FLOOD INSURANCE STUDY

APPROXIMATE ZONE A FLOODPLAIN DELINEATION STUDIES

WICKENBURG AREA, MARICOPA COUNTY, ARIZONA

TECHNICAL DATA NOTEBOOK

FIS Contract FCD 99 - 02

July 7, 2000

Prepared for:

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

Prepared by:

Wood, Patel & Associates, Inc.
2051 West Northern Avenue, Suite 100
Phoenix, AZ 85020
(602) 335-8500
Fax (602) 335-8580

WP #99958

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WICKENBURG AREA, MARICOPA COUNTY, ARIZONA

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2801 W. Durango
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Registered Professional Engineer (Civil)
CERTIFICATE NO. 22208
JACK K. MOODY
Date Signed 7/7/00
ARIZONA, U.S.A.

WP #99958

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Registered Professional Engineer (Civil) CERTIFICATE NO. 22208 JACK K. MOODY Date Signed 7/7/00 ARIZONA, U.S.A.

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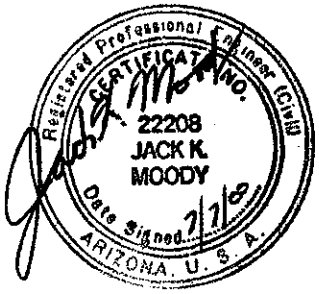
Exhibit A: Current FIRM Panels
Exhibit B: Study Work Maps



SECTION 1

INTRODUCTION

Digitized USGS 7.5-Minute Quadrangle Maps were provided by the Flood Control District of Maricopa County as part of this contract and used for the approximate Zone A study areas.

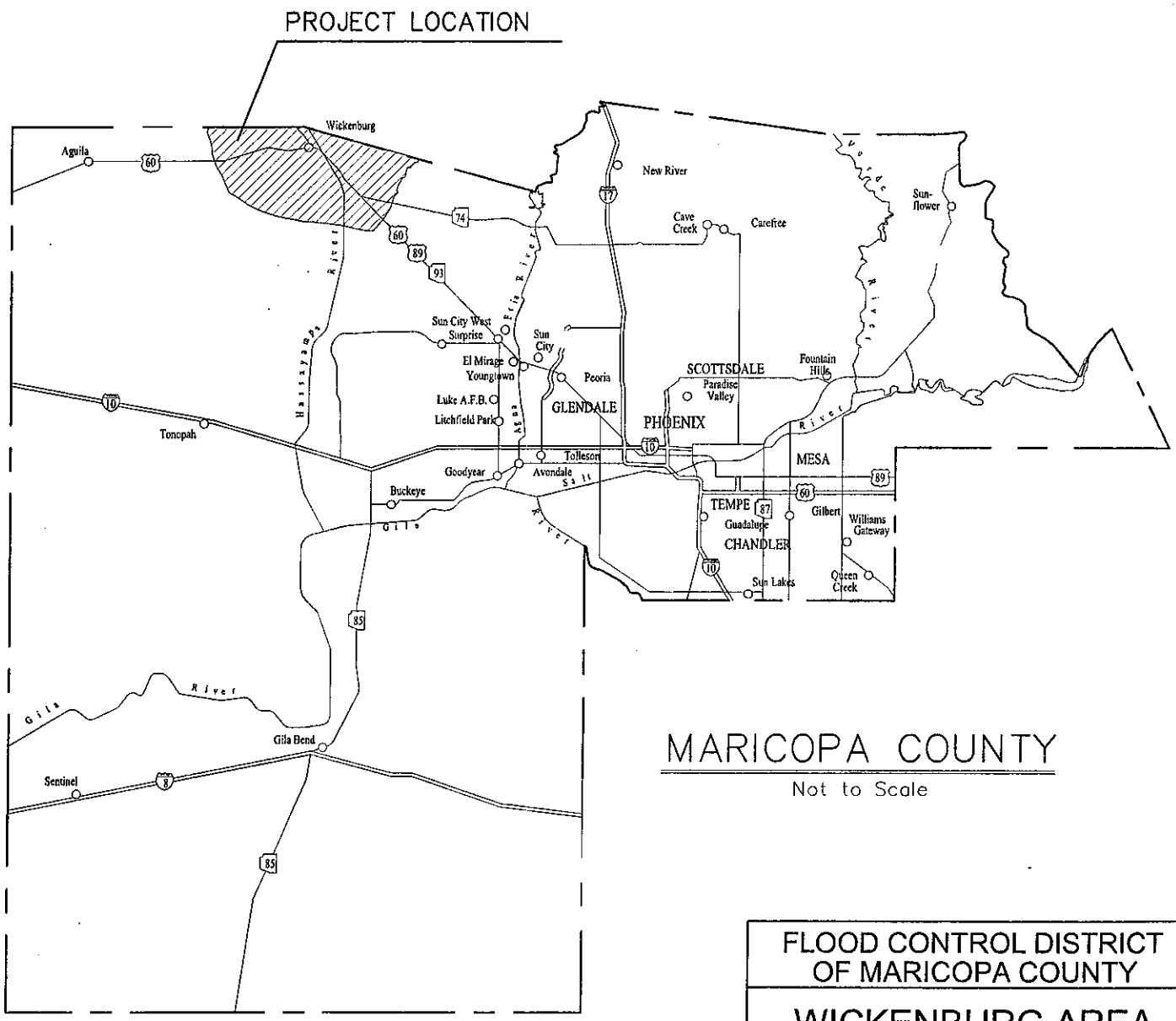
Note that since some of the watercourses to be studied do not have official names, for convenience a naming system was used for the Zone A Studies. A wash name consists of section number, township, and range of the most downstream reach of each watercourse (also called file name), and this naming system was used throughout the report (see Figure 1.2 for wash names, file names and sheet numbers) .

Haestad Methods' *FlowMaster* software was used to estimate the water surface elevation and top width of flow for each cross-section (normal depth method).

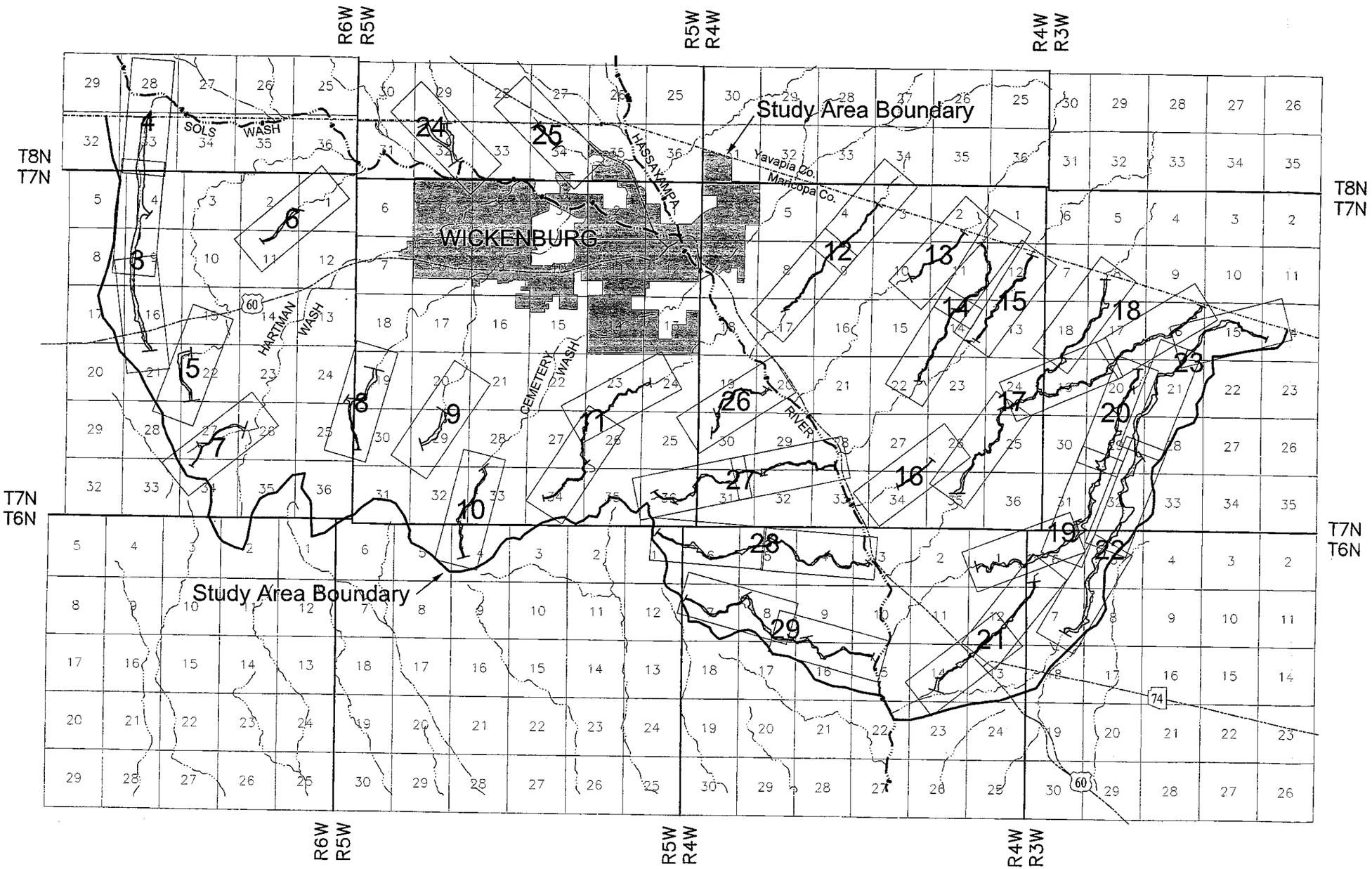
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

APPROXIMATE ZONE A FLOODPLAIN DELINEATION STUDIES

F.C.D. CONTRACT NO. 99-02



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY	
WICKENBURG AREA APPROXIMATE ZONE A FLOODPLAIN DELINEATION STUDIES F.C.D. CONTRACT NO. 99-02	
WOOD/PATEL CIVIL ENGINEERS HYDROLOGISTS LAND SURVEYORS	
Location Map	Figure 1.1



NOTES

Sheet No.	Wash Name	File Name
1	Cover Sheet	
2	Sheet Index Map	
3,4	Tributary to Sols Wash AH2	WASH33T8R6
5	Tributary to Sols Wash AH3	WASH22T7R6
6	Tributary to Sols Wash AH4	WASH2T7R6
7	Tributary to Hartman Wash	WASH27T7R6
8	Yucca Flat Wash	WASH19T7R5
9	Holly Wash	WASH20T7R5
10	Cemetery Wash	WASH28T7R5
11	Turtleback Wash	WASH24T7R5
12	Tributary to Mockingbird Wash	WASH17T7R4
13	Tributary to Wash K	WASH10T7R4
14	Tributary to Monarch Wash	WASH22T7R4
15	Monarch Wash	WASH14T7R4
16	Wash C	WASH34T7R4
17,18	San Domingo Wash	WASH35T7R4
18	Tub Spring Wash	WASH35T7R4
19,20	Ox Wash	WASH1T6R4
21	Tributary to Little San Domingo Wash	WASH14T6R4
22,23	Little San Domingo Wash	WASH7T6R3
24	Tributary to Sols Wash	WASH32T8R5
25	Tributary to Amir Wash	WASH34T8R5
26	Wash20T7R4	WASH20T7R4
27	Wash28T7R4	WASH28T7R4
28	Wash3T6R4	WASH3T6R4
29	Wash15T6R4	WASH15T6R4

Not to Scale

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

WICKENBURG AREA

APPROXIMATE ZONE A FLOODPLAIN DELINEATION STUDIES
F.C.D. CONTRACT NO. 99-02

Wood, Patel & Associates, Inc. — Civil Engineers, Hydrologists, Land Surveyors

Study Area Map

Figure 1.2

INTRODUCTION

Wood, Patel & Associates, Inc. (Wood/Patel) was contracted with the Flood Control District of Maricopa County (FCDMC), Arizona, to delineate approximate Zone A 100-year floodplains for some of the major undelineated watercourses that are located within Maricopa County. The study area is near the Town of Wickenburg in northwestern Maricopa County. Specifically, it is within Township 6 North, Township 7 North, and Township 8 North, and Range 3 West, Range 4 West, Range 5 West, and Range 6 West. It is designated as Watershed "G" on the FCDMC's watershed management plan and encompasses approximately 80 linear miles of watercourses that were to be delineated. Figure 1.1 is the location map, and Figure 1.2 is the study area map.

In 1994, the Wickenburg Area Drainage Master Study (Wickenburg ADMS) was completed by others under a contract with the Flood Control District of Maricopa County (Black & Veatch, 1994). Nearly all of Watershed "G" is located within the Wickenburg ADMS, and most of the watercourses to be delineated are the upper reaches of ones delineated in the Wickenburg ADMS which were previously reviewed and approved by FEMA.

As part of the Wickenburg ADMS, peak runoff for contributing sub-basins was estimated for three hydrologically similar areas: Sols Wash, West Tributaries, and East Tributaries. The three Wickenburg ADMS study areas covered 146 square miles and encompassed the study area of the current Zone A Studies.

In addition to developing peak runoff estimations, the Wickenburg ADMS included floodplain delineations of about 110 miles of watercourses. As stated previously, most of the reaches in the Zone A Studies are extensions of previously delineated Wickenburg ADMS watercourses. In order to provide continuity, it was necessary to set downstream peak flow values equal to the published peak 100-year flow estimates. This constraint dictated that the Wickenburg ADMS be used as the basis of peak flow estimates for the Zone A studies.

Peak 100-year, 24-hour flows were obtained from the Wickenburg ADMS for relevant sub-basins and these published flow rates were used as the downstream flow. The flow paths for Zone A delineations were then identified, and cross-section locations were established. At each cross-section location, the contributing area was measured by planimeter and a ratio of contributing area to total area was calculated. This ratio was then applied to the total downstream flow, and the result was used for peak runoff at each successive upstream cross-section location.

SECTION 2

ADWR/FEMA FORMS AND LOCAL GOVERNMENT/ADWR ABSTRACTS

ADWR/FEMA FORMS AND LOCAL GOVERNMENT/ADWR ABSTRACTS

The following are Study Documentation Abstracts for FEMA submittals as documented in State Standard SSA1-97 as well as the FEMA MT-2 forms.

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

Section 2.1: Study Documentation Abstract for FEMA Submittals

2.1.1	Date Study Accepted	
2.1.2	Study Contractor Contact(s) Address Phone Internal Reference Number	Wood, Patel & Associates, Inc. 2051 West Northern, Suite 100 Phoenix, AZ 85021 (602) 335-8500 WP # 99958
2.1.3	FEMA Technical Review Contractor Contact(s) Address Phone Internal Reference Number	
2.1.4	FEMA Regional Reviewer Phone:	
2.1.5	State Technical Reviewer Phone:	
2.1.6	Local Technical Reviewer Phone:	Joe Tram, FCDMC (602) 506-1501
2.1.7	Reach Description	Watershed "G", Wickenburg Area, Maricopa County, AZ
2.1.8	USGS Quad Sheet(s) with original photo date & latest photo revision date	Congress SW, Flores, Sam Powell Peak, Morgan Butte, Outlaw Hill, Vulture Peak, Wickenburg, Red Picacho, Wildcat Well, Vulture Mine, Wickenburg SW, Wittman
2.1.9	Unique Conditions and Problems	Most of the Zone A floodplain delineation watercourses are the upper reaches of those delineated by detailed study method in the Wickenburg ADMS where topographic maps with 1-foot contour intervals were used. However, for the approximate Zone A studies, topographic maps with 20-foot contour intervals were used.
2.1.10	Coordination of Q's Discharges (Agency, Date, Comments)	FCDMC, November 1999 The hydrology is approved by FEMA for the original Wickenburg ADMS.

Approximate Zone A Floodplain Delineation Studies

Wickenburg Area, Maricopa County, AZ

FEMA

Application/Certification

MT-2 Forms

FORM 1

Revision Requester and Community Official

FEDERAL EMERGENCY MANAGEMENT AGENCY **REVISION REQUESTER AND COMMUNITY OFFICIAL**	O.M.B No. 3067-0148 Expires April 30, 2001

Public reporting burden for this form is estimated to average 2.13 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing and reviewing the 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, S.W., Washington DC 20472; and to the Office of Management and Budget, Paperwork Reduction Project (3067-0148), Washington, DC 20503.

You are not required to respond to this collection of information unless a valid OMB Control Number is displayed in the upper right corner of this form.

1. REQUESTED RESPONSE FROM FEMA

This request is for a:

☐ 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, floodway or flood elevations. LOMRs typically decrease flood hazards. (See 44 CFR Ch. 1 Parts 60 & 65.)

☒ Other Describe: New flood insurance study - area studied for flood hazard determination & mapping

2. OVERVIEW

1. The basis for this revision request is (are): (check all that apply)

☐ Physical Change ☐ Improved Methodology/Data ☐ Floodway Revision

☒ Other Describe: New flood insurance study
Note: A photograph is not required, but is very helpful during review.

Flooding Source: Tributaries to Hassayampa River

3. Project Name/Identifier: Approximate Zone A Floodplain Delineation Studies - Wickenburg Area, Maricopa County, AZ

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

5. 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 480287	Katy, City Harris County	TX TX	480301 48201C	0005D 0220G	02/08/83 09/28/90
04013C	Maricopa County	AZ	04013C	230,235 255,265, 270,660, 675,680	09/29/89 09/04/91
04013C	Maricopa County	AZ	04013C	225,240 245,260 300,625 650	

6. The area of revision encompasses the following types of flooding and structures. Check all that apply.

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

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

4. ENCROACHMENT INFORMATION

1. Does the State have jurisdiction over the floodway or its adoption by communities participating in the NFIP?
   ☒ Yes ☐ No

If Yes, attach a copy of a letter notifying the appropriate State agency of the floodway revision and documentation of the approval of the revised floodway by the appropriate State agency.

2. Does the development in the floodway cause the 1% annual chance (base) elevation to increase at any location by more than 0.000 feet? ☐ Yes ☐ No ☒ N/A

3. Does the cumulative effect of all development that has occurred since the effective SFHA was originally identified cause the base flood elevation to increase at any location by more than one foot (or other increase limit if community or state has adopted more stringent criteria - even if a floodway has not been delineated by FEMA)? ☐ Yes ☒ No

If the answer to either items is Yes, please attach documentation that all requirements of Section 65.12 of the NFIP regulations have been met, regarding evaluation of alternatives, notice to individual legal property owners, concurrence of CEO, and certification that no insurable structures are impacted.

5. MAINTENANCE RESPONSIBILITY

The community is willing to assume responsibility for ☒ performing ☐ overseeing compliance with the maintenance and operation plans of the Bridge/Culvert
(Name)
flood control structure. If not performed promptly by an owner other than the community, the community will provide the necessary services without cost to the Federal government.

Operation and maintenance plans are attached. ☐ **Yes** ☐ **No** ☒ **N/A**

6. REVIEW FEE

The review fee for the appropriate request category has been included. ☐ Yes Fee amount: $_____

OR

This request is based on a federally sponsored flood-control project where 50 percent or more of the project's cost is federally sponsored, or the request is based on detailed hydrologic and hydraulic studies conducted by Federal, State, or local agencies to replace approximate studies conducted by FEMA and shown on the effective FIRM; thus the project is fee exempt.
☒ Yes

Please see Instructions for Fee Amounts

7. SIGNATURE

Note: **I understand that my signature indicates that all information submitted in support of this request is correct**

Jack K. Moody

Signature of Revision Requester

Jack K. Moody, P.E., Project Manager
Printed Name and Title of Revision Requester

Wood, Patel & Associates, Inc.
Company Name

Telephone No.: (602) 335-8500 Date: May 18, 2000

Note: **Signature indicates that the community understands, from the revision requester, the impacts of the revision on flooding conditions in the community.**

Signature of Community Official

MICHAEL S. ELLEGOOD, PE
Printed Name and Title of Community Official

FLOOD CONTROL DIST OF MARICOPA CTY
Community Name

Telephone No.: (602) 506-4700 Date: 9/25/00

CERTIFICATION BY REGISTERED PROFESSIONAL ENGINEER AND/OR LAND SURVEYOR

This certification is in accordance with 44 CFR Ch. 1, Sect 65.2

Jack K. Moody

Signature

Jack Moody, P.E., Project Manager
Printed Name and Title of Revision Requester

egistr No. 22208 Expires (Date) 9-30-2000 State AZ

Type of License/Expertise: Civil

Check which forms have been included with this request

Form Name and (Number)	Required if .....
☒ **Hydrologic** (3)	new or revised discharges
☒ **Hydraulic** (4)	new or revised water-surface elevations
☒ **Mapping** (5)	floodplain/floodway changes
☐ **Channelization** (6)	channel is modified
☒ **Bridge/Culvert** (7)	addition/revision of bridge/culvert
☐ **Levee/Floodwall** (8)	addition/revision of levee/floodwall
☐ **Coastal** (9)	new or revised coastal elevations
☐ **Coastal Structures** (10)	addition/revision of coastal structure
☐ **Dam** (11)	addition/revision of dam
☐ **Alluvial Fan** (12)	structures proposed on alluvial fan

FORM 3

Hydrologic Analysis

FEDERAL EMERGENCY MANAGEMENT AGENCY **HYDROLOGIC ANALYSIS**	O.M.B No. 3067-0148 Expires April 30, 2001

PUBLIC BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average **3.67** hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing and reviewing the 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, S.W., Washington DC 20472; and to the Office of Management and Budget, Paperwork Reduction Project (3067-0148), Washington, DC 20503.

You are not required to respond to this collection of information unless a valid OMB Control Number is displayed in the upper right corner of this form.

Note: Fill out one form for each flooding source studied

Community Name: Wickenburg Area, Maricopa County, AZ

Flooding Source: Tributaries to Hassayampa River

Project Name/Identifier: Approximate Zone A Floodplain Delineation Studies, Wickenburg Area, Maricopa County, AZ

1. REASON FOR NEW HYDROLOGIC ANALYSIS

☒ No existing analysis ☐ Improved data ☐ Changed physical condition of watershed

☐ Alternative methodology ☐ Proposed Conditions (CLOMR) ☐ Other

For the reason stated above, please attach a detailed explanation. If a computer program/model was used in revising the hydrologic analysis, **please provide a diskette with the input files** for the same flood recurrence intervals contained in the FIS for that stream; and at least for the 1% annual chance (base) flood where no detailed study exists.

Explanation provided: ☒ Yes ☐ No **Diskettes provided:** ☒ Yes ☐ No

2. METHODOLOGY FOR NEW ANALYSIS

Indicate Method	Required Data	Data Included
☐ Statistical Analysis of Gage Records	Form 3 - Attachment A	☐ Yes ☐ No
☐ Regional Regression Equations	Form 3 - Attachment C	☐ Yes ☐ No
☐ Precipitation/Runoff Model	Form 3 - Attachment D	☐ Yes ☐ No
☒ Other	Back-up computations and supporting data	☒ Yes ☐ No

3. APPROVAL OF ANALYSIS

The hydrologic analysis has already been approved by a local, state, or Federal Agency. ☒ Yes ☐ No ☐ Not Required

If Yes, attach evidence of approval. ☒ **Approval attached.** If No, attach explanation. ☐ **Explanation attached.**

4. COMPARISON OF BASE FLOOD DISCHARGES

Location:	Drainage Area (SqMi)	FIS(cfs)	Revised (cfs)

Note: When revised discharges are not significantly different than the FIS discharges, FEMA may require a confidence limits analysis (see attachment B) at a later date to complete the review.

If only a portion of a detailed study area was revised please attach an explanation describing the transition from the proposed discharges to the effective discharges. ☒ **Explanation Included** ☐ **Explanation Not Required**

5. HISTORICAL FLOODING INFORMATION

If historical data are available for the flooding source please provide: Location, peak discharges/water-surface elevations and dates, and source of information. ☐ **Data Attached** ☒ **Data Not Available**

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

ATTACHMENT A: STATISTICAL ANALYSIS OF GAGE RECORDS

Gaging Station: _____

Gage Location (latitude and longitude): _____

		FIS:		Revised:	
1.	Number of years of data	_____		_____	
	Systematic	_____		_____	
	Historical	_____		_____	
2.	Homogeneous data	☐ Yes	☐ No	☐ Yes	☐ No
3.	Data adjustments	☐ Yes	☐ No	☐ Yes	☐ No
4.	Number of high outliers	_____		_____	
	Low outliers	_____		_____	
	Zero events	_____		_____	
5.	Generalized skew	_____		_____	
6.	Station skew	_____		_____	
7.	Adopted skew	_____		_____	
8.	Probability distribution used (justify if log-Pearson III was not used)	_____		_____	
9.	Transfer equations to ungaged sites			☐ Yes	☐ No
	If Yes, specify method				
_____					
10.	Expected probability*			☐ Yes	☐ No
11.	Comparison of results with other analyses			☐ Yes	☐ No
	If Yes, describe comparison				
_____					

12. **Attach analysis including plot of flood-frequency curve. Analysis Attached?** ☐ Yes ☐ No

*FEMA does not accept expected probability analyses for the purpose of reflecting flood hazard information in a FIS.

If any data are not available, indicate by N/A.

ATTACHMENT B: CONFIDENCE LIMITS EVALUATION

Stream: _____

Select one location for Confidence Limits Evaluation (*describe location*): _____

1. Discharges for selected location:

Exceedence Probability		FIS:	Revised:
10%	(10-year)	_____ cfs	_____ cfs
2%	(50-year)	_____ cfs	_____ cfs
1%	(100-year)	_____ cfs	_____ cfs
0.2%	(500-year)	_____ cfs	_____ cfs

2. 1% Annual Chance (Base) Flood Confidence Intervals

90% Confidence Interval:	5% limit	_____ cfs
	95% limit	_____ cfs
50% Confidence Interval:	25% limit	_____ cfs
	75% limit	_____ cfs

3. If the discharge of the base flood in the FIS is beyond the 50% confidence interval but within the 90% confidence interval, does the base flood elevation change by 1.0 foot or more? ☐ Yes ☐ No

An example of confidence limits analysis can be found in Appendix 9 of Bulletin 17B.

4. **Confidence Limits Analysis Attached?** ☐ Yes ☐ No

ATTACHMENT C: REGIONAL REGRESSION EQUATIONS

1. Bibliographical Reference:

_____

_____

_____

(Attach a copy of title page, table of contents, and pertinent pages including equations.)

2. Gaged or ungaged stream: _____

3. Hydrologic region(s): _____
Attach backup map.

4. Provide parameters, values, and source of data used to define parameters.

_____

_____

_____

		FIS:		Revised:	
5.	Urbanized conditions calculations	☐ Yes	☐ No	☐ Yes	☐ No
6.	Percent of watershed urbanization	_____		_____	
7.	Is the watershed controlled?	☐ Yes	☐ No	☐ Yes	☐ No
8.	Comparison with other analyses	☐ Yes	☐ No	☐ Yes	☐ No

If the answer to 5, 7, or 8 is Yes, explain methdology below. If data are not available, indicate with N/A.

Comments

_____

9. **Attach computation and supporting maps, delineating the watershed boundary and drainage area divides.**

Computation and Supporting Maps provided? ☐ Yes ☐ No

ATTACHMENT D: PRECIPITATION/RUNOFF MODEL

		FIS:		Revised:	
.	Method or model used:	____		____	
	Version:	____		____	
	Date:	____		____	
2.	Source of rainfall depth:	____		____	
3.	Source of rainfall distribution:	____		____	
4.	Rainfall duration:	____		____	
5.	Areal adjustment to precipitation (%):	____		____	
6.	Maximum overland flow length	____		____	
7.	Hydrograph development method:	____		____	
8.	Loss rate method:	____		____	
	Source of soils information:	____		____	
	Source of land use information:	____		____	
9.	Channel routing method:	____		____	
10.	Reservoir routing:	☐ Yes	☐ No	☐ Yes	☐ No
11.	Baseflow considerations: **If Yes, explain below how baseflow was determined:**	☐ Yes	☐ No	☐ Yes	☐ No
	____				
12.	Snowmelt considerations:	☐ Yes	☐ No	☐ Yes	☐ No
13.	Model calibration: **If Yes, explain below how calibration was performed**	☐ Yes	☐ No	☐ Yes	☐ No
	____				
14.	Future land use condition: **If Yes, explain why below**	☐ Yes	☐ No	☐ Yes	☐ No
	____				

15. **Attach precipitation/runoff model, hydrologic model schematic, curve number calculations, time of concentration calculations, and supporting maps, delineating the watershed boundary and drainage area divides.**

Information and Maps provided? ☐ Yes ☐ No

NOTE: FEMA policy is to base flooding on existing conditions.

FORM 4

Riverine Hydraulic Analysis

FEDERAL EMERGENCY MANAGEMENT AGENCY **RIVERINE HYDRAULIC ANALYSIS**	O.M.B No. 3067-0148 Expires April 30, 2001

PUBLIC BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 2.25 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing and reviewing the 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, S.W., Washington DC 20472; and to the Office of Management and Budget, Paperwork Reduction Project (3067-0148), Washington, DC 20503.

You are not required to respond to this collection of information unless a valid OMB Control Number is displayed in the upper right corner of this form.

Note: Fill out one form for each flooding source studied

Community Name: Wickenburg Area, Maricopa County, AZ

Flooding Source: Tributary to Sols Wash AH2 (Wash33T8R6), Sheet No. 3 & 4

Project Name/Identifier: Approximate Zone A Floodplain Delineation Studies, Wickenburg Area, Maricopa County, AZ

1. REACH TO BE REVISED

Describe the limits of the revision OR submit a copy of the FIRM with the revision area clearly highlighted.
Copy of FIRM(s) attached depicting area of the revision (highlighted, or circled)? ☒ Yes

Downstream Limit: Maricopa County limit on the north, about 1.866 miles upstream of confluence with Sols Wash Tributary AH2

Upstream Limit: south limit of Section 16, T7N, R6W

2. MODELS SUBMITTED

Requirements: for areas which have detailed flooding:
Full input and output listings along with files on diskette for each of the models listed below (items 1-4) and a summary of the source of input parameters used in the models must be provided. The summary must include a description of any changes made from model to model (e.g., Duplicate Effective model to Corrected Effective model). At a minimum, the Duplicate Effective (item 1) and the Revised or Post-Project Conditions (item 4) models must be submitted. See instructions for directions on when other models may be required.

for areas which do not have detailed flooding:
Only the 100-year (Base) flood profile is required. A hydraulic model is not required for areas which do not have detailed flooding; however, BFEs may not be added to the revised FIRM. If a hydraulic model is developed for the area, items 3 and 4 described below must be submitted.

Hydraulic models are not developed, hydraulic analyses (including all calculations) for existing or pre-project conditions and revised or post-project conditions must be submitted.

1. Duplicate Effective Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____
Copies of the hydraulic analysis used in the effective FIS, referred to as the effective models (10-, 50-, 100-, and 500-year multi-profile runs and the floodway run) must be obtained and then reproduced on the requester's equipment to produce the Duplicate Effective model. This is required to assure that the effective models input data has been transferred correctly to the requester's equipment and to assure that the revised data will be integrated into the effective data to provide a continuous FIS model upstream and downstream of the revised reach.

2. Corrected Effective Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____
The Corrected Effective model is the model that corrects any errors that occur in the Duplicate Effective model, adds any additional cross sections to the Duplicate Effective model, or incorporates more detailed topographic information than that used in the currently effective model. The Correctly Effective model must not reflect any man-made physical changes since the date of the effective model. An error could be a technical error in the modeling procedures, or any construction in the floodplain that occurred prior to the date of the effective model but was not incorporated into the effective model.

3. Existing or Pre-Project Conditions Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____
The Duplicate Effective model or Corrective Effective model is modified to produce the Existing or Pre-Project Conditions model to reflect any modifications that have occurred within the floodplain since the date of the Effective model but prior to the construction of the project for which the revision is being requested. If no modification has occurred since the date of the effective model, then this model would be identical to the Corrected Effective model or Duplicate Effective model.

4. Revised or Post-Project Conditions Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____
The Existing or Pre-Project Conditions model (or Duplicate Effective model or Corrected Effective model, as appropriate) is revised to reflect revised or post-project conditions. This model must incorporate any physical changes to the floodplain since the effective model was produced as well as the effects of the project. When the request is for the proposed project this model must reflect proposed conditions.

5. Other – Please attach a sheet describing all other models submitted along with the file names. ☒ **Natural** ☐ **Floodway**

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

3. STARTING WATER-SURFACE ELEVATIONS

Explain how they were determined. Explanation Attached? ☐ Yes ☒ No

NOTE: If the effective study is an approximate study, the slope/area method is recommended.
For detailed analysis studies, using a known water-surface elevation is recommended.

4. RESULTS (from the model used to revise the 100-year water surface elevations)

If the results indicate any of the following, attach an explanation - to this form, or to the hydraulic model printout- as to the reasonableness of the situation.

☒ Supercritical depth ☒ Critical Depth ☐ Drawdowns ☐ Negative Floodway Surcharges

☐ Floodway Surcharges Greater Than Maximum Allowed by Community/State

☐ Water surface elevations higher than the end points of cross sections.

☐ Floodway discharge is different than the Natural 100-year (base) flood discharge.

☐ Project causes 100-year floodplain or floodway elevations to increase (state if increases are located off the requester's property)

Explanation attached with Form ☒ **Explanation provided on attached printout** ☐

If Hydraulic model used is HEC-2, has it been checked with FEMA'S CHECK-2 computer program? ☐ **Yes** ☐ **No**
(see instructions for information on how to obtain CHECK-2)

5. REVISED FIRM/FBFM AND FLOOD PROFILES

1. Profile Transition

a. 100-Year Water-Surface Elevations - indicate the difference in water surface elevations where the project 100-year elevations tie into the existing 100-year water surface elevations at each end of the project.

Downstream End _____ within _____ (feet) Upstream End _____ within _____ (feet)
Cross-Section # *Cross-Section #*

b. Floodway Elevations - indicate the difference in water surface elevations where the project floodway elevations tie into the existing floodway water surface elevations at each end of the project.

Downstream End _____ within _____ (feet) Upstream End _____ within _____ (feet)
Cross-Section # *Cross-Section #*

c. Floodway widths - indicate the difference in floodway widths where the project floodway widths tie into the existing floodway width at each end of the project.

Downstream End _____ within _____ (feet) Upstream End _____ within _____ (feet)
Cross-Section # *Cross-Section #*

2. Profile Checklist (check box if information has been provided on profile)

The following information (unless in parentheses) must be included at the same scale as the existing profiles for this project:

☐ Stream Name ☐ Community Name ☐ Corporate Limits labeled ☐ Study limits labeled

☐ Confluences labeled ☐ Channel Stationing ☐ Streambed profiled ☐ Cross Sections labeled

☐ Horizontal/Vertical Scales indicated ☐ 100-year elevs profiled*

☐ Road Crossings ☐ Labeled ☐ Low Chord Elevations ☐ Top of Road Elevations

*All recurrence intervals in the effective study must also be profiled.

Floodway Data Table

Attach a Floodway Data Table for each cross section listed in the published Floodway Data table in the FIS report.

Floodway Data Table Attached ☐ **Yes** ☒ **Not Required**

FEDERAL EMERGENCY MANAGEMENT AGENCY **RIVERINE HYDRAULIC ANALYSIS**	O.M.B No. 3067-0148 Expires April 30, 2001

PUBLIC BURDEN DISCLOSURE NOTICE

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Note: Fill out one form for each flooding source studied

Community Name: Wickenburg Area, Maricopa County, AZ

Flooding Source: Sols Wash Tributary AH3 (Wash22T7R6), Sheet No. 5

Project Name/Identifier: Approximate Zone A Floodplain Delineation Studies, Wickenburg Area, Maricopa County, AZ

1. REACH TO BE REVISED

Describe the limits of the revision OR submit a copy of the FIRM with the revision area clearly highlighted.
Copy of FIRM(s) attached depicting area of the revision (highlighted, or circled)? ☒ Yes

Downstream Limit: Northwest corner of Section 22, T7N, R6W

Upstream Limit: Southwest corner of Section 22, T7N, R6W

2. MODELS SUBMITTED

Requirements: for areas which have detailed flooding:	**for areas which do not have detailed flooding:**
Full input and output listings along with files on diskette for each of the models listed below (items 1-4) and a summary of the source of input parameters used in the models must be provided. The summary must include a description of any changes made from model to model (e.g., Duplicate Effective model to Corrected Effective model). At a minimum, the Duplicate Effective (item 1) and the Revised or Post-Project Conditions (item 4) models must be submitted. See instructions for directions on when other models may be required.	Only the 100-year (Base) flood profile is required. A hydraulic model is not required for areas which do not have detailed flooding; however, BFEs may not be added to the revised FIRM. If a hydraulic model is developed for the area, items 3 and 4 described below must be submitted.

If hydraulic models are not developed, hydraulic analyses (including all calculations) for existing or pre-project conditions and revised or post-project conditions must be submitted.

1. Duplicate Effective Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____

Copies of the hydraulic analysis used in the effective FIS, referred to as the effective models (10-, 50-, 100-, and 500-year multi-profile runs and the floodway run) must be obtained and then reproduced on the requester's equipment to produce the Duplicate Effective model. This is required to assure that the effective models input data has been transferred correctly to the requester's equipment and to assure that the revised data will be integrated into the effective data to provide a continuous FIS model upstream and downstream of the revised reach.

2. Corrected Effective Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____

The Corrected Effective model is the model that corrects any errors that occur in the Duplicate Effective model, adds any additional cross sections to the Duplicate Effective model, or incorporates more detailed topographic information than that used in the currently effective model. The Correctly Effective model must not reflect any man-made physical changes since the date of the effective model. An error could be a technical error in the modeling procedures, or any construction in the floodplain that occurred prior to the date of the effective model but was not incorporated into the effective model.

3. Existing or Pre-Project Conditions Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____

The Duplicate Effective model or Corrective Effective model is modified to produce the Existing or Pre-Project Conditions model to reflect any modifications that have occurred within the floodplain since the date of the Effective model but prior to the construction of the project for which the revision is being requested. If no modification has occurred since the date of the effective model, then this model would be identical to the Corrected Effective model or Duplicate Effective model.

4. Revised or Post-Project Conditions Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____

The Existing or Pre-Project Conditions model (or Duplicate Effective model or Corrected Effective model, as appropriate) is revised to reflect revised or post-project conditions. This model must incorporate any physical changes to the floodplain since the effective model was produced as well as the effects of the project. When the request is for the proposed project this model must reflect proposed conditions.

5. Other – Please attach a sheet describing all other models submitted along with the file names. ☒ **Natural** ☐ **Floodway**

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

3. STARTING WATER-SURFACE ELEVATIONS

Explain how they were determined. Explanation Attached? ☐ Yes ☒ No

NOTE: If the effective study is an approximate study, the slope/area method is recommended.
For detailed analysis studies, using a known water-surface elevation is recommended.

4. RESULTS (from the model used to revise the 100-year water surface elevations)

If the results indicate any of the following, attach an explanation - to this form, or to the hydraulic model printout- as to the reasonableness of the situation.

☒ Supercritical depth ☒ Critical Depth ☐ Drawdowns ☐ Negative Floodway Surcharges

☐ Floodway Surcharges Greater Than Maximum Allowed by Community/State

☐ Water surface elevations higher than the end points of cross sections.

☐ Floodway discharge is different than the Natural 100-year (base) flood discharge.

☐ Project causes 100-year floodplain or floodway elevations to increase (state if increases are located off the requester's property)

Explanation attached with Form ☒ **Explanation provided on attached printout** ☐

If Hydraulic model used is HEC-2, has it been checked with FEMA'S CHECK-2 computer program? ☐ **Yes** ☐ **No**
(see instructions for information on how to obtain CHECK-2)

5. REVISED FIRM/FBFM AND FLOOD PROFILES

1. Profile Transition

a. 100-Year Water-Surface Elevations - indicate the difference in water surface elevations where the project 100-year elevations tie into the existing 100-year water surface elevations at each end of the project.

Downstream End _____ within _____ (feet) Upstream End _____ within _____ (feet)
Cross-Section # *Cross-Section #*

b. Floodway Elevations - indicate the difference in water surface elevations where the project floodway elevations tie into the existing floodway water surface elevations at each end of the project.

Downstream End _____ within _____ (feet) Upstream End _____ within _____ (feet)
Cross-Section # *Cross-Section #*

c. Floodway widths - indicate the difference in floodway widths where the project floodway widths tie into the existing floodway width at each end of the project.

Downstream End _____ within _____ (feet) Upstream End _____ within _____ (feet)
Cross-Section # *Cross-Section #*

2. Profile Checklist (check box if information has been provided on profile)

The following information (unless in parentheses) must be included at the same scale as the existing profiles for this project:

☐ Stream Name ☐ Community Name ☐ Corporate Limits labeled ☐ Study limits labeled

☐ Confluences labeled ☐ Channel Stationing ☐ Streambed profiled ☐ Cross Sections labeled

☐ Horizontal/Vertical Scales indicated ☐ 100-year elevs profiled*

☐ Road Crossings ☐ Labeled ☐ Low Chord Elevations ☐ Top of Road Elevations

*All recurrence intervals in the effective study must also be profiled.

Floodway Data Table

Attach a Floodway Data Table for each cross section listed in the published Floodway Data table in the FIS report.

Floodway Data Table Attached ☐ **Yes** ☒ **Not Required**

FEDERAL EMERGENCY MANAGEMENT AGENCY **RIVERINE HYDRAULIC ANALYSIS**	O.M.B No. 3067-0148 Expires April 30, 2001

PUBLIC BURDEN DISCLOSURE NOTICE

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Note: Fill out one form for each flooding source studied

Community Name: Wickenburg Area, Maricopa County, AZ

Flooding Source: Sols Wash Tributary AH4 (Wash2T7R6), Sheet No. 6

Project Name/Identifier: Approximate Zone A Floodplain Delineation Studies, Wickenburg Area, Maricopa County, AZ

1. REACH TO BE REVISED

Describe the limits of the revision OR submit a copy of the FIRM with the revision area clearly highlighted.
Copy of FIRM(s) attached depicting area of the revision (highlighted, or circled)? ☒ Yes

Downstream Limit: East limit of Section 2, T7N, R6W

Upstream Limit: Section 11, T7N, R6W

2. MODELS SUBMITTED

Requirements: for areas which have detailed flooding:	**for areas which do not have detailed flooding:**
Full input and output listings along with files on diskette for each of the models listed below (items 1-4) and a summary of the source of input parameters used in the models must be provided. The summary must include a description of any changes made from model to model (e.g., Duplicate Effective model to Corrected Effective model). At a minimum, the Duplicate Effective (item 1) and the Revised or Post-Project Conditions (item 4) models must be submitted. See instructions for directions on when other models may be required.	Only the 100-year (Base) flood profile is required. A hydraulic model is not required for areas which do not have detailed flooding; however, BFEs may not be added to the revised FIRM. If a hydraulic model is developed for the area, items 3 and 4 described below must be submitted.

If hydraulic models are not developed, hydraulic analyses (including all calculations) for existing or pre-project conditions and revised or post-project conditions must be submitted.

1. Duplicate Effective Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____

Copies of the hydraulic analysis used in the effective FIS, referred to as the effective models (10-, 50-, 100-, and 500-year multi-profile runs and the floodway run) must be obtained and then reproduced on the requester's equipment to produce the Duplicate Effective model. This is required to assure that the effective models input data has been transferred correctly to the requester's equipment and to assure that the revised data will be integrated into the effective data to provide a continuous FIS model upstream and downstream of the revised reach.

2. Corrected Effective Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____

The Corrected Effective model is the model that corrects any errors that occur in the Duplicate Effective model, adds any additional cross sections to the Duplicate Effective model, or incorporates more detailed topographic information than that used in the currently effective model. The Correctly Effective model must not reflect any man-made physical changes since the date of the effective model. An error could be a technical error in the modeling procedures, or any construction in the floodplain that occurred prior to the date of the effective model but was not incorporated into the effective model.

3. Existing or Pre-Project Conditions Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____

The Duplicate Effective model or Corrective Effective model is modified to produce the Existing or Pre-Project Conditions model to reflect any modifications that have occurred within the floodplain since the date of the Effective model but prior to the construction of the project for which the revision is being requested. If no modification has occurred since the date of the effective model, then this model would be identical to the Corrected Effective model or Duplicate Effective model.

4. Revised or Post-Project Conditions Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____

The Existing or Pre-Project Conditions model (or Duplicate Effective model or Corrected Effective model, as appropriate) is revised to reflect revised or post-project conditions. This model must incorporate any physical changes to the floodplain since the effective model was produced as well as the effects of the project. When the request is for the proposed project this model must reflect proposed conditions.

5. Other – Please attach a sheet describing all other models submitted along with the file names. ☒ **Natural** ☐ **Floodway**

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

3. STARTING WATER-SURFACE ELEVATIONS

Explain how they were determined. Explanation Attached? ☐ Yes ☒ No

NOTE: If the effective study is an approximate study, the slope/area method is recommended.
For detailed analysis studies, using a known water-surface elevation is recommended.

4. RESULTS (from the model used to revise the 100-year water surface elevations)

If the results indicate any of the following, attach an explanation - to this form, or to the hydraulic model printout- as to the reasonableness of the situation.

☒ Supercritical depth ☒ Critical Depth ☐ Drawdowns ☐ Negative Floodway Surcharges

☐ Floodway Surcharges Greater Than Maximum Allowed by Community/State

☐ Water surface elevations higher than the end points of cross sections.

☐ Floodway discharge is different than the Natural 100-year (base) flood discharge.

☐ Project causes 100-year floodplain or floodway elevations to increase (state if increases are located off the requester's property)

Explanation attached with Form ☒ **Explanation provided on attached printout** ☐

If Hydraulic model used is HEC-2, has it been checked with FEMA'S CHECK-2 computer program? ☐ **Yes** ☐ **No**
(see instructions for information on how to obtain CHECK-2)

5. REVISED FIRM/FBFM AND FLOOD PROFILES

1. Profile Transition

a. 100-Year Water-Surface Elevations - indicate the difference in water surface elevations where the project 100-year elevations tie into the existing 100-year water surface elevations at each end of the project.

Downstream End _____ within _____ (feet) Upstream End _____ within _____ (feet)
Cross-Section # *Cross-Section #*

b. Floodway Elevations - indicate the difference in water surface elevations where the project floodway elevations tie into the existing floodway water surface elevations at each end of the project.

Downstream End _____ within _____ (feet) Upstream End _____ within _____ (feet)
Cross-Section # *Cross-Section #*

c. Floodway widths - indicate the difference in floodway widths where the project floodway widths tie into the existing floodway width at each end of the project.

Downstream End _____ within _____ (feet) Upstream End _____ within _____ (feet)
Cross-Section # *Cross-Section #*

2. Profile Checklist (check box if information has been provided on profile)

The following information (unless in parentheses) must be included at the same scale as the existing profiles for this project:

☐ Stream Name ☐ Community Name ☐ Corporate Limits labeled ☐ Study limits labeled

☐ Confluences labeled ☐ Channel Stationing ☐ Streambed profiled ☐ Cross Sections labeled

☐ Horizontal/Vertical Scales indicated ☐ 100-year elevs profiled*

☐ Road Crossings ☐ Labeled ☐ Low Chord Elevations ☐ Top of Road Elevations

*All recurrence intervals in the effective study must also be profiled.

Floodway Data Table

Attach a Floodway Data Table for each cross section listed in the published Floodway Data table in the FIS report.

Floodway Data Table Attached ☐ **Yes** ☒ **Not Required**

FEDERAL EMERGENCY MANAGEMENT AGENCY **RIVERINE HYDRAULIC ANALYSIS**	O.M.B No. 3067-0148 Expires April 30, 2001

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Note: Fill out one form for each flooding source studied

Community Name: Wickenburg Area, Maricopa County, AZ

Flooding Source: Tributary to Hartman Wash AH2 (Wash27T7R6), Sheet No.7

Project Name/Identifier: Approximate Zone A Floodplain Delineation Studies, Wickenburg Area, Maricopa County, AZ

1. REACH TO BE REVISED

Describe the limits of the revision OR submit a copy of the FIRM with the revision area clearly highlighted.
Copy of FIRM(s) attached depicting area of the revision (highlighted, or circled)? ☒ Yes

Downstream Limit: East limit of Section 27, T7N, R6W

Upstream Limit: Section 34, T7N, R6W

2. MODELS SUBMITTED

Requirements: for areas which have detailed flooding:	**for areas which do not have detailed flooding**:
Full input and output listings along with files on diskette for each of the models listed below (items 1-4) and a summary of the source of input parameters used in the models must be provided. The summary must include a description of any changes made from model to model (e.g., Duplicate Effective model to Corrected Effective model). At a minimum, the Duplicate Effective (item 1) and the Revised or Post-Project Conditions (item 4) models must be submitted. See instructions for directions on when other models may be required.	Only the 100-year (Base) flood profile is required. A hydraulic model is not required for areas which do not have detailed flooding; however, BFEs may not be added to the revised FIRM. If a hydraulic model is developed for the area, items 3 and 4 described below must be submitted.

If hydraulic models are not developed, hydraulic analyses (including all calculations) for existing or pre-project conditions and revised or post-project conditions must be submitted.

1. Duplicate Effective Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____

Copies of the hydraulic analysis used in the effective FIS, referred to as the effective models (10-, 50-, 100-, and 500-year multi-profile runs and the floodway run) must be obtained and then reproduced on the requester's equipment to produce the Duplicate Effective model. This is required to assure that the effective models input data has been transferred correctly to the requester's equipment and to assure that the revised data will be integrated into the effective data to provide a continuous FIS model upstream and downstream of the revised reach.

2. Corrected Effective Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____

The Corrected Effective model is the model that corrects any errors that occur in the Duplicate Effective model, adds any additional cross sections to the Duplicate Effective model, or incorporates more detailed topographic information than that used in the currently effective model. The Correctly Effective model must not reflect any man-made physical changes since the date of the effective model. An error could be a technical error in the modeling procedures, or any construction in the floodplain that occurred prior to the date of the effective model but was not incorporated into the effective model.

3. Existing or Pre-Project Conditions Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____

The Duplicate Effective model or Corrective Effective model is modified to produce the Existing or Pre-Project Conditions model to reflect any modifications that have occurred within the floodplain since the date of the Effective model but prior to the construction of the project for which the revision is being requested. If no modification has occurred since the date of the effective model, then this model would be identical to the Corrected Effective model or Duplicate Effective model.

4. Revised or Post-Project Conditions Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____

The Existing or Pre-Project Conditions model (or Duplicate Effective model or Corrected Effective model, as appropriate) is revised to reflect revised or post-project conditions. This model must incorporate any physical changes to the floodplain since the effective model was produced as well as the effects of the project. When the request is for the proposed project this model must reflect proposed conditions.

5. Other – Please attach a sheet describing all other models submitted along with the file names. ☒ **Natural** ☐ **Floodway**

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

3. STARTING WATER-SURFACE ELEVATIONS

Explain how they were determined. Explanation Attached? ☐ Yes ☒ No

NOTE: If the effective study is an approximate study, the slope/area method is recommended.
For detailed analysis studies, using a known water-surface elevation is recommended.

4. RESULTS (from the model used to revise the 100-year water surface elevations)

If the results indicate any of the following, attach an explanation - to this form, or to the hydraulic model printout- as to the reasonableness of the situation.

☒ Supercritical depth ☒ Critical Depth ☐ Drawdowns ☐ Negative Floodway Surcharges

☐ Floodway Surcharges Greater Than Maximum Allowed by Community/State

☐ Water surface elevations higher than the end points of cross sections.

☐ Floodway discharge is different than the Natural 100-year (base) flood discharge.

☐ Project causes 100-year floodplain or floodway elevations to increase (state if increases are located off the requester's property)

Explanation attached with Form ☒ **Explanation provided on attached printout** ☐

If Hydraulic model used is HEC-2, has it been checked with FEMA'S CHECK-2 computer program? ☐ **Yes** ☐ **No**
(see instructions for information on how to obtain CHECK-2)

5. REVISED FIRM/FBFM AND FLOOD PROFILES

1. Profile Transition

a. 100-Year Water-Surface Elevations - indicate the difference in water surface elevations where the project 100-year elevations tie into the existing 100-year water surface elevations at each end of the project.

Downstream End _____ within _____ (feet) Upstream End _____ within _____ (feet)
Cross-Section # *Cross-Section #*

b. Floodway Elevations - indicate the difference in water surface elevations where the project floodway elevations tie into the existing floodway water surface elevations at each end of the project.

Downstream End _____ within _____ (feet) Upstream End _____ within _____ (feet)
Cross-Section # *Cross-Section #*

c. Floodway widths - indicate the difference in floodway widths where the project floodway widths tie into the existing floodway width at each end of the project.

Downstream End _____ within _____ (feet) Upstream End _____ within _____ (feet)
Cross-Section # *Cross-Section #*

2. Profile Checklist (check box if information has been provided on profile)

The following information (unless in parentheses) must be included at the same scale as the existing profiles for this project:

☐ Stream Name ☐ Community Name ☐ Corporate Limits labeled ☐ Study limits labeled

☐ Confluences labeled ☐ Channel Stationing ☐ Streambed profiled ☐ Cross Sections labeled

☐ Horizontal/Vertical Scales indicated ☐ 100-year elevs profiled*

☐ Road Crossings ☐ Labeled ☐ Low Chord Elevations ☐ Top of Road Elevations

*All recurrence intervals in the effective study must also be profiled.

Floodway Data Table

Attach a Floodway Data Table for each cross section listed in the published Floodway Data table in the FIS report.

Floodway Data Table Attached ☐ **Yes** ☒ **Not Required**

FEDERAL EMERGENCY MANAGEMENT AGENCY **RIVERINE HYDRAULIC ANALYSIS**	O.M.B No. 3067-0148 Expires April 30, 2001

PUBLIC BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 2.25 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing and reviewing the 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, S.W., Washington DC 20472; and to the Office of Management and Budget, Paperwork Reduction Project (3067-0148), Washington, DC 20503.

You are not required to respond to this collection of information unless a valid OMB Control Number is displayed in the upper right corner of this form.

Note: Fill out one form for each flooding source studied

Community Name: Wickenburg Area, Maricopa County, AZ

Flooding Source: Yucca Flat Wash (Wash19T7R5), Sheet No. 8

Project Name/Identifier: Approximate Zone A Floodplain Delineation Studies, Wickenburg Area, Maricopa County, AZ

1. REACH TO BE REVISED

Describe the limits of the revision OR submit a copy of the FIRM with the revision area clearly highlighted.
Copy of FIRM(s) attached depicting area of the revision (highlighted, or circled)? ☒ Yes

Downstream Limit: Section 19, T7N, R5W

Upstream Limit: Section 30, T7N, R5W

2. MODELS SUBMITTED

Requirements: for areas which have detailed flooding:	**for areas which do not have detailed flooding:**
Full input and output listings along with files on diskette for each of the models listed below (items 1-4) and a summary of the source of input parameters used in the models must be provided. The summary must include a description of any changes made from model to model (e.g., Duplicate Effective model to Corrected Effective model). At a minimum, the Duplicate Effective (item 1) and the Revised or Post-Project Conditions (item 4) models must be submitted. See instructions for directions on when other models may be required.	Only the 100-year (Base) flood profile is required. A hydraulic model is not required for areas which do not have detailed flooding; however, BFEs may not be added to the revised FIRM. If a hydraulic model is developed for the area, items 3 and 4 described below must be submitted.

Hydraulic models are not developed, hydraulic analyses (including all calculations) for existing or pre-project conditions and revised or post-project conditions must be submitted.

1. Duplicate Effective Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____

Copies of the hydraulic analysis used in the effective FIS, referred to as the effective models (10-, 50-, 100-, and 500-year multi-profile runs and the floodway run) must be obtained and then reproduced on the requester's equipment to produce the Duplicate Effective model. This is required to assure that the effective models input data has been transferred correctly to the requester's equipment and to assure that the revised data will be integrated into the effective data to provide a continuous FIS model upstream and downstream of the revised reach.

2. Corrected Effective Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____

The Corrected Effective model is the model that corrects any errors that occur in the Duplicate Effective model, adds any additional cross sections to the Duplicate Effective model, or incorporates more detailed topographic information than that used in the currently effective model. The Correctly Effective model must not reflect any man-made physical changes since the date of the effective model. An error could be a technical error in the modeling procedures, or any construction in the floodplain that occurred prior to the date of the effective model but was not incorporated into the effective model.

3. Existing or Pre-Project Conditions Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____

The Duplicate Effective model or Corrective Effective model is modified to produce the Existing or Pre-Project Conditions model to reflect any modifications that have occurred within the floodplain since the date of the Effective model but prior to the construction of the project for which the revision is being requested. If no modification has occurred since the date of the effective model, then this model would be identical to the Corrected Effective model or Duplicate Effective model.

4. Revised or Post-Project Conditions Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____

The Existing or Pre-Project Conditions model (or Duplicate Effective model or Corrected Effective model, as appropriate) is revised to reflect revised or post-project conditions. This model must incorporate any physical changes to the floodplain since the effective model was produced as well as the effects of the project. When the request is for the proposed project this model must reflect proposed conditions.

5. Other – Please attach a sheet describing all other models submitted along with the file names. ☒ **Natural** ☐ **Floodway**

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

3. STARTING WATER-SURFACE ELEVATIONS

Explain how they were determined. Explanation Attached? ☐ Yes ☒ No

NOTE: If the effective study is an approximate study, the slope/area method is recommended.
For detailed analysis studies, using a known water-surface elevation is recommended.

4. RESULTS (from the model used to revise the 100-year water surface elevations)

If the results indicate any of the following, attach an explanation - to this form, or to the hydraulic model printout- as to the reasonableness of the situation.

☒ Supercritical depth ☒ Critical Depth ☐ Drawdowns ☐ Negative Floodway Surcharges

☐ Floodway Surcharges Greater Than Maximum Allowed by Community/State

☐ Water surface elevations higher than the end points of cross sections.

☐ Floodway discharge is different than the Natural 100-year (base) flood discharge.

☐ Project causes 100-year floodplain or floodway elevations to increase (state if increases are located off the requester's property)

Explanation attached with Form ☒ Explanation provided on attached printout ☐

If Hydraulic model used is HEC-2, has it been checked with FEMA'S CHECK-2 computer program? ☐ Yes ☐ No
(see instructions for information on how to obtain CHECK-2)

5. REVISED FIRM/FBFM AND FLOOD PROFILES

1. Profile Transition

a. 100-Year Water-Surface Elevations - indicate the difference in water surface elevations where the project 100-year elevations tie into the existing 100-year water surface elevations at each end of the project.

Downstream End _____ within _____ (feet) Upstream End _____ within _____ (feet)
Cross-Section # *Cross-Section #*

b. Floodway Elevations - indicate the difference in water surface elevations where the project floodway elevations tie into the existing floodway water surface elevations at each end of the project.

Downstream End _____ within _____ (feet) Upstream End _____ within _____ (feet)
Cross-Section # *Cross-Section #*

c. Floodway widths - indicate the difference in floodway widths where the project floodway widths tie into the existing floodway width at each end of the project.

Downstream End _____ within _____ (feet) Upstream End _____ within _____ (feet)
Cross-Section # *Cross-Section #*

2. Profile Checklist (check box if information has been provided on profile)

The following information (unless in parentheses) must be included at the same scale as the existing profiles for this project:

☐ Stream Name ☐ Community Name ☐ Corporate Limits labeled ☐ Study limits labeled

☐ Confluences labeled ☐ Channel Stationing ☐ Streambed profiled ☐ Cross Sections labeled

☐ Horizontal/Vertical Scales indicated ☐ 100-year elevs profiled*

☐ Road Crossings ☐ Labeled ☐ Low Chord Elevations ☐ Top of Road Elevations

*All recurrence intervals in the effective study must also be profiled.

Floodway Data Table

Attach a Floodway Data Table for each cross section listed in the published Floodway Data table in the FIS report.

Floodway Data Table Attached ☐ Yes ☒ Not Required

FEDERAL EMERGENCY MANAGEMENT AGENCY **RIVERINE HYDRAULIC ANALYSIS**	O.M.B No. 3067-0148 Expires April 30, 2001

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Note: Fill out one form for each flooding source studied

Community Name: Wickenburg Area, Maricopa County, AZ

Flooding Source: Holly Wash (Wash20T7R5), Sheet No.9

Project Name/Identifier: Approximate Zone A Floodplain Delineation Studies, Wickenburg Area, Maricopa County, AZ

1. REACH TO BE REVISED

Describe the limits of the revision OR submit a copy of the FIRM with the revision area clearly highlighted.
Copy of FIRM(s) attached depicting area of the revision (highlighted, or circled)? ☒ Yes

Downstream Limit: South limit of Section 20, T7N, R5W

Upstream Limit: Section 29, T7N, R5W

2. MODELS SUBMITTED

Requirements: for areas which have detailed flooding:	**for areas which do not have detailed flooding:**
Full input and output listings along with files on diskette for each of the models listed below (items 1-4) and a summary of the source of input parameters used in the models must be provided. The summary must include a description of any changes made from model to model (e.g., Duplicate Effective model to Corrected Effective model). At a minimum, the Duplicate Effective (item 1) and the Revised or Post-Project Conditions (item 4) models must be submitted. See instructions for directions on when other models may be required.	Only the 100-year (Base) flood profile is required. A hydraulic model is not required for areas which do not have detailed flooding; however, BFEs may not be added to the revised FIRM. If a hydraulic model is developed for the area, items 3 and 4 described below must be submitted.

If hydraulic models are not developed, hydraulic analyses (including all calculations) for existing or pre-project conditions and revised or post-project conditions must be submitted.

1. Duplicate Effective Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____
Copies of the hydraulic analysis used in the effective FIS, referred to as the effective models (10-, 50-, 100-, and 500-year multi-profile runs and the floodway run) must be obtained and then reproduced on the requester's equipment to produce the Duplicate Effective model. This is required to assure that the effective models input data has been transferred correctly to the requester's equipment and to assure that the revised data will be integrated into the effective data to provide a continuous FIS model upstream and downstream of the revised reach.

2. Corrected Effective Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____
The Corrected Effective model is the model that corrects any errors that occur in the Duplicate Effective model, adds any additional cross sections to the Duplicate Effective model, or incorporates more detailed topographic information than that used in the currently effective model. The Correctly Effective model must not reflect any man-made physical changes since the date of the effective model. An error could be a technical error in the modeling procedures, or any construction in the floodplain that occurred prior to the date of the effective model but was not incorporated into the effective model.

3. Existing or Pre-Project Conditions Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____
The Duplicate Effective model or Corrective Effective model is modified to produce the Existing or Pre-Project Conditions model to reflect any modifications that have occurred within the floodplain since the date of the Effective model but prior to the construction of the project for which the revision is being requested. If no modification has occurred since the date of the effective model, then this model would be identical to the Corrected Effective model or Duplicate Effective model.

4. Revised or Post-Project Conditions Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____
The Existing or Pre-Project Conditions model (or Duplicate Effective model or Corrected Effective model, as appropriate) is revised to reflect revised or post-project conditions. This model must incorporate any physical changes to the floodplain since the effective model was produced as well as the effects of the project. When the request is for the proposed project this model must reflect proposed conditions.

5. Other – Please attach a sheet describing all other models submitted along with the file names. ☒ **Natural** ☐ **Floodway**

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

3. STARTING WATER-SURFACE ELEVATIONS

Explain how they were determined. Explanation Attached? ☐ Yes ☒ No

NOTE: If the effective study is an approximate study, the slope/area method is recommended.
For detailed analysis studies, using a known water-surface elevation is recommended.

4. RESULTS (from the model used to revise the 100-year water surface elevations)

If the results indicate any of the following, attach an explanation - to this form, or to the hydraulic model printout- as to the reasonableness of the situation.

☒ *Supercritical depth* ☒ *Critical Depth* ☐ *Drawdowns* ☐ *Negative Floodway Surcharges*

☐ Floodway Surcharges Greater Than Maximum Allowed by Community/State

☐ Water surface elevations higher than the end points of cross sections.

☐ Floodway discharge is different than the Natural 100-year (base) flood discharge.

☐ Project causes 100-year floodplain or floodway elevations to increase (state if increases are located off the requester's property)

Explanation attached with Form ☒ **Explanation provided on attached printout** ☐

If Hydraulic model used is HEC-2, has it been checked with FEMA'S CHECK-2 computer program? ☐ **Yes** ☐ **No**
(see instructions for information on how to obtain CHECK-2)

5. REVISED FIRM/FBFM AND FLOOD PROFILES

1. Profile Transition

a. 100-Year Water-Surface Elevations - indicate the difference in water surface elevations where the project 100-year elevations tie into the existing 100-year water surface elevations at each end of the project.

Downstream End _____ within _____ (feet) Upstream End _____ within _____ (feet)
Cross-Section # *Cross-Section #*

b. Floodway Elevations - indicate the difference in water surface elevations where the project floodway elevations tie into the existing floodway water surface elevations at each end of the project.

Downstream End _____ within _____ (feet) Upstream End _____ within _____ (feet)
Cross-Section # *Cross-Section #*

c. Floodway widths - indicate the difference in floodway widths where the project floodway widths tie into the existing floodway width at each end of the project.

Downstream End _____ within _____ (feet) Upstream End _____ within _____ (feet)
Cross-Section # *Cross-Section #*

2. Profile Checklist (check box if information has been provided on profile)

The following information (unless in parentheses) must be included at the same scale as the existing profiles for this project:

☐ Stream Name ☐ Community Name ☐ Corporate Limits labeled ☐ Study limits labeled

☐ Confluences labeled ☐ Channel Stationing ☐ Streambed profiled ☐ Cross Sections labeled

☐ Horizontal/Vertical Scales indicated ☐ 100-year elevs profiled*

☐ Road Crossings ☐ Labeled ☐ Low Chord Elevations ☐ Top of Road Elevations

*All recurrence intervals in the effective study must also be profiled.

Floodway Data Table

Attach a Floodway Data Table for each cross section listed in the published Floodway Data table in the FIS report.

Floodway Data Table Attached ☐ **Yes** ☒ **Not Required**

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Note: Fill out one form for each flooding source studied

Community Name: Wickenburg Area, Maricopa County, AZ

Flooding Source: Cemetery Wash (Wash28T7R5), Sheet No.10

Project Name/Identifier: Approximate Zone A Floodplain Delineation Studies, Wickenburg Area, Maricopa County, AZ

1. REACH TO BE REVISED

Describe the limits of the revision OR submit a copy of the FIRM with the revision area clearly highlighted.
Copy of FIRM(s) attached depicting area of the revision (highlighted, or circled)? ☒ Yes

Downstream Limit: South limit of Section 28, T7N, R5W

Upstream Limit: Section 4, T6N, R5W

2. MODELS SUBMITTED

Requirements: for areas which have detailed flooding:	**for areas which do not have detailed flooding:**
Full input and output listings along with files on diskette for each of the models listed below (items 1-4) and a summary of the source of input parameters used in the models must be provided. The summary must include a description of any changes made from model to model (e.g., Duplicate Effective model to Corrected Effective model). At a minimum, the Duplicate Effective (item 1) and the Revised or Post-Project Conditions (item 4) models must be submitted. See instructions for directions on when other models may be required.	Only the 100-year (Base) flood profile is required. A hydraulic model is not required for areas which do not have detailed flooding; however, BFEs may not be added to the revised FIRM. If a hydraulic model is developed for the area, items 3 and 4 described below must be submitted.

If hydraulic models are not developed, hydraulic analyses (including all calculations) for existing or pre-project conditions and revised or post-project conditions must be submitted.

1. Duplicate Effective Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____
Copies of the hydraulic analysis used in the effective FIS, referred to as the effective models (10-, 50-, 100-, and 500-year multi-profile runs and the floodway run) must be obtained and then reproduced on the requester's equipment to produce the Duplicate Effective model. This is required to assure that the effective models input data has been transferred correctly to the requester's equipment and to assure that the revised data will be integrated into the effective data to provide a continuous FIS model upstream and downstream of the revised reach.

2. Corrected Effective Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____
The Corrected Effective model is the model that corrects any errors that occur in the Duplicate Effective model, adds any additional cross sections to the Duplicate Effective model, or incorporates more detailed topographic information than that used in the currently effective model. The Correctly Effective model must not reflect any man-made physical changes since the date of the effective model. An error could be a technical error in the modeling procedures, or any construction in the floodplain that occurred prior to the date of the effective model but was not incorporated into the effective model.

3. Existing or Pre-Project Conditions Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____
The Duplicate Effective model or Corrective Effective model is modified to produce the Existing or Pre-Project Conditions model to reflect any modifications that have occurred within the floodplain since the date of the Effective model but prior to the construction of the project for which the revision is being requested. If no modification has occurred since the date of the effective model, then this model would be identical to the Corrected Effective model or Duplicate Effective model.

4. Revised or Post-Project Conditions Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____
The Existing or Pre-Project Conditions model (or Duplicate Effective model or Corrected Effective model, as appropriate) is revised to reflect revised or post-project conditions. This model must incorporate any physical changes to the floodplain since the effective model was produced as well as the effects of the project. When the request is for the proposed project this model must reflect proposed conditions.

5. Other – Please attach a sheet describing all other models submitted along with the file names. ☒ **Natural** ☐ **Floodway**

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

3. STARTING WATER-SURFACE ELEVATIONS

Explain how they were determined. Explanation Attached? ☐ Yes ☒ No

NOTE: If the effective study is an approximate study, the slope/area method is recommended.
For detailed analysis studies, using a known water-surface elevation is recommended.

4. RESULTS (from the model used to revise the 100-year water surface elevations)

If the results indicate any of the following, attach an explanation - to this form, or to the hydraulic model printout- as to the reasonableness of the situation.

☒ Supercritical depth ☒ Critical Depth ☐ Drawdowns ☐ Negative Floodway Surcharges

☐ Floodway Surcharges Greater Than Maximum Allowed by Community/State

☐ Water surface elevations higher than the end points of cross sections.

☐ Floodway discharge is different than the Natural 100-year (base) flood discharge.

☐ Project causes 100-year floodplain or floodway elevations to increase (state if increases are located off the requester's property)

Explanation attached with Form ☒ **Explanation provided on attached printout** ☐

If Hydraulic model used is HEC-2, has it been checked with FEMA'S CHECK-2 computer program? ☐ **Yes** ☐ **No**
(see instructions for information on how to obtain CHECK-2)

5. REVISED FIRM/FBFM AND FLOOD PROFILES

1. Profile Transition

a. 100-Year Water-Surface Elevations - indicate the difference in water surface elevations where the project 100-year elevations tie into the existing 100-year water surface elevations at each end of the project.

Downstream End _____ within _____ (feet) Upstream End _____ within _____ (feet)
Cross-Section # *Cross-Section #*

b. Floodway Elevations - indicate the difference in water surface elevations where the project floodway elevations tie into the existing floodway water surface elevations at each end of the project.

Downstream End _____ within _____ (feet) Upstream End _____ within _____ (feet)
Cross-Section # *Cross-Section #*

c. Floodway widths - indicate the difference in floodway widths where the project floodway widths tie into the existing floodway width at each end of the project.

Downstream End _____ within _____ (feet) Upstream End _____ within _____ (feet)
Cross-Section # *Cross-Section #*

2. Profile Checklist (check box if information has been provided on profile)

The following information (unless in parentheses) must be included at the same scale as the existing profiles for this project:

☐ Stream Name ☐ Community Name ☐ Corporate Limits labeled ☐ Study limits labeled

☐ Confluences labeled ☐ Channel Stationing ☐ Streambed profiled ☐ Cross Sections labeled

☐ Horizontal/Vertical Scales indicated ☐ 100-year elevs profiled*

☐ Road Crossings ☐ Labeled ☐ Low Chord Elevations ☐ Top of Road Elevations

*All recurrence intervals in the effective study must also be profiled.

Floodway Data Table

Attach a Floodway Data Table for each cross section listed in the published Floodway Data table in the FIS report.

Floodway Data Table Attached ☐ **Yes** ☒ **Not Required**

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Note: Fill out one form for each flooding source studied

Community Name: Wickenburg Area, Maricopa County, AZ

Flooding Source: Turtleback Wash (Wash24T7R5), Sheet No. 11

Project Name/Identifier: Approximate Zone A Floodplain Delineation Studies, Wickenburg Area, Maricopa County, AZ

1. REACH TO BE REVISED

Describe the limits of the revision OR submit a copy of the FIRM with the revision area clearly highlighted.
Copy of FIRM(s) attached depicting area of the revision (highlighted, or circled)? ☒ Yes

Downstream Limit: Section 24, T7N, R5W

Upstream Limit: Section 34, T7N, R5W

2. MODELS SUBMITTED

Requirements: for areas which have detailed flooding:	**for areas which do not have detailed flooding:**
Full input and output listings along with files on diskette for each of the models listed below (items 1-4) and a summary of the source of input parameters used in the models must be provided. The summary must include a description of any changes made from model to model (e.g., Duplicate Effective model to Corrected Effective model). At a minimum, the Duplicate Effective (item 1) and the Revised or Post-Project Conditions (item 4) models must be submitted. See instructions for directions on when other models may be required.	Only the 100-year (Base) flood profile is required. A hydraulic model is not required for areas which do not have detailed flooding; however, BFEs may not be added to the revised FIRM. If a hydraulic model is developed for the area, items 3 and 4 described below must be submitted.

If hydraulic models are not developed, hydraulic analyses (including all calculations) for existing or pre-project conditions and revised or post-project conditions must be submitted.

1. Duplicate Effective Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____
Copies of the hydraulic analysis used in the effective FIS, referred to as the effective models (10-, 50-, 100-, and 500-year multi-profile runs and the floodway run) must be obtained and then reproduced on the requester's equipment to produce the Duplicate Effective model. This is required to assure that the effective models input data has been transferred correctly to the requester's equipment and to assure that the revised data will be integrated into the effective data to provide a continuous FIS model upstream and downstream of the revised reach.

2. Corrected Effective Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____
The Corrected Effective model is the model that corrects any errors that occur in the Duplicate Effective model, adds any additional cross sections to the Duplicate Effective model, or incorporates more detailed topographic information than that used in the currently effective model. The Correctly Effective model must not reflect any man-made physical changes since the date of the effective model. An error could be a technical error in the modeling procedures, or any construction in the floodplain that occurred prior to the date of the effective model but was not incorporated into the effective model.

3. Existing or Pre-Project Conditions Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____
The Duplicate Effective model or Corrective Effective model is modified to produce the Existing or Pre-Project Conditions model to reflect any modifications that have occurred within the floodplain since the date of the Effective model but prior to the construction of the project for which the revision is being requested. If no modification has occurred since the date of the effective model, then this model would be identical to the Corrected Effective model or Duplicate Effective model.

4. Revised or Post-Project Conditions Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____
The Existing or Pre-Project Conditions model (or Duplicate Effective model or Corrected Effective model, as appropriate) is revised to reflect revised or post-project conditions. This model must incorporate any physical changes to the floodplain since the effective model was produced as well as the effects of the project. When the request is for the proposed project this model must reflect proposed conditions.

5. Other – Please attach a sheet describing all other models submitted along with the file names. ☒ **Natural** ☐ **Floodway**

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

3. STARTING WATER-SURFACE ELEVATIONS

Explain how they were determined. Explanation Attached? ☐ Yes ☒ No

NOTE: If the effective study is an approximate study, the slope/area method is recommended.
For detailed analysis studies, using a known water-surface elevation is recommended.

4. RESULTS (from the model used to revise the 100-year water surface elevations)

If the results indicate any of the following, attach an explanation - to this form, or to the hydraulic model printout- as to the reasonableness of the situation.

☒ Supercritical depth ☒ Critical Depth ☐ Drawdowns ☐ Negative Floodway Surcharges

☐ Floodway Surcharges Greater Than Maximum Allowed by Community/State

☐ Water surface elevations higher than the end points of cross sections.

☐ Floodway discharge is different than the Natural 100-year (base) flood discharge.

☐ Project causes 100-year floodplain or floodway elevations to increase (state if increases are located off the requester's property)

Explanation attached with Form ☒ **Explanation provided on attached printout** ☐

If Hydraulic model used is HEC-2, has it been checked with FEMA'S CHECK-2 computer program? ☐ **Yes** ☐ **No**
(see instructions for information on how to obtain CHECK-2)

5. REVISED FIRM/FBFM AND FLOOD PROFILES

1. Profile Transition

a. 100-Year Water-Surface Elevations - indicate the difference in water surface elevations where the project 100-year elevations tie into the existing 100-year water surface elevations at each end of the project.

Downstream End _____ within _____ (feet) Upstream End _____ within _____ (feet)
Cross-Section # *Cross-Section #*

b. Floodway Elevations - indicate the difference in water surface elevations where the project floodway elevations tie into the existing floodway water surface elevations at each end of the project.

Downstream End _____ within _____ (feet) Upstream End _____ within _____ (feet)
Cross-Section # *Cross-Section #*

c. Floodway widths - indicate the difference in floodway widths where the project floodway widths tie into the existing floodway width at each end of the project.

Downstream End _____ within _____ (feet) Upstream End _____ within _____ (feet)
Cross-Section # *Cross-Section #*

2. Profile Checklist (check box if information has been provided on profile)

The following information (unless in parentheses) must be included at the same scale as the existing profiles for this project:

☐ Stream Name ☐ Community Name ☐ Corporate Limits labeled ☐ Study limits labeled

☐ Confluences labeled ☐ Channel Stationing ☐ Streambed profiled ☐ Cross Sections labeled

☐ Horizontal/Vertical Scales indicated ☐ 100-year elevs profiled*

☐ Road Crossings ☐ Labeled ☐ Low Chord Elevations ☐ Top of Road Elevations

*All recurrence intervals in the effective study must also be profiled.

Floodway Data Table

Attach a Floodway Data Table for each cross section listed in the published Floodway Data table in the FIS report.

Floodway Data Table Attached ☐ **Yes** ☒ **Not Required**

FEDERAL EMERGENCY MANAGEMENT AGENCY **RIVERINE HYDRAULIC ANALYSIS**	O.M.B No. 3067-0148 Expires April 30, 2001

PUBLIC BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 2.25 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing and reviewing the 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, S.W., Washington DC 20472; and to the Office of Management and Budget, Paperwork Reduction Project (3067-0148), Washington, DC 20503.

You are not required to respond to this collection of information unless a valid OMB Control Number is displayed in the upper right corner of this form.

Note: Fill out one form for each flooding source studied

Community Name: Wickenburg Area, Maricopa County, AZ

Flooding Source: Tributary to Mockingbird Wash (Wash17T7R4), Sheet No. 12

Project Name/Identifier: Approximate Zone A Floodplain Delineation Studies, Wickenburg Area, Maricopa County, AZ

1. REACH TO BE REVISED

Describe the limits of the revision OR submit a copy of the FIRM with the revision area clearly highlighted.
Copy of FIRM(s) attached depicting area of the revision (highlighted, or circled)? ☒ Yes

Downstream Limit: Section 17, T7N, R4W

Upstream Limit: Section 4, T7N, R4W

2. MODELS SUBMITTED

Requirements: for areas which have detailed flooding:	**for areas which do not have detailed flooding:**
Full input and output listings along with files on diskette for each of the models listed below (items 1-4) and a summary of the source of input parameters used in the models must be provided. The summary must include a description of any changes made from model to model (e.g., Duplicate Effective model to Corrected Effective model). At a minimum, the Duplicate Effective (item 1) and the Revised or Post-Project Conditions (item 4) models must be submitted. See instructions for directions on when other models may be required.	Only the 100-year (Base) flood profile is required. A hydraulic model is not required for areas which do not have detailed flooding; however, BFEs may not be added to the revised FIRM. If a hydraulic model is developed for the area, items 3 and 4 described below must be submitted.

Hydraulic models are not developed, hydraulic analyses (including all calculations) for existing or pre-project conditions and revised or post-project conditions must be submitted.

1. Duplicate Effective Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____

Copies of the hydraulic analysis used in the effective FIS, referred to as the effective models (10-, 50-, 100-, and 500-year multi-profile runs and the floodway run) must be obtained and then reproduced on the requester's equipment to produce the Duplicate Effective model. This is required to assure that the effective models input data has been transferred correctly to the requester's equipment and to assure that the revised data will be integrated into the effective data to provide a continuous FIS model upstream and downstream of the revised reach.

2. Corrected Effective Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____

The Corrected Effective model is the model that corrects any errors that occur in the Duplicate Effective model, adds any additional cross sections to the Duplicate Effective model, or incorporates more detailed topographic information than that used in the currently effective model. The Correctly Effective model must not reflect any man-made physical changes since the date of the effective model. An error could be a technical error in the modeling procedures, or any construction in the floodplain that occurred prior to the date of the effective model but was not incorporated into the effective model.

3. Existing or Pre-Project Conditions Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____

The Duplicate Effective model or Corrective Effective model is modified to produce the Existing or Pre-Project Conditions model to reflect any modifications that have occurred within the floodplain since the date of the Effective model but prior to the construction of the project for which the revision is being requested. If no modification has occurred since the date of the effective model, then this model would be identical to the Corrected Effective model or Duplicate Effective model.

4. Revised or Post-Project Conditions Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____

The Existing or Pre-Project Conditions model (or Duplicate Effective model or Corrected Effective model, as appropriate) is revised to reflect revised or post-project conditions. This model must incorporate any physical changes to the floodplain since the effective model was produced as well as the effects of the project. When the request is for the proposed project this model must reflect proposed conditions.

5. Other – Please attach a sheet describing all other models submitted along with the file names. ☒ **Natural** ☐ **Floodway**

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

3. STARTING WATER-SURFACE ELEVATIONS

Explain how they were determined. Explanation Attached? ☐ Yes ☒ No

NOTE: If the effective study is an approximate study, the slope/area method is recommended.
For detailed analysis studies, using a known water-surface elevation is recommended.

4. RESULTS (from the model used to revise the 100-year water surface elevations)

If the results indicate any of the following, attach an explanation - to this form, or to the hydraulic model printout- as to the reasonableness of the situation.

☒ Supercritical depth ☒ Critical Depth ☐ Drawdowns ☐ Negative Floodway Surcharges

☐ Floodway Surcharges Greater Than Maximum Allowed by Community/State

☐ Water surface elevations higher than the end points of cross sections.

☐ Floodway discharge is different than the Natural 100-year (base) flood discharge.

☐ Project causes 100-year floodplain or floodway elevations to increase (state if increases are located off the requester's property)

Explanation attached with Form ☒ **Explanation provided on attached printout** ☐

If Hydraulic model used is HEC-2, has it been checked with FEMA'S CHECK-2 computer program? ☐ **Yes** ☐ **No**
(see instructions for information on how to obtain CHECK-2)

5. REVISED FIRM/FBFM AND FLOOD PROFILES

1. Profile Transition

a. 100-Year Water-Surface Elevations - indicate the difference in water surface elevations where the project 100-year elevations tie into the existing 100-year water surface elevations at each end of the project.

Downstream End _____ within _____ (feet) Upstream End _____ within _____ (feet)
Cross-Section # *Cross-Section #*

b. Floodway Elevations - indicate the difference in water surface elevations where the project floodway elevations tie into the existing floodway water surface elevations at each end of the project.

Downstream End _____ within _____ (feet) Upstream End _____ within _____ (feet)
Cross-Section # *Cross-Section #*

c. Floodway widths - indicate the difference in floodway widths where the project floodway widths tie into the existing floodway width at each end of the project.

Downstream End _____ within _____ (feet) Upstream End _____ within _____ (feet)
Cross-Section # *Cross-Section #*

2. Profile Checklist (check box if information has been provided on profile)

The following information (unless in parentheses) must be included at the same scale as the existing profiles for this project:

☐ Stream Name ☐ Community Name ☐ Corporate Limits labeled ☐ Study limits labeled

☐ Confluences labeled ☐ Channel Stationing ☐ Streambed profiled ☐ Cross Sections labeled

☐ Horizontal/Vertical Scales indicated ☐ 100-year elevs profiled*

☐ Road Crossings ☐ Labeled ☐ Low Chord Elevations ☐ Top of Road Elevations

*All recurrence intervals in the effective study must also be profiled.

Floodway Data Table

Attach a Floodway Data Table for each cross section listed in the published Floodway Data table in the FIS report.

Floodway Data Table Attached ☐ **Yes** ☒ **Not Required**

FEDERAL EMERGENCY MANAGEMENT AGENCY **RIVERINE HYDRAULIC ANALYSIS**	O.M.B No. 3067-0148 Expires April 30, 2001

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Note: Fill out one form for each flooding source studied

Community Name: Wickenburg Area, Maricopa County, AZ

Flooding Source: Tributary to Wash K (Wash10T7R4), Sheet No. 13

Project Name/Identifier: Approximate Zone A Floodplain Delineation Studies, Wickenburg Area, Maricopa County, AZ

1. REACH TO BE REVISED

Describe the limits of the revision OR submit a copy of the FIRM with the revision area clearly highlighted.
Copy of FIRM(s) attached depicting area of the revision (highlighted, or circled)? ☒ Yes

Downstream Limit: Section 10, T7N, R4W

Upstream Limit: Section 2, T7N, R4W, County line

2. MODELS SUBMITTED

Requirements: for areas which have detailed flooding:	**for areas which do not have detailed flooding**:
Full input and output listings along with files on diskette for each of the models listed below (items 1-4) and a summary of the source of input parameters used in the models must be provided. The summary must include a description of any changes made from model to model (e.g., Duplicate Effective model to Corrected Effective model). At a minimum, the Duplicate Effective (item 1) and the Revised or Post-Project Conditions (item 4) models must be submitted. See instructions for directions on when other models may be required.	Only the 100-year (Base) flood profile is required. A hydraulic model is not required for areas which do not have detailed flooding; however, BFEs may not be added to the revised FIRM. If a hydraulic model is developed for the area, items 3 and 4 described below must be submitted.

Hydraulic models are not developed, hydraulic analyses (including all calculations) for existing or pre-project conditions and revised or post-project conditions must be submitted.

1. Duplicate Effective Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____
Copies of the hydraulic analysis used in the effective FIS, referred to as the effective models (10-, 50-, 100-, and 500-year multi-profile runs and the floodway run) must be obtained and then reproduced on the requester's equipment to produce the Duplicate Effective model. This is required to assure that the effective models input data has been transferred correctly to the requester's equipment and to assure that the revised data will be integrated into the effective data to provide a continuous FIS model upstream and downstream of the revised reach.

2. Corrected Effective Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____
The Corrected Effective model is the model that corrects any errors that occur in the Duplicate Effective model, adds any additional cross sections to the Duplicate Effective model, or incorporates more detailed topographic information than that used in the currently effective model. The Correctly Effective model must not reflect any man-made physical changes since the date of the effective model. An error could be a technical error in the modeling procedures, or any construction in the floodplain that occurred prior to the date of the effective model but was not incorporated into the effective model.

3. Existing or Pre-Project Conditions Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____
The Duplicate Effective model or Corrective Effective model is modified to produce the Existing or Pre-Project Conditions model to reflect any modifications that have occurred within the floodplain since the date of the Effective model but prior to the construction of the project for which the revision is being requested. If no modification has occurred since the date of the effective model, then this model would be identical to the Corrected Effective model or Duplicate Effective model.

4. Revised or Post-Project Conditions Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____
The Existing or Pre-Project Conditions model (or Duplicate Effective model or Corrected Effective model, as appropriate) is revised to reflect revised or post-project conditions. This model must incorporate any physical changes to the floodplain since the effective model was produced as well as the effects of the project. When the request is for the proposed project this model must reflect proposed conditions.

5. Other – Please attach a sheet describing all other models submitted along with the file names. ☒ **Natural** ☐ **Floodway**

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

3. STARTING WATER-SURFACE ELEVATIONS

Explain how they were determined. Explanation Attached? ☐ Yes ☒ No

NOTE: If the effective study is an approximate study, the slope/area method is recommended.
For detailed analysis studies, using a known water-surface elevation is recommended.

4. RESULTS (from the model used to revise the 100-year water surface elevations)

If the results indicate any of the following, attach an explanation - to this form, or to the hydraulic model printout- as to the reasonableness of the situation.

☒ Supercritical depth ☒ Critical Depth ☐ Drawdowns ☐ Negative Floodway Surcharges

☐ Floodway Surcharges Greater Than Maximum Allowed by Community/State

☐ Water surface elevations higher than the end points of cross sections.

☐ Floodway discharge is different than the Natural 100-year (base) flood discharge.

☐ Project causes 100-year floodplain or floodway elevations to increase (state if increases are located off the requester's property)

Explanation attached with Form ☒ **Explanation provided on attached printout** ☐

If Hydraulic model used is HEC-2, has it been checked with FEMA'S CHECK-2 computer program? ☐ **Yes** ☐ **No**
(see instructions for information on how to obtain CHECK-2)

5. REVISED FIRM/FBFM AND FLOOD PROFILES

1. Profile Transition

a. 100-Year Water-Surface Elevations - indicate the difference in water surface elevations where the project 100-year elevations tie into the existing 100-year water surface elevations at each end of the project.

Downstream End _____ within _____ (feet) Upstream End _____ within _____ (feet)
Cross-Section # *Cross-Section #*

b. Floodway Elevations - indicate the difference in water surface elevations where the project floodway elevations tie into the existing floodway water surface elevations at each end of the project.

Downstream End _____ within _____ (feet) Upstream End _____ within _____ (feet)
Cross-Section # *Cross-Section #*

c. Floodway widths - indicate the difference in floodway widths where the project floodway widths tie into the existing floodway width at each end of the project.

Downstream End _____ within _____ (feet) Upstream End _____ within _____ (feet)
Cross-Section # *Cross-Section #*

2. Profile Checklist (check box if information has been provided on profile)

The following information (unless in parentheses) must be included at the same scale as the existing profiles for this project:

☐ Stream Name ☐ Community Name ☐ Corporate Limits labeled ☐ Study limits labeled

☐ Confluences labeled ☐ Channel Stationing ☐ Streambed profiled ☐ Cross Sections labeled

☐ Horizontal/Vertical Scales indicated ☐ 100-year elevs profiled*

☐ Road Crossings ☐ Labeled ☐ Low Chord Elevations ☐ Top of Road Elevations

*All recurrence intervals in the effective study must also be profiled.

Floodway Data Table

Attach a Floodway Data Table for each cross section listed in the published Floodway Data table in the FIS report.

Floodway Data Table Attached ☐ **Yes** ☒ **Not Required**

FEDERAL EMERGENCY MANAGEMENT AGENCY **RIVERINE HYDRAULIC ANALYSIS**	O.M.B No. 3067-0148 Expires April 30, 2001

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Note: Fill out one form for each flooding source studied

Community Name: Wickenburg Area, Maricopa County, AZ

Flooding Source: Tributary to Monarch Wash (Wash22T7R4), Sheet No.14

Project Name/Identifier: Approximate Zone A Floodplain Delineation Studies, Wickenburg Area, Maricopa County, AZ

1. REACH TO BE REVISED

Describe the limits of the revision OR submit a copy of the FIRM with the revision area clearly highlighted.
Copy of FIRM(s) attached depicting area of the revision (highlighted, or circled)? ☒ Yes

Downstream Limit: Section 22, T7N, R4W

Upstream Limit: Section 2, T7N, R4W, County line

2. MODELS SUBMITTED

Requirements: for areas which have detailed flooding:	**for areas which do not have detailed flooding:**
Full input and output listings along with files on diskette for each of the models listed below (items 1-4) and a summary of the source of input parameters used in the models must be provided. The summary must include a description of any changes made from model to model (e.g., Duplicate Effective model to Corrected Effective model). At a minimum, the Duplicate Effective (item 1) and the Revised or Post-Project Conditions (item 4) models must be submitted. See instructions for directions on when other models may be required.	Only the 100-year (Base) flood profile is required. A hydraulic model is not required for areas which do not have detailed flooding; however, BFEs may not be added to the revised FIRM. If a hydraulic model is developed for the area, items 3 and 4 described below must be submitted.

If hydraulic models are not developed, hydraulic analyses (including all calculations) for existing or pre-project conditions and revised or post-project conditions must be submitted.

1. Duplicate Effective Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____
Copies of the hydraulic analysis used in the effective FIS, referred to as the effective models (10-, 50-, 100-, and 500-year multi-profile runs and the floodway run) must be obtained and then reproduced on the requester's equipment to produce the Duplicate Effective model. This is required to assure that the effective models input data has been transferred correctly to the requester's equipment and to assure that the revised data will be integrated into the effective data to provide a continuous FIS model upstream and downstream of the revised reach.

2. Corrected Effective Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____
The Corrected Effective model is the model that corrects any errors that occur in the Duplicate Effective model, adds any additional cross sections to the Duplicate Effective model, or incorporates more detailed topographic information than that used in the currently effective model. The Correctly Effective model must not reflect any man-made physical changes since the date of the effective model. An error could be a technical error in the modeling procedures, or any construction in the floodplain that occurred prior to the date of the effective model but was not incorporated into the effective model.

3. Existing or Pre-Project Conditions Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____
The Duplicate Effective model or Corrective Effective model is modified to produce the Existing or Pre-Project Conditions model to reflect any modifications that have occurred within the floodplain since the date of the Effective model but prior to the construction of the project for which the revision is being requested. If no modification has occurred since the date of the effective model, then this model would be identical to the Corrected Effective model or Duplicate Effective model.

4. Revised or Post-Project Conditions Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____
The Existing or Pre-Project Conditions model (or Duplicate Effective model or Corrected Effective model, as appropriate) is revised to reflect revised or post-project conditions. This model must incorporate any physical changes to the floodplain since the effective model was produced as well as the effects of the project. When the request is for the proposed project this model must reflect proposed conditions.

5. Other – Please attach a sheet describing all other models submitted along with the file names. ☒ **Natural** ☐ **Floodway**

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

3. STARTING WATER-SURFACE ELEVATIONS

Explain how they were determined. Explanation Attached? ☐ Yes ☒ No

NOTE: If the effective study is an approximate study, the slope/area method is recommended.
For detailed analysis studies, using a known water-surface elevation is recommended.

4. RESULTS (from the model used to revise the 100-year water surface elevations)

If the results indicate any of the following, attach an explanation - to this form, or to the hydraulic model printout- as to the reasonableness of the situation.

☒ Supercritical depth ☒ Critical Depth ☐ Drawdowns ☐ Negative Floodway Surcharges

☐ Floodway Surcharges Greater Than Maximum Allowed by Community/State

☐ Water surface elevations higher than the end points of cross sections.

☐ Floodway discharge is different than the Natural 100-year (base) flood discharge.

☐ Project causes 100-year floodplain or floodway elevations to increase (state if increases are located off the requester's property)

Explanation attached with Form ☒ **Explanation provided on attached printout** ☐

If Hydraulic model used is HEC-2, has it been checked with FEMA'S CHECK-2 computer program? ☐ **Yes** ☐ **No**
(see instructions for information on how to obtain CHECK-2)

5. REVISED FIRM/FBFM AND FLOOD PROFILES

1. Profile Transition

a. 100-Year Water-Surface Elevations - indicate the difference in water surface elevations where the project 100-year elevations tie into the existing 100-year water surface elevations at each end of the project.

Downstream End _____ within _____ (feet) Upstream End _____ within _____ (feet)
Cross-Section # *Cross-Section #*

b. Floodway Elevations - indicate the difference in water surface elevations where the project floodway elevations tie into the existing floodway water surface elevations at each end of the project.

Downstream End _____ within _____ (feet) Upstream End _____ within _____ (feet)
Cross-Section # *Cross-Section #*

c. Floodway widths - indicate the difference in floodway widths where the project floodway widths tie into the existing floodway width at each end of the project.

Downstream End _____ within _____ (feet) Upstream End _____ within _____ (feet)
Cross-Section # *Cross-Section #*

2. Profile Checklist (check box if information has been provided on profile)

The following information (unless in parentheses) must be included at the same scale as the existing profiles for this project:

☐ Stream Name ☐ Community Name ☐ Corporate Limits labeled ☐ Study limits labeled

☐ Confluences labeled ☐ Channel Stationing ☐ Streambed profiled ☐ Cross Sections labeled

☐ Horizontal/Vertical Scales indicated ☐ 100-year elevs profiled*

☐ Road Crossings ☐ Labeled ☐ Low Chord Elevations ☐ Top of Road Elevations

*All recurrence intervals in the effective study must also be profiled.

Floodway Data Table

Attach a Floodway Data Table for each cross section listed in the published Floodway Data table in the FIS report.

Floodway Data Table Attached ☐ **Yes** ☒ **Not Required**

FEDERAL EMERGENCY MANAGEMENT AGENCY **RIVERINE HYDRAULIC ANALYSIS**	O.M.B No. 3067-0148 Expires April 30, 2001

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Note: Fill out one form for each flooding source studied

Community Name: Wickenburg Area, Maricopa County, AZ

Flooding Source: Monarch Wash (Wash14T7R4), Sheet No.15

Project Name/Identifier: Approximate Zone A Floodplain Delineation Studies, Wickenburg Area, Maricopa County, AZ

1. REACH TO BE REVISED

Describe the limits of the revision OR submit a copy of the FIRM with the revision area clearly highlighted.
Copy of FIRM(s) attached depicting area of the revision (highlighted, or circled)? ☒ Yes

Downstream Limit: Section 14, T7N, R4W

Upstream Limit: Section 12, T7N, R4W

2. MODELS SUBMITTED

Requirements: for areas which have detailed flooding:	**for areas which do not have detailed flooding:**
Full input and output listings along with files on diskette for each of the models listed below (items 1-4) and a summary of the source of input parameters used in the models must be provided. The summary must include a description of any changes made from model to model (e.g., Duplicate Effective model to Corrected Effective model). At a minimum, the Duplicate Effective (item 1) and the Revised or Post-Project Conditions (item 4) models must be submitted. See instructions for directions on when other models may be required.	Only the 100-year (Base) flood profile is required. A hydraulic model is not required for areas which do not have detailed flooding; however, BFEs may not be added to the revised FIRM. If a hydraulic model is developed for the area, items 3 and 4 described below must be submitted.

If hydraulic models are not developed, hydraulic analyses (including all calculations) for existing or pre-project conditions and revised or post-project conditions must be submitted.

1. Duplicate Effective Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____

Copies of the hydraulic analysis used in the effective FIS, referred to as the effective models (10-, 50-, 100-, and 500-year multi-profile runs and the floodway run) must be obtained and then reproduced on the requester's equipment to produce the Duplicate Effective model. This is required to assure that the effective models input data has been transferred correctly to the requester's equipment and to assure that the revised data will be integrated into the effective data to provide a continuous FIS model upstream and downstream of the revised reach.

2. Corrected Effective Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____

The Corrected Effective model is the model that corrects any errors that occur in the Duplicate Effective model, adds any additional cross sections to the Duplicate Effective model, or incorporates more detailed topographic information than that used in the currently effective model. The Correctly Effective model must not reflect any man-made physical changes since the date of the effective model. An error could be a technical error in the modeling procedures, or any construction in the floodplain that occurred prior to the date of the effective model but was not incorporated into the effective model.

3. Existing or Pre-Project Conditions Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____

The Duplicate Effective model or Corrective Effective model is modified to produce the Existing or Pre-Project Conditions model to reflect any modifications that have occurred within the floodplain since the date of the Effective model but prior to the construction of the project for which the revision is being requested. If no modification has occurred since the date of the effective model, then this model would be identical to the Corrected Effective model or Duplicate Effective model.

4. Revised or Post-Project Conditions Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____

The Existing or Pre-Project Conditions model (or Duplicate Effective model or Corrected Effective model, as appropriate) is revised to reflect revised or post-project conditions. This model must incorporate any physical changes to the floodplain since the effective model was produced as well as the effects of the project. When the request is for the proposed project this model must reflect proposed conditions.

5. Other – Please attach a sheet describing all other models submitted along with the file names. ☒ **Natural** ☐ **Floodway**

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

3. STARTING WATER-SURFACE ELEVATIONS

Explain how they were determined. Explanation Attached? ☐ Yes ☒ No

NOTE: If the effective study is an approximate study, the slope/area method is recommended.
For detailed analysis studies, using a known water-surface elevation is recommended.

4. RESULTS (from the model used to revise the 100-year water surface elevations)

If the results indicate any of the following, attach an explanation - to this form, or to the hydraulic model printout- as to the reasonableness of the situation.

☒ Supercritical depth ☒ Critical Depth ☐ Drawdowns ☐ Negative Floodway Surcharges

☐ Floodway Surcharges Greater Than Maximum Allowed by Community/State

☐ Water surface elevations higher than the end points of cross sections.

☐ Floodway discharge is different than the Natural 100-year (base) flood discharge.

☐ Project causes 100-year floodplain or floodway elevations to increase (state if increases are located off the requester's property)

Explanation attached with Form ☒ **Explanation provided on attached printout** ☐

If Hydraulic model used is HEC-2, has it been checked with FEMA'S CHECK-2 computer program? ☐ **Yes** ☐ **No**
(see instructions for information on how to obtain CHECK-2)

5. REVISED FIRM/FBFM AND FLOOD PROFILES

1. Profile Transition

a. 100-Year Water-Surface Elevations - indicate the difference in water surface elevations where the project 100-year elevations tie into the existing 100-year water surface elevations at each end of the project.

Downstream End _____ within _____ (feet) Upstream End _____ within _____ (feet)
Cross-Section # *Cross-Section #*

b. Floodway Elevations - indicate the difference in water surface elevations where the project floodway elevations tie into the existing floodway water surface elevations at each end of the project.

Downstream End _____ within _____ (feet) Upstream End _____ within _____ (feet)
Cross-Section # *Cross-Section #*

c. Floodway widths - indicate the difference in floodway widths where the project floodway widths tie into the existing floodway width at each end of the project.

Downstream End _____ within _____ (feet) Upstream End _____ within _____ (feet)
Cross-Section # *Cross-Section #*

2. Profile Checklist (check box if information has been provided on profile)

The following information (unless in parentheses) must be included at the same scale as the existing profiles for this project:

☐ Stream Name ☐ Community Name ☐ Corporate Limits labeled ☐ Study limits labeled

☐ Confluences labeled ☐ Channel Stationing ☐ Streambed profiled ☐ Cross Sections labeled

☐ Horizontal/Vertical Scales indicated ☐ 100-year elevs profiled*

☐ Road Crossings ☐ Labeled ☐ Low Chord Elevations ☐ Top of Road Elevations

*All recurrence intervals in the effective study must also be profiled.

Floodway Data Table

Attach a Floodway Data Table for each cross section listed in the published Floodway Data table in the FIS report.

Floodway Data Table Attached ☐ **Yes** ☒ **Not Required**

FEDERAL EMERGENCY MANAGEMENT AGENCY **RIVERINE HYDRAULIC ANALYSIS**	O.M.B No. 3067-0148 Expires April 30, 2001

PUBLIC BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 2.25 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing and reviewing the 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, S.W., Washington DC 20472; and to the Office of Management and Budget, Paperwork Reduction Project (3067-0148), Washington, DC 20503.

You are not required to respond to this collection of information unless a valid OMB Control Number is displayed in the upper right corner of this form.

Note: Fill out one form for each flooding source studied

Community Name: Wickenburg Area, Maricopa County, AZ

Flooding Source: Wash C (Wash34T7R4), Sheet No.16

Project Name/Identifier: Approximate Zone A Floodplain Delineation Studies, Wickenburg Area, Maricopa County, AZ

1. REACH TO BE REVISED

Describe the limits of the revision OR submit a copy of the FIRM with the revision area clearly highlighted.
Copy of FIRM(s) attached depicting area of the revision (highlighted, or circled)? ☒ Yes

Downstream Limit: Section 34, T7N, R4W, 1.03 miles to Hassayampa River

Upstream Limit: Section 27, T7N, R4W

2. MODELS SUBMITTED

Requirements: for areas which have detailed flooding:	**for areas which do not have detailed flooding**:
Full input and output listings along with files on diskette for each of the models listed below (items 1-4) and a summary of the source of input parameters used in the models must be provided. The summary must include a description of any changes made from model to model (e.g., Duplicate Effective model to Corrected Effective model). At a minimum, the Duplicate Effective (item 1) and the Revised or Post-Project Conditions (item 4) models must be submitted. See instructions for directions on when other models may be required.	Only the 100-year (Base) flood profile is required. A hydraulic model is not required for areas which do not have detailed flooding; however, BFEs may not be added to the revised FIRM. If a hydraulic model is developed for the area, items 3 and 4 described below must be submitted.

Hydraulic models are not developed, hydraulic analyses (including all calculations) for existing or pre-project conditions and revised or post-project conditions must be submitted.

1. Duplicate Effective Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____
Copies of the hydraulic analysis used in the effective FIS, referred to as the effective models (10-, 50-, 100-, and 500-year multi-profile runs and the floodway run) must be obtained and then reproduced on the requester's equipment to produce the Duplicate Effective model. This is required to assure that the effective models input data has been transferred correctly to the requester's equipment and to assure that the revised data will be integrated into the effective data to provide a continuous FIS model upstream and downstream of the revised reach.

2. Corrected Effective Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____
The Corrected Effective model is the model that corrects any errors that occur in the Duplicate Effective model, adds any additional cross sections to the Duplicate Effective model, or incorporates more detailed topographic information than that used in the currently effective model. The Correctly Effective model must not reflect any man-made physical changes since the date of the effective model. An error could be a technical error in the modeling procedures, or any construction in the floodplain that occurred prior to the date of the effective model but was not incorporated into the effective model.

3. Existing or Pre-Project Conditions Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____
The Duplicate Effective model or Corrective Effective model is modified to produce the Existing or Pre-Project Conditions model to reflect any modifications that have occurred within the floodplain since the date of the Effective model but prior to the construction of the project for which the revision is being requested. If no modification has occurred since the date of the effective model, then this model would be identical to the Corrected Effective model or Duplicate Effective model.

4. Revised or Post-Project Conditions Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____
The Existing or Pre-Project Conditions model (or Duplicate Effective model or Corrected Effective model, as appropriate) is revised to reflect revised or post-project conditions. This model must incorporate any physical changes to the floodplain since the effective model was produced as well as the effects of the project. When the request is for the proposed project this model must reflect proposed conditions.

5. Other – Please attach a sheet describing all other models submitted along with the file names. ☒ **Natural** ☐ **Floodway**

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

3. STARTING WATER-SURFACE ELEVATIONS

Explain how they were determined. Explanation Attached? ☐ Yes ☒ No

NOTE: If the effective study is an approximate study, the slope/area method is recommended.
For detailed analysis studies, using a known water-surface elevation is recommended.

4. RESULTS (from the model used to revise the 100-year water surface elevations)

If the results indicate any of the following, attach an explanation - to this form, or to the hydraulic model printout- as to the reasonableness of the situation.

☒ Supercritical depth ☒ Critical Depth ☐ Drawdowns ☐ Negative Floodway Surcharges

☐ Floodway Surcharges Greater Than Maximum Allowed by Community/State

☐ Water surface elevations higher than the end points of cross sections.

☐ Floodway discharge is different than the Natural 100-year (base) flood discharge.

☐ Project causes 100-year floodplain or floodway elevations to increase (state if increases are located off the requester's property)

Explanation attached with Form ☒ **Explanation provided on attached printout** ☐

If Hydraulic model used is HEC-2, has it been checked with FEMA'S CHECK-2 computer program? ☐ **Yes** ☐ **No**
(see instructions for information on how to obtain CHECK-2)

5. REVISED FIRM/FBFM AND FLOOD PROFILES

1. Profile Transition

a. 100-Year Water-Surface Elevations - indicate the difference in water surface elevations where the project 100-year elevations tie into the existing 100-year water surface elevations at each end of the project.

Downstream End _____ within _____ (feet) Upstream End _____ within _____ (feet)
Cross-Section # *Cross-Section #*

b. Floodway Elevations - indicate the difference in water surface elevations where the project floodway elevations tie into the existing floodway water surface elevations at each end of the project.

Downstream End _____ within _____ (feet) Upstream End _____ within _____ (feet)
Cross-Section # *Cross-Section #*

c. Floodway widths - indicate the difference in floodway widths where the project floodway widths tie into the existing floodway width at each end of the project.

Downstream End _____ within _____ (feet) Upstream End _____ within _____ (feet)
Cross-Section # *Cross-Section #*

2. Profile Checklist (check box if information has been provided on profile)

The following information (unless in parentheses) must be included at the same scale as the existing profiles for this project:

☐ Stream Name ☐ Community Name ☐ Corporate Limits labeled ☐ Study limits labeled

☐ Confluences labeled ☐ Channel Stationing ☐ Streambed profiled ☐ Cross Sections labeled

☐ Horizontal/Vertical Scales indicated ☐ 100-year elevs profiled*

☐ Road Crossings ☐ Labeled ☐ Low Chord Elevations ☐ Top of Road Elevations

*All recurrence intervals in the effective study must also be profiled.

Floodway Data Table

Attach a Floodway Data Table for each cross section listed in the published Floodway Data table in the FIS report.

Floodway Data Table Attached ☐ **Yes** ☒ **Not Required**

FEDERAL EMERGENCY MANAGEMENT AGENCY **RIVERINE HYDRAULIC ANALYSIS**	O.M.B No. 3067-0148 Expires April 30, 2001

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Note: Fill out one form for each flooding source studied

Community Name: Wickenburg Area, Maricopa County, AZ

Flooding Source: San Domingo Wash (Wash35T7R4), Sheet No. 17 & 18

Project Name/Identifier: Approximate Zone A Floodplain Delineation Studies, Wickenburg Area, Maricopa County, AZ

1. REACH TO BE REVISED

Describe the limits of the revision OR submit a copy of the FIRM with the revision area clearly highlighted.
Copy of FIRM(s) attached depicting area of the revision (highlighted, or circled)? ☒ Yes

Downstream Limit: Section 35, T7N, R4W

Upstream Limit: Sections 8 & 16, T7N, R3W

2. MODELS SUBMITTED

Requirements: for areas which have detailed flooding:	**for areas which do not have detailed flooding:**
Full input and output listings along with files on diskette for each of the models listed below (items 1-4) and a summary of the source of input parameters used in the models must be provided. The summary must include a description of any changes made from model to model (e.g., Duplicate Effective model to Corrected Effective model). At a minimum, the Duplicate Effective (item 1) and the Revised or Post-Project Conditions (item 4) models must be submitted. See instructions for directions on when other models may be required.	Only the 100-year (Base) flood profile is required. A hydraulic model is not required for areas which do not have detailed flooding; however, BFEs may not be added to the revised FIRM. If a hydraulic model is developed for the area, items 3 and 4 described below must be submitted.

If hydraulic models are not developed, hydraulic analyses (including all calculations) for existing or pre-project conditions and revised or post-project conditions must be submitted.

1. Duplicate Effective Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____

Copies of the hydraulic analysis used in the effective FIS, referred to as the effective models (10-, 50-, 100-, and 500-year multi-profile runs and the floodway run) must be obtained and then reproduced on the requester's equipment to produce the Duplicate Effective model. This is required to assure that the effective models input data has been transferred correctly to the requester's equipment and to assure that the revised data will be integrated into the effective data to provide a continuous FIS model upstream and downstream of the revised reach.

2. Corrected Effective Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____

The Corrected Effective model is the model that corrects any errors that occur in the Duplicate Effective model, adds any additional cross sections to the Duplicate Effective model, or incorporates more detailed topographic information than that used in the currently effective model. The Correctly Effective model must not reflect any man-made physical changes since the date of the effective model. An error could be a technical error in the modeling procedures, or any construction in the floodplain that occurred prior to the date of the effective model but was not incorporated into the effective model.

3. Existing or Pre-Project Conditions Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____

The Duplicate Effective model or Corrective Effective model is modified to produce the Existing or Pre-Project Conditions model to reflect any modifications that have occurred within the floodplain since the date of the Effective model but prior to the construction of the project for which the revision is being requested. If no modification has occurred since the date of the effective model, then this model would be identical to the Corrected Effective model or Duplicate Effective model.

4. Revised or Post-Project Conditions Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____

The Existing or Pre-Project Conditions model (or Duplicate Effective model or Corrected Effective model, as appropriate) is revised to reflect revised or post-project conditions. This model must incorporate any physical changes to the floodplain since the effective model was produced as well as the effects of the project. When the request is for the proposed project this model must reflect proposed conditions.

5. Other – Please attach a sheet describing all other models submitted along with the file names. ☒ **Natural** ☐ **Floodway**

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

3. STARTING WATER-SURFACE ELEVATIONS

Explain how they were determined. Explanation Attached? ☐ Yes ☒ No

NOTE: If the effective study is an approximate study, the slope/area method is recommended.
For detailed analysis studies, using a known water-surface elevation is recommended.

4. RESULTS (from the model used to revise the 100-year water surface elevations)

If the results indicate any of the following, attach an explanation - to this form, or to the hydraulic model printout- as to the reasonableness of the situation.

☒ Supercritical depth ☒ Critical Depth ☐ Drawdowns ☐ Negative Floodway Surcharges

☐ Floodway Surcharges Greater Than Maximum Allowed by Community/State

☐ Water surface elevations higher than the end points of cross sections.

☐ Floodway discharge is different than the Natural 100-year (base) flood discharge.

☐ Project causes 100-year floodplain or floodway elevations to increase (state if increases are located off the requester's property)

Explanation attached with Form ☒ **Explanation provided on attached printout** ☐

If Hydraulic model used is HEC-2, has it been checked with FEMA'S CHECK-2 computer program? ☐ **Yes** ☐ **No**
(see instructions for information on how to obtain CHECK-2)

5. REVISED FIRM/FBFM AND FLOOD PROFILES

1. Profile Transition

a. 100-Year Water-Surface Elevations - indicate the difference in water surface elevations where the project 100-year elevations tie into the existing 100-year water surface elevations at each end of the project.

Downstream End _____ within _____ (feet) Upstream End _____ within _____ (feet)
Cross-Section # *Cross-Section #*

b. Floodway Elevations - indicate the difference in water surface elevations where the project floodway elevations tie into the existing floodway water surface elevations at each end of the project.

Downstream End _____ within _____ (feet) Upstream End _____ within _____ (feet)
Cross-Section # *Cross-Section #*

c. Floodway widths - indicate the difference in floodway widths where the project floodway widths tie into the existing floodway width at each end of the project.

Downstream End _____ within _____ (feet) Upstream End _____ within _____ (feet)
Cross-Section # *Cross-Section #*

2. Profile Checklist (check box if information has been provided on profile)

The following information (unless in parentheses) must be included at the same scale as the existing profiles for this project:

☐ Stream Name ☐ Community Name ☐ Corporate Limits labeled ☐ Study limits labeled

☐ Confluences labeled ☐ Channel Stationing ☐ Streambed profiled ☐ Cross Sections labeled

☐ Horizontal/Vertical Scales indicated ☐ 100-year elevs profiled*

☐ Road Crossings ☐ Labeled ☐ Low Chord Elevations ☐ Top of Road Elevations

*All recurrence intervals in the effective study must also be profiled.

Floodway Data Table

Attach a Floodway Data Table for each cross section listed in the published Floodway Data table in the FIS report.

Floodway Data Table Attached ☐ **Yes** ☒ ***Not Required***

FEDERAL EMERGENCY MANAGEMENT AGENCY **RIVERINE HYDRAULIC ANALYSIS**	O.M.B No. 3067-0148 Expires April 30, 2001

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Note: Fill out one form for each flooding source studied

Community Name: Wickenburg Area, Maricopa County, AZ

Flooding Source: Ox Wash (Wash1T6R4), Sheet No. 19 & 20

Project Name/Identifier: Approximate Zone A Floodplain Delineation Studies, Wickenburg Area, Maricopa County, AZ

1. REACH TO BE REVISED

Describe the limits of the revision OR submit a copy of the FIRM with the revision area clearly highlighted.
Copy of FIRM(s) attached depicting area of the revision (highlighted, or circled)? ☒ Yes

Downstream Limit: Section 1, T6N, R4W

Upstream Limit: Section 20, T7N, R3W

2. MODELS SUBMITTED

Requirements: for areas which have detailed flooding:	**for areas which do not have detailed flooding:**
Full input and output listings along with files on diskette for each of the models listed below (items 1-4) and a summary of the source of input parameters used in the models must be provided. The summary must include a description of any changes made from model to model (e.g., Duplicate Effective model to Corrected Effective model). At a minimum, the Duplicate Effective (item 1) and the Revised or Post-Project Conditions (item 4) models must be submitted. See instructions for directions on when other models may be required.	Only the 100-year (Base) flood profile is required. A hydraulic model is not required for areas which do not have detailed flooding; however, BFEs may not be added to the revised FIRM. If a hydraulic model is developed for the area, items 3 and 4 described below must be submitted.

If hydraulic models are not developed, hydraulic analyses (including all calculations) for existing or pre-project conditions and revised or post-project conditions must be submitted.

1. Duplicate Effective Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____

Copies of the hydraulic analysis used in the effective FIS, referred to as the effective models (10-, 50-, 100-, and 500-year multi-profile runs and the floodway run) must be obtained and then reproduced on the requester's equipment to produce the Duplicate Effective model. This is required to assure that the effective models input data has been transferred correctly to the requester's equipment and to assure that the revised data will be integrated into the effective data to provide a continuous FIS model upstream and downstream of the revised reach.

2. Corrected Effective Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____

The Corrected Effective model is the model that corrects any errors that occur in the Duplicate Effective model, adds any additional cross sections to the Duplicate Effective model, or incorporates more detailed topographic information than that used in the currently effective model. The Correctly Effective model must not reflect any man-made physical changes since the date of the effective model. An error could be a technical error in the modeling procedures, or any construction in the floodplain that occurred prior to the date of the effective model but was not incorporated into the effective model.

3. Existing or Pre-Project Conditions Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____

The Duplicate Effective model or Corrective Effective model is modified to produce the Existing or Pre-Project Conditions model to reflect any modifications that have occurred within the floodplain since the date of the Effective model but prior to the construction of the project for which the revision is being requested. If no modification has occurred since the date of the effective model, then this model would be identical to the Corrected Effective model or Duplicate Effective model.

4. Revised or Post-Project Conditions Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____

The Existing or Pre-Project Conditions model (or Duplicate Effective model or Corrected Effective model, as appropriate) is revised to reflect revised or post-project conditions. This model must incorporate any physical changes to the floodplain since the effective model was produced as well as the effects of the project. When the request is for the proposed project this model must reflect proposed conditions.

5. Other – Please attach a sheet describing all other models submitted along with the file names. ☒ **Natural** ☐ **Floodway**

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

3. STARTING WATER-SURFACE ELEVATIONS

Explain how they were determined. Explanation Attached? ☐ Yes ☒ No

NOTE: If the effective study is an approximate study, the slope/area method is recommended.
For detailed analysis studies, using a known water-surface elevation is recommended.

4. RESULTS (from the model used to revise the 100-year water surface elevations)

If the results indicate any of the following, attach an explanation - to this form, or to the hydraulic model printout- as to the reasonableness of the situation.

☒ Supercritical depth ☒ Critical Depth ☐ Drawdowns ☐ Negative Floodway Surcharges

☐ Floodway Surcharges Greater Than Maximum Allowed by Community/State

☐ Water surface elevations higher than the end points of cross sections.

☐ Floodway discharge is different than the Natural 100-year (base) flood discharge.

☐ Project causes 100-year floodplain or floodway elevations to increase (state if increases are located off the requester's property)

Explanation attached with Form ☒ **Explanation provided on attached printout** ☐

If Hydraulic model used is HEC-2, has it been checked with FEMA'S CHECK-2 computer program? ☐ **Yes** ☐ **No**
(see instructions for information on how to obtain CHECK-2)

5. REVISED FIRM/FBFM AND FLOOD PROFILES

1. Profile Transition

a. 100-Year Water-Surface Elevations - indicate the difference in water surface elevations where the project 100-year elevations tie into the existing 100-year water surface elevations at each end of the project.

Downstream End _____ within _____ (feet) Upstream End _____ within _____ (feet)
Cross-Section # *Cross-Section #*

b. Floodway Elevations - indicate the difference in water surface elevations where the project floodway elevations tie into the existing floodway water surface elevations at each end of the project.

Downstream End _____ within _____ (feet) Upstream End _____ within _____ (feet)
Cross-Section # *Cross-Section #*

c. Floodway widths - indicate the difference in floodway widths where the project floodway widths tie into the existing floodway width at each end of the project.

Downstream End _____ within _____ (feet) Upstream End _____ within _____ (feet)
Cross-Section # *Cross-Section #*

2. Profile Checklist (check box if information has been provided on profile)

The following information (unless in parentheses) must be included at the same scale as the existing profiles for this project:

☐ Stream Name ☐ Community Name ☐ Corporate Limits labeled ☐ Study limits labeled

☐ Confluences labeled ☐ Channel Stationing ☐ Streambed profiled ☐ Cross Sections labeled

☐ Horizontal/Vertical Scales indicated ☐ 100-year elevs profiled*

☐ Road Crossings ☐ Labeled ☐ Low Chord Elevations ☐ Top of Road Elevations

*All recurrence intervals in the effective study must also be profiled.

Floodway Data Table

Attach a Floodway Data Table for each cross section listed in the published Floodway Data table in the FIS report.

Floodway Data Table Attached ☐ **Yes** ☒ **Not Required**

FEDERAL EMERGENCY MANAGEMENT AGENCY **RIVERINE HYDRAULIC ANALYSIS**	O.M.B No. 3067-0148 Expires April 30, 2001

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Note: Fill out one form for each flooding source studied

Community Name: Wickenburg Area, Maricopa County, AZ

Flooding Source: Tributary to Little San Domingo Wash (Wash14T6R4), Sheet No.21

Project Name/Identifier: Approximate Zone A Floodplain Delineation Studies, Wickenburg Area, Maricopa County, AZ

1. REACH TO BE REVISED

Describe the limits of the revision OR submit a copy of the FIRM with the revision area clearly highlighted.
Copy of FIRM(s) attached depicting area of the revision (highlighted, or circled)? ☒ Yes

Downstream Limit: Section 14, T6N, R4W

Upstream Limit: Section 6, T6N, R3W

2. MODELS SUBMITTED

Requirements: for areas which have detailed flooding:
Full input and output listings along with files on diskette for each of the models listed below (items 1-4) and a summary of the source of input parameters used in the models must be provided. The summary must include a description of any changes made from model to model (e.g., Duplicate Effective model to Corrected Effective model). At a minimum, the Duplicate Effective (item 1) and the Revised or Post-Project Conditions (item 4) models must be submitted. See instructions for directions on when other models may be required.

for areas which do not have detailed flooding:
Only the 100-year (Base) flood profile is required. A hydraulic model is not required for areas which do not have detailed flooding; however, BFEs may not be added to the revised FIRM. If a hydraulic model is developed for the area, items 3 and 4 described below must be submitted.

Hydraulic models are not developed, hydraulic analyses (including all calculations) for existing or pre-project conditions and revised or post-project conditions must be submitted.

1. Duplicate Effective Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____
Copies of the hydraulic analysis used in the effective FIS, referred to as the effective models (10-, 50-, 100-, and 500-year multi-profile runs and the floodway run) must be obtained and then reproduced on the requester's equipment to produce the Duplicate Effective model. This is required to assure that the effective models input data has been transferred correctly to the requester's equipment and to assure that the revised data will be integrated into the effective data to provide a continuous FIS model upstream and downstream of the revised reach.

2. Corrected Effective Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____
The Corrected Effective model is the model that corrects any errors that occur in the Duplicate Effective model, adds any additional cross sections to the Duplicate Effective model, or incorporates more detailed topographic information than that used in the currently effective model. The Correctly Effective model must not reflect any man-made physical changes since the date of the effective model. An error could be a technical error in the modeling procedures, or any construction in the floodplain that occurred prior to the date of the effective model but was not incorporated into the effective model.

3. Existing or Pre-Project Conditions Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____
The Duplicate Effective model or Corrective Effective model is modified to produce the Existing or Pre-Project Conditions model to reflect any modifications that have occurred within the floodplain since the date of the Effective model but prior to the construction of the project for which the revision is being requested. If no modification has occurred since the date of the effective model, then this model would be identical to the Corrected Effective model or Duplicate Effective model.

4. Revised or Post-Project Conditions Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____
The Existing or Pre-Project Conditions model (or Duplicate Effective model or Corrected Effective model, as appropriate) is revised to reflect revised or post-project conditions. This model must incorporate any physical changes to the floodplain since the effective model was produced as well as the effects of the project. When the request is for the proposed project this model must reflect proposed conditions.

5. Other – Please attach a sheet describing all other models submitted along with the file names. ☒ **Natural** ☐ **Floodway**

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

3. STARTING WATER-SURFACE ELEVATIONS

Explain how they were determined. Explanation Attached? ☐ Yes ☒ No

NOTE: If the effective study is an approximate study, the slope/area method is recommended.
For detailed analysis studies, using a known water-surface elevation is recommended.

4. RESULTS (from the model used to revise the 100-year water surface elevations)

If the results indicate any of the following, attach an explanation - to this form, or to the hydraulic model printout- as to the reasonableness of the situation.

☒ Supercritical depth ☒ Critical Depth ☐ Drawdowns ☐ Negative Floodway Surcharges

☐ Floodway Surcharges Greater Than Maximum Allowed by Community/State

☐ Water surface elevations higher than the end points of cross sections.

☐ Floodway discharge is different than the Natural 100-year (base) flood discharge.

☐ Project causes 100-year floodplain or floodway elevations to increase (state if increases are located off the requester's property)

Explanation attached with Form ☒ **Explanation provided on attached printout** ☐

If Hydraulic model used is HEC-2, has it been checked with FEMA'S CHECK-2 computer program? ☐ **Yes** ☐ **No**
(see instructions for information on how to obtain CHECK-2)

5. REVISED FIRM/FBFM AND FLOOD PROFILES

1. Profile Transition

a. 100-Year Water-Surface Elevations - indicate the difference in water surface elevations where the project 100-year elevations tie into the existing 100-year water surface elevations at each end of the project.

Downstream End _____ within _____ (feet) Upstream End _____ within _____ (feet)
Cross-Section # *Cross-Section #*

b. Floodway Elevations - indicate the difference in water surface elevations where the project floodway elevations tie into the existing floodway water surface elevations at each end of the project.

Downstream End _____ within _____ (feet) Upstream End _____ within _____ (feet)
Cross-Section # *Cross-Section #*

c. Floodway widths - indicate the difference in floodway widths where the project floodway widths tie into the existing floodway width at each end of the project.

Downstream End _____ within _____ (feet) Upstream End _____ within _____ (feet)
Cross-Section # *Cross-Section #*

2. Profile Checklist (check box if information has been provided on profile)

The following information (unless in parentheses) must be included at the same scale as the existing profiles for this project:

☐ Stream Name ☐ Community Name ☐ Corporate Limits labeled ☐ Study limits labeled

☐ Confluences labeled ☐ Channel Stationing ☐ Streambed profiled ☐ Cross Sections labeled

☐ Horizontal/Vertical Scales indicated ☐ 100-year elevs profiled*

☐ Road Crossings ☐ Labeled ☐ Low Chord Elevations ☐ Top of Road Elevations

*All recurrence intervals in the effective study must also be profiled.

Floodway Data Table

Attach a Floodway Data Table for each cross section listed in the published Floodway Data table in the FIS report.

Floodway Data Table Attached ☐ **Yes** ☒ **Not Required**

FEDERAL EMERGENCY MANAGEMENT AGENCY **RIVERINE HYDRAULIC ANALYSIS**	O.M.B No. 3067-0148 Expires April 30, 2001

PUBLIC BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 2.25 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing and reviewing the 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, S.W., Washington DC 20472; and to the Office of Management and Budget, Paperwork Reduction Project (3067-0148), Washington, DC 20503.

You are not required to respond to this collection of information unless a valid OMB Control Number is displayed in the upper right corner of this form.

Note: Fill out one form for each flooding source studied

Community Name: Wickenburg Area, Maricopa County, AZ

Flooding Source: Little San Domingo Wash (Wash7T6R3), Sheet No.22 & 23

Project Name/Identifier: Approximate Zone A Floodplain Delineation Studies, Wickenburg Area, Maricopa County, AZ

1. REACH TO BE REVISED

Describe the limits of the revision OR submit a copy of the FIRM with the revision area clearly highlighted.
Copy of FIRM(s) attached depicting area of the revision (highlighted, or circled)? ☒ Yes

Downstream Limit: Section 7, T6N, R3W

Upstream Limit: Section 14, T7N, R3W

2. MODELS SUBMITTED

Requirements: for areas which have detailed flooding:	**for areas which do not have detailed flooding:**
Full input and output listings along with files on diskette for each of the models listed below (items 1-4) and a summary of the source of input parameters used in the models must be provided. The summary must include a description of any changes made from model to model (e.g., Duplicate Effective model to Corrected Effective model). At a minimum, the Duplicate Effective (item 1) and the Revised or Post-Project Conditions (item 4) models must be submitted. See instructions for directions on when other models may be required.	Only the 100-year (Base) flood profile is required. A hydraulic model is not required for areas which do not have detailed flooding; however, BFEs may not be added to the revised FIRM. If a hydraulic model is developed for the area, items 3 and 4 described below must be submitted.

If hydraulic models are not developed, hydraulic analyses (including all calculations) for existing or pre-project conditions and revised or post-project conditions must be submitted.

1. Duplicate Effective Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____
Copies of the hydraulic analysis used in the effective FIS, referred to as the effective models (10-, 50-, 100-, and 500-year multi-profile runs and the floodway run) must be obtained and then reproduced on the requester's equipment to produce the Duplicate Effective model. This is required to assure that the effective models input data has been transferred correctly to the requester's equipment and to assure that the revised data will be integrated into the effective data to provide a continuous FIS model upstream and downstream of the revised reach.

2. Corrected Effective Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____
The Corrected Effective model is the model that corrects any errors that occur in the Duplicate Effective model, adds any additional cross sections to the Duplicate Effective model, or incorporates more detailed topographic information than that used in the currently effective model. The Correctly Effective model must not reflect any man-made physical changes since the date of the effective model. An error could be a technical error in the modeling procedures, or any construction in the floodplain that occurred prior to the date of the effective model but was not incorporated into the effective model.

3. Existing or Pre-Project Conditions Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____
The Duplicate Effective model or Corrective Effective model is modified to produce the Existing or Pre-Project Conditions model to reflect any modifications that have occurred within the floodplain since the date of the Effective model but prior to the construction of the project for which the revision is being requested. If no modification has occurred since the date of the effective model, then this model would be identical to the Corrected Effective model or Duplicate Effective model.

4. Revised or Post-Project Conditions Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____
The Existing or Pre-Project Conditions model (or Duplicate Effective model or Corrected Effective model, as appropriate) is revised to reflect revised or post-project conditions. This model must incorporate any physical changes to the floodplain since the effective model was produced as well as the effects of the project. When the request is for the proposed project this model must reflect proposed conditions.

5. Other – Please attach a sheet describing all other models submitted along with the file names. ☒ **Natural** ☐ **Floodway**

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

3. STARTING WATER-SURFACE ELEVATIONS

Explain how they were determined. Explanation Attached? ☐ Yes ☒ No

NOTE: If the effective study is an approximate study, the slope/area method is recommended.
For detailed analysis studies, using a known water-surface elevation is recommended.

4. RESULTS (from the model used to revise the 100-year water surface elevations)

If the results indicate any of the following, attach an explanation - to this form, or to the hydraulic model printout- as to the reasonableness of the situation.

☒ Supercritical depth ☒ Critical Depth ☐ Drawdowns ☐ Negative Floodway Surcharges

☐ Floodway Surcharges Greater Than Maximum Allowed by Community/State

☐ Water surface elevations higher than the end points of cross sections.

☐ Floodway discharge is different than the Natural 100-year (base) flood discharge.

☐ Project causes 100-year floodplain or floodway elevations to increase (state if increases are located off the requester's property)

Explanation attached with Form ☒ **Explanation provided on attached printout** ☐

If Hydraulic model used is HEC-2, has it been checked with FEMA'S CHECK-2 computer program? ☐ **Yes** ☐ **No**
(see instructions for information on how to obtain CHECK-2)

5. REVISED FIRM/FBFM AND FLOOD PROFILES

1. Profile Transition

a. 100-Year Water-Surface Elevations - indicate the difference in water surface elevations where the project 100-year elevations tie into the existing 100-year water surface elevations at each end of the project.

Downstream End _____ within _____ (feet) Upstream End _____ within _____ (feet)
Cross-Section # *Cross-Section #*

b. Floodway Elevations - indicate the difference in water surface elevations where the project floodway elevations tie into the existing floodway water surface elevations at each end of the project.

Downstream End _____ within _____ (feet) Upstream End _____ within _____ (feet)
Cross-Section # *Cross-Section #*

c. Floodway widths - indicate the difference in floodway widths where the project floodway widths tie into the existing floodway width at each end of the project.

Downstream End _____ within _____ (feet) Upstream End _____ within _____ (feet)
Cross-Section # *Cross-Section #*

2. Profile Checklist (check box if information has been provided on profile)

The following information (unless in parentheses) must be included at the same scale as the existing profiles for this project:

☐ Stream Name ☐ Community Name ☐ Corporate Limits labeled ☐ Study limits labeled

☐ Confluences labeled ☐ Channel Stationing ☐ Streambed profiled ☐ Cross Sections labeled

☐ Horizontal/Vertical Scales indicated ☐ 100-year elevs profiled*

☐ Road Crossings ☐ Labeled ☐ Low Chord Elevations ☐ Top of Road Elevations

*All recurrence intervals in the effective study must also be profiled.

Floodway Data Table

Attach a Floodway Data Table for each cross section listed in the published Floodway Data table in the FIS report.

Floodway Data Table Attached ☐ **Yes** ☒ **Not Required**

FEDERAL EMERGENCY MANAGEMENT AGENCY **RIVERINE HYDRAULIC ANALYSIS**	O.M.B No. 3067-0148 Expires April 30, 2001

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Note: Fill out one form for each flooding source studied

Community Name: Wickenburg Area, Maricopa County, AZ

Flooding Source: Tributary to Sols Wash (Wash32T8R5), Sheet No.24

Project Name/Identifier: Approximate Zone A Floodplain Delineation Studies, Wickenburg Area, Maricopa County, AZ

1. REACH TO BE REVISED

Describe the limits of the revision OR submit a copy of the FIRM with the revision area clearly highlighted.
Copy of FIRM(s) attached depicting area of the revision (highlighted, or circled)? ☒ Yes

Downstream Limit: Section 32, T8N, R5W

Upstream Limit: Section 32, T8N, R5W, North County line

2. MODELS SUBMITTED

Requirements: for areas which have detailed flooding:	**for areas which do not have detailed flooding:**
Full input and output listings along with files on diskette for each of the models listed below (items 1-4) and a summary of the source of input parameters used in the models must be provided. The summary must include a description of any changes made from model to model (e.g., Duplicate Effective model to Corrected Effective model). At a minimum, the Duplicate Effective (item 1) and the Revised or Post-Project Conditions (item 4) models must be submitted. See instructions for directions on when other models may be required.	Only the 100-year (Base) flood profile is required. A hydraulic model is not required for areas which do not have detailed flooding; however, BFEs may not be added to the revised FIRM. If a hydraulic model is developed for the area, items 3 and 4 described below must be submitted.

If hydraulic models are not developed, hydraulic analyses (including all calculations) for existing or pre-project conditions and revised or post-project conditions must be submitted.

1. Duplicate Effective Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____

Copies of the hydraulic analysis used in the effective FIS, referred to as the effective models (10-, 50-, 100-, and 500-year multi-profile runs and the floodway run) must be obtained and then reproduced on the requester's equipment to produce the Duplicate Effective model. This is required to assure that the effective models input data has been transferred correctly to the requester's equipment and to assure that the revised data will be integrated into the effective data to provide a continuous FIS model upstream and downstream of the revised reach.

2. Corrected Effective Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____

The Corrected Effective model is the model that corrects any errors that occur in the Duplicate Effective model, adds any additional cross sections to the Duplicate Effective model, or incorporates more detailed topographic information than that used in the currently effective model. The Correctly Effective model must not reflect any man-made physical changes since the date of the effective model. An error could be a technical error in the modeling procedures, or any construction in the floodplain that occurred prior to the date of the effective model but was not incorporated into the effective model.

3. Existing or Pre-Project Conditions Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____

The Duplicate Effective model or Corrective Effective model is modified to produce the Existing or Pre-Project Conditions model to reflect any modifications that have occurred within the floodplain since the date of the Effective model but prior to the construction of the project for which the revision is being requested. If no modification has occurred since the date of the effective model, then this model would be identical to the Corrected Effective model or Duplicate Effective model.

4. Revised or Post-Project Conditions Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____

The Existing or Pre-Project Conditions model (or Duplicate Effective model or Corrected Effective model, as appropriate) is revised to reflect revised or post-project conditions. This model must incorporate any physical changes to the floodplain since the effective model was produced as well as the effects of the project. When the request is for the proposed project this model must reflect proposed conditions.

5. Other – Please attach a sheet describing all other models submitted along with the file names. ☒ **Natural** ☐ **Floodway**

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

3. STARTING WATER-SURFACE ELEVATIONS

Explain how they were determined. Explanation Attached? ☐ Yes ☒ No

NOTE: If the effective study is an approximate study, the slope/area method is recommended.
For detailed analysis studies, using a known water-surface elevation is recommended.

4. RESULTS (from the model used to revise the 100-year water surface elevations)

If the results indicate any of the following, attach an explanation - to this form, or to the hydraulic model printout- as to the reasonableness of the situation.

☒ Supercritical depth ☒ Critical Depth ☐ Drawdowns ☐ Negative Floodway Surcharges

☐ Floodway Surcharges Greater Than Maximum Allowed by Community/State

☐ Water surface elevations higher than the end points of cross sections.

☐ Floodway discharge is different than the Natural 100-year (base) flood discharge.

☐ Project causes 100-year floodplain or floodway elevations to increase (state if increases are located off the requester's property)

Explanation attached with Form ☒ **Explanation provided on attached printout** ☐

If Hydraulic model used is HEC-2, has it been checked with FEMA'S CHECK-2 computer program? ☐ **Yes** ☐ **No**
(see instructions for information on how to obtain CHECK-2)

5. REVISED FIRM/FBFM AND FLOOD PROFILES

1. Profile Transition

a. 100-Year Water-Surface Elevations - indicate the difference in water surface elevations where the project 100-year elevations tie into the existing 100-year water surface elevations at each end of the project.

Downstream End _____ within _____ (feet) Upstream End _____ within _____ (feet)
Cross-Section # *Cross-Section #*

b. Floodway Elevations - indicate the difference in water surface elevations where the project floodway elevations tie into the existing floodway water surface elevations at each end of the project.

Downstream End _____ within _____ (feet) Upstream End _____ within _____ (feet)
Cross-Section # *Cross-Section #*

c. Floodway widths - indicate the difference in floodway widths where the project floodway widths tie into the existing floodway width at each end of the project.

Downstream End _____ within _____ (feet) Upstream End _____ within _____ (feet)
Cross-Section # *Cross-Section #*

2. Profile Checklist (check box if information has been provided on profile)

The following information (unless in parentheses) must be included at the same scale as the existing profiles for this project:

☐ Stream Name ☐ Community Name ☐ Corporate Limits labeled ☐ Study limits labeled

☐ Confluences labeled ☐ Channel Stationing ☐ Streambed profiled ☐ Cross Sections labeled

☐ Horizontal/Vertical Scales indicated ☐ 100-year elevs profiled*

☐ Road Crossings ☐ Labeled ☐ Low Chord Elevations ☐ Top of Road Elevations

*All recurrence intervals in the effective study must also be profiled.

Floodway Data Table

Attach a Floodway Data Table for each cross section listed in the published Floodway Data table in the FIS report.

Floodway Data Table Attached ☐ **Yes** ☒ **Not Required**

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Note: Fill out one form for each flooding source studied

Community Name: Wickenburg Area, Maricopa County, AZ

Flooding Source: Tributary to Amir Wash (Wash34T8R5), Sheet No.25

Project Name/Identifier: Approximate Zone A Floodplain Delineation Studies, Wickenburg Area, Maricopa County, AZ

1. REACH TO BE REVISED

Describe the limits of the revision OR submit a copy of the FIRM with the revision area clearly highlighted.
Copy of FIRM(s) attached depicting area of the revision (highlighted, or circled)? ☒ Yes

Downstream Limit: Section 34, T8N, R5W

Upstream Limit: Section 34, T8N, R5W, North County line

2. MODELS SUBMITTED

Requirements: for areas which have detailed flooding:	**for areas which do not have detailed flooding:**
Full input and output listings along with files on diskette for each of the models listed below (items 1-4) and a summary of the source of input parameters used in the models must be provided. The summary must include a description of any changes made from model to model (e.g., Duplicate Effective model to Corrected Effective model). At a minimum, the Duplicate Effective (item 1) and the Revised or Post-Project Conditions (item 4) models must be submitted. See instructions for directions on when other models may be required.	Only the 100-year (Base) flood profile is required. A hydraulic model is not required for areas which do not have detailed flooding; however, BFEs may not be added to the revised FIRM. If a hydraulic model is developed for the area, items 3 and 4 described below must be submitted.

Hydraulic models are not developed, hydraulic analyses (including all calculations) for existing or pre-project conditions and revised or post-project conditions must be submitted.

1. Duplicate Effective Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____
Copies of the hydraulic analysis used in the effective FIS, referred to as the effective models (10-, 50-, 100-, and 500-year multi-profile runs and the floodway run) must be obtained and then reproduced on the requester's equipment to produce the Duplicate Effective model. This is required to assure that the effective models input data has been transferred correctly to the requester's equipment and to assure that the revised data will be integrated into the effective data to provide a continuous FIS model upstream and downstream of the revised reach.

2. Corrected Effective Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____
The Corrected Effective model is the model that corrects any errors that occur in the Duplicate Effective model, adds any additional cross sections to the Duplicate Effective model, or incorporates more detailed topographic information than that used in the currently effective model. The Correctly Effective model must not reflect any man-made physical changes since the date of the effective model. An error could be a technical error in the modeling procedures, or any construction in the floodplain that occurred prior to the date of the effective model but was not incorporated into the effective model.

3. Existing or Pre-Project Conditions Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____
The Duplicate Effective model or Corrective Effective model is modified to produce the Existing or Pre-Project Conditions model to reflect any modifications that have occurred within the floodplain since the date of the Effective model but prior to the construction of the project for which the revision is being requested. If no modification has occurred since the date of the effective model, then this model would be identical to the Corrected Effective model or Duplicate Effective model.

4. Revised or Post-Project Conditions Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____
The Existing or Pre-Project Conditions model (or Duplicate Effective model or Corrected Effective model, as appropriate) is revised to reflect revised or post-project conditions. This model must incorporate any physical changes to the floodplain since the effective model was produced as well as the effects of the project. When the request is for the proposed project this model must reflect proposed conditions.

5. Other – Please attach a sheet describing all other models submitted along with the file names. ☒ **Natural** ☐ **Floodway**

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

3. STARTING WATER-SURFACE ELEVATIONS

Explain how they were determined. Explanation Attached? ☐ Yes ☒ No

NOTE: If the effective study is an approximate study, the slope/area method is recommended.
For detailed analysis studies, using a known water-surface elevation is recommended.

4. RESULTS (from the model used to revise the 100-year water surface elevations)

If the results indicate any of the following, attach an explanation - to this form, or to the hydraulic model printout- as to the reasonableness of the situation.

☒ Supercritical depth ☒ Critical Depth ☐ Drawdowns ☐ Negative Floodway Surcharges

☐ Floodway Surcharges Greater Than Maximum Allowed by Community/State

☐ Water surface elevations higher than the end points of cross sections.

☐ Floodway discharge is different than the Natural 100-year (base) flood discharge.

☐ Project causes 100-year floodplain or floodway elevations to increase (state if increases are located off the requester's property)

Explanation attached with Form ☒ **Explanation provided on attached printout** ☐

If Hydraulic model used is HEC-2, has it been checked with FEMA'S CHECK-2 computer program? ☐ **Yes** ☐ **No**
(see instructions for information on how to obtain CHECK-2)

5. REVISED FIRM/FBFM AND FLOOD PROFILES

1. Profile Transition

a. 100-Year Water-Surface Elevations - indicate the difference in water surface elevations where the project 100-year elevations tie into the existing 100-year water surface elevations at each end of the project.

Downstream End _____ within _____ (feet) Upstream End _____ within _____ (feet)
Cross-Section # *Cross-Section #*

b. Floodway Elevations - indicate the difference in water surface elevations where the project floodway elevations tie into the existing floodway water surface elevations at each end of the project.

Downstream End _____ within _____ (feet) Upstream End _____ within _____ (feet)
Cross-Section # *Cross-Section #*

c. Floodway widths - indicate the difference in floodway widths where the project floodway widths tie into the existing floodway width at each end of the project.

Downstream End _____ within _____ (feet) Upstream End _____ within _____ (feet)
Cross-Section # *Cross-Section #*

2. Profile Checklist (check box if information has been provided on profile)

The following information (unless in parentheses) must be included at the same scale as the existing profiles for this project:

☐ Stream Name ☐ Community Name ☐ Corporate Limits labeled ☐ Study limits labeled

☐ Confluences labeled ☐ Channel Stationing ☐ Streambed profiled ☐ Cross Sections labeled

☐ Horizontal/Vertical Scales indicated ☐ 100-year elevs profiled*

☐ Road Crossings ☐ Labeled ☐ Low Chord Elevations ☐ Top of Road Elevations

*All recurrence intervals in the effective study must also be profiled.

Floodway Data Table

Attach a Floodway Data Table for each cross section listed in the published Floodway Data table in the FIS report.

Floodway Data Table Attached ☐ **Yes** ☒ **Not Required**

FEDERAL EMERGENCY MANAGEMENT AGENCY **RIVERINE HYDRAULIC ANALYSIS**	O.M.B No. 3067-0148 Expires April 30, 2001

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Note: Fill out one form for each flooding source studied

Community Name: Wickenburg Area, Maricopa County, AZ

Flooding Source: Wash20T7R4, Sheet No.26

Project Name/Identifier: Approximate Zone A Floodplain Delineation Studies, Wickenburg Area, Maricopa County, AZ

1. REACH TO BE REVISED

Describe the limits of the revision OR submit a copy of the FIRM with the revision area clearly highlighted.
Copy of FIRM(s) attached depicting area of the revision (highlighted, or circled)? ☒ Yes

Downstream Limit: Section 20, T7N, R4W, west Hassayampa River

Upstream Limit: Section 30, T7N, R4W

2. MODELS SUBMITTED

Requirements: for areas which have detailed flooding:	**for areas which do not have detailed flooding:**
Full input and output listings along with files on diskette for each of the models listed below (items 1-4) and a summary of the source of input parameters used in the models must be provided. The summary must include a description of any changes made from model to model (e.g., Duplicate Effective model to Corrected Effective model). At a minimum, the Duplicate Effective (item 1) and the Revised or Post-Project Conditions (item 4) models must be submitted. See instructions for directions on when other models may be required.	Only the 100-year (Base) flood profile is required. A hydraulic model is not required for areas which do not have detailed flooding; however, BFEs may not be added to the revised FIRM. If a hydraulic model is developed for the area, items 3 and 4 described below must be submitted.

If hydraulic models are not developed, hydraulic analyses (including all calculations) for existing or pre-project conditions and revised or post-project conditions must be submitted.

1. Duplicate Effective Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____

Copies of the hydraulic analysis used in the effective FIS, referred to as the effective models (10-, 50-, 100-, and 500-year multi-profile runs and the floodway run) must be obtained and then reproduced on the requester's equipment to produce the Duplicate Effective model. This is required to assure that the effective models input data has been transferred correctly to the requester's equipment and to assure that the revised data will be integrated into the effective data to provide a continuous FIS model upstream and downstream of the revised reach.

2. Corrected Effective Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____

The Corrected Effective model is the model that corrects any errors that occur in the Duplicate Effective model, adds any additional cross sections to the Duplicate Effective model, or incorporates more detailed topographic information than that used in the currently effective model. The Correctly Effective model must not reflect any man-made physical changes since the date of the effective model. An error could be a technical error in the modeling procedures, or any construction in the floodplain that occurred prior to the date of the effective model but was not incorporated into the effective model.

3. Existing or Pre-Project Conditions Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____

The Duplicate Effective model or Corrective Effective model is modified to produce the Existing or Pre-Project Conditions model to reflect any modifications that have occurred within the floodplain since the date of the Effective model but prior to the construction of the project for which the revision is being requested. If no modification has occurred since the date of the effective model, then this model would be identical to the Corrected Effective model or Duplicate Effective model.

4. Revised or Post-Project Conditions Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____

The Existing or Pre-Project Conditions model (or Duplicate Effective model or Corrected Effective model, as appropriate) is revised to reflect revised or post-project conditions. This model must incorporate any physical changes to the floodplain since the effective model was produced as well as the effects of the project. When the request is for the proposed project this model must reflect proposed conditions.

5. Other – Please attach a sheet describing all other models submitted along with the file names. ☒ **Natural** ☐ **Floodway**

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

3. STARTING WATER-SURFACE ELEVATIONS

Explain how they were determined. Explanation Attached? ☐ Yes ☒ No

NOTE: If the effective study is an approximate study, the slope/area method is recommended.
For detailed analysis studies, using a known water-surface elevation is recommended.

4. RESULTS (from the model used to revise the 100-year water surface elevations)

If the results indicate any of the following, attach an explanation - to this form, or to the hydraulic model printout- as to the reasonableness of the situation.

☒ Supercritical depth ☒ Critical Depth ☐ Drawdowns ☐ Negative Floodway Surcharges

☐ Floodway Surcharges Greater Than Maximum Allowed by Community/State

☐ Water surface elevations higher than the end points of cross sections.

☐ Floodway discharge is different than the Natural 100-year (base) flood discharge.

☐ Project causes 100-year floodplain or floodway elevations to increase (state if increases are located off the requester's property)

Explanation attached with Form ☒ **Explanation provided on attached printout** ☐

If Hydraulic model used is HEC-2, has it been checked with FEMA'S CHECK-2 computer program? ☐ **Yes** ☐ **No**
(see instructions for information on how to obtain CHECK-2)

5. REVISED FIRM/FBFM AND FLOOD PROFILES

1. Profile Transition

a. 100-Year Water-Surface Elevations - indicate the difference in water surface elevations where the project 100-year elevations tie into the existing 100-year water surface elevations at each end of the project.

Downstream End _____ within _____ (feet) Upstream End _____ within _____ (feet)
Cross-Section # *Cross-Section #*

b. Floodway Elevations - indicate the difference in water surface elevations where the project floodway elevations tie into the existing floodway water surface elevations at each end of the project.

Downstream End _____ within _____ (feet) Upstream End _____ within _____ (feet)
Cross-Section # *Cross-Section #*

c. Floodway widths - indicate the difference in floodway widths where the project floodway widths tie into the existing floodway width at each end of the project.

Downstream End _____ within _____ (feet) Upstream End _____ within _____ (feet)
Cross-Section # *Cross-Section #*

2. Profile Checklist (check box if information has been provided on profile)

The following information (unless in parentheses) must be included at the same scale as the existing profiles for this project:

☐ Stream Name ☐ Community Name ☐ Corporate Limits labeled ☐ Study limits labeled

☐ Confluences labeled ☐ Channel Stationing ☐ Streambed profiled ☐ Cross Sections labeled

☐ Horizontal/Vertical Scales indicated ☐ 100-year elevs profiled*

☐ Road Crossings ☐ Labeled ☐ Low Chord Elevations ☐ Top of Road Elevations

*All recurrence intervals in the effective study must also be profiled.

Floodway Data Table

Attach a Floodway Data Table for each cross section listed in the published Floodway Data table in the FIS report.

Floodway Data Table Attached ☐ **Yes** ☒ **Not Required**

FEDERAL EMERGENCY MANAGEMENT AGENCY **RIVERINE HYDRAULIC ANALYSIS**	O.M.B No. 3067-0148 Expires April 30, 2001

PUBLIC BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 2.25 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing and reviewing the 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, S.W., Washington DC 20472; and to the Office of Management and Budget, Paperwork Reduction Project (3067-0148), Washington, DC 20503.

You are not required to respond to this collection of information unless a valid OMB Control Number is displayed in the upper right corner of this form.

Note: Fill out one form for each flooding source studied

Community Name: Wickenburg Area, Maricopa County, AZ

Flooding Source: Wash28T7R4, Sheet No.27

Project Name/Identifier: Approximate Zone A Floodplain Delineation Studies, Wickenburg Area, Maricopa County, AZ

1. REACH TO BE REVISED

Describe the limits of the revision OR submit a copy of the FIRM with the revision area clearly highlighted.
Copy of FIRM(s) attached depicting area of the revision (highlighted, or circled)? ☒ Yes

Downstream Limit: Section 28, T7N, R4W, west Hassayampa River

Upstream Limit: Section 36, T7N, R5W

2. MODELS SUBMITTED

Requirements: for areas which have detailed flooding:	**for areas which do not have detailed flooding:**
Full input and output listings along with files on diskette for each of the models listed below (items 1-4) and a summary of the source of input parameters used in the models must be provided. The summary must include a description of any changes made from model to model (e.g., Duplicate Effective model to Corrected Effective model). At a minimum, the Duplicate Effective (item 1) and the Revised or Post-Project Conditions (item 4) models must be submitted. See instructions for directions on when other models may be required.	Only the 100-year (Base) flood profile is required. A hydraulic model is not required for areas which do not have detailed flooding; however, BFEs may not be added to the revised FIRM. If a hydraulic model is developed for the area, items 3 and 4 described below must be submitted.

If hydraulic models are not developed, hydraulic analyses (including all calculations) for existing or pre-project conditions and revised or post-project conditions must be submitted.

1. Duplicate Effective Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____

Copies of the hydraulic analysis used in the effective FIS, referred to as the effective models (10-, 50-, 100-, and 500-year multi-profile runs and the floodway run) must be obtained and then reproduced on the requester's equipment to produce the Duplicate Effective model. This is required to assure that the effective models input data has been transferred correctly to the requester's equipment and to assure that the revised data will be integrated into the effective data to provide a continuous FIS model upstream and downstream of the revised reach.

2. Corrected Effective Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____

The Corrected Effective model is the model that corrects any errors that occur in the Duplicate Effective model, adds any additional cross sections to the Duplicate Effective model, or incorporates more detailed topographic information than that used in the currently effective model. The Correctly Effective model must not reflect any man-made physical changes since the date of the effective model. An error could be a technical error in the modeling procedures, or any construction in the floodplain that occurred prior to the date of the effective model but was not incorporated into the effective model.

3. Existing or Pre-Project Conditions Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____

The Duplicate Effective model or Corrective Effective model is modified to produce the Existing or Pre-Project Conditions model to reflect any modifications that have occurred within the floodplain since the date of the Effective model but prior to the construction of the project for which the revision is being requested. If no modification has occurred since the date of the effective model, then this model would be identical to the Corrected Effective model or Duplicate Effective model.

4. Revised or Post-Project Conditions Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____

The Existing or Pre-Project Conditions model (or Duplicate Effective model or Corrected Effective model, as appropriate) is revised to reflect revised or post-project conditions. This model must incorporate any physical changes to the floodplain since the effective model was produced as well as the effects of the project. When the request is for the proposed project this model must reflect proposed conditions.

5. Other – Please attach a sheet describing all other models submitted along with the file names. ☒ **Natural** ☐ **Floodway**

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

3. STARTING WATER-SURFACE ELEVATIONS

Explain how they were determined. Explanation Attached? ☐ Yes ☒ No

NOTE: If the effective study is an approximate study, the slope/area method is recommended.
For detailed analysis studies, using a known water-surface elevation is recommended.

4. RESULTS (from the model used to revise the 100-year water surface elevations)

If the results indicate any of the following, attach an explanation - to this form, or to the hydraulic model printout- as to the reasonableness of the situation.

☒ Supercritical depth ☒ Critical Depth ☐ Drawdowns ☐ Negative Floodway Surcharges

☐ Floodway Surcharges Greater Than Maximum Allowed by Community/State

☐ Water surface elevations higher than the end points of cross sections.

☐ Floodway discharge is different than the Natural 100-year (base) flood discharge.

☐ Project causes 100-year floodplain or floodway elevations to increase (state if increases are located off the requester's property)

Explanation attached with Form ☒ **Explanation provided on attached printout** ☐

If Hydraulic model used is HEC-2, has it been checked with FEMA'S CHECK-2 computer program? ☐ **Yes** ☐ **No**
(see instructions for information on how to obtain CHECK-2)

5. REVISED FIRM/FBFM AND FLOOD PROFILES

1. Profile Transition

a. 100-Year Water-Surface Elevations - indicate the difference in water surface elevations where the project 100-year elevations tie into the existing 100-year water surface elevations at each end of the project.

Downstream End _____ within _____ (feet) Upstream End _____ within _____ (feet)
Cross-Section # *Cross-Section #*

b. Floodway Elevations - indicate the difference in water surface elevations where the project floodway elevations tie into the existing floodway water surface elevations at each end of the project.

Downstream End _____ within _____ (feet) Upstream End _____ within _____ (feet)
Cross-Section # *Cross-Section #*

c. Floodway widths - indicate the difference in floodway widths where the project floodway widths tie into the existing floodway width at each end of the project.

Downstream End _____ within _____ (feet) Upstream End _____ within _____ (feet)
Cross-Section # *Cross-Section #*

2. Profile Checklist (check box if information has been provided on profile)

The following information (unless in parentheses) must be included at the same scale as the existing profiles for this project:

☐ Stream Name ☐ Community Name ☐ Corporate Limits labeled ☐ Study limits labeled

☐ Confluences labeled ☐ Channel Stationing ☐ Streambed profiled ☐ Cross Sections labeled

☐ Horizontal/Vertical Scales indicated ☐ 100-year elevs profiled*

☐ Road Crossings ☐ Labeled ☐ Low Chord Elevations ☐ Top of Road Elevations

*All recurrence intervals in the effective study must also be profiled.

Floodway Data Table

Attach a Floodway Data Table for each cross section listed in the published Floodway Data table in the FIS report.

Floodway Data Table Attached ☐ **Yes** ☒ **Not Required**

FEDERAL EMERGENCY MANAGEMENT AGENCY **RIVERINE HYDRAULIC ANALYSIS**	O.M.B No. 3067-0148 Expires April 30, 2001

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Note: Fill out one form for each flooding source studied

Community Name: Wickenburg Area, Maricopa County, AZ

Flooding Source: Wash3T6R4, Sheet No.28

Project Name/Identifier: Approximate Zone A Floodplain Delineation Studies, Wickenburg Area, Maricopa County, AZ

1. REACH TO BE REVISED

Describe the limits of the revision OR submit a copy of the FIRM with the revision area clearly highlighted.
Copy of FIRM(s) attached depicting area of the revision (highlighted, or circled)? ☒ Yes

Downstream Limit: Section 3, T6N, R4W, west Hassayampa River

Upstream Limit: Section 1, T6N, R5W

2. MODELS SUBMITTED

Requirements: for areas which have detailed flooding:	**for areas which do not have detailed flooding**:
Full input and output listings along with files on diskette for each of the models listed below (items 1-4) and a summary of the source of input parameters used in the models must be provided. The summary must include a description of any changes made from model to model (e.g., Duplicate Effective model to Corrected Effective model). At a minimum, the Duplicate Effective (item 1) and the Revised or Post-Project Conditions (item 4) models must be submitted. See instructions for directions on when other models may be required.	Only the 100-year (Base) flood profile is required. A hydraulic model is not required for areas which do not have detailed flooding; however, BFEs may not be added to the revised FIRM. If a hydraulic model is developed for the area, items 3 and 4 described below must be submitted.

If hydraulic models are not developed, hydraulic analyses (including all calculations) for existing or pre-project conditions and revised or post-project conditions must be submitted.

1. Duplicate Effective Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____
Copies of the hydraulic analysis used in the effective FIS, referred to as the effective models (10-, 50-, 100-, and 500-year multi-profile runs and the floodway run) must be obtained and then reproduced on the requester's equipment to produce the Duplicate Effective model. This is required to assure that the effective models input data has been transferred correctly to the requester's equipment and to assure that the revised data will be integrated into the effective data to provide a continuous FIS model upstream and downstream of the revised reach.

2. Corrected Effective Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____
The Corrected Effective model is the model that corrects any errors that occur in the Duplicate Effective model, adds any additional cross sections to the Duplicate Effective model, or incorporates more detailed topographic information than that used in the currently effective model. The Correctly Effective model must not reflect any man-made physical changes since the date of the effective model. An error could be a technical error in the modeling procedures, or any construction in the floodplain that occurred prior to the date of the effective model but was not incorporated into the effective model.

3. Existing or Pre-Project Conditions Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____
The Duplicate Effective model or Corrective Effective model is modified to produce the Existing or Pre-Project Conditions model to reflect any modifications that have occurred within the floodplain since the date of the Effective model but prior to the construction of the project for which the revision is being requested. If no modification has occurred since the date of the effective model, then this model would be identical to the Corrected Effective model or Duplicate Effective model.

4. Revised or Post-Project Conditions Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____
The Existing or Pre-Project Conditions model (or Duplicate Effective model or Corrected Effective model, as appropriate) is revised to reflect revised or post-project conditions. This model must incorporate any physical changes to the floodplain since the effective model was produced as well as the effects of the project. When the request is for the proposed project this model must reflect proposed conditions.

5. Other – Please attach a sheet describing all other models submitted along with the file names. ☒ **Natural** ☐ **Floodway**

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

3. STARTING WATER-SURFACE ELEVATIONS

Explain how they were determined. Explanation Attached? ☐ Yes ☒ No

NOTE: If the effective study is an approximate study, the slope/area method is recommended.
For detailed analysis studies, using a known water-surface elevation is recommended.

4. RESULTS (from the model used to revise the 100-year water surface elevations)

If the results indicate any of the following, attach an explanation - to this form, or to the hydraulic model printout- as to the reasonableness of the situation.

☒ Supercritical depth ☒ Critical Depth ☐ Drawdowns ☐ Negative Floodway Surcharges

☐ Floodway Surcharges Greater Than Maximum Allowed by Community/State

☐ Water surface elevations higher than the end points of cross sections.

☐ Floodway discharge is different than the Natural 100-year (base) flood discharge.

☐ Project causes 100-year floodplain or floodway elevations to increase (state if increases are located off the requester's property)

Explanation attached with Form ☒ **Explanation provided on attached printout** ☐

If Hydraulic model used is HEC-2, has it been checked with FEMA'S CHECK-2 computer program? ☐ **Yes** ☐ **No**
(see instructions for information on how to obtain CHECK-2)

5. REVISED FIRM/FBFM AND FLOOD PROFILES

1. Profile Transition

a. 100-Year Water-Surface Elevations - indicate the difference in water surface elevations where the project 100-year elevations tie into the existing 100-year water surface elevations at each end of the project.

Downstream End _____ within _____ (feet) Upstream End _____ within _____ (feet)
Cross-Section # *Cross-Section #*

b. Floodway Elevations - indicate the difference in water surface elevations where the project floodway elevations tie into the existing floodway water surface elevations at each end of the project.

Downstream End _____ within _____ (feet) Upstream End _____ within _____ (feet)
Cross-Section # *Cross-Section #*

c. Floodway widths - indicate the difference in floodway widths where the project floodway widths tie into the existing floodway width at each end of the project.

Downstream End _____ within _____ (feet) Upstream End _____ within _____ (feet)
Cross-Section # *Cross-Section #*

2. Profile Checklist (check box if information has been provided on profile)

The following information (unless in parentheses) must be included at the same scale as the existing profiles for this project:

☐ Stream Name ☐ Community Name ☐ Corporate Limits labeled ☐ Study limits labeled

☐ Confluences labeled ☐ Channel Stationing ☐ Streambed profiled ☐ Cross Sections labeled

☐ Horizontal/Vertical Scales indicated ☐ 100-year elevs profiled*

☐ Road Crossings ☐ Labeled ☐ Low Chord Elevations ☐ Top of Road Elevations

*All recurrence intervals in the effective study must also be profiled.

Floodway Data Table

Attach a Floodway Data Table for each cross section listed in the published Floodway Data table in the FIS report.

Floodway Data Table Attached ☐ **Yes** ☒ **Not Required**

FEDERAL EMERGENCY MANAGEMENT AGENCY **RIVERINE HYDRAULIC ANALYSIS**	O.M.B No. 3067-0148 Expires April 30, 2001

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Note: Fill out one form for each flooding source studied

Community Name: Wickenburg Area, Maricopa County, AZ

Flooding Source: Wash15T6R4, Sheet No.29

Project Name/Identifier: Approximate Zone A Floodplain Delineation Studies, Wickenburg Area, Maricopa County, AZ

1. REACH TO BE REVISED

Describe the limits of the revision OR submit a copy of the FIRM with the revision area clearly highlighted.
Copy of FIRM(s) attached depicting area of the revision (highlighted, or circled)? ☒ Yes

Downstream Limit: Section 15, T6N, R4W, west Hassayampa River

Upstream Limit: Section 7, T6N, R4W

2. MODELS SUBMITTED

Requirements: for areas which have detailed flooding:	**for areas which do not have detailed flooding:**
Full input and output listings along with files on diskette for each of the models listed below (items 1-4) and a summary of the source of input parameters used in the models must be provided. The summary must include a description of any changes made from model to model (e.g., Duplicate Effective model to Corrected Effective model). At a minimum, the Duplicate Effective (item 1) and the Revised or Post-Project Conditions (item 4) models must be submitted. See instructions for directions on when other models may be required.	Only the 100-year (Base) flood profile is required. A hydraulic model is not required for areas which do not have detailed flooding; however, BFEs may not be added to the revised FIRM. If a hydraulic model is developed for the area, items 3 and 4 described below must be submitted.

If hydraulic models are not developed, hydraulic analyses (including all calculations) for existing or pre-project conditions and revised or post-project conditions must be submitted.

1. Duplicate Effective Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____
Copies of the hydraulic analysis used in the effective FIS, referred to as the effective models (10-, 50-, 100-, and 500-year multi-profile runs and the floodway run) must be obtained and then reproduced on the requester's equipment to produce the Duplicate Effective model. This is required to assure that the effective models input data has been transferred correctly to the requester's equipment and to assure that the revised data will be integrated into the effective data to provide a continuous FIS model upstream and downstream of the revised reach.

2. Corrected Effective Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____
The Corrected Effective model is the model that corrects any errors that occur in the Duplicate Effective model, adds any additional cross sections to the Duplicate Effective model, or incorporates more detailed topographic information than that used in the currently effective model. The Correctly Effective model must not reflect any man-made physical changes since the date of the effective model. An error could be a technical error in the modeling procedures, or any construction in the floodplain that occurred prior to the date of the effective model but was not incorporated into the effective model.

3. Existing or Pre-Project Conditions Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____
The Duplicate Effective model or Corrective Effective model is modified to produce the Existing or Pre-Project Conditions model to reflect any modifications that have occurred within the floodplain since the date of the Effective model but prior to the construction of the project for which the revision is being requested. If no modification has occurred since the date of the effective model, then this model would be identical to the Corrected Effective model or Duplicate Effective model.

4. Revised or Post-Project Conditions Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____
The Existing or Pre-Project Conditions model (or Duplicate Effective model or Corrected Effective model, as appropriate) is revised to reflect revised or post-project conditions. This model must incorporate any physical changes to the floodplain since the effective model was produced as well as the effects of the project. When the request is for the proposed project this model must reflect proposed conditions.

5. Other – Please attach a sheet describing all other models submitted along with the file names. ☒ **Natural** ☐ **Floodway**

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

3. STARTING WATER-SURFACE ELEVATIONS

Explain how they were determined. Explanation Attached? ☐ Yes ☒ No

NOTE: *If the effective study is an approximate study, the slope/area method is recommended.*
For detailed analysis studies, using a known water-surface elevation is recommended.

4. RESULTS (from the model used to revise the 100-year water surface elevations)

If the results indicate any of the following, attach an explanation - to this form, or to the hydraulic model printout- as to the reasonableness of the situation.

☒ Supercritical depth ☒ Critical Depth ☐ Drawdowns ☐ Negative Floodway Surcharges

☐ Floodway Surcharges Greater Than Maximum Allowed by Community/State

☐ Water surface elevations higher than the end points of cross sections.

☐ Floodway discharge is different than the Natural 100-year (base) flood discharge.

☐ Project causes 100-year floodplain or floodway elevations to increase (state if increases are located off the requester's property)

Explanation attached with Form ☒ **Explanation provided on attached printout** ☐

If Hydraulic model used is HEC-2, has it been checked with FEMA'S CHECK-2 computer program? ☐ **Yes** ☐ **No**
(see instructions for information on how to obtain CHECK-2)

5. REVISED FIRM/FBFM AND FLOOD PROFILES

1. Profile Transition

a. 100-Year Water-Surface Elevations - indicate the difference in water surface elevations where the project 100-year elevations tie into the existing 100-year water surface elevations at each end of the project.

Downstream End _____ within _____ (feet) Upstream End _____ within _____ (feet)
Cross-Section # *Cross-Section #*

b. Floodway Elevations - indicate the difference in water surface elevations where the project floodway elevations tie into the existing floodway water surface elevations at each end of the project.

Downstream End _____ within _____ (feet) Upstream End _____ within _____ (feet)
Cross-Section # *Cross-Section #*

c. Floodway widths - indicate the difference in floodway widths where the project floodway widths tie into the existing floodway width at each end of the project.

Downstream End _____ within _____ (feet) Upstream End _____ within _____ (feet)
Cross-Section # *Cross-Section #*

2. Profile Checklist (check box if information has been provided on profile)

The following information (unless in parentheses) must be included at the same scale as the existing profiles for this project:

☐ Stream Name ☐ Community Name ☐ Corporate Limits labeled ☐ Study limits labeled

☐ Confluences labeled ☐ Channel Stationing ☐ Streambed profiled ☐ Cross Sections labeled

☐ Horizontal/Vertical Scales indicated ☐ 100-year elevs profiled*

☐ Road Crossings ☐ Labeled ☐ Low Chord Elevations ☐ Top of Road Elevations

*All recurrence intervals in the effective study must also be profiled.

Floodway Data Table

Attach a Floodway Data Table for each cross section listed in the published Floodway Data table in the FIS report.

Floodway Data Table Attached ☐ **Yes** ☒ **Not Required**

FORM 5

Riverine/Coastal Mapping

FEDERAL EMERGENCY MANAGEMENT AGENCY **RIVERINE / COASTAL MAPPING**	O.M.B No. 3067-0148 Expires April 30, 2001

PUBLIC BURDEN DISCLOSURE NOTICE

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You are not required to respond to this collection of information unless a valid OMB Control Number is displayed in the upper right corner of this form.

Note: Fill out one form for each flooding source studied

Community Name: Wickenburg Area, Maricopa County, AZ

Flooding Source: Tributaries to Hassayampa River

Project Name/Identifier: Approzimate Zone A Floodplain Delineation Studies, Wickenburg Area, Maricopa County, AZ

This is a ☒ Manual ☐ Digital submission. *Digital map submissions may be used to update digital FIRMs (DFIRMs). For updating DFIRMs, these submissions must be coordinated with FEMA Headquarters as far in advance as possible.*

1. MAPPING CHANGES

1. A topographic workmap must be submitted showing the following information (check N/A when not applicable):

a. Revised approximate 100-year floodplain boundaries (Zone A)	☒ Yes	☐ No	☐ N/A
b. Revised detailed 100- and 500-year floodplain boundaries.	☐ Yes	☐ No	☒ N/A
c. Revised floodway boundaries	☐ Yes	☐ No	☒ N/A
d. Location and alignment of all cross sections with stationing control indicated.	☒ Yes	☐ No	☐ N/A
e. Stream alignments, road alignments and dam alignments.	☒ Yes	☐ No	☐ N/A
f. Current community boundaries.	☒ Yes	☐ No	☐ N/A
g. Effective 100- year floodplain and floodway boundaries from FIRM/FBFM reduced or enlarged to the scale of the topographic workmap	☒ Yes	☐ No	☐ N/A
.. Tie-ins between the effective and revised 100-, 500-year and floodway boundaries	☒ Yes	☐ No	☐ N/A
i. The requester's property boundaries and community easements	☒ Yes	☐ No	☐ N/A
j. The signed certification of a registered professional engineer	☒ Yes	☐ No	☐ N/A
k. Location and description of reference marks	☒ Yes	☐ No	☐ N/A
l. Vertical datum (example: NGVD, NAVD)	☒ Yes	☐ No	☐ N/A
m. Coastal zone designations tie into adjacent areas not being revised	☐ Yes	☐ No	☒ N/A
n. Location and alignment of all coastal transects used to revise the coastal analyze	☐ Yes	☐ No	☒ N/A
o. V-zone has been delineated to extend landward to the heel of the primary frontal dune	☐ Yes	☐ No	☒ N/A

If any items are marked No or N/A please attach an explanation.

2. What is the source and date of the updated topographic information (example: orthophoto maps, July 1985; filed survey, May 1979, beach profile, June 1987 etc.)? USGS topographic 7.5-minute quadrangles

3. What is the scale and contour interval of the following workmaps?

Effective FIS Scale _____ Contour Interval _____

Revision Request Scale 1" = 2000' Contour Interval 20'

NOTE: Revised topographic information must be of equal or greater detail than effective.

4. Attach an annotated FIRM/FBFM at the scale of the effective FIRM/FBFM showing the revised 100- and 500-year floodplain and the floodway boundaries and how they tie into those shown on the effective FIRM/FBFM downstream and upstream of the revisions or adjacent to the area of revision for coastal studies. **FIRM/FBFM attached?** ☒ **Yes** ☐ **No**

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

2. EARTH FILL PLACEMENT

1. The fill is: ☐ Existing ☐ Proposed

2. Has fill been/will be placed in the regulatory floodway? ☐ Yes ☐ No
   If Yes, please attach completed Riverine Hydraulic Analysis Form (Form 4).

3. Has fill been/will be placed in floodway fringe (*area between the floodway and 100-year floodplain boundaries*)? ☐ Yes ☐ No

   If Yes, then complete A, B, C, and D below.

   a. Are fill slopes for granular materials steeper than one vertical on one-and-one-half horizontal? ☐ Yes ☐ No

      If Yes, justify steeper slopes _____

   b. Is adequate erosion protection provided for fill slopes exposed to moving flood waters? (*Slopes exposed to flows with velocities of up to 5 feet per second (fps) during the 100-year flood must, at a minimum, be protected by a cover of grass, vines, weeds, or similar vegetation; slopes exposed to flows with velocities greater than 5 fps during the 100-year flood must, at a minimum, be protected by stone or rock riprap.)*

      ☐ Yes ☐ No

      If No, describe erosion protection provided _____

   c. Has all fill placed in revised 100-year floodplain been compacted to 95 percent of the maximum density obtainable with the Standard Proctor Test Method or acceptable equivalent method? ☐ Yes ☐ No

   d. Can structures conceivably be constructed on the fill at any time in the future? ☐ Yes ☐ No

   If Yes, attach certification of fill compaction (item 3c. above) by the community's NFIP permit official, a registered professional engineer, or an accredited soils engineer in accordance with Subparagraph 65.5(a)(6) of the NFIP regulations.

   Fill certification attached ☐ **Yes** ☐ **No**

4. Has fill been/will be placed in a V zone? ☐ Yes ☐ No

   If Yes, is the fill protected from erosion by a flood control structure such as a revetment or seawall?

   ☐ Yes ☐ No

   If Yes, attach the Coastal Structures Form (Form 10).

FORM 7

Bridge/Culvert

FEDERAL EMERGENCY MANAGEMENT AGENCY **BRIDGE/CULVERT**	O.M.B. Burden No. 3067-0148 Expires April 30, 2001

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You are not required to respond to this collection of information unless a valid OMB Control Number is displayed in the upper right corner of this form.

Community Name: Wickenburg Area, Maricopa County, AZ

Flooding Source: Tributary to Little San Domingo Wash

Project Name/Identifier: Approximate Zone A Floodplain Delineation Studies, Wickenburg Area, Maricopa County, AZ

1. IDENTIFIER

1. Name of structure (roadway, railroad, etc.): Railroad west of US93

2. Location of bridge/culvert along flooding source (in terms of stream distance or cross-section identifier):

   3400 ft upstream of the confluence with Little San Domingo Wash

3. This revision reflects (check one of the following):

   ☐ 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

   New Zone A Study

4. Hydraulic model used to analyze the structure *(e.g., HEC-2 with special bridge routine, WSPRO, HY8)*

   N/A

   If different than hydraulic analysis for the flooding source, justify why the hydraulic analysis used for the flooding source could not analyze the structure(s). *(Attach justification)*

   Justification attached ☐ **Yes** ☐ **No** ☒ **N/A**

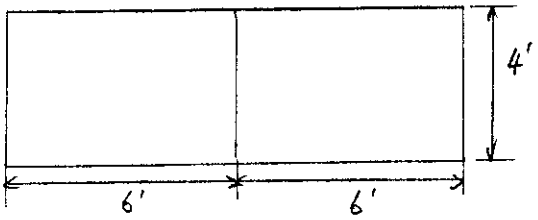
PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

2. DRAWING CHECKLIST

Attach plans of the structure(s) certified by a registered professional engineer. The plan detail and information should include the following (check the boxes if the information has been provided):

N/A

- ☐ Dimensions (height, width, span, radius, length)
- ☐ Shape (culverts only)
- ☐ Material
- ☐ Beveling or Rounding
- ☐ Wing Wall Angle
- ☐ 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
- ☐ Skew Angle
- ☐ Cross-Section Locations
- ☐ Distances Between Cross Sections
- ☐ Erosion Protection



3. SEDIMENT TRANSPORT CONSIDERATIONS

If there is any indication from historical records that sediment transport (including scour and deposition) can affect the 100-year (base flood) water-surface elevations; and/or based on the stream geomorphology, vegetative cover, development of the watershed and bank conditions, there is a potential for debris and sediment transport (including sewer and deposition) to affect the base flood elevations, then provide the following information **(Check the box if provided):**

N/A

- ☐ Estimated sediment load
- ☐ Method used to estimate sediment transport
- ☐ Method used to estimate scour and/or deposition
- ☐ Method used to revise hydraulic or hydrologic analysis (model) to account for sediment transport

FEDERAL EMERGENCY MANAGEMENT AGENCY **BRIDGE/CULVERT**	O.M.B. Burden No. 3067-0148 Expires April 30, 2001

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You are not required to respond to this collection of information unless a valid OMB Control Number is displayed in the upper right corner of this form.

Community Name: Wickenburg Area, Maricopa County, AZ

Flooding Source: Tributary to Sols Wash AH2

Project Name/Identifier: Approximate Zone A Floodplain Delineation Studies, Wickenburg Area, Maricopa County, AZ

1. IDENTIFIER

1. Name of structure (roadway, railroad, etc.): US60

2. Location of bridge/culvert along flooding source (in terms of stream distance or cross-section identifier):

   4.239 miles upstream of the confluence with Sols Wash Tributary AH2

3. This revision reflects (check one of the following):

   ☐ 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

   New Zone A study

4. Hydraulic model used to analyze the structure *(e.g., HEC-2 with special bridge routine, WSPRO, HY8)*

   N/A

   If different than hydraulic analysis for the flooding source, justify why the hydraulic analysis used for the flooding source could not analyze the structure(s). *(Attach justification)*

   Justification attached ☐ **Yes** ☐ **No** ☒ **N/A**

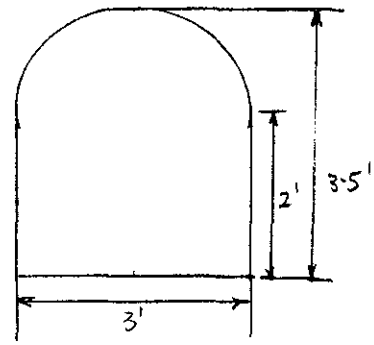
PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

2. DRAWING CHECKLIST

Attach plans of the structure(s) certified by a registered professional engineer. The plan detail and information should include the following (check the boxes if the information has been provided):

N/A

- ☐ Dimensions (height, width, span, radius, length)
- ☐ Shape (culverts only)
- ☐ Material
- ☐ Beveling or Rounding
- ☐ Wing Wall Angle
- ☐ 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
- ☐ Skew Angle
- ☐ Cross-Section Locations
- ☐ *Distances Between Cross Sections*
- ☐ Erosion Protection



3. SEDIMENT TRANSPORT CONSIDERATIONS

If there is any indication from historical records that sediment transport (including scour and deposition) can affect the 100-year (base flood) water-surface elevations; and/or based on the stream geomorphology, vegetative cover, development of the watershed and bank conditions, there is a potential for debris and sediment transport (including sewer and deposition) to affect the base flood elevations, then provide the following information **(Check the box if provided):**

N/A

- ☐ Estimated sediment load
- ☐ Method used to estimate sediment transport
- ☐ Method used to estimate scour and/or deposition
- ☐ Method used to revise hydraulic or hydrologic analysis (model) to account for sediment transport

SECTION 3

MAPPING AND SURVEY INFORMATION

MAPPING & SURVEY INFORMATION

3.1 MAPPING

The digitized USGS 7.5-Minute Quadrangle Maps were provided by the Flood Control District of Maricopa County as part of this FIS contract and used for the approximate Zone A study areas.

The following USGS Topographic 7.5-Minute Quadrangle Maps were used in the hydrologic and hydraulic analyses:

1. Congress SW
2. Flores
3. Sam Powell Peak
4. Morgan Butte
5. Outlaw Hill
6. Vulture Peak
7. Wickenburg
8. Red Picacho
9. Wildcat Well
10. Vulture Mine
11. Wickenburg SW
12. Wittman

3.2 FIELD SURVEY INFORMATION

Several field visits were conducted for estimation of Manning's "n" values for representative cross sections for this approximate Zone A study. Hand GPS and measuring tape were used to verify geometric data of typical cross sections.

SECTION 4

HYDROLOGY

HYDROLOGY

4.1 PROJECT BACKGROUND

The study area for the Approximate Zone A Floodplain Delineation Studies (Zone A Studies) is near the Town of Wickenburg in northwestern Maricopa County. Refer to Figure 1.1 for the location map and Figure 1.2 for the study area map (all Figures for Hydrology are shown in Appendix D). It is designated as Watershed "G" on the FCDMC's watershed management plan and encompasses approximately 80 square miles.

In 1994, the Wickenburg Area Drainage Master Study (Wickenburg ADMS) was completed by others under a contract with the FCDMC (Black & Veatch, 1994). Nearly all of Watershed "G" is located within the Wickenburg ADMS, and most of the watercourses are the upper reaches of ones delineated in the Wickenburg ADMS. Discussions on the hydrologic analysis conducted for the Wickenburg ADMS were found in the following documents:

Technical Documentation Report, Hydrologic Analyses Floodplain Delineation
Watershed Hydrology Report, Volume I
Watershed Hydrology Report, Volume IIa
Watershed Hydrology Report, Volume IIb

As part of the Wickenburg ADMS, peak runoff for contributing sub-basins was estimated for three hydrologically similar areas: Sols Wash, West Tributaries, and East Tributaries. The three Wickenburg ADMS study areas covered 146 square miles and encompassed the study area of the current Zone A Studies.

In addition to developing peak runoff estimations, the Wickenburg ADMS included floodplain delineations of about 110 miles of watercourses. These delineations were submitted to FEMA for approval and will be incorporated on the revised FIRM. As stated previously, most of the reaches in the Zone A Studies are extensions of previously-delineated Wickenburg ADMS watercourses. In order to provide continuity, it was necessary to set downstream peak flow values equal to the published and FEMA approved peak 100-year flow estimates. This constraint dictated that the Wickenburg ADMS be used as the basis of peak flow estimates for the Zone A studies.

4.2 METHOD DESCRIPTION

As indicated in Section 4.1, the Wickenburg ADMS was previously approved by FEMA and used for the detailed floodplain delineations. Therefore, the hydrologic data was applied in this study. The original Wickenburg ADMS was reviewed and the following information on the hydrologic methodology is summarized below. Additional background information may be found in the final reports of the Wickenburg ADMS.

Hydrologic Method:	US Army Corps of Engineers' HEC-1 Flood Hydrograph Package, August 2, 1988 Version
Base Hydrologic Model:	Wickenburg ADMS HEC-1 models for Sols Wash Area, West Tributaries Area, and East Tributaries Area
Rainfall Distribution:	SCS Type II, 24-hour
Initial Loss Rates:	Green and Ampt
Unit Hydrograph Procedure:	Phoenix Mountain S-Graph
Areal Reduction Factors:	NOAA Technical Memorandum NWS Hydro-40

As previously stated, published results of the Wickenburg ADMS form the basis for the approximate peak flow analysis for the Zone A Studies. The specific methodology used to develop peak flow rates for the Zone A Studies is described in the following steps:

Step 1: Obtain the published peak flow rate for the reach immediately downstream of a Zone A reach from the Wickenburg ADMS.

Step 2: Obtain the corresponding contributing drainage area from the Wickenburg ADMS.

Step 3: Establish the location of the thalweg of the undelineated watercourse and select cross-section locations for which estimated peak flow rates are desired.

Step 4: For each cross-section location, measure the upstream drainage area by planimeter.

Step 5: Develop a ratio of drainage area at the cross-section compared to total upstream drainage area from Step 2.

Step 6: Apply the area ratio to the total peak flow to obtain an estimate of peak flow at the particular cross-section.

4.3 PARAMETER ESTIMATION

Peak 100-year, 24-hour flows were obtained from the Wickenburg ADMS for relevant sub-basins and these published flow rates were used as the downstream flow. The flow paths for Zone A delineations were then identified, and cross-section locations were established. At each cross-section location, the contributing area was measured by planimeter and a ratio of contributing area to total area was calculated. This ratio was then applied to the total downstream flow, and the result was used for peak runoff at each successive upstream cross-section location.

It is noted that there were several washes within the study area that had not previously been delineated. Therefore, no downstream peak flow data were available. For these washes, other hydrologically similar sub-basins in the vicinity were evaluated. Sub-basins similar in size, shape, and topographical characteristics were selected as a basis for estimating peak flow. Flow per unit area was calculated for each similar delineated wash and the unit flow was applied to its undelineated counterpart.

4.3.1 Drainage Area Boundaries

The Zone A Studies includes about 80 miles of undelineated watercourses extending from Morristown on the south to the northern Maricopa County boundary. It includes the area from San Domingo Peak and the Wickenburg Mountains on the east to Black Mountain on the west. General watershed characteristics for the study area were described in the Wickenburg ADMS and are summarized from the final report as follows:

<u>Sols Wash Area</u>

Sub-basins are typically well-defined with slopes ranging from 60 to 100 ft/mile. Watercourses are also well-defined. Soils are typically sandy, gravelly, and rocky loams. In the foothills areas, soils are shallow to very shallow and well-drained. Vegetation includes desert shrubs/cacti with an

understory of grass. Except for more densely vegetated areas near washes, average ground cover was estimated to be 10-20 percent.

As shown in Figures 4.1, 4.2, and 4.7 (see Appendix D), watercourses studied in the Sols Wash Area are:

Wash 33T8R6,	Wash 22T7R6
Wash 2T7R6,	Wash 27T7R6
Wash 19T7R5,	Wash 20T7R5
Wash32T8R5,	Wash34T8R5

It should be noted that the watercourse names selected for the Zone A Studies consist of section number, township, and range of the most downstream reach of each watercourse as defined before.

West Tributaries Area

The West Tributaries Area encompasses the Vulture Mountains and foothills areas with steep slopes, relatively shallow coarse soils, rock outcroppings, and sparse desert vegetation. Sub-basin slopes exceed 50% in the upper reaches and watercourses are well-defined. Soils are primarily sandy clay loams and sandy loams. In the foothills areas, soils are shallow to very shallow and well-drained. Vegetation includes desert shrubs/cacti with an average ground cover estimated to be 15 percent.

As shown in Figures 4.3 and 4.6 (see Appendix D), watercourses studied in the West Tributaries Area are:

Wash 28T7R5,	Wash 24T7R5
Wash20T7R4,	Wash28T7R4
Wash3T6R4,	Wash15T6R4

East Tributaries Area

The East Tributaries Area encompasses the Wickenburg Mountains and foothills areas with steep slopes, shallow coarse soils, scattered rock outcroppings, and sparse desert vegetation. Sub-basin slopes exceed 50% in the mountainous areas and are about 2% along the washes. Watercourses are confined to well-defined canyons and/or ravines with some braided flow. Soils on the mountains and hillsides are primarily sandy loams and sandy clay loams with a covering of coarse gravel and small cobbles. Vegetation includes desert shrubs/cacti with an average ground cover estimated to be 15 percent.

As shown in Figures 4.4 and 4.5 (see Appendix D), watercourses studied in the East Tributaries Area are:

Wash 17T7R4,	Wash 10T7R4
Wash 22T7R4,	Wash 14T7R4
Wash 34T7R4,	Wash 35T7R4
Wash 1T6R4,	Wash 14T6R4
Wash 7T6R3	

4.3.2 Watershed Work Maps

Work maps used in the Zone A studies:

USGS 7.5-Minute Topographic Maps
Wickenburg ADMS Watershed Hydrology Maps
FCDMC Aerial Photographic Maps (circa 1996)

Nomenclature, concentration points, and routing reaches were taken directly from the Wickenburg ADMS.

4.3.3 Gage Data

The District operates a number of real-time (ALERT) precipitation and stage gages in the vicinity of the study area, including:

Gage Name	Sensor ID	Type	Year Installed
Black Hill	7035	Stage	1995
Black Mtn.	7050	Precip	1994
CasandroDam	7130	Precip	1996
Casandro Wash	7190	Precip	1994
Castle Hot Springs	5490	Precip	1981
Constellation Rd.	7100	Precip	1994
Flying E Tank	7070	Precip	1995
Flying E Wash	7080	Precip	1994
Hartman Wash	7060	Precip	1994
HassyR. @ Box Canyon	5305	Stage	1983
HassyR. @ US60	5225	Stage	1994
Martinez Creek	7010	Precip	1994
Powder House Wash	7110	Precip	1995
Sols Tank	7030	Precip	1995
Sols Wash	5275	Stage	1981
Sols Wash nr Matthie	7040	Precip	1995
Sunnycove FRS	5245	Stage	1986
Sunset FRS	5230	Precip	1989
Vulture Mine	5260	Precip	1981
Wickenburg Airport	7120	Precip	1994

It is noted that the majority of stage and precipitation gages were installed within the last five years. Several of the stage gages were installed in the early to mid 1980s; however, even this longer period of record is considered insufficient for direct calibration purposes.

The Wickenburg ADMS identified the following U.S. Geological Survey (USGS) gage data, but noted that the data were insufficient for purposes of model calibration:

Station No.	Name	Period of Record
516600	Ox Wash near Morristown	1963-1979
515800	Hartman Wash near Wickenburg	1964-1979

4.3.4 Statistical Parameters

As discussed in Section 4.2.3, no adequate data on precipitation or stage are available for any of the study watercourses. Therefore, no statistical analysis was conducted.

4.3.5 Precipitation

Published peak flows from the Wickenburg ADMS were used as the basis for estimating peak flows for the Zone A Studies. Therefore, precipitation depths used in the Wickenburg ADMS also apply. Precipitation depths for the Wickenburg ADMS were based on NOAA Atlas 2, Volume VIII, and corrected using the FCDMC's Depth-Duration Frequency Development Procedure. Point precipitation values were further adjusted in accordance with NOAA Technical Memorandum NWS Hydro-40.

4.3.6 Physical Parameters

Physical parameters had been estimated for the Wickenburg ADMS and were unchanged for the Zone A Studies. For a more detailed description and summary tables of parameter values, please refer to the Wickenburg ADMS.

Rainfall losses were computed using the Green and Ampt method. HEC-1 input parameters were calculated for the Wickenburg ADMS in accordance with the District's Hydrologic Design Procedures Manual and SCS Soil Surveys.

The Phoenix Mountain S-Graph unit hydrograph was used in the Wickenburg ADMS due to prevailing steep watercourse slopes. Sub-basin lag times were calculated using the Corps of Engineers' lag formula.

There were no flood control storage or channelization projects within the study reaches. Channel routing was performed in the Wickenburg ADMS using the normal depth method. Channel geometry and physical characteristics were estimated in the Wickenburg ADMS based on available mapping and field reconnaissance.

4.4 PROBLEMS ENCOUNTERED DURING THE STUDY

4.4.1 Special Problems and Solutions

As previously noted, peak flow estimates were developed by proportioning the published flow at the downstream end according to contributing area. However, the following washes had not been previously studied as shown in Figures 4.6 and 4.7 (see Appendix D):

Wash 32T8R5	Wash 34T8R5
Wash 20T7R4	Wash 28T7R4
Wash 3T6R4	Wash 15T6R4

As a result, no peak flow data were available as a starting point. For these washes, comparable sub-basins in the vicinity were evaluated and were used as a basis for estimating peak flow. The comparable subbasins were chosen because they have similar hydrologic characteristics to the study area. These hydrologic characteristics include subbasin size, topographic conditions, and locations. The comparable subbasins HEC-1 hydrograph names, their hydrology work map figure numbers, and other related information are listed in Table 4.1. First, flow per unit area was calculated for each similar delineated watercourse. Second, contributing drainage areas were planimetered at each watercourse cross-section. Finally, each area was multiplied by the appropriate unit flow to obtain the peak flow estimate. The results of the analysis for the downstream reach of each watercourse is presented in Table 4.1.

Table 4.1

Results of Hydrologic Analysis for Previously Undelineated Watercourses

Watercourse	Area	Q_{100}	Wickenburg ADMS Base Data (Comparable Sub-basin)			
Name	(mile²)	(cfs)	HEC-1 Name	Fig. No.	Area	Q100 (cfs)
Wash 32T8R5	1.25	1,290	SAI155	4.2	1.51	1,559
Wash 34T8R5	0.15	180	SAJ140	4.2	0.34	408
Wash 20T7R4	0.70	866	SW6	4.3	0.98	1,212
Wash 28T7R4	1.66	1,648	SR10	4.3	1.57	1,559
Wash 3T6R4	3.93	4,294	CW16	4.3	4.80	5,244
Wash 15T6R4	3.35	4,187	CW8	4.3	3.53	4,412

Several watercourses required a deviation from the prescribed procedure in order to match published peak flow rates from existing floodplain delineations. The following exceptions were noted.

Watercourse Name	Modified Procedure
Wash 35T7R4	Interim cross-section flows were set to match flow from upstream hydrographs.
Wash 1T6R4	Downstream flow was set at 3,315 cfs to match flow from the published detailed floodplain delineation study.

4.4.2 Modeling Warning and Error Messages

No warning or error messages were encountered when reviewing the HEC-1 model output for the Wickenburg ADMS.

4.5 CALIBRATION

It was reported in the Wickenburg ADMS that no model calibration was performed because there were no active gage stations in the vicinity. As previously noted, the majority of stage and precipitation gages in the study area were installed within the last five years. Several of the stage gages were installed in the early to mid 1980's; however, even this longer period of record is considered insufficient for direct calibration purposes.

4.6 FINAL RESULTS

4.6.1 Hydrologic Analysis Results

The results of the Zone A floodplain delineation for Watershed "G" are presented in Table 4.2, and the cross sections locations are shown in Figures 4.1 through 4.7 (see Appendix D).

4.6.2 Verification of Results

It was reported in the Wickenburg ADMS that the results were not verified against any other measured, comparative, or statistical data. The methodology selected for the Zone A Studies dictates that the results will be compatible with adjacent downstream reaches and with similar washes in the area.

Table 4.2 Results of Hydrologic Analysis

Wash Name/ Confluence Wash Name	File Name	Cross-Section Number	River Miles to Confluence	Drainage Area (sq. mile)	Q100 (cfs)
Tributary to	Wash33T8R6	100	1.866	3.980	2,142
Sols Wash AH2/		200	2.339	3.360	1,808
SolsWash Tributary		300	2.794	0.900	484
AH2		400	3.665	0.340	183
Sols Wash	Wash22T7R6	100	7.598	0.740	633
Tributary AH3/		200	8.053	0.500	428
Sols Wash					
Tributary AH2					
Sols Wash	Wash2T7R6	100	1.476	0.320	309
Tributary AH4/		200	2.328	0.070	68
Sols Wash					
Tributary AH2					
Tributary to	Wash27T7R6	100	0.777	0.320	302
Hartman Wash/		200	1.269	0.050	47
Hartman Wash					
Yucca Flat Wash/	Wash19T7R5	100	2.965	1.900	2,085
Flying Wash		200	3.571	0.510	560
		300	4.120	0.240	263
		400	4.499	0.050	55
Holly Wash/	Wash20T7R5	200	2.715	0.120	132
Upper Flying "E" Wash		300	3.074	0.050	55
Cemetery Wash/	Wash28T7R5	300	6.821	0.570	675
Cemetery Wash		400	7.427	0.340	403
Tributary #3		500	7.749	0.170	201
Turtleback Wash/	Wash24T7R5	200	2.283	2.530	3,226
Hassayampa River		300	2.396	2.440	3,111
		400	2.680	2.160	2,754
		500	2.908	2.030	2,588
		600	3.230	1.940	2,473
		700	3.400	1.850	2,359
		800	3.722	1.680	2,142
		900	4.233	1.430	1,832

Wash Name/ Confluence Wash Name	File Name	Cross-Section Number	River Miles to Confluence	Drainage Area (sq. mile)	Q100 (cfs)
		1000	4.725	0.520	779
		1100	5.009	0.450	674
		1200	5.350	0.160	240
		1300	5.578	0.080	120
Tributary to	Wash17T7R4	100	1.227	0.890	673
Mockingbird Wash/		200	1.700	0.680	514
Hassayampa River		300	2.155	0.610	461
		400	2.628	0.520	393
		500	2.969	0.380	287
		600	3.216	0.290	219
Tributary to	Wash10T7R4	200	3.934	0.710	652
Wash K/		300	4.408	0.240	220
Hassayampa River		400	4.881	0.140	129
Tributary to	Wash22T7R4	100	0.246	5.180	2,306
Monarch Wash/		200	0.606	5.010	2,230
Monarch Wash		300	1.004	4.940	2,199
		400	1.629	4.680	2,084
		500	2.159	4.510	2,008
		600	2.633	4.400	1,959
		700	2.973	3.880	1,727
Monarch Wash/	Wash14T7R4	1100	4.121	3.120	1,305
Hassayampa River		1200	4.367	3.080	1,289
		1300	4.841	3.020	1,264
		1400	5.447	2.750	1,151
Wash C/	Wash34T7R4	100	1.030	0.090	150
Hassayampa River		200	1.504	0.040	15
		300	1.788	0.010	4
San Domingo Wash/	Wash35T7R4	100	2.250	18.640	12,870
Hassayampa River		200	2.667	18.540	12,830
		300	3.197	18.440	12,789
		400	3.614	18.340	12,749
		500	3.841	18.210	12,696
		600	4.087	18.000	12,611
		700	4.296	14.630	10,655
		800	4.883	14.630	10,655
		2000	5.261	11.030	10,089
		2100	5.602	10.870	9,937
		2200	5.905	10.740	9,814

Wash Name/ Confluence Wash Name	File Name	Cross-Section Number	River Miles to Confluence	Drainage Area (sq. mile)	Q100 (cfs)
		2300	6.398	10.100	9,206
		2400	6.852	10.000	9,111
		2500	7.458	9.200	8,352
		2600	7.799	8.940	8,105
		2700	8.121	8.830	8,001
		2800	8.614	8.480	7,669
Tub Spring Wash/	Wash35T7R4	900	0.435	3.390	2,819
San Domingo Wash		1000	0.890	3.310	2,752
		1100	1.250	3.180	2,644
		1200	1.647	2.260	1,879
		1300	2.026	2.150	1,788
		1400	2.367	1.590	1,322
Ox Wash/	Wash1T6R4	100	2.324	3.860	3,315
Hassayampa River		200	2.740	3.740	3,315
		300	3.270	3.670	3,315
		400	3.858	3.450	3,315
		500	4.520	3.280	3,315
		600	5.051	1.520	1,595
		700	5.487	1.420	1,490
		800	6.055	0.530	557
		900	6.528	0.250	263
		1000	7.134	0.100	105
		1100	7.437	0.070	74
Tributary to Little	Wash14T6R4	100	0.000	0.860	821
San Domingo Wash/		200	0.360	0.630	601
Little San Domingo		300	0.852	0.540	516
Wash		400	1.420	0.310	296
		500	1.648	0.270	258
		600	2.367	0.100	95
Little San Domingo	Wash7T6R3	100	3.809	4.600	2,849
Wash/		200	4.756	4.380	2,713
Hassayampa River		300	5.362	4.160	2,576
		400	6.006	3.690	2,285
		500	6.309	3.460	2,143
		600	6.839	3.080	1,908
		700	7.445	2.640	1,635
		800	7.748	2.060	1,276
		900	8.847	1.690	1,047
		1000	9.226	1.430	886
		1100	9.699	1.110	687
		1200	10.002	0.900	557
		1300	10.343	0.670	415
		1400	10.760	0.380	235
		1500	11.176	0.100	62

Wash Name/ Confluence Wash Name	File Name	Cross-Section Number	River Miles to Confluence	Drainage Area (sq. mile)	Q100 (cfs)
Tributary to	Wash32T8R5	100	0.455	0.920	949
Sols Wash/		200	0.833	0.800	826
Sols Wash					
Tributary to	Wash34T8R5	100	0.235	0.150	180
Amir Wash/		200	0.417	0.060	72
Amir Wash					
Wash20T7R4/	Wash20T7R4	100	0.133	0.440	544
Hassayampa River		200	0.341	0.340	421
		300	0.511	0.260	322
		400	0.682	0.160	198
Wash28T7R4/	Wash28T7R4	100	0.114	1.480	1,469
Hassayampa River		200	0.795	1.280	1,271
		300	1.155	1.180	1,171
		400	1.780	0.950	943
		500	2.102	0.830	824
		600	2.689	0.490	486
		700	3.371	0.220	218
Wash3T6R4/	Wash3T6R4	100	0.189	3.740	4,086
Hassayampa River		200	0.720	3.620	3,955
		300	1.439	3.040	3,322
		400	1.913	2.610	2,852
		500	2.462	1.100	1,202
		600	3.011	0.850	929
		700	4.015	0.110	120
Wash15T6R4/	Wash15T6R4	100	0.152	2.670	3,337
Hassayampa River		200	0.530	2.600	3,250
		300	0.682	2.520	3,150
		400	1.174	2.320	2,900
		500	1.591	1.840	2,300
		600	2.254	1.070	1,337
		700	2.652	0.330	412
		800	3.011	0.250	312
		900	3.712	0.040	50

SECTION 5

HYDRAULICS

HYDRAULICS

5.1 METHOD DESCRIPTION

Manning's equation was applied to this approximate Zone A study to compute the normal flow depth and top width of each cross-section. Haestad Methods' *FlowMaster* software (FlowMaster PE - Version 6.0) was used for the normal depth computations.

5.2 WORK STUDY MAPS

The digitized USGS 7.5-Minute Quadrangle Maps were provided by the FCDMC as part of this FIS contract and used for the approximate Zone A study areas. Note that the topographic contour interval is 20 feet.

5.3 PARAMETER ESTIMATION

5.3.1 Roughness Coefficients

Manning's n value estimations for all cross-sections were documented under separate cover - Manning's Roughness Coefficient (n-Value) Determination Report as prepared by Wood/Patel in May 2000.

Note that due to the 20-foot contour interval the low flow channel cannot be defined by the cross sections used in the hydraulic computations, therefore, the cross section bottom was chosen to represent the main conveyance corridor. This includes the low flow channel and the main conveyance area below the overbanks. The main channel n value represents this area.

5.3.2 Expansion and Contraction Coefficients

Not applicable for the Zone A approximate studies.

5.4 CROSS-SECTION DESCRIPTION

All cross-sections are stationed from left to right looking downstream with the starting station set at 1000. Typically, cross-section numbering starts with 100 at the downstream limit of the washes and increases by intervals of 100 as the study progresses upstream. All cross-sections were first cut by using BOSS RMS (BOSS International), and then exported to HEC-RAS. Each cross-section was selected from the topographic maps and evaluated by using site visit information to reflect typical sections. The bottom width and elevation were adjusted by linear interpolation between contour lines by using HEC-RAS Graphical Edit capability. Finally, the cross-section data were input to FlowMaster by hand. The corresponding river mile for each cross-section is documented in Section 7. The profile slopes (average wash bed slopes) were estimated from the digitized USGS 7.5-Minute Quadrangle Maps. All input parameters for the hydraulic calculations are listed in Table 5.1.

5.5 MODELING CONSIDERATIONS

5.5.1 Hydraulic Jump and Drop Analysis

No hydraulic jumps or drops were analyzed in this approximate Zone A study.

5.5.2 Bridges and Culverts

No bridges or culverts were analyzed in this approximate Zone A study. However, two washes upstream of the railroad and highway were delineated to show a ponding situation behind the embankment since the pipes capacity cannot carry the 100-year 24-hour storm flow.

5.5.3 Levees and Dikes

No levees or dikes were analyzed in this approximate Zone A study.

5.5.4 Islands and Flow Splits

No islands or flow splits were analyzed in this approximate Zone A study.

5.5.5 Ineffective Flow Areas

Ineffective flow areas were adjusted in the process of cross-section geometry modifications.

5.5.6 Supercritical Flow

For some of the cross-sections where supercritical flow occurs, the critical flow water surface elevations were delineated.

5.6 FLOODWAY MODELING

No floodway modeling is required for approximate Zone A studies.

5.7 PROBLEMS ENCOUNTERED DURING THE STUDY

5.7.1 Special Problems and Solutions

The normal depth computation tool of BOSS RMS was first used to compute the water surface elevations; however, an error with the software was found. The software developer was contacted and a revised version was obtained after several weeks delay. However, the modeling results still have significant discrepancies compared to other commercial software. Therefore, it was finally decided that FlowMaster was to be used for this project with FCDMC Project Manager's agreement.

Another issue was how the tributary Zone A floodplain delineations are to tie-in with the existing detailed riverine floodplain with floodway (main stem). After FCDMC Project Manager communicated with FEMA staff it was decided that the Zone A tributary floodplain delineations are to be extended to the floodway district of the major river.

5.7.2 Modeling Warnings and Messages

No modeling warnings or messages were encountered from FlowMaster computation output files.

5.8 CALIBRATION

No model calibration was attempted.

5.9 FINAL RESULTS

5.9.1 Hydraulic Analysis Results

The hydraulic modeling output results are shown in Appendix E. The floodplain delineations are shown on the work maps (see Exhibit B). Note that the sheet numbers and the hydraulic calculations follow the order set forth in the hydrologic analysis.

5.9.2 Verification of Results

The floodplain delineations near the previous detailed study reaches are compatible.

Table 5.1 Input Parameters for Hydraulic Analysis

Wash Name/ Confluence Wash Name	File Name	Cross-Section Number	River Miles to Confluence	Q100 (cfs)	Slope (ft/ft)	"n" value		
						Main Wash	Left Bank	Right Bank
Tributary to	Wash33T8R6	100	1.866	2,142	0.0068	0.05	0.045	0.045
Sols Wash AH2/		200	2.339	1,808	0.0077	0.05	0.045	0.045
SolsWash Tributary		300	2.794	484	0.0100	0.045	0.045	0.045
AH2		400	3.665	183	0.0100	0.05	0.045	0.045
Sols Wash	Wash22T7R6	100	7.598	633	0.0770	0.05	0.055	0.055
Tributary AH3/		200	8.053	428	0.0120	0.05	0.055	0.055
Sols Wash								
Tributary AH2								
Sols Wash	Wash2T7R6	100	1.476	309	0.0420	0.05	0.055	0.055
Tributary AH4/		200	2.328	68	0.1200	0.05	0.055	0.055
Sols Wash								
Tributary AH2								
Tributary to	Wash27T7R6	100	0.777	302	0.0130	0.05	0.055	0.055
Hartman Wash/		200	1.269	47	0.0094	0.05	0.055	0.055
Hartman Wash								
Yucca Flat Wash/	Wash19T7R5	100	2.965	2,085	0.0190	0.05	0.06	0.06
Flying Wash		200	3.571	560	0.0140	0.05	0.06	0.06
		300	4.120	263	0.0250	0.05	0.06	0.06
		400	4.499	55	0.0460	0.05	0.06	0.06
Holly Wash/	Wash20T7R5	200	2.715	132	0.0280	0.05	0.055	0.055

Wash Name/ Confluence Wash Name	File Name	Cross-Section Number	River Miles to Confluence	Q100 (cfs)	Slope (ft/ft)	"n" value		
						Main Wash	Left Bank	Right Bank
Upper Flying "E" Wash		300	3.074	55	0.0160	0.05	0.055	0.055
Cemetery Wash/	Wash28T7R5	300	6.821	675	0.0210	0.055	0.065	0.065
Cemetery Wash		400	7.427	403	0.0240	0.05	0.06	0.06
Tributary #3		500	7.749	201	0.0280	0.05	0.06	0.06
Turtleback Wash/	Wash24T7R5	200	2.283	3,226	0.0200	0.06	0.065	0.065
Hassayampa River		300	2.396	3,111	0.0190	0.06	0.065	0.065
		400	2.680	2,754	0.0240	0.06	0.065	0.065
		500	2.908	2,588	0.0220	0.06	0.065	0.065
		600	3.230	2,473	0.0210	0.06	0.065	0.065
		700	3.400	2,359	0.0160	0.06	0.065	0.065
		800	3.722	2,142	0.0093	0.06	0.065	0.065
		900	4.233	1,832	0.0100	0.06	0.07	0.07
		1000	4.725	779	0.0230	0.06	0.07	0.07
		1100	5.009	674	0.0240	0.065	0.075	0.075
		1200	5.350	240	0.0260	0.065	0.075	0.075
		1300	5.578	120	0.0300	0.065	0.075	0.075
Tributary to	Wash17T7R4	100	1.227	673	0.0320	0.05	0.055	0.055
Mockingbird Wash/		200	1.700	514	0.0280	0.05	0.055	0.055
Hassayampa River		300	2.155	461	0.0360	0.05	0.055	0.055
		400	2.628	393	0.0190	0.05	0.055	0.055
		500	2.969	287	0.0300	0.05	0.055	0.055
		600	3.216	219	0.0420	0.05	0.055	0.055
Tributary to	Wash10T7R4	200	3.934	652	0.0500	0.05	0.055	0.055
Wash K/		300	4.408	220	0.0320	0.05	0.055	0.055
Hassayampa River		400	4.881	129	0.0330	0.05	0.055	0.055

Wash Name/ Confluence Wash Name	File Name	Cross-Section Number	River Miles to Confluence	Q100 (cfs)	Slope (ft/ft)	"n" value		
						Main Wash	Left Bank	Right Bank
Tributary to	Wash22T7R4	100	0.246	2,306	0.0490	0.05	0.06	0.06
Monarch Wash/		200	0.606	2,230	0.0290	0.05	0.06	0.06
Monarch Wash		300	1.004	2,199	0.0240	0.05	0.06	0.06
		400	1.629	2,084	0.0330	0.05	0.06	0.06
		500	2.159	2,008	0.0310	0.05	0.06	0.06
		600	2.633	1,959	0.0250	0.05	0.06	0.06
		700	2.973	1,727	0.0330	0.05	0.06	0.06
Monarch Wash/	Wash14T7R4	1100	4.121	1,305	0.0280	0.05	0.06	0.06
Hassayampa River		1200	4.367	1,289	0.0310	0.05	0.06	0.06
		1300	4.841	1,264	0.0250	0.05	0.06	0.06
		1400	5.447	1,151	0.0710	0.05	0.06	0.06
Wash C/	Wash34T7R4	100	1.030	150	0.0230	0.05	0.06	0.06
Hassayampa River		200	1.504	15	0.0220	0.05	0.06	0.06
		300	1.788	4	0.0470	0.05	0.06	0.06
San Domingo Wash/	Wash35T7R4	100	2.250	12,870	0.0140	0.05	0.06	0.06
Hassayampa River		200	2.667	12,830	0.0370	0.05	0.06	0.06
		300	3.197	12,789	0.0240	0.05	0.06	0.06
		400	3.614	12,749	0.0250	0.05	0.06	0.06
		500	3.841	12,696	0.0290	0.05	0.06	0.06
		600	4.087	12,611	0.0470	0.05	0.06	0.06
		700	4.296	10,655	0.0340	0.05	0.065	0.065
		800	4.883	10,655	0.0480	0.045	0.065	0.065
Tub Spring Wash/		900	0.435	2,819	0.0210	0.05	0.06	0.06
San Domingo Wash		1000	0.890	2,752	0.0390	0.05	0.06	0.06
		1100	1.250	2,644	0.0520	0.05	0.06	0.06
		1200	1.647	1,879	0.0220	0.05	0.06	0.06
		1300	2.026	1,788	0.0590	0.05	0.06	0.06
		1400	2.367	1,322	0.0310	0.05	0.06	0.06
San Domingo Wash/		2000	5.261	10,089	0.0260	0.05	0.06	0.06

Wash Name/ Confluence Wash Name	File Name	Cross-Section Number	River Miles to Confluence	Q100 (cfs)	Slope (ft/ft)	"n" value		
						Main Wash	Left Bank	Right Bank
Hassayampa River		2100	5.602	9,937	0.0260	0.045	0.055	0.055
		2200	5.905	9,814	0.0260	0.045	0.055	0.055
		2300	6.398	9,206	0.0310	0.045	0.055	0.055
		2400	6.852	9,111	0.0300	0.045	0.055	0.055
		2500	7.458	8,352	0.0290	0.045	0.055	0.055
		2600	7.799	8,105	0.0250	0.045	0.055	0.055
		2700	8.121	8,001	0.0260	0.045	0.055	0.055
		2800	8.614	7,669	0.0240	0.045	0.055	0.055
Ox Wash/	Wash1T6R4	100	2.324	3,315	0.0170	0.05	0.06	0.06
Hassayampa River		200	2.740	3,315	0.0240	0.05	0.06	0.06
		300	3.270	3,315	0.0210	0.055	0.06	0.06
		400	3.858	3,315	0.0120	0.055	0.065	0.065
		500	4.520	3,315	0.0210	0.055	0.065	0.065
		600	5.051	1,595	0.0150	0.055	0.065	0.065
		700	5.487	1,490	0.0170	0.05	0.06	0.06
		800	6.055	557	0.0240	0.05	0.06	0.06
		900	6.528	263	0.0260	0.05	0.06	0.06
		1000	7.134	105	0.0180	0.045	0.055	0.055
		1100	7.437	74	0.0370	0.045	0.055	0.055
Tributary to Little	Wash14T6R4	100	0.000	821	0.0130	0.05	0.07	0.07
San Domingo Wash/		200	0.360	601	0.0190	0.05	0.07	0.07
Little San Domingo		300	0.852	516	0.0200	0.05	0.07	0.07
Wash		400	1.420	296	0.0150	0.055	0.07	0.07
		500	1.648	258	0.0140	0.06	0.065	0.065
		600	2.367	95	0.0230	0.065	0.06	0.06
Little San Domingo	Wash7T6R3	100	3.809	2,849	0.0140	0.045	0.055	0.055
Wash/		200	4.756	2,713	0.0120	0.045	0.055	0.055
Hassayampa River		300	5.362	2,576	0.0180	0.045	0.055	0.055
		400	6.006	2,285	0.0140	0.045	0.055	0.055

Wash Name/ Confluence Wash Name	File Name	Cross-Section Number	River Miles to Confluence	Q100 (cfs)	Slope (ft/ft)	"n" value		
						Main Wash	Left Bank	Right Bank
		500	6.309	2,143	0.0200	0.045	0.055	0.055
		600	6.839	1,908	0.0240	0.045	0.055	0.055
		700	7.445	1,635	0.0150	0.045	0.055	0.055
		800	7.748	1,276	0.0120	0.045	0.055	0.055
		900	8.847	1,047	0.0280	0.045	0.055	0.055
		1000	9.226	886	0.0350	0.05	0.06	0.06
		1100	9.699	687	0.0400	0.055	0.065	0.065
		1200	10.002	557	0.0360	0.055	0.065	0.065
		1300	10.343	415	0.0490	0.05	0.06	0.06
		1400	10.760	235	0.0600	0.05	0.06	0.06
		1500	11.176	62	0.0580	0.05	0.06	0.06
Tributary to	Wash32T8R5	100	0.455	949	0.0120	0.045	0.055	0.055
Sols Wash/		200	0.833	826	0.0210	0.045	0.055	0.055
Sols Wash								
Tributary to	Wash34T8R5	200	0.417	72	0.0270	0.055	0.065	0.065
Amir Wash/								
Amir Wash								
Wash20T7R4/	Wash20T7R4	100	0.133	544	0.0820	0.055	0.06	0.06
Hassayampa River		200	0.341	421	0.0360	0.055	0.06	0.06
		300	0.511	322	0.0330	0.055	0.06	0.06
		400	0.682	198	0.0340	0.055	0.06	0.06
Wash28T7R4/	Wash28T7R4	100	0.114	1,469	0.0780	0.09	0.12	0.12
Hassayampa River		200	0.795	1,271	0.0210	0.07	0.1	0.1
		300	1.155	1,171	0.0240	0.06	0.08	0.08
		400	1.780	943	0.0170	0.055	0.065	0.065
		500	2.102	824	0.0180	0.055	0.065	0.065
		600	2.689	486	0.0320	0.055	0.065	0.065

Wash Name/ Confluence Wash Name	File Name	Cross-Section Number	River Miles to Confluence	Q100 (cfs)	Slope (ft/ft)	"n" value		
						Main Wash	Left Bank	Right Bank
		700	3.371	218	0.0460	0.055	0.065	0.065
Wash3T6R4/	Wash3T6R4	100	0.189	4,086	0.0500	0.045	0.055	0.055
Hassayampa River		200	0.720	3,955	0.0160	0.045	0.055	0.055
		300	1.439	3,322	0.0270	0.045	0.055	0.055
		400	1.913	2,852	0.0250	0.045	0.055	0.055
		500	2.462	1,202	0.0250	0.045	0.055	0.055
		600	3.011	929	0.0160	0.045	0.055	0.055
		700	4.015	120	0.0600	0.045	0.055	0.055
Wash15T6R4/	Wash15T6R4	100	0.152	3,337	0.0200	0.05	0.06	0.06
Hassayampa River		200	0.530	3,250	0.0320	0.05	0.06	0.06
		300	0.682	3,150	0.0240	0.05	0.06	0.06
		400	1.174	2,900	0.0310	0.05	0.06	0.06
		500	1.591	2,300	0.0280	0.05	0.06	0.06
		600	2.254	1,337	0.0220	0.05	0.06	0.06
		700	2.652	412	0.0160	0.05	0.065	0.065
		800	3.011	312	0.0300	0.05	0.065	0.065
		900	3.712	50	0.0350	0.05	0.065	0.065

SECTION 6

EROSION AND SEDIMENT TRANSPORT

EROSION AND SEDIMENT TRANSPORT

The erosion and sediment transport characteristics of this study area were not analyzed for this approximate Zone A study.

SECTION 7

KEY TO CROSS-SECTION LABELING

KEY TO CROSS-SECTION LABELING

All cross-sections are stationed from left to right looking downstream with the left end point starting at 1000. Typically, cross-section numbering starts with 100 as the downstream limit of the washes and increases by intervals of 100 as the study progresses upstream. These cross-section numbers are names of the cross-section and do not represent any distances. All cross-sections were first cut by using BOSS RMS (BOSS International), and then exported to HEC-RAS. The cross-section numbers and corresponding river miles to the confluences for all washes are listed in the following tables.

FLOOD INSURANCE STUDY

KEY TO CROSS-SECTION (XS) LABELING

PREPARED BY:
SC: Wood, Patel & Associates, Inc.
TEC:

DATE PREPARED:
SC: 3-15-2000
TEC:

COMMUNITY NAME Wickenburg Area
STATE Arizona
FEMA CID NO.

STREAM NAME Tributary of Sols Wash AH2
RUN DATE
FILE NAME Wash33T8R6

Field Survey Section No.	XS Letter Draft FIS	River Mile Stationing	Profile Station	XS Letter Final FIS
	100	1.866		
	200	2.339		
	300	2.794		
	400	3.665		

FLOOD INSURANCE STUDY

KEY TO CROSS-SECTION (XS) LABELING

PREPARED BY:
SC: Wood, Patel & Associates, Inc.
TEC:

DATE PREPARED:
SC: 3-15-2000
TEC:

COMMUNITY NAME Wickenburg Area
STATE Arizona
FEMA CID NO.

STREAM NAME Sols Wash Tributary AH3
RUN DATE
FILE NAME Wash22T7R6

Field Survey Section No.	XS Letter Draft FIS	River Mile Stationing	Profile Station	XS Letter Final FIS
	100	7.598		
	200	8.053		

FLOOD INSURANCE STUDY

KEY TO CROSS-SECTION (XS) LABELING

PREPARED BY:
SC: Wood, Patel & Associates, Inc.
TEC:

DATE PREPARED:
SC: 3-15-2000
TEC:

COMMUNITY NAME Wickenburg Area
STATE Arizona
FEMA CID NO.

STREAM NAME Sols Wash Tributary AH4
RUN DATE
FILE NAME Wash2T7R6

Field Survey Section No.	XS Letter Draft FIS	River Mile Stationing	Profile Station	XS Letter Final FIS
	100	1.476		
	200	2.328		

FLOOD INSURANCE STUDY

KEY TO CROSS-SECTION (XS) LABELING

PREPARED BY:
SC: Wood, Patel & Associates, Inc.
TEC:

DATE PREPARED:
SC: 3-15-2000
TEC:

COMMUNITY NAME Wickenburg Area
STATE Arizona
FEMA CID NO.

STREAM NAME Tributary of Hartman Wash
RUN DATE
FILE NAME Wash27T7R6

Field Survey Section No.	XS Letter Draft FIS	River Mile Stationing	Profile Station	XS Letter Final FIS
	100	0.777		
	200	1.269		

FLOOD INSURANCE STUDY

KEY TO CROSS-SECTION (XS) LABELING

PREPARED BY:
SC: Wood, Patel & Associates, Inc.
TEC:

DATE PREPARED:
SC: 3-15-2000
TEC:

COMMUNITY NAME Wickenburg Area
STATE Arizona
FEMA CID NO.

STREAM NAME Yucca Flat Wash
RUN DATE
FILE NAME Wash19T7R5

Field Survey Section No.	XS Letter Draft FIS	River Mile Stationing	Profile Station	XS Letter Final FIS
	100	2.965		
	200	3.571		
	300	4.120		
	400	4.499		

FLOOD INSURANCE STUDY

KEY TO CROSS-SECTION (XS) LABELING

PREPARED BY:
SC: Wood, Patel & Associates, Inc.
TEC:

DATE PREPARED:
SC: 3-15-2000
TEC:

COMMUNITY NAME Wickenburg Area
STATE Arizona
FEMA CID NO.

STREAM NAME Holly Wash
RUN DATE
FILE NAME Wash20T7R5

Field Survey Section No.	XS Letter Draft FIS	River Mile Stationing	Profile Station	XS Letter Final FIS
	200	2.715		
	300	3.074		

FLOOD INSURANCE STUDY

KEY TO CROSS-SECTION (XS) LABELING

PREPARED BY:
SC: Wood, Patel & Associates, Inc.
TEC:

DATE PREPARED:
SC: 3-15-2000
TEC:

COMMUNITY NAME Wickenburg Area
STATE Arizona
FEMA CID NO.

STREAM NAME Cemetery Wash
RUN DATE
FILE NAME Wash28T7R5

Field Survey Section No.	XS Letter Draft FIS	River Mile Stationing	Profile Station	XS Letter Final FIS
	300	6.821		
	400	7.427		
	500	7.749		

FLOOD INSURANCE STUDY

KEY TO CROSS-SECTION (XS) LABELING

PREPARED BY:
SC: Wood, Patel & Associates, Inc.
TEC:

DATE PREPARED:
SC: 3-15-2000
TEC:

COMMUNITY NAME Wickenburg Area
STATE Arizona
FEMA CID NO.

STREAM NAME Turtleback Wash
RUN DATE
FILE NAME Wash24T7R5

Field Survey Section No.	XS Letter Draft FIS	River Mile Stationing	Profile Station	XS Letter Final FIS
	200	2.283		
	300	2.396		
	400	2.680		
	500	2.908		
	600	3.230		
	700	3.400		
	800	3.722		
	900	4.233		
	1000	4.725		
	1100	5.009		
	1200	5.350		
	1300	5.578		

FLOOD INSURANCE STUDY

KEY TO CROSS-SECTION (XS) LABELING

PREPARED BY:
SC: Wood, Patel & Associates, Inc.
TEC:

DATE PREPARED:
SC: 3-15-2000
TEC:

COMMUNITY NAME Wickenburg Area
STATE Arizona
FEMA CID NO.

STREAM NAME Tributary of Mockingbird Wash
FILE NAME Wash17T7R4

Field Survey Section No.	XS Letter Draft FIS	River Mile Stationing	Profile Station	XS Letter Final FIS
	100	1.227		
	200	1.700		
	300	2.155		
	400	2.628		
	500	2.969		
	600	3.216		

FLOOD INSURANCE STUDY

KEY TO CROSS-SECTION (XS) LABELING

PREPARED BY:
SC: Wood, Patel & Associates, Inc.
TEC:

DATE PREPARED:
SC: 3-15-2000
TEC:

COMMUNITY NAME Wickenburg Area
STATE Arizona
FEMA CID NO.

STREAM NAME Tributary of Wash K
RUN DATE
FILE NAME Wash10T7R4

Field Survey Section No.	XS Letter Draft FIS	River Mile Stationing	Profile Station	XS Letter Final FIS
	200	3.934		
	300	4.408		
	400	4.881		

FLOOD INSURANCE STUDY

KEY TO CROSS-SECTION (XS) LABELING

PREPARED BY:
SC: Wood, Patel & Associates, Inc.
TEC:

DATE PREPARED:
SC: 3-15-2000
TEC:

COMMUNITY NAME Wickenburg Area
STATE Arizona
FEMA CID NO.

STREAM NAME Tributary of Monarch Wash
RUN DATE
FILE NAME Wash22T7R4

Field Survey Section No.	XS Letter Draft FIS	River Mile Stationing	Profile Station	XS Letter Final FIS
	100	0.246		
	200	0.606		
	300	1.004		
	400	1.629		
	500	2.159		
	600	2.633		
	700	2.973		

FLOOD INSURANCE STUDY

KEY TO CROSS-SECTION (XS) LABELING

PREPARED BY:
SC: Wood, Patel & Associates, Inc.
TEC:

DATE PREPARED:
SC: 3-15-2000
TEC:

COMMUNITY NAME Wickenburg Area
STATE Arizona
FEMA CID NO.

STREAM NAME Monarch Wash
RUN DATE
FILE NAME Wash14T7R4

Field Survey Section No.	XS Letter Draft FIS	River Mile Stationing	Profile Station	XS Letter Final FIS
	1100	4.121		
	1200	4.367		
	1300	4.841		
	1400	5.447		

FLOOD INSURANCE STUDY

KEY TO CROSS-SECTION (XS) LABELING

PREPARED BY:
SC: Wood, Patel & Associates, Inc.
TEC:

DATE PREPARED:
SC: 3-15-2000
TEC:

COMMUNITY NAME Wickenburg Area
STATE Arizona
FEMA CID NO.

STREAM NAME Wash C
RUN DATE
FILE NAME Wash34T7R4

Field Survey Section No.	XS Letter Draft FIS	River Mile Stationing	Profile Station	XS Letter Final FIS
	100	1.030		
	200	1.504		
	300	1.788		

FLOOD INSURANCE STUDY

KEY TO CROSS-SECTION (XS) LABELING

PREPARED BY:
SC: Wood, Patel & Associates, Inc.
TEC:

DATE PREPARED:
SC: 3-15-2000
TEC:

COMMUNITY NAME Wickenburg Area
STATE Arizona
FEMA CID NO.

STREAM NAME SanDomingo Wash
RUN DATE
FILE NAME Wash35T7R4

Field Survey Section No.	XS Letter Draft FIS	River Mile Stationing	Profile Station	XS Letter Final FIS
	100	2.250		
	200	2.667		
	300	3.197		
	400	3.614		
	500	3.841		
	600	4.087		
	700	4.296		
	800	4.883		
	900	0.435		
	1000	0.890		
	1100	1.250		
	1200	1.647		
	1300	2.026		
	1400	2.367		
	2000	5.261		
	2100	5.602		
	2200	5.905		
	2300	6.398		
	2400	6.852		
	2500	7.458		
	2600	7.799		
	2700	8.121		
	2800	8.614		

FLOOD INSURANCE STUDY

KEY TO CROSS-SECTION (XS) LABELING

PREPARED BY:
SC: Wood, Patel & Associates, Inc.
TEC:

DATE PREPARED:
SC: 3-15-2000
TEC:

COMMUNITY NAME Wickenburg Area
STATE Arizona
FEMA CID NO.

STREAM NAME Ox Wash
RUN DATE
FILE NAME Wash1T6R4

Field Survey Section No.	XS Letter Draft FIS	River Mile Stationing	Profile Station	XS Letter Final FIS
	100	2.324		
	200	2.740		
	300	3.270		
	400	3.858		
	500	4.520		
	600	5.051		
	700	5.487		
	800	6.055		
	900	6.528		
	1000	7.134		
	1100	7.437		

FLOOD INSURANCE STUDY

KEY TO CROSS-SECTION (XS) LABELING

PREPARED BY:
SC: Wood, Patel & Associates, Inc.
TEC:

DATE PREPARED:
SC: 3-15-2000
TEC:

COMMUNITY NAME Wickenburg Area
STATE Arizona
FEMA CID NO.

STREAM NAME Tributary of Little San Domingo Wash
FILE NAME Wash14T6R4

Field Survey Section No.	XS Letter Draft FIS	River Mile Stationing	Profile Station	XS Letter Final FIS
	100	0.000		
	200	0.360		
	300	0.852		
	400	1.420		
	500	1.648		
	600	2.367		

FLOOD INSURANCE STUDY

KEY TO CROSS-SECTION (XS) LABELING

PREPARED BY:
SC: Wood, Patel & Associates, Inc.
TEC:

DATE PREPARED:
SC: 3-15-2000
TEC:

COMMUNITY NAME Wickenburg Area
STATE Arizona
FEMA CID NO.

STREAM NAME Little San Domingo Wash
RUN DATE
FILE NAME Wash7T6R3

Field Survey Section No.	XS Letter Draft FIS	River Mile Stationing	Profile Station	XS Letter Final FIS
	100	3.809		
	200	4.756		
	300	5.362		
	400	6.006		
	500	6.309		
	600	6.839		
	700	7.445		
	800	7.748		
	900	8.847		
	1000	9.226		
	1100	9.699		
	1200	10.002		
	1300	10.343		
	1400	10.760		
	1500	11.176		

FLOOD INSURANCE STUDY

KEY TO CROSS-SECTION (XS) LABELING

PREPARED BY:
SC: Wood, Patel & Associates, Inc.
TEC:

DATE PREPARED:
SC: 3-15-2000
TEC:

COMMUNITY NAME Wickenburg Area
STATE Arizona
FEMA CID NO.

STREAM NAME Tributary of Sols Wash
RUN DATE
FILE NAME Wash32T8R5

Field Survey Section No.	XS Letter Draft FIS	River Mile Stationing	Profile Station	XS Letter Final FIS
	100	0.455		
	200	0.833		

FLOOD INSURANCE STUDY

KEY TO CROSS-SECTION (XS) LABELING

PREPARED BY:
SC: Wood, Patel & Associates, Inc.
TEC:

DATE PREPARED:
SC: 3-15-2000
TEC:

COMMUNITY NAME Wickenburg Area
STATE Arizona
FEMA CID NO.

STREAM NAME Tributary of Amir Wash
RUN DATE
FILE NAME Wash34T8R5

Field Survey Section No.	XS Letter Draft FIS	River Mile Stationing	Profile Station	XS Letter Final FIS
	100	0.235		
	200	0.417		

FLOOD INSURANCE STUDY

KEY TO CROSS-SECTION (XS) LABELING

PREPARED BY:
SC: Wood, Patel & Associates, Inc.
TEC:

DATE PREPARED:
SC: 3-15-2000
TEC:

COMMUNITY NAME Wickenburg Area
STATE Arizona
FEMA CID NO.

STREAM NAME Wash20T7R4
RUN DATE
FILE NAME Wash20T7R4

Field Survey Section No.	XS Letter Draft FIS	River Mile Stationing	Profile Station	XS Letter Final FIS
	100	0.133		
	200	0.341		
	300	0.511		
	400	0.682		

FLOOD INSURANCE STUDY

KEY TO CROSS-SECTION (XS) LABELING

PREPARED BY:
SC: Wood, Patel & Associates, Inc.
TEC:

DATE PREPARED:
SC: 3-15-2000
TEC:

COMMUNITY NAME Wickenburg Area
STATE Arizona
FEMA CID NO.

STREAM NAME Wash28T7R4
RUN DATE
FILE NAME Wash28T7R4

Field Survey Section No.	XS Letter Draft FIS	River Mile Stationing	Profile Station	XS Letter Final FIS
	100	0.114		
	200	0.795		
	300	1.155		
	400	1.780		
	500	2.102		
	600	2.689		
	700	3.371		

FLOOD INSURANCE STUDY

KEY TO CROSS-SECTION (XS) LABELING

PREPARED BY:
SC: Wood, Patel & Associates, Inc.
TEC:

DATE PREPARED:
SC: 3-15-2000
TEC:

COMMUNITY NAME Wickenburg Area
STATE Arizona
FEMA CID NO.

STREAM NAME Wash3T6R4
RUN DATE
FILE NAME Wash3T6R4

Field Survey Section No.	XS Letter Draft FIS	River Mile Stationing	Profile Station	XS Letter Final FIS
	100	0.189		
	200	0.72		
	300	1.439		
	400	1.913		
	500	2.462		
	600	3.011		
	700	4.015		

FLOOD INSURANCE STUDY

KEY TO CROSS-SECTION (XS) LABELING

PREPARED BY:
SC: Wood, Patel & Associates, Inc.
TEC:

DATE PREPARED:
SC: 3-15-2000
TEC:

COMMUNITY NAME Wickenburg Area
STATE Arizona
FEMA CID NO.

STREAM NAME Wash15T6R4
RUN DATE
FILE NAME Wash15T6R4

Field Survey Section No.	XS Letter Draft FIS	River Mile Stationing	Profile Station	XS Letter Final FIS
	100	0.152		
	200	0.530		
	300	0.682		
	400	1.174		
	500	1.591		
	600	2.254		
	700	2.652		
	800	3.011		
	900	3.712		

SECTION 8

DRAFT FIS REPORT DATA

DRAFT FIS REPORT DATA

FLOOD INSURANCE STUDY
APPROXIMATE ZONE A FLOODPLAIN DELINEATION STUDIES
WICKENBURG AREA, MARICOPA COUNTY, ARIZONA

8.1 INTRODUCTION

8.1.1 Purpose of Study

Community Name:	Wickenburg Area
County:	Maricopa
State:	Arizona

Authority and Acknowledgments

Study Contractor:	Wood, Patel & Associates, Inc.
Contract No:	FCD 99 - 02
Completion Date:	May 2000

Coordination

Initial Consultation and Coordination Officer's (CCO) meeting date:
June 28, 1999

Attendees and agencies represented at the initial CCO meeting:
Joe Tram (FCDMC)
Ash Patel (Wood/Patel)
Jack Moody (Wood/Patel)

8.2 AREA STUDIED

8.2.1 Scope of Study

The study area for the Approximate Zone A Floodplain Delineation Studies is near the Town of Wickenburg in northwestern Maricopa County. It is designated as Watershed "G" on the FCDMC's Watershed Management Plan, and encompasses approximately 80 square miles.

8.2.2 Community Description

See effective FIS

8.2.3 Principal Flood Problems

See effective FIS

8.3 ENGINEERING METHODS

8.3.1 Hydrologic Analysis

Peak 100-year, 24-hour flows were obtained from the Wickenburg ADMS for relevant sub-basins and these published flow rates were used as the downstream flow. The flow paths for Zone A delineations were then identified, and cross-section locations were established. At each cross-section location, the contributing area was measured by planimeter and a ratio of contributing area to total area was calculated. This ratio was then applied to the total downstream flow, and the result was used for peak runoff at each successive upstream cross-section location (see Table 4.2).

8.3.2 Hydraulic Analysis

The digitized USGS 7.5-Minute Quadrangle Maps were provided by the FCDMC as part of this FIS contract and used for the approximate Zone A study areas.

Haestad Methods' *FlowMaster* software was used to estimate the water surface elevation and top width of flow for each cross-section (normal depth method). Table 5.1 is the summary table of the input data.

8.4 FLOODPLAIN MANAGEMENT APPLICATIONS

8.4.1 Floodplain Boundaries

The digitized USGS Topographic 7.5-Minute Quadrangle Maps were used to delineate the approximate study areas.

8.4.2 Floodways

No floodway delineation is required for the approximate Zone A studies.

APPENDIX A

REFERENCES

REFERENCES

A.1 Data Collection Summary

A.1.1 Other Published Flood Studies

Data were collected from studies that have been performed in and around the study area:

- Wickenburg ADMS Technical Documentation Report, Hydrological Analyses Floodplain Delineation (Black & Veatch, 1994)
- Wickenburg ADMS Technical Documentation Report, Appendix 3.0, Volumes IIa and IIb (Black & Veatch, 1994)
- FEMA Flood Insurance Rate Maps for Maricopa County, Arizona and Incorporated Areas, Map Nos. 04013C0230E, 04013C0235E, 04013C0255F, 04013C0265E, 04013C0270E, 04013C0660E, 04013C0675E, and 04013C0680 E
- Work Maps from the Floodplain Delineation Study: Wickenburg ADMS (Black & Veatch, 1994)

Note that additional FEMA FIRMs cover the study area, but are not printed: Map Nos. 04013C0225D, 04013C0240D, 04013C0245D, 04013C0260D, 04013C0300D, 04013C0625D, and 04013C0650D.

A.1.2 USGS Mapping

The following USGS Topographic 7.5-Minute Quadrangles were used in the hydrologic and hydraulic analyses:

- Congress SW
- Flores
- Sam Powell Peak
- Morgan Butte
- Outlaw Hill
- Vulture Peak
- Wickenburg
- Red Picacho
- Wildcat Well
- Vulture Mine
- Wickenburg SW
- Wittman

A.1.3 Drainage Structures

Record drawings were collected from the Arizona Department of Transportation (ADOT) on drainage structures that cross State Highway 60 within the study area. Record drawings of drainage structures under the Burlington Northern & Santa Fe Railroad were requested but were not provided.

A.1.4 Historical Flood Information

Data were collected on ALERT gages and their periods of record within the study area. Additionally, historical flooding information was collected on the 1997 Tropical Storm Nora and its effects on the Wickenburg area. Measured runoff within the study area approached the 24-hour, 100-year rainfall and produced significant runoff in small and medium-sized watercourses, as well as the Hassayampa River (Waters, 1997).

A.1.5 Research Contacts

The following research contacts were made during the course of data collection:

Agency/Organization	Contact	Purpose
Flood Control District of Maricopa County	J. Tram, S. Waters	Historical flood data; gage data
Black & Veatch / Coe & Van Loo		Background data
Arizona Department of Transportation	Engineering Records	Record drawings of highway drainage structures

A.2 Referenced Documents

The following references were used in the hydrologic and hydraulic analyses and documentation:

1. Arizona Department of Transportation, Plan and Profile of Proposed State Highway Wickenburg-Phoenix, Maricopa County, F-022-2(8), December 1964.

2. Arizona Department of Transportation, Plan and Profile of Proposed State Highway Wickenburg-Phoenix, Maricopa County, F-FG-022-2(11), March 1964.

3. Arizona Department of Water Resources, State Standard SS1-97, *Requirements for Flood Study Technical Documentation*, November 1997.

4. Black & Veatch, Inc., *Wickenburg ADMS Technical Documentation Report, Hydrological Analyses Floodplain Delineation*, May 1994.

5. Federal Emergency Management Agency, *Flood Insurance Rate Maps for Maricopa County, Arizona and Incorporated Areas*, Rev. September 1995.

6. Flood Control District of Maricopa County, *Drainage Design Manual for Maricopa County, Arizona, Volume I, Hydrology*, January 1995.

7. Flood Control District of Maricopa County, *Drainage Design Manual for Maricopa County, Arizona, Volume II, Hydraulics*, January 1996.

8. Waters, Stephen D., Flood Control District of Maricopa County, *Storm Report for Tropical Storm Nora*, September 1997.

APPENDIX B

GENERAL DOCUMENTATION AND CORRESPONDENCE

Approximate Zone "A" Floodplain Delineation Studies (Wickenburg Area)
Contract FCD 99-02
W/P# 99958

Meeting Minutes

Time: 7:30 AM, Thursday, September 2, 1999

Location: Flood Control District of Maricopa County
2801 West Durango

Purpose: Field Visit and Meeting to Discuss Hydrology and Hydraulic Methodologies

Attendees:	Agency/Company	E-mail	Phone
Joe Tram	FCDMC	jjt@mail.maricopa.gov	602-506-4771
Ash Patel	Wood/Patel	apatel@woodpatel.com	602-234-1344
Jack Moody	Wood/Patel	jmoody@woodpatel.com	602-234-1344
Shimin Zou	Wood/Patel	szou@woodpatel.com	602-234-1344

The attendees met in the field to discuss hydrology, hydraulic as well as mapping issues. We visited the wash within Section 14, Township 6 North, Range 4 West and the wash within Section 3, Township 6 North, Range 4 West.

- The normal depth method is to be used to calculate hydraulic parameters including flow depth at representative locations along a wash. HEC-RAS or HEC-2 models are not applicable and therefore will not be used.

- The USGS 7.5 Minute Series topo is to be used in this study. The contour interval is 20 ft, and therefore the low flow washes or their locations are not well defined on the topo. Adjustments to the cross-sections geometry will not be necessary since the water surface elevations will not be shown on the FIRM maps and the entire wash valley, where applicable, will be delineated as floodplain.

- Field inspection shows that the culverts crossing either Highway US 60 or the railroad restrict the flood flows in the washes. It is recommended that the upstream areas of these structures be delineated as ponding area up to elevations of top of the highway or railroad embankment.

- Manning's "n" value estimation: typical cross-sections should be used to estimate Manning's "n" values for the washes. Procedures prepared for the FCDMC by the USGS will be applied to compute the Manning's "n" values for both main channel and overbanks from field observations.

Following the field visit, the attendees met at the FCDMC office to discuss other issues.

- Wood/Patel submitted preliminary hydraulic calculations and delineation on the wash that we visited in the field.

- Wood/Patel submitted the project schedule.

- The hydrology prepared and documented in the Wickenburg ADMS will be utilized for this study. Where concentration points are available, the flows will be taken directly from the ADMS. The flow in the upper reach of the wash will be estimated using a relationship based on the contributing drainage area. Flow estimates for intermediate points will be based on a linear interpolation of the stream distance.

- A few washes have not been evaluated in the ADMS and don't have flows established. The flows in these washes will be estimated by comparing the watershed to similar nearby watersheds using an area relationship.

- Wood/Patel indicated that LTM Engineering, Inc. (Laurie Miller) would be performing and documenting the hydrologic calculations.

Note:
If you are aware of any changes or additions necessary to the information contained in these minutes, please notify Jack Moody (602-234-1344) or e-mail at jmoody@woodpatel.com. These minutes as well as all further correspondence will be e-mailed to interested parties.

cc: All Attendees

Y:\WP\MEMOS\99958 Meeting Minutes.doc

PUBLIC NOTICE
YOUR RIGHT TO KNOW
ANNOUNCEMENT OF FLOOD HAZARD STUDY

The Flood Control District of Maricopa County (FCDMC), under the authority of the National Flood Insurance Act of 1968 (P.L. 90-448), as amended, and the Flood Disaster Protection Act of 1973 (P.L. 93-234), is funding an approximate study of Flood Hazards for numerous unnamed tributaries to the Hassayampa River outside of the Wickenburg Area. The study is being performed for the FCDMC by Wood, Patel & Associates, Inc. of Phoenix.

This study will examine and evaluate the flood hazard areas in the unincorporated areas of Maricopa County. This information will be used to carry out the floodplain management objectives of the National Flood Insurance Program. This information will also be used as the basis for determining the appropriate flood insurance premium rates for buildings and their contents.

This announcement is intended to inform all interested persons 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, so that the information can be considered during the course of this study. Your comments should be addressed to Mr. Joe Tram, hydrologist at the Flood Control District of Maricopa County.

Published in The Wickenburg Sun on Sept. 1 and 8, 1999.

Flood Hazard Study
Notice

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:

Sep. 1 and 8, 1999

KEVIN CLOE
PUBLISHER

Sworn to before me this **8th** day of **September** A.D. **1999**

Jo Ann R Peterson
Notary Public

OFFICIAL SEAL
JO ANN R. PETERSON
Notary Public - State of Arizona
MARICOPA COUNTY
My Comm. Expires Sept. 30, 2001

PUBLIC NOTICE
YOUR RIGHT TO KNOW
ANNOUNCEMENT OF FLOOD HAZARD STUDY

The Flood Control District of Maricopa County (FCDMC), under the authority of the National Flood Insurance Act of 1968 (P.L. 90-448), as amended, and the Flood Disaster Protection Act of 1973 (P.L. 93-234), is funding an approximate study of Flood Hazards for numerous unnamed tributaries to the Hassayampa River outside of the Wickenburg Area. The study is being performed for the FCDMC by Wood, Patel & Associates, Inc. of Phoenix.

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This announcement is intended to inform all interested persons 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, so that the information can be considered during the course of this study. Your comments should be addressed to Mr. Joe Tram, hydrologist at the Flood Control District of Maricopa County,

99444-August 31, September 7, 1999

THE ARIZONA REPUBLIC

STATE OF ARIZONA
COUNTY OF MARICOPA } SS.

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

The Arizona Republic

August 31, September 7, 1999

Sworn to before me this
10 day of
September A.D. 1999

OFFICIAL SEAL
MARILYN GREENWOOD
NOTARY PUBLIC-ARIZONA
MARICOPA COUNTY
My Comm. Expires May 23, 2003

Notary Public

WOOD, PATEL & ASSOC., INC.

LETTER OF TRANSMITTAL

Civil Engineers, Hydrologists, Land Surveyors

1550 East Missouri, Suite 203

Phoenix, AZ 85014

(602) 234-1344 • FAX 234-1322

TO: Jo Tram

DATE: 11-2-1999 | JOB NO. 99958

ATTENTION:

RE: Wickenburg Zone A Study

WE ARE SENDING YOU ☒ Attached ☐ Under separate cover via _____ the following items:

☐ Shop drawings ☐ Prints ☐ Plans ☐ Samples ☐ Specifications
☐ Copy of letter ☐ Change Order ☐ _____

COPIES	DATE	NO.	DESCRIPTION
1	11-2-1999		Hydrology Report
1	11-2-1999		Data Collection Report
1	11-2-1999		Manning's "n" value calculation sheets

THESE ARE TRANSMITTED as checked below:

☐ For approval ☐ Approved as submitted ☐ Approved as noted
☐ For your use ☐ As requested ☒ For review and comment

REMARKS:

COPY TO: File

SIGNED:

FORMS\TRANSMIT.GEN

Approximate Zone "A" Floodplain Delineation Studies (Wickenburg Area)
Contract FCD 99-02
W/P# 99958

Meeting Minutes

Time: 10:00 AM, Tuesday, November 2, 1999

Location: Flood Control District of Maricopa County
2801 West Durango

Purpose: Meeting to Discuss Preliminary Hydrology and Data Collection Reports, and Manning's "n"-Value Computation Sheet

Attendees:	Agency/Company	E-mail	Phone
Joe Tram	FCDMC	jjt@mail.maricopa.gov	602-506-4771
Jack Moody JM.	Wood/Patel	jmoody@woodpatel.com	602-234-1344
Shimin Zou	Wood/Patel	szou@woodpatel.com	602-234-1344

The attendees met at the FCDMC office to review the preliminary reports and discuss other issues.

- Wood/Patel submitted preliminary hydrology report. Joe recommended that the wash name conventions be explained clearly and earlier within the report.
- Wood/Patel submitted preliminary data collection report. Joe will review the report and give comments to Wood/Patel.
- Wood/Patel also presented Manning's n-value computation sheets for most of the washes which Wood/Patel employees have visited in the field. Joe suggested that the Manning's n-value computation sheets need to be modified to reflect District's updated method.
- Wood/Patel requested that some figures from the Wickenburg ADMS need to be modified and incorporated into the hydrology report. Wood/Patel borrowed these exhibits from the District and will return to Chris Perry after vellums for these exhibits are made.

Note:
If you are aware of any changes or additions necessary to the information contained in these minutes, please notify Jack Moody (602-234-1344) or e-mail at jmoody@woodpatel.com. These minutes as well as all further correspondence will be e-mailed to interested parties.

cc: All Attendees
Ash Patel (Wood/Patel)

Y:\WP\MEMOS\99958 Meeting Minutes11-2.doc

WOOD, PATEL & ASSOC., INC.

LETTER OF TRANSMITTAL

Civil Engineers, Hydrologists, Land Surveyors

1550 East Missouri, Suite 203

Phoenix, AZ 85014

(602) 234-1344 • FAX 234-1322

DATE: November 5, 1999	JOB NO. 99958
ATTN: Chris Perry	
RE: Zone "A" Study Wickenburg	

TO:

Flood Control District of Maricopa County

2801 West Durango Street

Phoenix, AZ 85009

WE ARE SENDING YOU ■ Attached ☐ Under separate cover via DELIVERY the following items:

☐ Shop drawings ☐ Prints ☐ Plans ☐ Samples ☐ Specifications
☐ Correspondence ☐ Change Order ☐ Survey ☐ Report ■ Other

COPIES	DATE	NO.	DESCRIPTION
1		5	Wickenburg ADMS Watershed Hydrology Maps
			5-5, 5-6, 6-4, 7-5 and 7-6

THESE ARE TRANSMITTED as checked below:

☐ For approval ☐ Approved as submitted ☐ Approved as noted
☐ For your use ☐ As requested ☐ For review and comment

REMARKS: Thank you for letting us borrow these. Please let Joe Tram know that I returned them.

COPY TO: Joe Tram @ FCDMC

SIGNED: Jack K. Moody, P.E.

FORMS\TRANSMIT.GEN

Moody, Jack

From: Grimm, Michael [Michael.Grimm@fema.gov]
Sent: Tuesday, February 22, 2000 11:29 AM
To: 'Joe Tram - FCDX'
Cc: 'jmoody@woodpatel.com'; Dave Johnson - FCDX; 'brian>hyde@state.co.us'; Yuan, Max; 'Monther Madanat'; 'Pernille Buch-Pedersen'
Subject: RE: mapping tributary flows of major floodplains

Thanks Joe,

Sorry for my confusion. We have talked so much lately about mapping alluvial fans in Maricopa County I was assuming you were talking about another Fan case. Thanks for clearing up that this is NOT a fan case, but rather a deatiled riverine with floodway (mainstem) tie-in with tributary with a riverine Zone A and adminstrative floodway issue.

We'll be on the look out for the proposed mapping. Sounds like what you are proposing makes sense.

Sorry you won't be at FMA next week.

Mike

-----Original Message-----
From: Joe Tram - FCDX [mailto:jjt@mail.maricopa.gov]
Sent: Tuesday, February 22, 2000 1:13 PM
To: 'Grimm, Michael'
Cc: 'jmoody@woodpatel.com'; Dave Johnson - FCDX;
'brian>hyde@state.co.us'; Yuan, Max
Subject: RE: mapping tributary flows of major floodplains

Thanks for taking the time and discussing the issue....when we submit the Zone A tributaries we will take them down to the floodway district of the major river, requesting a break line be included on the FIRMS through the floodway fringe. In this manner we can regulate that area that is in the floodway fringe of the major river as an administrative floodway for tributary flow....THANKS AGAIN...

-----Original Message-----
From: Grimm, Michael [mailto:Michael.Grimm@fema.gov]
Sent: Tuesday, February 22, 2000 6:50 AM
To: 'Joe Tram - FCDX'
Cc: 'jmoody@woodpatel.com'; Dave Johnson - FCDX;
'brian>hyde@state.co.us'; Yuan, Max
Subject: RE: mapping tributary flows of major
floodplains

Joe,

Why don't you give me a call so we can discuss this. I am a bit confused by
your examples and "floodway warping"(?) (is that an western technical
term????). A fax example delineation would help as well, so we can refer to
something as we talk.

As you know we are open to fan delineations that support local (more
stringent) regs such as Maricopa County. Have the new regs been adopted yet
for the admin. fldwy?

I beleive the Skyline Wash LOMR submittal that came in went through your local mapping guidelines etc... and is mapped with an administrative floodway that you all delineated in support of your regs. I asked Max and Frank to fax you a copy of the LOMR for you concurrence before we finalize anything. You should see that soon if you haven't already.

THanks. I look forward to your call.

I will be in San Diego next week at the joint FMA/AFMA conference and will be presenting the FEMA Fan Guidleines (abbreviated version) and hope to see you there. It should be a great place to talk about mapping options. I'll send you a copy of the revised guidelines that include examples of mapping based on various methods.

I think you question is consistent with some things Brian has brought up at the Mapping Council meetings regarding mapping of fans and how it relates to floodplain management regulations. I think I'll see Brian this week here in D.C. so I will talk to him abou this then as well. I believe he is pursuing some of these items througn ASFPM.

MG

-----Original Message-----
From: Joe Tram - FCDX [mailto:jjt@mail.maricopa.gov]
Sent: Friday, February 18, 2000 5:20 PM
To: 'MICHAEL.grimm@FEMA.gov'
Cc: 'jmoody@woodpatel.com'; Dave Johnson - FCDX;
'brian>hyde@state.co.us'
Subject: mapping tributary flows of major floodplains

We currently are doing some Zone A delineations for tributaries in addition to doing some major rivers that have tributaries that have not been studied.

Is FEMA going to be adverse to us having the floodway district of the major rivers warp into the banks at locations of tributaries that are not being studied.....Also, will FEMA put the break lines through the floodway fringe to the floodway district of a major floodplain when we submit the zone A's such that they tie -into the floodway district thus reflecting an administrative floodway?

It appears that under the current procedure if a major delineation is undertaken and a floodway district is developed, there is

the potential to
have floodway fringe in areas where major tributaries flow into the river
based upon the depths and velocities of the overbank. Then then the
Tributary is studied a floodway district is delineated with higher
velocities and possibly depths...

In addition, in the interim, development could be permitted based upon the
floodway fringe only to be faced with criteria of a floodway district once
the tributary is delineated.

Is this situation covered in the current criteria, if not, would FEMA accept
the 2nd paragraph for future study contractors in our jurisdiction? And if
so, would FEMA be adverse to accepting modifications (LOMRs) to existing
floodplains, if we submitted revised floodways where we know there are
tributaries on major rivers?

Is this an issue we need to take up with Brian and the mapping guideline
section...??

THANKS.....

APPENDIX C

SURVEY FIELD NOTES

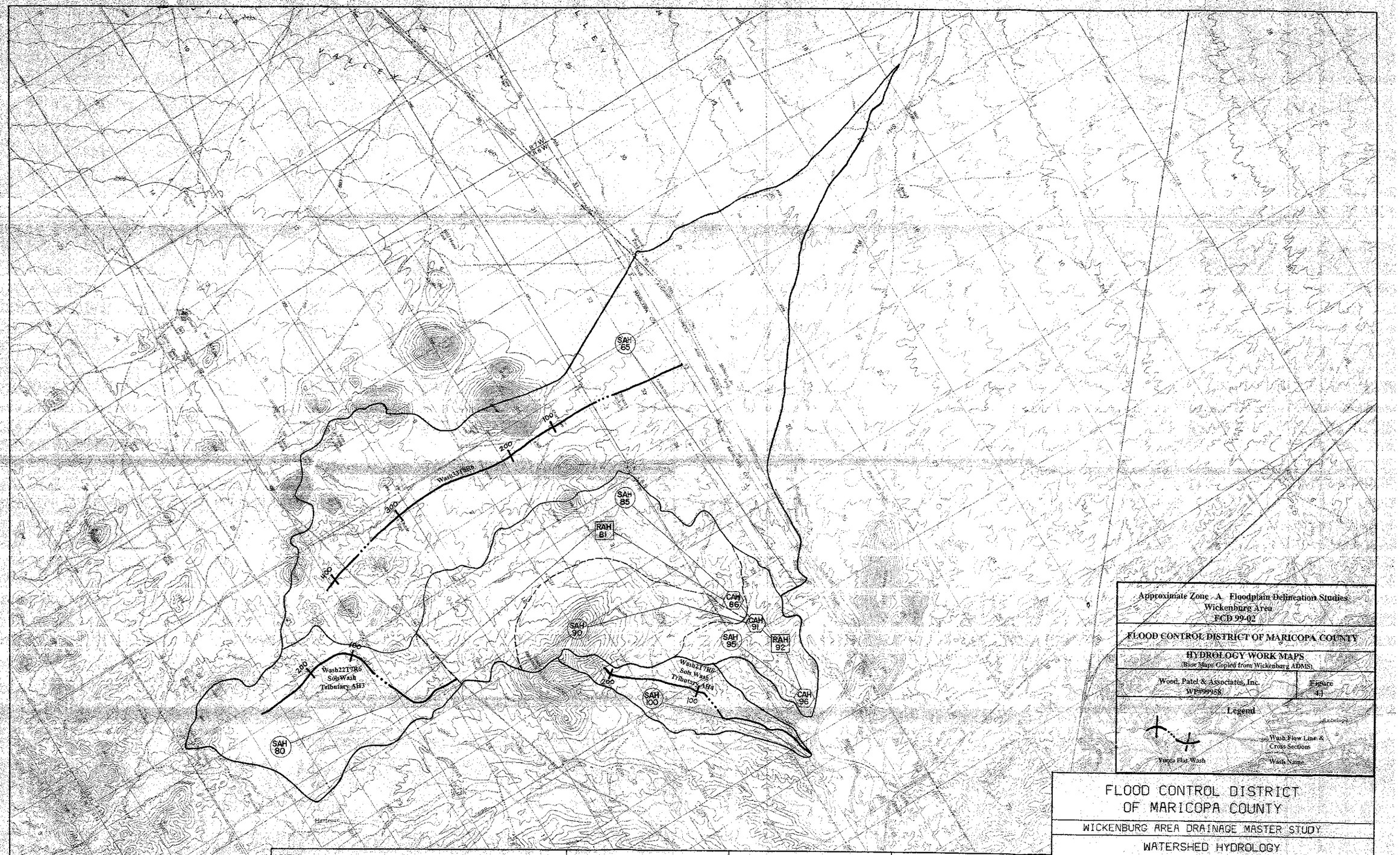
FIELD SURVEY INFORMATION

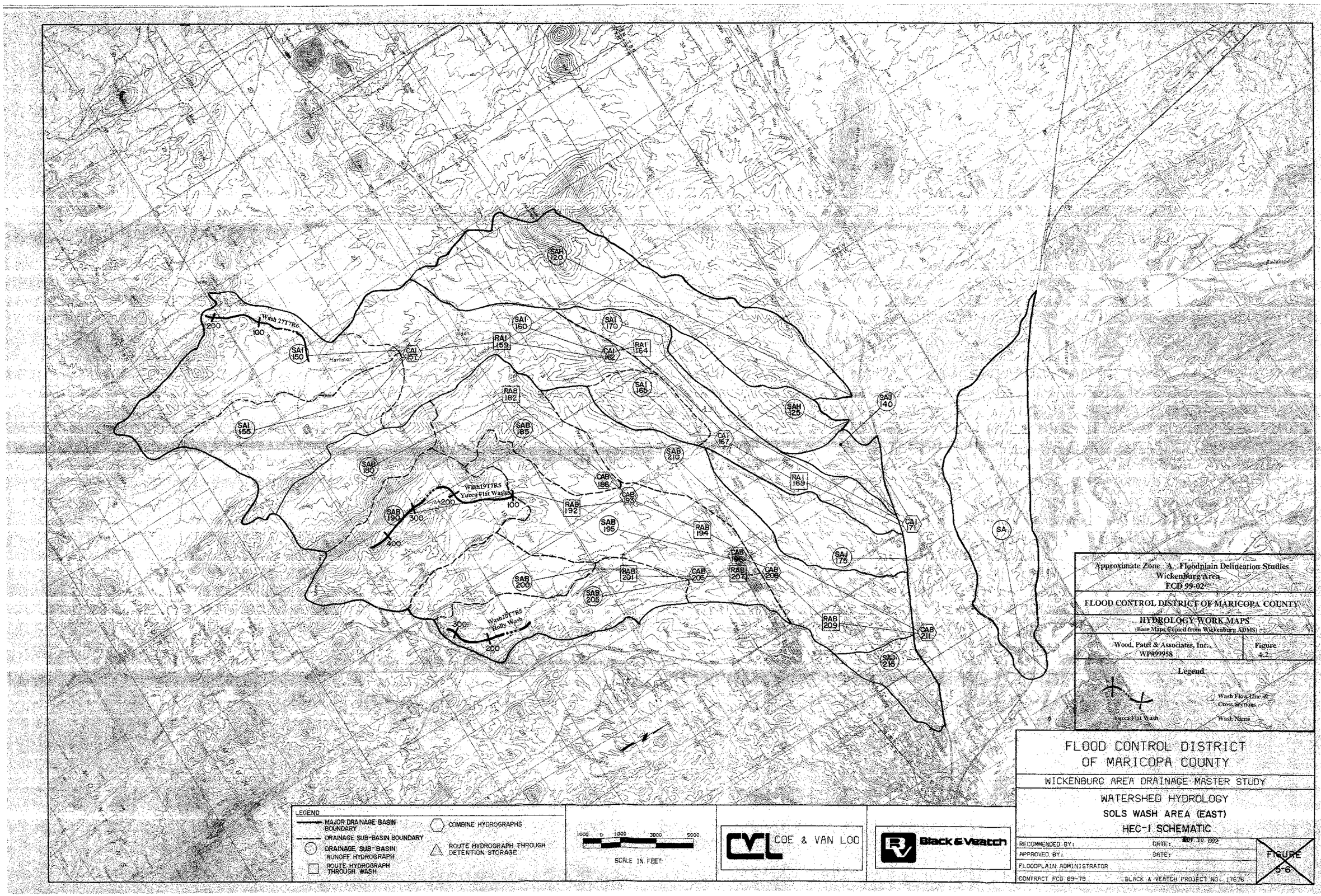
Several field visits were conducted for estimation of Manning's "n" values for representative cross sections for this approximate Zone A study. Hand GPS and measuring tape were used to verify geometric data of typical cross sections.

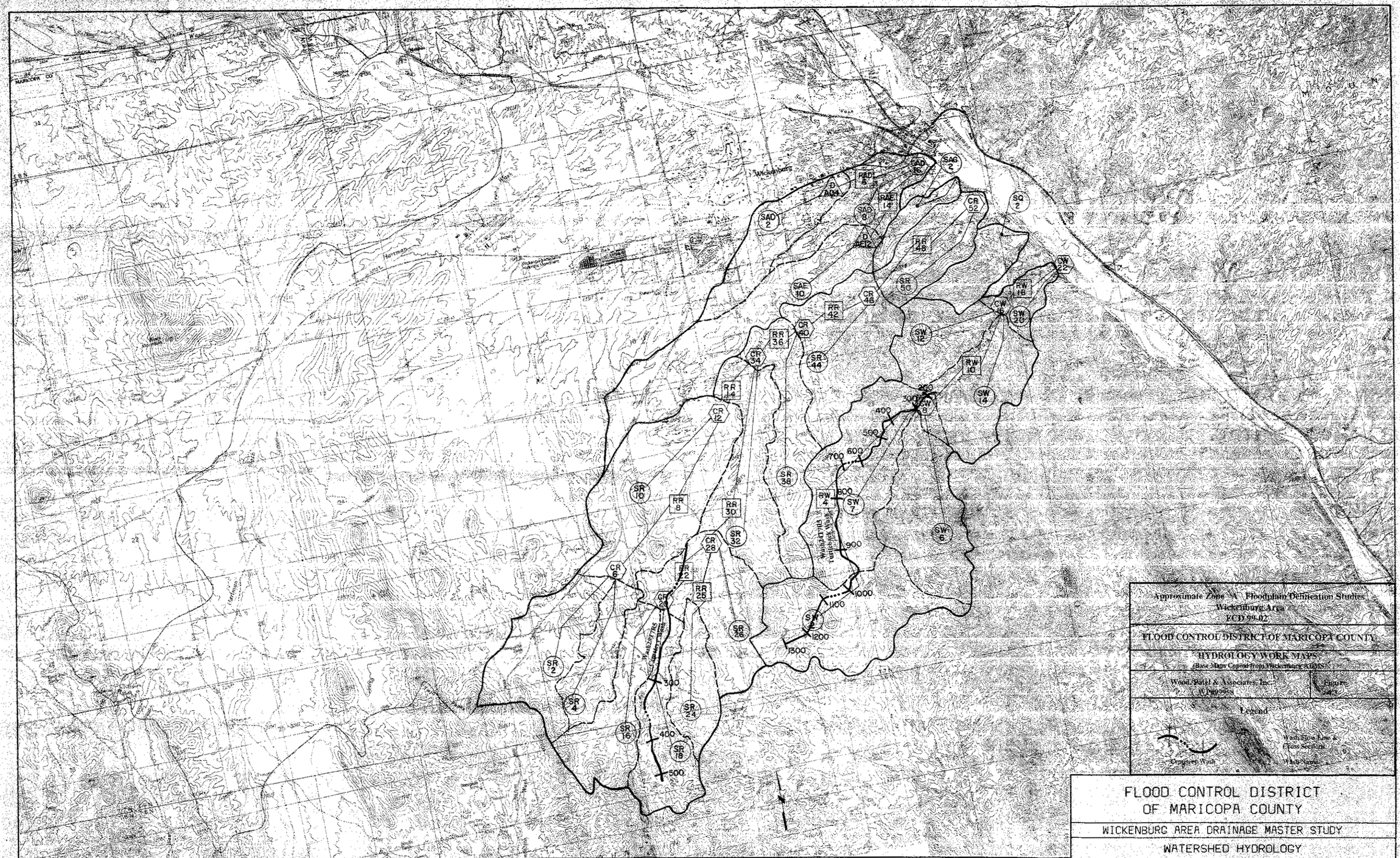
APPENDIX D

HYDROLOGIC ANALYSIS SUPPORTING DOCUMENTATION

HYDROLOGY WORK MAPS


SAH 65
SAH 85
RAH 81
CAH 86
CAH 91
SAH 90
SAH 95
RAH 92
SAH 100
CAH 96
SAH 80
Wash22TR6
Sols Wash
Tributary AH3
Wash21TR6
Sols Wash
Tributary AH4
Wash17TR6
Approximate Zone A Floodplain Delineation Studies
Wickenburg Area
FCD 99-02
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
HYDROLOGY WORK MAPS
(Base Maps Copied from Wickenburg ADMS)
Wood, Patel & Associates, Inc.
WP#99958
Figure 4-1
Legend
Yuma Flat Wash
Wash Flow Line & Cross Sections
Wash Name
LEGEND
MAJOR DRAINAGE BASIN BOUNDARY
DRAINAGE SUB-BASIN BOUNDARY
DRAINAGE SUB-BASIN RUNOFF HYDROGRAPH
ROUTE HYDROGRAPH THROUGH WASH
COMBINE HYDROGRAPHS
ROUTE HYDROGRAPH THROUGH DETENTION STORAGE
1000 0 1000 3000 5000
SCALE IN FEET
COE & VAN LOO
Black & Veatch
FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY
WICKENBURG AREA DRAINAGE MASTER STUDY
WATERSHED HYDROLOGY
SOLS WASH AREA (WEST)
HEC-1 SCHEMATIC
RECOMMENDED BY:
DATE: NOV 10 1992
APPROVED BY:
DATE:
FLOODPLAIN ADMINISTRATOR
CONTRACT FCD 89-79
BLACK & VEATCH PROJECT NO. 17676
FIGURE 5-5


Approximate Zone A Floodplain Delineation Studies
Wickenburg Area
FCD 99-02
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
HYDROLOGY WORK MAPS
(Base Maps Copied from Wickenburg ADMS)
Wood, Patel & Associates, Inc.
WP#99958
Figure 4.2
Legend
Wash Flow Line & Cross Sections
Yucca Flat Wash
Wash Name
Wash 27T7R6
Wash 19T7R5
Yucca Flat Wash
Wash 20T7R5
Holly Wash
Harriman
SAI 120
SAI 150
SAI 155
SAI 160
SAI 170
SAI 140
SAH 125
SAB 180
SAB 185
SAB 190
SAB 195
SAB 200
SAB 205
SAB 210
SAB 215
SAJ 175
SA
CAI 157
CAI 162
CAI 167
CAI 171
CAB 186
CAB 193
CAB 196
CAB 206
CAB 208
CAB 211
RAI 159
RAI 164
RAI 169
RAB 182
RAB 192
RAB 194
RAB 201
RAB 207
RAB 209
LEGEND
MAJOR DRAINAGE BASIN BOUNDARY
DRAINAGE SUB-BASIN BOUNDARY
DRAINAGE SUB-BASIN RUNOFF HYDROGRAPH
ROUTE HYDROGRAPH THROUGH WASH
COMBINE HYDROGRAPHS
ROUTE HYDROGRAPH THROUGH DETENTION STORAGE
1000 0 1000 3000 5000
SCALE IN FEET
COE & VAN LOO
Black & Veatch
FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY
WICKENBURG AREA DRAINAGE MASTER STUDY
WATERSHED HYDROLOGY
SOLS WASH AREA (EAST)
HEC-1 SCHEMATIC
RECOMMENDED BY:
DATE: NOV 10 1992
APPROVED BY:
DATE:
FLOODPLAIN ADMINISTRATOR
CONTRACT FCD 89-78
BLACK & VEATCH PROJECT NO. 17676
FIGURE 5-6



FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY

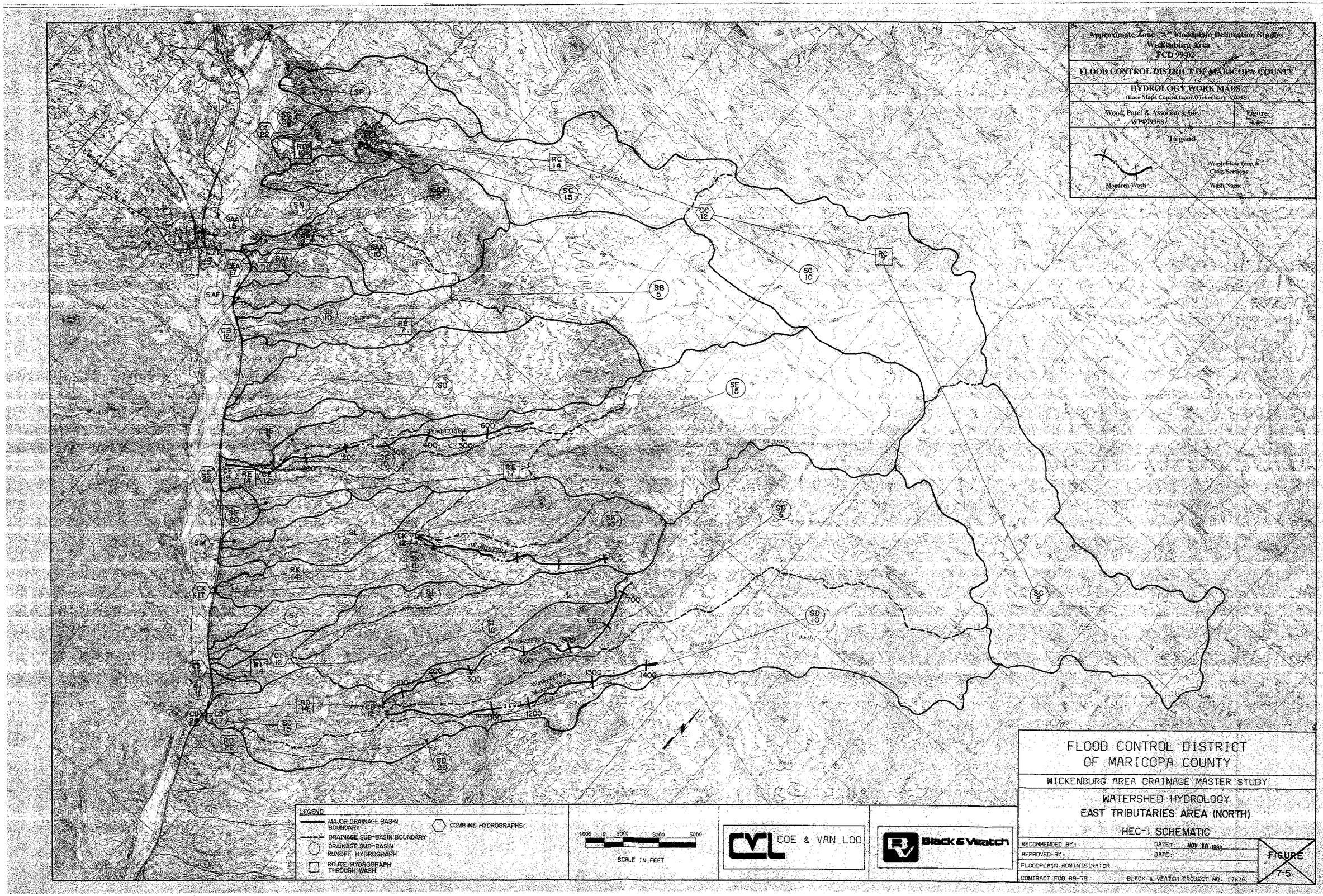
WICKENBURG AREA DRAINAGE MASTER STUDY

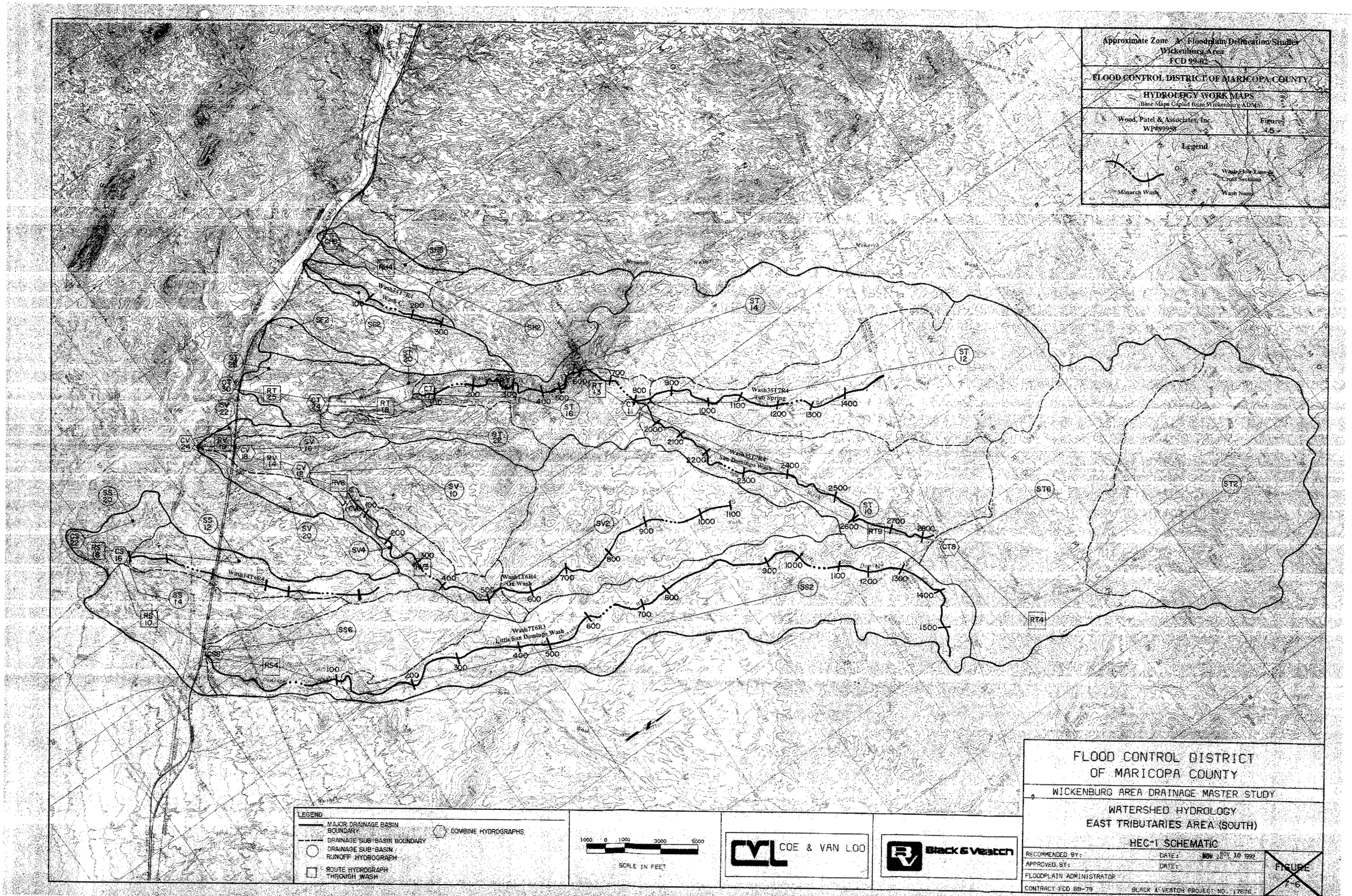
WATERSHED HYDROLOGY
WEST TRIBUTARIES AREA

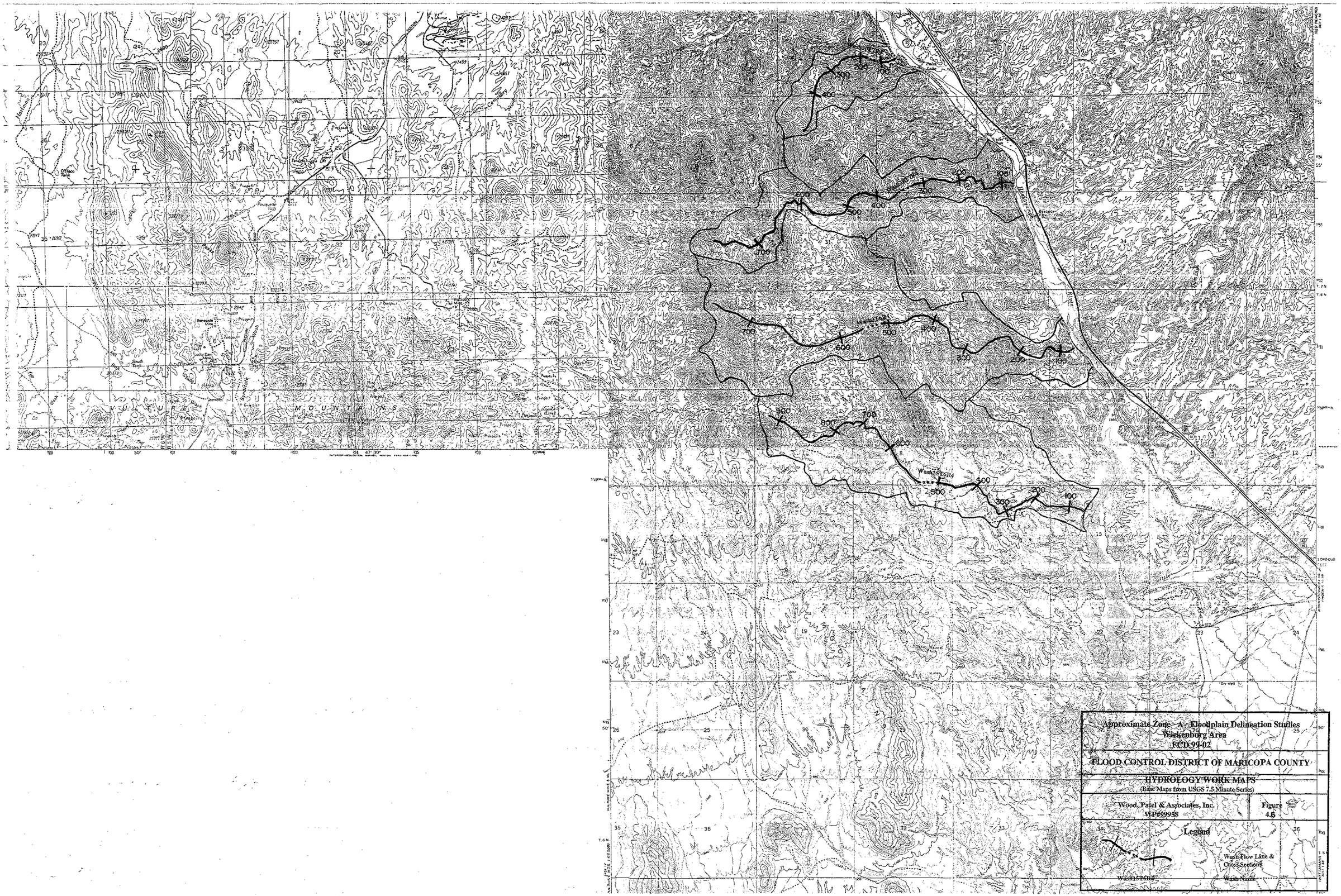
HEC-1 SCHEMATIC

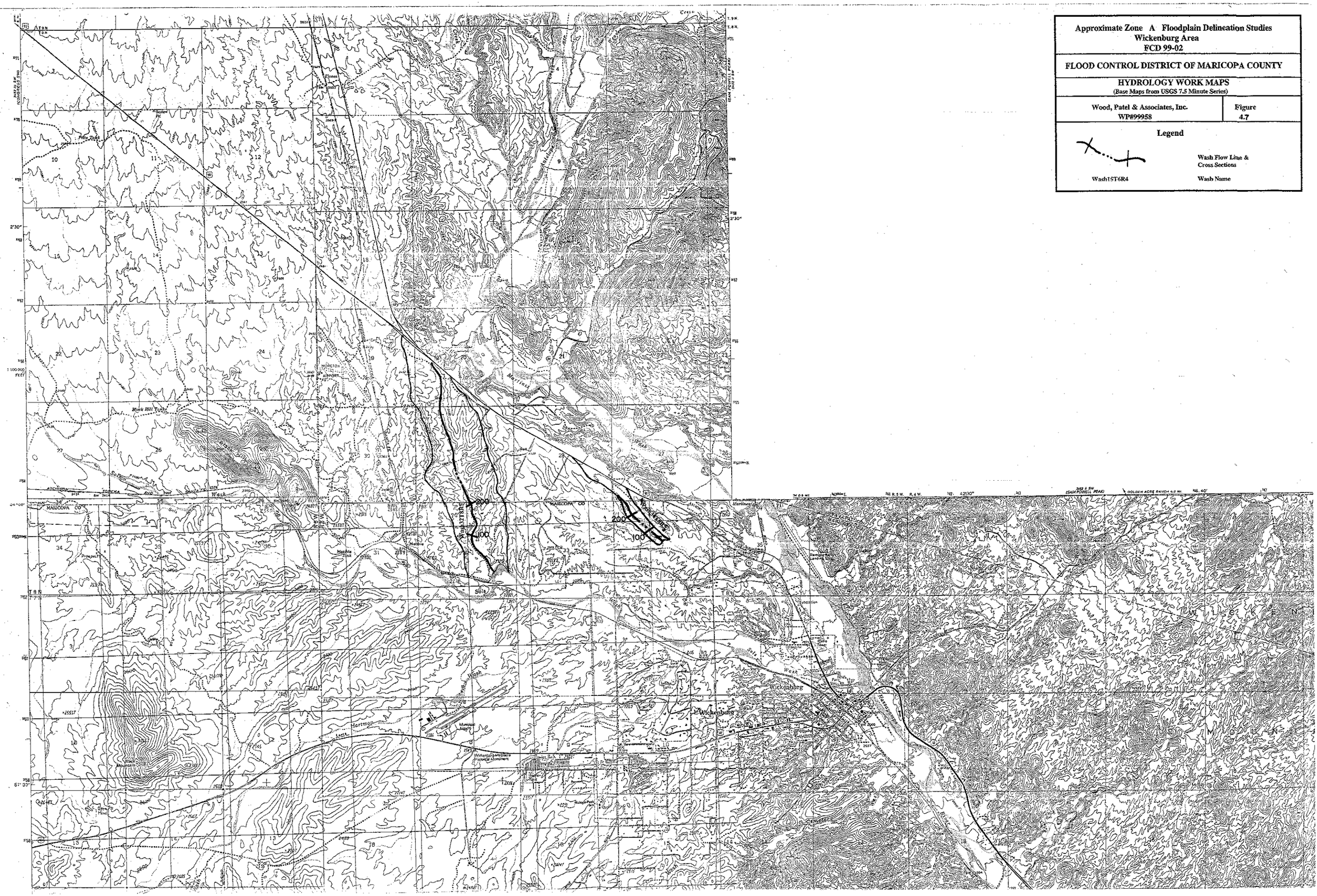
RECOMMENDED BY: DATE: NOV 10 1992
APPROVED BY: DATE:
FLOODPLAIN ADMINISTRATOR
CONTRACT FCD 89-79 BLACK & VEATCH PROJECT NO. 17676

FIGURE 6-4


Approximate Zone "A" Floodplain Delineation Studies
Wickenburg Area
FCD 99-02
FLOOD CONTROL DISTRICT of MARICOPA COUNTY
HYDROLOGY WORK MAPS
(Base Maps Copied from Wickenburg ADMS)
Wood, Patel & Associates, Inc.
WP#99958
Figure
4.4
Legend
Monarch Wash
Wash Flow Line & Cross Sections
Wash Name
LEGEND
MAJOR DRAINAGE BASIN BOUNDARY
DRAINAGE SUB-BASIN BOUNDARY
DRAINAGE SUB-BASIN RUNOFF HYDROGRAPH
ROUTE HYDROGRAPH THROUGH WASH
COMBINE HYDROGRAPHS
SCALE IN FEET
COE & VAN LOO
Black & Veatch
FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY
WICKENBURG AREA DRAINAGE MASTER STUDY
WATERSHED HYDROLOGY
EAST TRIBUTARIES AREA (NORTH)
HEC-1 SCHEMATIC
RECOMMENDED BY:
DATE: NOV 10 1992
APPROVED BY:
DATE:
FLOODPLAIN ADMINISTRATOR
CONTRACT FCD 89-79
BLACK & VEATCH PROJECT NO. 17676
FIGURE
7-5


Approximate Zone "A" Floodplain Delineation Studies
Wickenburg Area
FCD 99-02
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
HYDROLOGY WORK MAPS
(Base Maps Copied from Wickenburg ADMS)
Wood, Patel & Associates, Inc.
WP#99998
Figure 15
Legend
Wash Flow Lines & Cross Sections
Wash Name
Monarch Wash
Wash3ST7R4
Tom Spring
Wash3ST7R4
San Domingo Wash
Wash7R6R4
Wash7R6R3
Little San Domingo Wash
LEGEND
MAJOR DRAINAGE BASIN BOUNDARY
DRAINAGE SUB-BASIN BOUNDARY
DRAINAGE SUB-BASIN RUNOFF HYDROGRAPH
ROUTE HYDROGRAPH THROUGH WASH
COMBINE HYDROGRAPHS
SCALE IN FEET
COE & VAN LOO
Black & Veatch
FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY
WICKENBURG AREA DRAINAGE MASTER STUDY
WATERSHED HYDROLOGY
EAST TRIBUTARIES AREA (SOUTH)
HEC-1 SCHEMATIC
RECOMMENDED BY:
DATE:
APPROVED BY:
DATE:
FLOODPLAIN ADMINISTRATOR
CONTRACT FCD 89-79
BLACK & VEATCH PROJECT NO. 17676
FIGURE 7-6


Approximate Zone "A" Floodplain Delineation Studies
Waikenburg Area
FCD 99-02
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
HYDROLOGY WORK MAPS
(Base Maps from USGS 7.5 Minute Series)
Wood, Patel & Associates, Inc.
WP#99958
Figure
4.6
Legend
Wash Flow Line &
Cross Sections
Wash Name
Wash15PGR4
Wash15PGR4
MOUNTAINS
VULTURE



Approximate Zone A Floodplain Delineation Studies
Wickenburg Area
FCD 99-02

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

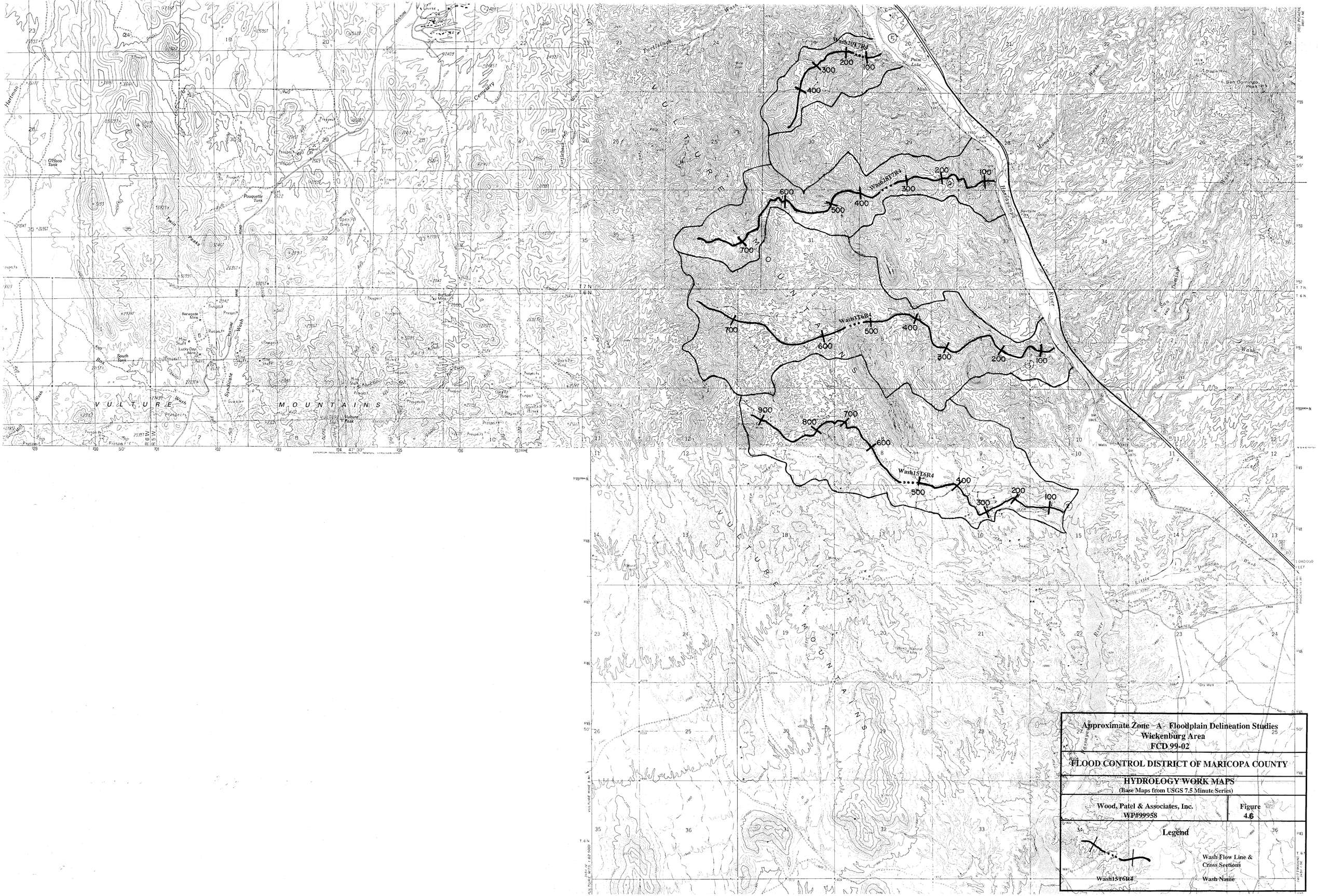
HYDROLOGY WORK MAPS
(Base Maps from USGS 7.5 Minute Series)

Wood, Patel & Associates, Inc. WP#99958	Figure 4.7

Legend

Wash Flow Line & Cross Sections

Wash15T6R4 — Wash Name


Approximate Zone - A - Floodplain Delineation Studies
Wickenburg Area
FCD 99-02
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
HYDROLOGY WORK MAPS
(Base Maps from USGS 7.5 Minute Series)
Wood, Patel & Associates, Inc.
WP#99958
Figure
4.6
Legend
Wash Flow Line &
Cross Sections
Wash15T6R4
Wash Name
Wash11T6R4
Wash16T6R4
Wash15T6R4
VULTURE MOUNTAINS
Hassayampa River
Vulture Peak
Palm Lake
Cemetery
Pouquette Tank
O'Haco Tank
South Tank
Lucky Day Mine
Renegade Mine
Sunflower Mine
Turtleback Mts.
Hartman Wash
Twin Peaks
Box Wash
Sunflower Wash
Turtleback Wash
Homestead Wash
Sun Dumingue Wash
Little Sun Dumingue Wash
San Domingo Peak
Wells Fargo
Dry Well
Gates
Topeka
Wells
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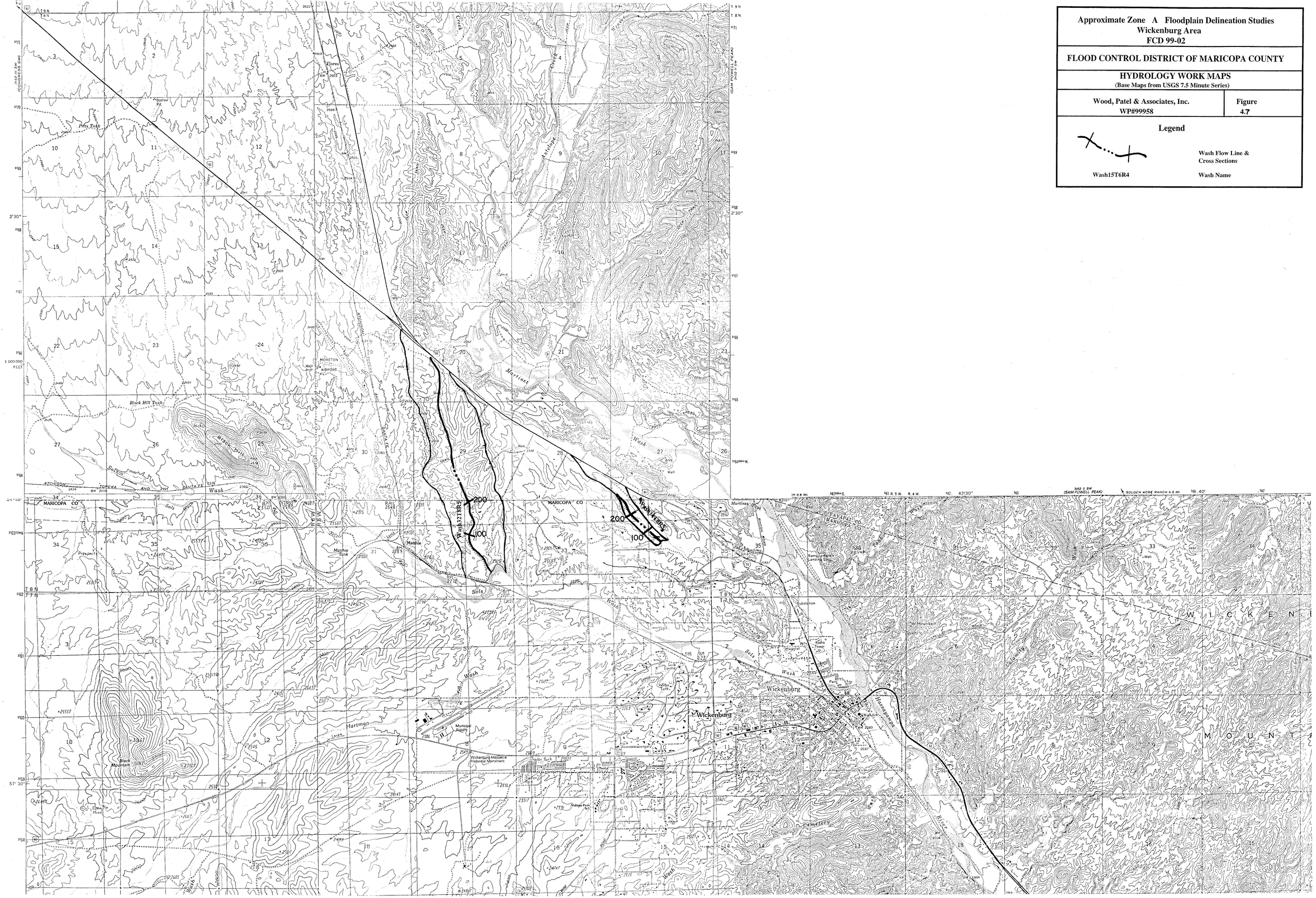


Approximate Zone A Floodplain Delineation Studies
Wickenburg Area
FCD 99-02

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

HYDROLOGY WORK MAPS
(Base Maps from USGS 7.5 Minute Series)

Wood, Patel & Associates, Inc. WP#99958	Figure 4.7

Legend

Wash Flow Line & Cross Sections

Wash15T6R4 — Wash Name

APPENDIX E

HYDRAULIC ANALYSIS SUPPORTING DOCUMENTATION

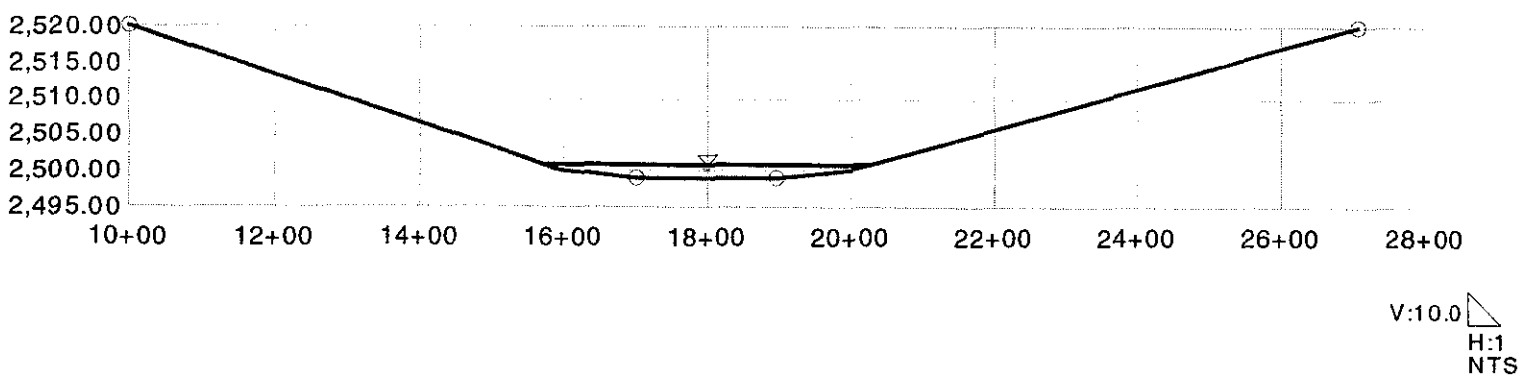
HYDRAULIC CALCULATIONS

Wash Name:	**Tributary to Sols Wash AH2**
Tributary to:	**Sols Wash Tributary AH2**
File Name:	**Wash33T8R6**

Cross Section 100
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash33T8R6 Section 100
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.047
Slope	0.006800 ft/ft
Water Surface Elevation	2,500.82 ft
Elevation Range	2,499.00 to 2,520.00
Discharge	2,142.00 cfs



Section 100
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash33T8R6 Section 100
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.006800	ft/ft
Discharge	2,142.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.047	
Water Surface Elevation	2,500.82	ft
Elevation Range	2,499.00 to 2,520.00	
Flow Area	650.4	ft²
Wetted Perimeter	455.59	ft
Top Width	455.55	ft
Actual Depth	1.82	ft
Critical Elevation	2,500.22	ft
Critical Slope	0.033143	ft/ft
Velocity	3.29	ft/s
Velocity Head	0.17	ft
Specific Energy	2,500.99	ft
Froude Number	0.49	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	17+02	0.045
17+02	18+97	0.050
18+97	27+07	0.045

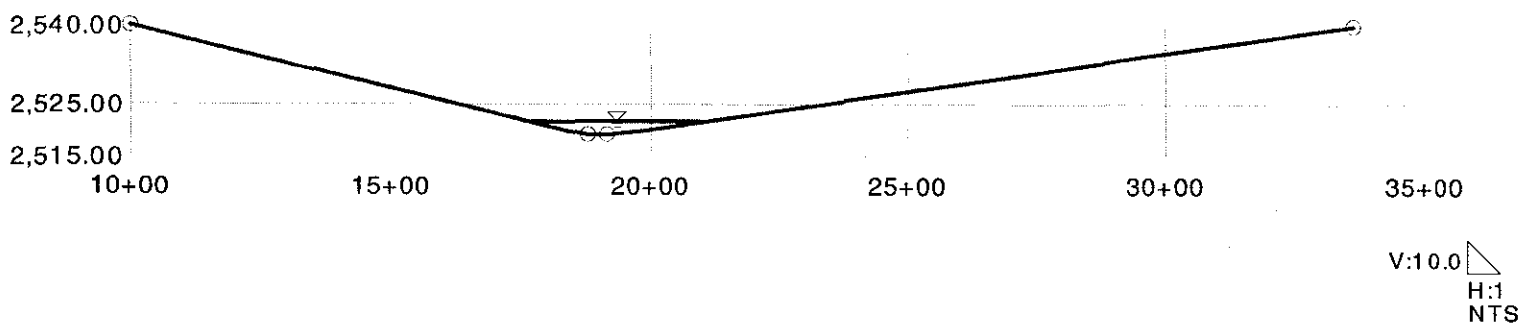
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,520.00
15+96	2,500.00
17+02	2,499.00
18+97	2,499.00
19+98	2,500.00
27+07	2,520.00

Cross Section 200
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash33T8R6 Section 200
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.046	
Slope	0.007700	ft/ft
Water Surface Elevation	2,521.65	ft
Elevation Range	2,519.00 to 2,540.00	
Discharge	1,808.00	cfs



Section 200
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash33T8R6 Section 200
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.007700	ft/ft
Discharge	1,808.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.046	
Water Surface Elevation	2,521.65	ft
Elevation Range	2,519.00 to 2,540.00	
Flow Area	487.7	ft^2
Wetted Perimeter	330.24	ft
Top Width	330.19	ft
Actual Depth	2.65	ft
Critical Elevation	2,521.01	ft
Critical Slope	0.028935	ft/ft
Velocity	3.71	ft/s
Velocity Head	0.21	ft
Specific Energy	2,521.87	ft
Froude Number	0.54	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	18+77	0.045
18+77	19+16	0.050
19+16	33+62	0.045

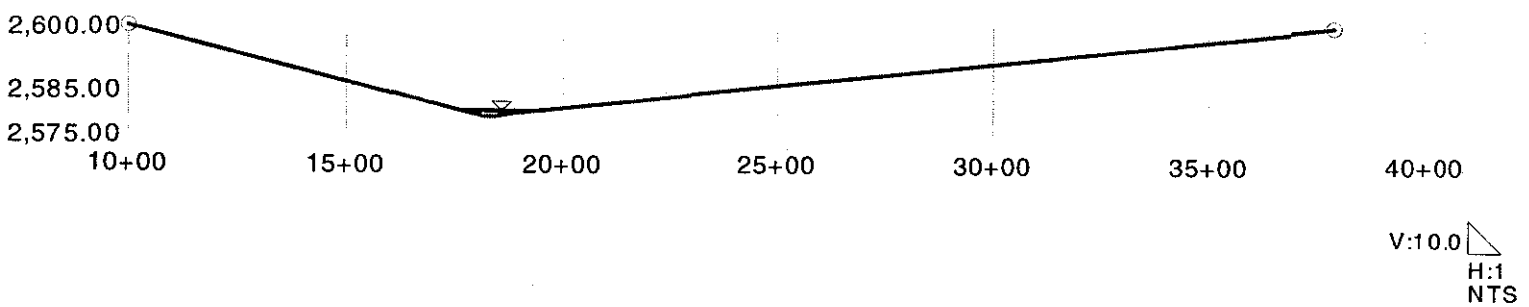
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,540.00
18+40	2,520.00
18+77	2,519.00
19+16	2,519.00
19+87	2,520.00
33+62	2,540.00

Cross Section 300
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash33T8R6 Section 300
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.045	
Slope	0.010000	ft/ft
Water Surface Elevation	2,580.66	ft
Elevation Range	2,579.00 to 2,600.00	
Discharge	484.00	cfs



Section 300
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash33T8R6 Section 300
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.010000	ft/ft
Discharge	484.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.045	
Water Surface Elevation	2,580.66	ft
Elevation Range	2,579.00 to 2,600.00	
Flow Area	164.8	ft^2
Wetted Perimeter	196.43	ft
Top Width	196.39	ft
Actual Depth	1.66	ft
Critical Elevation	2,580.30	ft
Critical Slope	0.033350	ft/ft
Velocity	2.94	ft/s
Velocity Head	0.13	ft
Specific Energy	2,580.79	ft
Froude Number	0.57	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	37+91	0.045

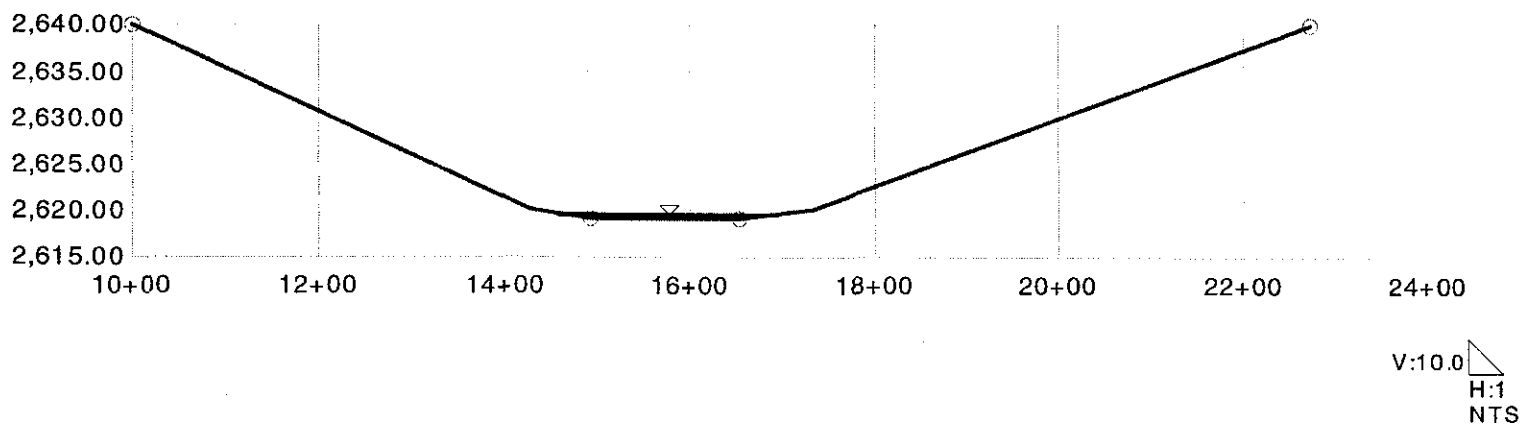
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,600.00
17+85	2,580.00
18+18	2,579.00
18+39	2,579.00
18+93	2,580.00
37+91	2,600.00

Cross Section 400
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash33T8R6 Section 400
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.048	
Slope	0.010000	ft/ft
Water Surface Elevation	2,619.52	ft
Elevation Range	2,619.00 to 2,640.00	
Discharge	183.00	cfs



Section 400
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash33T8R6 Section 400
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Slope	0.010000 ft/ft
Discharge	183.00 cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.048	
Water Surface Elevation	2,619.52	ft
Elevation Range	2,619.00 to 2,640.00	
Flow Area	103.7	ft²
Wetted Perimeter	237.96	ft
Top Width	237.95	ft
Actual Depth	0.52	ft
Critical Elevation	2,619.33	ft
Critical Slope	0.051736	ft/ft
Velocity	1.76	ft/s
Velocity Head	0.05	ft
Specific Energy	2,619.57	ft
Froude Number	0.47	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	14+92	0.045
14+92	16+53	0.050
16+53	22+73	0.045

Natural Channel Points

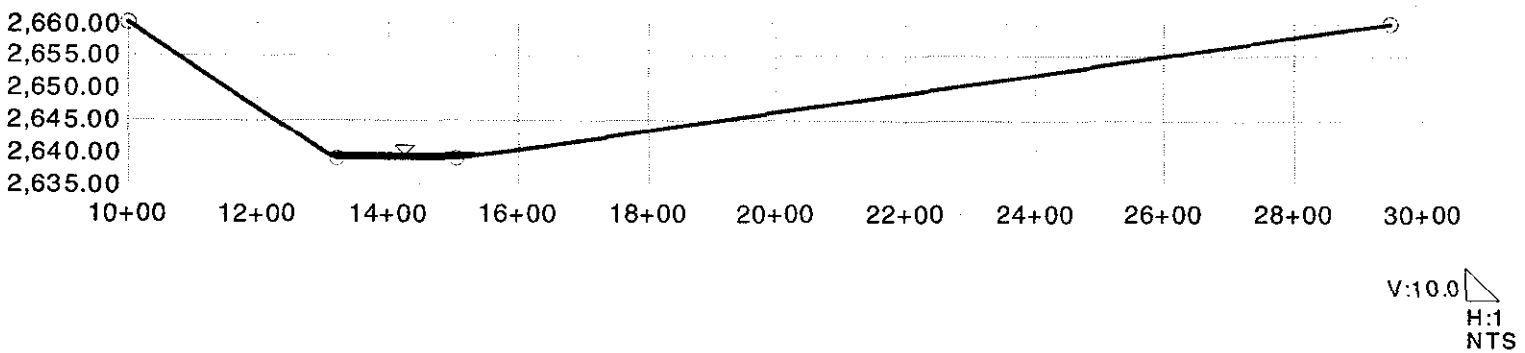
Station (ft)	Elevation (ft)
10+00	2,640.00
14+25	2,620.00
14+92	2,619.00
16+53	2,619.00
17+34	2,620.00
22+73	2,640.00

Wash Name:	**Sols Wash Tributary AH3**
Tributary to:	**Sols Wash Tributary AH2**
File Name:	**Wash22T7R6**

Cross Section 100
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash22T7R6 Section 100
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.051	
Slope	0.077000	ft/ft
Water Surface Elevation	2,639.58	ft
Elevation Range	2,639.00 to 2,660.00	
Discharge	633.00	cfs



Section 100
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash22T7R6 Section 100
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.077000	ft/ft
Discharge	633.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.051	
Water Surface Elevation	2,639.58	ft
Elevation Range	2,639.00 to 2,660.00	
Flow Area	120.3	ft²
Wetted Perimeter	229.16	ft
Top Width	229.14	ft
Actual Depth	0.58	ft
Critical Elevation	2,639.68	ft
Critical Slope	0.044859	ft/ft
Velocity	5.26	ft/s
Velocity Head	0.43	ft
Specific Energy	2,640.01	ft
Froude Number	1.28	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	13+20	0.055
13+20	15+03	0.050
15+03	29+50	0.055

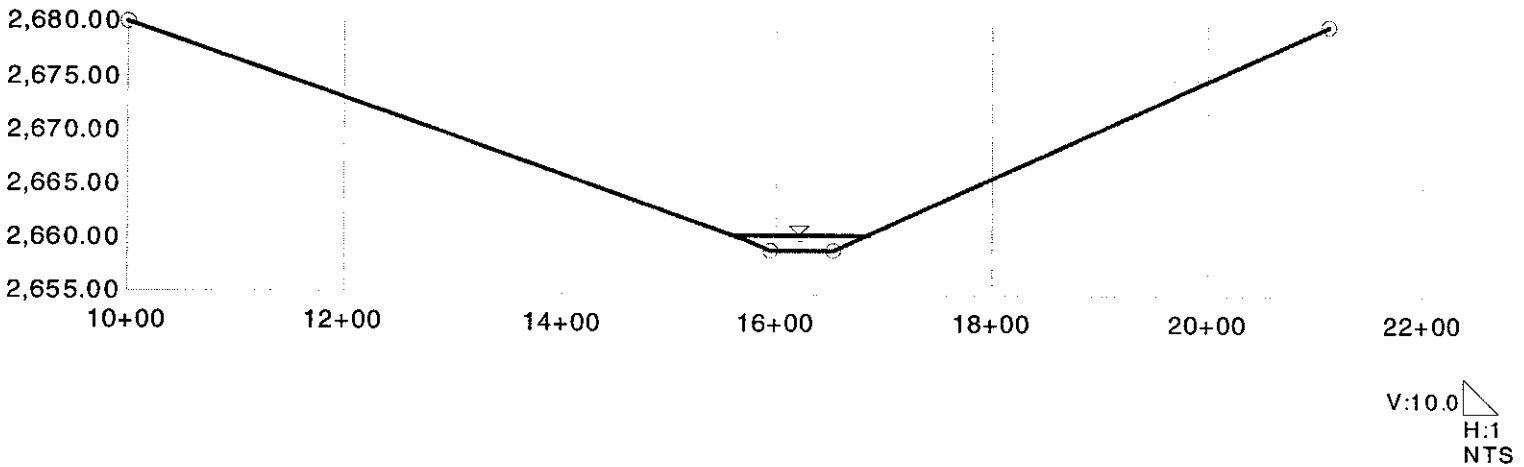
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,660.00
13+04	2,640.00
13+20	2,639.00
15+03	2,639.00
15+66	2,640.00
29+50	2,660.00

Cross Section 200
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash22T7R6 Section 200
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.053	
Slope	0.012000	ft/ft
Water Surface Elevation	2,660.43	ft
Elevation Range	2,659.00 to 2,680.00	
Discharge	428.00	cfs



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Section 200
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash22T7R6 Section 200
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.012000	ft/ft
Discharge	428.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.053	
Water Surface Elevation	2,660.43	ft
Elevation Range	2,659.00 to 2,680.00	
Flow Area	134.6	ft²
Wetted Perimeter	128.86	ft
Top Width	128.80	ft
Actual Depth	1.43	ft
Critical Elevation	2,660.01	ft
Critical Slope	0.043824	ft/ft
Velocity	3.18	ft/s
Velocity Head	0.16	ft
Specific Energy	2,660.59	ft
Froude Number	0.55	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	15+93	0.055
15+93	16+53	0.050
16+53	21+13	0.055

Natural Channel Points

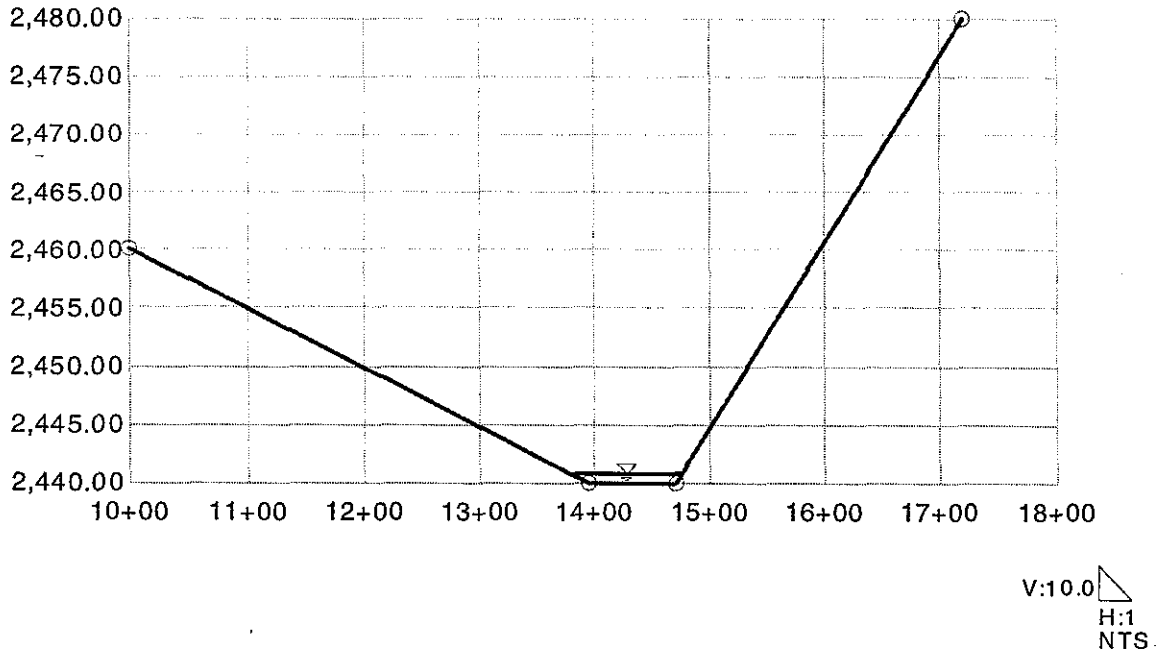
Station (ft)	Elevation (ft)
10+00	2,680.00
15+69	2,660.00
15+93	2,659.00
16+53	2,659.00
16+76	2,660.00
21+13	2,680.00

Wash Name:	**Sols Wash Tributary AH4**
Tributary to:	**Sols Wash Tributary AH2**
File Name:	**Wash2T7R6**

Cross Section 100
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash2T7R6 Section 100
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.051	
Slope	0.042000	ft/ft
Water Surface Elevation	2,440.76	ft
Elevation Range	2,440.00 to 2,480.00	
Discharge	309.00	cfs



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Section 100
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash2T7R6 Section 100
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Slope	0.042000 ft/ft
Discharge	309.00 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.051	
Water Surface Elevation	2,440.76	ft
Elevation Range	2,440.00 to 2,480.00	
Flow Area	66.2	ft²
Wetted Perimeter	96.84	ft
Top Width	96.76	ft
Actual Depth	0.76	ft
Critical Elevation	2,440.76	ft
Critical Slope	0.042412	ft/ft
Velocity	4.67	ft/s
Velocity Head	0.34	ft
Specific Energy	2,441.10	ft
Froude Number	1.00	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	13+94	0.055
13+94	14+71	0.050
14+71	17+20	0.055

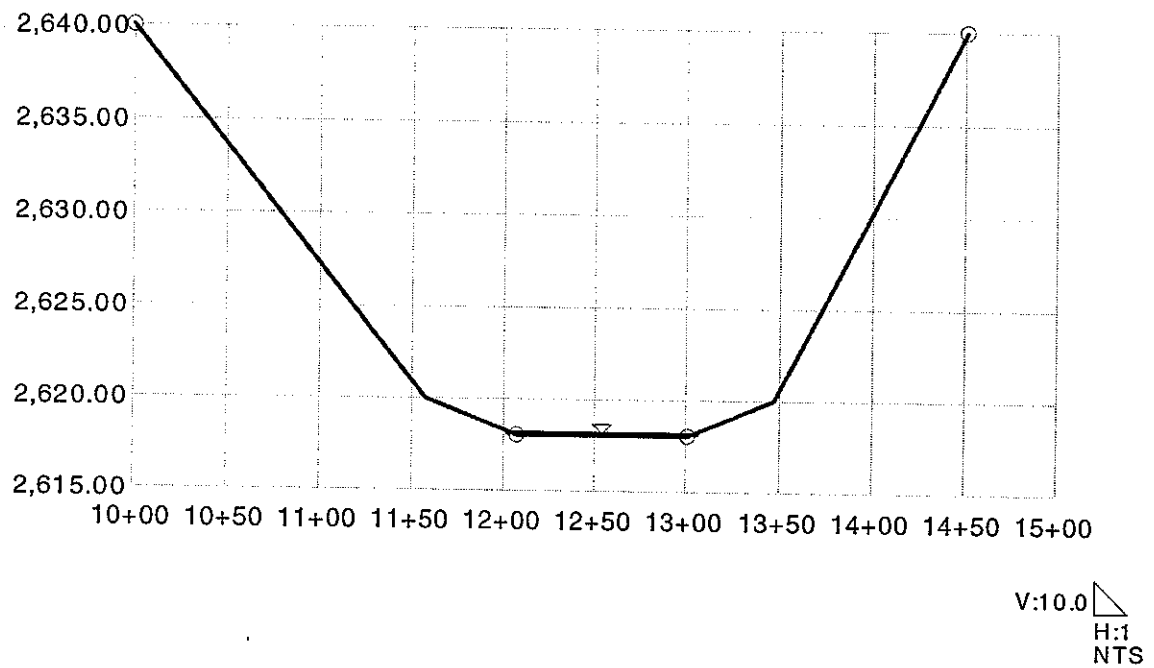
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,460.00
13+94	2,440.00
14+71	2,440.00
15+96	2,460.00
17+20	2,480.00

Cross Section 200
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash2T7R6 Section 200
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.050	
Slope	0.120000	ft/ft
Water Surface Elevation	2,618.20	ft
Elevation Range	2,618.00 to 2,640.00	
Discharge	68.00	cfs



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Section 200
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash2T7R6 Section 200
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.120000	ft/ft
Discharge	68.00	cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.050	
Water Surface Elevation	2,618.20	ft
Elevation Range	2,618.00 to 2,640.00	
Flow Area	20.0	ft²
Wetted Perimeter	103.71	ft
Top Width	103.71	ft
Actual Depth	0.20	ft
Critical Elevation	2,618.25	ft
Critical Slope	0.060262	ft/ft
Velocity	3.40	ft/s
Velocity Head	0.18	ft
Specific Energy	2,618.38	ft
Froude Number	1.37	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	12+07	0.055
12+07	13+01	0.050
13+01	14+52	0.055

Natural Channel Points

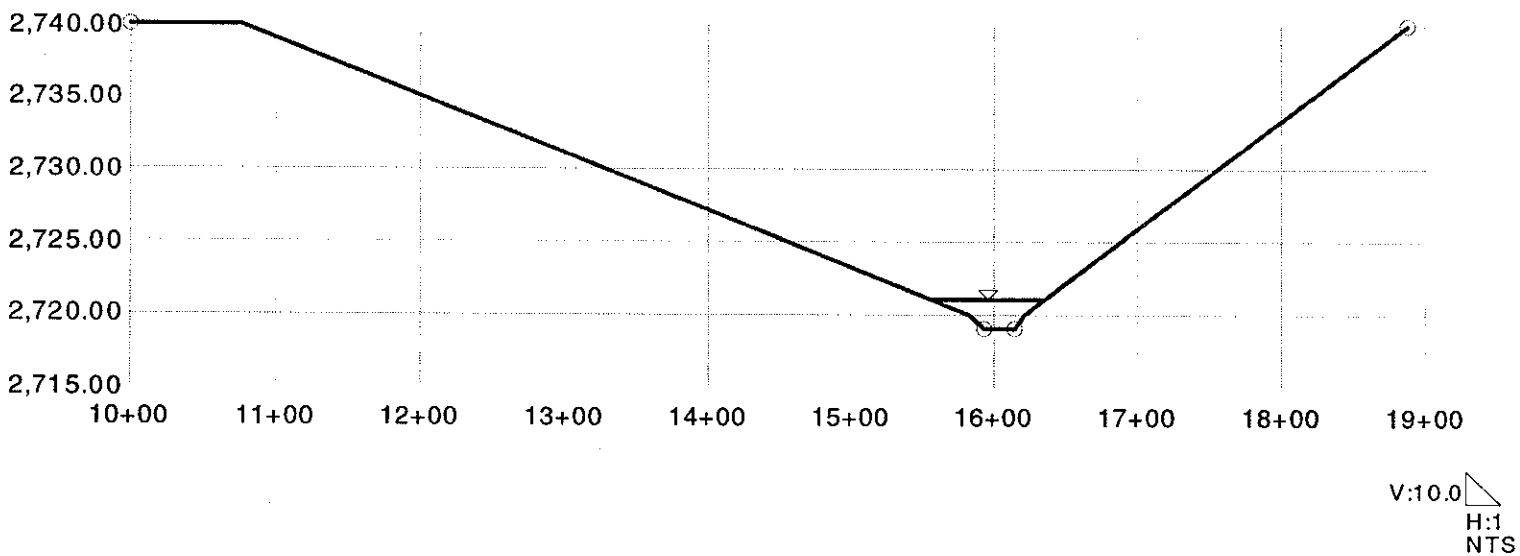
Station (ft)	Elevation (ft)
10+00	2,640.00
11+57	2,620.00
12+07	2,618.00
13+01	2,618.00
13+47	2,620.00
14+52	2,640.00

Wash Name:	**Tributary to Hartman Wash**
Tributary to:	**Hartman Wash**
File Name:	**Wash27T7R6**

Cross Section 100
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash27T7R6 Section 100
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.054	
Slope	0.013000	ft/ft
Water Surface Elevation	2,721.01	ft
Elevation Range	2,719.00 to 2,740.00	
Discharge	302.00	cfs



Section 100
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash27T7R6 Section 100
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.013000	ft/ft
Discharge	302.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.054	
Water Surface Elevation	2,721.01	ft
Elevation Range	2,719.00 to 2,740.00	
Flow Area	87.9	ft²
Wetted Perimeter	77.40	ft
Top Width	77.22	ft
Actual Depth	2.01	ft
Critical Elevation	2,720.53	ft
Critical Slope	0.042988	ft/ft
Velocity	3.44	ft/s
Velocity Head	0.18	ft
Specific Energy	2,721.20	ft
Froude Number	0.57	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	15+93	0.055
15+93	16+14	0.050
16+14	18+88	0.055

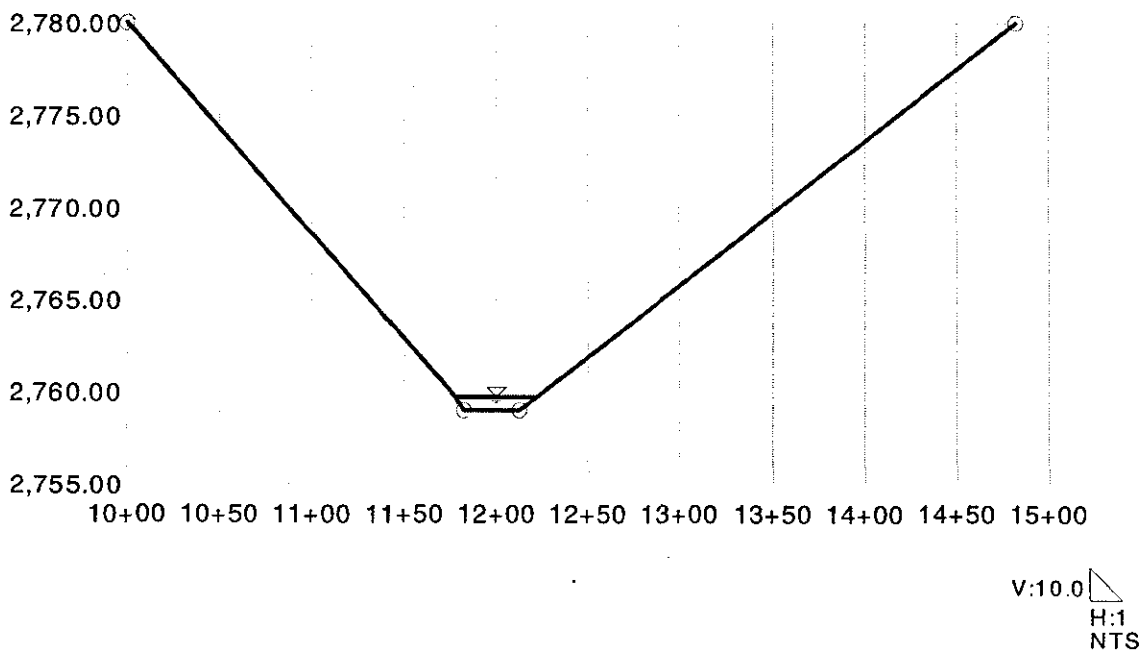
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,740.00
10+76	2,740.00
15+83	2,720.00
15+93	2,719.00
16+14	2,719.00
16+21	2,720.00
18+88	2,740.00

Cross Section 200
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash27T7R6 Section 200
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.052	
Slope	0.009400	ft/ft
Water Surface Elevation	2,759.67	ft
Elevation Range	2,759.00 to 2,780.00	
Discharge	47.00	cfs



Section 200
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash27T7R6 Section 200
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.009400	ft/ft
Discharge	47.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.052	
Water Surface Elevation	2,759.67	ft
Elevation Range	2,759.00 to 2,780.00	
Flow Area	24.8	ft²
Wetted Perimeter	44.11	ft
Top Width	44.04	ft
Actual Depth	0.67	ft
Critical Elevation	2,759.40	ft
Critical Slope	0.054713	ft/ft
Velocity	1.90	ft/s
Velocity Head	0.06	ft
Specific Energy	2,759.72	ft
Froude Number	0.45	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	11+82	0.055
11+82	12+12	0.050
12+12	14+83	0.055

Natural Channel Points

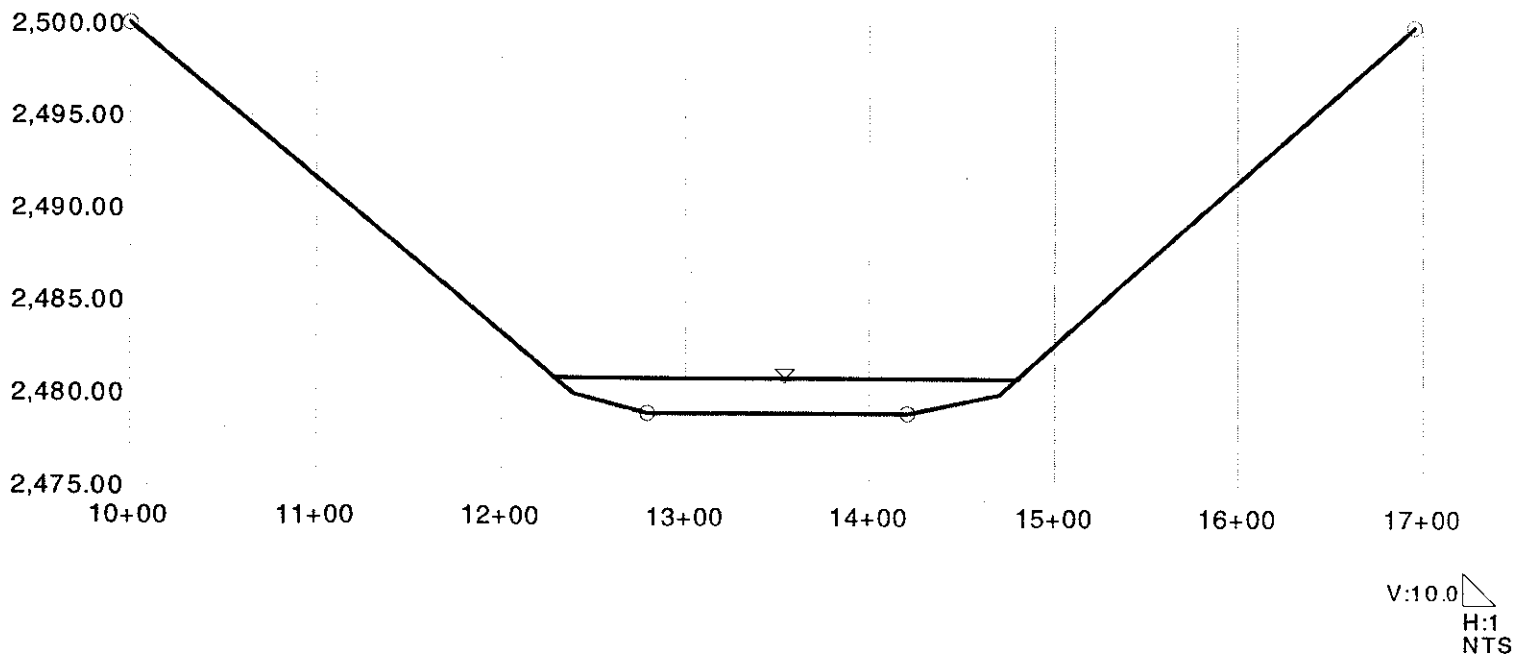
Station (ft)	Elevation (ft)
10+00	2,780.00
11+75	2,760.00
11+82	2,759.00
12+12	2,759.00
12+26	2,760.00
14+83	2,780.00

Wash Name:	**Yucca Flat Wash**
Tributary to:	**Flying Wash**
File Name:	**Wash19T7R5**

Cross Section 100
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash19T7R5 Section 100
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.055	
Slope	0.019000	ft/ft
Water Surface Elevation	2,480.90	ft
Elevation Range	2,479.00 to 2,500.00	
Discharge	2,085.00	cfs



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Section 100
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash19T7R5 Section 100
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.019000	ft/ft
Discharge	2,085.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.055	
Water Surface Elevation	2,480.90	ft
Elevation Range	2,479.00 to 2,500.00	
Flow Area	405.5	ft²
Wetted Perimeter	253.05	ft
Top Width	252.95	ft
Actual Depth	1.90	ft
Critical Elevation	2,480.56	ft
Critical Slope	0.039629	ft/ft
Velocity	5.14	ft/s
Velocity Head	0.41	ft
Specific Energy	2,481.31	ft
Froude Number	0.72	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	12+79	0.060
12+79	14+20	0.050
14+20	16+96	0.060

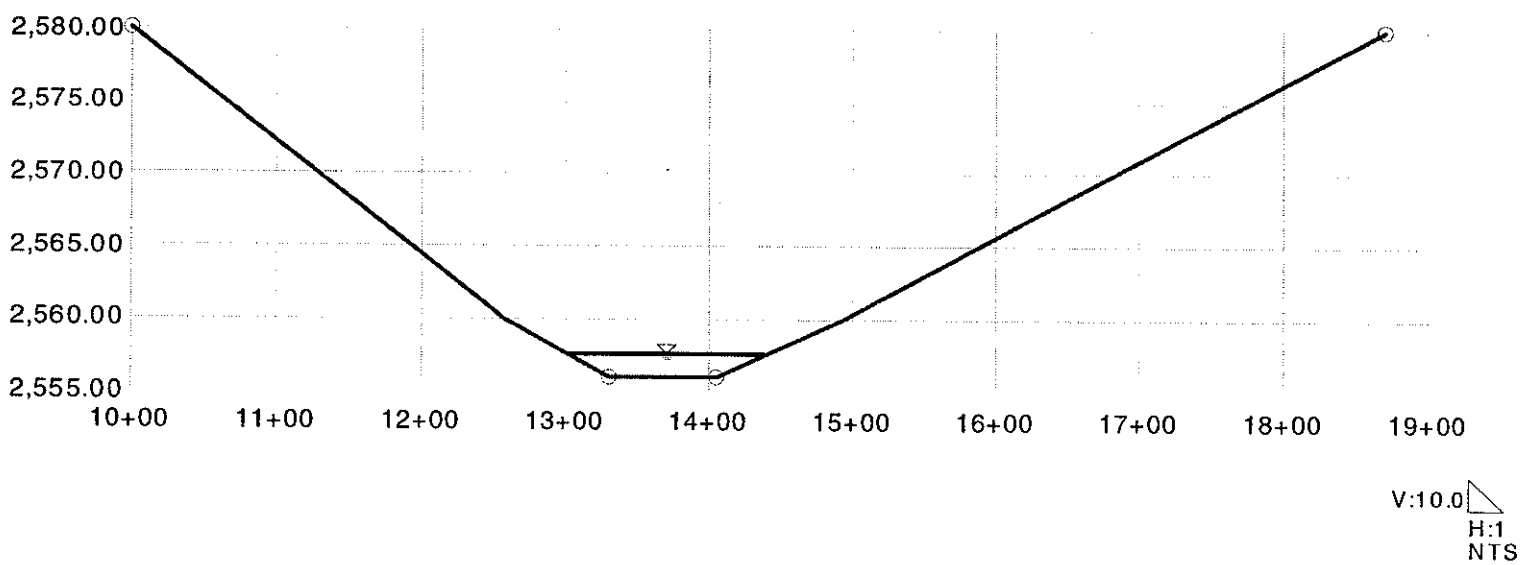
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,500.00
12+38	2,480.00
12+79	2,479.00
14+20	2,479.00
14+70	2,480.00
16+96	2,500.00

Cross Section 200
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash19T7R5 Section 200
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.055	
Slope	0.014000	ft/ft
Water Surface Elevation	2,557.50	ft
Elevation Range	2,556.00 to 2,580.00	
Discharge	560.00	cfs



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Section 200
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash19T7R5 Section 200
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.014000	ft/ft
Discharge	560.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.055	
Water Surface Elevation	2,557.50	ft
Elevation Range	2,556.00 to 2,580.00	
Flow Area	157.2	ft^2
Wetted Perimeter	135.29	ft
Top Width	135.21	ft
Actual Depth	1.50	ft
Critical Elevation	2,557.08	ft
Critical Slope	0.045228	ft/ft
Velocity	3.56	ft/s
Velocity Head	0.20	ft
Specific Energy	2,557.69	ft
Froude Number	0.58	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	13+31	0.060
13+31	14+06	0.050
14+06	18+70	0.060

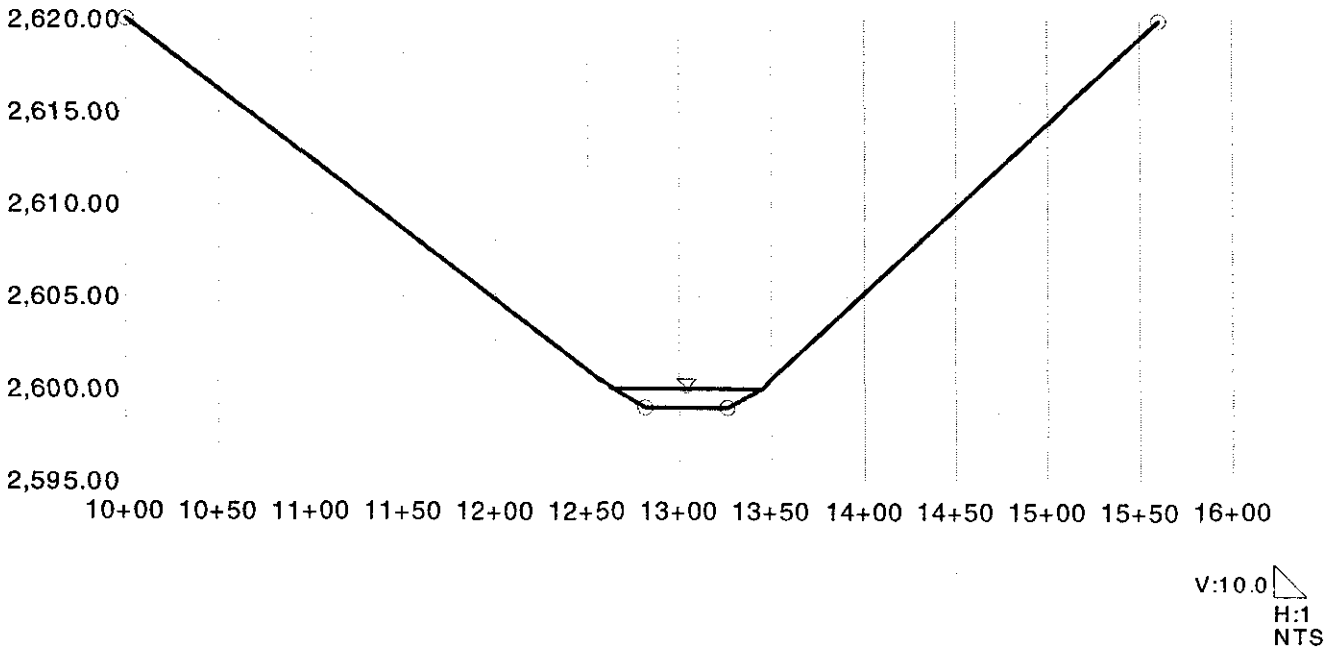
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,580.00
12+58	2,560.00
13+31	2,556.00
14+06	2,556.00
14+94	2,560.00
18+70	2,580.00

Cross Section 300
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash19T7R5 Section 300
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.055	
Slope	0.025000	ft/ft
Water Surface Elevation	2,600.07	ft
Elevation Range	2,599.00 to 2,620.00	
Discharge	263.00	cfs



Section 300
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash19T7R5 Section 300
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.025000	ft/ft
Discharge	263.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.055	
Water Surface Elevation	2,600.07	ft
Elevation Range	2,599.00 to 2,620.00	
Flow Area	69.1	ft^2
Wetted Perimeter	82.85	ft
Top Width	82.78	ft
Actual Depth	1.07	ft
Critical Elevation	2,599.90	ft
Critical Slope	0.048862	ft/ft
Velocity	3.81	ft/s
Velocity Head	0.23	ft
Specific Energy	2,600.30	ft
Froude Number	0.73	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	12+81	0.060
12+81	13+26	0.050
13+26	15+61	0.060

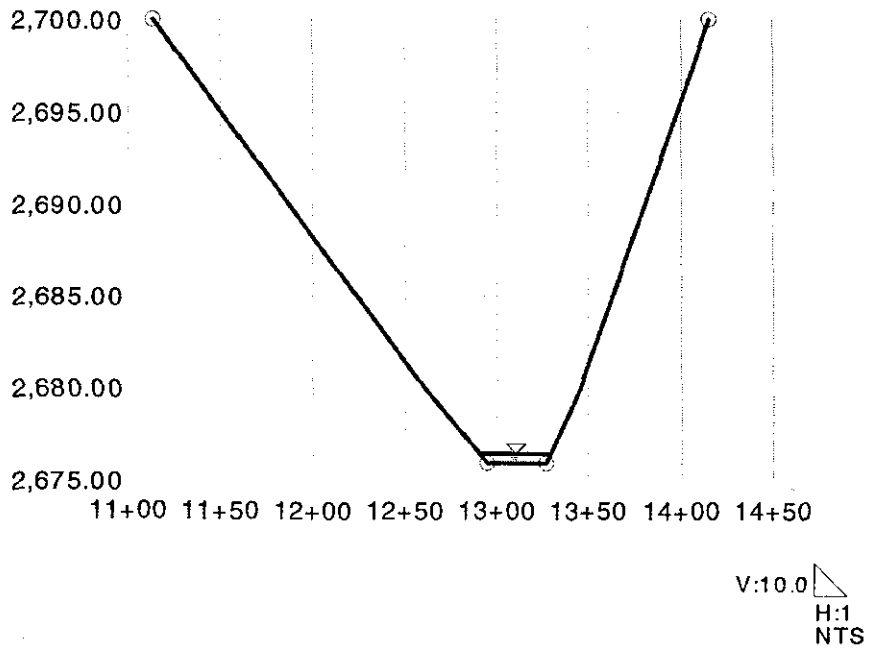
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,620.00
12+63	2,600.00
12+81	2,599.00
13+26	2,599.00
13+44	2,600.00
15+61	2,620.00

Cross Section 400
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash19T7R5 Section 400
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.052	
Slope	0.046000	ft/ft
Water Surface Elevation	2,676.45	ft
Elevation Range	2,676.00 to 2,700.00	
Discharge	55.00	cfs



Section 400
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash19T7R5 Section 400
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.046000	ft/ft
Discharge	55.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.052	
Water Surface Elevation	2,676.45	ft
Elevation Range	2,676.00 to 2,700.00	
Flow Area	16.1	ft^2
Wetted Perimeter	38.89	ft
Top Width	38.81	ft
Actual Depth	0.45	ft
Critical Elevation	2,676.43	ft
Critical Slope	0.052815	ft/ft
Velocity	3.43	ft/s
Velocity Head	0.18	ft
Specific Energy	2,676.63	ft
Froude Number	0.94	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
11+13	12+94	0.060
12+94	13+27	0.050
13+27	14+16	0.060

Natural Channel Points

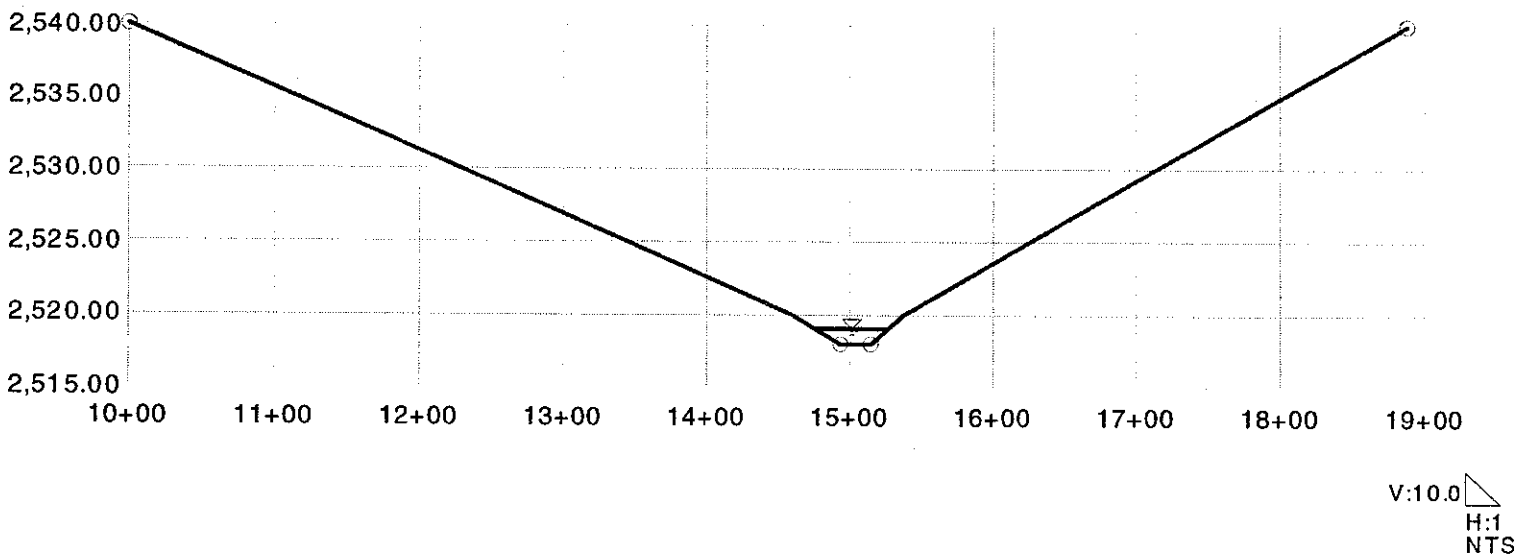
Station (ft)	Elevation (ft)
11+13	2,700.00
12+60	2,680.00
12+94	2,676.00
13+27	2,676.00
13+45	2,680.00
14+16	2,700.00

Wash Name:	**Holly Wash**
Tributary to:	**Upper Flying "E" Wash**
File Name:	**Wash20T7R5**

Cross Section 200
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash20T7R5 Section 200
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.053	
Slope	0.028000	ft/ft
Water Surface Elevation	2,519.00	ft
Elevation Range	2,518.00 to 2,540.00	
Discharge	132.00	cfs



Section 200
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash20T7R5 Section 200
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.028000	ft/ft
Discharge	132.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.053	
Water Surface Elevation	2,519.00	ft
Elevation Range	2,518.00 to 2,540.00	
Flow Area	35.1	ft^2
Wetted Perimeter	49.15	ft
Top Width	49.07	ft
Actual Depth	1.00	ft
Critical Elevation	2,518.88	ft
Critical Slope	0.047408	ft/ft
Velocity	3.76	ft/s
Velocity Head	0.22	ft
Specific Energy	2,519.22	ft
Froude Number	0.78	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	14+94	0.055
14+94	15+15	0.050
15+15	18+88	0.055

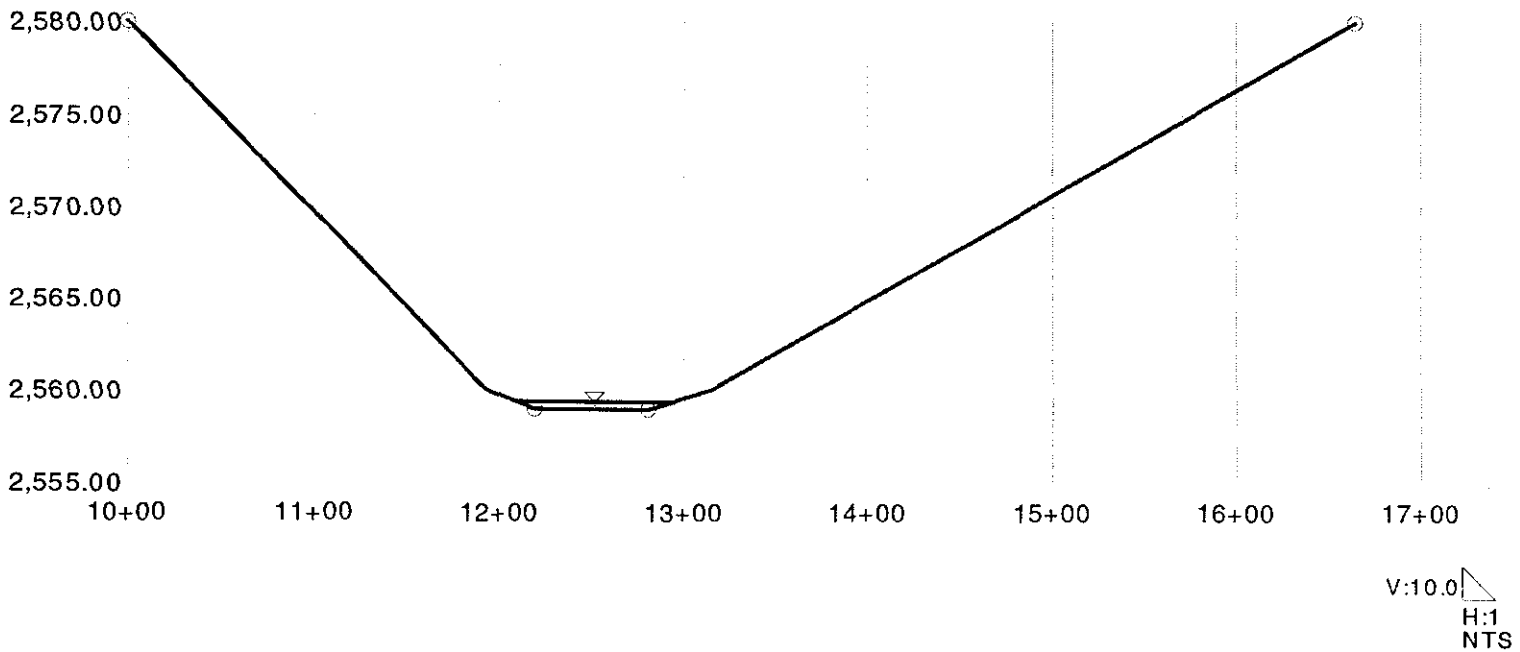
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,540.00
14+60	2,520.00
14+94	2,518.00
15+15	2,518.00
15+37	2,520.00
18+88	2,540.00

Cross Section 300
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash20T7R5 Section 300
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.051	
Slope	0.016000	ft/ft
Water Surface Elevation	2,559.41	ft
Elevation Range	2,559.00 to 2,580.00	
Discharge	55.00	cfs



Section 300
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash20T7R5 Section 300
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.016000	ft/ft
Discharge	55.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.051	
Water Surface Elevation	2,559.41	ft
Elevation Range	2,559.00 to 2,580.00	
Flow Area	30.3	ft²
Wetted Perimeter	86.50	ft
Top Width	86.48	ft
Actual Depth	0.41	ft
Critical Elevation	2,559.28	ft
Critical Slope	0.061402	ft/ft
Velocity	1.82	ft/s
Velocity Head	0.05	ft
Specific Energy	2,559.46	ft
Froude Number	0.54	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	12+18	0.055
12+18	12+80	0.050
12+80	16+65	0.055

Natural Channel Points

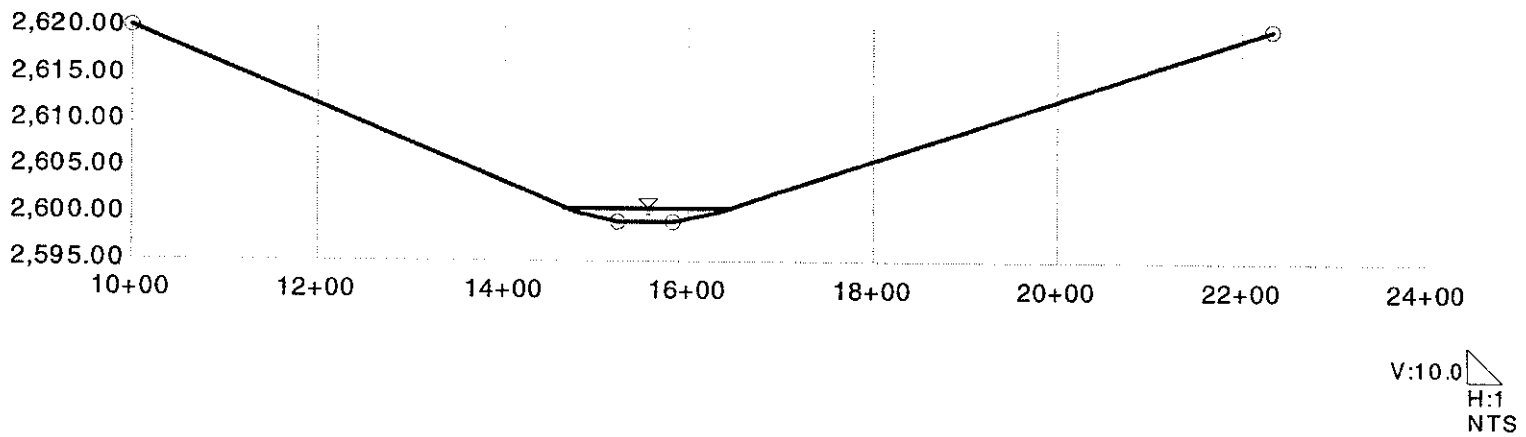
Station (ft)	Elevation (ft)
10+00	2,580.00
11+92	2,560.00
12+18	2,559.00
12+80	2,559.00
13+14	2,560.00
16+65	2,580.00

Wash Name:	**Cemetery Wash**
Tributary to:	**Cemetery Wash Tributary #3**
File Name:	**Wash28T7R5**

Cross Section 300
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash28T7R5 Section 300
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.062	
Slope	0.021000	ft/ft
Water Surface Elevation	2,600.48	ft
Elevation Range	2,599.00 to 2,620.00	
Discharge	675.00	cfs



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Section 300
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash28T7R5 Section 300
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.021000	ft/ft
Discharge	675.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.062	
Water Surface Elevation	2,600.48	ft
Elevation Range	2,599.00 to 2,620.00	
Flow Area	188.9	ft^2
Wetted Perimeter	181.84	ft
Top Width	181.81	ft
Actual Depth	1.48	ft
Critical Elevation	2,600.15	ft
Critical Slope	0.059780	ft/ft
Velocity	3.57	ft/s
Velocity Head	0.20	ft
Specific Energy	2,600.68	ft
Froude Number	0.62	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	15+22	0.065
15+22	15+82	0.055
15+82	22+34	0.065

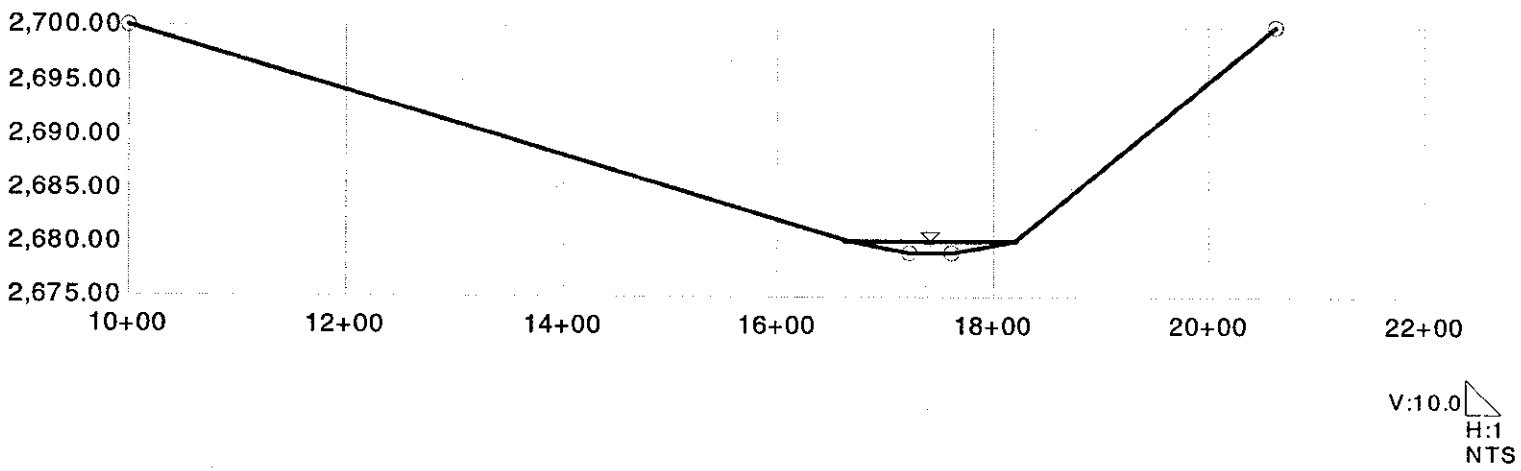
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,620.00
14+77	2,600.00
15+22	2,599.00
15+82	2,599.00
16+33	2,600.00
22+34	2,620.00

Cross Section 400
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash28T7R5 Section 400
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.058	
Slope	0.024000	ft/ft
Water Surface Elevation	2,680.16	ft
Elevation Range	2,679.00 to 2,700.00	
Discharge	403.00	cfs



Section 400
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash28T7R5 Section 400
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.024000	ft/ft
Discharge	403.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.058	
Water Surface Elevation	2,680.16	ft
Elevation Range	2,679.00 to 2,700.00	
Flow Area	121.9	ft²
Wetted Perimeter	161.49	ft
Top Width	161.46	ft
Actual Depth	1.16	ft
Critical Elevation	2,679.97	ft
Critical Slope	0.057368	ft/ft
Velocity	3.31	ft/s
Velocity Head	0.17	ft
Specific Energy	2,680.33	ft
Froude Number	0.67	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	17+22	0.060
17+22	17+60	0.050
17+60	20+63	0.060

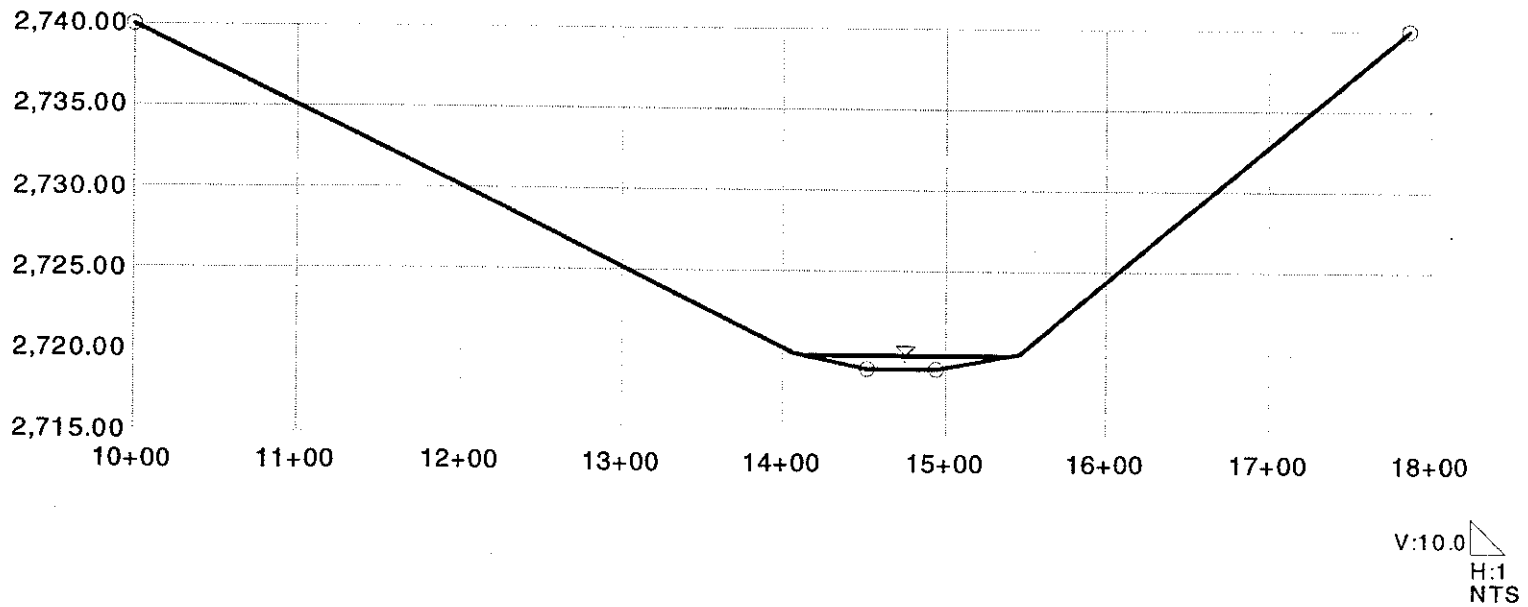
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,700.00
16+66	2,680.00
17+22	2,679.00
17+60	2,679.00
18+20	2,680.00
20+63	2,700.00

Cross Section 500
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash28T7R5 Section 500
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.057	
Slope	0.028000	ft/ft
Water Surface Elevation	2,719.82	ft
Elevation Range	2,719.00 to 2,740.00	
Discharge	201.00	cfs



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Section 500
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash28T7R5 Section 500
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.028000	ft/ft
Discharge	201.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.057	
Water Surface Elevation	2,719.82	ft
Elevation Range	2,719.00 to 2,740.00	
Flow Area	68.0	ft^2
Wetted Perimeter	122.85	ft
Top Width	122.83	ft
Actual Depth	0.82	ft
Critical Elevation	2,719.68	ft
Critical Slope	0.060095	ft/ft
Velocity	2.96	ft/s
Velocity Head	0.14	ft
Specific Energy	2,719.96	ft
Froude Number	0.70	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	14+52	0.060
14+52	14+94	0.050
14+94	17+87	0.060

Natural Channel Points

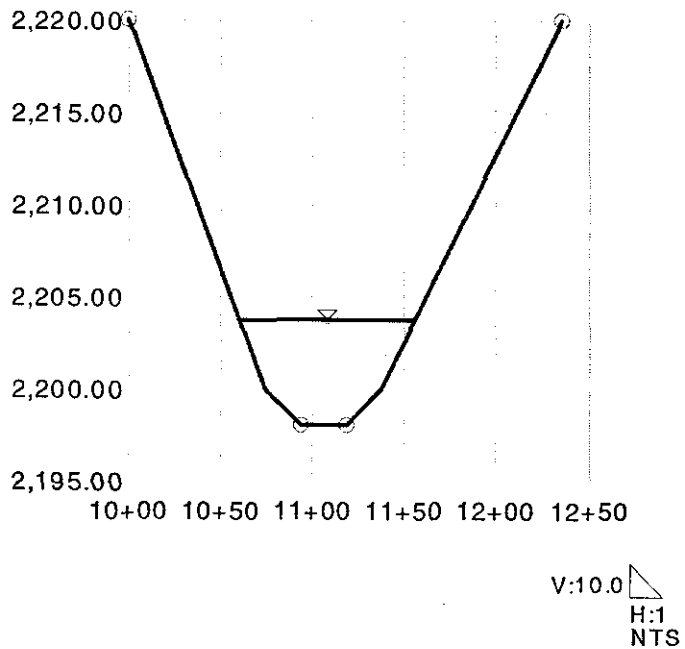
Station (ft)	Elevation (ft)
10+00	2,740.00
14+06	2,720.00
14+52	2,719.00
14+94	2,719.00
15+46	2,720.00
17+87	2,740.00

Wash Name:	**Turtleback Wash**
Tributary to:	**Hassayampa River**
File Name:	**Wash24T7R5**

Cross Section 200
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash24T7R5 Section 200
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.064
Slope	0.020000 ft/ft
Water Surface Elevation	2,203.78 ft
Elevation Range	2,198.00 to 2,220.00
Discharge	3,226.00 cfs



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Section 200
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash24T7R5 Section 200
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.020000	ft/ft
Discharge	3,226.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.064	
Water Surface Elevation	2,203.78	ft
Elevation Range	2,198.00 to 2,220.00	
Flow Area	387.8	ft^2
Wetted Perimeter	96.77	ft
Top Width	95.68	ft
Actual Depth	5.78	ft
Critical Elevation	2,202.88	ft
Critical Slope	0.039603	ft/ft
Velocity	8.32	ft/s
Velocity Head	1.08	ft
Specific Energy	2,204.85	ft
Froude Number	0.73	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	10+93	0.065
10+93	11+18	0.060
11+18	12+36	0.065

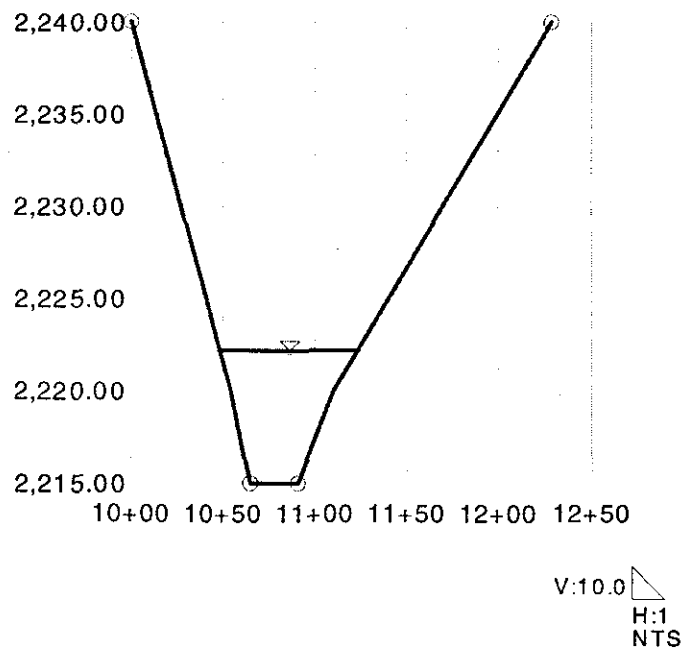
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,220.00
10+74	2,200.00
10+93	2,198.00
11+18	2,198.00
11+37	2,200.00
12+36	2,220.00

Cross Section 300
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash24T7R5 Section 300
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.063	
Slope	0.019000	ft/ft
Water Surface Elevation	2,222.23	ft
Elevation Range	2,215.00 to 2,240.00	
Discharge	3,111.00	cfs



Section 300
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash24T7R5 Section 300
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.019000	ft/ft
Discharge	3,111.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.063	
Water Surface Elevation	2,222.23	ft
Elevation Range	2,215.00 to 2,240.00	
Flow Area	351.7	ft²
Wetted Perimeter	77.71	ft
Top Width	75.32	ft
Actual Depth	7.23	ft
Critical Elevation	2,221.07	ft
Critical Slope	0.037989	ft/ft
Velocity	8.85	ft/s
Velocity Head	1.22	ft
Specific Energy	2,223.45	ft
Froude Number	0.72	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	10+64	0.065
10+64	10+90	0.060
10+90	12+29	0.065

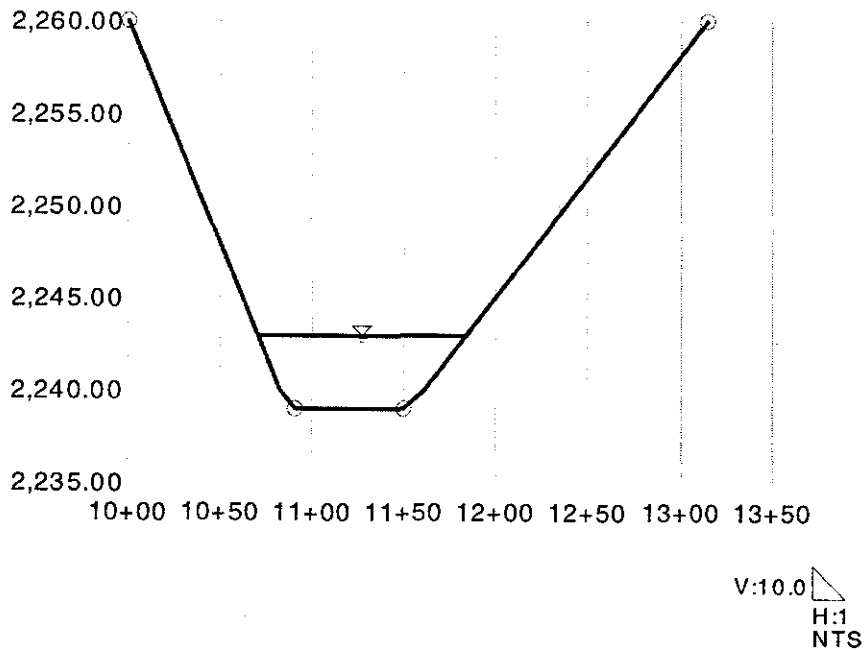
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,240.00
10+54	2,220.00
10+64	2,215.00
10+90	2,215.00
11+10	2,220.00
12+29	2,240.00

Cross Section 400
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash24T7R5 Section 400
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.062
Slope	0.024000 ft/ft
Water Surface Elevation	2,242.94 ft
Elevation Range	2,239.00 to 2,260.00
Discharge	2,754.00 cfs



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Section 400
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash24T7R5 Section 400
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.024000	ft/ft
Discharge	2,754.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.062	
Water Surface Elevation	2,242.94	ft
Elevation Range	2,239.00 to 2,260.00	
Flow Area	352.4	ft^2
Wetted Perimeter	114.31	ft
Top Width	113.66	ft
Actual Depth	3.94	ft
Critical Elevation	2,242.40	ft
Critical Slope	0.040854	ft/ft
Velocity	7.81	ft/s
Velocity Head	0.95	ft
Specific Energy	2,243.89	ft
Froude Number	0.78	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	10+90	0.065
10+90	11+50	0.060
11+50	13+15	0.065

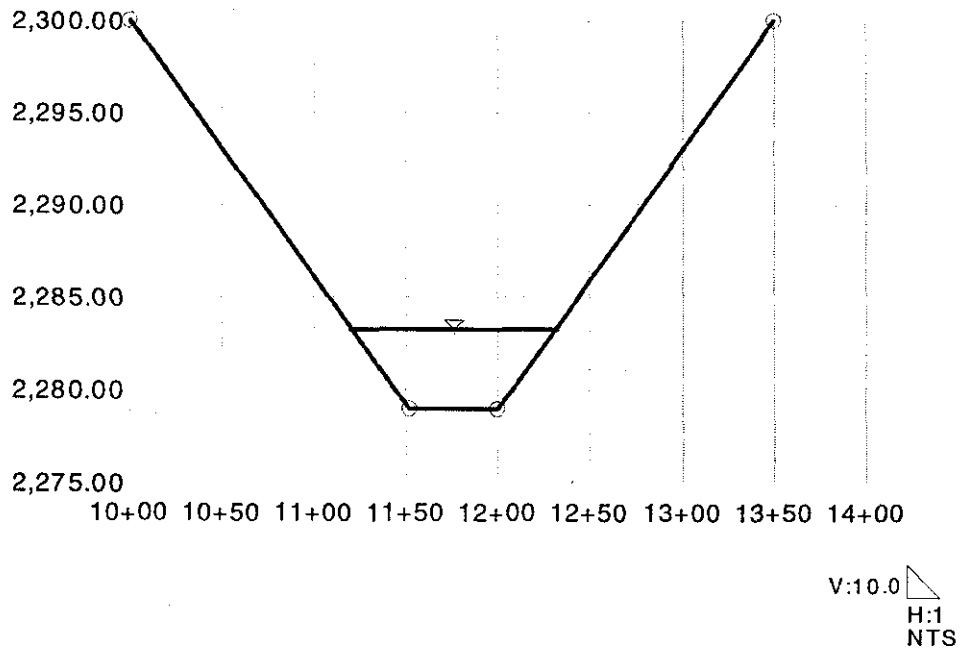
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,260.00
10+82	2,240.00
10+90	2,239.00
11+50	2,239.00
11+61	2,240.00
13+15	2,260.00

Cross Section 500
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash24T7R5 Section 500
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.063
Slope	0.022000 ft/ft
Water Surface Elevation	2,283.29 ft
Elevation Range	2,279.00 to 2,300.00
Discharge	2,588.00 cfs



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Section 500
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash24T7R5 Section 500
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.022000	ft/ft
Discharge	2,588.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.063	
Water Surface Elevation	2,283.29	ft
Elevation Range	2,279.00 to 2,300.00	
Flow Area	348.1	ft^2
Wetted Perimeter	112.67	ft
Top Width	112.10	ft
Actual Depth	4.29	ft
Critical Elevation	2,282.64	ft
Critical Slope	0.041643	ft/ft
Velocity	7.43	ft/s
Velocity Head	0.86	ft
Specific Energy	2,284.15	ft
Froude Number	0.74	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	11+52	0.065
11+52	12+00	0.060
12+00	13+51	0.065

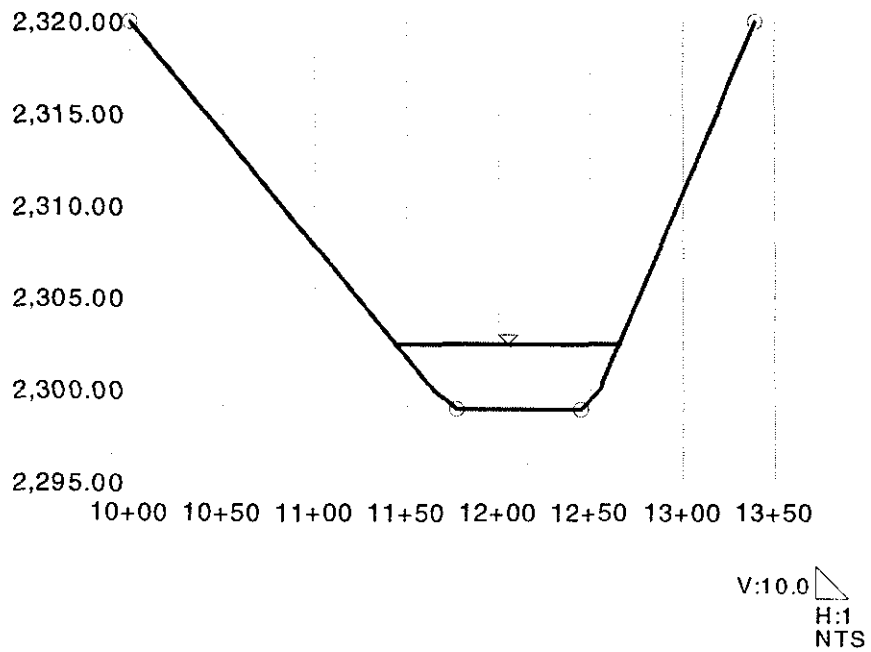
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,300.00
11+43	2,280.00
11+52	2,279.00
12+00	2,279.00
12+08	2,280.00
13+51	2,300.00

Cross Section 600
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash24T7R5 Section 600
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.062	
Slope	0.021000	ft/ft
Water Surface Elevation	2,302.57	ft
Elevation Range	2,299.00 to 2,320.00	
Discharge	2,473.00	cfs



Section 600
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash24T7R5 Section 600
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.021000	ft/ft
Discharge	2,473.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.062	
Water Surface Elevation	2,302.57	ft
Elevation Range	2,299.00 to 2,320.00	
Flow Area	354.5	ft²
Wetted Perimeter	123.59	ft
Top Width	123.05	ft
Actual Depth	3.57	ft
Critical Elevation	2,301.95	ft
Critical Slope	0.042308	ft/ft
Velocity	6.98	ft/s
Velocity Head	0.76	ft
Specific Energy	2,303.33	ft
Froude Number	0.72	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	11+77	0.065
11+77	12+44	0.060
12+44	13+40	0.065

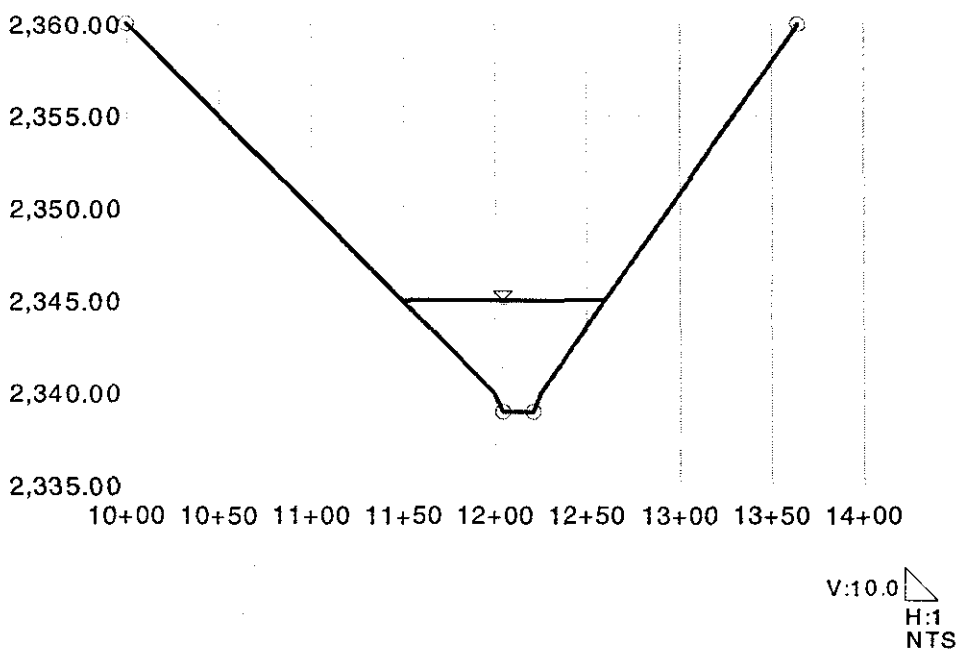
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,320.00
11+64	2,300.00
11+77	2,299.00
12+44	2,299.00
12+55	2,300.00
13+40	2,320.00

Cross Section 700
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash24T7R5 Section 700
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.064	
Slope	0.016000	ft/ft
Water Surface Elevation	2,345.08	ft
Elevation Range	2,339.00 to 2,360.00	
Discharge	2,359.00	cfs



Section 700
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash24T7R5 Section 700
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.016000	ft/ft
Discharge	2,359.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.064	
Water Surface Elevation	2,345.08	ft
Elevation Range	2,339.00 to 2,360.00	
Flow Area	366.5	ft²
Wetted Perimeter	112.13	ft
Top Width	111.30	ft
Actual Depth	6.08	ft
Critical Elevation	2,343.95	ft
Critical Slope	0.043532	ft/ft
Velocity	6.44	ft/s
Velocity Head	0.64	ft
Specific Energy	2,345.72	ft
Froude Number	0.63	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	12+04	0.065
12+04	12+20	0.060
12+20	13+65	0.065

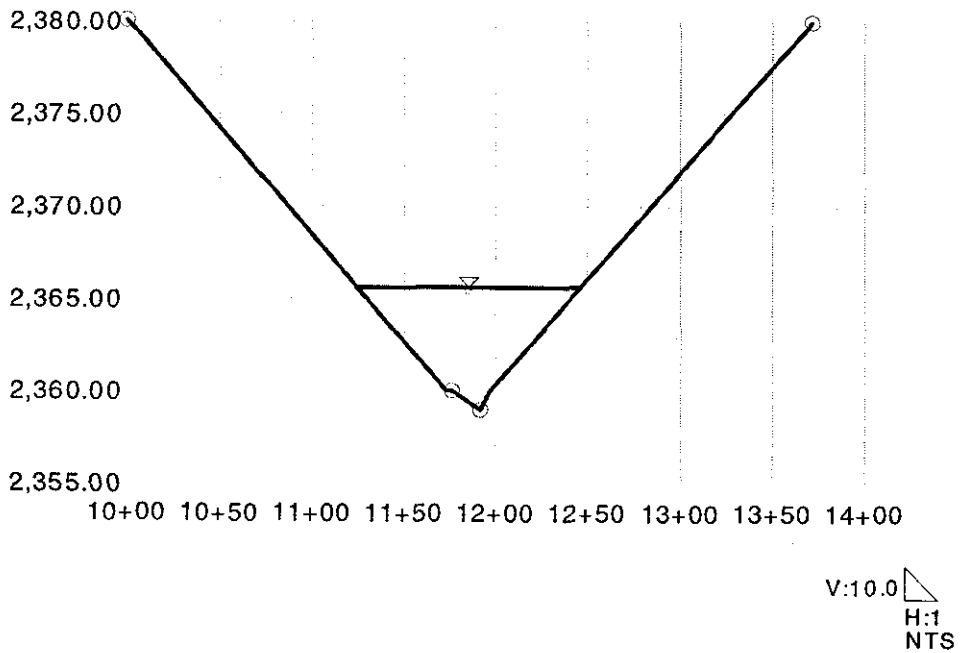
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,360.00
11+99	2,340.00
12+04	2,339.00
12+20	2,339.00
12+24	2,340.00
13+65	2,360.00

Cross Section 800
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash24T7R5 Section 800
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.064
Slope	0.009300 ft/ft
Water Surface Elevation	2,365.64 ft
Elevation Range	2,359.00 to 2,380.00
Discharge	2,142.00 cfs



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Section 800
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash24T7R5 Section 800
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.009300	ft/ft
Discharge	2,142.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.064	
Water Surface Elevation	2,365.64	ft
Elevation Range	2,359.00 to 2,380.00	
Flow Area	422.7	ft²
Wetted Perimeter	123.00	ft
Top Width	122.22	ft
Actual Depth	6.64	ft
Critical Elevation	2,363.90	ft
Critical Slope	0.044508	ft/ft
Velocity	5.07	ft/s
Velocity Head	0.40	ft
Specific Energy	2,366.04	ft
Froude Number	0.48	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	11+76	0.065
11+76	11+91	0.060
11+91	13+72	0.065

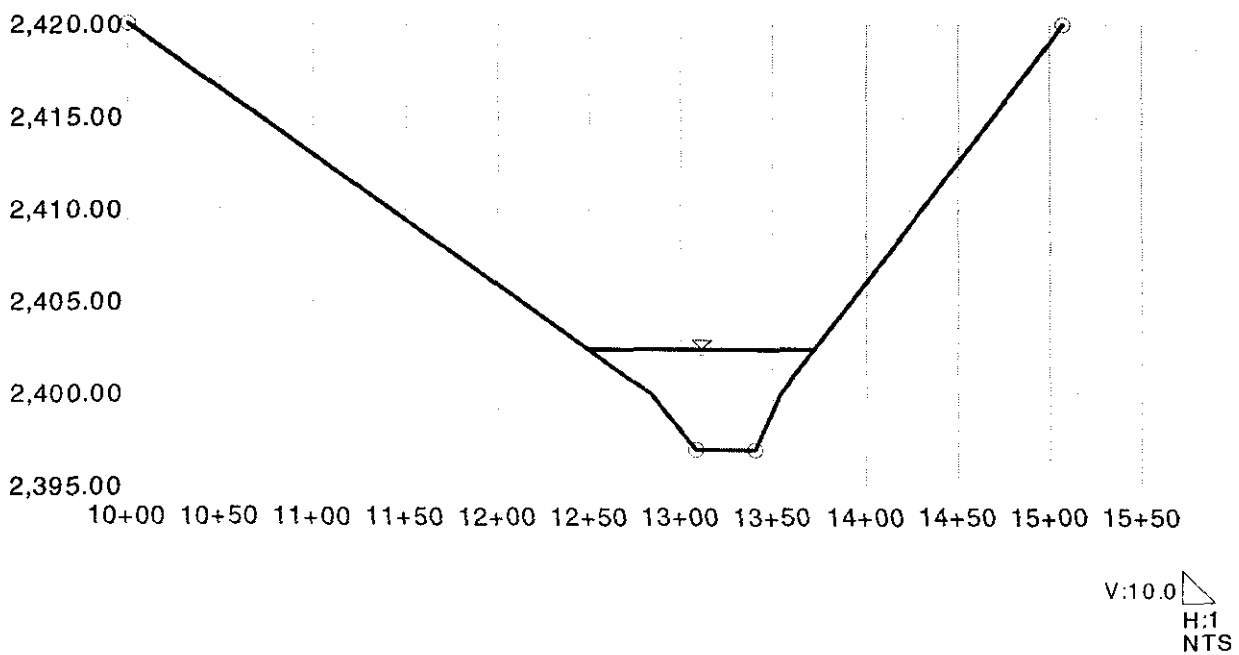
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,380.00
11+72	2,360.00
11+76	2,360.00
11+91	2,359.00
11+96	2,360.00
13+72	2,380.00

Cross Section 900
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash24T7R5 Section 900
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.067	
Slope	0.010000	ft/ft
Water Surface Elevation	2,402.41	ft
Elevation Range	2,397.00 to 2,420.00	
Discharge	1,832.00	cfs



Section 900
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash24T7R5 Section 900
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.010000	ft/ft
Discharge	1,832.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.067	
Water Surface Elevation	2,402.41	ft
Elevation Range	2,397.00 to 2,420.00	
Flow Area	389.1	ft^2
Wetted Perimeter	124.41	ft
Top Width	123.67	ft
Actual Depth	5.41	ft
Critical Elevation	2,400.68	ft
Critical Slope	0.049888	ft/ft
Velocity	4.71	ft/s
Velocity Head	0.34	ft
Specific Energy	2,402.75	ft
Froude Number	0.47	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	13+08	0.070
13+08	13+40	0.060
13+40	15+08	0.070

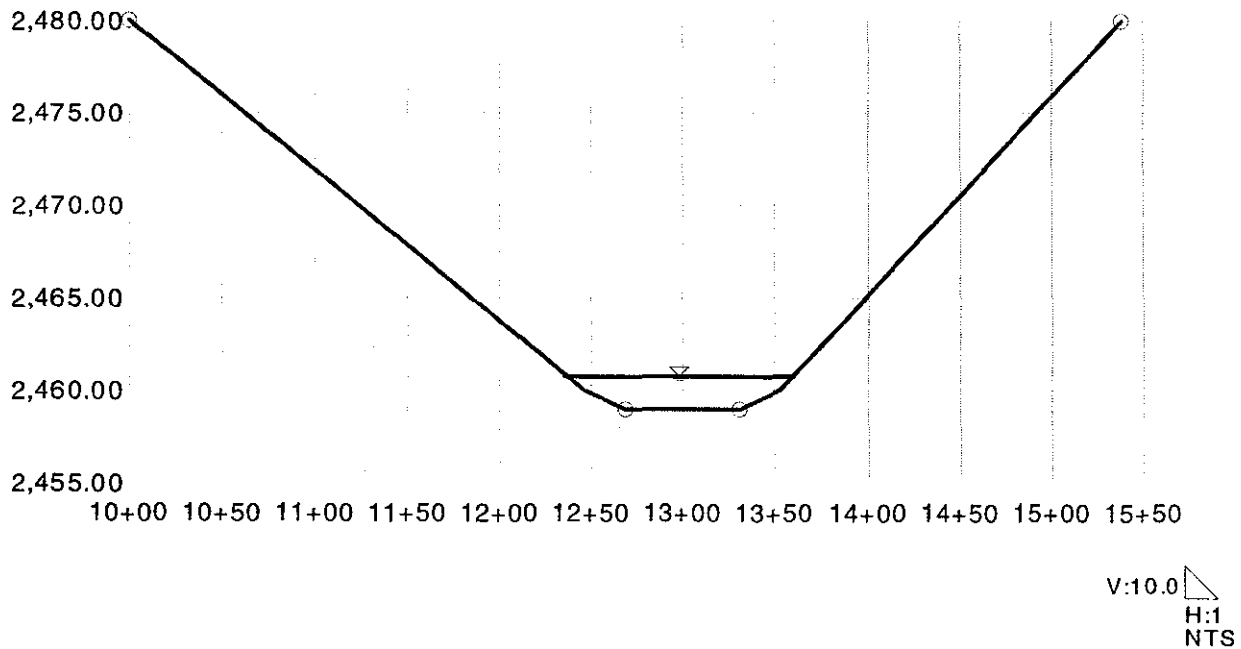
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,420.00
12+83	2,400.00
13+08	2,397.00
13+40	2,397.00
13+54	2,400.00
15+08	2,420.00

Cross Section 1000
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash24T7R5 Section 1000
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.065	
Slope	0.023000	ft/ft
Water Surface Elevation	2,460.79	ft
Elevation Range	2,459.00 to 2,480.00	
Discharge	779.00	cfs



Section 1000
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash24T7R5 Section 1000
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.023000	ft/ft
Discharge	779.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.065	
Water Surface Elevation	2,460.79	ft
Elevation Range	2,459.00 to 2,480.00	
Flow Area	177.9	ft^2
Wetted Perimeter	125.21	ft
Top Width	125.09	ft
Actual Depth	1.79	ft
Critical Elevation	2,460.40	ft
Critical Slope	0.059535	ft/ft
Velocity	4.38	ft/s
Velocity Head	0.30	ft
Specific Energy	2,461.09	ft
Froude Number	0.65	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	12+68	0.070
12+68	13+31	0.060
13+31	15+39	0.070

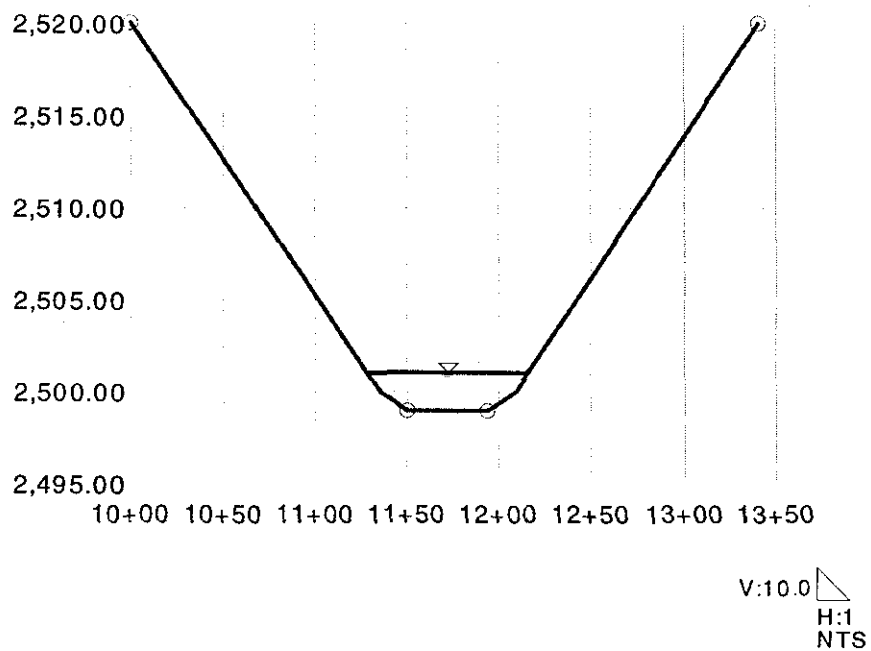
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,480.00
12+45	2,460.00
12+68	2,459.00
13+31	2,459.00
13+53	2,460.00
15+39	2,480.00

Cross Section 1100
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash24T7R5 Section 1100
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.070	
Slope	0.024000	ft/ft
Water Surface Elevation	2,501.09	ft
Elevation Range	2,499.00 to 2,520.00	
Discharge	674.00	cfs



Section 1100
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash24T7R5 Section 1100
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.024000	ft/ft
Discharge	674.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.070	
Water Surface Elevation	2,501.09	ft
Elevation Range	2,499.00 to 2,520.00	
Flow Area	147.0	ft^2
Wetted Perimeter	88.76	ft
Top Width	88.53	ft
Actual Depth	2.09	ft
Critical Elevation	2,500.60	ft
Critical Slope	0.066370	ft/ft
Velocity	4.59	ft/s
Velocity Head	0.33	ft
Specific Energy	2,501.42	ft
Froude Number	0.63	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	11+50	0.075
11+50	11+93	0.065
11+93	13+41	0.075

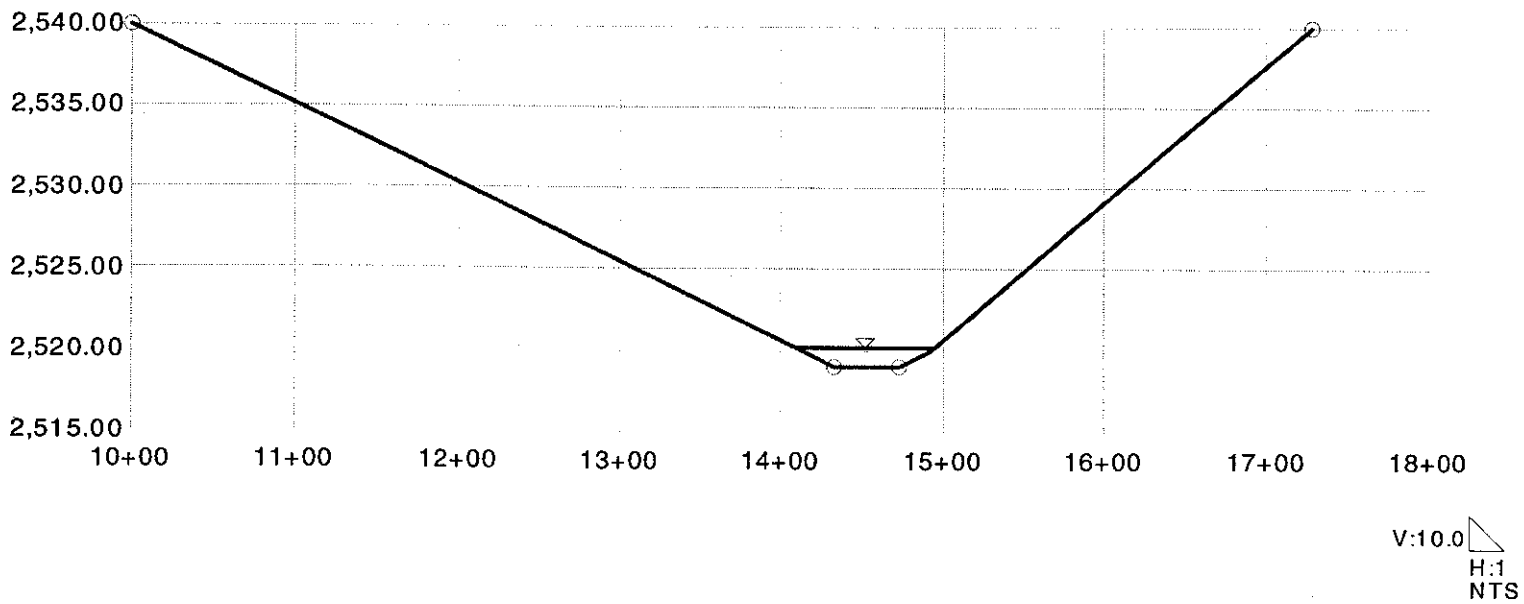
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,520.00
11+35	2,500.00
11+50	2,499.00
11+93	2,499.00
12+09	2,500.00
13+41	2,520.00

Cross Section 1200
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash24T7R5 Section 1200
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.070	
Slope	0.026000	ft/ft
Water Surface Elevation	2,520.21	ft
Elevation Range	2,519.00 to 2,540.00	
Discharge	240.00	cfs



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Section 1200
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash24T7R5 Section 1200
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.026000	ft/ft
Discharge	240.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.070	
Water Surface Elevation	2,520.21	ft
Elevation Range	2,519.00 to 2,540.00	
Flow Area	75.9	ft²
Wetted Perimeter	84.83	ft
Top Width	84.76	ft
Actual Depth	1.21	ft
Critical Elevation	2,519.89	ft
Critical Slope	0.081777	ft/ft
Velocity	3.16	ft/s
Velocity Head	0.16	ft
Specific Energy	2,520.36	ft
Froude Number	0.59	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	14+33	0.075
14+33	14+73	0.065
14+73	17+29	0.075

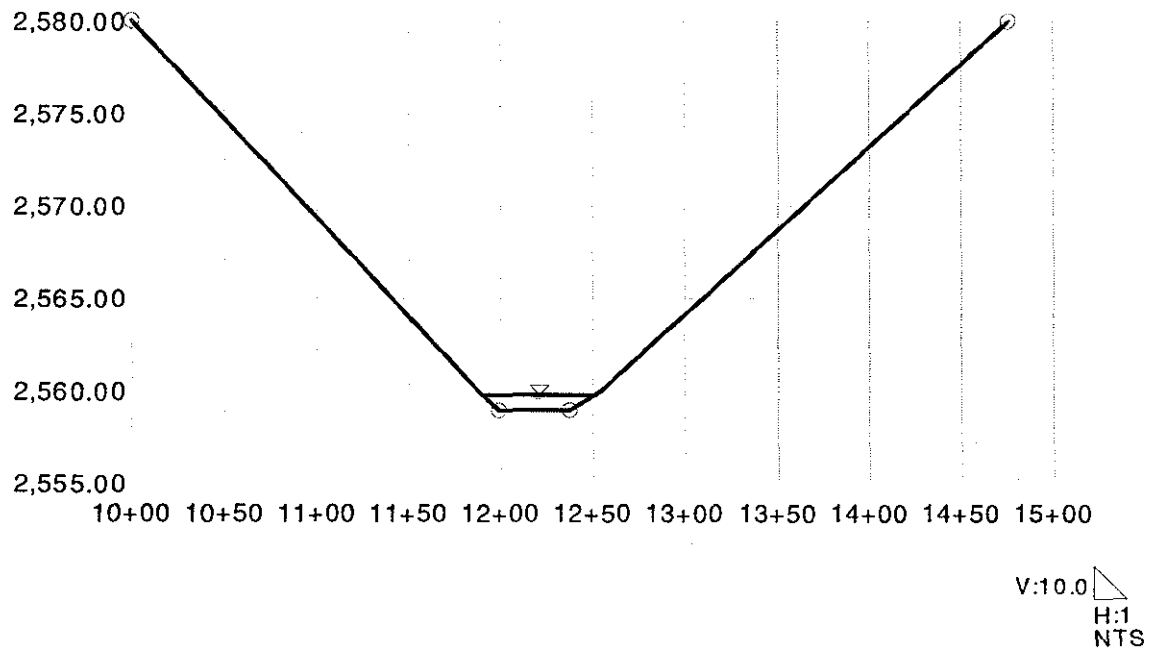
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,540.00
14+14	2,520.00
14+33	2,519.00
14+73	2,519.00
14+92	2,520.00
17+29	2,540.00

Cross Section 1300
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash24T7R5 Section 1300
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.069	
Slope	0.030000	ft/ft
Water Surface Elevation	2,559.83	ft
Elevation Range	2,559.00 to 2,580.00	
Discharge	120.00	cfs



Section 1300
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash24T7R5 Section 1300
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.030000	ft/ft
Discharge	120.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.069	
Water Surface Elevation	2,559.83	ft
Elevation Range	2,559.00 to 2,580.00	
Flow Area	41.8	ft^2
Wetted Perimeter	62.21	ft
Top Width	62.15	ft
Actual Depth	0.83	ft
Critical Elevation	2,559.62	ft
Critical Slope	0.085845	ft/ft
Velocity	2.87	ft/s
Velocity Head	0.13	ft
Specific Energy	2,559.95	ft
Froude Number	0.62	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	11+98	0.075
11+98	12+37	0.065
12+37	14+76	0.075

Natural Channel Points

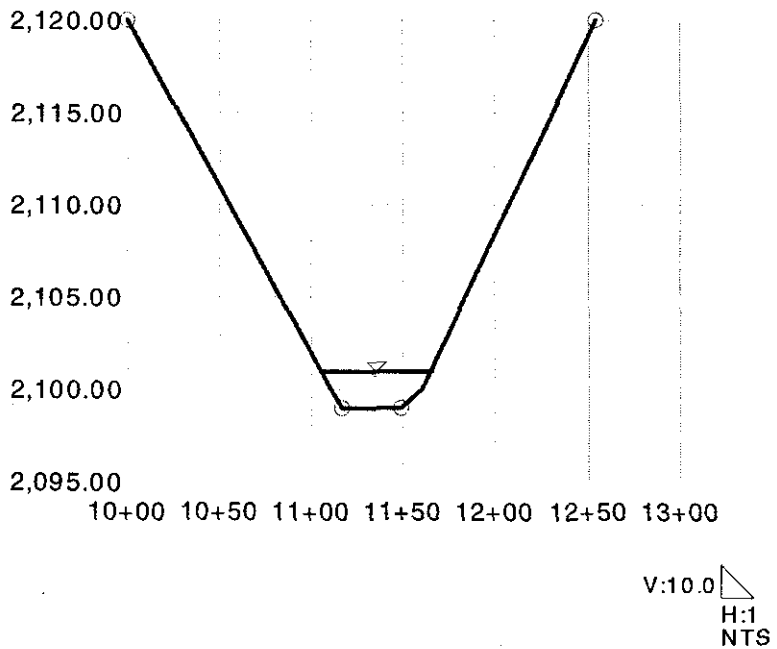
Station (ft)	Elevation (ft)
10+00	2,580.00
11+87	2,560.00
11+98	2,559.00
12+37	2,559.00
12+54	2,560.00
14+76	2,580.00

Wash Name:	**Tributary to Mockingbird Wash**
Tributary to:	**Hassayampa River**
File Name:	**Wash17T7R4**

Cross Section 100
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash17T7R4 Section 100
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.052	
Slope	0.032000	ft/ft
Water Surface Elevation	2,101.00	ft
Elevation Range	2,099.00 to 2,120.00	
Discharge	673.00	cfs



Section 100
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash17T7R4 Section 100
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.032000	ft/ft
Discharge	673.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.052	
Water Surface Elevation	2,101.00	ft
Elevation Range	2,099.00 to 2,120.00	
Flow Area	96.9	ft²
Wetted Perimeter	60.62	ft
Top Width	60.29	ft
Actual Depth	2.00	ft
Critical Elevation	2,100.96	ft
Critical Slope	0.034490	ft/ft
Velocity	6.95	ft/s
Velocity Head	0.75	ft
Specific Energy	2,101.75	ft
Froude Number	0.97	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	11+16	0.055
11+16	11+49	0.050
11+49	12+55	0.055

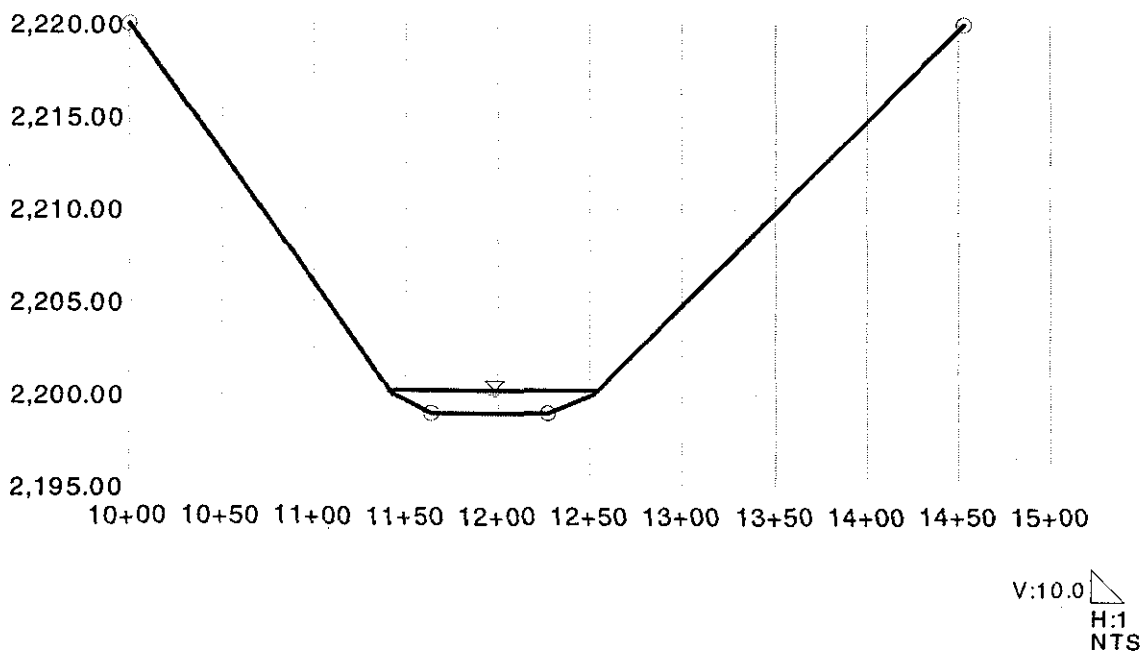
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,120.00
11+10	2,100.00
11+16	2,099.00
11+49	2,099.00
11+60	2,100.00
12+55	2,120.00

Cross Section 200
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash17T7R4 Section 200
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.052	
Slope	0.028000	ft/ft
Water Surface Elevation	2,200.21	ft
Elevation Range	2,199.00 to 2,220.00	
Discharge	514.00	cfs



Section 200
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash17T7R4 Section 200
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.028000	ft/ft
Discharge	514.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.052	
Water Surface Elevation	2,200.21	ft
Elevation Range	2,199.00 to 2,220.00	
Flow Area	110.2	ft²
Wetted Perimeter	113.64	ft
Top Width	113.57	ft
Actual Depth	1.21	ft
Critical Elevation	2,200.09	ft
Critical Slope	0.041633	ft/ft
Velocity	4.67	ft/s
Velocity Head	0.34	ft
Specific Energy	2,200.55	ft
Froude Number	0.83	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	11+63	0.055
11+63	12+27	0.050
12+27	14+54	0.055

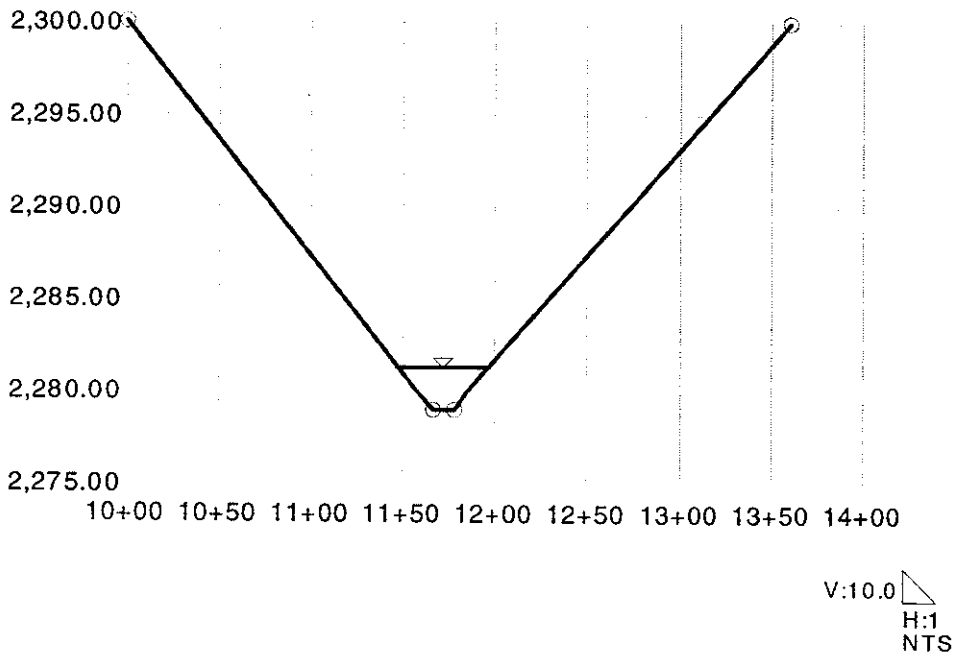
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,220.00
11+42	2,200.00
11+63	2,199.00
12+27	2,199.00
12+52	2,200.00
14+54	2,220.00

Cross Section 300
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash17T7R4 Section 300
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.054
Slope	0.036000 ft/ft
Water Surface Elevation	2,281.29 ft
Elevation Range	2,279.00 to 2,300.00
Discharge	461.00 cfs



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Section 300
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash17T7R4 Section 300
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.036000	ft/ft
Discharge	461.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.054	
Water Surface Elevation	2,281.29	ft
Elevation Range	2,279.00 to 2,300.00	
Flow Area	70.1	ft²
Wetted Perimeter	49.79	ft
Top Width	49.51	ft
Actual Depth	2.29	ft
Critical Elevation	2,281.26	ft
Critical Slope	0.038007	ft/ft
Velocity	6.58	ft/s
Velocity Head	0.67	ft
Specific Energy	2,281.96	ft
Froude Number	0.97	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	11+66	0.055
11+66	11+78	0.050
11+78	13+61	0.055

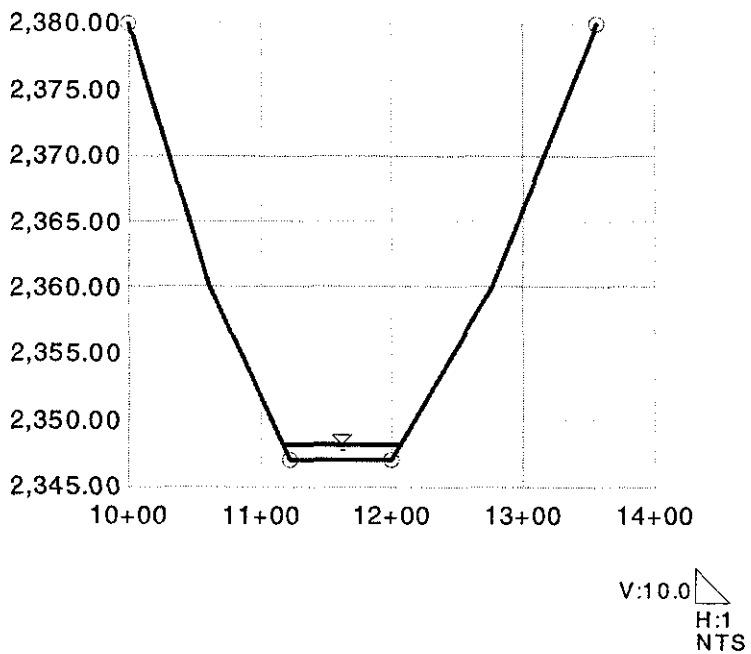
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,300.00
11+57	2,280.00
11+66	2,279.00
11+78	2,279.00
11+85	2,280.00
13+61	2,300.00

Cross Section 400
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash17T7R4 Section 400
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.051	
Slope	0.019000	ft/ft
Water Surface Elevation	2,348.13	ft
Elevation Range	2,347.00 to 2,380.00	
Discharge	393.00	cfs



Section 400
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash17T7R4 Section 400
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.019000	ft/ft
Discharge	393.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.051	
Water Surface Elevation	2,348.13	ft
Elevation Range	2,347.00 to 2,380.00	
Flow Area	93.9	ft²
Wetted Perimeter	89.15	ft
Top Width	88.93	ft
Actual Depth	1.13	ft
Critical Elevation	2,347.91	ft
Critical Slope	0.039460	ft/ft
Velocity	4.18	ft/s
Velocity Head	0.27	ft
Specific Energy	2,348.40	ft
Froude Number	0.72	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	11+23	0.055
11+23	12+00	0.050
12+00	13+56	0.055

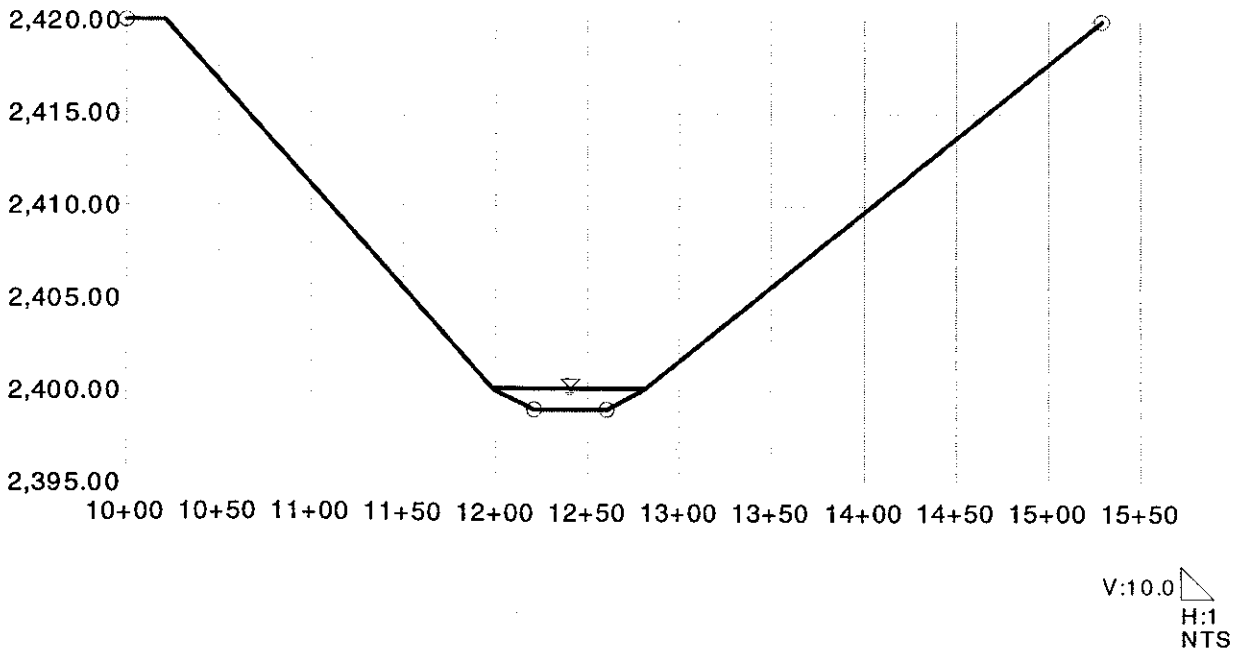
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,380.00
10+62	2,360.00
11+23	2,347.00
12+00	2,347.00
12+76	2,360.00
13+56	2,380.00

Cross Section 500
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash17T7R4 Section 500
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.053	
Slope	0.030000	ft/ft
Water Surface Elevation	2,400.08	ft
Elevation Range	2,399.00 to 2,420.00	
Discharge	287.00	cfs



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Section 500
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash17T7R4 Section 500
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.030000	ft/ft
Discharge	287.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.053	
Water Surface Elevation	2,400.08	ft
Elevation Range	2,399.00 to 2,420.00	
Flow Area	67.4	ft^2
Wetted Perimeter	82.85	ft
Top Width	82.79	ft
Actual Depth	1.08	ft
Critical Elevation	2,399.98	ft
Critical Slope	0.044729	ft/ft
Velocity	4.26	ft/s
Velocity Head	0.28	ft
Specific Energy	2,400.37	ft
Froude Number	0.83	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	12+20	0.055
12+20	12+60	0.050
12+60	15+30	0.055

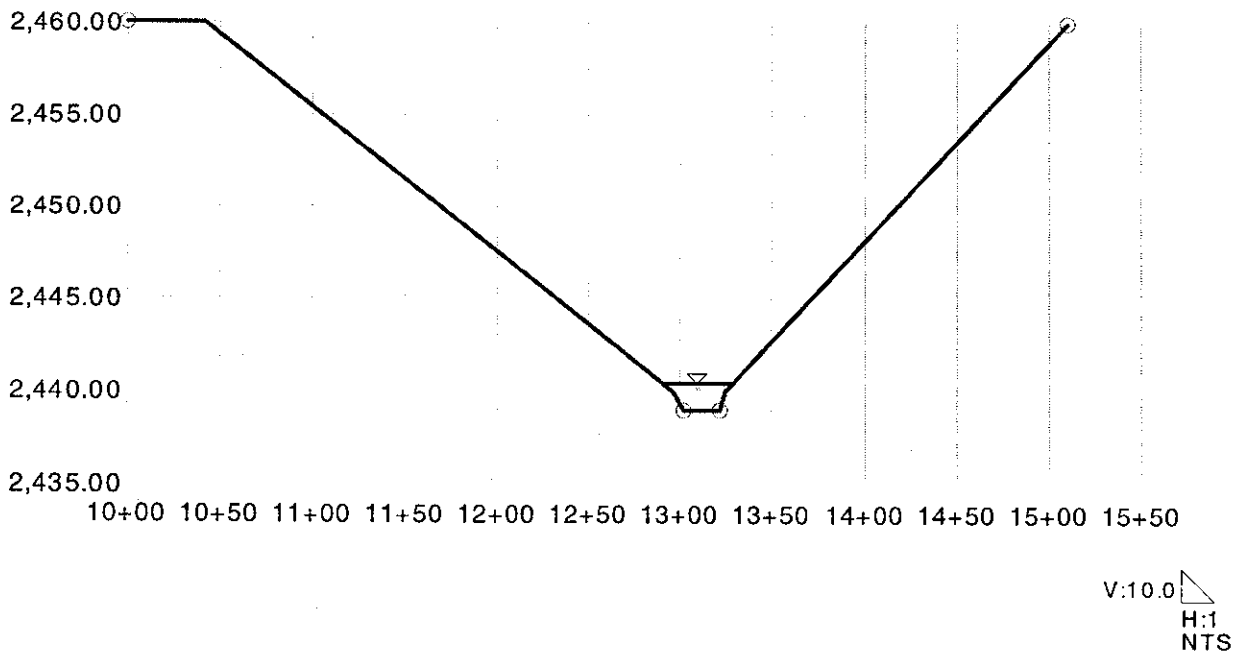
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,420.00
10+21	2,420.00
11+99	2,400.00
12+20	2,399.00
12+60	2,399.00
12+80	2,400.00
15+30	2,420.00

Cross Section 600
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash17T7R4 Section 600
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.053	
Slope	0.042000	ft/ft
Water Surface Elevation	2,440.40	ft
Elevation Range	2,439.00 to 2,460.00	
Discharge	219.00	cfs



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Section 600
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash17T7R4 Section 600
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.042000	ft/ft
Discharge	219.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.053	
Water Surface Elevation	2,440.40	ft
Elevation Range	2,439.00 to 2,460.00	
Flow Area	38.3	ft^2
Wetted Perimeter	39.06	ft
Top Width	38.83	ft
Actual Depth	1.40	ft
Critical Elevation	2,440.41	ft
Critical Slope	0.040745	ft/ft
Velocity	5.72	ft/s
Velocity Head	0.51	ft
Specific Energy	2,440.91	ft
Froude Number	1.01	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	13+02	0.055
13+02	13+21	0.050
13+21	15+11	0.055

Natural Channel Points

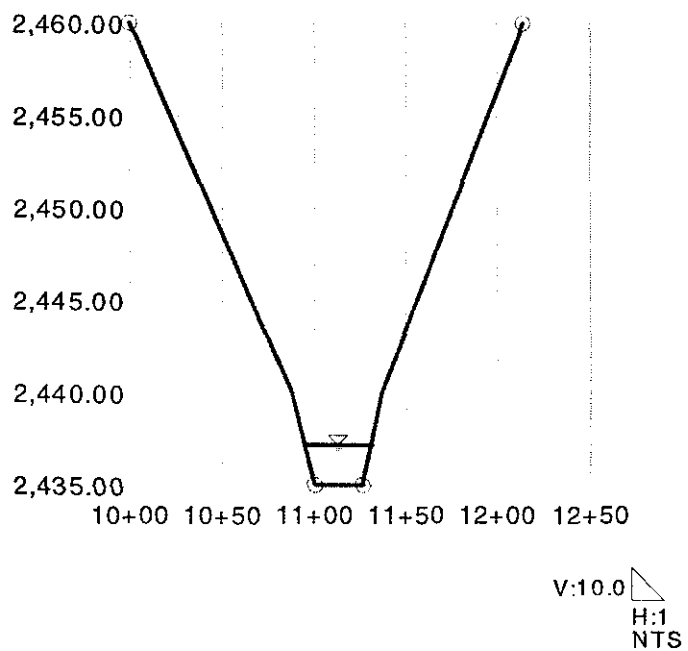
Station (ft)	Elevation (ft)
10+00	2,460.00
10+41	2,460.00
12+95	2,440.00
13+02	2,439.00
13+21	2,439.00
13+25	2,440.00
15+11	2,460.00

Wash Name:	**Tributary to Wash K**
Tributary to:	**Hassayampa River**
File Name:	**Wash 10T7R4**

Cross Section 200
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash10T7R4 Section 200
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.052	
Slope	0.050000	ft/ft
Water Surface Elevation	2,437.18	ft
Elevation Range	2,435.00 to 2,460.00	
Discharge	652.00	cfs



Section 200
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash10T7R4 Section 200
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.050000	ft/ft
Discharge	652.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.052	
Water Surface Elevation	2,437.18	ft
Elevation Range	2,435.00 to 2,460.00	
Flow Area	67.6	ft²
Wetted Perimeter	36.94	ft
Top Width	36.02	ft
Actual Depth	2.18	ft
Critical Elevation	2,437.49	ft
Critical Slope	0.031266	ft/ft
Velocity	9.65	ft/s
Velocity Head	1.45	ft
Specific Energy	2,438.63	ft
Froude Number	1.24	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	11+00	0.055
11+00	11+26	0.050
11+26	12+14	0.055

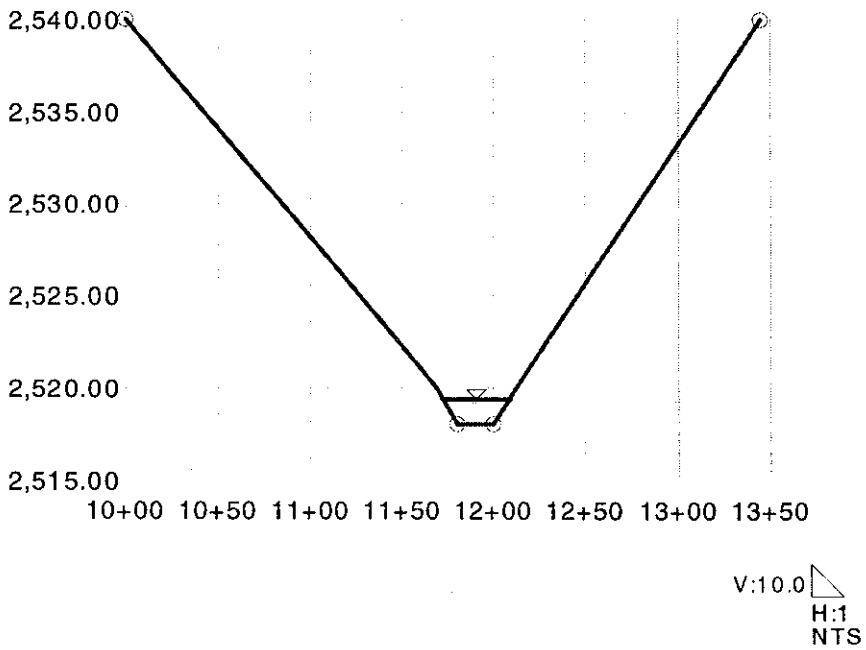
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,460.00
10+87	2,440.00
11+00	2,435.00
11+26	2,435.00
11+36	2,440.00
12+14	2,460.00

Cross Section 300
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash10T7R4 Section 300
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.052	
Slope	0.032000	ft/ft
Water Surface Elevation	2,519.46	ft
Elevation Range	2,518.00 to 2,540.00	
Discharge	220.00	cfs



Section 300
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash10T7R4 Section 300
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.032000	ft/ft
Discharge	220.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.052	
Water Surface Elevation	2,519.46	ft
Elevation Range	2,518.00 to 2,540.00	
Flow Area	40.9	ft²
Wetted Perimeter	37.44	ft
Top Width	37.21	ft
Actual Depth	1.46	ft
Critical Elevation	2,519.37	ft
Critical Slope	0.039853	ft/ft
Velocity	5.37	ft/s
Velocity Head	0.45	ft
Specific Energy	2,519.91	ft
Froude Number	0.90	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	11+80	0.055
11+80	11+99	0.050
11+99	13+45	0.055

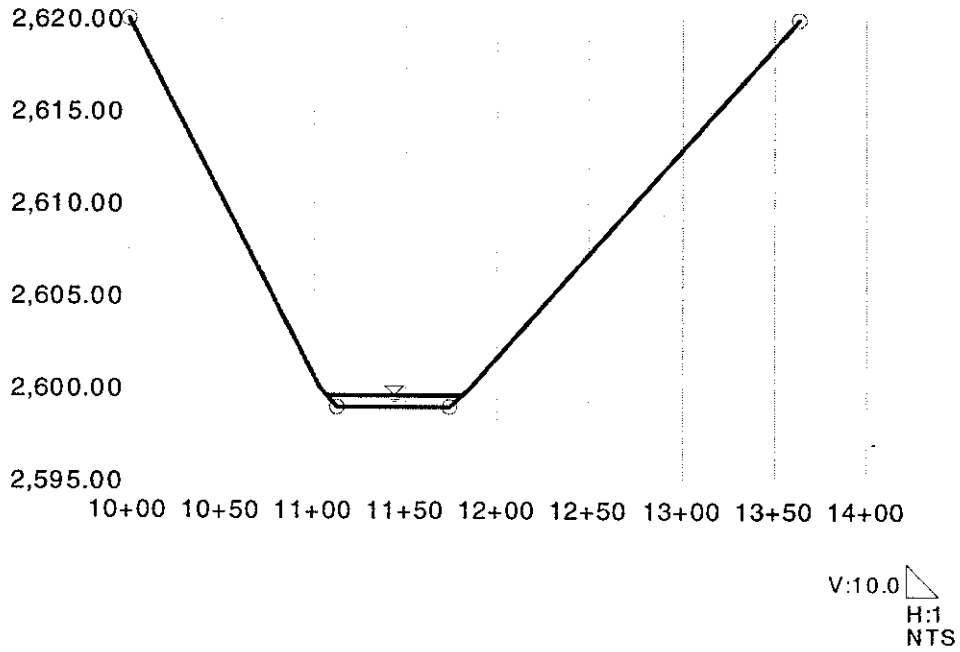
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,540.00
11+68	2,520.00
11+80	2,518.00
11+99	2,518.00
12+12	2,520.00
13+45	2,540.00

Cross Section 400
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash10T7R4 Section 400
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.051
Slope	0.033000 ft/ft
Water Surface Elevation	2,599.56 ft
Elevation Range	2,599.00 to 2,620.00
Discharge	129.00 cfs



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Section 400
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash10T7R4 Section 400
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.033000	ft/ft
Discharge	129.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	*0.051*	
Water Surface Elevation	2,599.56	ft
Elevation Range	2,599.00 to 2,620.00	
Flow Area	37.7	ft²
Wetted Perimeter	72.89	ft
Top Width	72.83	ft
Actual Depth	0.56	ft
Critical Elevation	2,599.50	ft
Critical Slope	0.048620	ft/ft
Velocity	3.42	ft/s
Velocity Head	0.18	ft
Specific Energy	2,599.75	ft
Froude Number	0.84	
Flow Type	*Subcritical*	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	11+12	0.055
11+12	11+73	0.050
11+73	13+64	0.055

Natural Channel Points

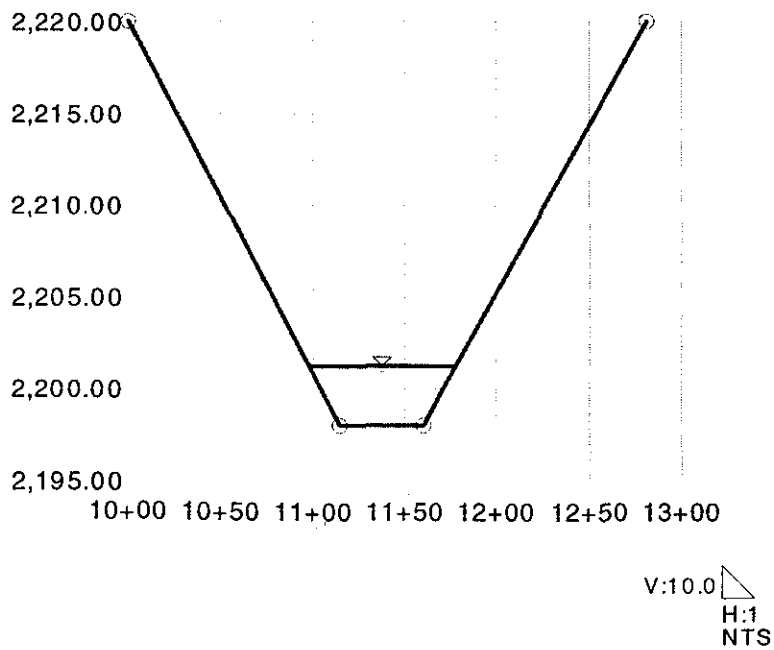
Station (ft)	Elevation (ft)
10+00	2,620.00
11+03	2,600.00
11+12	2,599.00
11+73	2,599.00
11+85	2,600.00
13+64	2,620.00

Wash Name:	**Tributary to Monarch Wash**
Tributary to:	**Monarch Wash**
File Name:	**Wash 22T7R4**

Cross Section 100
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash22T7R4 Section 100
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth -

Section Data	
Mannings Coefficient	0.054
Slope	0.049000 ft/ft
Water Surface Elevation	2,201.27 ft
Elevation Range	2,198.00 to 2,220.00
Discharge	2,306.00 cfs



Section 100
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash22T7R4 Section 100
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.049000	ft/ft
Discharge	2,306.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.054	
Water Surface Elevation	2,201.27	ft
Elevation Range	2,198.00 to 2,220.00	
Flow Area	204.5	ft²
Wetted Perimeter	80.34	ft
Top Width	79.71	ft
Actual Depth	3.27	ft
Critical Elevation	2,201.71	ft
Critical Slope	0.030742	ft/ft
Velocity	11.28	ft/s
Velocity Head	1.98	ft
Specific Energy	2,203.25	ft
Froude Number	1.24	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	11+14	0.060
11+14	11+60	0.050
11+60	12+82	0.060

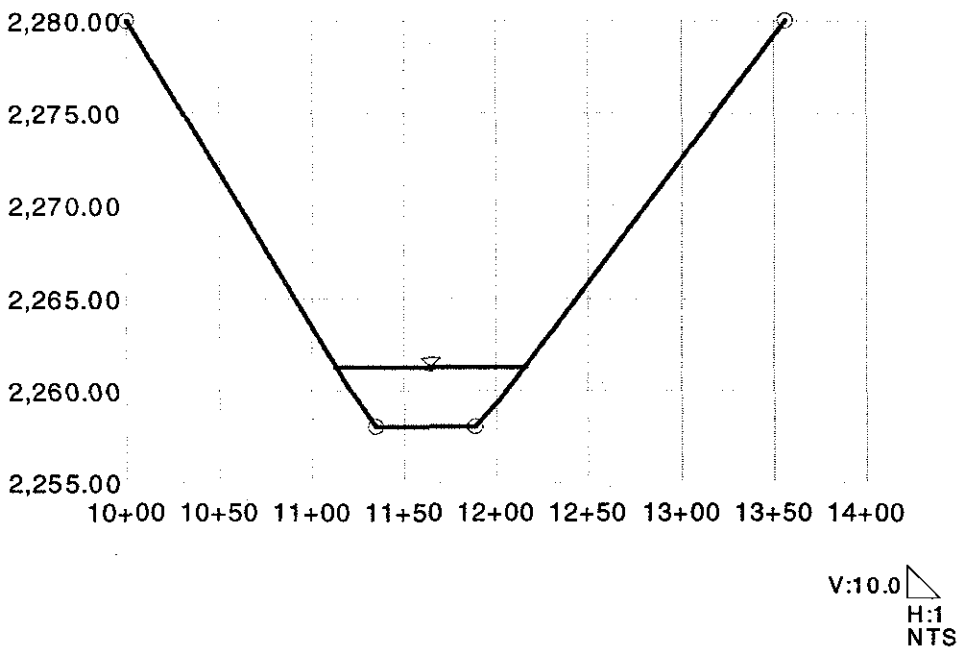
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,220.00
11+04	2,200.00
11+14	2,198.00
11+60	2,198.00
11+70	2,200.00
12+82	2,220.00

Cross Section 200
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash22T7R4 Section 200
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.055	
Slope	0.029000	ft/ft
Water Surface Elevation	2,261.28	ft
Elevation Range	2,258.00 to 2,280.00	
Discharge	2,230.00	cfs



Section 200
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash22T7R4 Section 200
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.029000	ft/ft
Discharge	2,230.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.055	
Water Surface Elevation	2,261.28	ft
Elevation Range	2,258.00 to 2,280.00	
Flow Area	261.4	ft^2
Wetted Perimeter	103.82	ft
Top Width	103.38	ft
Actual Depth	3.28	ft
Critical Elevation	2,261.18	ft
Critical Slope	0.032737	ft/ft
Velocity	8.53	ft/s
Velocity Head	1.13	ft
Specific Energy	2,262.41	ft
Froude Number	0.95	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	11+34	0.060
11+34	11+88	0.050
11+88	13+57	0.060

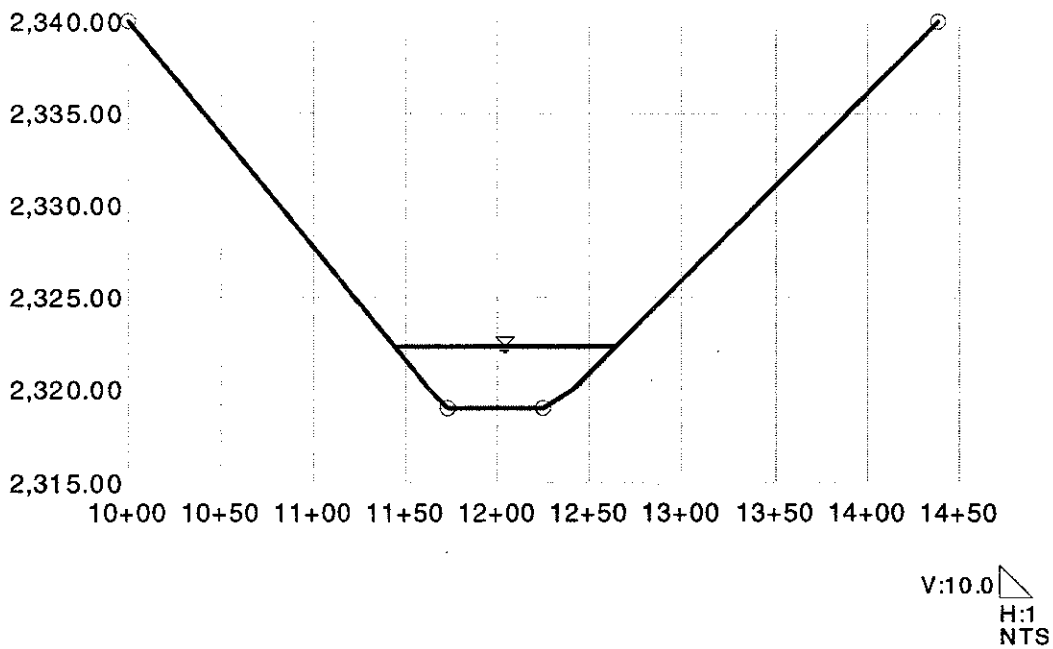
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,280.00
11+20	2,260.00
11+34	2,258.00
11+88	2,258.00
12+06	2,260.00
13+57	2,280.00

Cross Section 300
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash22T7R4 Section 300
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.056	
Slope	0.024000	ft/ft
Water Surface Elevation	2,322.29	ft
Elevation Range	2,319.00 to 2,340.00	
Discharge	2,199.00	cfs



Section 300
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash22T7R4 Section 300
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.024000	ft/ft
Discharge	2,199.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.056	
Water Surface Elevation	2,322.29	ft
Elevation Range	2,319.00 to 2,340.00	
Flow Area	293.8	ft²
Wetted Perimeter	120.51	ft
Top Width	120.18	ft
Actual Depth	3.29	ft
Critical Elevation	2,321.99	ft
Critical Slope	0.034631	ft/ft
Velocity	7.48	ft/s
Velocity Head	0.87	ft
Specific Energy	2,323.16	ft
Froude Number	0.84	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	11+72	0.060
11+72	12+25	0.050
12+25	14+39	0.060

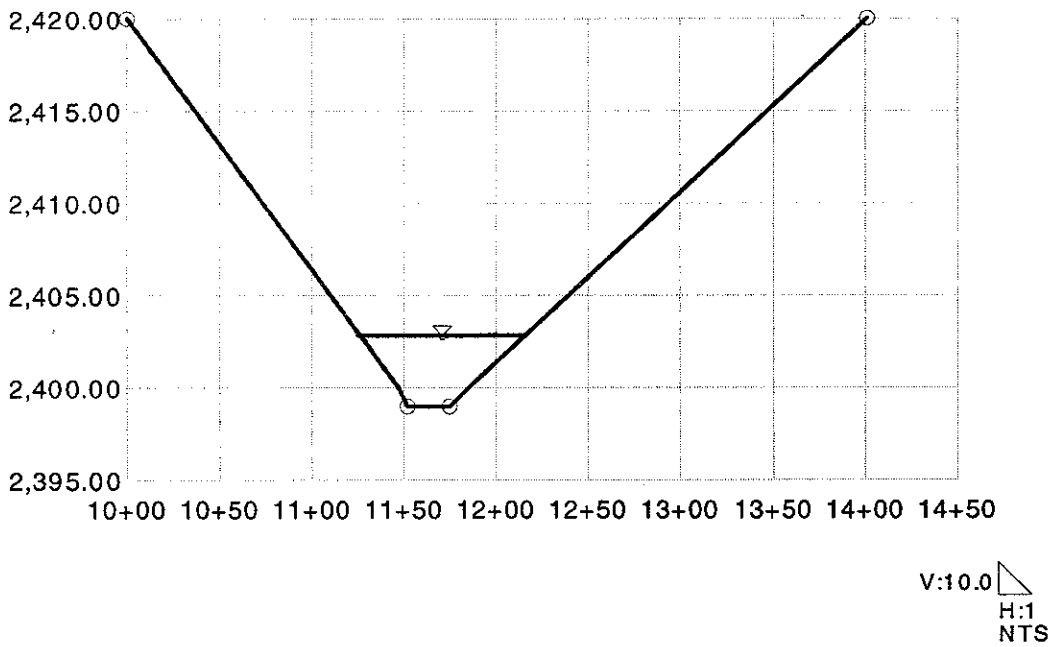
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,340.00
11+62	2,320.00
11+72	2,319.00
12+25	2,319.00
12+41	2,320.00
14+39	2,340.00

Cross Section 400
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash22T7R4 Section 400
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.051	
Slope	0.033000	ft/ft
Water Surface Elevation	2,402.89	ft
Elevation Range	2,399.00 to 2,420.00	
Discharge	2,084.00	cfs



Section 400
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash22T7R4 Section 400
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.033000	ft/ft
Discharge	2,084.00	cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.051	
Water Surface Elevation	2,402.89	ft
Elevation Range	2,399.00 to 2,420.00	
Flow Area	219.2	ft²
Wetted Perimeter	91.85	ft
Top Width	91.39	ft
Actual Depth	3.89	ft
Critical Elevation	2,403.04	ft
Critical Slope	0.027861	ft/ft
Velocity	9.51	ft/s
Velocity Head	1.40	ft
Specific Energy	2,404.29	ft
Froude Number	1.08	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	11+52	0.060
11+52	11+75	0.050
11+75	14+02	0.060

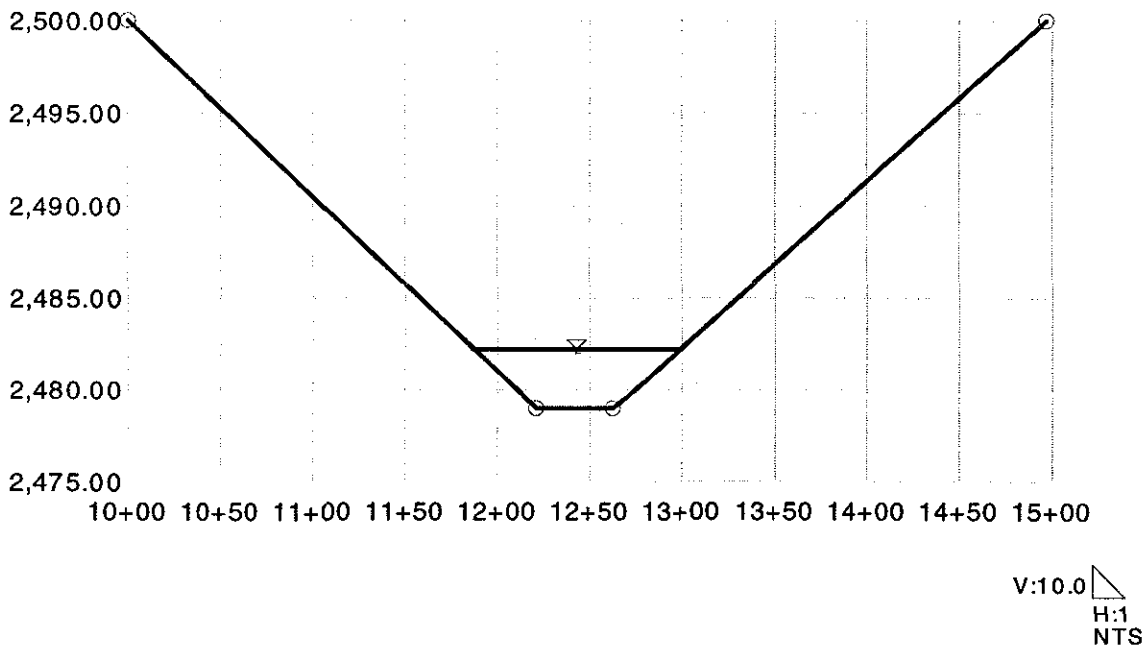
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,420.00
11+46	2,400.00
11+52	2,399.00
11+75	2,399.00
11+85	2,400.00
14+02	2,420.00

Cross Section 500
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash22T7R4 Section 500
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.056	
Slope	0.031000	ft/ft
Water Surface Elevation	2,482.26	ft
Elevation Range	2,479.00 to 2,500.00	
Discharge	2,008.00	cfs



Section 500
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash22T7R4 Section 500
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.031000	ft/ft
Discharge	2,008.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.056	
Water Surface Elevation	2,482.26	ft
Elevation Range	2,479.00 to 2,500.00	
Flow Area	253.2	ft^2
Wetted Perimeter	113.28	ft
Top Width	112.98	ft
Actual Depth	3.26	ft
Critical Elevation	2,482.15	ft
Critical Slope	0.035902	ft/ft
Velocity	7.93	ft/s
Velocity Head	0.98	ft
Specific Energy	2,483.24	ft
Froude Number	0.93	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	12+20	0.060
12+20	12+62	0.050
12+62	14+97	0.060

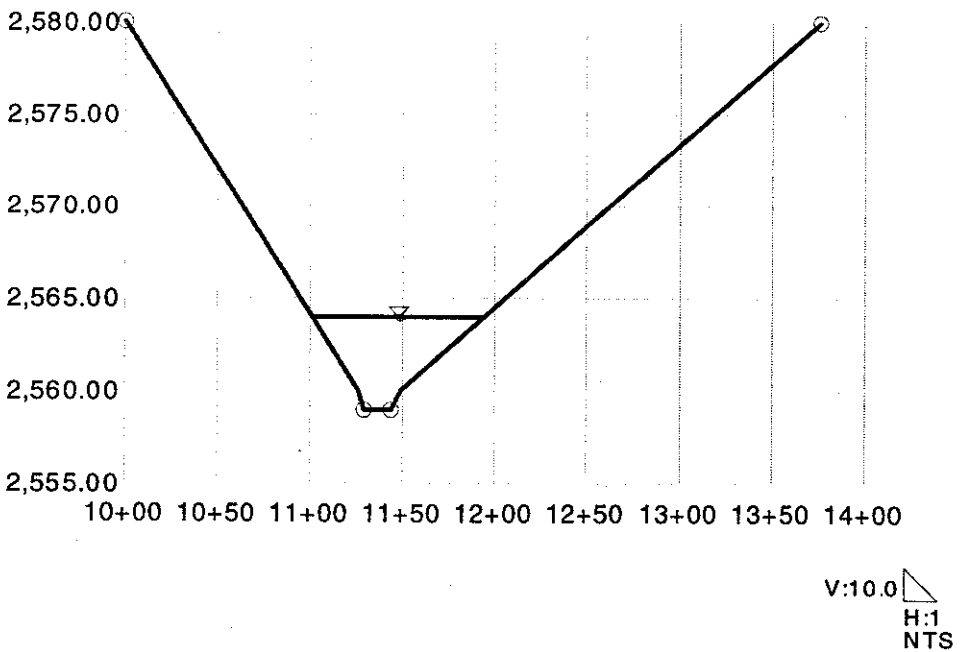
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,500.00
12+10	2,480.00
12+20	2,479.00
12+62	2,479.00
12+74	2,480.00
14+97	2,500.00

Cross Section 600
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash22T7R4 Section 600
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.059	
Slope	0.025000	ft/ft
Water Surface Elevation	2,564.02	ft
Elevation Range	2,559.00 to 2,580.00	
Discharge	1,959.00	cfs



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Section 600
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash22T7R4 Section 600
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.025000	ft/ft
Discharge	1,959.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.059	
Water Surface Elevation	2,564.02	ft
Elevation Range	2,559.00 to 2,580.00	
Flow Area	253.5	ft²
Wetted Perimeter	94.81	ft
Top Width	94.07	ft
Actual Depth	5.02	ft
Critical Elevation	2,563.63	ft
Critical Slope	0.037213	ft/ft
Velocity	7.73	ft/s
Velocity Head	0.93	ft
Specific Energy	2,564.94	ft
Froude Number	0.83	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	11+29	0.060
11+29	11+43	0.050
11+43	13+77	0.060

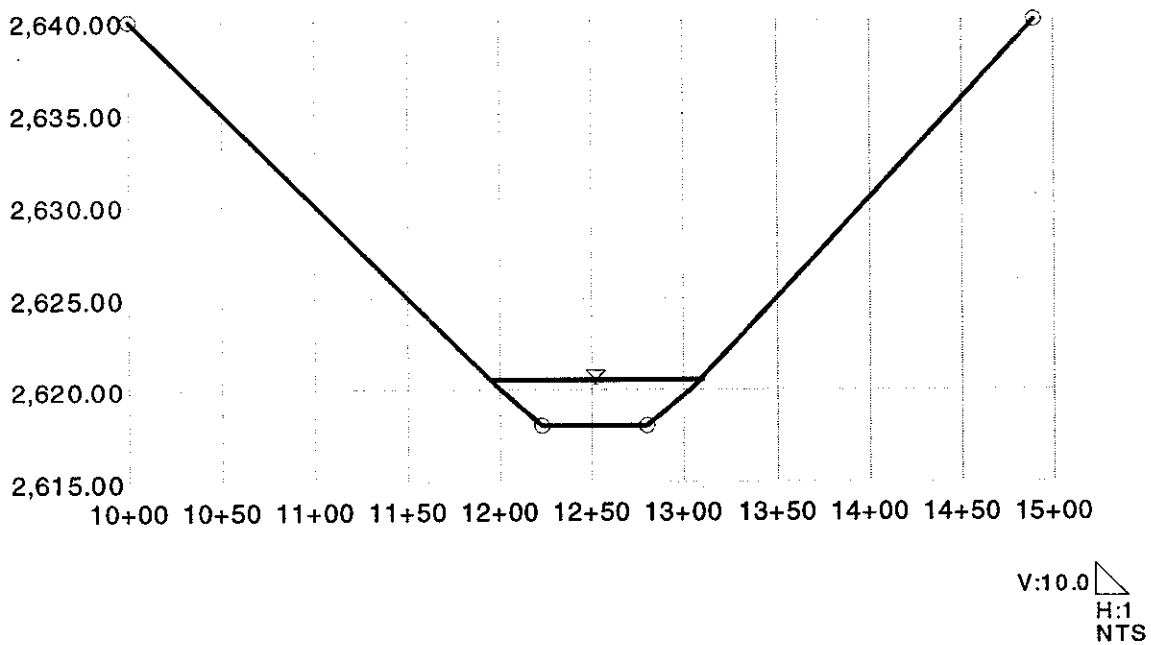
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,580.00
11+26	2,560.00
11+29	2,559.00
11+43	2,559.00
11+49	2,560.00
13+77	2,580.00

Cross Section 700
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash22T7R4 Section 700
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.055	
Slope	0.033000	ft/ft
Water Surface Elevation	2,620.58	ft
Elevation Range	2,618.00 to 2,640.00	
Discharge	1,727.00	cfs



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Section 700
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash22T7R4 Section 700
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.033000	ft/ft
Discharge	1,727.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.055	
Water Surface Elevation	2,620.58	ft
Elevation Range	2,618.00 to 2,640.00	
Flow Area	225.5	ft^2
Wetted Perimeter	115.42	ft
Top Width	115.19	ft
Actual Depth	2.58	ft
Critical Elevation	2,620.53	ft
Critical Slope	0.035657	ft/ft
Velocity	7.66	ft/s
Velocity Head	0.91	ft
Specific Energy	2,621.49	ft
Froude Number	0.96	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	12+22	0.060
12+22	12+80	0.050
12+80	14+90	0.060

Natural Channel Points

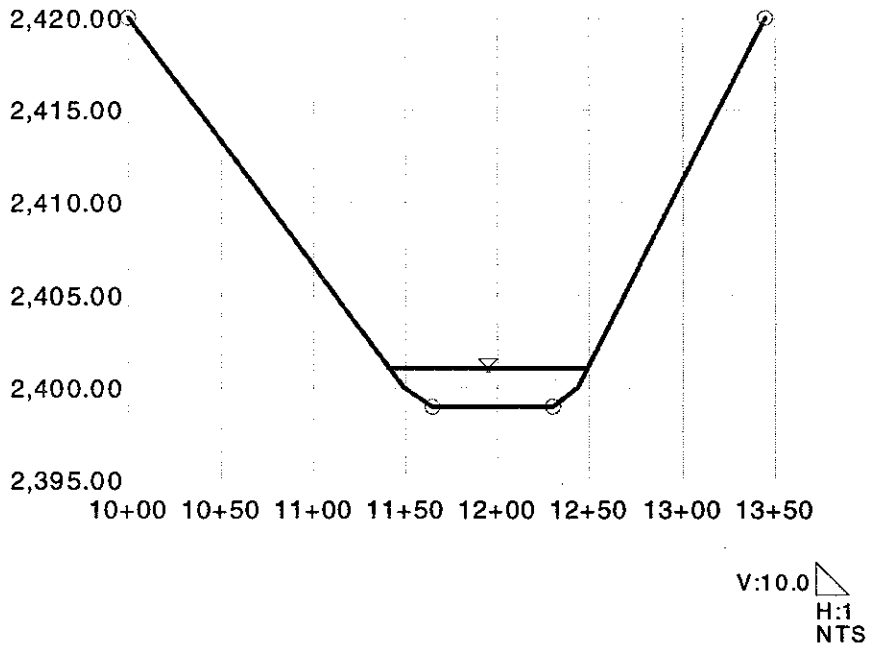
Station (ft)	Elevation (ft)
10+00	2,640.00
12+00	2,620.00
12+22	2,618.00
12+80	2,618.00
13+04	2,620.00
14+90	2,640.00

Wash Name:	**Monarch Wash**
Tributary to:	**Hassayampa River**
File Name:	**Wash14T7R4**

Cross Section 1100
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash14T7R4 Section 1100
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.054	
Slope	0.028000	ft/ft
Water Surface Elevation	2,401.11	ft
Elevation Range	2,399.00 to 2,420.00	
Discharge	1,305.00	cfs



Section 1100
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash14T7R4 Section 1100
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.028000	ft/ft
Discharge	1,305.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.054	
Water Surface Elevation	2,401.11	ft
Elevation Range	2,399.00 to 2,420.00	
Flow Area	193.6	ft^2
Wetted Perimeter	109.12	ft
Top Width	108.87	ft
Actual Depth	2.11	ft
Critical Elevation	2,400.97	ft
Critical Slope	0.036036	ft/ft
Velocity	6.74	ft/s
Velocity Head	0.71	ft
Specific Energy	2,401.82	ft
Froude Number	0.89	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	11+64	0.060
11+64	12+30	0.050
12+30	13+45	0.060

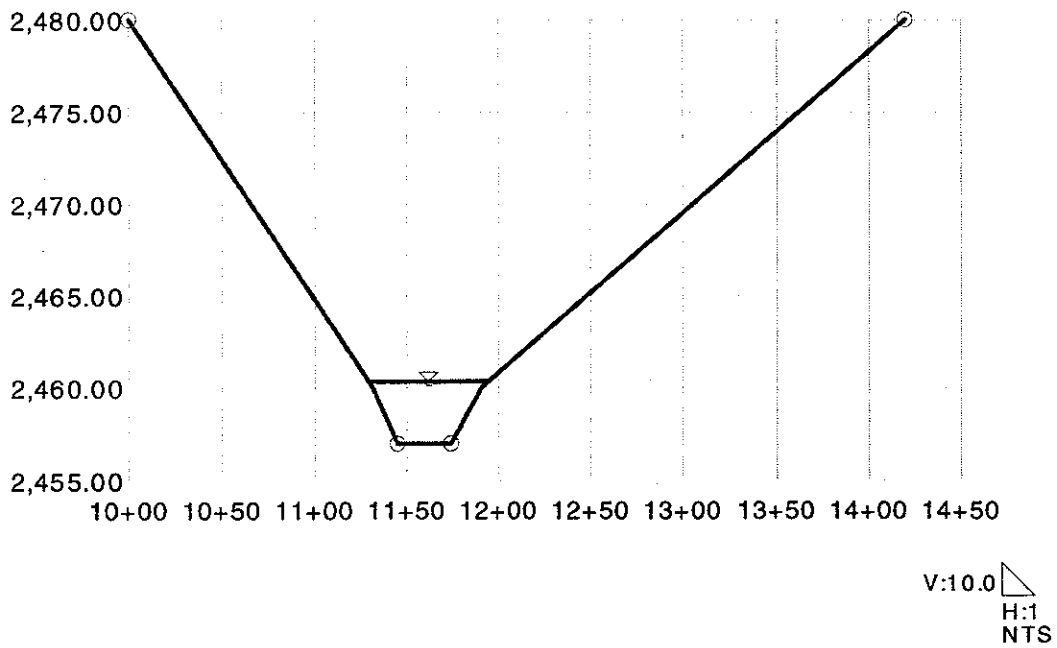
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,420.00
11+48	2,400.00
11+64	2,399.00
12+30	2,399.00
12+43	2,400.00
13+45	2,420.00

Cross Section 1200
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash14T7R4 Section 1200
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.056	
Slope	0.031000	ft/ft
Water Surface Elevation	2,460.34	ft
Elevation Range	2,457.00 to 2,480.00	
Discharge	1,289.00	cfs



Section 1200
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash14T7R4 Section 1200
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.031000	ft/ft
Discharge	1,289.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.056	
Water Surface Elevation	2,460.34	ft
Elevation Range	2,457.00 to 2,480.00	
Flow Area	154.8	ft²
Wetted Perimeter	65.86	ft
Top Width	65.20	ft
Actual Depth	3.34	ft
Critical Elevation	2,460.25	ft
Critical Slope	0.034335	ft/ft
Velocity	8.33	ft/s
Velocity Head	1.08	ft
Specific Energy	2,461.42	ft
Froude Number	0.95	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	11+44	0.060
11+44	11+74	0.050
11+74	14+20	0.060

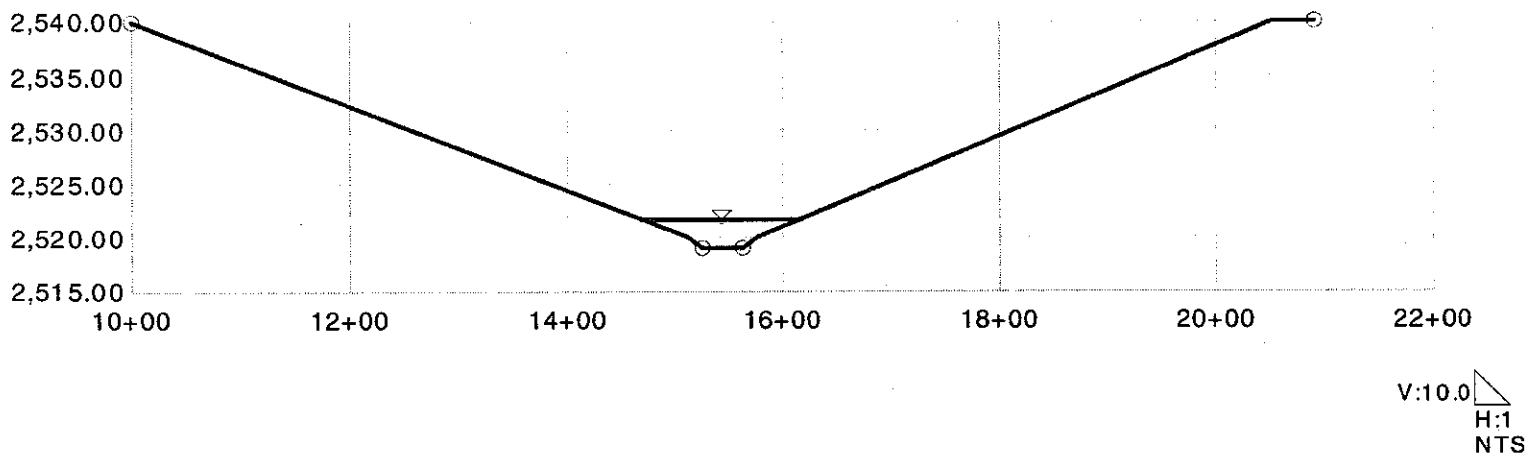
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,480.00
11+31	2,460.00
11+44	2,457.00
11+74	2,457.00
11+90	2,460.00
14+20	2,480.00

Cross Section 1300
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash14T7R4 Section 1300
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.058	
Slope	0.025000	ft/ft
Water Surface Elevation	2,521.69	ft
Elevation Range	2,519.00 to 2,540.00	
Discharge	1,264.00	cfs



Section 1300
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash14T7R4 Section 1300
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	*0.025000*	*ft/ft*
Discharge	1,264.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.058	
Water Surface Elevation	2,521.69	ft
Elevation Range	2,519.00 to 2,540.00	
Flow Area	231.1	ft²
Wetted Perimeter	148.64	ft
Top Width	148.50	ft
Actual Depth	2.69	ft
Critical Elevation	2,521.38	ft
Critical Slope	0.043272	ft/ft
Velocity	5.47	ft/s
Velocity Head	0.46	ft
Specific Energy	2,522.16	ft
Froude Number	0.77	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	15+25	0.060
15+25	15+61	0.050
15+61	20+92	0.060

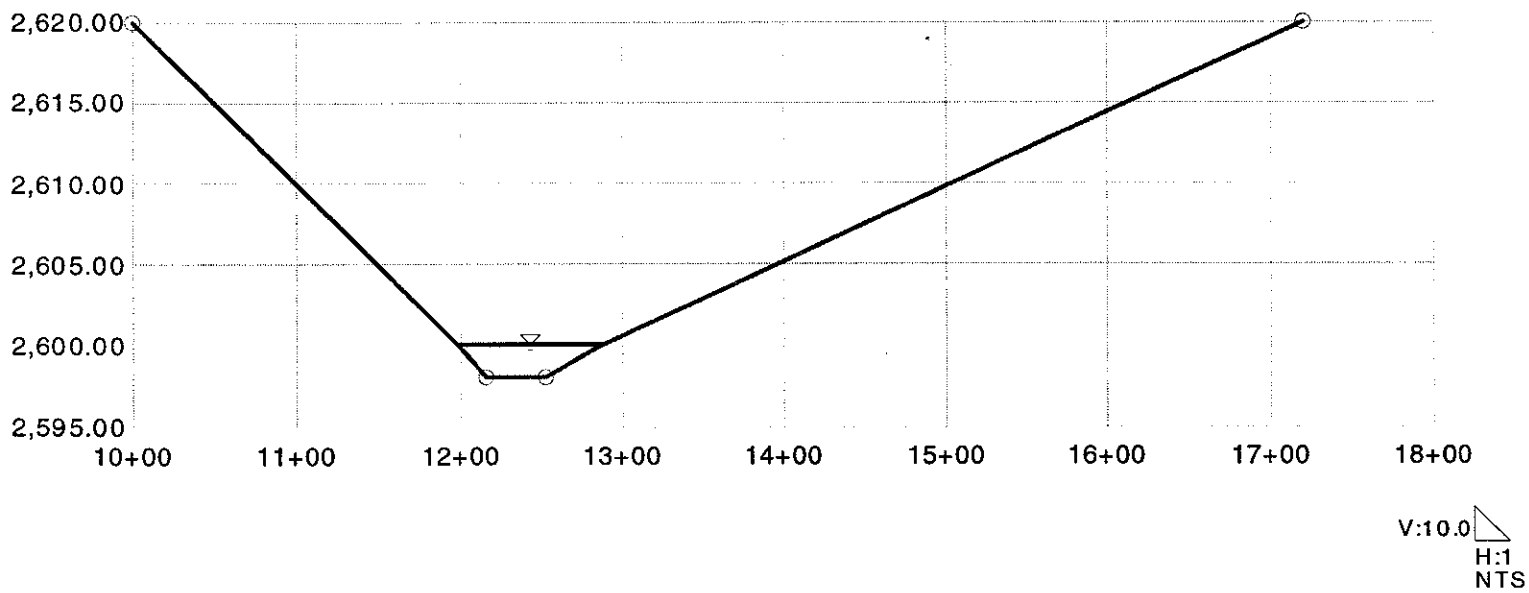
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,540.00
15+11	2,520.00
15+25	2,519.00
15+61	2,519.00
15+76	2,520.00
20+52	2,540.00
20+92	2,540.00

Cross Section 1400
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash14T7R4 Section 1400
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.056	
Slope	0.071000	ft/ft
Water Surface Elevation	2,600.06	ft
Elevation Range	2,598.00 to 2,620.00	
Discharge	1,151.00	cfs



Section 1400
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash14T7R4 Section 1400
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.071000	ft/ft
Discharge	1,151.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.056	
Water Surface Elevation	2,600.06	ft
Elevation Range	2,598.00 to 2,620.00	
Flow Area	127.9	ft²
Wetted Perimeter	88.95	ft
Top Width	88.77	ft
Actual Depth	2.06	ft
Critical Elevation	2,600.40	ft
Critical Slope	0.039205	ft/ft
Velocity	9.00	ft/s
Velocity Head	1.26	ft
Specific Energy	2,601.31	ft
Froude Number	1.32	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	12+16	0.060
12+16	12+52	0.050
12+52	17+21	0.060

Natural Channel Points

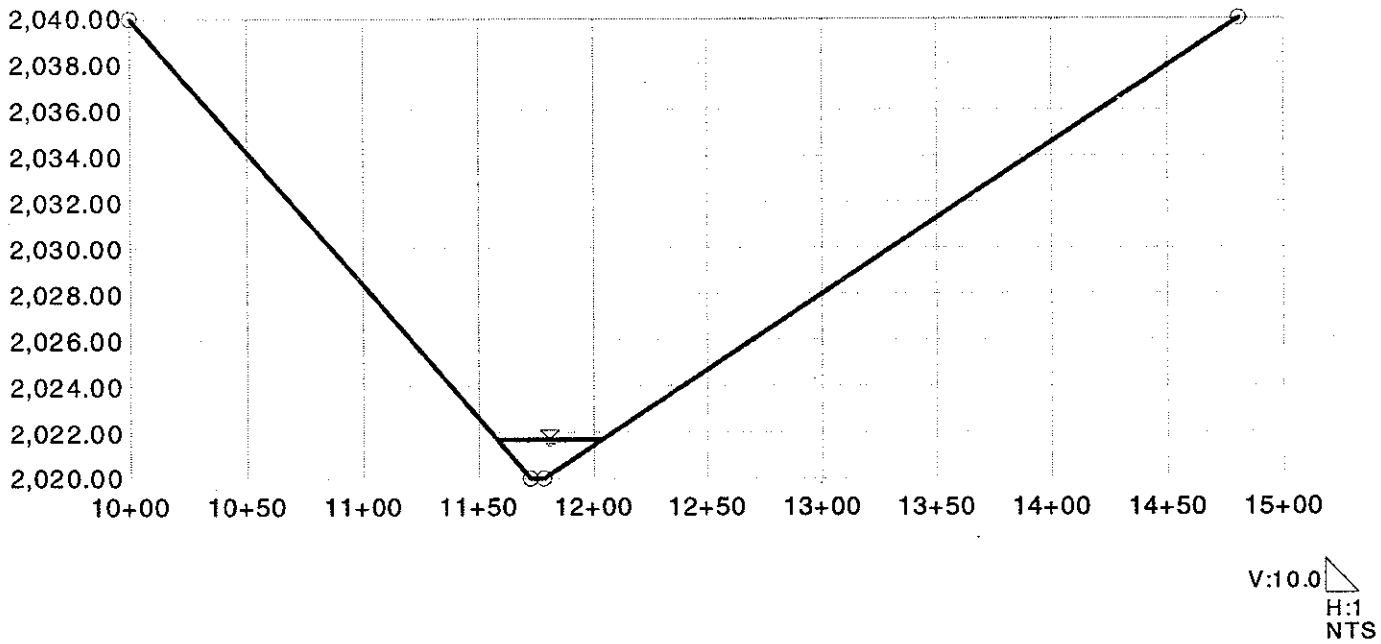
Station (ft)	Elevation (ft)
10+00	2,620.00
11+99	2,600.00
12+16	2,598.00
12+52	2,598.00
12+86	2,600.00
17+21	2,620.00

Wash Name:	**Wash C**
Tributary to:	**Hassayampa River**
File Name:	**Wash34T7R4**

Cross Section 100
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash34T7R4 Section 100
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.059	
Slope	0.023000	ft/ft
Water Surface Elevation	2,021.63	ft
Elevation Range	2,020.00 to 2,040.00	
Discharge	150.00	cfs



Section 100
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash34T7R4 Section 100
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.023000	ft/ft
Discharge	150.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.059	
Water Surface Elevation	2,021.63	ft
Elevation Range	2,020.00 to 2,040.00	
Flow Area	41.3	ft^2
Wetted Perimeter	44.84	ft
Top Width	44.69	ft
Actual Depth	1.63	ft
Critical Elevation	2,021.35	ft
Critical Slope	0.054727	ft/ft
Velocity	3.63	ft/s
Velocity Head	0.21	ft
Specific Energy	2,021.83	ft
Froude Number	0.67	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	11+73	0.060
11+73	11+79	0.050
11+79	14+81	0.060

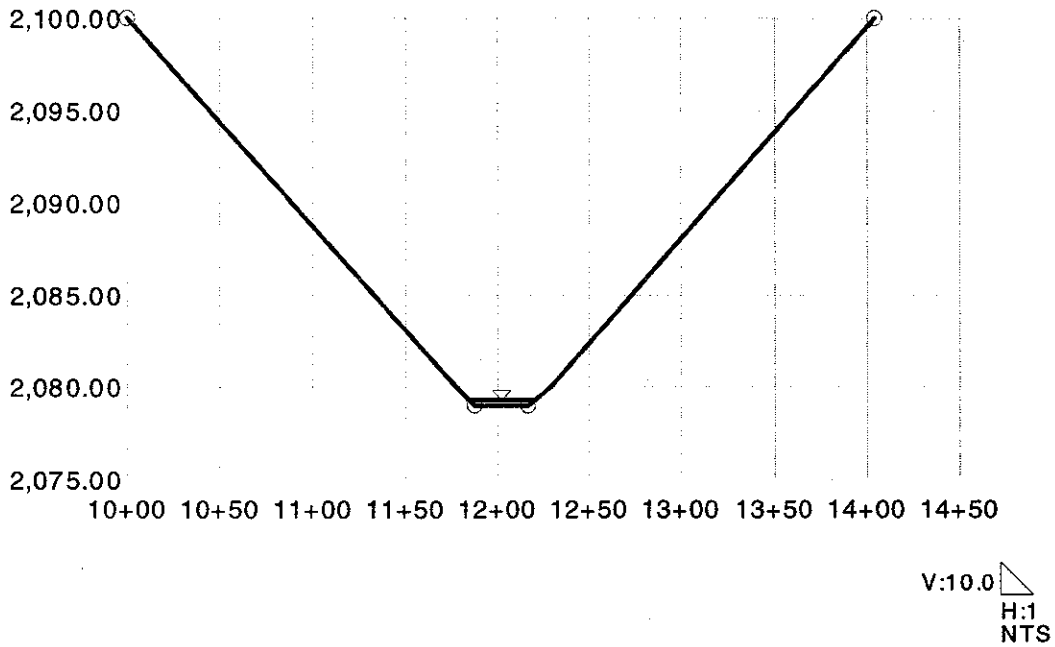
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,040.00
11+73	2,020.00
11+79	2,020.00
14+81	2,040.00

Cross Section 200
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash34T7R4 Section 200
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.052	
Slope	0.022000	ft/ft
Water Surface Elevation	2,079.28	ft
Elevation Range	2,079.00 to 2,100.00	
Discharge	15.00	cfs



Section 200
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash34T7R4 Section 200
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.022000	ft/ft
Discharge	15.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.052	
Water Surface Elevation	2,079.28	ft
Elevation Range	2,079.00 to 2,100.00	
Flow Area	8.9	ft^2
Wetted Perimeter	35.37	ft
Top Width	35.34	ft
Actual Depth	0.28	ft
Critical Elevation	2,079.20	ft
Critical Slope	0.068993	ft/ft
Velocity	1.69	ft/s
Velocity Head	0.04	ft
Specific Energy	2,079.32	ft
Froude Number	0.59	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	11+87	0.060
11+87	12+16	0.050
12+16	14+05	0.060

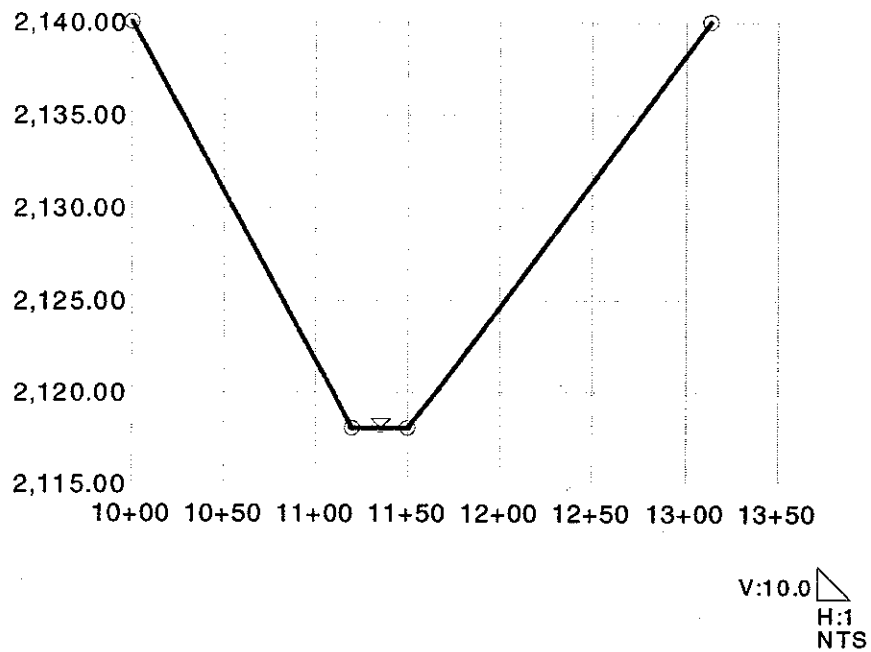
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,100.00
11+77	2,080.00
11+87	2,079.00
12+16	2,079.00
12+29	2,080.00
14+05	2,100.00

Cross Section 300
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash34T7R4 Section 300
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.050	
Slope	0.047000	ft/ft
Water Surface Elevation	2,118.10	ft
Elevation Range	2,118.00 to 2,140.00	
Discharge	4.00	cfs



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Section 300
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash34T7R4 Section 300
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.047000	ft/ft
Discharge	4.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.050	
Water Surface Elevation	2,118.10	ft
Elevation Range	2,118.00 to 2,140.00	
Flow Area	3.0	ft²
Wetted Perimeter	32.21	ft
Top Width	32.20	ft
Actual Depth	0.10	ft
Critical Elevation	2,118.08	ft
Critical Slope	0.086438	ft/ft
Velocity	1.32	ft/s
Velocity Head	0.03	ft
Specific Energy	2,118.12	ft
Froude Number	0.76	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	11+19	0.060
11+19	11+50	0.050
11+50	13+14	0.060

Natural Channel Points

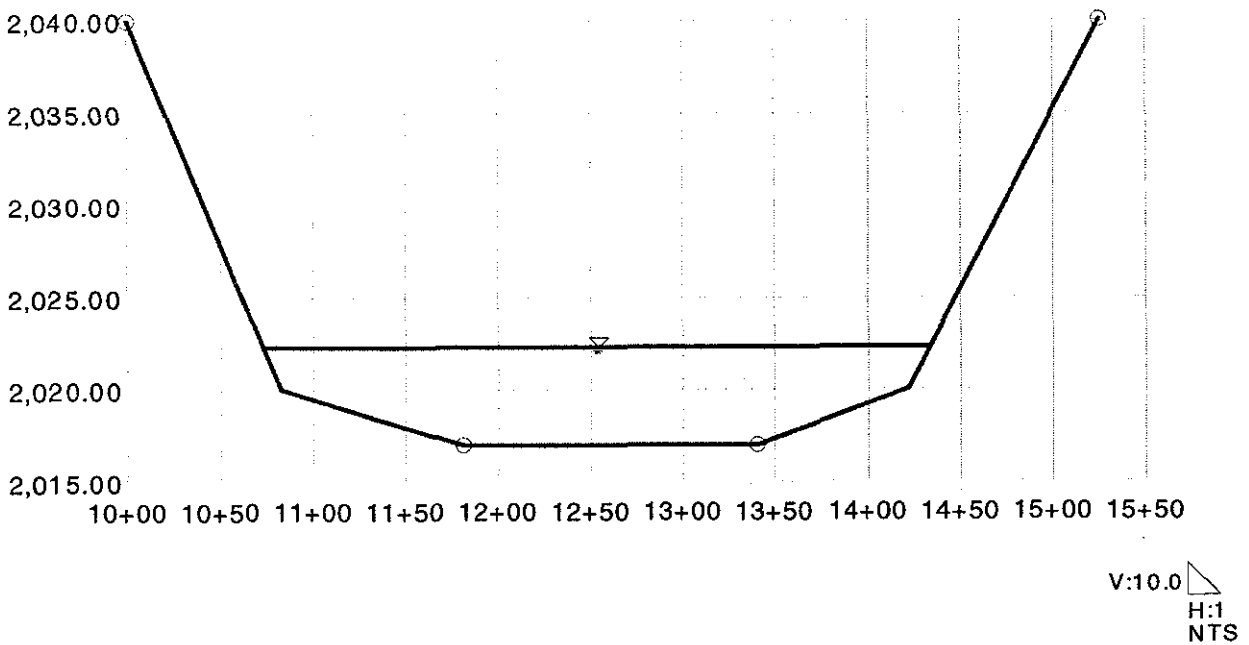
Station (ft)	Elevation (ft)
10+00	2,140.00
11+09	2,120.00
11+19	2,118.00
11+50	2,118.00
11+65	2,120.00
13+14	2,140.00

Wash Name:	**San Domingo Wash**
Tributary to:	**Hassayampa River**
File Name:	**Wash 35T7R4**

Cross Section 100
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash35R7R4 Section 100
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.056	
Slope	0.014000	ft/ft
Water Surface Elevation	2,022.28	ft
Elevation Range	2,017.00 to 2,040.00	
Discharge	12,870.00	cfs



Section 100
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash35R7R4 Section 100
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.014000	ft/ft
Discharge	12,870.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.056	
Water Surface Elevation	2,022.28	ft
Elevation Range	2,017.00 to 2,040.00	
Flow Area	1,547.5	ft²
Wetted Perimeter	361.68	ft
Top Width	361.08	ft
Actual Depth	5.28	ft
Critical Elevation	2,021.36	ft
Critical Slope	0.029952	ft/ft
Velocity	8.32	ft/s
Velocity Head	1.07	ft
Specific Energy	2,023.35	ft
Froude Number	0.71	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	11+81	0.060
11+81	13+40	0.050
13+40	15+25	0.060

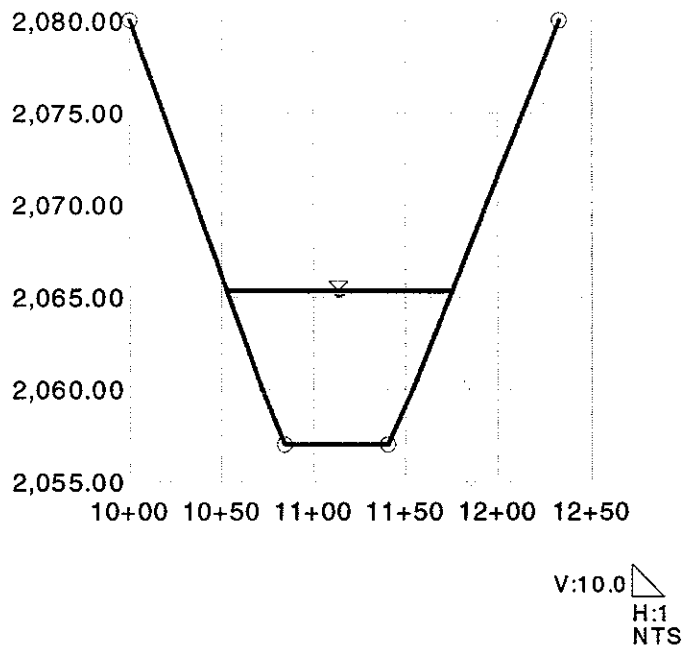
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,040.00
10+82	2,020.00
11+81	2,017.00
13+40	2,017.00
14+22	2,020.00
15+25	2,040.00

Cross Section 200
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash35T7R4 Section 200
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.056	
Slope	0.037000	ft/ft
Water Surface Elevation	2,065.30	ft
Elevation Range	2,057.00 to 2,080.00	
Discharge	12,830.00	cfs



Section 200
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash35T7R4 Section 200
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.037000	ft/ft
Discharge	12,830.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.056	
Water Surface Elevation	2,065.30	ft
Elevation Range	2,057.00 to 2,080.00	
Flow Area	753.1	ft²
Wetted Perimeter	124.76	ft
Top Width	122.71	ft
Actual Depth	8.30	ft
Critical Elevation	2,066.24	ft
Critical Slope	0.024455	ft/ft
Velocity	17.04	ft/s
Velocity Head	4.51	ft
Specific Energy	2,069.81	ft
Froude Number	1.21	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	10+84	0.060
10+84	11+40	0.050
11+40	12+33	0.060

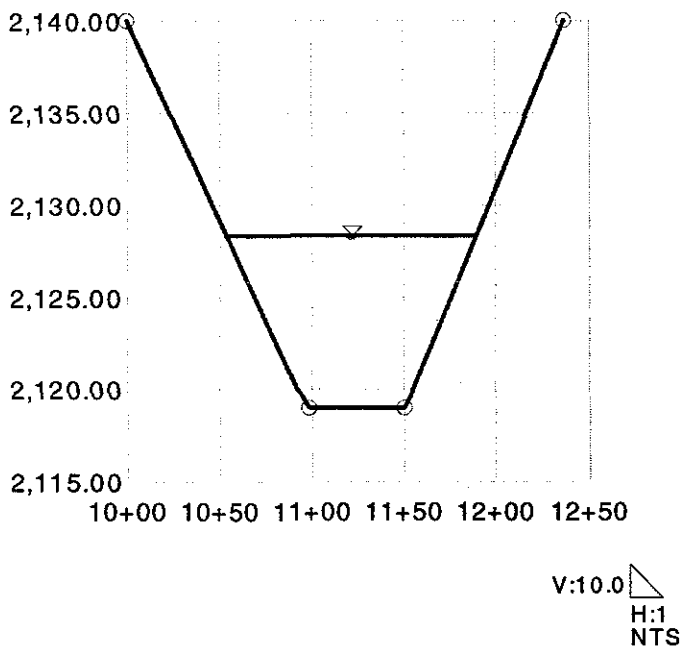
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,080.00
10+71	2,060.00
10+84	2,057.00
11+40	2,057.00
11+54	2,060.00
12+33	2,080.00

Cross Section 300
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash35T7R4 Section 300
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.056	
Slope	0.024000	ft/ft
Water Surface Elevation	2,128.38	ft
Elevation Range	2,119.00 to 2,140.00	
Discharge	12,789.00	cfs



Section 300
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash35T7R4 Section 300
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.024000	ft/ft
Discharge	12,789.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.056	
Water Surface Elevation	2,128.38	ft
Elevation Range	2,119.00 to 2,140.00	
Flow Area	899.1	ft^2
Wetted Perimeter	138.62	ft
Top Width	136.52	ft
Actual Depth	9.38	ft
Critical Elevation	2,128.27	ft
Critical Slope	0.025217	ft/ft
Velocity	14.22	ft/s
Velocity Head	3.14	ft
Specific Energy	2,131.53	ft
Froude Number	0.98	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	10+97	0.060
10+97	11+50	0.050
11+50	12+37	0.060

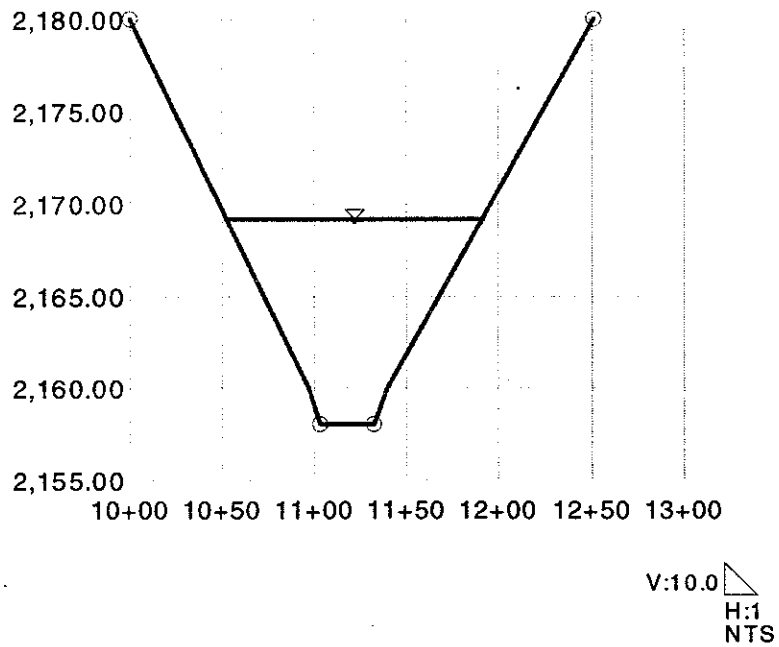
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,140.00
10+91	2,120.00
10+97	2,119.00
11+50	2,119.00
11+55	2,120.00
12+37	2,140.00

Cross Section 400
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash35T7R4 Section 400
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.058	
Slope	0.025000	ft/ft
Water Surface Elevation	2,169.20	ft
Elevation Range	2,158.00 to 2,180.00	
Discharge	12,749.00	cfs



Section 400
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash35T7R4 Section 400
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.025000	ft/ft
Discharge	12,749.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.058	
Water Surface Elevation	2,169.20	ft
Elevation Range	2,158.00 to 2,180.00	
Flow Area	910.2	ft²
Wetted Perimeter	141.48	ft
Top Width	139.17	ft
Actual Depth	11.20	ft
Critical Elevation	2,169.02	ft
Critical Slope	0.026942	ft/ft
Velocity	14.01	ft/s
Velocity Head	3.05	ft
Specific Energy	2,172.25	ft
Froude Number	0.97	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	11+03	0.060
11+03	11+32	0.050
11+32	12+52	0.060

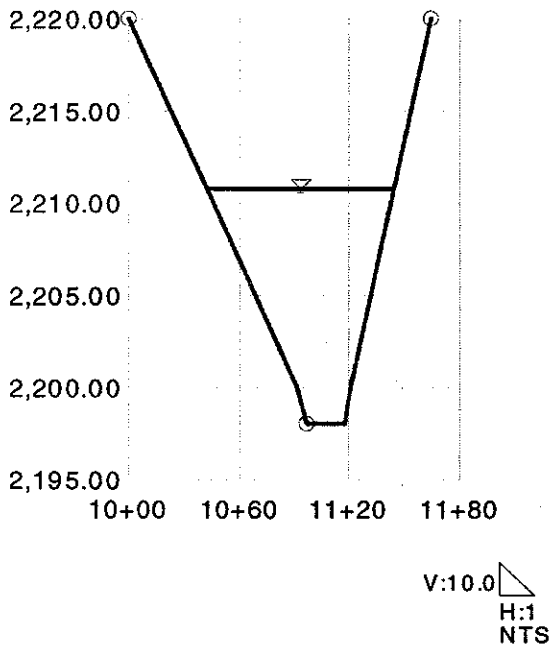
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,180.00
10+96	2,160.00
11+03	2,158.00
11+32	2,158.00
11+39	2,160.00
12+52	2,180.00

Cross Section 500
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash35T7R4 Section 500
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.055	
Slope	0.029000	ft/ft
Water Surface Elevation	2,210.76	ft
Elevation Range	2,198.00 to 2,220.00	
Discharge	12,696.00	cfs



Section 500
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash35T7R4 Section 500
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.029000	ft/ft
Discharge	12,696.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.055	
Water Surface Elevation	2,210.76	ft
Elevation Range	2,198.00 to 2,220.00	
Flow Area	752.9	ft²
Wetted Perimeter	106.17	ft
Top Width	101.64	ft
Actual Depth	12.76	ft
Critical Elevation	2,211.29	ft
Critical Slope	0.024024	ft/ft
Velocity	16.86	ft/s
Velocity Head	4.42	ft
Specific Energy	2,215.18	ft
Froude Number	1.09	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	10+97	0.060
10+97	11+64	0.050

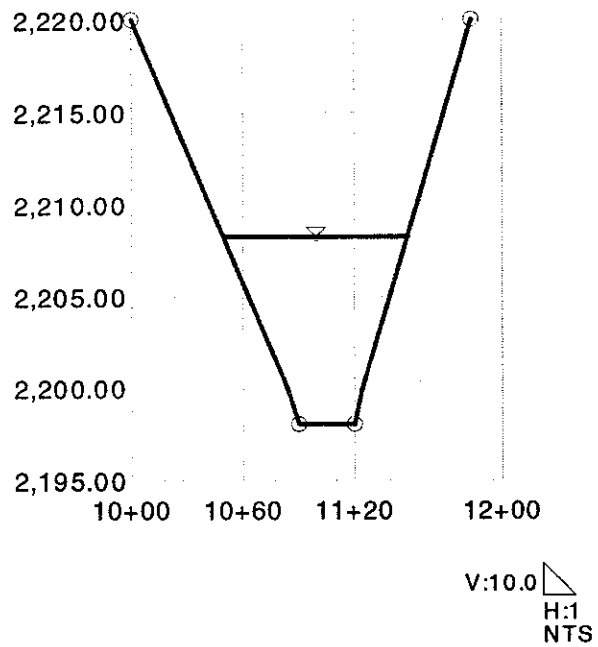
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,220.00
10+92	2,200.00
10+97	2,198.00
11+18	2,198.00
11+21	2,200.00
11+64	2,220.00

Cross Section 600
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash35T7R4 Section 600
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.057	
Slope	0.047000	ft/ft
Water Surface Elevation	2,208.26	ft
Elevation Range	2,198.00 to 2,220.00	
Discharge	12,611.00	cfs



Section 600
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash35T7R4 Section 600
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.047000	ft/ft
Discharge	12,611.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.057	
Water Surface Elevation	2,208.26	ft
Elevation Range	2,198.00 to 2,220.00	
Flow Area	653.5	ft^2
Wetted Perimeter	103.10	ft
Top Width	100.06	ft
Actual Depth	10.26	ft
Critical Elevation	2,209.83	ft
Critical Slope	0.025519	ft/ft
Velocity	19.30	ft/s
Velocity Head	5.79	ft
Specific Energy	2,214.05	ft
Froude Number	1.33	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	10+90	0.060
10+90	11+20	0.050
11+20	11+84	0.060

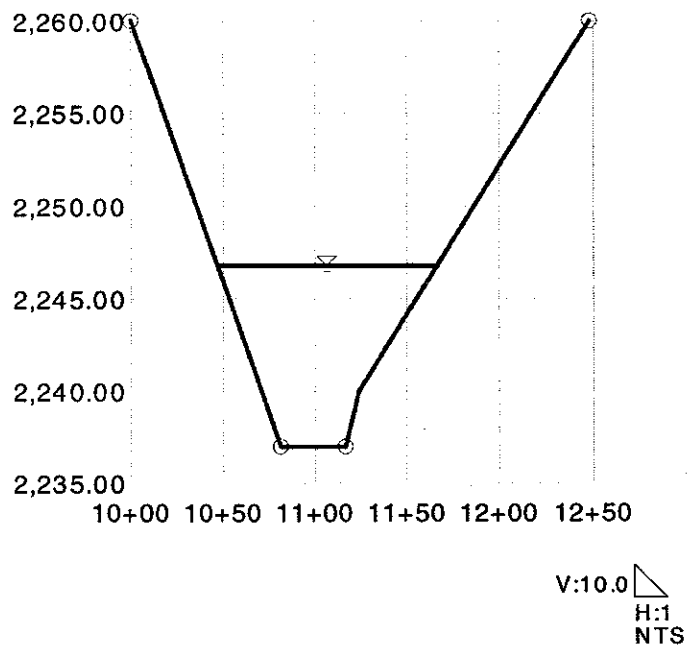
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,220.00
10+84	2,200.00
10+90	2,198.00
11+20	2,198.00
11+25	2,200.00
11+84	2,220.00

Cross Section 700
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash35T7R4 Section 700
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.061
Slope	0.034000 ft/ft
Water Surface Elevation	2,246.79 ft
Elevation Range	2,237.00 to 2,260.00
Discharge	10,655.00 cfs



Section 700
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash35T7R4 Section 700
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.034000	ft/ft
Discharge	10,655.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.061	
Water Surface Elevation	2,246.79	ft
Elevation Range	2,237.00 to 2,260.00	
Flow Area	723.9	ft²
Wetted Perimeter	122.31	ft
Top Width	119.87	ft
Actual Depth	9.79	ft
Critical Elevation	2,247.06	ft
Critical Slope	0.030264	ft/ft
Velocity	14.72	ft/s
Velocity Head	3.37	ft
Specific Energy	2,250.16	ft
Froude Number	1.06	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	10+81	0.065
10+81	11+16	0.050
11+16	12+48	0.065

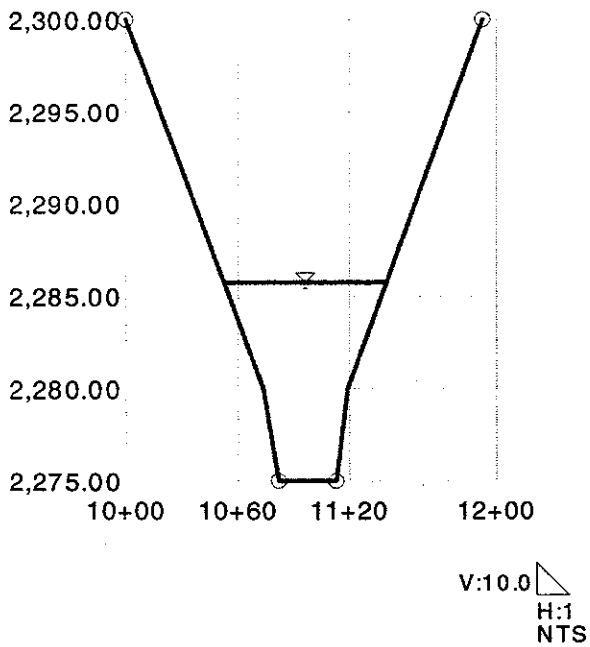
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,260.00
10+70	2,240.00
10+81	2,237.00
11+16	2,237.00
11+24	2,240.00
12+48	2,260.00

Cross Section 800
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash35T7R4 Section 800
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.059	
Slope	0.048000	ft/ft
Water Surface Elevation	2,285.74	ft
Elevation Range	2,275.00 to 2,300.00	
Discharge	10,655.00	cfs



Section 800
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash35T7R4 Section 800
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.048000	ft/ft
Discharge	10,655.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.059	
Water Surface Elevation	2,285.74	ft
Elevation Range	2,275.00 to 2,300.00	
Flow Area	570.1	ft²
Wetted Perimeter	92.24	ft
Top Width	87.47	ft
Actual Depth	10.74	ft
Critical Elevation	2,287.16	ft
Critical Slope	0.027857	ft/ft
Velocity	18.69	ft/s
Velocity Head	5.43	ft
Specific Energy	2,291.17	ft
Froude Number	1.29	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	10+82	0.065
10+82	11+13	0.045
11+13	11+93	0.065

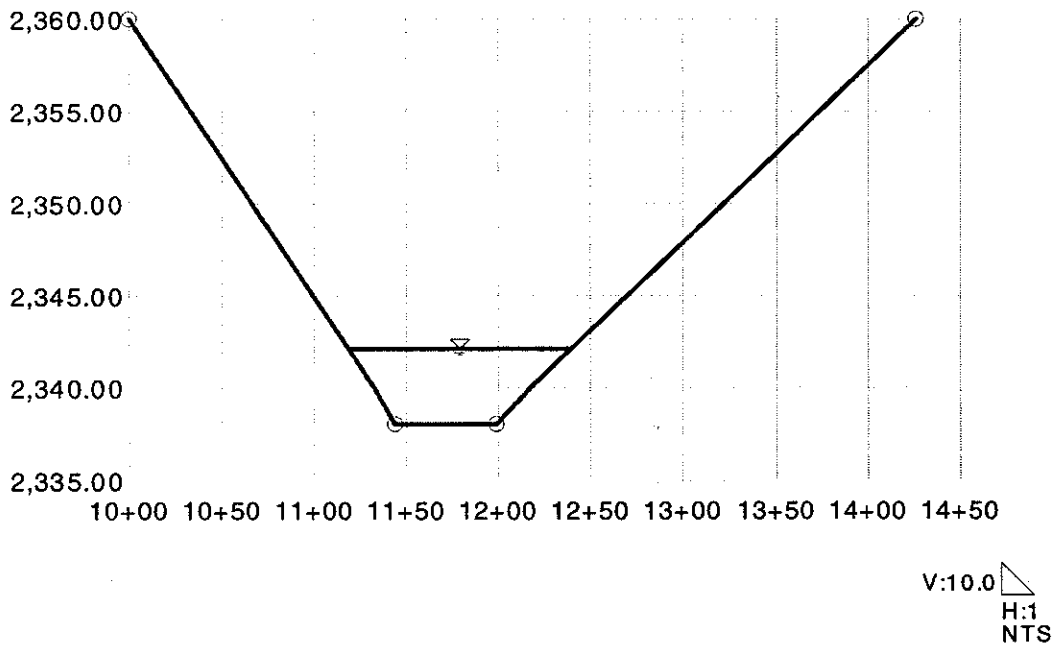
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,300.00
10+74	2,280.00
10+82	2,275.00
11+13	2,275.00
11+19	2,280.00
11+93	2,300.00

Cross Section 900
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash35T7R4 Section 900
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.055	
Slope	0.021000	ft/ft
Water Surface Elevation	2,342.08	ft
Elevation Range	2,338.00 to 2,360.00	
Discharge	2,819.00	cfs



Section 900
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash35T7R4 Section 900
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.021000	ft/ft
Discharge	2,819.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.055	
Water Surface Elevation	2,342.08	ft
Elevation Range	2,338.00 to 2,360.00	
Flow Area	354.7	ft^2
Wetted Perimeter	121.01	ft
Top Width	120.46	ft
Actual Depth	4.08	ft
Critical Elevation	2,341.64	ft
Critical Slope	0.032464	ft/ft
Velocity	7.95	ft/s
Velocity Head	0.98	ft
Specific Energy	2,343.06	ft
Froude Number	0.82	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	11+43	0.060
11+43	11+99	0.050
11+99	14+26	0.060

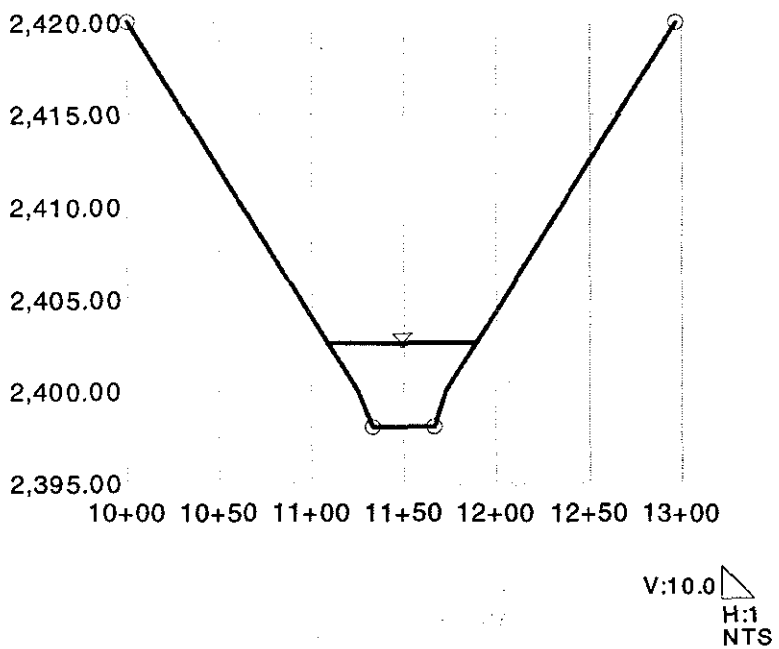
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,360.00
11+32	2,340.00
11+43	2,338.00
11+99	2,338.00
12+17	2,340.00
14+26	2,360.00

Cross Section 1000
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash35T7R4 Section 1000
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.056
Slope	0.039000 ft/ft
Water Surface Elevation	2,402.66 ft
Elevation Range	2,398.00 to 2,420.00
Discharge	2,752.00 cfs



Section 1000
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash35T7R4 Section 1000
Flow Element	*Irregular Channel*
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.039000	ft/ft
Discharge	2,752.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.056	
Water Surface Elevation	2,402.66	ft
Elevation Range	2,398.00 to 2,420.00	
Flow Area	249.0	ft²
Wetted Perimeter	81.21	ft
Top Width	80.22	ft
Actual Depth	4.66	ft
Critical Elevation	2,402.91	ft
Critical Slope	0.031460	ft/ft
Velocity	11.05	ft/s
Velocity Head	1.90	ft
Specific Energy	2,404.56	ft
Froude Number	1.11	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	11+33	0.060
11+33	11+66	0.050
11+66	12+97	0.060

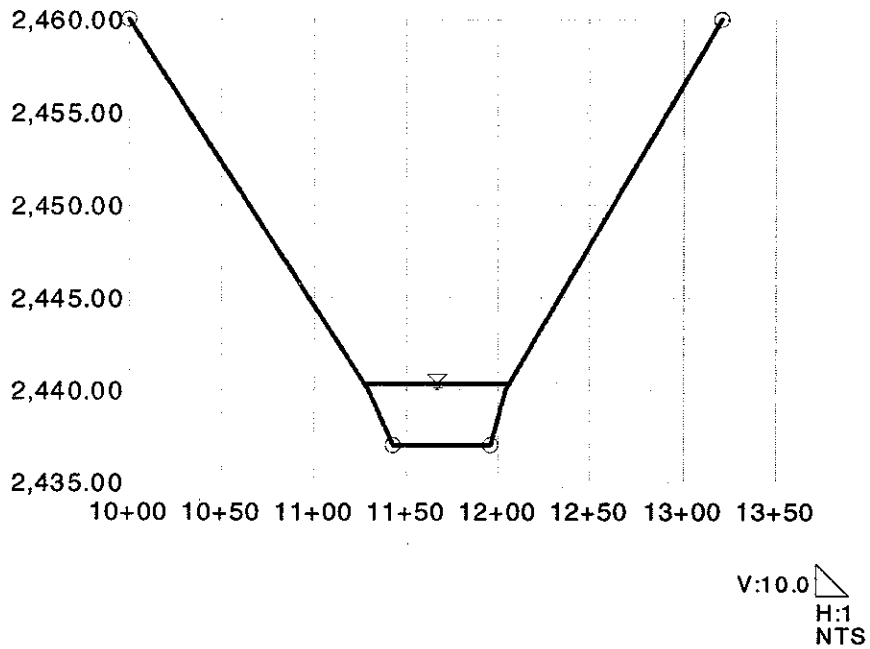
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,420.00
11+25	2,400.00
11+33	2,398.00
11+66	2,398.00
11+72	2,400.00
12+97	2,420.00

Cross Section 1100
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash35T7R4 Section 1100
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.053	
Slope	0.052000	ft/ft
Water Surface Elevation	2,440.30	ft
Elevation Range	2,437.00 to 2,460.00	
Discharge	2,644.00	cfs



Section 1100
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash35T7R4 Section 1100
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.052000	ft/ft
Discharge	2,644.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.053	
Water Surface Elevation	2,440.30	ft
Elevation Range	2,437.00 to 2,460.00	
Flow Area	215.0	ft^2
Wetted Perimeter	79.55	ft
Top Width	78.67	ft
Actual Depth	3.30	ft
Critical Elevation	2,440.91	ft
Critical Slope	0.029035	ft/ft
Velocity	12.30	ft/s
Velocity Head	2.35	ft
Specific Energy	2,442.65	ft
Froude Number	1.31	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	11+42	0.060
11+42	11+95	0.050
11+95	13+21	0.060

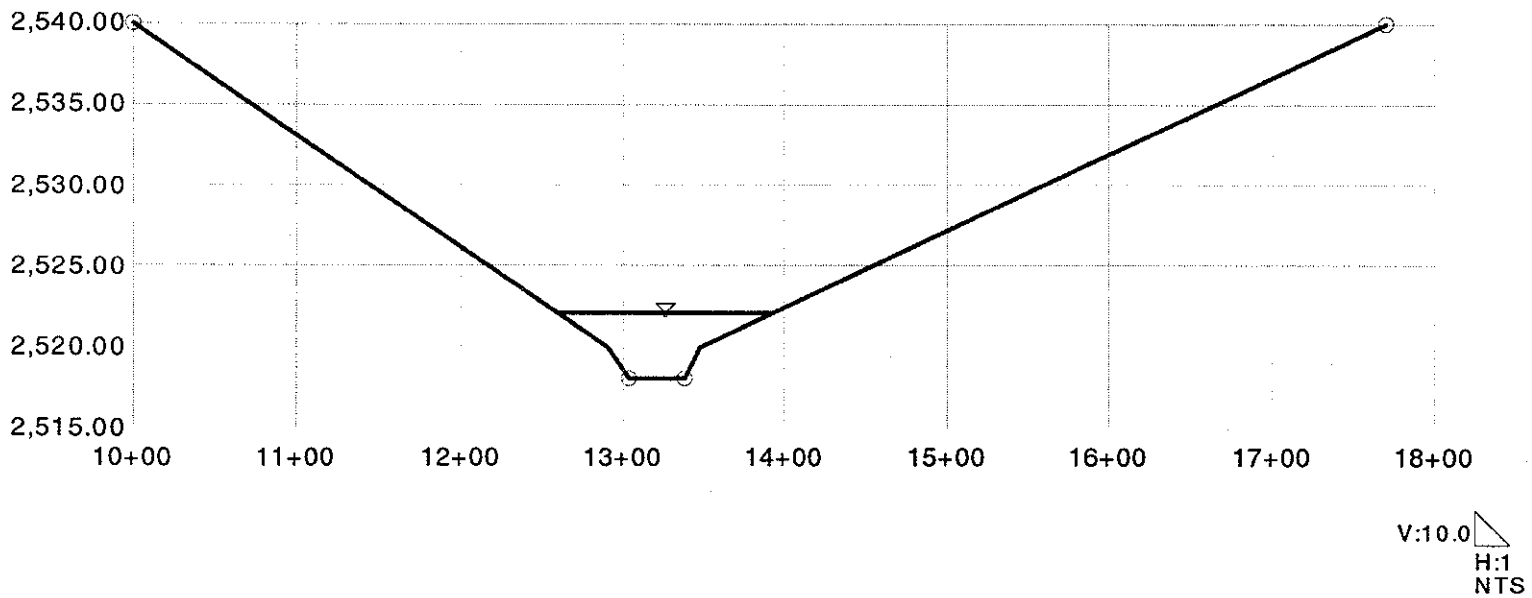
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,460.00
11+29	2,440.00
11+42	2,437.00
11+95	2,437.00
12+04	2,440.00
13+21	2,460.00

Cross Section 1200
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash35T7R4 Section 1200
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.058	
Slope	0.022000	ft/ft
Water Surface Elevation	2,522.13	ft
Elevation Range	2,518.00 to 2,540.00	
Discharge	1,879.00	cfs



Section 1200
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash35T7R4 Section 1200
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.022000	ft/ft
Discharge	1,879.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.058	
Water Surface Elevation	2,522.13	ft
Elevation Range	2,518.00 to 2,540.00	
Flow Area	290.7	ft²
Wetted Perimeter	132.65	ft
Top Width	132.15	ft
Actual Depth	4.13	ft
Critical Elevation	2,521.67	ft
Critical Slope	0.038362	ft/ft
Velocity	6.46	ft/s
Velocity Head	0.65	ft
Specific Energy	2,522.78	ft
Froude Number	0.77	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	13+04	0.060
13+04	13+38	0.050
13+38	17+70	0.060

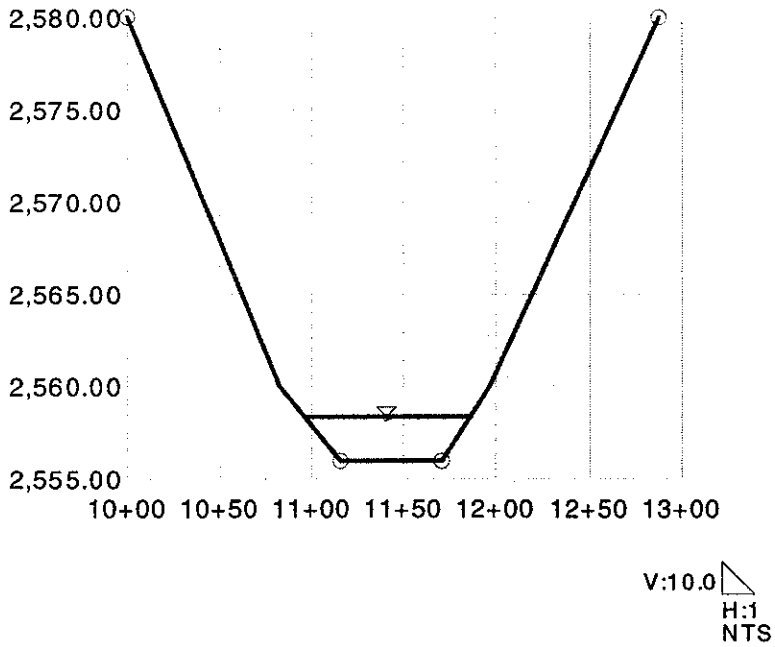
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,540.00
12+91	2,520.00
13+04	2,518.00
13+38	2,518.00
13+47	2,520.00
17+70	2,540.00

Cross Section 1300
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash35T7R4 Section 1300
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.054	
Slope	0.059000	ft/ft
Water Surface Elevation	2,558.39	ft
Elevation Range	2,556.00 to 2,580.00	
Discharge	1,788.00	cfs



Section 1300
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash35T7R4 Section 1300
Flow Element	*Irregular Channel*
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.059000	ft/ft
Discharge	1,788.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.054	
Water Surface Elevation	2,558.39	ft
Elevation Range	2,556.00 to 2,580.00	
Flow Area	173.5	ft²
Wetted Perimeter	90.57	ft
Top Width	90.25	ft
Actual Depth	2.39	ft
Critical Elevation	2,558.81	ft
Critical Slope	0.032874	ft/ft
Velocity	10.30	ft/s
Velocity Head	1.65	ft
Specific Energy	2,560.04	ft
Froude Number	1.31	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	11+15	0.060
11+15	11+70	0.050
11+70	12+88	0.060

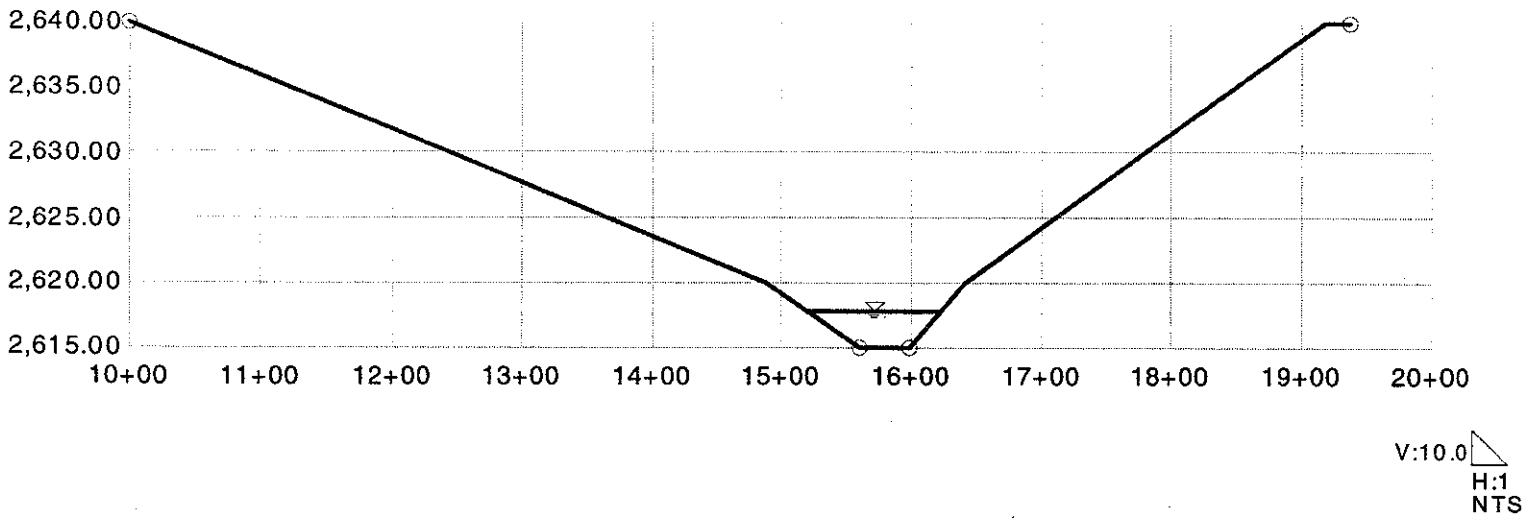
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,580.00
10+82	2,560.00
11+15	2,556.00
11+70	2,556.00
11+96	2,560.00
12+88	2,580.00

Cross Section 1400
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash35T7R4 Section 1400
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.056	
Slope	0.031000	ft/ft
Water Surface Elevation	2,617.71	ft
Elevation Range	2,615.00 to 2,640.00	
Discharge	1,322.00	cfs



Section 1400
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash35T7R4 Section 1400
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.031000	ft/ft
Discharge	1,322.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.056	
Water Surface Elevation	2,617.71	ft
Elevation Range	2,615.00 to 2,640.00	
Flow Area	188.2	ft²
Wetted Perimeter	101.12	ft
Top Width	100.88	ft
Actual Depth	2.71	ft
Critical Elevation	2,617.57	ft
Critical Slope	0.038256	ft/ft
Velocity	7.02	ft/s
Velocity Head	0.77	ft
Specific Energy	2,618.48	ft
Froude Number	0.91	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	15+60	0.060
15+60	15+98	0.050
15+98	19+37	0.060

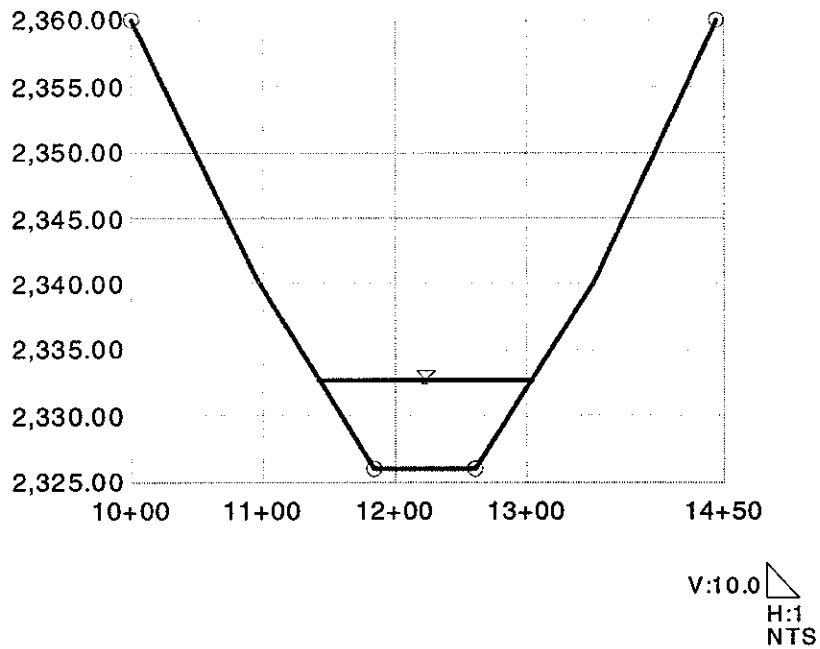
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,640.00
14+88	2,620.00
15+60	2,615.00
15+98	2,615.00
16+42	2,620.00
19+19	2,640.00
19+37	2,640.00

Cross Section 2000
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash35T7R4 Section 2000
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.055	
Slope	0.026000	ft/ft
Water Surface Elevation	2,332.70	ft
Elevation Range	2,326.00 to 2,360.00	
Discharge	10,089.00	cfs



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Section 2000
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash35T7R4 Section 2000
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.026000	ft/ft
Discharge	10,089.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.055	
Water Surface Elevation	2,332.70	ft
Elevation Range	2,326.00 to 2,360.00	
Flow Area	804.6	ft^2
Wetted Perimeter	163.28	ft
Top Width	162.22	ft
Actual Depth	6.70	ft
Critical Elevation	2,332.67	ft
Critical Slope	0.026422	ft/ft
Velocity	12.54	ft/s
Velocity Head	2.44	ft
Specific Energy	2,335.14	ft
Froude Number	0.99	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	11+83	0.060
11+83	12+61	0.050
12+61	14+44	0.060

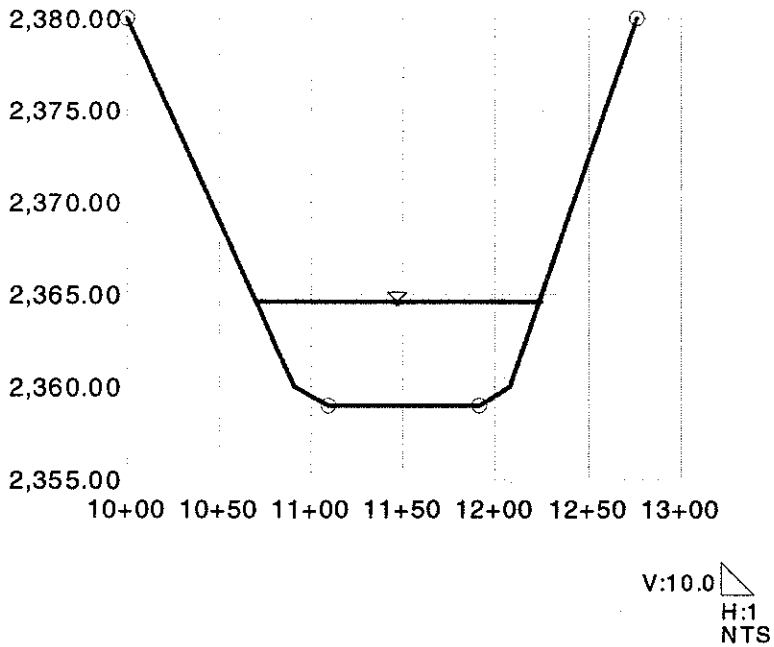
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,360.00
10+96	2,340.00
11+83	2,326.00
12+61	2,326.00
13+50	2,340.00
14+44	2,360.00

Cross Section 2100
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash35TR4 Section 2100
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.050	
Slope	0.026000	ft/ft
Water Surface Elevation	2,364.66	ft
Elevation Range	2,359.00 to 2,380.00	
Discharge	9,937.00	cfs



Section 2100
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash35TR4 Section 2100
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.026000	ft/ft
Discharge	9,937.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.050	
Water Surface Elevation	2,364.66	ft
Elevation Range	2,359.00 to 2,380.00	
Flow Area	736.1	ft²
Wetted Perimeter	156.27	ft
Top Width	155.04	ft
Actual Depth	5.66	ft
Critical Elevation	2,364.97	ft
Critical Slope	0.021460	ft/ft
Velocity	13.50	ft/s
Velocity Head	2.83	ft
Specific Energy	2,367.49	ft
Froude Number	1.09	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	11+09	0.055
11+09	11+91	0.045
11+91	12+77	0.055

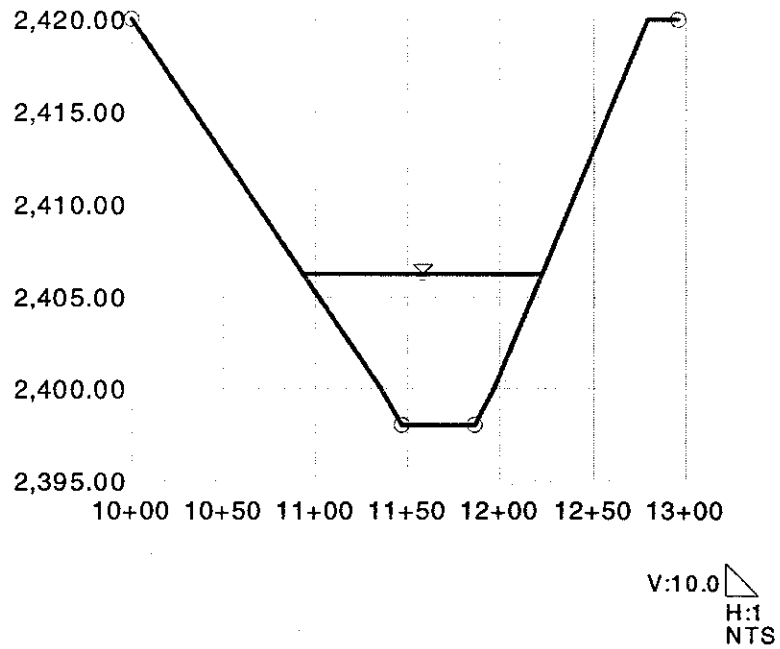
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,380.00
10+90	2,360.00
11+09	2,359.00
11+91	2,359.00
12+08	2,360.00
12+77	2,380.00

Cross Section 2200
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash35T7R4 Section 2200
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.052	
Slope	0.026000	ft/ft
Water Surface Elevation	2,406.27	ft
Elevation Range	2,398.00 to 2,420.00	
Discharge	9,814.00	cfs



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Section 2200
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash35T7R4 Section 2200
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.026000	ft/ft
Discharge	9,814.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.052	
Water Surface Elevation	2,406.27	ft
Elevation Range	2,398.00 to 2,420.00	
Flow Area	699.1	ft²
Wetted Perimeter	131.27	ft
Top Width	129.69	ft
Actual Depth	8.27	ft
Critical Elevation	2,406.55	ft
Critical Slope	0.022683	ft/ft
Velocity	14.04	ft/s
Velocity Head	3.06	ft
Specific Energy	2,409.34	ft
Froude Number	1.07	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	11+46	0.055
11+46	11+86	0.045
11+86	12+96	0.055

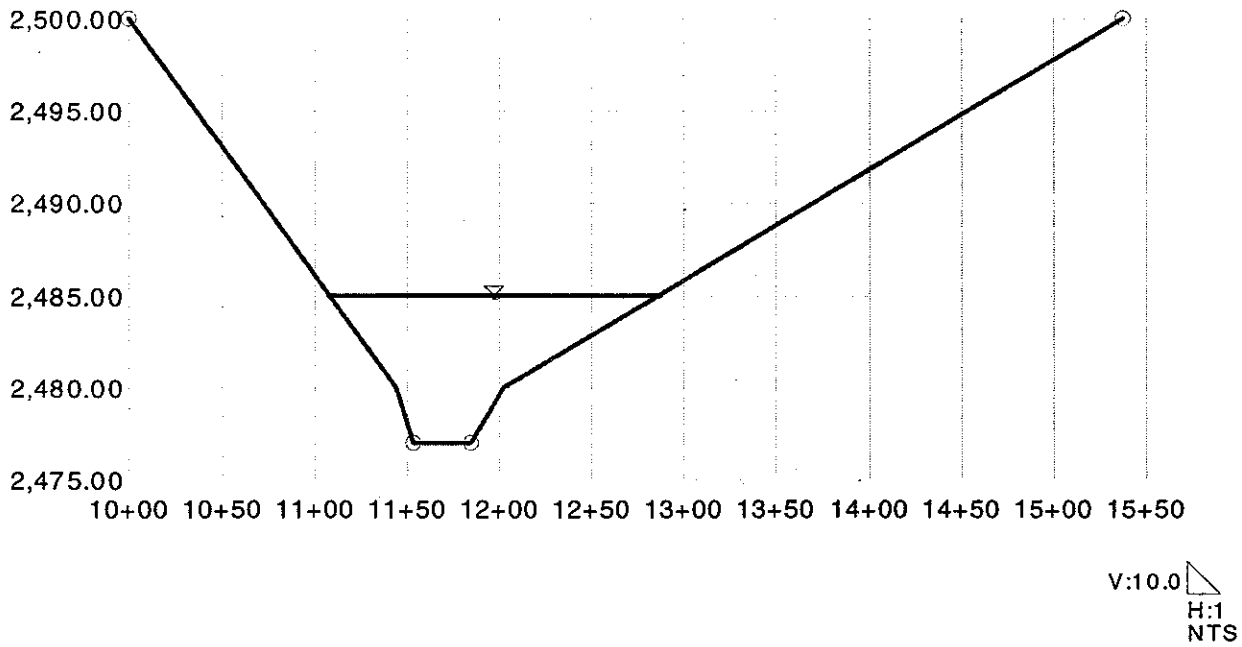
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,420.00
11+35	2,400.00
11+46	2,398.00
11+86	2,398.00
11+96	2,400.00
12+80	2,420.00
12+96	2,420.00

Cross Section 2300
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash35T7R4 Section 2300
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.053	
Slope	0.031000	ft/ft
Water Surface Elevation	2,485.04	ft
Elevation Range	2,477.00 to 2,500.00	
Discharge	9,206.00	cfs



Section 2300
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash35T7R4 Section 2300
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.031000	ft/ft
Discharge	9,206.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.053	
Water Surface Elevation	2,485.04	ft
Elevation Range	2,477.00 to 2,500.00	
Flow Area	736.4	ft^2
Wetted Perimeter	180.87	ft
Top Width	179.68	ft
Actual Depth	8.04	ft
Critical Elevation	2,485.33	ft
Critical Slope	0.025874	ft/ft
Velocity	12.50	ft/s
Velocity Head	2.43	ft
Specific Energy	2,487.47	ft
Froude Number	1.09	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	11+53	0.055
11+53	11+84	0.045
11+84	15+38	0.055

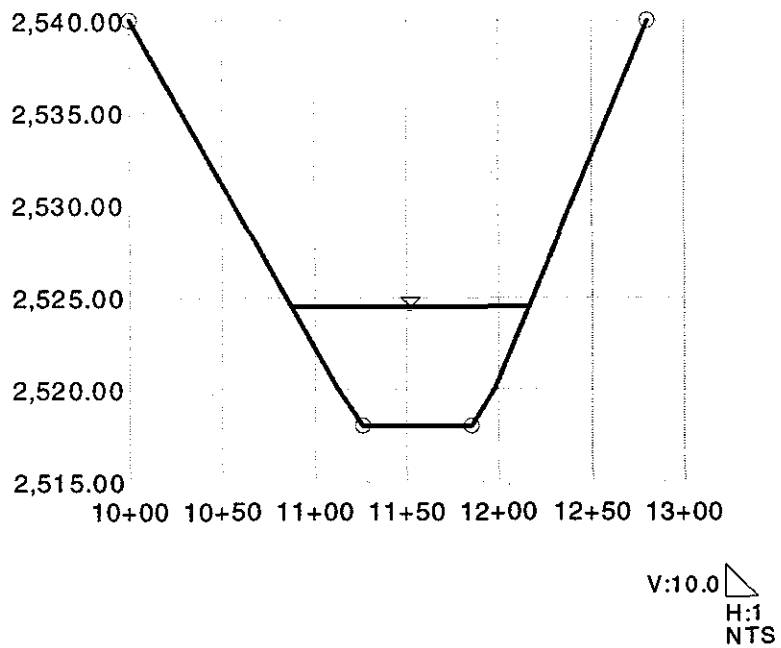
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,500.00
11+43	2,480.00
11+53	2,477.00
11+84	2,477.00
12+02	2,480.00
15+38	2,500.00

Cross Section 2400
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash35T7R4 Section 2400
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.051	
Slope	0.030000	ft/ft
Water Surface Elevation	2,524.52	ft
Elevation Range	2,518.00 to 2,540.00	
Discharge	9,111.00	cfs



Section 2400
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash35T7R4 Section 2400
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.030000	ft/ft
Discharge	9,111.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.051	
Water Surface Elevation	2,524.52	ft
Elevation Range	2,518.00 to 2,540.00	
Flow Area	628.4	ft²
Wetted Perimeter	130.54	ft
Top Width	129.30	ft
Actual Depth	6.52	ft
Critical Elevation	2,525.09	ft
Critical Slope	0.021806	ft/ft
Velocity	14.50	ft/s
Velocity Head	3.27	ft
Specific Energy	2,527.79	ft
Froude Number	1.16	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	11+26	0.055
11+26	11+85	0.045
11+85	12+81	0.055

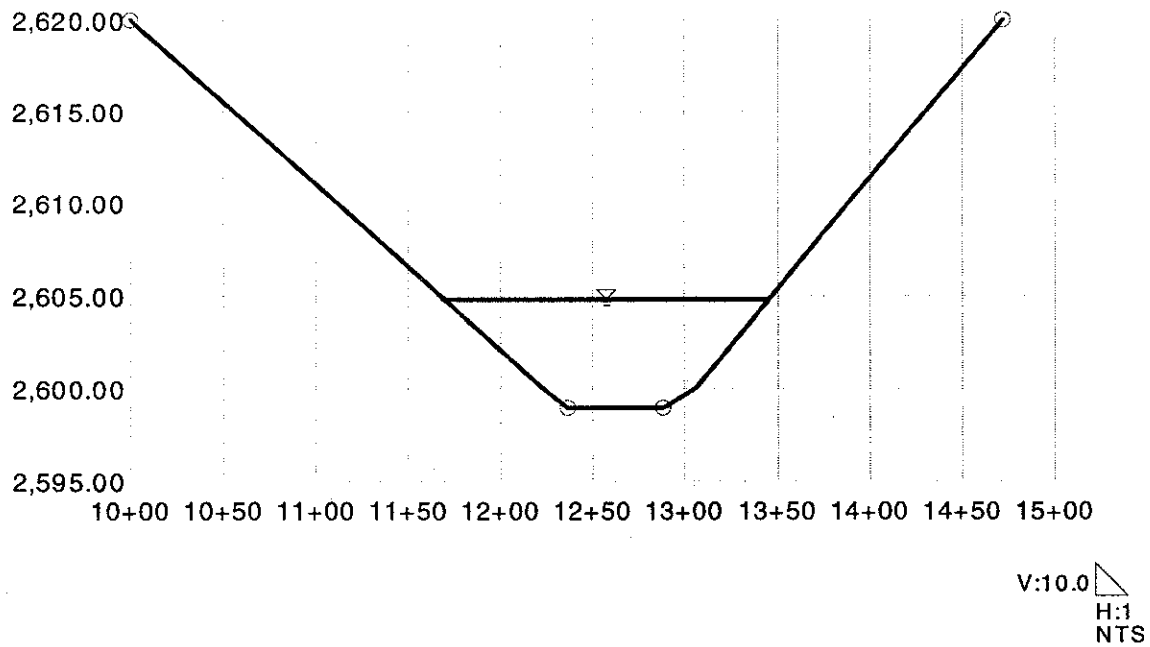
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,540.00
11+12	2,520.00
11+26	2,518.00
11+85	2,518.00
11+97	2,520.00
12+81	2,540.00

Cross Section 2500
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash35T7R4 Section 2500
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.052
Slope	0.029000 ft/ft
Water Surface Elevation	2,604.80 ft
Elevation Range	2,599.00 to 2,620.00
Discharge	8,352.00 cfs



Section 2500
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash35T7R4 Section 2500
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.029000	ft/ft
Discharge	8,352.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.052	
Water Surface Elevation	2,604.80	ft
Elevation Range	2,599.00 to 2,620.00	
Flow Area	694.1	ft^2
Wetted Perimeter	177.62	ft
Top Width	177.06	ft
Actual Depth	5.80	ft
Critical Elevation	2,605.01	ft
Critical Slope	0.025009	ft/ft
Velocity	12.03	ft/s
Velocity Head	2.25	ft
Specific Energy	2,607.05	ft
Froude Number	1.07	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	12+36	0.055
12+36	12+88	0.045
12+88	14+72	0.055

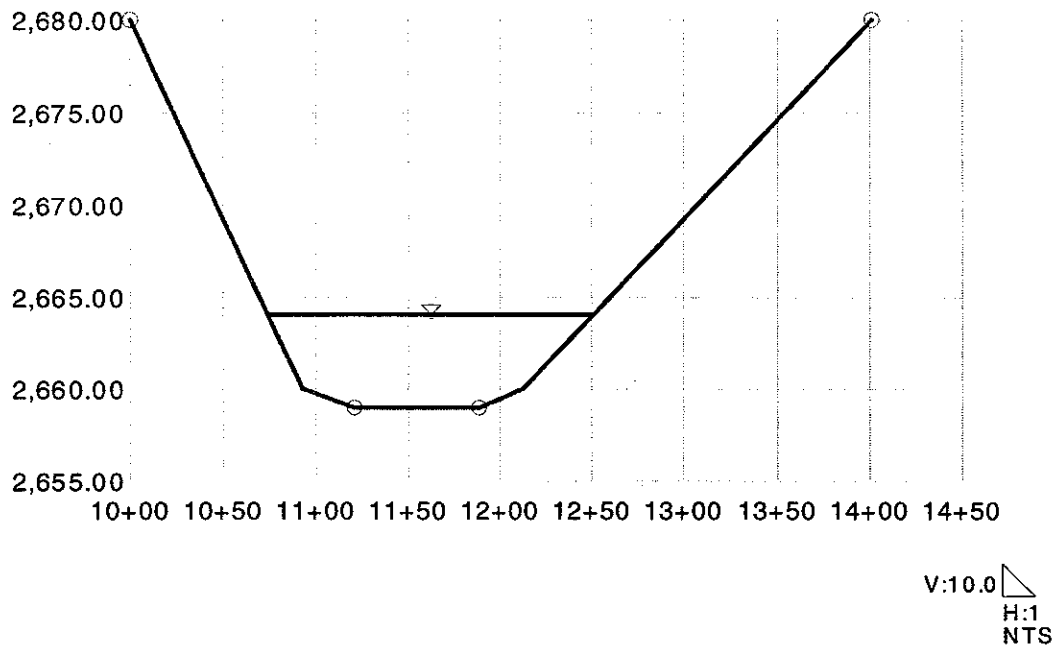
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,620.00
12+22	2,600.00
12+36	2,599.00
12+88	2,599.00
13+06	2,600.00
14+72	2,620.00

Cross Section 2600
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash35T7R4 Section 2600
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.051	
Slope	0.025000	ft/ft
Water Surface Elevation	2,664.12	ft
Elevation Range	2,659.00 to 2,680.00	
Discharge	8,105.00	cfs



Section 2600
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash35T7R4 Section 2600
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.025000	ft/ft
Discharge	8,105.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.051	
Water Surface Elevation	2,664.12	ft
Elevation Range	2,659.00 to 2,680.00	
Flow Area	707.1	ft²
Wetted Perimeter	178.54	ft
Top Width	177.84	ft
Actual Depth	5.12	ft
Critical Elevation	2,664.16	ft
Critical Slope	0.024286	ft/ft
Velocity	11.46	ft/s
Velocity Head	2.04	ft
Specific Energy	2,666.16	ft
Froude Number	1.01	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	11+20	0.055
11+20	11+88	0.045
11+88	14+01	0.055

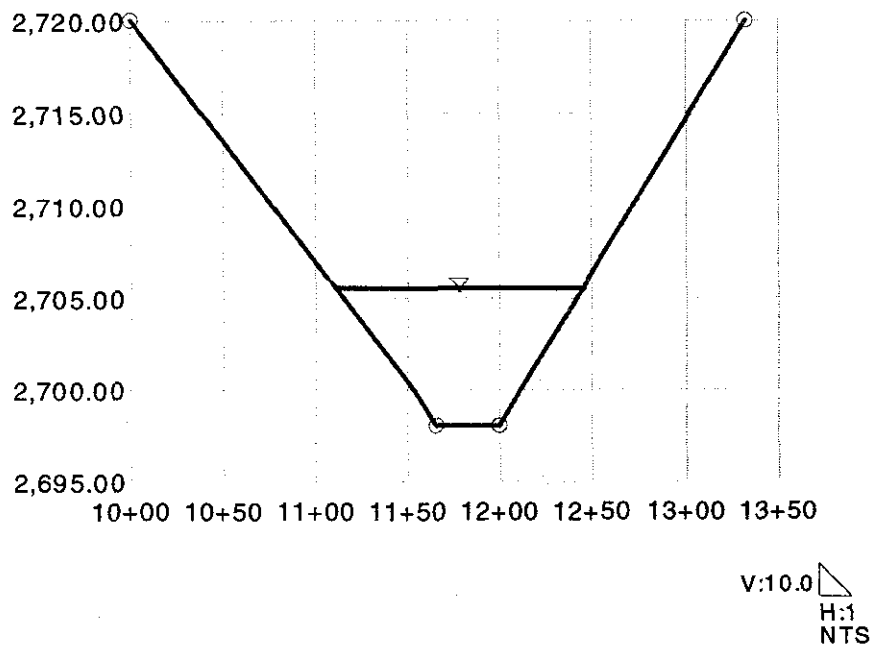
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,680.00
10+92	2,660.00
11+20	2,659.00
11+88	2,659.00
12+12	2,660.00
14+01	2,680.00

Cross Section 2700
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash35T7R4 Section 2700
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.053	
Slope	0.026000	ft/ft
Water Surface Elevation	2,705.59	ft
Elevation Range	2,698.00 to 2,720.00	
Discharge	8,001.00	cfs



Section 2700
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash35T7R4 Section 2700
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.026000	ft/ft
Discharge	8,001.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.053	
Water Surface Elevation	2,705.59	ft
Elevation Range	2,698.00 to 2,720.00	
Flow Area	631.3	ft²
Wetted Perimeter	136.03	ft
Top Width	134.88	ft
Actual Depth	7.59	ft
Critical Elevation	2,705.71	ft
Critical Slope	0.024261	ft/ft
Velocity	12.67	ft/s
Velocity Head	2.50	ft
Specific Energy	2,708.09	ft
Froude Number	1.03	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	11+65	0.055
11+65	11+99	0.045
11+99	13+33	0.055

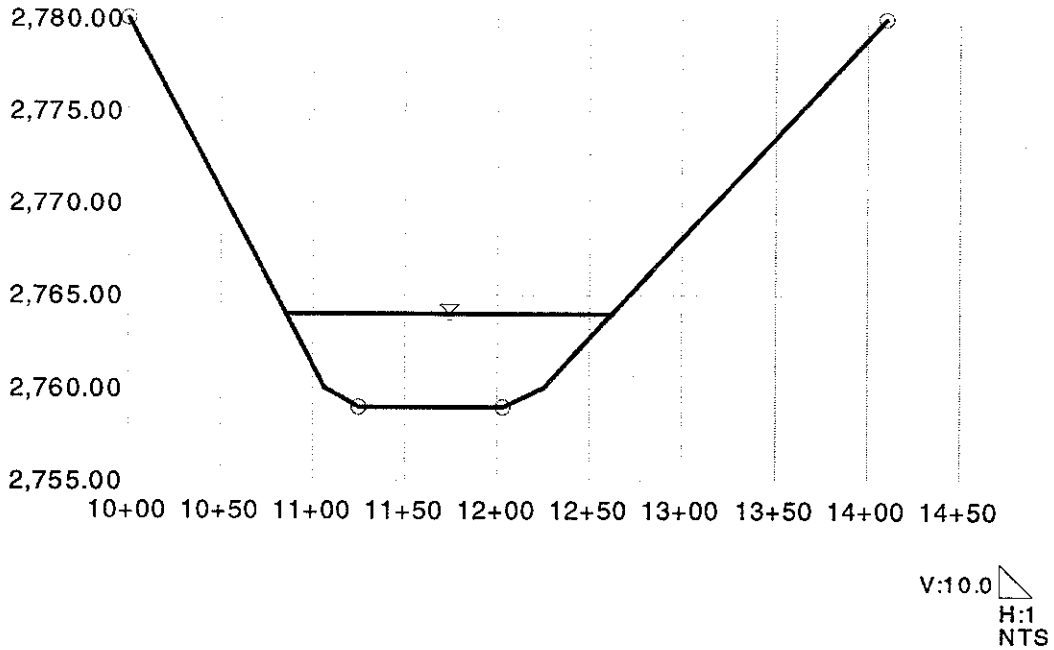
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,720.00
11+53	2,700.00
11+65	2,698.00
11+99	2,698.00
12+11	2,700.00
13+33	2,720.00

Cross Section 2800
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash35T7R4 Section 2800
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.051	
Slope	0.024000	ft/ft
Water Surface Elevation	2,763.97	ft
Elevation Range	2,759.00 to 2,780.00	
Discharge	7,669.00	cfs



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Section 2800
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash35T7R4 Section 2800
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.024000	ft/ft
Discharge	7,669.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.051	
Water Surface Elevation	2,763.97	ft
Elevation Range	2,759.00 to 2,780.00	
Flow Area	686.4	ft²
Wetted Perimeter	177.63	ft
Top Width	176.99	ft
Actual Depth	4.97	ft
Critical Elevation	2,763.97	ft
Critical Slope	0.023983	ft/ft
Velocity	11.17	ft/s
Velocity Head	1.94	ft
Specific Energy	2,765.91	ft
Froude Number	1.00	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	11+25	0.055
11+25	12+03	0.045
12+03	14+11	0.055

Natural Channel Points

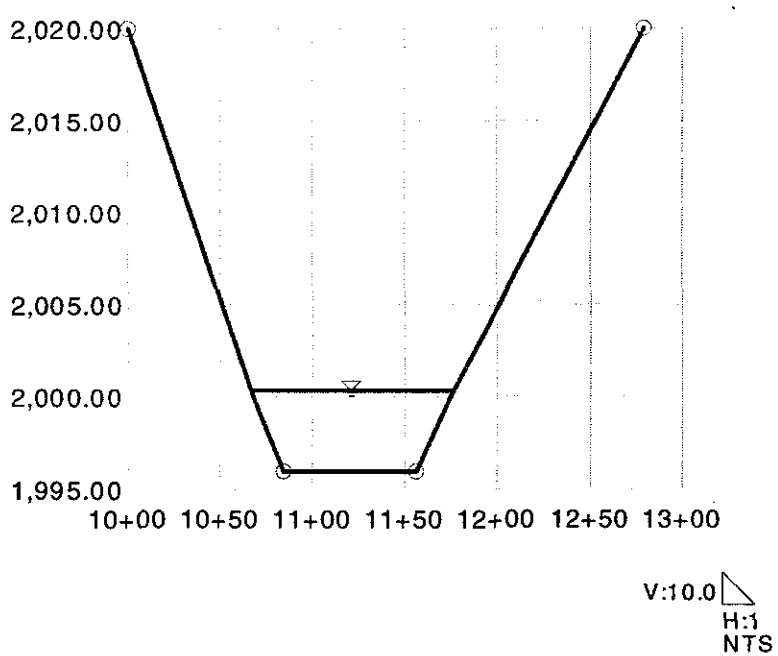
Station (ft)	Elevation (ft)
10+00	2,780.00
11+06	2,760.00
11+25	2,759.00
12+03	2,759.00
12+25	2,760.00
14+11	2,780.00

Wash Name:	**Ox Wash**
Tributary to:	**Hassayampa River**
File Name:	**Wash1T6R4**

Cross Section 100
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash1T6R4 Section 100
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.054	
Slope	0.017000	ft/ft
Water Surface Elevation	2,000.33	ft
Elevation Range	1,996.00 to 2,020.00	
Discharge	3,315.00	cfs



Section 100
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash1T6R4 Section 100
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.017000	ft/ft
Discharge	3,315.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.054	
Water Surface Elevation	2,000.33	ft
Elevation Range	1,996.00 to 2,020.00	
Flow Area	393.9	ft²
Wetted Perimeter	110.85	ft
Top Width	109.86	ft
Actual Depth	4.33	ft
Critical Elevation	1,999.73	ft
Critical Slope	0.028883	ft/ft
Velocity	8.42	ft/s
Velocity Head	1.10	ft
Specific Energy	2,001.43	ft
Froude Number	0.78	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	10+84	0.060
10+84	11+56	0.050
11+56	12+80	0.060

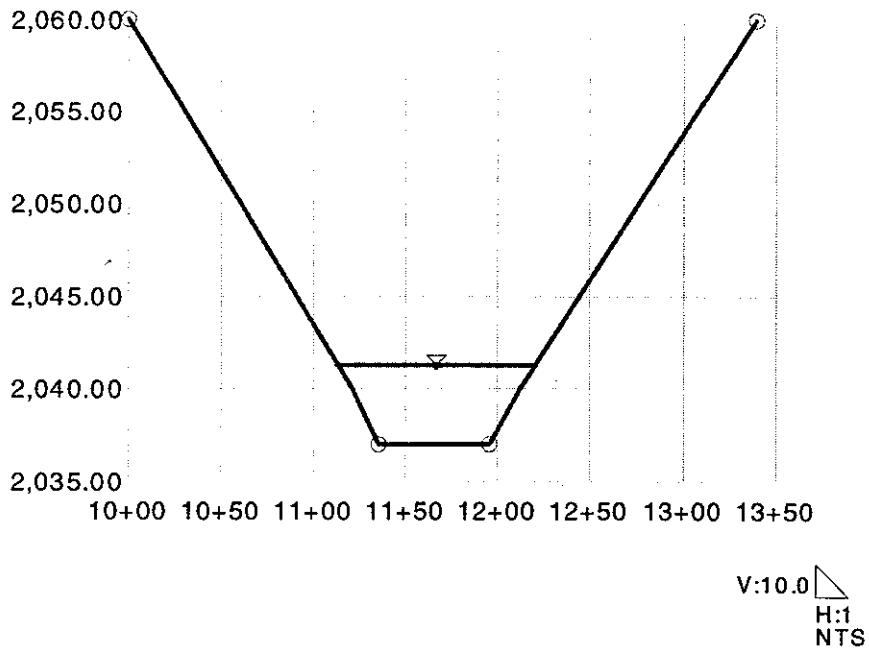
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,020.00
10+67	2,000.00
10+84	1,996.00
11+56	1,996.00
11+74	2,000.00
12+80	2,020.00

Cross Section 200
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash1T6R4 Section 200
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.055	
Slope	0.024000	ft/ft
Water Surface Elevation	2,041.28	ft
Elevation Range	2,037.00 to 2,060.00	
Discharge	3,315.00	cfs



Section 200
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash1T6R4 Section 200
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.024000	ft/ft
Discharge	3,315.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.055	
Water Surface Elevation	2,041.28	ft
Elevation Range	2,037.00 to 2,060.00	
Flow Area	356.3	ft^2
Wetted Perimeter	108.68	ft
Top Width	107.91	ft
Actual Depth	4.28	ft
Critical Elevation	2,041.03	ft
Critical Slope	0.029916	ft/ft
Velocity	9.31	ft/s
Velocity Head	1.35	ft
Specific Energy	2,042.63	ft
Froude Number	0.90	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	11+35	0.060
11+35	11+95	0.050
11+95	13+40	0.060

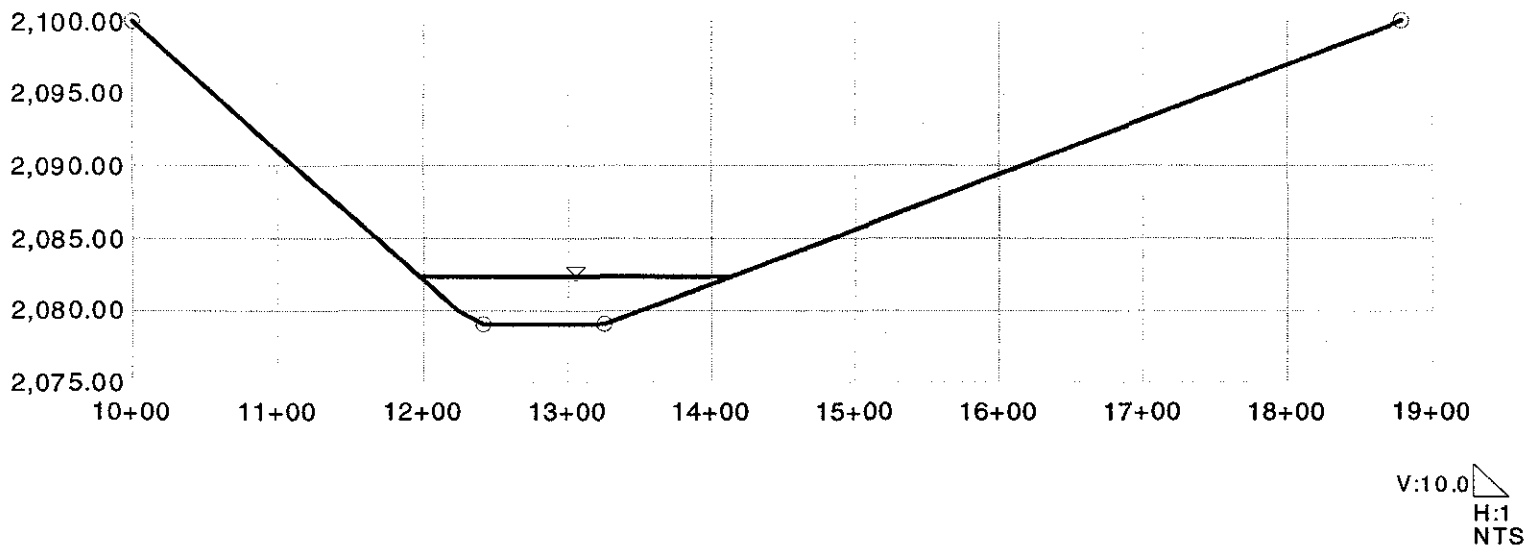
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,060.00
11+20	2,040.00
11+35	2,037.00
11+95	2,037.00
12+12	2,040.00
13+40	2,060.00

Cross Section 300
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash1T6R4 Section 300
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.058	
Slope	0.021000	ft/ft
Water Surface Elevation	2,082.34	ft
Elevation Range	2,079.00 to 2,100.00	
Discharge	3,315.00	cfs



Section 300
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash1T6R4 Section 300
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.021000	ft/ft
Discharge	3,315.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.058	
Water Surface Elevation	2,082.34	ft
Elevation Range	2,079.00 to 2,100.00	
Flow Area	505.5	ft^2
Wetted Perimeter	215.08	ft
Top Width	214.88	ft
Actual Depth	3.34	ft
Critical Elevation	2,081.86	ft
Critical Slope	0.038598	ft/ft
Velocity	6.56	ft/s
Velocity Head	0.67	ft
Specific Energy	2,083.01	ft
Froude Number	0.75	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	12+41	0.060
12+41	13+26	0.055
13+26	18+79	0.060

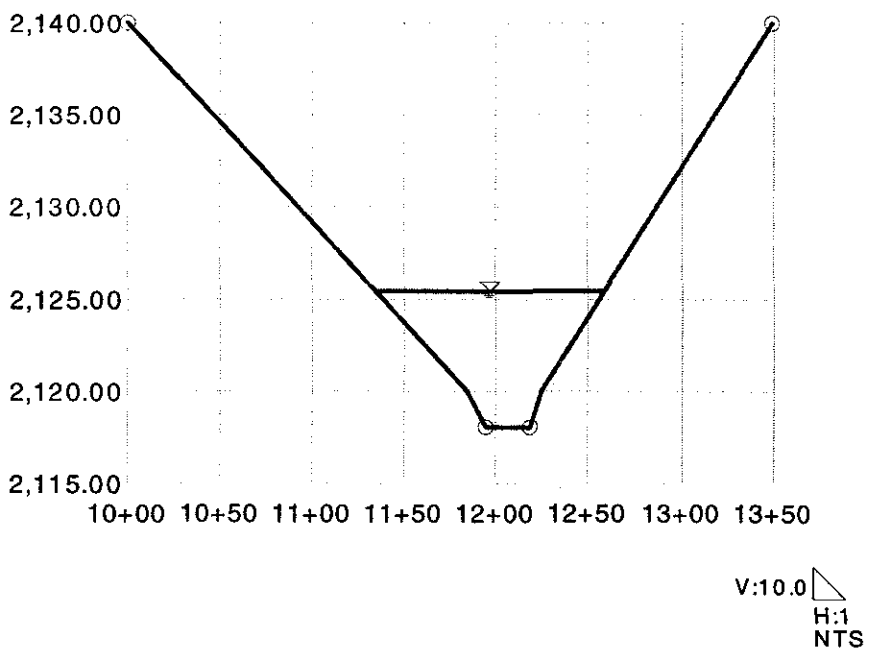
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,100.00
12+24	2,080.00
12+41	2,079.00
13+26	2,079.00
13+51	2,080.00
18+79	2,100.00

Cross Section 400
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash1T6R4 Section 400
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.063	
Slope	0.012000	ft/ft
Water Surface Elevation	2,125.40	ft
Elevation Range	2,118.00 to 2,140.00	
Discharge	3,315.00	cfs



Section 400
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash1T6R4 Section 400
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.012000	ft/ft
Discharge	3,315.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.063	
Water Surface Elevation	2,125.40	ft
Elevation Range	2,118.00 to 2,140.00	
Flow Area	505.7	ft^2
Wetted Perimeter	124.73	ft
Top Width	123.49	ft
Actual Depth	7.40	ft
Critical Elevation	2,123.74	ft
Critical Slope	0.039596	ft/ft
Velocity	6.56	ft/s
Velocity Head	0.67	ft
Specific Energy	2,126.07	ft
Froude Number	0.57	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	11+94	0.065
11+94	12+18	0.055
12+18	13+49	0.065

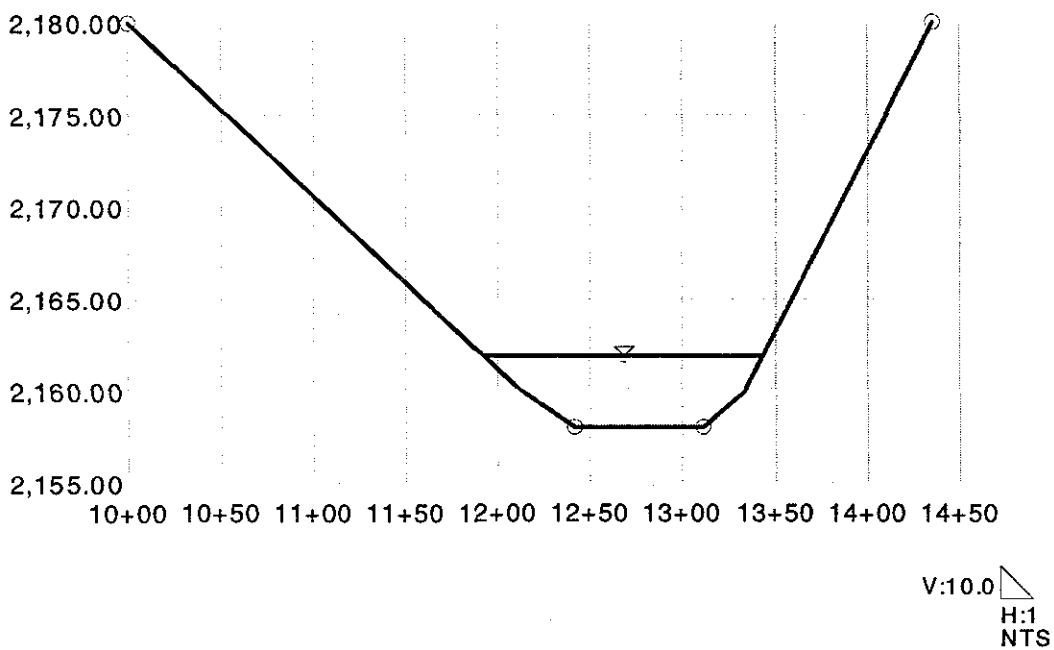
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,140.00
11+84	2,120.00
11+94	2,118.00
12+18	2,118.00
12+24	2,120.00
13+49	2,140.00

Cross Section 500
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash1T6R4 Section 500
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.061	
Slope	0.021000	ft/ft
Water Surface Elevation	2,161.89	ft
Elevation Range	2,158.00 to 2,180.00	
Discharge	3,315.00	cfs



Section 500
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash1T6R4 Section 500
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.021000	ft/ft
Discharge	3,315.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.061	
Water Surface Elevation	2,161.89	ft
Elevation Range	2,158.00 to 2,180.00	
Flow Area	451.3	ft²
Wetted Perimeter	152.17	ft
Top Width	151.74	ft
Actual Depth	3.89	ft
Critical Elevation	2,161.31	ft
Critical Slope	0.039111	ft/ft
Velocity	7.35	ft/s
Velocity Head	0.84	ft
Specific Energy	2,162.73	ft
Froude Number	0.75	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	12+41	0.065
12+41	13+11	0.055
13+11	14+36	0.065

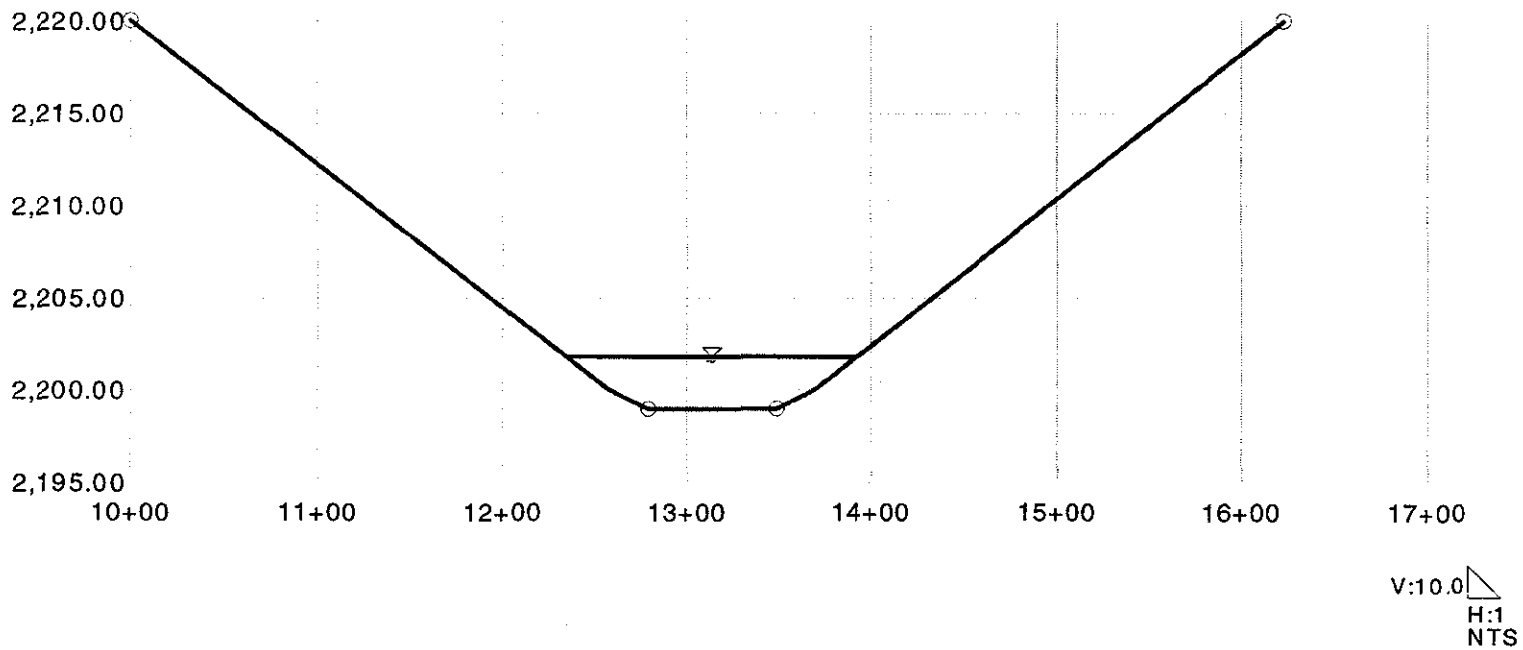
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,180.00
12+12	2,160.00
12+41	2,158.00
13+11	2,158.00
13+34	2,160.00
14+36	2,180.00

Cross Section 600
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash1T6R4 Section 600
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.061	
Slope	0.015000	ft/ft
Water Surface Elevation	2,201.76	ft
Elevation Range	2,199.00 to 2,220.00	
Discharge	1,595.00	cfs



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Section 600
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash1T6R4 Section 600
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.015000	ft/ft
Discharge	1,595.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.061	
Water Surface Elevation	2,201.76	ft
Elevation Range	2,199.00 to 2,220.00	
Flow Area	326.6	ft^2
Wetted Perimeter	157.05	ft
Top Width	156.87	ft
Actual Depth	2.76	ft
Critical Elevation	2,201.05	ft
Critical Slope	0.045966	ft/ft
Velocity	4.88	ft/s
Velocity Head	0.37	ft
Specific Energy	2,202.13	ft
Froude Number	0.60	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	12+79	0.065
12+79	13+48	0.055
13+48	16+23	0.065

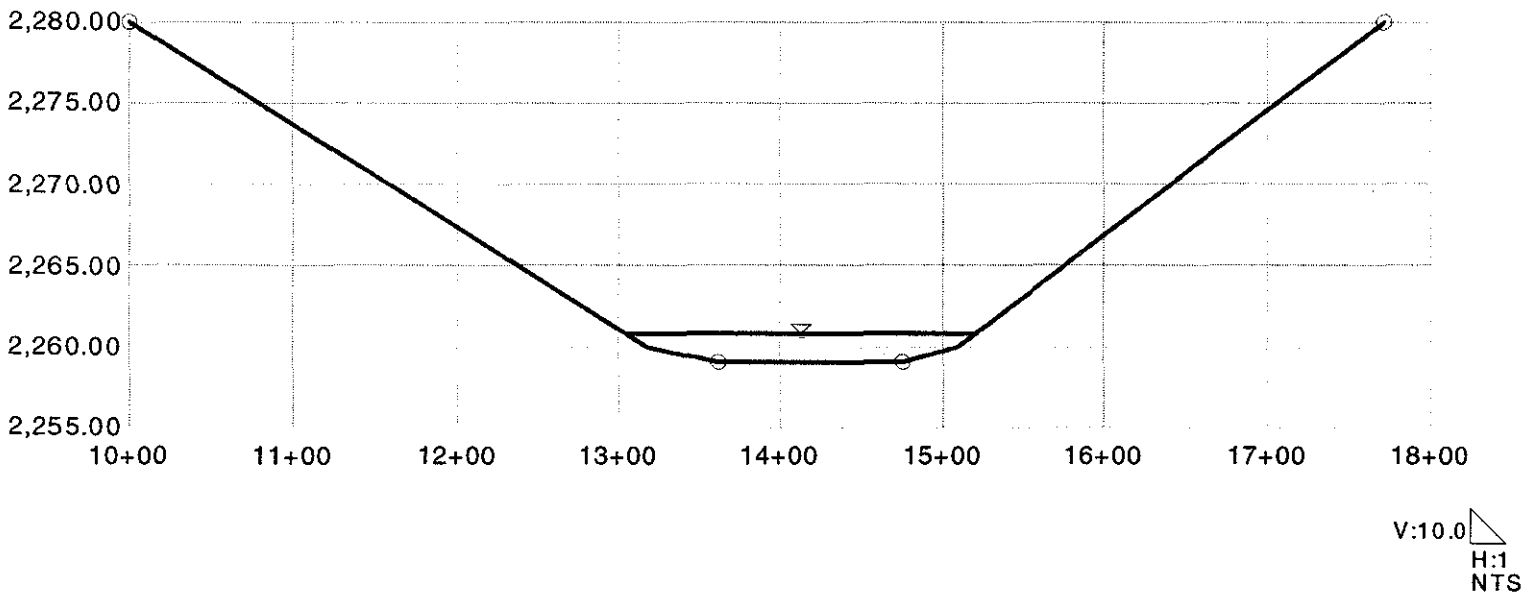
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,220.00
12+57	2,200.00
12+79	2,199.00
13+48	2,199.00
13+69	2,200.00
16+23	2,220.00

Cross Section 700
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash1T6R4 Section 700
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.055	
Slope	0.017000	ft/ft
Water Surface Elevation	2,260.84	ft
Elevation Range	2,259.00 to 2,280.00	
Discharge	1,490.00	cfs



Section 700
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash1T6R4 Section 700
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.017000	ft/ft
Discharge	1,490.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.055	
Water Surface Elevation	2,260.84	ft
Elevation Range	2,259.00 to 2,280.00	
Flow Area	323.1	ft²
Wetted Perimeter	216.28	ft
Top Width	216.19	ft
Actual Depth	1.84	ft
Critical Elevation	2,260.45	ft
Critical Slope	0.041565	ft/ft
Velocity	4.61	ft/s
Velocity Head	0.33	ft
Specific Energy	2,261.17	ft
Froude Number	0.67	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	13+62	0.060
13+62	14+75	0.050
14+75	17+71	0.060

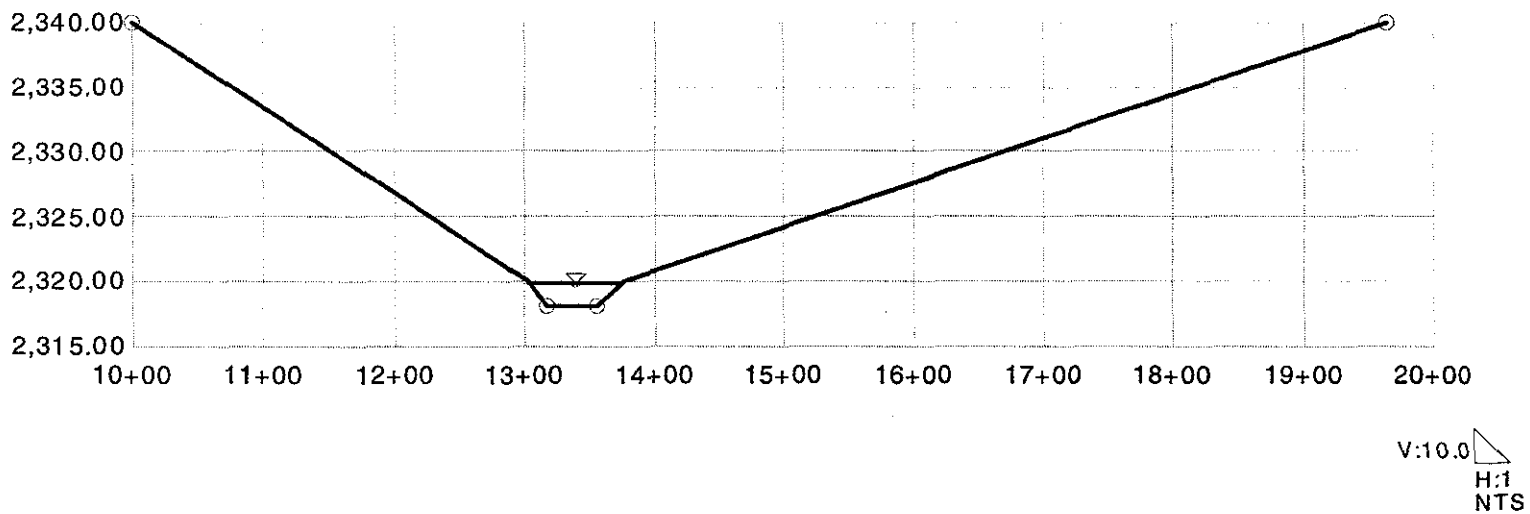
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,280.00
13+18	2,260.00
13+62	2,259.00
14+75	2,259.00
15+10	2,260.00
17+71	2,280.00

Cross Section 800
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash1T6R4 Section 800
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.055	
Slope	0.024000	ft/ft
Water Surface Elevation	2,319.87	ft
Elevation Range	2,318.00 to 2,340.00	
Discharge	557.00	cfs



Section 800
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash1T6R4 Section 800
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.024000	ft/ft
Discharge	557.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.055	
Water Surface Elevation	2,319.87	ft
Elevation Range	2,318.00 to 2,340.00	
Flow Area	103.7	ft²
Wetted Perimeter	71.99	ft
Top Width	71.78	ft
Actual Depth	1.87	ft
Critical Elevation	2,319.63	ft
Critical Slope	0.040258	ft/ft
Velocity	5.37	ft/s
Velocity Head	0.45	ft
Specific Energy	2,320.32	ft
Froude Number	0.79	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	13+17	0.060
13+17	13+56	0.050
13+56	19+64	0.060

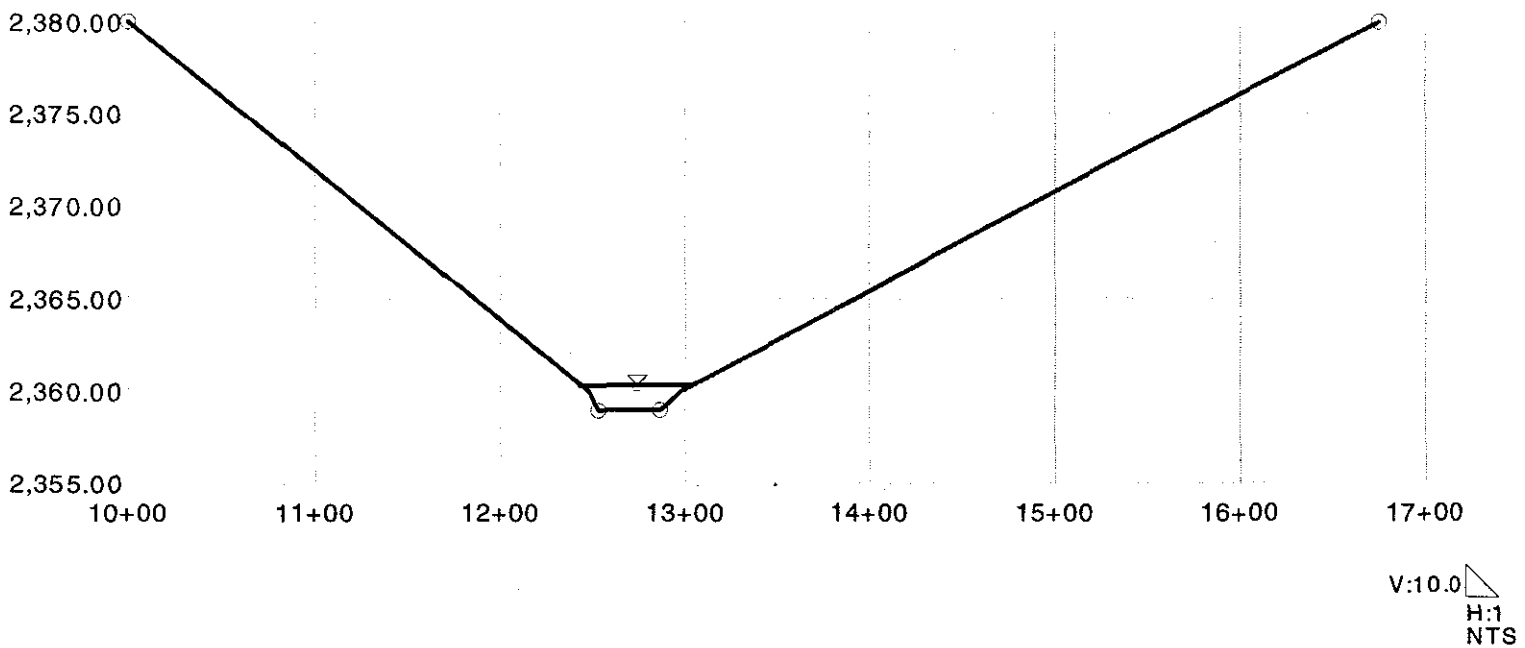
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,340.00
13+02	2,320.00
13+17	2,318.00
13+56	2,318.00
13+76	2,320.00
19+64	2,340.00

Cross Section 900
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash1T6R4 Section 900
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.055	
Slope	0.026000	ft/ft
Water Surface Elevation	2,360.34	ft
Elevation Range	2,359.00 to 2,380.00	
Discharge	263.00	cfs



Section 900
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash1T6R4 Section 900
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.026000	ft/ft
Discharge	263.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.055	
Water Surface Elevation	2,360.34	ft
Elevation Range	2,359.00 to 2,380.00	
Flow Area	60.3	ft^2
Wetted Perimeter	60.79	ft
Top Width	60.64	ft
Actual Depth	1.34	ft
Critical Elevation	2,360.14	ft
Critical Slope	0.045310	ft/ft
Velocity	4.36	ft/s
Velocity Head	0.30	ft
Specific Energy	2,360.64	ft
Froude Number	0.77	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	12+53	0.060
12+53	12+86	0.050
12+86	16+75	0.060

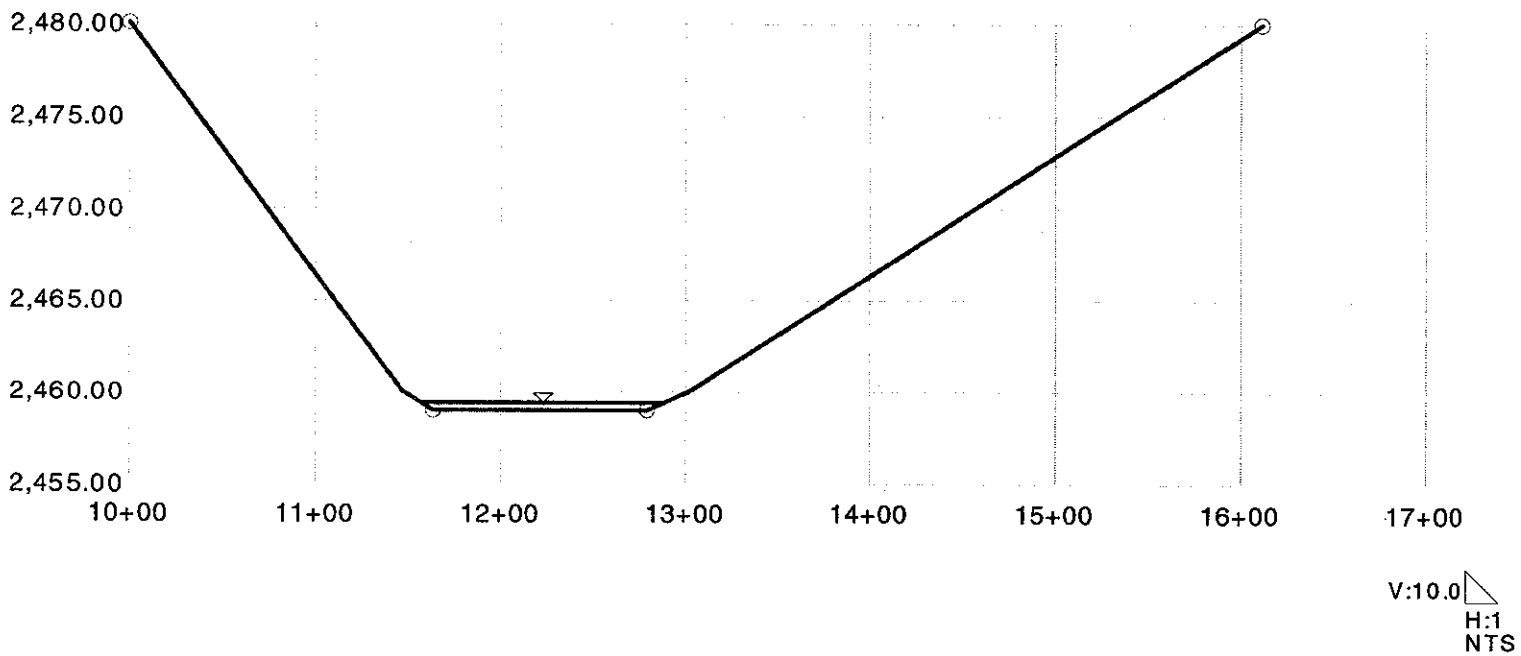
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,380.00
12+47	2,360.00
12+53	2,359.00
12+86	2,359.00
12+97	2,360.00
16+75	2,380.00

Cross Section 1000
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash1T6R4 Section 1000
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.046	
Slope	0.018000	ft/ft
Water Surface Elevation	2,459.39	ft
Elevation Range	2,459.00 to 2,480.00	
Discharge	105.00	cfs



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Section 1000
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash1T6R4 Section 1000
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.018000	ft/ft
Discharge	105.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.046	
Water Surface Elevation	2,459.39	ft
Elevation Range	2,459.00 to 2,480.00	
Flow Area	47.7	ft²
Wetted Perimeter	131.09	ft
Top Width	131.07	ft
Actual Depth	0.39	ft
Critical Elevation	2,459.29	ft
Critical Slope	0.047757	ft/ft
Velocity	2.20	ft/s
Velocity Head	0.08	ft
Specific Energy	2,459.46	ft
Froude Number	0.64	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	11+63	0.055
11+63	12+79	0.045
12+79	16+12	0.055

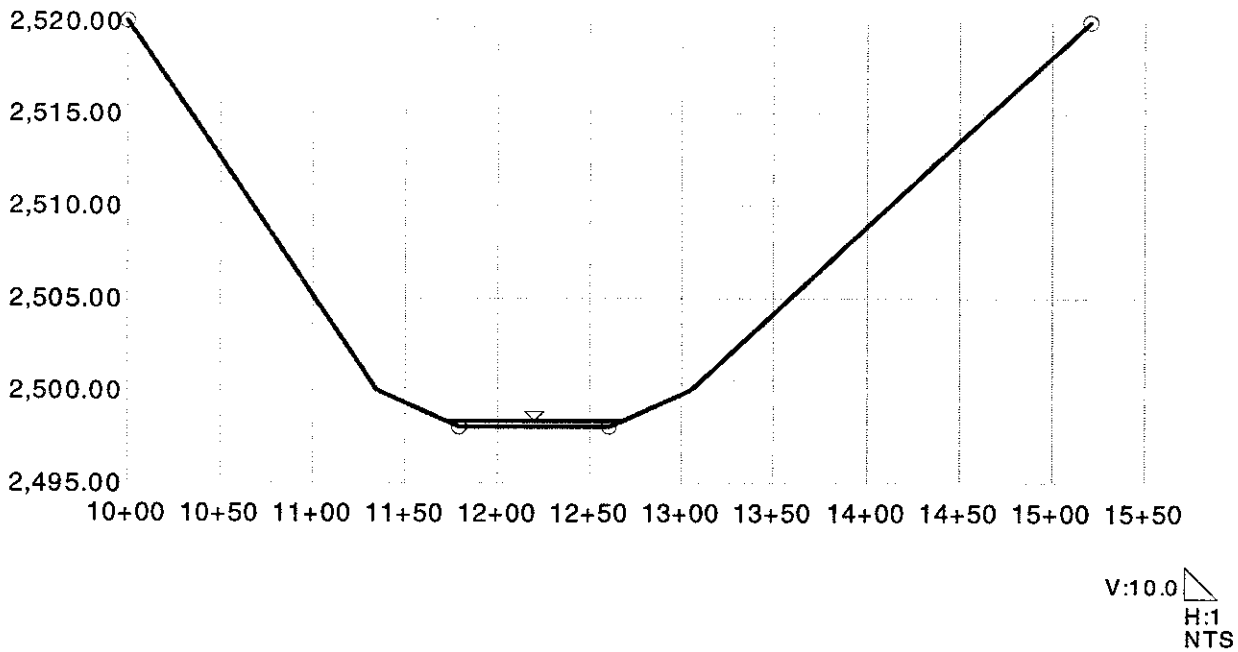
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,480.00
11+47	2,460.00
11+63	2,459.00
12+79	2,459.00
13+02	2,460.00
16+12	2,480.00

Cross Section 1100
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash1T6R4 Section 1100
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.047	
Slope	0.037000	ft/ft
Water Surface Elevation	2,498.31	ft
Elevation Range	2,498.00 to 2,520.00	
Discharge	74.00	cfs



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Section 1100
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash1T6R4 Section 1100
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.037000	ft/ft
Discharge	74.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.047	
Water Surface Elevation	2,498.31	ft
Elevation Range	2,498.00 to 2,520.00	
Flow Area	27.5	ft^2
Wetted Perimeter	95.09	ft
Top Width	95.07	ft
Actual Depth	0.31	ft
Critical Elevation	2,498.29	ft
Critical Slope	0.048971	ft/ft
Velocity	2.69	ft/s
Velocity Head	0.11	ft
Specific Energy	2,498.43	ft
Froude Number	0.88	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	11+79	0.055
11+79	12+60	0.045
12+60	15+21	0.055

Natural Channel Points

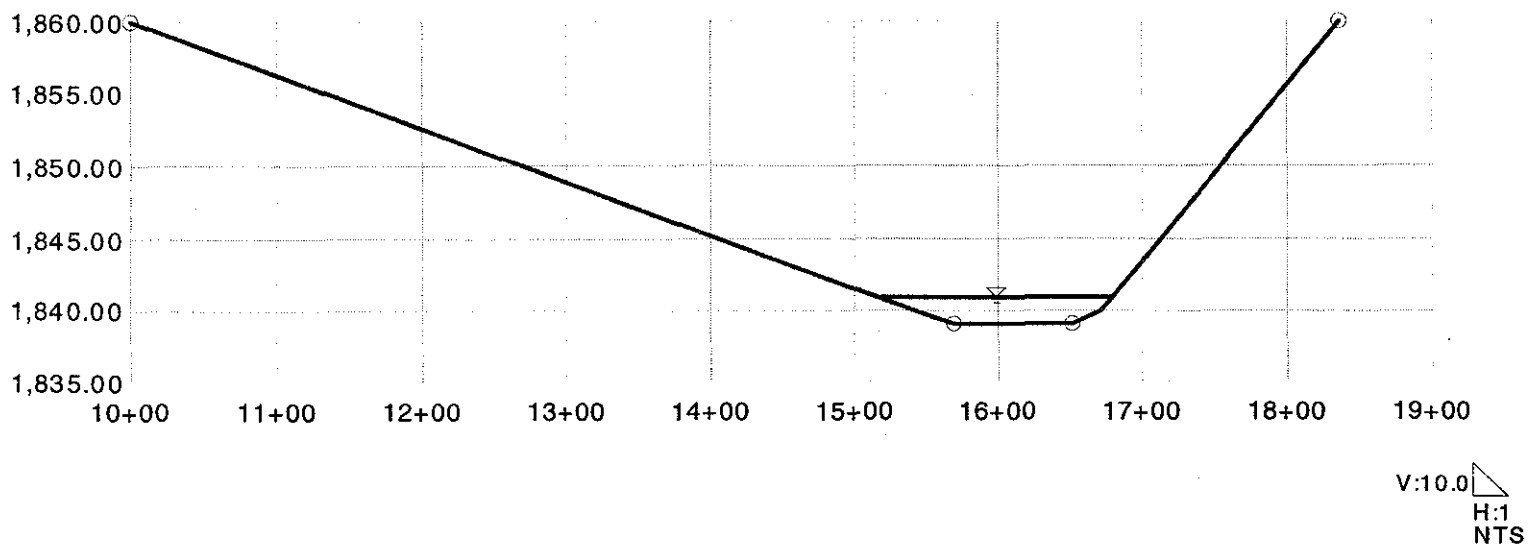
Station (ft)	Elevation (ft)
10+00	2,520.00
11+34	2,500.00
11+79	2,498.00
12+60	2,498.00
13+05	2,500.00
15+21	2,520.00

Wash Name:	**Tributary to Little San Domingo Wash**
Tributary to:	**Little San Domingo Wash**
File Name:	**Wash14T6R4**

Cross Section 100
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash14T6R4 Section 100
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.060	
Slope	0.013000	ft/ft
Water Surface Elevation	1,840.85	ft
Elevation Range	1,839.00 to 1,860.00	
Discharge	821.00	cfs



Section 100
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash14T6R4 Section 100
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.013000	ft/ft
Discharge	821.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.060	
Water Surface Elevation	1,840.85	ft
Elevation Range	1,839.00 to 1,860.00	
Flow Area	229.0	ft²
Wetted Perimeter	159.96	ft
Top Width	159.85	ft
Actual Depth	1.85	ft
Critical Elevation	1,840.27	ft
Critical Slope	0.052137	ft/ft
Velocity	3.58	ft/s
Velocity Head	0.20	ft
Specific Energy	1,841.05	ft
Froude Number	0.53	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	15+69	0.070
15+69	16+52	0.050
16+52	18+36	0.070

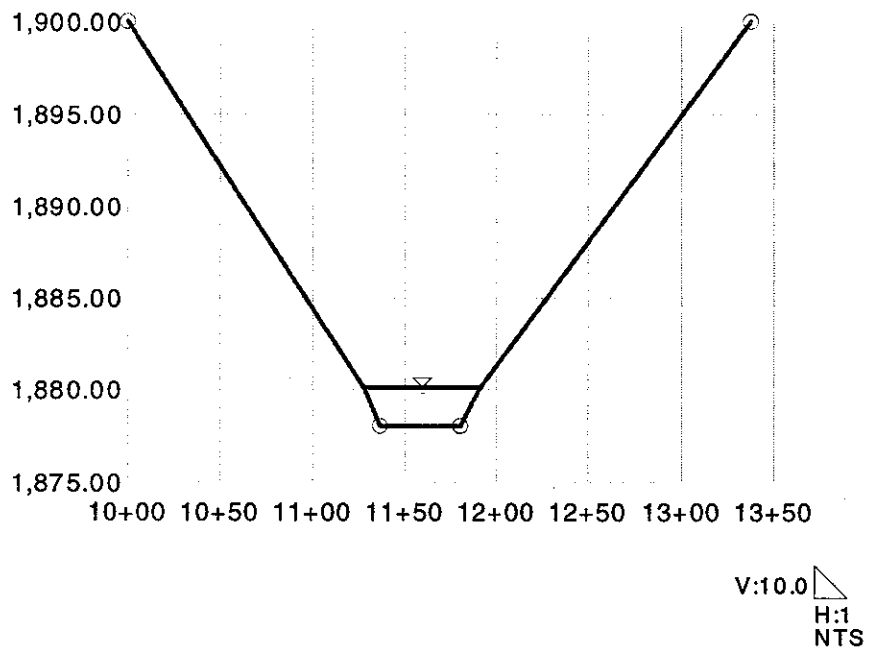
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	1,860.00
15+42	1,840.00
15+69	1,839.00
16+52	1,839.00
16+72	1,840.00
18+36	1,860.00

Cross Section 200
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash14T6R4 Section 200
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.057	
Slope	0.019000	ft/ft
Water Surface Elevation	1,880.12	ft
Elevation Range	1,878.00 to 1,900.00	
Discharge	601.00	cfs



Section 200
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash14T6R4 Section 200
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.019000	ft/ft
Discharge	601.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.057	
Water Surface Elevation	1,880.12	ft
Elevation Range	1,878.00 to 1,900.00	
Flow Area	113.6	ft²
Wetted Perimeter	64.12	ft
Top Width	63.66	ft
Actual Depth	2.12	ft
Critical Elevation	1,879.69	ft
Critical Slope	0.041442	ft/ft
Velocity	5.29	ft/s
Velocity Head	0.44	ft
Specific Energy	1,880.56	ft
Froude Number	0.70	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	11+36	0.070
11+36	11+80	0.050
11+80	13+38	0.070

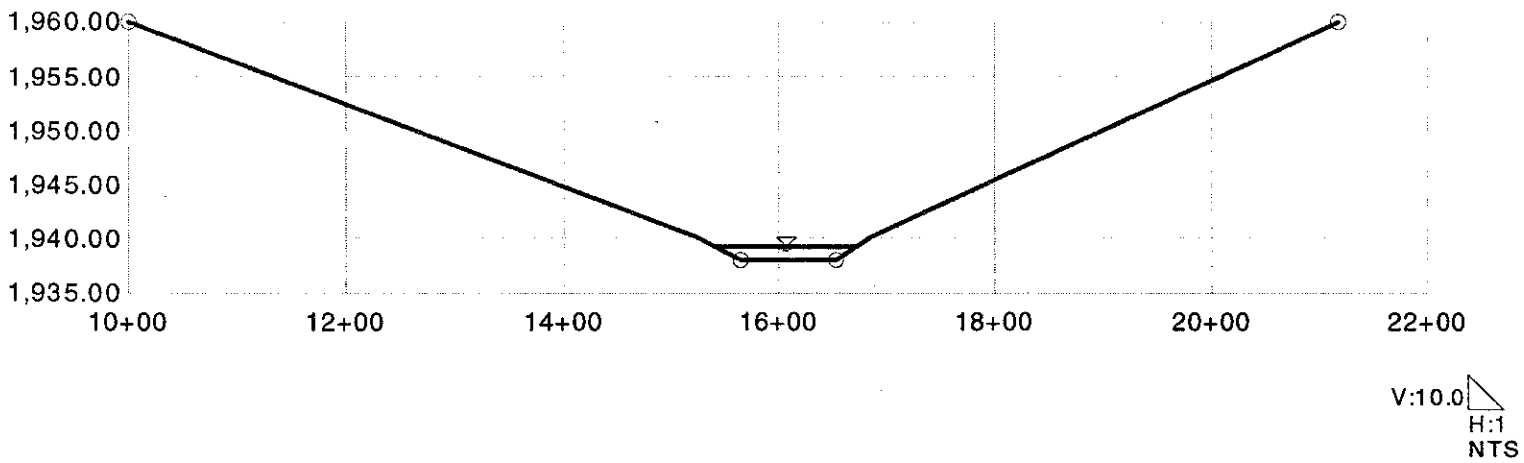
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	1,900.00
11+28	1,880.00
11+36	1,878.00
11+80	1,878.00
11+90	1,880.00
13+38	1,900.00

Cross Section 300
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash14T6R4 Section 300
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.057	
Slope	0.020000	ft/ft
Water Surface Elevation	1,939.23	ft
Elevation Range	1,938.00 to 1,960.00	
Discharge	516.00	cfs



Section 300
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash14T6R4 Section 300
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.020000	ft/ft
Discharge	516.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.057	
Water Surface Elevation	1,939.23	ft
Elevation Range	1,938.00 to 1,960.00	
Flow Area	137.6	ft²
Wetted Perimeter	134.27	ft
Top Width	134.20	ft
Actual Depth	1.23	ft
Critical Elevation	1,938.94	ft
Critical Slope	0.050700	ft/ft
Velocity	3.75	ft/s
Velocity Head	0.22	ft
Specific Energy	1,939.45	ft
Froude Number	0.65	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	15+63	0.070
15+63	16+53	0.050
16+53	21+18	0.070

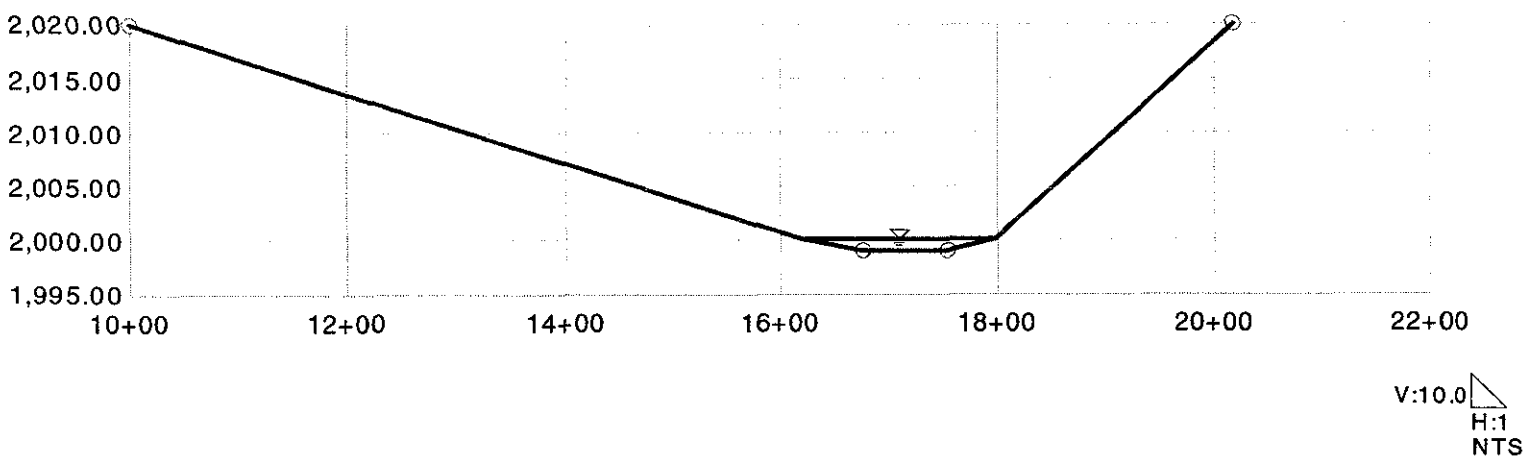
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	1,960.00
15+23	1,940.00
15+63	1,938.00
16+53	1,938.00
16+85	1,940.00
21+18	1,960.00

Cross Section 400
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash14T6R4 Section 400
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.064	
Slope	0.015000	ft/ft
Water Surface Elevation	2,000.00	ft
Elevation Range	1,999.00 to 2,020.00	
Discharge	296.00	cfs



Section 400
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash14T6R4 Section 400
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.015000	ft/ft
Discharge	296.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.064	
Water Surface Elevation	2,000.00	ft
Elevation Range	1,999.00 to 2,020.00	
Flow Area	129.0	ft²
Wetted Perimeter	179.13	ft
Top Width	179.11	ft
Actual Depth	1.00	ft
Critical Elevation	1,999.66	ft
Critical Slope	0.074129	ft/ft
Velocity	2.30	ft/s
Velocity Head	0.08	ft
Specific Energy	2,000.08	ft
Froude Number	0.48	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	16+76	0.070
16+76	17+54	0.055
17+54	20+18	0.070

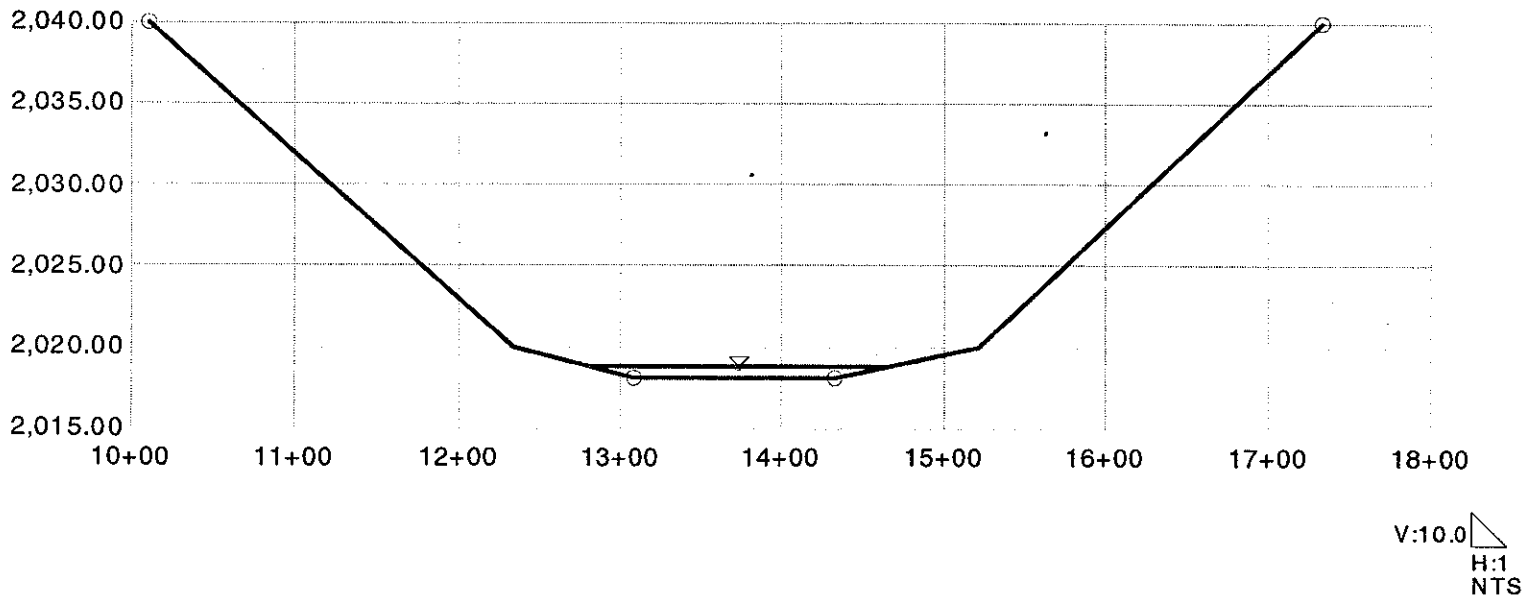
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,020.00
16+19	2,000.00
16+76	1,999.00
17+54	1,999.00
17+98	2,000.00
20+18	2,020.00

Cross Section 500
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash14T6R4 Section 500
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.062	
Slope	0.014000	ft/ft
Water Surface Elevation	2,018.78	ft
Elevation Range	2,018.00 to 2,040.00	
Discharge	258.00	cfs



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Section 500
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash14T6R4 Section 500
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.014000	ft/ft
Discharge	258.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.062	
Water Surface Elevation	2,018.78	ft
Elevation Range	2,018.00 to 2,040.00	
Flow Area	121.2	ft^2
Wetted Perimeter	187.80	ft
Top Width	187.78	ft
Actual Depth	0.78	ft
Critical Elevation	2,018.48	ft
Critical Slope	0.073769	ft/ft
Velocity	2.13	ft/s
Velocity Head	0.07	ft
Specific Energy	2,018.85	ft
Froude Number	0.47	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+11	13+08	0.065
13+08	14+33	0.060
14+33	17+34	0.065

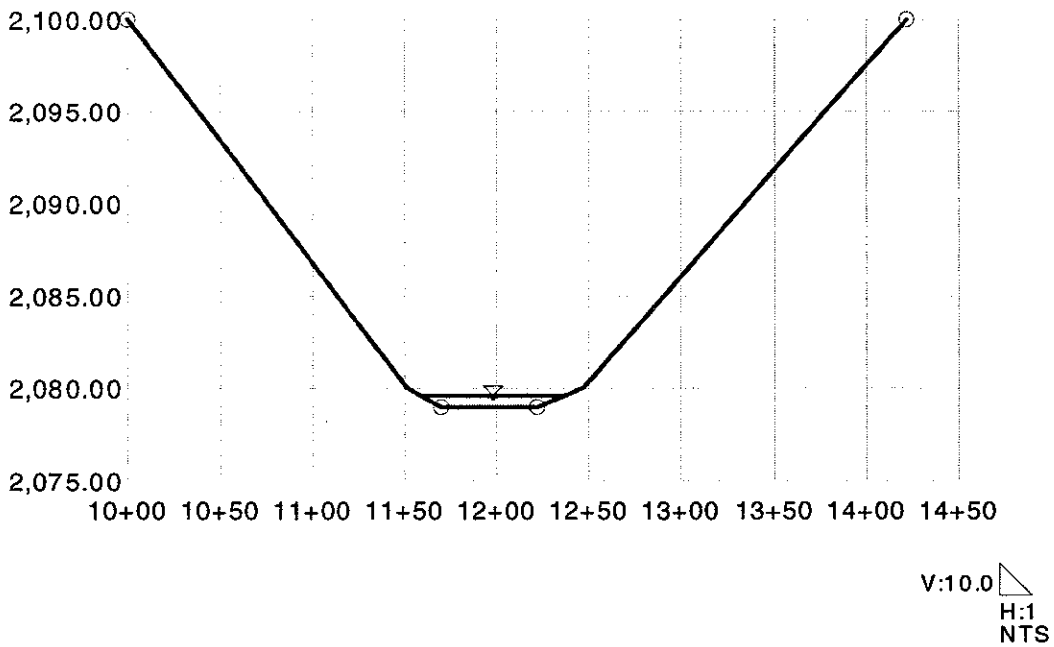
Natural Channel Points

Station (ft)	Elevation (ft)
10+11	2,040.00
12+34	2,020.00
13+08	2,018.00
14+33	2,018.00
15+21	2,020.00
17+34	2,040.00

Cross Section 600
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash14T6R4 Section 600
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.063	
Slope	0.023000	ft/ft
Water Surface Elevation	2,079.63	ft
Elevation Range	2,079.00 to 2,100.00	
Discharge	95.00	cfs



Section 600
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash14T6R4 Section 600
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.023000	ft/ft
Discharge	95.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.063	
Water Surface Elevation	2,079.63	ft
Elevation Range	2,079.00 to 2,100.00	
Flow Area	41.2	ft²
Wetted Perimeter	79.08	ft
Top Width	79.05	ft
Actual Depth	0.63	ft
Critical Elevation	2,079.44	ft
Critical Slope	0.080532	ft/ft
Velocity	2.31	ft/s
Velocity Head	0.08	ft
Specific Energy	2,079.71	ft
Froude Number	0.56	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	11+69	0.060
11+69	12+21	0.065
12+21	14+22	0.060

Natural Channel Points

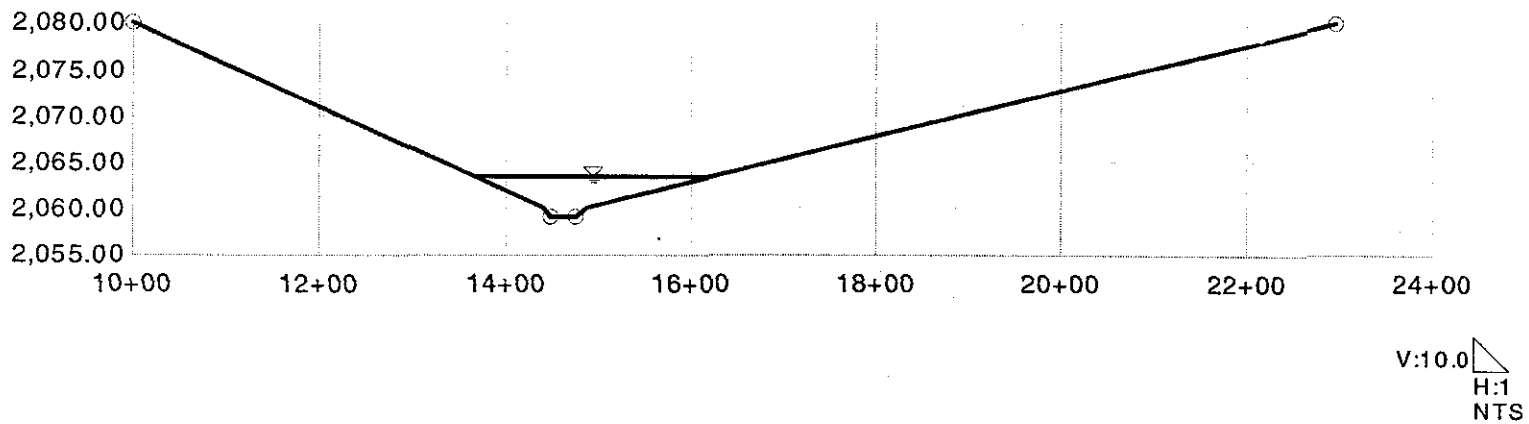
Station (ft)	Elevation (ft)
10+00	2,100.00
11+51	2,080.00
11+69	2,079.00
12+21	2,079.00
12+46	2,080.00
14+22	2,100.00

Wash Name:	**Little San Domingo Wash**
Tributary to:	**Hassayampa River**
File Name:	**Wash7T6R3**

Cross Section 100
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash7T6R3 Section 100
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.054
Slope	0.014000 ft/ft
Water Surface Elevation	2,063.30 ft
Elevation Range	2,059.00 to 2,080.00
Discharge	2,849.00 cfs



Section 100
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash7T6R3 Section 100
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.014000	ft/ft
Discharge	2,849.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.054	
Water Surface Elevation	2,063.30	ft
Elevation Range	2,059.00 to 2,080.00	
Flow Area	532.9	ft²
Wetted Perimeter	253.40	ft
Top Width	253.17	ft
Actual Depth	4.30	ft
Critical Elevation	2,062.63	ft
Critical Slope	0.035063	ft/ft
Velocity	5.35	ft/s
Velocity Head	0.44	ft
Specific Energy	2,063.75	ft
Froude Number	0.65	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	14+48	0.055
14+48	14+75	0.045
14+75	22+95	0.055

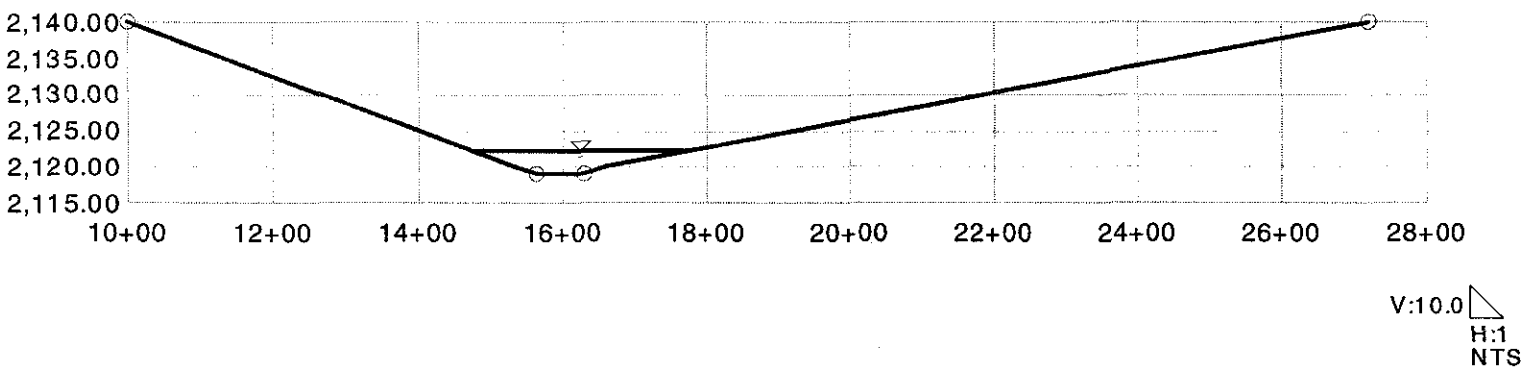
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,080.00
14+41	2,060.00
14+48	2,059.00
14+75	2,059.00
14+88	2,060.00
22+95	2,080.00

Cross Section 200
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash7T6R3 Section 200
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.053	
Slope	0.012000	ft/ft
Water Surface Elevation	2,122.18	ft
Elevation Range	2,119.00 to 2,140.00	
Discharge	2,713.00	cfs



Section 200
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash7T6R3 Section 200
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.012000	ft/ft
Discharge	2,713.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.053	
Water Surface Elevation	2,122.18	ft
Elevation Range	2,119.00 to 2,140.00	
Flow Area	576.1	ft^2
Wetted Perimeter	304.97	ft
Top Width	304.88	ft
Actual Depth	3.18	ft
Critical Elevation	2,121.49	ft
Critical Slope	0.035224	ft/ft
Velocity	4.71	ft/s
Velocity Head	0.34	ft
Specific Energy	2,122.52	ft
Froude Number	0.60	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	15+62	0.055
15+62	16+31	0.045
16+31	27+20	0.055

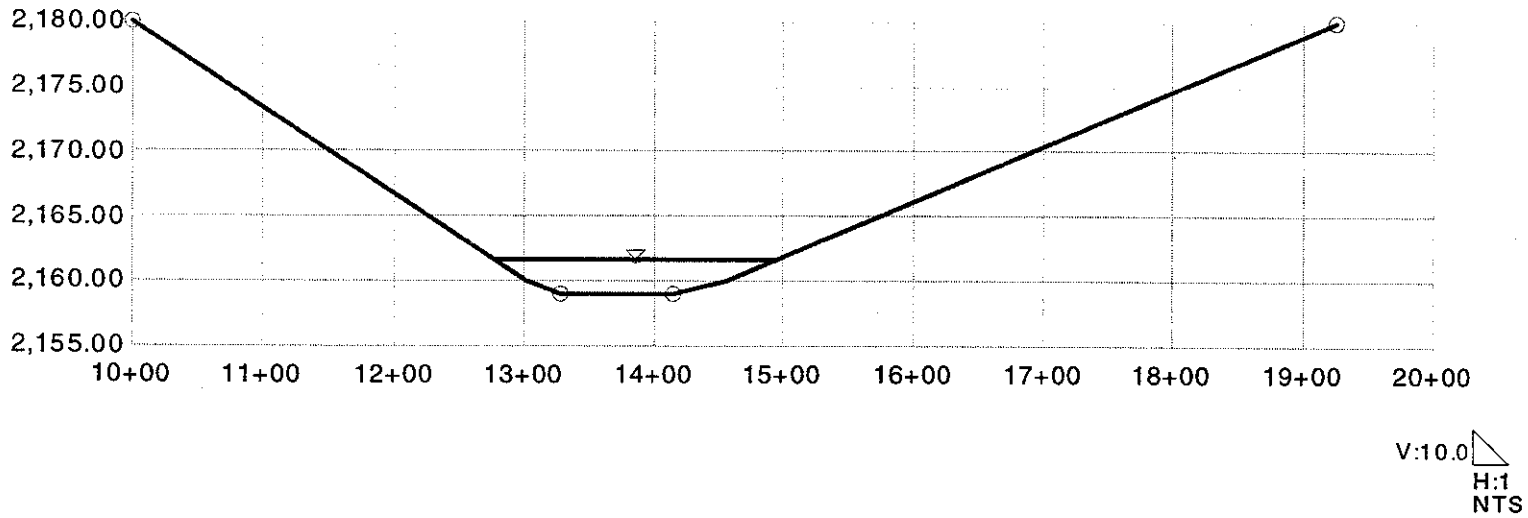
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,140.00
15+30	2,120.00
15+62	2,119.00
16+31	2,119.00
16+62	2,120.00
27+20	2,140.00

Cross Section 300
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash7T6R3 Section 300
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.051	
Slope	0.018000	ft/ft
Water Surface Elevation	2,161.63	ft
Elevation Range	2,159.00 to 2,180.00	
Discharge	2,576.00	cfs



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Section 300
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash7T6R3 Section 300
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.018000	ft/ft
Discharge	2,576.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.051	
Water Surface Elevation	2,161.63	ft
Elevation Range	2,159.00 to 2,180.00	
Flow Area	423.8	ft²
Wetted Perimeter	217.77	ft
Top Width	217.65	ft
Actual Depth	2.63	ft
Critical Elevation	2,161.26	ft
Critical Slope	0.031891	ft/ft
Velocity	6.08	ft/s
Velocity Head	0.57	ft
Specific Energy	2,162.20	ft
Froude Number	0.77	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	13+28	0.055
13+28	14+15	0.045
14+15	19+26	0.055

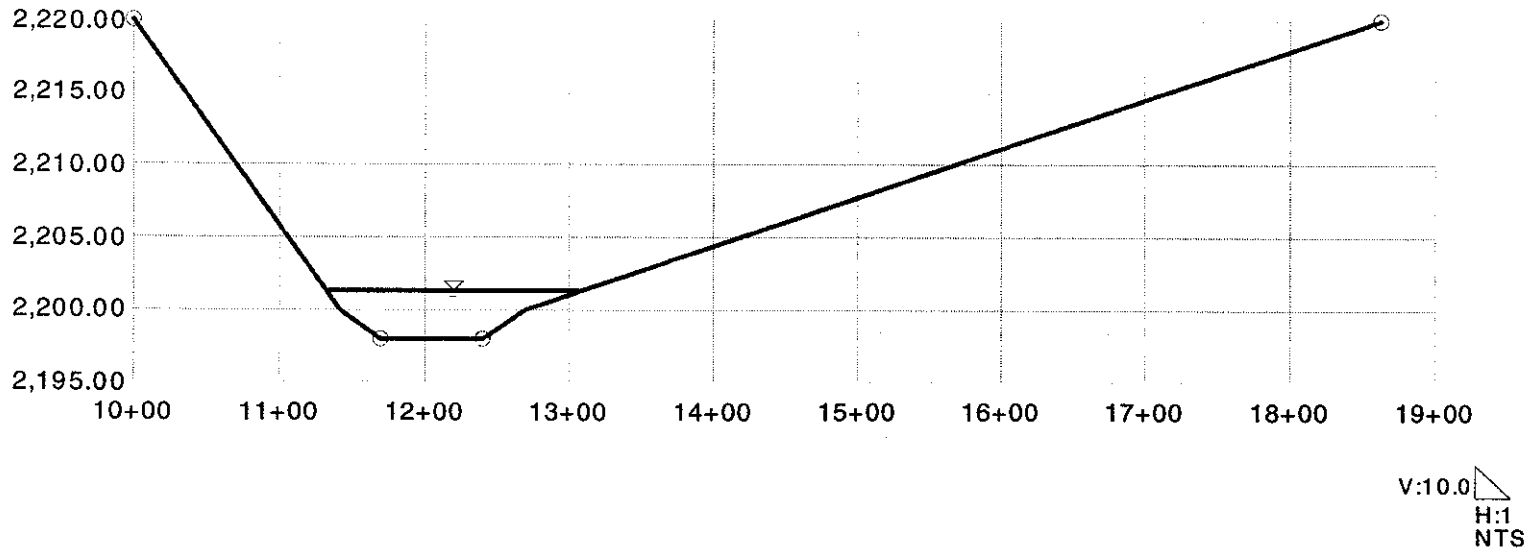
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,180.00
13+01	2,160.00
13+28	2,159.00
14+15	2,159.00
14+56	2,160.00
19+26	2,180.00

Cross Section 400
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash7T6R3 Section 400
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.051	
Slope	0.014000	ft/ft
Water Surface Elevation	2,201.27	ft
Elevation Range	2,198.00 to 2,220.00	
Discharge	2,285.00	cfs



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Section 400
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash7T6R3 Section 400
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.014000	ft/ft
Discharge	2,285.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.051	
Water Surface Elevation	2,201.27	ft
Elevation Range	2,198.00 to 2,220.00	
Flow Area	388.1	ft²
Wetted Perimeter	173.76	ft
Top Width	173.51	ft
Actual Depth	3.27	ft
Critical Elevation	2,200.67	ft
Critical Slope	0.030591	ft/ft
Velocity	5.89	ft/s
Velocity Head	0.54	ft
Specific Energy	2,201.80	ft
Froude Number	0.69	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	11+69	0.055
11+69	12+40	0.045
12+40	18+62	0.055

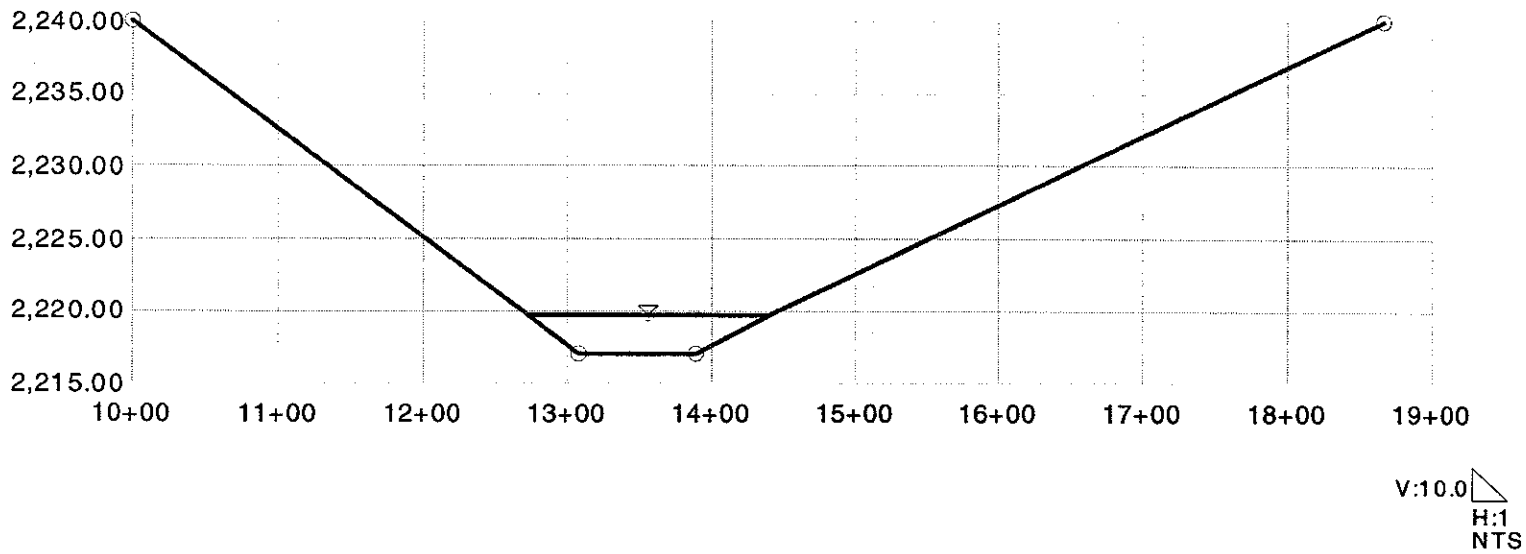
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,220.00
11+42	2,200.00
11+69	2,198.00
12+40	2,198.00
12+69	2,200.00
18+62	2,220.00

Cross Section 500
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash7T6R3 Section 500
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.050	
Slope	0.020000	ft/ft
Water Surface Elevation	2,219.65	ft
Elevation Range	2,217.00 to 2,240.00	
Discharge	2,143.00	cfs



Section 500
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash7T6R3 Section 500
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.020000	ft/ft
Discharge	2,143.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.050	
Water Surface Elevation	2,219.65	ft
Elevation Range	2,217.00 to 2,240.00	
Flow Area	326.3	ft²
Wetted Perimeter	165.83	ft
Top Width	165.66	ft
Actual Depth	2.65	ft
Critical Elevation	2,219.37	ft
Critical Slope	0.030293	ft/ft
Velocity	6.57	ft/s
Velocity Head	0.67	ft
Specific Energy	2,220.32	ft
Froude Number	0.83	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	13+08	0.055
13+08	13+89	0.045
13+89	18+66	0.055

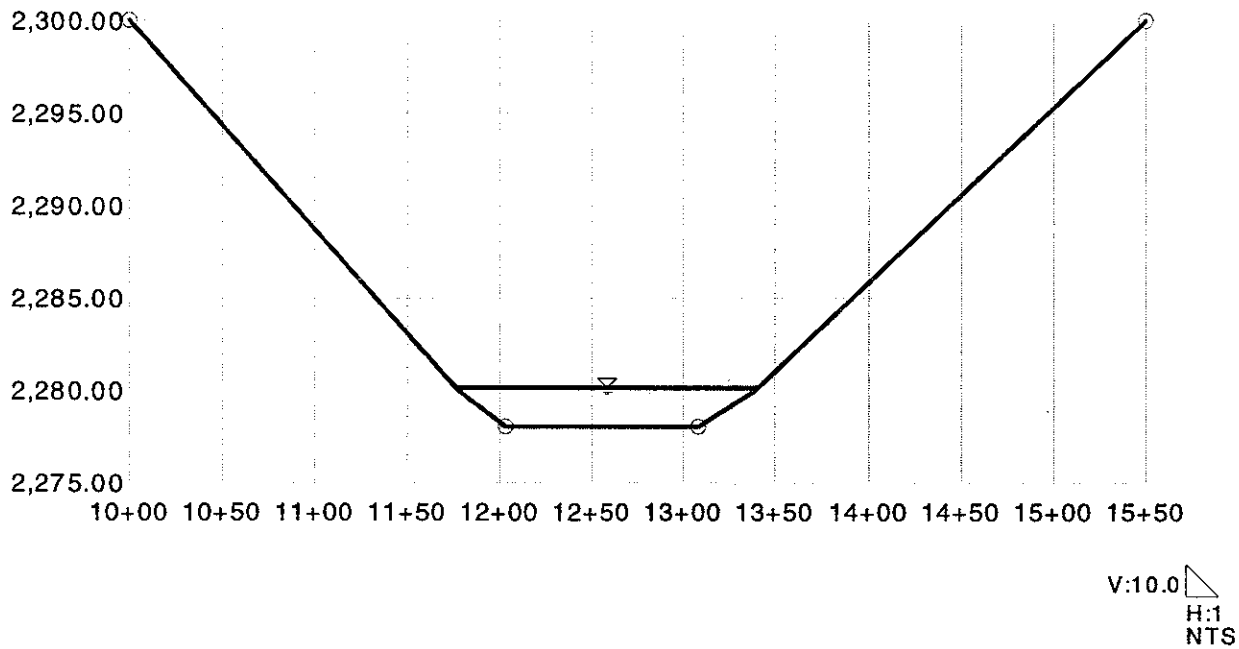
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,240.00
12+69	2,220.00
13+08	2,217.00
13+89	2,217.00
14+46	2,220.00
18+66	2,240.00

Cross Section 600
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash7T6R3 Section 600
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.049	
Slope	0.024000	ft/ft
Water Surface Elevation	2,280.09	ft
Elevation Range	2,278.00 to 2,300.00	
Discharge	1,908.00	cfs



Section 600
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash7T6R3 Section 600
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.024000	ft/ft
Discharge	1,908.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.049	
Water Surface Elevation	2,280.09	ft
Elevation Range	2,278.00 to 2,300.00	
Flow Area	281.5	ft²
Wetted Perimeter	163.88	ft
Top Width	163.73	ft
Actual Depth	2.09	ft
Critical Elevation	2,279.98	ft
Critical Slope	0.029400	ft/ft
Velocity	6.78	ft/s
Velocity Head	0.71	ft
Specific Energy	2,280.80	ft
Froude Number	0.91	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	12+03	0.055
12+03	13+08	0.045
13+08	15+50	0.055

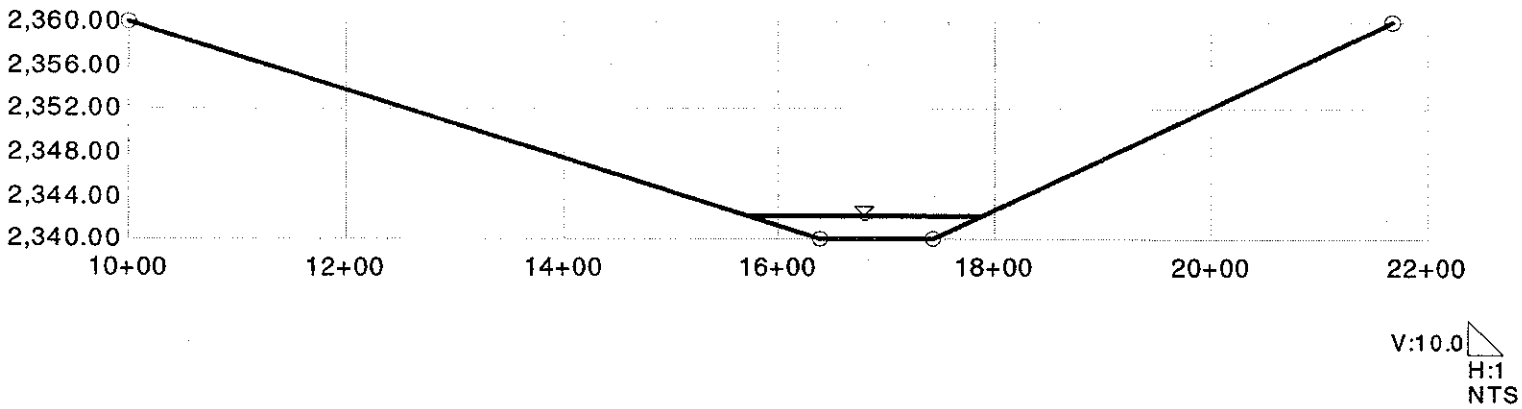
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,300.00
11+77	2,280.00
12+03	2,278.00
13+08	2,278.00
13+39	2,280.00
15+50	2,300.00

Cross Section 700
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash7T6R3 Section 700
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.050	
Slope	0.015000	ft/ft
Water Surface Elevation	2,342.10	ft
Elevation Range	2,340.00 to 2,360.00	
Discharge	1,635.00	cfs



Section 700
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash7T6R3 Section 700
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.015000	ft/ft
Discharge	1,635.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.050	
Water Surface Elevation	2,342.10	ft
Elevation Range	2,340.00 to 2,360.00	
Flow Area	336.3	ft^2
Wetted Perimeter	215.87	ft
Top Width	215.79	ft
Actual Depth	2.10	ft
Critical Elevation	2,341.70	ft
Critical Slope	0.033791	ft/ft
Velocity	4.86	ft/s
Velocity Head	0.37	ft
Specific Energy	2,342.47	ft
Froude Number	0.69	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	16+39	0.055
16+39	17+43	0.045
17+43	21+67	0.055

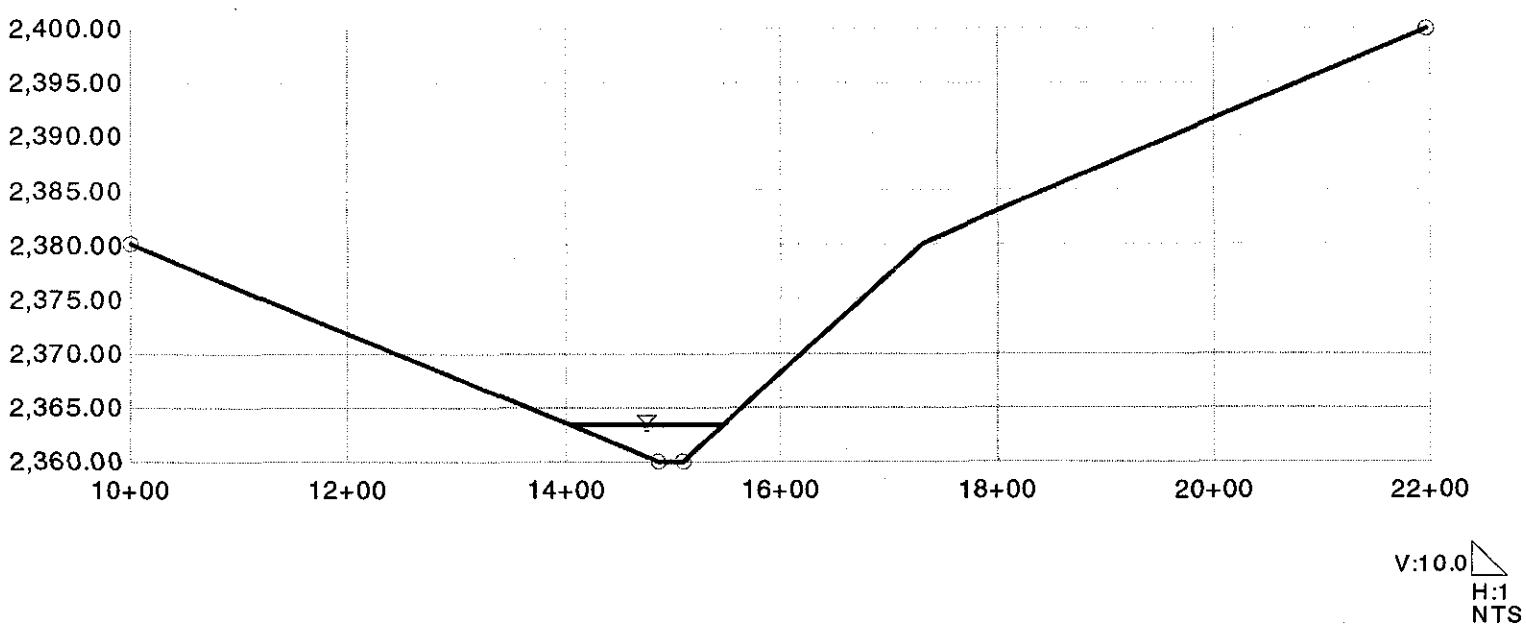
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,360.00
16+39	2,340.00
17+43	2,340.00
21+67	2,360.00

Cross Section 800
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash7T6R3 Section 800
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.053	
Slope	0.012000	ft/ft
Water Surface Elevation	2,363.34	ft
Elevation Range	2,360.00 to 2,400.00	
Discharge	1,276.00	cfs



Section 800
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash7T6R3 Section 800
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.012000	ft/ft
Discharge	1,276.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.053	
Water Surface Elevation	2,363.34	ft
Elevation Range	2,360.00 to 2,400.00	
Flow Area	270.7	ft^2
Wetted Perimeter	140.40	ft
Top Width	140.18	ft
Actual Depth	3.34	ft
Critical Elevation	2,362.63	ft
Critical Slope	0.035995	ft/ft
Velocity	4.71	ft/s
Velocity Head	0.35	ft
Specific Energy	2,363.68	ft
Froude Number	0.60	
Flow Type	Subcritical	

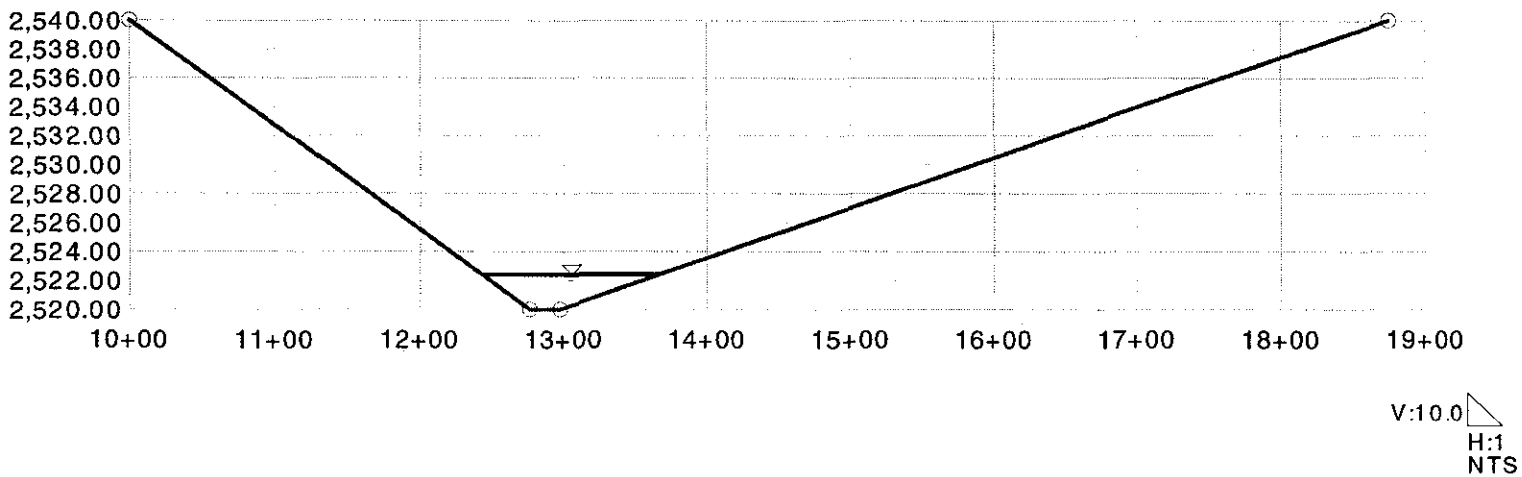
Roughness Segments		
Start Station	End Station	Mannings Coefficient
10+00	14+86	0.055
14+86	15+08	0.045
15+08	21+96	0.055

Natural Channel Points	
Station (ft)	Elevation (ft)
10+00	2,380.00
14+86	2,360.00
15+08	2,360.00
17+30	2,380.00
21+96	2,400.00

Cross Section 900
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash7T6R3 Section 900
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.053	
Slope	0.028000	ft/ft
Water Surface Elevation	2,522.44	ft
Elevation Range	2,520.00 to 2,540.00	
Discharge	1,047.00	cfs



Section 900
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash7T6R3 Section 900
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.028000	ft/ft
Discharge	1,047.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.053	
Water Surface Elevation	2,522.44	ft
Elevation Range	2,520.00 to 2,540.00	
Flow Area	177.9	ft²
Wetted Perimeter	125.15	ft
Top Width	125.02	ft
Actual Depth	2.44	ft
Critical Elevation	2,522.28	ft
Critical Slope	0.037690	ft/ft
Velocity	5.89	ft/s
Velocity Head	0.54	ft
Specific Energy	2,522.97	ft
Froude Number	0.87	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	12+76	0.055
12+76	12+97	0.045
12+97	18+75	0.055

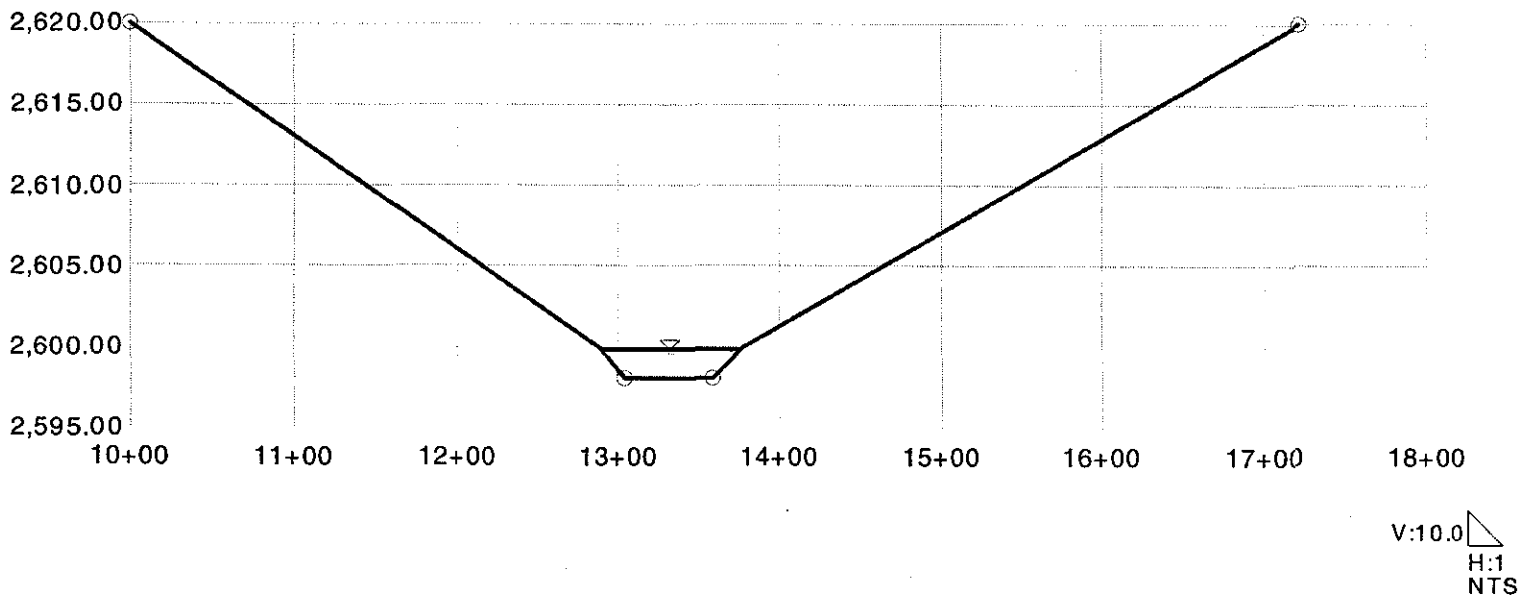
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,540.00
12+76	2,520.00
12+97	2,520.00
18+75	2,540.00

Cross Section 1000
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash7T6R3 Section 1000
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.054	
Slope	0.035000	ft/ft
Water Surface Elevation	2,599.86	ft
Elevation Range	2,598.00 to 2,620.00	
Discharge	886.00	cfs



Section 1000
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash7T6R3 Section 1000
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.035000	ft/ft
Discharge	886.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.054	
Water Surface Elevation	2,599.86	ft
Elevation Range	2,598.00 to 2,620.00	
Flow Area	130.7	ft^2
Wetted Perimeter	86.76	ft
Top Width	86.55	ft
Actual Depth	1.86	ft
Critical Elevation	2,599.83	ft
Critical Slope	0.037176	ft/ft
Velocity	6.78	ft/s
Velocity Head	0.71	ft
Specific Energy	2,600.57	ft
Froude Number	0.97	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	13+04	0.060
13+04	13+58	0.050
13+58	17+22	0.060

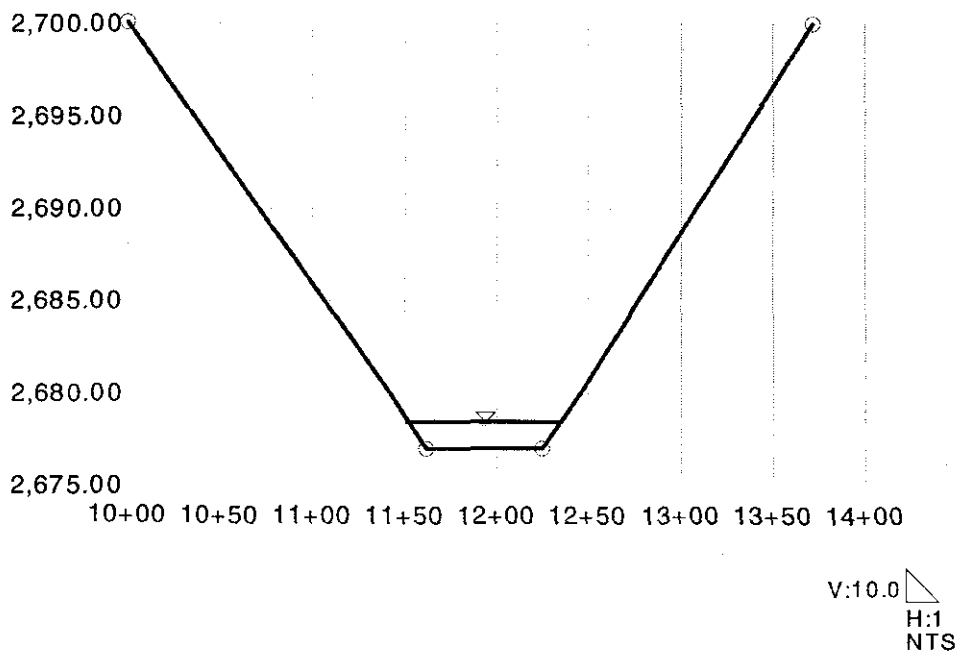
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,620.00
12+88	2,600.00
13+04	2,598.00
13+58	2,598.00
13+77	2,600.00
17+22	2,620.00

Cross Section 1100
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash7T6R3 Section 1100
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.057	
Slope	0.040000	ft/ft
Water Surface Elevation	2,678.50	ft
Elevation Range	2,677.00 to 2,700.00	
Discharge	687.00	cfs



Section 1100
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash7T6R3 Section 1100
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.040000	ft/ft
Discharge	687.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.057	
Water Surface Elevation	2,678.50	ft
Elevation Range	2,677.00 to 2,700.00	
Flow Area	110.7	ft^2
Wetted Perimeter	84.17	ft
Top Width	83.95	ft
Actual Depth	1.50	ft
Critical Elevation	2,678.45	ft
Critical Slope	0.044454	ft/ft
Velocity	6.21	ft/s
Velocity Head	0.60	ft
Specific Energy	2,679.09	ft
Froude Number	0.95	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	11+61	0.065
11+61	12+25	0.055
12+25	13+72	0.065

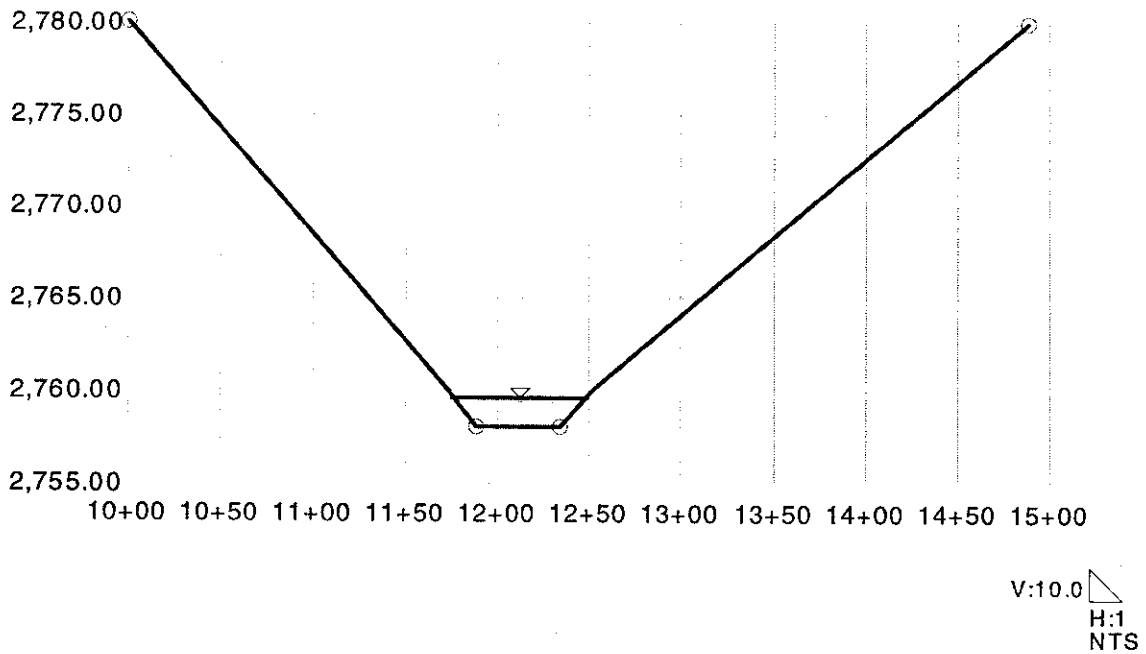
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,700.00
11+41	2,680.00
11+61	2,677.00
12+25	2,677.00
12+45	2,680.00
13+72	2,700.00

Cross Section 1200
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash7T6R3 Section 1200
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.059	
Slope	0.036000	ft/ft
Water Surface Elevation	2,759.62	ft
Elevation Range	2,758.00 to 2,780.00	
Discharge	557.00	cfs



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Section 1200
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash7T6R3 Section 1200
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.036000	ft/ft
Discharge	557.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.059	
Water Surface Elevation	2,759.62	ft
Elevation Range	2,758.00 to 2,780.00	
Flow Area	96.9	ft²
Wetted Perimeter	73.75	ft
Top Width	73.56	ft
Actual Depth	1.62	ft
Critical Elevation	2,759.50	ft
Critical Slope	0.047214	ft/ft
Velocity	5.75	ft/s
Velocity Head	0.51	ft
Specific Energy	2,760.13	ft
Froude Number	0.88	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	11+88	0.065
11+88	12+34	0.055
12+34	14+89	0.065

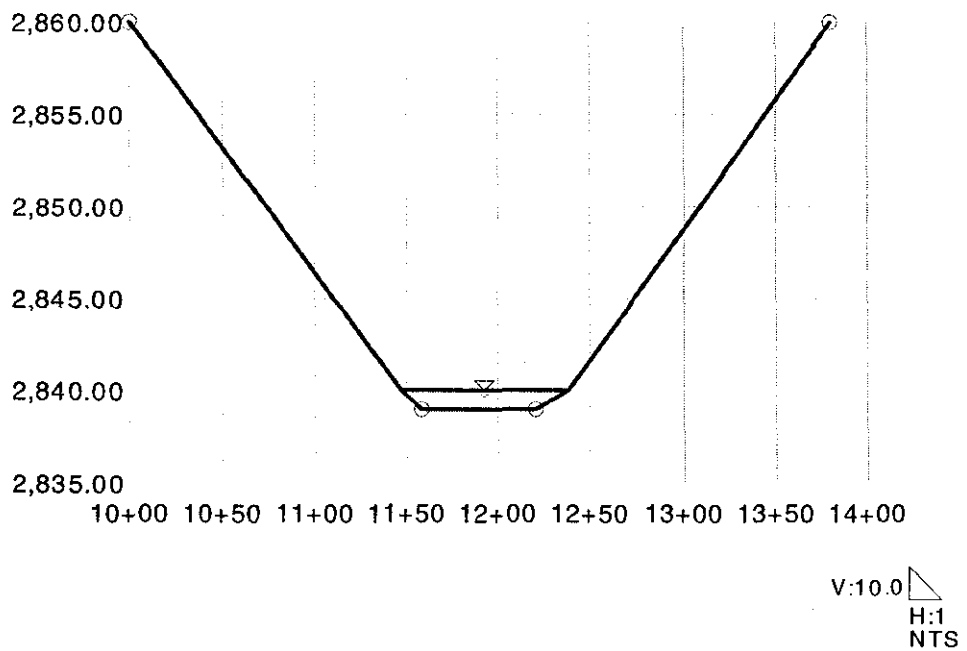
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,780.00
11+72	2,760.00
11+88	2,758.00
12+34	2,758.00
12+52	2,760.00
14+89	2,780.00

Cross Section 1300
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash7T6R3 Section 1300
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.053	
Slope	0.049000	ft/ft
Water Surface Elevation	2,839.99	ft
Elevation Range	2,839.00 to 2,860.00	
Discharge	415.00	cfs



Section 1300
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash7T6R3 Section 1300
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.049000	ft/ft
Discharge	415.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.053	
Water Surface Elevation	2,839.99	ft
Elevation Range	2,839.00 to 2,860.00	
Flow Area	76.2	ft²
Wetted Perimeter	91.81	ft
Top Width	91.74	ft
Actual Depth	0.99	ft
Critical Elevation	2,840.02	ft
Critical Slope	0.043719	ft/ft
Velocity	5.45	ft/s
Velocity Head	0.46	ft
Specific Energy	2,840.45	ft
Froude Number	1.05	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	11+58	0.060
11+58	12+20	0.050
12+20	13+81	0.060

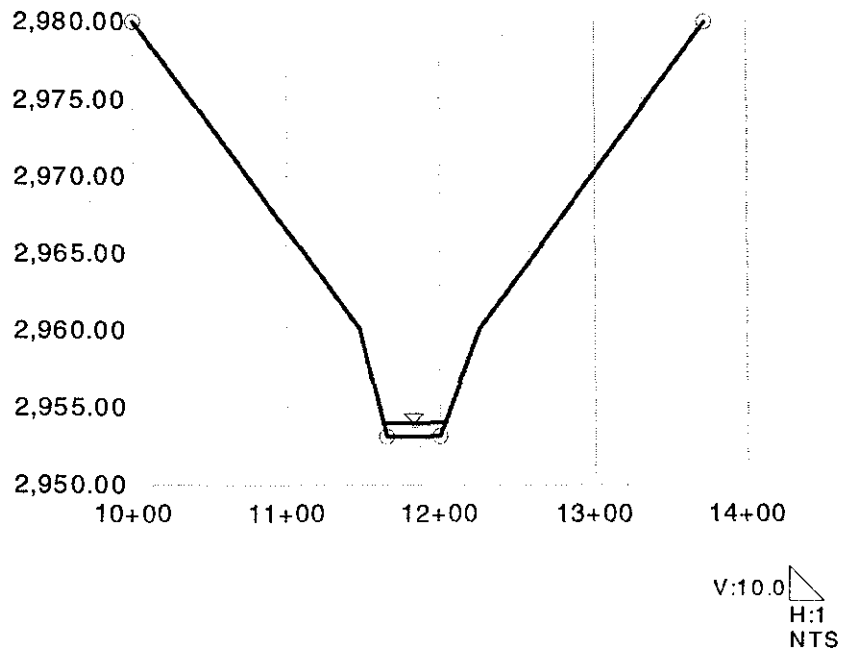
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,860.00
11+46	2,840.00
11+58	2,839.00
12+20	2,839.00
12+38	2,840.00
13+81	2,860.00

Cross Section 1400
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash7T6R3 Section 1400
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.051	
Slope	0.060000	ft/ft
Water Surface Elevation	2,953.94	ft
Elevation Range	2,953.00 to 2,980.00	
Discharge	235.00	cfs



Section 1400
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash7T6R3 Section 1400
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.060000	ft/ft
Discharge	235.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.051	
Water Surface Elevation	2,953.94	ft
Elevation Range	2,953.00 to 2,980.00	
Flow Area	36.5	ft^2
Wetted Perimeter	41.95	ft
Top Width	41.64	ft
Actual Depth	0.94	ft
Critical Elevation	2,954.07	ft
Critical Slope	0.039247	ft/ft
Velocity	6.44	ft/s
Velocity Head	0.64	ft
Specific Energy	2,954.58	ft
Froude Number	1.21	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	11+64	0.060
11+64	12+00	0.050
12+00	13+73	0.060

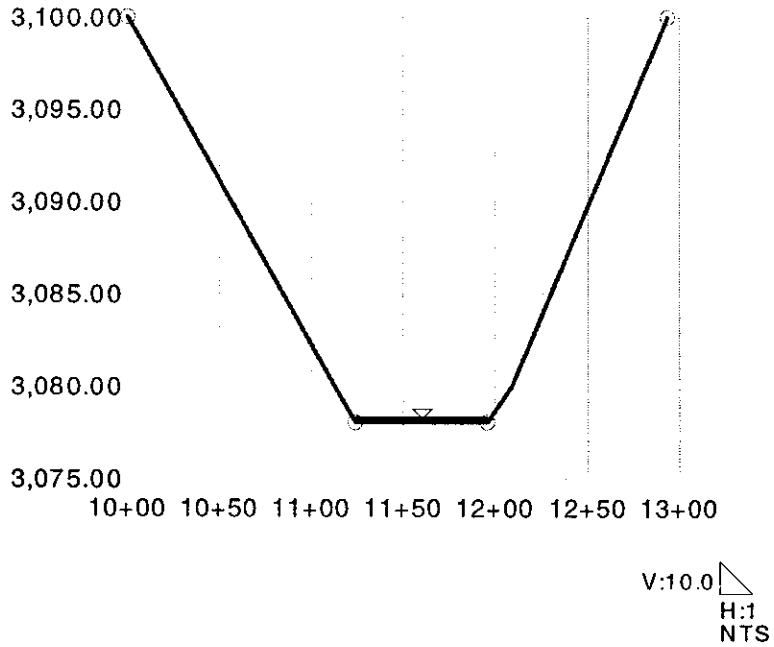
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,980.00
11+47	2,960.00
11+64	2,953.00
12+00	2,953.00
12+25	2,960.00
13+73	2,980.00

Cross Section 1500
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash7T6R3 Section 1500
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.051	
Slope	0.058000	ft/ft
Water Surface Elevation	3,078.28	ft
Elevation Range	3,078.00 to 3,100.00	
Discharge	62.00	cfs



Section 1500
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash7T6R3 Section 1500
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.058000	ft/ft
Discharge	62.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.051	
Water Surface Elevation	3,078.28	ft
Elevation Range	3,078.00 to 3,100.00	
Flow Area	20.6	ft^2
Wetted Perimeter	74.73	ft
Top Width	74.68	ft
Actual Depth	0.28	ft
Critical Elevation	3,078.28	ft
Critical Slope	0.057055	ft/ft
Velocity	3.00	ft/s
Velocity Head	0.14	ft
Specific Energy	3,078.42	ft
Froude Number	1.01	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	11+24	0.060
11+24	11+95	0.050
11+95	12+94	0.060

Natural Channel Points

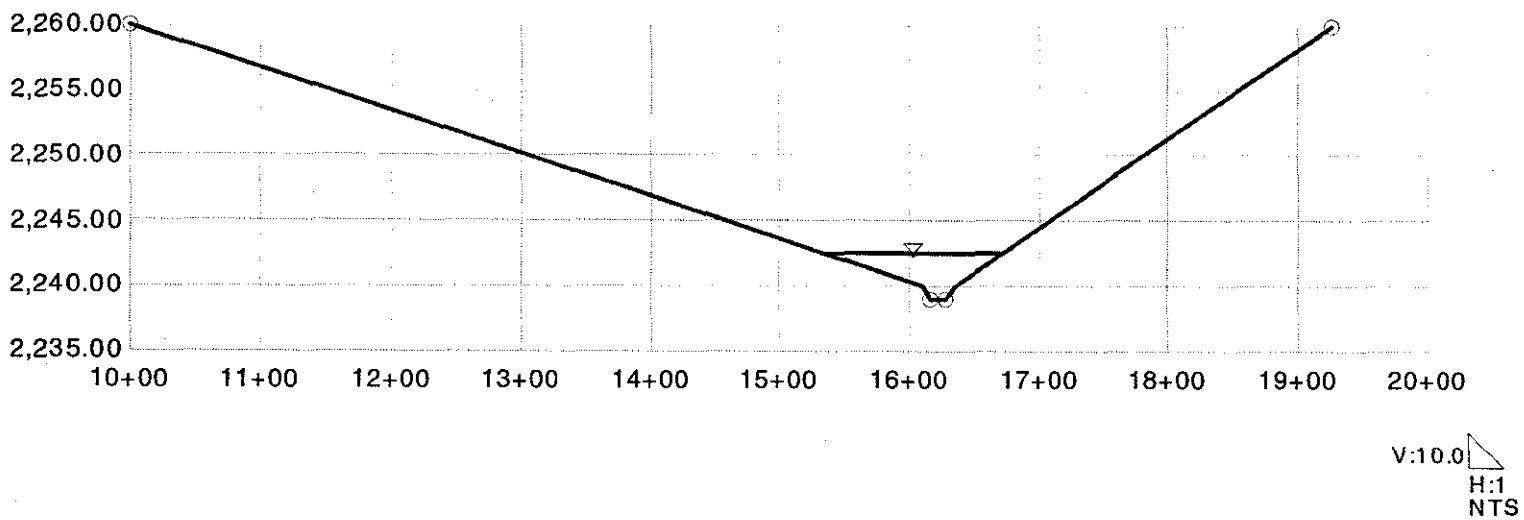
Station (ft)	Elevation (ft)
10+00	3,100.00
11+12	3,080.00
11+24	3,078.00
11+95	3,078.00
12+09	3,080.00
12+94	3,100.00

Wash Name:	**Tributary to Sols Wash**
Tributary to:	**Sols Wash**
File Name:	**Wash32T8R5**

Cross Section 100
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash32T8R5 Section 100
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.054	
Slope	0.012000	ft/ft
Water Surface Elevation	2,242.52	ft
Elevation Range	2,239.00 to 2,260.00	
Discharge	949.00	cfs



Section 100
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash32T8R5 Section 100
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Slope	0.012000 ft/ft
Discharge	949.00 cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.054	
Water Surface Elevation	2,242.52	ft
Elevation Range	2,239.00 to 2,260.00	
Flow Area	228.1	ft²
Wetted Perimeter	139.97	ft
Top Width	139.70	ft
Actual Depth	3.52	ft
Critical Elevation	2,241.86	ft
Critical Slope	0.039070	ft/ft
Velocity	4.16	ft/s
Velocity Head	0.27	ft
Specific Energy	2,242.79	ft
Froude Number	0.57	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	16+16	0.055
16+16	16+28	0.045
16+28	19+27	0.055

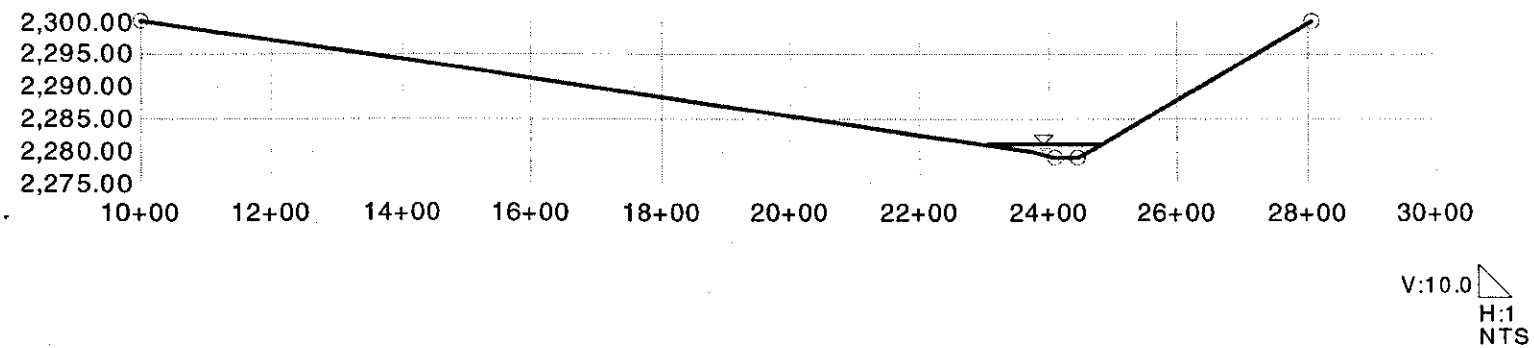
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,260.00
16+10	2,240.00
16+16	2,239.00
16+28	2,239.00
16+36	2,240.00
19+27	2,260.00

Cross Section 200
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash32T8R5 Section 200
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.053	
Slope	0.021000	ft/ft
Water Surface Elevation	2,280.99	ft
Elevation Range	2,279.00 to 2,300.00	
Discharge	826.00	cfs



Section 200
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash32T8R5 Section 200
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.021000	ft/ft
Discharge	826.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.053	
Water Surface Elevation	2,280.99	ft
Elevation Range	2,279.00 to 2,300.00	
Flow Area	190.5	ft²
Wetted Perimeter	172.85	ft
Top Width	172.77	ft
Actual Depth	1.99	ft
Critical Elevation	2,280.71	ft
Critical Slope	0.041192	ft/ft
Velocity	4.34	ft/s
Velocity Head	0.29	ft
Specific Energy	2,281.28	ft
Froude Number	0.73	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	24+09	0.055
24+09	24+45	0.045
24+45	28+08	0.055

Natural Channel Points

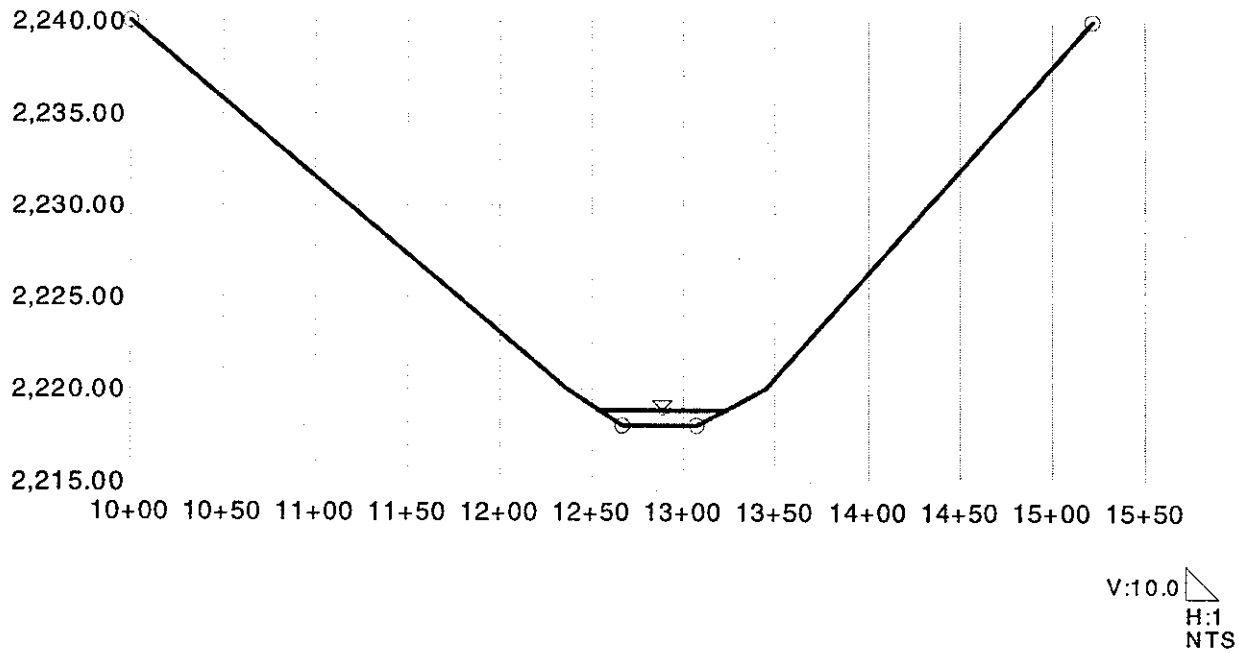
Station (ft)	Elevation (ft)
10+00	2,300.00
23+74	2,280.00
24+09	2,279.00
24+45	2,279.00
24+62	2,280.00
28+08	2,300.00

Wash Name:	**Tributary to Amir Wash**
Tributary to:	**Amir Wash**
File Name:	**Wash34T8R5**

Cross Section 100
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash34T8R5 Section 100
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.059	
Slope	0.032000	ft/ft
Water Surface Elevation	2,218.91	ft
Elevation Range	2,218.00 to 2,240.00	
Discharge	180.00	cfs



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FlowMaster v6.0 [614e]
Page 1 of 1

Worksheet
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash34T8R5 Section 100
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.032000	ft/ft
Discharge	180.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.059	
Water Surface Elevation	2,218.91	ft
Elevation Range	2,218.00 to 2,240.00	
Flow Area	50.6	ft²
Wetted Perimeter	71.11	ft
Top Width	71.05	ft
Actual Depth	0.91	ft
Critical Elevation	2,218.76	ft
Critical Slope	0.060727	ft/ft
Velocity	3.56	ft/s
Velocity Head	0.20	ft
Specific Energy	2,219.11	ft
Froude Number	0.74	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	12+66	0.065
12+66	13+06	0.055
13+06	15+23	0.065

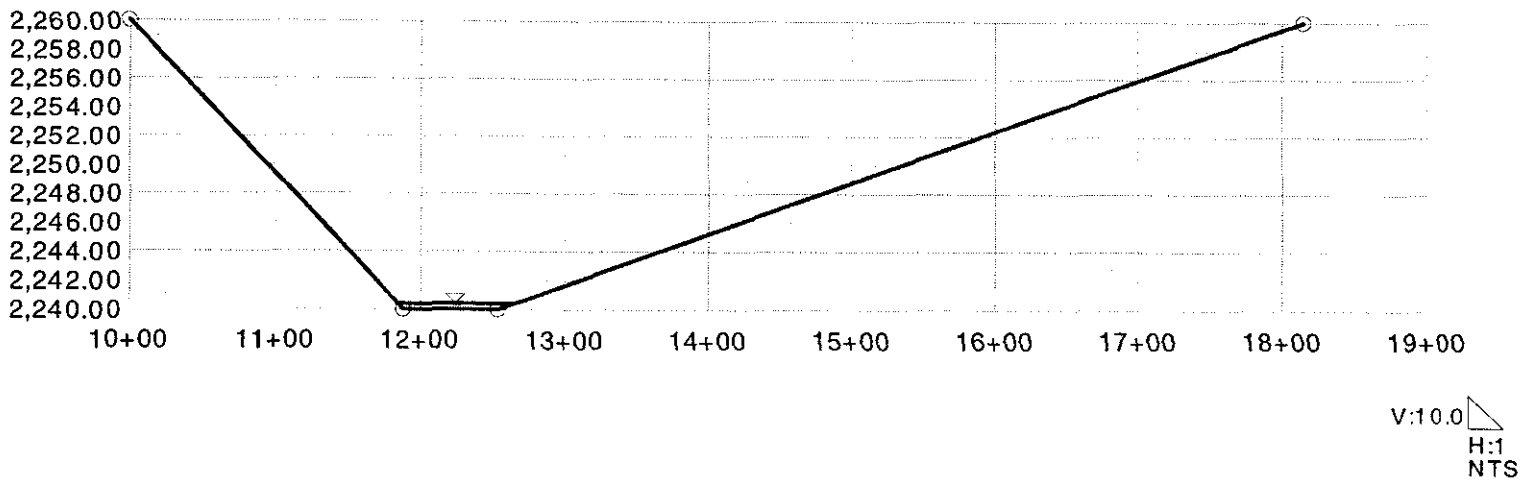
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,240.00
12+36	2,220.00
12+66	2,218.00
13+06	2,218.00
13+45	2,220.00
15+23	2,240.00

Cross Section 200
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash34T8R5 Section 200
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.057	
Slope	0.027000	ft/ft
Water Surface Elevation	2,240.43	ft
Elevation Range	2,240.00 to 2,260.00	
Discharge	72.00	cfs



Section 200
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash34T8R5 Section 200
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.027000	ft/ft
Discharge	72.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.057	
Water Surface Elevation	2,240.43	ft
Elevation Range	2,240.00 to 2,260.00	
Flow Area	31.6	ft^2
Wetted Perimeter	81.23	ft
Top Width	81.20	ft
Actual Depth	0.43	ft
Critical Elevation	2,240.33	ft
Critical Slope	0.070910	ft/ft
Velocity	2.28	ft/s
Velocity Head	0.08	ft
Specific Energy	2,240.51	ft
Froude Number	0.64	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	11+88	0.065
11+88	12+53	0.055
12+53	18+15	0.065

Natural Channel Points

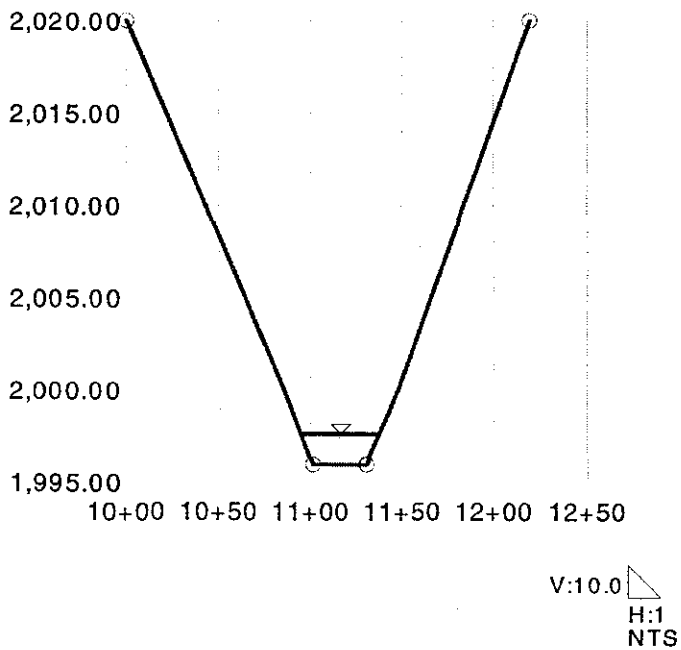
Station (ft)	Elevation (ft)
10+00	2,260.00
11+88	2,240.00
12+53	2,240.00
18+15	2,260.00

Wash Name:	**Wash20T7R4**
Tributary to:	**Hassayampa River**
File Name:	**Wash20T7R4**

Cro[illegible] Section 100
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash20T7R4 Section 100
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.057	
Slope	0.082000	ft/ft
Water Surface Elevation	1,997.64	ft
Elevation Range	1,996.00 to 2,020.00	
Discharge	544.00	cfs



Section 100
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash20T7R4 Section 100
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.082000	ft/ft
Discharge	544.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.057	
Water Surface Elevation	1,997.64	ft
Elevation Range	1,996.00 to 2,020.00	
Flow Area	58.8	ft^2
Wetted Perimeter	42.94	ft
Top Width	42.55	ft
Actual Depth	1.64	ft
Critical Elevation	1,998.01	ft
Critical Slope	0.040189	ft/ft
Velocity	9.26	ft/s
Velocity Head	1.33	ft
Specific Energy	1,998.97	ft
Froude Number	1.39	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	11+01	0.060
11+01	11+30	0.055
11+30	12+19	0.060

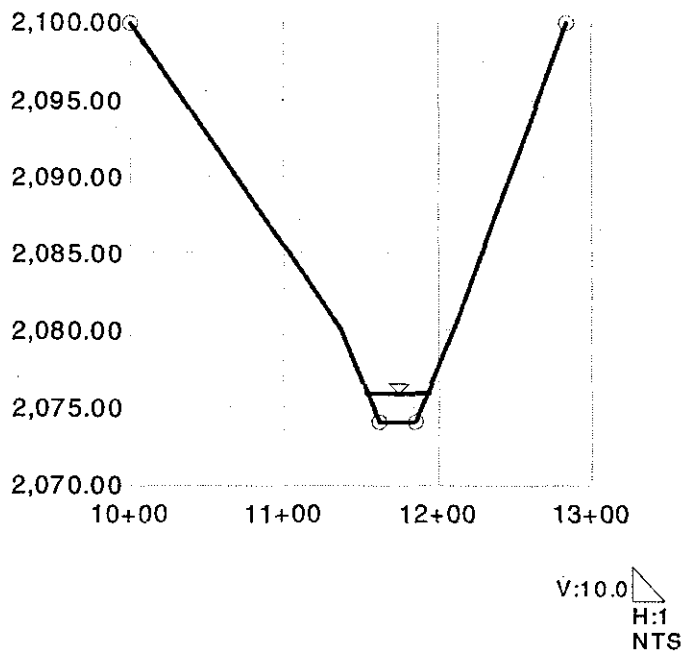
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,020.00
10+85	2,000.00
11+01	1,996.00
11+30	1,996.00
11+47	2,000.00
12+19	2,020.00

Cro[illegible] Section 200
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash20T7R4 Section 200
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.057	
Slope	0.036000	ft/ft
Water Surface Elevation	2,075.97	ft
Elevation Range	2,074.00 to 2,100.00	
Discharge	421.00	cfs



Section 200
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash20T7R4 Section 200
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.036000	ft/ft
Discharge	421.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.057	
Water Surface Elevation	2,075.97	ft
Elevation Range	2,074.00 to 2,100.00	
Flow Area	63.6	ft²
Wetted Perimeter	40.90	ft
Top Width	40.44	ft
Actual Depth	1.97	ft
Critical Elevation	2,075.89	ft
Critical Slope	0.041967	ft/ft
Velocity	6.62	ft/s
Velocity Head	0.68	ft
Specific Energy	2,076.65	ft
Froude Number	0.93	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	11+62	0.060
11+62	11+86	0.055
11+86	12+84	0.060

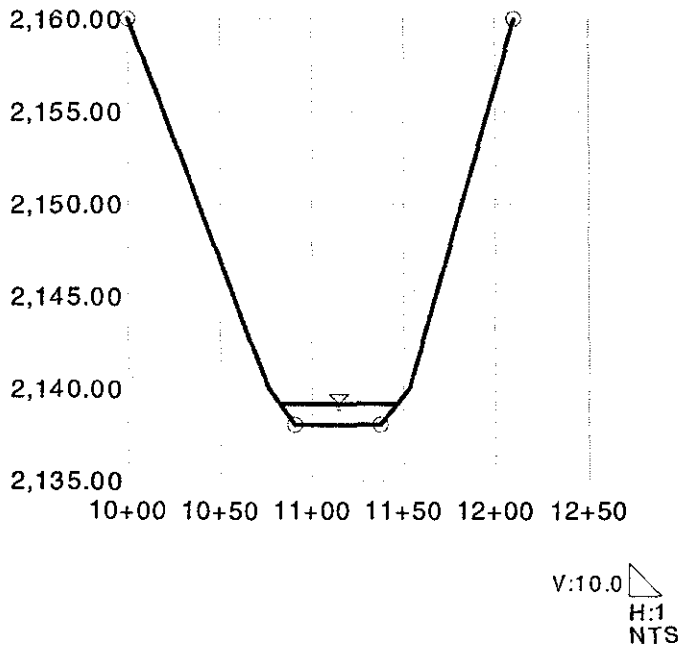
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,100.00
11+37	2,080.00
11+62	2,074.00
11+86	2,074.00
12+11	2,080.00
12+84	2,100.00

Cro... Section 300
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash20T7R4 Section 300
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.056	
Slope	0.033000	ft/ft
Water Surface Elevation	2,139.19	ft
Elevation Range	2,138.00 to 2,160.00	
Discharge	322.00	cfs



Section 300
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash20T7R4 Section 300
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.033000	ft/ft
Discharge	322.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.056	
Water Surface Elevation	2,139.19	ft
Elevation Range	2,138.00 to 2,160.00	
Flow Area	66.3	ft²
Wetted Perimeter	64.96	ft
Top Width	64.80	ft
Actual Depth	1.19	ft
Critical Elevation	2,139.07	ft
Critical Slope	0.047593	ft/ft
Velocity	4.85	ft/s
Velocity Head	0.37	ft
Specific Energy	2,139.55	ft
Froude Number	0.85	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	10+90	0.060
10+90	11+37	0.055
11+37	12+10	0.060

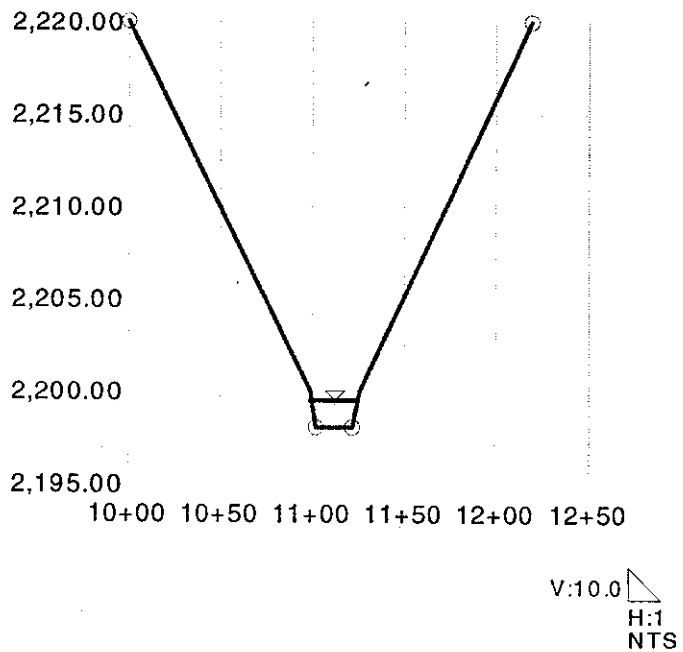
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,160.00
10+76	2,140.00
10+90	2,138.00
11+37	2,138.00
11+53	2,140.00
12+10	2,160.00

Cross Section 400
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash20T7R4 Section 400
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.056	
Slope	0.034000	ft/ft
Water Surface Elevation	2,199.53	ft
Elevation Range	2,198.00 to 2,220.00	
Discharge	198.00	cfs



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Section 400
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash20T7R4 Section 400
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.034000	ft/ft
Discharge	198.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.056	
Water Surface Elevation	2,199.53	ft
Elevation Range	2,198.00 to 2,220.00	
Flow Area	34.3	ft²
Wetted Perimeter	26.54	ft
Top Width	25.89	ft
Actual Depth	1.53	ft
Critical Elevation	2,199.41	ft
Critical Slope	0.044628	ft/ft
Velocity	5.76	ft/s
Velocity Head	0.52	ft
Specific Energy	2,200.05	ft
Froude Number	0.88	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	11+02	0.060
11+02	11+21	0.055
11+21	12+19	0.060

Natural Channel Points

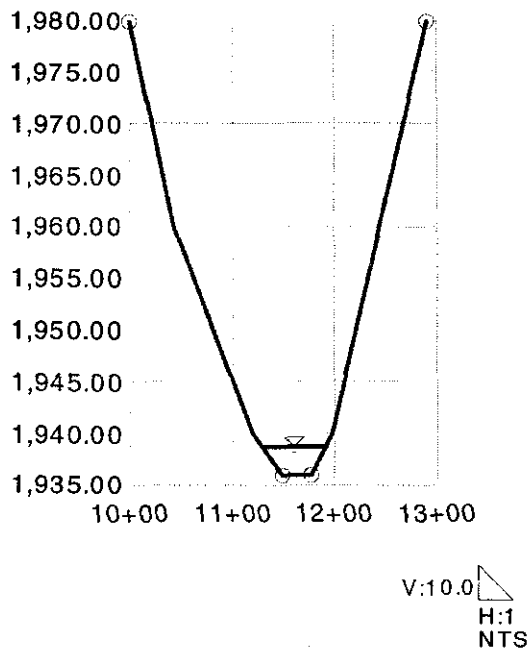
Station (ft)	Elevation (ft)
10+00	2,220.00
10+98	2,200.00
11+02	2,198.00
11+21	2,198.00
11+26	2,200.00
12+19	2,220.00

Wash Name:	**Wash28T7R4**
Tributary to:	**Hassayampa River**
File Name:	**Wash28T7R4**

Cross Section 100
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash28T7R4 Section 100
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.055	
Slope	0.078000	ft/ft
Water Surface Elevation	1,938.72	ft
Elevation Range	1,936.00 to 1,980.00	
Discharge	1,469.00	cfs



Section 100
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash28T7R4 Section 100
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Slope	0.078000 ft/ft
Discharge	1,469.00 cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.055	
Water Surface Elevation	1,938.72	ft
Elevation Range	1,936.00 to 1,980.00	
Flow Area	124.9	ft^2
Wetted Perimeter	63.41	ft
Top Width	62.96	ft
Actual Depth	2.72	ft
Critical Elevation	1,939.36	ft
Critical Slope	0.033978	ft/ft
Velocity	11.76	ft/s
Velocity Head	2.15	ft
Specific Energy	1,940.87	ft
Froude Number	1.47	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	11+49	0.012
11+49	11+78	0.090
11+78	12+90	0.012

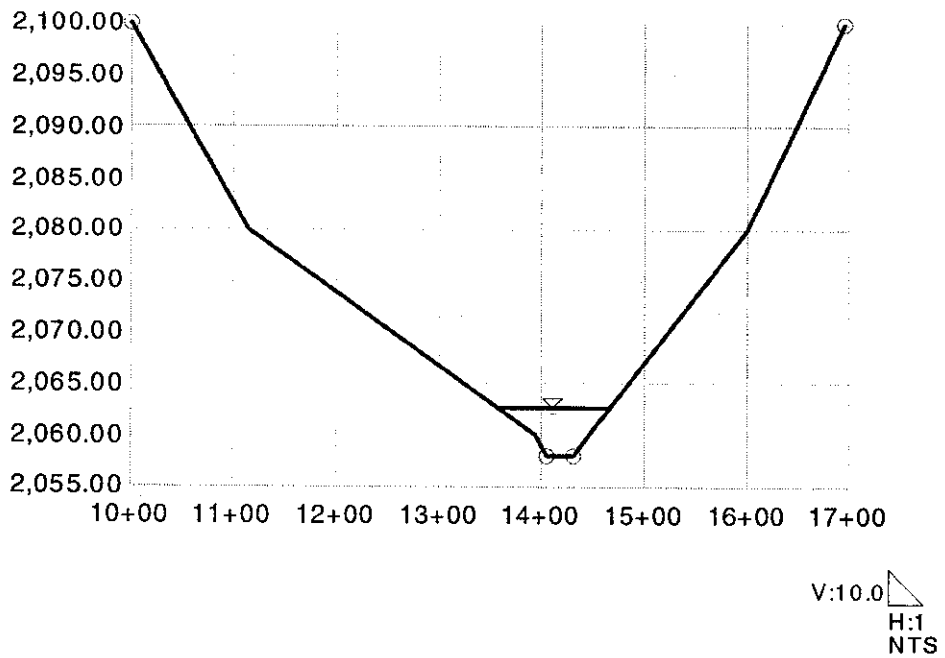
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	1,980.00
10+42	1,960.00
11+19	1,940.00
11+49	1,936.00
11+78	1,936.00
11+98	1,940.00
12+45	1,960.00
12+90	1,980.00

Cross Section 200
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash28T7R4 Section 200
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.094
Slope	0.021000 ft/ft
Water Surface Elevation	2,062.61 ft
Elevation Range	2,058.00 to 2,100.00
Discharge	1,271.00 cfs



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Section 200
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash28T7R4 Section 200
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.021000	ft/ft
Discharge	1,271.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.094	
Water Surface Elevation	2,062.61	ft
Elevation Range	2,058.00 to 2,100.00	
Flow Area	289.7	ft²
Wetted Perimeter	109.98	ft
Top Width	109.44	ft
Actual Depth	4.61	ft
Critical Elevation	2,061.22	ft
Critical Slope	0.102097	ft/ft
Velocity	4.39	ft/s
Velocity Head	0.30	ft
Specific Energy	2,062.91	ft
Froude Number	0.48	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	14+06	0.100
14+06	14+31	0.070
14+31	16+95	0.100

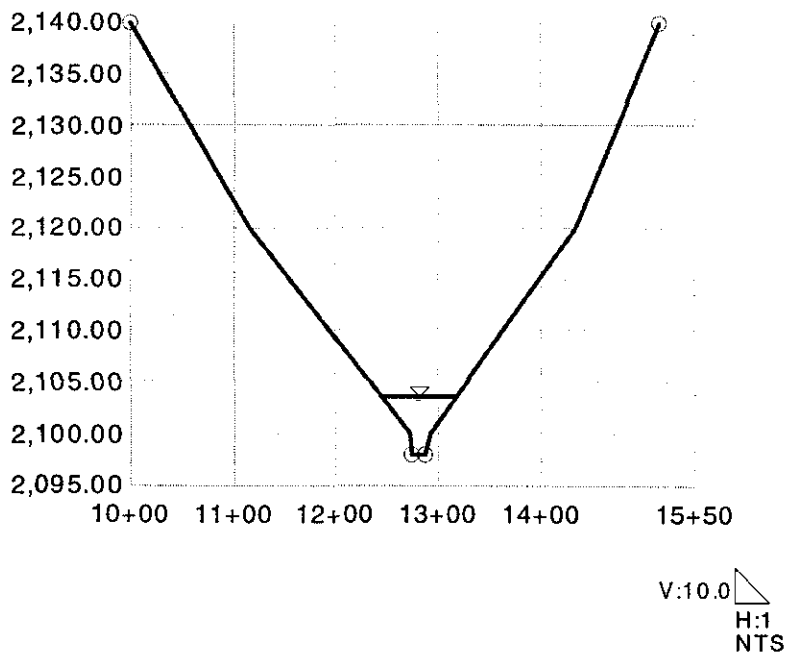
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,100.00
11+15	2,080.00
13+93	2,060.00
14+06	2,058.00
14+31	2,058.00
14+46	2,060.00
16+01	2,080.00
16+95	2,100.00

Cross Section 300
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash28T7R4 Section 300
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.077	
Slope	0.024000	ft/ft
Water Surface Elevation	2,103.61	ft
Elevation Range	2,098.00 to 2,140.00	
Discharge	1,171.00	cfs



Section 300
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash28T7R4 Section 300
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.024000	ft/ft
Discharge	1,171.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.077	
Water Surface Elevation	2,103.61	ft
Elevation Range	2,098.00 to 2,140.00	
Flow Area	202.3	ft^2
Wetted Perimeter	75.47	ft
Top Width	73.91	ft
Actual Depth	5.61	ft
Critical Elevation	2,102.61	ft
Critical Slope	0.067074	ft/ft
Velocity	5.79	ft/s
Velocity Head	0.52	ft
Specific Energy	2,104.13	ft
Froude Number	0.62	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	12+75	0.080
12+75	12+88	0.060
12+88	15+17	0.080

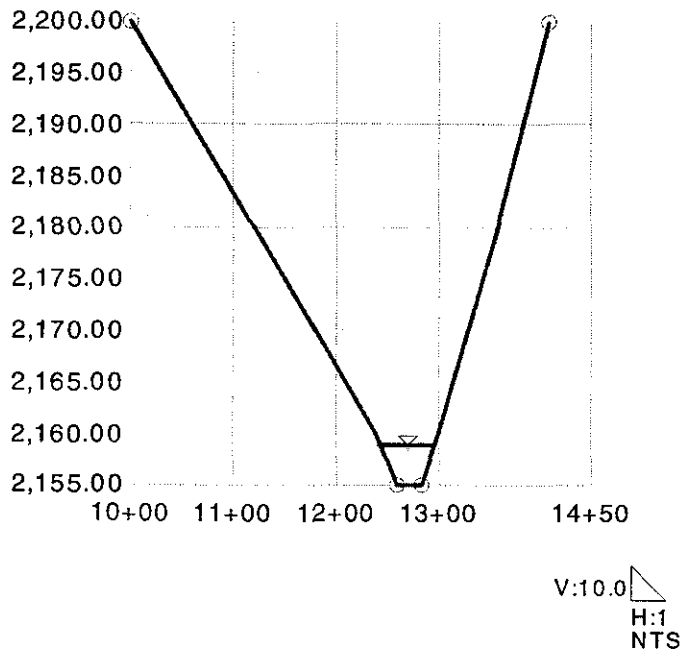
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,140.00
11+16	2,120.00
12+72	2,100.00
12+75	2,098.00
12+88	2,098.00
12+92	2,100.00
14+35	2,120.00
15+17	2,140.00

Cross Section 400
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash28T7R4 Section 400
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.060	
Slope	0.017000	ft/ft
Water Surface Elevation	2,158.84	ft
Elevation Range	2,155.00 to 2,200.00	
Discharge	943.00	cfs



Section 400
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash28T7R4 Section 400
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.017000	ft/ft
Discharge	943.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.060	
Water Surface Elevation	2,158.84	ft
Elevation Range	2,155.00 to 2,200.00	
Flow Area	149.0	ft^2
Wetted Perimeter	53.69	ft
Top Width	52.64	ft
Actual Depth	3.84	ft
Critical Elevation	2,158.03	ft
Critical Slope	0.041141	ft/ft
Velocity	6.33	ft/s
Velocity Head	0.62	ft
Specific Energy	2,159.46	ft
Froude Number	0.66	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	12+59	0.065
12+59	12+84	0.055
12+84	14+09	0.065

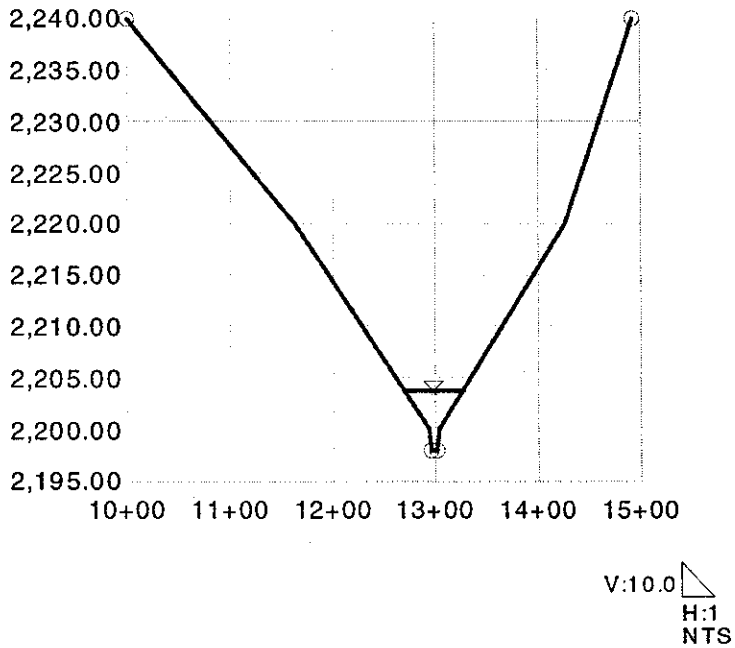
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,200.00
11+19	2,180.00
12+39	2,160.00
12+59	2,155.00
12+84	2,155.00
13+00	2,160.00
13+59	2,180.00
14+09	2,200.00

Cross Section 500
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash28T7R4 Section 500
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.064
Slope	0.018000 ft/ft
Water Surface Elevation	2,203.81 ft
Elevation Range	2,198.00 to 2,240.00
Discharge	824.00 cfs



Section 500
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash28T7R4 Section 500
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.018000	ft/ft
Discharge	824.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.064	
Water Surface Elevation	2,203.81	ft
Elevation Range	2,198.00 to 2,240.00	
Flow Area	146.8	ft²
Wetted Perimeter	60.83	ft
Top Width	58.17	ft
Actual Depth	5.81	ft
Critical Elevation	2,202.91	ft
Critical Slope	0.049595	ft/ft
Velocity	5.61	ft/s
Velocity Head	0.49	ft
Specific Energy	2,204.30	ft
Froude Number	0.62	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	12+95	0.065
12+95	13+02	0.055
13+02	14+94	0.065

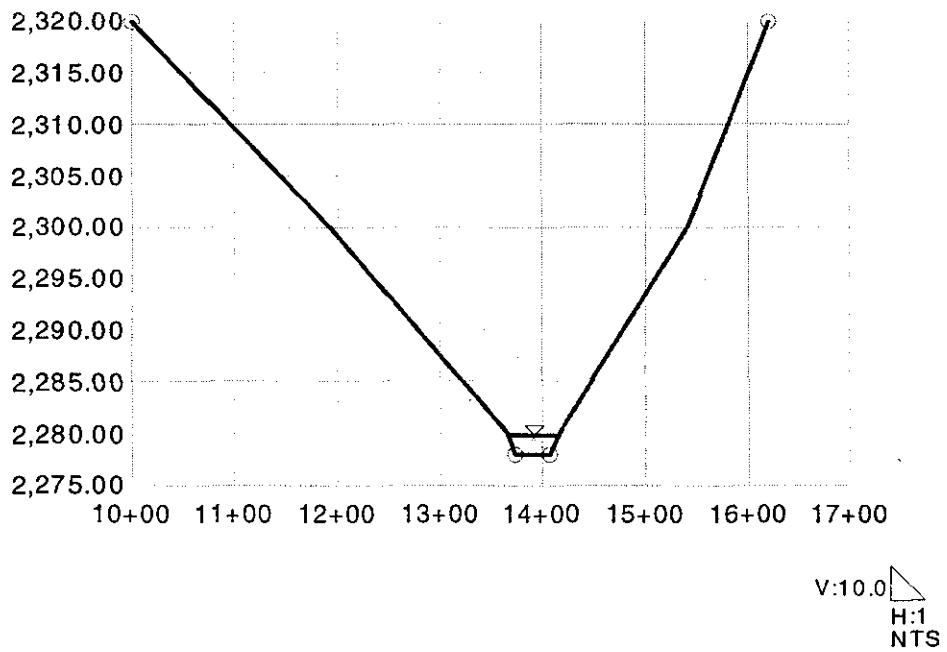
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,240.00
11+63	2,220.00
12+94	2,200.00
12+95	2,198.00
13+02	2,198.00
13+04	2,200.00
14+26	2,220.00
14+94	2,240.00

Cross Section 600
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash28T7R4 Section 600
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.059	
Slope	0.032000	ft/ft
Water Surface Elevation	2,279.91	ft
Elevation Range	2,278.00 to 2,320.00	
Discharge	486.00	cfs



Section 600
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash28T7R4 Section 600
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.032000	ft/ft
Discharge	486.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.059	
Water Surface Elevation	2,279.91	ft
Elevation Range	2,278.00 to 2,320.00	
Flow Area	79.3	ft^2
Wetted Perimeter	50.60	ft
Top Width	50.17	ft
Actual Depth	1.91	ft
Critical Elevation	2,279.74	ft
Critical Slope	0.044551	ft/ft
Velocity	6.13	ft/s
Velocity Head	0.58	ft
Specific Energy	2,280.49	ft
Froude Number	0.86	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	13+74	0.065
13+74	14+07	0.055
14+07	16+22	0.065

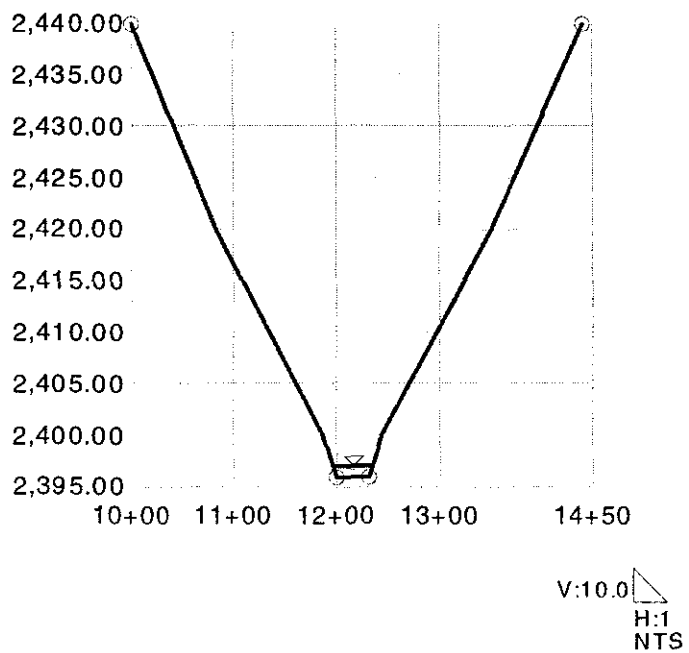
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,320.00
11+93	2,300.00
13+66	2,280.00
13+74	2,278.00
14+07	2,278.00
14+17	2,280.00
15+42	2,300.00
16+22	2,320.00

Cross Section 700
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash28T7R4 Section 700
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.057
Slope	0.046000 ft/ft
Water Surface Elevation	2,397.10 ft
Elevation Range	2,396.00 to 2,440.00
Discharge	218.00 cfs



Section 700
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash28T7R4 Section 700
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.046000	ft/ft
Discharge	218.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.057	
Water Surface Elevation	2,397.10	ft
Elevation Range	2,396.00 to 2,440.00	
Flow Area	39.2	ft²
Wetted Perimeter	39.49	ft
Top Width	39.16	ft
Actual Depth	1.10	ft
Critical Elevation	2,397.09	ft
Critical Slope	0.047985	ft/ft
Velocity	5.57	ft/s
Velocity Head	0.48	ft
Specific Energy	2,397.58	ft
Froude Number	0.98	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	12+00	0.065
12+00	12+32	0.055
12+32	14+41	0.065

Natural Channel Points

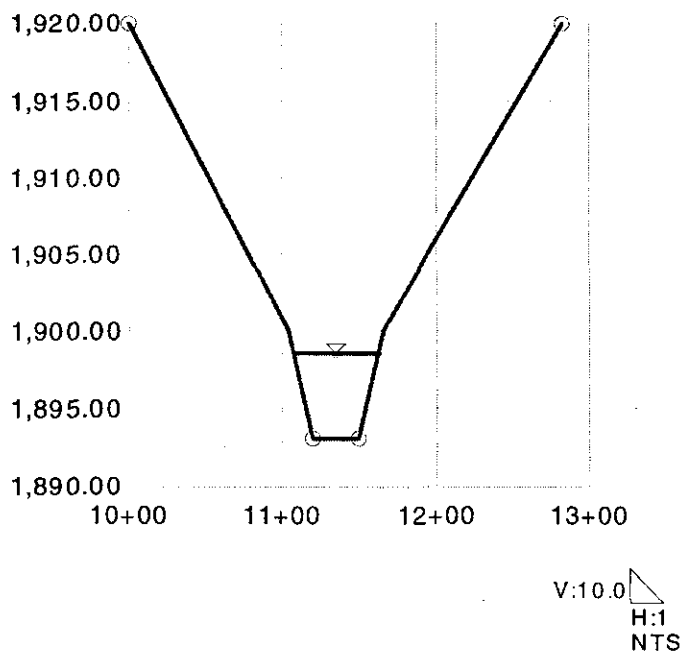
Station (ft)	Elevation (ft)
10+00	2,440.00
10+83	2,420.00
11+87	2,400.00
12+00	2,396.00
12+32	2,396.00
12+45	2,400.00
13+50	2,420.00
14+41	2,440.00

Wash Name:	**Wash3T6R4**
Tributary to:	**Hassayampa River**
File Name:	**Wash3T6R4**

Cross Section 100
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash3T6R4 Section 100
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.050
Slope	0.050000 ft/ft
Water Surface Elevation	1,898.57 ft
Elevation Range	1,893.00 to 1,920.00
Discharge	4,086.00 cfs



Section 100
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash3T6R4 Section 100
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.050000	ft/ft
Discharge	4,086.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.050	
Water Surface Elevation	1,898.57	ft
Elevation Range	1,893.00 to 1,920.00	
Flow Area	239.9	ft^2
Wetted Perimeter	58.50	ft
Top Width	56.24	ft
Actual Depth	5.57	ft
Critical Elevation	1,899.89	ft
Critical Slope	0.022434	ft/ft
Velocity	17.03	ft/s
Velocity Head	4.51	ft
Specific Energy	1,903.07	ft
Froude Number	1.45	
Flow Type	*Supercritical*	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	11+20	0.055
11+20	11+50	0.045
11+50	12+83	0.055

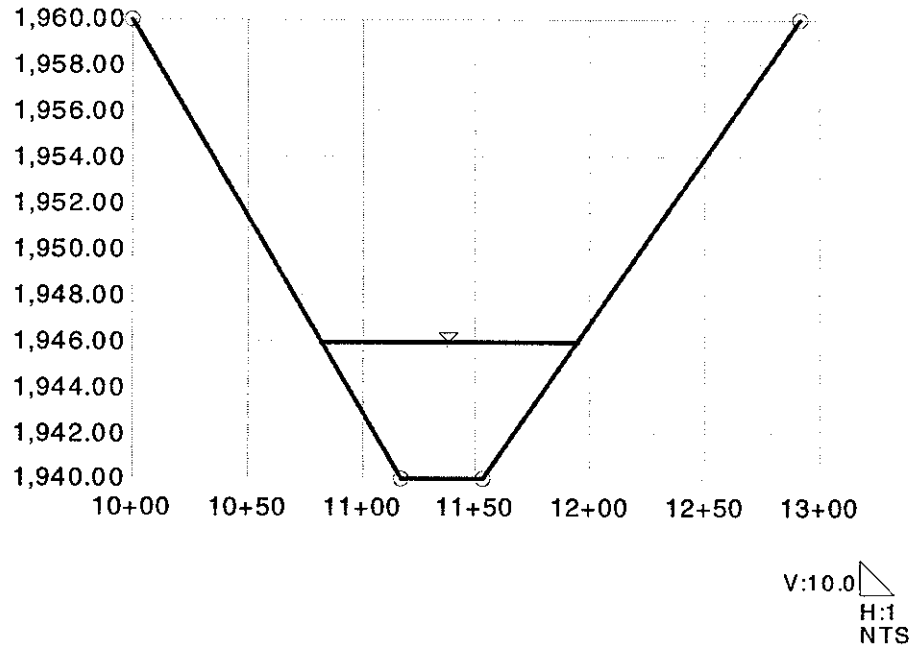
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	1,920.00
11+03	1,900.00
11+20	1,893.00
11+50	1,893.00
11+66	1,900.00
12+83	1,920.00

Cross Section 200
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash3T6R4 Section 200
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.052	
Slope	0.016000	ft/ft
Water Surface Elevation	1,945.95	ft
Elevation Range	1,940.00 to 1,960.00	
Discharge	3,955.00	cfs



Section 200
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash3T6R4 Section 200
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.016000	ft/ft
Discharge	3,955.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.052	
Water Surface Elevation	1,945.95	ft
Elevation Range	1,940.00 to 1,960.00	
Flow Area	441.1	ft^2
Wetted Perimeter	113.12	ft
Top Width	112.19	ft
Actual Depth	5.95	ft
Critical Elevation	1,945.29	ft
Critical Slope	0.025997	ft/ft
Velocity	8.97	ft/s
Velocity Head	1.25	ft
Specific Energy	1,947.20	ft
Froude Number	0.80	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	11+17	0.055
11+17	11+53	0.045
11+53	12+92	0.055

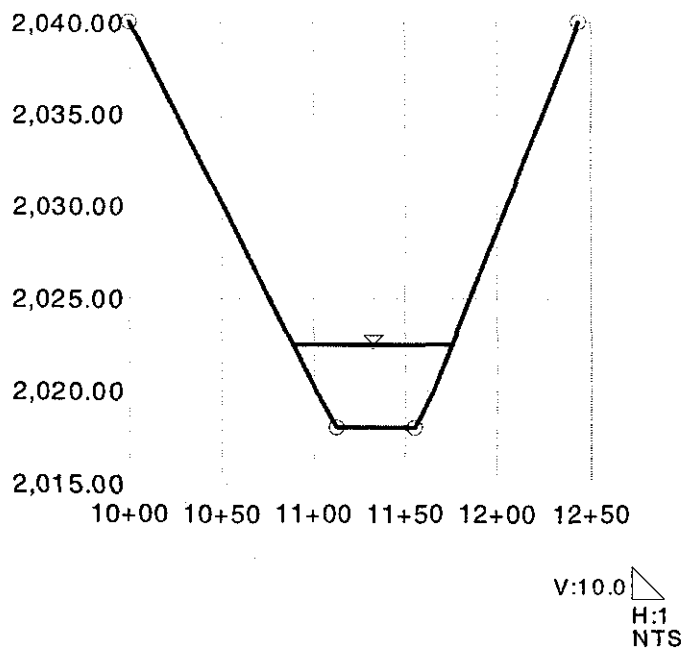
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	1,960.00
11+17	1,940.00
11+53	1,940.00
12+92	1,960.00

Cross Section 300
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash3T6R4 Section 300
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.050	
Slope	0.027000	ft/ft
Water Surface Elevation	2,022.57	ft
Elevation Range	2,018.00 to 2,040.00	
Discharge	3,322.00	cfs



Section 300
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash3T6R4 Section 300
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.027000	ft/ft
Discharge	3,322.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.050	
Water Surface Elevation	2,022.57	ft
Elevation Range	2,018.00 to 2,040.00	
Flow Area	301.2	ft^2
Wetted Perimeter	88.08	ft
Top Width	87.13	ft
Actual Depth	4.57	ft
Critical Elevation	2,022.69	ft
Critical Slope	0.024509	ft/ft
Velocity	11.03	ft/s
Velocity Head	1.89	ft
Specific Energy	2,024.46	ft
Froude Number	1.05	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	11+12	0.055
11+12	11+55	0.045
11+55	12+44	0.055

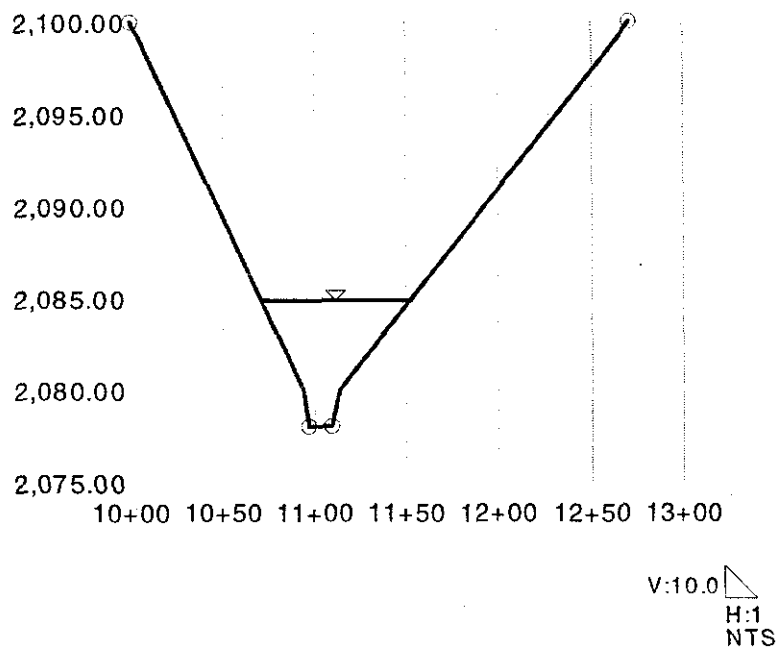
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,040.00
11+01	2,020.00
11+12	2,018.00
11+55	2,018.00
11+65	2,020.00
12+44	2,040.00

Cross Section 400
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash3T6R4 Section 400
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.054	
Slope	0.025000	ft/ft
Water Surface Elevation	2,084.96	ft
Elevation Range	2,078.00 to 2,100.00	
Discharge	2,852.00	cfs



Section 400
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash3T6R4 Section 400
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.025000	ft/ft
Discharge	2,852.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.054	
Water Surface Elevation	2,084.96	ft
Elevation Range	2,078.00 to 2,100.00	
Flow Area	286.9	ft^2
Wetted Perimeter	84.22	ft
Top Width	82.30	ft
Actual Depth	6.96	ft
Critical Elevation	2,084.79	ft
Critical Slope	0.028623	ft/ft
Velocity	9.94	ft/s
Velocity Head	1.54	ft
Specific Energy	2,086.50	ft
Froude Number	0.94	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	10+96	0.055
10+96	11+09	0.045
11+09	12+71	0.055

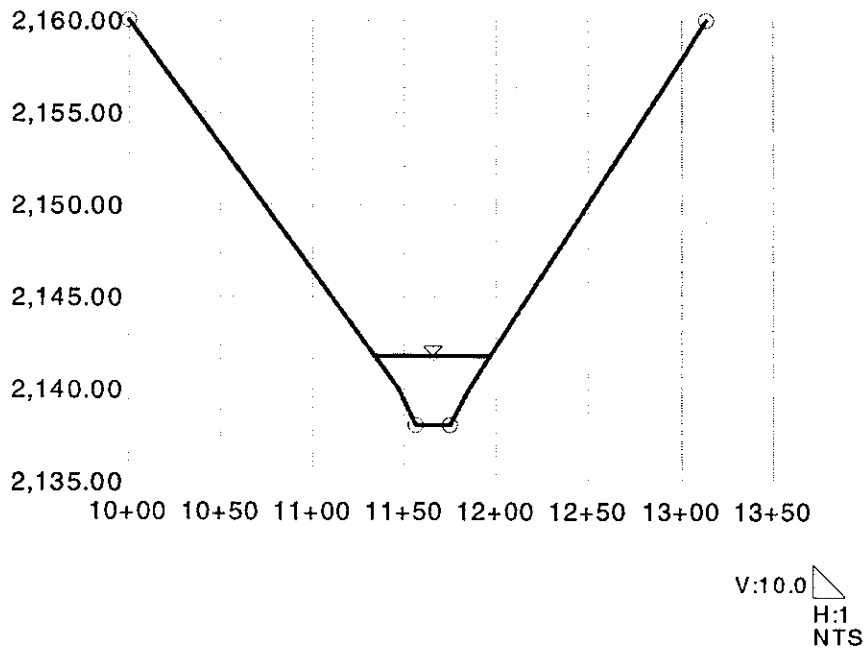
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,100.00
10+93	2,080.00
10+96	2,078.00
11+09	2,078.00
11+13	2,080.00
12+71	2,100.00

Cross Section 500
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash3T6R4 Section 500
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.052	
Slope	0.025000	ft/ft
Water Surface Elevation	2,141.82	ft
Elevation Range	2,138.00 to 2,160.00	
Discharge	1,202.00	cfs



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Section 500
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash3T6R4 Section 500
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.025000	ft/ft
Discharge	1,202.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.052	
Water Surface Elevation	2,141.82	ft
Elevation Range	2,138.00 to 2,160.00	
Flow Area	151.5	ft^2
Wetted Perimeter	64.64	ft
Top Width	63.98	ft
Actual Depth	3.82	ft
Critical Elevation	2,141.64	ft
Critical Slope	0.030666	ft/ft
Velocity	7.93	ft/s
Velocity Head	0.98	ft
Specific Energy	2,142.79	ft
Froude Number	0.91	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	11+56	0.055
11+56	11+75	0.045
11+75	13+14	0.055

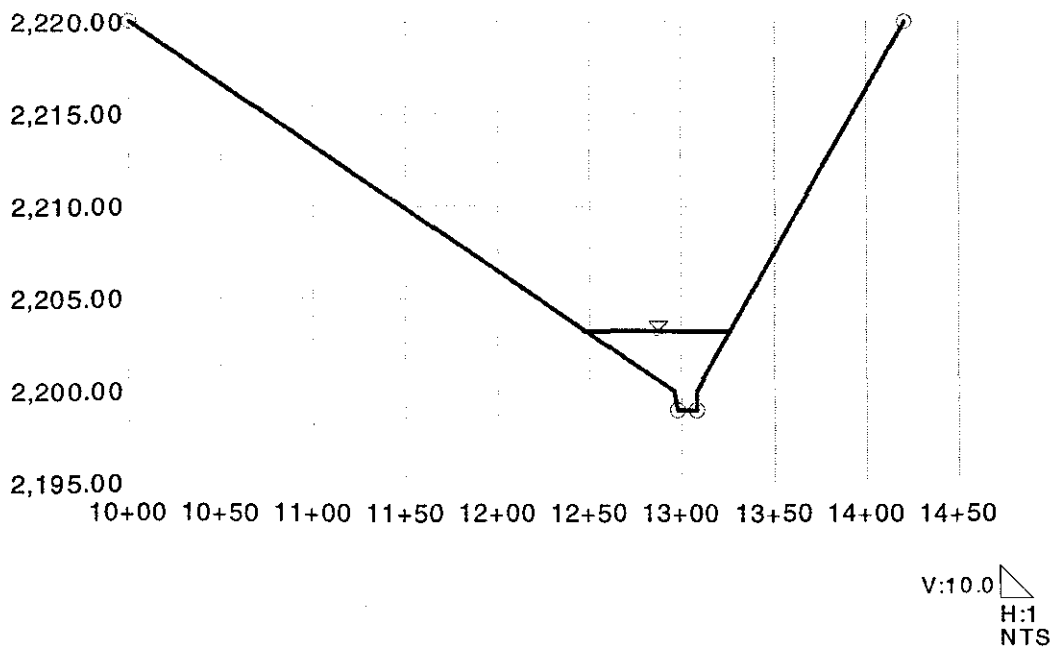
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,160.00
11+46	2,140.00
11+56	2,138.00
11+75	2,138.00
11+85	2,140.00
13+14	2,160.00

Cros. ection 600
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash3T6R4 Section 600
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.054	
Slope	0.016000	ft/ft
Water Surface Elevation	2,203.30	ft
Elevation Range	2,199.00 to 2,220.00	
Discharge	929.00	cfs



Section 600
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash3T6R4 Section 600
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.016000	ft/ft
Discharge	929.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.054	
Water Surface Elevation	2,203.30	ft
Elevation Range	2,199.00 to 2,220.00	
Flow Area	165.9	ft²
Wetted Perimeter	81.93	ft
Top Width	80.30	ft
Actual Depth	4.30	ft
Critical Elevation	2,202.71	ft
Critical Slope	0.035683	ft/ft
Velocity	5.60	ft/s
Velocity Head	0.49	ft
Specific Energy	2,203.79	ft
Froude Number	0.69	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	12+97	0.055
12+97	13+08	0.045
13+08	14+21	0.055

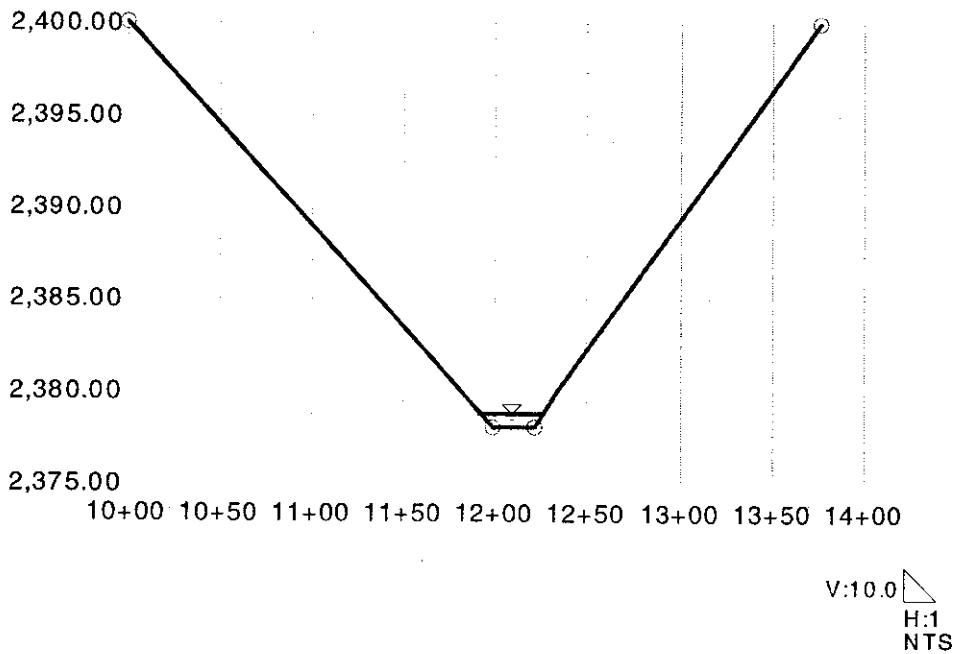
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,220.00
12+95	2,200.00
12+97	2,199.00
13+08	2,199.00
13+08	2,200.00
14+21	2,220.00

Cross Section 700
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash3T6R4 Section 700
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.048	
Slope	0.060000	ft/ft
Water Surface Elevation	2,378.76	ft
Elevation Range	2,378.00 to 2,400.00	
Discharge	120.00	cfs



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Section 700
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash3T6R4 Section 700
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.060000	ft/ft
Discharge	120.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.048	
Water Surface Elevation	2,378.76	ft
Elevation Range	2,378.00 to 2,400.00	
Flow Area	21.7	ft^2
Wetted Perimeter	34.46	ft
Top Width	34.36	ft
Actual Depth	0.76	ft
Critical Elevation	2,378.86	ft
Critical Slope	0.038611	ft/ft
Velocity	5.52	ft/s
Velocity Head	0.47	ft
Specific Energy	2,379.23	ft
Froude Number	1.22	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	11+98	0.055
11+98	12+21	0.045
12+21	13+77	0.055

Natural Channel Points

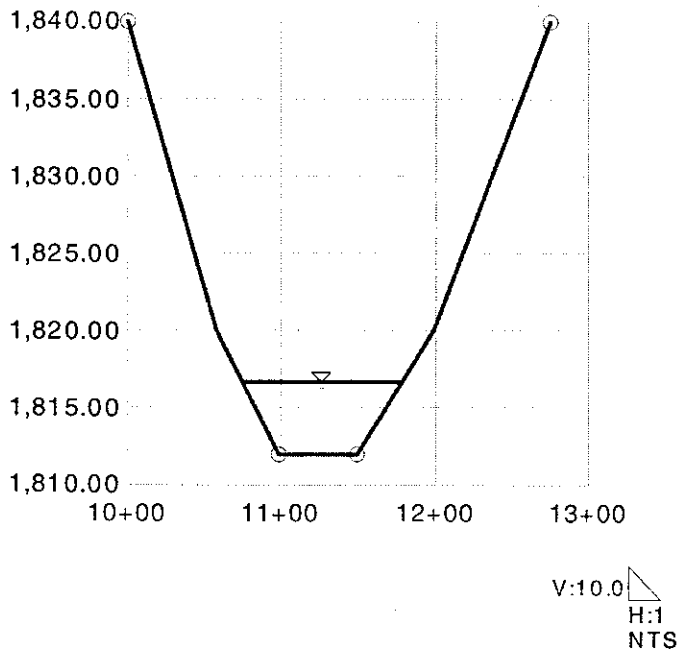
Station (ft)	Elevation (ft)
10+00	2,400.00
11+81	2,380.00
11+98	2,378.00
12+21	2,378.00
12+34	2,380.00
13+77	2,400.00

Wash Name:	**Wash15T6R4**
Tributary to:	**Hassayampa River**
File Name:	**Wash15T6R4**

Cross Section 100
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash15T6R4 Section 100
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.053	
Slope	0.020000	ft/ft
Water Surface Elevation	1,816.67	ft
Elevation Range	1,812.00 to 1,840.00	
Discharge	3,337.00	cfs



Section 100
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash15T6R4 Section 100
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.020000	ft/ft
Discharge	3,337.00	cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.053	
Water Surface Elevation	1,816.67	ft
Elevation Range	1,812.00 to 1,840.00	
Flow Area	365.9	ft^2
Wetted Perimeter	105.41	ft
Top Width	104.58	ft
Actual Depth	4.67	ft
Critical Elevation	1,816.29	ft
Critical Slope	0.027721	ft/ft
Velocity	9.12	ft/s
Velocity Head	1.29	ft
Specific Energy	1,817.97	ft
Froude Number	0.86	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	10+98	0.060
10+98	11+50	0.050
11+50	12+75	0.060

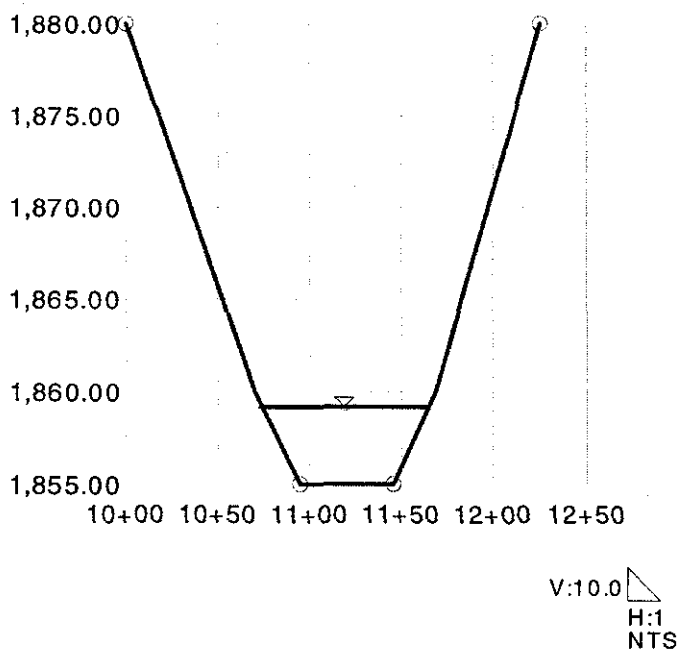
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	1,840.00
10+57	1,820.00
10+98	1,812.00
11+50	1,812.00
11+99	1,820.00
12+75	1,840.00

Cross Section 200
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash15T6R4 Section 200
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.055	
Slope	0.032000	ft/ft
Water Surface Elevation	1,859.25	ft
Elevation Range	1,855.00 to 1,880.00	
Discharge	3,250.00	cfs



Section 200
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash15T6R4 Section 200
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.032000	ft/ft
Discharge	3,250.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.055	
Water Surface Elevation	1,859.25	ft
Elevation Range	1,855.00 to 1,880.00	
Flow Area	303.0	ft^2
Wetted Perimeter	92.63	ft
Top Width	91.75	ft
Actual Depth	4.25	ft
Critical Elevation	1,859.35	ft
Critical Slope	0.029364	ft/ft
Velocity	10.73	ft/s
Velocity Head	1.79	ft
Specific Energy	1,861.03	ft
Froude Number	1.04	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	10+94	0.060
10+94	11+45	0.050
11+45	12+25	0.060

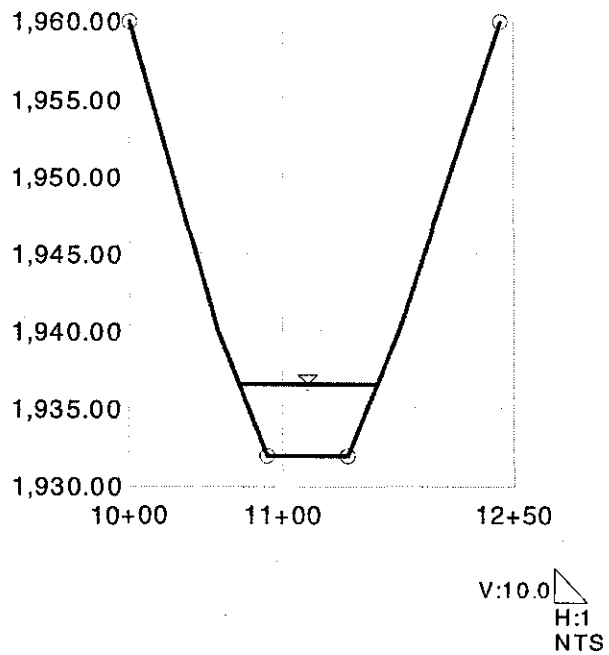
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	1,880.00
10+69	1,860.00
10+94	1,855.00
11+45	1,855.00
11+68	1,860.00
12+25	1,880.00

Cros[illegible]ection 300
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash15T6R4 Section 300
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.054	
Slope	0.024000	ft/ft
Water Surface Elevation	1,936.53	ft
Elevation Range	1,932.00 to 1,960.00	
Discharge	3,150.00	cfs



Section 300
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash15T6R4 Section 300
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.024000	ft/ft
Discharge	3,150.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.054	
Water Surface Elevation	1,936.53	ft
Elevation Range	1,932.00 to 1,960.00	
Flow Area	320.3	ft^2
Wetted Perimeter	90.46	ft
Top Width	89.38	ft
Actual Depth	4.53	ft
Critical Elevation	1,936.30	ft
Critical Slope	0.029009	ft/ft
Velocity	9.84	ft/s
Velocity Head	1.50	ft
Specific Energy	1,938.03	ft
Froude Number	0.92	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	10+90	0.060
10+90	11+42	0.050
11+42	12+42	0.060

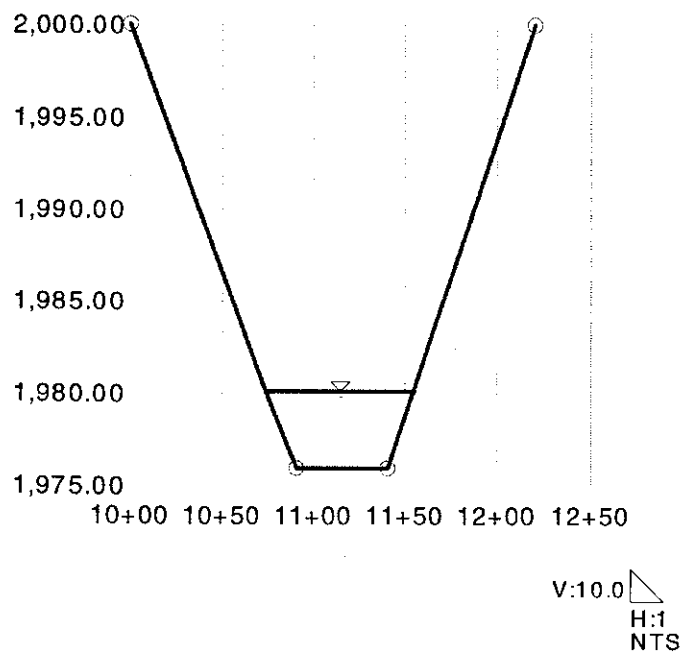
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	1,960.00
10+57	1,940.00
10+90	1,932.00
11+42	1,932.00
11+75	1,940.00
12+42	1,960.00

Cros Section 400
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash15T6R4 Section 400
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.054	
Slope	0.031000	ft/ft
Water Surface Elevation	1,980.13	ft
Elevation Range	1,976.00 to 2,000.00	
Discharge	2,900.00	cfs



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Section 400
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash15T6R4 Section 400
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.031000	ft/ft
Discharge	2,900.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.054	
Water Surface Elevation	1,980.13	ft
Elevation Range	1,976.00 to 2,000.00	
Flow Area	270.3	ft^2
Wetted Perimeter	81.98	ft
Top Width	80.89	ft
Actual Depth	4.13	ft
Critical Elevation	1,980.21	ft
Critical Slope	0.028780	ft/ft
Velocity	10.73	ft/s
Velocity Head	1.79	ft
Specific Energy	1,981.92	ft
Froude Number	1.03	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	10+90	0.060
10+90	11+40	0.050
11+40	12+20	0.060

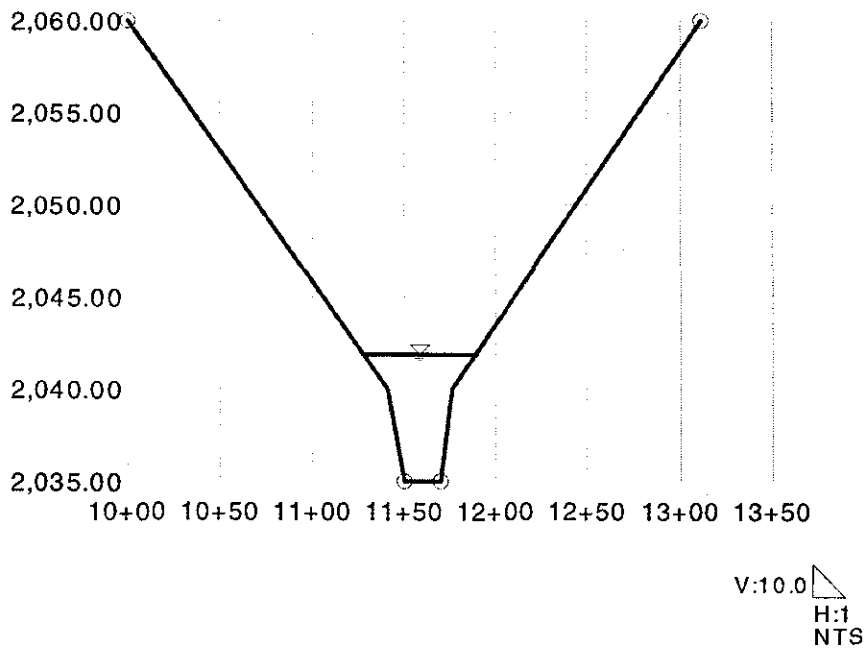
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,000.00
10+74	1,980.00
10+90	1,976.00
11+40	1,976.00
11+54	1,980.00
12+20	2,000.00

Cross Section 500
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash15T6R4 Section 500
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.057	
Slope	0.028000	ft/ft
Water Surface Elevation	2,041.86	ft
Elevation Range	2,035.00 to 2,060.00	
Discharge	2,300.00	cfs



Section 500
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash15T6R4 Section 500
Flow Element	Irregular Channel
Method	*Manning's Formula*
Solve For	Channel Depth

Input Data		
Slope	0.028000	ft/ft
Discharge	2,300.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.057	
Water Surface Elevation	2,041.86	ft
Elevation Range	2,035.00 to 2,060.00	
Flow Area	228.2	ft²
Wetted Perimeter	64.68	ft
Top Width	61.63	ft
Actual Depth	6.86	ft
Critical Elevation	2,041.59	ft
Critical Slope	0.033045	ft/ft
Velocity	10.08	ft/s
Velocity Head	1.58	ft
Specific Energy	2,043.44	ft
Froude Number	0.92	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	11+50	0.060
11+50	11+69	0.050
11+69	13+12	0.060

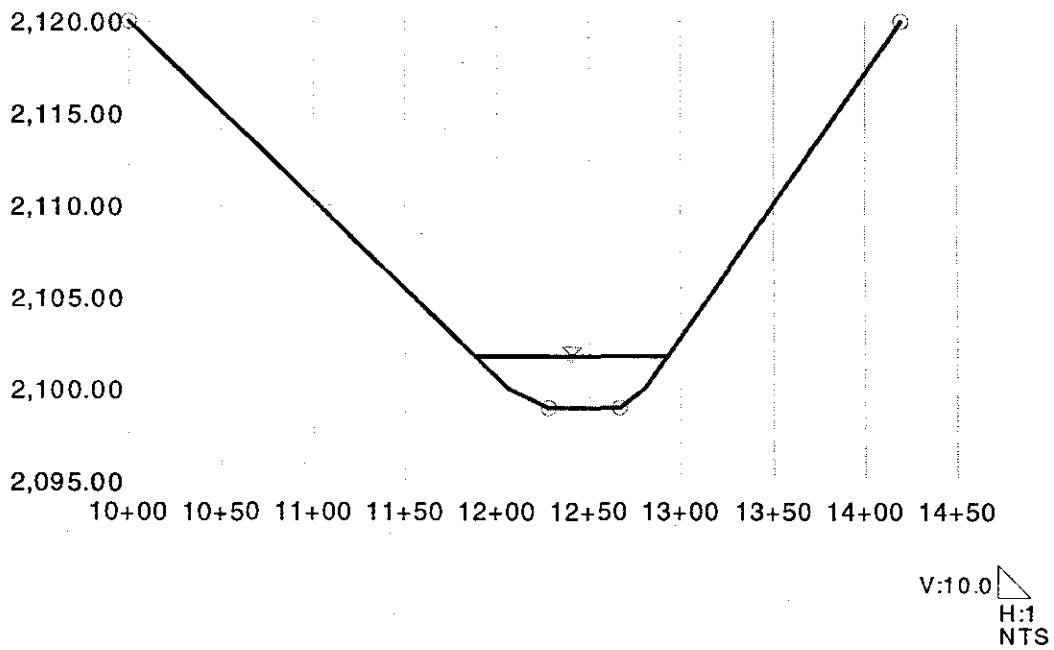
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,060.00
11+40	2,040.00
11+50	2,035.00
11+69	2,035.00
11+76	2,040.00
13+12	2,060.00

Cros Section 600
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash15T6R4 Section 600
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.056	
Slope	0.022000	ft/ft
Water Surface Elevation	2,101.76	ft
Elevation Range	2,099.00 to 2,120.00	
Discharge	1,337.00	cfs



Section 600
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash15T6R4 Section 600
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.022000	ft/ft
Discharge	1,337.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.056	
Water Surface Elevation	2,101.76	ft
Elevation Range	2,099.00 to 2,120.00	
Flow Area	213.3	ft^2
Wetted Perimeter	104.76	ft
Top Width	104.49	ft
Actual Depth	2.76	ft
Critical Elevation	2,101.39	ft
Critical Slope	0.038370	ft/ft
Velocity	6.27	ft/s
Velocity Head	0.61	ft
Specific Energy	2,102.37	ft
Froude Number	0.77	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	12+28	0.060
12+28	12+66	0.050
12+66	14+20	0.060

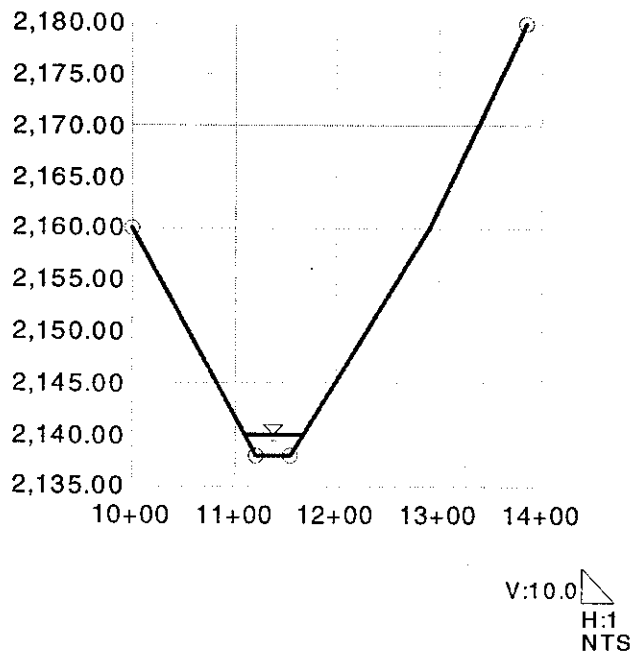
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,120.00
12+06	2,100.00
12+28	2,099.00
12+66	2,099.00
12+80	2,100.00
14+20	2,120.00

Cross Section 700
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash15T6R4 Section 700
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.056	
Slope	0.016000	ft/ft
Water Surface Elevation	2,140.00	ft
Elevation Range	2,138.00 to 2,180.00	
Discharge	412.00	cfs



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Section 700
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash15T6R4 Section 700
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.016000	ft/ft
Discharge	412.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.056	
Water Surface Elevation	2,140.00	ft
Elevation Range	2,138.00 to 2,180.00	
Flow Area	90.9	ft^2
Wetted Perimeter	57.32	ft
Top Width	56.97	ft
Actual Depth	2.00	ft
Critical Elevation	2,139.52	ft
Critical Slope	0.043138	ft/ft
Velocity	4.53	ft/s
Velocity Head	0.32	ft
Specific Energy	2,140.32	ft
Froude Number	0.63	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	11+20	0.065
11+20	11+54	0.050
11+54	13+86	0.065

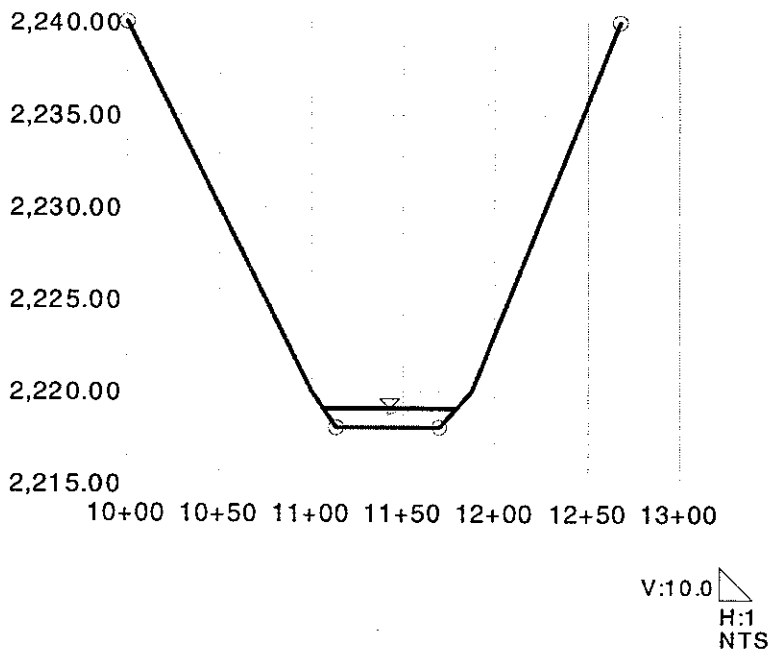
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,160.00
11+10	2,140.00
11+20	2,138.00
11+54	2,138.00
11+67	2,140.00
12+91	2,160.00
13+86	2,180.00

Cross Section 800
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash15T6R4 Section 800
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.054	
Slope	0.030000	ft/ft
Water Surface Elevation	2,219.06	ft
Elevation Range	2,218.00 to 2,240.00	
Discharge	312.00	cfs



Section 800
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash15T6R4 Section 800
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.030000	ft/ft
Discharge	312.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.054	
Water Surface Elevation	2,219.06	ft
Elevation Range	2,218.00 to 2,240.00	
Flow Area	67.9	ft²
Wetted Perimeter	72.53	ft
Top Width	72.39	ft
Actual Depth	1.06	ft
Critical Elevation	2,218.94	ft
Critical Slope	0.044361	ft/ft
Velocity	4.59	ft/s
Velocity Head	0.33	ft
Specific Energy	2,219.39	ft
Froude Number	0.84	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	11+13	0.065
11+13	11+69	0.050
11+69	12+68	0.065

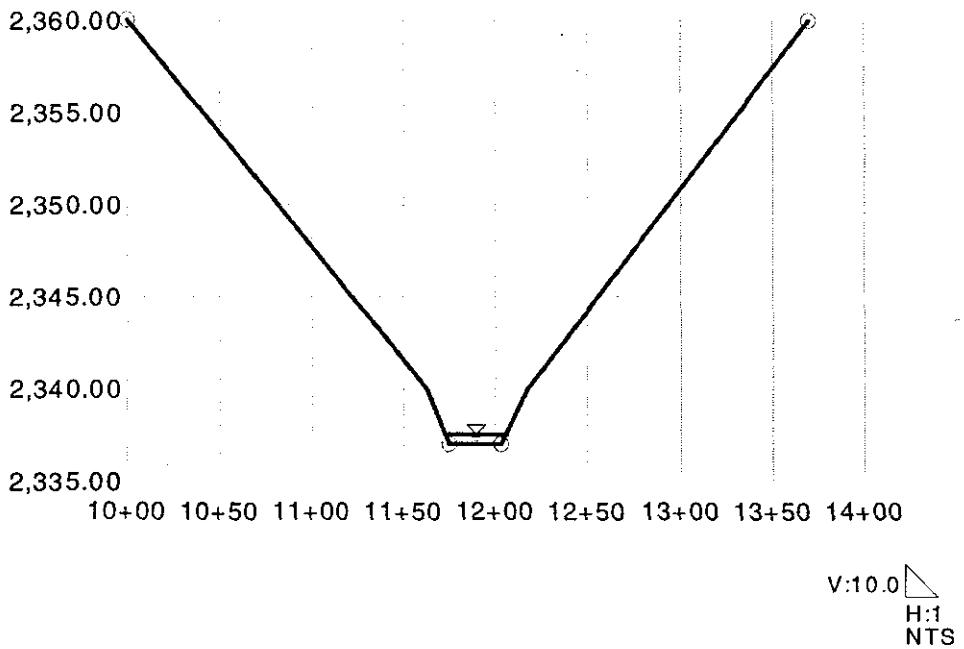
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,240.00
11+00	2,220.00
11+13	2,218.00
11+69	2,218.00
11+87	2,220.00
12+68	2,240.00

Cro. Section 900
Cross Section for Irregular Channel

Project Description	
Worksheet	Wash15T6R4 Section 900
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.052	
Slope	0.035000	ft/ft
Water Surface Elevation	2,337.51	ft
Elevation Range	2,337.00 to 2,360.00	
Discharge	50.00	cfs



Section 900
Worksheet for Irregular Channel

Project Description	
Worksheet	Wash15T6R4 Section 900
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.035000	ft/ft
Discharge	50.00	cfs

Options	
Current Roughness Method	Horton's Method
Open Channel Weighting Method	Horton's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.052	
Water Surface Elevation	2,337.51	ft
Elevation Range	2,337.00 to 2,360.00	
Flow Area	15.5	ft²
Wetted Perimeter	32.71	ft
Top Width	32.60	ft
Actual Depth	0.51	ft
Critical Elevation	2,337.45	ft
Critical Slope	0.053303	ft/ft
Velocity	3.23	ft/s
Velocity Head	0.16	ft
Specific Energy	2,337.67	ft
Froude Number	0.83	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	11+75	0.065
11+75	12+03	0.050
12+03	13+70	0.065

Natural Channel Points

Station (ft)	Elevation (ft)
10+00	2,360.00
11+62	2,340.00
11+75	2,337.00
12+03	2,337.00
12+17	2,340.00
13+70	2,360.00

APPENDIX F

EROSION/SEDIMENT TRANSPORT ANALYSIS SUPPORTING DOCUMENTATION

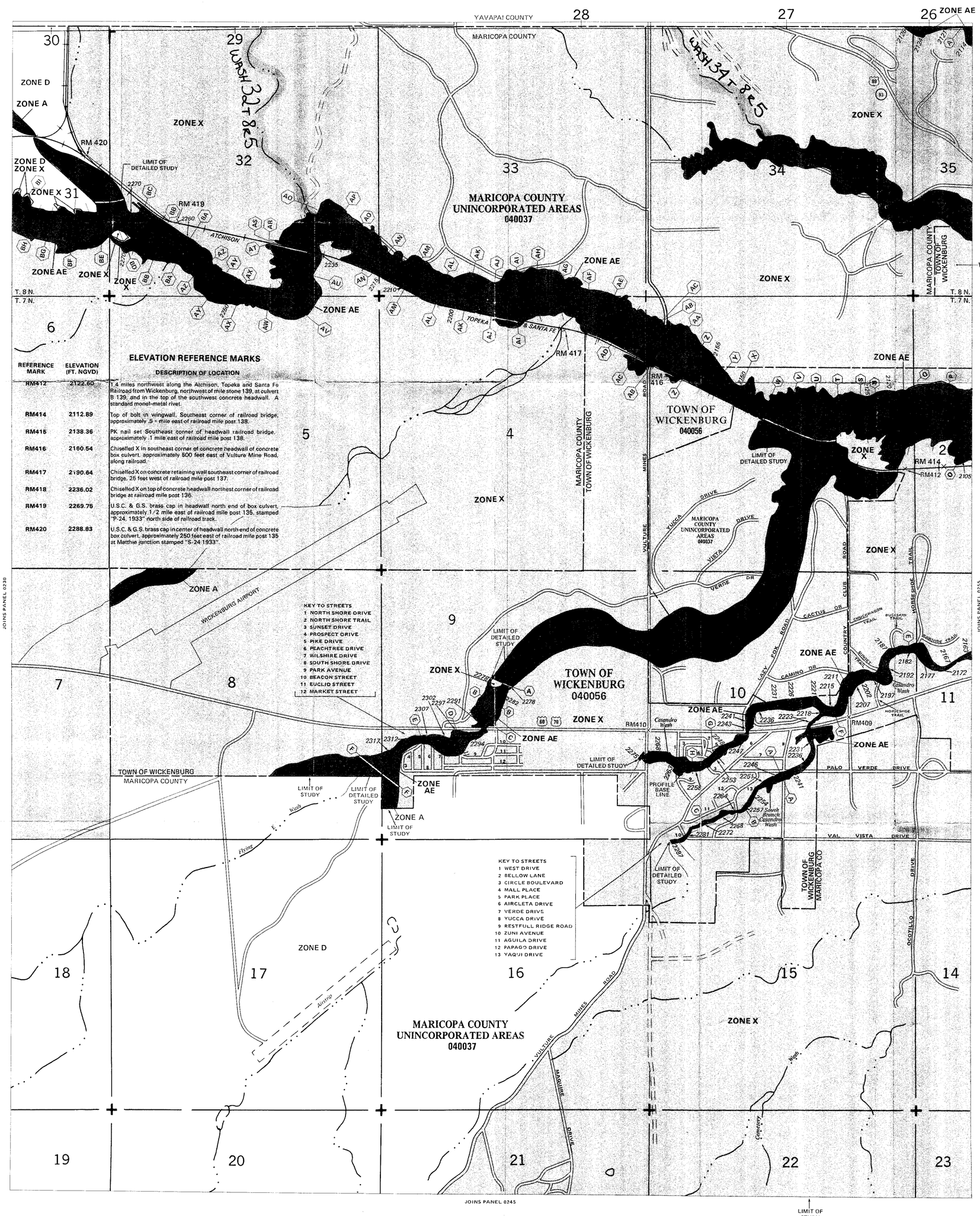
EROSION/SEDIMENT TRANSPORT ANALYSIS SUPPORTING DOCUMENTATION

The erosion and sediment transport characteristics of this study area were not analyzed for this approximate Zone A study.

EXHIBIT MAPS

EXHIBIT A

Current FIRM Panels



ELEVATION REFERENCE MARKS

REFERENCE MARK	ELEVATION (FT. NGVD)	DESCRIPTION OF LOCATION
RM412	2122.60	1.4 miles northwest along the Atchison, Topeka and Santa Fe Railroad from Wickenburg, northwest of mile stone 139, at culvert B 139, and in the top of the southwest concrete headwall. A standard monel-metal rivet.
RM414	2112.89	Top of bolt in wingwall. Southeast corner of railroad bridge, approximately .5 + mile east of railroad mile post 138.
RM415	2138.36	PK nail set Southeast corner of headwall railroad bridge, approximately .1 mile east of railroad mile post 138.
RM416	2160.54	Chiselled X in southeast corner of concrete headwall of concrete box culvert, approximately 500 feet east of Vulture Mine Road, along railroad.
RM417	2190.64	Chiselled X on concrete retaining wall southeast corner of railroad bridge, 25 feet west of railroad mile post 137.
RM418	2236.02	Chiselled X on top of concrete headwall northest corner of railroad bridge at railroad mile post 136.
RM419	2269.75	U.S.C. & G.S. brass cap in headwall north end of box culvert, approximately 1/2 mile east of railroad mile post 135, stamped "P 24, 1933" north side of railroad track.
RM420	2288.83	U.S.C. & G.S. brass cap in center of headwall north end of concrete box culvert, approximately 250 feet east of railroad mile post 135 at Matthie junction stamped "S 24 1933".

NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 7 NORTH, RANGE 5 WEST AND TOWNSHIP 8 NORTH, RANGE 5 WEST

LEGEND

SPECIAL FLOOD HAZARD AREAS INUNDATED BY 100-YEAR FLOOD

- **ZONE A** No base flood elevations determined.
- **ZONE AE** Base flood elevations determined.
- **ZONE AH** Flood depths of 1 to 3 feet (usually areas of ponding); base flood elevations determined.
- **ZONE AO** Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
- **ZONE A99** To be protected from 100-year flood by Federal flood protection system under construction; no base elevations determined.
- **ZONE V** Coastal flood with velocity hazard (wave action); no base flood elevations determined.
- **ZONE VE** Coastal flood with velocity hazard (wave action); base flood elevations determined.

FLOODWAY AREAS IN ZONE AE

OTHER FLOOD AREAS

- **ZONE X** Areas of 500-year flood; areas of 100-year flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 100-year flood.

OTHER AREAS

- **ZONE X** Areas determined to be outside 500-year flood plain.
- **ZONE D** Areas in which flood hazards are undetermined.

Flood Boundary

Floodway Boundary

Zone D Boundary

Boundary Dividing Special Flood Hazard Zones, and Boundary Dividing Areas of Different Coastal Base Flood Elevations Within Special Flood Hazard Zones.

513 — Base Flood Elevation Line; Elevation in Feet*

D — D Cross Section Line

(EL 987) Base Flood Elevation in Feet Where Uniform Within Zone*

RM7X Elevation Reference Mark

*Referenced to the National Geodetic Vertical Datum of 1929

NOTES

This map is for use in administering the National Flood Insurance Program; it does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size, or all planimetric features outside Special Flood Hazard Areas.

Areas of special flood hazard (100-year flood) include Zones A, A1-30, AE, AH, AO, A99, V, V1-30 AND VE.

Certain areas not in Special Flood Hazard Areas may be protected by flood control structures.

Boundaries of the floodways were computed at cross-sections and interpolated between cross-sections. The floodways were based on hydraulic considerations with regard to requirements of the Federal Emergency Management Agency.

Floodway widths in some areas may be too narrow to show to scale. Floodway widths are provided in the Flood Insurance Study Report.

Coastal base flood elevations apply only landward of the shoreline.

Corporate limits shown are current as of the date of this map. The user should contact appropriate community officials to determine if corporate limits have changed subsequent to the issuance of the map.

For community map revision history prior to countywide mapping, see Section 6.0 of the Flood Insurance Study Report.

For adjoining map panels see separately printed Map Index.

MAP REPOSITORY
Refer to Repository Listing on Index Map

EFFECTIVE DATE OF
COUNTYWIDE FLOOD INSURANCE RATE MAP:
APRIL 15, 1988
EFFECTIVE DATE (S) OF REVISION (S) TO THIS PANEL:

Map revised SEPTEMBER 29, 1989 to change base flood elevations and special flood hazard areas, to add base flood elevations and special flood hazard areas, to change zone designations, to reflect updated topographic information, to incorporate previously issued letters of map revision and map amendment, and to update map format.

To determine if flood insurance is available, contact an insurance agent or call the National Flood Insurance Program at (800) 638-6620.

APPROXIMATE SCALE IN FEET
1000 0 1000

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

MARICOPA COUNTY, ARIZONA AND INCORPORATED AREAS

PANEL 235 OF 4350

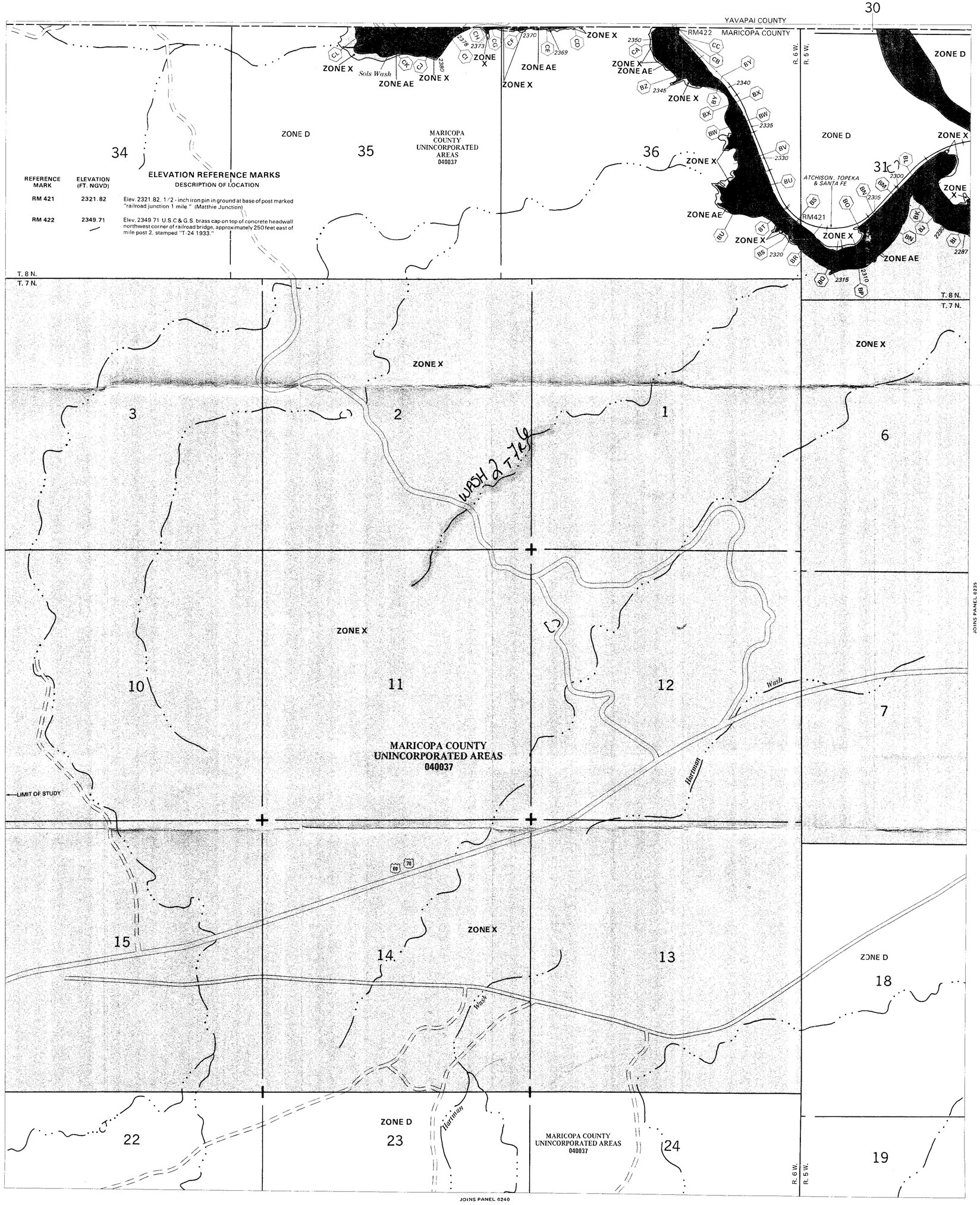
CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
MARICOPA COUNTY, UNINCORPORATED AREAS	040037	0235	E
WICKENBURG, TOWN OF	040056	0235	E

MAP NUMBER
04013C0235 E

MAP REVISED:
SEPTEMBER 29, 1989

Federal Emergency Management Agency



ELEVATION REFERENCE MARKS

REFERENCE MARK	ELEVATION (FT. NGVD)	DESCRIPTION OF LOCATION
RM 421	2321.82	Elev. 2321.82. 1/2 - inch iron pin in ground at base of post marked "railroad junction 1 mile." (Matthie Junction)
RM 422	2349.71	Elev. 2349.71 U.S.C & G.S. brass cap on top of concrete headwall northwest corner of railroad bridge, approximately 250 feet east of mile post 2, stamped "T-24 1933."

LEGEND

SPECIAL FLOOD HAZARD AREAS INUNDATED BY 100-YEAR FLOOD

- **ZONE A** — No base flood elevations determined.
- **ZONE AE** — Base flood elevations determined.
- **ZONE AH** — Flood depths of 1 to 3 feet (usually areas of ponding); base flood elevations determined.
- **ZONE AO** — Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
- **ZONE A99** — To be protected from 100-year flood by Federal flood protection system under construction; no base elevations determined.
- **ZONE V** — Coastal flood with velocity hazard (wave action); no base flood elevations determined.
- **ZONE VE** — Coastal flood with velocity hazard (wave action); base flood elevations determined.

FLOODWAY AREAS IN ZONE AE

OTHER FLOOD AREAS

- **ZONE X** — Areas of 500-year flood; areas of 100-year flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 100-year flood.

OTHER AREAS

- **ZONE X** — Areas determined to be outside 500-year flood plain.
- **ZONE D** — Areas in which flood hazards are undetermined.

Flood Boundary

Floodway Boundary

Zone D Boundary

Boundary Dividing Special Flood Hazard Zones, and Boundary Dividing Areas of Different Coastal Base Flood Elevations Within Special Flood Hazard Zones.

513 — Base Flood Elevation Line; Elevation in Feet*

D — D — Cross Section Line

(EL 987) — Base Flood Elevation in Feet Where Uniform Within Zone*

RM7X — Elevation Reference Mark

*Referenced to the National Geodetic Vertical Datum of 1929

NOTES

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Coastal base flood elevations apply only landward of the shoreline.

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For adjoining map panels see separately printed Map Index.

MAP REPOSITORY
Refer to Repository Listing on Index Map

EFFECTIVE DATE OF
COUNTYWIDE FLOOD INSURANCE RATE MAP:
APRIL 15, 1988

EFFECTIVE DATE (S) OF REVISION (S) TO THIS PANEL:

Map revised SEPTEMBER 29, 1989 to change base flood elevations and special flood hazard areas, to add base flood elevations and special flood hazard areas, to change zone designations, to reflect updated topographic information, to incorporate previously issued letters of map revision and map amendment, and to update map format.

To determine if flood insurance is available, contact an insurance agent or call the National Flood Insurance Program at (800) 638-6620.

APPROXIMATE SCALE IN FEET
1000 0 1000

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

MARICOPA COUNTY, ARIZONA AND INCORPORATED AREAS

PANEL 230 OF 4350

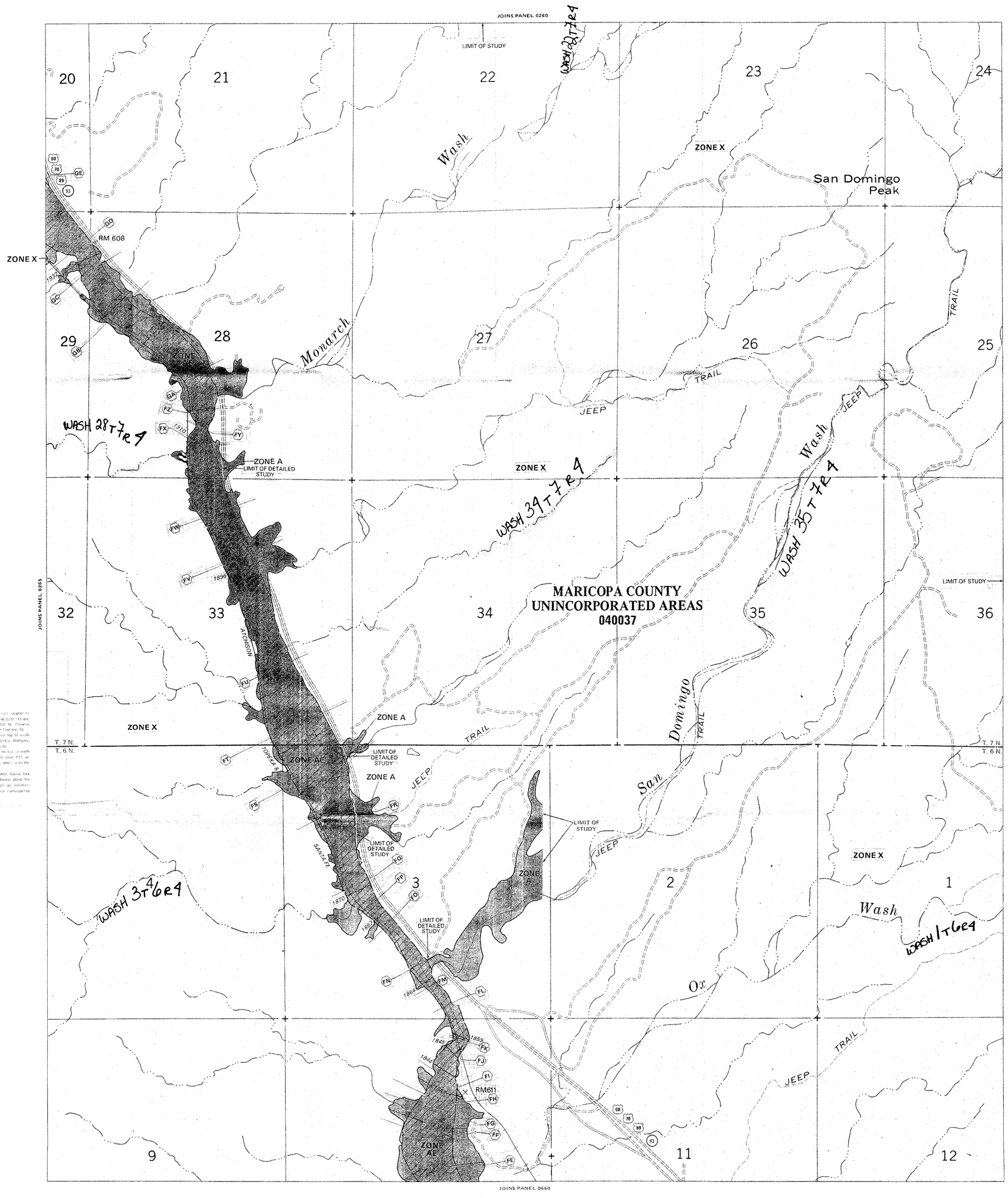
CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
MARICOPA COUNTY, UNINCORPORATED AREAS	040037	0230	E

MAP NUMBER
04013C0230 E

MAP REVISED:
SEPTEMBER 29, 1989

Federal Emergency Management Agency



NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 6 NORTH, AND TOWNSHIP 7 NORTH, RANGE 4 WEST.

ELEVATION REFERENCE MARKS

REFERENCE MARK	ELEVATION (FT. NGVD)	DESCRIPTION OF LOCATION
RM608	1,942.97	Brass cap stamped A.D.O.T., ELEV. 1943.24 STA. 1064+33, located on top of bolt on north metal guardrail, 0.25 mile north of mile post 115 on eastbound lanes where sign reads "TIMPANOGOS, 4820' N." Phoenix Highway, approximately 2.25 mile north of mile post 115 on Highway 93.
RM609	1,911.23	Brass cap stamped A.D.O.T., 1911.90 STA. 1106+50, on top of south metal guardrail, approximately 225 feet north of Hernandez Antiguas, approximately 0.25 mile north of mile post 116 on Highway 93.
RM610	1,881.55	Brass cap stamped A.R.S.D.T., 1881.73 STA. 1163+25, on top of north metal guardrail, approximately 0.10 mile north of mile post 117 on Highway 93 and opposite the entrance to Quintas Cuenas, which is on the east side of Highway 93.
RM611	1,854.72	Brass cap stamped U.S. Geological Survey, B.M. Elevation Above Sea Level, 1865 feet Datum (ft. 1,000 high, 200 miles northwest along the Atchison, Topeka, and Santa Fe Railroad from Hot Springs Junction, Maricopa County, 0.20 mile southeast of the bridge over Hassayampa River and 75 feet southwest of the centerline of the track.

LEGEND

SPECIAL FLOOD HAZARD AREAS INUNDATED BY 100-YEAR FLOOD

- **ZONE A** No base flood elevations determined.
- **ZONE AE** Base flood elevations determined.
- **ZONE AH** Flood depths of 1 to 3 feet (usually areas of ponding); base flood elevations determined.
- **ZONE AO** Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
- **ZONE A99** To be protected from 100-year flood by Federal flood protection system under construction; no base elevations determined.
- **ZONE V** Coastal flood with velocity hazard (wave action); no base flood elevations determined.
- **ZONE VE** Coastal flood with velocity hazard (wave action); base flood elevations determined.

FLOODWAY AREAS IN ZONE AE

OTHER FLOOD AREAS

- **ZONE X** Areas of 500-year flood; areas of 100-year flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 100-year flood.

OTHER AREAS

- **ZONE X** Areas determined to be outside 500-year flood plain.
- **ZONE D** Areas in which flood hazards are undetermined.

Flood Boundary

Floodway Boundary

Zone D Boundary

Boundary Dividing Special Flood Hazard Zones, and Boundary Dividing Areas of Different Coastal Base Flood Elevations Within Special Flood Hazard Zones.

513 — Base Flood Elevation Line; Elevation in Feet*

D — D — Cross Section Line

(EL 987) — Base Flood Elevation in Feet Where Uniform Within Zone*

RM7X — Elevation Reference Mark

*Referenced to the National Geodetic Vertical Datum of 1929

NOTES

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Areas of special flood hazard (100-year flood) include Zones A, A1-30, AE, AH, AO, A99, V, V1-30 AND VE.

Certain areas not in Special Flood Hazard Areas may be protected by flood control structures.

Boundaries of the floodways were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the Federal Emergency Management Agency.

Floodway widths in some areas may be too narrow to show to scale. Floodway widths are provided in the Flood Insurance Study Report.

Coastal base flood elevations apply only landward of the shoreline.

Corporate limits shown are current as of the date of this map. The user should contact appropriate community officials to determine if corporate limits have changed subsequent to the issuance of the map.

For community map revision history prior to countywide mapping, see Section 6.0 of the Flood Insurance Study Report.

For adjoining map panels see separately printed Map Index.

MAP REPOSITORY

Refer to Repository Listing on Index Map

EFFECTIVE DATE OF
COUNTYWIDE FLOOD INSURANCE RATE MAP
APRIL 15, 1988

EFFECTIVE DATE (S) OF REVISION (S) TO THIS PANEL:

Map revised September 4, 1991 to update corporate limits, to change base flood elevations, to add base flood elevations, to add special flood hazard areas, to change special flood hazard areas, to change zone designations, to update map format, to add roads and road names and to incorporate previously issued letter of map revision.

To determine if flood insurance is available, contact an insurance agent or call the National Flood Insurance Program at (800) 638-6620.

N

APPROXIMATE SCALE IN FEET
1000 0 1000

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

MARICOPA COUNTY, ARIZONA AND INCORPORATED AREAS

PANEL 270 OF 4350

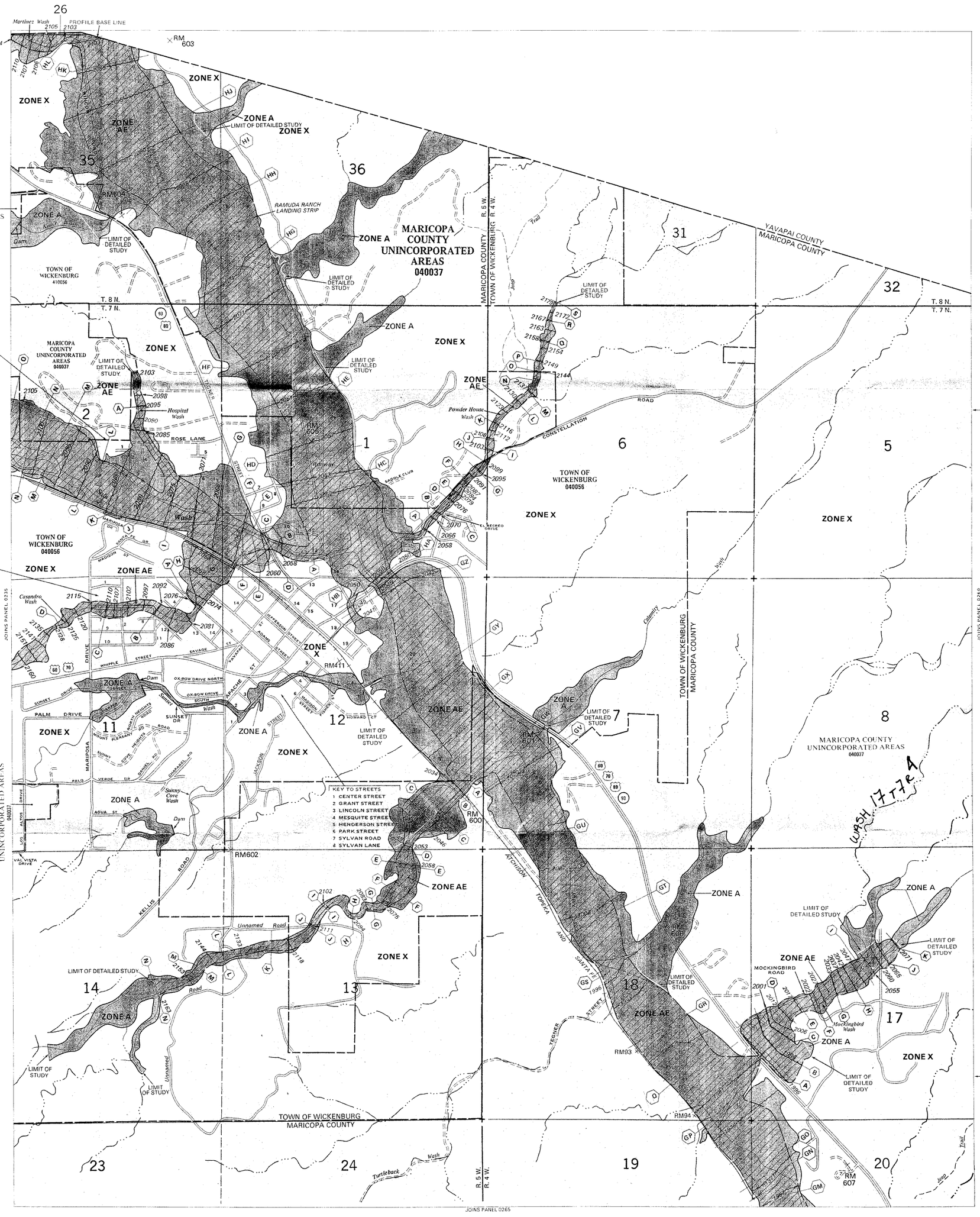
CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
MARICOPA COUNTY, UNINCORPORATED AREAS	040037	0270	E

MAP NUMBER
04013C0270 E

MAP REVISED:
SEPTEMBER 4, 1991

Federal Emergency Management Agency



ELEVATION REFERENCE MARKS

REFERENCE MARK	ELEVATION (FT. NGVD)	DESCRIPTION OF LOCATION
RM93	1,993.78	U.S. Geological Survey standard disk 2.4 miles southeast of Wickenburg, approximately 100 feet south of the Atchison, Topeka and Santa Fe Railroad, stamped M 24 1 1933.
RM94	1,984.28	Mag-nail set in a centerline of telephone on south side of Atchison, Topeka and Santa Fe Railroad, 2.5 miles southeast of Wickenburg. U.S. Geological Survey reconnaissance 1V 119.
RM411	2,029.86	At Wickenburg, 0.4 mile south of the Atchison, Topeka and Santa Fe Railroad station, 600 feet south of milepost 140, 75 feet west of the centerline of the track and in the corner of a reinforced wall. A standard disk stamped N 24 1 1933 and set in the top of a concrete post.
RM600	2,056.18	Chiseled 2" x 2" "+" on southeast corner of railroad bridge at Cemetery Wash.
RM601	2,034.24	Chiseled 2" x 2" "+" on top of 2" x 4" concrete roadbed on the northwest corner of Calamity Wash Bridge on State Route 93, approximately 0.4 mile north of mile post 112.
RM602	2,164.67	Chiseled "X" on top of north end of curb at the northeast corner of cattle guard on Kellis Road across from south entrance to cemetery, approximately 3/8 mile south of the intersection of Kellis Road and Whipple Street in Wickenburg.
*RM603	2,142.71	Brass cap set in a rock, stamped U.S. Coast and Geodetic Survey, HABS 1924, approximately 2 miles north of Wickenburg, 600 feet east of the east bank of the Hassayampa River, known as triangulation station 3141 on the U.S. Department of Interior Geological Survey, Wickenburg Quadrangle.
RM604	2,394.75	Brass cap stamped A.D.O.T. ELEV. 2295.34 S.A. 910 + 46.56 16L1, set in top of 1" x 3½" x 12" recessed on the west side of highway 89 approximately 200 feet south of Hixon Road, Wickenburg.
RM605	2,057.02	Chiseled 2" x 2" "+" on southeast corner of concrete slab at top of transition of a ramp to a hay storage shelter that is line formed north of 3 and oriented in a north-south direction, at Ghostle Transmitter Farm Inc., located at the approximate of the west end of Cavaness Street and Weaver Street in Wickenburg.
RM606	2,011.16	Brass cap stamped A.D.O.T., Sta 938 + 68, Dev. 2011.47 1957, on top of a 1" x 3" x 5/8" high box culvert on the east side of Route 93, where Turtleback Wash crosses under the highway, 0.75 mile north of north end of a median and 4.50 miles north of mile post 113. Brass cap is approximately 75' below highway elevation.
RM607	2,012.52	Brass cap stamped Arizona Highway Department, STA & ELEV. set on 8" x 10 1/2" x 2" high roadbed in north end of a cattleguard crossing at the entrance to Rock House Ranch, located approximately 165 feet north of entrance to Foothills Trailer Park on a driveway that is parallel to and on the west side of Highway 93. Foothills Trailer Park entrance is west from the main on crossing on Highway 93 that is 0.93 mile north of mile post 114.

*OUTSIDE CORPORATE LIMITS

LEGEND

SPECIAL FLOOD HAZARD AREAS INUNDATED BY 100-YEAR FLOOD

- **ZONE A** No base flood elevations determined.
- **ZONE AE** Base flood elevations determined.
- **ZONE AH** Flood depths of 1 to 3 feet (usually areas of ponding); base flood elevations determined.
- **ZONE AO** Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
- **ZONE A99** To be protected from 100-year flood by Federal flood protection system under construction; no base elevations determined.
- **ZONE V** Coastal flood with velocity hazard (wave action); no base flood elevations determined.
- **ZONE VE** Coastal flood with velocity hazard (wave action); base flood elevations determined.

FLOODWAY AREAS IN ZONE AE

OTHER FLOOD AREAS

- **ZONE X** Areas of 500-year flood; areas of 100-year flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 100-year flood.

OTHER AREAS

- **ZONE X** Areas determined to be outside 500-year flood plain.
- **ZONE D** Areas in which flood hazards are undetermined.

Flood Boundary

Floodway Boundary

Zone D Boundary

Boundary Dividing Special Flood Hazard Zones, and Boundary Dividing Areas of Different Coastal Base Flood Elevations Within Special Flood Hazard Zones.

513 — Base Flood Elevation Line; Elevation in Feet*

D — D — Cross Section Line

(EL 987) — Base Flood Elevation in Feet Where Uniform Within Zone*

RM7 × — Elevation Reference Mark

*Referenced to the National Geodetic Vertical Datum of 1929

NOTES

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For adjoining map panels see separately printed Map Index.

MAP REPOSITORY
Refer to Repository Listing on Index Map

EFFECTIVE DATE OF
COUNTYWIDE FLOOD INSURANCE RATE MAP:
APRIL 15, 1988

EFFECTIVE DATE (S) OF REVISION (S) TO THIS PANEL

Map revised September 29, 1989 to change base flood elevations and special flood hazard areas, to add base flood elevations and special flood hazard areas, to change zone designations, to reflect updated topographic information, to incorporate previously issued letters of map revision and map amendment, and to update map format.

Map revised September 4, 1991 to update corporate limits, to change base flood elevations, to add base flood elevations, to add special flood hazard areas, to change special flood hazard areas, to change zone designations, to update map format, to add roads and road names and to incorporate previously issued letter of map revision.

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N

APPROXIMATE SCALE IN FEET
1000 0 1000

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

MARICOPA COUNTY, ARIZONA AND INCORPORATED AREAS

PANEL 255 OF 4350

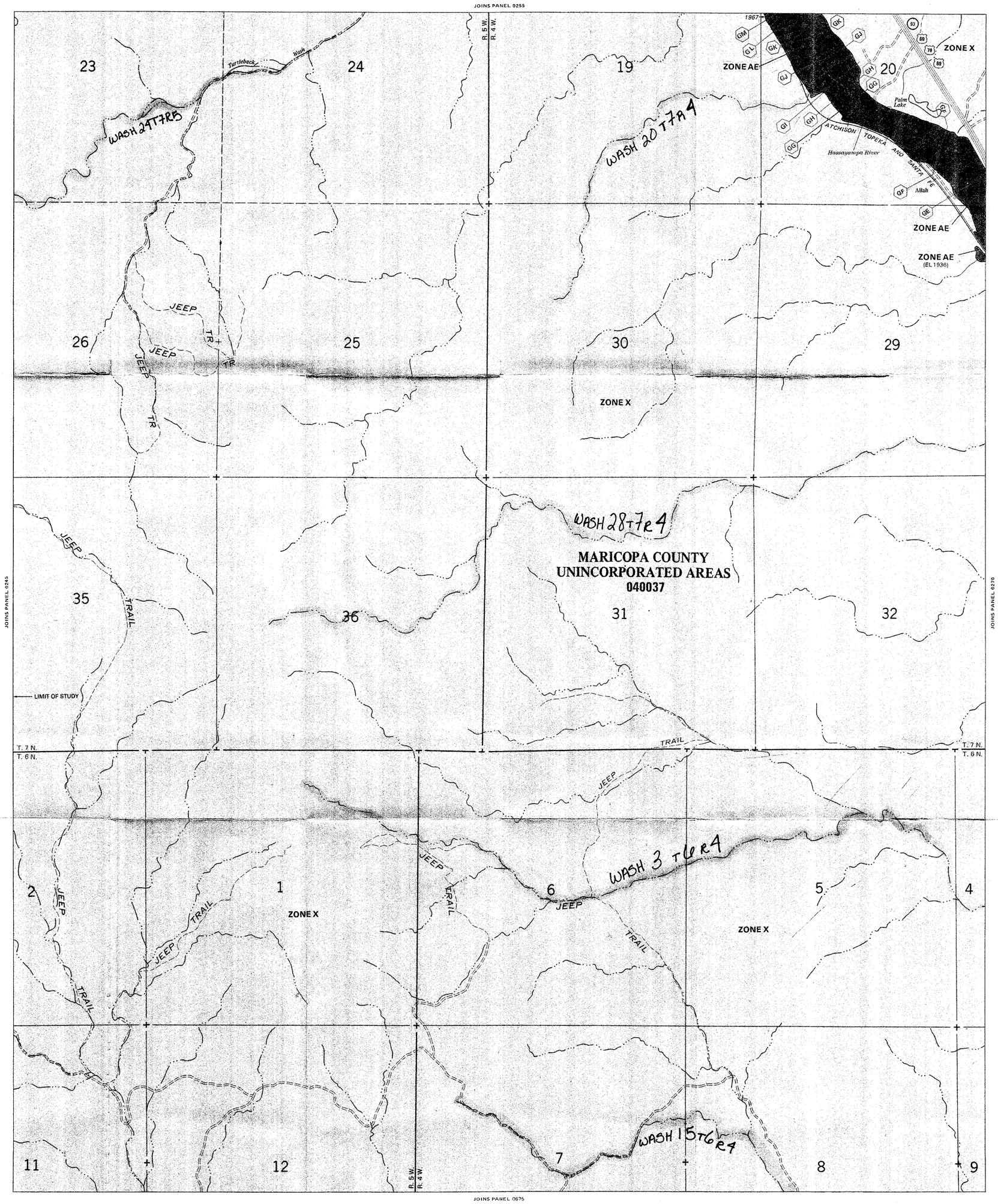
CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
MARICOPA COUNTY, UNINCORPORATED AREAS	040037	0255	F
WICKENBURG, TOWN OF	040056	0255	F

MAP NUMBER
04013C0255 F

MAP REVISED:
SEPTEMBER 4, 1991

Federal Emergency Management Agency



LEGEND

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- **ZONE A99** To be protected from 100-year flood by Federal flood protection system under construction; no base elevations determined.
- **ZONE V** Coastal flood with velocity hazard (wave action); no base flood elevations determined.
- **ZONE VE** Coastal flood with velocity hazard (wave action); base flood elevations determined.

FLOODWAY AREAS IN ZONE AE

OTHER FLOOD AREAS

- **ZONE X** Areas of 500-year flood; areas of 100-year flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 100-year flood.

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Flood Boundary

Floodway Boundary

Zone D Boundary

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(EL 987) Base Flood Elevation in Feet Where Uniform Within Zone*

RM7X Elevation Reference Mark

*Referenced to the National Geodetic Vertical Datum of 1929

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For community map revision history prior to countywide mapping, see Section 6.0 of the Flood Insurance Study Report.

For adjoining map panels see separately printed Map Index

MAP REPOSITORY

Refer to Repository Listing on Index Map

EFFECTIVE DATE OF
COUNTYWIDE FLOOD INSURANCE RATE MAP:

APRIL 15, 1988

EFFECTIVE DATE (S) OF REVISION (S) TO THIS PANEL:

Map revised September 4, 1991 to update corporate limits, to change base flood elevations, to add base flood elevations, to add special flood hazard areas, to change special flood hazard areas, to change zone designations, to update map format, to add roads and road names and to incorporate previously issued letter of map revision.

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APPROXIMATE SCALE IN FEET

1000 0 1000

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

MARICOPA COUNTY,
ARIZONA AND
INCORPORATED AREAS

PANEL 265 OF 4350

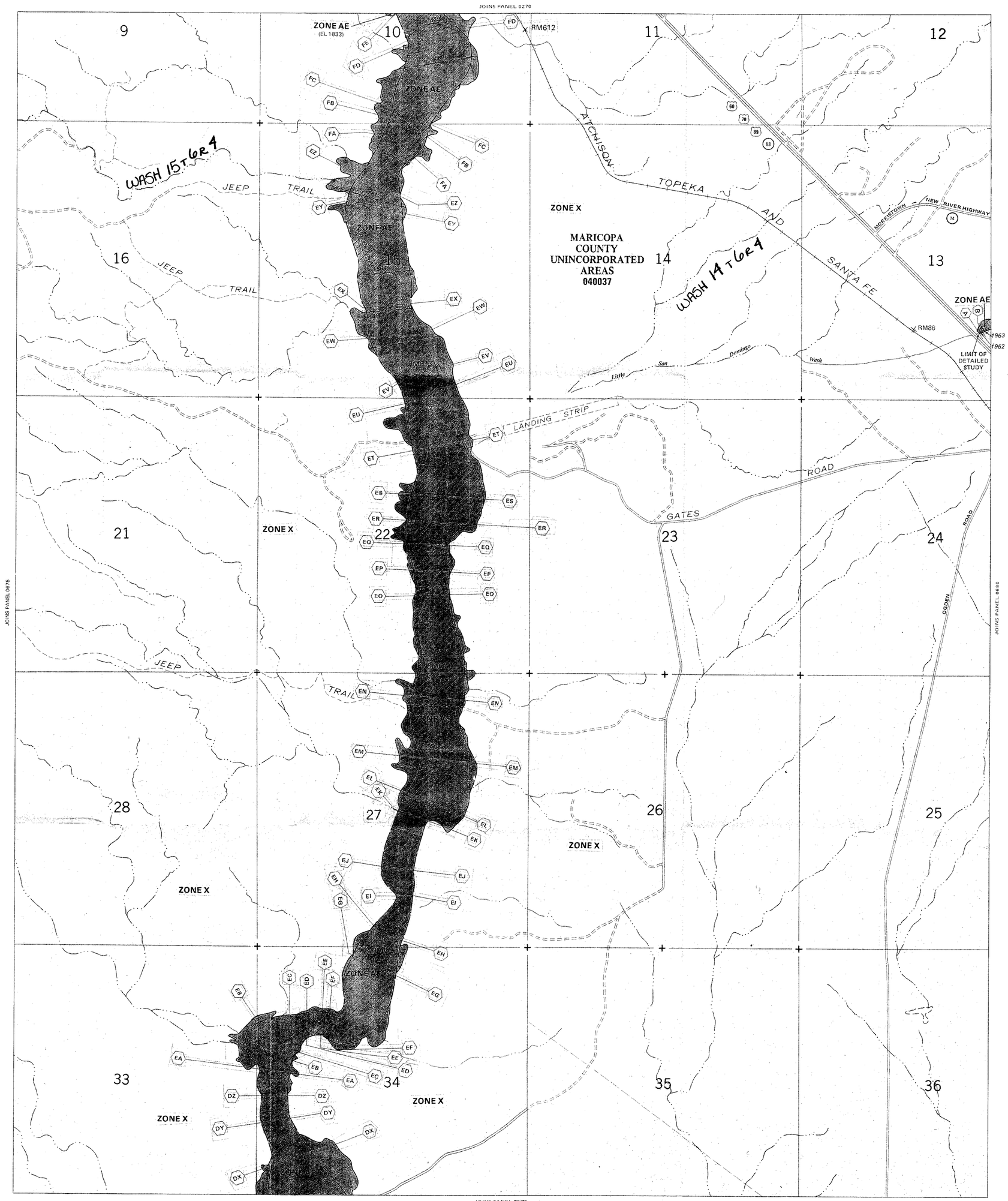
CONTAINS

COMMUNITY	NUMBER	PANEL	SUFFIX
MARICOPA COUNTY UNINCORPORATED AREAS	040037	0265	E

MAP NUMBER
04013C0265E

MAP REVISED:
SEPTEMBER 4, 1991

Federal Emergency Management Agency



ELEVATION REFERENCE MARKS

REFERENCE MARK	ELEVATION (FT NGVD)	DESCRIPTION OF LOCATION
RM48	1,956.302	U.S. Geological Survey brass cap in concrete post 70 feet northwest of the centerline of the Atchison, Topeka and Santa Fe Railroad, 705 feet northwest of milepost 150 and a bridge, and 0.6 mile northwest along railroad from the station at Morristown, marked H 24 1,957. Brass cap stamped U.S. Coast and Geodetic Survey Bench Mark J24 1933, 2.4 miles northwest along the Atchison, Topeka and Santa Fe Railroad from Hot Springs Junction, Maricopa County, 175 feet northwest of mile post 148, 450 feet southeast of Bridge G 148, in a rock point sticking out from the west slope of a ravine, and 20 feet northwest of the centerline of the track.
RM612	1,771.76	Chiseled 2" x 2" x 1" cut stone cap in concrete post for a hay storage building on Double A Ranch, north of north wing of Gates Road and approximately 50 feet east of Hassayampa River bank.
RM619	1,768.40	1-3" metal and aluminum cap, set in a tube of rock, stamped B.L.M., on west side Hassayampa River, 2,867 feet upstream, approximately 250 feet north of the south section line of Section 22, T6N, R4W.
RM624	1,762.19	1-3" metal and aluminum cap stamped B.L.M., approximately 80 feet west of 4" high tank on east side of Hassayampa River, set 0.25' above ground, rocks piled around it, very close to section line between sections 10 and 34, T6N, R4W, approximately 0.50 mile west of section corner 26, 27, 34 and 35, and 100 feet south of section line.
RM816	1,741.41	

NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 6 NORTH, RANGE 4 WEST

LEGEND

SPECIAL FLOOD HAZARD AREAS INUNDATED BY 100-YEAR FLOOD

- **ZONE A** No base flood elevations determined.
- **ZONE AE** Base flood elevations determined.
- **ZONE AH** Flood depths of 1 to 3 feet (usually areas of ponding); base flood elevations determined.
- **ZONE AO** Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
- **ZONE A99** To be protected from 100-year flood by Federal flood protection system under construction; no base elevations determined.
- **ZONE V** Coastal flood with velocity hazard (wave action); no base flood elevations determined.
- **ZONE VE** Coastal flood with velocity hazard (wave action); base flood elevations determined.

FLOODWAY AREAS IN ZONE AE

OTHER FLOOD AREAS

- **ZONE X** Areas of 500-year flood; areas of 100-year flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 100-year flood.

OTHER AREAS

- **ZONE X** Areas determined to be outside 500-year flood plain.
- **ZONE D** Areas in which flood hazards are undetermined.

Flood Boundary

Floodway Boundary

Zone D Boundary

Boundary Dividing Special Flood Hazard Zones, and Boundary Dividing Areas of Different Coastal Base Flood Elevations Within Special Flood Hazard Zones.

513 — Base Flood Elevation Line; Elevation in Feet*

D — D — Cross Section Line

(EL 987) — Base Flood Elevation in Feet Where Uniform Within Zone*

RM7 × — Elevation Reference Mark

*Referenced to the National Geodetic Vertical Datum of 1929

NOTES

This map is for use in administering the National Flood Insurance Program; it does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size, or all planimetric features outside Special Flood Hazard Areas.

Areas of special flood hazard (100-year flood) include Zones A, A1-30, AE, AH, AO, A99, V, V1-30 AND VE.

Certain areas not in Special Flood Hazard Areas may be protected by flood control structures.

Boundaries of the floodways were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the Federal Emergency Management Agency.

Floodway widths in some areas may be too narrow to show to scale. Floodway widths are provided in the Flood Insurance Study Report.

Coastal base flood elevations apply only landward of the shoreline.

Corporate limits shown are current as of the date of this map. The user should contact appropriate community officials to determine if corporate limits have changed subsequent to the issuance of the map.

For community map revision history prior to countywide mapping, see Section 6.0 of the Flood Insurance Study Report.

For adjoining map panels see separately printed Map Index.

MAP REPOSITORY
Refer to Repository Listing on Index Map

EFFECTIVE DATE OF
COUNTYWIDE FLOOD INSURANCE RATE MAP:
APRIL 15, 1988

EFFECTIVE DATE (S) OF REVISION (S) TO THIS PANEL:

Map revised September 4, 1991 to update corporate limits, to change base flood elevations, to add base flood elevations, to add special flood hazard areas, to change special flood hazard areas, to change zone designations, to update map format, to add roads and road names and to incorporate previously issued letter of map revision.

To determine if flood insurance is available, contact an insurance agent or call the National Flood Insurance Program at (800) 638-6620.

N

APPROXIMATE SCALE IN FEET
1000 0 1000

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

MARICOPA COUNTY, ARIZONA AND INCORPORATED AREAS

PANEL 660 OF 4350

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
MARICOPA COUNTY, UNINCORPORATED AREAS	040037	0660	E

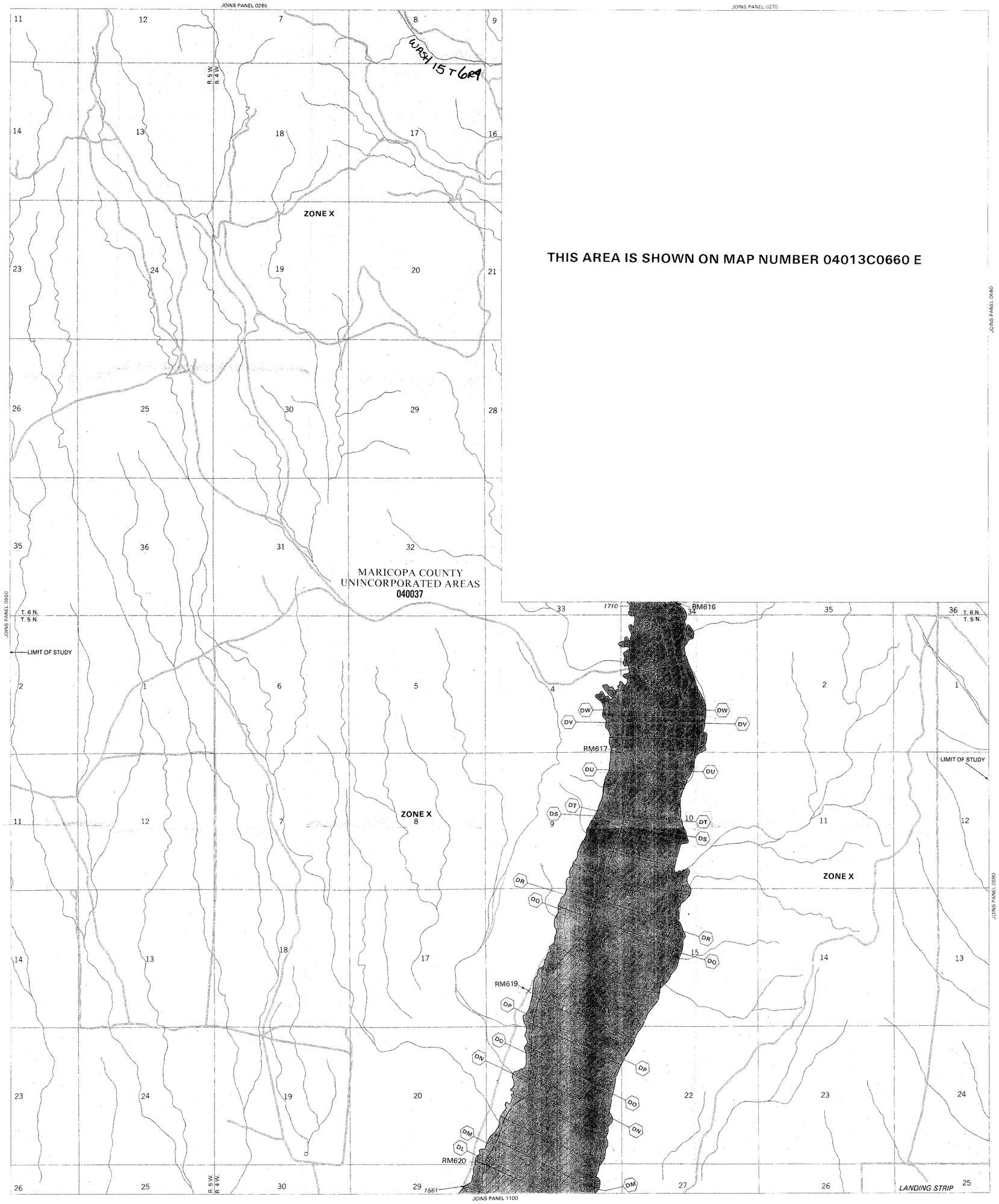
MAP NUMBER
04013C0660 E

MAP REVISED:
SEPTEMBER 4, 1991

Federal Emergency Management Agency

ELEVATION REFERENCE MARKS

REFERENCE MARK	ELEVATION (F - NGVD)	DESCRIPTION OF LOCATION
RM616	1,736.28	Chiseled 2" x 2", "+" on northwest corner of 3' x 2' x 0.5' high concrete pad on well site, approximately 200 feet northwest of concrete bank, 15' x 15' x 4' high on east side of Hassayampa River at end of dirt road and approximately 450 feet north of south line Section 34, T.6N., R4W.
RM617	1,675.29	Brass cap stamped U.S. General Land Office Survey 1916, 2" diameter, 0.90' above natural ground, corner of Sections 3, 4, 9 and 10, T5N., R4W.
RM618	1,643.39	Brass cap stamped U.S. General Land Office, 1916, 2" diameter, 0.80' above natural ground, corner of Sections 9, 10, 15 and 16, T5N, R4W.
RM619	1,615.03	North edge of 6" pipe, 0.80' above natural ground at well site on west side Hassayampa River, north of horse corral, in Section 16, T5N, R4W, in northeast portion of said section; along a dirt road approximately 1,400 feet north of the south line of Section 16.
RM620	1,565.03	Brass cap stamped U.S. General Land Office, 1916, 2" diameter, 1.10' above natural ground, corner of Sections 29, 31, 28 and 29, T5N, R4W.



LEGEND

SPECIAL FLOOD HAZARD AREAS INUNDATED BY 100-YEAR FLOOD

- **ZONE A** No base flood elevations determined.
- **ZONE AE** Base flood elevations determined.
- **ZONE AH** Flood depths of 1 to 3 feet (usually areas of ponding); base flood elevations determined.
- **ZONE AO** Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
- **ZONE A99** To be protected from 100-year flood by Federal flood protection system under construction; no base elevations determined.
- **ZONE V** Coastal flood with velocity hazard (wave action); no base flood elevations determined.
- **ZONE VE** Coastal flood with velocity hazard (wave action); base flood elevations determined.

FLOODWAY AREAS IN ZONE AE

OTHER FLOOD AREAS

- **ZONE X** Areas of 500-year flood; areas of 100-year flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 100-year flood.

OTHER AREAS

- **ZONE X** Areas determined to be outside 500-year flood plain.
- **ZONE D** Areas in which flood hazards are undetermined.

Flood Boundary

Floodway Boundary

Zone D Boundary

Boundary Dividing Special Flood Hazard Zones, and Boundary Dividing Areas of Different Coastal Base Flood Elevations Within Special Flood Hazard Zones.

513 — Base Flood Elevation Line; Elevation in Feet*

(D)——(D) Cross Section Line

(EL 987) Base Flood Elevation in Feet Where Uniform Within Zone*

RM7X Elevation Reference Mark

*Referenced to the National Geodetic Vertical Datum of 1929

NOTES

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For adjoining map panels see separately printed Map Index.

MAP REPOSITORY
Refer to Repository Listing on Index Map

EFFECTIVE DATE OF
COUNTYWIDE FLOOD INSURANCE RATE MAP:
APRIL 15, 1986

EFFECTIVE DATE (S) OF REVISION (S) TO THIS PANEL:
Map revised September 4, 1991 to update corporate limits, to change base flood elevations, to add base flood elevations, to add special flood hazard areas, to change special flood hazard areas, to change zone designations, to update map format, to add roads and road names and to incorporate previously issued letter of map revision.

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APPROXIMATE SCALE IN FEET
2000 0 2000

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

MARICOPA COUNTY, ARIZONA AND INCORPORATED AREAS

PANEL 675 OF 4350

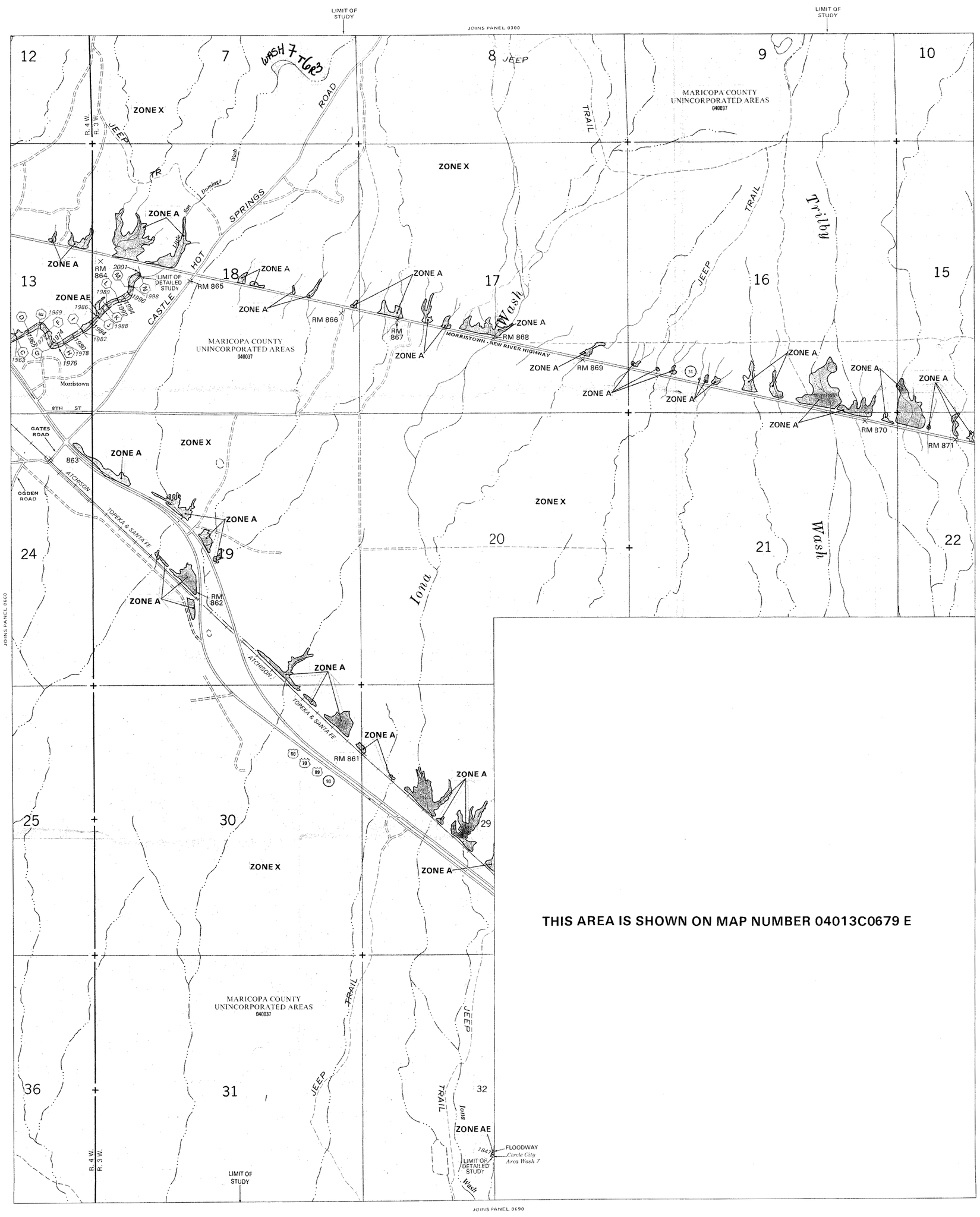
CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
MARICOPA COUNTY: UNINCORPORATED AREAS	040037	0675	E

MAP NUMBER
04013C0675 E

MAP REVISED:
SEPTEMBER 4, 1991

Federal Emergency Management Agency



ELEVATION REFERENCE MARKS

REFERENCE MARK	ELEVATION (FT. NGVD)	DESCRIPTION OF LOCATION
RM863	1,970.682	U.S. Geological Survey brass cap in 3½" iron pipe 250 feet northeast of the Arrington, Topeka and Santa Fe Railroad station, 60 feet northeast of the centerline of the track and 30 feet northeast of the centerline of Gates Road at Morristown, marked 1,961 Phoenix.
RM861	1,940.44	1.7 miles southeast along the Atchison, Topeka and Santa Fe Railroad from Hot Springs Junction, northwest corner headwall, at culvert A-153, and in the top of the northeast concrete headwall. A standard Monumental disk stamped
RM862	1,961.381	0.6 mile southeast along the Atchison, Topeka and Santa Fe Railroad from Hot Springs Junction, at a concrete highway overpass, in the top of the west wing of the north abutment, and 3 feet higher than the track. A standard disk stamped 0.74 1,962.
RM864	2,029.11	In M.S.R. 1,R in concrete rip rap wall station 48 + 14
RM865	2,073.25	Brass cap, 150 feet right on crest edge at cattle guard station 62 + 73
RM866	2,034.53	Brass cap, 150 feet right station 90 + 22
RM867	2,048.78	Brass cap top of headwall right station 107 + 60
RM868	2,041.67	Brass cap top of headwall right station 124 + 74
RM869	2,060.56	Brass cap top of headwall right station 144 + 50
RM870	2,071.13	Brass cap top of headwall right station 201 + 30
RM871	2,079.07	Brass cap top of headwall right station 216 + 53

NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 6 NORTH, RANGE 3 WEST AND TOWNSHIP 6 NORTH, RANGE 4 WEST

LEGEND

SPECIAL FLOOD HAZARD AREAS INUNDATED BY 100-YEAR FLOOD

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FLOODWAY AREAS IN ZONE AE

OTHER FLOOD AREAS

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Floodway Boundary

Zone D Boundary

Boundary Dividing Special Flood Hazard Zones, and Boundary Dividing Areas of Different Coastal Base Flood Elevations Within Special Flood Hazard Zones.

~~~513~~~ Base Flood Elevation Line; Elevation in Feet*

D—D Cross Section Line

(EL 987) Base Flood Elevation in Feet Where Uniform Within Zone*

RM7 X Elevation Reference Mark

*Referenced to the National Geodetic Vertical Datum of 1929

NOTES

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MAP REPOSITORY
Refer to Repository Listing on Index Map

EFFECTIVE DATE OF
COUNTYWIDE FLOOD INSURANCE RATE MAP:
APRIL 15, 1988

EFFECTIVE DATE (S) OF REVISION (S) TO THIS PANEL:
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APPROXIMATE SCALE IN FEET
1000 0 1000

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

MARICOPA COUNTY, ARIZONA AND INCORPORATED AREAS

PANEL 680 OF 4350

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
MARICOPA COUNTY, UNINCORPORATED AREAS	040037	0680	E

MAP NUMBER
04013C0680 E

MAP REVISED:
SEPTEMBER 4, 1991

Federal Emergency Management Agency
~~~

EXHIBIT B

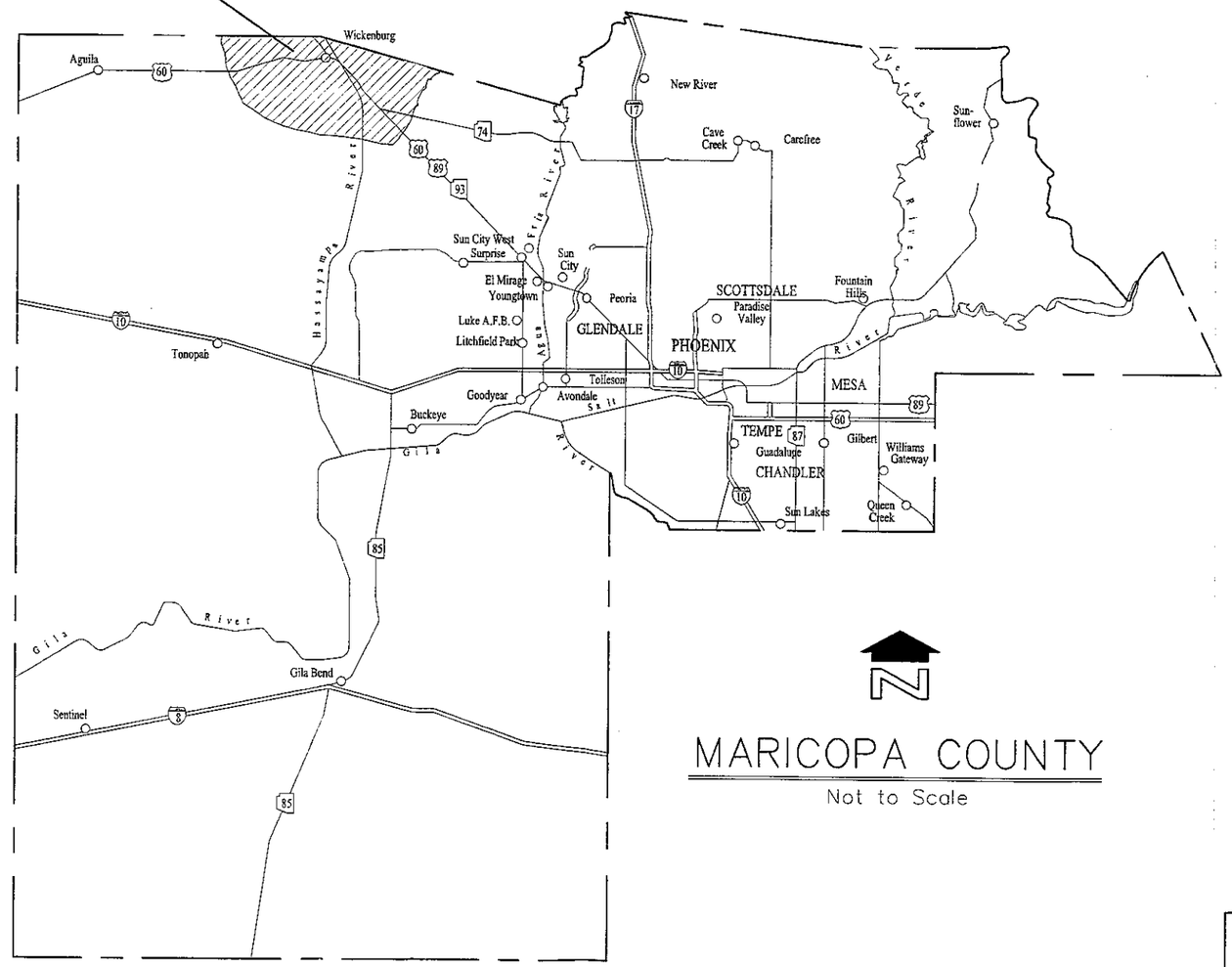
Study Work Maps

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

APPROXIMATE ZONE A FLOODPLAIN DELINEATION STUDIES

F.C.D. CONTRACT NO. 99-02

PROJECT LOCATION



MARICOPA COUNTY

Not to Scale

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

WICKENBURG AREA

APPROXIMATE ZONE A FLOODPLAIN DELINEATION STUDIES

F.C.D. CONTRACT NO. 99-02

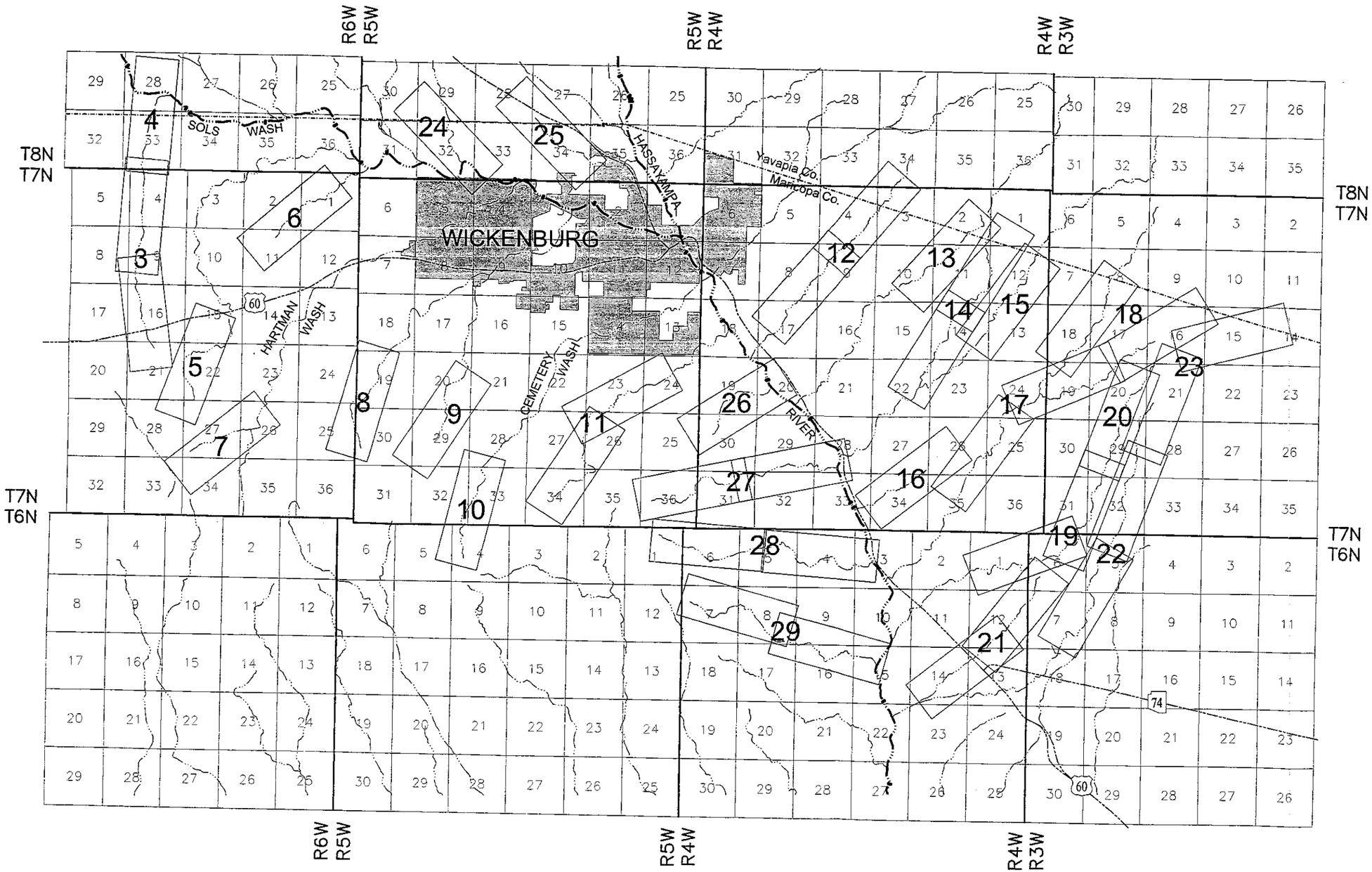
Wood, Patel & Associates, Inc.

CIVIL ENGINEERS
HYDROLOGISTS
LAND SURVEYORS

2051 W. Northern Ave.
Suite 100
Phoenix, AZ 85021

Phone: (602) 335-8500
Fax: (602) 335-8580

W/P# 99958



NOTES

Sheet No.	Wash Name	File Name
1	Cover Sheet	
2	Sheet Index Map	
3,4	Tributary to Sols Wash AH2	WASH33T8R6
5	Tributary to Sols Wash AH3	WASH22T7R6
6	Tributary to Sols Wash AH4	WASH2T7R6
7	Tributary to Hartman Wash	WASH27T7R6
8	Yucca Flat Wash	WASH19T7R5
9	Holly Wash	WASH20T7R5
10	Cemetery Wash	WASH28T7R5
11	Turtleback Wash	WASH24T7R5
12	Tributary to Mockingbird Wash	WASH17T7R4
13	Tributary to Wash K	WASH10T7R4
14	Tributary to Monarch Wash	WASH22T7R4
15	Monarch Wash	WASH14T7R4
16	Wash C	WASH34T7R4
17,18	San Domingo Wash	WASH35T7R4
18	Tub Spring Wash	WASH35T7R4
19,20	Ox Wash	WASH1T6R4
21	Tributary to Little San Domingo Wash	WASH14T6R4
22,23	Little San Domingo Wash	WASH7T6R3
24	Tributary to Sols Wash	WASH32T8R5
25	Tributary to Amir Wash	WASH34T8R5
26	Wash20T7R4	WASH20T7R4
27	Wash28T7R4	WASH28T7R4
28	Wash3T6R4	WASH3T6R4
29	Wash15T6R4	WASH15T6R4

Not to Scale

NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY

WICKENBURG AREA

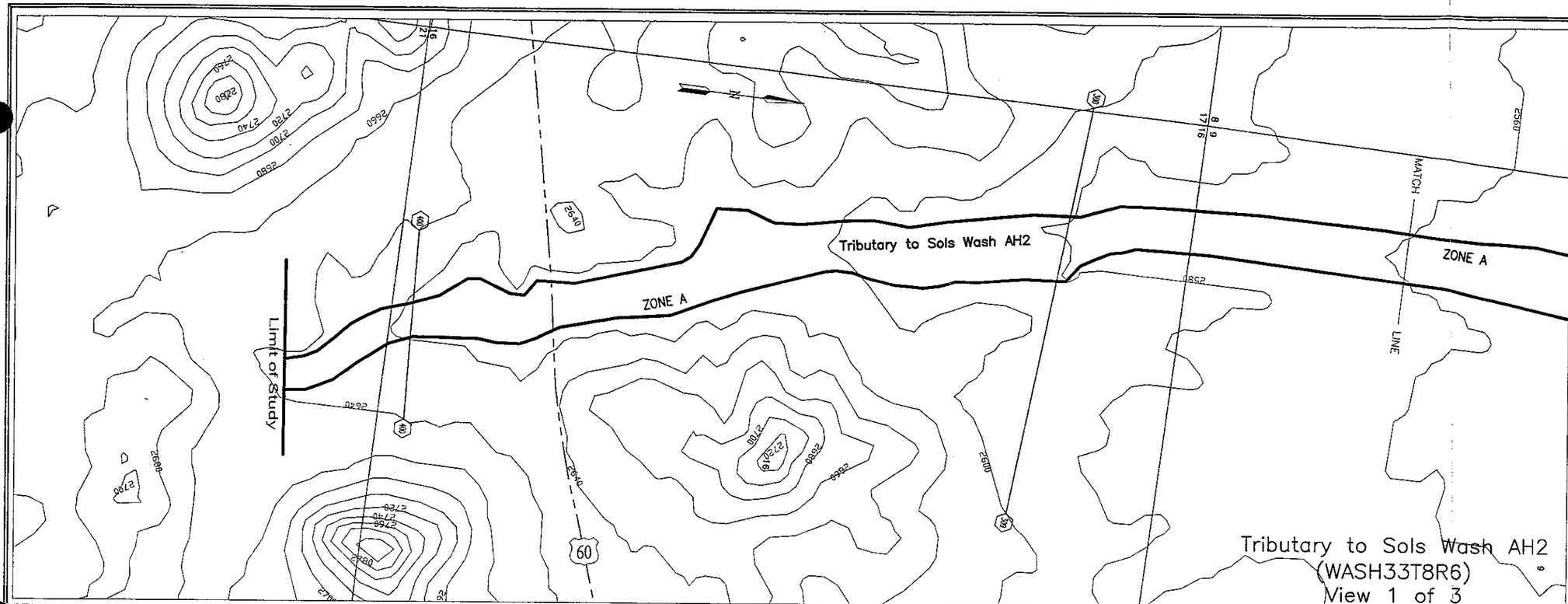
APPROXIMATE ZONE A FLOODPLAIN
DELINEATION STUDIES
F.C.D. CONTRACT NO. 99-02

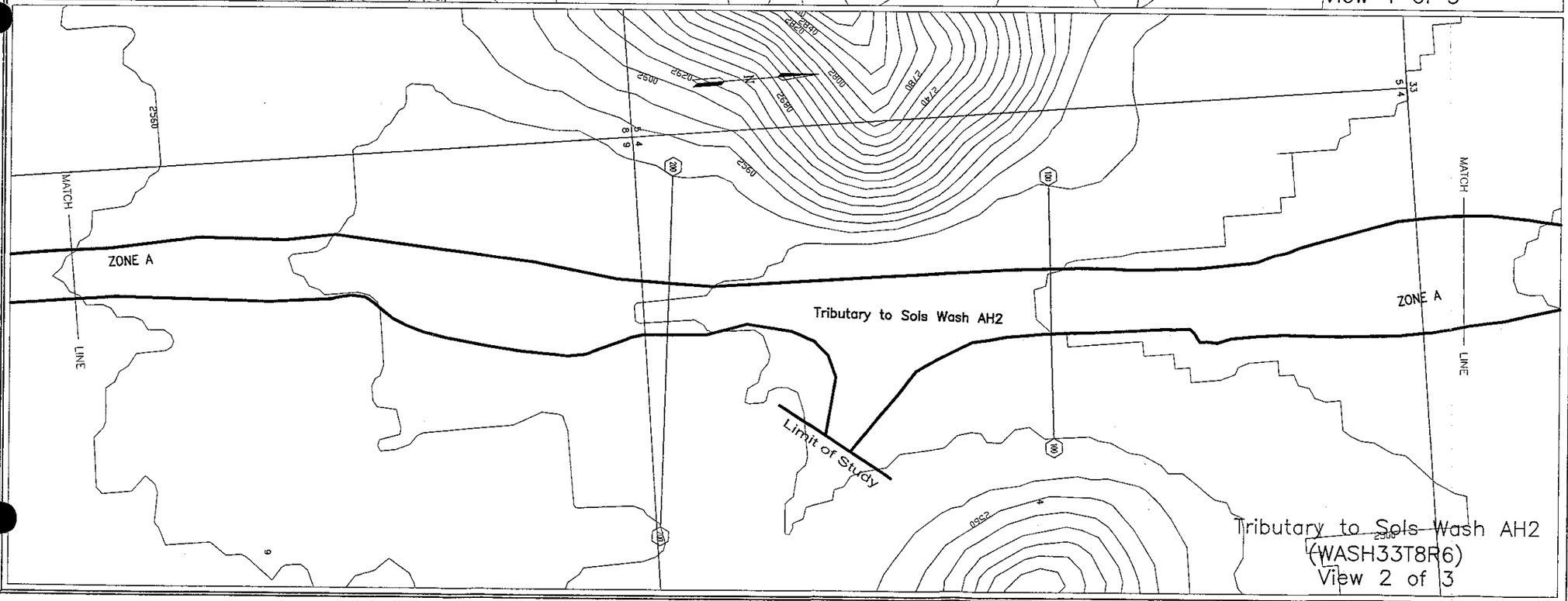
Wood, Patel & Associates, Inc.
CIVIL ENGINEERS
HYDROLOGISTS
LAND SURVEYORS

	BY	DATE
DESIGN	--	--
DESIGN CHK.	--	--
PLANS	--	--
PLANS CHK.	--	--

W/P# 99958 SHEET 2 OF 29

THIS MAP WAS PREPARED FROM USGS DIGITAL ELEVATION MODELS (DEM) AND DIGITAL LINE GRAPH DATA (DLG)





LEGEND

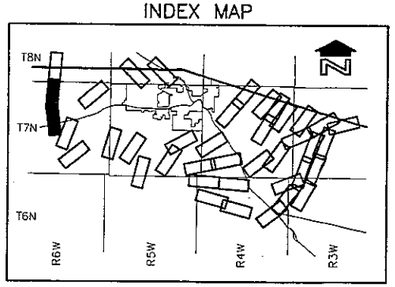
100-YR FLOODPLAIN BOUNDARY	
ZONE DESIGNATIONS	ZONE A
APPROX. FLOODPLAIN BOUNDARY	
CROSS SECTION	100 — 100
PLSS SECTION LINES	16 | 15 / 21 | 22
CORPORATE LIMITS	Corporate Limits
COUNTY, PARISH, STATE OR INTERNATIONAL BOUNDARY	County Boundary
WASH FLOWLINE	

ELEVATION REFERENCE MARKS

NOTE: NO ELEVATION REFERENCE MARKS WERE USED FOR THIS PROJECT. ALL WORK IS BASED ON 20' CONTOURS GENERATED FROM USGS DIGITAL ELEVATION MODELS (DEM).

NOTES

INDEX MAP



400' 0' 400' 800'

CONTOUR INTERVAL = 20 FEET

NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

WICKENBURG AREA

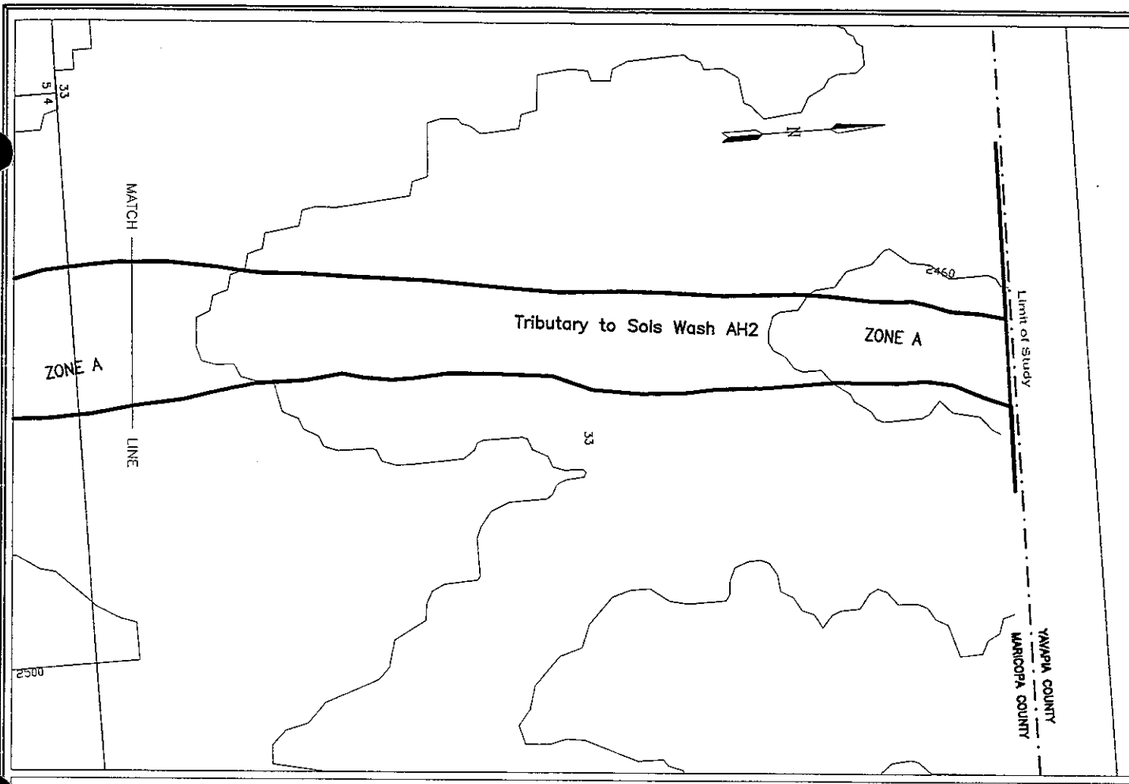
APPROXIMATE ZONE A FLOODPLAIN DELINEATION STUDIES
F.C.D. CONTRACT NO. 99-02

Wood, Patel & Associates, Inc. CIVIL ENGINEERS HYDROLOGISTS LAND SURVEYORS

	BY	DATE
DESIGN	–	–
DESIGN CHK.	–	–
PLANS	–	–
PLANS CHK.	–	–

W/P# 99958 SHEET 3 OF 29

THIS MAP WAS PREPARED FROM USGS DIGITAL ELEVATION MODELS (DEM) AND DIGITAL LINE GRAPH DATA (DLG)



Tributary to Sols Wash AH2
(WASH33T8R6)
View 3 of 3

LEGEND

100-YR FLOODPLAIN BOUNDARY	
ZONE DESIGNATIONS	ZONE A
APPROX. FLOODPLAIN BOUNDARY	
CROSS SECTION	100 — 100
PLSS SECTION LINES	16 | 15 / 21 | 22
CORPORATE LIMITS	Corporate Limits
COUNTY, PARISH, STATE OR INTERNATIONAL BOUNDARY	County Boundary
WASH FLOWLINE	

ELEVATION REFERENCE MARKS

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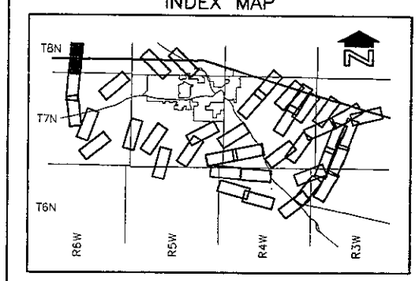
NOTES

INDEX MAP



400' 0' 400' 800'

CONTOUR INTERVAL = 20 FEET

NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY

WICKENBURG AREA

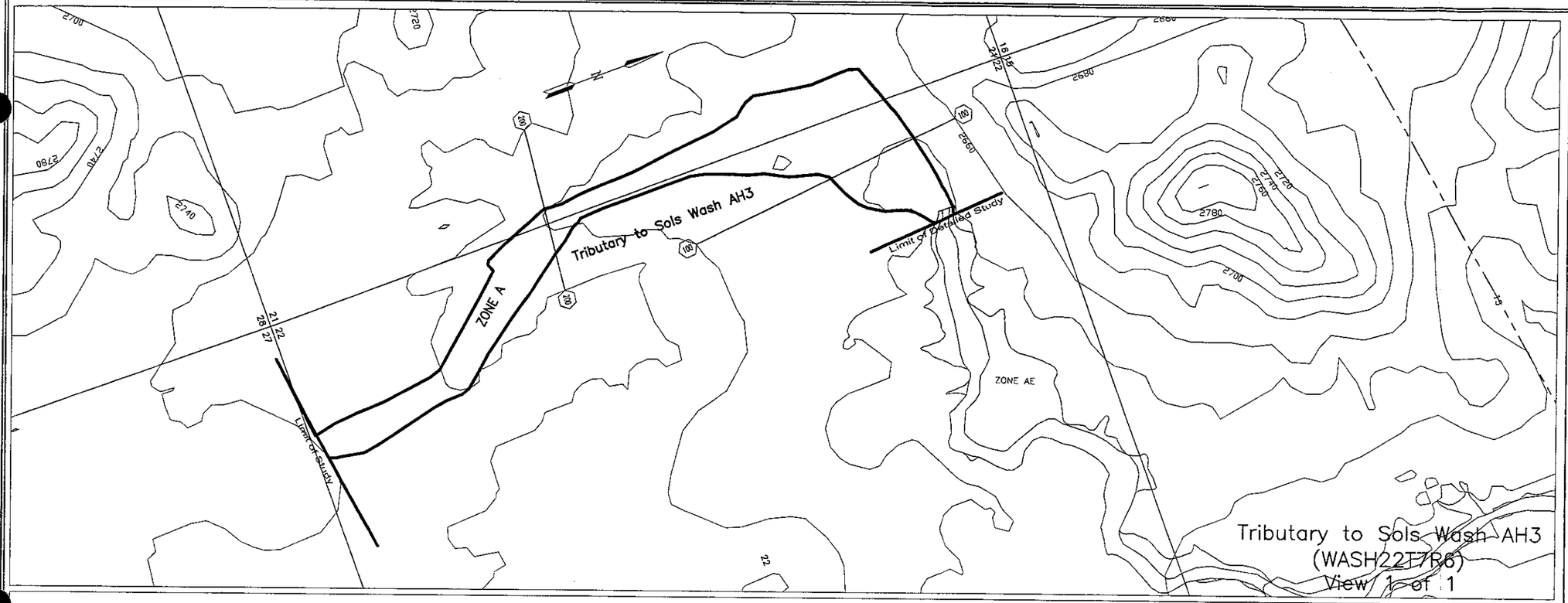
APPROXIMATE ZONE A FLOODPLAIN
DELINEATION STUDIES
F.C.D. CONTRACT NO. 99-02

Wood, Patel & Associates, Inc. — Civil Engineers, Hydrologists, Land Surveyors

	BY	DATE
DESIGN	–	–
DESIGN CHK.	–	–
PLANS	–	–
PLANS CHK.	–	–

W/P# 99958 SHEET 4 OF 29

THIS MAP WAS PREPARED FROM USGS DIGITAL ELEVATION MODELS (DEM) AND DIGITAL LINE GRAPH DATA (DLG)



LEGEND

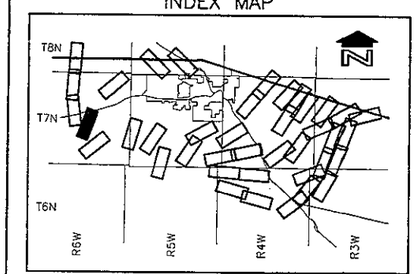
100-YR FLOODPLAIN BOUNDARY	
ZONE DESIGNATIONS	ZONE A
APPROX. FLOODPLAIN BOUNDARY	
CROSS SECTION	100 — 100
PLSS SECTION LINES	16 15 / 21 22
CORPORATE LIMITS	Corporate Limits
COUNTY, PARISH, STATE OR INTERNATIONAL BOUNDARY	County Boundary
WASH FLOWLINE	

ELEVATION REFERENCE MARKS

NOTE: NO ELEVATION REFERENCE MARKS WERE USED FOR THIS PROJECT. ALL WORK IS BASED ON 20' CONTOURS GENERATED FROM USGS DIGITAL ELEVATION MODELS (DEM).

NOTES

INDEX MAP



400' 0' 400' 800'

CONTOUR INTERVAL = 20 FEET

NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

WICKENBURG AREA

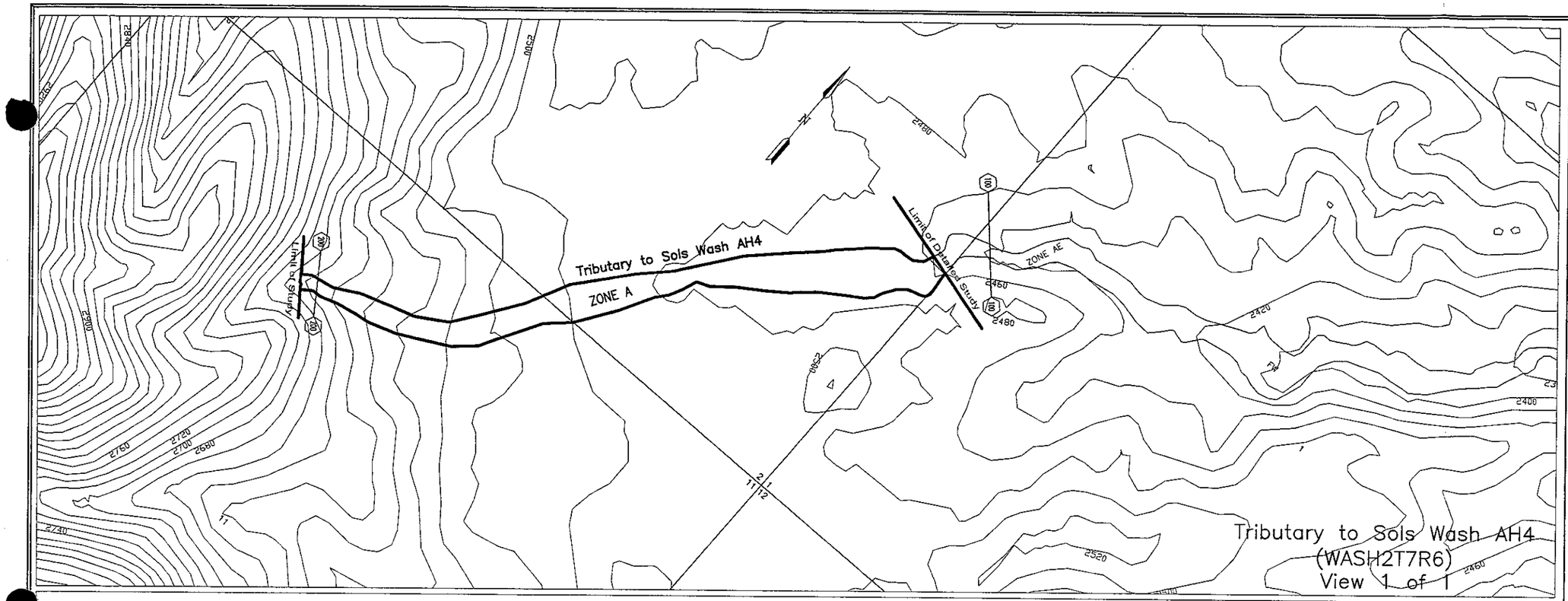
APPROXIMATE ZONE A FLOODPLAIN DELINEATION STUDIES
F.C.D. CONTRACT NO. 99-02

Wood, Patel & Associates, Inc. — CIVIL ENGINEERS, HYDROLOGISTS, LAND SURVEYORS

	BY	DATE
DESIGN	–	–
DESIGN CHK.	–	–
PLANS	–	–
PLANS CHK.	–	–

W/P# 99958 SHEET 5 OF 29

THIS MAP WAS PREPARED FROM USGS DIGITAL ELEVATION MODELS (DEM) AND DIGITAL LINE GRAPH DATA (DLG)



LEGEND

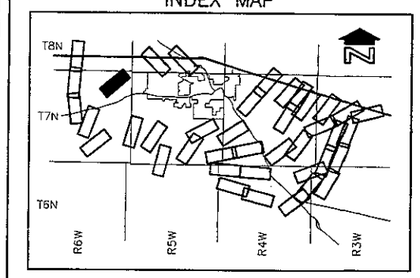
100-YR FLOODPLAIN BOUNDARY	
ZONE DESIGNATIONS	ZONE A
APPROX. FLOODPLAIN BOUNDARY	
CROSS SECTION	100 — 100
PLSS SECTION LINES	16 | 15 / 21 | 22
CORPORATE LIMITS	Corporate Limits
COUNTY, PARISH, STATE OR INTERNATIONAL BOUNDARY	County Boundary
WASH FLOWLINE	

ELEVATION REFERENCE MARKS

NOTE: NO ELEVATION REFERENCE MARKS WERE USED FOR THIS PROJECT. ALL WORK IS BASED ON 20' CONTOURS GENERATED FROM USGS DIGITAL ELEVATION MODELS (DEM).

NOTES

INDEX MAP



400' 0' 400' 800'

CONTOUR INTERVAL = 20 FEET

NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

WICKENBURG AREA

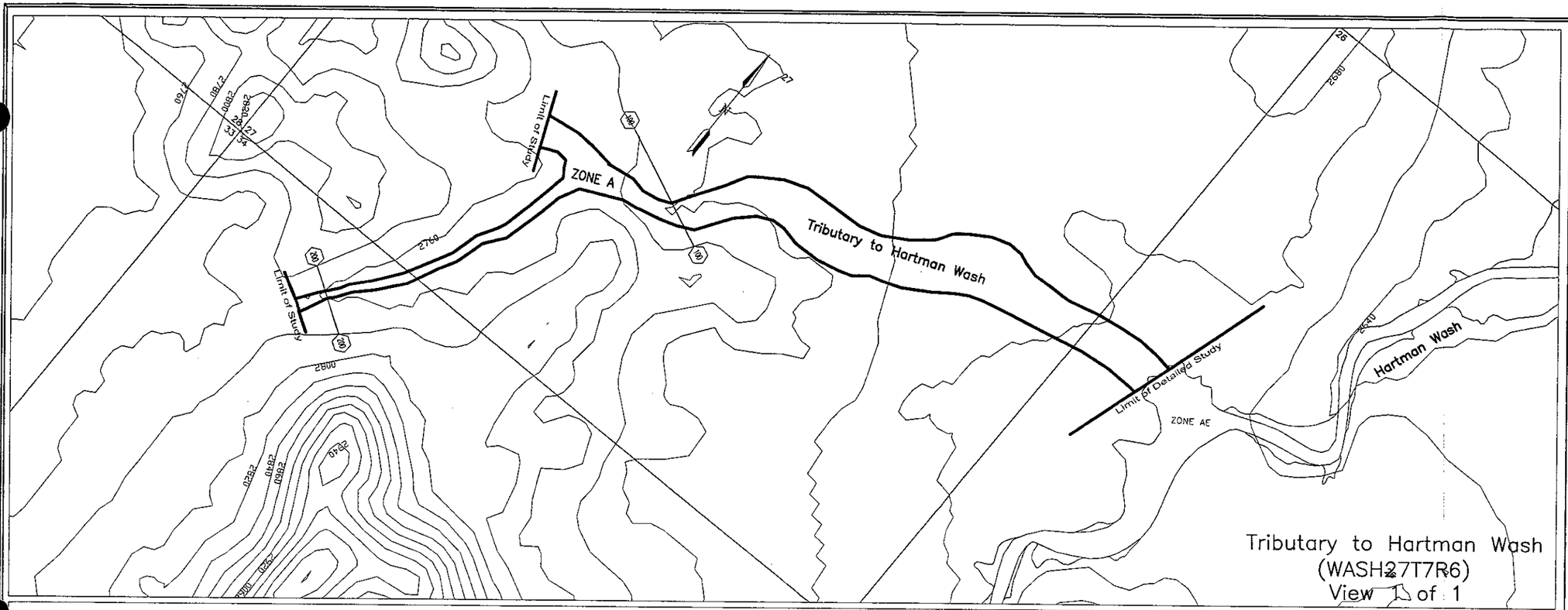
APPROXIMATE ZONE A FLOODPLAIN DELINEATION STUDIES
F.C.D. CONTRACT NO. 99-02

Wood, Patel & Associates, Inc. — Civil Engineers, Hydrologists, Land Surveyors

	BY	DATE
DESIGN	–	–
DESIGN CHK.	–	–
PLANS	–	–
PLANS CHK.	–	–

W/P# 99958 SHEET 6 OF 29

THIS MAP WAS PREPARED FROM USGS DIGITAL ELEVATION MODELS (DEM) AND DIGITAL LINE GRAPH DATA (DLG)



LEGEND

100-YR FLOODPLAIN BOUNDARY	
ZONE DESIGNATIONS	ZONE A
APPROX. FLOODPLAIN BOUNDARY	
CROSS SECTION	100 — 100
PLSS SECTION LINES	16 | 15 / 21 | 22
CORPORATE LIMITS	Corporate Limits
COUNTY, PARISH, STATE OR INTERNATIONAL BOUNDARY	County Boundary
WASH FLOWLINE	

ELEVATION REFERENCE MARKS

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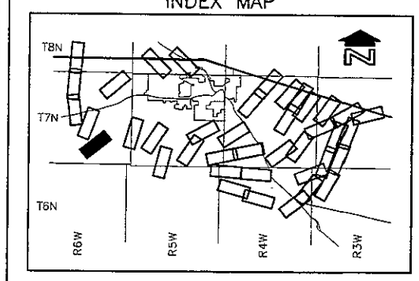
NOTES

INDEX MAP



400' 0' 400' 800'

CONTOUR INTERVAL = 20 FEET

NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

WICKENBURG AREA

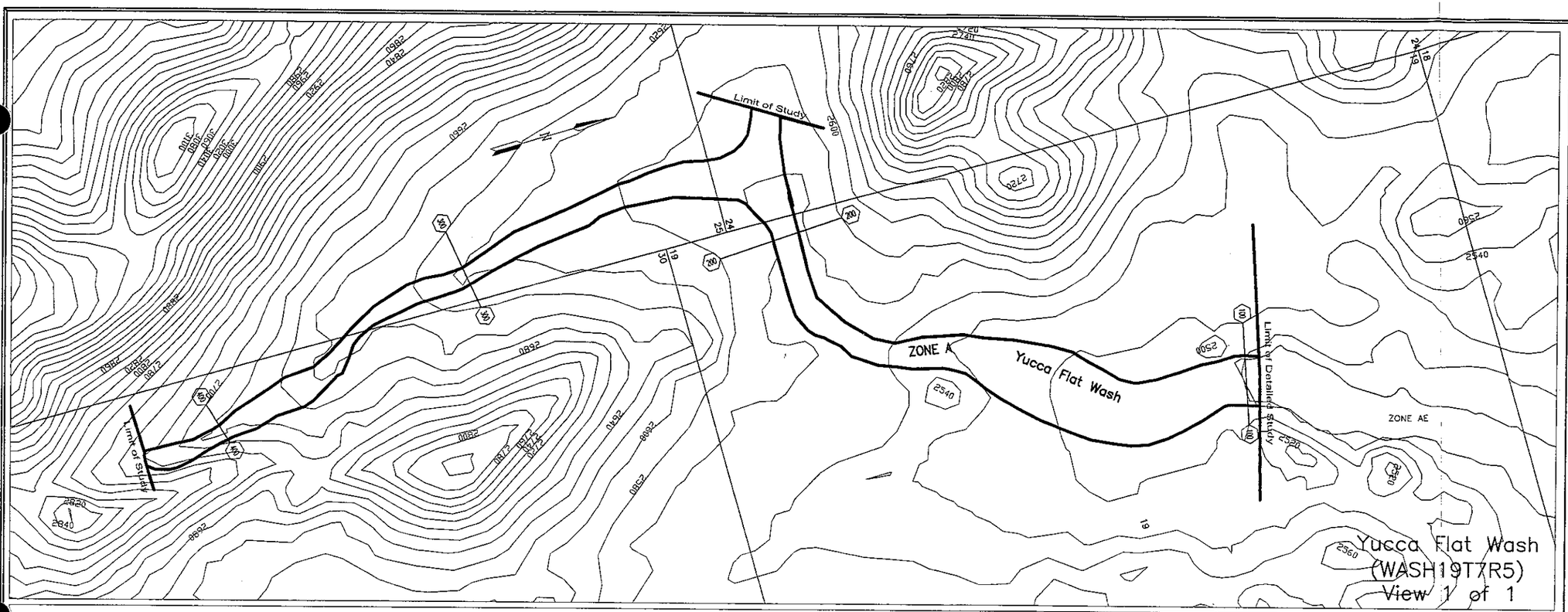
APPROXIMATE ZONE A FLOODPLAIN DELINEATION STUDIES
F.C.D. CONTRACT NO. 99-02

Wood, Patel & Associates, Inc. CIVIL ENGINEERS HYDROLOGISTS LAND SURVEYORS

	BY	DATE
DESIGN	–	–
DESIGN CHK.	–	–
PLANS	–	–
PLANS CHK.	–	–

W/P# 99958 SHEET 7 OF 29

THIS MAP WAS PREPARED FROM USGS DIGITAL ELEVATION MODELS (DEM) AND DIGITAL LINE GRAPH DATA (DLG)



LEGEND

100-YR FLOODPLAIN BOUNDARY	
ZONE DESIGNATIONS	ZONE A
APPROX. FLOODPLAIN BOUNDARY	
CROSS SECTION	100 — 100
PLSS SECTION LINES	16 | 15 / 21 | 22
CORPORATE LIMITS	Corporate Limits
COUNTY, PARISH, STATE OR INTERNATIONAL BOUNDARY	County Boundary
WASH FLOWLINE	

ELEVATION REFERENCE MARKS

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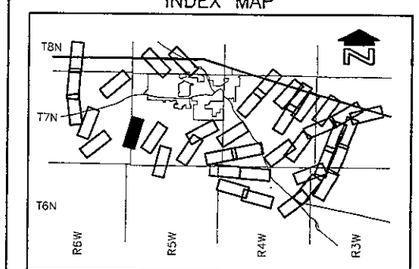
INDEX MAP



400' 0' 400' 800'

CONTOUR INTERVAL = 20 FEET

NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

WICKENBURG AREA

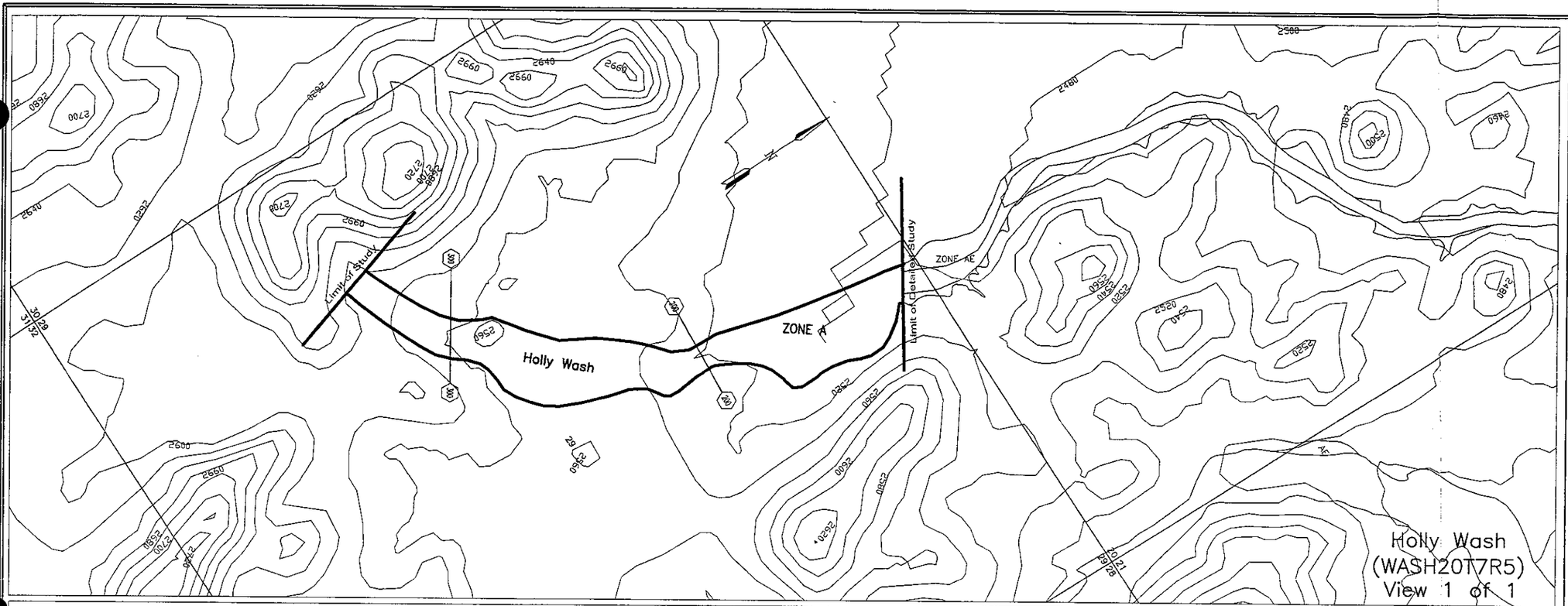
APPROXIMATE ZONE A FLOODPLAIN DELINEATION STUDIES
F.C.D. CONTRACT NO. 99-02

Wood, Patel & Associates, Inc. — CIVIL ENGINEERS, HYDROLOGISTS, LAND SURVEYORS

	BY	DATE
DESIGN	--	--
DESIGN CHK.	--	--
PLANS	--	--
PLANS CHK.	--	--

W/P# 99958 SHEET 8 OF 29

THIS MAP WAS PREPARED FROM USGS DIGITAL ELEVATION MODELS (DEM) AND DIGITAL LINE GRAPH DATA (DLG)



LEGEND

100-YR FLOODPLAIN BOUNDARY	
ZONE DESIGNATIONS	ZONE A
APPROX. FLOODPLAIN BOUNDARY	
CROSS SECTION	100 — 100
PLSS SECTION LINES	16 | 15 / 21 | 22
CORPORATE LIMITS	Corporate Limits
COUNTY, PARISH, STATE OR INTERNATIONAL BOUNDARY	County Boundary
WASH FLOWLINE	

ELEVATION REFERENCE MARKS

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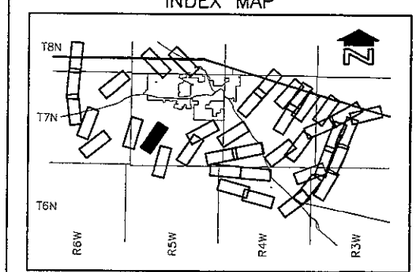
INDEX MAP



400' 0' 400' 800'

CONTOUR INTERVAL = 20 FEET

NO	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

WICKENBURG AREA

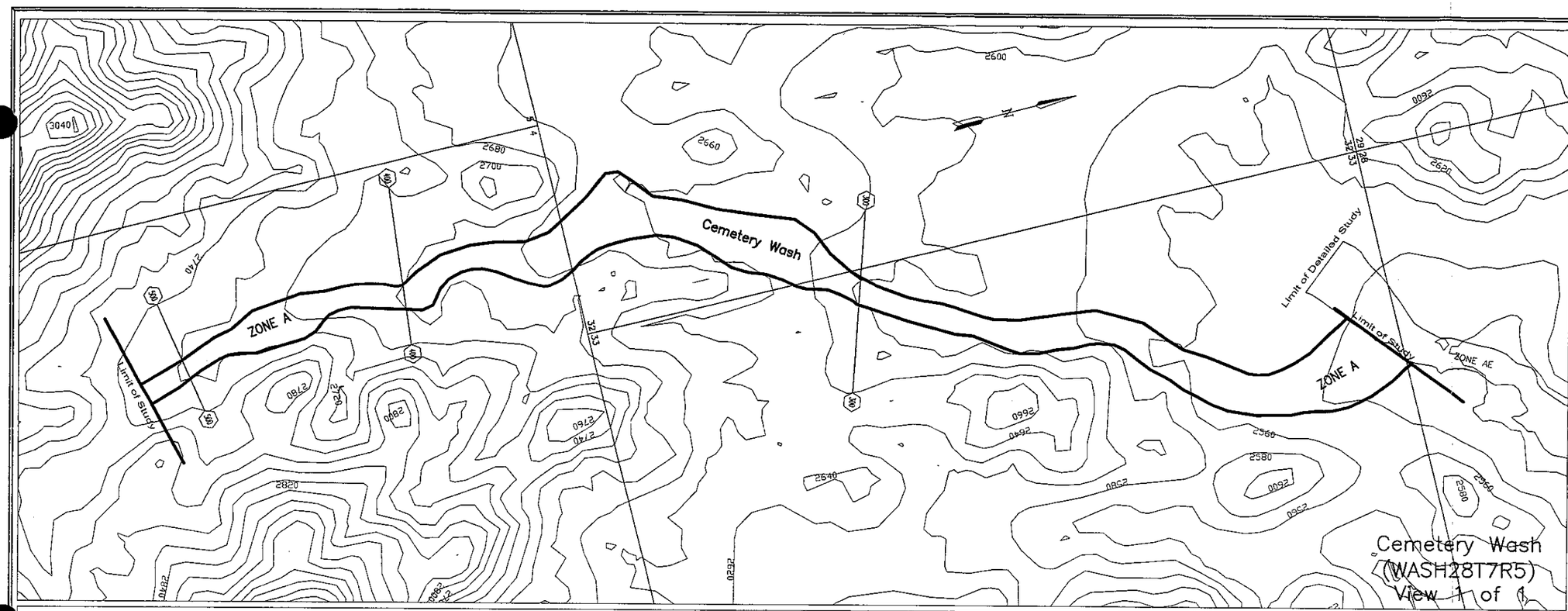
APPROXIMATE ZONE A FLOODPLAIN DELINEATION STUDIES
F.C.D. CONTRACT NO. 99-02

Wood, Patel & Associates, Inc. CIVIL ENGINEERS HYDROLOGISTS LAND SURVEYORS

	BY	DATE
DESIGN	–	–
DESIGN CHK.	–	–
PLANS	–	–
PLANS CHK.	–	–

W/P# 99958 SHEET 9 OF 29

THIS MAP WAS PREPARED FROM USGS DIGITAL ELEVATION MODELS (DEM) AND DIGITAL LINE GRAPH DATA (DLG)



LEGEND

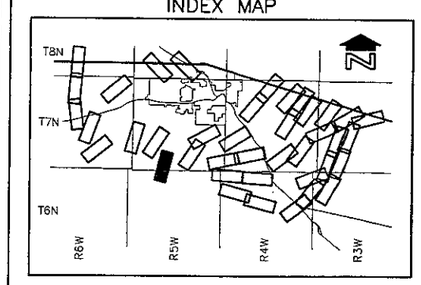
100-YR FLOODPLAIN BOUNDARY	
ZONE DESIGNATIONS	ZONE A
APPROX. FLOODPLAIN BOUNDARY	
CROSS SECTION	100 — 100
PLSS SECTION LINES	16 | 15 / 21 | 22
CORPORATE LIMITS	Corporate Limits
COUNTY, PARISH, STATE OR INTERNATIONAL BOUNDARY	County Boundary
WASH FLOWLINE	

ELEVATION REFERENCE MARKS

NOTE: NO ELEVATION REFERENCE MARKS WERE USED FOR THIS PROJECT. ALL WORK IS BASED ON 20' CONTOURS GENERATED FROM USGS DIGITAL ELEVATION MODELS (DEM).

NOTES

INDEX MAP



400' 0' 400' 800'

CONTOUR INTERVAL = 20 FEET

NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

WICKENBURG AREA

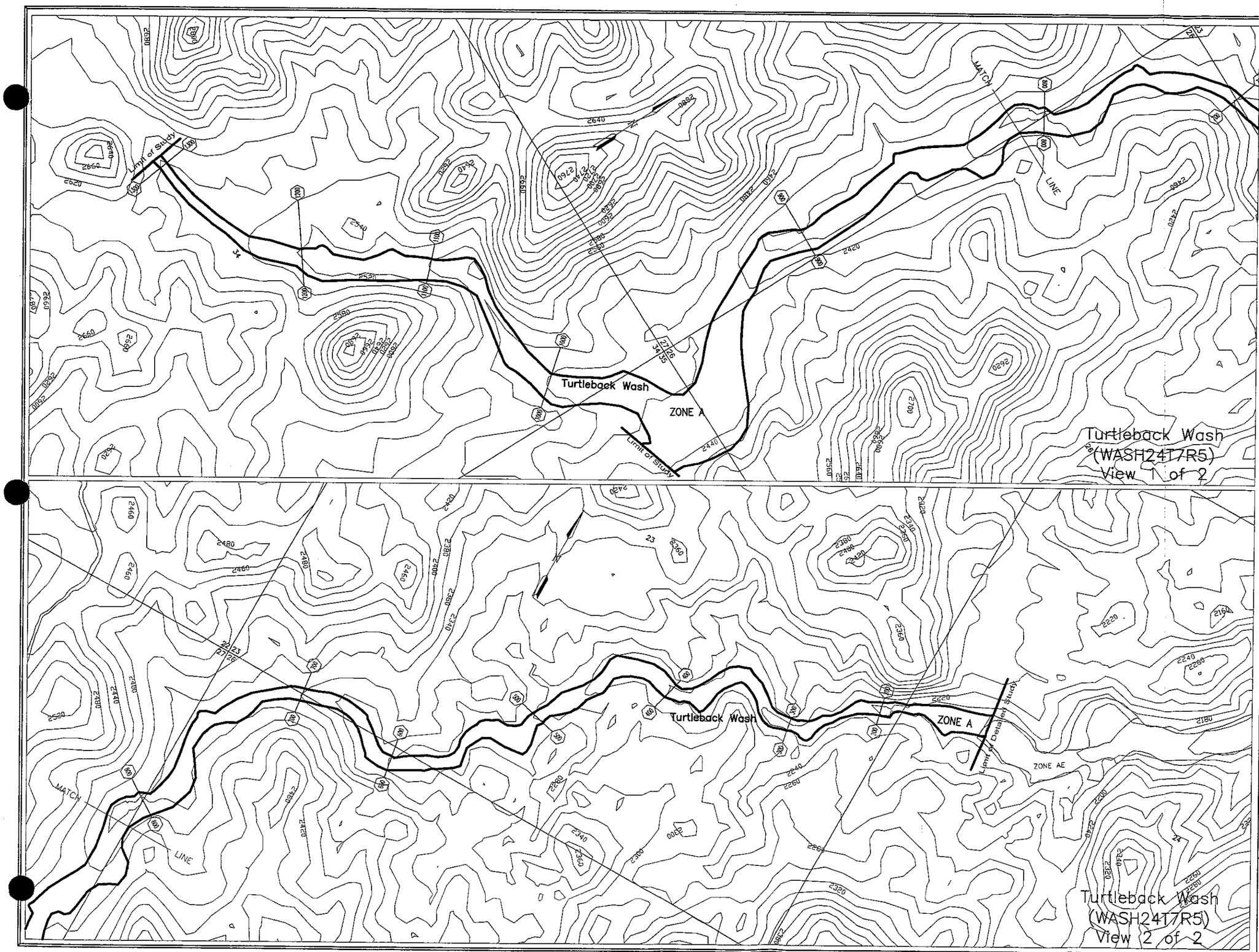
APPROXIMATE ZONE A FLOODPLAIN DELINEATION STUDIES
F.C.D. CONTRACT NO. 99-02

Wood, Patel & Associates, Inc. — CIVIL ENGINEERS, HYDROLOGISTS, LAND SURVEYORS

	BY	DATE
DESIGN	–	–
DESIGN CHK.	–	–
PLANS	–	–
PLANS CHK.	–	–

W/P# 99958 SHEET 10 OF 29

THIS MAP WAS PREPARED FROM USGS DIGITAL ELEVATION MODELS (DEM) AND DIGITAL LINE GRAPH DATA (DLG)



LEGEND

100-YR FLOODPLAIN BOUNDARY	
ZONE DESIGNATIONS	ZONE A
APPROX. FLOODPLAIN BOUNDARY	
CROSS SECTION	100 — 100
PLSS SECTION LINES	16 | 15 / 21 | 22
CORPORATE LIMITS	Corporate Limits
COUNTY, PARISH, STATE OR INTERNATIONAL BOUNDARY	County Boundary
WASH FLOWLINE	

ELEVATION REFERENCE MARKS

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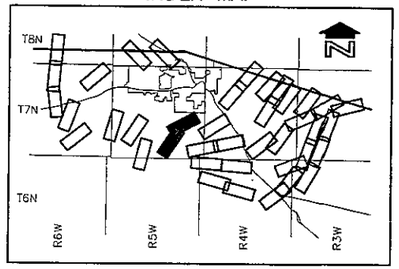
NOTES

INDEX MAP



400' 0' 400' 800'

CONTOUR INTERVAL = 20 FEET

NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

WICKENBURG AREA

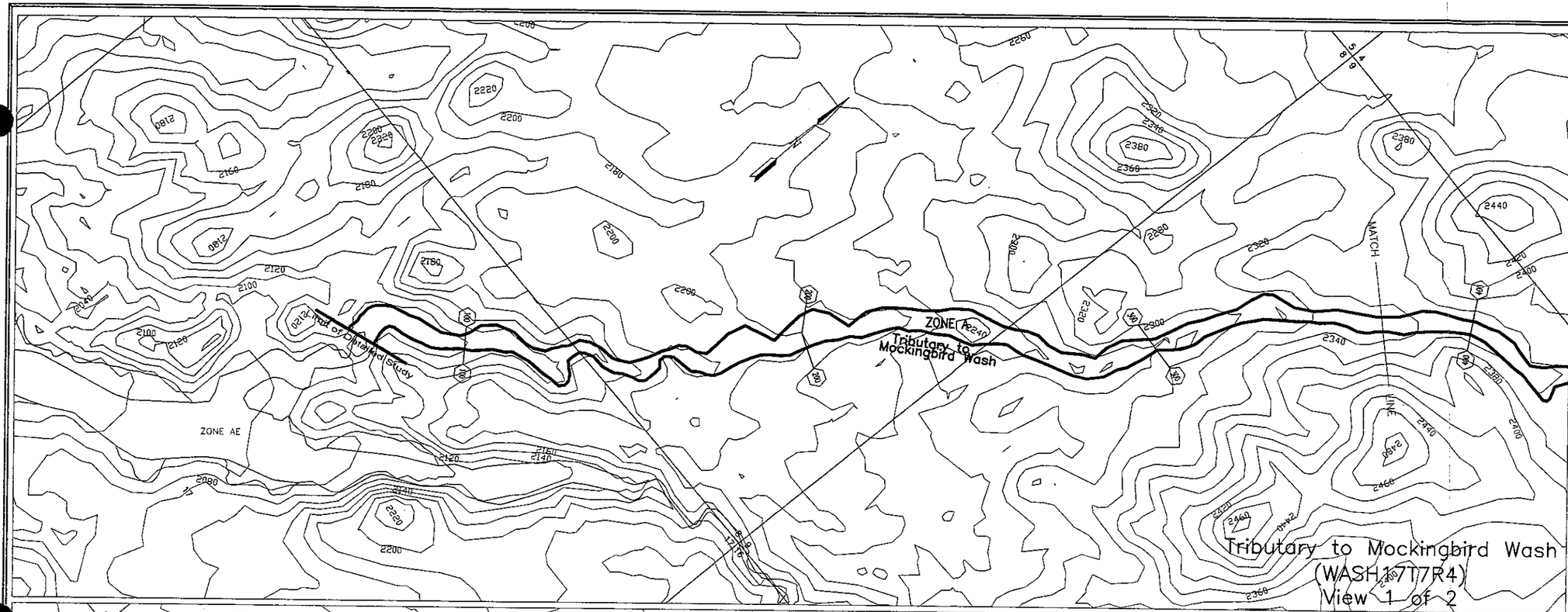
APPROXIMATE ZONE A FLOODPLAIN DELINEATION STUDIES
F.C.D. CONTRACT NO. 99-02

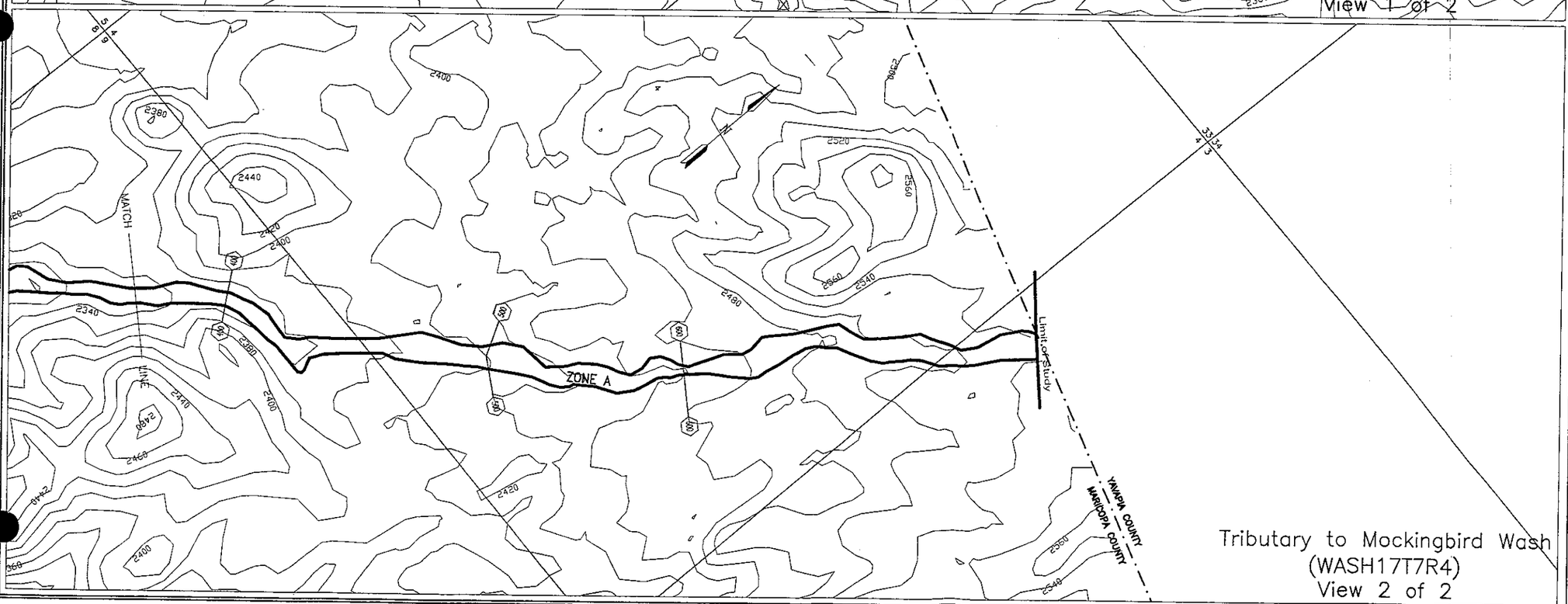
Wood, Patel & Associates, Inc. — CIVIL ENGINEERS, HYDROLOGISTS, LAND SURVEYORS

	BY	DATE
DESIGN	–	–
DESIGN CHK.	–	–
PLANS	–	–
PLANS CHK.	–	–

W/P# 99958 SHEET 11 OF 29

THIS MAP WAS PREPARED FROM USGS DIGITAL ELEVATION MODELS (DEM) AND DIGITAL LINE GRAPH DATA (DLG)





LEGEND

100-YR FLOODPLAIN BOUNDARY	
ZONE DESIGNATIONS	ZONE A
APPROX. FLOODPLAIN BOUNDARY	
CROSS SECTION	100 — 100
PLSS SECTION LINES	16 | 15 / 21 | 22
CORPORATE LIMITS	Corporate Limits
COUNTY, PARISH, STATE OR INTERNATIONAL BOUNDARY	County Boundary
WASH FLOWLINE	

ELEVATION REFERENCE MARKS

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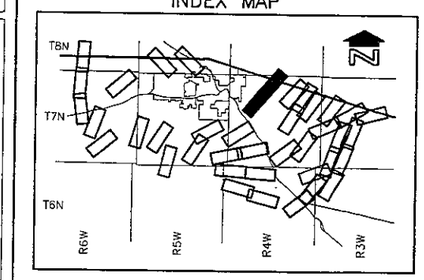
INDEX MAP



400' 0' 400' 800'

CONTOUR INTERVAL = 20 FEET

NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

WICKENBURG AREA

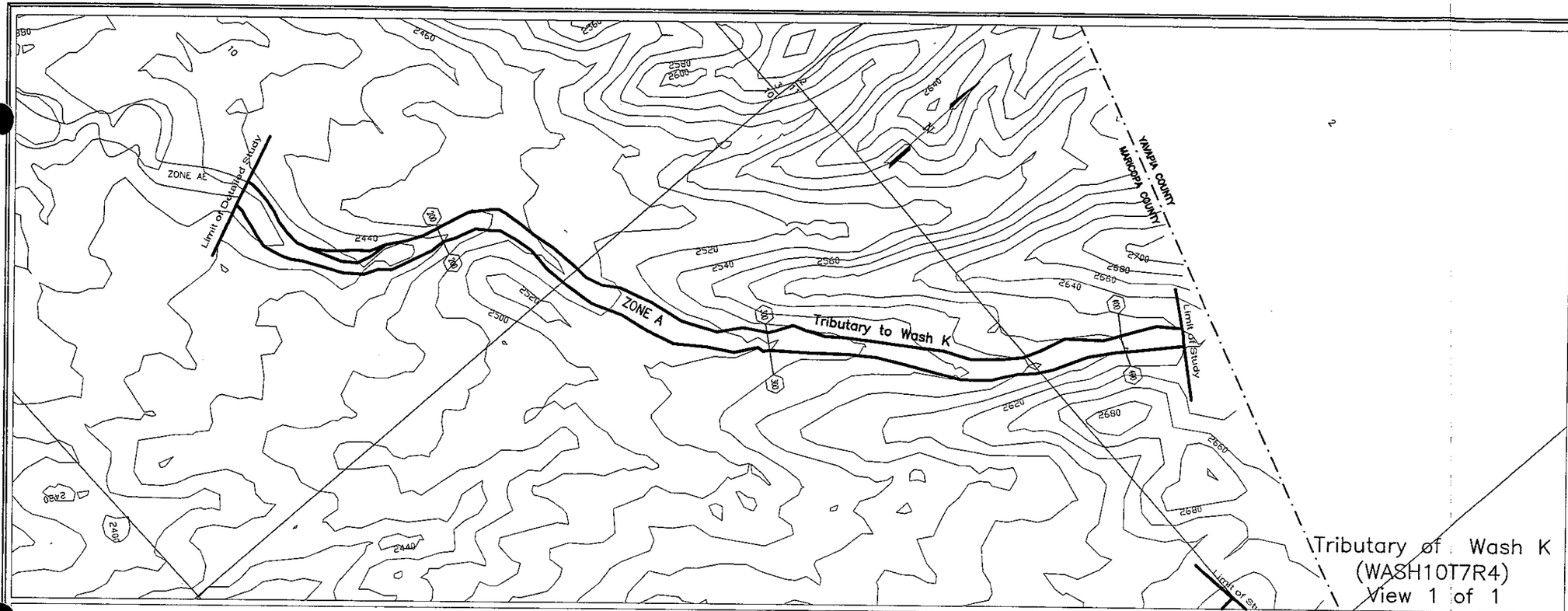
APPROXIMATE ZONE A FLOODPLAIN DELINEATION STUDIES
F.C.D. CONTRACT NO. 99-02

Wood, Patel & Associates, Inc. — CIVIL ENGINEERS HYDROLOGISTS LAND SURVEYORS

	BY	DATE
DESIGN	–	–
DESIGN CHK.	–	–
PLANS	–	–
PLANS CHK.	–	–

W/P# 99958 SHEET 12 OF 29

THIS MAP WAS PREPARED FROM USGS DIGITAL ELEVATION MODELS (DEM) AND DIGITAL LINE GRAPH DATA (DLG)



Tributary of Wash K
(WASH10T7R4)
View 1 of 1

LEGEND

100-YR FLOODPLAIN BOUNDARY	
ZONE DESIGNATIONS	ZONE A
APPROX. FLOODPLAIN BOUNDARY	
CROSS SECTION	100 — 100
PLSS SECTION LINES	16 | 15 / 21 | 22
CORPORATE LIMITS	Corporate Limits
COUNTY, PARISH, STATE OR INTERNATIONAL BOUNDARY	County Boundary
WASH FLOWLINE	

ELEVATION REFERENCE MARKS

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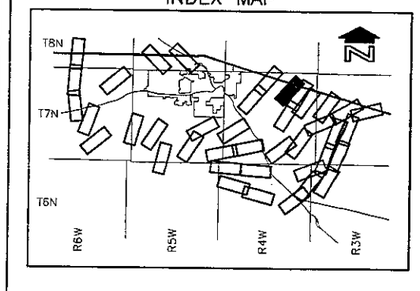
NOTES

INDEX MAP



400' 0' 400' 800'

CONTOUR INTERVAL = 20 FEET

NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY

WICKENBURG AREA

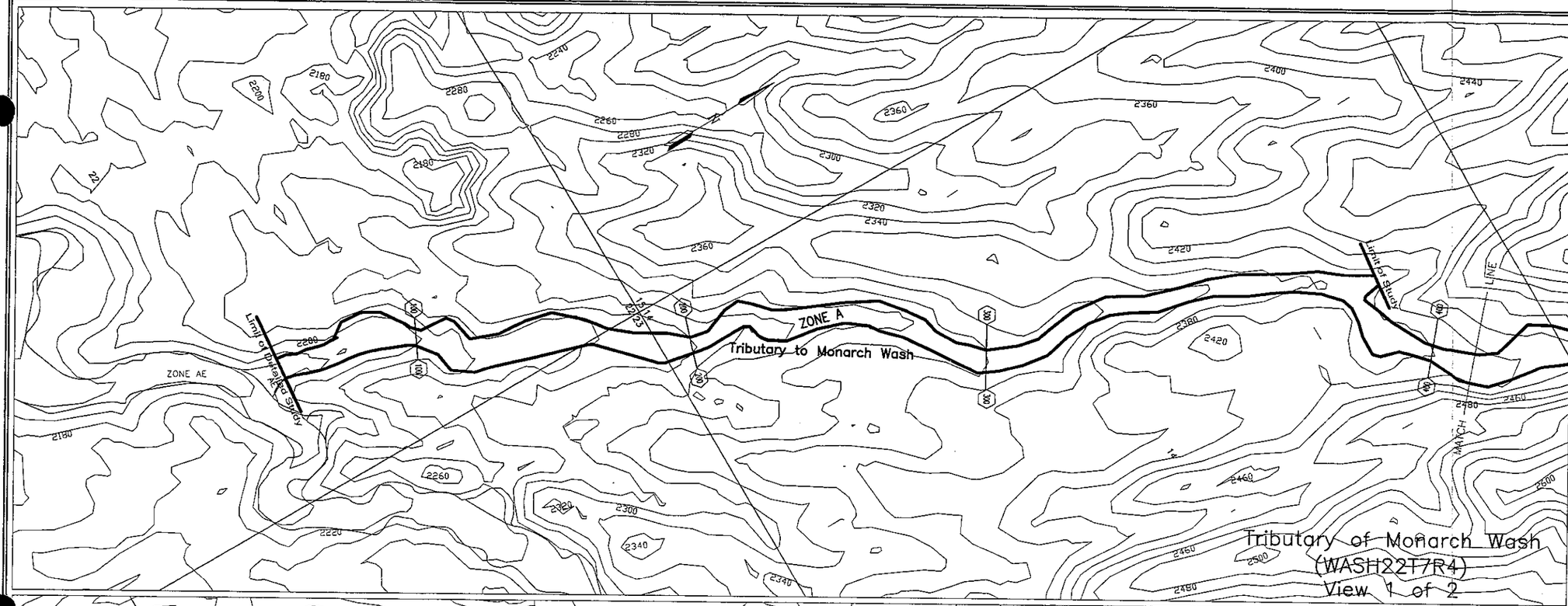
APPROXIMATE ZONE A FLOODPLAIN
DELINEATION STUDIES
F.C.D. CONTRACT NO. 99-02

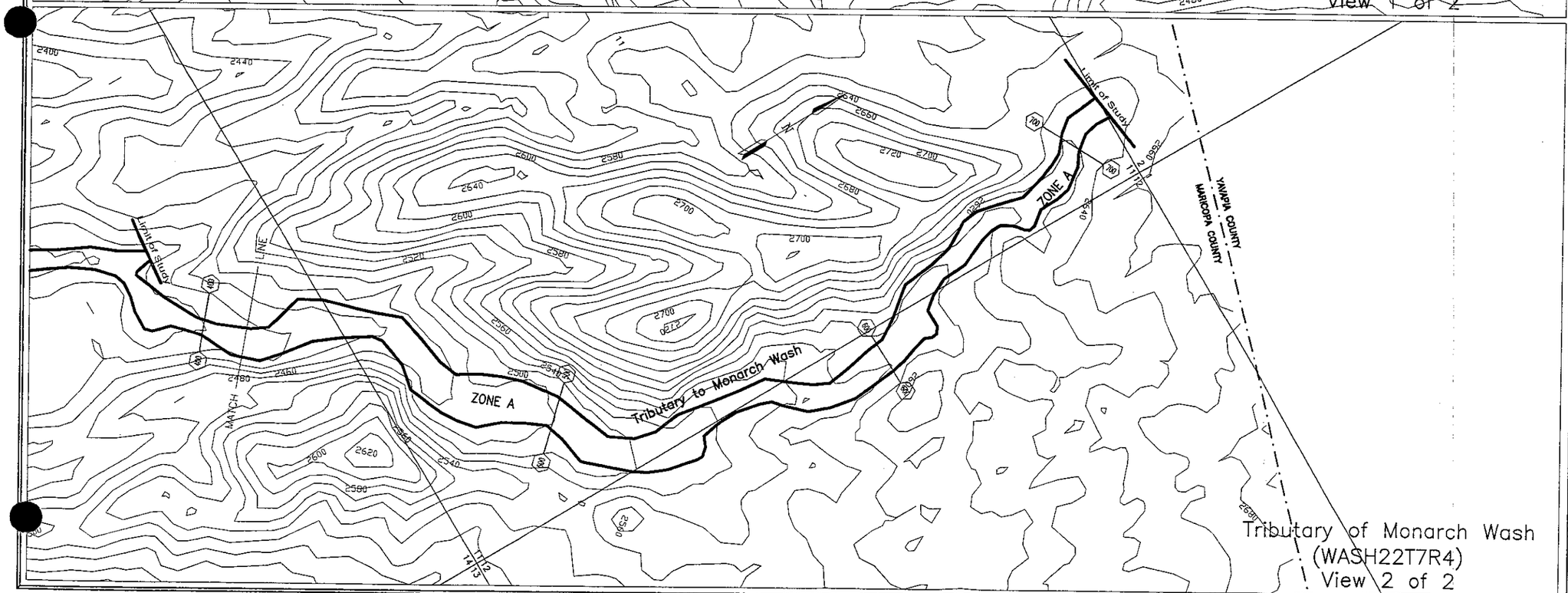
Wood, Patel & Associates, Inc. — Civil Engineers, Hydrologists, Land Surveyors

	BY	DATE
DESIGN	–	–
DESIGN CHK.	–	–
PLANS	–	–
PLANS CHK.	–	–

W/P# 99958 SHEET 13 OF 29

THIS MAP WAS PREPARED FROM USGS DIGITAL ELEVATION MODELS (DEM) AND DIGITAL LINE GRAPH DATA (DLG)





LEGEND

100-YR FLOODPLAIN BOUNDARY	
ZONE DESIGNATIONS	ZONE A
APPROX. FLOODPLAIN BOUNDARY	
CROSS SECTION	100 — 100
PLSS SECTION LINES	16 | 15 / 21 | 22
CORPORATE LIMITS	Corporate Limits
COUNTY, PARISH, STATE OR INTERNATIONAL BOUNDARY	County Boundary
WASH FLOWLINE	

ELEVATION REFERENCE MARKS

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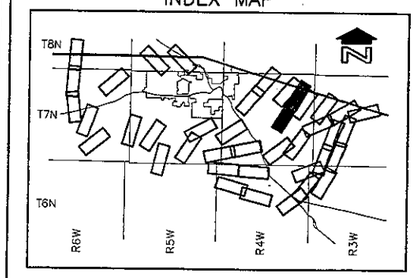
NOTES

INDEX MAP



400' 0' 400' 800'

CONTOUR INTERVAL = 20 FEET

NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

WICKENBURG AREA

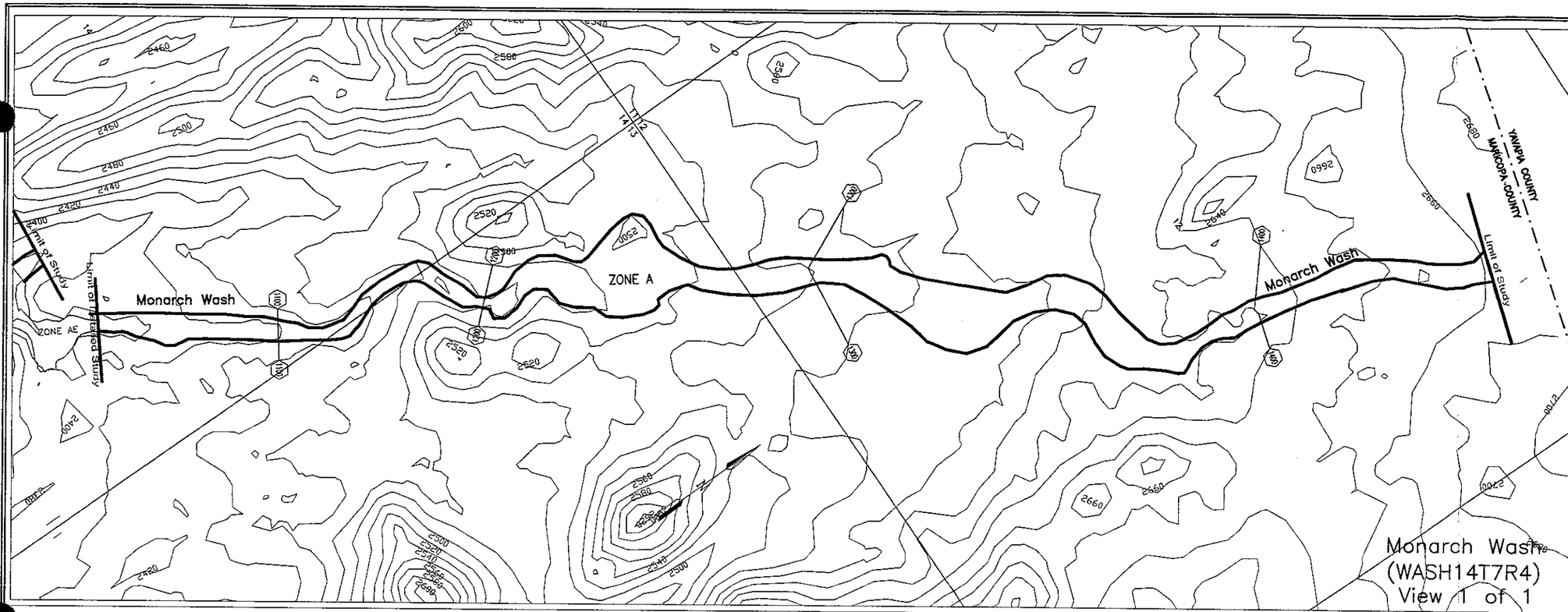
APPROXIMATE ZONE A FLOODPLAIN DELINEATION STUDIES
F.C.D. CONTRACT NO. 99-02

Wood, Patel & Associates, Inc. — CIVIL ENGINEERS, HYDROLOGISTS, LAND SURVEYORS

	BY	DATE
DESIGN	–	–
DESIGN CHK.	–	–
PLANS	–	–
PLANS CHK.	–	–

W/P# 99958 SHEET 14 OF 29

THIS MAP WAS PREPARED FROM USGS DIGITAL ELEVATION MODELS (DEM) AND DIGITAL LINE GRAPH DATA (DLG)



LEGEND

100-YR FLOODPLAIN BOUNDARY	
ZONE DESIGNATIONS	ZONE A
APPROX. FLOODPLAIN BOUNDARY	
CROSS SECTION	100 — 100
PLSS SECTION LINES	16 | 15 / 21 | 22
CORPORATE LIMITS	Corporate Limits
COUNTY, PARISH, STATE OR INTERNATIONAL BOUNDARY	County Boundary
WASH FLOWLINE	

ELEVATION REFERENCE MARKS

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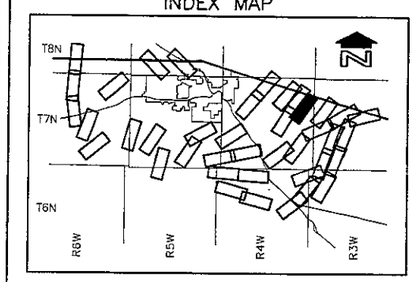
NOTES

INDEX MAP



400' 0' 400' 800'

CONTOUR INTERVAL = 20 FEET

NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

WICKENBURG AREA

APPROXIMATE ZONE A FLOODPLAIN DELINEATION STUDIES
F.C.D. CONTRACT NO. 99-02

Wood, Patel & Associates, Inc. — CIVIL ENGINEERS, HYDROLOGISTS, LAND SURVEYORS

	BY	DATE
DESIGN	–	–
DESIGN CHK.	–	–
PLANS	–	–
PLANS CHK.	–	–

W/P# 99958 SHEET 15 OF 29

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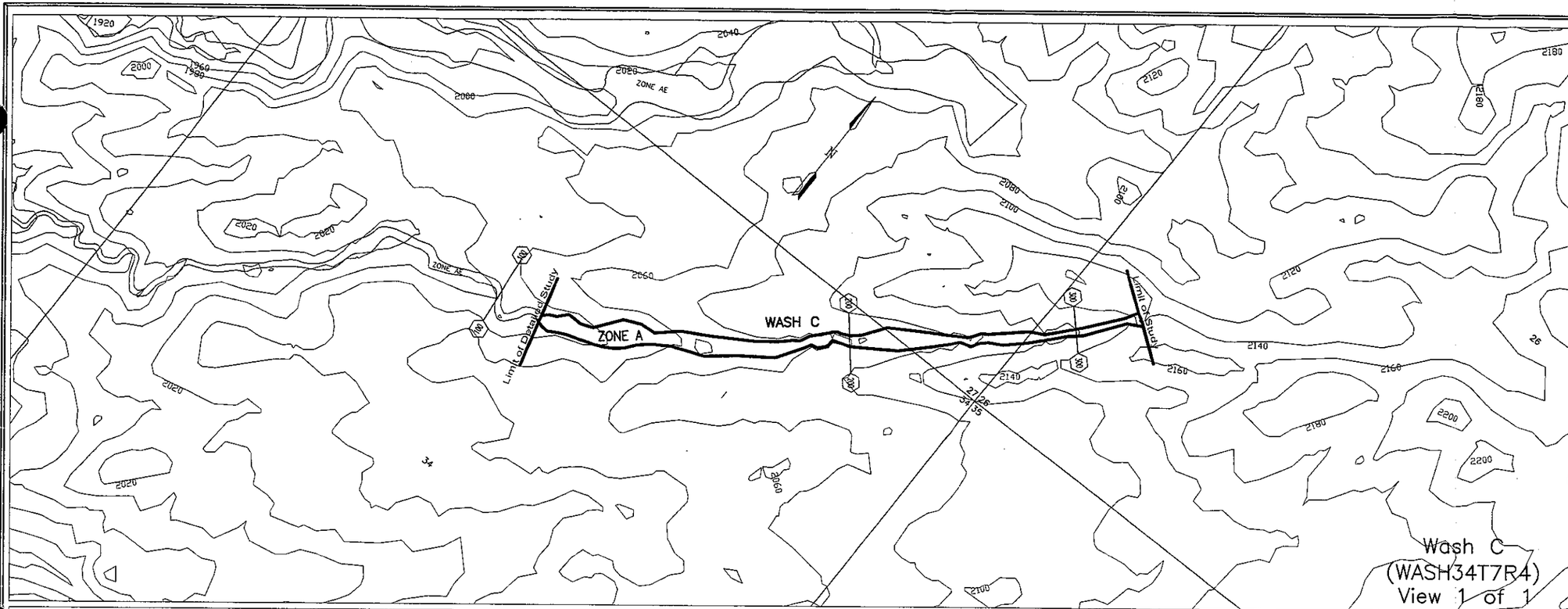

LEGEND

100-YR FLOODPLAIN BOUNDARY	
ZONE DESIGNATIONS	ZONE A
APPROX. FLOODPLAIN BOUNDARY	
CROSS SECTION	100 — 100
PLSS SECTION LINES	16|15 / 21|22
CORPORATE LIMITS	Corporate Limits
COUNTY, PARISH, STATE OR INTERNATIONAL BOUNDARY	County Boundary
WASH FLOWLINE	

ELEVATION REFERENCE MARKS

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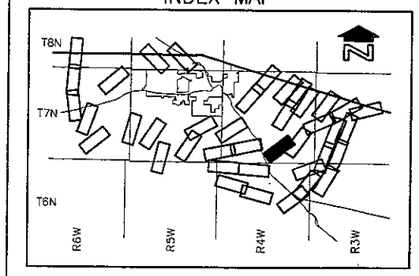
NOTES

INDEX MAP



400' 0' 400' 800'

CONTOUR INTERVAL = 20 FEET

NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

WICKENBURG AREA

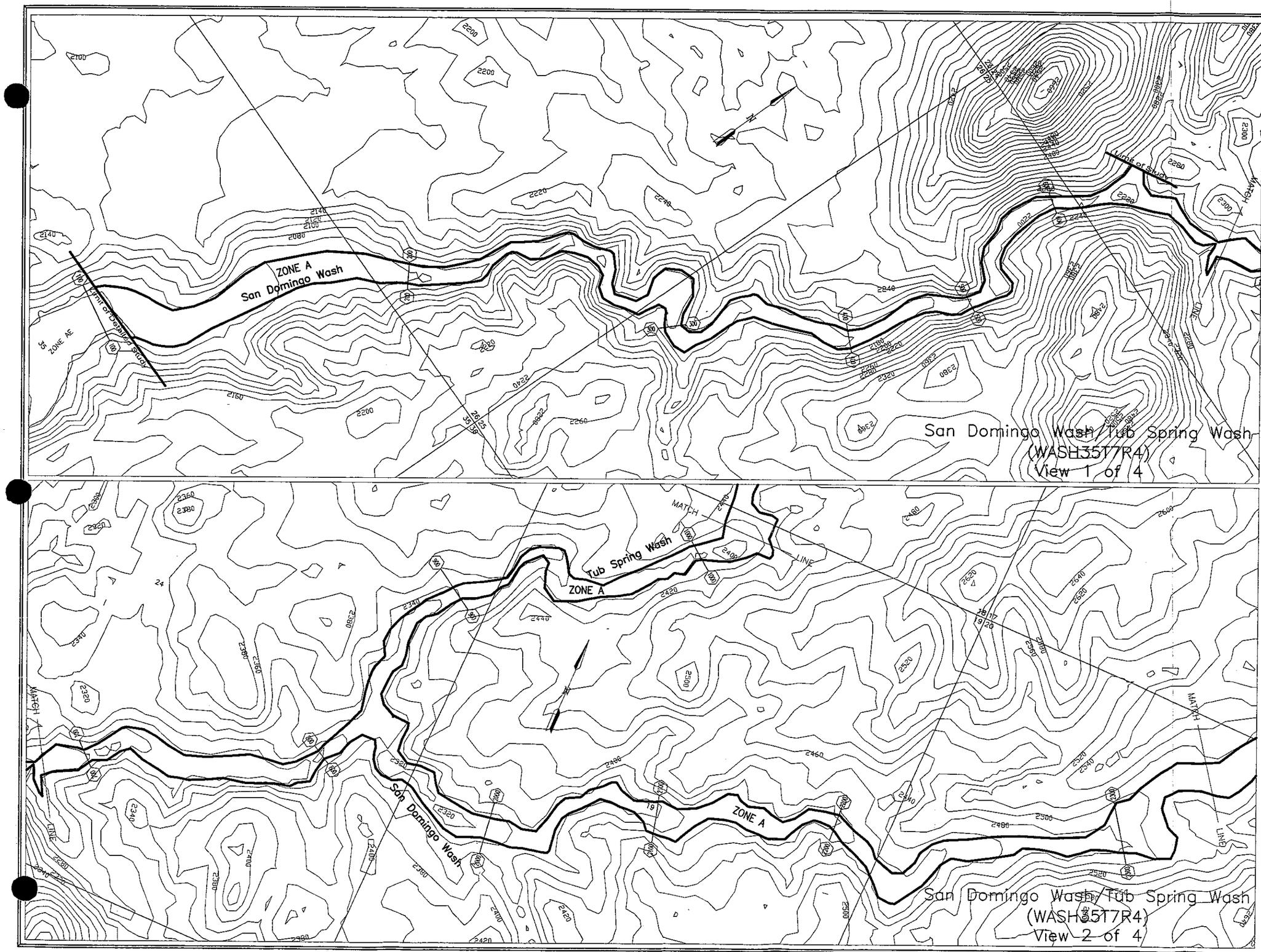
APPROXIMATE ZONE A FLOODPLAIN DELINEATION STUDIES
F.C.D. CONTRACT NO. 99-02

Wood, Patel & Associates, Inc. CIVIL ENGINEERS HYDROLOGISTS LAND SURVEYORS

	BY	DATE
DESIGN	--	--
DESIGN CHK.	--	--
PLANS	--	--
PLANS CHK.	--	--

W/P# 99958 SHEET 16 OF 29

THIS MAP WAS PREPARED FROM USGS DIGITAL ELEVATION MODELS (DEM) AND DIGITAL LINE GRAPH DATA (DLG)



LEGEND

100-YR FLOODPLAIN BOUNDARY	
ZONE DESIGNATIONS	ZONE A
APPROX. FLOODPLAIN BOUNDARY	
CROSS SECTION	100 — 100
PLSS SECTION LINES	16|15 / 21|22
CORPORATE LIMITS	Corporate Limits
COUNTY, PARISH, STATE OR INTERNATIONAL BOUNDARY	County Boundary
WASH FLOWLINE	

ELEVATION REFERENCE MARKS

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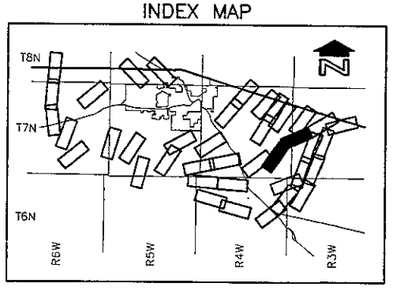
NOTES

INDEX MAP



400' 0' 400' 800'

CONTOUR INTERVAL = 20 FEET

NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

WICKENBURG AREA

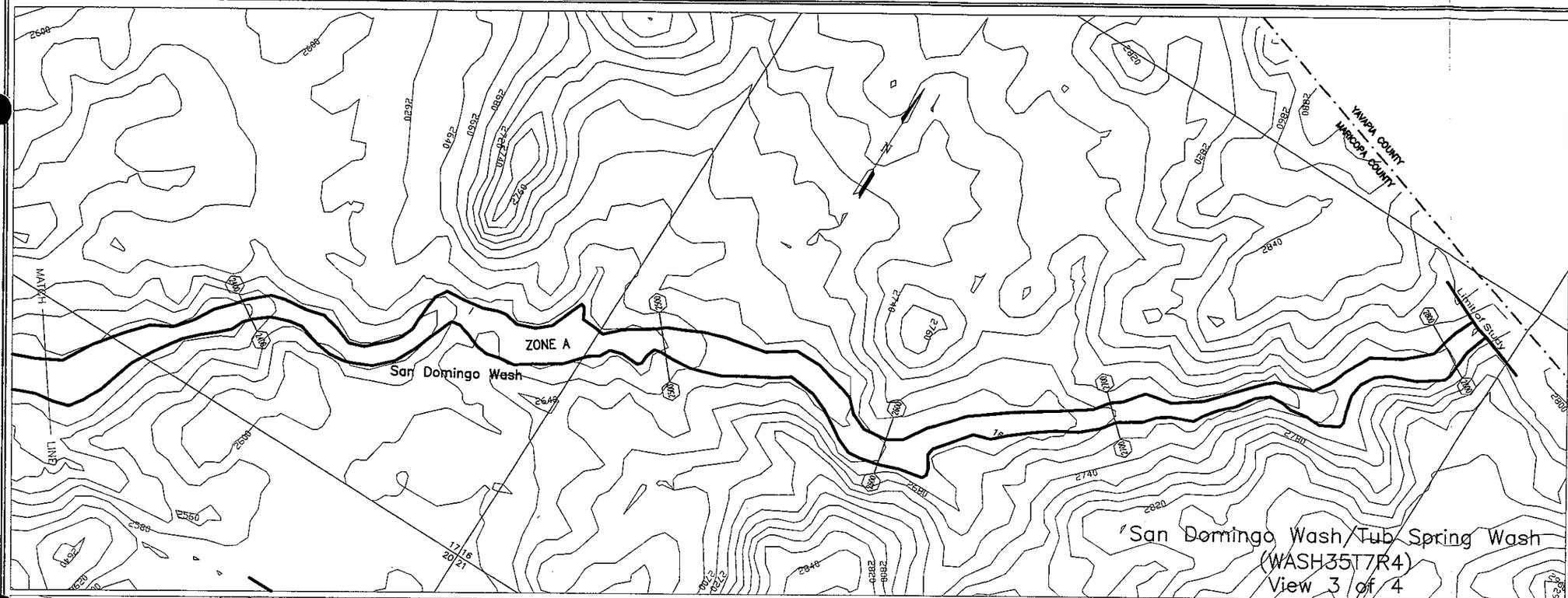
APPROXIMATE ZONE A FLOODPLAIN DELINEATION STUDIES
F.C.D. CONTRACT NO. 99-02

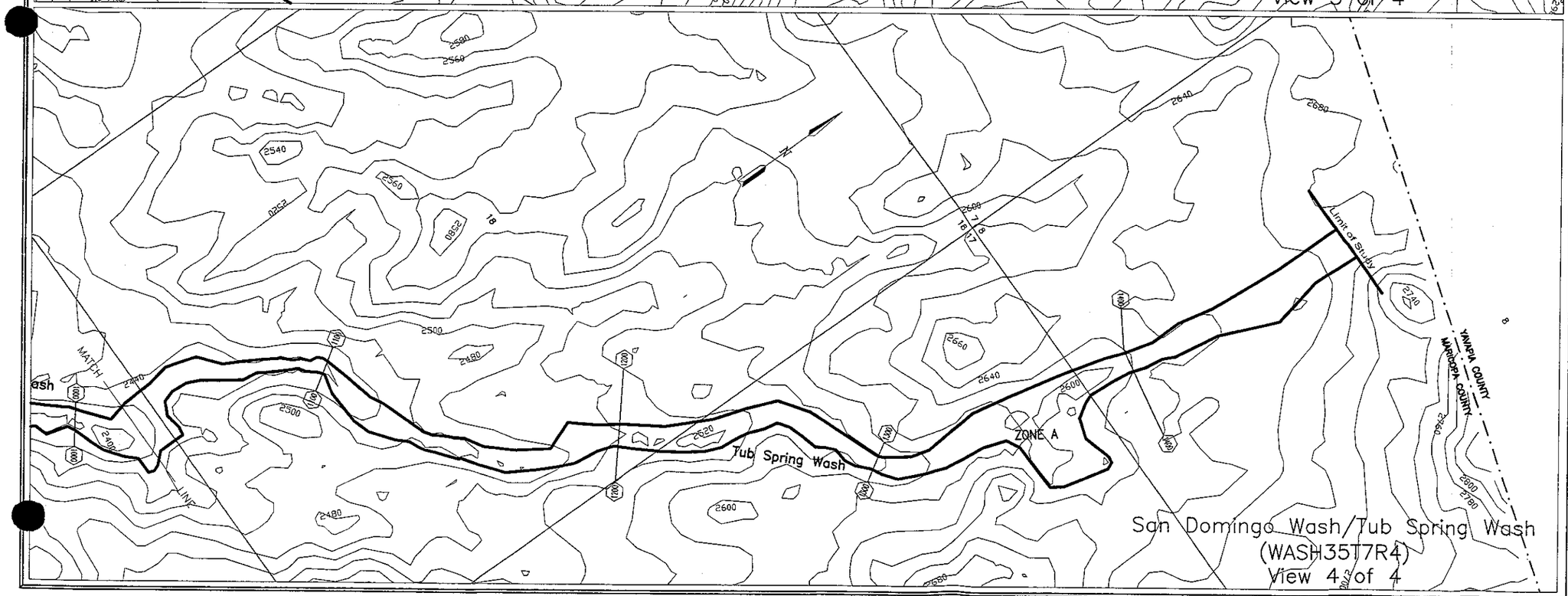
Wood, Patel & Associates, Inc. — Civil Engineers, Hydrologists, Land Surveyors

	BY	DATE
DESIGN	–	–
DESIGN CHK.	–	–
PLANS	–	–
PLANS CHK.	–	–

W/P# 99958 SHEET 17 OF 29

THIS MAP WAS PREPARED FROM USGS DIGITAL ELEVATION MODELS (DEM) AND DIGITAL LINE GRAPH DATA (DLG)





LEGEND

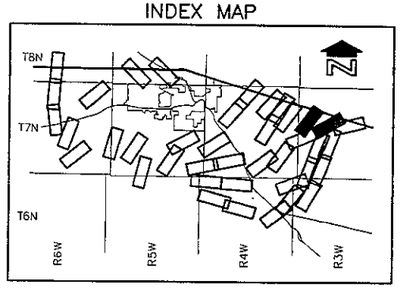
100-YR FLOODPLAIN BOUNDARY	
ZONE DESIGNATIONS	ZONE A
APPROX. FLOODPLAIN BOUNDARY	
CROSS SECTION	100 — 100
PLSS SECTION LINES	16 | 15 / 21 | 22
CORPORATE LIMITS	Corporate Limits
COUNTY, PARISH, STATE OR INTERNATIONAL BOUNDARY	County Boundary
WASH FLOWLINE	

ELEVATION REFERENCE MARKS

NOTE: NO ELEVATION REFERENCE MARKS WERE USED FOR THIS PROJECT. ALL WORK IS BASED ON 20' CONTOURS GENERATED FROM USGS DIGITAL ELEVATION MODELS (DEM).

NOTES

INDEX MAP



400' 0' 400' 800'

CONTOUR INTERVAL = 20 FEET

NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

WICKENBURG AREA

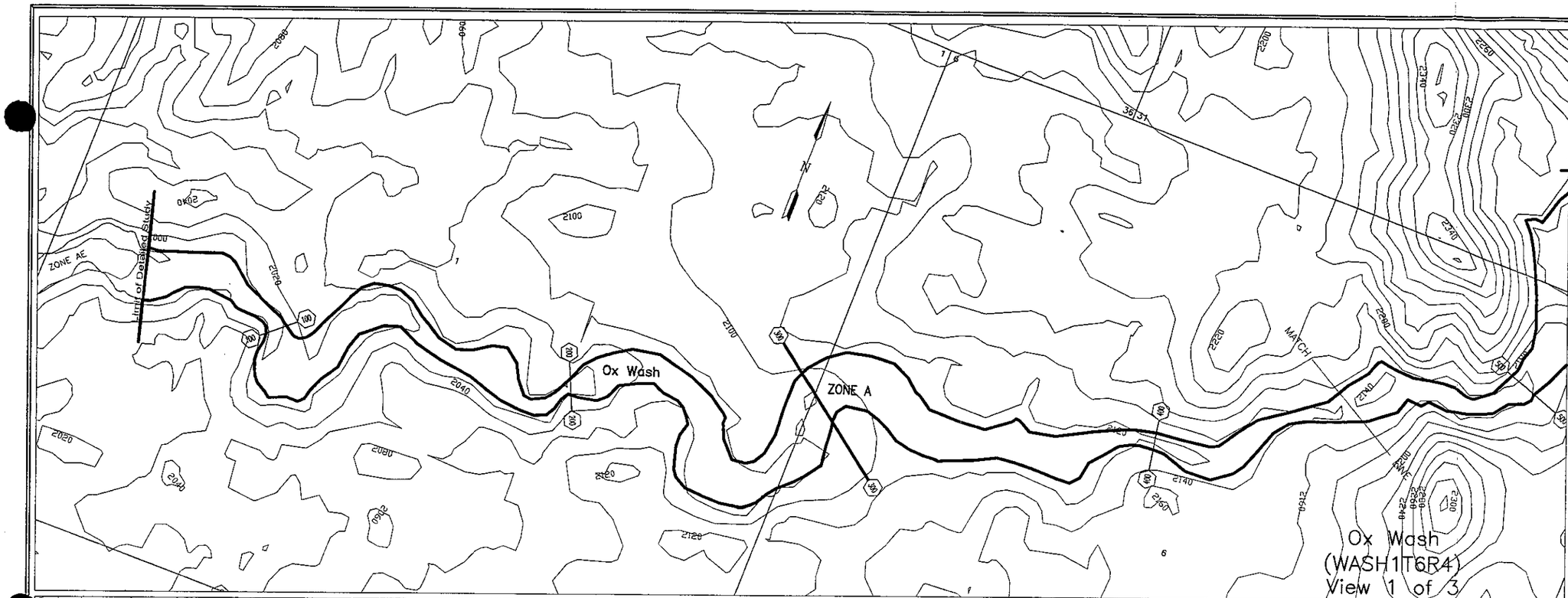
APPROXIMATE ZONE A FLOODPLAIN DELINEATION STUDIES
F.C.D. CONTRACT NO. 99-02

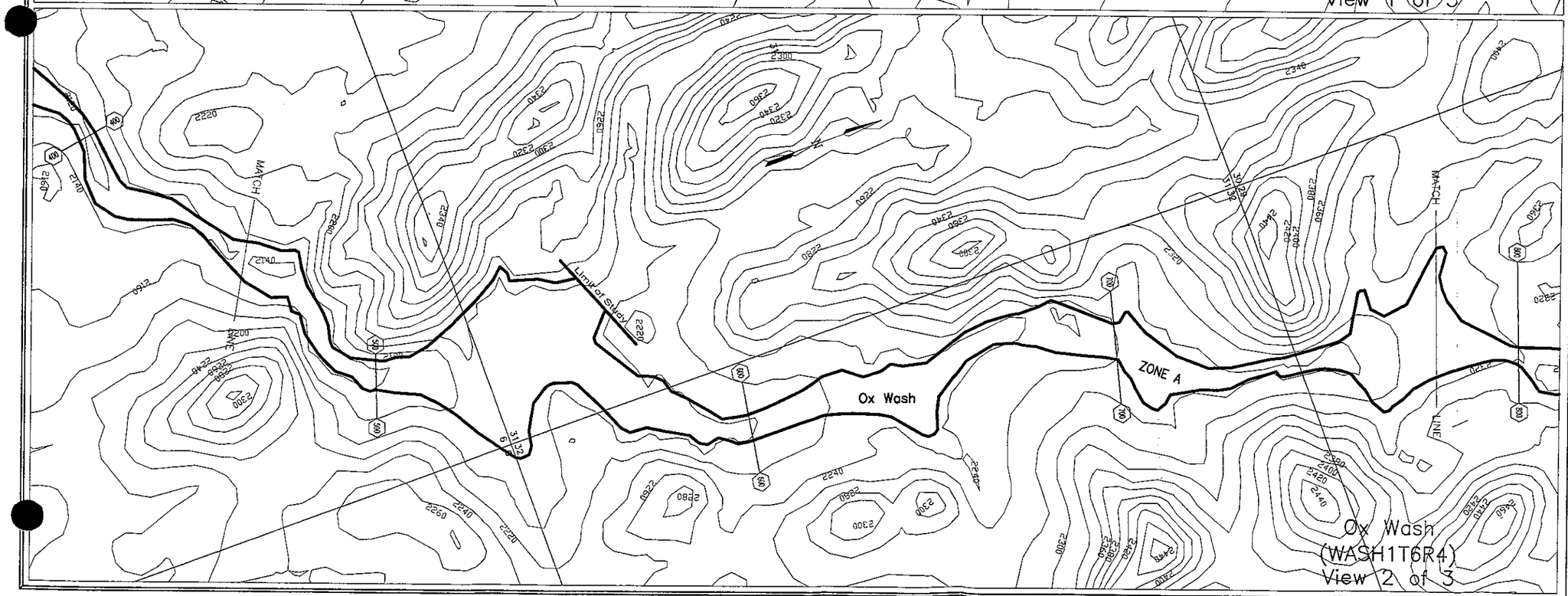
Wood, Patel & Associates, Inc. — CIVIL ENGINEERS, HYDROLOGISTS, LAND SURVEYORS

	BY	DATE
DESIGN	–	–
DESIGN CHK.	–	–
PLANS	–	–
PLANS CHK.	–	–

W/P# 99958 SHEET 18 OF 29

THIS MAP WAS PREPARED FROM USGS DIGITAL ELEVATION MODELS (DEM) AND DIGITAL LINE GRAPH DATA (DLG)





LEGEND

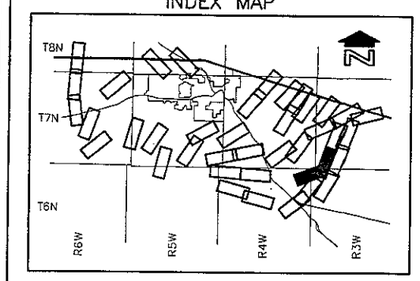
100-YR FLOODPLAIN BOUNDARY	
ZONE DESIGNATIONS	ZONE A
APPROX. FLOODPLAIN BOUNDARY	
CROSS SECTION	100 — 100
PLSS SECTION LINES	16 | 15 / 21 | 22
CORPORATE LIMITS	Corporate Limits
COUNTY, PARISH, STATE OR INTERNATIONAL BOUNDARY	County Boundary
WASH FLOWLINE	

ELEVATION REFERENCE MARKS

NOTE: NO ELEVATION REFERENCE MARKS WERE USED FOR THIS PROJECT. ALL WORK IS BASED ON 20' CONTOURS GENERATED FROM USGS DIGITAL ELEVATION MODELS (DEM).

NOTES

INDEX MAP



400' 0' 400' 800'

CONTOUR INTERVAL = 20 FEET

NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

WICKENBURG AREA

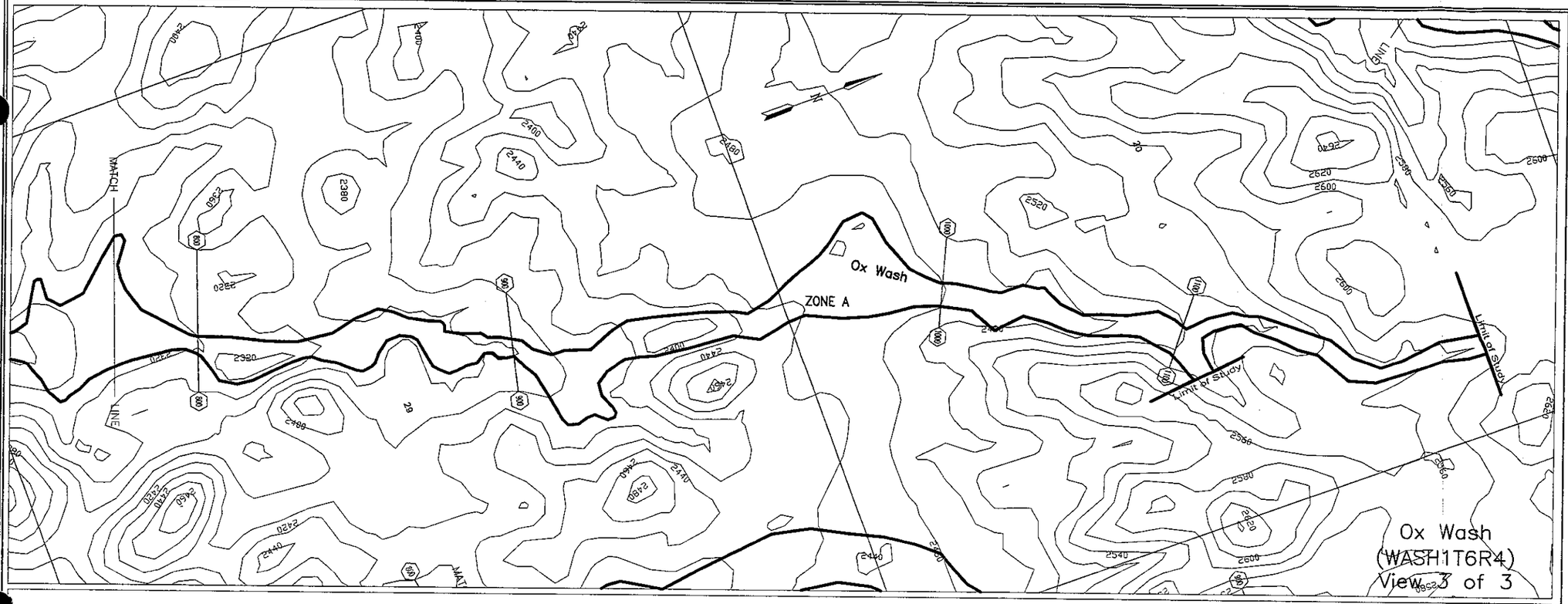
APPROXIMATE ZONE A FLOODPLAIN DELINEATION STUDIES
F.C.D. CONTRACT NO. 99-02

Wood, Patel & Associates, Inc. — CIVIL ENGINEERS, HYDROLOGISTS, LAND SURVEYORS

	BY	DATE
DESIGN	–	–
DESIGN CHK.	–	–
PLANS	–	–
PLANS CHK.	–	–

W/P# 99958 SHEET 19 OF 29

THIS MAP WAS PREPARED FROM USGS DIGITAL ELEVATION MODELS (DEM) AND DIGITAL LINE GRAPH DATA (DLG)



LEGEND

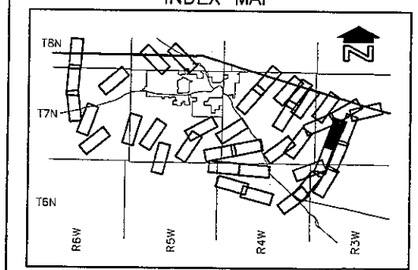
100-YR FLOODPLAIN BOUNDARY	
ZONE DESIGNATIONS	ZONE A
APPROX. FLOODPLAIN BOUNDARY	
CROSS SECTION	100 — 100
PLSS SECTION LINES	16 | 15 / 21 | 22
CORPORATE LIMITS	Corporate Limits
COUNTY, PARISH, STATE OR INTERNATIONAL BOUNDARY	County Boundary
WASH FLOWLINE	

ELEVATION REFERENCE MARKS

NOTE: NO ELEVATION REFERENCE MARKS WERE USED FOR THIS PROJECT. ALL WORK IS BASED ON 20' CONTOURS GENERATED FROM USGS DIGITAL ELEVATION MODELS (DEM).

NOTES

INDEX MAP



400' 0' 400' 800'

CONTOUR INTERVAL = 20 FEET

NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

WICKENBURG AREA

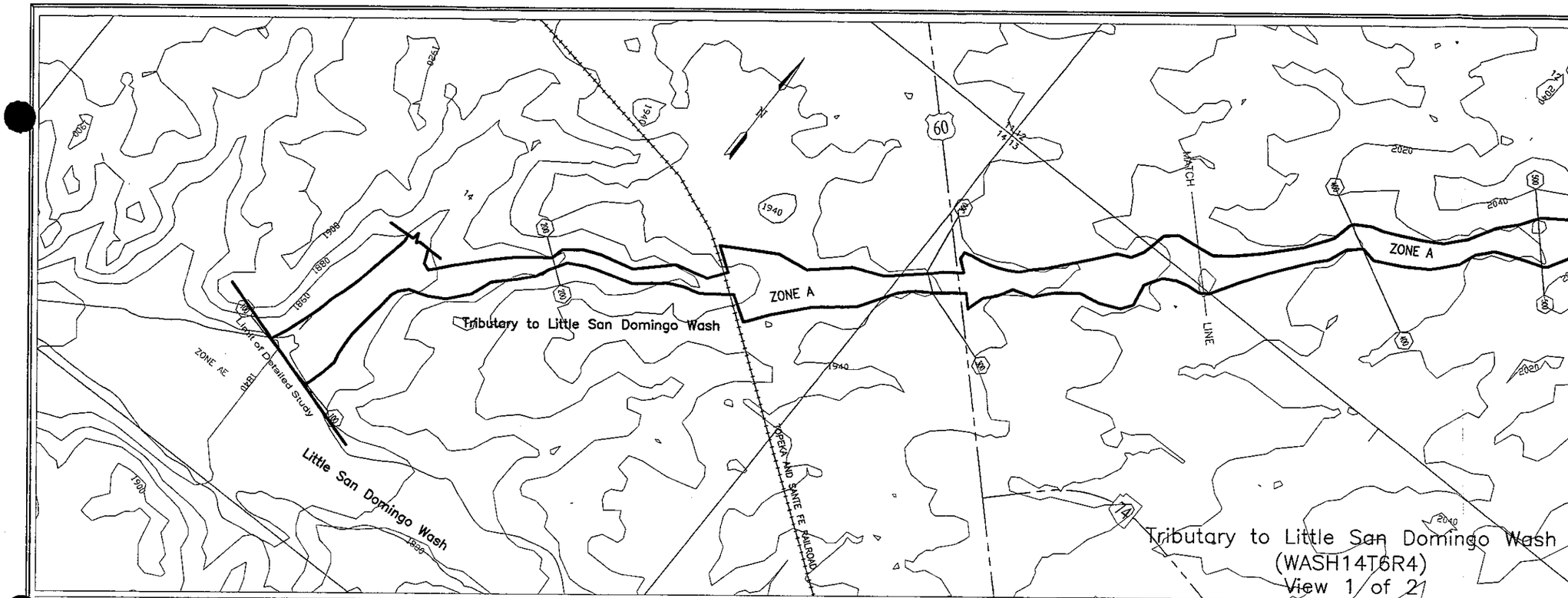
APPROXIMATE ZONE A FLOODPLAIN DELINEATION STUDIES
F.C.D. CONTRACT NO. 99-02

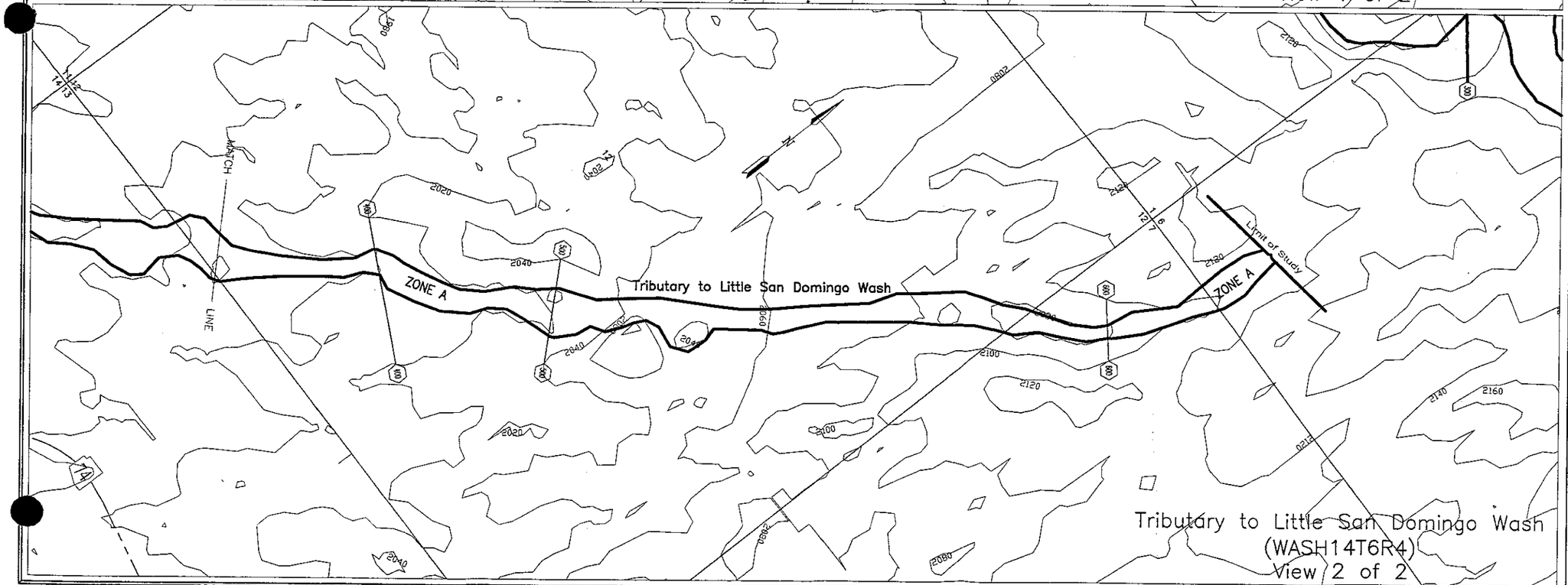
Wood, Patel & Associates, Inc. CIVIL ENGINEERS HYDROLOGISTS LAND SURVEYORS

	BY	DATE
DESIGN	–	–
DESIGN CHK.	–	–
PLANS	–	–
PLANS CHK	–	–

W/P# 99958 SHEET 20 OF 29

THIS MAP WAS PREPARED FROM USGS DIGITAL ELEVATION MODELS (DEM) AND DIGITAL LINE GRAPH DATA (DLG)





THIS MAP WAS PREPARED FROM USGS DIGITAL ELEVATION MODELS (DEM) AND DIGITAL LINE GRAPH DATA (DLG)

LEGEND

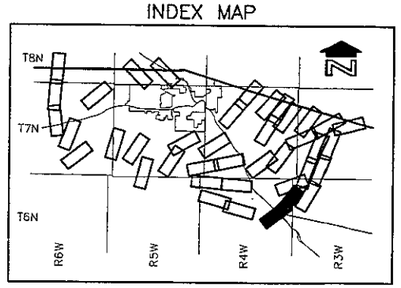
100-YR FLOODPLAIN BOUNDARY	
ZONE DESIGNATIONS	ZONE A
APPROX. FLOODPLAIN BOUNDARY	
CROSS SECTION	100 — 100
PLSS SECTION LINES	16 | 15 / 21 | 22
CORPORATE LIMITS	Corporate Limits
COUNTY, PARISH, STATE OR INTERNATIONAL BOUNDARY	County Boundary
WASH FLOWLINE	

ELEVATION REFERENCE MARKS

NOTE: NO ELEVATION REFERENCE MARKS WERE USED FOR THIS PROJECT. ALL WORK IS BASED ON 20' CONTOURS GENERATED FROM USGS DIGITAL ELEVATION MODELS (DEM).

NOTES

INDEX MAP



400' 0' 400' 800'

CONTOUR INTERVAL = 20 FEET

NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

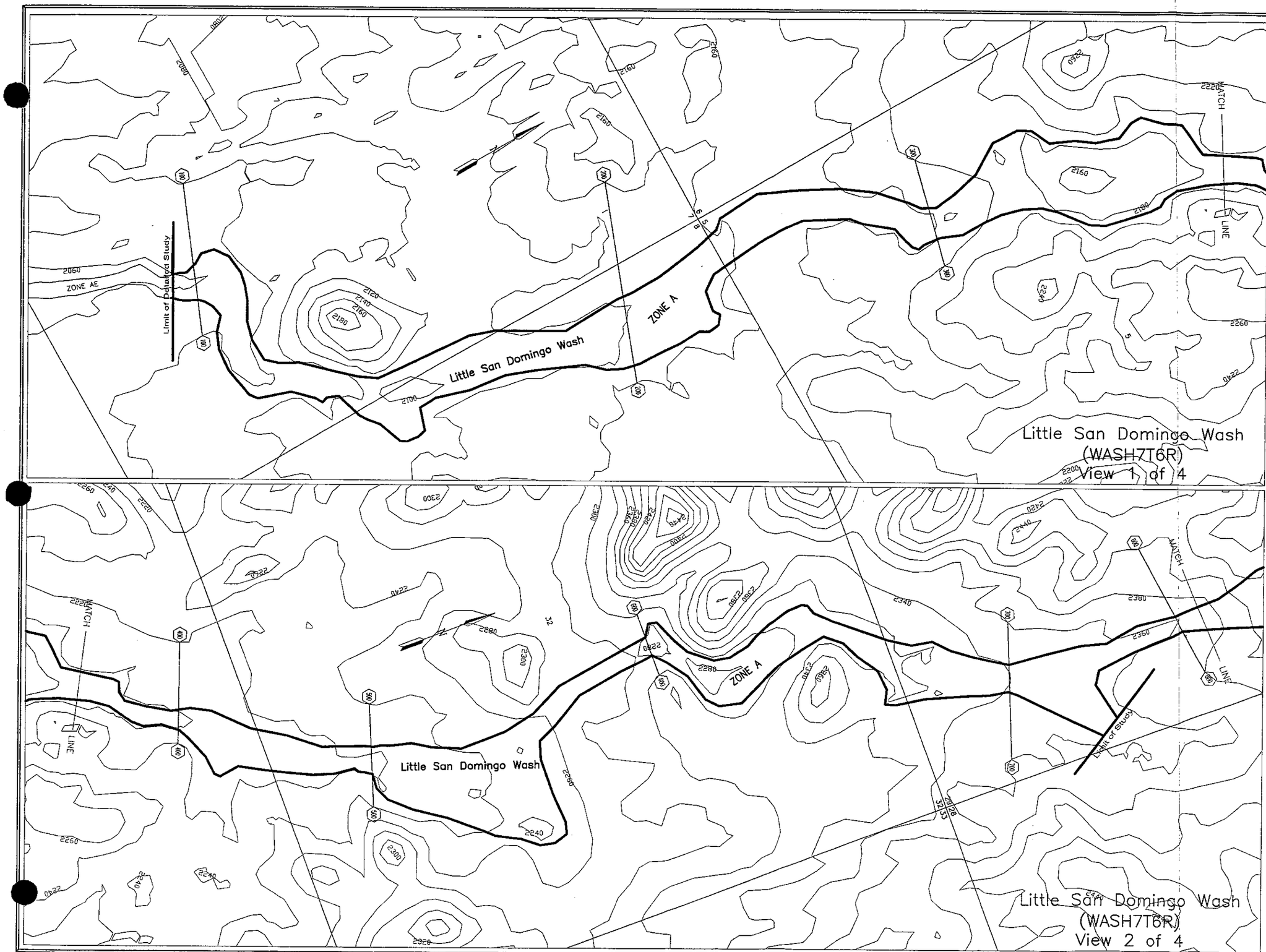
WICKENBURG AREA

APPROXIMATE ZONE A FLOODPLAIN DELINEATION STUDIES
F.C.D. CONTRACT NO. 99-02

Wood, Patel & Associates, Inc. — CIVIL ENGINEERS, HYDROLOGISTS, LAND SURVEYORS

	BY	DATE
DESIGN	–	–
DESIGN CHK.	–	–
PLANS	–	–
PLANS CHK.	–	–

W/P# 99958 SHEET 21 OF 29



LEGEND

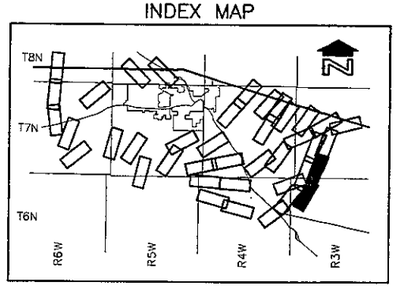
100-YR FLOODPLAIN BOUNDARY	
ZONE DESIGNATIONS	ZONE A
APPROX. FLOODPLAIN BOUNDARY	
CROSS SECTION	100 — 100
PLSS SECTION LINES	16 | 15 / 21 | 22
CORPORATE LIMITS	Corporate Limits
COUNTY, PARISH, STATE OR INTERNATIONAL BOUNDARY	County Boundary
WASH FLOWLINE	

ELEVATION REFERENCE MARKS

NOTE: NO ELEVATION REFERENCE MARKS WERE USED FOR THIS PROJECT. ALL WORK IS BASED ON 20' CONTOURS GENERATED FROM USGS DIGITAL ELEVATION MODELS (DEM).

NOTES

INDEX MAP



400' 0' 400' 800'

CONTOUR INTERVAL = 20 FEET

NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

WICKENBURG AREA

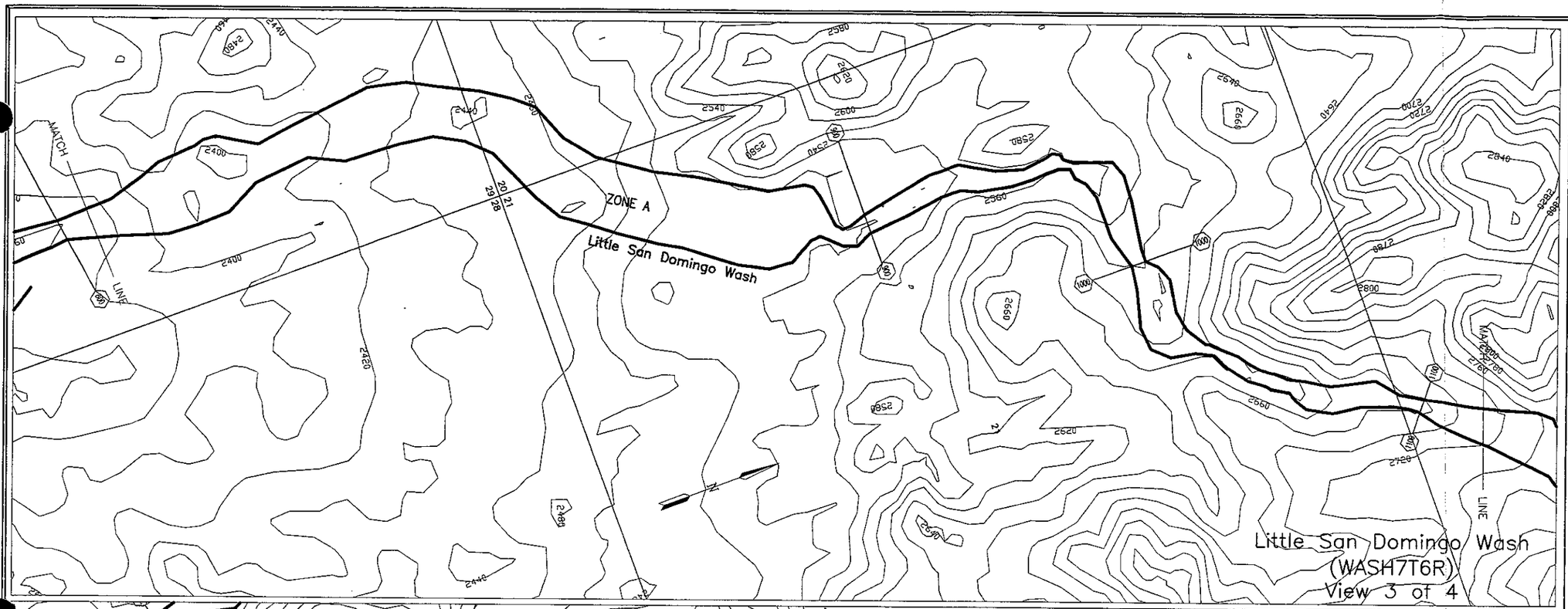
APPROXIMATE ZONE A FLOODPLAIN DELINEATION STUDIES
F.C.D. CONTRACT NO. 99-02

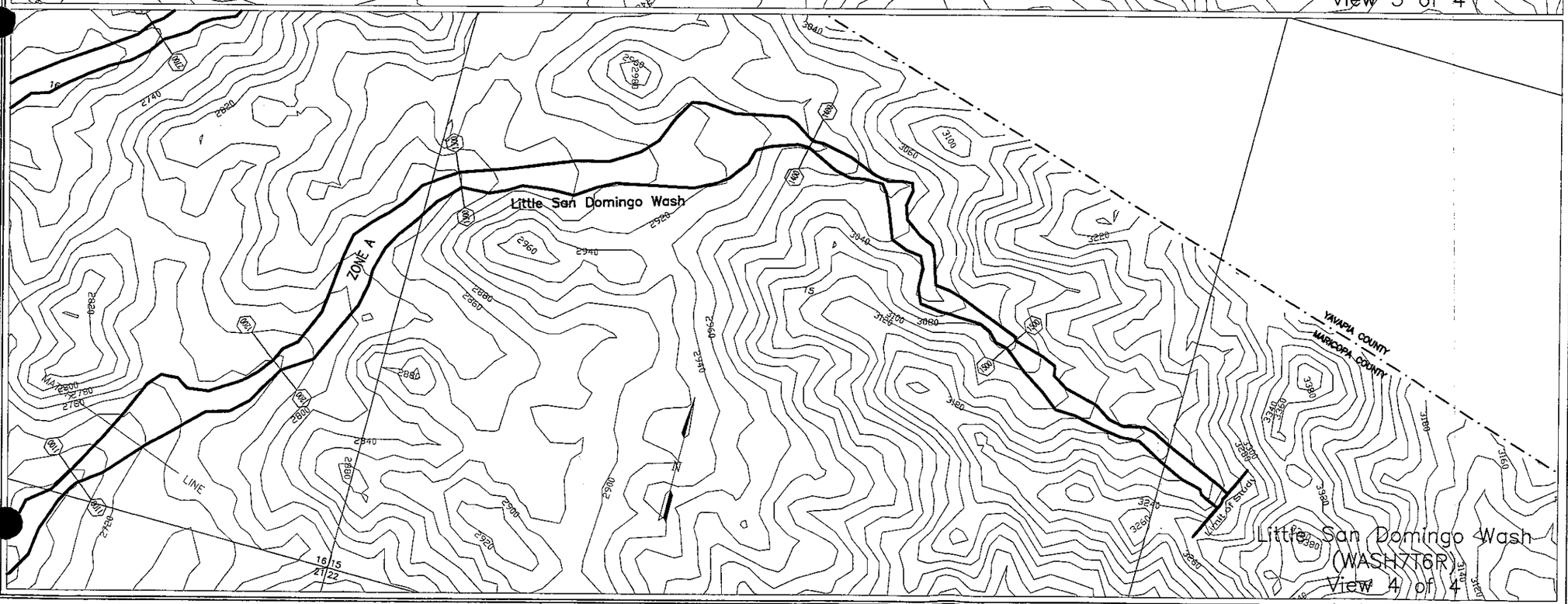
Wood, Patel & Associates, Inc. CIVIL ENGINEERS HYDROLOGISTS LAND SURVEYORS

	BY	DATE
DESIGN	–	–
DESIGN CHK.	–	–
PLANS	–	–
PLANS CHK.	–	–

W/P# 99958 SHEET 22 OF 29

THIS MAP WAS PREPARED FROM USGS DIGITAL ELEVATION MODELS (DEM) AND DIGITAL LINE GRAPH DATA (DLG)





LEGEND

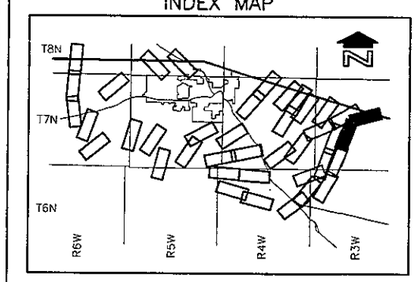
100-YR FLOODPLAIN BOUNDARY	
ZONE DESIGNATIONS	ZONE A
APPROX. FLOODPLAIN BOUNDARY	
CROSS SECTION	100 — 100
PLSS SECTION LINES	16 | 15 / 21 | 22
CORPORATE LIMITS	Corporate Limits
COUNTY, PARISH, STATE OR INTERNATIONAL BOUNDARY	County Boundary
WASH FLOWLINE	

ELEVATION REFERENCE MARKS

NOTE: NO ELEVATION REFERENCE MARKS WERE USED FOR THIS PROJECT. ALL WORK IS BASED ON 20' CONTOURS GENERATED FROM USGS DIGITAL ELEVATION MODELS (DEM).

NOTES

INDEX MAP



400' 0' 400' 800'

CONTOUR INTERVAL = 20 FEET

NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

WICKENBURG AREA

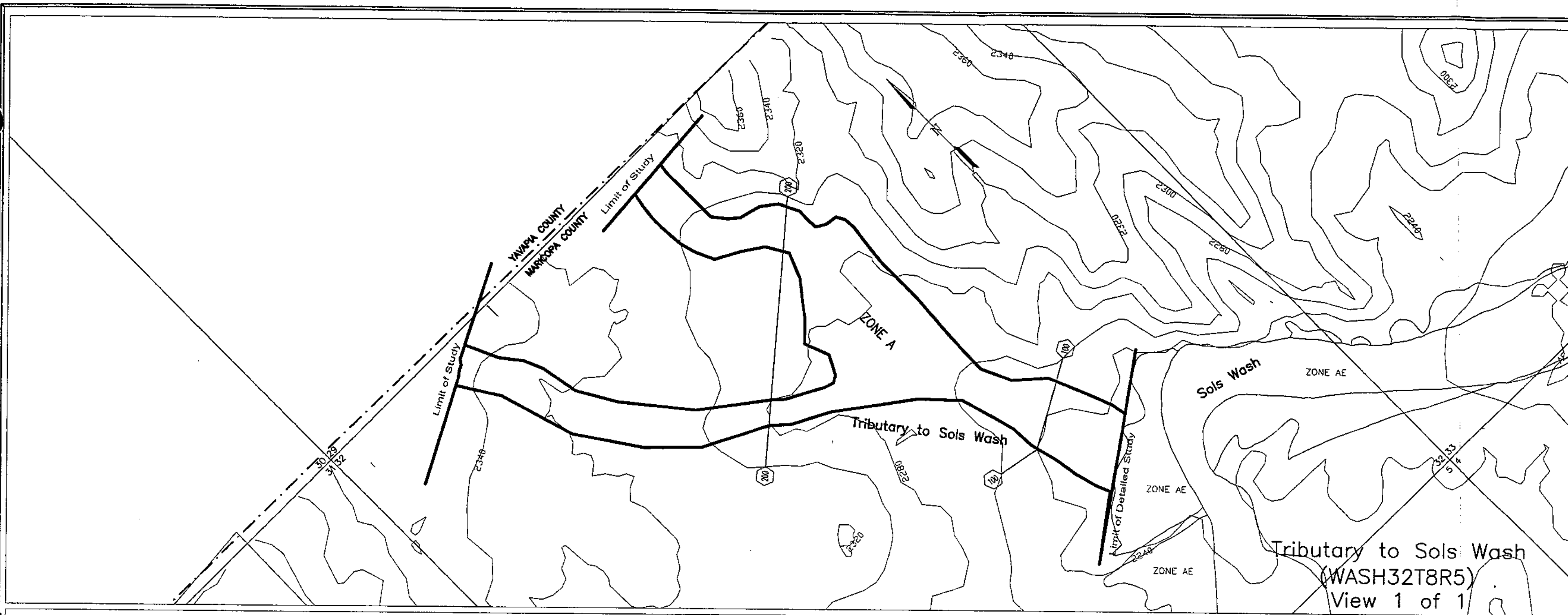
APPROXIMATE ZONE A FLOODPLAIN DELINEATION STUDIES
F.C.D. CONTRACT NO. 99-02

Wood, Patel & Associates, Inc.
CIVIL ENGINEERS
HYDROLOGISTS
LAND SURVEYORS

	BY	DATE
DESIGN	--	--
DESIGN CHK.	--	--
PLANS	--	--
PLANS CHK.	--	--

W/P# 99958 SHEET 23 OF 29

THIS MAP WAS PREPARED FROM USGS DIGITAL ELEVATION MODELS (DEM) AND DIGITAL LINE GRAPH DATA (DLG)



LEGEND

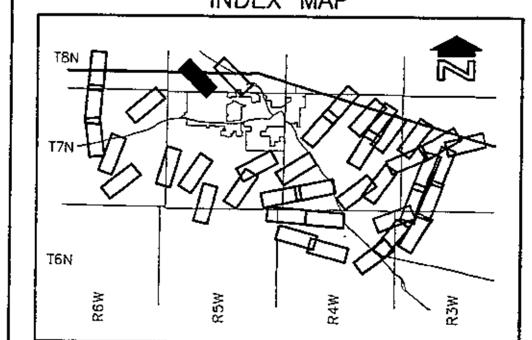
100-YR FLOODPLAIN BOUNDARY	
ZONE DESIGNATIONS	ZONE A
APPROX. FLOODPLAIN BOUNDARY	
CROSS SECTION	100 — 100
PLSS SECTION LINES	16 15 / 21 22
CORPORATE LIMITS	Corporate Limits
COUNTY, PARISH, STATE OR INTERNATIONAL BOUNDARY	County Boundary
WASH FLOWLINE	

ELEVATION REFERENCE MARKS

NOTE: NO ELEVATION REFERENCE MARKS WERE USED FOR THIS PROJECT. ALL WORK IS BASED ON 20' CONTOURS GENERATED FROM USGS DIGITAL ELEVATION MODELS (DEM).

NOTES

INDEX MAP



400' 0' 400' 800'

CONTOUR INTERVAL = 20 FEET

NO	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

WICKENBURG AREA

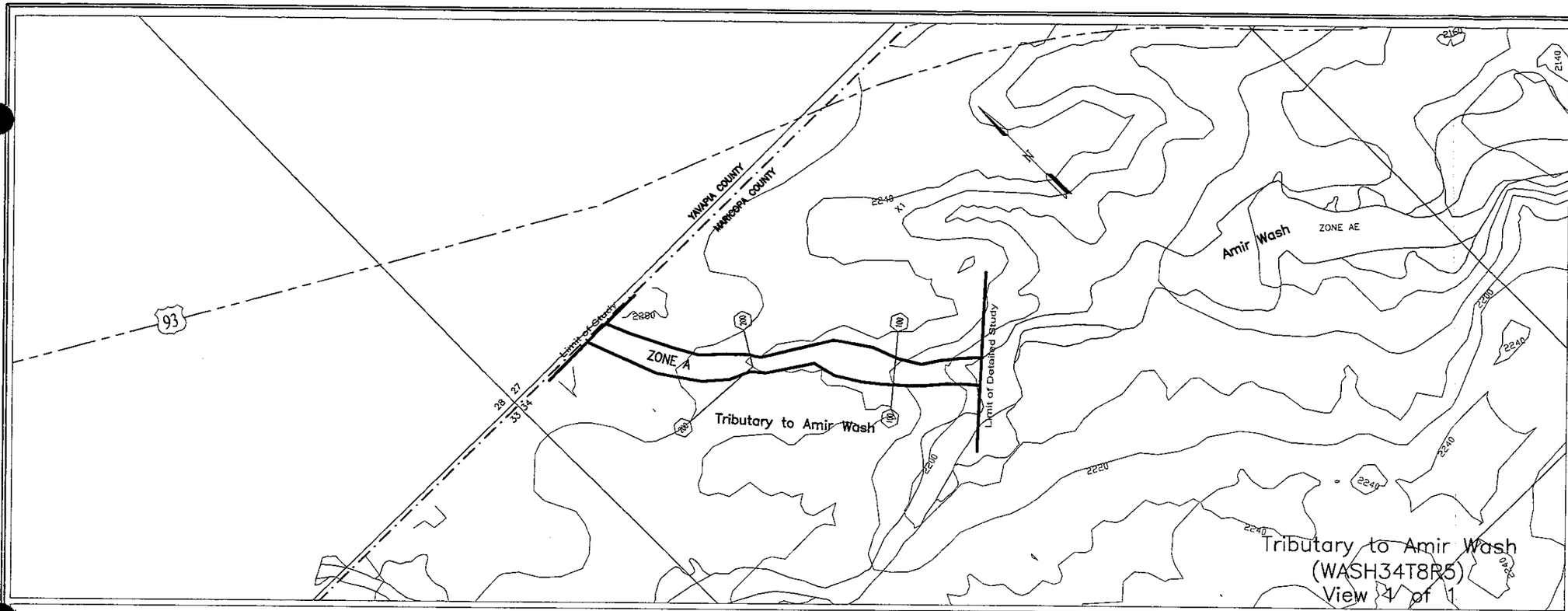
APPROXIMATE ZONE A FLOODPLAIN DELINEATION STUDIES
F.C.D. CONTRACT NO. 99-02

Wood, Patel & Associates, Inc. CIVIL ENGINEERS HYDROLOGISTS LAND SURVEYORS

	BY	DATE
DESIGN	–	–
DESIGN CHK.	–	–
PLANS	–	–
PLANS CHK.	–	–

W/P# 99958 SHEET 24 OF 29

THIS MAP WAS PREPARED FROM USGS DIGITAL ELEVATION MODELS (DEM) AND DIGITAL LINE GRAPH DATA (DLG)



LEGEND

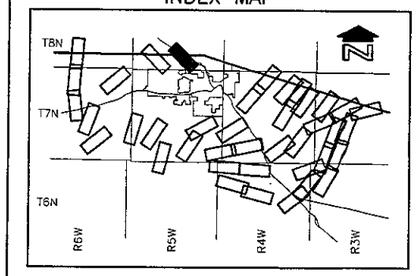
100-YR FLOODPLAIN BOUNDARY	
ZONE DESIGNATIONS	ZONE A
APPROX. FLOODPLAIN BOUNDARY	
CROSS SECTION	100 — 100
PLSS SECTION LINES	16 | 15 / 21 | 22
CORPORATE LIMITS	Corporate Limits
COUNTY, PARISH, STATE OR INTERNATIONAL BOUNDARY	County Boundary
WASH FLOWLINE	

ELEVATION REFERENCE MARKS

NOTE: NO ELEVATION REFERENCE MARKS WERE USED FOR THIS PROJECT. ALL WORK IS BASED ON 20' CONTOURS GENERATED FROM USGS DIGITAL ELEVATION MODELS (DEM).

NOTES

INDEX MAP



400' 0' 400' 800'

CONTOUR INTERVAL = 20 FEET

NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

WICKENBURG AREA

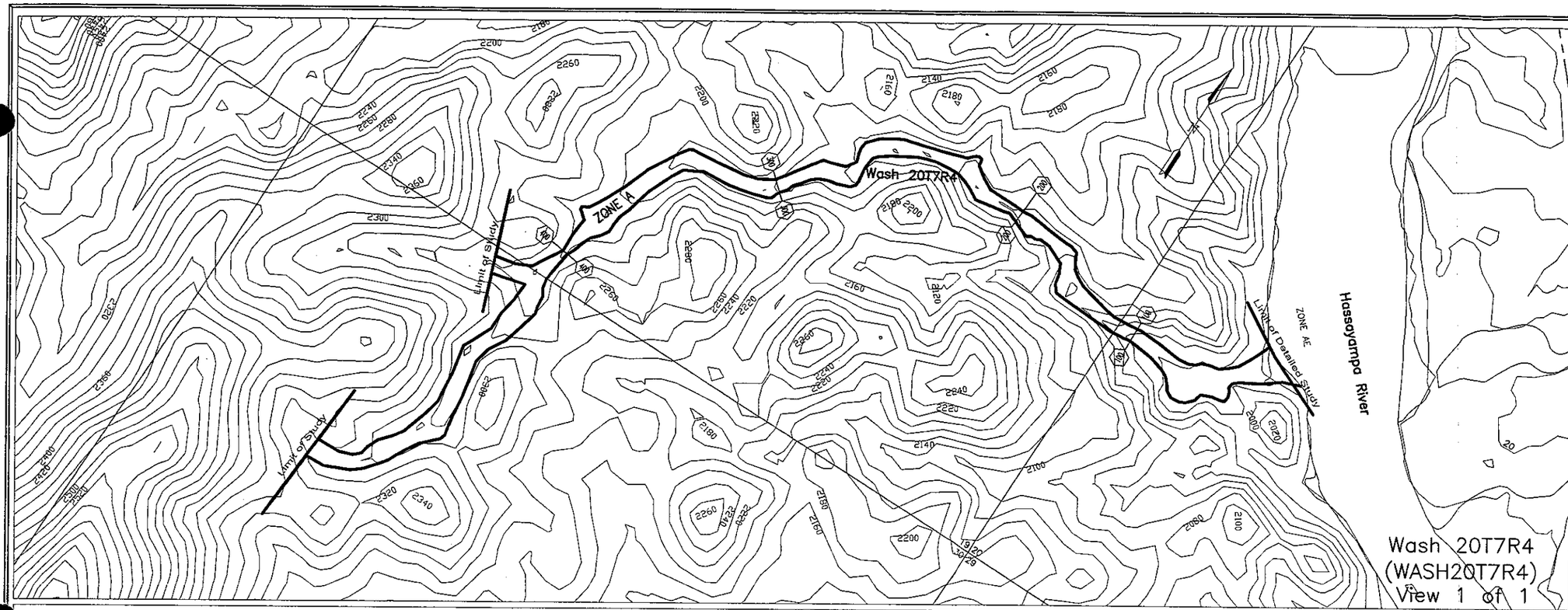
APPROXIMATE ZONE A FLOODPLAIN DELINEATION STUDIES
F.C.D. CONTRACT NO. 99-02

Wood, Patel & Associates, Inc. CIVIL ENGINEERS HYDROLOGISTS LAND SURVEYORS

	BY	DATE
DESIGN	–	–
DESIGN CHK.	–	–
PLANS	–	–
PLANS CHK.	–	–

W/P# 99958 SHEET 25 OF 29

THIS MAP WAS PREPARED FROM USGS DIGITAL ELEVATION MODELS (DEM) AND DIGITAL LINE GRAPH DATA (DLG)



Wash 20T7R4
(WASH20T7R4)
View 1 of 1

LEGEND

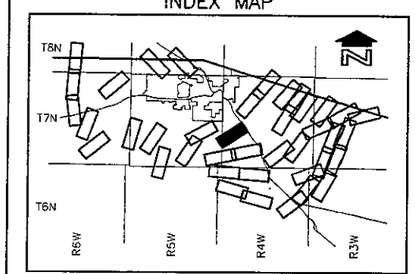
100-YR FLOODPLAIN BOUNDARY	
ZONE DESIGNATIONS	ZONE A
APPROX. FLOODPLAIN BOUNDARY	
CROSS SECTION	100 — 100
PLSS SECTION LINES	16 | 15 / 21 | 22
CORPORATE LIMITS	Corporate Limits
COUNTY, PARISH, STATE OR INTERNATIONAL BOUNDARY	County Boundary
WASH FLOWLINE	

ELEVATION REFERENCE MARKS

NOTE: NO ELEVATION REFERENCE MARKS WERE USED FOR THIS PROJECT. ALL WORK IS BASED ON 20' CONTOURS GENERATED FROM USGS DIGITAL ELEVATION MODELS (DEM).

NOTES

INDEX MAP



400' 0' 400' 800'

CONTOUR INTERVAL = 20 FEET

NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

WICKENBURG AREA

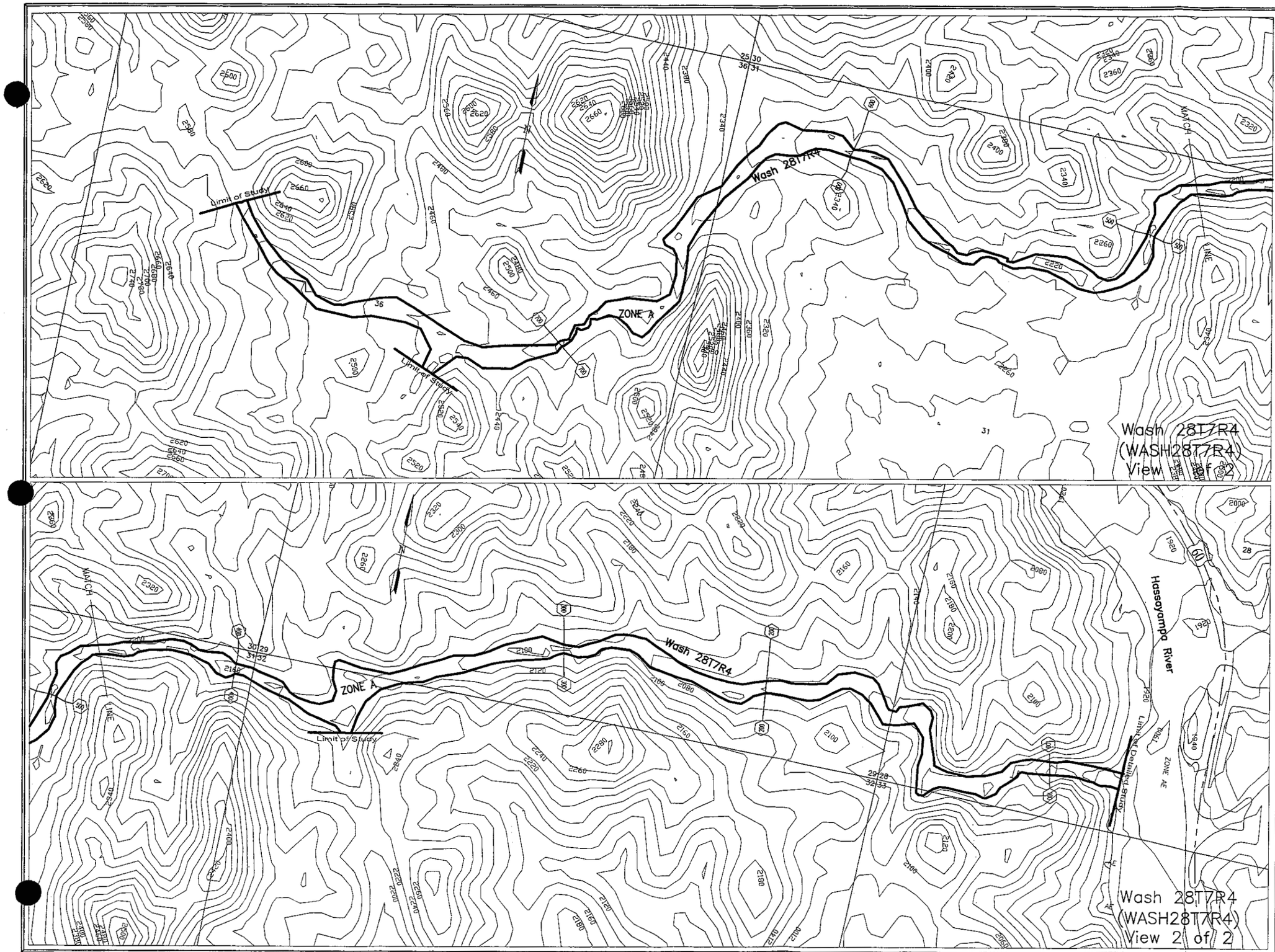
APPROXIMATE ZONE A FLOODPLAIN DELINEATION STUDIES
F.C.D. CONTRACT NO. 99-02

Wood, Patel & Associates, Inc. — CIVIL ENGINEERS, HYDROLOGISTS, LAND SURVEYORS

	BY	DATE
DESIGN	–	–
DESIGN CHK.	–	–
PLANS	–	–
PLANS CHK.	–	–

W/P# 99958 SHEET 26 OF 29

THIS MAP WAS PREPARED FROM USGS DIGITAL ELEVATION MODELS (DEM) AND DIGITAL LINE GRAPH DATA (DLG)



LEGEND

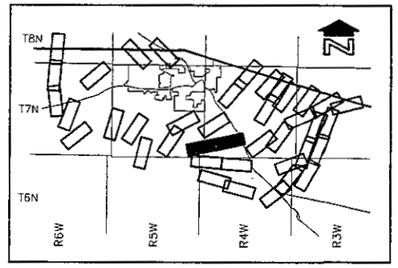
100-YR FLOODPLAIN BOUNDARY	
ZONE DESIGNATIONS	ZONE A
APPROX. FLOODPLAIN BOUNDARY	
CROSS SECTION	100 — 100
PLSS SECTION LINES	16 | 15 / 21 | 22
CORPORATE LIMITS	Corporate Limits
COUNTY, PARISH, STATE OR INTERNATIONAL BOUNDARY	County Boundary
WASH FLOWLINE	

ELEVATION REFERENCE MARKS

NOTE: NO ELEVATION REFERENCE MARKS WERE USED FOR THIS PROJECT. ALL WORK IS BASED ON 20' CONTOURS GENERATED FROM USGS DIGITAL ELEVATION MODELS (DEM).

NOTES

INDEX MAP



400' 0' 400' 800'

CONTOUR INTERVAL = 20 FEET

NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

WICKENBURG AREA

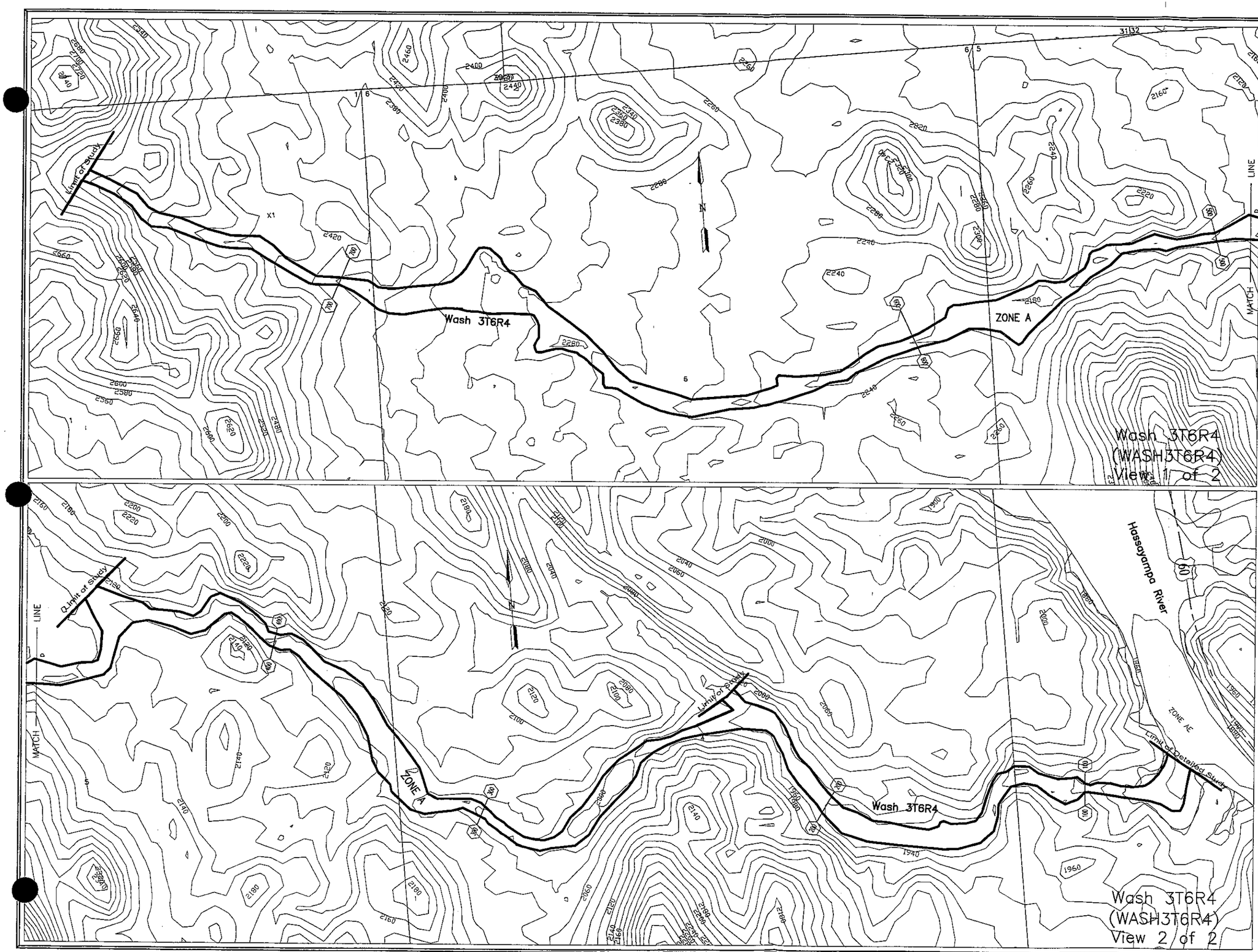
APPROXIMATE ZONE A FLOODPLAIN DELINEATION STUDIES
F.C.D. CONTRACT NO. 99-02

Wood, Patel & Associates, Inc.
CIVIL ENGINEERS
HYDROLOGISTS
LAND SURVEYORS

	BY	DATE
DESIGN	–	–
DESIGN CHK.	–	–
PLANS	–	–
PLANS CHK.	–	–

W/P# 99958 SHEET 27 OF 29

THIS MAP WAS PREPARED FROM USGS DIGITAL ELEVATION MODELS (DEM) AND DIGITAL LINE GRAPH DATA (DLG)



LEGEND

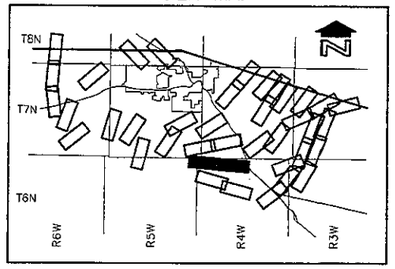
100-YR FLOODPLAIN BOUNDARY	
ZONE DESIGNATIONS	ZONE A
APPROX. FLOODPLAIN BOUNDARY	
CROSS SECTION	100 — 100
PLSS SECTION LINES	16 | 15 / 21 | 22
CORPORATE LIMITS	Corporate Limits
COUNTY, PARISH, STATE OR INTERNATIONAL BOUNDARY	County Boundary
WASH FLOWLINE	

ELEVATION REFERENCE MARKS

NOTE: NO ELEVATION REFERENCE MARKS WERE USED FOR THIS PROJECT. ALL WORK IS BASED ON 20' CONTOURS GENERATED FROM USGS DIGITAL ELEVATION MODELS (DEM).

NOTES

INDEX MAP



400' 0' 400' 800'

CONTOUR INTERVAL = 20 FEET

NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

WICKENBURG AREA

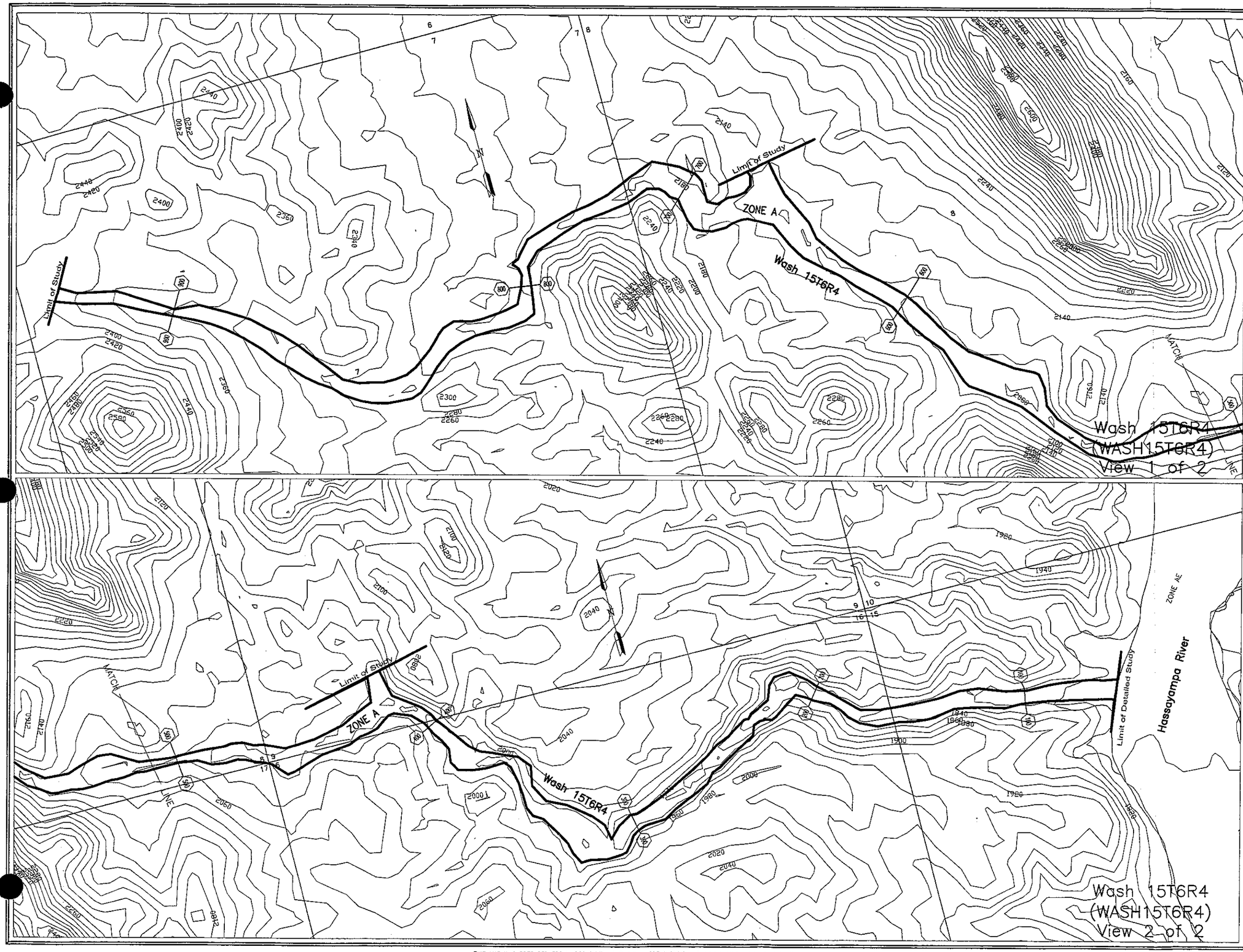
APPROXIMATE ZONE A FLOODPLAIN DELINEATION STUDIES
F.C.D. CONTRACT NO. 99-02

Wood, Patel & Associates, Inc. CIVIL ENGINEERS HYDROLOGISTS LAND SURVEYORS

	BY	DATE
DESIGN	–	–
DESIGN CHK.	–	–
PLANS	–	–
PLANS CHK.	–	–

W/P# 99958 SHEET 28 OF 29

THIS MAP WAS PREPARED FROM USGS DIGITAL ELEVATION MODELS (DEM) AND DIGITAL LINE GRAPH DATA (DLG)



LEGEND

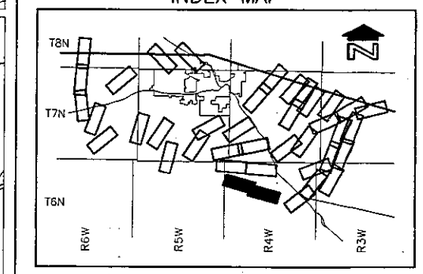
100-YR FLOODPLAIN BOUNDARY	
ZONE DESIGNATIONS	ZONE A
APPROX. FLOODPLAIN BOUNDARY	
CROSS SECTION	100 — 100
PLSS SECTION LINES	16|15 / 21|22
CORPORATE LIMITS	Corporate Limits
COUNTY, PARISH, STATE OR INTERNATIONAL BOUNDARY	County Boundary
WASH FLOWLINE	

ELEVATION REFERENCE MARKS

NOTE: NO ELEVATION REFERENCE MARKS WERE USED FOR THIS PROJECT. ALL WORK IS BASED ON 20' CONTOURS GENERATED FROM USGS DIGITAL ELEVATION MODELS (DEM).

NOTES

INDEX MAP



400' 0' 400' 800'

CONTOUR INTERVAL = 20 FEET

NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

WICKENBURG AREA

APPROXIMATE ZONE A FLOODPLAIN DELINEATION STUDIES
F.C.D. CONTRACT NO. 99-02

Wood, Patel & Associates, Inc. — CIVIL ENGINEERS, HYDROLOGISTS, LAND SURVEYORS

	BY	DATE
DESIGN	–	–
DESIGN CHK.	–	–
PLANS	–	–
PLANS CHK.	–	–

W/P# 99958 SHEET 29 OF 29

THIS MAP WAS PREPARED FROM USGS DIGITAL ELEVATION MODELS (DEM) AND DIGITAL LINE GRAPH DATA (DLG)