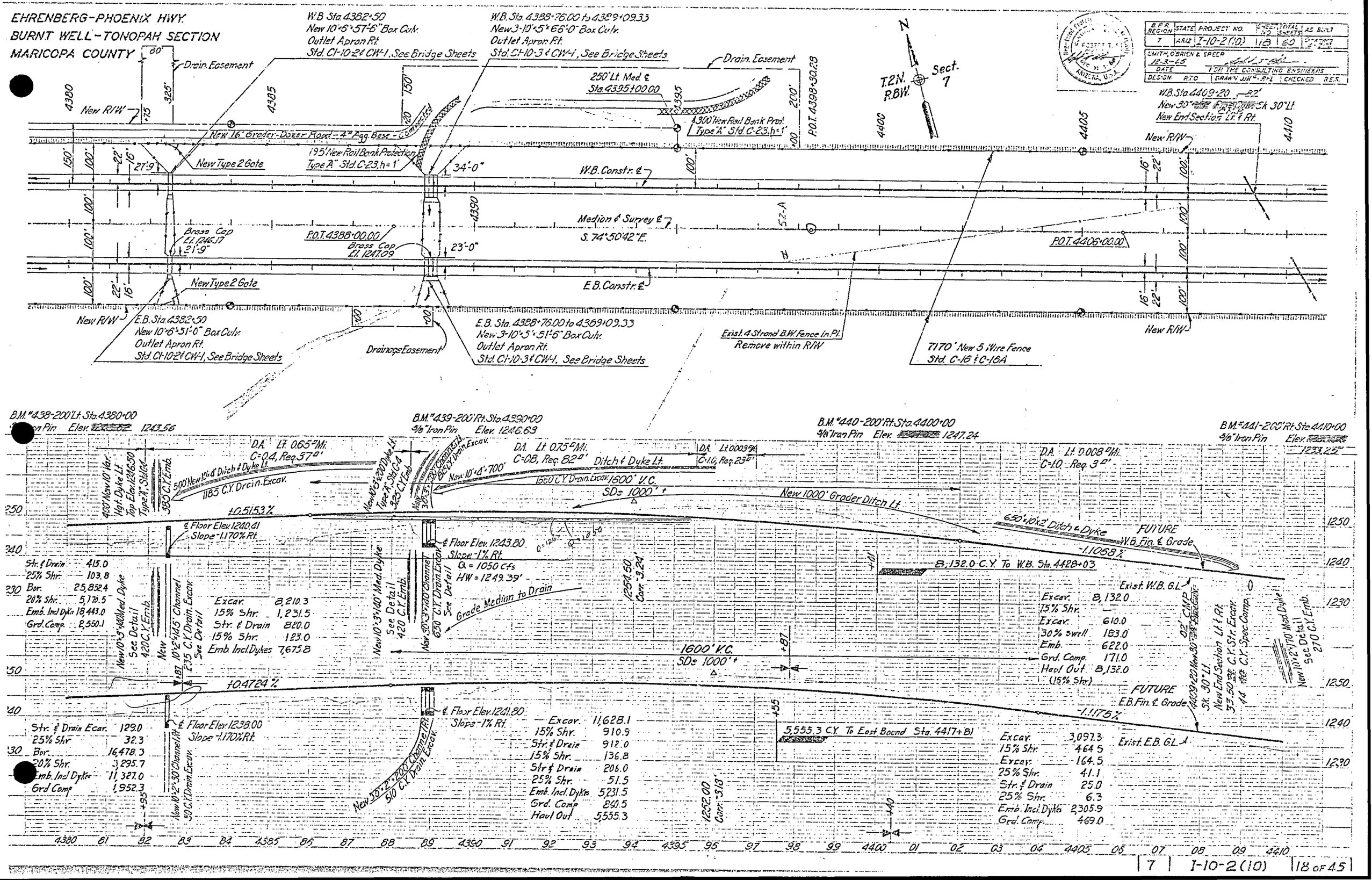
SMITH, O'BRIEN & SPEER
12-31-65
DATE
FOR THE CONSULTING ENGINEERS
DESIGN R.T.O. DRAWN J.J.R. - R.F.L. CHECKED R.E.S.



EHRENBERG-PHOENIX HWY.
BURNT WELL-TONOPAH SECTION
MARICOPA COUNTY

B.P.R. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
7	ARIZ	I-10-2(10)	118	60	STANDARD

SMITH, O'BRIEN & SPEER
12-3-65
DATE — FOR THE CONSULTING ENGINEERS
DESIGN: R.T.O. | DRAWN: J.H.M.-R.H. | CHECKED: R.E.S.



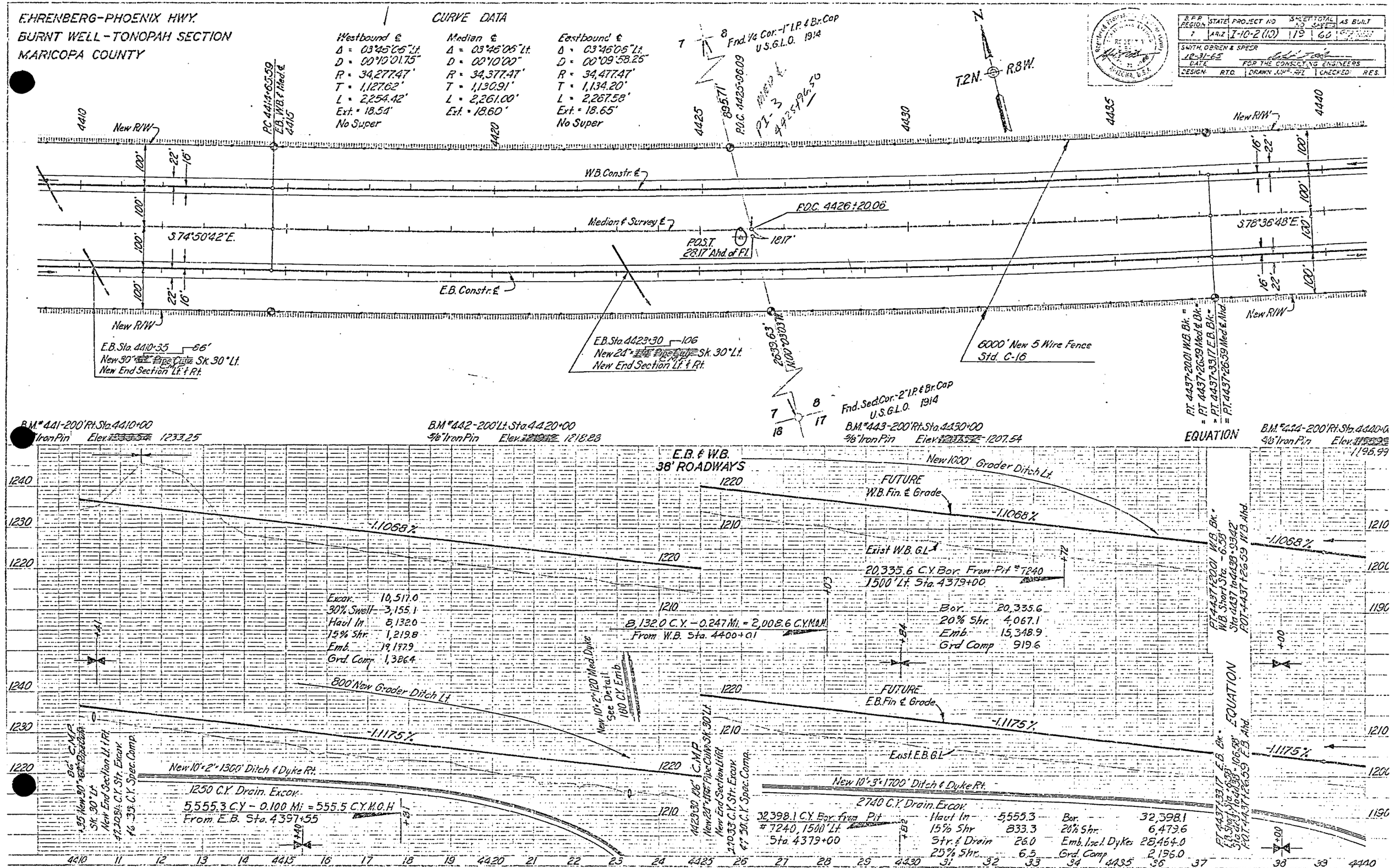
EHRENBERG-PHOENIX HWY.
BURNT WELL-TONOPAH SECTION
MARICOPA COUNTY

S.P.R. REGION	STATE	PROJECT NO	SHEET NO	TOTAL SHEETS	AS BUILT
7	ARIZ	I-10-2(10)	19	60	

SMITH, OBRIEN & SPEER
12-31-65
DATE — FOR THE CONSULTING ENGINEERS
DESIGN: RTO. DRAWN: J.H.F.-R.F.Z. CHECKED: R.E.S.

CURVE DATA

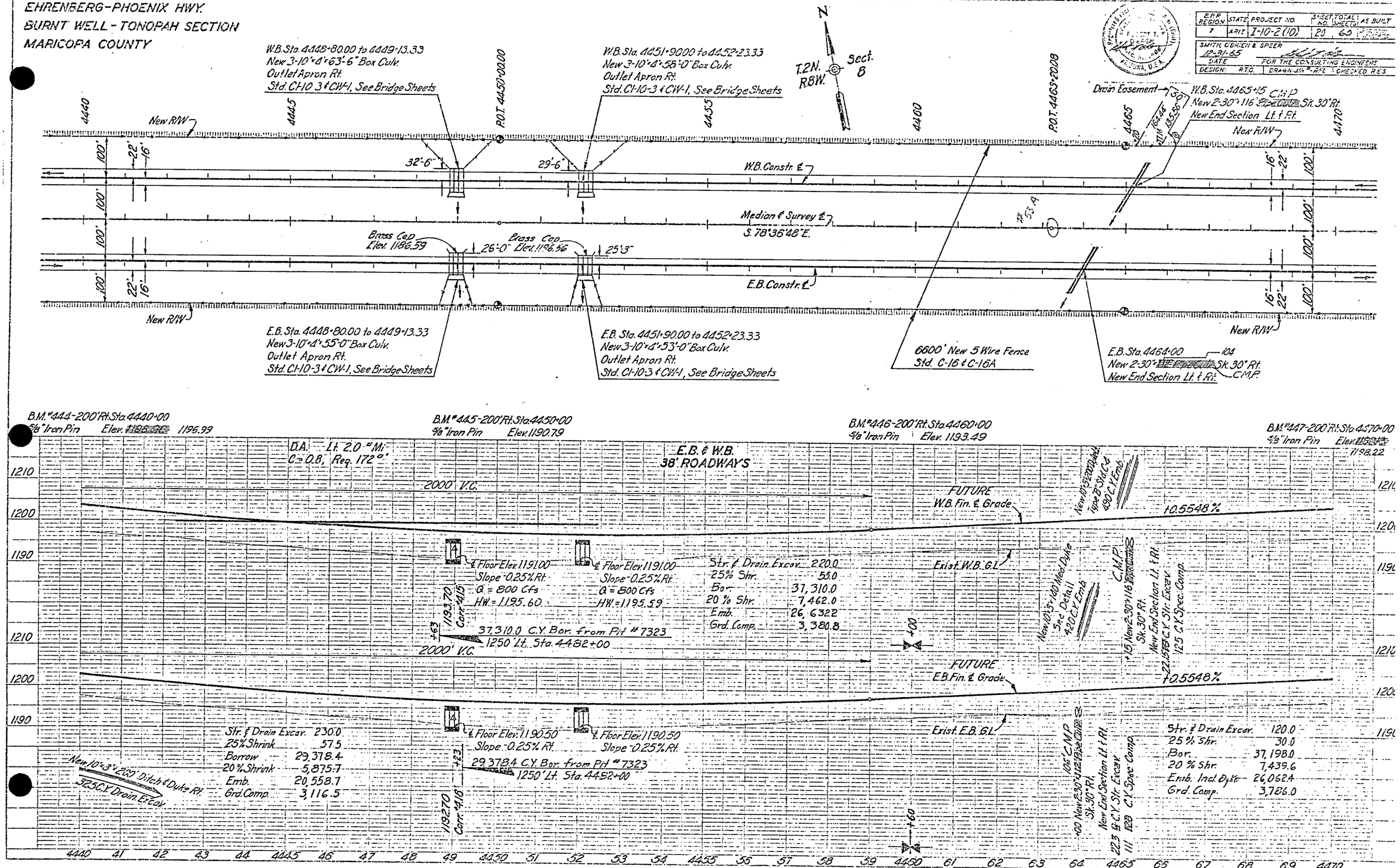
Westbound ℄	Median ℄	Eastbound ℄
Δ = 03°45'06" Lt.	Δ = 03°46'06" Lt.	Δ = 03°46'06" Lt.
D = 00°10'01.75"	D = 00°10'00"	D = 00°09'58.25"
R = 34,277.47'	R = 34,377.47'	R = 34,477.47'
T = 1,127.62'	T = 1,130.91'	T = 1,134.20'
L = 2,254.42'	L = 2,261.00'	L = 2,267.58'
Ext. = 18.54'	Ext. = 18.60'	Ext. = 18.65'
No Super	No Super	No Super



EHRENBERG-PHOENIX HWY.
BURNT WELL - TONOPAH SECTION
MARICOPA COUNTY

BPR REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
7	ARIZ	I-10-2(10)	20	60	

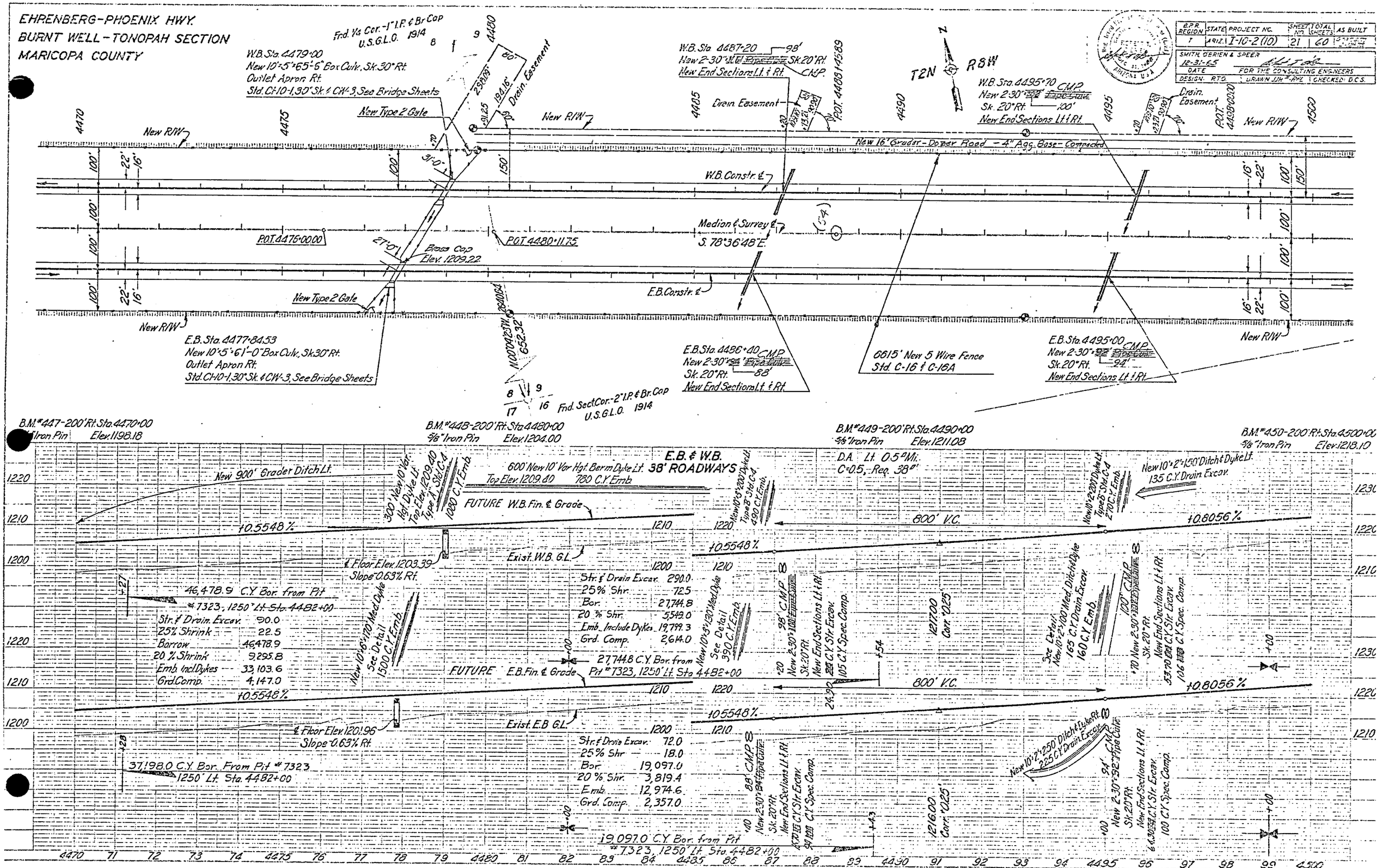
SMITH, O'BRIEN & SPEER
12-31-65
DATE — FOR THE CONSULTING ENGINEERS
DESIGN: R.T.O. — DRAWN: J.H.B.-R.P.L. — CHECKED: R.E.S.



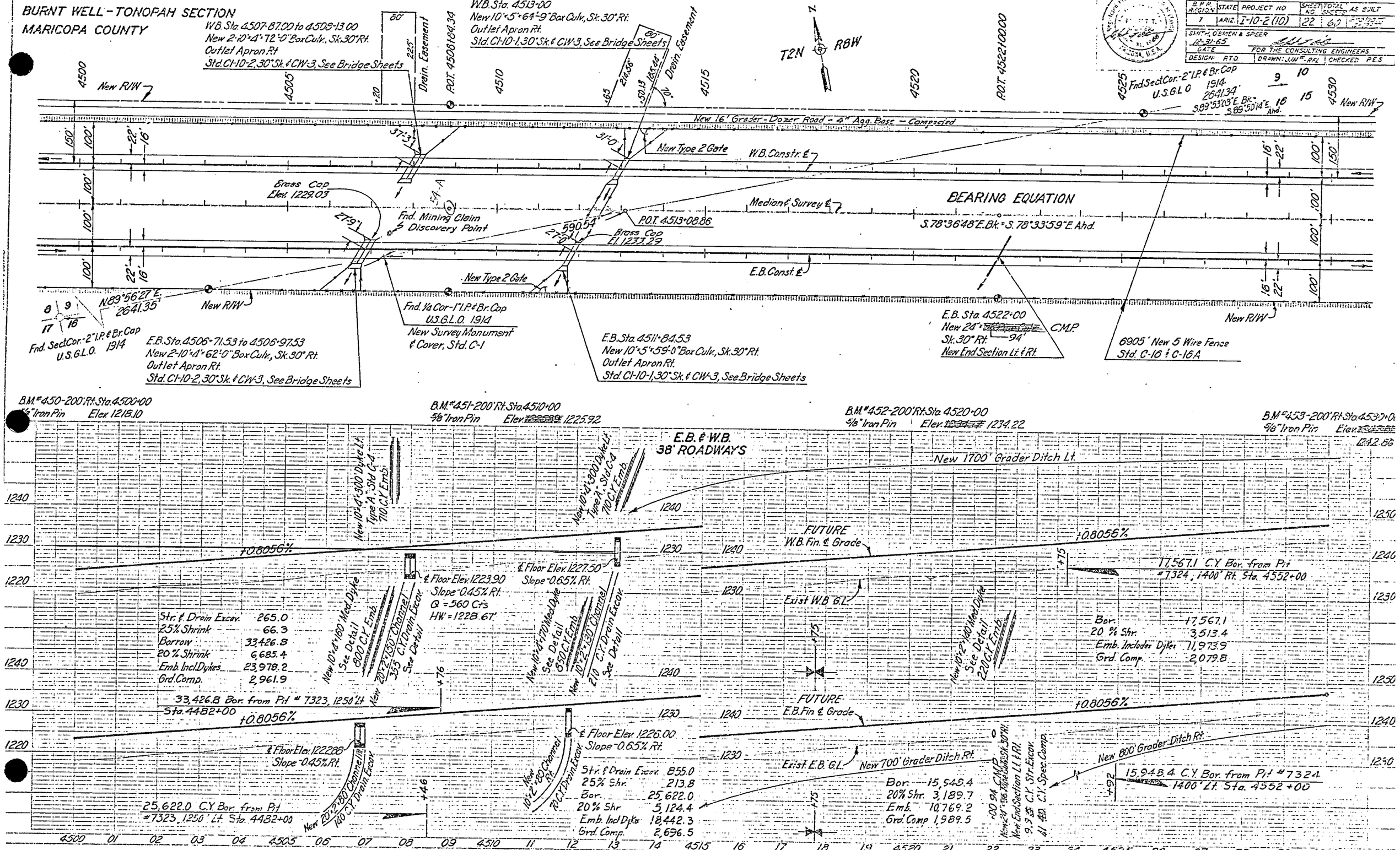
EHRENBERG-PHOENIX HWY.
BURNT WELL-TONOPAH SECTION
MARICOPA COUNTY

B.P.R. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
7	ARIZ.	I-10-2(10)	21	60	

SMITH, OBRIEN & SPEER
12-31-65
DATE
FOR THE CONSULTING ENGINEERS
DESIGN: R.T.O. DRAWN: J.H.P. CHECKED: D.C.S.



EHRENBERG-PHOENIX HWY.
BURNT WELL-TONOPAH SECTION
MARICOPA COUNTY

BPR REGION	STATE	PROJECT NO	SHEET NO	TOTAL SHEETS	AS BUILT
7	ARIZ.	I-10-2(10)	22	62	

SMITH, OBRIEN & SPEER
12-31-65
DATE
FOR THE CONSULTING ENGINEERS
DESIGN: RTO | DRAWN: JJH-RFL | CHECKED PES