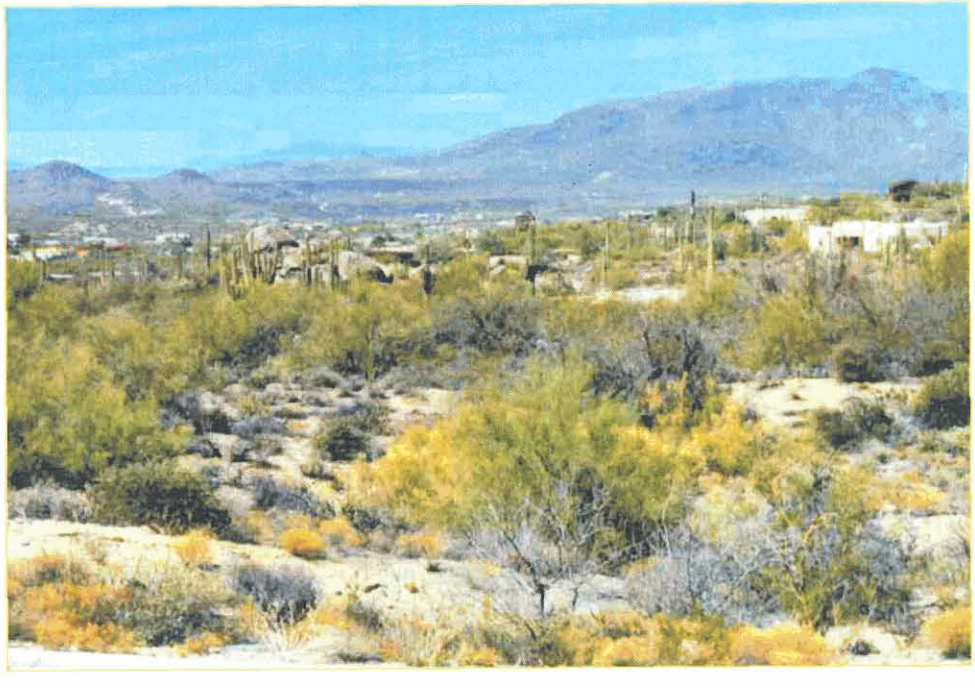
Flood Control District of Maricopa County
Phoenix, Arizona
April 2002

FLOODPLAIN DELINEATION STUDY
OF
ANDORA HILLS & GALLOWAY WASHES
FCD 99-14

TECHNICAL DATA NOTEBOOK
VOLUME 1 of 2



Submitted by:

JE Fuller / Hydrology and Geomorphology, Inc.
6101 S. Rural Road, Suite 110
Tempe, Arizona 85283
(480) 752-2124

on behalf of:

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

NATIONAL FLOOD INSURANCE PROGRAM

FEMA MAP COORDINATION CONTRACTOR

FLOOD CONTROL DISTRICT
RECEIVED
MAY 16 '02
CH & GM | FINANCE
PIO | LANDS
ADMIN | O & M
PE | P & PM
CONTRACTS
ROW | XS

May 9, 2002

Mr. Richard P. Harris, P.E.
Project Manager
Engineering Division
Flood Control District of Maricopa County
2801 West Durango Street
Phoenix, AZ 85009-6399

IN REPLY REFER TO:
Case No.: 01-09-1157P
Communities: Towns of Carefree and Cave Creek and City of Scottsdale, AZ
Community Nos.: 040126, 040129, and 045012

316-AD/ACK

Dear Mr. Harris:

This acknowledges receipt of additional data in support of your request for a Letter of Map Revision for the above-referenced communities. Our review of the submitted data indicates we have the minimum data needed to continue our evaluation. If we need additional data to complete our evaluation, or if delays are encountered, we will notify you in writing within 60 days of the date of this letter.

If you write to us about your request, please include the case number shown above in your letter. If you have general questions about your request, Federal Emergency Management Agency (FEMA) policy, or the National Flood Insurance Program, please call the FEMA Map Assistance Center, toll free, at 1-877-FEMA MAP (1-877-336-2627). If you have specific questions concerning your request, please call the Revisions Coordinator for your State, Pernille Buch-Pedersen, who may be reached at (703) 317-6224.

Sincerely,

Andrea L. Ryon, P.E., Director
Engineering Division
Michael Baker Jr., Inc.

cc: The Honorable Vincent Francia
Mayor, Town of Cave Creek

The Honorable Edward C. Morgan
Mayor, Town of Carefree

The Honorable Mary Manross
Mayor, City of Scottsdale

Mr. William Erickson
Floodplain Administrator
Transportation Systems Department
City of Scottsdale

Mr. Jonathan H. Pearson
Town Administrator
Town of Carefree

Mr. Wayne Anderson, P.E.
Town Engineer
Town of Cave Creek

Mr. Brian R. Iserman, P.E.
Hydrologist
JE Fuller Hydrology & Geomorphology, Inc.

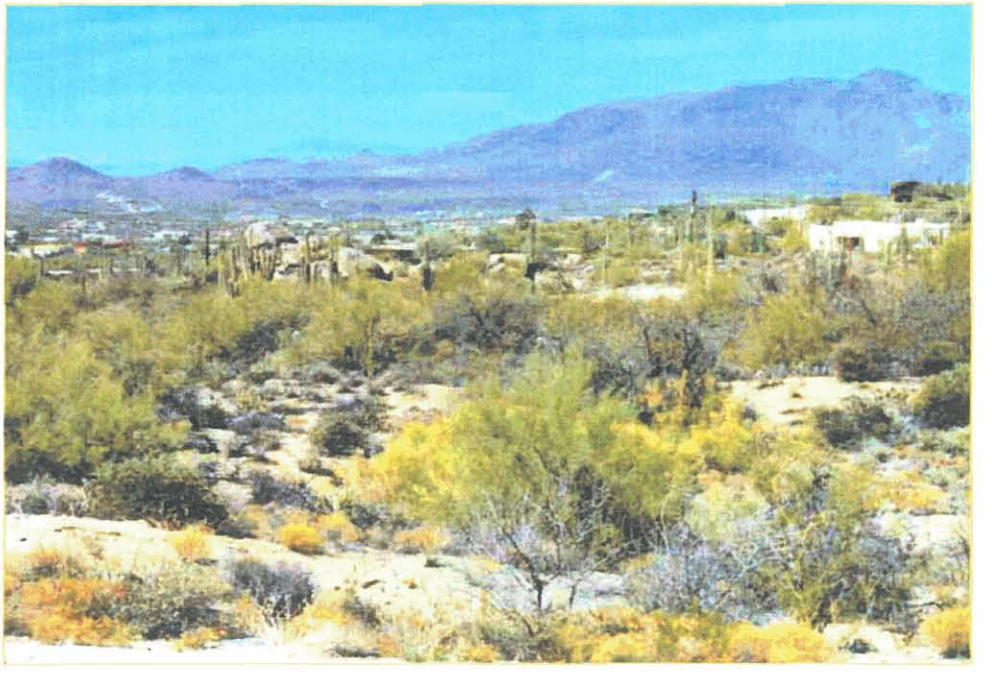
3601 Eisenhower Avenue, Alexandria, Virginia 22304-6425 PH: 703.960.8800 FX: 703.960.9125

Michael Baker Jr., Inc., under contract with the FEDERAL EMERGENCY MANAGEMENT AGENCY, is a Map Coordination Contractor for the National Flood Insurance Program

Flood Control District of Maricopa County
Phoenix, Arizona
April 2002

FLOODPLAIN DELINEATION STUDY
OF
ANDORA HILLS & GALLOWAY WASHES
FCD 99-14

TECHNICAL DATA NOTEBOOK
VOLUME 1 of 2



Submitted by:

JE Fuller / Hydrology and Geomorphology, Inc.
6101 S. Rural Road, Suite 110
Tempe, Arizona 85283
(480) 752-2124

on behalf of:

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

Property of
Flood Control District of
Please Return
2801 W. Durango
Phoenix

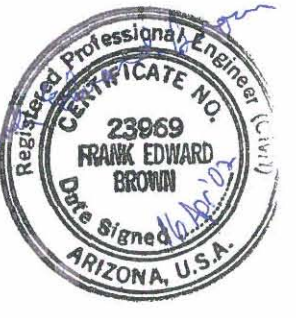


TABLE OF CONTENTS
TECHNICAL DATA NOTEBOOK

VOLUME 1 OF 2

SECTION 1: INTRODUCTION **1-1**

1.1 Purpose of study 1-1

1.2 Authority for study 1-1

1.3 Location of study reach 1-1

1.4 Methodology 1-2

1.5 Study Results 1-2

SECTION 2: ADWR/FEMA Forms and Local Government/ADWR Abstracts **2-1**

2.1 Study Documentation Abstract for FEMA Submittals 2-1

2.2 FEMA Forms 2-2

SECTION 3: SURVEY AND MAPPING INFORMATION **3-1**

3.1 Field Survey Information 3-1

3.2 Mapping 3-1

SECTION 4: HYDROLOGY **4-1**

4.1 Method Description 4-1

4.2 Parameter Estimation 4-3

4.3 Problems Encountered During Study 4-23

4.4 Calibration 4-23

4.5 Final Results 4-23

4.6 References 4-29

SECTION 5: HYDRAULIC ANALYSIS **5-1**

5.1 Method Description 5-1

5.2 Work Study Maps 5-2

TABLE OF CONTENTS (Continued)

5.3 Parameter Estimation 5-4

5.4 Cross-section descriptions 5-4

5.5 Modeling Considerations 5-5

5.6 Floodway modeling 5-7

5.7 Special problems encountered during the study 5-8

5.8 Calibration 5-8

5.9 Final Results 5-9

SECTION 6: EROSION AND SEDIMENT TRANSPORT 6-1

SECTION 7: DRAFT FIS REPORT DATA 7-1

7.1 Summary of Discharges 7-1

7.2 Floodway Data 7-2

7.3 Annotated Flood Insurance Rate Maps 7-4

7.4 Flood Profiles 7-5

LIST OF FIGURES

1 Location Map 1-3

2 Vicinity Map 1-4

4.1-1 Project Area 4-2

4.2.2-1 Comparison to Sabol Subbasins 4-4

4.2.2-2 Tc Flow Paths 4-5

4.2.2-3 Lca Map 4-6

4.2.2-4 Routing Reaches 4-7

4.2.2-5 Soils Map 4-8

4.2.2-6 Land Use Map 4-9

4.2.5.5-1 Daily Precipitation Extremes 4-15

4.2.5.5-2 Probability and Time of Year of 2" of Precipitation in One Day 4-16

4.2.5.5-3 Probability and Time of Year of 3" of Precipitation in One Day 4-16

4.5.1-1 Computed 100-Year Discharges 4-25

TABLE OF CONTENTS (Continued)
LIST OF FIGURES

4.5.1-2 Inflow & Outflow Hydrographs at RR282 4-26

Reduced Floodplain Work Maps 5-3

7.3 Annotated Flood Insurance Rate Maps 7-4

LIST OF TABLES

4.2.2-1 Subbasin IDs 4-10

4.2.5.1-1: Monthly Precipitation Summary for Carefree, Arizona (021282) 4-12

4.2.5.1-2: Monthly Precipitation Summary for Carefree Ranch (#4930) 4-12

4.2.5.2-1: Distribution of Annual Peak Flows 4-13

4.2.5.3-1: Point Precipitation Values for Galloway Wash 4-14

4.2.5.4-1: Summary of Areal Reduction Values for Index Storms Used in JD Records .. 4-14

4.2.5.5-1: Extreme Precipitation Events Recorded at FCDMC Carefree Ranch Gauge (4930) 4-15

4.2.6.1-1: Summary of composite Green & Ampt Rainfall Losses with Lag Times 4-17

4.2.6.1-2: Natural-Conditions Rainfall Loss Characteristics for Study Area Soil Map Units 4-18

4.2.6.1-3: Land Use Default Values 4-19

4.2.6.2-1 Maricopa County Unit Hydrograph Proceedure 2 Lag Time Summary 4-19

4.5.1-1 Summary Hydrologic Analyses Results for Galloway Wash 4-24

4.5.1-2 Summary of Reservoir Routing at Charles Blair McDonald Drive, CP282 (100-yr 24-hr) 4-24

4.5.1-3 Computed Discharge Values for Galloway Wash 4-26

4.5.2-1 Comparison of HEC-1 Results to USGS Regional Regression Analysis and Previous Studies 4-28

4.5.2-2: Unit-Discharge Comparison of HEC-1 Model Results with Results of USGS Regional Regression Analysis and Sabol 4-29

5.5.2.1: Culverts and Bridges 5-5

5.5.4.1. Summary of Split Flows and Other Changes in Discharge 5-6

5.9.1 HEC-RAS Floodplain Output 5-10

5.9.2 HEC-RAS Floodway Output 5-11

TABLE OF CONTENTS (Continued)
LIST OF PHOTOS

4-1: Looking upstream (east) at outlet of detention basin on the north branch of Galloway Wash at Charles Blair McDonald Dr. 4-21

4-2: Looking approximately northeast into the inlet chamber to the detention basin outlet. Note the 3'x2' orifice inlet to the chamber at upper right. 4-21

4-3: Looking downstream (west) at entrance to the two unregulated cells of the detention basin located on the north branch of Galloway Wash at Charles Blair McDonald Dr. 4-22

4-4 Aerial view of detention basin outlet structure..... 4-22

LIST OF APPENDICES

A REFERENCES

B GENERAL DOCUMENTATION & CORRESPONDENCE
- B.1 Special Problems Report
- B.2 Contact (Telephone) Reports
- B.3 Meeting Minutes or Reports
- B.4 General Correspondence
- B.5 Contract Documents

C SURVEY FIELD NOTES
- C.1 Survey Field Notes for Aerial Mapping Control
- C.2 Survey Field Notes for Hydrologic Modeling
- C.3 Survey Field Notes for Hydraulic Modeling

D HYDROLOGIC ANALYSIS SUPPORTING DOCUMENTATION
- D.1 Precipitation Data
- D.2 Physical Parameter Calculations
- D.3 Hydrograph Routing Data
- D.4 Reservoir Routing Data
- D.5 Hydrologic Calculations

VOLUME 2 OF 2

E HYDRAULIC ANALYSIS SUPPORTING DOCUMENTATION
- E.1: Roughness Coefficient Estimation
- E.2: Cross Section Plots
- E.3: Expansion and Contraction Coefficients
- E.4: Analysis of Structures
- E.5: Hydraulic Calculations
- E.5.1: Flow Distribution/HEC-2 Analyses to Determine Splits/Overflows Which Were Not Mapped
- E.5.2: Flow Data

TABLE OF CONTENTS (Continued)

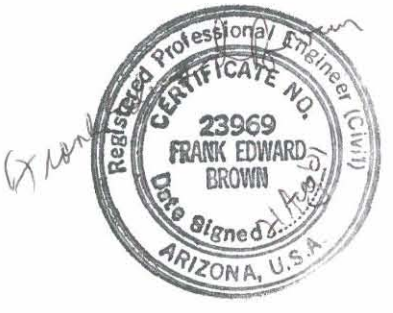
E HYDRAULIC ANALYSIS SUPPORTING DOCUMENTATION

E.5.3: Summary of Manning's 'n' Values, Channel Reach Lengths, Coefficients of Contraction and Expansion
E.5.4: HEC-RAS Geometry Data
E.5.5: HEC-RAS Output (Tables 5.9.1, 5.9.2).
Study Work Maps and CD with Hydrology/Hydraulic models Located in Back Pockets

Preface

This study was conducted for the Flood Control District of Maricopa County (FCDMC) by JE Fuller / Hydrology and Geomorphology, Inc. (JEF) in association with Dibble & Associates (Dibble), M&B Aerial Mapping, LLC (M&B), and A Team Professional Associates, Inc (A Team). JEF was responsible for the overall management and integration of the work products from the other team members as well as for the performance of the hydrology and floodplain delineation for Galloway Wash and development of as-built plans for all structures modeled in this study. Dibble performed the floodplain delineation for Andora Hills Wash using existing hydrology provided by the FCDMC in the Technical Data Notebook for the study titled *Cave Creek Above Carefree Highway Floodplain Delineation Study, FCD 95-28.* M&B performed the topographic mapping using control surveyed by A Team. A Team also performed the survey in support of development of the as-built plans for all structures modeled in this study.

Three change orders were issued for this project. **Change Order 1** was for inclusion of the Dream Street Bridge on Galloway Wash, which was constructed after the original study was approximately 95% complete. **Change Order 2** was for a time extension, and **Change Order 3** was for revisions to the floodway on Andora Hills Wash between river stations 1.266 and 1.609. The **Change Order 3** revisions were requested by the Flood Control District of Maricopa County as a result of a shift in the floodplain management strategy for that particular reach of Andora Hills Wash. JEF performed the subsequent floodway modifications to Andora Hills Wash between river stations 1.266 and 1.609.



SECTION 1: INTRODUCTION

1.1 Purpose of study

The purpose of this floodplain delineation study is to develop revised 100-year peak discharges for the Galloway Wash watershed and to delineate revised 100-year floodplains and 100-year floodways associated with the Andora Hills and Galloway Washes using detailed step-backwater modeling methods based on new 2-foot contour interval, 200-scale topographic mapping. The 100-year peak discharges for Andora Hills Wash were furnished by the Flood Control District of Maricopa County, based on discharges developed for a previous Floodplain Delineation; however, new hydrology was developed for Galloway Wash during this study.

This information will be used to update existing floodplain regulations as part of the regular phase of the National Flood Insurance Program (NFIP). The information will also be used by local and regional planners and floodplain administrators to further promote sound land use practices and floodplain development.

This study is contained within portions of the Town of Carefree, Arizona, the Town of Cave Creek, Arizona, the City of Scottsdale, Arizona and unincorporated areas of Maricopa County, Arizona. This study includes approximately 3.0 river miles of Andora Hills Wash from its confluence with Cave Creek, and approximately 4.8 river miles of Galloway wash from its confluence with Cave Creek.

1.2 Authority for study

JE Fuller / Hydrology and Geomorphology, Inc. (JEF) performed this study under contract with the Flood Control District of Maricopa County (FCDMC). JEF's Project Manager for this project is Brian Iserman, P.E. The contract number is FCD 99-14. The FCDMC is located at 2801 West Durango Street, Phoenix, AZ 85009 (602) 506-1501. The Project Manager for the FCDMC is David Boggs, P.E.

1.3 Location of study reach

The Andora Hills and Galloway Washes are located in north east Maricopa County, Arizona (see Figure 1 and Figure 2). The watersheds of both Andora Hills Wash and Galloway Wash encompass approximately 24 square miles. The floodplain delineation covers sections 26, 27, 28, 29, 34, 35, 36 of Township 6 North, Range 4 East, and sections 30 and 31 of Township 6 North, Range 5 East (see Figure 2, Reference 1).

Andora Hills Wash is a well-defined, foothills wash with channel bottom widths typically no greater than approximately 20 feet. The channel bed material varies between coarse-grained sands and gravels to cobbles and boulders. The upper reaches tend to have more cobbles and boulders than the lower reaches. **Galloway Wash** is also a well defined foothills wash, however

it has main channel bottom widths typically greater than 60 feet. The channel bed material is uniformly comprised of course sands and gravels. Neither wash has significant overbank flow during the 100-year regulatory peak discharge.

The climate in the area is semi-arid desert with an average annual precipitation of approximately 12 inches. Precipitation is typically divided into two seasons of comparative rainfall depths: summer and winter. The summer storms are associated with warm, moist tropical air masses that enter the state from the Gulf of Mexico producing moderate to intense afternoon and evening thundershowers. Winter precipitation originates from the Pacific Ocean and produces light to moderate precipitation over relatively large areas.

1.4 Methodology

1.4.1 Hydrology

The 100-year peak discharge values used for Andora Hills Wash were provided by the FCDMC in the Technical Data Notebook for the study titled *Cave Creek Above Carefree Highway Floodplain Delineation Study, FCD 95-28*[9]. This same study also provided a limited number of 100-year discharge values for Galloway Wash. The HEC-1 modeling was done using the methodology set forth in the *Drainage Design Manual for Maricopa County, Volume I, Hydrology*[6]. To provide an adequate number of concentration points along Galloway Wash for the purpose of detailed hydraulic modeling, this study (FCD 99-14) includes additional hydrologic analyses. 100-year peak discharge values for Galloway Wash at additional concentration points were determined using the US Army Corps of Engineers (COE) HEC-1 Computer Program, version 4.0.1E, dated May, 1991 in accordance with the methodology set forth in the FCDMC *Drainage Design Manual.*

1.4.2 Hydraulics

The U.S. Army Corps of Engineers HEC-RAS computer program, Version 2.2a, was used to determine the 100-year floodplain/floodway limits and water surface elevations. Cross section data were developed using BOSS RiverCAD Version 4.0. The floodplain/floodway limits and base flood elevations were drafted using AutoCAD Land Development Desktop Release 2, Service Pack 1. Cross section locations are shown on the work study maps found in the back pockets of the Exhibit Maps section of this notebook.

1.5 Study Results

This study resulted in the new delineation of approximately 7.8 miles of floodplain/floodway in the Andora Hills and Galloway Washes study area. The new delineation of Andora Hills Wash includes modeling of five culverts and two split-flow junctions. The new delineation of Galloway Wash includes modeling of one culvert, two bridges, two split-flow junctions and one tributary junction. The inundation areas and water surface elevations for the newly delineated floodplains and floodways are shown in the maps in Section 5 and the Exhibit Maps at the end of this notebook.

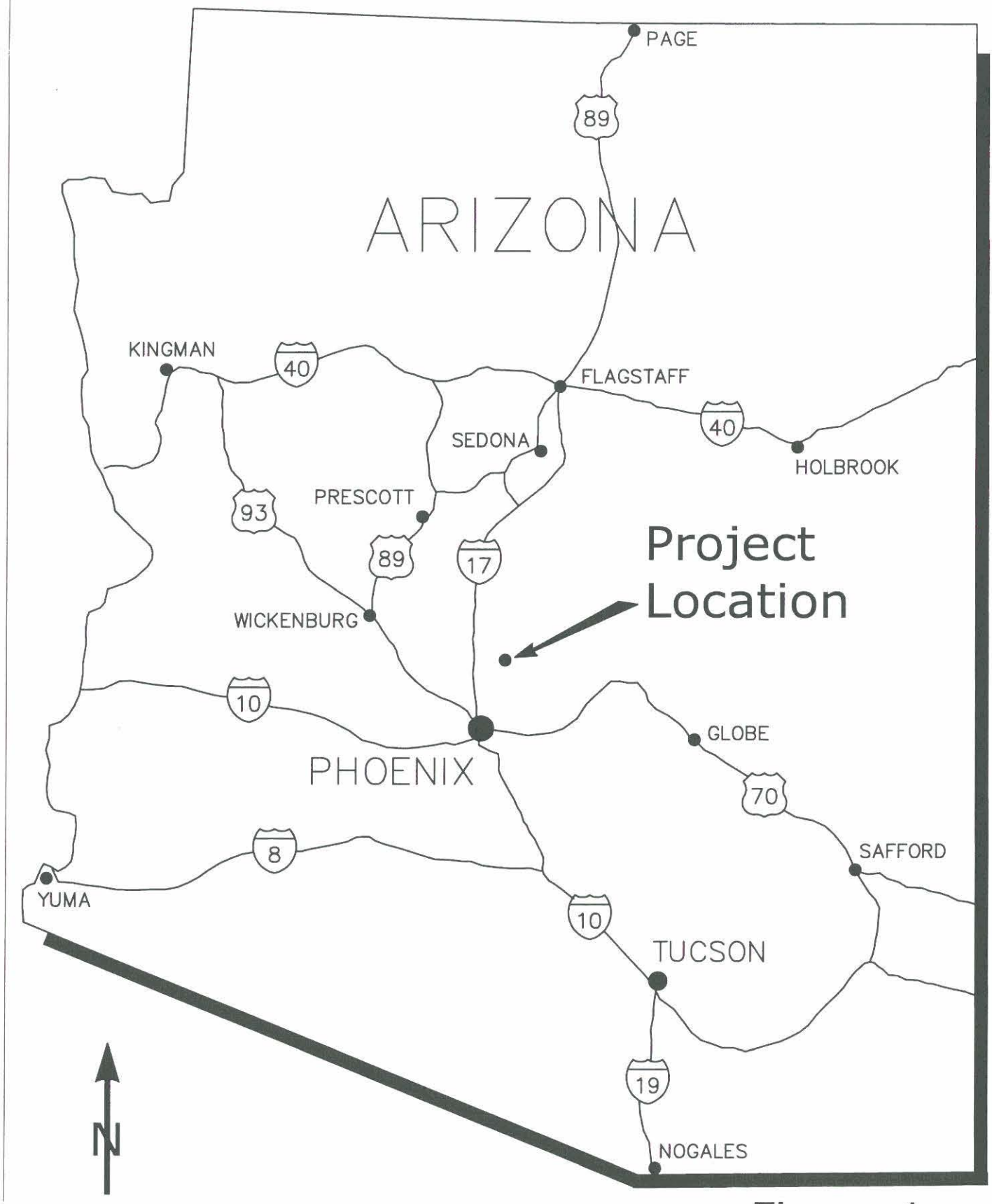


Figure 1
Location Map

Floodplain Delineation Study of Andora Hills & Galloway Washes, FCD 99-14

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

FLOODPLAIN DELINEATION STUDY OF ANDORA HILLS & GALLOWAY WASHES FCD 99-14

SEPTEMBER, 2000

MARICOPA UNINCORPORATED

CAVE CREEK

CAREFREE

SCOTTSDALE

PROJECT AREA

GALLOWAY WASH BASIN

GALLOWAY WASH STUDY AREA FOR NEW FLOODPLAIN DELINEATION FCD 99-14

ANDORA HILLS WASH BASIN

LEGEND

- PROJECT AREA BOUNDARY (HYDROLOGY)
- PROJECT AREA BOUNDARY (HYDRAULICS)
- JURISDICTIONAL BOUNDARY

FIGURE 2
VICINITY MAP

Scale in Feet
2000 0 2000 4000

JE FULLER HYDROLOGY & GEOMORPHOLOGY, INC.
5235 SOUTH KYRENE ROAD, SUITE 205
TEMPE, ARIZONA 85283
480-752-2124

SECTION 2: ADWR/FEMA Forms and Local Government/ADWR Abstracts

2.1 Study Documentation Abstract for FEMA Submittals

Study Documentation Abstract For FEMA Submittals		Initial Study	Restudy	CLOMR	LOMR	X Other
Section 2.1: Study Documentation Abstract for FEMA Submittals						
2.1.1	Date Study Accepted					
2.1.2	Study Contractor	JE Fuller / Hydrology and Geomorphology, Inc.				
	Contact(s)	Brian R. Iserman, P.E., Jonathan E. Fuller, P.E.				
	Address	6101 S. Rural Rd., Suite 110 Tempe, AZ 85283				
	Phone	(480) 752-2124				
	Internal Reference Number					
2.1.3	FEMA Technical Review Contractor	Michael Baker, Jr.				
	Contact(s)	Pernille Buch-Pederson				
	Address	3600 Eisenhower Ave. Suite 600 Alexandria, VA 22304				
	Phone	703-317-6224				
	Internal Reference Number					
2.1.4	FEMA Regional Reviewer	Michael Baker, Jr. Engineering				
	Phone	(703) 960-8800				
2.1.5	State Technical Reviewer	Arizona Department of Water Resources				
	Phone	(602) 417-2445				
2.1.6	Local Technical Reviewer	Flood Control District of Maricopa County (FCDMC)				
	Phone	(602) 506-1501				
2.1.7	Reach Description	Galloway Wash from confluence with Cave Creek to Pima Rd., Andora Hills Wash from confluence with Cave Creek to Burro Rd.				
2.1.8	USGS Quad Sheet(s) with original photo date & latest photo revision date	Cave Creek, & Wildcat Hill Arizona 1965, Photo Revised 1981, Original photo date: 1962				
2.1.9	Unique Conditions and Problems					
2.1.10	Coordination of Peak Discharges (Agency, Date, Comments)	FCDMC, 1998, from existing Upper Cave Creek Hydrology FCDMC Contract No. 95-25 and from this current project FCDMC Contract No. 99-14				

2.2 FEMA Forms

FEDERAL EMERGENCY MANAGEMENT AGENCY **REVISION REQUESTER AND COMMUNITY OFFICIAL FORM**	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:

2. OVERVIEW

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

☒ Physical Change ☒ Improved Methodology/Data ☒ Floodway Revision

☐ Other Describe:

Note: A photograph is not required, but is very helpful during review.

2. Flooding Source: Andora Hills and Galloway Washes

3. Project Name/Identifier: Floodplain Delineation Study of Andora Hills and Galloway Washes, FCD 99-14

4. FEMA zone designations affected: Zone AE, 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
040037	Unincorporated Maricopa County	AZ	04013C	805F 808G 809G	12/3/93
040126	Town of Carefree	AZ	04013C	805F 808G 809G	12/3/93
040129	Town of Cave Creek	AZ	04013C	805F 808G 809G	12/3/93
045012	City of Scottsdale	AZ	04013C	805F 808G 809G	12/3/93

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

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

(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**

Richard P. Harris

Signature of Revision Requester

Richard P. Harris, P.E. Project Manager
Printed Name and Title of Revision Requester

Flood Control District of Maricopa County
Company Name

Telephone No.: (602) 506-1501 Date: 05/18/01

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

Jonathan Pearson

Signature of Community Official

Jonathon Pearson, Town Administrator
Printed Name and Title of Community Official

Town of Carefree, Arizona
Community Name

Telephone No.: (480) 488-3686 Date: 5/30/01

CERTIFICATION BY REGISTERED PROFESSIONAL ENGINEER AND/OR LAND SURVEYOR

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

Brian R. Iserman 5/18/01

Signature

Brian Iserman, P.E., Hydrologist
Printed Name and Title of Revision Requester

Registr No. 29325 Expires (Date) 9/30/01 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

4. ENCROACHMENT INFORMATION

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

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

(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**

Richard P. Harris
Signature of Revision Requester

Richard P. Harris, P.E. Project Manager
Printed Name and Title of Revision Requester

Flood Control District of Maricopa County
Company Name

Telephone No.: (602) 506-1501 Date: 05/23/01

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

Collis Lovely for
Signature of Community Official

Collis Lovely, Floodplain Administrator
Printed Name and Title of Community Official

City of Scottsdale, Arizona
Community Name

Telephone No.: (480) 312-7852 Date: 5/23/01

CERTIFICATION BY REGISTERED PROFESSIONAL ENGINEER AND/OR LAND SURVEYOR

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

Brian L. Iserman 5/18/01
Signature

Brian Iserman, P.E., Hydrologist
Printed Name and Title of Revision Requester

Registr No. 29325 Expires (Date) 9/30/01 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

4. ENCROACHMENT INFORMATION

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

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

(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

lease 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**

Richard P. Harris

Signature of Revision Requester

Richard P. Harris, P.E. Project Manager
Printed Name and Title of Revision Requester

Flood Control District of Maricopa County
Company Name

Telephone No.: (602) 506-1501 Date: 05/23/01

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

Usama Abujbarah

Signature of Community Official

Usama Abujbarah, Town Manager
Printed Name and Title of Community Official

Town of Cave Creek, Arizona
Community Name

Telephone No.: (480) 488-1400 Date: 5/24/2001

CERTIFICATION BY REGISTERED PROFESSIONAL ENGINEER AND/OR LAND SURVEYOR

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

Brian L. Iserman 5/18/01

Signature

Brian Iserman, P.E., Hydrologist
Printed Name and Title of Revision Requester

Registr No. 29325 Expires (Date) 9/30/01 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

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

ublic 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: Unincorporated Maricopa County, Town of Carefree, Town of Cave Creek, City of Scottsdale, Arizona

Flooding Source: Galloway Wash

Project Name/Identifier: Floodplain Delineation Study of Andora Hills and Galloway Washes, FCD 99-14

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)
See Page 4-26 in the TDN for an expanded, detailed comparison of discharges at 11 concentration points.			

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

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

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

ATTACHMENT D: PRECIPITATION/RUNOFF MODEL

		FIS:		Revised:	
1.	Method or model used:	TR-20, HEC-1		HEC-1	
	Version:	Not Available		4.0.1E	
	Date:	Not Available		May 1991	
2.	Source of rainfall depth:	NOAA Atlas II		NOAA Atlas II	
3.	Source of rainfall distribution:	Not Available		SCS Type II	
4.	Rainfall duration:	Not Available		24 Hour	
5.	Areal adjustment to precipitation (%):	Not Applicable		See Table 2 of FCDMC Drainage Design Manual, Volume I	
6.	Maximum overland flow length is	N/A, Snyder & Clark Unit Graphs used		N/A, Given Unit Graph used	
6.	Hydrograph development method:	Snyder & Clark		The Phoenix Mountain & Desert Rangeland S-Graphs from Table 5.3 of the FCDMC Drainage Design Manual, Volume I	
8.	Loss rate method:	Green & Ampt and others N/A		Green & Ampt	
	Source of soils information: Source of land use information:	Not Available		SCS & USFS provided by FCDMC digitally	
9.	Channel routing method: normal depth storage routing	Normal Depth & others N/A		Normal depth storage routing	
10.	Reservoir routing:	Modified Puls & others N/A		Modified Puls	
11.	Baseflow considerations: no	☐ Yes	☒ No	☐ Yes	☒ No
	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.

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

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: Unincorporated Maricopa County, Town of Carefree, Town of Cave Creek, City of Scottsdale, Arizona

Flooding Source: Andora Hills Wash

Project Name/Identifier: Floodplain Delineation Study of Andora Hills and Galloway Washes, FCD 99-14

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: River mile 0.1

Upstream Limit: River mile 3.023

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 Andora.prj ☒ Floodway File Name Andora.prj
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. See Section 3 explanation attached.

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.

☐ Supercritial 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)

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)

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

Section 3
Explanation of starting water-surface elevations:

Normal depth is the basis for the starting water surface elevation for Andora Hills Wash. Starting water-surface elevations for tributaries are assumed to equal the computed water surface elevations of the main streams just downstream of the confluence (i.e., HEC-RAS junction assuming coincident peaks). This assumption is valid because all tributaries in this study originate as distributary branches born from the main stream (i.e., the ratio of the tributary watershed area to the main stream watershed area is approximately 1.0).

Section 4
Explanation of critical depth:

32 of 86 cross sections modeled default to critical depth. Slopes for the entire study area average 1.7%. Therefore, critical flow is expected to occur in parts of the study area with the greatest slopes.

Explanation of water surface higher than the endpoints of cross sections:

All cross sections contain the 100-year discharge, however an inconsequential flow split (i.e., breakout flow) of approximately 1 cfs occurs between River Stations 2.090 and 2.124. This relatively small flow split was not modeled per the FCDMC's request. A separate HEC-2 split flow analysis, which uses the side weir routine, was used to estimate the overflow discharge; this model output is located in Appendix E of the TDN. The split discharge estimate was not deducted from the discharge used in the floodplain delineations presented in this study. The entire 100-year peak discharge continued to be used for further downstream delineation per the FCDMC's request.

One other breakout of approximately 276 cfs occurs at River Station 1.461. A detailed split flow analysis was not conducted for this breakout because the expected flood hazard associated with this breakout could not be adequately characterized using the HEC RAS model. Instead, the area impacted by this breakout has been modeled using approximate methods to determine an A Zone. Supporting documentation for the approximate A Zone delineation is included in Appendix E. The split discharge estimate was not deducted from the discharge used in the floodplain delineations presented in this study. The entire 100-year peak discharge continued to be used for further downstream delineation per the FCDMC's request.

FEDERAL EMERGENCY MANAGEMENT AGENCY **RIVERINE / COASTAL MAPPING FORM**	O.M.B No. 3067-0148 Expires April 30, 2001

Public reporting burden for this form is estimated to average 1.5 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing 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: Unincorporated Maricopa County, Town of Carefree, Town of Cave Creek, City of Scottsdale, Arizona

Flooding Source: Andora Hills Wash

Project Name/Identifier: Floodplain Delineation Study of Andora Hills & Galloway Washes, FCD 99-14

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
h. 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.)? Aerial mapping, flown 9/30/99, and Field Survey performed throughout Spring, 2000

3. What is the scale and contour interval of the following workmaps?

Effective FIS Scale 400 Contour Interval 4'

Revision Request Scale 1"= 200' Contour Interval 2'

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 ☒ N/A

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

. 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).

Explanation for **Mapping Changes, 1A**

This is a detailed study with no Zone A boundaries.

Explanation for **Mapping Changes, 1M, 1N, & 1O, 1I**

No coastal or V- zones.
Study not for individual property.

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

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: Unincorporated Maricopa County, Town of Carefree, Town of Cave Creek, City of Scottsdale, Arizona

Flooding Source: Galloway Wash

Project Name/Identifier: Floodplain Delineation Study of Andora Hills and Galloway Washes, FCD 99-14

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: River mile 0.035

Upstream Limit: River mile 4.832

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 Galloway.prj ☒ Floodway File Name Galloway.prj
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.

☐ Supercritial 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)

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)

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

Section 3
Explanation of starting water-surface elevations:

Normal depth is the basis for the starting water surface elevation for Galloway Wash. Starting water-surface elevations for tributaries are assumed to equal the computed water surface elevations of the main streams just downstream of the confluence (i.e., HEC-RAS junction assuming coincident peaks). This assumption is valid for all tributaries in this study originating as distributary branches born from the main stream (i.e., the ratio of the tributary watershed area to the main stream watershed area is approximately 1.0). Since a short reach of Grapevine Wash above the confluence with Galloway Wash modeled in order to make a smooth transition, the peaks are approximately coincident, and therefore, the starting water surface elevation for the tributary of Grapevine Wash is assumed to equal the computed water surface elevation on the main branch of Galloway Wash. Note that the existing discharge was used for Grapevine Wash in order to smoothly join the floodplains.

Section 4
Explanation of critical depth:

132 of 154 cross sections modeled default to critical depth. Because slopes for the entire study area average 1.4%, and the relatively smooth, sand-bed channel has very little overbank flow, critical flow is expected to occur throughout the study area, especially those areas with the greatest slopes and least obstructions to flow.

Explanation of water surface higher than the endpoints of cross sections:

The 100-year discharge exceeds the right endpoint of cross section 4.796 on Galloway Wash, Reach 5 by approximately 1.2 feet. Since the overflow is in the form of side-weir flow, an HEC-2 analysis was performed separately in order to quantify the discharge of the overflow. Based on the HEC-2 analysis, an estimated 94 cfs overflows out of the main channel and is captured by another hydraulically separate channel which is not part of the study

An inconsequential flow split of approximately 60 cfs occurs at Galloway Wash, Reach 6, between River Stations 3.504 and 3.514. This relatively small flow split was not modeled per the FCDMC's request. The calculations to determine the above described flow splits/overflows are located in Appendix E of the TDN. The split discharge estimates were not deducted from the discharges used in the floodplain delineations presented in this study. The entire 100-year peak discharge continued to be used for further downstream delineation per the FCDMC's request.

Another inconsequential flow split of approximately 206 cfs occurs at Galloway Wash, Reach 6, between River Stations 3.364 and 3.374. This flow split was not modeled per the FCDMC's request. The calculations to determine the above described flow splits/overflows are located in Appendix E of the TDN. The split discharge estimates were not deducted from the discharges used in the floodplain delineations presented in this study. The entire 100-year peak discharge continued to be used for further downstream delineation per the FCDMC's request.

FEDERAL EMERGENCY MANAGEMENT AGENCY **RIVERINE / COASTAL MAPPING FORM**	O.M.B No. 3067-0148 Expires April 30, 2001

Public reporting burden for this form is estimated to average 1.5 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing 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: Unincorporated Maricopa County, Town of Carefree, Town of Cave Creek, City of Scottsdale Arizona

Flooding Source: Galloway Wash

Project Name/Identifier: Floodplain Delineation Study of Andora Hills & Galloway Washes, FCD 99-14

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
Location and alignment of all cross sections with stationing control indicated.	☒ Yes	☐ No	☐ N/A
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
h. 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.)? Aerial mapping, flown 9/30/99, and Field Survey performed throughout Spring, 2000

3. What is the scale and contour interval of the following workmaps?

Effective FIS Scale _____ Contour Interval _____

Revision Request Scale 1"= 200' Contour Interval 2'

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 ☒ N/A

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

. 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).

Explanation for **Mapping Changes, 1A**

This is a detailed study with no Zone A boundaries.

Explanation for **Mapping Changes, 1M, 1N, 1O, 1I**

No coastal or V- zones.
Study not for individual property.

SECTION 3: SURVEY AND MAPPING INFORMATION

3.1 Field Survey Information

Horizontal and vertical control surveys for this project were performed by A Team Professional Associates, Inc. Field surveys for the mapping were performed during October and early November 1999. As-built surveys were performed throughout the Spring of 2000. The field crews worked under the direct supervision of Mr. Dave Rhine, R.L.S..

The coordinate grid is based on North American Datum of 1983 (NAD 83), Central Zone of Arizona State Plane Coordinate System. Elevations are based upon National Geodetic Vertical Datum of 1929 (NGVD 29) with a conversion factor to North America Vertical Datum of 1988 (NAVD88) provided.

The survey work included establishment of a horizontal and vertical control net, a bench loop for the vertical control, placement and location of aerial photography panels, location of ERM's, installation of two new ERMs and map checks using both spot elevations and cross sections. Additional survey work was done to develop as-built plans for 8 structures.

Appendix C is organized as a narrative description of the procedures, techniques, and equipment used to establish horizontal and vertical control, set panels, locate control points and ERM's, and perform checkshots. Section C.3 includes copies of the field books, the NGS Control Station data sheets, the Excel spreadsheets used to calculate the Root Mean Square Error for the spot check shots and cross sections, and as-built drawings for the 8 structures modeled in this project.

3.2 Mapping

Existing mapping for the western extent of this study was provided by the FCDMC from the previous study titled Flood Delineation Study of Cave Creek above Carefree Highway, FCD 95-28 by George V. Sabol Consulting Engineers, Inc. in Association with Mclaughlin Kmetty Engineers, LTD. The first 0.3 river miles of Galloway Wash and the first 0.5 river miles of the Andora Hills Wash are located on this existing mapping. The existing mapping was flown January 12, 1996 by Aerial Mapping Company, Inc. This existing mapping was used in order to best join the new study to the Cave Creek floodplain delineation.

The new mapping area was joined to the existing 1996 mapping, and includes strips along Andora Hills and Galloway Washes of approximately 1.8 square miles. The new mapping was produced using aerial photogrammetry. The photography and mapping were produced by M&BAerial Mapping, LLC,(M&B) under the supervision of Mr. Robert Moon.

The map scale is 1"=200'. The project was flown for 2-ft interval contour mapping. The flight date was September 30, 1999. Two flight lines were flown in an east to west alignment resulting in a scale of 1:7200.

The horizontal and vertical control as well as the panels used in the mapping were supplied by A Team Professional Associates, Inc. The coordinate system is based on NAD 83 (grid), Arizona State Plane - Central Zone. The vertical coordinate system is NGVD 29. To convert from NGVD29 to NAVD88 add 2.05 feet (0.625 meters) to all elevations. This conversion is based on Vertcon since the nearest true datum point is more than 20 miles away from the project location.

An analytical adjustment was performed to densify the field control for mapping purposes. The mapping was derived from a digital terrain model, constructed according to the FCDMC's specifications. Mass points at a nominal 50' interval provide the base data, along with breakline information at all terrain grade breaks.

SECTION 4: HYDROLOGY

4.1 Method Description

Andora Hills Wash

The 100-year peak discharge values used for Andora Hills Wash were provided by the FCDMC in the Technical Data Notebook for the study titled *Cave Creek Above Carefree Highway Floodplain Delineation Study, FCD 95-28*[9]. This same study also provided a limited number of 100-year discharge values for Galloway Wash. The HEC-1 modeling performed by Sabol to obtain these earlier results was done using the methodology set forth in the *Drainage Design Manual for Maricopa County, Volume I, Hydrology*[6].

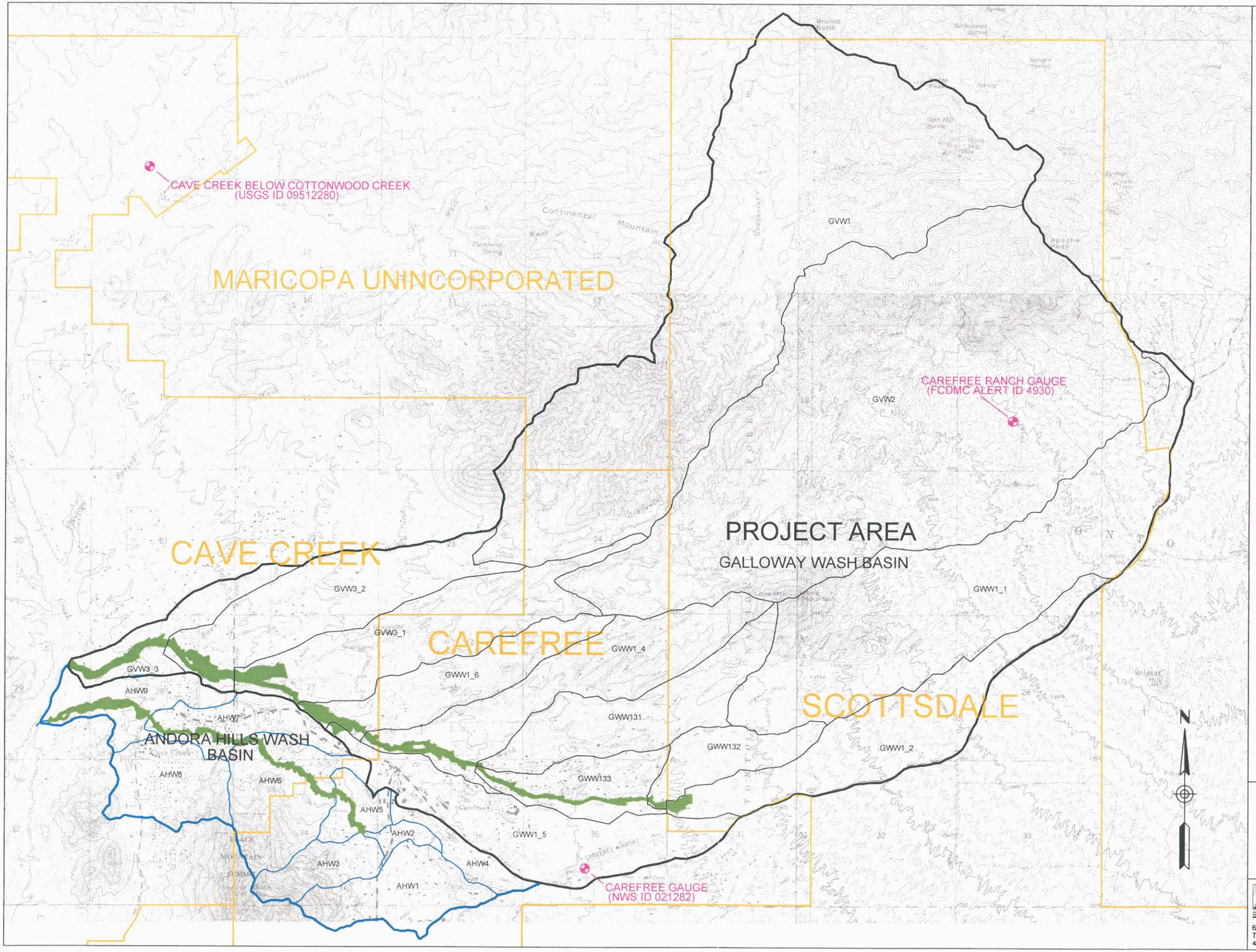
Galloway Wash

Since the FCD 95-28 study did not provide an adequate number of concentration points along Galloway Wash for the purpose of detailed hydraulic modeling, this study (FCD 99-14) includes the additional hydrologic analyses. 100-year peak discharge values for Galloway Wash at additional concentration points were determined using the US Army Corps of Engineers (COE) HEC-1 Computer Program, version 4.0.1E, dated May, 1991 in accordance with the methodology set forth in the FCDMC *Drainage Design Manual.* Concentration point locations for the Galloway Wash HEC-1 modeling were discussed and mutually agreed upon between the Flood Control District of Maricopa County (FCDMC) and JEF. Concentration points are included at the following locations:

- At the limits of this study
- At significant tributaries to Galloway Wash
- At significant road crossings.

The new Galloway Wash HEC-1 modeling was developed for existing conditions using the 100-year, 24 hour rainfall depth and the SCS Type II distribution. Additionally, a 6-hour HEC-1 model was developed using the 6-hour storm patterns published in the District's Drainage Design Manual. HEC-1 rainfall losses for the Galloway Wash watershed were estimated using the Green and Ampt infiltration equation option. The Phoenix Mountain and Desert/Rangeland S-graphs as defined in the *Drainage Design Manual, Volume I* are used in this study to generate hydrographs. The normal depth storage routing routine was used for all channel reaches in this study. Representative 8-point cross sections were obtained from previous FIS study model results and attendant topographical mapping.

The overall HEC-1 modeling study area is indicated on Figure 4.1-1. The remainder of Section 4 describes data, parameters and modeling results for Galloway Wash only. See Sabol, 1997 for similar values for Andora Hills Wash. 100-year peak discharges for both washes are also presented in Sections 5 and 7 of this Technical Data Notebook (TDN).



FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY

FLOODPLAIN DELINEATION STUDY OF
ANDORA HILLS & GALLOWAY WASHES
FCD 99-14

FIGURE 4.1-1

MARCH, 2002

LEGEND

- PROJECT AREA BOUNDARY (HYDROLOGY)
- BASIN BOUNDARIES FOR ANDORA HILLS WASH (From existing hydrology)
- PROJECT AREA BOUNDARY (HYDRAULICS)
- JURISDICTIONAL BOUNDARY
- GAUGE LOCATION

JE FULLER
HYDROLOGY & GEOMORPHOLOGY, INC.
6101 SOUTH RURAL ROAD, SUITE 110
TEMPE, ARIZONA 85283
480-752-2124

4.2 Parameter Estimation

4.2.1 Drainage Area Boundaries

The Galloway Wash study watershed is approximately 21 square miles (see Figure 4.1-1). Galloway Wash is also referred to as "Rowler Wash" in a street map published by the Town of Carefree. The elevation of the watershed outlet at the Cave Creek confluence is approximately 2025 feet (NGVD 1929), and the elevation of the highest point in the watershed is approximately 4890 feet (NGVD 1929) at Butte Peak located in the northeast part of the watershed.

The study watershed is covered by the Upper Sonoran plant community and spans across multiple jurisdictions, including Maricopa County, the City of Scottsdale, and the Towns of Cave Creek and Carefree. Most of the watershed falls under the vacant land, rural and large-lot-residential land use categories.

4.2.2 Watershed Work Maps

A reduced set (half size) of watershed work maps is presented in Figure 4.2.2-1, Figure 4.2.2-2, Figure 4.2.2-3, Figure 4.2.2-4, Figure 4.2.2-5, and Figure 4.2.2-6. These work maps depict subbasin boundaries and concentration points, Tc (time of concentration or lag time) flow paths and Lca (distance from the concentration point to the centroid of the watershed) flow paths, hydrograph routing paths, soils boundaries, and land-use boundaries. Full-size 24"x36" plots of these maps are contained in pockets at the back of this volume.

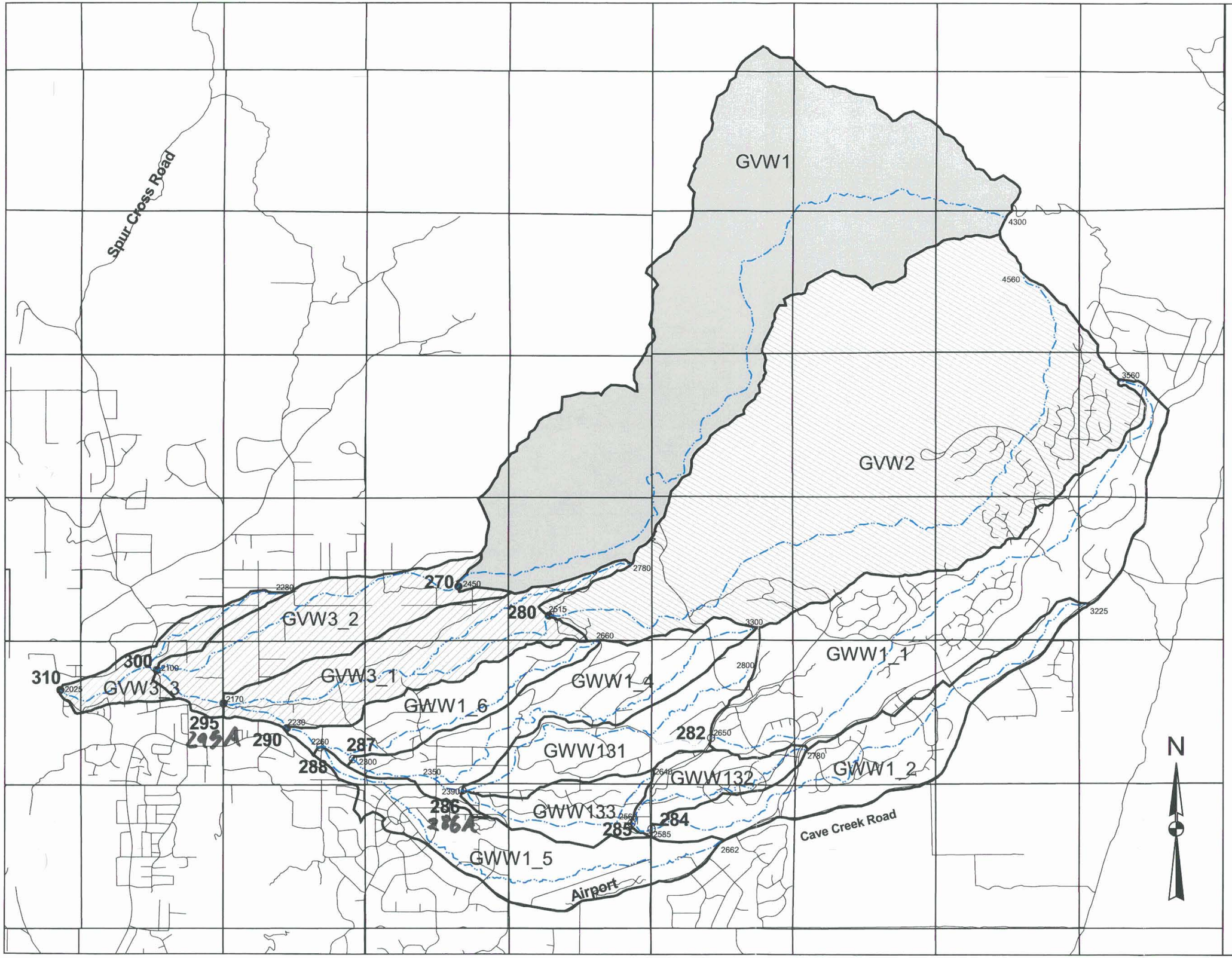
The base map for the watershed work maps is USGS digital raster graphics (DRG) projected to Stateplane North American Datum of 1983 and tiled by FCDMC. The subbasin naming convention is an expansion of the naming convention presented in the floodplain delineation study titled *Cave Creek Above Carefree Highway Floodplain Delineation Study, FCD 95-28*[9].

Subbasin labels for subbasins draining directly to Galloway Wash are indicated by GWW1_(X), where the "X" is replaced by the actual subbasin number starting with subbasin 1 at the upstream most subbasin within the main Galloway Wash watershed. Subbasin labels for the Rowe Wash tributary to Galloway Wash are indicated by GVW1_(X), and subbasin labels for the Grapevine Wash tributary to Galloway Wash are indicated by GVW3_(X). Revisions to the hydrology based on FEMA review comments received in a letter dated February 8, 2002 resulted in further subdivision of subbasin GWW1_3. Due to the six character limitation for KK identifiers in HEC-1, the new subbasins were labeled GWW13X, where X ranges from 1 to 3 for the three new basins. Figure 4.2.2-1 shows the relation of the subbasins from this study with those from FCD 95-28. Table 4.2.2-1 presents a cross-reference listing of the subbasin names to the HEC-1 labels in this study area.

Concentration point identification numbers are likewise an expansion of the previous Sabol hydrology numbering scheme, which uses three-digit numbers between 270 and 310 for the Galloway Wash sub basins. Routing reaches are identified by the concentration point

identification numbers attributable to each end of the routing reach. So, for example, the routing reach identification number 282286 refers to the routing reach, which begins at concentration point 282 and ends at concentration point 286. The single reservoir routing in the model is labeled as RR282, and is located just upstream of Charles Blair McDonald Drive (CP 282) along the North Branch of Galloway Wash in subbasin GWW1_1.

Table 4.2.2-1 Subbasin IDs	
Subbasin	**HEC-1 ID**
Rowe Wash	GVW1
	GV3_2
Grapevine Wash	GVW2
	GVW3_1
North Branch Galloway Wash	GWW1_1
	GWW131
Galloway Wash	GWW1_2
	GWW132
	GWW133
	GWW1_4
	GWW1_5
	GWW1_6
	GVW3_3



FLOOD CONTOL DISTRICT
OF MARICOPA COUNTY

FLOODPLAIN DELINEATION STUDY OF
ANDORA HILLS & GALLOWAY WASHES
FCD 99-14

FIGURE 4.2.2-1
COMPARISON TO SABOL
(FCD 95-28) SUBBASINS

MARCH 2002

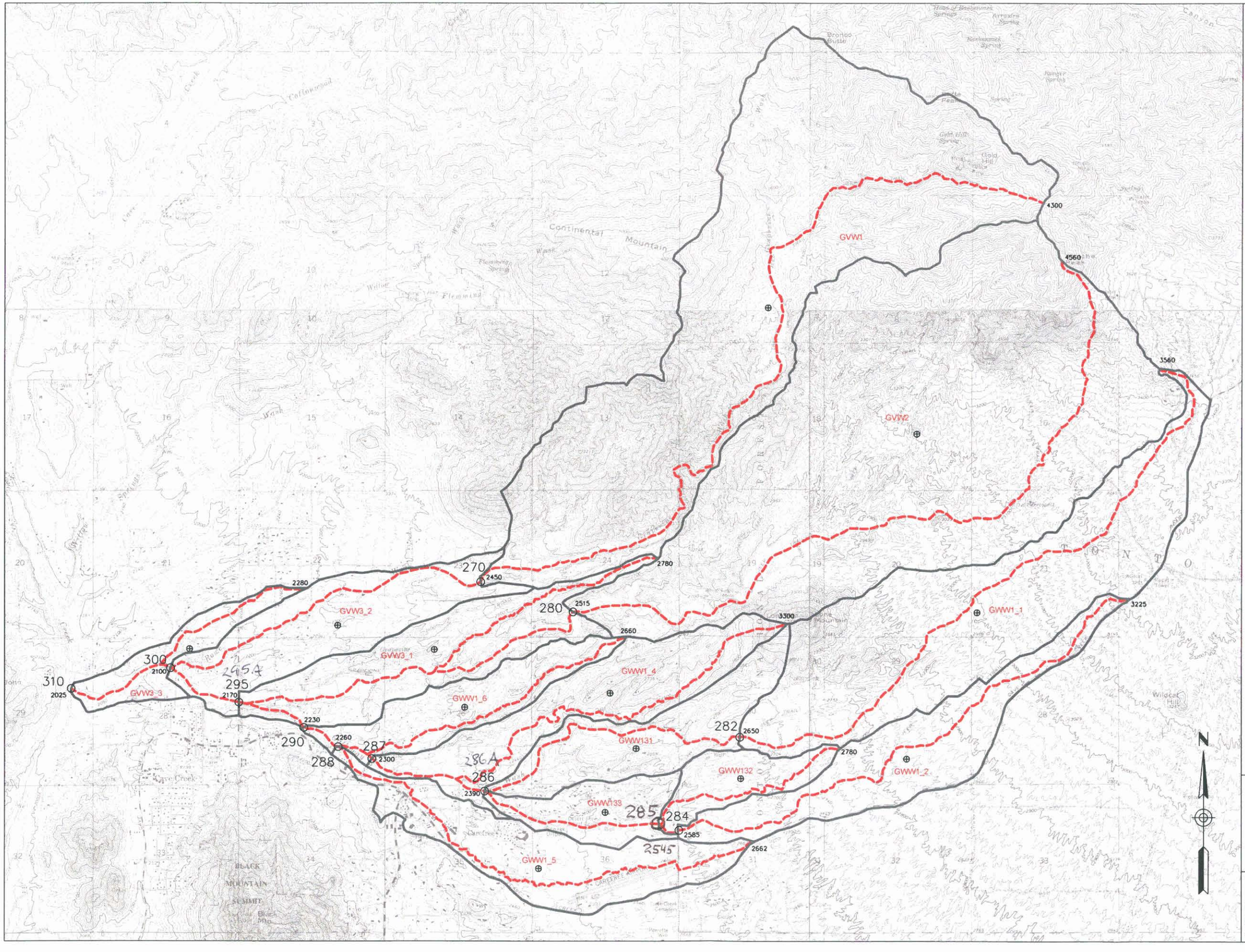
LEGEND

- Sabol Subbasin GWW1
- Sabol Subbasin GVW1
- Sabol Subbasin GVW2
- Sabol Subbasin GWW1
- 3225 Elevation
- Flow paths
- Streets
- 286 New Concentration Points
- 280 Sabol Concentration Points

SCALE

2000 0 2000 4000 Feet

JE FULLER
HYDROLOGY & GEOMORPHOLOGY, INC.



FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY

FLOODPLAIN DELINEATION STUDY OF
ANDORA HILLS & GALLOWAY WASHES
FCD 99-14

FIGURE 4.2.2-2
Tc FLOW PATHS

MARCH, 2002

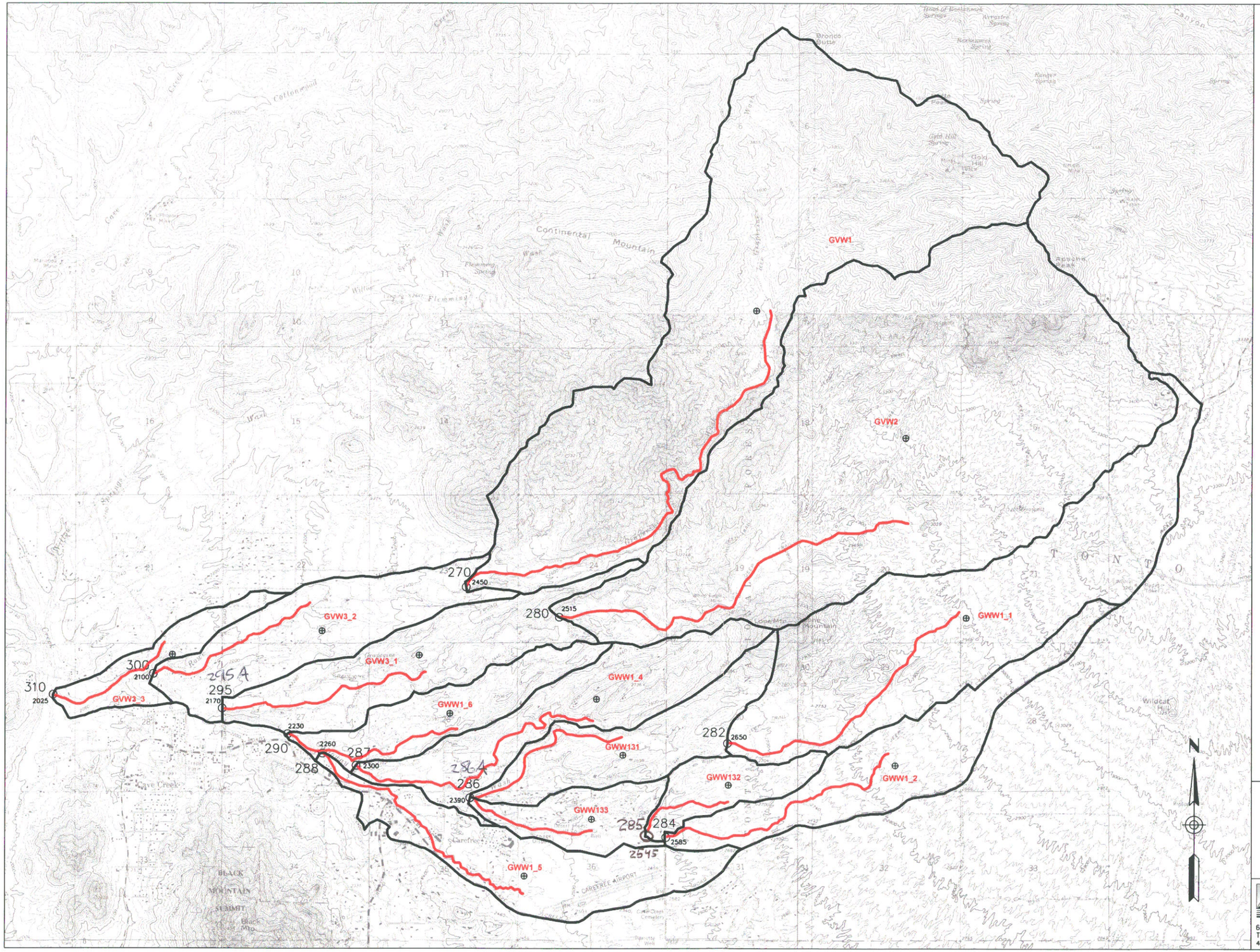
LEGEND

- SUBBASIN
- SUBBASIN CENTROID
- 286 / 2390 — CONCENTRATION POINT (CONCENTRATION POINT NUMBER) (ELEVATION)
- Tc FLOW PATH — 2390 (ELEVATION AT UPPER END OF FLOWPATH)

DRAFT

SCALE IN FEET
0' 1670' 3340' 5010'

JE FULLER
HYDROLOGY & GEOMORPHOLOGY, INC.
6101 SOUTH RURAL ROAD, SUITE 110
TEMPE, ARIZONA 85283
480-752-2124



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

FLOODPLAIN DELINEATION STUDY OF ANDORA HILLS & GALLOWAY WASHES FCD 99-14

FIGURE 4.2.2-3
Lca MAP

MARCH, 2002

LEGEND

- SUBBASIN
- SUBBASIN CENTROID
- 286 / 2390 CONCENTRATION POINT
- Lca FLOW PATH

DRAFT

SCALE IN FEET

0' 1670' 3340' 5010'

JE FULLER
HYDROLOGY & GEOMORPHOLOGY, INC.

6101 SOUTH RURAL ROAD, SUITE 110
TEMPE, ARIZONA 85283
480-752-2124

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

FLOODPLAIN DELINEATION STUDY OF
ANDORA HILLS & GALLOWAY WASHES
FCD 99-14

FIGURE 4.2.2-4
ROUTING REACHES

MARCH, 2002

LEGEND

- SUBBASIN
- SUBBASIN CENTROID
- 286 / 2390 — CONCENTRATION POINT (CONCENTRATION POINT NUMBER) (ELEVATION)
- ROUTING REACH
- ROUTING REACH (FLOODPLAIN DELINEATION RESTUDY REACH)

DRAFT

SCALE IN FEET
0' 1670' 3340' 5010'

JE FULLER
HYDROLOGY & GEOMORPHOLOGY, INC.
6101 SOUTH RURAL ROAD, SUITE 110
TEMPE, ARIZONA 85283
480-752-2124

FLOOD CONTOL DISTRICT
OF MARICOPA COUNTY

FLOODPLAIN DELINEATION STUDY OF
ANDORA HILLS & GALLOWAY WASHES
FCD 99-14

FIGURE 4.2.2-5
SOILS MAP
FOR GALLOWAY WASH

MARCH 2002

LEGEND

- Subbasins
- Flow paths
- 41 — Soil survey map unit
- Streets

Source: Soils data from Camp, 1986 and USFS as provided digitally by FCDMC.

N

SCALE

2000 0 2000 4000 Feet

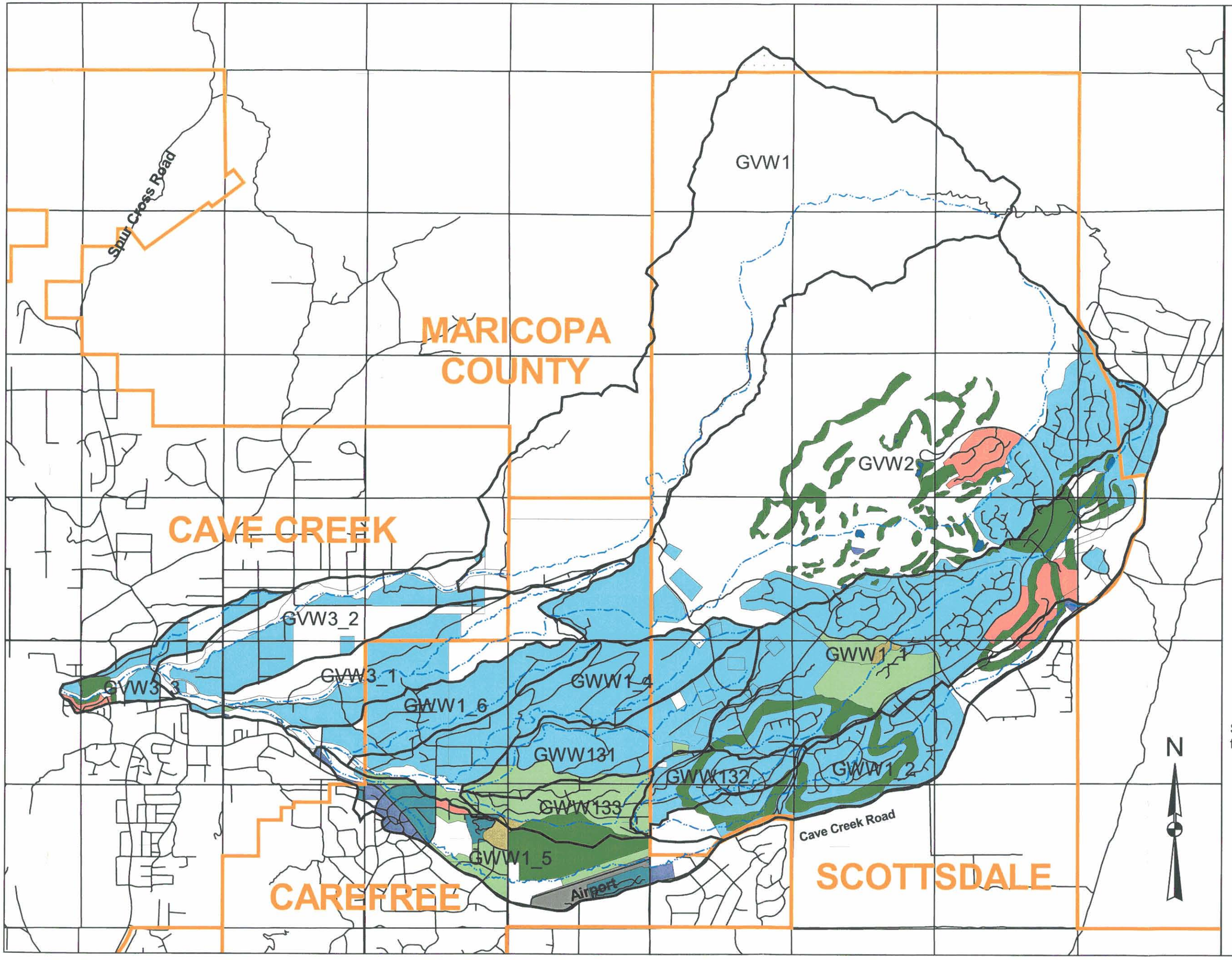
JE FULLER
HYDROLOGY & GEOMORPHOLOGY, INC

FLOOD CONTOL DISTRICT OF MARICOPA COUNTY

FLOODPLAIN DELINEATION STUDY OF ANDORA HILLS & GALLOWAY WASHES FCD 99-14

FIGURE 4.2.2-6 LAND USE MAP FOR GALLOWAY WASH

MARCH 2002



LEGEND

- Airport
- Dedicated or Non-developable Open Space
- Hotel, Motel or Resort
- Large Lot Residential (>1 and <=2 du/acre)
- Medium Density Residential (>5 and <=15 du/acre)
- Neighborhood Retail Center (<100,000 sq.ft.)
- Recreational Open Space
- Rural (1 dwelling unit per acre or less)
- Small Lot Residential (>2 and <=5 du/acre)
- Vacant
- Water
- Flow paths
- Streets
- Subbasins
- Jurisdictional Boundary

Source: Land use data modified from MAG as provided digitally by FCDMC.

SCALE

2000 0 2000 4000 Feet

JE FULLER HYDROLOGY & GEOMORPHOLOGY, INC.

4.2.3 Gauge Data

The locations of the gauges described below are shown in Figure 4.1-1 (page 4-2).

4.2.3.1 Precipitation Gauging:

Two precipitation gauges having published data are known to exist in the Galloway Wash Basin:

- Carefree, Arizona (NWS ID 021282)
  Operated by the National Weather Service (NWS) continuously since June 1, 1961
  Approximate elevation: 2510 feet msl.

- Carefree Ranch (ALERT ID 4930)
  Operated by the Flood Control District of Maricopa County continuously since July 1985.
  Approximate elevation: 3200 feet msl.

4.2.3.2 Stream Gauging:

No stream gauging records of any kind were identified for Galloway wash. The Flood Control District of Maricopa County (FCDMC) operated an automated precipitation/stream-stage sensor station on Grapevine Wash, a tributary to Galloway Wash, between 1989 and 1992. The gauge was discontinued due to poor radio telemetry communications and problems related to gauging a highly mobile sand-bed stream. No reliable data were ever collected from this station (Waters, 1999, personal communication).

The nearest stream gauge with published data is operated by the US Geological Survey (USGS) on **Cave Creek below Cottonwood Creek (ID # 09512280)** (see Figure 4.1-1). This gauge was established June 16, 1978 and is located approximately 3.5 miles north of the Town of Cave Creek in Section 4, Township 6 North, Range 4 East, G&SRB&M The drainage area at the gauge site is approximately 82.7 square miles, and the gauge is at an approximate elevation of 2280 feet (NGVD 1929).

The next nearest stream gauge with published data was operated by the USGS on **Cave Creek near Cave Creek (ID #09512300)** from 1968 through 1994. During this period, the USGS collected continuous data for the period beginning May 17, 1958 and ending September 30, 1967, and only recorded the annual peak discharge for the period beginning October 1968 and ending in 1994. The FCDMC took over maintenance and operation of this gauge site on May 27, 1994 by installing a continuously-recording ALERT station (station ID 4918). This gauge is located in Section 12, Township 5 North, Range 3 East, G&SRB&M at an elevation of approximately 1850 feet (NGVD 1929) and the drainage area at this gauge location is approximately 121 square miles.

4.2.4 Statistical Parameters

4.2.4.1 Precipitation Statistics:

Precipitation depth-duration-frequency statistics published by the National Oceanic and Atmospheric Administration[11] were used for this study. The NOAA Atlas 2 is currently being revised; however, the revised atlas has not been approved for use by the FCDMC or any other local agency at this time.

4.2.4.2 Discharge Statistics:

Streamflow statistics are published by the USGS for Cave Creek near Cave Creek (ID 09512300) in *Statistical Summaries of Streamflow Data and Characteristics of Drainage Basins for Selected Streamflow-Gaging Stations in Arizona Through Water Year 1996*[12]. Streamflow statistics are also published by the Flood Control District of Maricopa County in *Annual Hydrologic Data Report, Volume II Surface Water Data, Water Year 1998*[5]. Both of the above publications present the results of log-Pearson Type II analyses for the two gauging stations noted in section 4.2.3.2.

The streamflow statistics for the two gauges located on Cave Creek, which are presented in the above two publications, were not used to develop the peak discharge estimates used in this study for Galloway Wash because the Galloway Wash study area is much smaller (between 1 and 21 square miles compared to 83 and 121 square miles). However, these statistics were used as a means to verify the HEC-1 results and to maintain regional consistency.

4.2.5 Precipitation and Runoff

4.2.5.1 Historical Precipitation Records

The NWS Carefree, Arizona precipitation gauge (021282) is located at the Carefree Airport (see Figure 4.1-1) at an approximate elevation of 2510 feet msl. Monthly statistics based on over 37 years of record are presented in Table 4.2.5.1-1 below.

d

Table 4.2.5.1-1: Monthly Precipitation Summary for Carefree, Arizona (021282)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Average Precip. (in.)	1.43	1.36	1.70	0.60	0.16	0.12	1.29	1.69	1.15	1.10	1.11	1.55	13.26

The FCDMC Carefree Ranch precipitation gauge (#4930) is located approximately 5 miles northeast of the Carefree Airport in Section 16, Township 6 North, Range 4 East at an approximate elevation of 3200 feet msl (see Figure 4.1-1). Monthly statistics based on 12 years of record through November 1999 are presented in Table 4.2.5.1-2 below.

Table 4.2.5.1-2: Monthly Precipitation Summary for Carefree Ranch (#4930)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Average Precip. (in.)	2.22	1.56	1.58	0.96	0.16	0.04	0.77	1.47	0.89	0.59	0.80	1.04	12.08

4.2.5.2 Historic Flooding

The distribution of annual peak flow data from the two Cave Creek gauges is presented in Table 4.2.5.2-1 (next page). The data in the tables in Section 4.2.5 show the seasonal variability of rainfall and runoff patterns in the region surrounding the study area. In general, the study area experiences two distinct precipitation seasons; summer monsoons (July-October) and winter frontal storms (December-March).

The monsoon season precipitation events tend to be convective and relatively shorter duration but more intense than the winter storms, and are usually highly variable spatially and temporally. The winter storms tend to be frontal and relatively longer duration, but less intense than the summer storms, and tend to have less spatial and temporal variability throughout the area impacted by the storm. As Table 4.2.5-3 demonstrates, significant runoff can occur as a result of storms occurring during either of the two general seasons.

In the region surrounding the study area, it is generally observed that the smaller watersheds (less than 5 square miles) tend to yield the largest peak flows as a result of the more intense, short duration storm events. Likewise, the larger basins (greater than 10 square miles) tend to yield the largest peak flows as a result of the storms having greater spatial and temporal distribution than the summer storms.

4.2.5.3 Rainfall Depth and Distribution

The storm frequencies used in the HEC-1 modeling for this project include the 100-year 24-hour storm and the 100-year 6-hour storm. The SCS Type II distribution was used for the 100-year 24-hour storm. JD records were used to define the index storm distributions for the 100-year 6-hour storm as defined in Table 2.4 and Figure 2.17 of the FCDMC's *Drainage Design Manual, Volume I*[6].

Table 4.2.5.2-1: Distribution of Annual Peak Flows
(Discharge shown in cfs with date of discharge underneath)

Cave Creek near Cave Creek (09512300), 39 years of record

Jan	Feb	March	April	May	June	July	August	Sept	Oct	Nov	Dec
3380 (10/5/95)	279 (2/28/97)	1420 (3/3/83)				610 (7/16/65)	148 (8/9/84)	332 (9/7/96)	132 (10/7/93)	856 (11/2/74)	280 (12/16/61)
13800 (1/8/93)	1260 (2/9/76)	4780 (3/1/91)				1350 (7/22/86)	170 (8/21/88)	696 (9/17/61)	1200 (10/2/81)		910 (12/27/84)
		7500 (3/2/78)				1900 (7/24/90)	364 (8/4/71)	1800 (9/6/67)	3950 (10/19/72)		6000 (12/22/65)
						3950 (7/17/72)	1390 (8/5/74)	2700 (9/5/70)	8570 (10/29/59)		6900 (12/18/78)
							1510 (8/6/63)	5680 (9/12/58)			12400 (12/19/67)
							3120 (8/2/64)				
							3590 (8/5/59)				
							4680 (8/22/92)				

Cave Creek below Cottonwood Creek (09512280), 20 years of record

Jan	Feb	March	April	May	June	July	August	Sept	Oct	Nov	Dec
173 (1/5/89)	7020 (2/19/80)	19 (3/6/81)				964 (7/16/90)	594 (8/9/84)	124 (9/11/96)		682 (11/15/93)	1470 (12/27/84)
3100 (10/5/95)		118 (3/3/87)					3460 (8/23/92)	476 (9/11/97)		746 (11/26/85)	
9200 (1/8/93)		617 (3/15/82)								840 (11/1/87)	
		709 (3/28/98)								2720 (11/30/82)	
		3900 (3/1/91)									

Average 100-year 24 hour and 100-year 6-hour point rainfall values were determined by overlaying the watershed boundary onto the precipitation isopluvial maps published in the FCDMC's *Drainage Design Manual, Volume I*[6]. Table 4.2.5.3-1 presents the resulting point rainfall values. Detailed precipitation frequency values for Galloway Wash are presented in Appendix D.1.

Table 4.2.5.3-1: Point Precipitation Values for Galloway Wash	
Storm Frequency & Duration	Point Precipitation Inches
100-year 24-hour	4.8
100-year 6-hour	3.5

4.2.5.4 Areal Precipitation Reduction

The point rainfall value for the 100-year 6-hour storm was adjusted using the depth-area reduction relationship developed by the U.S. Army Corps of Engineers for the August 19, 1954 Queen Creek, Arizona storm as depicted in Table 2.2 in the FCDMC's *Drainage Design Manual, Volume I.* The point rainfall value for the 100-year 24-hour storm was adjusted using the depth-area reduction relationship published by the National Weather Service (NWS) in HYDRO-40[15] and presented in Figure 2.1a of the *Drainage Design Manual, Volume I.*

Simulation of areal reduction of point rainfall depths within the HEC-1 models is accomplished using the JD record option. Table 4.2.5.3-1 below presents a summary of areally reduced point rainfall depths used in the HEC-1 models.

Table 4.2.5.4-1: Summary of Areal Reduction Values for Index Storms Used in JD Records		
Area (square miles)	**Rainfall (inches)**	**Temporal Distribution**
100-Year 24-Hour Storm		
0.01	4.80	SCS Type II
1	4.78	SCS Type II
10	4.51	SCS Type II
20	4.37	SCS Type II
70	4.11	SCS Type II
100-Year 6-Hour Storm		
.01	3.50	Maricopa County Pattern 1
.5	3.48	Maricopa County Pattern 1
2.8	3.43	Maricopa County Pattern 2
16	3.23	Maricopa County Pattern 3
90	2.84	Maricopa County Pattern 4

4.2.5.5 Comparison to Historical Recorded Extremes

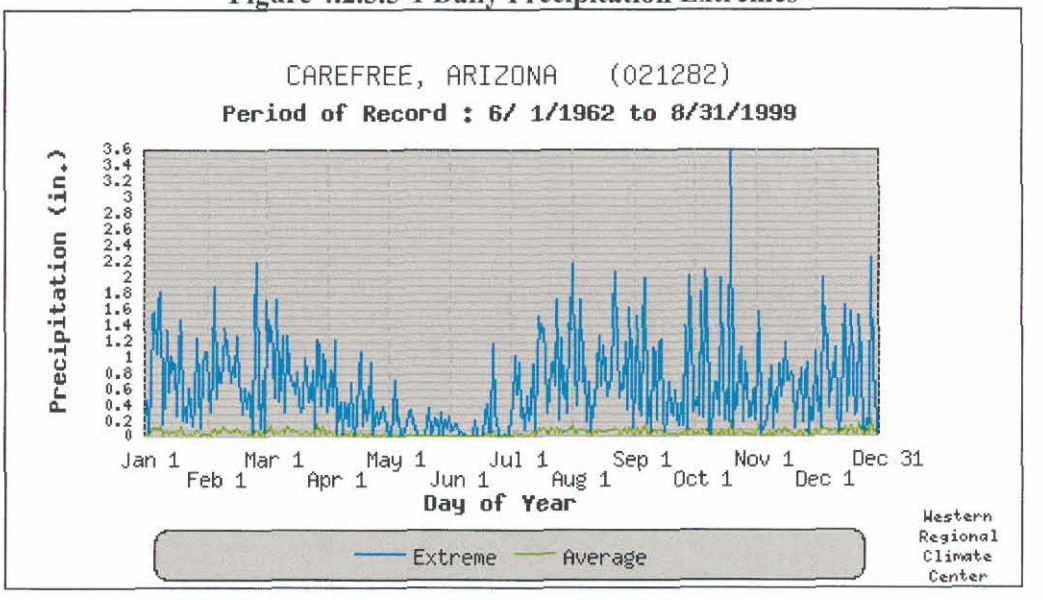
Extreme value data for the FCDMC Carefree Ranch precipitation gauge (#4930) are presented in Table 4.2.5.5-1 below. The data in the table represent the most extreme events measured at that gauge site for the period beginning July 1, 1985 and ending April, 1998. These data were downloaded from the FCDMC's Flood Warning internet web site (http://www.fcd.maricopa.gov/alert/alert.htm).

Table 4.2.5.5-1: Extreme Precipitation Events Recorded at FCDMC Carefree Ranch Gauge (4930)					
Number of Events >1" / 24Hours	Number of Events >2" / 24Hours	Number of Events >3" / 24Hours	Greatest 15-Minute Depth (in)*	Greatest 1-Hour Depth (in)*	Greatest 3- Hour Depth (in)*
38	3	0	0.98"	1.61"	1.85"

* For the period beginning December 1987 and ending April 1998.

Extreme value data for the NWS Carefree precipitation gauge (021282) are presented in Figure 4.2.5.5-1 (next page). The data in this figure represent the maximum daily precipitation recorded for each day of the year between June 1, 1962 and August 31, 1999. The maximum daily precipitation recorded, according to the figure, appears to be approximately 3.6 inches and occurred at about the middle of October.

Figure 4.2.5.5-1 Daily Precipitation Extremes



This figure demonstrates that extreme precipitation events in the project area tend to occur between about the end of July and the end of October, and between the beginning of December and about the first week of March. This trend is also observed in Figures 4.2.5.5-2 and 4.2.5.5-3 (next page). These figures present graphically the probability of 2 inches and 3 inches of rain, respectively, falling during a one-day period. The figures also show the expected time of year, having a probability greater than zero, which would receive two or three inches of precipitation in one day.

The estimates of the 100-year 24-hour and the 100-year 6-hour point rainfall values (i.e., 4.8" and 3.5" respectively) are greater than any one-day event recorded at the two precipitation gauges which are located in the study area. The greatest one-day precipitation total recorded during the

36-year period of record at the NWS Carefree gauge site is 3.6 inches. At the FCDMC Carefree Ranch gauge location, three precipitation events were recorded during the approximately 13 years of record for this gauge which had 24-hour totals in excess of two inches, and no precipitation events were recorded during the period of record with 24-hour totals exceeding three inches.

Figure 4.2.5.5-2 Probability and Time of Year of 2" of Precipitation in One Day

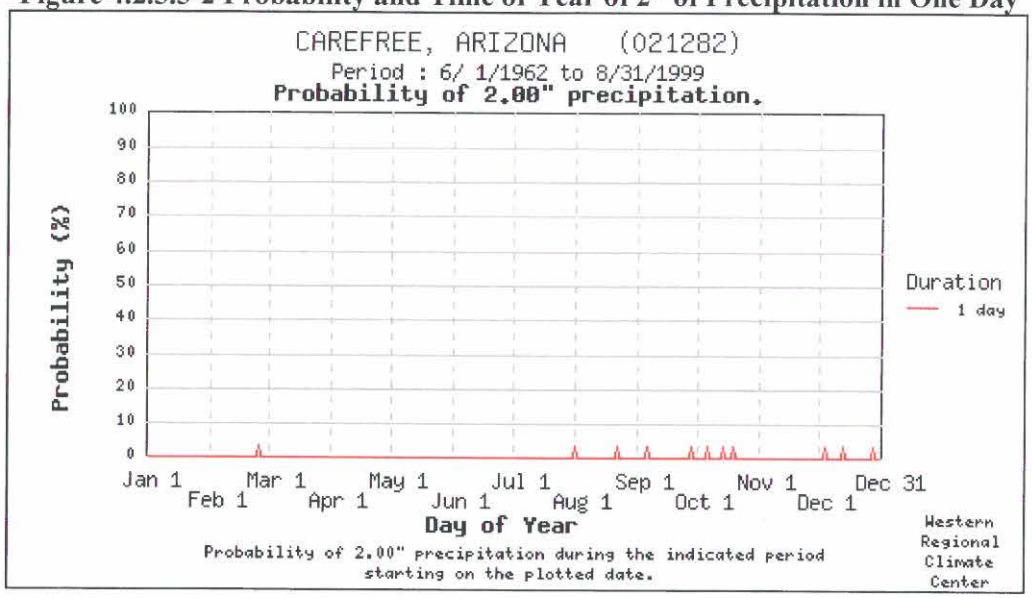
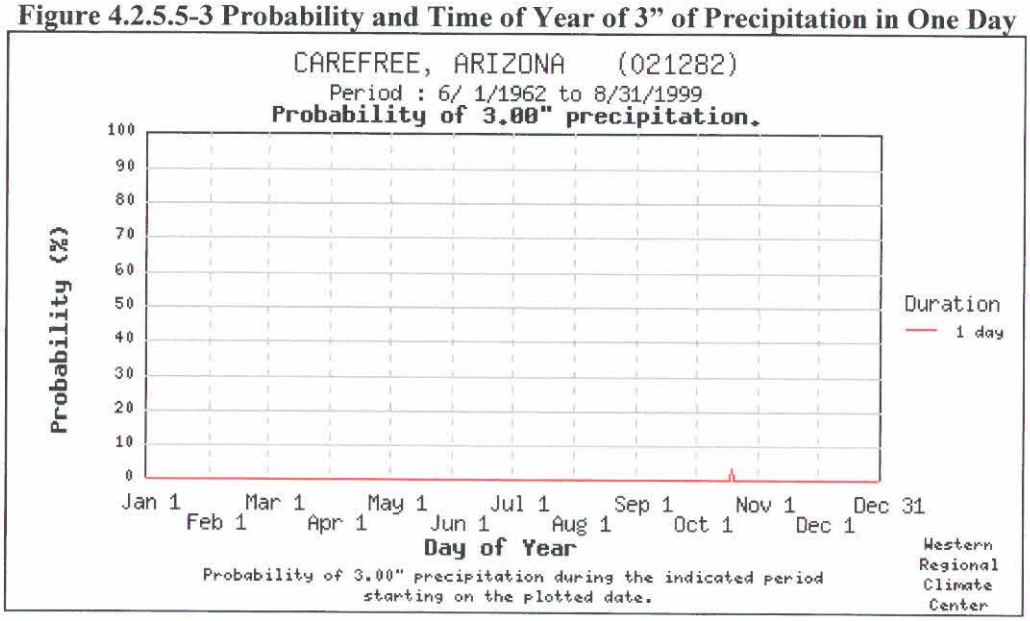


Figure 4.2.5.5-3 Probability and Time of Year of 3" of Precipitation in One Day



4.2.6 Physical Parameters

Parameters for rainfall losses, including those parameters related to soils and land use classifications, were defined using the methodologies defined in the FCDMC's *Drainage Design Manual, Volume I*[6]. The following subsections describe how these parameters were determined and present summaries of the various parameters. Detailed physical parameters for each subbasin are included in Appendix D.2.

4.2.6.1 Rainfall Losses

HEC-1 rainfall losses for the Galloway Wash watershed were estimated using the Green and Ampt infiltration equation option. Table 4.2.6-1, below, presents composite Green and Ampt loss parameters for each subbasin along with lag times for both the 100-year 24-hour and the 100-year 6-hour storms. A detailed discussion of the calculation of these parameters is included after the presentation of the summary table.

Table 4.2.6.1-1: Summary of composite Green & Ampt Rainfall Losses with Lag Times

Subbasin	Area (sq. mi.)	IA (inches)	DTHETA	PSIF (inches)	XKSAT Adjusted (in/hr)	RTIMP percent	Lag (minutes)
GWW1_1	2.552	0.19	0.25	5.3	0.26	9	48.4
GWW1_2	1.043	0.20	0.25	5.2	0.28	2	45.2
GWW131	0.774	0.20	0.25	5.4	0.23	3	34.6
GWW132	0.347	0.20	0.25	5.3	0.26	1	22.7
GWW133	0.397	0.18	0.25	5.8	0.22	12	23.4
GWW1_4	1.004	0.20	0.25	5.8	0.20	1	43.0
GWW1_5	0.983	0.16	0.23	6.2	0.19	24	41.2
GWW1_6	0.593	0.20	0.25	5.3	0.24	0	34.8
GVW1	4.905	0.20	0.17	6.8	0.13	17	71.1
GVW2	6.023	0.20	0.23	6.2	0.18	12	56.7
GVW3_1	1.043	0.20	0.25	5.2	0.26	0	42.3
GVW3_2	0.972	0.20	0.25	5.3	0.24	0	36.8
GVW3_3	0.341	0.20	0.25	6.0	0.19	2	28.2

Soils

Digital soils maps derived from the Soil Conservation Service (SCS) and the US Forest Service (USFS) were provided by the FCDMC in dxf format and as ArcView shapefiles for the project area. The digital soil map unit data are based on *Soil Survey of Aguila-Carefree, Parts of Maricopa and Pinal Counties, Arizona* (SCS 1986) and on *USFS, Tonto National Forest, General Ecosystem Survey*, 1989[14]. Figure 4.6 presents the digital soils data as provided by the FCDMC. Table 4.2.6.1-2 (next page) presents the soil units found in the study area with their corresponding natural-conditions rainfall loss characteristics.

Using ArcView, the delineated subbasin polygons were overlaid on the digital SCS and USFS soil map unit polygons to determine the percentage of each soil map unit contained in each subwatershed. Using the FCDMC's DDMS computer program[7], soil texture class data were logarithmically weighted by area and related to Table 4.2 and Figure 4.3 in the *Drainage Design Manual, Volume I*[6] to determine average Green and Ampt XKSAT, PSIF and percentage of rock outcrop parameter values for bare ground. The bare ground XKSAT values were then adjusted for vegetation cover using average vegetative cover values calculated from land use data using DDMS. It was assumed that only approximately 50% of all natural rock outcrops are directly connected impervious areas. The assigned RTIMP percentages shown in Table 4.2.6.1-2 reflect this assumption.

Table 4.2.6.1-2: Natural-Conditions Rainfall Loss Characteristics for Study Area Soil Map Units

Soil Map Unit	Bare-Ground XKSAT (in/hr)	Natural Rock Outcrop (%)	Assigned RTIMP (percent)
SCS Soil Units			
6-Anthony-Arizo complex	0.62	0	0
8-Arizo cobbly sandy loam	0.96	0	0
12-Carefree cobbly clay loam	0.01	0	0
24-continental clay loam	0.02	0	0
26-continental cobbly clay loam	0.01	0	0
33-Eba very gravelly loam (1-8% slopes)	0.23	0	0
34-Eba very gravelly loam (8-20% slopes)	0.23	0	0
40-Eba Pinaleno complex (3-20% slopes)	0.17	0	0
41-Eba Pinaleno complex (20-40% slopes)	0.17	0	0
61-Gran-Wickenburg complex	0.15	0	0
63-Gran-Wickenburg-Rock outcrop complex	0.14	25	0
72-Lehmans-Rock outcrop complex	0.09	30	15
93-Nickel-Cave complex	0.33	0	0
96-Pinaleno-Tres Hermanos complex	0.07	0	0
104-Rock outcrop-Lehmans complex	0.14	60	30
121-Tres-Hermanos-Anthony complex	0.12	0	0
USFS Soil Units			
301-Sandy Loam	0.40	0	0
303-Sandy Loam	0.40	15	7

Land Use

Digital land use data were provided by the FCDMC for the study area in dxf format and as ArcView shapefiles. Aerial photography dated January 1999, were also provided by the FCDMC in geo-referenced tiff files for the study area. The digital land use data, as supplied by the FCDMC, were digitized by the Maricopa Association of Governments using existing zoning data (MAG 1995). Using ArcView, the land use polygons were overlaid onto the aerial photography and edited to reflect the actual land use observed on the 1999 aerial photography. The updated land use shapefiles were then overlaid by the subbasins to determine the percentage of each land use type in each subwatershed. The results were then were exported from ArcView to Microsoft Excel 2000, where they were sorted by subbasin and accumulated by land use type. The land use breakdowns were then input into the FCDMC's DDMS program which calculates the area-weighted averages of each land use type, and then the area-weighted average percent vegetation, RTIMP, IA, and Kn for each subbasin.

Table 4.2.6.1-3 presents the default values for DTHETA (antecedent moisture conditions), percent vegetative cover, RTIMP percent (impervious area percentage), IA (initial abstraction, or surface retention loss in inches), and Kn (estimated mean Manning's n for all channels associated with a particular land use or basin area).

Table 4.2.6.1-3: Land Use Default Values

Land Use Type	DTHETA Condition	% Veg. Cover	RTIMP Percent	IA inches	Kn
Airport	Normal	8	85	0.07	0.02
Dedicated Open Space	Normal	35	0	0.20	0.05
Large Lot Residential	Normal	35	15	0.18	0.04
Medium Density Residential	Normal	25	30	0.15	0.03
Neighborhood Retail Center	Normal	10	80	0.07	0.02
Recreational Open Space	Normal	75	0	0.20	0.03
Hotels/Resorts	Normal	32	60	0.11	0.03
Rural	Normal	30	0	0.20	0.04
Small Lot Residential	Normal	30	25	0.15	0.04
Vacant	Normal	30	0	0.20	0.045
Water	Normal	0	100	0.00	0

4.2.6.2 Unit Hydrograph

The Phoenix Mountain and Desert/Rangeland S-graphs, defined in Table 5.3 of the *Drainage Design Manual, Volume I*[6] are used for this study. The Phoenix Mountain S-graph is used only in subbasins GVW1 and GVW2, which are located in mountainous terrain in the northeastern side of the study area. The Desert/Rangeland S-graph is used for the remaining basins, which are located in the lower portions of the study area in the foothills and more gently sloping desert terrain. Table 4.2.6.2-1 presents a summary of the parameters and lag times for each subbasin.

Table 4.2.6.2-1 Maricopa County Unit Hydrograph Proceedure 2 Lag Time Summary						
Subbasin	**S-Graph Type**	**Kn**	**L miles**	**Lca Miles**	**Slope ft/mile**	**Lag Minutes**
GWW1_1	Desert/Rangeland	0.039	4.64	2.04	196.1	48.4
GWW1_2	Desert/Rangeland	0.039	3.88	1.87	164.9	45.2
GWW131	Desert/Rangeland	0.040	2.58	1.28	158.9	34.6
GWW132	Desert/Rangeland	0.039	1.56	0.70	141.0	22.7
GWW133	Desert/Rangeland	0.037	1.59	0.90	157.2	23.4
GWW1_4	Desert/Rangeland	0.040	3.64	2.11	274.7	43.0
GWW1_5	Desert/Rangeland	0.034	3.57	1.89	112.6	41.2
GWW1_6	Desert/Rangeland	0.039	2.61	1.31	164.8	34.8
GVW1	Mountain	0.045	6.19	3.56	298.9	71.1
GVW2	Mountain	0.043	5.51	2.77	371.1	56.7
GVW3_1	Desert/Rangeland	0.043	3.31	1.51	184.3	42.3
GVW3_2	Desert/Rangeland	0.043	2.42	1.26	144.6	36.8
GVW3_3	Desert/Rangeland	0.040	1.88	0.95	135.6	28.2

4.2.6.3 Routing Parameters

Channel Routing

The normal depth storage routing routine was used for all channel reaches in this study. Representative 8-point cross sections were obtained from previous FIS study model results and attendant topographical mapping. Manning's n values assigned to the 8-point cross sections are consistent with those used in previous HEC-1 and HEC-2 modeling efforts. The NSTPS parameter (the number of steps used in the storage routing) was determined by developing a stage/discharge table for each representative 8-point cross-section and then iterating between NSTSPS and the corresponding HEC-1 discharge at the upstream end of the routing reach. Three iterations were performed in order for the HEC-1 discharge and related NSTPS to stabilize. Appendix D.3 includes routing data, a table including confidence checks, and cross-section plots.

Reservoir Routing

Reservoir routing is included in the Galloway Wash HEC-1 at an online detention basin. This detention basin (RR 282) is located on the north branch of Galloway Wash approximately one-half mile east of the Pima Road alignment at Charles Blair McDonald Drive. The outlet for the basin is 6-12'x4' concrete box culverts, with two unregulated (i.e., flow-through) cells, and four flanking cells (two on each side of the unrestricted cells) regulated by constricted weir inlets.

Each pair of flanking regulated cells shares an inlet restriction which consists of a common inlet chamber with a single 3'x2' orifice entrance which has an invert approximately two feet above the invert to the two unregulated center cells. Additionally, the flanking common inlet chambers have open tops, which permit weir flow at stages greater than approximately 11 feet above the unregulated cell inverts. The following 4 images show the above described structure.

The stage-storage-discharge data used in this HEC-1 for this structure were previously reported by A-N West, Inc. in *Detailed Drainage Design Report for Desert Mountain Properties Proposed Detention Basin No. S-1,* Revised March, 1996[1]. The structure was as-built by the City of Scottsdale in May 1997. A portion of the design report and the as-built drawings are included in Appendix D.4.

Photo 4-1: Looking upstream (east) at outlet of detention basin on the north branch of Galloway Wash at Charles Blair McDonald Dr.

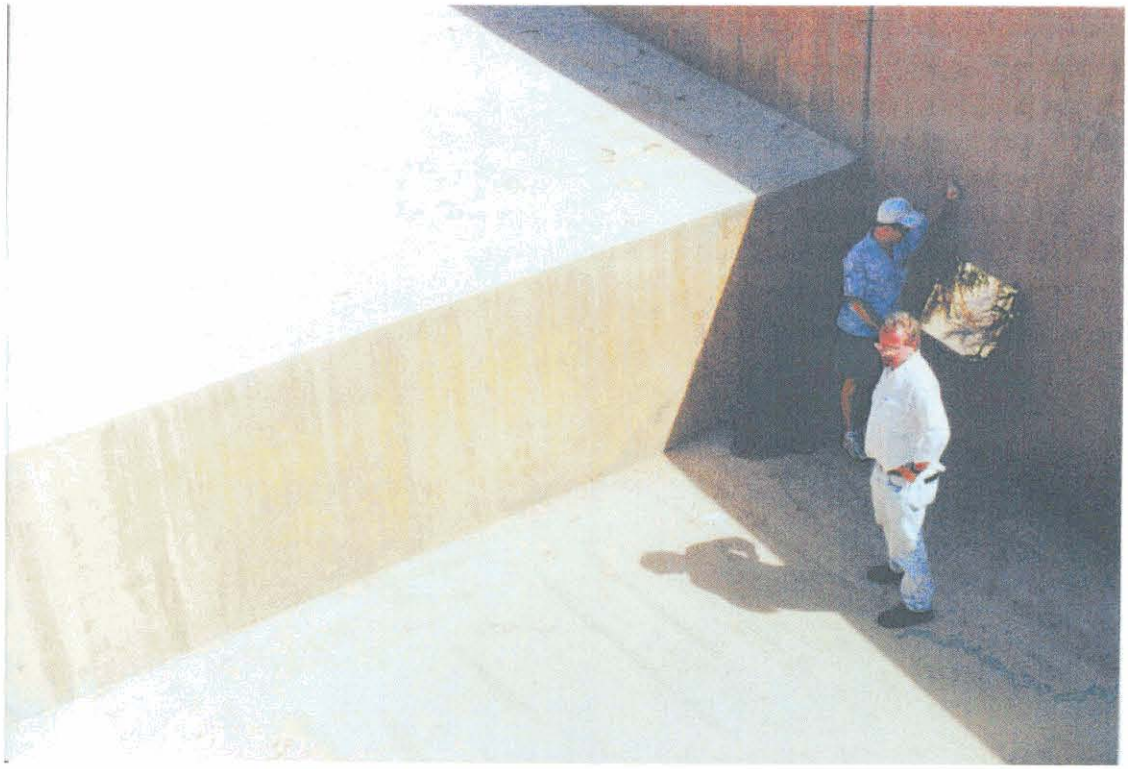


Photo 4-2: Looking approximately northeast into the inlet chamber to the detention basin outlet. Note the 3'x2' orifice inlet to the chamber at upper right.

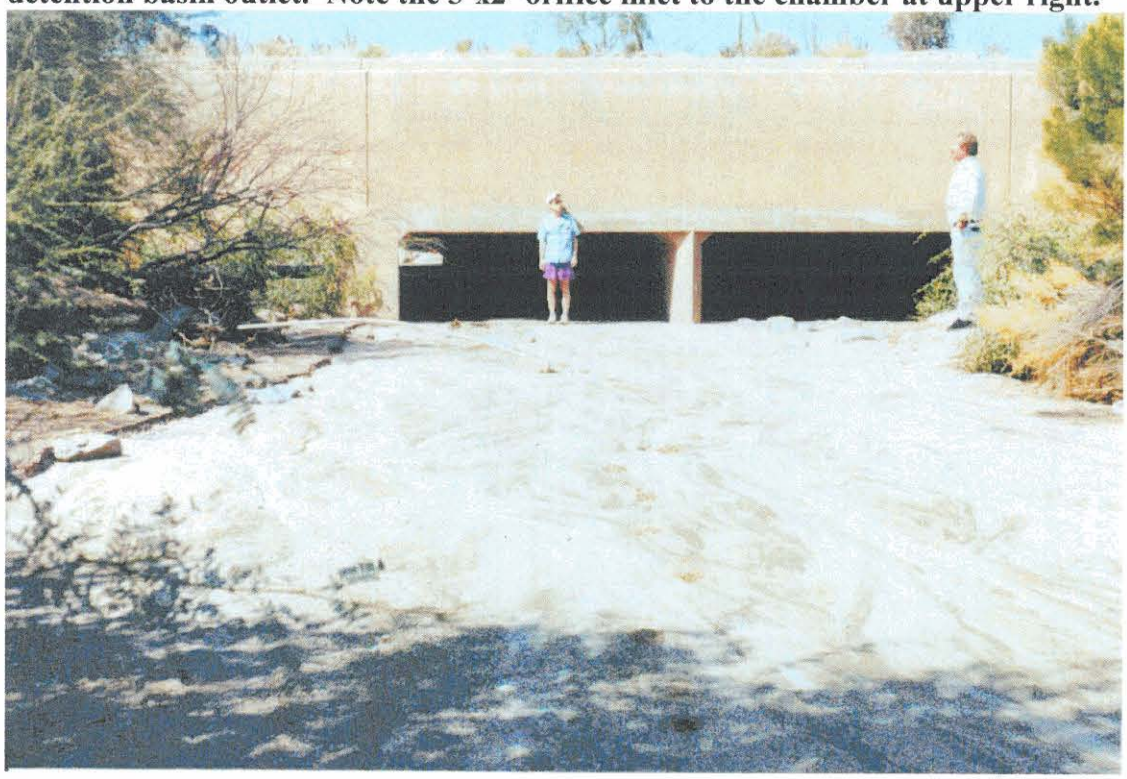


Photo 4-3: Looking downstream (west) at entrance to the two unregulated cells of the detention basin located on the north branch of Galloway Wash at Charles Blair McDonald Dr.

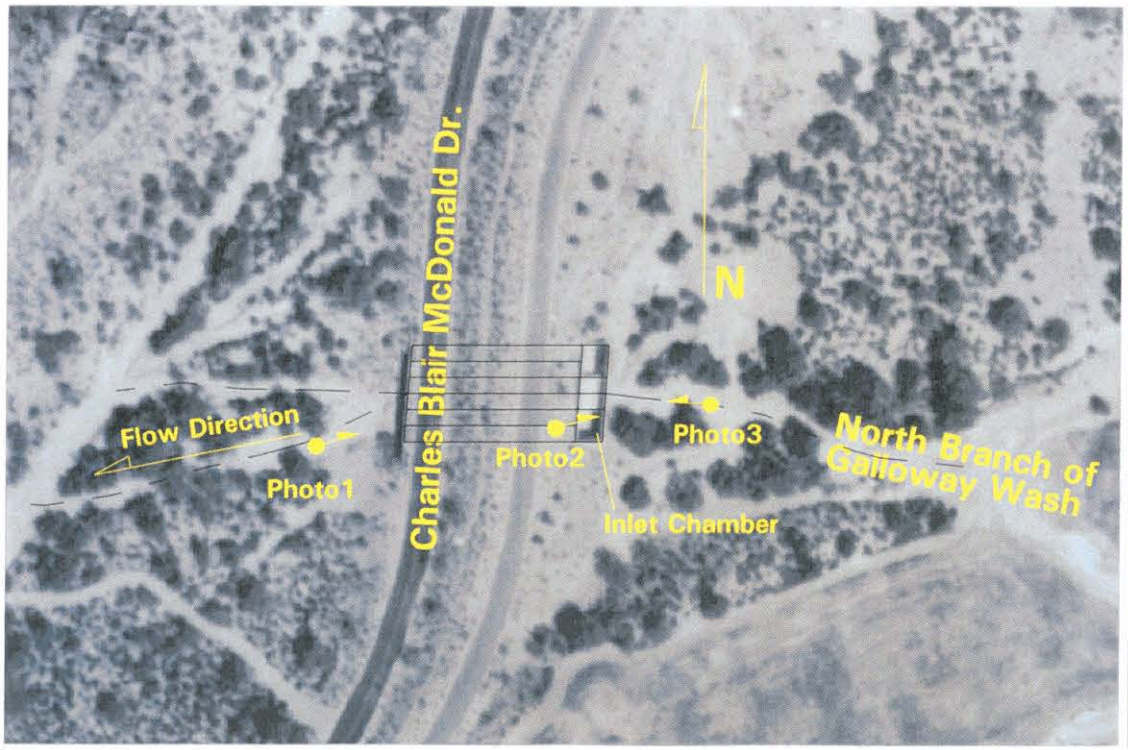


Photo 4-4 Aerial view of detention basin outlet structure.

4.3 Problems Encountered During Study

4.3.1 Special Problems and Solutions

No unusual or special problems were encountered during the course of this study.

4.3.2 Modeling Warning and Error Messages

The HEC-1 reported one type of warning message as follows: "routed outflow (xxxxx) is greater than maximum outflow (xxxxx) in storage-outflow table". This warning is the result of a hydrograph being generated for the index or transposition areas. For each occurrence of this warning, it is for a case in which the index area is much greater than the actual basin area at the point where the warning is generated. Therefore, this warning does not affect any of the interpolated discharges at the locations where the warning is reported in HEC-1.

4.4 Calibration

Due to a lack of rainfall and runoff data, calibration of the HEC-1 model based on physical data was not performed.

4.5 Final Results

4.5.1 Hydrologic Analysis Results

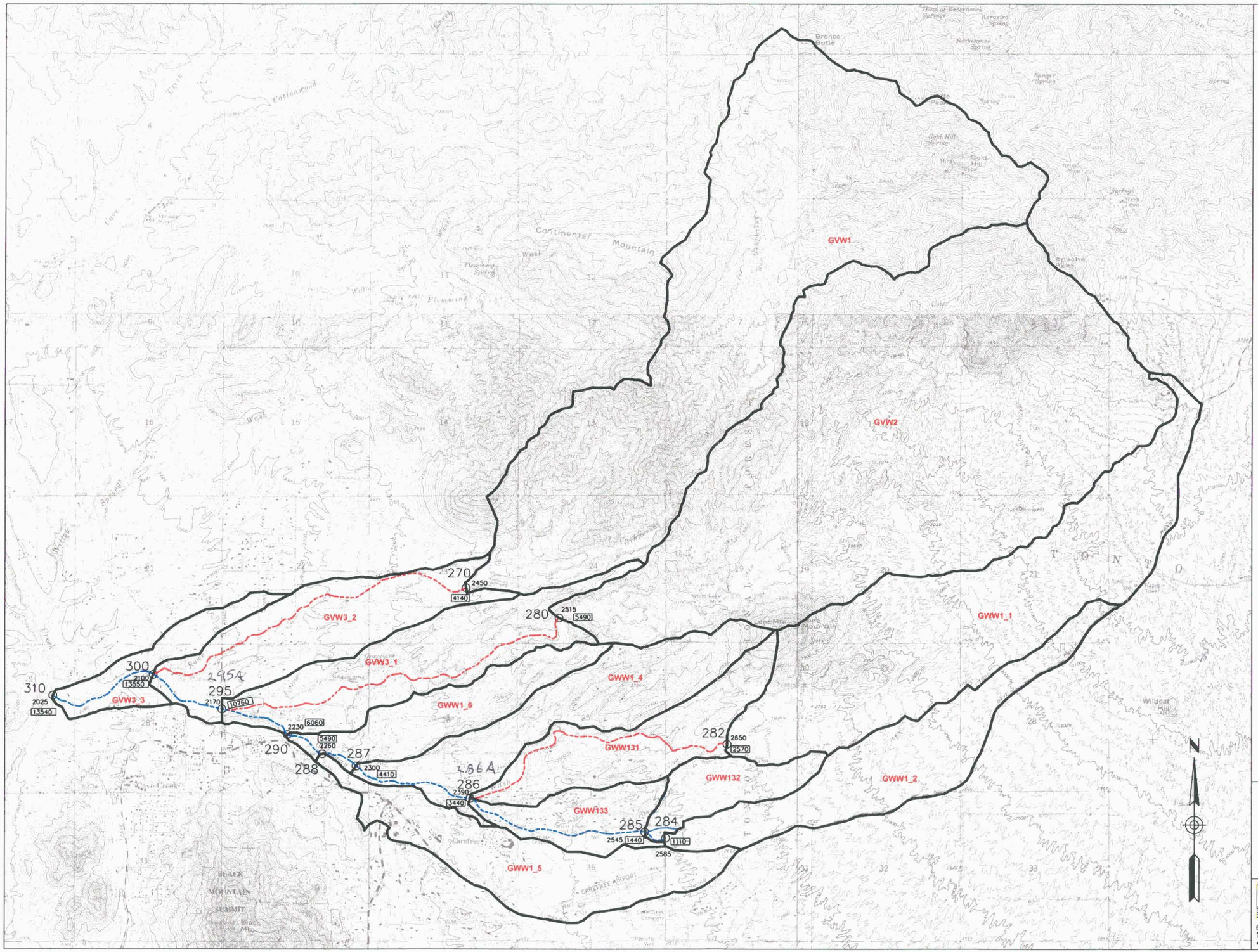
Table 4.5.1-1, Table 4.5.1-2, and Figure 4.5.1-1 present summary results of the HEC-1 modeling. Figure 4.5.1-2 presents the inflow and outflow hydrographs associated with the reservoir routing at RR282; the detention basin at Charles Blair McDonald Drive. Appendix D.6 contains the detailed HEC-1 model output. At all but one concentration point, 284, the 24-hour storm yielded greater discharge values than the 6-hour storm. In this case, the greater 6-hour discharge is the result of the small basin size; it is the smallest upland basin without a routing reach or combination of flows associated with it. Table 4.5.1-3 presents JEF's recommendations for the 100-year regulatory discharge values to be used in this study.

Table 4.5.1-1 Summary Hydrologic Analyses Results for Galloway Wash

	100-Year 24-Hour Storm		100-Year 6-Hour Storm	
Concentration Point	Peak Discharge (cfs)	Time of Peak (hours since storm began)	Peak Discharge (cfs)	Time to Peak (hours since storm began)
270	4,140	12.83	3,749	4.83
280	5,490	12.67	4,686	4.67
282	2,570	12.58	2,427	4.58
284	1,110	12.50	1,155	4.50
285	1,440	12.33	1,446	4.42
286A	1,750	12.42	1,717	4.42
286	3,440	12.50	3,231	4.67
287	4,410	12.58	3,955	4.67
288	5,490	12.58	4,779	4.67
290	6,060	12.50	5,187	4.58
295A	5,720	12.83	5,014	4.83
295	10,800	12.75	9,018	4.75
300	13,500	12.75	11,333	4.83
310	13,500	12.92	11,341	4.92

Table 4.5.1-2 Summary of Reservoir Routing at Charles Blair McDonald Drive, CP282 (100-yr 24-hr)

Peak Inflow (cfs)	Peak Outflow (cfs)	Peak Stage (feet above invert)
2571	2407	12.7



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

FLOODPLAIN DELINEATION STUDY OF
ANDORA HILLS & GALLOWAY WASHES
FCD 99-14

FIGURE 4.5.1-1
COMPUTED 100-YEAR DISCHARGES

MARCH, 2002

LEGEND

- SUBBASIN
- 4140 — COMPUTED 100-YEAR DISCHARGE (cfs)
- 286 / 2390 — CONCENTRATION POINT (CONCENTRATION POINT NUMBER) (ELEVATION)
- ROUTING REACH
- ROUTING REACH (FLOODPLAIN DELINEATION RESTUDY REACH)

SCALE IN FEET
0' 1670' 3340' 5010'

JE FULLER
HYDROLOGY & GEOMORPHOLOGY, INC.
6101 SOUTH RURAL ROAD, SUITE 110
TEMPE, ARIZONA 85283
480-752-2124

Figure 4.5.1-2: Inflow & Outflow Hydrographs at RR282
Detention Basin at Charles Blair McDonald Drive

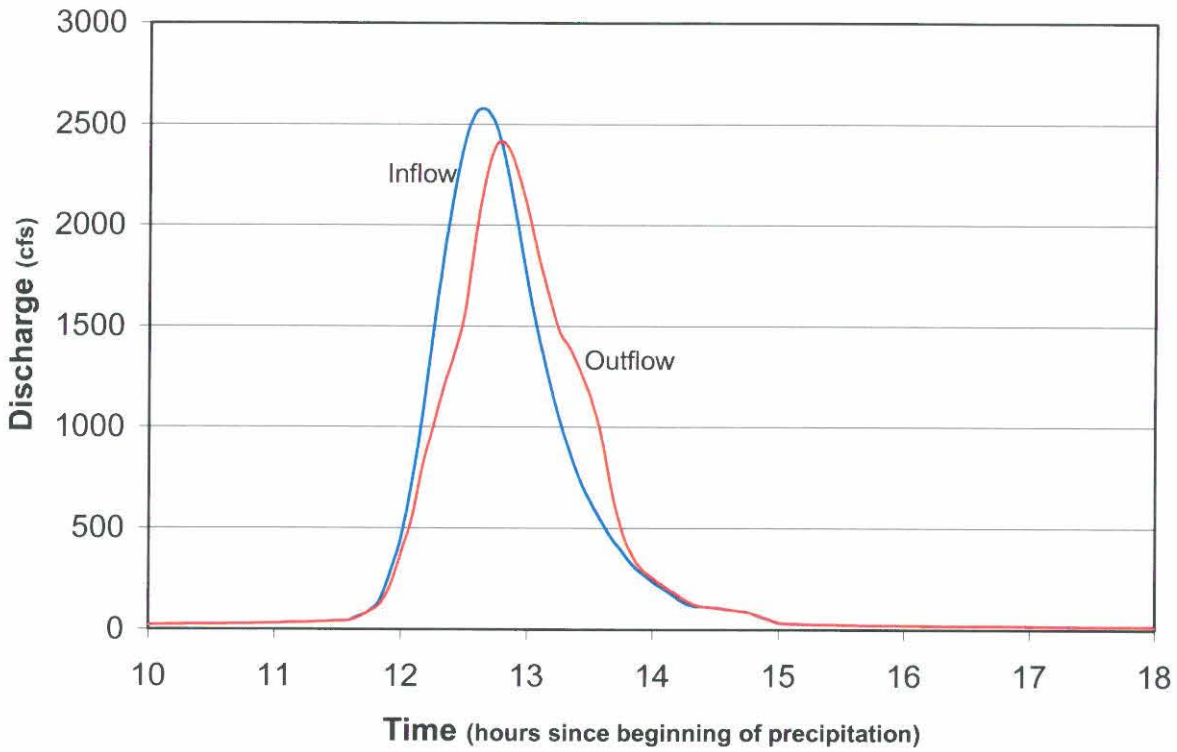


Table 4.5.1-3 Computed Discharge Values for Galloway Wash	
Concentration Point	**Discharge (cfs)**
270	4,140
280	5,490
282	2,570
284	1,110
285	1,440
286A	1,750
286	3,440
287	4,410
288	5,490
290	6,060
295A	5,720
295	10,800
300	13,500
310	13,500

4.5.2 Verification of Results

The results of the HEC-1 model were compared to two indirect data sources:

1. USGS regional regression predictions
2. The previous FIS study for the project area.

Table 4.5.2-1 and Table 4.5.2-2, shown on the next two pages, display the results of a comparison of HEC-1 discharge values and unit discharge values throughout the study area with those discharge values and unit discharge values at the same concentration points derived from the USGS regional regression equation for the 100-year peak discharge and from the previous FIS studies conducted by Sabol in 1997[9], Cella Barr Associates (CBA) in 1989[3], and Harris-Toups Associates in 1979[10]. In general, the discharge and unit discharge values from the HEC-1 modeling agree with the USGS[13]-derived discharges and Sabol[9] discharges and unit discharges; with the JEF unit discharges derived from the 100-year 24-hour storm hovering just above and below the USGS-derived unit discharges, and just above the Sabol discharges and unit discharges. Additional comparison of the results with other regression predictions are included in the back of Appendix D.6.

The regulatory discharge values noted in Table 4.5.2-1 under Harris-Toups[10] and Cella Barr[3] were obtained from the HEC-2 models for those two studies. The Harris-Toups discharges at JEF concentration points 295, 300 and 310 are considerably higher than any of the other discharge estimates presented in the comparison table. Also, the Cella Barr discharge estimate at JEF concentration point 284 (Galloway Wash at Pima Road), is significantly less than the JEF HEC-1 and the USGS regression discharge estimates for that concentration point. These differences could be attributable to the use of different hydrologic models such as the Soil Conservation Service TR20 model, or by application of HEC-1 modeling using different methodology and guidelines than are now required by the FCDMC.

Table 4.5.2-1 Comparison of HEC-1 Results to USGS Regional Regression Analysis and Previous Studies								
Concentration Point**	**Area (sq. mi.)**	**Mean Basin Elevation (ft)**	**USGS[14] Q100 (cfs)**	**JEF 24hr HEC-1 Q100 (cfs)**	**Sabol[9] 24hr HEC-1 Q100 (cfs)**	**JEF 6hr HEC-1 Q100 (cfs)**	**Harris-Toups[10] (1979) Q100 (cfs)**	**CBA[3] Q100 (cfs)**
270	4.905	3498	4384	4,140	3,471	3,749		
280	6.023	3179	5250	5,490	4,340	4,686		
282	2.552	3014	2971	2,570		2,427		
284	1.043	2826	1548	1,110		1,155		703*
285	1.390			1,440		1,446		
286A	1.790			1,750		1,717		
286	5.113	2842	4954	3,440		3,231	2,350	2,466
287	6.117	2800	5618	4,410		3,955	4,375	
288	7.09	2752	6235	5,490		4,779	4,375	
290	7.693	2732	6593	6,060	6,269	5,187	6,400	
295A	7.060			5,720		5,014		
295	14.759	2894	9614	10,800	9,547	9,018	13,400	
300	20.636	3011	11493	13,500	11,828	11,333	19,040	
310	20.977	2997	11627	13,500	12,838	11,341	18,900	

*Approximately 0.3 mile below concentration point 284; actual value at concentration point 284 is 430 cfs.
**For locations of concentration points, see figure 4.5.1-1.

Table 4.5.2-2: Unit-Discharge Comparison of HEC-1 Model Results with Results of USGS Regional Regression Analysis and Sabol[9]

Concentration Point	Area (sq. mi.)	USGS[13] unit Discharge (cfs/sq.mi.)	JEF 24-hr unit Discharge (cfs/sq.mi.)	Sabol[9] 24hr Unit Discharge (cfs/sq.mi.)	JEF 6-hr unit Discharge (cfs/sq.mi.)
270	4.905	894	844	708	812
280	6.023	872	912	721	778
282	2.552	1164	1007		951
284	1.043	1484	1064		1107
285	1.390		1036		1040
286A	1.790		978		959
286	5.113	969	672		632
287	6.117	918	721		647
288	7.09	879	774		674
290	7.693	857	788	815	674
295A	7.060		810		710
295	14.759	651	732	647	611
300	20.636	557	655	573	549
310	20.977	554	644	612	541

Flood-Flow –Frequency from Cave Creek Gauges

Station	Area (sq. mi.)	100-yr Peak Discharge (cfs)	Unit Discharge (cfs/sq. mi.)
Cave Creek below Cottonwood Creek (09512280)	82.7	19,700	238
Cave Creek near Cave Creek (09512300)	121	21,500	178

Data for 09512280 from FCDMC, 1998 and for 09512300 from Pope & others, 1998.

4.6 References

1. A-N West, Inc., March, 1996, Detailed Drainage Design Report for Desert Mountain Properties Proposed Detention Basin No. S-1, Prepared for Desert Mountain Properties.

2. Camp, P.D., 1986, Soil Survey of Aguila-Carefree Area, Parts of Maricopa and Pinal Counties, Arizona: U.S. Soil Conservation Service Report, 306 p.

3. Cella Barr Associates, December 1989, Flood Insurance Re-Study for Various Streams in Maricopa County, Arizona, Prepared for FEMA.

4. CH2M-Hill, March 1990, Final Hydrologic and Hydraulic Report for Cave Creek/Carefree Flood Delineation Study, FCD 88-53, Prepared for the Flood Control District of Maricopa County.

5. Flood Control District Of Maricopa County, 1998, Annual Hydrologic Data Report, Volume II, Surface Water Data. FCDMC, Phoenix, Arizona.

6. Flood Control District of Maricopa County, 1995, Drainage Design Manual, Volume I, Hydrology, Flood Control District of Maricopa County, Arizona. Revised Jan. 1, 1995.

7. Flood Control District of Maricopa County, 1995, Drainage Design Menu System, Version 1.2.

8. Federal Emergency Management Agency, December 23, 1997 Draft, Flood Insurance Study, Maricopa County, Arizona and Incorporated Areas, Volumes 1 through 8.

9. George V. Sabol Consulting Engineers, Inc., July 1997, Cave Creek Above Carefree Highway Floodplain Delineation Study, FCD 95-28, Prepared for the Flood Control District of Maricopa County.

10. Harris-Toups Associates, January 1979, Flood Insurance Study of Unincorporated Areas of Maricopa County, Arizona. Prepared for US Department of Housing and Urban Development, Federal Insurance Administration.

11. Miller, J.F., Frederick, R.H., and Tracey, R.J., 1973, Precipitation-Frequency Atlas of the Western United States, VIII, Arizona: NOAA Atlas 2. National Oceanic and Atmospheric Administration, Silver Spring, MD.

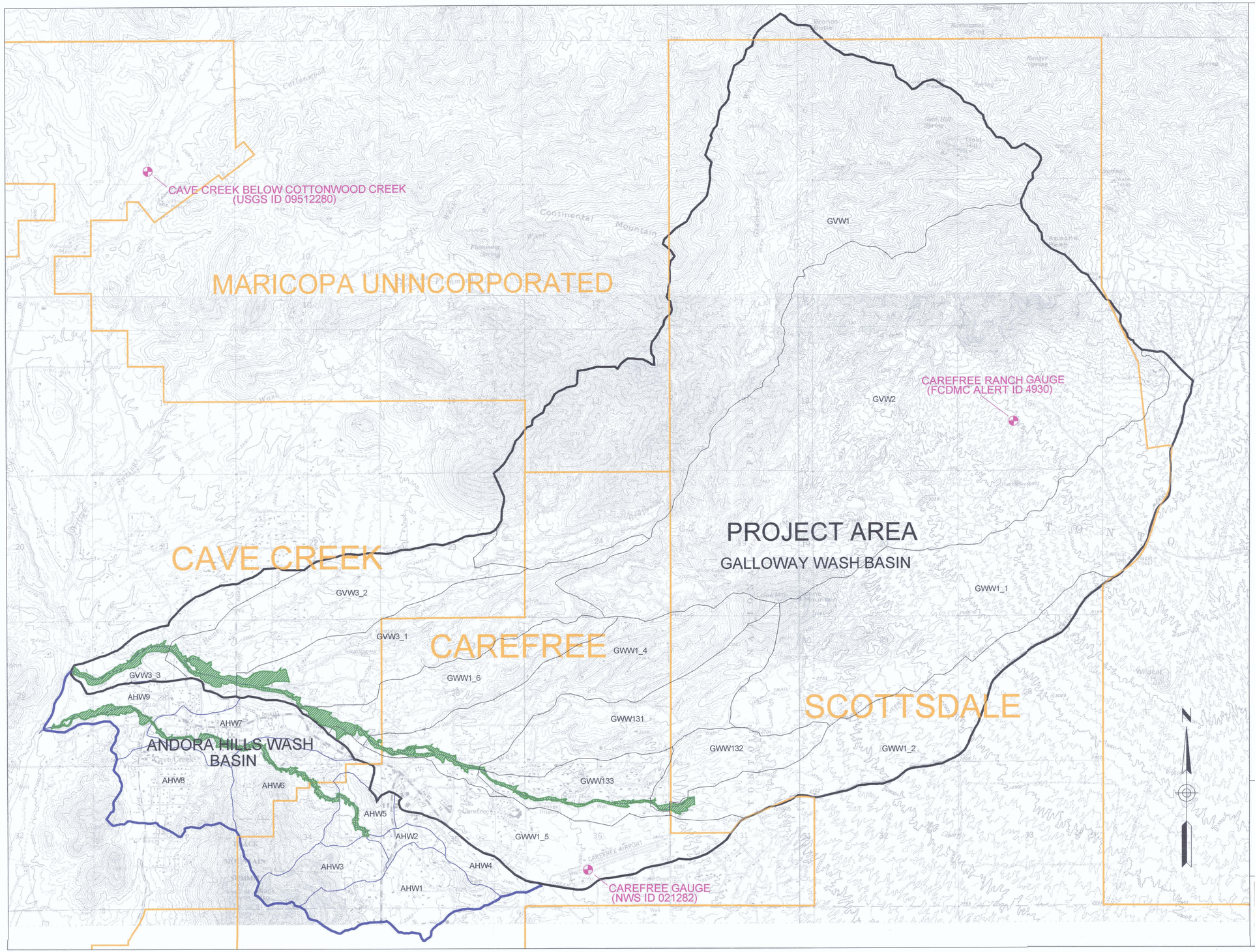
12. Pope, G. L., Rigasna, P. D., and Smith, C. F., 1998, Statistical Summaries of Streamflow Data and Characteristics for Selected Streamflow-Gaging Stations in Arizona Through Water Year 1996: U.S. Geological Survey, Water Resources Investigations Report 98-4225: Tucson, Arizona, 907 p.

13. Thomas, B.E., Hjalmarson, H.W., Waltemeyer, S.D., 1994, Methods for Estimating Magnitude and Frequency of Floods in the Southwestern United States: U.S. Geological Survey, Open-File Report 93-419.

14. U.S. Forest Service, 1989, General Ecosystem Survey, Tonto National Forest. USDA.

15. Zehr, R.M., and Myers, V.A., 1984, Depth-Area Relations in the Semi-arid Southwest United States, NOAA Technical Memorandum NWS HYDRO-40, Office of Hydrology, NOAA, Silver Spring, MD.

HYDROLOGY STUDY WORK MAPS



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

FLOODPLAIN DELINEATION STUDY OF
ANDORA HILLS & GALLOWAY WASHES
FCD 99-14

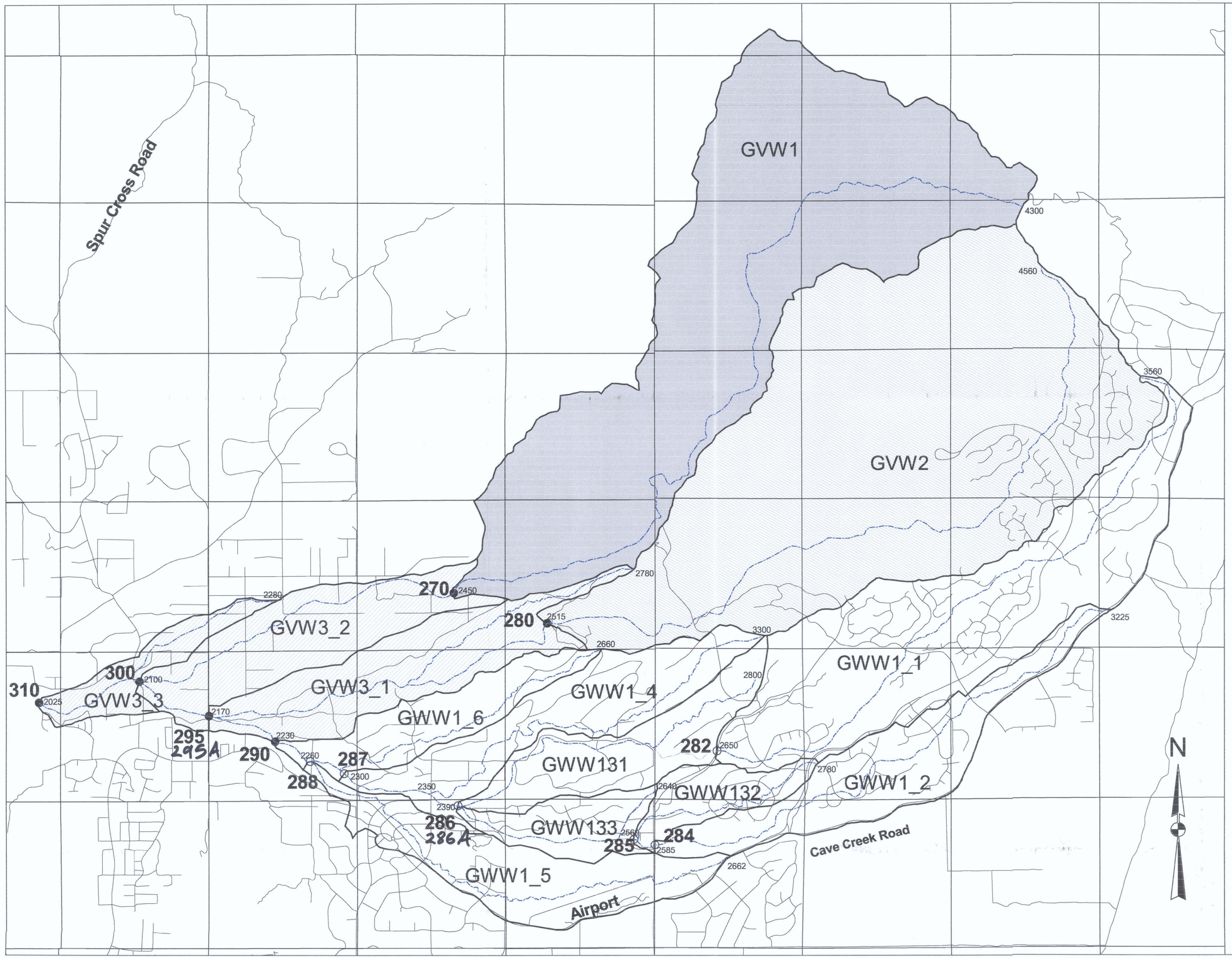
FIGURE 4.1-1

MARCH, 2002

LEGEND

- PROJECT AREA BOUNDARY (HYDROLOGY)
- BASIN BOUNDARIES FOR ANDORA HILLS WASH (from existing hydrology)
- PROJECT AREA BOUNDARY (HYDRAULICS)
- JURISDICTIONAL BOUNDARY
- GAUGE LOCATION

JE FULLER
HYDROLOGY & GEOMORPHOLOGY, INC.
6101 SOUTH RURAL ROAD, SUITE 110
TEMPE, ARIZONA 85283
480-752-2124



FLOOD CONTOL DISTRICT
OF MARICOPA COUNTY

FLOODPLAIN DELINEATION STUDY OF
ANDORA HILLS & GALLOWAY WASHES
FCD 99-14

FIGURE 4.2.2-1
COMPARISON TO SABOL (FCD 95-28) SUBBASINS

MARCH 2002

LEGEND

- Sabol Subbasin GWW1
- Sabol Subbasin GVW1
- Sabol Subbasin GVW2
- Sabol Subbasin GWW1
- 3225 Elevation
- Flow paths
- Streets
- 286 New Concentration Points
- 280 Sabol Concentration Points

SCALE

2000 0 2000 4000 Feet

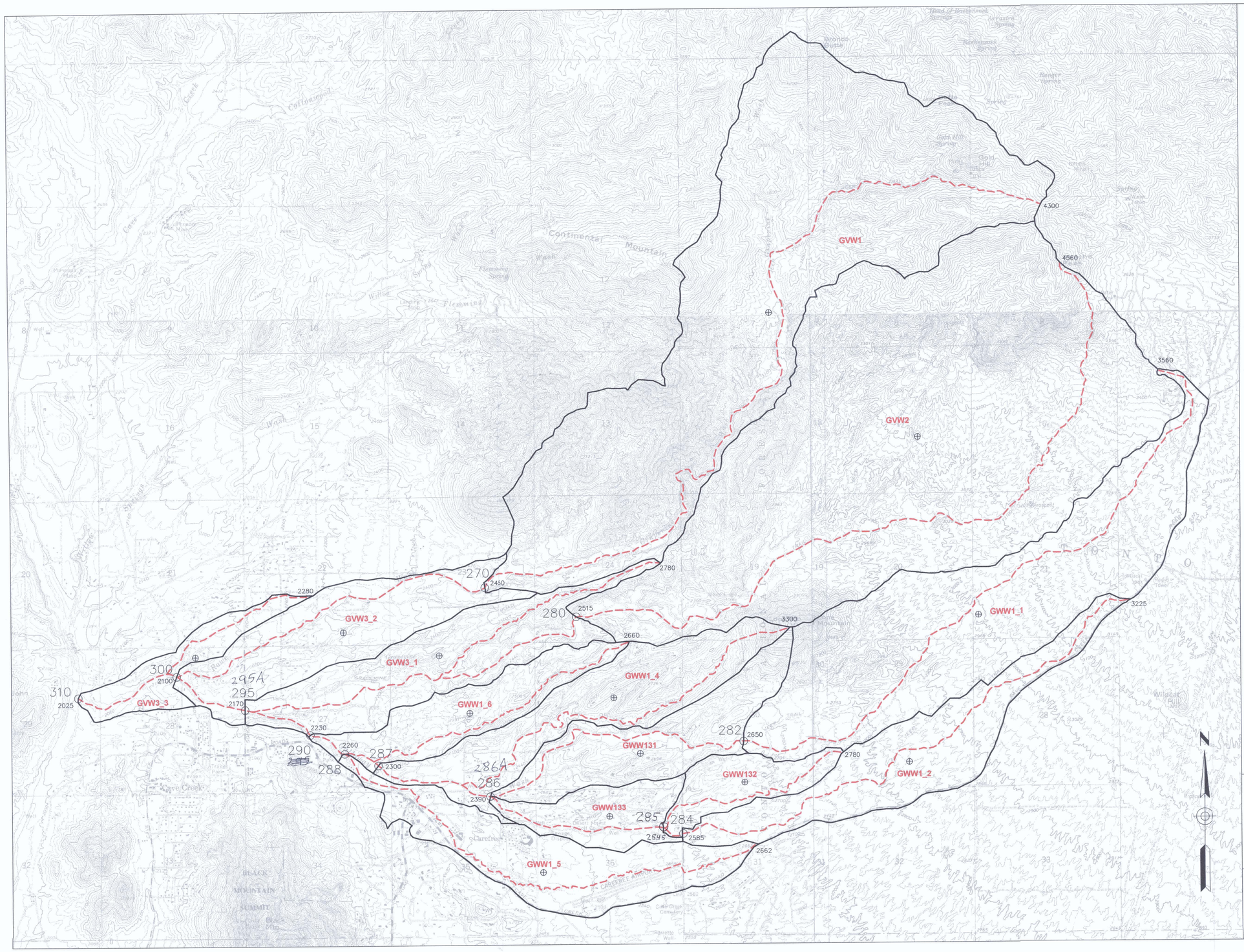
JE FULLER
HYDROLOGY & GEOMORPHOLOGY, INC.

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

FLOODPLAIN DELINEATION STUDY OF
ANDORA HILLS & GALLOWAY WASHES
FCD 99-14

FIGURE 4.2.2-2
Tc FLOW PATHS

MARCH, 2002



SCALE IN FEET

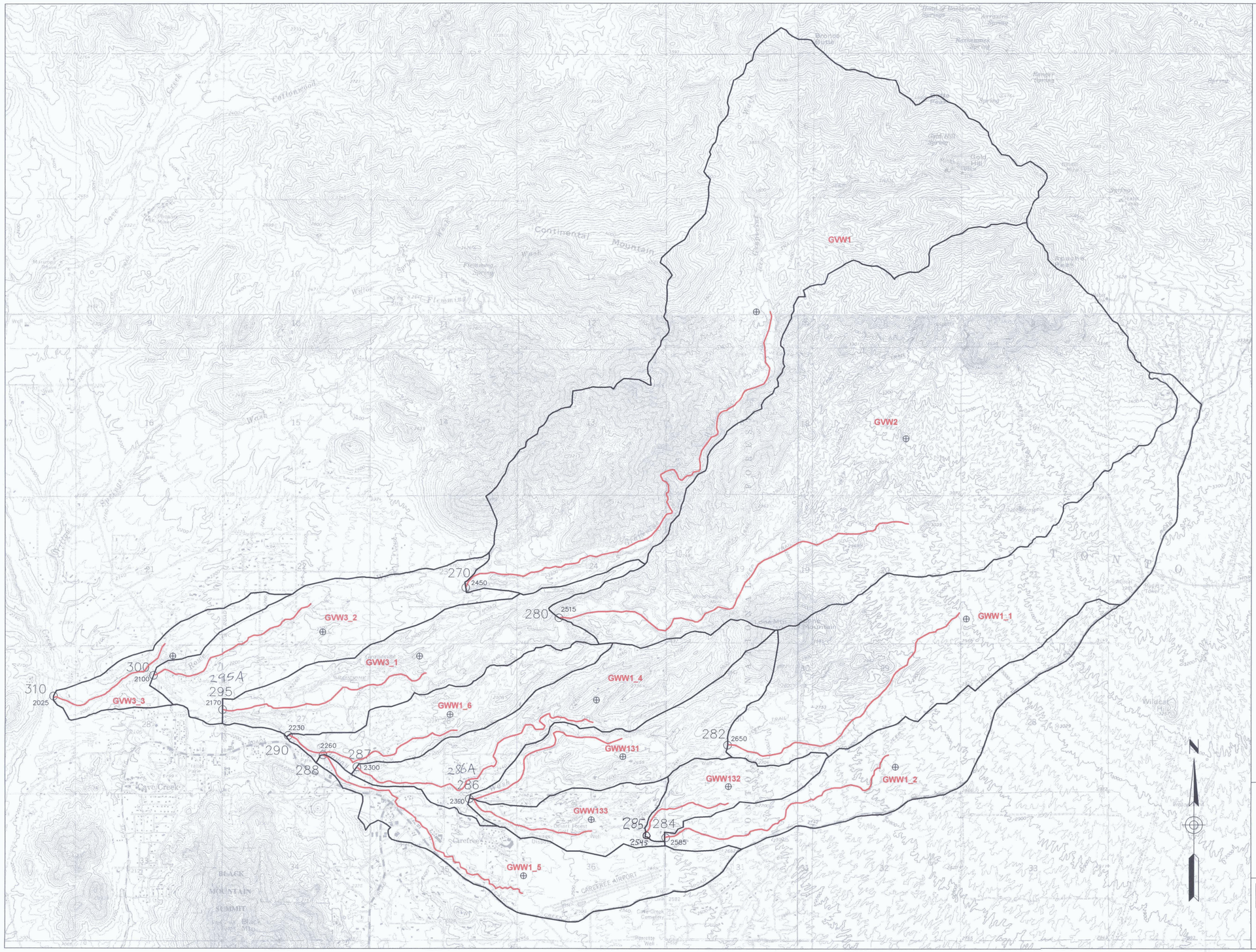
0' 1670' 3340' 5010'

LEGEND

- SUBBASIN
- ⊕ SUBBASIN CENTROID
- 286 / 2390 — CONCENTRATION POINT (CONCENTRATION POINT NUMBER) (ELEVATION)
- 2390 — Tc FLOW PATH (ELEVATION AT UPPER END OF FLOWPATH)

JE FULLER
HYDROLOGY & GEOMORPHOLOGY, INC.

6101 SOUTH RURAL ROAD, SUITE 110
TEMPE, ARIZONA 85283
480-752-2124



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

FLOODPLAIN DELINEATION STUDY OF ANDORA HILLS & GALLOWAY WASHES
FCD 99-14

FIGURE 4.2.2-3
Lca MAP

MARCH, 2002

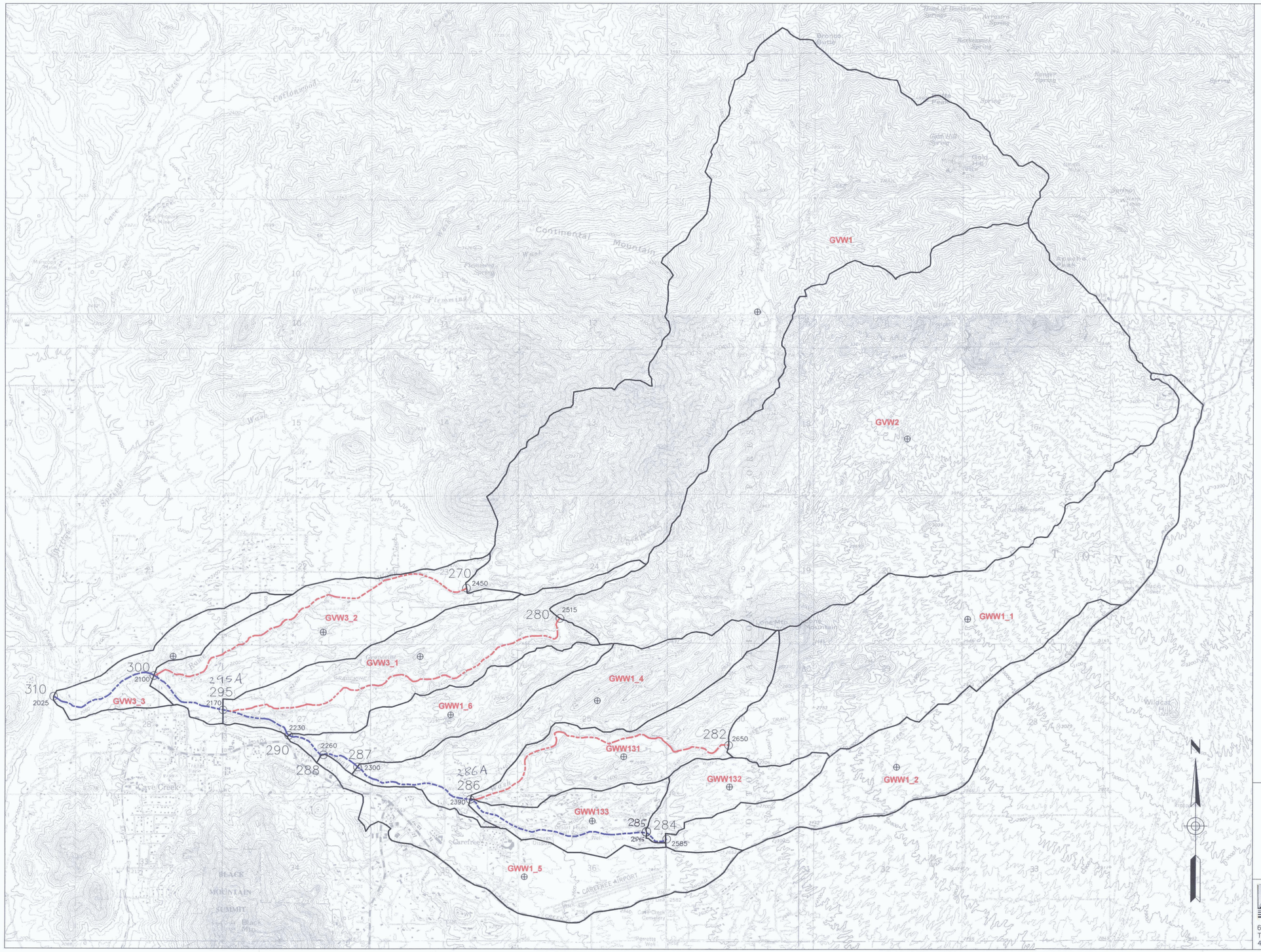
LEGEND

- SUBBASIN
- SUBBASIN CENTROID
- 286 / 2390 — CONCENTRATION POINT
- Lca FLOW PATH

SCALE IN FEET

0' 1670' 3340' 5010'

JE FULLER
HYDROLOGY & GEOMORPHOLOGY, INC.
6101 SOUTH RURAL ROAD, SUITE 110
TEMPE, ARIZONA 85283
480-752-2124



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

FLOODPLAIN DELINEATION STUDY OF
ANDORA HILLS & GALLOWAY WASHES
FCD 99-14

FIGURE 4.2.2-4
ROUTING REACHES

MARCH, 2002

LEGEND

- SUBBASIN
- SUBBASIN CENTROID
- 286 / 2390 — CONCENTRATION POINT (CONCENTRATION POINT NUMBER) (ELEVATION)
- ROUTING REACH
- ROUTING REACH (FLOODPLAIN DELINEATION RESTUDY REACH)

DRAFT

SCALE IN FEET

0' 1670' 3340' 5010'

JE FULLER
HYDROLOGY & GEOMORPHOLOGY, INC.
6101 SOUTH RURAL ROAD, SUITE 110
TEMPE, ARIZONA 85283
480-752-2124

FLOOD CONTOL DISTRICT
OF MARICOPA COUNTY

FLOODPLAIN DELINEATION STUDY OF
ANDORA HILLS & GALLOWAY WASHES
FCD 99-14

FIGURE 4.2.2-5
SOILS MAP
FOR GALLOWAY WASH

MARCH 2002

LEGEND

- Subbasins
- Flow paths
- 41 — Soil survey map unit
- Streets

Source: Soils data from Camp, 1986 and USFS as provided digitally by FCDMC.

N

SCALE

2000 0 2000 4000 Feet

JE FULLER
HYDROLOGY & GEOMORPHOLOGY, INC.

FLOOD CONTOL DISTRICT OF MARICOPA COUNTY

FLOODPLAIN DELINEATION STUDY OF ANDORA HILLS & GALLOWAY WASHES FCD 99-14

FIGURE 4.2.2-6 LAND USE MAP FOR GALLOWAY WASH

MARCH 2002

LEGEND

- Airport
- Dedicated or Non-developable Open Space
- Hotel, Motel or Resort
- Large Lot Residential (>1 and <=2 du/acre)
- Medium Density Residential (>5 and <=15 du/acre)
- Neighborhood Retail Center (<100,000 sq.ft.)
- Recreational Open Space
- Rural (1 dwelling unit per acre or less)
- Small Lot Residential (>2 and <=5 du/acre)
- Vacant
- Water
- Flow paths
- Streets
- Subbasins
- Jurisdictional Boundary

Source: Land use data modified from MAG as provided digitally by FCDMC.

SCALE

2000 0 2000 4000 Feet

JE FULLER HYDROLOGY & GEOMORPHOLOGY, INC.

MARICOPA COUNTY

CAVE CREEK

CAREFREE

SCOTTSDALE

Spur Cross Road

Cave Creek Road

Airport

GVW1

GVW2

GVW3_2

GVW3_1

GVW3_3

GWW1_6

GWW1_4

GWW131

GWW133

GWW1_5

GWW132

GWW1_1

GWW1_2

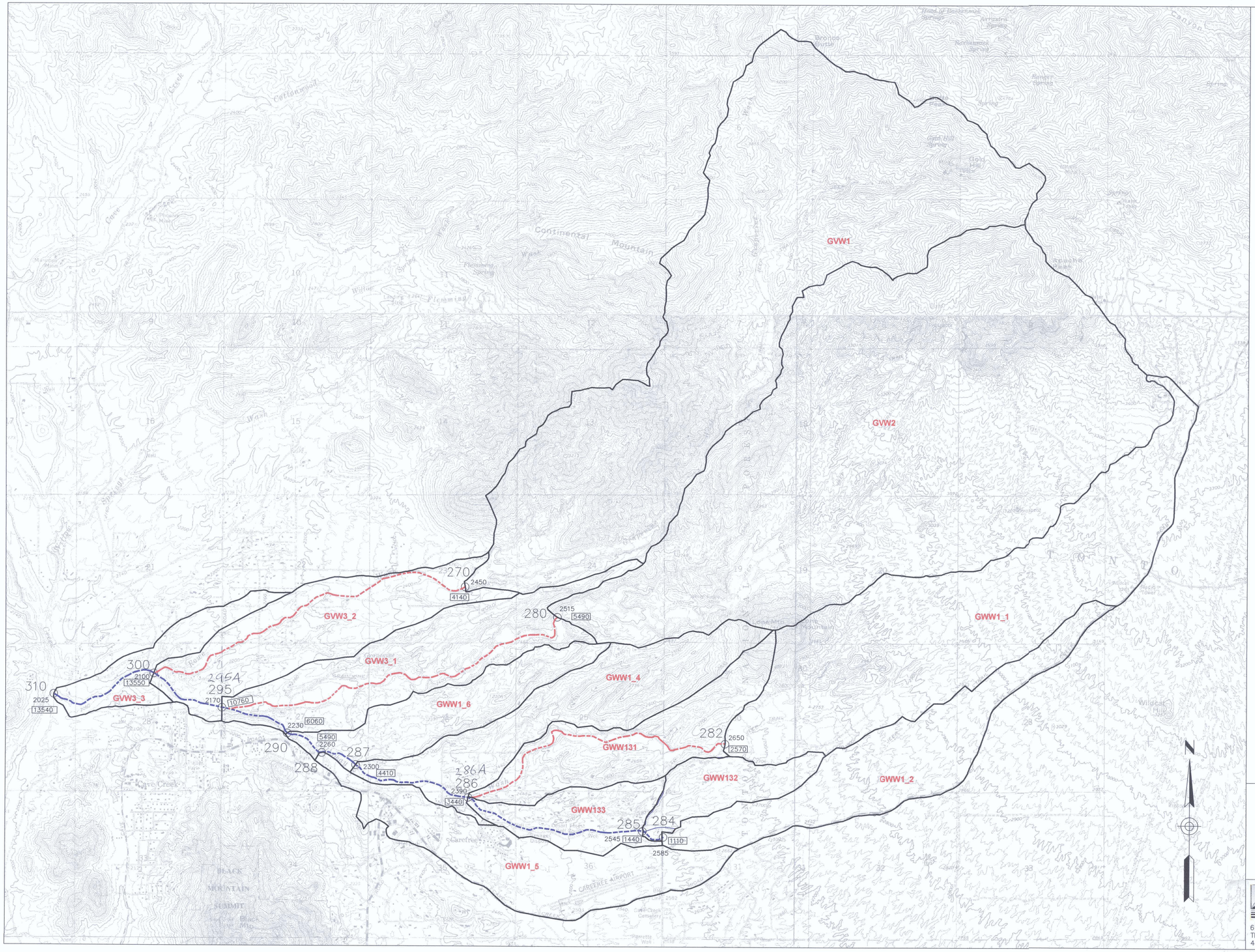
N

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

FLOODPLAIN DELINEATION STUDY OF
ANDORA HILLS & GALLOWAY WASHES
FCD 99-14

FIGURE 4.5.1-1
COMPUTED 100-YEAR DISCHARGES

MARCH, 2002



LEGEND

- SUBBASIN
- 4140 — COMPUTED 100-YEAR DISCHARGE (cfs)
- 286 / 2390 — CONCENTRATION POINT (CONCENTRATION POINT NUMBER) (ELEVATION)
- ROUTING REACH
- ROUTING REACH (FLOODPLAIN DELINEATION RESTUDY REACH)

NORTH

SCALE IN FEET
0' 1670' 3340' 5010'

JE FULLER
HYDROLOGY & GEOMORPHOLOGY, INC.
6101 SOUTH RURAL ROAD, SUITE 110
TEMPE, ARIZONA 85283
480-752-2124

SECTION 5: HYDRAULIC ANALYSIS

5.1 Method Description

The Andora Hills and Galloway Washes are located in northeast Maricopa County, Arizona (see Figure 1 and Figure 2). The watersheds of both Andora Hills Wash and Galloway Wash encompass approximately 24 square miles and drain from east to west. The floodplain delineation covers sections 26, 27, 28, 29, 34, 35, 36 of Township 6 North, Range 4 East, and sections 30 and 31 of Township 6 North, Range 5 East (see Figure 2, Reference 1).

The U.S. Army Corps of Engineers HEC-RAS (River Analysis System), computer program, Version 2.2a, was used to determine the 100-year floodplain/floodway limits and water surface elevations. Cross section data were developed using BOSS RiverCAD Version 4.0. The floodplain/floodway limits and base flood elevations were drafted using AutoCAD Land Development Desktop Release 2, Service Pack 1. Cross section locations are shown on the work study maps found in the back pockets of the Exhibit Maps section of this notebook.

Because the Andora Hills and Galloway Wash watershed areas are much smaller than that of the Cave Creek watershed, and because the 100-year peak discharges for the these watersheds are not coincident, normal depth is the basis for the starting water-surface elevations at the downstream extent of both Andora Hills and Galloway Washes, where these washes join Cave Creek.

Discharge rates used for both Andora Hills and Galloway Washes were taken from the HEC-1 model. Discharge rates were interpolated linearly between concentrations points for some portions of the reaches to more realistically estimate flow conditions. Liner interpolation was deemed an adequate method of estimating discharge rates given uniform sub-basin shapes and uniform increases in contributing area along the reaches.

Starting water-surface elevations for tributaries are assumed to equal the computed water surface elevations of the main streams just downstream of the confluence (i.e., HEC-RAS junction assuming coincident peaks). This assumption is valid for all tributaries in this study which originate as distributary branches born from the main stream (i.e., the ratio of the tributary watershed area to the main stream watershed area is approximately 1). Thus, the hydrographs are coincident.

Since a short reach of Grapevine Wash above the confluence with Galloway Wash was modeled in order to make a smooth transition, the peaks are approximately coincident, and therefore, the starting water surface elevation for the tributary of Grapevine Wash is assumed to equal the computed water surface elevation on the main branch of Galloway Wash. Note that the existing discharge was used for Grapevine Wash in order to smoothly join the floodplains.

Diverging flow paths (splits), and converging flow paths (junctions) were modeled using the HEC-RAS Junction routine. Computed water surfaces and/or energy elevations were balanced at

HEC-RAS distributary junctions (i.e., at the first upstream cross section for each channel born from the split). Where flow leaves the main channel by overtopping without a connecting distributary channel, the HEC-2 split flow routine was used to determine the amount of flow leaving the main channel because this routine more accurately models this type of side-weir split (see separate HEC-2 model output in Appendix E.5.1).

5.2 Work Study Maps

This floodplain delineation study includes topographic mapping and floodplain delineation of Andora Hills Wash and the lower 4.8 miles of Galloway Wash. A reduced set of the work maps (Sheets 1 through 6), including a cover sheet showing the project location, is included at the back of this section. The full size (24" X 36", 1"=200' scale) study work maps are located in the map pockets of Volume 2 of this Technical Data Notebook.

The work maps include cross-section locations, floodplain/floodway boundaries, computed water surface elevations, 100-year discharge values, zone designations, road names, a coordinate grid, corporate boundaries, stream names/numbers, and elevation reference marks used in the study. These exhibit items are set over two different map bases, which are 200 foot scale, with topographic contours at 2 foot interval. Sheet 1 includes existing topographic mapping flown by Aerial Mapping Company (AMC) on January 12, 1996, which is edge-matched to the new mapping which was flown September 30, 1999. Sheets 2 through 6 include the new topographic mapping only.

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

FLOODPLAIN DELINEATION STUDY OF ANDORA HILLS & GALLOWAY WASHES FCD 99-14

APRIL, 2002

LEGEND

- 100-YR FLOODPLAIN BOUNDARY
- FLOODWAY BOUNDARY
- HYDRAULIC BASE LINE WITH RIVER MILE (1.2 — 1.3)
- CROSS SECTION (RS = 0.300, FP = 2061.5, FW = 2061.5, Q = 13,700)
- ELEVATION REFERENCE MARK — ERM 4
- BASE FLOOD ELEVATIONS — 2060
- ZONE DESIGNATIONS — ZONE AE
- CORPORATE LIMITS — TOWN OF CAVE CREEK
- SECTION LINE

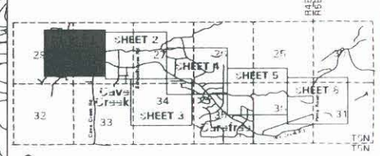
ELEVATION REFERENCE MARKS

I.D. NUMBER	ELEVATION (FT)	DESCRIPTION/LOCATION
ERM 1	2107.87	BC AT C/L INTERSECTION OF CAVE CREEK RD AND RANCHO MANANA BLVD. SECTION 28, T6N, R4E (N1030225.88, E688635.02)
ERM 2	2128.59	BC AT C/L OF SPUR CROSS RD APPROX 115 FT NORTH OF CAVE CREEK RD, SECTION 28, T6N, R4E (N1030858, E689461.65)

NOTES

1. THE HYDRAULIC BASE LINE IS CROSS SECTION STATION 15,200 UNLESS NOTED OTHERWISE.
2. HORIZONTAL PROJECTION IS ARIZONA STATEPLANE, CENTRAL ZONE, NORTH AMERICAN DATUM OF 1983.
3. ALL ELEVATIONS ARE BASED ON NATIONAL GEODETIC VERTICAL DATUM OF 1929. (CONVERSION FACTOR: 1988 NGVD = 2,756 + 1.021 NGVD

INDEX MAP



200 0' 200 400

SCALE: 1"= 200 FEET

CONTOUR INTERVAL = 2 FEET

REGISTERED LAND SURVEYOR CERTIFICATE NO. 24530 DAVID A. RHINE ARIZONA, U.S.A.

JE FULLER HYDROLOGY & GEOMORPHOLOGY, INC

in association with

DIBBLE & ASSOCIATES CONSULTING ENGINEERS

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1"= 200' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS. FLIGHT DATE: 9/30/99

M&B AERIAL MAPPING COMPANY, LLC

GROUND CONTROL SURVEY DATA PROVIDED BY A TEAM PROFESSIONAL ASSOCIATES, INC.

REGISTERED PROFESSIONAL ENGINEER CERTIFICATE NO. 23969 FRANK EDWARD BROWN ARIZONA, U.S.A.

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

FLOODPLAIN DELINEATION STUDY OF ANDORA HILLS & GALLOWAY WASHES FCD 99-14

APRIL, 2002

LEGEND

100-YR FLOODPLAIN BOUNDARY

FLOODWAY BOUNDARY

HYDRAULIC BASE LINE WITH RIVER MILE 1.2 1.3

CROSS SECTION

ELEVATION REFERENCE MARK ERM 4

BASE FLOOD ELEVATIONS 2060

ZONE DESIGNATIONS ZONE AE

CORPORATE LIMITS TOWN OF CAVECREEK

SECTION LINE

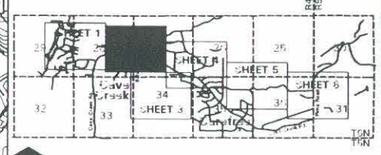
ELEVATION REFERENCE MARKS

I.D. NUMBER	ELEVATION (FT)	DESCRIPTION/LOCATION
ERM 3	2308.85	E COR., MCHD BC IN HANDHOLE AT C/L OF SCHOOL HOUSE RD, APPROX. 0.2 MI N OF CAVE CREEK RD, SECTIONS 27-28, T5N, R4E (N1031481.10, E881918.75)
ERM 8	2188.80	PCDMC BC ON STONE BASE AT N END OF CUTOFF WALL ON W SIDEOF SCHOOL HOUSE RD AT ANDORA HILLS WASH, APPROX. 0.14 MI S OF CAVE CREEK RD, S28, T5N, R4E (N1028834.74,E881901.8)
ERM 130	2164.76	CHISELED SQUARE IN CONCRETE FLAGPOLE BASE AT AMERICAN LEGION POST 34, ON N SIDE OF CAVE CREEK RD, 0.2 MI W OF SCHOOL HOUSE RD, S28, T5N, R4E (N1030394.4, E881048.-88)

NOTES

1. THE HYDRAULIC BASE LINE IS PROJECTION STATION 15,000 UNLESS NOTED OTHERWISE.
2. HORIZONTAL PROJECTION IS ARIZONA STATEPLANE, CENTRAL ZONE, NORTH AMERICAN DATUM OF 1983.
3. ALL ELEVATIONS ARE BASED ON NATIONAL GEODETIC VERTICAL DATUM OF 1929. CONVERSION FACTOR: 1988 NGVD = 2.05 + 1929 NGVD

INDEX MAP



200 0' 200 400

SCALE: 1"= 200 FEET

CONTOUR INTERVAL = 2 FEET

REGISTERED LAND SURVEYOR
24530
DAVID A. RHINE
ARIZONA, U.S.A.

REGISTERED PROFESSIONAL ENGINEER
23080
FRANK EDWARD BROWN
ARIZONA, U.S.A.

JE FULLER
HYDROLOGY & GEOMORPHOLOGY, INC.
in association with
DIBBLE & ASSOCIATES
CONSULTING ENGINEERS

SHEET 2 OF 6

MATCH TO SHEET 1

MATCH SHEET 4

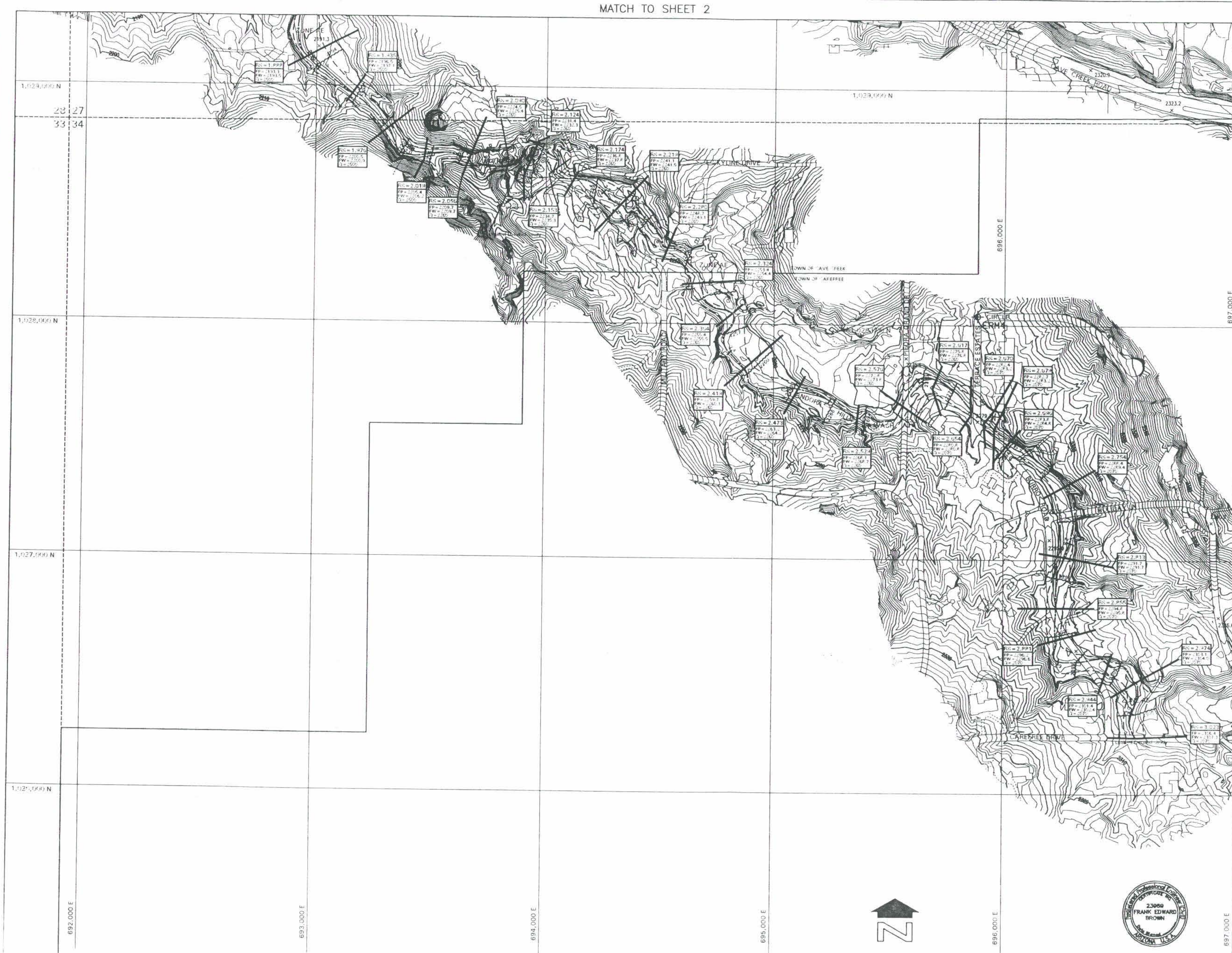
MATCH TO SHEET 3

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1"= 200' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS. FLIGHT DATE: 9/30/99

M&B AERIAL MAPPING COMPANY, LLC

GROUND CONTROL SURVEY DATA PROVIDED BY A TEAM PROFESSIONAL ASSOCIATES, INC.

MATCH TO SHEET 2



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

FLOODPLAIN DELINEATION STUDY OF ANDORA HILLS & GALLOWAY WASHES FCD 99-14

APRIL, 2002

LEGEND

100-YR FLOODPLAIN BOUNDARY
FLOODWAY BOUNDARY
HYDRAULIC BASE LINE WITH RIVER MILE
CROSS SECTION
ELEVATION REFERENCE MARK — ERM 4
BASE FLOOD ELEVATIONS — 2080
ZONE DESIGNATIONS — ZONE AE
CORPORATE LIMITS — TOWN OF CAVECREEK
SECTION LINE

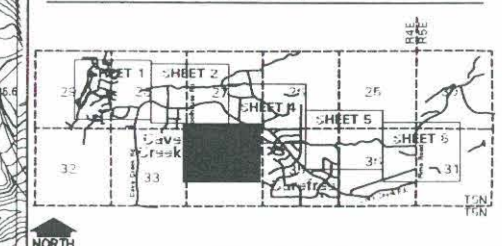
ELEVATION REFERENCE MARKS

I.D. NUMBER	ELEVATION (FT)	DESCRIPTION/LOCATION
ERM 4	2290.43	BC IN C/L OF TERRACE ESTATES CIRCLE, APPROXIMATELY 1000 FEET NORTH OF INTERSECTION OF BURRO ROAD AND HOLIDAY LANE, S34, T6N, R4E (N1028038.59, E695882.82)

NOTES

1. THE HYDRAULIC BASE LINE IS CROSS SECTION STATION 10,000 UNLESS NOTED OTHERWISE.
2. HORIZONTAL PROJECTION IS ARIZONA STATEPLANE, CENTRAL ZONE, NORTH AMERICAN DATUM OF 1983.
3. ALL ELEVATIONS ARE BASED ON NATIONAL GEODETIC VERTICAL DATUM OF 1929. CONVERSION FACTOR: 1988 NGVD = 2.05 + 1929 NGVD

INDEX MAP



200 0' 200 400

SCALE: 1"= 200 FEET

CONTOUR INTERVAL = 2 FEET

REGISTERED LAND SURVEYOR 24530 DAVID A. RHINE ARIZONA, U.S.A.

REGISTERED PROFESSIONAL ENGINEER 23869 FRANK EDWARD BROWN ARIZONA, U.S.A.

JE FULLER HYDROLOGY & GEOMORPHOLOGY, INC

in association with

DIBBLE & ASSOCIATES CONSULTING ENGINEERS

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1"= 200' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS. FLIGHT DATE: 9/30/99

M&B AERIAL MAPPING COMPANY, LLC

GROUND CONTROL SURVEY DATA PROVIDED BY A TEAM PROFESSIONAL ASSOCIATES, INC.

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

FLOODPLAIN DELINEATION STUDY OF ANDORA HILLS & GALLOWAY WASHES FCD 99-14

APRIL, 2002

LEGEND

- 100-YR FLOODPLAIN BOUNDARY
- FLOODWAY BOUNDARY
- HYDRAULIC BASE LINE WITH RIVER MILE (1.2, 1.3)
- CROSS SECTION
- ELEVATION REFERENCE MARK — ERM 4
- BASE FLOOD ELEVATIONS — 2080
- ZONE DESIGNATIONS — ZONE AE
- CORPORATE LIMITS — TOWN OF CAVECREEK
- SECTION LINE

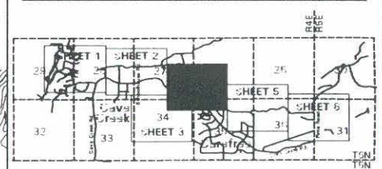
ELEVATION REFERENCE MARKS

I.D. NUMBER	ELEVATION (FT)	DESCRIPTION/LOCATION
ERM 6	2286.66	FCDMC BC ON TOP OF N END OF CULVERT HEADWALL ON E SIDE OF GALLOWAY RD, APPROX 0.25 MI N OF CAVE CREEK RD, SECTION 27, T8N, R4E (N1030140.93, E896383.49)
ERM 7	2373.76	BC STAMPED "RLS 11062, 1 M, 1987", IN PAVEMENT APPROX 10 FT W & 15 FT N OF C/L INTERSECTION OF SUNDANCE TRAIL & TRANQUIL TRAIL S26, T8N, R4E (N1028893.58, E899813.23)

NOTES

1. THE HYDRAULIC BASE LINE IS CROSS SECTION STATION 10,000 UNLESS NOTED OTHERWISE.
2. HORIZONTAL PROJECTION IS ARIZONA STATEPLANE, CENTRAL ZONE, NORTH AMERICAN DATUM OF 1983.
3. ALL ELEVATIONS ARE BASED ON NATIONAL GEODETIC VERTICAL DATUM OF 1929. (CONVERSION FACTOR: 1988 NGVD = 2.56 + 1929 NGVD)

INDEX MAP



200 0' 200 400

SCALE: 1"= 200 FEET
CONTOUR INTERVAL = 2 FEET

REGISTERED LAND SURVEYOR
24530
DAVID A. RHINE
ARIZONA, USA

JE FULLER
HYDROLOGY & GEOMORPHOLOGY, INC.
in association with
DIBBLE & ASSOCIATES
CONSULTING ENGINEERS

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1"= 200' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS. FLIGHT DATE: 9/30/99

M&B AERIAL MAPPING COMPANY, LLC

GROUND CONTROL SURVEY DATA PROVIDED BY A TEAM PROFESSIONAL ASSOCIATES, INC.

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

FLOODPLAIN DELINEATION STUDY OF ANDORA HILLS & GALLOWAY WASHES FCD 99-14

APRIL, 2002

LEGEND

100-YR FLOODPLAIN BOUNDARY

FLOODWAY BOUNDARY

HYDRAULIC BASE LINE WITH RIVER MILE — 1.2 — 1.3

CROSS SECTION

ELEVATION REFERENCE MARK — ERM 4

BASE FLOOD ELEVATIONS — 2080

ZONE DESIGNATIONS — ZONE AE

CORPORATE LIMITS — TOWN OF CAVE CREEK

SECTION LINE

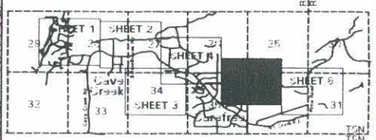
ELEVATION REFERENCE MARKS

I.D. NUMBER	ELEVATION (FT)	DESCRIPTION/LOCATION
ERM 8	2443.44	BC ON TOP OF SOUTH END OF CULVERT HEADWALL, LOCATED APPROX 25 FT N AND 25 FT W OF C/L INTERSECTION OF MULE TRAIN RD AND SERENE STREET, SECTION 35, T8N, R4E (N1028825.55, E702432.48)

NOTES

1. THE HYDRAULIC BASE LINE IS CROSS SECTION STATION 10,000 UNLESS NOTED OTHERWISE.
2. HORIZONTAL PROJECTION IS ARIZONA STATEPLANE, CENTRAL ZONE, NORTH AMERICAN DATUM OF 1983.
3. ALL ELEVATIONS ARE BASED ON NATIONAL GEODETIC VERTICAL DATUM OF 1929. CONVERSION FACTOR: 1988 NGVD = 2.05 + 1929 NGVD

INDEX MAP



200 0' 200 400

SCALE: 1"= 200 FEET

CONTOUR INTERVAL = 2 FEET

REGISTERED LAND SURVEYOR
24530
DAVID A. RHINE
ARIZONA, USA

JE FULLER
HYDROLOGY & GEOMORPHOLOGY, INC

in association with

DIBBLE & ASSOCIATES
CONSULTING ENGINEERS

SHEET 5 OF 6

MATCH TO SHEET 4

MATCH SHEET 6

1,030,000 N

1,029,000 N

1,027,000 N

701,000 E

702,000 E

703,000 E

704,000 E

705,000 E

ERM8

GALLOWAY WASH TRIBUTARY

GALLOWAY WASH

CAVE CREEK

CAREFREE DRIVE

ROCKING CHAIR RD

SERENE STREET

ZONE AE

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1"= 200' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS. FLIGHT DATE: 9/30/98

M&B AERIAL MAPPING COMPANY, LLC

GROUND CONTROL SURVEY DATA

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

FLOODPLAIN DELINEATION STUDY OF ANDORA HILLS & GALLOWAY WASHES FCD 99-14

APRIL, 2002

LEGEND

100-YR FLOODPLAIN BOUNDARY
FLOODWAY BOUNDARY
HYDRAULIC BASE LINE WITH RIVER MILE — 1.2 — 1.3
CROSS SECTION — RS = 0.300, FP = 2561.0, FW = 2561.5, Q = 13,700
ELEVATION REFERENCE MARK — ERM 4
BASE FLOOD ELEVATIONS — 2060
ZONE DESIGNATIONS — ZONE AE
CORPORATE LIMITS — TOWN OF CAVECREEK
SECTION LINE

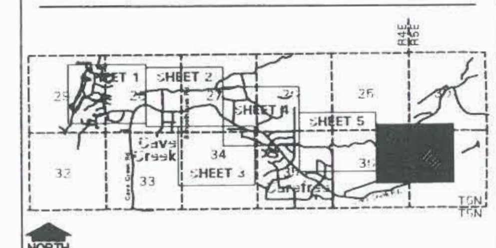
ELEVATION REFERENCE MARKS

I.D. NUMBER	ELEVATION (FT)	DESCRIPTION/LOCATION
ERM 9	2557.10	BC IN C/L OF CAREFREE DRIVE, APPROX 0.2 MI W OF INTERSECTION OF PIMA ROAD AND CAREFREE DRIVE, SECTION 36, T6N, R4E (N1027710.79, E706517.19)

NOTES

1. THE HYDRAULIC BASE LINE IS CROSS SECTION STATION 10,000 UNLESS NOTED OTHERWISE.
2. HORIZONTAL PROJECTION IS ARIZONA STATEPLANE, CENTRAL ZONE, NORTH AMERICAN DATUM OF 1983.
3. ALL ELEVATIONS ARE BASED ON NATIONAL GEODETIC VERTICAL DATUM OF 1929. CONVERSION FACTOR: 1988 NGVD = 2.05 + 1929 NGVD

INDEX MAP



200 0' 200 400

SCALE: 1" = 200 FEET

CONTOUR INTERVAL = 2 FEET

24530 DAVID A. RHINE — REGISTERED LAND SURVEYOR — ARIZONA, USA

JE FULLER HYDROLOGY & GEOMORPHOLOGY, INC.

in association with

DIBBLE & ASSOCIATES CONSULTING ENGINEERS

SHEET 6 OF 6

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR

M&B AERIAL MAPPING COMPANY, LLC

GROUND CONTROL SURVEY DATA

5.3 Parameter Estimation

5.3.1 Roughness Coefficients

Hydraulic modeling of channels using HEC-RAS, requires a minimum of three (3) values of the roughness coefficients. These values are for the main channel and the left and right overbanks. The coefficient values are determined for the time of peak flow through the cross-section.

N values are usually calculated by establishing a base value for a typical channel and adjusting this value for channel characteristics. The base value can be determined by a comparison with typical values established through channel studies that are available in widely accepted references.

The USGS publications titled *Verification of Roughness Coefficients for Selected Natural and Constructed Stream Channels in Arizona (Reference 3), and Estimated Manning's Roughness Coefficients for Stream Channels and Flood Plains in Maricopa County, Arizona* (Reference 2), were used as aids to determine the base values in this study. Two separate field investigations were conducted to determine channel characteristics for the study reach. Notes and photographs were taken to document the characteristics. The findings of these field investigations were summarized in a separate Manning's n value report produced by JEF in association with Dibble & Associates, Inc. (Dibble) for this study for the FCDMC (see Appendix E.1)

5.3.2 Expansion and Contraction Coefficients

The expansion and contraction coefficients used throughout the study reach were 0.3 and 0.1, respectively.

5.4 Cross-section descriptions

The cross section labeling represents the distance upstream along the thalwegs of Andora Hills and Galloway Washes from the Cave Creek thalweg as established by the FCDMC, or as the case is with tributaries, the distance upstream of their confluence with the main channel of either Andora Hills Wash or Galloway Wash. The HEC-RAS results were examined to determine that the sections were representative of the reach and to remove non-effective flow areas.

Cross sections were generally placed at intervals of 200'. For reaches immediately above and below split flows and junctions, upstream and downstream of hydraulic structures, and for reaches which display irregular channel characteristics, cross sections were generally placed at intervals of less than approximately 100 feet.

A detailed description of channel cross-section characteristics is contained in the n-value report for this project, which is included in Appendix E.1

5.5 Modeling Considerations

5.5.1 Hydraulic Jump and drop analysis

No hydraulically significant hydraulic jumps or drops occur in this study reach.

5.5.2 Bridge or Culverts

Five culverts were analyzed on Andora Hills Wash, and two bridges and one culvert were analyzed on Galloway Wash. As-built drawings are located in Appendix C.3 for these structures. Table 5.5.2.1 includes a listing of these structures.

Table 5.5.2.1: Culverts and Bridges

Location	Dimensions	Type
Andora Hills Wash		
1. El Indio Circle, RS 0.429	2-12.87'x8'	Concrete Box Culvert (CBC)
2. Miramonte Drive golf cart path, RS 0.673	4-58"x44", 1-9'x78"	Horizontally-Eliptical, Corrugated Metal Pipe (HECMP)
3. Grapevine Road, RS 0.797	5-56"x26"	HECMP
4. Cave Creek Road, RS 0.893	4-12'x7'	CBC
5. Terrace Estates Circle, RS 2.662	2-10'x36"	CBC
Galloway Wash		
6. Private Footbridge, RS 3.503	Approx. 50'x2'	Wood
7. Galloway Road, RS 2.275	8-10'x6'	CBC, with steel handrails
8. Private Driveway, RS 0.866	2 spans, total approx. 180', Average height above channel invert is approximately 6.5 feet	2 steel railroad flat-bed cars with wood decks, supported by concrete piers. Includes steel handrails.
9. Dream Street, RS 3.369	28'x6'	Con Arch Bridge

The HEC-RAS culvert routine, which uses the Federal Highway Administration's (FHWA) standard equations for culvert hydraulics (Design of Highway Culverts, FHWA, 1985) under inlet control, was used to define the floodplain delineations at structure numbers 1 through 5, and 7 as listed in table 5.5.2.1. The HEC-RAS bridge routine was used to analyze the hydraulics at structures 6, 8 and 9. The bridge modeling approach chosen for these structures was the highest energy answer of either, the energy (standard step), momentum or Yarnell (class A only if piers present) methods. For overtopping, the pressure and/or weir high flow methods were chosen.

5.5.3 Levees and Dikes

No levees or dikes are located in this study reach.

5.5.4 Islands and Flow Splits

Two flow splits each occur on Andora Hills Wash and Galloway Wash. Table 5.5.4.1 presents the location of modeled flow splits/junctions and their associated discharges. Diverging flow paths (splits), and converging flow paths (junctions) were modeled using the HEC-RAS Junction routine. Computed water surfaces elevations and/or energy elevations were balanced across the

Table 5.5.4.1. Summary of Split Flows and Other Changes in Discharge						
HEC-RAS				Split / Q Source		
River	Reach	River Sta	Q (cfs)	RAS[1]	HEC-1[2]	Comments
Andora	Reach 1	0.162	3200		X	
	Reach 2	0.271	1913	X		
	Reach 3	0.522	3100		X	
	Reach 3	0.729	3000		X	
	Reach 3	0.999	2900		X	
	Reach 3	0.992	2750		X	
	Reach 3	1.496	2700		X	
	Reach 4	1.555	2395	X		
	Reach 5	1.668	2620		X	
	Reach 5	2.056	2500		X	
	Reach 5	2.617	2260		X	
	Reach 5	3.023	2070		X	
	Split 1	0.244	305	X		
	Split 2	0.093	1287	X		
Galloway	Reach 1	0.792	13500		X	
	Reach 1	0.905	10800		X	
	Reach 2	1.056	6693	X		
	Reach 3	1.474	10800		X	
	Reach 4	2.004	6060		X	
	Reach 4	2.098	5490		X	
	Reach 4	2.299	4410		X	
	Reach 4	2.647	3440		X	
	Reach 5	2.872	3224	X		
	Reach 6	3.216	3440		X	
	Reach 6	3.504	1840		X	
	Reach 6	3.861	1750		X	
	Reach 6	4.277	1595		X	
	Reach 6	4.505	1440		X	
	Reach 6	4.543	1110		X	
	Reach 7	4.639	935	X		
	Reach 8	4.832	1110		X	
	Split 1	0.240	260	X		
	Split 2	0.148	4175	X		
	Split 3	0.082	175	X		
Grapevine	Reach 1	0.210	5720		X	Same xsec location as Grapevine 0.00 (CH2M-Hill)

[1]Flow split from HECRAS energy balance of discharges at split flow. See also Appendix E.5.
[2]Flow change based on HEC-1 hydrology.

In three circumstances, flow splits resulted in estimated discharges and depths of less than 100 cfs and 0.5 foot respectively. In these cases, the resulting flow leaving the main channel was not mapped, nor was the estimated discharge subtracted from the 100-year regulatory discharge modeled in the main channel. These flow splits are documented along with the FEMA forms under "Explanations of water surfaces higher than the endpoints of cross sections" with backup calculations/analysis output located in Appendix E.5.

Divided-flow islands were allowed in the HEC-RAS analysis if they met the following criteria:

1. The islands were relatively short (i.e., less than 1,000 feet in the direction of flow or 4 cross sections),
2. Channel (thalweg) slopes and elevations on each side of the island are similar, and
3. The conveyance on each side of the island is uniform (i.e., no significant changes in flow distribution from one side of the island to the other for the length of the island as shown in HEC-RAS flow distribution output summary).

If these criteria were not met by an island flow situation, then a new HEC-RAS junction was developed, resulting in an additional distributary reach splitting from the main channel and eventually rejoinging. In either case (divided flow or split flow), a shaded Zone X was applied to the island between the split reaches only if they showed signs of stability as evidenced by the presence of bedrock or stable geomorphic surfaces (i.e., well-developed soils with reddening from clay or carbonate deposits, terrestrial vegetation, stable slopes, etc.).

5.5.5 Ineffective Flow Areas

Ineffective flow areas were modeled in areas where rapid expansion or contraction of flow occurred. A general expansion rate of 4 to 1 (i.e., one foot lateral expansion for every 4 feet of linear flow) was used to set these ineffective flow limits for rapid expansion, and a 1 to 1 contraction rate was used to set ineffective flow limits for rapidly contracting reaches. For reaches with low velocities (i.e., less than 5 feet per second), the expansion rate varied between 3 to 1 and 4 to 1. References 5 and 6 to this section provide further discussion of application of expansion and contraction coefficients in riverine environments.

5.5.6 Supercritical Flow

Supercritical flow does not occur for significant lengths along any reach in this study.

5.6 Floodway modeling

Floodways were determined using HEC-RAS by first applying the equal-conveyance encroachment method 4 with a target of one foot. The model was then optimized to bring the surcharges as close as possible to one foot by varying the method 4 targets at each cross section.

After a review of the one-foot target results, the targets were decreased in reaches which would have been adversely impacted (in general) by increased stream sinuosity, significantly-increased erosion potential, or decreased floodway width (as compared to the original study). Additionally, the targets were adjusted to avoid abrupt changes in the floodway width and energy-grade surcharges greater than 1 foot. The final floodway delineation also takes ineffective flow areas into consideration by matching the floodway boundary to cross-section stations indicating the ineffective flow boundary.

Once the floodway profiles were optimized, the method 4 encroachments were imported to method 1. Floodway profiles were calculated for all reaches except Split 1 of Andora Hills Wash at the request of the Flood Control District of Maricopa County.

5.7 Special problems encountered during the study

5.7.1 Special Problems and Solutions

The effective FIS for the lowest 1000 foot section of Grapevine Wash upstream from Galloway Wash was originally done by Harris Toups in 1979. The 1990 CH2M-Hill restudy of Grapevine Wash did not extend downstream to the confluence with Galloway Wash. This study includes that 1000-foot section of Grapevine Wash in order to replace the older study and to prevent confusion in the future. The Grapevine Wash cross section 0.210 from this study, is at the same location as the CH2M-Hill cross section 0.00.

Due to the relatively better resolution of the new mapping compared to the mapping used for the existing studies (i.e.1"=200' scale and 2-foot contour interval vs. 1"=400' scale and 4' contour interval mapping) floodplains are joined laterally at the confluences of Galloway Wash with Rowe Wash, Grapevine Wash and Galloway Wash North Tributary (aka Galloway Middle Tributary). The relative inaccuracies inherent in the lower resolution mapping precluded the matching of water surface elevations to the previous study water surface elevations at those confluences.

5.7.2 Modeling warning and error messages

Warning messages reported by the HEC-RAS output include:

1. Default to critical depth,
2. Energy loss greater than 1.0 foot,
3. Multiple critical depth solutions, and
4. Divided flow.

The numbers of cross sections which default to critical depth are noted in the supporting documentation along with the FEMA forms. Slopes for the entire study area average greater than 1.4%. Therefore, critical flow is expected to occur throughout the study area. Energy losses greater than one foot between cross sections are also expected because of the steep slope, even where the cross sections are spaced at 100-foot intervals. Where multiple critical depth solutions were found, the lowest critical depth solution was chosen by default as the correct solution. Divided flow warnings were encountered (see section 5.5.4 for how divided flow was handled).

5.8 Calibration

No stream gauging records were available to which the model could be calibrated, and no other calibration procedures were utilized.

5.9 Final Results

5.9.1 Hydraulic analysis results

A summary of the HEC-RAS hydraulic results are provided in Table 5.9.1 and Table 5.9.2. Appendix E.5 contains additional model output including: cross section plots, discharge summary tables, Manning's 'n' value summary tables, reach length summary tables, contraction/expansion summary tables, and junction summary tables. This study results in approximately 7.8 river miles of revised floodplain/floodway delineations.

5.10 References

1. Cave Creek and Wildcat Hill Quadrangles 1:24000 United States Department of the Interior Geological Survey

3. Phillips, J. V. and Ingersoll, T.L., 1998, *Verification of Roughness Coefficients for Selected Natural and Constructed Stream Channels in Arizona*: U.S. Geological Survey Professional Paper 1584, 77 p.

4. Thomsen, B.W. and Hjalmarson, H.W., 1991, *Estimated Manning's Roughness Coefficients for Stream Channels and Flood Plains in Maricopa County, Arizona*. U.S. Geological Survey: Tucson, Arizona, 126 p.

5. U.S. Army Corps of Engineers, HEC-RAS River Analysis System Users Manual, Version 2.2, September 1998.

6. U.S. Army Corps of Engineers, HEC-RAS River Analysis System Hydraulic Reference Manual, Version 2.2, September 1998

7. U.S. Army Corps of Engineers, HEC-RAS River Analysis System, Version 2.2, September 1998.

Table 5.9.2
HEC RAS Output - Floodway

River	Reach	River Sta	Top Wdth Act (ft)	Area (sq ft)	Vel Total (ft/s)	W.S. Elev (ft)	Base WS (ft)	Prof Delta WS (ft)
Andora Hills	5	3.023	78.8	337.7	6.1	2307.3	2306.4	0.9
Andora Hills	5	2.974	76.6	295.9	7.0	2304.0	2303.1	0.9
Andora Hills	5	2.944	58.7	349.9	5.9	2302.4	2301.4	1.0
Andora Hills	5	2.881	44.2	194.7	10.6	2296.6	2296.2	0.5
Andora Hills	5	2.855	72.4	364.7	5.7	2295.8	2294.8	1.0
Andora Hills	5	2.813	40.2	197.5	10.5	2291.7	2291.7	0.0
Andora Hills	5	2.754	70.4	396.1	5.2	2289.4	2288.4	1.0
Andora Hills	5	2.696	30.3	190.1	10.9	2284.8	2283.8	1.0
Andora Hills	5	2.679	45.6	228.4	9.1	2283.2	2282.7	0.5
Andora Hills	5	2.670	86.6	442.8	4.7	2283.2	2282.4	0.9
Andora Hills	5	2.662	Culvert					
Andora Hills	5	2.654	86.6	262.3	7.9	2280.8	2280.8	0.0
Andora Hills	5	2.617	71.3	376.9	6.0	2276.8	2275.8	1.0
Andora Hills	5	2.576	50.8	278.7	8.1	2273.8	2272.8	1.0
Andora Hills	5	2.529	41.1	233.2	9.7	2268.7	2268.1	0.6
Andora Hills	5	2.473	65.6	347.0	6.5	2264.2	2263.2	1.0
Andora Hills	5	2.419	56.9	299.2	7.6	2260.1	2259.7	0.4
Andora Hills	5	2.364	95.2	316.8	7.1	2255.5	2255.4	0.1
Andora Hills	5	2.324	135.3	593.4	3.8	2254.4	2253.4	1.0
Andora Hills	5	2.280	27.6	166.4	13.6	2249.1	2248.7	0.3
Andora Hills	5	2.219	71.4	380.1	6.0	2241.5	2241.1	0.4
Andora Hills	5	2.174	51.5	255.9	8.8	2237.8	2236.8	1.0
Andora Hills	5	2.153	61.1	259.2	8.7	2235.3	2234.7	0.6
Andora Hills	5	2.124	108.9	337.9	6.7	2232.3	2231.4	1.0
Andora Hills	5	2.090	43.0	204.1	11.1	2225.4	2224.5	0.8
Andora Hills	5	2.056	49.4	248.4	9.1	2209.7	2209.7	0.0
Andora Hills	5	2.019	52.0	295.0	8.5	2206.2	2205.4	0.8
Andora Hills	5	1.976	36.5	231.1	10.8	2200.9	2200.5	0.3
Andora Hills	5	1.935	55.8	289.9	8.6	2197.1	2196.5	0.5
Andora Hills	5	1.888	99.3	354.0	7.1	2193.5	2193.3	0.2
Andora Hills	5	1.831	116.1	431.6	5.8	2190.4	2190.4	0.0
Andora Hills	5	1.786	91.1	313.7	8.0	2187.0	2187.0	0.0
Andora Hills	5	1.731	121.7	332.0	7.5	2181.6	2181.6	0.0
Andora Hills	5	1.668	85.6	419.3	6.3	2177.9	2177.8	0.1
Andora Hills	5	1.609	61.3	255.0	10.3	2172.5	2172.4	0.1
Andora Hills	5	1.566	160.3	439.4	6.0	2169.0	2169.0	0.0
Andora Hills	4	1.555	59.4	267.4	9.0	2167.9	2167.5	0.3
Andora Hills	4	1.539	83.4	255.0	9.4	2165.1	2165.1	0.0
Andora Hills	Split 1	0.244	61.0	87.2	3.5	2168.5	2168.5	0.0
Andora Hills	Split 1	0.232	54.1	53.3	5.7	2166.8	2166.8	0.0
Andora Hills	3	1.496	89.7	470.2	5.7	2163.0	2162.0	1.0
Andora Hills	3	1.466	65.7	290.1	9.3	2160.2	2160.1	0.1
Andora Hills	3	1.438	31.5	208.1	13.0	2155.0	2154.9	0.1
Andora Hills	3	1.394	112.1	338.5	8.0	2149.9	2149.9	0.0
Andora Hills	3	1.353	188.9	691.2	3.9	2147.5	2147.5	0.0
Andora Hills	3	1.298	104.9	330.5	8.2	2143.7	2143.7	0.0
Andora Hills	3	1.266	46.7	220.2	12.3	2139.1	2139.1	0.0
Andora Hills	3	1.222	43.8	291.8	9.3	2135.0	2134.0	1.0
Andora Hills	3	1.170	39.3	323.8	8.3	2131.9	2131.0	1.0
Andora Hills	3	1.133	33.9	238.7	11.3	2128.3	2127.8	0.5
Andora Hills	3	1.085	125.5	338.1	8.0	2123.3	2123.3	0.0
Andora Hills	3	1.039	84.3	305.4	8.8	2115.4	2115.4	0.0
Andora Hills	3	0.992	119.7	503.5	5.5	2112.5	2112.5	0.0

Table 5.9.2
HEC RAS Output - Floodway

River	Reach	River Sta	Top Wdth Act	Area	Vel Total	W.S. Elev	Base WS	Prof Delta WS
			(ft)	(sq ft)	(ft/s)	(ft)	(ft)	(ft)
Andora Hills	3	0.954	62.5	262.7	10.5	2108.3	2108.3	0.0
Andora Hills	3	0.911	98.3	351.1	8.3	2103.0	2102.8	0.2
Andora Hills	3	0.902	52.0	426.1	6.8	2102.7	2102.4	0.3
Andora Hills	3	0.893	Culvert					
Andora Hills	3	0.884	50.0	424.4	6.8	2102.0	2101.6	0.4
Andora Hills	3	0.854	96.8	565.4	5.1	2101.2	2101.1	0.1
Andora Hills	3	0.830	129.4	1087.1	8.2	2098.8	2098.8	0.0
Andora Hills	3	0.816	133.1	596.8	7.4	2094.5	2094.5	0.0
Andora Hills	3	0.805	126.8	493.6	5.9	2089.2	2089.2	0.0
Andora Hills	3	0.797	Culvert					
Andora Hills	3	0.789	146.9	391.6	7.4	2087.2	2087.2	0.0
Andora Hills	3	0.761	88.9	294.3	9.9	2081.7	2081.7	0.0
Andora Hills	3	0.729	105.3	422.6	8.8	2079.9	2079.9	0.0
Andora Hills	3	0.687	231.5	762.2	3.9	2080.2	2080.2	0.0
Andora Hills	3	0.679	223.7	887.6	3.5	2080.2	2080.2	0.0
Andora Hills	3	0.673	Culvert					
Andora Hills	3	0.667	255.6	485.3	6.2	2076.6	2076.6	0.0
Andora Hills	3	0.628	208.2	392.7	8.0	2072.2	2072.2	0.0
Andora Hills	3	0.592	214.5	439.5	7.1	2067.6	2067.6	0.0
Andora Hills	3	0.563	297.2	459.9	6.5	2063.1	2063.1	0.0
Andora Hills	3	0.522	185.1	776.9	5.2	2060.5	2060.5	0.0
Andora Hills	3	0.480	184.7	437.9	7.1	2053.1	2053.1	0.0
Andora Hills	3	0.447	111.4	322.6	9.6	2050.2	2050.2	0.0
Andora Hills	3	0.432	274.7	511.8	6.1	2048.0	2048.0	0.0
Andora Hills	3	0.429	Culvert					
Andora Hills	3	0.426	249.7	519.2	6.0	2047.7	2047.7	0.0
Andora Hills	3	0.393	165.8	577.4	5.4	2042.6	2042.6	0.0
Andora Hills	3	0.317	136.2	355.5	8.7	2035.3	2035.3	0.0
Andora Hills	2	0.271	70.8	197.5	9.7	2028.0	2028.0	0.0
Andora Hills	2	0.236	53.9	204.3	9.4	2022.9	2022.9	0.0
Andora Hills	2	0.185	41.6	173.9	11.0	2015.8	2015.8	0.0
Andora Hills	Split 2	0.093	63.9	147.7	8.7	2028.4	2028.4	0.0
Andora Hills	Split 2	0.083	49.2	134.9	9.5	2022.2	2022.2	0.0
Andora Hills	Split 2	0.042	50.2	174.8	7.4	2016.8	2016.8	0.0
Andora Hills	1	0.162	75.8	324.9	9.9	2013.3	2013.3	0.0
Andora Hills	1	0.140	82.2	434.5	7.4	2012.3	2012.2	0.1
Andora Hills	1	0.129	53.4	279.4	11.5	2010.1	2010.0	0.1

Table 5.9.1
HEC RAS Output - Floodplain

River	Reach	River Sta	Q Total	W.S. Elev	Crit W.S.	Vel Total	Top Width	Max Chl Dpth	Froude # XS	Sta W.S. Lft	Sta W.S. Rgt
			(cfs)	(ft)	(ft)	(ft/s)	(ft)	(ft)		(ft)	(ft)
Galloway	8	4.832	1110	2608.0	2608.0	4.9	249.7	2.3	0.8	9777.2	10058.3
Galloway	8	4.796	1110	2604.0	2604.0	4.2	248.8	2.6	0.8	9747.1	10040.0
Galloway	8	4.770	1110	2600.9	2600.9	4.7	222.6	2.9	0.8	9783.3	10043.7
Galloway	8	4.732	1110	2595.8	2595.8	4.8	310.9	2.0	1.0	9724.2	10035.1
Galloway	8	4.694	1110	2591.2	2591.2	4.6	343.3	2.2	0.9	9654.9	10061.4
Galloway	8	4.656	1110	2585.2	2585.2	5.3	224.0	2.1	0.9	9882.2	10106.2
Galloway	Split 1	0.082	175	2582.7	2582.7	4.5	56.2	1.3	0.9	9968.9	10025.1
Galloway	Split 1	0.033	175	2578.3		4.6	32.4	2.2	0.8	9976.9	10009.3
Galloway	Split 1	0.027	175	2573.9	2573.9	6.5	21.4	2.6	1.0	9987.6	10008.9
Galloway	7	4.639	935	2582.7	2582.7	6.4	117.8	1.7	1.0	9923.5	10041.3
Galloway	7	4.618	935	2579.0	2579.0	8.5	50.7	2.7	1.0	9960.6	10011.3
Galloway	7	4.581	935	2573.8	2573.8	8.7	46.2	3.5	1.0	9970.9	10017.1
Galloway	6	4.543	1110	2569.0	2569.0	8.6	56.8	2.7	1.0	9972.8	10029.6
Galloway	6	4.505	1440	2563.1	2562.8	6.9	199.7	2.9	0.8	9955.5	10185.8
Galloway	6	4.467	1440	2559.8	2559.8	9.0	66.3	3.5	1.0	9956.9	10023.2
Galloway	6	4.429	1440	2555.0	2555.0	8.3	85.1	2.7	1.0	9922.8	10007.8
Galloway	6	4.391	1440	2550.9	2550.9	9.5	56.4	3.9	1.0	9966.3	10022.7
Galloway	6	4.353	1440	2545.6	2545.6	8.0	90.2	3.1	1.0	9961.0	10051.1
Galloway	6	4.315	1440	2541.0	2541.0	7.1	213.6	3.1	1.0	9856.7	10080.2
Galloway	6	4.277	1595	2536.0	2536.0	6.0	185.8	2.3	0.9	9877.6	10093.6
Galloway	6	4.240	1595	2531.7	2531.7	7.1	142.8	2.9	0.9	9923.4	10082.3
Galloway	6	4.202	1595	2527.5	2527.5	9.2	66.8	3.6	1.0	9993.6	10060.5
Galloway	6	4.164	1595	2523.2	2523.2	9.0	69.5	3.2	1.0	9998.0	10067.5
Galloway	6	4.126	1595	2518.8	2518.8	8.3	94.5	3.5	0.9	9976.1	10070.6
Galloway	6	4.088	1595	2512.2	2512.2	8.7	79.9	3.0	1.0	9987.5	10067.4
Galloway	6	4.050	1595	2507.8	2507.8	9.9	54.5	3.9	1.0	9973.4	10027.9
Galloway	6	4.012	1595	2501.9	2501.9	9.1	69.6	3.0	1.0	9969.6	10039.2
Galloway	6	3.974	1595	2496.5	2496.5	8.0	102.8	2.4	1.0	9911.9	10014.6
Galloway	6	3.936	1595	2491.5	2491.5	9.0	73.9	3.0	1.0	9934.3	10008.1
Galloway	6	3.899	1595	2486.4	2486.4	9.2	69.6	3.5	1.0	9952.9	10022.5
Galloway	6	3.861	1750	2480.7	2480.7	8.2	137.6	3.0	1.0	9972.4	10110.0
Galloway	6	3.823	1750	2475.9	2475.9	8.4	96.0	3.2	0.9	9960.0	10056.0
Galloway	6	3.785	1750	2470.8	2470.8	7.1	137.3	2.8	1.0	9933.7	10071.0
Galloway	6	3.747	1750	2465.0	2465.0	8.3	100.6	2.5	1.0	9982.1	10082.7
Galloway	6	3.709	1750	2460.5	2460.5	8.8	82.7	3.0	1.0	9992.5	10075.2
Galloway	6	3.671	1750	2455.4	2455.4	8.3	100.8	2.9	1.0	9931.7	10032.5
Galloway	6	3.634	1750	2450.4	2450.4	8.7	86.0	2.6	1.0	9935.4	10021.5
Galloway	6	3.596	1750	2445.7	2445.7	8.1	196.1	3.0	1.0	9877.6	10087.2
Galloway	6	3.562	1750	2441.7	2441.7	7.5	120.1	2.8	0.9	9927.0	10047.1
Galloway	6	3.528	1750	2436.6	2436.6	7.7	106.0	3.8	0.9	9942.9	10048.9
Galloway	6	3.514	1750	2434.9	2434.9	6.8	261.6	4.3	0.9	9929.1	10201.6
Galloway	6	3.504	1840	2434.3	2433.8	4.8	306.5	5.0	0.6	9909.2	10215.7
Galloway	6	3.503	Bridge								
Galloway	6	3.502	1840	2433.4	2433.4	7.5	169.7	4.3	0.9	9991.9	10161.6
Galloway	6	3.493	1840	2431.8	2431.8	7.2	134.8	3.5	1.0	9987.2	10122.1
Galloway	6	3.482	1840	2430.6	2430.6	7.7	123.4	2.8	1.0	9986.1	10109.5
Galloway	6	3.444	1840	2426.2	2426.2	8.7	92.0	2.8	1.0	9990.7	10082.7
Galloway	6	3.404	1840	2421.5	2421.5	8.4	107.7	2.6	1.0	9915.0	10022.7
Galloway	6	3.373	1840	2418.6	2414.8	4.2	190.7	8.7	0.4	9905.3	10096.0
Galloway	6	3.369	Bridge								
Galloway	6	3.364	1840	2413.6	2413.6	11.7	37.6	4.5	1.0	9990.8	10028.4
Galloway	6	3.331	1840	2409.3	2409.3	10.3	58.4	5.1	1.0	9993.0	10051.3
Galloway	6	3.292	1840	2404.5	2404.5	10.2	60.5	4.8	1.0	9980.9	10041.4
Galloway	6	3.255	1840	2398.6	2398.6	8.0	116.7	2.8	1.0	9929.7	10046.4
Galloway	6	3.216	3440	2394.7	2394.7	10.6	95.8	4.5	1.0	9968.6	10064.4
Galloway	6	3.179	3440	2391.5	2391.5	10.7	92.1	4.3	1.0	9953.8	10045.8
Galloway	6	3.141	3440	2387.1	2387.1	9.7	124.8	3.8	1.0	9956.5	10081.3
Galloway	6	3.103	3440	2382.4	2382.4	8.8	162.2	3.4	1.0	9905.2	10067.5
Galloway	6	3.066	3440	2378.9	2378.9	9.9	115.0	4.5	1.0	9957.2	10072.2
Galloway	6	3.027	3440	2375.2	2375.2	8.9	289.9	4.2	0.9	9883.9	10212.3
Galloway	6	2.988	3440	2370.2	2370.2	8.0	209.7	3.7	1.0	9886.6	10096.3
Galloway	6	2.952	3440	2366.3	2366.3	9.4	144.3	3.4	1.0	9953.7	10098.0
Galloway	6	2.913	3440	2362.4	2362.4	8.1	267.0	4.1	0.9	9824.9	10106.0
Galloway	6	2.889	3440	2359.4	2359.4	6.6	321.8	4.7	0.8	9872.4	10195.3
Galloway	Split 2	0.240	216	2355.5		4.5	52.8	1.9	0.8	9985.8	10048.3
Galloway	Split 2	0.213	216	2351.6	2351.6	4.3	72.6	2.1	0.9	9949.0	10105.3
Galloway	Split 2	0.156	216	2344.1		4.8	47.4	2.1	0.9	9991.9	10039.4
Galloway	Split 2	0.129	216	2341.5		4.4	48.5	2.1	0.8	9992.2	10040.6

Table 5.9.1
HEC RAS Output - Floodplain

River	Reach	River Sta	Q Total	W.S. Elev	Crit W.S.	Vel Total	Top Width	Max Chl Dpth	Froude # XS	Sta W.S. Lft	Sta W.S. Rgt
			(cfs)	(ft)	(ft)	(ft/s)	(ft)	(ft)		(ft)	(ft)
Galloway	Split 2	0.088	216	2337.4	2337.4	5.5	86.7	2.6	0.9	9984.9	10072.5
Galloway	2	0.046	216	2331.7	2331.7	4.2	74.1	1.2	1.0	9941.4	10015.5
Galloway	5	2.872	3224	2354.3	2354.3	9.9	116.6	4.4	1.0	9955.4	10072.0
Galloway	5	2.837	3224	2350.1	2350.1	9.9	111.0	4.8	0.9	9927.3	10038.3
Galloway	5	2.799	3224	2345.3	2345.3	10.2	98.1	3.7	1.0	9919.7	10017.8
Galloway	5	2.760	3224	2340.1	2340.1	11.0	79.4	5.2	1.0	9930.9	10010.3
Galloway	5	2.723	3224	2334.7	2334.7	10.4	248.7	6.2	1.0	9924.6	10173.2
Galloway	5	2.679	3224	2329.2		7.5	182.6	3.0	0.9	9957.8	10140.3
Galloway	4	2.647	3440	2326.8		8.4	135.2	4.2	0.9	9965.9	10101.1
Galloway	4	2.610	3440	2323.6	2323.6	10.6	93.3	5.0	1.0	9933.1	10026.3
Galloway	4	2.572	3440	2320.4	2320.4	9.6	132.5	6.1	0.9	9965.4	10097.9
Galloway	4	2.534	3440	2315.2	2315.2	9.0	153.4	3.8	1.0	9986.8	10140.2
Galloway	4	2.496	3440	2311.1	2311.1	10.4	101.4	4.7	1.0	9925.7	10027.1
Galloway	4	2.458	3440	2306.5	2306.5	9.5	192.8	4.7	1.0	9892.3	10188.0
Galloway	4	2.420	3440	2301.6	2301.6	9.2	140.2	5.3	0.9	9929.8	10111.2
Galloway	4	2.382	3440	2297.3	2297.3	8.7	152.9	4.7	1.0	9954.6	10107.5
Galloway	4	2.344	3440	2292.4	2292.4	10.5	94.7	3.9	1.0	9992.2	10086.9
Galloway	4	2.299	4410	2289.7	2289.7	8.8	218.4	4.8	0.9	9827.7	10046.2
Galloway	4	2.281	4410	2289.5	2286.7	5.4	218.7	7.2	0.4	9868.3	10087.0
Galloway	4	2.275	Culvert								
Galloway	4	2.268	4410	2285.5	2285.5	11.4	108.2	4.3	1.0	9929.2	10037.5
Galloway	4	2.240	4410	2280.6	2280.6	10.1	148.5	4.4	1.0	9942.3	10090.7
Galloway	4	2.193	4410	2275.9	2275.9	9.2	185.8	3.9	1.0	9876.4	10062.2
Galloway	4	2.162	4410	2272.3	2272.3	9.3	562.0	5.3	1.0	9455.2	10030.8
Galloway	4	2.098	5490	2264.4	2264.4	7.5	378.2	3.8	1.0	9850.1	10228.3
Galloway	4	2.041	5490	2257.4	2257.4	7.1	439.8	3.8	1.0	9930.2	10457.9
Galloway	4	2.004	6060	2253.0	2253.0	5.9	514.0	4.0	0.9	9924.2	10438.2
Galloway	4	1.966	6060	2248.3	2248.3	7.5	337.9	4.1	0.9	9937.6	10369.6
Galloway	4	1.928	6060	2244.5	2244.5	7.1	392.2	4.7	0.8	9900.9	10306.2
Galloway	4	1.917	6060	2243.0	2243.0	7.2	327.0	5.0	0.9	9910.8	10237.9
Galloway	4	1.890	6060	2241.0		7.3	176.0	6.3	0.6	9973.4	10149.4
Galloway	4	1.846	6060	2236.8	2236.8	13.6	79.1	7.3	1.0	9963.4	10042.5
Galloway	4	1.815	6060	2231.8	2231.8	13.4	83.5	6.8	1.0	9986.4	10069.9
Galloway	4	1.790	6060	2228.6	2228.6	12.5	250.3	7.0	1.0	9983.5	10247.0
Galloway	4	1.761	6060	2224.6	2224.6	10.5	145.8	6.1	0.9	9932.1	10078.0
Galloway	4	1.739	6060	2221.6	2221.6	12.7	94.7	6.0	1.0	9939.4	10034.1
Galloway	4	1.701	6060	2216.4	2216.4	10.9	156.1	5.5	0.9	9977.5	10133.6
Galloway	4	1.663	6060	2212.3	2212.3	12.4	104.1	5.8	1.0	9966.3	10070.4
Galloway	4	1.625	6060	2207.5	2207.5	12.2	108.1	5.6	1.0	9927.9	10036.0
Galloway	4	1.587	6060	2204.2	2204.2	12.8	98.3	6.6	1.0	9914.5	10012.7
Galloway	4	1.549	6060	2200.5	2200.5	11.5	126.5	6.5	0.9	9927.3	10053.8
Galloway	4	1.511	6060	2195.3	2195.3	12.9	98.8	5.7	1.0	9921.9	10020.7
Galloway	3	1.474	10800	2191.6	2191.6	6.8	581.1	6.5	0.8	9940.6	10521.7
Galloway	3	1.435	10800	2186.7	2186.7	8.6	409.0	5.9	1.0	9925.6	10345.1
Galloway	3	1.397	10800	2182.4	2182.4	9.4	302.7	5.5	1.0	9917.2	10219.9
Galloway	3	1.360	10800	2177.8	2177.8	9.2	326.0	5.2	1.0	9905.3	10231.3
Galloway	3	1.331	10800	2174.3	2174.3	8.8	344.8	5.2	1.0	9923.1	10268.0
Galloway	3	1.284	10800	2166.6	2166.6	10.6	241.9	6.5	1.0	9916.1	10158.0
Galloway	3	1.246	10800	2163.7	2163.1	8.6	285.7	7.7	0.8	9829.4	10115.1
Galloway	3	1.209	10800	2159.1	2159.1	12.5	410.6	6.6	1.4	9671.0	10081.6
Galloway	3	1.171	10800	2155.6	2155.6	6.9	544.9	7.4	0.8	9659.1	10204.0
Galloway	3	1.133	10800	2150.4	2150.4	7.2	471.2	8.2	0.8	9706.5	10276.5
Galloway	3	1.110	10800	2147.7	2147.7	6.2	713.4	9.3	0.8	9742.0	10561.4
Galloway	3	1.095	10800	2146.0	2146.0	5.8	708.5	8.2	0.8	9810.5	10529.7
Galloway	2	1.056	6693	2140.6	2140.6	11.6	135.2	5.5	1.0	9887.8	10023.0
Galloway	2	1.019	6693	2136.9	2136.9	12.3	110.3	6.3	1.0	9965.4	10075.6
Galloway	2	0.974	6693	2133.2	2133.2	11.9	103.7	10.2	0.9	9959.8	10063.5
Galloway	2	0.941	6693	2126.4	2126.4	12.6	100.6	7.3	1.0	9959.8	10060.4
Galloway	Split 3	0.148	4107	2141.8	2141.8	5.2	345.4	10.2	0.6	9681.3	10026.7
Galloway	Split 3	0.115	4107	2137.1	2137.1	6.4	301.4	9.3	0.6	9749.5	10050.9
Galloway	Split 3	0.072	4107	2132.7	2132.7	5.2	358.6	8.2	0.8	9751.7	10110.3
Galloway	Split 3	0.035	4107	2127.2	2127.2	9.3	118.1	7.3	1.0	9945.4	10063.5
Galloway	1	0.905	10800	2124.4		9.4	224.9	9.1	0.7	9969.9	10194.8
Galloway	1	0.896	10800	2124.6	2122.5	7.6	266.8	9.8	0.5	9963.8	10230.6
Galloway	1	0.868	10800	2124.6	2120.0	5.8	348.1	11.8	0.4	9908.7	10256.8
Galloway	1	0.866	Bridge								
Galloway	1	0.864	10800	2119.0	2119.0	13.2	168.1	6.9	1.0	9957.2	10125.3
Galloway	1	0.845	10800	2115.4		11.6	183.3	5.9	0.9	9936.5	10119.8

Table 5.9.1
HEC RAS Output - Floodplain

River	Reach	River Sta	Q Total	W.S. Elev	Crit W.S.	Vel Total	Top Width	Max Chl Dpth	Froude # XS	Sta W.S. Lft	Sta W.S. Rgt
			(cfs)	(ft)	(ft)	(ft/s)	(ft)	(ft)		(ft)	(ft)
Galloway	1	0.792	13500	2110.5	2110.5	12.5	189.5	7.2	1.0	9934.1	10123.6
Galloway	1	0.754	13500	2108.5	2108.5	11.3	247.7	8.9	0.9	9799.2	10046.8
Galloway	1	0.711	13500	2103.6	2103.6	10.3	252.8	10.9	0.8	9818.2	10070.9
Galloway	1	0.678	13500	2100.9	2100.9	10.4	217.6	12.1	0.8	9825.1	10042.7
Galloway	1	0.641	13500	2095.1	2095.1	11.2	220.5	9.2	0.9	9843.0	10063.5
Galloway	1	0.603	13500	2091.6	2091.6	12.3	174.0	9.6	1.0	9854.8	10028.8
Galloway	1	0.565	13500	2087.3	2087.3	10.4	255.6	9.4	0.9	9840.1	10095.7
Galloway	1	0.527	13500	2083.6	2083.6	10.5	298.0	10.4	0.8	9777.1	10075.1
Galloway	1	0.489	13500	2079.6	2079.6	9.3	349.3	10.6	0.7	9710.1	10059.4
Galloway	1	0.451	13500	2076.4	2076.4	9.8	266.4	11.7	0.8	9771.4	10037.8
Galloway	1	0.413	13500	2072.3	2072.3	13.5	178.5	10.8	0.8	9897.1	10075.7
Galloway	1	0.376	13500	2069.5	2069.5	10.6	228.2	11.3	0.9	9913.1	10141.3
Galloway	1	0.338	13500	2064.8	2064.8	12.8	164.3	9.4	1.0	9920.9	10085.2
Galloway	1	0.300	13500	2060.9		12.4	202.3	10.5	0.7	9849.7	10052.0
Galloway	1	0.262	13500	2057.3	2057.3	12.9	199.1	11.8	0.7	9838.8	10037.9
Galloway	1	0.224	13500	2053.6	2053.6	12.3	228.9	14.2	0.7	9835.3	10064.2
Galloway	1	0.186	13500	2046.8	2046.8	12.1	248.7	11.3	0.7	9804.2	10052.9
Galloway	1	0.149	13500	2041.9	2041.8	11.7	266.7	12.7	0.6	9820.1	10096.1
Galloway	1	0.111	13500	2039.8		10.5	170.8	14.2	0.6	9917.2	10088.0
Galloway	1	0.073	13500	2035.1	2035.0	13.7	154.2	12.9	0.9	9901.9	10056.1
Galloway	1	0.035	13500	2032.5	2030.9	9.5	259.8	12.3	0.6	9892.5	10152.2
Grapevine	1	0.210	5720	2216.7	2216.7	7.3	405.4	5.1	1.0	9665.7	10141.8

Table 5.9.1
HEC RAS Output - Floodplain

River	Reach	River Sta	Q Total	W.S. Elev	Crit W.S.	Vel Total	Top Width	Max Chl Dpth	Froude # XS	Sta W.S. Lft	Sta W.S. Rgt
			(cfs)	(ft)	(ft)	(ft/s)	(ft)	(ft)		(ft)	(ft)
Andora Hills	5	3.023	2070	2306.4	2305.7	5.2	196.5	4.1	0.6	9928.4	10124.9
Andora Hills	5	2.974	2070	2303.1	2302.1	5.5	127.0	5.3	0.6	9905.9	10032.8
Andora Hills	5	2.944	2070	2301.4	2299.7	5.0	113.6	6.1	0.5	9920.4	10034.0
Andora Hills	5	2.881	2070	2296.2	2296.1	7.4	125.9	5.1	0.9	9952.1	10078.0
Andora Hills	5	2.855	2070	2294.8	2293.7	4.9	153.4	4.8	0.5	9916.1	10069.5
Andora Hills	5	2.813	2070	2291.7	2290.9	7.3	79.8	5.9	0.7	9968.0	10047.8
Andora Hills	5	2.754	2070	2288.4	2287.2	5.7	99.2	7.7	0.5	9928.3	10027.5
Andora Hills	5	2.696	2070	2283.8	2283.8	7.2	106.5	7.0	0.8	9914.8	10021.3
Andora Hills	5	2.679	2070	2282.7	2282.4	5.6	150.4	6.4	0.6	9924.2	10074.7
Andora Hills	5	2.670	2070	2282.4	2281.2	4.2	154.8	7.9	0.4	9906.8	10061.6
Andora Hills	5	2.662	Culvert								
Andora Hills	5	2.654	2070	2280.8	2280.8	6.1	161.8	6.5	0.7	9937.0	10098.8
Andora Hills	5	2.617	2260	2275.8	2274.6	6.2	108.0	5.5	0.6	9917.1	10025.1
Andora Hills	5	2.576	2260	2272.8	2271.8	6.2	109.6	5.1	0.6	9924.8	10034.4
Andora Hills	5	2.529	2260	2268.1	2267.5	8.0	78.2	6.4	0.7	9971.7	10049.9
Andora Hills	5	2.473	2260	2263.2	2262.1	6.3	99.1	6.7	0.6	9927.1	10026.2
Andora Hills	5	2.419	2260	2259.7	2258.6	5.0	176.2	6.4	0.5	9968.3	10144.5
Andora Hills	5	2.364	2260	2255.4	2254.7	7.3	94.7	5.1	0.7	9943.1	10037.8
Andora Hills	5	2.324	2260	2253.4	2252.0	4.3	213.2	6.6	0.5	9935.4	10151.0
Andora Hills	5	2.280	2260	2248.7	2248.7	9.3	69.0	7.2	0.9	9957.0	10026.0
Andora Hills	5	2.219	2260	2241.1	2239.3	3.9	177.0	6.6	0.4	9919.7	10096.8
Andora Hills	5	2.174	2260	2236.8	2236.8	10.1	72.5	5.0	1.0	9946.1	10018.5
Andora Hills	5	2.153	2260	2234.7	2234.1	5.8	133.3	6.3	0.6	9923.7	10056.9
Andora Hills	5	2.124	2260	2231.4	2231.4	6.8	127.2	7.6	0.7	9761.9	10011.2
Andora Hills	5	2.090	2260	2224.5	2224.5	8.9	75.2	8.6	0.9	9979.4	10101.3
Andora Hills	5	2.056	2260	2209.7	2208.7	8.9	57.2	7.3	0.7	9969.7	10026.9
Andora Hills	5	2.019	2500	2205.4	2204.9	8.4	80.7	6.5	0.8	9962.7	10043.4
Andora Hills	5	1.976	2500	2200.5	2199.9	8.6	69.8	7.4	0.8	9968.3	10038.1
Andora Hills	5	1.935	2500	2196.5	2196.2	7.9	99.3	6.8	0.8	9965.1	10064.3
Andora Hills	5	1.888	2500	2193.3	2193.0	5.6	172.5	6.9	0.6	9965.9	10138.3
Andora Hills	5	1.831	2500	2190.4	2189.0	5.8	116.0	7.1	0.5	9912.7	10028.7
Andora Hills	5	1.786	2500	2187.0	2186.5	7.9	91.5	6.2	0.8	9942.6	10034.1
Andora Hills	5	1.731	2500	2181.6	2181.3	7.6	120.7	5.5	0.8	9924.2	10044.9
Andora Hills	5	1.668	2620	2177.8	2176.5	5.3	163.8	7.2	0.5	9896.6	10060.4
Andora Hills	5	1.609	2620	2172.4	2172.3	9.4	86.7	5.0	0.9	9947.8	10034.5
Andora Hills	5	1.566	2620	2169.0	2168.7	5.6	189.1	5.8	0.6	9849.8	10039.0
Andora Hills	4	1.555	2395	2167.5	2167.1	7.9	99.4	5.3	0.8	9926.5	10026.0
Andora Hills	4	1.539	2395	2165.1	2165.1	7.9	120.2	4.2	0.9	9950.0	10070.2
Andora Hills	Split 1	0.244	305	2168.5	2168.0	3.5	61.0	2.2	0.5	9954.6	10015.6
Andora Hills	Split 1	0.232	305	2166.8	2166.8	5.7	54.1	1.6	1.0	9962.8	10016.9
Andora Hills	3	1.496	2700	2162.0	2160.9	4.7	245.1	5.6	0.5	9755.4	10035.5
Andora Hills	3	1.466	2700	2160.1	2160.1	5.1	304.3	8.7	0.7	9679.5	10020.1
Andora Hills	3	1.438	2700	2154.9	2154.9	9.6	85.8	7.9	0.9	9941.6	10027.4
Andora Hills	3	1.394	2700	2149.9	2149.9	8.0	112.1	6.4	0.8	9909.0	10021.1
Andora Hills	3	1.353	2700	2147.5	2145.3	3.9	188.9	6.7	0.4	9854.0	10042.9
Andora Hills	3	1.298	2700	2143.7	2143.7	8.2	104.9	8.2	0.8	9967.3	10072.2
Andora Hills	3	1.266	2700	2139.1	2139.1	12.3	46.7	6.6	1.0	9978.7	10025.5
Andora Hills	3	1.222	2700	2134.0	2133.1	8.9	69.1	7.0	0.8	9961.6	10030.6
Andora Hills	3	1.170	2700	2131.0	2129.1	7.6	68.6	8.2	0.6	9956.7	10025.3
Andora Hills	3	1.133	2700	2127.8	2127.2	9.8	60.4	7.8	0.8	9972.6	10033.0
Andora Hills	3	1.085	2700	2123.3	2123.3	8.0	125.5	7.6	0.9	9957.1	10082.6
Andora Hills	3	1.039	2700	2115.4	2115.4	8.8	84.3	7.5	0.8	9930.4	10014.6
Andora Hills	3	0.992	2750	2112.5	2111.0	5.5	119.7	7.6	0.5	9925.0	10044.8
Andora Hills	3	0.954	2750	2108.3	2108.3	10.5	62.5	7.5	0.9	9963.9	10026.4
Andora Hills	3	0.911	2900	2102.8	2102.3	8.9	96.0	4.8	0.9	9937.3	10033.3
Andora Hills	3	0.902	2900	2102.4	2099.1	7.0	52.0	7.9	0.4	9957.0	10009.0
Andora Hills	3	0.893	Culvert								
Andora Hills	3	0.884	2900	2101.6	2098.2	7.1	50.0	8.1	0.4	9957.0	10007.0
Andora Hills	3	0.854	2900	2101.1	2098.4	4.0	363.3	8.1	0.3	9684.7	10048.0
Andora Hills	3	0.830	2900	2098.8	2098.8	8.2	306.2	8.3	0.9	9664.1	10019.8
Andora Hills	3	0.816	2900	2094.5	2094.5	7.4	261.5	7.6	0.8	9762.8	10026.3
Andora Hills	3	0.805	2900	2089.2	2088.1	5.9	126.4	7.6	0.5	9863.9	10033.9
Andora Hills	3	0.797	Culvert								
Andora Hills	3	0.789	2900	2087.2	2087.2	7.4	146.9	6.9	0.8	9905.1	10052.0
Andora Hills	3	0.761	2900	2081.7	2081.7	9.9	88.9	5.0	1.0	9953.1	10042.0
Andora Hills	3	0.729	3000	2079.9	2079.5	8.8	189.7	5.6	0.9	9843.6	10043.8
Andora Hills	3	0.687	3000	2080.2	2078.2	3.9	231.5	8.1	0.4	9789.5	10021.0
Andora Hills	3	0.679	3000	2080.2	2077.0	3.5	256.4	8.9	0.3	9747.5	10019.2
Andora Hills	3	0.673	Culvert								
Andora Hills	3	0.667	3000	2076.6	2076.6	6.2	255.6	6.1	0.8	9746.4	10002.0
Andora Hills	3	0.628	3000	2072.2	2072.2	8.0	234.6	3.9	1.1	9737.3	10050.2

Table 5.9.1
HEC RAS Output - Floodplain

River	Reach	River Sta	Q Total	W.S. Elev	Crit W.S.	Vel Total	Top Width	Max Chl Dpth	Froude # XS	Sta W.S. Lft	Sta W.S. Rgt
			(cfs)	(ft)	(ft)	(ft/s)	(ft)	(ft)		(ft)	(ft)
Andora Hills	3	0.592	3000	2067.6	2067.6	7.1	252.5	5.1	0.9	9828.2	10169.7
Andora Hills	3	0.563	3000	2063.1	2063.1	6.5	297.2	4.4	0.9	9874.9	10234.4
Andora Hills	3	0.522	3100	2060.5	2060.5	5.2	314.2	9.3	0.5	9945.7	10259.9
Andora Hills	3	0.480	3100	2053.1	2053.1	7.1	184.7	6.5	0.8	9968.2	10152.9
Andora Hills	3	0.447	3100	2050.2	2050.2	9.6	111.4	7.1	1.0	9966.9	10202.6
Andora Hills	3	0.432	3100	2048.0	2048.0	6.1	274.7	9.5	0.8	9974.4	10249.1
Andora Hills	3	0.429	Culvert								
Andora Hills	3	0.426	3100	2047.7	2047.7	6.0	249.7	9.8	0.7	9982.3	10231.9
Andora Hills	3	0.393	3100	2042.6	2040.3	5.4	165.8	9.2	0.5	9968.7	10249.9
Andora Hills	3	0.317	3100	2035.3	2035.3	8.7	136.2	6.1	1.0	9913.9	10050.1
Andora Hills	2	0.271	1913	2028.0	2028.0	9.7	70.8	5.2	1.0	9958.3	10029.1
Andora Hills	2	0.236	1913	2022.9	2022.4	9.4	53.8	6.4	0.9	9980.1	10033.9
Andora Hills	2	0.185	1913	2015.8	2015.6	10.9	41.7	6.0	0.9	9982.2	10023.9
Andora Hills	Split 2	0.093	1287	2028.4	2028.4	8.7	63.9	4.9	1.0	9986.3	10050.2
Andora Hills	Split 2	0.083	1287	2022.2	2022.2	9.5	49.2	5.7	1.0	9963.5	10012.7
Andora Hills	Split 2	0.042	1287	2016.8	2015.8	7.3	50.4	6.4	0.7	9982.2	10032.6
Andora Hills	1	0.162	3200	2013.3	2012.8	9.9	75.6	6.0	0.9	9968.5	10044.2
Andora Hills	1	0.140	3200	2012.2	2010.4	7.5	81.7	7.8	0.6	9937.8	10019.5
Andora Hills	1	0.129	3200	2010.0	2009.8	11.2	62.1	6.1	0.9	9957.3	10019.4

Table 5.9.2
HEC RAS Output - Floodway

River	Reach	River Sta	Top Wdth Act (ft)	Area (sq ft)	Vel Total (ft/s)	W.S. Elev (ft)	Base WS (ft)	Prof Delta WS (ft)
Galloway	8	4.832	249.7	228.6	4.9	2608.0	2608.0	0.0
Galloway	8	4.796	248.8	262.6	4.2	2604.0	2604.0	0.0
Galloway	8	4.770	221.8	235.8	4.7	2600.9	2600.9	0.0
Galloway	8	4.732	175.3	202.9	5.5	2595.8	2595.8	0.0
Galloway	8	4.694	186.6	193.8	5.7	2591.2	2591.2	0.1
Galloway	8	4.656	224.0	210.9	5.3	2585.2	2585.2	0.0
Galloway	Split 1	0.082	56.2	39.4	4.5	2582.7	2582.7	0.0
Galloway	Split 1	0.033	32.4	38.4	4.6	2578.3	2578.3	0.0
Galloway	Split 1	0.027	21.4	27.0	6.5	2573.9	2573.9	0.0
Galloway	7	4.639	117.8	145.5	6.4	2582.7	2582.7	0.0
Galloway	7	4.618	50.7	110.0	8.5	2579.0	2579.0	0.0
Galloway	7	4.581	46.2	107.3	8.7	2573.8	2573.8	0.0
Galloway	6	4.543	56.8	128.6	8.6	2569.0	2569.0	0.0
Galloway	6	4.505	76.1	187.8	7.7	2563.1	2563.1	0.0
Galloway	6	4.467	66.3	160.3	9.0	2559.8	2559.8	0.0
Galloway	6	4.429	85.1	174.3	8.3	2555.0	2555.0	0.0
Galloway	6	4.391	56.4	152.4	9.5	2550.9	2550.9	0.0
Galloway	6	4.353	87.0	177.8	8.1	2545.6	2545.6	0.0
Galloway	6	4.315	88.3	179.9	8.0	2541.1	2541.0	0.1
Galloway	6	4.277	148.0	240.5	6.6	2536.1	2536.0	0.1
Galloway	6	4.240	90.8	203.8	7.8	2531.8	2531.7	0.1
Galloway	6	4.202	66.8	173.4	9.2	2527.5	2527.5	0.0
Galloway	6	4.164	65.0	173.5	9.2	2523.2	2523.2	0.0
Galloway	6	4.126	94.5	191.8	8.3	2518.8	2518.8	0.0
Galloway	6	4.088	79.9	183.2	8.7	2512.2	2512.2	0.0
Galloway	6	4.050	54.5	160.8	9.9	2507.8	2507.8	0.0
Galloway	6	4.012	69.6	174.8	9.1	2501.9	2501.9	0.0
Galloway	6	3.974	99.0	197.5	8.1	2496.5	2496.5	0.0
Galloway	6	3.936	69.0	175.4	9.1	2491.5	2491.5	0.0
Galloway	6	3.899	69.6	173.4	9.2	2486.4	2486.4	0.0
Galloway	6	3.861	73.9	191.6	9.1	2480.8	2480.7	0.0
Galloway	6	3.823	96.0	209.5	8.4	2475.9	2475.9	0.0
Galloway	6	3.785	104.6	221.2	7.9	2470.9	2470.8	0.1
Galloway	6	3.747	92.0	205.5	8.5	2465.0	2465.0	0.0
Galloway	6	3.709	82.7	199.1	8.8	2460.5	2460.5	0.0
Galloway	6	3.671	94.0	206.2	8.5	2455.4	2455.4	0.0
Galloway	6	3.634	80.0	197.3	8.9	2450.4	2450.4	0.0
Galloway	6	3.596	85.0	201.2	8.7	2445.9	2445.7	0.2
Galloway	6	3.562	77.6	193.6	9.0	2441.7	2441.7	0.0
Galloway	6	3.528	106.0	228.0	7.7	2436.6	2436.6	0.0
Galloway	6	3.514	142.8	380.1	6.8	2434.9	2434.9	0.0
Galloway	6	3.504	182.4	571.6	4.8	2434.3	2434.3	0.0
Galloway	6	3.503 B	R U 182.3	492.4	6.1	2434.3	2434.3	0.0
Galloway	6	3.503 B	R D 189.2	488.9	5.8	2434.1	2434.1	0.0
Galloway	6	3.502	105.4	245.5	7.5	2433.4	2433.4	0.0
Galloway	6	3.493	103.3	235.2	7.8	2432.1	2431.8	0.3
Galloway	6	3.482	123.4	239.7	7.7	2430.6	2430.6	0.0
Galloway	6	3.444	92.0	212.4	8.7	2426.2	2426.2	0.0
Galloway	6	3.404	95.0	214.1	8.6	2421.5	2421.5	0.0
Galloway	6	3.373	190.7	441.5	4.2	2418.6	2418.6	0.0
Galloway	6	3.369 B	R U 136.2	247.1	7.5	2418.6	2418.6	0.0

Table 5.9.2
HEC RAS Output - Floodway

River	Reach	River Sta	Top Wdth Act	Area	Vel Total	W.S. Elev	Base WS	Prof Delta WS
			(ft)	(sq ft)	(ft/s)	(ft)	(ft)	(ft)
Galloway	6	3.369 B	R D 93.3	225.4	8.2	2417.4	2417.4	0.0
Galloway	6	3.364	37.6	158.0	11.7	2413.6	2413.6	0.0
Galloway	6	3.331	58.4	178.8	10.3	2409.3	2409.3	0.0
Galloway	6	3.292	60.5	180.6	10.2	2404.5	2404.5	0.0
Galloway	6	3.255	114.0	228.8	8.0	2398.6	2398.6	0.0
Galloway	6	3.216	95.8	324.0	10.6	2394.7	2394.7	0.0
Galloway	6	3.179	92.1	320.7	10.7	2391.5	2391.5	0.0
Galloway	6	3.141	120.7	352.7	9.8	2387.1	2387.1	0.0
Galloway	6	3.103	160.0	389.3	8.8	2382.4	2382.4	0.0
Galloway	6	3.066	115.0	346.8	9.9	2378.9	2378.9	0.0
Galloway	6	3.027	90.3	322.9	10.7	2375.2	2375.2	0.0
Galloway	6	2.988	209.7	431.3	8.0	2370.2	2370.2	0.0
Galloway	6	2.952	144.3	366.0	9.4	2366.3	2366.3	0.0
Galloway	6	2.913	146.8	405.3	8.5	2362.4	2362.4	-0.1
Galloway	6	2.889	265.2	508.7	6.8	2359.4	2359.4	0.0
Galloway	Split 2	0.240	52.8	47.7	4.5	2355.5	2355.5	0.0
Galloway	Split 2	0.213	72.6	49.7	4.3	2351.6	2351.6	0.0
Galloway	Split 2	0.156	47.4	44.7	4.8	2344.1	2344.1	0.0
Galloway	Split 2	0.129	48.5	49.0	4.4	2341.5	2341.5	0.0
Galloway	Split 2	0.088	29.7	131.7	5.5	2337.4	2337.4	0.0
Galloway	Split 2	0.046	74.1	51.2	4.2	2331.7	2331.7	0.0
Galloway	5	2.872	116.6	326.1	9.9	2354.3	2354.3	0.0
Galloway	5	2.837	111.0	324.6	9.9	2350.1	2350.1	0.0
Galloway	5	2.799	98.1	314.8	10.2	2345.3	2345.3	0.0
Galloway	5	2.760	79.4	293.0	11.0	2340.1	2340.1	0.0
Galloway	5	2.723	95.0	1075.1	10.4	2334.7	2334.7	0.0
Galloway	5	2.679	179.0	432.7	7.5	2329.2	2329.2	0.0
Galloway	4	2.647	135.2	410.6	8.4	2326.8	2326.8	0.0
Galloway	4	2.610	93.3	324.3	10.6	2323.6	2323.6	0.0
Galloway	4	2.572	132.5	357.3	9.6	2320.4	2320.4	0.0
Galloway	4	2.534	110.6	359.3	9.6	2315.3	2315.2	0.1
Galloway	4	2.496	94.6	326.1	10.6	2311.1	2311.1	0.0
Galloway	4	2.458	128.7	426.7	9.5	2306.5	2306.5	0.0
Galloway	4	2.420	140.2	372.5	9.2	2301.6	2301.6	0.0
Galloway	4	2.382	152.9	394.0	8.7	2297.3	2297.3	0.0
Galloway	4	2.344	94.7	326.6	10.5	2292.4	2292.4	0.0
Galloway	4	2.299	168.2	551.1	8.8	2289.7	2289.7	0.0
Galloway	4	2.281	169.5	872.3	5.4	2289.5	2289.5	0.0
Galloway	4	2.275	Culvert					
Galloway	4	2.268	97.5	394.9	11.4	2285.5	2285.5	0.0
Galloway	4	2.240	148.5	437.3	10.1	2280.6	2280.6	0.0
Galloway	4	2.193	185.8	479.2	9.2	2275.9	2275.9	0.0
Galloway	4	2.162	179.1	1046.6	9.3	2272.3	2272.3	0.0
Galloway	4	2.098	327.9	832.1	7.5	2264.4	2264.4	0.0
Galloway	4	2.041	355.4	846.8	7.1	2257.4	2257.4	0.0
Galloway	4	2.004	514.0	1026.3	5.9	2253.0	2253.0	0.0
Galloway	4	1.966	337.9	811.8	7.5	2248.3	2248.3	0.0
Galloway	4	1.928	367.8	895.3	7.1	2244.5	2244.5	0.0
Galloway	4	1.917	327.0	846.4	7.2	2243.0	2243.0	0.0
Galloway	4	1.890	176.0	831.5	7.3	2241.0	2241.0	0.0
Galloway	4	1.846	79.1	444.4	13.6	2236.8	2236.8	0.0

Table 5.9.2
HEC RAS Output - Floodway

River	Reach	River Sta	Top Wdth Act	Area	Vel Total	W.S. Elev	Base WS	Prof Delta WS
			(ft)	(sq ft)	(ft/s)	(ft)	(ft)	(ft)
Galloway	4	1.815	83.5	451.7	13.4	2231.8	2231.8	0.0
Galloway	4	1.790	92.5	915.8	12.5	2228.6	2228.6	0.0
Galloway	4	1.761	145.8	578.1	10.5	2224.6	2224.6	0.0
Galloway	4	1.739	94.7	477.2	12.7	2221.6	2221.6	0.0
Galloway	4	1.701	136.5	577.0	10.9	2216.4	2216.4	0.0
Galloway	4	1.663	104.1	489.1	12.4	2212.3	2212.3	0.0
Galloway	4	1.625	108.1	495.5	12.2	2207.5	2207.5	0.0
Galloway	4	1.587	98.3	473.0	12.8	2204.2	2204.2	0.0
Galloway	4	1.549	126.5	525.6	11.5	2200.5	2200.5	0.0
Galloway	4	1.511	98.8	468.5	12.9	2195.3	2195.3	0.0
Galloway	3	1.474	581.1	1585.9	6.8	2191.6	2191.6	0.0
Galloway	3	1.435	409.0	1260.6	8.6	2186.7	2186.7	0.0
Galloway	3	1.397	302.7	1148.1	9.4	2182.4	2182.4	0.0
Galloway	3	1.360	326.0	1171.4	9.2	2177.8	2177.8	0.0
Galloway	3	1.331	344.8	1229.7	8.8	2174.3	2174.3	0.0
Galloway	3	1.284	241.9	1022.0	10.6	2166.6	2166.6	0.0
Galloway	3	1.246	245.1	1324.3	8.6	2163.7	2163.7	0.0
Galloway	3	1.209	336.6	911.1	12.5	2159.1	2159.1	0.0
Galloway	3	1.171	500.9	1666.0	6.9	2155.6	2155.6	0.0
Galloway	3	1.133	471.2	1490.9	7.2	2150.4	2150.4	0.0
Galloway	3	1.110	574.6	2175.9	6.2	2147.7	2147.7	0.0
Galloway	3	1.095	708.5	1864.8	5.8	2146.0	2146.0	0.0
Galloway	2	1.056	135.2	577.6	11.6	2140.6	2140.6	0.0
Galloway	2	1.019	110.3	546.3	12.3	2136.9	2136.9	0.0
Galloway	2	0.974	103.7	563.3	11.9	2133.2	2133.2	0.0
Galloway	2	0.941	100.6	530.9	12.6	2126.4	2126.4	0.0
Galloway	Split 3	0.148	345.4	797.9	5.2	2141.8	2141.8	0.0
Galloway	Split 3	0.115	301.4	644.4	6.4	2137.1	2137.1	0.0
Galloway	Split 3	0.072	358.6	796.2	5.2	2132.7	2132.7	0.0
Galloway	Split 3	0.035	118.1	440.2	9.3	2127.2	2127.2	0.0
Galloway	1	0.905	224.9	1152.0	9.4	2124.4	2124.4	0.0
Galloway	1	0.896	216.2	1484.1	7.6	2124.6	2124.6	0.0
Galloway	1	0.868	254.3	2066.6	5.8	2124.6	2124.6	0.0
Galloway	1	0.866 B	R U 254.3	1510.8	8.4	2124.6	2124.6	0.0
Galloway	1	0.866 B	R D 280.5	1210.9	8.9	2123.1	2123.1	0.0
Galloway	1	0.864	168.1	821.6	13.2	2119.0	2119.0	0.0
Galloway	1	0.845	183.3	931.2	11.6	2115.4	2115.4	0.0
Galloway	1	0.792	189.5	1078.7	12.5	2110.5	2110.5	0.0
Galloway	1	0.754	211.8	1282.7	11.3	2108.5	2108.5	0.0
Galloway	1	0.711	252.8	1310.4	10.3	2103.6	2103.6	0.0
Galloway	1	0.678	217.6	1303.2	10.4	2100.9	2100.9	0.0
Galloway	1	0.641	220.5	1204.5	11.2	2095.1	2095.1	0.0
Galloway	1	0.603	174.0	1101.2	12.3	2091.6	2091.6	0.0
Galloway	1	0.565	255.6	1297.8	10.4	2087.3	2087.3	0.0
Galloway	1	0.527	278.2	1292.6	10.5	2083.6	2083.6	0.0
Galloway	1	0.489	333.1	1456.6	9.3	2079.6	2079.6	0.0
Galloway	1	0.451	266.4	1377.0	9.8	2076.4	2076.4	0.0
Galloway	1	0.413	178.5	1003.8	13.5	2072.3	2072.3	0.0
Galloway	1	0.376	228.2	1275.2	10.6	2069.5	2069.5	0.0
Galloway	1	0.338	164.3	1055.5	12.8	2064.8	2064.8	0.0
Galloway	1	0.300	202.3	1091.4	12.4	2060.9	2060.9	0.0

Table 5.9.2
HEC RAS Output - Floodway

River	Reach	River Sta	Top Wdth Act (ft)	Area (sq ft)	Vel Total (ft/s)	W.S. Elev (ft)	Base WS (ft)	Prof Delta WS (ft)
Galloway	1	0.262	199.1	1047.5	12.9	2057.3	2057.3	0.0
Galloway	1	0.224	228.9	1099.6	12.3	2053.6	2053.6	0.0
Galloway	1	0.186	248.7	1117.0	12.1	2046.8	2046.8	0.0
Galloway	1	0.149	266.7	1156.0	11.7	2041.9	2041.9	0.0
Galloway	1	0.111	170.8	1284.6	10.5	2039.8	2039.8	0.0

SECTION 6: EROSION AND SEDIMENT TRANSPORT

No erosion or sediment transport analyses were conducted as part of this study.

SECTION 7: DRAFT FIS REPORT DATA

7.1 Summary of Discharges

Flooding Source and Location	Drainage Area (Square Miles)	Peak Discharges (cfs)			
		10-Year	50-year	100-year	500-Year
Andora Hills Wash at Cave Creek	2.8	--[1]	--[1]	3200	--[1]
Galloway Wash at Cave Creek	21.0	--[1]	--[1]	13500	--[1]
Grapevine Wash at Galloway Wash	7.1	--[1]	--[1]	5720	--[1]

[1] Not Computed

7.2 Floodway Data

Table 5.9.2
HEC RAS Output - Floodway

River	Reach	River Sta	Top Wdth Act	Area	Vel Total	W.S. Elev	Base WS	Prof Delta WS
			(ft)	(sq ft)	(ft/s)	(ft)	(ft)	(ft)
Andora Hills	5	3.023	78.8	337.7	6.1	2307.3	2306.4	0.9
Andora Hills	5	2.974	76.6	295.9	7.0	2304.0	2303.1	0.9
Andora Hills	5	2.944	58.7	349.9	5.9	2302.4	2301.4	1.0
Andora Hills	5	2.881	44.2	194.7	10.6	2296.6	2296.2	0.5
Andora Hills	5	2.855	72.4	364.7	5.7	2295.8	2294.8	1.0
Andora Hills	5	2.813	40.2	197.5	10.5	2291.7	2291.7	0.0
Andora Hills	5	2.754	70.4	396.1	5.2	2289.4	2288.4	1.0
Andora Hills	5	2.696	30.3	190.1	10.9	2284.8	2283.8	1.0
Andora Hills	5	2.679	45.6	228.4	9.1	2283.2	2282.7	0.5
Andora Hills	5	2.670	86.6	442.8	4.7	2283.2	2282.4	0.9
Andora Hills	5	2.662	Culvert					
Andora Hills	5	2.654	86.6	262.3	7.9	2280.8	2280.8	0.0
Andora Hills	5	2.617	71.3	376.9	6.0	2276.8	2275.8	1.0
Andora Hills	5	2.576	50.8	278.7	8.1	2273.8	2272.8	1.0
Andora Hills	5	2.529	41.1	233.2	9.7	2268.7	2268.1	0.6
Andora Hills	5	2.473	65.6	347.0	6.5	2264.2	2263.2	1.0
Andora Hills	5	2.419	56.9	299.2	7.6	2260.1	2259.7	0.4
Andora Hills	5	2.364	95.2	316.8	7.1	2255.5	2255.4	0.1
Andora Hills	5	2.324	135.3	593.4	3.8	2254.4	2253.4	1.0
Andora Hills	5	2.280	27.6	166.4	13.6	2249.1	2248.7	0.3
Andora Hills	5	2.219	71.4	380.1	6.0	2241.5	2241.1	0.4
Andora Hills	5	2.174	51.5	255.9	8.8	2237.8	2236.8	1.0
Andora Hills	5	2.153	61.1	259.2	8.7	2235.3	2234.7	0.6
Andora Hills	5	2.124	108.9	337.9	6.7	2232.3	2231.4	1.0
Andora Hills	5	2.090	43.0	204.1	11.1	2225.4	2224.5	0.8
Andora Hills	5	2.056	49.4	248.4	9.1	2209.7	2209.7	0.0
Andora Hills	5	2.019	52.0	295.0	8.5	2206.2	2205.4	0.8
Andora Hills	5	1.976	36.5	231.1	10.8	2200.9	2200.5	0.3
Andora Hills	5	1.935	55.8	289.9	8.6	2197.1	2196.5	0.5
Andora Hills	5	1.888	99.3	354.0	7.1	2193.5	2193.3	0.2
Andora Hills	5	1.831	116.1	431.6	5.8	2190.4	2190.4	0.0
Andora Hills	5	1.786	91.1	313.7	8.0	2187.0	2187.0	0.0
Andora Hills	5	1.731	121.7	332.0	7.5	2181.6	2181.6	0.0
Andora Hills	5	1.668	85.6	419.3	6.3	2177.9	2177.8	0.1
Andora Hills	5	1.609	61.3	255.0	10.3	2172.5	2172.4	0.1
Andora Hills	5	1.566	160.3	439.4	6.0	2169.0	2169.0	0.0
Andora Hills	4	1.555	59.4	267.4	9.0	2167.9	2167.5	0.3
Andora Hills	4	1.539	83.4	255.0	9.4	2165.1	2165.1	0.0
Andora Hills	Split 1	0.244	61.0	87.2	3.5	2168.5	2168.5	0.0
Andora Hills	Split 1	0.232	54.1	53.3	5.7	2166.8	2166.8	0.0
Andora Hills	3	1.496	89.7	470.2	5.7	2163.0	2162.0	1.0
Andora Hills	3	1.466	65.7	290.1	9.3	2160.2	2160.1	0.1
Andora Hills	3	1.438	31.5	208.1	13.0	2155.0	2154.9	0.1
Andora Hills	3	1.394	112.1	338.5	8.0	2149.9	2149.9	0.0
Andora Hills	3	1.353	188.9	691.2	3.9	2147.5	2147.5	0.0
Andora Hills	3	1.298	104.9	330.5	8.2	2143.7	2143.7	0.0
Andora Hills	3	1.266	46.7	220.2	12.3	2139.1	2139.1	0.0
Andora Hills	3	1.222	43.8	291.8	9.3	2135.0	2134.0	1.0
Andora Hills	3	1.170	39.3	323.8	8.3	2131.9	2131.0	1.0
Andora Hills	3	1.133	33.9	238.7	11.3	2128.3	2127.8	0.5
Andora Hills	3	1.085	125.5	338.1	8.0	2123.3	2123.3	0.0
Andora Hills	3	1.039	84.3	305.4	8.8	2115.4	2115.4	0.0
Andora Hills	3	0.992	119.7	503.5	5.5	2112.5	2112.5	0.0

Table 5.9.2
HEC RAS Output - Floodway

River	Reach	River Sta	Top Wdth Act (ft)	Area (sq ft)	Vel Total (ft/s)	W.S. Elev (ft)	Base WS (ft)	Prof Delta WS (ft)
Andora Hills	3	0.954	62.5	262.7	10.5	2108.3	2108.3	0.0
Andora Hills	3	0.911	98.3	351.1	8.3	2103.0	2102.8	0.2
Andora Hills	3	0.902	52.0	426.1	6.8	2102.7	2102.4	0.3
Andora Hills	3	0.893	Culvert					
Andora Hills	3	0.884	50.0	424.4	6.8	2102.0	2101.6	0.4
Andora Hills	3	0.854	96.8	565.4	5.1	2101.2	2101.1	0.1
Andora Hills	3	0.830	129.4	1087.1	8.2	2098.8	2098.8	0.0
Andora Hills	3	0.816	133.1	596.8	7.4	2094.5	2094.5	0.0
Andora Hills	3	0.805	126.8	493.6	5.9	2089.2	2089.2	0.0
Andora Hills	3	0.797	Culvert					
Andora Hills	3	0.789	146.9	391.6	7.4	2087.2	2087.2	0.0
Andora Hills	3	0.761	88.9	294.3	9.9	2081.7	2081.7	0.0
Andora Hills	3	0.729	105.3	422.6	8.8	2079.9	2079.9	0.0
Andora Hills	3	0.687	231.5	762.2	3.9	2080.2	2080.2	0.0
Andora Hills	3	0.679	223.7	887.6	3.5	2080.2	2080.2	0.0
Andora Hills	3	0.673	Culvert					
Andora Hills	3	0.667	255.6	485.3	6.2	2076.6	2076.6	0.0
Andora Hills	3	0.628	208.2	392.7	8.0	2072.2	2072.2	0.0
Andora Hills	3	0.592	214.5	439.5	7.1	2067.6	2067.6	0.0
Andora Hills	3	0.563	297.2	459.9	6.5	2063.1	2063.1	0.0
Andora Hills	3	0.522	185.1	776.9	5.2	2060.5	2060.5	0.0
Andora Hills	3	0.480	184.7	437.9	7.1	2053.1	2053.1	0.0
Andora Hills	3	0.447	111.4	322.6	9.6	2050.2	2050.2	0.0
Andora Hills	3	0.432	274.7	511.8	6.1	2048.0	2048.0	0.0
Andora Hills	3	0.429	Culvert					
Andora Hills	3	0.426	249.7	519.2	6.0	2047.7	2047.7	0.0
Andora Hills	3	0.393	165.8	577.4	5.4	2042.6	2042.6	0.0
Andora Hills	3	0.317	136.2	355.5	8.7	2035.3	2035.3	0.0
Andora Hills	2	0.271	70.8	197.5	9.7	2028.0	2028.0	0.0
Andora Hills	2	0.236	53.9	204.3	9.4	2022.9	2022.9	0.0
Andora Hills	2	0.185	41.6	173.9	11.0	2015.8	2015.8	0.0
Andora Hills	Split 2	0.093	63.9	147.7	8.7	2028.4	2028.4	0.0
Andora Hills	Split 2	0.083	49.2	134.9	9.5	2022.2	2022.2	0.0
Andora Hills	Split 2	0.042	50.2	174.8	7.4	2016.8	2016.8	0.0
Andora Hills	1	0.162	75.8	324.9	9.9	2013.3	2013.3	0.0
Andora Hills	1	0.140	82.2	434.5	7.4	2012.3	2012.2	0.1
Andora Hills	1	0.129	53.4	279.4	11.5	2010.1	2010.0	0.1

Table 5.9.2
HEC RAS Output - Floodway

River	Reach	River Sta	Top Wdth Act	Area	Vel Total	W.S. Elev	Base WS	Prof Delta WS
			(ft)	(sq ft)	(ft/s)	(ft)	(ft)	(ft)
Galloway	8	4.832	249.7	228.6	4.9	2608.0	2608.0	0.0
Galloway	8	4.796	248.8	262.6	4.2	2604.0	2604.0	0.0
Galloway	8	4.770	221.8	235.8	4.7	2600.9	2600.9	0.0
Galloway	8	4.732	175.3	202.9	5.5	2595.8	2595.8	0.0
Galloway	8	4.694	186.6	193.8	5.7	2591.2	2591.2	0.1
Galloway	8	4.656	224.0	210.9	5.3	2585.2	2585.2	0.0
Galloway	Split 1	0.082	56.2	39.4	4.5	2582.7	2582.7	0.0
Galloway	Split 1	0.033	32.4	38.4	4.6	2578.3	2578.3	0.0
Galloway	Split 1	0.027	21.4	27.0	6.5	2573.9	2573.9	0.0
Galloway	7	4.639	117.8	145.5	6.4	2582.7	2582.7	0.0
Galloway	7	4.618	50.7	110.0	8.5	2579.0	2579.0	0.0
Galloway	7	4.581	46.2	107.3	8.7	2573.8	2573.8	0.0
Galloway	6	4.543	56.8	128.6	8.6	2569.0	2569.0	0.0
Galloway	6	4.505	76.1	187.8	7.7	2563.1	2563.1	0.0
Galloway	6	4.467	66.3	160.3	9.0	2559.8	2559.8	0.0
Galloway	6	4.429	85.1	174.3	8.3	2555.0	2555.0	0.0
Galloway	6	4.391	56.4	152.4	9.5	2550.9	2550.9	0.0
Galloway	6	4.353	87.0	177.8	8.1	2545.6	2545.6	0.0
Galloway	6	4.315	88.3	179.9	8.0	2541.1	2541.0	0.1
Galloway	6	4.277	148.0	240.5	6.6	2536.1	2536.0	0.1
Galloway	6	4.240	90.8	203.8	7.8	2531.8	2531.7	0.1
Galloway	6	4.202	66.8	173.4	9.2	2527.5	2527.5	0.0
Galloway	6	4.164	65.0	173.5	9.2	2523.2	2523.2	0.0
Galloway	6	4.126	94.5	191.8	8.3	2518.8	2518.8	0.0
Galloway	6	4.088	79.9	183.2	8.7	2512.2	2512.2	0.0
Galloway	6	4.050	54.5	160.8	9.9	2507.8	2507.8	0.0
Galloway	6	4.012	69.6	174.8	9.1	2501.9	2501.9	0.0
Galloway	6	3.974	99.0	197.5	8.1	2496.5	2496.5	0.0
Galloway	6	3.936	69.0	175.4	9.1	2491.5	2491.5	0.0
Galloway	6	3.899	69.6	173.4	9.2	2486.4	2486.4	0.0
Galloway	6	3.861	73.9	191.6	9.1	2480.8	2480.7	0.0
Galloway	6	3.823	96.0	209.5	8.4	2475.9	2475.9	0.0
Galloway	6	3.785	104.6	221.2	7.9	2470.9	2470.8	0.1
Galloway	6	3.747	92.0	205.5	8.5	2465.0	2465.0	0.0
Galloway	6	3.709	82.7	199.1	8.8	2460.5	2460.5	0.0
Galloway	6	3.671	94.0	206.2	8.5	2455.4	2455.4	0.0
Galloway	6	3.634	80.0	197.3	8.9	2450.4	2450.4	0.0
Galloway	6	3.596	85.0	201.2	8.7	2445.9	2445.7	0.2
Galloway	6	3.562	77.6	193.6	9.0	2441.7	2441.7	0.0
Galloway	6	3.528	106.0	228.0	7.7	2436.6	2436.6	0.0
Galloway	6	3.514	142.8	380.1	6.8	2434.9	2434.9	0.0
Galloway	6	3.504	182.4	571.6	4.8	2434.3	2434.3	0.0
Galloway	6	3.503 B	R U 182.3	492.4	6.1	2434.3	2434.3	0.0
Galloway	6	3.503 B	R D 189.2	488.9	5.8	2434.1	2434.1	0.0
Galloway	6	3.502	105.4	245.5	7.5	2433.4	2433.4	0.0
Galloway	6	3.493	103.3	235.2	7.8	2432.1	2431.8	0.3
Galloway	6	3.482	123.4	239.7	7.7	2430.6	2430.6	0.0
Galloway	6	3.444	92.0	212.4	8.7	2426.2	2426.2	0.0
Galloway	6	3.404	95.0	214.1	8.6	2421.5	2421.5	0.0
Galloway	6	3.373	190.7	441.5	4.2	2418.6	2418.6	0.0
Galloway	6	3.369 B	R U 136.2	247.1	7.5	2418.6	2418.6	0.0

Table 5.9.2
HEC RAS Output - Floodway

River	Reach	River Sta	Top Wdth Act	Area	Vel Total	W.S. Elev	Base WS	Prof Delta WS
			(ft)	(sq ft)	(ft/s)	(ft)	(ft)	(ft)
Galloway	6	3.369 B	R D 93.3	225.4	8.2	2417.4	2417.4	0.0
Galloway	6	3.364	37.6	158.0	11.7	2413.6	2413.6	0.0
Galloway	6	3.331	58.4	178.8	10.3	2409.3	2409.3	0.0
Galloway	6	3.292	60.5	180.6	10.2	2404.5	2404.5	0.0
Galloway	6	3.255	114.0	228.8	8.0	2398.6	2398.6	0.0
Galloway	6	3.216	95.8	324.0	10.6	2394.7	2394.7	0.0
Galloway	6	3.179	92.1	320.7	10.7	2391.5	2391.5	0.0
Galloway	6	3.141	120.7	352.7	9.8	2387.1	2387.1	0.0
Galloway	6	3.103	160.0	389.3	8.8	2382.4	2382.4	0.0
Galloway	6	3.066	115.0	346.8	9.9	2378.9	2378.9	0.0
Galloway	6	3.027	90.3	322.9	10.7	2375.2	2375.2	0.0
Galloway	6	2.988	209.7	431.3	8.0	2370.2	2370.2	0.0
Galloway	6	2.952	144.3	366.0	9.4	2366.3	2366.3	0.0
Galloway	6	2.913	146.8	405.3	8.5	2362.4	2362.4	-0.1
Galloway	6	2.889	265.2	508.7	6.8	2359.4	2359.4	0.0
Galloway	Split 2	0.240	52.8	47.7	4.5	2355.5	2355.5	0.0
Galloway	Split 2	0.213	72.6	49.7	4.3	2351.6	2351.6	0.0
Galloway	Split 2	0.156	47.4	44.7	4.8	2344.1	2344.1	0.0
Galloway	Split 2	0.129	48.5	49.0	4.4	2341.5	2341.5	0.0
Galloway	Split 2	0.088	29.7	131.7	5.5	2337.4	2337.4	0.0
Galloway	Split 2	0.046	74.1	51.2	4.2	2331.7	2331.7	0.0
Galloway	5	2.872	116.6	326.1	9.9	2354.3	2354.3	0.0
Galloway	5	2.837	111.0	324.6	9.9	2350.1	2350.1	0.0
Galloway	5	2.799	98.1	314.8	10.2	2345.3	2345.3	0.0
Galloway	5	2.760	79.4	293.0	11.0	2340.1	2340.1	0.0
Galloway	5	2.723	95.0	1075.1	10.4	2334.7	2334.7	0.0
Galloway	5	2.679	179.0	432.7	7.5	2329.2	2329.2	0.0
Galloway	4	2.647	135.2	410.6	8.4	2326.8	2326.8	0.0
Galloway	4	2.610	93.3	324.3	10.6	2323.6	2323.6	0.0
Galloway	4	2.572	132.5	357.3	9.6	2320.4	2320.4	0.0
Galloway	4	2.534	110.6	359.3	9.6	2315.3	2315.2	0.1
Galloway	4	2.496	94.6	326.1	10.6	2311.1	2311.1	0.0
Galloway	4	2.458	128.7	426.7	9.5	2306.5	2306.5	0.0
Galloway	4	2.420	140.2	372.5	9.2	2301.6	2301.6	0.0
Galloway	4	2.382	152.9	394.0	8.7	2297.3	2297.3	0.0
Galloway	4	2.344	94.7	326.6	10.5	2292.4	2292.4	0.0
Galloway	4	2.299	168.2	551.1	8.8	2289.7	2289.7	0.0
Galloway	4	2.281	169.5	872.3	5.4	2289.5	2289.5	0.0
Galloway	4	2.275	Culvert					
Galloway	4	2.268	97.5	394.9	11.4	2285.5	2285.5	0.0
Galloway	4	2.240	148.5	437.3	10.1	2280.6	2280.6	0.0
Galloway	4	2.193	185.8	479.2	9.2	2275.9	2275.9	0.0
Galloway	4	2.162	179.1	1046.6	9.3	2272.3	2272.3	0.0
Galloway	4	2.098	327.9	832.1	7.5	2264.4	2264.4	0.0
Galloway	4	2.041	355.4	846.8	7.1	2257.4	2257.4	0.0
Galloway	4	2.004	514.0	1026.3	5.9	2253.0	2253.0	0.0
Galloway	4	1.966	337.9	811.8	7.5	2248.3	2248.3	0.0
Galloway	4	1.928	367.8	895.3	7.1	2244.5	2244.5	0.0
Galloway	4	1.917	327.0	846.4	7.2	2243.0	2243.0	0.0
Galloway	4	1.890	176.0	831.5	7.3	2241.0	2241.0	0.0
Galloway	4	1.846	79.1	444.4	13.6	2236.8	2236.8	0.0

Table 5.9.2
HEC RAS Output - Floodway

River	Reach	River Sta	Top Wdth Act	Area	Vel Total	W.S. Elev	Base WS	Prof Delta WS
			(ft)	(sq ft)	(ft/s)	(ft)	(ft)	(ft)
Galloway	4	1.815	83.5	451.7	13.4	2231.8	2231.8	0.0
Galloway	4	1.790	92.5	915.8	12.5	2228.6	2228.6	0.0
Galloway	4	1.761	145.8	578.1	10.5	2224.6	2224.6	0.0
Galloway	4	1.739	94.7	477.2	12.7	2221.6	2221.6	0.0
Galloway	4	1.701	136.5	577.0	10.9	2216.4	2216.4	0.0
Galloway	4	1.663	104.1	489.1	12.4	2212.3	2212.3	0.0
Galloway	4	1.625	108.1	495.5	12.2	2207.5	2207.5	0.0
Galloway	4	1.587	98.3	473.0	12.8	2204.2	2204.2	0.0
Galloway	4	1.549	126.5	525.6	11.5	2200.5	2200.5	0.0
Galloway	4	1.511	98.8	468.5	12.9	2195.3	2195.3	0.0
Galloway	3	1.474	581.1	1585.9	6.8	2191.6	2191.6	0.0
Galloway	3	1.435	409.0	1260.6	8.6	2186.7	2186.7	0.0
Galloway	3	1.397	302.7	1148.1	9.4	2182.4	2182.4	0.0
Galloway	3	1.360	326.0	1171.4	9.2	2177.8	2177.8	0.0
Galloway	3	1.331	344.8	1229.7	8.8	2174.3	2174.3	0.0
Galloway	3	1.284	241.9	1022.0	10.6	2166.6	2166.6	0.0
Galloway	3	1.246	245.1	1324.3	8.6	2163.7	2163.7	0.0
Galloway	3	1.209	336.6	911.1	12.5	2159.1	2159.1	0.0
Galloway	3	1.171	500.9	1666.0	6.9	2155.6	2155.6	0.0
Galloway	3	1.133	471.2	1490.9	7.2	2150.4	2150.4	0.0
Galloway	3	1.110	574.6	2175.9	6.2	2147.7	2147.7	0.0
Galloway	3	1.095	708.5	1864.8	5.8	2146.0	2146.0	0.0
Galloway	2	1.056	135.2	577.6	11.6	2140.6	2140.6	0.0
Galloway	2	1.019	110.3	546.3	12.3	2136.9	2136.9	0.0
Galloway	2	0.974	103.7	563.3	11.9	2133.2	2133.2	0.0
Galloway	2	0.941	100.6	530.9	12.6	2126.4	2126.4	0.0
Galloway	Split 3	0.148	345.4	797.9	5.2	2141.8	2141.8	0.0
Galloway	Split 3	0.115	301.4	644.4	6.4	2137.1	2137.1	0.0
Galloway	Split 3	0.072	358.6	796.2	5.2	2132.7	2132.7	0.0
Galloway	Split 3	0.035	118.1	440.2	9.3	2127.2	2127.2	0.0
Galloway	1	0.905	224.9	1152.0	9.4	2124.4	2124.4	0.0
Galloway	1	0.896	216.2	1484.1	7.6	2124.6	2124.6	0.0
Galloway	1	0.868	254.3	2066.6	5.8	2124.6	2124.6	0.0
Galloway	1	0.866 B	R U 254.3	1510.8	8.4	2124.6	2124.6	0.0
Galloway	1	0.866 B	R D 280.5	1210.9	8.9	2123.1	2123.1	0.0
Galloway	1	0.864	168.1	821.6	13.2	2119.0	2119.0	0.0
Galloway	1	0.845	183.3	931.2	11.6	2115.4	2115.4	0.0
Galloway	1	0.792	189.5	1078.7	12.5	2110.5	2110.5	0.0
Galloway	1	0.754	211.8	1282.7	11.3	2108.5	2108.5	0.0
Galloway	1	0.711	252.8	1310.4	10.3	2103.6	2103.6	0.0
Galloway	1	0.678	217.6	1303.2	10.4	2100.9	2100.9	0.0
Galloway	1	0.641	220.5	1204.5	11.2	2095.1	2095.1	0.0
Galloway	1	0.603	174.0	1101.2	12.3	2091.6	2091.6	0.0
Galloway	1	0.565	255.6	1297.8	10.4	2087.3	2087.3	0.0
Galloway	1	0.527	278.2	1292.6	10.5	2083.6	2083.6	0.0
Galloway	1	0.489	333.1	1456.6	9.3	2079.6	2079.6	0.0
Galloway	1	0.451	266.4	1377.0	9.8	2076.4	2076.4	0.0
Galloway	1	0.413	178.5	1003.8	13.5	2072.3	2072.3	0.0
Galloway	1	0.376	228.2	1275.2	10.6	2069.5	2069.5	0.0
Galloway	1	0.338	164.3	1055.5	12.8	2064.8	2064.8	0.0
Galloway	1	0.300	202.3	1091.4	12.4	2060.9	2060.9	0.0

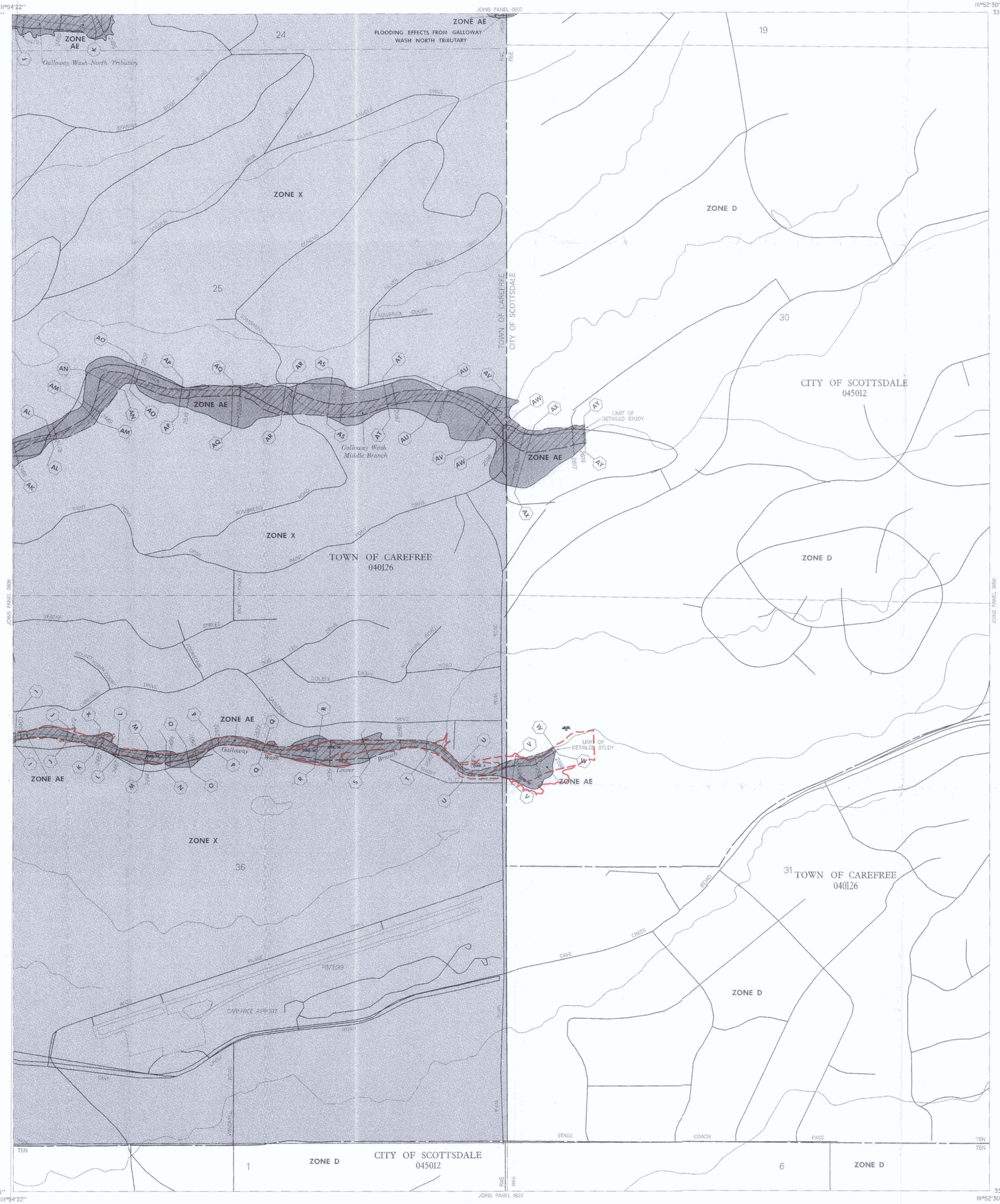
Table 5.9.2
HEC RAS Output - Floodway

River	Reach	River Sta	Top Wdth Act (ft)	Area (sq ft)	Vel Total (ft/s)	W.S. Elev (ft)	Base WS (ft)	Prof Delta WS (ft)
Galloway	1	0.262	199.1	1047.5	12.9	2057.3	2057.3	0.0
Galloway	1	0.224	228.9	1099.6	12.3	2053.6	2053.6	0.0
Galloway	1	0.186	248.7	1117.0	12.1	2046.8	2046.8	0.0
Galloway	1	0.149	266.7	1156.0	11.7	2041.9	2041.9	0.0
Galloway	1	0.111	170.8	1284.6	10.5	2039.8	2039.8	0.0

7.3 Annotated Flood Insurance Rate Maps

ELEVATION REFERENCE MARKS

REFERENCE MARK	ELEVATION (FEET NGVD)	DESCRIPTION OF LOCATION
RM599	2503.56	Carefree Airport, in island for fuel pump, in concrete slab and flush with surface, standard tablet stamped 21 HRP 1963 2504.



LEGEND FOR ANNOTATION

100-YR FLOODPLAIN BOUNDARY	
FLOODWAY BOUNDARY	
JE Fuller/Hydrology & Geomorphology, Inc.	August, 2001

LEGEND

To obtain more detailed information in areas where Base Flood Elevations (BFEs)and /or floodways have been determined, users are encouraged to consult the Flood Profiles and Floodway Data tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations and therefore may not exactly reflect the flood elevation data presented in the FIS. BFEs shown on the FIRM are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS should be utilized in conjunction with the FIRM for purposes of construction and /or floodplain management.

ERM elevations listed on this map were obtained and/or developed to establish vertical control for determination of flood elevations and floodplain boundaries portrayed on this map. Users should be aware that these ERM elevations may have changed since the publication of this map. To obtain up-to-date elevation information on National Geodetic Survey (NGS) ERMs shown on this map, please contact the Information Services Branch of the NGS at (301) 713-3242, or visit their website at www.ngs.noaa.gov. Map users should seek verification of non-NGS ERM monument elevations when using these elevations for construction or floodplain management purposes.

Coastal BFE's shown on this map may apply only landward of 0.0' NGVD. Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this community. Elevations shown in this Summary of Stillwater Elevations table should be used for construction, and /or Floodplain management purposes when they are higher than the elevations shown on this FIRM.

LEGEND

SPECIAL FLOOD HAZARD AREAS INUNDATED BY 100-YEAR FLOOD

- **ZONE A** No base flood elevations determined.
- **ZONE AE** Base flood elevations determined.
- **ZONE AH** Flood depths of 1 to 3 feet (usually areas of ponding); base flood elevations determined.
- **ZONE AO** Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
- **ZONE A99** To be protected from 100-year flood by federal flood protection system under construction ; no base flood elevations determined.
- **ZONE V** Coastal flood with velocity hazard (wave action); no base flood elevations determined.
- **ZONE VE** Coastal flood with velocity hazard (wave action); base flood elevations determined.

FLOODWAY AREAS IN ZONE AE

OTHER FLOOD AREAS

- **ZONE X** Areas of 500-year flood; areas of 100-year flood with average depths of less than 1 foot or with drainage areas less than 1 square mile, and areas protected by levees from 100-year flood.

OTHER AREAS

- **ZONE X** Areas determined to be outside 500-year floodplain.
- **ZONE D** Areas in which flood hazards are undetermined.

UNDEVELOPED COASTAL BARRIERS

Identified 1983 | Identified 1990 | Otherwise Protected Areas

Coastal barrier areas are normally located within or adjacent to Special Flood Hazard Areas.

- Floodplain Boundary
- Floodway Boundary
- Zone D Boundary
- Boundary Dividing Special Flood Hazard Zones, and Boundary Dividing Areas of Different Coastal Base Flood Elevations Within Special Flood Hazard Zones.
- 513 — Base Flood Elevation Line; Elevation in Feet. See Map Index for Elevation Datum.
- D — D — Cross Section Line
- (EL 987) — Base Flood Elevation in Feet Where Uniform Within Zone. See Map Index for Elevation Datum.
- RM7 × — Elevation Reference Mark
- M2 • — River Mile
- 97°07'30", 32°22'30" — Horizontal Coordinates Based on North American Datum of 1927 (NAD 27) Projection.

NOTES

This map is for use in administering the National Flood Insurance Program; it does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size, or all climatic features outside Special Flood Hazard Areas. The community map repository should be consulted for more detailed data on BFE's, and for any information on floodway delineations, prior to use of this map for property purchase or construction purposes.

Areas of Special Flood Hazard (100-year flood) include Zones A, AE, A1-A30, AH, AO, A99, V, VE and V1-V30.

Certain areas not in Special Flood Hazard Areas may be protected by flood control structures.

Boundaries of the floodways were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the Federal Emergency Management Agency.

Floodway widths in some areas may be too narrow to show to scale. Refer to Floodway Data Table where floodway width is shown at 100 inch.

Corporate limits shown are current as of the date of this map. The user should contact appropriate community officials to determine if corporate limits have changed subsequent to the issuance of this map.

This map may incorporate approximate boundaries of Coastal Barrier Resource System Units and /or Otherwise Protected Areas established under the Coastal Barrier Improvement Act of 1990 (PL 101-591).

For community map revision history prior to countywide mapping, see Section 6.0 of the Flood Insurance Study Report.

For adjoining map panels and base map source see separately printed Map Index.

MAP REPOSITORY
Refer to Repository Listing on Map Index

EFFECTIVE DATE OF
COUNTYWIDE FLOOD INSURANCE RATE MAP:
APRIL 15, 1988

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL:
SEPTEMBER 29, 1989, SEPTEMBER 4, 1991, DECEMBER 3, 1993

Map revised July 19, 2001 to update corporate limits, to change base flood elevations, to add base flood elevations, to add Special Flood Hazard Areas, to change Special Flood Hazard Areas, to change zone designations, to update map format, to add roads and road names, and to incorporate previously issued Letters of Map Revision.

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
500 0 500

MAP ROOM 0809H

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

MARICOPA COUNTY, ARIZONA AND INCORPORATED AREAS

PANEL 809 OF 4350
(SEE MAP INDEX FOR PANELS NOT PRINTED)

CONTAINS: COMMUNITY	NUMBER	PANEL	SUFFIX
CAREFREE, TOWN OF	040126	0809	H
SCOTTSDALE, CITY OF	045012	0809	H

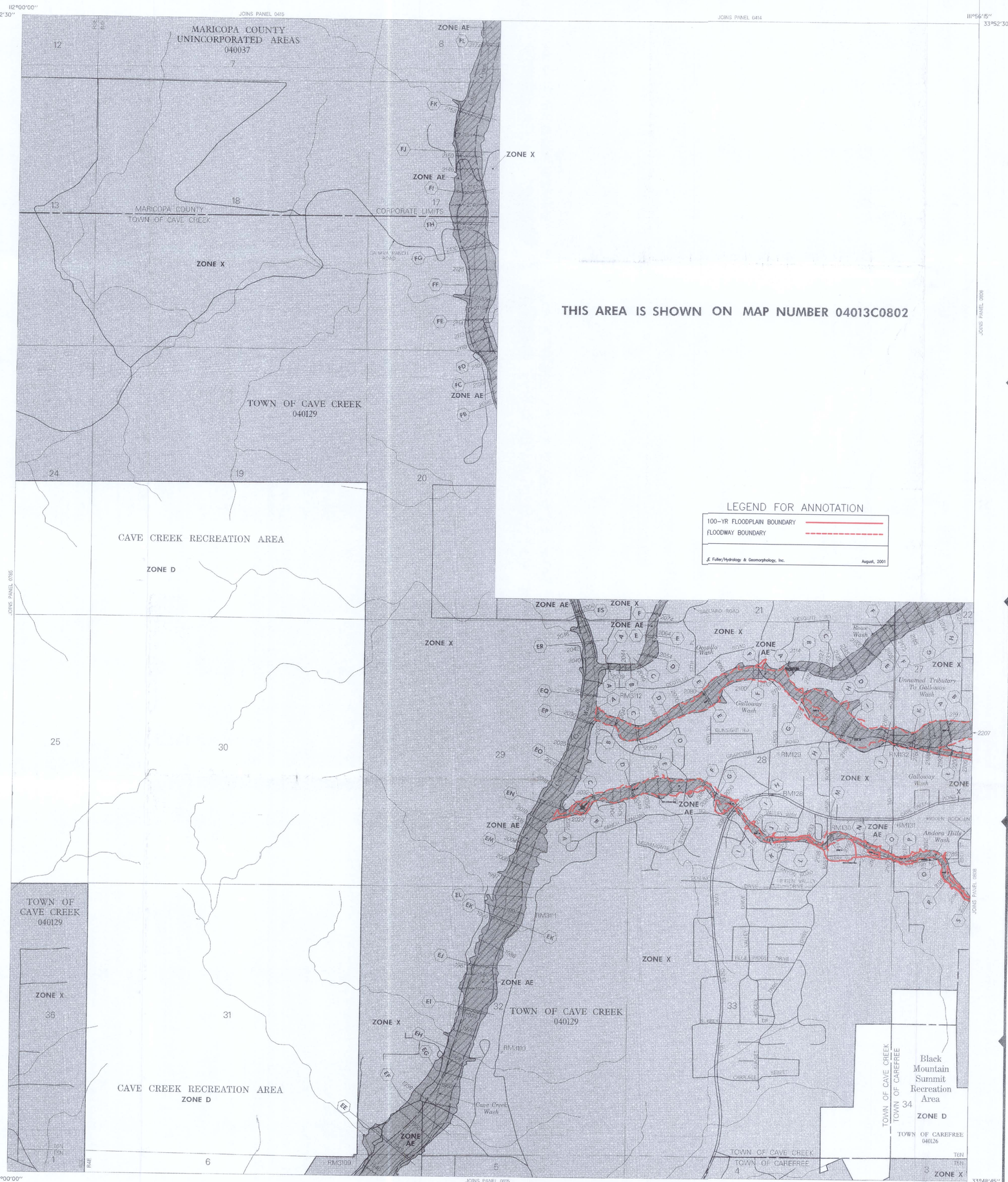
MAP NUMBER
04013C0809 H

MAP REVISED:
JULY 19, 2001

Federal Emergency Management Agency

ELEVATION REFERENCE MARKS

REFERENCE MARK	ELEVATION (FEET NGVD)	DESCRIPTION OF LOCATION
RM128	2127.89	Top of pavement at centerline intersection of Cave Creek and Spur Cross Roads.
RM129	2132.16	Top concrete base of corner fence post on south side of Grapevine Road at Spur Cross Road, north.
RM130	2164.75	Chiseled square in concrete base for flagpole in front of American Legion Post 34, on south side of Cave Creek Road, 0.2 mile west of School House Road.
RM131	2186.35	Top of -inch rebar at centerline intersection of Cave Creek and School House Roads.
RM132	2175.38	Top pavement at centerline intersection of School House and Grapevine Roads.
RM3109	1993.22	Located at the top of USGLO brass cap at northeast corner of section 6, T5N, R4E.
RM3110	1985.02	Located at the top of brass cap in concrete 7 feet west of power line and 7 feet west of power and telephone pole #P51007660 being in the southeast quarter of section 32, T6N, R4E, approximate coordinates N1025619.4, E484463.9.
RM3111	2005.81	Located at the top of brass cap in concrete 10 feet north and 6 feet west of electric transformer #M66450 being on the west side of Andora Hills Wash Drive, being in the northeast quarter of section 32, T6N, R4E, approximate coordinates N1028278.3, E485054.4.
RM3112	2057.34	Located at the top of brass cap in concrete 10 feet south of Ocotillo Road and 55th Street, being in the northeast quarter of section 29, T6N, R4E, approximate coordinates N1032723.2, E486628.2.



LEGEND

SPECIAL FLOOD HAZARD AREAS INUNDATED BY 100-YEAR FLOOD

- **ZONE A** — No base flood elevations determined.
- **ZONE AE** — Base flood elevations determined.
- **ZONE AH** — Flood depths of 1 to 3 feet (usually areas of ponding); base flood elevations determined.
- **ZONE AO** — Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
- **ZONE A99** — To be protected from 100-year flood by Federal flood protection system under construction; no base flood elevations determined.
- **ZONE V** — Coastal flood with velocity hazard (wave action); no base flood elevations determined.
- **ZONE VE** — Coastal flood with velocity hazard (wave action); base flood elevations determined.

FLOODWAY AREAS IN ZONE AE

OTHER FLOOD AREAS

- **ZONE X** — Areas of 500-year flood; areas of 100 year flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 100-year flood.

OTHER AREAS

- **ZONE X** — Areas determined to be outside 500-year floodplain.
- **ZONE D** — Areas in which flood hazards are undetermined.

UNDEVELOPED COASTAL BARRIERS

Identified 1983 | Identified 1990 | Otherwise Protected Areas

Coastal barrier areas are normally located within or adjacent to Special Flood Hazard Areas.

- Floodplain Boundary
- Floodway Boundary
- Zone D Boundary
- Boundary Dividing Special Flood Hazard Zones, and Boundary Dividing Areas of Different Coastal Base Flood Elevations Within Special Flood Hazard Zones.
- 513 — Base Flood Elevation Line; Elevation in Feet. See Map Index for Elevation Datum.
- (D) — Cross Section Line
- (EL. 987) — Base Flood Elevation in Feet Where Uniform Within Zone. See Map Index for Elevation Datum.
- RM7 — Elevation Reference Mark
- M2 — River Mile
- 97°07'30", 32°22'30" — Horizontal Coordinates Based on North American Datum of 1927 (NAD 27) Projection.

NOTES

This map is for use in administering the National Flood Insurance Program; it does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size, or all planimetric features outside Special Flood Hazard Areas. The community map repository should be consulted for more detailed data on BFE's, and for any information on floodway delineations, prior to use of this map for property purchase or construction purposes.

Areas of Special Flood Hazard (100-year flood) include Zones A, AE, A1-A30, AH, AO, A99, V, VE and V1-V30.

Certain areas not in Special Flood Hazard Areas may be protected by flood control structures.

Boundaries of the floodways were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the Federal Emergency Management Agency.

Floodway widths in some areas may be too narrow to show to scale. Refer to Floodway Data Table where floodway width is shown at 1/20 inch.

Corporate limits shown are current as of the date of this map. The user should contact appropriate community officials to determine if corporate limits have changed subsequent to the issuance of this map.

This map may incorporate approximate boundaries of Coastal Barrier Resource System Units and/or Otherwise Protected Areas established under the Coastal Barrier Improvement Act of 1990 (PL 101-591).

For community map revision history prior to countywide mapping, see Section 6.0 of the Flood Insurance Study Report.

For adjoining map panels and base map source see separately printed Map Index.

MAP REPOSITORY
Refer to Repository Listing on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP:
APRIL 15, 1988

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL:
SEPTEMBER 29, 1989, DECEMBER 3, 1993

Map revised July 19, 2001 to update corporate limits, to change base flood elevations, to add base flood elevations, to add Special Flood Hazard Areas, to change Special Flood Hazard Areas, to change zone designations, to update map formats, to add roads and road names, and to incorporate previously issued Letters of Map Revision.

To determine if flood insurance is available, contact an insurance agent or call the National Flood Insurance Program at (800) 638-6620.

APPROXIMATE SCALE IN FEET
1000 0 1000

LEGEND

To obtain more detailed information in areas where Base Flood Elevations (BFEs)and /or floodways have been determined, users are encouraged to consult the Flood Profiles and Floodway Data tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations and therefore may not exactly reflect the flood elevation data presented in the FIS. BFEs shown on the FIRM are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS should be utilized in conjunction with the FIRM for purposes of construction and /or floodplain management.

ERM elevations listed on this map were obtained and/or developed to establish vertical control for determination of flood elevations and floodplain boundaries portrayed on this map. Users should be aware that these ERM elevations may have changed since the publication of this map. To obtain up-to-date elevation information on National Geodetic Survey (NGS) ERMs shown on this map, please contact the Information Services Branch of the NGS at (301) 713-3242, or visit their website at www.ngs.noaa.gov. Map users should seek verification of non-NGS ERM monument elevations when using these elevations for construction or floodplain management purposes.

Coastal BFE's shown on this map may apply only landward of 0.0' NGVD. Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this community. Elevations shown in the Summary of Stillwater Elevations table should be used for construction, and /or floodplain management purposes when they are higher than the elevations shown on this FIRM.

MAP ROOM 0805G

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

MARICOPA COUNTY, ARIZONA AND INCORPORATED AREAS

PANEL 805 OF 4350
(SEE MAP INDEX FOR PANELS NOT PRINTED)

CONTAINS: COMMUNITY	NUMBER	PANEL	SUFFIX
CAREFREE, TOWN OF	040126	0805	G
CAVE CREEK, TOWN OF	040129	0805	G
MARICOPA COUNTY, UNINCORPORATED AREAS	040037	0805	G

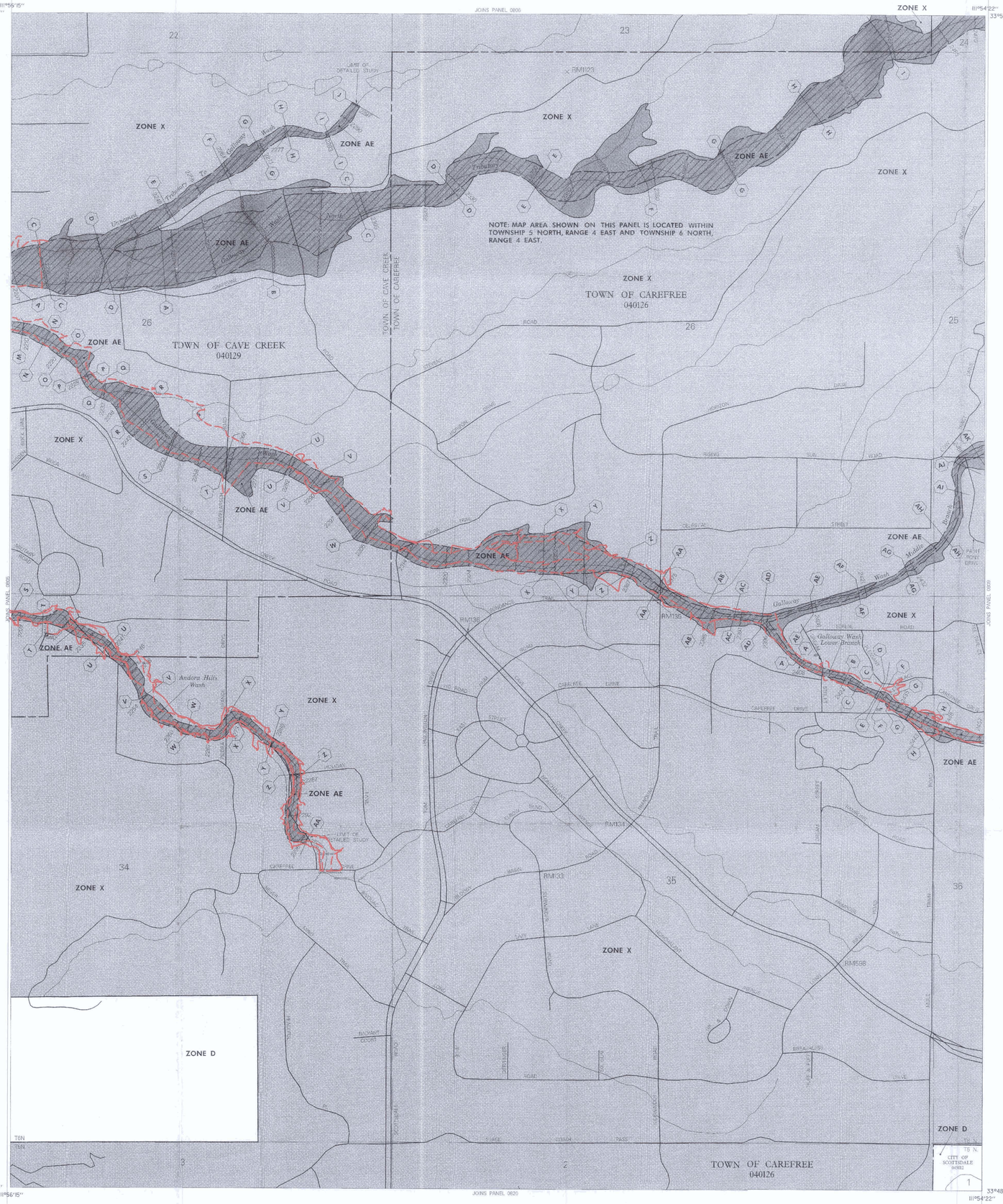
MAP NUMBER
04013C0805 G

MAP REVISED:
JULY 19, 2001

Federal Emergency Management Agency

ELEVATION REFERENCE MARKS

REFERENCE MARK	ELEVATION (FEET NGVD)	DESCRIPTION OF LOCATION
RM133	2373.54	Top of pavement at centerline intersection of Sidewinder and Bloody Basin Roads.
RM134	2389.00	Top of pavement at centerline intersection of Cave Creek and Bloody Basin Roads.
RM135	2375.04	Top square of concrete base at northwest corner of intersection of Sundance and Tranquil Trails.
RM136	2344.24	Rim of handhole at centerline intersection of Cave Creek and Scottsdale Roads.
RM598	2445.00	Intersection of Cave Creek Road and Long Rifle Road South, copper nail and washer.
RM1123	2406.61	Brass cap in headwall N85W, 1708 feet to the approximate northeast corner of section 27, T4N, R4E.



LEGEND FOR ANNOTATION

100-YR FLOODPLAIN BOUNDARY	
FLOODWAY BOUNDARY	

JE Fuller/Hydrology & Geomorphology, Inc. — April, 2002

LEGEND

To obtain more detailed information in areas where Base Flood Elevations (BFEs) and /or floodways have been determined, users are encouraged to consult the Flood Profiles and Floodway Data tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFE's shown on the FIRM represent rounded whole-foot elevations and therefore may not exactly reflect the flood elevation data presented in the FIS. BFE's shown on the FIRM are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS should be utilized in conjunction with the FIRM for purposes of construction and /or floodplain management.

ERM elevations listed on this map were obtained and/or developed to establish vertical control for dissemination of flood elevations and floodplain boundaries portrayed on this map. Users should be aware that these ERM elevations may have changed since the publication of this map. To obtain up-to-date elevation information on National Geodetic Survey (NGS) ERM's shown on this map, please contact the Information Services Branch of the NGS at (301) 713-3242, or visit their website at www.ngs.noaa.gov. Map users should seek verification of non-NGS ERM monument elevations when using these elevations for construction or floodplain management purposes.

Coastal BFE's shown on this map may apply only landward of 0.0' NGVD. Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this community. Elevations shown in the Summary of Stillwater Elevations table should be used for construction, and /or floodplain management purposes when they are higher than the elevations shown on this FIRM.

LEGEND

SPECIAL FLOOD HAZARD AREAS INUNDATED BY 100-YEAR FLOOD

- **ZONE A** No base flood elevations determined.
- **ZONE AE** Base flood elevations determined.
- **ZONE AH** Flood depths of 1 to 3 feet (usually areas of ponding); base flood elevations determined.
- **ZONE AO** Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
- **ZONE A99** To be protected from 100-year flood by federal flood protection system under construction; no base flood elevations determined.
- **ZONE V** Coastal flood with velocity hazard (wave action); no base flood elevations determined.
- **ZONE VE** Coastal flood with velocity hazard (wave action); base flood elevations determined.

FLOODWAY AREAS IN ZONE AE

OTHER FLOOD AREAS

- **ZONE X** Areas of 500-year flood; areas of 100-year flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 100-year flood.

OTHER AREAS

- **ZONE X** Areas determined to be outside 500-year floodplain.
- **ZONE D** Areas in which flood hazards are undetermined.

UNDEVELOPED COASTAL BARRIERS

Identified 1983 | Identified 1990 | Otherwise Protected Areas

Coastal barrier areas are normally located within or adjacent to Special Flood Hazard Areas.

- Floodplain Boundary
- Floodway Boundary
- Zone D Boundary
- Boundary Dividing Special Flood Hazard Zones, and Boundary Dividing Areas of Different Coastal Base Flood Elevations Within Special Flood Hazard Zones
- 513 — Base Flood Elevation Line; Elevation in Feet. See Map Index for Elevation Datum.
- D — D — Cross Section Line
- (EL 987) — Base Flood Elevation in Feet Where Uniform Within Zone. See Map Index for Elevation Datum.
- RM7 — Elevation Reference Mark
- M2 — River Mile
- 97°07'30", 32°22'30" — Horizontal Coordinates Based on North American Datum of 1927 (NAD 27) Projection.

NOTES

This map is for use in administering the National Flood Insurance Program; it does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size, or all planimetric features outside Special Flood Hazard Areas. The community map repository should be consulted for more detailed data on BFE's and for any information on floodway delineations, prior to use of this map for property purchase or construction purposes.

Areas of Special Flood Hazard (100-year Flood) include: Zones A, AE, A1-A30, AH, AO, A99, V, VE and V1-V30.

Certain areas not in Special Flood Hazard Areas may be protected by flood control structures.

Boundaries of the floodways were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the Federal Emergency Management Agency.

Floodway widths in some areas may be too narrow to show to scale. Refer to Floodway Data Table where floodway width is shown at 1/20 inch.

Corporate limits shown are current as of the date of this map. The user should contact appropriate community officials to determine if corporate limits have changed subsequent to the issuance of this map.

This map may incorporate approximate boundaries of Coastal Barrier Resource System Units and /or Otherwise Protected Areas established under the Coastal Barrier Improvement Act of 1990 (PL 101-591).

For community map revision history prior to countywide mapping, see Section 6.0 of the Flood Insurance Study Report.

For adjoining map panels and base map source see separately printed Map Index.

MAP REPOSITORY
Refer to Repository Listing on Map Index

EFFECTIVE DATE OF
COUNTYWIDE FLOOD INSURANCE RATE MAP:
APRIL 15, 1988

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL:
SEPTEMBER 29, 1989, SEPTEMBER 4, 1991, DECEMBER 3, 1993

Map revised July 19, 2001 to update corporate limits, to change base flood elevations, to add base flood elevations, to add Special Flood Hazard Areas, to change Special Flood Hazard Areas, to change zone designations, to update map format, to add roads and road names, and to incorporate previously issued Letters of Map Revision.

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
500 0 500

MAP ROOM 0808H

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

MARICOPA COUNTY, ARIZONA AND INCORPORATED AREAS

PANEL 808 OF 4350
(SEE MAP INDEX FOR PANELS NOT PRINTED)

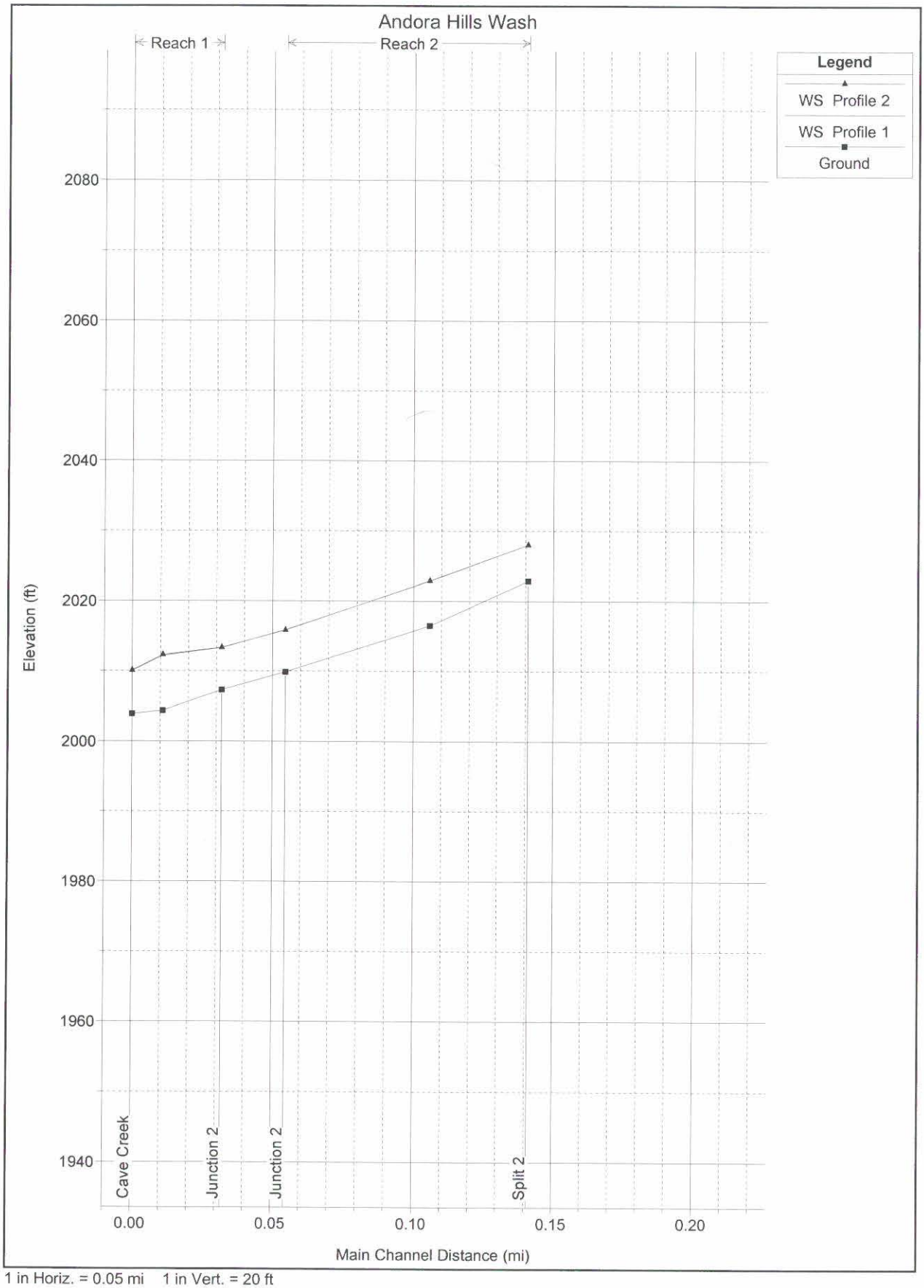
CONTAINS: COMMUNITY	NUMBER	PANEL	SUFFIX
CAREFREE, TOWN OF	040126	0808	H
CAVE CREEK, TOWN OF	040129	0808	H
SCOTTSDALE, CITY OF	045012	0808	H

MAP NUMBER
04013C0808 H

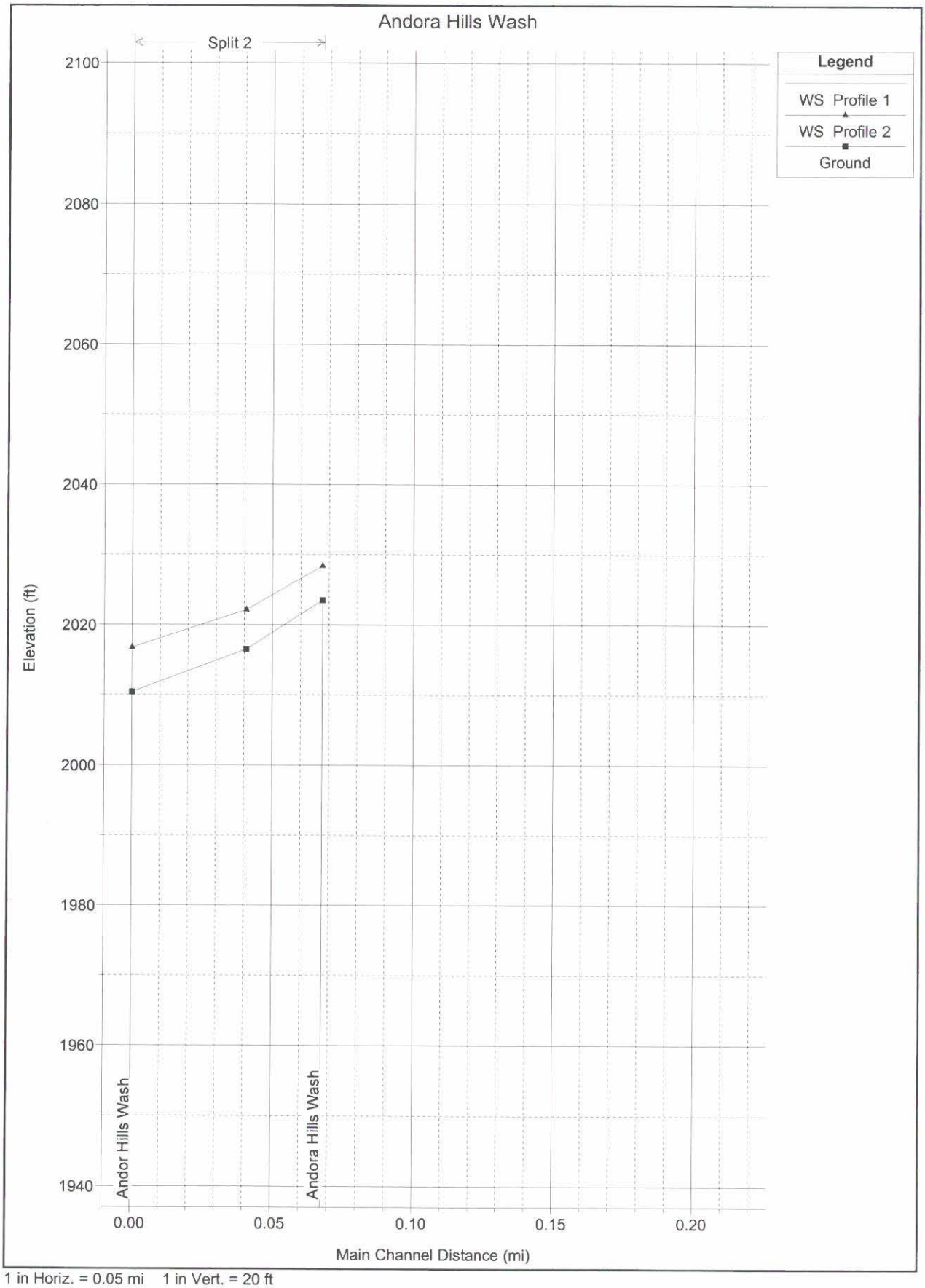
MAP REVISED:
JULY 19, 2001

Federal Emergency Management Agency

7.4 Flood Profiles

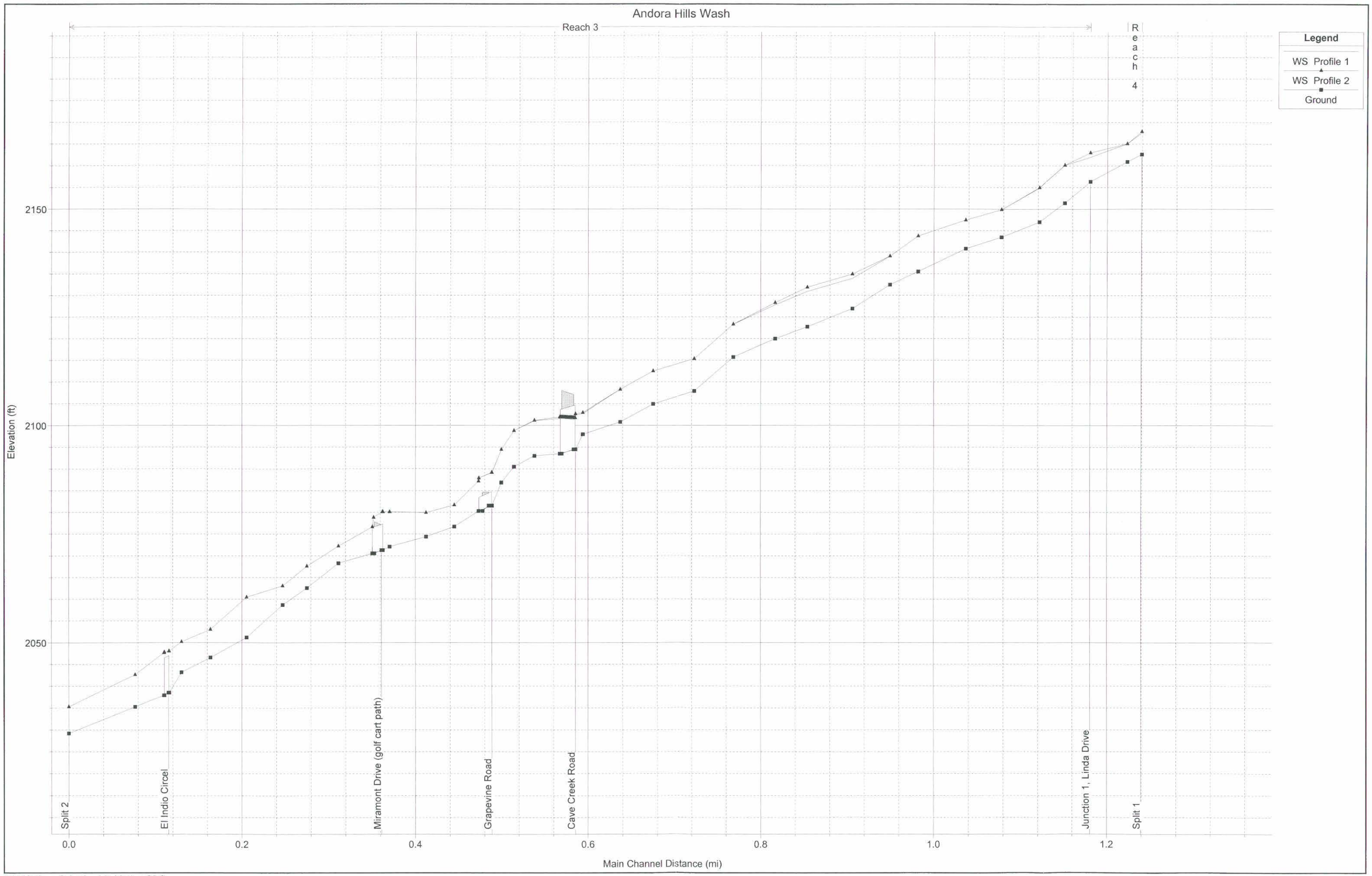


1 in Horiz. = 0.05 mi 1 in Vert. = 20 ft

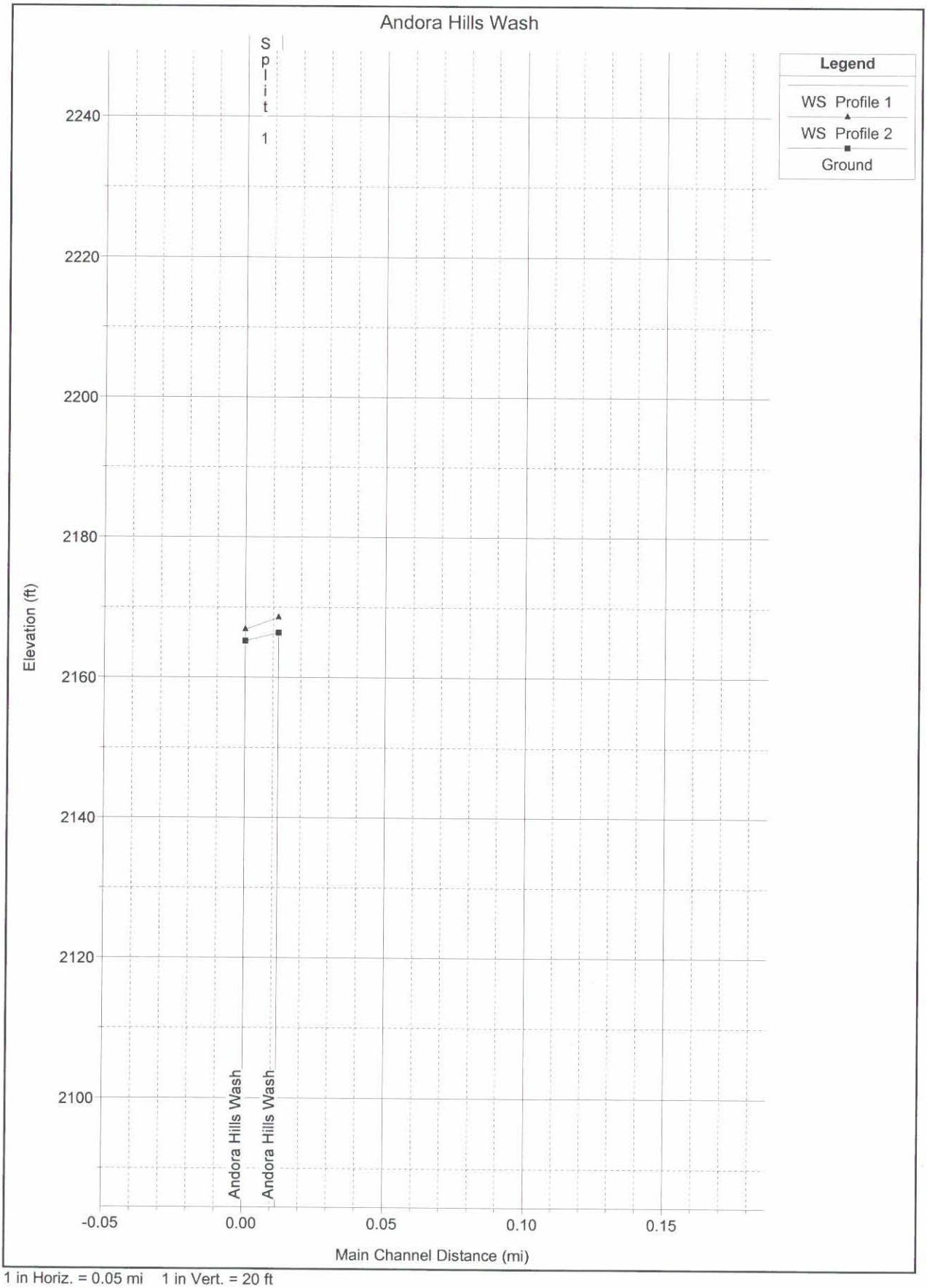


1 in Horiz. = 0.05 mi 1 in Vert. = 20 ft

Andora Hills Wash



1 in Horiz. = 0.1 mi 1 in Vert. = 20 ft



1 in Horiz. = 0.05 mi 1 in Vert. = 20 ft

Andora Hills Wash

Reach 5

Legend

WS Profile 1

WS Profile 2

Ground

Elevation (ft)

2300

2250

2200

2150

Split 1

School House Rd.

Piedra Grande Drive

Terrace Estates Circle

Carefree Drive

0.0

0.5

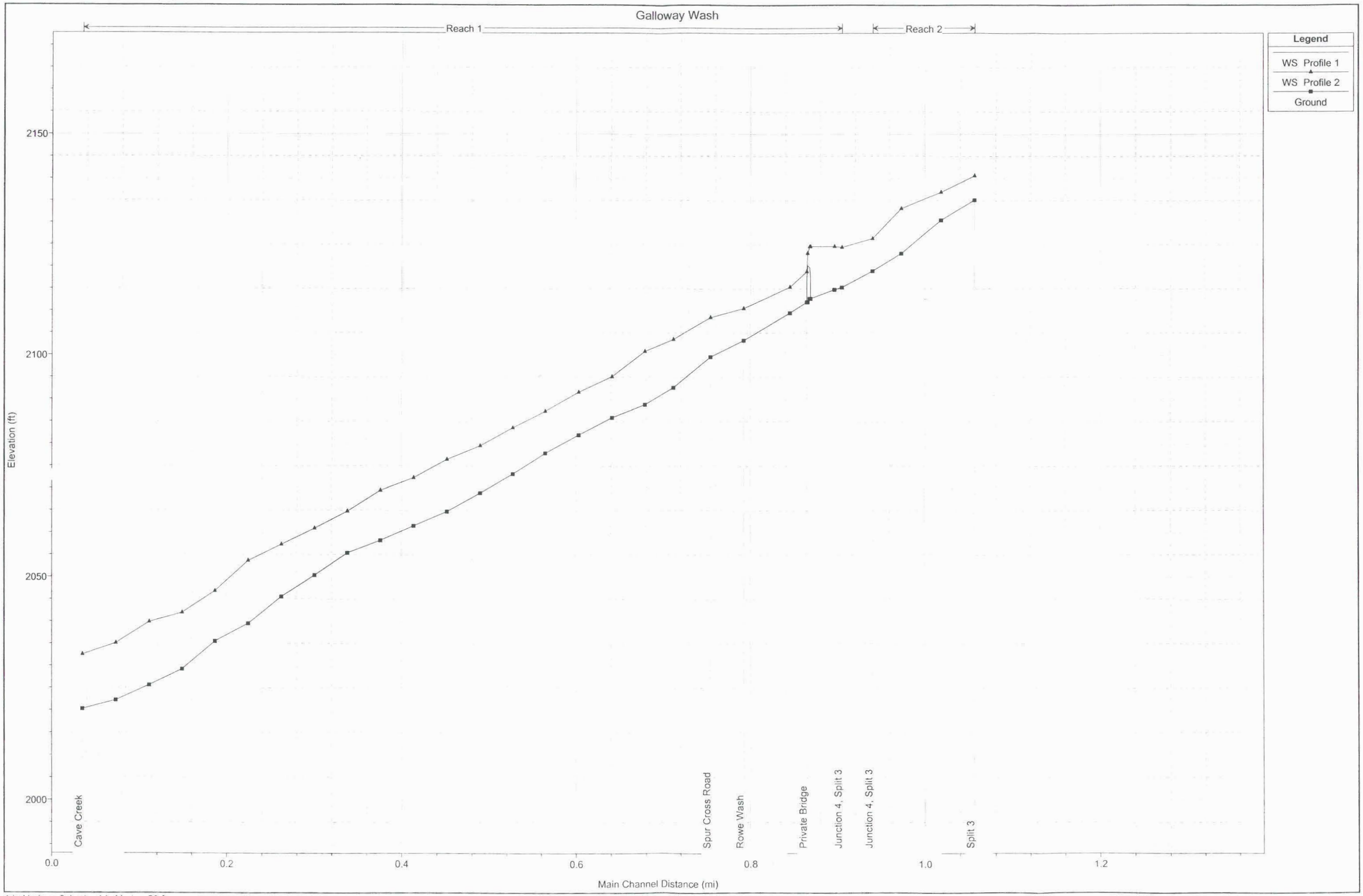
1.0

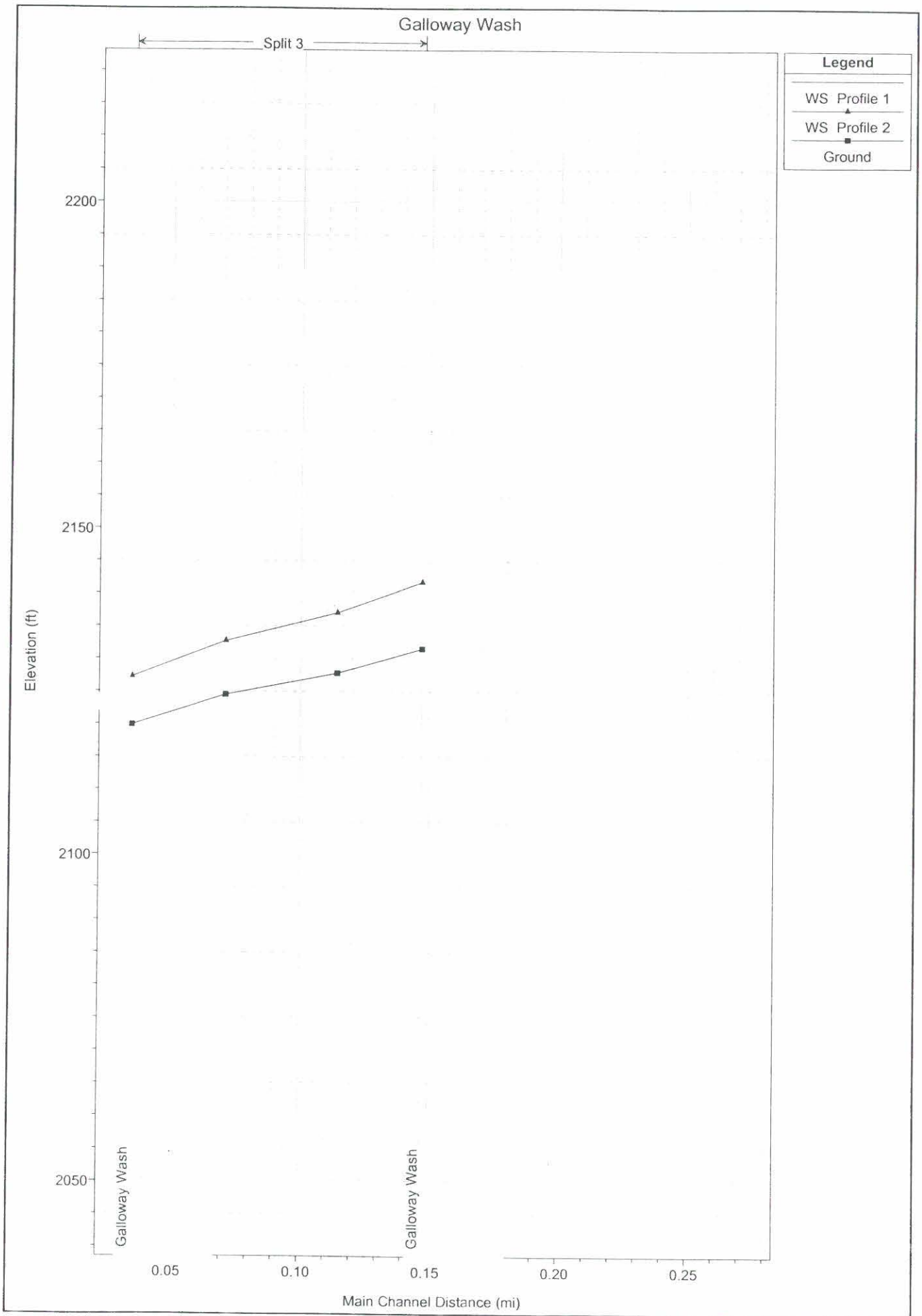
1.5

2.0

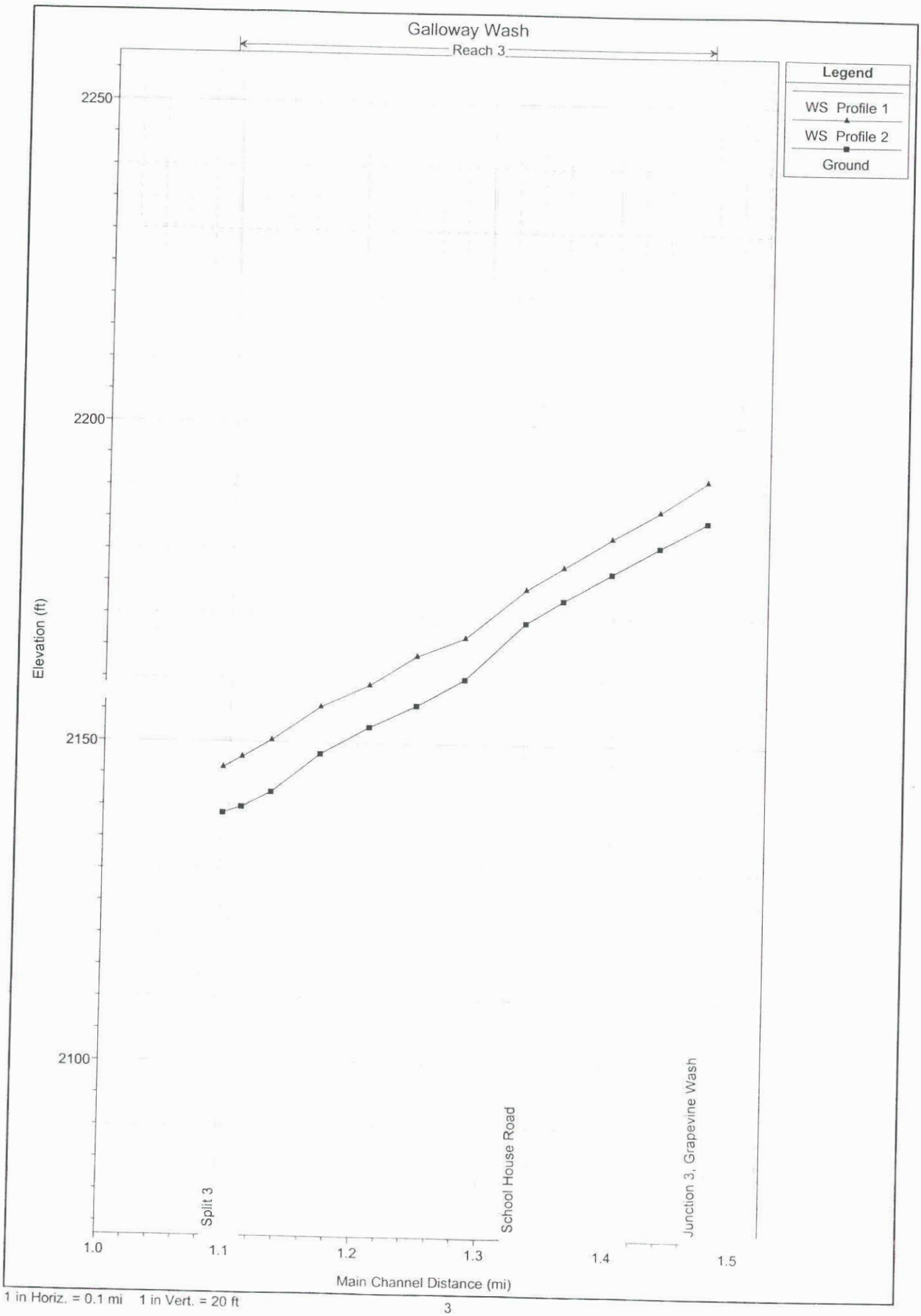
Main Channel Distance (mi)

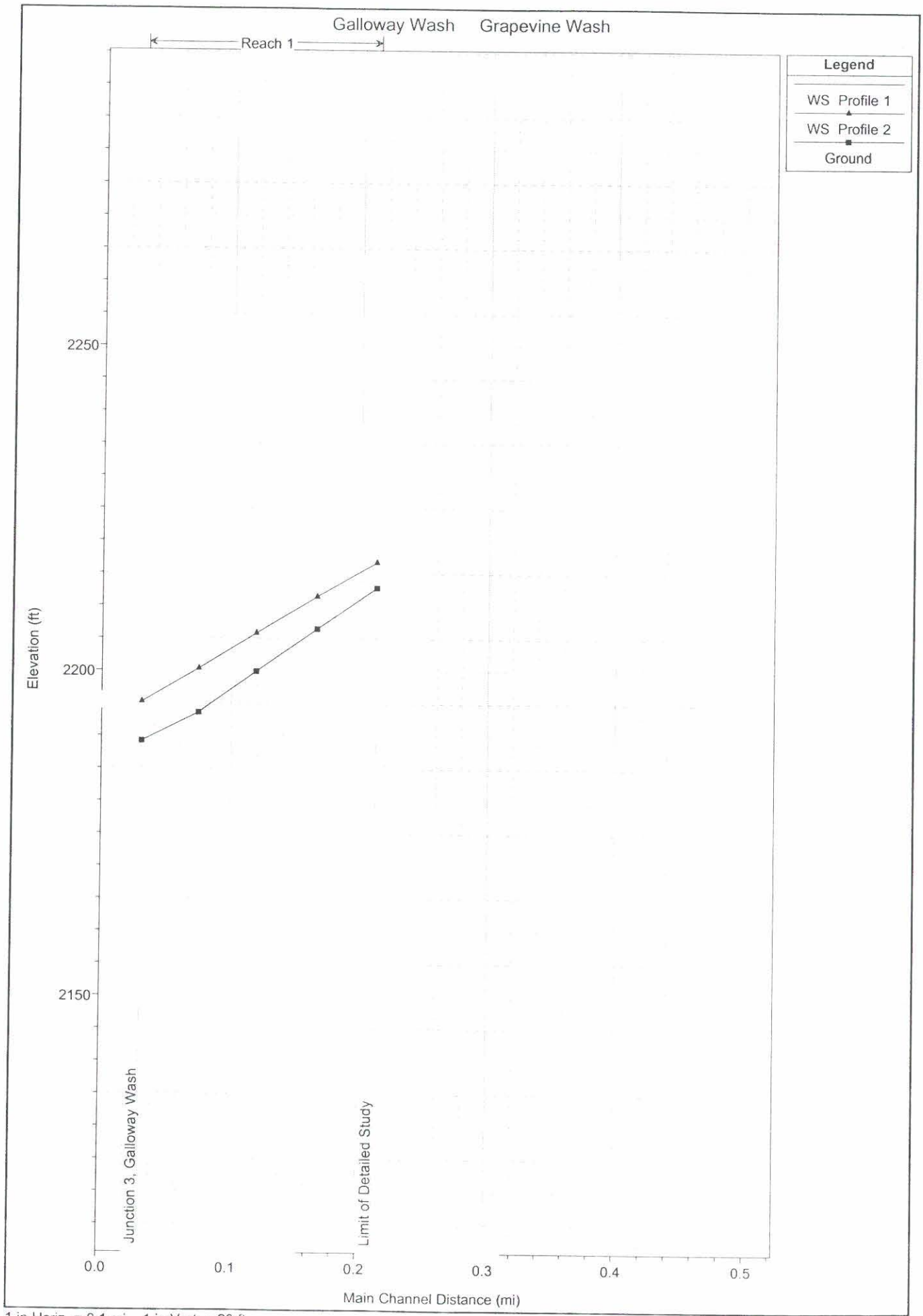
1 in Horiz. = 0.15 mi 1 in Vert. = 20 ft


Galloway Wash
Reach 1
Reach 2
Legend
WS Profile 1
WS Profile 2
Ground
Elevation (ft)
2150
2100
2050
2000
Cave Creek
Spur Cross Road
Rowe Wash
Private Bridge
Junction 4, Split 3
Junction 4, Split 3
Split 3
0.0
0.2
0.4
0.6
0.8
1.0
1.2
Main Channel Distance (mi)
1 in Horiz. = 0.1 mi 1 in Vert. = 20 ft



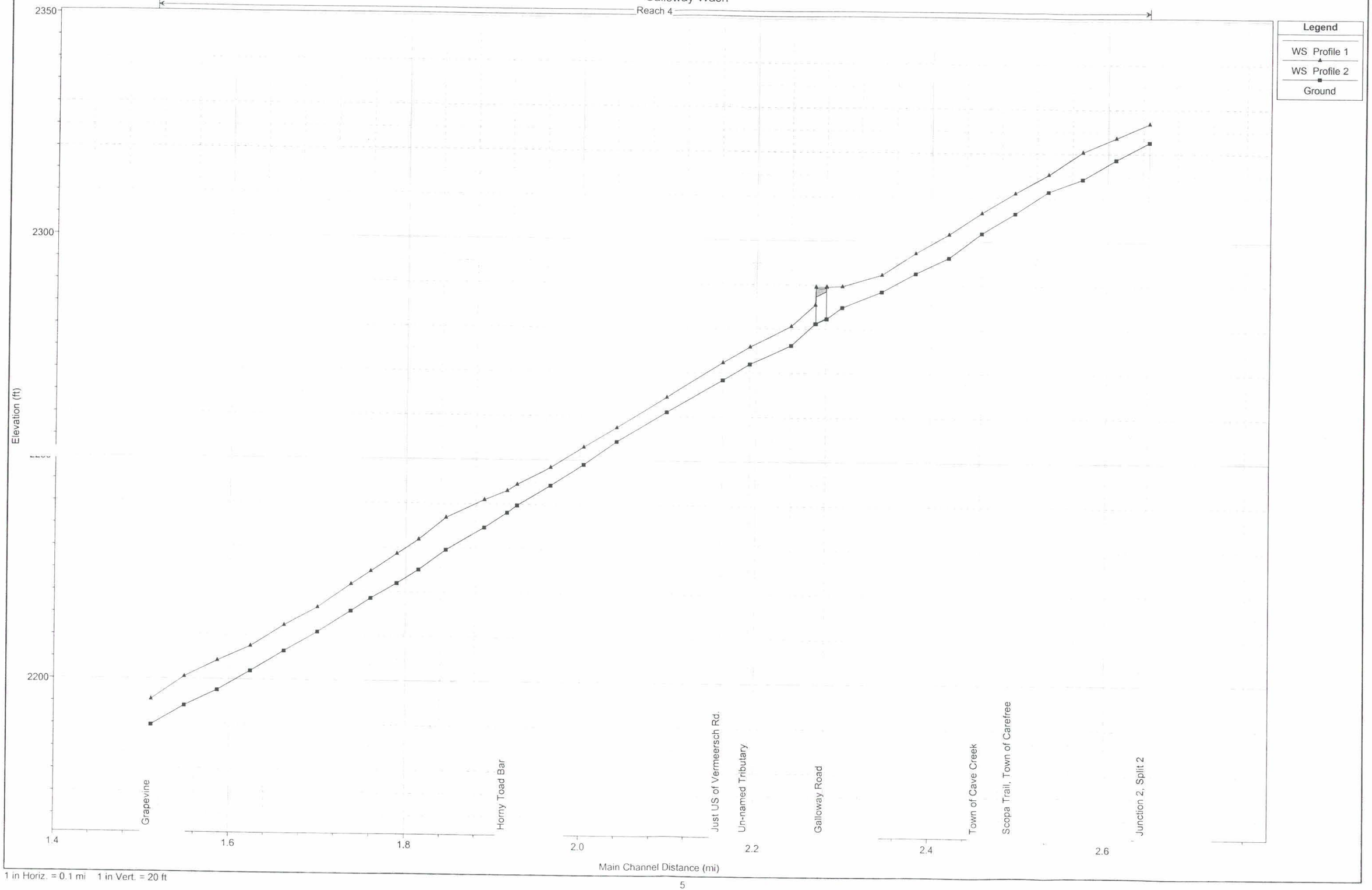
1 in Horiz. = 0.05 mi 1 in Vert. = 20 ft


Galloway Wash
Reach 3
Legend
WS Profile 1
WS Profile 2
Ground
2250
2200
2150
2100
Elevation (ft)
Split 3
School House Road
Junction 3, Grapevine Wash
1.0
1.1
1.2
1.3
1.4
1.5
Main Channel Distance (mi)
1 in Horiz. = 0.1 mi 1 in Vert. = 20 ft

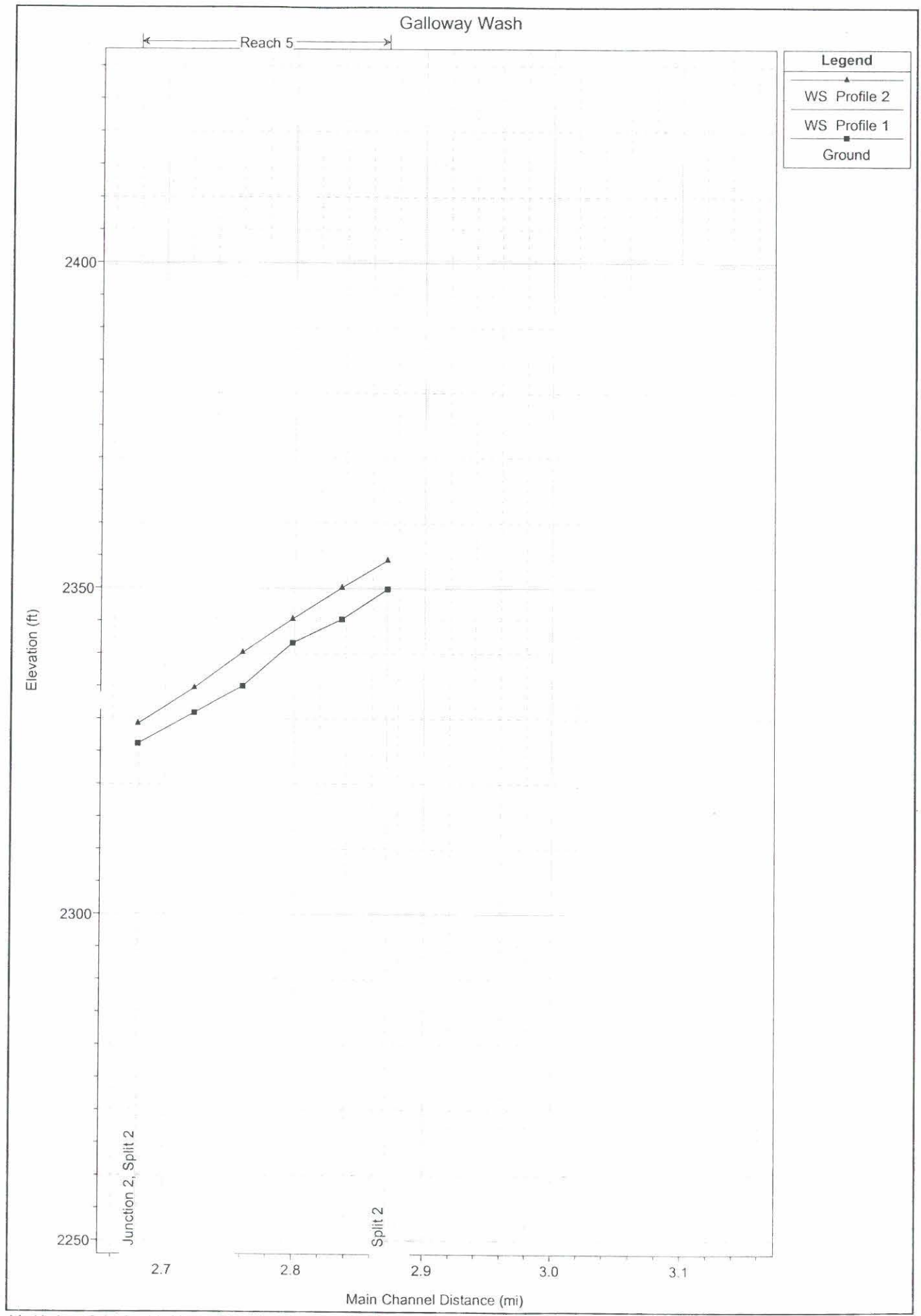

Galloway Wash
Grapevine Wash
Reach 1
Legend
WS Profile 1
WS Profile 2
Ground
2250
2200
2150
Elevation (ft)
Junction 3, Galloway Wash
Limit of Detailed Study
0.0
0.1
0.2
0.3
0.4
0.5
Main Channel Distance (mi)
1 in Horiz. = 0.1 mi
1 in Vert. = 20 ft

Galloway Wash

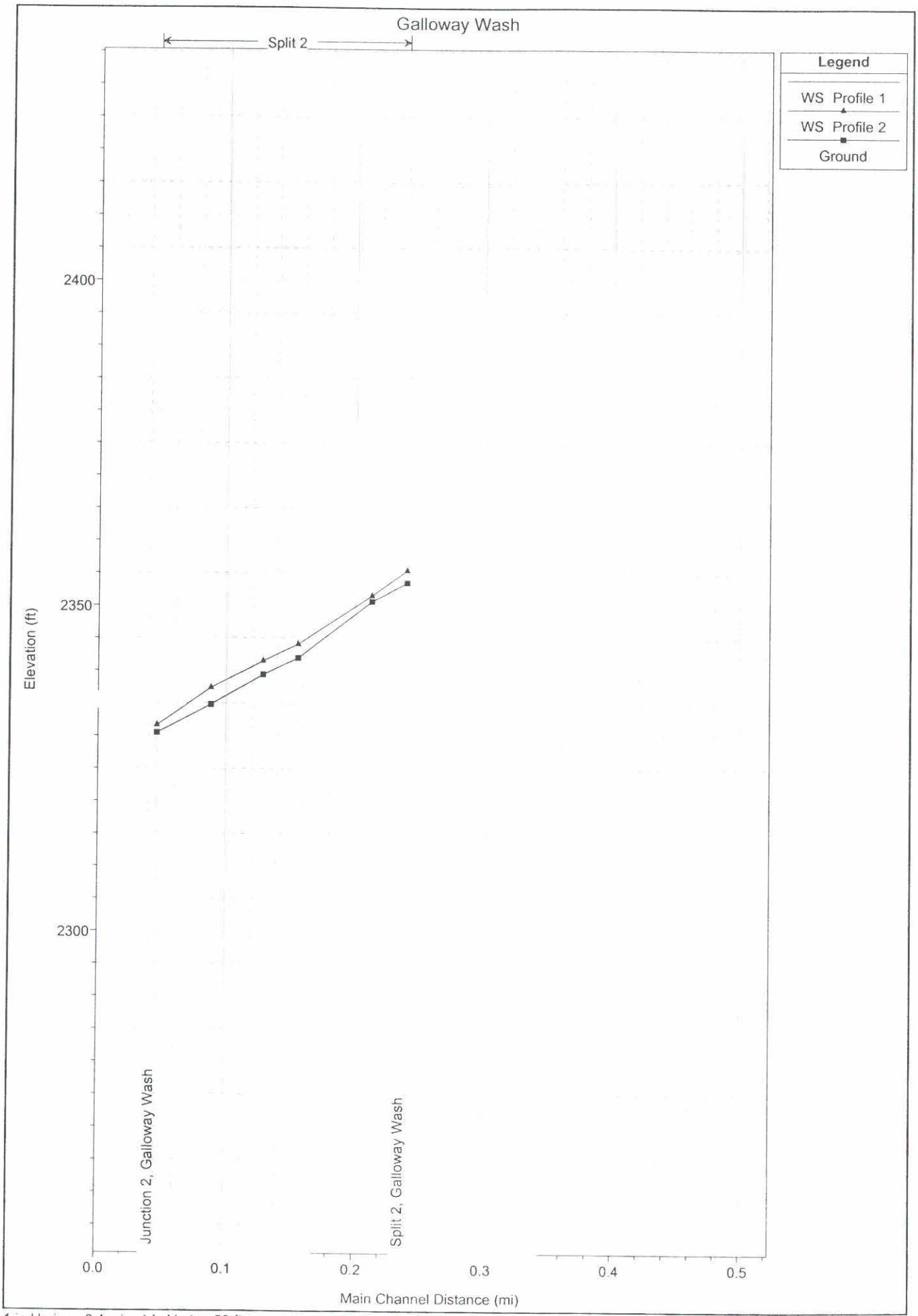
Reach 4



1 in Horiz. = 0.1 mi 1 in Vert. = 20 ft



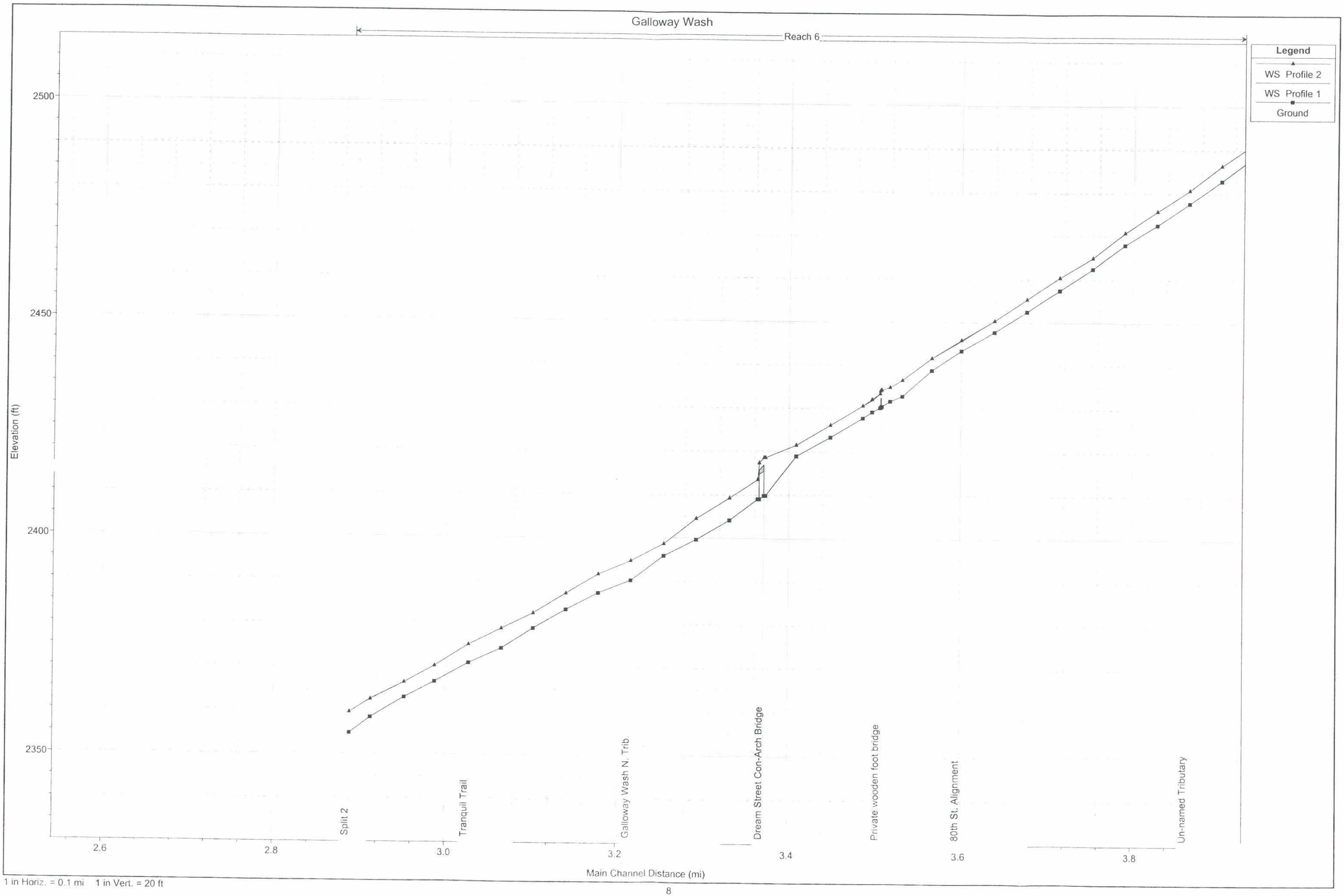
1 in Horiz. = 0.1 mi 1 in Vert. = 20 ft



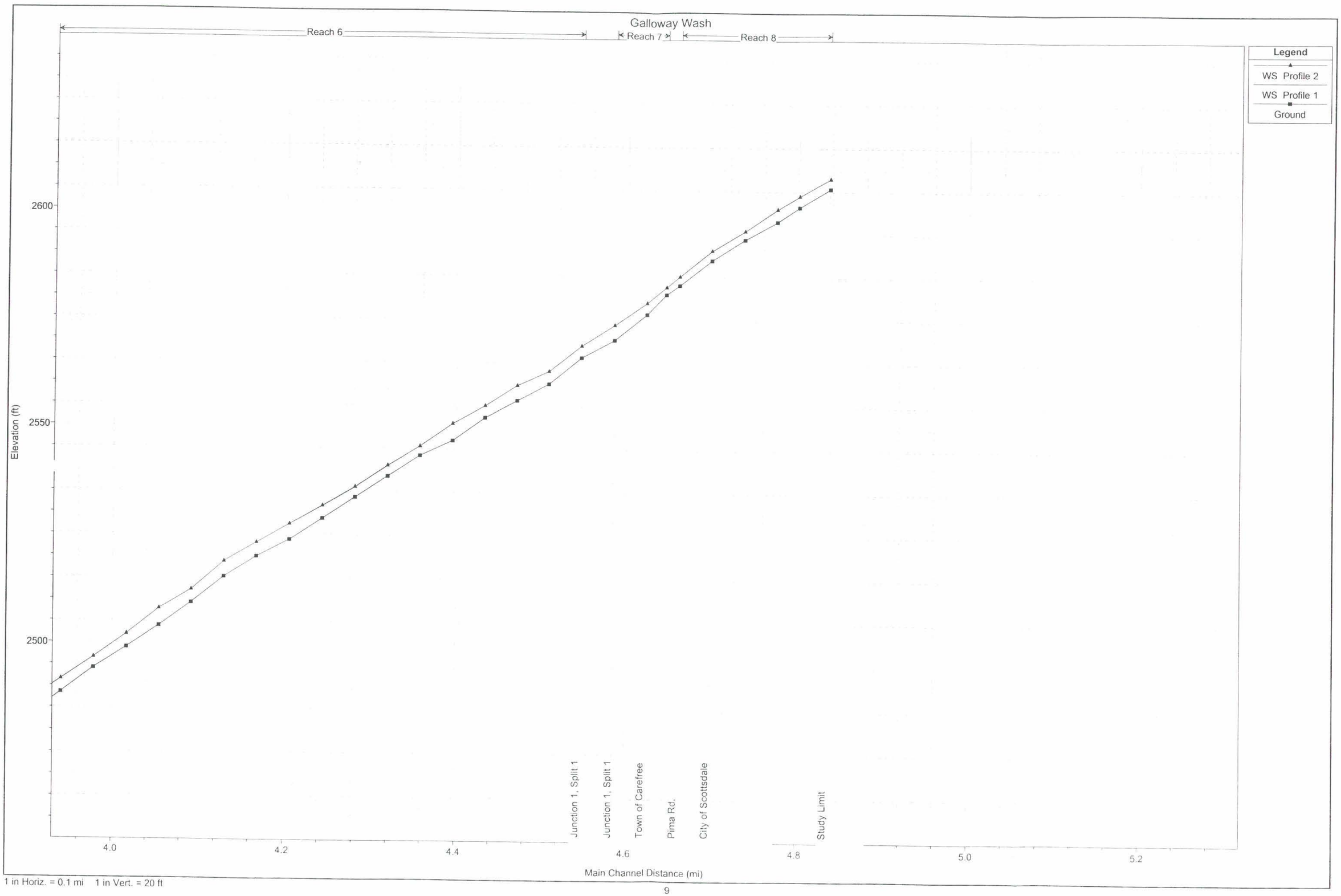
1 in Horiz. = 0.1 mi 1 in Vert. = 20 ft

Galloway Wash

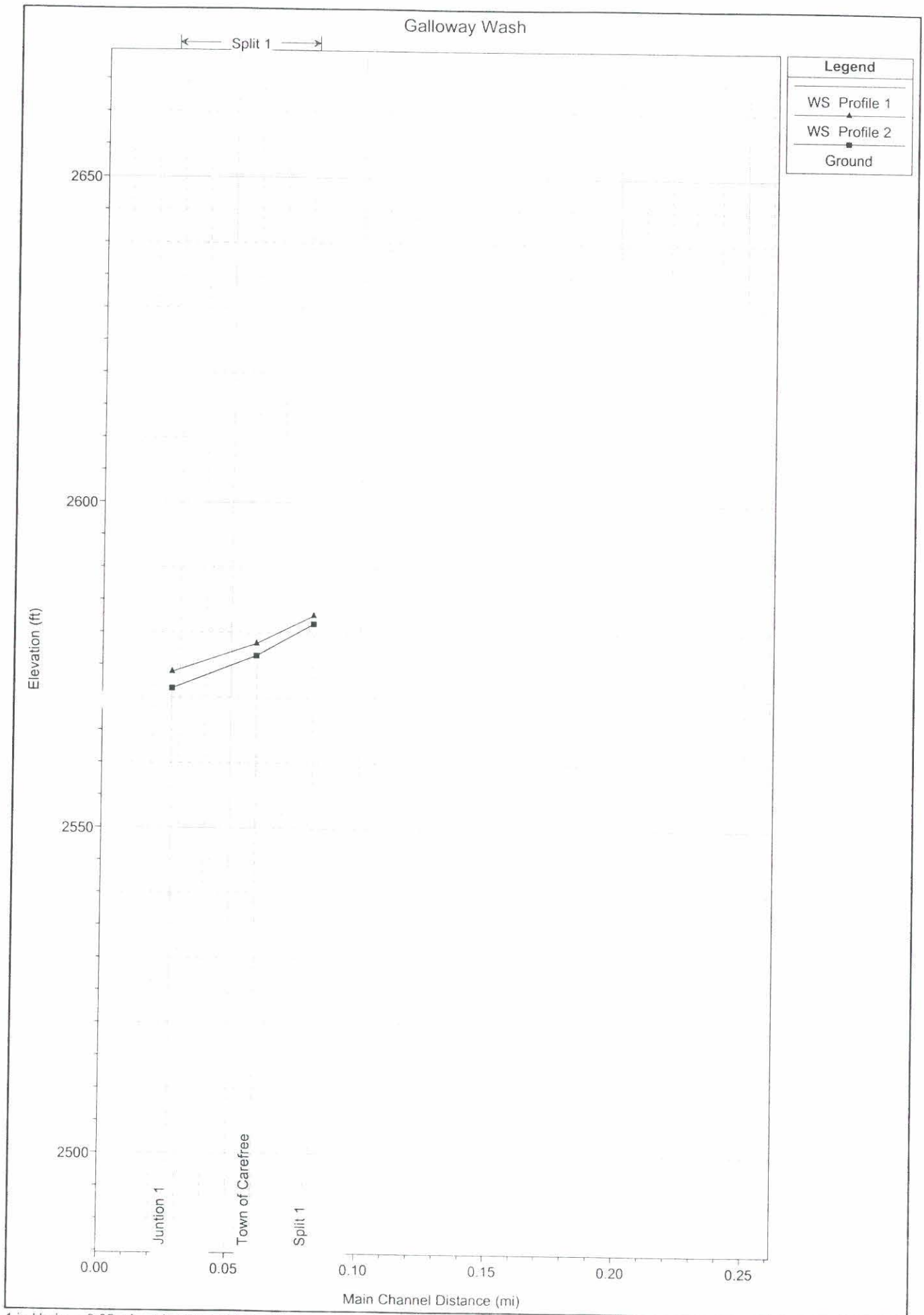
Reach 6



1 in Horiz. = 0.1 mi 1 in Vert. = 20 ft



1 in Horiz. = 0.1 mi 1 in Vert. = 20 ft



1 in Horiz. = 0.05 mi 1 in Vert. = 20 ft

APPENDIX A: REFERENCES

A.1 Data collection summary

December 6, 1999

JE Fuller/Hydrology & Geomorphology, Inc., (JEF) has collected and reviewed data which are pertinent to the hydrology and hydraulics of the project study area (see Figure 1, Project Area). These data have come from the Flood Control District of Maricopa County and from outside sources. The categories of data which were sought include: previous flood hazard reports and hydrology for the study area; existing topographic mapping; historical flooding information; as-built plans for existing structures; FEMA Flood Hazard Boundary Maps and any Letters of Map Amendment and/or Revision; and other pertinent data.

Previous Flood Hazard Reports and Hydrology Studies:

1. American Engineering Company, August 11, 1987, HEC-2 Analysis, Andora Hills Wash, Rancho Manana Crossing, A LOMR Prepared for Rancho Manana Country Club Developers.

2. A-N West, Inc., March, 1996, Detailed Drainage Design Report for Desert Mountain Properties Proposed Detention Basin No. S-1, Prepared for Desert Mountain Properties.

3. Cella Barr Associates, December 1989, Flood Insurance Re-Study for Various Streams in Maricopa County, Arizona, Prepared for FEMA.

4. CH2M-Hill, March 1990. Final Hydrologic and Hydraulic Report for Cave Creek/Carefree Flood Delineation Study, FCD 88-53, Prepared for the Flood Control District of Maricopa County.

5. Federal Emergency Management Agency, December 23, 1997 Draft. Flood Insurance Study, Maricopa County, Arizona and Incorporated Areas, Volumes 1 through 8.

6. George V. Sabol Consulting Engineers, Inc., July 1997, Cave Creek Above Carefree Highway Floodplain Delineation Study, FCD 95-28, Prepared for the Flood Control District of Maricopa County.

7. Harris-Toups Associates, January 1979, Flood Insurance Study of Unincorporated Areas of Maricopa County, Arizona. Prepared for US Department of Housing and Urban Development, Federal Insurance Administration.

8. Robert H. Murphy, P.E., March 4, 1997, Floodplain Investigation of Galloway Wash, LOMR Prepared for Donald R. Ross.

Existing Topographic Mapping:

1. Aerial Mapping Company, Inc. Flight Date: December 12, 1996, Covers portions of sections 16, 17, 20, 21, 28, 29 and 31-33, T6N, R4E, and portions of sections 5 and 6, T5N, R4E, and portions of section 1, T5N, R3E, G&SRB&M, Scale: 1"=200', CI=2'. Study Contractor: George V. Sabol Consulting Engineers, Inc. (see reference 7 above)

2. CH2M-Hill, Flight Date: August 1989, Actual mapping company not known at this time, Covers portions of sections 1-5, 8-17 and 20-27, T6N, R4E, and portions of sections 18, 19 and 30, T6N, R5E, G&SRB&M, Scale: 1"=200', CI=4'.

3. Cooper Aerial Survey Co., March 3, 1988, Covers portions of sections 25-27 and 34-36, T6N, R4E, and portions of sections 30 and 31, T6N, R5E, G&SRB&M, Scale: 1"=400', CI=4'. Study Contractor: Cella Barr Associates (see reference 3 above)

4. Harris Toups Associates, Actual flight date and mapping company unknown at this time, Covers portions of sections 15-17, 20-22, 26-29 and 32-35, T6N, R4E, G&SRB&M, Scale: 1"=400', CI=4'.

5. U.S. Geological Survey, Photorevised 1981, 7.5 Minute Series (Topographic), quadrangles include Cave Creek, Humboldt Mountain, New River Mesa, and Wildcat Hill., Scale: 1"=2000', CI=20'.

Historical Flooding Information

The following newspaper articles/photos were found at the Cave Creek Museum:

Foothills Sentinel, January 13, 1993, page A1, "Floods in the Foothills, 12 inches of rain drench area; more forecast this week."

Foothills Sentinel, March 9, 1988, "Club Submerged," page 9.

Foothills Sentinel, October 13, 1993, Photo "Flooded Crossing on Cave Creek Road."

Foothills Sentinel, September 19, 1988, "Roaring River" Galloway Wash running at Schoolhouse Road.

Foothills Sentinel, August 22, 1990, three photos of damage attributable to flooding in and around the Carefree/Cave Creek Area.

Carefree Enterprise, April 1978, "Wet Set," General flood notes from around the state regarding the Flood of 1978, includes a photo of Cave Creek at flood stage.

As-Built Plans for Existing Structures:

New as-builts for all culverts and bridges along Andora Hills and Galloway Washes were surveyed; no existing as-built plans were sought. Seven structures were identified during initial reconnaissance visits, and from the new aerial photography developed for this project.

A stage-storage-discharge relationship for Detention Basin No. S-1, located on the Middle Branch of Galloway Wash at Charles Blair McDonald Drive, was obtained from Mr. Greg Schuelke, P.E. of A-N West Inc. These data were incorporated into the new HEC-1 model prepared for Galloway Wash during this project.

FEMA Flood Hazard Boundary Maps, LOMAs, LOMRs:

Existing FEMA Flood Hazard Boundary Maps available for this area include FIRM Panel Number 04013C 0805F, 04013C 0808G, and 04013C 0809G. There are two recent LOMRs approved in the study area:

1. Prepared by American Engineering Company for Rancho Manana Country Club Developers for a culvert crossing on Andora Hills Wash at Rancho Manana Boulevard, approved January 16, 1989.

2. Prepared by Robert H. Murphy, P.E. for encroachment into the channel of Galloway Wash starting approximately 300 feet downstream of School House Road and ending approximately 1,300 feet downstream of School House Road, approved October 20, 1997.

Other Pertinent Data:

GIS data supplied digitally by the Flood Control District of Maricopa County included:

1. Soils data for the project area
2. Land use data for the project area
3. Roads and section lines for the project area
4. Existing hydrologic delineations in the project area
5. Existing floodplain mapping in the project area
6. Existing digital topography by Aerial Mapping Company, Inc. Flight Date: December 12, 1996, Sections 28 & 29, T6N, R4E, projected by the Maricopa County Flood Control District from NAD 27 to NAD 83
7. USGS DEM data in the project area in comma delimited text projected by the Maricopa County Flood Control District from NAD 27 to NAD 83
8. USGS DRG data for the project area, projected by the Maricopa County Flood Control District from NAD 27 to NAD 83.

Stream Gauging:

No stream gauging records of any kind were identified for the Andora Hills and Galloway washes. The Flood Control District of Maricopa County operated an automated precipitation/stream-stage sensor station on Grapevine Wash, a tributary to Galloway Wash, between 1989 and 1992. The gauge was discontinued due to poor radio telemetry communications and problems related to control section stability. No reliable data were ever collected from this station.

Precipitation Gauging:

No precipitation gauges are known to exist in the Andora Hills Wash basin. Two precipitation gauges are known to exist in the Galloway Wash Basin:

1. Carefree, Arizona (NWS ID 021282)
   Operated by the National Weather Service continuously since June 1, 1961

2. Carefree Ranch (ALERT ID 4930) Operated by the Flood Control District of Maricopa County continuously since November 1987.

Monthly precipitation statistics were gathered for these two precipitation stations.

Future Drainage Improvements:

JEF staff contacted Mr. Joe Adams of Cavalier Development regarding the planned construction of an 8-cell 10'x6' concrete box culvert on Galloway Wash at the new Galloway Road alignment; approximately 730 feet upstream of Vermeersch Road. Mr. Adams indicated that construction of the culverts is expected to be completed by January or February, 2000. Galloway Road will be the main entrance to the new Black Mountain Shadows subdivision. The phone number for Cavalier Development is 480-948-1068.

TABLE OF CONTENTS
APPENDIX B
VOLUME 1 OF 2 OF THE TDN

B.1 Special Problem Reports

B.2 Contact (telephone) Reports

B.3 Meeting Minutes or Reports

B.4 General Correspondence

B.5 Contract Documents

B.1 Special Problem Reports

The current effective study of Grapevine Wash was performed by CH2M Hill, (March, 1990). However, this study did not extend to the confluence with Galloway Wash; falling short by approximately 1,000 feet. The original study, performed by Harris Toups (January, 1979) would have remained the current effective study for this 1,000-foot reach between the CH2M Hill Study and this study (JEF, November, 2000). To avoid confusion, JEF has included this 1,000-foot reach of Grapevine in the re-study of Galloway Wash. Grapevine Wash was referred to as "North Tributary Galloway Wash" in the CH2M Hill study.

The flood peaks for Galloway Wash and Grapevine Wash at their confluence are approximately coincident, and therefore, the starting water surface elevation for the tributary of Grapevine Wash is assumed to equal the computed water surface elevation on the main branch of Galloway Wash. Note that the existing discharge and not the revised discharge from this study was used for Grapevine Wash in order to smoothly join the floodplains.

APPENDIX B: GENERAL DOCUMENTATION AND CORRESPONDENCE

B.2 Contact (telephone) Reports

Phone conversations of substance have been noted in memorandums contained in Appendix B.4. No other contact reports are recorded here.

B.3 Meeting Minutes or Reports

Memorandum **JE Fuller/ Hydrology & Geomorphology, Inc.**

DATE: September 10, 1999

TO: David Boggs, P.E.

FROM: Brian R. Iserman, P.E. BRI 9/10/99

RE: **Andora Hills & Galloway Washes Kickoff Meeting Minutes, FCD 99-14**

A kickoff meeting was held at the offices of the Flood Control District of Maricopa County (FCDMC) on September 7, 1999 for the referenced project. In attendance were:

David Boggs, P.E., (FCDMC, Floodplain Delineation Branch)
Joe Tram, P.E. (FCDMC, Floodplain Delineation Branch)
Valerie Swick (FCDMC, Hydrology Branch)
Marta Dent (FCDMC, GIS)
Lynn Thomas (FCDMC, Regulatory Branch)
Ted Lehman (JEF)
Brian Iserman (JEF)

Project Team:

JEF's subconsulting team for this project was briefly described by Brian Iserman to include A-Team Professional Associates (survey), M&B Aerial Mapping (topographic mapping and aerial photography) and Dibble & Associates (assistance with floodplain mapping).

Propery Owner Notification/Right of Entry:

Joe Tram discussed the possibility of simply doing the legal advertisement only and not including a mass mailing. He noted that the mass mailing is not really required, and that it is a throw back to the watercourse master studies. He suggested that David Boggs get in touch with David Johnston (FCDMC Chief of Regulatory Divion) to see what he would prefer.

Joe requested that we send the copy for the legal ad to David Boggs for review before we send it out for publication.

Joe asked what JEF is doing for right of entry. Brian Iserman indicated that the survey subconsultant (A Team) will be responsible for right of entry if any is required.

Schedule:

Brian Iserman handed out a draft schedule for those in attendance to review. Joe Tram requested that I send an update whenever the schedule changes.

Billings:

Bills should be sent to Linda Hannan. Joe Tram noted that the billing estimates need to be delivered soon. He also noted that bills for GIS work will be subject to Marta's approval based on her acceptance of the work.

Topographic Mapping:

Joe Tram and Valerie Swick noted that the original Harris-Toups study done on Galloway wash had some base flood elevations listed which were actually below grade according to the 4' CI mapping. Joe Tram requested that JEF include the same cross section alignments as that study in the new study. Valerie noted that those cross sections were probably spaced at 500 foot intervals. JEF's will be spaced at approximately 250 foot intervals. Brian Iserman indicated that JEF would use the same cross section alignments were practicable. This was requested so that the district could compare the previous mapping to the new mapping.

Joe Tram also noted that he would like JEF to make sure to include the same ERMs used in the Harris-Toups study. Brian Iserman indicated that JEF will make sure that the ERMs noted on the FIRM panels will be used in the new survey work.

Digital Orthophotos:

Brian Iserman discussed how the digital orthophotos will be rectified: The overall mosiaic will be rectified using the USGS DEM's. Where the photos overlay the area of detailed mapping, they will be rectified using ground control from the new survey and mapping. The contact between the two rectifications will be seamless.

Hydrology:

Joe Tram noted that the District would like to keep the Sabol hydrology for Galloway Wash which was developed for the upper Cave Creek Floodplain Delineation Study (FCD 95-28) unchanged. Ted Lehman noted that JEF will subdivide the basins in the Sabol HEC-1 in order to get additional concentration points for the Galloway HEC-RAS. Ted noted that the resulting 100-year discharges will be different from the Sabol results by the mere fact that JEF will be subdividing basins. Joe Tram and Valerie Swick agreed that we should wait and see what our results are, and then make a decision as to changing the hydrology.

Hydraulics:

Joe Tram asked Brian Iserman how splits will be modeled. Brian told Joe that JEF will utilize the HEC-RAS split flow routine (balance energy grade or water surface elevation) and, where necessary, utilize the HEC-2 split flow method (true side weir flow) if necessary. Brian informed Joe of an JEF internal memo which details JEF's approach to modeling split flows. Brian explained that a courtesy copy of this memo was provided to

Pedro Calza of the District during the Rio Verde South Floodplain Delineation study, and to David Evans & Associates for their work on the Rio Verde South Floodplain Delineation study. Joe Tram requested that we send a copy to David Boggs. Brian said he would do it.

Miscelaneous:

Marta Dent noted that the District has downloaded new soils data from NRCS and will make that available to JEF. Ted Lehman noted that he will develop a formal request to Marta for all our GIS data needs.

David Boggs said he will formally contact Stu Spalding (Cave Creek Town Engineer), and Eric Korsten (Carefree Town Engineer) to inform them of the project.

Lynn Thomas noted that the District provides floodplain management services for the towns of Carefree and Cavecreek, and that the District also provides drainage design review for the Town of Cave Creek.

David Boggs noted that Dave Johnston talked to someone who was an eye witness to Galloway Wash overtopping at the Hornytoad Bar & Grill. Brian Iserman said he will contact Dave Johnston to get more information.

Marta Dent noted that M&B Aerial Mapping recently submitted their 11th GIS submittal for the Gavilon Peak mapping. She noted that this is their first GIS conversion work, so they are learning a lot at this point. Marta and Joe discussed the possibility of holding another GIS submittal training class soon. Brian Iserman said JEF would be interested in attending and that he will let Robert Moon of M&B know of the class.

Memorandum **JE Fuller/ Hydrology & Geomorphology, Inc.**

DATE: September 16, 1999

TO: David Boggs, P.E.

FROM: Brian R. Iserman, P.E. BRI 9/16/99

RE: **Andora Hills & Galloway Washes Team Meeting Minutes, FCD 99-14**

A project team meeting was held at the offices of Dibble & Associates on September 9, 1999 for the referenced project. In attendance were:

Robert Moon (M&B Aerial Mapping, LTD.)
Hal Epperson PRLS (A Team Professional Associates, Inc.)
Frank Brown, P.E. (Dibble & Associates)
Brian Iserman, P.E. (JEF)

Billing/Payment

General invoicing and payment protocol were discussed. The District will retain 10% of all invoices for the first half of the project, and then 5% for the second half of the project. JEF will pay consultants after the District pays JEF. Consultants should include a brief project status statement with invoices.

Survey

The team discussed mapping quality control cross section and spot elevation locations. JEF will provide final locations to A-Team next week. Brian Iserman supplied Reference Mark descriptions from the Harris-Toups study to Hal Epperson. Brian will also provide survey notes and calculations from the existing mapping located on the west end of the project (FCD 95-28) next week.

A Team will use a Tremble digital laser level for the benchmark loop, and GPS (RTK) for culture, culverts, and quality control points.

Frank Brown provided A Team and JEF with a letter with photos and specifications for the as-built survey work to be completed on four culverts on Andora Hills Wash.

Mapping

Robert Moon requested that the USGS DEMs provided by the District should be translated to NAD 83 (they are probably NAD27). Brian said he will ask the District to do that for us.

The team discussed tying in the new topo to the existing topo at the west end of the project (FCD 95-28). Frank Brown (who worked on the Upper Cave Creek Floodplain Delineation Study) noted that the horizontal datum used for that study (FCD 95-28) was

NAD27. Hal said that with RMs from the FCD 95-28 study near Andora and Galloway Washes, he should be able to provide common points to both maps for the horizontal translation of the existing mapping. Robert will then be able to tie the new mapping in to the existing mapping.

Schedule

Hal estimated that A-Team could be ready for the flight by about September 22 or so, and could provide final survey data by the end of September or first week of October. Robert Moon estimated that the mapping could be done by about the first half of November sometime (about 4 to 6 weeks of work). Brian and Frank discussed possibly being able to start preliminary HEC-RAS by mid to end of November.

Memorandum **JE Fuller/ Hydrology & Geomorphology, Inc.**

DATE: October 20, 1999

TO: David Boggs, P.E.

CC: Valerie Swick

FROM: Brian R. Iserman, P.E. BRI 10/20/99

RE: **Andora Hills & Galloway Washes Hydrology Meeting Minutes, FCD 99-14**

A hydrology update meeting was held at the offices of the Flood Control District of Maricopa County (FCDMC) on October 20, 1999 for the referenced project. In attendance were:

David Boggs, P.E., (FCDMC, Floodplain Delineation Branch)
Valerie Swick (FCDMC, Hydrology Branch)
Brian Iserman (JEF)

The status of the HEC-1 modeling was presented by Brian Iserman: The physical parameters of the model (basin delineation, concentration points, routing reaches, reservoir routing, soils, and land use are in place and the model is operational. Brian explained how these parameters were estimated (existing HIS data, DDMS, Archview were used).

Valerie Swick noted that on JEFs review submittals that she would like to have the following:

- DDMS on disk
- HEC-1 on disk
- Maps
    - Landuse
    - Soils
    - Routing reaches
    - Collector (Tc) channels

Valerie also mentioned that she would like to have the maps plotted with USGS DRGs in the background. Additionally, the maps should have elevation labels at concentration points and at the tops of collector (Tc) channels.

Brian Iserman said that he will plan to deliver the first HEC-1 review submittal by Wednesday, October 27, 1999. JEF will plan to attend a HEC-1 review meeting with Valerie on Monday November 1, 1999 at 10 am at the District.

Memorandum **JE Fuller/ Hydrology & Geomorphology, Inc.**

DATE: January 13, 2000

TO: David Boggs, P.E.

FROM: Brian R. Iserman, P.E. BRI 1/13/00

RE: **Andora Hills & Galloway Washes Hydrology Review Meeting Minutes, FCD 99-14**

A hydrology review meeting was held at the offices of the Flood Control District of Maricopa County (FCDMC) on January 13, 2000 for the referenced project. In attendance were:

David Boggs, P.E., (FCDMC, Floodplain Delineation Branch)
Joe Tram, P.E. (FCDMC, Floodplain Delineation Branch)
Valerie Swick (FCDMC, Hydrology Branch)
Lynn Thomas (FCDMC, Regulatory Branch)
Brian Iserman (JEF)

Mr. Iserman gave a brief project update:

- QC on the topography is complete. He is currently writing up the results
- As-built plans are due from A Team (survey) next week
- A full survey report is due from A Team next week.

Ms. Thomas gave an update regarding the pending lawsuit related to the private bridge located on Galloway Wash just upstream of Spur Cross Road. There was discussion between Ms. Thomas, Mr. Boggs and Mr. Iserman regarding an approach to determining the changes in bed elevation in the reach surrounding the bridge. It was decided that for now, the new mapping should be compared to the mapping used for the previous FIS by Harris Toups. This will give the best indication of channel bed elevations since the previous FIS. Mr. Iserman said he will do a quick comparison and let Ms. Thomas know what is revealed.

Ms. Swick and Mr. Boggs presented review comments to Mr. Iserman. Ms. Swick indicated that she performed her standard spot checks of the model input and output, and found no problems. Comments generally related to the actual report and presentation of maps. Mr. Boggs presented Mr. Iserman with a copy of the Hydrology report, which contains the review comments.

Mr. Iserman said that he will spend next week making the editorial changes to the report. At the conclusion of the meeting, Mr. Iserman presented a revised schedule; there was a brief discussion of the most significant schedule changes.

Memorandum **JE Fuller/ Hydrology & Geomorphology, Inc.**

DATE: June 29, 2000

TO: David Boggs, P.E.

FROM: Brian Iserman, P.E. BRI 7/6/00

RE: **Floodplain Delineation Study of Andora Hills & Galloway Washes, FCD 99-14, Review Meeting Minutes**

CC: Jon Fuller, P.E.

On July 6, 2000, Mr. David Boggs, P.E. and Mr. Joe Tram, P.E. (Flood Control District of Maricopa County) and Mr. Brian Iserman, P.E. (JEF, Inc.), met to discuss review comments for the n-value report and cross-section locations for the referenced project. The following items were discussed:

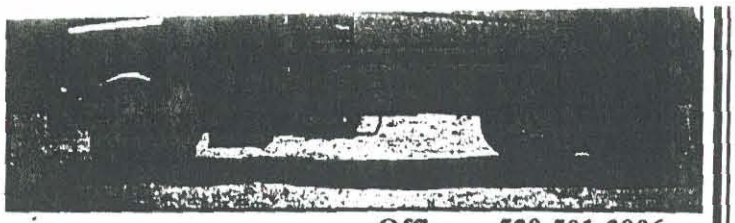
- N-Value Report
    - In general, Mr. Boggs thought that the n values were a little high. Mr. Iserman will evaluate the preliminary HEC-RAS models to determine if the Froude numbers indicate appropriate n-values. Mr. Boggs indicated that the n values should be adjusted based on the Froude number analyses (i.e., not too many critical flow messages from the HEC-RAS report).
    - Mr. Boggs indicated that, in general, the n value report was well done.
- Cross-section alignment
    - There were a few cross sections on Andora Hills Wash near Cave Creek Road which need to be realigned.
    - Mr. Boggs asked if cross sections which extend way beyond the floodplain would be trim. Mr. Iserman indicated that they would.
- Next Submittal
    - Mr. Iserman indicated that his goal is to submit a draft TDN with Draft HEC-RAS models by mid August
- Other Issues
    - Mr. Tram noted that the floodway at junctions with existing mapped tributaries should connect.
    - Mr. Boggs noted that the District would like to amend the topographic mapping to include fill which was placed in the Andora Hills Wash floodplain after the current topographic mapping was finished. The fill was placed by a developer, whom did not know that they were impacted by the floodplain. Mr. Dennis Richards, P.E. (West Consultants, the developers consultant) is currently developing a scope of work to have the

additional survey and mapping done, and incorporated into the existing topographic mapping. Because of schedule constraints, Mr. Boggs and Mr. Iserman decided that the amended topographic mapping should be provided to JEF by July 20 if it is to be included in this mapping project (i.e., FCD 99-14). Additionally, the District and JEF will review the scope of work which Mr. Richards develops.

lankets,
ructural
These
very
s. We
ob
is also
that is
ng and
in see-

pack rats. They have nibbled and destroyed the wiring in my cars parked outside. This has happened over six times. When my service station diagnoses my vehicle's problem I'm asked if I live in Cave Creek! It seems chewed wire is common here.

My current analysis is that the pack rats are very prolific, but snakes may eat only one rat



GOLD GRANITE, ABC,
DECORATIVE BOULDERS,
DECORATIVE ROCK, SAND

Office 520-501-3006
Mobile 602-571-4470
Pager 602-213-8763
Lake Pleasant, AZ
Serving New River,
Anthem, BCC, Cave Creek,
Wickenburg, Scottsdale

ount over each of the next

pen new schools, increase
ed for) better benefits and
st likely) cause a decrease

rs, the purpose of the pro-

mmodate growing student

uality staff.

nt radius standards.

ed) to have the following

staff members to accom-

l services, including those
unseling.

school and middle school

as classroom, office, and

ls.
; distances.
een changed.
cincts: Precinct: 0105
)453 Lone Mountain.
Precincts: 0051 Biscuit

DETAILED ZONE AE FLOODPLAIN DELINEATION STUDIES CAVE CREEK AND CAREFREE AREAS MARICOPA COUNTY

OPEN HOUSE

The Flood Control District of Maricopa County, under authority of the National Flood Insurance Act of 1968 (P.L. 90-488) as amended, and the Flood Disaster Act of 1973 (P.L. 93-234), has completed detailed floodplain delineations of Andora Hills, Galloway, and Grapevine washes in the vicinity of the Towns of Cave Creek and Carefree.

The purpose of these studies were to examine and evaluate flood hazards in areas which are or which are likely to be developed and to determine flood hazards within those areas.

The purpose of this announcement is to notify all interested persons of these studies so that they may have an opportunity to bring any relevant facts and technical data concerning local flood hazards to the attention of the Flood Control District. The study will be available for review at the cafeteria of Desert Mountain School, May 23rd from 6:00 p.m. to 8:00 p.m.

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

Buildings that are located within a 100-year floodplain are required by FEMA to have flood insurance coverage if they are financed by federally insured loans.

A sign language interpreter will be made available upon request with 72 hours advance notice. Alternative format materials, FM or infrared listening devices are also available upon 72 hours advance notice. Additional reasonable accommodations will be made available tot he extent possible with the time frame of the request. Please call Richard Harris, P.E. 602-506-4528 if additional information is needed.

ANDORA HILLS / GALLOWAY WASH FLOODPLAIN DELINEATION STUDY

PUBLIC MEETING 5/23/01

NAME	AFFILIATION	CONTACT	
		ADDRESS	PHONE
Pat + Don Morris	ACAS, Inc.	36713 N. 17th Ave.	623-465-0525
(also concerned about 11th Ave and Cloud to Maddox)		35648 N. 3rd St	623-581-9528
Larry Wright			
Ellis Lovely	City of Scottsdale	7447 E Indian Sch	480-312-7852
Richard Harris	FCDMC	2801 W. Durango Rd	(602) 506 4528
David Boggs	FCDMC	2801 W. Durango	(602) 506-4715
Eric Neal	Baker Engineering	1313 E Osborn	602-798-7527
Randy Puksifer		35600 N 16th ST	623-516-4755
Joe Muñoz	FCD/PIO	2801 W. Durango	602-506-2983
Brian Iserman	JEF Inc.	6101 S. Rural Rd. #110	480-752-2124

JE Fuller/ Hydrology & Geomorphology, Inc.

Jonathan Fuller, P.E., P.H.
Brian Iserman, P.E.
John Wallace, P.E.
W. Scott Ogden, P.E.
Ted Lehman

6101 S. Rural Rd., Suite 110
Tempe, Arizona 85283
480-752-2124 (voice)
480-839-2193 (fax)
www.jefuller.com

December 28, 2000

Flood Control District of Maricopa County
ATT: David Boggs, P.E.
2801 W. Durango
Phoenix, AZ 85009

RE: Floodplain Delineation Study of Andora Hills & Galloway Washes - FCD 99-14, Change Order 1

Dear David:

In response to our floodway review meeting of November 21, 2000, I have prepared a scope and fee estimate for the following change order tasks:

Table 1: Change-order Task Summary for Floodplain Delineation Study of Andora Hills & Galloway Washes

Task	Description
1	Coordination
2	Extend floodplain/floodway delineation
3	Include analysis of Dream Street bridge into HEC-RAS and TDN
4	Administrative Floodway Adjustments

Following is detailed scope, fee and schedule information for your review.

Scope

Task 1 – Coordination

1 Attend up to 2 additional coordination meetings at the FCDMC. Coordinate as-built survey data collection and contract administration. Meet with Representatives of Scottsdale, Carefree and Cave Creek as necessary to gain endorsement of study results.

Task 2 – Extend Floodplain/Floodway Delineation

2.1 Perform an additional 1000 feet of floodplain/floodway delineation on Grapevine Wash to the same care and standards as described in Task 6 of the original Scope of Work for this project to better match the existing water surface profiles of the CH_2Mhill Floodplain Delineation.

2.2 Provide additional topographic mapping to the same care and standards as described in Task 3 and Task 7 for an area surrounding approximately 600 lineal feet of the new Grapevine Wash floodplain delineation.

Task 3 – Include Analysis of Dream Street Bridge into HEC-RAS and TDN

3 Include analysis of the new con-arch bridge at Dream Street into the HEC-RAS model and the TDN. Attend one field meeting with the District Project Manager and the Engineer for the Town of Carefree. The analysis under this task will be based on as-built survey data supplied by the Town of Carefree. Channel improvements associated with the new construction of the bridge will not be included in the HEC-RAS. This additional analysis will be performed to the same care and standards as set forth in the original contract for this project.

Task 4 – Administrative Floodway Adjustments

4 Floodways are to be determined using equal conveyance encroachment (Method 4) initially, but encroachment Method 1 will be used in the final analysis (after the District has approved the Method 4 results). The floodway encroachment shall generally maintain a one-foot maximum rise in elevation as a criteria, except for reaches which appear likely to be adversely impacted by such encroachments. It will also be based upon maintaining the braided stream network within the floodway limits. Adverse impacts include, but are not limited to, a likely increase in stream sinuosity, a significantly-increased erosion potential, or a decreased floodway width (as compared to the original study).

To avoid such impacts, the consultant shall decrease the Method 4 target until such impacts are mitigated; keeping in mind that a zero-rise floodway may be necessary in some cases. Additionally, the consultant shall take care to avoid abrupt changes in the floodway width and energy-grade surcharges greater than 1 foot.

Work under this task shall not commence until after the District has approved Task 3, and determined how to proceed with that portion of the study which is impacted by the new Dream Street bridge and attendant channel restoration.

Fee

The total fee for this change order is $ 14,963.30; standard FCDMC Fee Attachments A, B and C have been included.

Schedule

I anticipate that the additional work described in the above scope will take approximately 6 weeks to complete. The anticipated date for a submittal to FEMA is February 1, 2001. If 120 days are allowed for FEMA review and publication of notification, a contract closing date of June 30, 2001 is expected. This would require amending the Contract closing date--extending it by 166 days.

Should you have questions regarding this change order request, please do not hesitate to contact me.

Sincerely,
JE Fuller/Hydrology & Geomorphology, Inc.

Brian R. Iserman

Brian R. Iserman, P.E.
Vice President

Flood Control District of Maricopa County
2801 West Durango Street
Phoenix, Arizona 85009
Phone: 602-506-1501
Fax: 602-506-2903

January 3, 2001

Jonathan Fuller, P.E., P.H.
JE Fuller Hydrology and Geomorphology, Inc.
6101 S. Rural Road, Suite 110
Tempe, AZ 85283

RE: Contract FCD 99-14, Andora Hills-Galloway Washes Floodplain Delineation Study
Change Order # 1

Dear Mr. Fuller:

Enclosed are two (2) original documents of Change Order # 1 to the above referenced contract. Please have both original documents signed by an authorized Officer of your firm. Upon completion, return **both original documents** to my attention no later than **Wednesday, January 10, 2001.**

The Flood Control District of Maricopa County will complete the processing of this Change Order. A fully executed original document will then be returned to you for your records.

Should you have any questions regarding this matter, please call Barbara C. Hummell, Contracts Branch Manager, at 602-506-4876.

Sincerely,

Wanett Maxwell

Wanett Maxwell
Contracts Specialist

Enclosures

JE.1

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

		Change Order Number:	1		
Date:	12/29/00	**Amount:**	$ 14,963.60	**File No:**	XXXXX
Contract No:	FCD 99-14			**PCN No:**	01499.28.50
Consultant Name:	JE Fuller Hydrology and Geomorphology, Inc				
Contract Title:	Andora Hills-Galloway Washes Floodplain Delineation Study				
Initial Amount:	$132,018.00	**Contract Award**	9/1/99	**Total Previous Change Orders:**	$0.00

By mutual agreement of the parties, the following contract change(s) are incorporated into the above contract.
All other contract terms and conditions remain unchanged.

After the completion of the bulk of the study, it was discovered that the Town of Carefree had constructed a concrete arch bridge across Galloway Wash on the Dream Street alignment. As this structure potentially affects the water surface of the 100-year floodplain and floodway, additional HEC-RAS modeling is required. Carefree is also implementing a "stream restoration" project nearby. The consultant will analyze the bridge with HEC RAS, and a meeting will be held with the Town to determine further action. The results of this analysis will be incorporated into the FEMA submittal and the Technical Data Notebook. The Galloway Wash study reach will be extended by 1000 ft upstream to match to the previous CH2M-Hill FDS.

FLOOD CONTROL DISTRICT
RECEIVED
JAN 08 '01

E.M.	FINANCE		
P.D.	LANES		
ADMIN	O & M		
REG	P & PM		
ENG	FILE		
CONTRACTS			
ROUTING			

WMW

By reason of this proposed change 166 days extension of time will be allowed.
The contract completion date is 6/30/01 .

The following financial information is submitted:

Initial Contract Amount		$ 132,018.00
Amended Contract Amount w/ previous change orders		$ 132,018.00
Current Change Order Request		$ 14,963.60
Amended Contract Amount w/ current change order		***$ 146,981.60***
Change Order Authorization Limit	$	40,000.00
Total Requested Change Orders	$	14,963.60
Change Order Authorization Remaining	$	25,036.40

We, the undersigned Consultant, hereby agree that upon execution of this change order we will perform all services as identified above, and will accept the above specified amount(s) as full payment therefore.

Consultant Name:	JE Fuller Hydr/Geomorph., Inc.	By:	Jath
Consultant Address:	6101 South Rural Road-Suite 110	Printed Name:	Jonathan Fuller, P.E., P.H.
	Tempe, AZ 85283	Title:	President
		Date:	13-Dec-00

DISTRICT APPROVAL

I certify that this change is required to accomplish the overall task for which this contract is initiated. David B Boggs 1/10/01 Project Manager Date	Division Concurrence Edward A Ralej 1/10/01 Division Manager Date
Funds are available to accomplish this Change Order Kay Young 1/11/01 Controller Date	I certify that this change is within the limits authorized by the County Procurement Code Barbara Chumbl 1/11/01 Contracts Branch Manage Date
General Manager Approval 1/12/01 Chief Engineer & General Manage Date	Chief Public Works Officer Approval Signature Not Required Chief Public Works Officer Date

Copy to: Contract File, Controller, Division Manager, Project Manager

Sharon McGuire
Contracts Specialist
Flood Control District of Maricopa County
2801 West Durango Street, Phoenix, Arizona 85009
Phone: (602) 506-8378 – Fax: (602) 506-2903 – E-mail: shm@mail.maricopa.gov

MEMORANDUM TO FILE

DATE: January 16, 2001

TO: Jonathan Fuller
JE Fuller Hydrology/Geomorphology
6101 S. Rural Road, Suite 110
Tempe AZ 85283

FROM: Sharon McGuire, Contracts Specialist

RE: Contract FCD 99-14, Andora Hills-Galloway Washes FDS
Change Order #1

Enclosed is a fully executed original of the above referenced change order for your records.

Should you have any questions, please do not hesitate to call.

Thank you

Flood Control District of Maricopa County
2801 West Durango Street
Phoenix, Arizona 85009
Phone: 602-506-1501
Fax: 602-506-2903

June 11, 2001

Jonathan Fuller, P.E., P.H.
JE Fuller Hydrology and Geomorphology, Inc.
6101 S. Rural Rd., Suite 110
Tempe, AZ 85283

RE: Contract FCD 99-14, Andora Hills and Galloway Washes Floodplain Delineation Study Change Order # 2

Dear Mr. Fuller:

Enclosed are two (2) original documents of Change Order # 2 to the above referenced contract. Please have both original documents signed by an authorized Officer of your firm. Upon completion, return **both original documents** to my attention no later than **Monday, June 18, 2001.**

The Flood Control District of Maricopa County will complete the processing of this Change Order. A fully executed original document will then be returned to you for your records.

Should you have any questions regarding this matter, please call Barbara C. Hummell, Contracts Branch Manager, at 602-506-4876.

Sincerely,

Wanett Maxwell
Contracts Specialist

Enclosures

JEFuller / Hydrology & Geomorphology, Inc.

6101 South Rural Road, Suite 110
Tempe, AZ 85283
480-752-2124 (voice)
480-839-2193 (fax)
www.jefuller.com

June 12, 2001

TRANSMITTAL

Flood Control District of Maricopa County
ATT: Wanett Maxwell
2801 W. Durango St.
Phoenix, AZ 85009

Attached are the following materials provided by JEFuller/ Hydrology & Geomorphology, Inc.:

2 executed originals of Contract FCD 99-14, Floodplain Delineation Study of Andora Hills & Galloway Washes, Change Order #2.

Brian R. Iserman 6/12/01

Brian Iserman, P.E. Date

TABLE A

CONSULTANT/SUBCONSULTANT
COST PROPOSAL SUMMARY

CONSULTANT/SUBCONSULTANT: JE Fuller/Hydrology & Geomorphoogy, Inc

PROJECT NAME: Floodplain Delineation Study of Andora Hills & Galloway Washs

CONTRACT NO.: FCD 99-14

CHANGE ORDER NO.: 1

DIRECT LABOR			
Classifications	**Man-hours**	**Hourly Rates**	**Labor Costs**
Project Manager	55	$ 30.00	$ 1,650.00
Engineer	110	$ 24.92	$ 2,741.20
Tech/CADD	75	$ 14.00	$ 1,050.00
Support Services			

Subtotal Labor $5,441.2

X Multiplier 2.75 = Total Labor $14,963.30

DIRECT AND OUTSIDE EXPENSES	
DESCRIPTION	**EXPENSE AMOUNT**

Total Expenses $0

B.4 General Correspondence

File : FCD 99-14

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
CONSULTANT EVALUATION FORM

To be filled out by Consultant

Date: December 6, 2002

Consultant Name JE Fuller/Hydrology & Geomorphology, Inc. Project Name FDS Andora Hills & Galloway Washes

Project Description Detailed hydrology and floodplain delineation of 8 miles of Andora Hills, Galloway, and Grapevine Washes.

Project Manager Brian R. Iserman, P.E. Contract Number FCD 99-14

Type of Review: Final

This form is to be used for design and study contracts.

Rate each of the following using a scale 1 through 5. Mark categories that do not apply N/A (Not Applicable). Use this form as the final review. Write comments, if any, in the space provided. Sign and date completed form and return to the Contracts Branch of the Flood Controld District of Maricopa County.

1	2	3	4	5
Needs Improvement		**Satisfactory**		**Superior**

RATING

TIMELINESS

	1	2	3	4	5
1. Timeliness of scoping and negotiations leading to contract award.	☐	☐	☐	☐	☑
2. Materials furnished to Consultant in a timely fashion.	☐	☐	☐	☐	☑
3. Department's timely response to Consultant questions.	☐	☐	☐	☐	☑
4. Department's timely reviews in accordance with the schedule.	☐	☐	☐	☑	☐
5. Timely payment of billings, billing questions resolved.	☐	☐	☐	☐	☑

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
CONSULTANT EVALUATION FORM

To be filled out by Consultant

KNOWLEDGE

6. Understanding of project objectives/scope of work. 1 2 3 4 5 ☐ ☐ ☐ ☑ ☐

7. Coordination to resolve issues beyond the scope of work. 1 2 3 4 5 ☐ ☐ ☐ ☑ ☐

8. Guidance by Department's project manager. 1 2 3 4 5 ☐ ☐ ☐ ☑ ☐

9. Acceptance of Value Engineering submittals. 1 2 3 4 5 ☐ ☐ ☐ ☑ ☐

COOPERATION/COMMUNICATIONS

10. Working relationship between Consultant and Department. 1 2 3 4 5 ☐ ☐ ☐ ☐ ☑

11. Clarity of decisions or instructions from Department. 1 2 3 4 5 ☐ ☐ ☐ ☑ ☐

12. Recognition and resolution of unusual or critical problems. 1 2 3 4 5 ☐ ☐ ☐ ☑ ☐

13. Compliance with contractual obligations. 1 2 3 4 5 ☐ ☐ ☐ ☐ ☑

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
CONSULTANT EVALUATION FORM

To be filled out by Consultant

QUALITY

14. Clarity of contract scope of work. — 1 2 3 4 5: ☐ ☐ ☐ ☐ ☑

15. Clarity of Department standards/expectations for drawings and specifications (if applicable for construction). — 1 2 3 4 5: ☐ ☐ ☐ ☐ ☑

16. Clarity of review comments. — 1 2 3 4 5: ☐ ☐ ☐ ☑ ☐

17. Appropriateness or relevancy of review comments for level of submittal. — 1 2 3 4 5: ☐ ☐ ☐ ☑ ☐

18. Maintained adequate and qualified management and review personnel throughout the project. — 1 2 3 4 5: ☐ ☐ ☐ ☑ ☐

How well are we doing? How can we improve?

COMMENTS:

Overall a successful project with many interesting facets. We look forward to working with
the District in the future.

Brian R. Sherman 12/9/02

Consultant Date

Copy

JE FULLER
HYDROLOGY & GEOMORPHOLOGY, INC.

6101 South Rural Road, Suite 110
Tempe, AZ 85283
480-752-2124 (voice)
480-839-2193 (fax)
www.jefuller.com

FLOOD CONTROL DISTRICT
RECEIVED
DEC 23 '02

CH & GM	FINANCE
PIO	LANDS
ADMIN	O & M
REG	P & PM
ENG	FILE
CONTRACTS	
ROUTING	

RPH

December 19, 2002

TRANSMITTAL

Town of Carefree
ATT: Jonathan H. Pearson
PO Box 740
Carefree, Arizona 85377

Attached are the following materials provided by JEFuller/ Hydrology & Geomorphology, Inc.:

1 set of replacement pages for Floodplain Delineation Study of Andora Hills & Galloway Washes Technical Data Notebook.

Includes replacement pages 4-25, 4-27, 4-29, 4-30, 4-31 and an additional panel point summary table which should be added to Appendix C.1 just before the first GPS Station Log.

Brian R. Iserman

Brian R. Iserman, P.E.

12/19/02

Date

Copy

JE FULLER
HYDROLOGY & GEOMORPHOLOGY, INC.

6101 South Rural Road, Suite 110
Tempe, AZ 85283
480-752-2124 (voice)
480-839-2193 (fax)
www.jefuller.com

December 19, 2002

TRANSMITTAL

City of Scottsdale
ATT: Bill Erickson, P.E.
7447 East Indian School Rd., Suite 205
Scottsdale, Arizona 85251

Attached are the following materials provided by JEFuller/ Hydrology & Geomorphology, Inc.:

1 set of replacement pages for Floodplain Delineation Study of Andora Hills & Galloway Washes Technical Data Notebook.

Includes replacement pages 4-25, 4-27, 4-29, 4-30, 4-31 and an additional panel point summary table which should be added to Appendix C.1 just before the first GPS Station Log.

Brian R. Iserman

Brian R. Iserman, P.E.

12/19/02

Date

Copy

JE FULLER
HYDROLOGY & GEOMORPHOLOGY, INC.

6101 South Rural Road, Suite 110
Tempe, AZ 85283
480-752-2124 (voice)
480-839-2193 (fax)
www.jefuller.com

December 19, 2002

TRANSMITTAL

Town of Cave Creek
ATT: Wayne Anderson, P.E.
37622 North Cave Creek Rd.
Cave Creek, Arizona 85331

Attached are the following materials provided by JEFuller/ Hydrology & Geomorphology, Inc.:

1 set of replacement pages for Floodplain Delineation Study of Andora Hills & Galloway Washes Technical Data Notebook.

Includes replacement pages 4-25, 4-27, 4-29, 4-30, 4-31 and an additional panel point summary table which should be added to Appendix C.1 just before the first GPS Station Log.

Brian R. Iserman

Brian R. Iserman, P.E.

12/19/02

Date

Richard Harris - FCDX

From: Brian Iserman [brian@jefuller.com]
Sent: Thursday, December 19, 2002 10:07 AM
To: Richard Harris - FCDX
Subject: Re: 12/17/02 Andoran Hills & Galloway Washes

Richard:

I will mail the inserts to the three jurisdictions listed below today. I will send you copies of the attendant transmittals.

Richard Harris - FCDX wrote:

> Brian,
>
> We are making some progress in getting the retainage for the subject project paid to your firm. During Tim's review of the final submittals he started us adding information to a list of Final Product Distribution, and one of the items on the list is the date on which the revised materials for the TDN were transferred to the local jurisdictions. For this project, the local jurisdictions were:
>
> 1. The City of Scottsdale
> 2. The Town of Carefree
> 3. The Town of Cave Creek
>
> Did you insert the revised materials yourself, or did you send/deliver them? Either way, I would like to know the date. Please provide this information, and copies of any related backup correspondance you might have had.
>
> If you have questions, please call me at (602) 506-4528.
>
> Thanks,
>
> Richard

--
Brian Iserman
JE Fuller/Hydrology & Geomorphology, Inc.
6101 S. Rural Road, Suite 110
Tempe, AZ 85283

Phone: 480-752-2124 x11
Fax: 480-839-2193

FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY

2801 West Durango Street · Phoenix, Arizona 85009
Telephone: (602) 506-1501
Fax: (602) 506-4601
TT: (602) 506-5897

URGENT

COVER SHEET

TO: Brian Iserman, P.E.

Company or Department: JE Fuller / Hydro + Geomorphology **Fax #** 480 839-2193

FROM: David B. Boggs, P.E. — Floodplain Hydraulics

Number of pages being sent including Cover Sheet: One

Comments: Brian - We had arranged for a "kick off" meeting for Ardora Hills / Galloway Washes this afternoon, but due to schedule conflicts here, we have to make it TODAY Tues. Sept 8th 10 AM - noon. Hope you can make it on such short notice. Sorry for the delay in notification -

DBB

JE Fuller/ Hydrology & Geomorphology, Inc.

Jonathan Fuller, P.E., P.H.
Brian Iserman, P.E.
John Wallace, P.E.
Ted Lehman
Michael Henze

5235 So. Kyrene Rd., Suite 205
Tempe, Arizona 85283
480-752-2124 (voice)
480-839-2193 (fax)
www.jefuller.com

September 7, 1999

To: Marta Dent
FCDMC

From: Ted Lehman

Re: request for digital data for Andora Hills / Galloway Wash FDS, FCD No. 99-14

The following is a list of digital data which we would like to get from the District for our use on the Andora Hills / Galloway Wash Floodplain Delineation Study.

1) Digital raster graphic (DRG) USGS 7.5' quadrangles for quadrangle names:

Wildcat Hill
Humboldt Mountain
Cave Creek
New River Mesa

2) FCDMC semi-rectified aerial photographs for the area within the subject watersheds.

3) Floodplain data: e.g. FEMA zones, XS locations if available, ERMs, water surface elvations, base flood elevations, FIRM panel boundariesetc.

4) TRS lines

5) Street centerlines

6) New soils data from SCS

7) Digital data delivered as part of FCD 95-28, especially regarding the hydrology (e.g.):

   a. Subbasin boundaries
   b. Time of concentration flow paths
   c. Subbasin centroids

8) Municipal boundaries

9) Land use

10) 7.5 minute quad boundaries

11) Drainage inquiries/complaints

12) Culvert and bridge and other drainage structure locations if cataloged

Please provide all the items, except the image files, as dxf and shapefiles if possible. It would also be most convenient if we could be provided these data on CD-ROM.

Thank you in advance for your help. Please call Brian Iserman or myself if you have any questions regarding this request. We look forward to working with you on the Andora Hills / Galloway FDS project.

Sincerely,

Ted Lehman

JEFuller / Hydrology & Geomorphology, Inc.

5235 South Kyrene, Suite 205
Tempe, AZ 85283
602-752-2124 (voice)
602-839-2193 (fax)
jefuller@aol.com (email)

September 13, 1999

TRANSMITTAL

Flood Control District of Maricopa County
ATT: David Boggs, P.E.
2801 W. Durango
Phoenix, AZ 85009

Attached are the following materials provided by JEFuller/ Hydrology & Geomorphology, Inc.:

Project Schedule dated 9/10/99 for Andora & Galloway Washes Floodplain Delineation Study, FCD 99-14.

Brian K Iserman

Brian Iserman, P.E.

9/13/99

Date

Memorandum **JE Fuller/ Hydrology & Geomorphology, Inc.**

DATE: September 13, 1999

TO: Marta Dent, FCDMC GIS

FROM: Brian Iserman, P.E. Bri 9/13/99

RE: Andora Hills & Galloway Washes Floodplain Delineation Study, FCD 99-14, Additional Data Request

Steve will fill this order.

As we discussed on the phone today, JEF is requesting USGS DEMs covering the area outlined on the attached figure. Please also transform the datum from UTM to NAD 83.

Please give me a call at 480-752-2124 if you have questions regarding this request.

Subject: Andora Hills/Galloway Wash
Date: Thu, 23 Sep 1999 10:56:10 -0700
From: David Boggs - FCDX <dbb@mail.maricopa.gov>
To: Dave Johnson - FCDX <drj@mail.maricopa.gov>
CC: Joe Tram - FCDX <jjt@mail.maricopa.gov>, "'brian@jefuller.com'" <brian@jefuller.com>

Dave:

We are seeking guidance on the need for mass mailings to notify property owners of the study. Many think it's not required. Joe Munoz is among this group. Brian Iserman at JE Fuller would like to know whether we can waive this req'ment. You can answer him by clicking the "Reply to All" button on your retuen response.

Secondly, we hear you have a name & phone # for the person who witnessed a break-out from Galloway to Andora Hills near the "Horny Toad" Bar & Grill. If so, Brian would also like thant info.

I'll be off tomorrow. Early reply appreciated. Aerial mapping begins next week 9/29/99.

Thanks,

David

Subject: Re: Legal Notice for Andora Hills & Galloway Washes Flood Study
Date: Thu, 23 Sep 1999 07:04:52 -0700
From: Tom.Bianco@pni.com
To: Brian Iserman <brian@jefuller.com>
CC: Marilyn.Greenwood@pni.com

Mr Iserman, I am prohibited from opening attachments.
Please re-send your legal notice by copying the text with your word processing program and pasting the text into the message area of your e-mail.
As a backup, also send a copy of your e-mail to marilyn.greenwood@pni.com
I will be starting vacation at 2 pm today, so Marilyn will ensure your notice gets published beginning 9/30.

Brian Iserman <brian@jefuller.com> on 09/21/99 12:14:45 PM

To: Tom Bianco/PNI
cc:
Subject: Legal Notice for Andora Hills & Galloway Washes Flood Study

Tom:

I have attached a legal notice to be published on September 30, and October 7. The notice is in Word 97 format. When you are ready with a price quote, please give me a call and I can give you a Mastercard number. We will require an affidavit of publication once the advertisement has run both times.

Thank You.

Brian Iserman
JE Fuller Hydrology & Geomorphology
480-752-2124

fcd revised legal ad.doc	**Name:** fcd revised legal ad.doc **Type:** Microsoft Word Document (application/msword) **Encoding:** base64 **Description:** Lotus Manuscript 1.0

Subject: RE: Andora Hills/Galloway Wash
Date: Thu, 23 Sep 1999 14:00:01 -0700
From: Dave Johnson - FCDX <drj@mail.maricopa.gov>
To: David Boggs - FCDX <dbb@mail.maricopa.gov>
CC: Joe Tram - FCDX <jjt@mail.maricopa.gov>, "'brian@jefuller.com'" <brian@jefuller.com>

A agree that we don't need a mass mailing to notify property owners until the results are available. However public notice of the study in the local newspaper would be appropriate.

I can't remember now who the eye witness was other than it being someone that had worked at MCDOT and I believe has since retired. I will try to resurrect that information through other contacts.

Dave

> *-----Original Message-----*
> *From: David Boggs - FCDX*
> *Sent: Thursday, September 23, 1999 10:56 AM*
> *To: Dave Johnson - FCDX*
> *Cc: Joe Tram - FCDX; 'brian@jefuller.com'*
> *Subject: Andora Hills/Galloway Wash*
> *Importance: High*
>
> *Dave:*
>
> *We are seeking guidance on the need for mass mailings to notify property owners of the study. Many think it's not required. Joe Munoz is among this group. Brian Iserman at JE Fuller would like to know whether we can waive this req'ment. You can answer him by clicking the "Reply to All" button on your retuen response.*
>
> *Secondly, we hear you have a name & phone # for the person who witnessed a break-out from Galloway to Andora Hills near the "Horny Toad" Bar & Grill. If so, Brian would also like thant info.*
>
> *I'll be off tomorrow. Early reply appreciated. Aerial mapping begins next week 9/29/99.*
>
> *Thanks,*
>
> *David*

Subject: JEF methods for split flow analysis
Date: Wed, 29 Sep 1999 09:29:03 -0700
From: Brian Iserman <brian@jefuller.com>
To: David Boggs <dvb@mail.maricopa.gov>
CC: Joe Tram <jjt@mail.maricopa.gov>

David & Joe:

Ted just reminded me that I forgot to forward the attached memo to you. This was writen up for internal use in order to document what we have done and to provide some continuity between studies. This is a document I will probably add to as we refine our techniques. So, please forward any comments you have to me.

Brian Iserman
JE Fuller Hydrology & Geomorphology, Inc.
752-2124

---

splits.doc	**Name:** splits.doc **Type:** Microsoft Word Document (application/msword) **Encoding:** base64

ANNOUNCEMENT OF INTENT TO UPDATE FLOODPLAIN DELINEATION STUDY OF ANDORA HILLS AND GALLOWAY WASHES

The Flood Control District of Maricopa County (FCDMC), under authority of the National Flood Insurance Act of 1968 (PL-90-448), as amended, and the Flood Disaster Protection Act of 1973 (PL93-234) is funding a detailed re-study of flood hazard areas and has contract JE Fuller/Hydrology & Geomorphology Inc. to carry out the study. The area encompasses: Andora Hills Wash from its confluence with Cave Creek to Carefree Drive and Galloway Wash from its confluence with Cave Creek to the Tonto National Forest boundary.

This study will reexamine and reevaluate the flood hazard areas for these two washes. The results will then be published to update the flood insurance rate maps (FIRMs) used by the Federal Emergency Management Agency (FEMA). The FIRMs will be used to determine flood insurance rates.

This announcement is intended to inform all interested persons and communities of the commencement of this study so that they may have an opportunity to bring any relevant technical information to the attention of the FCDMC/FEMA, to be considered during the course of this study. Your comments should be addressed to Mr. David Boggs, P.E., Project Manager at the Flood Control District of Maricopa County, 2801 West Durango Street, Phoenix, AZ 85009 (602) 506-1501.

bring to trial. Also, state laboratories

ARIZONA **BUSINESS** GAZETTE

PO BOX 194
Phoenix, Arizona 85001-0194
(602) 444-7300 FAX (602) 444-7364

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 weekly at Phoenix, Arizona, and that the copy hereto attached is a true copy of the advertisement published in the said paper on the dates indicated.

9/30/99
10/7/99

Sworn to before me this
7TH day of
OCTOBER A.D. 1999

OFFICIAL SEAL
NATHAN CARDON
NOTARY PUBLIC-ARIZONA
MARICOPA COUNTY
My Comm. Expires May 23, 2003

Notary Public

AFFIDAVIT OF PUBLICATION

UPDATE FLOODPLAIN DELINEATION

19

ANNOUNCEMENT OF INTENT TO UPDATE FLOODPLAIN DELINEATION STUDY OF ANDORA HILLS AND GALLOWAY WASHES

The Flood Control District of Maricopa County (FCDMC), under authority of the National Flood Insurance Act of 1968 (PL-90-448), as amended, and the Flood Disaster Protection Act of 1973 (PL93-234) is funding a detailed re-study of flood hazard areas and has contract JE Fuller/Hydrology & Geomorphology, Inc. to carry out the study. The area encompassses Andora Hills Wash from its confluence with Cave Creek to Carefree Drive and Galloway Wash from its confluence with Cave Creek to the Tonto National Forest boundary.

This study will reexamine and reevaluate the flood hazard areas for these two washes. The results will then be published to update the flood insurance rate maps (FIRMs) used by the Federal Emergency Management Agency (FEMA). The FIRMs will be used to determine flood insurance rates.

This announcement is intended to inform all interested persons and communities of the commencement of this study so that they may have an opportunity to bring any relevant technical information to the attention of the FCDMC/FEMA, to be considered during the course of this study. Your comments should be addressed to Mr. David Boggs, P.E., Project Manager at the Flood Control District of Maricopa County, 2801 West Durango Street, Phoenix, AZ 85009, (602) 506-1501.

Published September 30, October 7, 1999

ARIZONA **BUSINESS** GAZETTE

PO BOX 194
Phoenix, Arizona 85001-0194
(602) 444-7300 FAX (602) 444-7364

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 weekly at Phoenix, Arizona, and that the copy hereto attached is a true copy of the advertisement published in the said paper on the dates indicated.

9/30/99
10/7/99

Sworn to before me this
7TH day of
OCTOBER A.D. 1999

OFFICIAL SEAL
NATHAN CARDON
NOTARY PUBLIC-ARIZONA
MARICOPA COUNTY
My Comm. Expires May 23, 2003

Notary Public

715 Automobiles

1991 DODGE DYNASTY. Dark blue ext. & interior. Runs great. 98K miles. New rebuilt transmission. 480-585-5859.

87 CHEVY NOVA. Great transportation car. One owner. 4DR, AC, good tires. Eve: 480-488-9376, days: 480-488-9604. $2800

1986 Pontiac 6000 STE
Original owner
Excellent condition
High mileage
Dependable
$1500. 488-5847.

1994 BUICK PARK Avenue. Frost beige with leather. One owner, low miles. Ext. war, gold pkg. $12,000 obo. 480-595-8568

93' FORD E150 Hi-top Van. Top Quality conversion w/72K miles, V8 w/towing, TV, VCR, CD, leather/cloth/walnut interior, $12,500. (480) 595-5583.

1991 Chevy Caprice
Classic, 89K mi, loaded, new Michelin tires, phone in car, dual p/seats, 305 TBI, tint, p/compass, garaged, local car.
$5700 • 488-9140

1985 OLDSMOBILE 98 Regency Brougham. Beige with beige cloth. Only 85K miles. Excellent condition, $3,000. obo 319-6044

WELL MAINTAINED 1986 Lincoln Town car. White with great red leather interior. All power, 90,400 miles. $3,400. Call 480-488-2666.

725 Bicycles

LIKE NEW. LADIES trek Hybrid. 22 speed bike. Purple and green frost. $200. Cave Creek Area. 480-419-3891.

730 Boats & Supplies

99 KTM 125 5X. Excellent condition, FMF pipe & silencer. Fresh bottom and top end. $3800. 480-488-6875

KAWASAKI 650 JET ski, stage 3, in good condition. Asking, $1,900. 473-2636

1998 WELLCRAFT CUDDY cabin 21 ft. fully loaded w/sink, stove, icebox, potty, Cd player, Qn bed. Like new with low hours. $20,400. 480-502-8448

Motorcycles/

1983 HARLEY DAVIDSON Motorcycle FLT Tour Glide. 480-488-3555.

3 QUADS. 1 has engine out - 2 run good. $2000 takes all 3. 623-465-2729

YAMAHA 1986,YZ 250, in good condition, $1,100. 473-2636

735 Motorcycles/ ATVs

HARLEY DAVIDSON, 1991, 883 Sportster. Mint Condition. 595-1218.

97 KTM 360 EXC. Like new condition, licensed for on or off road riding, $3500. 480-488-6875.

1984 HARLEY DAVIDSON SPORTIER. Custom 1000 cc. new battery, excellent condition, tuned and ready to ride! $4,395 obo. 623-374-5345

98 BLUE SPORT go-ped, good condition. $350. To a good home. 602-788-8387

740 Motorhomes

1982 CROSS COUNTRY Motor Home. 26ft, 454 Engine. Tags to 2001. Gen./6 new tires. 77k mile. $9,300. 374-9773(e)/374-0030(d)

PACE ARROW DIESEL (Good Mileage) 26'. 47,000 miles. Mint inside, equipped to live in. 1984, well maintained. $14,500 or trade for utility van. 623-465-2729.

88 JAMBOREE, 26 ft. 59K, 4KW gen., CB, CD, AM/FM, Ford 460, twin beds. Immaculate, runs exc. $17,900 obo. §623-374-5345

745 Travel Trailers/ 5th Wheels

23 FT. CAVALODE Travel Trailer. Tandem wheels, rear bath & tub. A/C, front twin beds, TV, Microwave. Good condition. $4200. 623-465-8476

96-24' PLAYMOR toy trailer. Fully self contained w/bathroom, shower, refr., double sink, AC, roll out awning, stove. Excellent condition. $9900 480-488-6875

25 FT. TRAILER, 1960. Handy person special. Inside needs finishing. New shell and floor, 2 door model. $1200. 623-465-5408

95 FLEETWOOD PROWLER 5th Wheel. 21', Model #21L5T. Elec. gas frig, stove, microwave, heater, A/C, radio, shower & lavatory. Truck hitch included. 488-0859.

FURNISHED TRAILER in gated "55+" Resort. Storage shed, patio, clubhouse, recreational activities. Immediate occupancy, Mesa, AZ (480) 998-0985.

750 Trucks/ 4 Wheel Drive

86 FORD F350 Dually. New clutch, rear end, tires, battery, windshield. Moving, must sell. $6500 firm. 465-5820

97 FORD EXPLORER XLT. 4WD; 4 DR, white, 40K, orig. owner. Full power, AC, tow package; alarm w/keyless remote. Mint condition. $20,500. 595-6319

1997 Jeep Wrangler
Purchase/Lease by Owner
Purchase at $12,900
or lease as low as $160 per month with down payment
595-8399

1981 GMC 4X4 shortbed pickup. 4 speed, A/C, PS, PB, Shell, New on/off-road tires. In great shape. Just passed emmisions, $3500 obo 480-488-4383

1982 GMC 1/2 ton long bed. P/S, P/B, A/C, V8. White exterior, red interior. Lots of new parts, $3500 obo. 623-374-0791

750 Trucks/ 4 Wheel Drive

99 GRAND LAREDO. Off road suspension only 5,000 miles, tax and tags paid, orig. owner, warranty, $26,000 623-374-9656

1989 FORD F250 Supercab 3/4 ton truck. A/C, cruise, 5 speed, 7.3 Liter Diesel, dual tanks, batteries, hitch. Hook up for 5th wheel. $6300. 480-595-7550

1992 Mazda Navaho - 4WD
(Same as Ford Explorer)
91K miles. New AC.
Great Condition. 2 door.
$6400. 585-7573.

81 NISSAN 280ZX Turbo, 200K miles, runs strong. New alternator, 2 new tires, auto, leather, PS, PB, PW, t-tops, 16" wheels. $1100 obo 480-585-2161.

1947 DODGE PICK-up. Runs good condition. Original $4500. 623-465-2729.

99 GMC, 4X4, 3 door, SWB, big V8, air, automatic, locks, liner, 3 weeks old. private party. $25,000. 623-374-9656

1995 DODGE RAM 1500. Std cab, long bed, 360 V-8, 3.9 limited slip axle, A/T all power options. Tow package, bed liner, much more, $14,900, 480-502-2543

1999 GMC SUBURBAN 2500 SLT. Black, tan leather, all options, 20,000 miles. $34,000. 480-575-9109

755 Utility Trailers/ Campers

OVERHEAD CAMPER NEEDS work, $300. 623-582-3812

32FT. HILLSBORO HEAVY duty construction trailer. Very good condition. New $10,500 asking $4995. obo. Call 623-374-9243.

93 HUDSON SINGLE axle trailer. 5000 lbs GVW. Built in ramp, winch, electric brakes, tool box. $700. 480-585-7826.

STOCKLAND CAMPER SHELL, fiberglass fits 88-98 Chevy shortbed pickup. 2 sliding windows, locking rear window, exc. cond. $400 obo 480-585-5859

CAMPER SHELL, AERODYNAMIC design fits Toyota or ohter 76" beds. 2 sliding windows, locking back window, white fiberglass. $250. 623-465-9097

760 Vans

93 FORD E150 Hitop van. Top quality conversion w/72K hwy mi., V8 w/towing, TV, VCR, 10 CD changer. Leather, cltoh, walnut int. 4 chairs, 3 fold bench seat/bed. Priced to sell, $12,500. 480-595-5583

95 AERO STAR XLT. 79,000 miles. Real beauty. $10,500. 520-634-4150 or 602-407-5051.

1997 CHEVY ASTRO. 8 passenger van. Dual air, runs great, 13,500 obo. 480-502-5607

1992 PLYMOUTH VOYAGER SE 7 passenger, P/S, P/B, A/T, P/DL, A/C, CC, Tinted windows. White with blue, excellent condition, $5500 480-502-2543

900 Legals

Public Notice:
ARTICLES OF DISSOLUTION
BY INCORPORATORS OR INITIAL DIRECTORS OF B'JAE DENTAL DELIVERY SERVICE, INC.

1. The name of the corporation is B'Jae Dental Delivery Service, Inc.
2. The corporation was incorporated on the 29th day of July, 1999.
3. None of the corporation's shares have been issued. The corporation has not commenced business.
4. No debt of the corporation remains unpaid.
5. If shares have been issued, the net assets of the corporation remaining after winding up have been distributed to the shareholders.
6. A majority of the initial directors or of the incorporators have authorized the dissolution.

DATED this 17 day of September, 1999.
B'Jae Dental Delivery Service, Inc.
Signed by: Alexandeo Fuentes - President
Published Foothills Sentinel 9-29, 10-6, 10-13-99; Published Glendale Star 9-29, 10-6, 10-13-99-99.

Public Notice:
ARTICLES OF INCORPORATION OF A TAX-EXEMPT DESERT WILLOW PTO

1. Name. The Name of the Corporation is Desert Willow PTO.
2. Purpose: the purpose for which the corporation is organized is: educational.
3. Character of Affairs: The character of affairs of the corporation will be: educational parent - Teacher Organization.
4. No part of the net earning of the corporation shall inure to the benefit of, or be distributable to its members, directors, officers, or other private persons, except that the corporation shall be authorized and empowered to pay reasonable compensation for services rendered and to make payments and distributions in furtherance of the purposes set forth in Article 2. No substantial part of the activities of the corporation shall be the carrying on of propaganda, or otherwise attempting to influence legislation, and the corporation shall not participate in, or intervene in (including the publishing or distribution of statements), any political campaign on behalf of any candidate for public office. Notwithstanding any other provision of these Articles, the corporation shall not carry on any other activities not permitted to be carried on: (a) by a corporation exempt from Federal Income Tax under Section 501(c)(3) of the Internal Revenue Code of (or the corresponding provision of any future United States Internal Revenue Law) or: (b) by a corporation, contributions to which are deductible under Section 501 of the Internal Revenue Code of (c)(3) (or the corresponding provisions of any future United States Internal Revenue Laws).
5. Upon the dissolution of the corporation, the Board of Directors shall, after paying or making provision for the payment of all of the liabilities of the corporation, dispose of all its assets exclusively for the purposes of the corporation in such a manner, or to such organizations organized and operated exclusively for charitable, educational, religious or scientific purpose as shall at the time qualify as an exempt organization or organizations under section 501 of the Internal Revenue Code of (c)(3) (or the corresponding provision of any future United States Internal Revenue Laws) as the Board of Directors shall determine. Any such assets not disposed of shall be disposed of by the Superior Court of the county in which the principle office of the corporation is then located, exclusively for such purpose or to such organization or organizations, as said Court shall determine, which are organized and operated exclusively for such purpose.
6. The power of indemnification under the Arizona Revised Statutes shall not be denied or limited by the bylaws.
7. Board of Directors. The initial board of directors shall consist of 5 directors. The names and addresses of the persons who are to serve as the directors until the first annual meeting of the members, if a member corporation, or Board of Directors, if the corporation has no members, or until their successors are elected and qualifies are:

Julia Wiener, 29607 N. 48th Pl., Cave Creek, AZ. 85331
Shelly Richardson, 30601 N. 47th Pl., Cave Creek, AZ. 85331
Susan Haskell, 31030 N. 41st Pl., Cave Creek, AZ. 85331
Ann Harrington, 30219 N. 48th St., Cave Creek, AZ. 85331
Melody Carpenter, 7520 E. Desert Vista Dr., Scottsdale, AZ. 85255

The number of persons to serve on the board of directors thereafter shall be fixed by the Bylaws.
8. Known Place of Business (In Arizona). The street address of the known place of business of the Corporation is: 29607 N. 48th Pl., Cave Creek, AZ. 85331
9. Statutory Agent (In Arizona). The name and address of the statutory agent of the Corporation is: Julia Wiener, 29607 N. 48th Pl., Cave Creek, AZ. 85331.
10. Incorporators. The name and address of the incorporator is:

Julia Wiener
29607 N. 48th Place
Cave Creek, AZ. 85331

All powers, duties and responsibilities of the incorporators shall cease at the time of delivery of these Articles of Incorporation to the Arizona Corporation Commission.

900 Legal Notice

11. DISCRIMINATION: The corporation will not practice or permit discrimination on the basis of sex, age, race, national origin, religion, or physical handicap or disability.
12. MEMBERS. The corporation will not have members.

EXECUTED this 18th day of July, 1999 by all of the incorporators.
Signed: Julia Wiener
Acceptance of Appointment By Statutory Agent
The undersigned hereby acknowledges and accepts the appointment as statutory agent of the above-named corporation effective this 18 day of July 1999
Signed: Julia Wiener
Published Foothills Sentinel 9-15, 9-22, 9-29-99; Published Glendale Star 9-15, 9-22, 9-29-99.

Public Notice:
ARTICLES OF ORGANIZATION HAVE BEEN FILED IN THE OFFICE OF THE ARIZONA CORPORATION COMMISSION FOR

I
Name: Shea Consulting, LLC.
II
The address of the registered office is:
7119 East Shea Boulevard. #109-186
Scottsdale, AZ. 85254
The name and address of the Statutory Agent is:
James Flegenheimer
3501 West Ironwood Drive
Chandler, AZ. 85226
III
Management of the limited liability company is reserved to the members. The names and addresses of each person who is a member are
Roy Flegenheimer
7119 East Shea Boulevard. #109-186
Scottsdale, AZ. 85254
Published Foothills Sentinel 9-22, 9-29. 10-6-99; Published Glendale Star 9-22, 9-29, 10-6-99.

Public Notice:
APPLICATION FOR AUTHORITY TO TRANSACT BUSINESS IN ARIZONA

The name of the corporation is: Munkeboe Parti Linen & Neon Rentals, Inc.
We are a foreign corporation applying for authority to transact business in the state of Arizona.
1. The exact name of the foreign corporation is: Munkeboe Party Linen & Neon Rentals, Inc.
2. The name of the state, province or country in which the foreign corporation is incorporated is: Tennessee
3. The foreign corporation was incorporated on the 4th day of January, 1999 and the period of its duration is: Indefinite.
4. The street address of the principal office of the foreign corporation in the state, province or country of its incorporation is:

6339 Charlotte Pike
Nashville, TN. 37209

5. The name and street address of the statutory agent for the foreign corporation in Arizona is

Marleen E. Munkeboe
7483 Quien Sabe Way
Scottsdale, AZ. 85262

5.a. The street address of the known place of business of the foreign corporation in Arizona IF DIFFERENT from the street address of the statutory agent is:

7755 East Gelding Dr. Suite C102
Scottsdale, AZ. 85260

5.b. The Annual Report and general correspondence should be mailed to the address specified above in section 5.a.
7. The names and usual business addresses of the current directors and officers of the foreign corporation are:

Marleen E. Munkeboe - Board Member/President
7755 E. Gelding Dr., Suite C102
Scottsdale, AZ. 85260
Lisa Munkeboe-Schwartz - Secretary
6339 Charlotte Pike
Nashville, TN. 37209

8. The foreign corporation is authorized to issue 1,000 shares, itemized as follows: 1,000 shares of common (class or series) stock at x no par value or par value of 0 per share.
9. The foreign corporation has issued 1,000 shares, itemized as follows: 1,000 shares of common (class or series) stock at x no par value or par value of 50 per share.
10. The character of business the foreign corporation initially intends to conduct in Arizona is: Rentals of linens, chair covers & neon centerpieces.

DATED this 5th day of August, 1999.
Munkeboe Party Linens & Neon Rentals, Inc.
EXECUTED by: Marleen Munkeboe - President
Acceptance of Appointment By Statutory Agent
The undersigned hereby acknowledges and accepts the appointment as statutory agent of this corporation effective this 5th day of August, 1999.
Signed: Marleen Munkeboe
Published Foothills Sentinel 9-15, 9-22, 9-29-99; Published Glendale Star 9-15, 9-22, 9-29-99.

PUBLIC NOTICE:
ANNOUNCEMENT OF INTENT TO UPDATE FLOODPIAIN DELINEATION STUDY OF ANDORA HILLS AND GALLOWAY WASHES

The Flood Control District of Maricopa County (FCDMC), under authority of the National Flood Insurance Act of 1968 (PL-90-448), as amended, and the Flood Disaster Protection Act of 1973 (PL93-234)

900 Legal Notice

is funding a detailed re-study of flood hazard areas and has contracted JE Fuller/ Hydrology & Geomorphology, Inc. to carry out the study. The area encompasses Andora Hills Wash, from its confluence with Cave Creek to Carefree Drive and Galloway Wash from its confluence with Cave Creek to the Tonto National Forest boundary.

This study will reexamine and reevaluate the flood hazard areas for these two washes. The results will then be published to update the flood insurance rate maps (FIRMs) used by the Federal Emergency Management Agency (FEMA). The FIRMs will be used to determine flood insurance rates.

This announcement is intended to inform all interested persons and communities of the commencement of this study so that they may have an opportunity to bring any relevant technical information to the attention of the FCDMC/FEMA, to be considered during the course of this study. Your comments should be addressed to Mr. David Boggs, P.E., Project Manager at the Flood Control District of Maricopa County, 2801 West Durango Street, Phoenix, AZ., 85009, (602) 506-1501.

Published Foothills Sentinel 9-29, 10-6-99; Published Glendale Star 9-29, 10-6-99.

Public Notice:

900 Legal Notice

TOWN OF CAREFREE
ORDINANCE NUMBER 99-06

AN ORDINANCE OF THE MAYOR AND COUNCIL OF THE TOWN OF CAREFREE, MARICOPA COUNTY, ARIZONA, AMENDING CHAPTER 4 OF THE TOWN CODE OF THE TOWN OF CAREFREE, ARIZONA, BY ADOPTING ARTICLE 4-8 ENABLING THE MAGISTRATE COURT TO PASS ON TO DEFENDANTS THE TRANSACTION FEES (COSTS) INVOLVED WHEN TURNING OVER THOSE ACCOUNTS TO A "PRIVATE COLLECTION AGENCY" WHEN SAID ACCOUNTS ARE DELINQUENT FOR 120 DAYS OR MORE AND THE COURT HAS LITTLE OR NO HOPE OF COLLECTING ON ITS OWN AND DIRECTING THE TOWN CLERK OF THE TOWN OF CAREFREE TO INCORPORATE THE CHANGED ARTICLE 4-8 INTO THE TOWN CODE OF THE TOWN OF CAREFREE.

WHEREAS, Article 4-1 of the Town Code of the Town of Carefree, provides for the establishment of a Magistrate Court; and

WHEREAS, Article 2-1, of the Town Code empowers the Town Council to pass all necessary Ordinances to give effect to the provisions of said Article; and

WHEREAS, the Town Council has determined that it is necessary to adopt an Ordinance enabling the Magistrate Court to pass on to Defendants the transaction fees (costs) involved when turning over those accounts for collections to a "Private Collection Agency" in order to offset the cost of collections of fines, sanctions, and assessments which remain unpaid and result in additional costs for collection.

NOW, THEREFORE, BE IT ORDAINED by the Mayor and Common Council of the Town of Carefree, Maricopa County, Arizona, that Chapter 4 of the Town Code of the Town of Carefree is amended by adding THE NEW ARTICLE 4-8, which reads in its entirety as follows:

SECTION 4-8-1 PRIVATE COLLECTION AGENCY TRANSACTION FEES (COSTS):

(A) A defendant who defaults in his or her obligation for the payment of monies owed or due to the Magistrate Court, including but not limited to restitution, fines, sanctions, surcharges, assessments, penalties, bonds, costs, and/or fees, is liable for any and all fees and charges assessed by a "Private Collection Agency" that is licensed pursuant to Title 32, Chapter 9, Article 2, Arizona Revised Statutes, and that is engaged by the Magistrate Court to collect and enforce such payment. The collection fees and charges assessed by the "Private Collection Agency" shall be added to the sum or sums due from and chargeable against the defendant.

(B) A defendant who defaults in his or her obligation for the payment of monies owed or due to the Magistrate Court, including but not limited to restitution, fines, sanctions, surcharges, assessments, penalties, bonds, costs and/or fees, is liable for any and all fees and charges assessed by a duly licensed attorney, and who is engaged by the Magistrate Court to collect and enforce such payment. The "Private Collection Agency" fees and charges assessed by the attorney shall be added to the sum or sums due from and chargeable against the defendant.

BE IT FURTHER ORDAINED that the Town Clerk of the Town of Carefree incorporate the new wording for Section 4-8-1 into the Town Code of the Town of Carefree.

PASSED AND ADOPTED by the Mayor and Common Council of the Town of Carefree, Maricopa County, Arizona, this 7th day of SEPTEMBER, 1999.

6 AYES; 0 NOES; 0 ABSTENTIONS; 1 ABSENT

Signed: Edward C. Morgan, Mayor

ATTEST:

Signed: Elizabeth L. Wise, Town Clerk

APPROVED AS TO FORM:

Signed: Stephen A. Myers, Town Attorney

Published Foothills Sentinel 9-22, 9-29-99;

900 Legal Notice

Published Glendale Star 9-22, 9-29-99.

Public Notice:

ARTICLES OF INCORPORATION OF ATMYER PROPERTY COMPANY, INC

ARTICLE I

NAME: The name of the corporation is A PROPERTY COMPANY, Inc.

ARTICLE 2

PURPOSE: The purpose for which this corpo organized is the transaction of any and all law ness for which corporations may be incor under the laws of the State of Arizona, as a from time to time, and under the laws of ar states in which the corporation may qualify to ness.

ARTICLE 3

INITIAL BUSINESS: The corporation initially in engage in the business of purchase, sale ar agement of real estate, and activities related t

ARTICLE 4

AUTHORIZED CAPITAL: The Corporation sh the authority to issue up to one thousand shares of common stock with no par valu shares shall be issued for such consic expressed in dollars as may be fixed from time by the shareholders of the corporation, by the

Service Directory

5 lines–$34.68 for 4-wk. mo. ($1.70 per line, per week)

Cancellation of ads must be in writing.

Advertisers: Your sales message here will be mailed directly to the homes in Carefree, Cave Creek, Troon, Troon North, Terravita, Tatum Ranch, & Rio Verde.

Appliance Repair

RICK'S APPLIANCE
Servicing All Major Brands
Including Scottsman Ice Makers
Licensed, Insured with over 20 years experience. Call Charlie @ 623-581-8140

Appliances

BEST HOME APPLIANCES
G.E., Hot Point, Major Brands
Built-ins, Wall ovens, Cooktops
Washers, Dryers, Ranges-Gas & Electric
Side by Side Top Mnt. Refrigerators
WalMart Ctr., Tatum & Bell 602-482-2737

Asphalt Paving

BLACK MOUNTAIN PAVING INC.
Spec. in Tennis Courts, Parking Lots, Driveways, Seal Coat and Patching
Call Us Today• 488-3627 • Kevin Willer
Licensed • Bonded • Insured
Res. Lic. 087858 • Com. Lic. 087869

Auto Parts

CONTINENTAL AUTO PARTS
LINCOLN • Air Suspension Repairs & Used Lincoln Parts
• Full Time Mechanic on duty
Buckeye & 19th Ave. • 816 S. 19th Ave.
253-9504

Backhoe

BACKHOE SERVICE
Prompt response Guaranteed
Cave Creek, Carefree, N. Scottsdale
Call 480-575-9054
or Mobile 602-430-4718

KIB BACKHOE & GRADING
Grade Tractor • Backhoe • Septic Systems
Lot Clearing • Trenching • Fine Grading
Free Estimates • Reasonable • Quality Work
465-7892 Licensed & Bonded 250-7969 pgr

Barber

Joe's Village Square Barber Shop
6061 E. Cave Creek
480-488-2171

Barber

Little Barber Shop
Specialist in all Hair Types
595-8986
David Mon-Sat 9am-5:30pm
Los Portales Mall Street Level • Ste 221 99 Easy Street • Carefree

Bookkeeping Service

CUSTOM BOOKKEEPING SERVICES
Small Business Accounting
Monthly Financial Statements
Payroll • Quarterly Reports • Sales Tax
Carefree Office Center • 488-4397

Building Contracting

DESIGN BUILD
Need a Project Done Quickly?
Call and We Will Response Immediately.
License, Bonded and Insured.
480-595-5795

Cabinetry

CLASSIC WOODCRAFT
Furniture • Cabinetry • Doors, Entertainment Centers • Home Offices, Bookcases • 25 yrs. Local Experience
Good Work at Fair Prices 480-488-5568

Carpet Cleaning

Commercial • Residential
10 yr. Carpet Cleaning Experience!
Free Estimates • 24 hr Emer. Service
Locally Owned & Operated
KUNKEL CARPET CLEANING • *515-9999*

Coffee Shop

Birds Nest Coffee House
Breakfast & Lunch
M-F • 7-2 - Sat • 8-1
480/488-7993
6140 E. Cave Creek Rd

Computers

PC HELP - HOME OR BUSINESS
Training • Internet • E-Mail
Pre-Buy Advice • Set-up • Installation
Maint. • Upgrades • Troubleshooting
Bob @ 563-2606

Concrete

DECORATIVE • FOUNDATION
Room Additions • Custom Homes
Driveways • And More
Quality Workmanship
Ron • 602-678-0193 • 602-692-7271

Decks and Patio Covers

SCOTT FRANCIS CONSTRUCTION
Decks, Patio Covers & Spa Decks
Storage, Room Additions & Remodeling.
Licensed * Bonded * Insured
602-419-1414, Mbl. 602-740-3343

DumpTruck/Grading

WE DO IT ALL!!
Grading/Dump Truck Service
Backhoe/Bobcat Available
No Job Too Big or Small
Free Estimates, Call:
Scott: 602-717-2222 or
Jack: 602-763-5218

Employment

Have Fun and Earn Extra Money
on weekends demonstrating a variety of products in supermarkets. Must drive and have card table. College Students, Housewives and Retirees needed. Call Judy 566-7710 from 8-5.

Fencing

ELROD FENCE CO.
Free Estimates
Chain Link • Wood Fencing
Ornamental Iron & Repairs
Brad Elrod
Az Lic 103546
Fax (602) 585-7529
P.O. Box 7318
Cave Creek, AZ 85327
569-0103

GENERAL FENCE CO.
Chain Link Ornamental Iron • Gates
Horse Corrals • Split Rail • Repairs
Materials and Installation
Licensed/Bonded/Insured
488-6521

Flooring

Carpet, Tile, Vinyl, Wood • Free Estimates
Berber Installed for $12.99/yd
10 yr. Carpet Cleaning Experience!
CAREFREE FLOORS
Call for Appt. *515-9999*

SOUTHWEST INTERIORS & FLOORING
Tile, Nat.Stone, Carpet, Wood, Granite
Free Estimate. Professional Installations
Stain Resistant Carpet Instld for $12.50 per yrd
Ceramic Tile Installed For $3.75 Per Sq. Ft.
Showroom at 7202 E. Ho Rd.,Carefree
Ph# 595-2678 or Mbl. 402-2500

Firewood

JUNIPER, CEDAR, ALLIGATOR
Seasoned, Split, Full & Half Cords
A Cord is 4'Hx4'x8'L
Not Two Rows that are 20"wx4'hx8"L
Local Resident 29 years * 480-488-9287

Handyman

D & D MAINTENANCE SERVICES
Electrical, Hardware, Plumbing, Minor A/C, Punch List Repairs.
Serving the Desert Foothills Area.
(602) 686-4797.Lic. & Insd.

Hauling-Cleanup

PROP. DETAIL REMOVE: Yard Debris, Move-In, Move-Out & Const. Debris
Also 1 Time Landscape Clean-Up
Granite Topdress. Hauling Cost: $100/load. Concrete, Dirt, Etc. $150
Matt 480-964-5181 • Mbl.602-577-8950

YOU NAME IT WE HAUL IT!
Dirt, Concrete, Misc. Debris
Tractor and Bobcat Work Available
Call for Estimate.
570-6685

Healthcare

Carefree Assisted Living Home
"Quality Loving Care & Old World Charm in a Family Atmosphere."
480/502-7959
8038 E. Happy Valley Road • Scottsdale, AZ

Healthcare

SC HOMECAR
Up to 24 hour care, 7 days a week
Residing in your neighborhood, serving your neighb
7518-B Elbow Bend • Ste 4 • (behind Carefree Creek
480/575-9650

Home Improvemen

HEARTWOOD CONSTRUCTIO
Quality Craftsmanship & Desig
20 yrs. Experience. Kitchens, Bat
Ceramic Tile, Etc. No Job Too Sn
Lic. & Bonded. Call Jerry 602-369-

Housekeeping

DAVIDSON RESIDENTIAL CLEAI
Summer Special • Move-in or Move
Weekly, Bi-weekly or One-time Cle
Bonded & Insured Personnel
Jenece • 602/870-7689 • 602/585-

ELEGANT TOUCH HOME SRV.,
Custom Housecleaning
Bonded and Insured
Serving Carefree & Cave Cree
Since 1983
480-488-3893

Internet Services

TNT NETWORK, L.L.C.
Web Site Design and Upgrade
Online Databases • Consultin
Internet Marketing • E-Commer
480-488-4893 • email: tnt@carefre
http://www.tntnetwork.com

Irrigation

HIGH WATER BILL? We can help yc the most out of your irrigation syste
• Certified Water Auditor
• Over 10 Years Experience with Tr Shooting and Problem Solving
We Can Evaluate and Upgrade Y Present System or Install a New On ing Up to Date, High Efficiently Pe Com#A-21 126280; Res#C-21 10C
Call Earth Care Today: 488-291

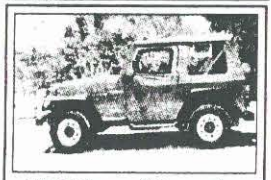
Kennels

SHARON'S DOG RESORT & GROO
Large individual indoor/outdoor n
Heated & Cooled
24 hour around the clock care
623-465-7283

SPRINGBROOK KENNELS
Lic. Vet Technician to care for Your Dogs & Cats in Country Atmosp
Grooming/Pickup/Delivery Availa
Lue Jeanne Brooks*488-1780*615-

750 Trucks/4 Wheel Drive

99 GRAND LAREDO. Off road suspension only 5,000 miles, tax and tags paid, orig. owner, warranty, $26,000 623-374-9656



1997 Jeep Wrangler
For Sale by Owner
Excellent condition,
AC, sound package,
5 speed, 4 wheel drive
$12,900 • 480-595-8399

1995 DODGE RAM 1500. Std cab, long bed, 360 V-8, 3.9 limited slip axle, A/T all power options. Tow package, bed liner, much more, $14,900, 480-502-2543

1990 DODGE 1/2 ton 4x4. 19,000 orig. mi. V-6, 4-speed, AC, PS, PB, longbed. 5 new Goodyear ATS radials. Ex-gout. vehicle. $6000 obo, 623-465-8719

1992 Mazda Navaho - 4WD
(Same as Ford Explorer)
91K miles. New AC.
Great Condition. 2 door.
$6400. 585-7573.

86 FORD F350 Dually. New clutch, rear end, tires, battery, windshield. Moving, must sell. $6500 firm. 465-5820

1975 IMPERIAL & parts car. Antique gas pumps. 623-253-8790.

81 NISSAN 280ZX Turbo, 200K miles, runs strong. New alternator, 2 new tires, auto, leather, PS, PB, PW, t-tops, 16" wheels. $1100 obo 480-585-2161.

755 Utility Trailers/Campers

93 HUDSON SINGLE axle trailer. 5000 lbs GVW. Built in ramp, winch, electric brakes, tool box. $700. 480-585-7826.

STOCKLAND CAMPER SHELL, fiberglass fits 88-98 Chevy shortbed pickup. 2 sliding windows, locking rear window, exc. cond. $400 obo 480-585-5859

UTILITY TRAILERS. SMALL, $115; P.U. size, $300; Lage, $500. 623-465-7705.

UTILITY TRAILER, 5X8'. Wood sides 2' high. Metal frame, gate, full size tires, wheel-jack. 1 yr old. New $1200 sell $800. 480-595-9763

CAB OVER CAMPER. 4 Star model. Sleeps 4-6. Gas, elec, stove, oven, 2 way refrigerator, cooler, 4 jacks. $600. 480-[illegible]83

HILLSBORO HEAVY duty con[illegible]on trailer. Very good condition. New $10,500 asking $4995. obo. Call 623-374-9243.

CAMPER SHELL, AERODYNAMIC design fits Toyota or other 76" beds. 2 sliding windows, locking back window, white fiberglass. $250. 623-465-9097

OVERHEAD CAMPER NEEDS work, $300. 623-582-3812

760 Vans

95 AERO STAR XLT. 79,000 miles. Real beauty. $10,500. 520-634-4150 or 602-407-5051.

1997 CHEVY ASTRO. 8 passenger van. Dual air, runs great, 13,500 obo. 480-502-5607

1992 PLYMOUTH VOYAGER SE 7 passenger, P/S, P/B, A/T, P/DL, A/C, CC, Tinted windows. White with blue, excellent condition, $5500 480-502-2543

1983 FORD E150 conversion, runs great, looks good. $2200 OBO. 623-374-5428.

900 Legals

Public Notice:
ARTICLES OF ORGANIZATION HAVE BEEN FILED IN THE OFFICE OF THE ARIZONA CORPORATION COMMISSION FOR

I

Name: American Advantage Insurance Innovators, LLC.

II

The address of the registered office is:
5420 E. Larkspur
Scottsdale, AZ. 85254
The name and address of the Statutory Agent is:
Steve Colten
5420 E. Larkspur
Scottsdale, AZ. 85254

III

Management of the limited liability company is reserved to the members. The names and addresses of each person who is a member are:
Steve Colten
5420 E. Larkspur
Scottsdale, AZ. 85254
Published Foothills Sentinel 10-6, 10-13, 10-20-99.
Published Glendale Star 10-6, 10-13, 10-20-99.

PUBLIC NOTICE:
ANNOUNCEMENT OF INTENT TO UPDATE FLOODPIAIN DELINEATION STUDY OF ANDORA HILLS AND GALLOWAY WASHES

The Flood Control District of Maricopa County (FCDMC), under authority of the National Flood Insurance Act of 1968 (PL-90-448), as amended, and the Flood Disaster Protection Act of 1973 (PL93-234) is funding a detailed re-study of flood hazard areas and has contracted JE Fuller/ Hydrology & Geomorphology, Inc. to carry out the study. The area encompasses Andora Hills Wash, from its confluence with Cave Creek to Carefree Drive and Galloway Wash from its confluence with Cave Creek to the Tonto National Forest boundary.

This study will reexamine and reevaluate the flood hazard areas for these two washes. The results will then be published to update the flood insurance rate maps (FIRMs) used by the Federal Emergency Management Agency (FEMA). The FIRMs will be used to determine flood insurance rates.

This announcement is intended to inform all interested persons and communities of the commencement of this study so that they may have an opportunity to bring any relevant technical information to the attention of the FCDMC/FEMA, to be considered during the course of this study. Your comments should be addressed to Mr. David Boggs, P.E., Project Manager at the Flood Control District of Maricopa County, 2801 West Durango Street, Phoenix, AZ., 85009, (602) 506-1501.

Published Foothills Sentinel 9-29, 10-6-99; Published Glendale Star 9-29, 10-6-99.

Public Notice:
TOWN OF CAREFREE, ARIZONA
ORDINANCE NUMBER 99-05

AN ORDINANCE OF THE MAYOR AND CITY COUNCIL OF THE TOWN OF CAREFREE, MARICOPA COUNTY, ARIZONA, ADDING ARTICLE 5-4, REGULATING THE ACTIVITIES AND RESPONSIBILITIES OF THOSE PERSONS WHO PURCHASE, RENT, OR USE ALARM SYSTEM DEVICES OR SERVICES, SECTION 5-4-1 THROUGH 5-4-10 TO THE TOWN CODE OF THE TOWN OF CAREFREE, AND PROVIDING FOR THE REPEAL OF ANY AND ALL CODE PROVISIONS AND ORDINANCES IN CONFLICT, AND DIRECTING THE TOWN CLERK OF THE TOWN OF CAREFREE TO INCORPORATE THE ADDITION OF ARTICLE 5-4 AND SECTIONS 5-4-1 THROUGH 5-4-10 INTO THE TOWN CODE OF THE TOWN OF CAREFREE.

WHEREAS, it is the intent of this Ordinance to encourage the improvement in reliability of alarm systems, devices, and services to reduce the incidence of false alarms at businesses and residential structures, thereby ensuring that police personnel will not be diverted from responding to actual criminal activity.

NOW, THEREFORE, BE IT ORDAINED BY THE MAYOR AND TOWN COUNCIL OF THE TOWN OF CAREFREE, MARICOPA COUNTY, ARIZONA THAT:

Article 5-4 REGULATING THE ACTIVITIES AND RESPONSIBILITIES OF THOSE PERSONS WHO PURCHASE, RENT, OR USE ALARM SYSTEM DEVICES OR SERVICES

Section 5-4-1 through Section 5-4-10 is hereby created and added to Title 5, Health and Safety, of the Town Code of the Town of Carefree as follows:

Section 5-4-1 Definitions.

The following words and phrases, whenever used in this section, shall be construed as defined in this section:

A. Act of Nature - means an unusual, extraordinary, sudden and unexpected manifestation of the forces of nature, the effects of which cannot be prevented by reasonable human care, skill or foresight.

B. Alarm System - Means any mechanical or electrical device which is used for the detection of smoke, fire or unauthorized entry into a building or other facility or for alerting others to the occurrence of fire or a medical emergency or the commission of an unlawful act within a building or other facility and which is designed to emit an outside audible alarm or transmits a signal or message when actuated. "Alarm Systems" include direct dial telephone devices, audible alarms and proprietor alarms.

C. Alarm User - means any person who purchases, leases, contracts for, otherwise obtains, or uses an alarm system.

D. Burglar Alarm System - means an alarm system signaling an entry or attempted entry to the area protected by a system.

E. Common Cause - means a technical difficulty or malfunction which causes an alarm system to generate a series of false alarms.

F. False Alarm - means any activation of an alarm not caused by or as a result of a criminal act, fire, unauthorized entry, or act of nature except for activation when the Fire or Sheriff's Departments have been given advance notice of such testing or activation caused by the Fire or Sheriff's Departments.

G. Fire Alarm System - means an alarm system designed to detect, and cause to be reported to the Fire Department or Emergency Communications Center, a fire alarm condition. "Fire Alarm System" does not include single station detectors or outside audible alarm sounding devices not connected to a central monitoring station.

H. Panic Alarm - means any device or system designed to be victim activated to alert others of the existence of an emergency.

I. Robbery Alarm System - means an alarm system signaling a robbery or holdup or attempted robbery wherein a personal confrontation is occurring. Such a system may include the use of a panic button activation device.

Section 5-4-2 Alarm User Responsibilities

The user of any alarm system, whether at a business or residence, shall be responsible for instructing all persons who are authorized to place the device or system into operation in the appropriate method of operation, advising them of the provisions of this article, and emphasizing the importance of avoiding false alarms. The operator shall maintain the alarm equipment in proper working order at all times so as to minimize the occurrence of false alarms.

The alarm system operation instructions shall be maintained on the premises.

The user shall post or provide to persons authorized to place the alarm system or device, into operation the phone numbers for:

1. Town Sheriff's Department and Fire Department.
2. The alarm business twenty-four hour service number.

The user shall notify the Sheriff's Department of the name and telephone number of the primary person, and at least one alternate, to be notified in the case the alarm is activated.

The user shall inactivate or cause to be inactivated the alarm system within fifteen (15) minutes of notification of its activation.

Section 5-4-3 Regulations

A. It shall be unlawful for any person to intentionally activate any burglar, robbery, fire or panic alarm; except to warn of a fire, criminal act or unauthorized entry in or into an alarm protected premises. This subsection shall not apply to the testing of an alarm system when the Fire or Sheriff's Departments have been given advance notice of such testing.

B. No person shall install, use, or cause to be used, any telephone device or telephone attachment that automatically selects or dials the Emergency 911 telephone number, or any Town of Carefree telephone number and then reproduces any pre-recorded message or signal.

Section 5-4-4 Penalty

A. When an alarm system generates two (2) false alarms within a calendar year, the Marshal's Office shall send a warning notice to the alarm user that two (2) subsequent false alarms within said period will subject the notified party to the sanctions as provided herein.

B. Any alarm system which has four (4) or more false alarms within a calendar year, shall be subject to penalty assessments as hereinafter provided.

If the Marshal's Office records four (4) false alarms within a calendar year for any alarm system, the Town Marshal or a designee shall notify the alarm user by certified mail of such fact. The Town Marshal or a designee shall direct that the alarm user within ten (10) days of receipt of the notice of excessive false alarms, to pay a penalty assessment to the Town of Carefree in the sum of twenty-five Dollars ($25.00). The alarm user shall be required to pay a penalty assessment of fifty dollars ($50.00) for each subsequent false alarm within the same calendar year.

In the event the assessment is not tendered within ten (10) days of receipt of notice, the unpaid balance will be subject to a charge of one and one half percent (1.5%) interest per month, in addition to the assessment.

C. A report from the Fire or Sheriff's Departments documenting a response to an alarm which revealed no evidence of a fire, criminal act or unlawful entry shall constitute prima facie evidence of a false alarm.

D. Evidence that a false alarm was caused by an act of nature, common cause or action of the Telephone Company may be presented as a defense to the counting of such an alarm as a false alarm.

Section 5-4-5 Penalty Assessment Appeal

Any party aggrieved by the decision resulting in a penalty assessment, may request a hearing on the penalty assessment by filing a written request for a hearing within ten (10) days of receipt of such penalty. The request shall be filed, in writing, with the Town Marshal or designee.

The request for hearing shall include a statement of the reason or reasons that the alarm user believes justify reduction or waiver of the penalty assessment. The alarm user shall describe, if applicable, what actions have been taken to discover and eliminate such alarm activation in the future.

In the event that the Town Marshal or designee finds that grounds exist justifying relief from the penalty assessment, the alarm user shall not be responsible for payment.

Section 5-4-6 Grace Period.

Newly installed and reinstalled alarm systems shall not be subject to the provision of this section relating to counting and assessment of false alarms for a period of thirty (30) days from the date the alarm system becomes operational if the alarm owner notifies the Town Marshal in writing within then (10) days of the completion of the installation or reinstallation. The written notice shall specify the date the system was installed or reinstalled and if reinstalled, the notice shall also describe the nature and extent of the reinstallation.

Alarm installation companies shall provide written notice to owner of the requirement to give the Town written notice of installation and reinstallation.

Section 5-4-7 Exemptions.

The provisions of the Ordinance shall not be applicable to audible alarms affixed to automobiles and audible fire or burglar alarms which are not connected to a central monitoring station.

Section 5-4-8 Liability of the Town of Carefree

The Fire and Sheriff's Departments shall take every reasonable precaution to assure the alarm notifications received are given appropriate attention and are acted upon with dispatch. Nevertheless the Town of Carefree shall not be liable for any failure, or neglect to respond appropriately upon receipt of an alarm notification.

Section 5-4-9 Severability

If any subsection, sentence, clause, phrase or portion of this ordinance is for any reason held to be invalid or unconstitutional by the decision of any court of competent jurisdiction, such decision shall not effect the validity of the remaining portions of this Ordinance.

Section 5-4-10 Repeal

All ordinances, parts of ordinances and parts of the Town of Carefree Code in conflict herein are repealed to the extent of such conflict.

BEE IT FURTHER ORDAINED that the Town Clerk of the Town of Carefree incorporate the new wording for Article 5-4 and Section 5-4-1 through 5-4-10 into the Town Code of the Town of Carefree.

PASSED AND ADOPTED BY the Mayor and Common Council of the Town of Carefree, Arizona, this 7th day of September, 1999.

Ayes 5 Noes 0 Abstentions 0 Absent 2

TOWN OF CAREFREE
Signed: Edward C. Morgan, Mayor
ATTEST
Signed: Elizabeth L. Wise, Town Clerk
APPROVED AS TO FORM.
Signed: Stephen A. Myers, Town Attorney
Published Foothills Sentinel 10-6, 10-13-99; Published Glendale

Public Notice:
IN THE SUPERIOR COURT OF THE STATE OF ARIZONA IN AND FOR THE COUNTY OF MARICOPA

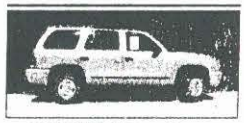
No. BP99-03747
NOTICE TO CREDITORS
In the Matter of the Estates of:
LEMUEL L. STROUD AND BEATRICE M. STROUD, husband and wife, Deceased.

NOTICE IS HEREBY GIVEN that SHERI STROUD has been appointed Personal Representative of this Estate. All persons having claims against these Estates are required to present their claims within four months after the first publication of this notice or the claims will be forever barred. Claims must be presented by delivering or mailing a written statement of the claim to the Personal Representative's attorney: James M. Mack, P.O. Box 3608, Carefree, Arizona 85377.

Dated this 16th day of September, 1999.
Signed: James M. Mack
P.O. Box 3608
Carefree, AZ. 85377
Attorney for the Personal Representative
Published Foothills Sentinel 9-22, 9-29, 10-6-99; Published Glendale Star 9-22, 9-29, 10-6-99.

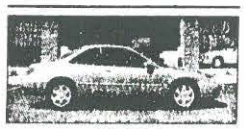
Budget
Car and Truck Sales
15500 N. Hayden Rd.
Scottsdale, AZ
(480) 607-1616

1999 Cadillac Deville
Like New. Travel with On-Star system and save thousands.
$30,088
Call Budget Today!



1999 Dodge Durango
V8 and Fully Loaded. Low Miles and Factory Warranty. Big Savings!
$27,995
Take a Test Drive Today!

Chrysler Sebring Convertible
Fun in the Sun with this Hot JXI Sebring. Loaded and ready for the road.
$21,995
Hurry!



1997 Acura CL
2.2 with Automatic and Low Miles. Perfect condition with leather, sun-roof & CD
ONLY:
$18,995

Memorandum **JE Fuller/ Hydrology & Geomorphology, Inc.**

DATE: October 4, 1999

TO: David Boggs, P.E.
Linda Hannan

FROM: Brian Iserman, P.E. Bri 10/4/99

RE: **Floodplain Delineation Study of Andora Hills & Galloway Washes, FCD-99-14**

CC: Jon Fuller, P.E.

The following summarizes the status of the referenced project through September, 1999.

Floodplain Delineation Study of Andora Hills & Galloway Washes **Project Status** **JEFuller/ Hydrology & Geomorphology, Inc.**	
Task #	**Estimated Percent Complete**
1 – Coordination	20 %
2 – Data Collection	50 %
3 – Topographic Mapping	15 %
4 – Field Survey	65 %
5 – Hydrology	15 %
6 – Floodplain Delineation	0 %
7 – GIS Conversion	0 %
8 – Deliverables	0 %
Total:	19 %

Problems Encountered:

No problems encountered

Tasks Completed this Month:

Task 1: Coordination

Received verbal notice to proceed from Dortha Klaahsen on September 3, 1999. Written notice to proceed is dated September 8, 1999. Held project kickoff meeting at the District September 7, 1999. JEF team meeting was held on September 9, 1999. Legal advertisements were ordered; the first advertisements ran in the Foothills Sentinel on September 29, 1999 and the Arizona Business Gazette September 30, 1999. The adds will run again on October 6, 1999 and October 7, 1999 in the Sentinel and the Gazette respectively. Received confirmation via e-mail that a mass mailing to property owners is not warranted at this time. Dave Johnson noted via e-mail that it should wait until after we have study results. Project schedule and project billing estimate were mailed September 13, 1999. Requested and received digital data from the HIS Branch.

Task 2: Data Collection

JEF has collected all existing hydrologic and hydraulic reports and FIS maps and data for the study area.

Task 3: Topographic Mapping

Aerial photography was flown on September 30, 1999.

Task 4: Field Survey

Survey work began on September 20, 1999. Panels were set by September 29, 1999. Four culverts have been surveyed for as-built plan preparation.

Task 5: Hydrology

Completed hydrology reconnaissance field trip with District staff on September 20, 1999. Prepared sub-basin delineation for Galloway watershed.

Task 6: Floodplain Delineation

No work has been completed for this task yet.

Tasks Scheduled for Next Month:

- **Continue coordinating project team**
- **Complete data collection report**
- **Continue Topographic Mapping**
- **Complete Field Survey**
- **Complete Hydrologic Modeling**

AFFIDAVIT OF PUBLICATION

COPY OF NOTICE

Announcement of Intent to Update
Floodplain Delineation Study of
Andora Hills and Galloway Washes

State of Arizona)
)ss
County of Maricopa)

I, **Ellen B. Parker**, being duly sworn, depose and say that I am Acting Publisher of the **Foothills Sentinel**, a weekly newspaper of general circulation and published every Wednesday at Cave Creek, Maricopa County, Arizona, and that the notice attached hereto, was published in said newspaper for __2___ consecutive weeks, the first publication having been made on September 29 and the last on October 6. That said notice was published in the regular and entire issue of every number of the paper during the period and times of publication, and that the same was published in the newspaper proper and not supplement.

Ellen B. Parker

Ellen B. Parker, Acting Publisher

State of Arizona)
)ss
County of Maricopa)

This instrument was acknowledged before me this 8th day of October, 1999 by **Ellen B. Parker.**

In witness whereof I herewith set my hand and official seal.

Dawn L Kolter, Notary Public.

JEFuller / Hydrology & Geomorphology, Inc.

5235 South Kyrene, Suite 205
Tempe, AZ 85283
602-752-2124 (voice)
602-839-2193 (fax)
jefuller@aol.com (email)

October 19, 1999

TRANSMITTAL

Flood Control District of Maricopa County
ATT: David Boggs, P.E.
2801 W. Durango
Phoenix, AZ 85009

Attached are the following materials provided by JEFuller/ Hydrology & Geomorphology, Inc.:

1. Affidavits of Publication for legal adds placed in the Arizona Business Gazette and the Foothills Sentinel for the Floodplain Delineation Study of Andora Hills & Galloway Washes, FCD 99-14.
2. Two copies of updated project schedule for FCD 99-14 which reflect minor changes to schedule for Tasks 1, 3, 4 and 5.

Brian R. Iserman

Brian Iserman, P.E.

10/19/99

Date

JEFuller / Hydrology & Geomorphology, Inc.

5235 South Kyrene, Suite 205
Tempe, AZ 85283
480-752-2124 (voice)
480-839-2193 (fax)
www.jefuller.com

October 20, 1999

TRANSMITTAL

Frank Brown, P.E.
Dibble & Associates

Attached are the following materials provided by JEFuller/ Hydrology & Geomorphology, Inc.:

1 set of stereo aerial photos for Floodplain Delineation of Andora Hills & Galloway Washes, FCD 99-14. These are being loaned for your use.

Brian K. Iserman

Brian Iserman, P.E.

10/20/99

Date

Memorandum **JE Fuller/ Hydrology & Geomorphology, Inc.**

DATE: October 29, 1999

TO: David Boggs, P.E.
Linda Hannan

FROM: Brian Iserman, P.E. bri 10/29/99

RE: **Floodplain Delineation Study of Andora Hills & Galloway Washes, FCD-99-14**

CC: Jon Fuller, P.E.

The following summarizes the status of the referenced project through October, 1999.

Floodplain Delineation Study of Andora Hills & Galloway Washes Project Status JEFuller/ Hydrology & Geomorphology, Inc.	
Task #	**Estimated Percent Complete**
1 – Coordination	25 %
2 – Data Collection	75 %
3 – Topographic Mapping	20 %
4 – Field Survey	80 %
5 – Hydrology	50 %
6 – Floodplain Delineation	0 %
7 – GIS Conversion	0 %
8 – Deliverables	0 %
Total:	25 %

Problems Encountered:

A bust in the bench loop was found. This seems to be the result of a discrepancy between the existing older FEMA RMs and the newer RMs associated with the survey done for the 1997 Cave Creek Mapping. A-Team is working to resolve the conflict. As a result, the photogrametric work has not been started yet.

Tasks Completed this Month:

Task 1: Coordination

Continued coordination between surveyor and mapping company. Updated project schedule. Completed legal advertisements and delivered affidavits of publication to the District.

Task 2: Data Collection

Performed some follow up data collection at Cave Creek Museum, and obtained data from upper watershed culvert design

Task 3: Topographic Mapping

Verified extents of mapping for photogrammetrist. Photogrammetrist has coordinated panel identification with the surveyor. Two panels were obscured, so follow-up panel location and identification is being performed.

Task 4: Field Survey

A review of the new aerial photography revealed three additional structures which need to have as-built surveys performed. Surveyor continued working on in-office computations and preparation of the survey report. Surveyor continued work to resolve apparent bust (approximately 0.3 foot) between older FEMA RMs and newer RMs.

Task 5: Hydrology

Completed preliminary HEC-1 modeling and performed some limited model sensitivity analysis and made comparisons between the 24-hour and the 6-hour storm events. Prepared model along with maps for submittal to the District for review. Attended second hydrology meeting to present basin delineation. This meeting also served as a general project coordination meeting as well.

Task 6: Floodplain Delineation

Performed reconnaissance to three additional structures to verify location and structure type for surveyor.

Tasks Scheduled for Next Month:

- **Continue coordinating project team**
- **Complete data collection report**
- **Continue Topographic Mapping**
- **Complete Field Survey**
- **Complete Hydrologic Modeling**

Subject: Andora Hoills/Galloway Wash FDS
Date: Wed, 3 Nov 1999 14:26:56 -0700
From: David Boggs - FCDX <dbb@mail.maricopa.gov>
To: "'brian@jefuller.com'" <brian@jefuller.com>

I've scheduled a meeting Wed. 11/10/99 at 10 AM to discuss the survey issues for the project.

Let me know how many brass caps you'll need, so I can arrange to have them ready for collection.

Thanks,

David

Subject: FW: Seive Analysis of Bed Material for Galloway Wash (Cave Creek Area)
Date: Fri, 19 Nov 1999 13:37:31 -0700
From: David Boggs - FCDX <dbb@mail.maricopa.gov>
To: "'brian@jefuller.com'" <brian@jefuller.com>
CC: Lynn Thomas - FCDX <lmt@mail.maricopa.gov>

Brian:

Warren Rosenbraugh, P.E. is in charge of the geotech lab on-call. Ed Raleigh said we could use this on-call for the Galloway sediment samples we discussed. Lynn Thomas, P.E. works in regulatory & is concerned with erosion set backs in Galloway Wash. If you can't get in touch with me when you take samples, contact Lynn directly at 506-4779. She may want to go along to get the samples, or at least locate the sampling locations on a map. I'll be in Washington DC Dec 5-10 for a FEMA course, so if you go to the field during that time, contact Lynn directly.

Warren is going to start the preliminary task assignment with the geotech lab to get the gradation analysis performed. If you guys encounter any glitches in my absence, see Ed Raleigh. He's aware of this effort & has been supportive.

Thanks

David

> *-----Original Message-----*
> *From: David Boggs - FCDX*
> *Sent: Friday, November 19, 1999 1:07 PM*
> *To: Warren Rosebraugh - FCDX*
> *Cc: Lynn Thomas - FCDX; Ed Raleigh - FCDX; Dave Johnson - FCDX*
> *Subject: Seive Analysis of Bed Material for Galloway Wash (Cave Creek Area)*
>
> *Warren:*
>
> *Further to our discussion, we would like to have 3 sediment samples analyzed using the on-call geotechnical services. The samples can be delivered to FCD or the lab by our study consultant (JE Fuller). Samples will be about 1 cubic foot each in volume. We would like to define the gradation curve, so % passing seive nos. 200, 140, 100, 70, 50, 40, 30, 20, 16, 14, 10, 8, 6, 4, and 3 would be useful, as well as %<3/8" and %< 1/2" would be enough. Samples would be collected in the 1st week of Jan (approx) & could be stored here until analysis can be arranged, if necessay.*
>
> *The material is from the bedload of Galloway Wash, and would be used as input to a HEC-6 model to be developed in-house to check long-term streambed aggredation/degradation.*
>
> *If you need additional info, let me know. If I'm not here, ask Lynn Thomas.*
>
> *Thanks,*
>
> *D Boggs*

Memorandum **JE Fuller/ Hydrology & Geomorphology, Inc.**

DATE: December 1, 1999

TO: David Boggs, P.E.
Linda Hannan

FROM: Brian Iserman, P.E. BKI 12/1/99

RE: **Floodplain Delineation Study of Andora Hills & Galloway Washes, FCD-99-14**

CC: Jon Fuller, P.E.

The following summarizes the status of the referenced project through November, 1999.

Floodplain Delineation Study of Andora Hills & Galloway Washes **Project Status** **JEFuller/ Hydrology & Geomorphology, Inc.**	
Task #	**Estimated Percent Complete**
1 – Coordination	30 %
2 – Data Collection	75 %
3 – Topographic Mapping	90 %
4 – Field Survey	85 %
5 – Hydrology	50 %
6 – Floodplain Delineation	0 %
7 – GIS Conversion	0 %
8 – Deliverables	0 %
Total:	38 %

Problems Encountered:

A bust in the bench loop was found. This seems to be the result of a discrepancy between the existing older FEMA RMs and the newer RMs associated with the survey done for the 1997 Cave Creek Mapping. A-Team has performed further work to verify the results and is preparing documentation for the TDN to explain the discrepancy.

Tasks Completed this Month:

Task 1: Coordination

Continued coordination between surveyor and mapping company. Updated project schedule.

Task 2: Data Collection

No further data collection tasks were undertaken this month.

Task 3: Topographic Mapping

Topographic mapping is complete except for edge match to existing Cave Creek topo.

Task 4: Field Survey

Three additional structures were surveyed for as-built preparation

Task 5: Hydrology

District Review

Task 6: Floodplain Delineation

No work on this task this month.

Tasks Scheduled for Next Month:

- **Continue coordinating project team**
- **Complete data collection report**
- **Finish Topographic Mapping**
- **Finish as-built drawings for structures**
- **Get district review comments and complete hydrologic modeling**

JEFuller / Hydrology & Geomorphology, Inc.

5235 South Kyrene, Suite 205
Tempe, AZ 85283
602-752-2124 (voice)
602-839-2193 (fax)
jefuller@aol.com (email)

December 6, 1999

TRANSMITTAL

Flood Control District of Maricopa County
ATT: David Boggs, P.E.
2801 W. Durango
Phoenix, AZ 85009

Attached are the following materials provided by JEFuller/ Hydrology & Geomorphology, Inc.:

2 copies of Draft Summary Report for Task 2: Data Collection for the Floodplain Delineation Study of Andora Hills and Galloway Washes.

Brian L. Iserman

Brian Iserman, P.E.

12/6/99

Date

Memorandum **JE Fuller/ Hydrology & Geomorphology, Inc.**

DATE: January 3, 2000

TO: David Boggs, P.E.
Linda Hannan

FROM: Brian Iserman, P.E. Bri 1/3/00

RE: **Floodplain Delineation Study of Andora Hills & Galloway Washes, FCD 99-14**

CC: Jon Fuller, P.E.

The following summarizes the status of the referenced project through December, 1999.

Floodplain Delineation Study of Andora Hills & Galloway Washes Project Status JEFuller/ Hydrology & Geomorphology, Inc.	
Task #	**Estimated Percent Complete**
1 – Coordination	35 %
2 – Data Collection	90 %
3 – Topographic Mapping	90 %
4 – Field Survey	90 %
5 – Hydrology	90 %
6 – Floodplain Delineation	0 %
7 – GIS Conversion	0 %
8 – Deliverables	0 %
Total:	46 %

Problems Encountered:

No unusual problems encountered this month

Tasks Completed this Month:

Task 1: Coordination

Continued coordination between surveyor and mapping company.

Task 2: Data Collection

Submitted draft of Task 2, Data Collection Report for District review

Task 3: Topographic Mapping

Topographic mapping is complete except for the quality control cross-section checks, GIS deliverables and mylars.

Task 4: Field Survey

Surveyor delivered check cross-sections to JEF this month.

Task 5: Hydrology

Refined HEC-1 model, performed internal QA-QC and Submitted Draft Hydrology Report for review

Task 6: Floodplain Delineation

No work on this task this month.

Tasks Scheduled for Next Month:

- **Continue coordinating project team**
- **Complete documentation for survey**
- **Perform mapping quality control calculations**
- **Complete GIS conversion of topography**
- **Finish as-built drawings for structures**
- **Get district review comments on hydrology report and finalize hydrology**
- **Submit cross-section layout to District and begin assembly of HEC-RAS**

Subject: Andorra Hills-Galloway Washes Hydrology Review Meeting
Date: Wed, 12 Jan 2000 10:36:11 -0700
From: David Boggs - FCDX <dbb@mail.maricopa.gov>
To: Valerie Swick - FCDX <vas@mail.maricopa.gov>,
"'brian@jefuller.com'" <brian@jefuller.com>
CC: Lynn Thomas - FCDX <lmt@mail.maricopa.gov>

When: Thursday, January 13, 2000 1:00 PM-2:00 PM (GMT-07:00) Arizona.
Where: Alert Conf Room

~~*~*~*~*~*~*~*~*

To discuyss the draft hydro report and review overall progress, including survey & mapping, digital work, invoices and projections, and to schedule a field trip to collect sediment samples.

JEFuller / Hydrology & Geomorphology, Inc.

5235 South Kyrene, Suite 205
Tempe, AZ 85283
602-752-2124 (voice)
602-839-2193 (fax)
jefuller@aol.com (email)

January 13, 2000

TRANSMITTAL

Flood Control District of Maricopa County
ATT: David Boggs, P.E.
2801 W. Durango
Phoenix, AZ 85009

Attached are the following materials provided by JEFuller/ Hydrology & Geomorphology, Inc.:

Project Schedule dated 1/13/00 for Andora & Galloway Washes Floodplain Delineation Study, FCD 99-14.

Brian R. Iserman — 1/13/00

Brian Iserman, P.E. — Date

Subject: RE: Andora Hills-Galloway letter stating use of new AutoCADD spec s
Date: Tue, 25 Jan 2000 08:54:46 -0700
From: Dortha Klaahsen - FCDX <dlk@mail.maricopa.gov>
To: David Boggs - FCDX <dbb@mail.maricopa.gov>,
"'brian@jefuller.com'" <brian@jefuller.com>
CC: Marta Dent - FCDX <mld@mail.maricopa.gov>,
Mark Brewer - FCDX <mrb@mail.maricopa.gov>,
Barbara Hummell - FCDX <bch@mail.maricopa.gov>,
Wanett Maxwell - FCDX <mwm@mail.maricopa.gov>

This should be a Contract Change Order.

-----Original Message-----
From: David Boggs - FCDX
Sent: Tuesday, January 25, 2000 7:50 AM
To: 'brian@jefuller.com'
Cc: Marta Dent - FCDX; Mark Brewer - FCDX; Barbara Hummell - FCDX; Dortha Klaahsen - FCDX; Wanett Maxwell - FCDX
Subject: Andora Hills-Galloway letter stating use of new AutoCADD specs

Brian:

I appreciate your voice mail offering to send us a letter stating the new AutoCADD specs will be used, instead of the old HIS specs (per the contract). We all agree on doing this. Let me find out whether the initiative should come from us (as a contract variation) or from you--before you send out the letter.

Thanks,

David Boggs, P.E.
FCD

Barbara said to use the new spec. no contract mod. is needed, nor a letter stating this.
Brii 1/26/99

JEFuller / Hydrology & Geomorphology, Inc.

5235 South Kyrene, Suite 205
Tempe, AZ 85283
602-752-2124 (voice)
602-839-2193 (fax)
jefuller@aol.com (email)

January 28, 2000

TRANSMITTAL

Flood Control District of Maricopa County
ATT: David Boggs, P.E.
2801 W. Durango
Phoenix, AZ 85009

Attached are the following materials provided by JEFuller/ Hydrology & Geomorphology, Inc.:

2 copies of Final Hydrology Report (Section 4 of the TDN) for the Floodplain Delineation Study of Andora Hills and Galloway Washes. Includes 3.5" disks containing HEC-1 and DDMS files.

Brian R. Iserman

Brian Iserman, P.E.

1/28/00

Date

JEFuller / Hydrology & Geomorphology, Inc.

5235 South Kyrene, Suite 205
Tempe, AZ 85283
480-752-2124 (voice)
480-839-2193 (fax)
www.jefuller.com

February 9, 2000

TRANSMITTAL

DIBBLE & ASSOCIATES
ATT: FRANK BROWN, P.E.
2633 E INDIAN SCHOOL RD., SUITE 401
PHOENIX, AZ 85016-6763

Attached are the following materials provided by JEFuller/ Hydrology & Geomorphology, Inc.:

1 CD containing Cave Creek TIN from FCD 95-28 for Floodplain Delineation Study of Andora Hills & Galloway Washes, FCD 99-14. This TIN model was projected by JEF from NAD 1927 to NAD 1983. The NGVD 1929 elevations remain the same.

Brian R. Iserman

Brian Iserman, P.E.

2/9/00

Date

Subject: Your Questions
Date: Wed, 9 Feb 2000 07:25:10 -0700
From: David Boggs - FCDX <dbb@mail.maricopa.gov>
To: "'brian@jefuller.com'" <brian@jefuller.com>

You can send Frank from Dibble & Assoc. to FCD to look at the Cave Creek TDN. As before, he will not be able to remove the document from the office, but can use the library & copy any relevant pages. I will be in New River most of today, so Frank should see Mona Merkevicius in front of the library. I have told Mona to expect him (or you) Her # is 506-0117.

Marta & Joe Tram seem ok with the Survey report. The CD with the DTM arrived yesterday, and Mark Brewer has begun his review of the topo vis a vis the Survey Report data. This process normally takes 2 weeks. That's the stock answer, but it should be completed sometime next week.

Hope that answers your questions.

Regards,

David

<<myheart.exe>>

myheart.exe	**Name:** myheart.exe **Type:** unspecified type (application/octet-stream) **Encoding:** base64

JEFuller / Hydrology & Geomorphology, Inc.

5235 South Kyrene, Suite 205
Tempe, AZ 85283
602-752-2124 (voice)
602-839-2193 (fax)
jefuller@aol.com (email)

February 10, 2000

TRANSMITTAL

Flood Control District of Maricopa County
ATT: Lynn Thomas, P.E.
2801 W. Durango
Phoenix, AZ 85009

Attached are the following materials provided by JEFuller/ Hydrology & Geomorphology, Inc.:

2 11x17 color work maps for the reach of Galloway Wash surrounding Spur Cross Road. These topographic maps were flown September 30, 1999 for the Floodplain Delineation Study of Andora Hills and Galloway Washes, FCD 99-14.

Brian R. Iserman

Brian Iserman, P.E.

2/10/00

Date

Subject: RE: Galloway/Andora Hills FDS (FCD-99-14)
Date: Tue, 14 Mar 2000 07:29:19 -0700
From: "David Boggs - FCDX" <dbb@mail.maricopa.gov>
To: "Lynn Thomas - FCDX" <lmt@mail.maricopa.gov>
CC: "Joe Tram - FCDX" <jjt@mail.maricopa.gov>, "'brian@jefuller.com' " <brian@jefuller.com>

I guess that, even if we get those "as-builts" from the developer, we still will need to send out Fuller's surveyors (A Team) to tie the elevations to the ERMs used in the FDS. We certainly need the developer's "as-builts", and a HEC-II/RAS run (if they did one) to give to Fuller (Brian Iserman), for comparison. Ap[preciate if you can speed up getting the info from the developer, as this study is on a fast track for a May completion.

Thanks,

David

> *-----Original Message-----*
> *From: Lynn Thomas - FCDX*
> *Sent: Monday, March 13, 2000 7:59 AM*
> *To: David Boggs - FCDX*
> *Cc: Jeff Low - FCDX*
> *Subject: RE: Galloway/Andora Hills FDS (FCD-99-14)*
>
> *The Regulatory Division is supposed to get As-Built plans for these culverts from the developer. Would you rather wait for these?*
>
> *Lynn*
>
> *-----Original Message-----*
> *From: David Boggs - FCDX*
> *Sent: Friday, March 10, 2000 3:05 PM*
> *To: Joe Tram - FCDX; Valerie Swick - FCDX*
> *Cc: Lynn Thomas - FCDX*
> *Subject: Galloway/Andora Hills FDS (FCD-99-14)*
>
> *A new 6 or 8 barrel set of 10'x8' Concrete box culverts has been constructed over Galloway Wash about 0.25 mi east of Vermeersch Road (~0.5 mi upstream of the Horny Toad Resturant). These culverts provide access to a new sub-division under construction on the north side of Galloway Wash--above the anticipated floodplain elevation. The construction is so new, that the structure was not included in the survey of "as-builts" nor was it captured in the aerial photographs. However, because of its significant potential effect on the hydraulics, I feel it cannot be ignored in the HEC-RAS modeling. Thus I have authorized the consultant to re-deploy his surveyors to obtain "as-built" dimensions.*
>
> *There will be some additional costs (mostly for survey) to the contract, as this structure was not envisaged in the original Scope of Work, and I have asked the consultant (JE Fuller) to request a contract variation to cover these costs. So I expect a request to be submitted next week.*
>
> *For advance notice.*
>
> *DBB*

ANNOUNCEMENT OF INTENT TO UPDATE FLOODPLAIN DELINEATION STUDY OF ANDORA HILLS AND GALLOWAY WASHES

The Flood Control District of Maricopa County (FCDMC), under authority of the National Flood Insurance Act of 1968 (PL-90-448), as amended, and the Flood Disaster Protection Act of 1973 (PL93-234) is funding a detailed re-study of flood hazard areas and has contracted JE Fuller/ Hydrology & Geomorphology, Inc. to carry out the study. The area encompasses Andora Hills Wash from its confluence with Cave Creek to Carefree Drive and Galloway Wash from its confluence with Cave Creek to the Tonto National Forest boundary.

This study will reexamine and reevaluate the flood hazard areas for these two washes. The results will then be published to update the flood insurance rate maps (FIRMs) used by the Federal Emergency Management Agency (FEMA). The FIRMs will be used to determine flood insurance rates.

This announcement is intended to inform all interested persons and communities of the commencement of this study so that they may have an opportunity to bring any relevant technical information to the attention of the FCDMC/FEMA, to be considered during the course of this study. Your comments should be addressed to Mr. David Boggs, P.E., Project Manager at the Flood Control District of Maricopa County, 2801 West Durango Street, Phoenix, AZ 85009, (602) 506-1501.

To be published: September 29 and October 6

Subject: RE: June Coordination for Andora Hills & Galloway Washes
Date: Wed, 7 Jun 2000 12:58:32 -0700
From: "David Boggs - FCDX" <dbb@mail.maricopa.gov>
To: "'Brian Iserman'" <brian@jefuller.com>
CC: "Lynn Thomas - FCDX" <lmt@mail.maricopa.gov>,
"Valerie Swick - FCDX " <vas@mail.maricopa.gov>

Brian:

It's really hectic here now. I have 2 other reviews ahead of yours, 4 days of inhouse HEC-WMS training next week, and we're going to ASFPM Conference in Austin TX--June 18-24. So I doubt I'll have need of anything from you before you get back. I left the Andora Hills/Galloway prelim floodway run plans with Lynn Thomas last week (while Batula & I were in Yellowstone). I will see if Lynn has any comments on that & one of us will call you if necessary.

I briefly scanned the N-value report & it seems in order, but I still need some more time to study it, but time is in short supply until June 26.

Thanks for keeping us posted,

David

-----Original Message-----
From: Brian Iserman [mailto:brian@jefuller.com]
Sent: Wednesday, June 07, 2000 10:29 AM
To: David Boggs - FCDX
Subject: June Coordination for Andora Hills & Galloway Washes

David:

I was thinking I need to coordinated with you a little. This month I will be on vacation Thursday, June 15 through Sunday, June 25. Is there anything you need to get from me before my time off in order for you to complete your review of the cross-section layout and the Reconnaissance/n-value report? Also, do you have a guess when you might get done reviewing these two items?

Brian Iserman
JE Fuller/Hydrology & Geomorphology, Inc.
480-752-2124

FLOOD CONTROL DISTRICT
of
Maricopa County

2801 West Durango Street • Phoenix, Arizona 85009-6399
Telephone (602) 506-1501
Fax (602) 506-4601
TT (602) 506-5897

BOARD OF DIRECTORS
Jan Brewer
Fulton Brock
Andrew Kunasek
Don Stapley
Mary Rose Garrido Wilcox

LETTER OF CONCERN

June 26, 2000

Brian Iserman
JE Fuller / Hydrology & Geomorphology, Inc.
5235 South Kyrene Road Suite 205
Tempe, Arizona 85283

RE: Contract FCD 99-14, Task C 69.00.030.5

Mr. Iserman:

It has come to the attention of the Flood Control District of Maricopa County that this project is overdue for delivery of certain items as specified in the contract. In particular, it is our understanding that the ground control component of setting, observing and reporting the few remaining Elevation Reference Points is the current problem and that there is a large window of time for deliverables. We are also aware that the surveying activities within this contract were let to others. However, we feel it is professionally inappropriate for us to talk with them directly since our agreement is with you. There are several of our professionals currently unable to work on this project until our concerns are laid to rest. Consequently, this letter is issued to express the concern of the District and direct Fuller to submit a written plan for recovery of the project keeping in mind the items mentioned above. This plan must contain all facts relating to the delay, and shall be submitted to the Project Manager and, in this case, the Mapping and Survey Manager of the District within ten calendar days of the date of this letter.

Please expedite the completion of the mentioned tasks. I will call later in the week to discuss your schedule.

You are advised that the District does not relinquish any of its rights and entitlements related to the completion of this contract.

Very truly Yours,

John R Stock

John R. Stock RLS
Mapping and Surveying Manager

Memorandum **JE Fuller/ Hydrology & Geomorphology, Inc.**

DATE: June 29, 2000

TO: David Boggs, P.E.

FROM: Brian Iserman, P.E. BLI 6/29/00

RE: **Floodplain Delineation Study of Andora Hills & Galloway Washes, FCD 99-14, Response to "Letter of Concern" From John R. Stock, RLS, Dated June 26, 2000.**

CC: John R. Stock, RLS

Following is our response to the referenced letter:

A Team Professional Associates, Inc (the project surveyor) re-visited the project site June 28 and 29 to collect the necessary missing data. It is their plan to provide the data to JEF, Inc. by the end of next week (Friday, July 7, 2000). Once the data have been provided, JEF, Inc. will check them and, if they are adequate, deliver them (in GIS format) to your office within 4 business hours of receipt from A Team.

We regret that it has taken so long to get this last bit of data delivered to your office in a timely manner. The delay has been the result of a combination of scheduling difficulties and communications errors between myself and our sub consultant. Please be assured that we are currently doing everything possible to deliver the data to your office quickly.

JEFuller / Hydrology & Geomorphology, Inc.

5235 South Kyrene, Suite 205
Tempe, AZ 85283
480-752-2124 (voice)
480-839-2193 (fax)
www.jefuller.com

August 2, 2000

TRANSMITTAL

Flood Control District of Maricopa County
ATT: David Boggs, P.E.
2801 W. Durango
Phoenix, AZ 85009

Attached are the following materials provided by JEFuller/ Hydrology & Geomorphology, Inc.:

Sealed survey control and ERM data for Floodplain Delineation Study of Andora Hills and Galloway Washes.

Brian R. Iserman

Brian Iserman, P.E.

8/2/00

Date

JEFuller / Hydrology & Geomorphology, Inc.

5235 South Kyrene, Suite 205
Tempe, AZ 85283
602-752-2124 (voice)
602-839-2193 (fax)
jefuller@aol.com (email)

September 5, 2000

TRANSMITTAL

Flood Control District of Maricopa County
ATT: David Boggs, P.E.
2801 W. Durango
Phoenix, AZ 85009

Attached are the following materials provided by JEFuller/ Hydrology & Geomorphology, Inc.:

1 original 2-volume bound copy of the Draft TDN for Floodplain Delineation Study of Andora Hills & Galloway Washes, FCD 99-14.

Brian Iserman, P.E.

9/5/00

Date

Subject:
Re: Question regarding Floodplain Delineation Study of Andora Hills & Galloway Washes
Date:
Wed, 11 Oct 2000 16:50:53 -0400
From:
"Pernille Buch-Pedersen" <PBUCH-PEDERSEN@mbakercorp.com>
To:
brian@jefuller.com

Brian,
It is correct to do the analysis using the normal depth for tributaries unless he watershed areas are not greatly different or the peaks are coincident, as described in FEMA 37. Both tributaries should be mapped using the back water elevation from Cave creek until the elevations on the tributaries exceed the Cave Creek elevation.
It is not likely that we will ask you to rerun the model using a known elevation. I suggest that you explain in your submittal, as you have done in your email, why the models are run using normal depth.
Please call me or email me if you have any questions
Pernille

>>> Brian Iserman <brian@jefuller.com> 10/09/00 04:05PM >>>
Pernille:

I have a question regarding matching the downstream extent of my current study reaches to the existing study. This is for a re-study of Andora Hills and Galloway Washes for the Flood Control District of Maricopa County.

I have a situation where the starting water surface elevation for my study washes (Andora Hills and Galloway Washes; small tributaries to Cave Creek) are approximately one to two feet below the water surface elevation of the main stream (Cave Creek) when the profiles are started using

normal depth. According to FEMA 37, I must use normal depth

to start the profile because the watershed areas are greatly

different and because the peaks are not coincident. The basin area of Andora Hills Wash is 2.8 square miles, Galloway Wash is 21 square miles and Cave Creek is 112 square miles. The times to peak are 12.25 hours, 12.92

hours and 13.33 hours respectively.

I can smooth the Andora Hills Wash Floodplain to match the Cave Creek Floodplain very nicely. However, I am concerned that the Baker reviewer may ask me to re-submit the profile using the known water surface elevation of Cave Creek at the

confluence. Is that likely?

I would appreciate your thoughts on the subject!

Brian Iserman
JE Fuller/Hydrology & Geomorphology, Inc.
480-752-2124
brian@jefuller.com

JEFuller / Hydrology & Geomorphology, Inc.

5235 South Kyrene, Suite 205
Tempe, AZ 85283
602-752-2124 (voice)
602-839-2193 (fax)
jefuller@aol.com (email)

October 31, 2000

TRANSMITTAL

Flood Control District of Maricopa County
ATT: David Boggs, P.E.
2801 W. Durango
Phoenix, AZ 85009

Attached are the following materials provided by JEFuller/ Hydrology & Geomorphology, Inc.:

1 original 2-volume bound copy of the Draft TDN for Floodplain Delineation Study of Andora Hills & Galloway Washes, FCD 99-14.

1 extra set of study work maps for review (not in bound TDN pockets)

1 bound set of District comments to September, 2000 Draft of TDN

2 sets of September, 2000 TDN work study maps with District comments

Note: This set is the 100% complete TDN with the Method 4 Floodway.

Brian L. Iserman — 10/31/00

Brian Iserman, P.E. — Date

Subject: Andora Galloway FDS Encroachments
Date: Fri, 17 Nov 2000 16:44:43 -0700
From: "David Boggs - FCDX" <dbb@mail.maricopa.gov>
To: "'brian@jefuller.com'" <brian@jefuller.com>

Brian:

I am still reviewing this submission. I see you spent a lot of effort taking care of details. I called your office Thu. & requested the CAD files for the floodplain/floodway, so I can overlay them on aerials--in anticipation of a request from Dave Johnson. By the way, Lynn Thomas is also independently reviewing the plans--with no reply yet.

In discussion with Joe Tram, he became somewhat alarmed that we are even trying to encroach AT ALL with velocities so high already & possibly supercritical instream Qs. He initially wanted to limit the increase in EGL to 1 ft, rather than WSELs (like HEC--2 Method 6). I'm not sure how this is going to play out here, but I'm giving you a head's up to see if you have any experience with HEC-RAS Method 5--which looks capable of producing the desired limits on EGLs. Or do you think it's better just to make floodplain=floodway in questionable reaches, with say Fr>.7? .86 ?

Appreciate you thoughts & experience.

Thanks,

David Boggs

Subject: Carefree Bridge over Dream Street
Date: Tue, 21 Nov 2000 15:58:55 -0700
From: "David Boggs - FCDX" <dbb@mail.maricopa.gov>
To: "Lynn Thomas - FCDX" <lmt@mail.maricopa.gov>,
"'brian@jefuller.com' " <brian@jefuller.com>
CC: "Joe Tram - FCDX" <jjt@mail.maricopa.gov>,
"Dave Johnson - FCDX " <drj@mail.maricopa.gov>,
"Valerie Swick - FCDX" <vas@mail.maricopa.gov>,
" Geza Kmetty - FCDX" <gek@mail.maricopa.gov>

For Info Only:

I spoke to Eric Korsten on Tue. 11/21/00 at about 3 PM concerning the new Concrete Arch bridge constructed over Galloway Wash recently. He confirmed that the City built the bridge with no contact with FCD. He assumed that the bridge would pass a flow of 1,700 cfs. The Qp-100 in our current re-study is only 1,100 cfs at RS-3.368 (the nearest cross section). Brian Iserman and I are scheduled to meet Dr. Korsten in Carefree Town Hall at 10 AM Tue 11/28/00. The "as built" plans for the bridge will be made available to us asap--perhaps by the time of our meeting.

Dr. Korsten confirmed that no additional Qs are needed from us (i.e. JE Fuller) for areas in downtown Carefree. He also confirmed that some excavation in the streambed was done under the bridge to reduce impact of backwater effects. He thought that he did not need any floodplain use permit, as the bridge should not constrict flow upstream. We shall see what analysis they did to investigate this when we meet him.

If you have comments, please let me know.

David Boggs
FCD

JEFuller / Hydrology & Geomorphology, Inc.

5235 South Kyrene, Suite 205
Tempe, AZ 85283
480-752-2124 (voice)
480-839-2193 (fax)
www.jefuller.com

November 28, 2000

TRANSMITTAL

Town of Carefree
Dr. Eric Korsten, P.E.
P.O. Box, 17915
Fountain Hills, AZ 85269

Attached are the following materials provided by JEFuller/ Hydrology & Geomorphology, Inc.:

1 plot at 1"=50' showing desired locations of surveyed cross-sections for as-built survey of Dream Street Bridge.

1 sheet with additional notes regarding locating cross-sections near the bridge.

Brian R. Iserman — 11/28/00

Brian Iserman, P.E. — Date

Subject: Andora Galloway
Date: Wed, 13 Dec 2000 09:24:54 -0700
From: "David Boggs - FCDX" <dbb@mail.maricopa.gov>
To: "'brian@jefuller.com'" <brian@jefuller.com>

Brian:

I spoke to the Carefree Town offices, and Eric Korsten is off this week. He is expected to resume duties Monday 12/18/00. We'll have to wait until he gets back to pursue theissues of the Dream Street bridge and stream restoration on Galloway Wash, as we have discussed. The change order is in process & should be approved this week, so I think you can safely proceed. Hopefully Eric will be able to provide "as built" drawings for the con-arch bridge by Monday (or at least the designs).

Regards,

David

Subject: Andora Hills/Galloway Wash Dream Street Bridge & Dream St--Mule T rain "Stream Restoration Project" ala Eric Korsten
Date: Mon, 18 Dec 2000 09:52:58 -0700
From: "David Boggs - FCDX" <dbb@mail.maricopa.gov>
To: "Dave Johnson - FCDX" <drj@mail.maricopa.gov>
CC: "'brian@jefuller.com'" <brian@jefuller.com>, "Joe Tram - FCDX " <jjt@mail.maricopa.gov>, "Lynn Thomas - FCDX" <lmt@mail.maricopa.gov>

Carefree, AZ--December 18, 2000

I spoke to Dr. Korsten this morning about this project. He claims that HE only intended to excavate about 100 ft up/dn stream of the Dream Steet bridge to add conveyance & provide a start to accelerate the channel re-establishing its equilibrium slope as it was prior to the construction of the Dream Street low-water crossing. This makes sense to me, since the old Dream Street low-water crossing acted as grade control for the wash. With the bridge construction, that grade control has been removed. Eric further claims that--unknown to him--the City of Carefree construction crews met with Mr. Kessler (owner of the foot bridge), who wanted a "pilot channel" to be excavated at his property around the foot bridge. This has been allegedly been performed without Eric's knowledge. When I asked, "who authorized that work", Eric claimed "those construction guys" did it. [dimped chad] Eric claims surprize and shock to see the extent of the excavation. Now, Mule Train low water crossing will need a cut-off wall or apron d/s of the cross, or else the channel wll head cut up & remove the Mule Train low-water crossing. Well the Mule Train turns out to be a Gravy Train for the on-call Town Engineer of Carefree, who now has to run a fluvial study on this stretch of channel (which he volunteer to do) & design & supervise construction of the Mule Train apron or cut-off wall.

Eric has the design drawings--up-dated to "as built" condition--for the Dream Street bridge. He is sending them to Brian Iserman (JE Fuller) for use in the HEC-RAS model. Brian should have the bridge's dimensions & elevations tomorrow & then be able to complete the HEC-RAS bridge modeling.

I indicated that FCD would likely make a field vist later this week & would like to see him. JJT &/or Regulatory Representative are recommended to come with me. Please indicate availablity & interest.

I told Eric that we were expecting to be notified of such a large undertaking prior to beginning the work, and we were disappointed to have been left out of the loop.

David Boggs
FCD

Subject: FW: "As Built" Survey for New Con-Arch Bridge at Dream Street
Date: Mon, 22 Jan 2001 16:26:34 -0700
From: "David Boggs - FCDX" <dbb@mail.maricopa.gov>
To: "'brian@jefuller.com'" <brian@jefuller.com>

Brian:

Here's Joe Tram's thoughts on the matter. He wants to give Eric the time & wait for the "as builts" from him.

David

> *-----Original Message-----*
> *From: Joe Tram - FCDX*
> *Sent: Monday, January 22, 2001 4:22 PM*
> *To: David Boggs - FCDX; John R Stock - FCDX*
> *Cc: 'brian@jefuller.com'*
> *Subject: RE: "As Built" Survey for New Con-Arch Bridge at Dream Street*
>
> *Suggest that we give Eric the extra week....do not believe that we will receive FEMAs comments such that the contract will be closed out by June 2001....as such, if Brian can submit it by middle of February, we can process a time extension based upon the receipt of FEMAs letter saying how long it will take them...thanks*
>
> *-----Original Message-----*
> *From: David Boggs - FCDX*
> *Sent: Monday, January 22, 2001 4:00 PM*
> *To: Joe Tram - FCDX; John R Stock - FCDX*
> *Cc: 'brian@jefuller.com'*
> *Subject: "As Built" Survey for New Con-Arch Bridge at Dream Street*
> *Importance: High*
>
> *The survey to produce a"s-built" drawing for this bridge has not begun in Carefree. Eric Korsten inticated to Brian Iserman that the survey will not be undertaken until the grading in the Galloway Wash channel is completed. This may be several weeks from now. Brian estimates he needs only one week to wrap up the study for FEMA submittal, once "as builts" are available. We now run the risk of delaying the FEMA submittal such that FEMA comments (if any) cannot be addressed by the revised contract close June 30, 2001.*
>
> *Two options:*
>
> *(1) Try to persuade Eric Korsten to give priority to "as built"s of the bridge. This seems reasonable, since his intransigience has led us to this point; however he shows no sign of recognizing an urgency or willingness to give priority to this issue. Maybe we need a call from Joe Tram or Mike Ellegood to change Eric's mind(?).*
>
> *(2) Perform "as built" survey w/ RTK equipment in-house. Brian can provide a sketch of points needed for the survey & we could do it in 1/2 a day.*
>
> *Appreciate your advice & comment on this.*
>
> *Thanks,*

Subject: Re: FDS Andora Hills & Galloway Washes final comments
Date: Mon, 26 Feb 2001 16:36:04 -0700
From: Brian Iserman <brian@jefuller.com>
To: Joe Tram - FCDX <jjt@mail.maricopa.gov>

Joe:

I think that in this case, because of the uncertainties of how the bridge will really perform during the 100-year flood, we should publish the most conservative (i.e., highest) possible computed water surface elevations (CWSEL). I was suspicious of a possible hydraulic jump just downstream of the bridge (resulting in a short reach of decreased CWSEL before the jump), so I ran the model again today without the bridge. The resulting CWSELs were exactly the same downstream of the bridge and, as you would expect, much lower upstream from the bridge until you get to the junction just upstream. So the way we have it now, we have the most conservative CWSELs in this reach.

What is important is that we don't fail to identify a flood hazard. The very worst case scenario I can think of (assuming fixed boundaries) would be for the bridge to somehow tilt off of the pier supports in one massive piece and "dam" the main channel. For that to happen though, something would need to be in place downstream of the bridge to keep it from being forced flat against the channel. If we take away our fixed boundary assumption (i.e., introduce erosion of the approaches) then we enter a whole other realm of possible hazards that are beyond this type of study. Further, because of the erosive nature of the soils in this study area, there are a couple other places I can think of along Galloway Wash which I think would be susceptable to fairly significant avulsions if subjected to sustained high flows. So it seems to me that we would be opening up another can of worms if we wanted to go back and start doing an erosion hazard study. But opening up worm cans is our specialty.

I also talked to Jon to get his input, and he concurred that we have done all we can with this type of study. However, he reminded me that we are on the Carefree study team, and that the District could add this reach into the study. At the very least, once the Carefree study gets under way (which may be a couple months off), Jon said we could take a quick look at it while we are out there and advise you further. I have been giving similar low-level geomorphic input to Jeff Low for other reaches of Galloway as permits have been coming up.

Joe Tram - FCDX wrote:

> *Thought just an unnumbered Zone A downstream of it. Maybe a note stating*
> *due to the elevation difference between the approach and downstream*
> *property, stability of the approach will need to be addressed. Appears that*
> *the water goes over the right approach but due to the terrain it returns*
> *rather quickly to the wash....Would a difference scenerio take place if it*
> *eroded, leaving an opening where the runoff would be focused...Since you*
> *have been modeling it, what do you think from the floodplain management*
> *standpoint.*
> *-----Original Message-----*
> *From: Brian Iserman [mailto:brian@jefuller.com]*
> *Sent: Monday, February 26, 2001 9:39 AM*
> *To: Joe Tram - FCDX*
> *Subject: FDS Andora Hills & Galloway Washes final*
> *comments*
>
> *Joe:*

> *I need to resolve one last comment from you regarding the railroad-car bridge on Galloway Wash. The comment seemed to be indicating that you might want some text somewhere explaining why we decided to include the bridge in the model (i.e., assume that it will stand during the 100-year flow event). Do you want to see some further explanation of our assumption either on the work map or in the TDN text? David suggested that I should contact you directly so that nothing gets lost in the translation.*
>
> --
> *Brian Iserman*
> *JE Fuller/Hydrology & Geomorphology, Inc.*
> *480-752-2124*
>

--
Brian Iserman
JE Fuller/Hydrology & Geomorphology, Inc.
480-752-2124

JEFuller / Hydrology & Geomorphology, Inc.

6101 S. Rural Rd., Suite 110
Tempe, AZ 85283
602-752-2124 (voice)
602-839-2193 (fax)
www.jefuller.com (email)

April 12, 2001

TRANSMITTAL

Flood Control District of Maricopa County
ATT: Richard Harris, P.E.
2801 W. Durango
Phoenix, AZ 85009

Attached are the following materials provided by JEFuller/ Hydrology & Geomorphology, Inc.:

1. 2 sets (2 volumes each) of the TDN for the Floodplain Delineation Study of Andora Hills & Galloway Washes, FCD 99-14

Brian R. Iserman

Brian Iserman, P.E.

4/12/01

Date

Date: April 17th, 2001

Subject: Andorra Hills/Galloway Wash FP Delineation Study
Specific: Final TDN Review

I just received the Final TDN for the subject study. Noted in the TDN:

1) Contraction and expansion coefficients appear low for a bridge at section 3.504, a culvert at section 2.281, and a bridge a 0.868.

2) Currently the HEC-RAS output files saved on the project CD are encripted (ASCII) and cannot be viewed with a normal text viewer. It would seem a good idea that the consultant provide Hydraulic Model output in text format in addition to the ASCII format on the CD, for management purposes.

3) The TDN shows a "Total Velocity" in the summary output. This velocity turns out to be less than the channel velocity for most sections. Given the possibility that the TDN information might be used for future embankment stabilization designs, should we ask for Channel Velocity to also be included in HEC-RAS summary output?

4) The R.L.S.'s signature on the subject project's Plan Cover Sheet (a.k.a. Location Map), is not legible. Should it be, prior to sending to FEMA? Also, other signature lines appear in the block located near the lower right hand corner of this sheet. Should they be signed before the transfer?

5) The Study Contractor's address should be added to the README file on the CD.

Subject: Re: Andora Hills,Galloway FP Study TDN Review Comments
Date: Wed, 18 Apr 2001 10:34:04 -0700
From: Brian Iserman <brian@jefuller.com>
To: Richard Harris - FCDX <rph@mail.maricopa.gov>

Richard:

I have received your comment letter via an attachment to your last e-mail. I have the following responses/explanations for each numbered item:

1. Contraction/Expansion coefficients of 0.3 and 0.5 were used on most bridges/culverts because they resulted in typical bridge section restrictions in the floodplain width. The two bridges and one culvert you noted exhibit very little, if any, contraction/expansion of the floodplain. So the standard or default values of 0.1 and 0.3 were kept at these crossings.

2. Both HEC-RAS output files are on the original CD (001 and REP). However, the REP file I included (which can be read by any text editor) did not have all the detailed output as is specified in the FCD CADD data delivery specs. So I re-generated the REP files for both models, and will include them on a new set of CDs.

3. The tables in the TDN have been assembled per the scope, which refers to State Standard 1-97, which specifies "average velocity" which is "Velocity Total" in HEC-RAS language, or the average velocity in the total cross section. As we discussed, the detailed output found in the REP files will contain all the detailed hydraulic data.

4. I will have the blue line run darker for the cover sheet. As I mentioned before, your other question regarding signatures in the title block by FCD is an FCD question, but I've never seen one signed before.

5. I have added our address into the readme.txt file. I didn't put it in originally because that is not required in the state standard format (SSA 1-97). But as you pointed out, it is in the FEMA standard; I forgot that there are some diferences in these standard formats. This revised readme file will be added to the revised CDs being supplied.

As I mentioned to you on the phone today, Scott Ogden will be picking up the two sets of TDNs today. I should be able to get everything done by late in the day Friday April 20, but I probably won't be able to deliver them until the following monday.

Richard Harris - FCDX wrote:

> *<<final TDN.doc>>*
> *As discussed. Please review and let me know if you have any questions.*
>
> *Thanks!*

>
> Richard
>
> ----------
> Name: final TDN.doc
> final TDN.doc Type: Microsoft Word Document (application/msword)
> Encoding: base64

--
Brian Iserman
JE Fuller/Hydrology & Geomorphology, Inc.
480-752-2124

Flood Control District of Maricopa County

Interoffice Memorandum

April 24, 2001

MEMO TO: Richard Harris

FROM: Tim Murphy

SUBJECT: FCD 99-14, Andora Hills and Galloway Washes, TDN Review

1. Recommend that you consider using some sort clear plastic covers to protect the inside cover of the report.

2. Section 5.5 isn't listed in the Table of Contents.

3. The page number listed for Section 5.7 in the Table of Contents is wrong. The correct page number is 5-8.

4. The page number for Table 4.5.1-3 in the Table of Contents is wrong. The correct page number is 4-26.

5. The page number for Table 5.5.2.1 in the Table of Contents is wrong. The correct page number is 5-5.

6. The page number for Table 5.5.4.1 in the Table of Contents is wrong. The correct page number is 5-6.

7. In section 3.2 (page 3.1) the wording in the third sentence is a little bit confusing.

8. They should revise the wording in the last sentence of the first paragraph of Section 4.2.2 (page 4-3), the full size exhibits are in volume one of the report, not volume two.

9. In the legend on Figure 4.2.2-1 they have two different symbols for Sabol Subbasin GWW1.

10. I couldn't see their changes on the annotated FIRM panels. Maybe they should use a different colored ink to show the changes.

11. I wouldn't have printed out the HEC-RAS model the way they did. I would have just generated a report file with everything in it (like they did), and printed that out. Instead they chose to print out separately the flow data, Manning's n values, reach lengths, contraction and expansion coefficients,

and geometry data. They only printed out summary tables instead of the full output data for each cross section. The CD does however have the complete report files and output files.

12. On the delineation drawings where floodplain equals floodway they should be showing the floodway line, and not the floodplain line.

13. Their line work for the floodway and the hydraulic baseline could have been better. They should have had more open space between the dashes. The hydraulic baseline looks almost like a solid line.

14. Consider including a printed copy of the read me file with the CD.

15. The FEMA forms still need to be completed and signed.

16. Information about the public meeting will need to be included.

17. You'll need to get community acknowledgements from Cave Creek, Carefree, and Scottsdale.

Flood Control District of Maricopa County
2801 West Durango Street
Phoenix, Arizona 85009-6399
(602) 506-1501
FAX: (602) 506-4601
TT: (602) 506-5897

DATE: April 25, 2001

MEMO TO: Richard Harris, Engineering Division

FROM: Cathy Regester, Regulatory Division

SUBJECT: FCD 99-14: Andora Hills and Galloway Washes FDS

I have reviewed the above delineation maps dated April 2001 and have the following comments:

1. On several of the sheets, a ¼ section corner has been identified on the maps. This is very useful. However, it would be more helpful if that ¼ section corner were more specifically labeled, i.e. NW corner, SW ¼ Section 28.
2. It is unclear what some of the lines shown on some of the map sheets are showing. In some instances they appear to be breaklines, in others, maybe trails. I have specifically noted some of these lines on sheets 1, 3, and 5 of 6. Please review and see if we need to show these. My concern is that in most instances they are the same linetype and lineweight as the intermediate contours.
3. I have noted on most of the sheets some streets which I think it would be helpful if the work map showed the street name. Mostly, these are streets which cross the flooding or are running very close to the floodplain. FEMA is supposed to show the street names of all streets which cross the profile baseline. If we do not provide them with a name, the FEMA profiles will just say "unnamed road". It could be helpful in determining the regulatory BFEs to have these street names appear on the FEMA profiles.
4. I don't see a label (name) for the split (north) on Andora Hills Wash between cross sections 0.162 and 0.271.
5. Do we require northings and eastings with the ERM descriptions? If so, these need to be added.
6. On sheet 2 of 6, the 2214 BFE on Grapevine Wash looks like it ties into the 2216 contour. Please check. (It's a minor difference.)
7. On sheet 3 of 6, BFEs 2232 and 2239 are not shown as "squiggly" lines.
8. Please check the ERM descriptions. It looks like all of the descriptions say the ERMs are in Section 28 but only those on the first couple of sheets are actually in Section 28. Additionally, ERM 4 on sheet 3 of 6 says it is on Burro Road but the plan view shows it on Terrace Estates Circle. Please check.

If you have any questions on these comments, please let me know.

Date: April 30th, 2001

Subject: Andora Hills and Galloway Washes FDS, FCD 99-14.

Brian,

I re-evaluated the technical comments from both Tim Murphy and Cathy Register for the subject study that I recently sent to you. I have retained only those that are considered by myself and other Floodplain Branch personnel as being technically necessary to fulfill the existing contract requirements for the subject study. No additional change orders should be required to address these comments:

1) Section 5.5 isn't listed in the Table of Contents.

2) The page number listed for Section 5.7 in the Table of Contents is wrong. The correct page number is 5-8.

3) The page number for Table 4.5.1-3 in the Table of Contents is wrong. The correct page number is 4-26.

4) The page number for Table 5.5.2.1 in the Table of Contents is wrong. The correct page number is 5-5.

5) The page number for Table 5.5.4.1 in the Table of Contents is wrong. The correct page number is 5-6.

6) In section 3.2 (page 3.1) the wording in the third sentence is a little bit confusing. Please check.

7) Please revise the wording in the last sentence of the first paragraph of Section 4.2.2 (page 4-3). The full-size exhibits are in volume I of the report, not volume II.

8) In the legend on Figure 4.2.2-1, there are two different symbols for Sabol Subbasin GWW1. Please rectify.

9) The changes on the annotated FIRM panels are not clear. A different colored ink could clarify the changes. Please address.

10) On the delineation drawings where floodplain equals floodway, the floodway line should be shown, not the floodplain line. Please address.

11) Please include a printed copy of the README file with the CD.

12) The FEMA forms still need to be completed and signed.

13) It is unclear what some of the lines shown on some of the map sheets are showing. In some instances they appear to be breaklines, in others, maybe trails. I have specifically noted some of these lines on sheets 1, 3, and 5 of 6. Please review and clarify/explain their purpose.

14) I have noted on most of the sheets some streets which I think it would be helpful if the work map showed the street names. Mostly, these are streets which cross the Floodplain or are running very close to the Floodplain. Per the project Scope, through FEMA Document 37 Chapter 9 Section A.1.a., "...all streets and roads within or near the 100-year Floodplain shall be shown and named. Please revise the maps accordingly.

15) On sheet 2 of 6, the 2214 BFE on Grapevine Wash looks like it ties into the 2216 contour. Please check.

16) On sheet 3 of 6, BFEs 2232 and 2239 are not shown as "squiggly" lines. Please correct.

17) Please check the ERM descriptions. It looks like all of the descriptions say the ERMs are in Section 28 but only those on the first couple of sheets are actually in Section 28. Additionally, ERM 4 on sheet 3 of 6 says it is on Burro Road but the plan view shows it on Terrace Estates Circle. Please rectify.

JE Fuller/ Hydrology & Geomorphology, Inc.

Jonathan Fuller, P.E., P.H.
Brian Iserman, P.E.
John Wallace, P.E.
Ted Lehman, P.E.
Scott Ogden, P.E.
Pat Deschamps, P.E.

6101 S Rural Rd., Suite 110
Tempe, Arizona 85283
480-752-2124 (voice)
480-839-2193 (fax)
www.jefuller.com

June 14, 2001

Flood Control District of Maricopa County
ATT: Richard Harris, P.E.
2801 W. Durango
Phoenix, AZ 85009

RE: Floodplain Delineation Study of Andora Hills & Galloway Washes - FCD 99-14, Final Revision Documentation

Dear Richard:

I have made the final revisions to the Technical Data Notebooks and Work Maps for the referenced study. These revisions were requested by your office in the form of a summary review e-mail attachment dated April 30th, 2001 from your office. Following is a listing of the comments from that memo and the steps that were taken by JEF to address the comments:

1) Section 5.5 isn't listed in the Table of Contents.

   - **Added Section 5.5 to the Table of Contents.**

2) The page number listed for Section 5.7 in the Table of Contents is wrong. The correct page number is 5-8.

   - **Corrected page number.**

3) The page number for Table 4.5.1-3 in the Table of Contents is wrong. The correct page number is 4-26.

   - **Corrected page number.**

4) The page number for Table 5.5.2.1 in the Table of Contents is wrong. The correct page number is 5-5.

   - **Corrected page number.**

5) The page number for Table 5.5.4.1 in the Table of Contents is wrong. The correct page number is 5-6.

   - **Corrected page number.**

6) In section 3.2 (page 3.1) the wording in the third sentence is a little bit confusing. Please check.

- **Re-worded sentence.**

7) Please revise the wording in the last sentence of the first paragraph of Section 4.2.2 (page 4-3). The full- size exhibits are in volume I of the report, not volume II.

- **Corrected wording.**

8) In the legend on Figure 4.2.2-1, there are two different symbols for Sabol Subbasin GWW1. Please rectify.

- **Corrected legend.**

9) The changes on the annotated FIRM panels are not clear. A different colored ink could clarify the changes. Please address.

- **Tried a different color of ink, however, that did not make it any clearer since the changes are subtle at the scale of the FIRM panel.**

10) On the delineation drawings where floodplain equals floodway, the floodway line should be shown, not the floodplain line. Please address.

- **Fixed line work.**

11) Please include a printed copy of the README file with the CD.

- **Inserted hard copy of README file behind CD sheet.**

12) The FEMA forms still need to be completed and signed.

- **FEMA forms were completed and signed.**

13) It is unclear what some of the lines shown on some of the map sheets are showing. In some instances they appear to be breaklines, in others, maybe trails. I have specifically noted some of these lines on sheets 1, 3, and 5 of 6. Please review and clarify/explain their purpose.

- **Most of these lines were "wash" or breaklines which were inadvertently placed into the wrong AutoCADD layer by the mapping contractor. JEF has fixed these layer assignments and turned off the layers containing them.**

14) I have noted on most of the sheets some streets which I think it would be helpful if the work map showed the street names. Mostly, these are streets which cross the Floodplain or are running very close to the Floodplain. Per the project Scope, through FEMA Document 37 Chapter 9 Section A.1.a.,"...all streets and roads within or near the 100-year Floodplain shall be shown and named. Please revise the maps accordingly.

- **Additional street names have been added.**

15) On sheet 2 of 6, the 2214 BFE on Grapevine Wash looks like it ties into the 2216 contour. Please check.

- **Fixed linework.**

16) On sheet 3 of 6, BFEs 2232 and 2239 are not shown as "squiggly" lines. Please correct.

- **The correct line type was re-assigned to these two lines.**

17) Please check the ERM descriptions. It looks like all of the descriptions say the ERMs are in Section 28 but only those on the first couple of sheets are actually in Section 28. Additionally, ERM 4 on sheet 3 of 6 says it is on Burro Road but the plan view shows it on Terrace Estates Circle. Please rectify.

- **All ERM descriptions have been corrected.**

Additionally, since we had to go back through the entire TDN and Work Maps, JEF has addressed other comments found in review letters from Tim Murphy and Cathy Regester which were not included in the summary listed above. Following is a listing of additional comments from Tim Murphy's memo dated April 24, 2001 and the steps that were taken by JEF to address the comments:

1. Recommend that you consider using some sort [of] clear plastic covers to protect the inside cover of the report

- **Added clear plastic covers.**

13. Their line work for the floodway and the hydraulic baseline could have been better. They should have had more open space between the dashes. The hydraulic baseline looks almost like a solid line.

- **Fixed line attributes.**

16. Information about the public meeting will need to be included.

    - **Included information about the public meeting in Appendix B.3**

17. You'll need to get community acknowledgements from Cave Creek, Carefree, and Scottsdale.

    - **Representatives from the Town of Cave Creek, Town of Carefree and City of Scottsdale have signed the FEMA Community Acknowledgement Forms.**

Following is a listing of additional comments from Cathy Regester's memo dated April 25, 2001 and the steps that were taken by JEF to address the comments:

1. On several of the sheets, a ¼ section corner has been identified on the maps. This is very useful. However, it would be more helpful if that ¼ section corner were more specifically labeled, i.e. NW corner, SW ¼ Section 28.

    - **The correct way to note a Section ¼ Corner is to refer to the side of the section (i.e., north, south, east or west) and the section number (i.e., East Section ¼ Corner of Section 28). There is only one Section ¼ Corner per side. Section ¼ Corners are not typically referenced in the manner described in item 1 of the memo. The Section ¼ Corners shown in the Work Maps are noted as "Section ¼ Corners" with the bounding section numbers noted below the text. There should be no mistaking which Section ¼ Corner is being referenced.**

4. I don't see a label (name) for the split (north) on Andora Hills Wash between cross sections 0.162 and 0.271.

    - **A label was added**

5. Do we require northings and eastings with the ERM descriptions? If so, these need to be added.

    - **Some FCD studies include the ERM northing and easting data, and others do not. We added northing and easting data.**

Copies of all District review letters and this letter have been included in Appendix B.4

Sincerely,
JE Fuller/Hydrology & Geomorphology, Inc.

Brian R. Iserman

Brian R. Iserman, P.E.
Hydrologist

JE Fuller/ Hydrology & Geomorphology, Inc.

Jonathan Fuller, P.E., P.H.
Brian Iserman, P.E.
John Wallace, P.E.
Ted Lehman, P.E.
Scott Ogden, P.E.
Pat Deschamps, P.E.

6101 S Rural Rd., Suite 110
Tempe, Arizona 85283
480-752-2124 (voice)
480-839-2193 (fax)
www.jefuller.com

August 16, 2001

Flood Control District of Maricopa County
ATT: Richard Harris, P.E.
2801 W. Durango
Phoenix, AZ 85009

RE: Floodplain Delineation Study of Andora Hills & Galloway Washes - FCD 99-14, Final Revision Documentation II

Dear Richard:

I have made the revisions related to Change Order 3 to the Technical Data Notebooks and Work Maps for the referenced study. These revisions were requested by your office during our phone conversation of August 14, 2001. Following are the two comments you made to me and JEF's response to these comments:

1) Add a comment in the main HEC-RAS project description to note this latest revision of the floodway.

   - **Added comment as noted.**

2) Include description of changes into Section 5.6 of the TDN.

   - **Included description of changes into Section 5.6 of the TDN.**

Sincerely,
JE Fuller/Hydrology & Geomorphology, Inc.

Brian L. Iserman

Brian R. Iserman, P.E.
Hydrologist

FLOOD CONTROL DISTRICT of Maricopa County
2801 West Durango Street
Phoenix, Arizona 85009-6399
(602) 506-1501
FAX: (602) 506-4601
TT: (602) 506-5897

LETTER OF TRANSMITTAL

TO: Brian Iserman
JE Fuller
6101 S. Rural Road, Suite 110
Tempe, AZ 85283

February 14, 2002

SUBJECT: Andora Hills and Galloway Washes -- Review comment letter from FEMA

WE ARE SENDING YOU THE FOLLOWING ITEMS: ☒ Enclosed ☐ Under separate cover

☐ Shop Drawings ☐ Prints ☐ Legal Description ☐ Samples ☐ Reports
☐ Specification ☐ Change Order ☐ Copy of Letter ☐ Plans ☐ Other

COPIES	DATE	NO.	DESCRIPTION
1	FEB 08 2002		copy of review-comment letter from FEMA

THESE ARE TRANSMITTED:

☐ For approval
☒ For your use
☐ As requested
☐ Resubmit copies for approval
☐ Submit copies for distribution
☐ FOR ESTIMATE DUE:

☐ Approved as submitted
☐ Approved as noted
☐ Returned for corrections
☐ For review and comments
☐ Return corrected prints
☐ Borrowed prints being returned

Remarks:

SIGNED: Mike Duncan 2-14-02
Mike Duncan for Richard Harris

NATIONAL FLOOD INSURANCE PROGRAM

FEMA MAP COORDINATION CONTRACTOR

FLOOD CONTROL DISTRICT
RECEIVED
FEB 13 '02
ICP & GM | FINANCE
PIO | PLANS
ADMIN | O & M
REG | P & PM
ENG | PUB
CONTRACTS
CONTROL

FEB 08 2002

Mr. Richard P. Harris, P.E.
Project Manager
Engineering Division
Flood Control District of Maricopa County
2801 West Durango Street
Phoenix, AZ 85009

IN REPLY REFER TO:
Case No.: 01-09-1157P
Communities: Towns of Carefree and Cave Creek and City of Scottsdale, AZ
Community Nos.: 040126, 040129, and 045012

316-AD

Dear Mr. Harris:

This is in regard to your September 5, 2001, request that the Federal Emergency Management Agency (FEMA) issue a Letter of Map Revision for the above-referenced community. In a previous letter, you were informed that additional data might be required to complete our review of the request. The data required to complete our review, which must be submitted within 90 days of the date of this letter, are listed on the enclosed summary.

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

If you are unable to meet the 90-day deadline for submittal of required items, and would like us to continue processing your request, you must request an extension of the deadline. This request must be submitted to us in writing and must provide (1) the reason why the data cannot be submitted within the requested timeframe, and (2) a new date for the submittal of the data. FEMA receives a very large volume of requests and cannot maintain inactive requests for an indefinite period of time. Therefore, the fees will be forfeited for any request for which neither the requested data nor a written extension request is received within 90 days.

If you have general questions about your request, FEMA policy, or the National Flood Insurance Program, please call the FEMA Map Assistance Center, toll free, at 1-877-FEMA MAP

3601 Eisenhower Avenue, Suite 600, Alexandria, Virginia 22304-6425 PH: 703.960.8800 FX: 703.960.9125

Michael Baker Jr., Inc., under contract with the FEDERAL EMERGENCY MANAGEMENT AGENCY, is a Map Coordination Contractor for the National Flood Insurance Program

(1-877-336-2627). If you have specific questions concerning your request, please call the Revisions Coordinator for your State, Pernille Buch-Pedersen, who may be reached at (703) 317-6224.

Sincerely,

Andrea L. Ryon

Andrea L. Ryon, P.E., Director
Engineering Division
Michael Baker Jr., Inc.

Enclosures

cc: Mr. Jonathan H. Pearson
Town of Carefree

Mr. Wayne Anderson, P.E.
Town Engineer
Town of Cave Creek

Mr. William Erickson
Transportation Systems Department
City of Scottsdale

Reviewers name:

Dawn Hawkins

NATIONAL FLOOD INSURANCE PROGRAM
FEMA MAP COORDINATION CONTRACTOR

Summary of Additional Data Required to Support a
Letter of Map Revision (LOMR)

Case No.: 01-09-1157P

Requester: Mr. Richard P. Harris, P.E.

Communities: Towns of Carefree and Cave Creek and City of Scottsdale, AZ

Community Nos.: 040126, 040129, and 045012

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

Galloway Wash

1. The submitted HEC-1 hydrologic computer models for Galloway Wash include a reservoir routing routine for Detention Basin No. S-1. The comment card in this HEC-1 model indicates that the basin is a proposed condition. Discharges for the flood having a 1-percent of being equaled or exceeded in any given year (base flood) must be based on existing conditions for LOMR requests. Please provide an as-built plan, certified by a professional engineer or land surveyor, for Detention Basin No. S-1, or revise the submitted HEC-1 model to reflect only existing conditions.

2. The submitted HEC-RAS hydraulic computer model for Galloway Wash uses a discharge of 1,110 cubic feet per second (cfs) along Galloway Wash from approximately 600 feet downstream of Dream Street to approximately 900 feet upstream of Pima Road. This discharge agrees with the 24-hour base flood discharge for Subbasin GWW1_2 at Pima Road along Galloway Wash. Our review of the submitted drainage area map, Figure 4.2.2-3, revealed that in addition to Subbasin GWW1-2, Subbasin GWW1_3 would contribute runoff to Galloway Wash from approximately 600 feet downstream of Dream Street to just downstream of Pima Road. The submitted HEC-1 hydrologic models for Galloway Wash do not account for the runoff from Subbasin GWW1_3 along the aforementioned reach. Please revise the submitted HEC-1 models to include the runoff from Subbasin GWW1_3 from approximately 600 feet downstream of Dream Street to just downstream of Pima Road, or provide an explanation for not including the runoff from Subbasin GWW1_3 along this reach.

3. The submitted HEC-RAS model uses contraction and expansion coefficients of 0.1 and 0.3, respectively, to model the private bridge at Cross Section 0.866. Typically, contraction and expansion coefficients of 0.3 and 0.5, respectively, are used to model the change in cross-section area in the vicinity of bridges. Please revise the submitted HEC-RAS model by using contraction and expansion coefficients of at least 0.3 and 0.5, respectively, to analyze the private bridge at Cross Section 0.866, or explain the reason for using the submitted contraction and expansion coefficients at this bridge.

4. The submitted work map entitled "Floodplain Delineation Study of Andora Hills & Galloway Washes, FCD 99-14," prepared by JE Fuller Hydrology and Geomorphology, Inc., dated June 2001, shows a split-flow condition along Galloway Wash from approximately 500 feet downstream to just downstream of Pima Road. This split-flow condition was not included in the submitted HEC-RAS model. Please provide a hydraulic analysis of the split-flow condition along Galloway Wash just downstream of Pima Road, or explain why this split-flow condition was not analyzed.

3601 Eisenhower Avenue, Suite 600, Alexandria, Virginia 22304-6425 PH: 703.960.8800 FX: 703.960.9125

5. Our review of the submitted annotated Flood Insurance Rate Map (FIRM) and the submitted work map entitled "Floodplain Delineation Study of Andora Hills & Galloway Washes, FCD 99-14," prepared by JE Fuller Hydrology and Geomorphology, Inc., dated August 2001, revealed that the revised floodway boundary delineations do not tie into the effective floodway boundary delineations at the upstream end of the revised reach along Grapevine Wash, which is shown as an unnamed tributary to Galloway Wash on effective FIRM Panel 04013C0808 H. Please submit an annotated FIRM, at the scale of the effective FIRM, that shows how the revised floodway boundary delineations graphically tie into the effective floodway boundary delineations at the upstream end of the revised reach along Grapevine Wash.

Andora Hills Wash

6. The submitted report entitled "Floodplain Delineation Study of Andora Hills & Galloway Washes, FCD 99-14, Technical Data Notebook, Volume 1 of 2," prepared by JE Fuller Hydrology and Geomorphology, Inc., dated June 2001, states that the hydrologic data for Andora Hills Wash was provided in the Technical Data Notebook submitted with the LOMR request for the Town of Cave Creek above Carefree Highway (Case No. 01-09-551P). The submitted HEC-RAS model for Andora Hills Wash uses discharges of 2,500 cfs, 2,700 cfs, 3,000 cfs, and 3,100 cfs that were not in the hydrologic data that were submitted with the LOMR request for Case No. 01-09-551P. Please provide backup calculations to support these discharges, or explain how these discharges were determined. In addition, the documentation that was submitted for LOMR Case No. 01-09-551P did not include a drainage area map for Andora Hills Wash. Please provide such a drainage area map.

call Frank to Verify

7. The above-referenced work map dated June 2001 shows that the regulatory floodway along Andora Hills Wash would overtop Cave Creek Road. Our review of the submitted HEC-RAS model revealed that the base flood would be contained in the four 12-foot by 10-foot box culverts at Cave Creek Road. Please revise the submitted work map to show that the regulatory floodway would not overtop Cave Creek Road, or explain why the regulatory floodway is shown overtopping the road.

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

⇦ C340 = 2070

360 = 2620

Q = 2500 cfs interpolated flow.

C350 Q = 2260 cfs.

Federal Emergency Management Agency

Washington, D.C. 20472

FEE SCHEDULE FOR PROCESSING REQUESTS FOR MAP CHANGES

This notice contains the revised fee schedule for processing certain types of requests for changes to National Flood Insurance Program (NFIP) maps. The change in the fee schedule will allow FEMA to further reduce the expenses to the NFIP by more fully recovering the costs associated with processing conditional and final map change requests. The revised fee schedule for map changes is effective for all requests dated June 1, 2000, or later and supersedes the current fee schedule, which was established on March 1, 1999.

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

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

Based on our review of actual cost data for Fiscal Year 1999, we are continuing to charge the following review and processing fees, which requesters must submit with all requests:

Request for single-lot/single-structure CLOMA, CLOMR-F, and LOMR-F	$400
Request for single-lot/single-structure LOMR-F based on as-built information (CLOMR-F previously issued by us)	$300
Request for multiple-lot/multiple-structure CLOMA	$700
Request for multiple-lot/multiple-structure CLOMR-F and LOMR-F	$800
Request for multiple-lot/multiple-structure LOMR-F based on as-built information (CLOMR-F previously issued)	$700

Fee Schedule for Requests for CLOMRs

Based on our review of actual cost data for Fiscal Year 1999, we are continuing to charge the following review and processing fees, which requesters must submit with all requests unless exempted by 44 CFR 72.5:

Request based on new hydrology, bridge, culvert, channel, or combination of any of these	$3,100
Request based on levee, berm, or other structural measure	$4,000

National Flood Insurance Program
NFIP
Administered by FEMA

Need Information on Flood Hazard Maps?

A wealth of information is only a click away at: **www.fema.gov/mit/tsd**

Homeowners will find:

- A helpful tutorial: "How to Challenge a Flood Risk Determination"
- Answers to Frequently Asked Questions, including, "Why do I need flood insurance?" "What are the different flood hazard zone designations and what do they mean?" and "What is a base flood elevation?

Insurance Agents and Bankers will find:

- Information on the National Flood Insurance Reform Act of 1994, which affects lenders
- Pages containing information on how to become a "Write Your Own" insurance agent
- Pages containing flood insurance rate information and a listing of map determination companies

Engineers and Surveyors will find:

- A listing of National Flood Insurance Program (NFIP) approved and test version software with links to free downloads
- Forms and fee schedules for requesting a map change or back-up study data
- A link to a listing of training courses and conferences related to emergency management

Floodplain Managers and Community Officials will find:

- The compendium of map change actions and the Guide for Community Officials
- A listing of key contacts at FEMA with direct e-mail links
- Forms necessary to initiate requests for back-up study data

All Four Constituent groups will find:

FEMA MAP ASSISTANCE CENTER
FMAC
1-877-FEMA MAP

- NFIP policies and regulations
- Forms for making map change requests
- The answers to over 80 Frequently Asked Questions
- Access to a database containing the status of recent requests for map changes
- Numerous reports and guidance documents in both Adobe Acrobat .PDF and MS Word formats
- Information on Map Modernization initiatives with direct e-mail links to FEMA Task Leaders
- A subscription service providing free news on the latest developments in flood hazard mapping via e-mail
- E-mail links to Map Specialists at the FEMA Map Assistance Center (1-877-FEMA MAP)

Questions and suggestions? Contact John Magnotti at 202-646-3932, or john.magnotti@fema.gov

JE Fuller/ Hydrology & Geomorphology, Inc.

Jonathan Fuller, P.E., P.H.
Brian Iserman, P.E.
John Wallace, P.E.
Ted Lehman, P.E.
W. Scott Ogden, P.E.
Pat Deschamps, P.E., L.S.

Michael Henze, M.A.
Tamara J. Norton, E.I.T.
Brooks Dillard, B.A.
Zack Washburn, M.S.
Mike Kellogg, M.S.

6101 S. Rural Rd., Suite 110
Tempe, Arizona 85283
480-752-2124 (voice)
480-839-2193 (fax)
www.jefuller.com

April 8, 2002

Flood Control District Of Maricopa County
Att: Richard Harris, P.E.
2801 W. Durango
Phoenix, AZ 85009

RE: Floodplain Delineation Study of Andora Hills & Galloway Washes, FCD 99-14: Response to FEMA Review Comments Received by your office 2/13/2002, FEMA Case No. 01-09-1157P

Dear Mr. Harris:

I am in receipt of the referenced FEMA review comments. Following are each of FEMA's comments followed by JEF's response to each comment:

1. *"The submitted HEC-1 hydrologic computer models for Galloway Wash include a reservoir routing routine for Detention Basin No. S-1. The comment card in this HEC-1 model indicates that the basin is a proposed condition. Discharges for the Flood having a 1-percent [chance] of being equaled or exceeded in any given year (base flood) must be based on existing conditions for LOMR requests. Please provide an as-built plan, certified by a professional engineer or land surveyor, for Detention Basin No. S-1, or revise the submitted HEC-1 model to reflect only existing conditions."*

As-built plan sheets have been added to the TDN in Appendix D.4. These as-built plans show no differences between the design and the built conditions. It appears that as-built routing was not performed since no changes were noted on the as-built plans.

2. *The submitted HEC-RAS hydraulic computer model for Galloway Wash uses a discharge of 1,110 cubic feet per second (cfs) along Galloway Wash from approximately 600 feet downstream of Dream Street to approximately 900 feet upstream of Pima Road. This discharge agrees with the 24-hour base flood discharge for Subbasin GWW1_2 at Pima Road along Galloway Wash. Our review of the submitted drainage area map, Figure 4.2.2-3, revealed that in addition to Subbasin GWW1-2, Subbasin GWW_3 would contribute runoff to Galloway Wash from approximately 600 feet downstream of Dream Street to just downstream of Pima Road. The submitted HEC-1 hydrologic models for Galloway Wash do not account for the runoff*

from Subbasin GWW1_3 along the aforementioned reach. Please revise the submitted HEC-1 models to include the runoff from Subbasin GWW1_3 from approximately 600 feet downstream of Dream Street to just downstream of Pima Road, or provide an explanation for not including the runoff from Subbasin GWW1_3 along this reach.

JEF has revised the HEC-1 hydrologic model by dividing subasin GWW1_3 into subbasins GWW 131, GWW132, and GWW133. The modification has changed discharge values throughout the study reach, and as a result, JEF has made subsequent changes to the hydraulics and attendant supporting documentation and work maps for all affected reaches of Galloway Wash. Included with this letter are the revised HEC-1 model, the revised HEC-RAS model, and revised hydrology and hydraulic workmap sheets.

3. *The submitted HEC-RAS model uses contraction and expansion coefficients of 0.1 and 0.3, respectively, to model the private bridge at Cross Section 0.866. Typically, contraction and expansion coefficients of 0.3 and 0.5, respectively, are used to model the change in cross-section area in the vicinity of bridges. Please revise the submitted HEC-RAS model by using contraction and expansion coefficients of at least 0.3 and 0.5, respectively, to analyze the private bridge at Cross Section 0.866, or explain the reason for using the submitted contraction and expansion coefficients at this bridge.*

Contraction and expansion coefficients of 0.3 and 0.5 were not used at this bridge because there is no appreciable channel geometry transition at the bridge. A sensitivity analysis was run to determine the difference. By changing the contraction and expansion coefficients to 0.3 and 0.5, respectively, the computed water surface elevations at two cross sections upstream of the bridge (river stations 0.896 and 0.905) increased by only 0.01 foot. The coefficients were changed to 0.3 and 0.5.

4. *The submitted work map entitled "Floodplain Delineation Study of Andora Hills & Galloway Washes, FCD 99-14," prepared by JE Fuller Hydrology and Geomorphology, Inc., dated June 2001, shows a split-flow condition along Galloway Wash from approximately 500 feet downstream to just downstream of Pima Road. This split-flow condition was not included in the submitted HEC-RAS model. Please provide a hydraulic analysis of the split-flow condition along Galloway Wash just downstream of Pima Road, or explain why this split-flow condition was not analyzed.*

Because the slopes on both sides of this short divided-flow reach were similar, and more importantly, because the flow distribution in the right side of the divide from upstream to downstream remained reasonably constant between cross sections 4.518 and 4.618 (less than 14 percent change compared to the total discharge), JEF decided not to perform a

split flow analysis at this divide. However, per FEMA request, JEF has revised the model by including a split flow analysis at this flow division.

The difference between the original divided-flow run and the new split flow reaches are not significant (a 0.19 foot increase at river station 4.618, and a decrease of 0.11 at river station 4.581). On the right split, the computed water surface elevation at the new cross section directly opposite the main branch river station 4.618 (river station 0.033) is 0.47 foot lower than the original computed water surface elevation at that station. Also on the right split, the computed water surface elevation at the new cross section directly opposite the main branch river station 4.581 (river station 0.027) is 0.04 foot higher than the original computed water surface elevation at that station.

5. *Our review of the submitted annotated flood insurance Rate Map (FIRM) and the submitted work map entitled "Floodplain Delineation Study of Andora Hills & Galloway Washes, FCD 99-14," prepared by JE Fuller Hydrology and Geomorphology, Inc., dated August 2001, revealed that the revised floodway boundary delineations do not tie into the effective floodway boundary delineations at the upstream end of the revised reach along Grapevine Wash, which is shown as an unnamed tributary to Galloway Wash on effective FIRM Panel 04013C0808 H. Please submit an annotated FIRM, at the scale of the effective FIRM, that shows how the revised floodway boundary delineations graphically tie into the effective floodway boundary delineations at the upstream end of the revised reach along Grapevine Wash.*

Originally, JEF used the exact cross section alignment from the previous study for cross section 0.210 on Grapevine Wash (see cross section 0.000 from "FIS of Cave Creek and Tributaries, Grapevine Wash", March, 1990 by CH2M-Hill). In order for the floodplain/floodway width to match at this same exact river station, JEF has re-aligned the cross section while keeping the same river station. This new alignment is actually a better alignment from a hydraulic modeling standpoint, however, it does not match the alignment from the CH2M-Hill study. Also note that the GR data for cross section 0.00 (actually cross section number 320 in the CH2M-Hill study) was taken from the original study for the area performed by Harris-Toups Associates (see Harris-Toups Associates, January 1979, Flood Insurance Study of Unincorporated Areas of Maricopa County, Arizona., Prepared for US Department of Housing and Urban Development, Federal Insurance Administration.). In the Harris-Toups study, the same cross section had an ID of 0.320.

The revised HEC-RAS model, with all attendant revised output summaries, and the revised work map sheet (sheet 2 of 6) are included with this letter.

While making this correction, JEF discovered an inadvertent error in the discharge used for Grapevine Wash for this study. An additional hydrograph combination card was inserted into the HEC-1 in order to better determine the discharge at the mouth of

Grapevine Wash. The discharge previously used was 4960 cfs. The revised discharge is 5720 cfs. The revised HEC-1 model, with all attendant revised output summaries and tables are included with this letter.

Enclosed are two copies of the revised work map for this reach, along with the revised HEC-RAS model, and the revised annotated FIRM Panel 04013C0808 H l.

6. *The submitted report entitled "Floodplain Delineation Study of Andora Hills & Galloway Washes, FCD 99-14, Technical Data Notebook, Volume 1 of 2," prepared by JE Fuller/Hydrology & Geomorphology, Inc., dated June 2001, states that the hydrologic data for Andora Hills Wash was provided in the Technical Data Notebook submitted with the LOMR request of the town of Cave Creek above Carefree Highway (Case No. 01-09-551P). The submitted HEC-RAS model for Andora Hills Wash uses discharges of 2,500 cfs, 2,700 cfs, 3,000 cfs, and 3,100 cfs that were not in the hydrologic data that were submitted with the LOMR request for Case No. 01-09-551P. Please provide backup calculations to support these discharges, or explain how these discharges were determined. In addition, the documentation that was submitted for LOMR Case No. 01-09-551P did not include a drainage area map for Andora Hills Wash. Please provide such a drainage area map.*

As stated in the submitted report ("Floodplain Delineation Study of Andora Hills & Galloway Washes, FCD 99-14, Technical Data Notebook, Volume 1 of 2," prepared by JE Fuller/Hydrology & Geomorphology, Inc., dated June 2001), the discharges used to model Andora Hills Wash came from the Technical Data Notebook submitted with the LOMR request of the Town of Cave Creek above Carefree Highway (Case No. 01-09-551P). The other discharge values noted are the result of a linear interpolation whereby, minor adjustments in the discharge were made at identified minor inflow points to avoid abrupt changes in discharge at concentration points. There are comments in the HEC-RAS cross-section data for which each one of these interpolated discharge changes take place. No calculations are usually provided when using this technique for small discharge adjustments since it is employed based on best engineering judgment and observations from aerial photographs. These adjustments, were made for the purpose of making the model as accurate as possible. It should be noted that this is a common standard of practice among engineers who specialize in floodplain delineations.

Regarding the second point brought up in question number 6, the drainage area map for Andora Hills Wash can be found in "Cave Creek Above Carefree Highway Floodplain Delineation Study", FCD 95-28, Technical Data Notebook, Hydrology, Existing Conditions, Book 1 of 2, in the Exhibits Section (See Hydrology Exhibit A "Watershed Drainage Map", Sheets 1 and 2). That study was performed by George V. Sabol Consulting Engineers, Inc. in association with McLaughlin Kmetty Engineers, Ltd. In July, 1997, and is listed in the references section on page 4-30 (reference number 9) in

our TDN. With this letter, I am transmitting to you one copy of the 2-sheet hydrology map from the above referenced study for you to forward to FEMA.

7. *The above-referenced work map dated June 2001 shows that the regulatory floodway along Andora Hills Wash would overtop Cave Creek Road. Our review of the submitted HEC-RAS model revealed that the base flood would be contained in the four 12-foot by 10-foot box culverts at Cave Creek Road. Please revise the submitted work map to show that the regulatory floodway would not overtop Cave Creek Road, or explain why the regulatory floodway is shown overtopping the road.*

The line work has been modified at the Cave Creek Road culverts to more clearly show that the culverts are not overtopped. The revised work map sheet (sheet 1 of 6) is included with this letter.

This concludes JEF's response to the referenced review comments. Should you have additional questions regarding these responses, or need additional data, please do not hesitate to contact me at 480-752-2124 extension 11.

Sincerely,
JE Fuller/Hydrology & Geomorphology, Inc.

Brian R. Iserman

Brian R. Iserman, P.E.
Hydrologist

B.5 Contract Documents

Pursuant to the provisions of the Arizona Revised Statutes Section 48-3603, the Board of Directors has the authority to enter into contracts.

The Flood Control District of Maricopa County, Arizona, hereinafter called the "District", is desirous of having certain professional services performed in connection with Contract FCD 99-14 for Floodplain Delineation of the Andora Hills and Galloway Washes (hereinafter called the "Project"), as more fully described in Exhibit A, Scope of Work, and in accordance with Exhibit B, Fee Proposal; and

JE Fuller/Hydrology & Geomorphology, Inc., hereinafter called "Consultant", with its principal office located at 5235 South Kyrene Road, Suite 205, Tempe, Arizona 85283, is desirous of performing said services;

THEREFORE, the parties hereto mutually agree as follows:

SECTION I - SERVICES OF THE CONSULTANT

The Consultant, under the general supervision of the Manager, Engineering Division shall prepare studies, reports, surveys, plans, drawings, specifications and cost estimates as are necessary for the Project and according to the directions and designated standards of the District and in accordance with Exhibit A. It is understood and agreed that the District's authorized representative shall be the Manager, Engineering Division or his duly authorized representative, hereinafter called the "Agent" and that he/she shall be the sole contact for administering this contract.

The Consultant shall meet periodically with the Agent so as to keep the District informed of the progress of the work in accordance with the schedule defined in Exhibit A.

The Consultant shall promptly advise the Agent of any factors which may develop during the Project, that would likely result in construction or design costs in excess of budgetary constraints.

SECTION II - PERIOD OF SERVICE

The Consultant shall complete all work per the schedule provided in Exhibit A, Scope of Work **within five hundred (500) calendar days** after receipt of the Notice to Proceed, including 60 days for District reviews and 180 days for FEMA reviews. Should extension of this contract period be necessary, and any such extension(s) continue the date of contract performance for a time period of more than one year from the date of original contract expiration, adjustment(s) of the consultant's fee(s) may, upon agreement by both the District and the Consultant, be made in accordance with the Consumer Price Index for Urban Consumers, Western Division published by the U.S. Department of Labor, Bureau of Labor Statistics, using the published edition coinciding with the initial contract expiration date. Any such fee adjustment shall only apply to the extended contract time period.

SECTION III - PAYMENTS TO THE CONSULTANT

The Consultant shall be paid for work under this Contract a **lump sum fee of one hundred thirty-two thousand eighteen dollars ($132,018.00)** plus any adjustments that have been approved in writing in accordance with the Maricopa County Procurement Code.

The District shall pay the Consultant upon completion of the work as accepted by the District, except that progress payments may be made as billed by the Consultant based on approved monthly progress reports subject to the limitations set forth in Exhibit A, Scope of Work. Ten percent of all contract payments made on an interim basis shall be retained by the District as insurance of proper performance of the contract or, at the option of the Consultant, a substitute security may be provided by the Consultant in an authorized form pursuant to procedures established by the District. The Consultant is entitled to all interest from any such substitute security.

When the contract is fifty percent (50%) completed, one-half (½) of the amount retained will be paid to the Consultant provided the Consultant is making satisfactory progress on the contract and there is no specific cause or claim requiring a greater amount to be retained. After the contract is fifty percent (50%) completed, no more than five percent (5%) of the amount of any subsequent progress payments shall be retained providing the Consultant is making satisfactory progress on the project, except if at any time the District determines satisfactory progress is not being made, ten percent (10%) retention shall be reinstated for all progress payments made under the contract subsequent to the determination.

If the Consultant desires a partial payment in accordance with the above provisions, the Consultant will complete and furnish Attachment No. 1 to this contract, the District-provided Minority/Women-owned Business Enterprise Participation Report, with each request for payment, indicating payment distribution to MBE/WBE firms. The Minority/Women-owned participation for this contract is five percent (5%).

Following approval and acceptance by the District of all work described in Exhibit A but prior to submittal by the District to FEMA, the Consultant shall submit a final invoice and a "Certificate of Substantial Performance" form for release of all monies due the Consultant, except for five percent (5%) retention. Any retention monies shall be paid or substitute security released, as applicable, to the Consultant upon (1) FEMA acceptance/approval of the project and completion of all final work required by the District to receive FEMA acceptance, (2) receipt of a "Certificate of Performance" form, Attachment 2 to this contract, and (3) an invoice for any sums remaining due and payable under this Contract.

SECTION IV - THE DISTRICT'S RESPONSIBILITIES

The District shall furnish the Consultant, at no cost to the Consultant, the following information or services for this Project:

A. One copy of on-hand maps, records, survey ties, benchmarks or other data pertinent to the Project. This does not, however, relieve the Consultant of the responsibility of searching records for additional information, for requesting specific information or for verification of that information provided. The District does not warrant the accuracy or comprehensiveness of any such information.

B. All available information and data relative to policies, standards, criteria, and studies, etc. impacting the Project as identified by the Consultant.

C. Availability of staff for consultation with the Consultant during the performance of studies and plan development in order to identify the problems, needs, and other functional aspects of the Project.

D. Examination of documents submitted by the Consultant and rendering of decisions pertaining thereto promptly, to avoid unreasonable delay in the progress of the work by the Consultant. The District will keep the Consultant advised concerning the progress of the District's review of work.

SECTION V - AMENDMENTS

This Contraet may be amended by mutual written agreement of the District and the Consultant. Any alteration in the scope of work that will result in a substantial change in the nature of the Project so as to materially increase or decrease the contract fee will require negotiation of an amendment to the contract to be executed by the District and the Consultant. No work shall commence on the change until the District has approved the contract amendment and the Consultant has been notified to proceed by the Agent. It is distinctly understood and agreed that no claim for extra work done or materials furnished by the Consultant will be allowed by the District except as provided herein, nor shall the Consultant do any work or furnish any materials not covered by this agreement unless such work is first authorized in writing in accordance with the Maricopa County Procurement Code. Any such work or materials furnished by the Consultant without such written authorization first being given shall be at his own risk, cost, and expense, and he hereby agrees that without such written authorization he will make no claim for compensation for such work or materials furnished.

SECTION VI - RECORDS

Records of the Consultant's payroll expense pertaining to this Project and records of accounts between the District and the Consultant shall be kept on a generally recognized accounting basis and shall be available upon request to the District or its authorized representative for audit during normal business hours. The records shall be subject to audit by appropriate grantor agency if the Project is funded all or in part by a grant.

All Consultant and District procurement records shall be retained for a period of one year and disposed of in accordance with the records retention guidelines and schedules approved by the State of Arizona Department of Library, Archives, and Public Records unless applicable Federal regulations require a longer period.

SECTION VII - PROJECT COMPLETION

If during the course of this contract situations arise which prevent completion within the allotted time, the Agent may grant an extension.

SECTION VIII - TERMINATION

The District may terminate this contract at any time upon reimbursement to the Consultant of expenses, which include reasonable charges for time and material for the percentage of work satisfactorily completed and turned over to the District.

The District reserves the right to postpone, terminate or abandon this Project for the Consultant's failure to complete the Project on time, or failure to comply with the provisions of the contract. The District also reserves the right to terminate any or all parts of this contract for its own convenience as the District may determine at its sole discretion.

The District hereby gives notice that pursuant to A.R.S. Section 38-511 "A" this contract may be canceled without penalty or further obligation within three years after execution if any person significantly involved in initiation, negotiation, securing, drafting, or creating a contract on behalf of the District is, at anytime while the contract or any extension of the contract is in effect, an employer, agent, or any other party to the contract in any capacity or a consultant to any other party of the contract with respect to the subject matter of the contract. Cancellation under this section shall be effective when written notice from the Chief Engineer and General Manager is received by all of the parties of the contract. In addition, the District may recoup any fee

for commission paid or due to any person significantly involved in initiation, negotiation, securing, drafting, or creating the contract on behalf of the District from any other party to the contract arising as a result of the Contract.

The Consultant may terminate this contract in the event of nonpayment of fees as specified in Section III, PAYMENTS TO THE CONSULTANT.

SECTION IX - OWNERSHIP OF DOCUMENTS

All original documents including, but not limited to studies, reports, tracings, drawings, physical and computer models, estimates, field notes, investigations, design analyses, calculations, computer software, and specifications, prepared in the performance of this Contract are to be and remain the property of the District and are to be delivered to the Agent before final payment is made to the Consultant. The District reserves the right to reuse the documents as it sees fit. However, the District will not reuse, alter, or modify these documents without noting such alterations, modifications, or intent of their reuse, and will hold the Consultant harmless from any claims arising from the reuse, alteration, or modification of the documents. The Consultant may retain reproducible copies of all such documents delivered to the District.

SECTION X - COMPLIANCE WITH LAWS

The Consultant is required to comply with all Federal, State and local laws, local ordinances and regulations. The Consultant's signature on this contract certifies compliance with the provisions of the I-9 requirements of the Immigration Reform and Control Act of 1986 for all personnel that the Consultant and any subconsultants employ to complete this Project. It is understood that the District shall conduct itself in accordance with the provisions of the Maricopa County Procurement Code.

SECTION XI - GENERAL CONSIDERATIONS

A. Prior to beginning the work, the Consultant shall furnish the District for approval the names of its key employees, and of its sub-consultants and their key employees to be used on this Project. Any subsequent changes are subject to the written approval of the District.

   With the exception of the District or the Federal Emergency Management Agency, the Consultant agrees not to accept any clients within the area of the 100-year floodplain for the project, during the period of the Contract, without the expressed written authority from the Chief Engineer and General Manager of the District.

   The Consultant in replacing a MBE/WBE subcontractor should attempt to contract with another MBE/WBE.

B. The failure of either party to enforce any of the provisions of this Contract or to require performance of the other party of any of the provisions hereof shall not be construed to be a waiver of such provisions, nor shall it affect the validity of this Contract or any part thereof, or the right of either party to thereafter enforce each and every provision.

C. The Consultant shall be responsible for the cost of any additional design, field layout, testing, construction and supervision necessary to correct those errors or omissions attributable to the Consultant and for any

damage incurred by the District as a result of additional construction costs caused by such Consultant errors or omissions.

D. The fact that the District has accepted or approved the Consultant's work shall in no way relieve the Consultant's responsibility.

E. It is mutually understood and agreed that this Contract shall be governed by the laws of the State of Arizona, both as to interpretation and performance. Any action at law, suit in equity, or judicial proceeding for the enforcement of this Contract, or any provision thereof, shall be instituted only in the courts of the State of Arizona.

SECTION XII - SUCCESSORS AND ASSIGNS

This Contract shall not be assigned by either party without prior written approval of the other except that the Consultant may use in the performance of this Contract without prior approval of the District, personnel or services of its related entities and affiliated companies as if they were an integral part of the Consultant; and it shall extend to and be binding upon the heirs, executors, administrators, successors and assigns of the parties hereto.

SECTION XIII - NO KICK-BACK CERTIFICATION

The Consultant warrants that no person has been employed or retained to solicit or secure this Contract upon any agreement or understanding for a commission, percentage, brokerage, or contingent fee; and that no member of the Board of Directors/Supervisors or any employee of the District has any interest, financially or otherwise, in the Consultant firm.

For breach or violation of this warranty, the District shall have the right to annul this Contract without liability, or at its discretion to deduct from the Contract price or consideration, the full amount of such commission, percentage, brokerage, or contingent fee.

SECTION XIV - ANTI-DISCRIMINATION PROVISION

The Flood Control District of Maricopa County will endeavor to ensure in every way possible that minority and women-owned business enterprises shall have every opportunity to participate in providing professional services, purchased goods, and contractual services to the Flood Control District of Maricopa County without being discriminated against on the grounds of race, religion, sex, age, disability, or national origin.

The Consultant agrees not to discriminate against any employee or applicant for employment because of race, religion, color, sex, age, disability, or national origin and further agrees not to engage in any unlawful employment practices. The Consultant further agrees to insert the foregoing provisions in all subcontracts hereunder.

SECTION XV - INDEMNIFICATION

For Professional Liability: To the fullest extent permitted by law, the Consultant shall indemnify and hold harmless the District and Maricopa County, their agents, representatives, officers, directors, officials, and employees from and against all claims, damages, losses and expenses (including but not limited to attorney

fees, court costs, expert witness fees, and the cost of appellate proceedings), relating to, arising out of, or alleged to have resulted from the Consultant's negligent errors, omissions, mistakes or acts relating to professional services in the performance of this Contract. The Consultant's duty to indemnify and hold harmless the District and Maricopa County, their agents, representatives, officers, directors, officials, and employees shall arise in connection with any claim, damage, loss or expense that is attributable to bodily injury, sickness, disease, death, or injury to, impairment, or destruction of property including loss of use resulting therefrom, caused by any negligent errors, omissions, mistakes or acts related to professional services in the performance of this Contract, including any person for whose errors, omissions, mistakes or negligent acts the Consultant may be legally liable.

The amount and type of insurance coverage requirements set forth herein will in no way be construed as limiting the scope of the indemnity in this paragraph.

For all other hazards, liabilities, and exposures: To the fullest extent permitted by law, the Consultant shall defend, indemnify and hold harmless the District and Maricopa County, their agents, representatives, officers, directors, officials and employees from and against all claims, damages, losses and expenses (including but not limited to attorney fees, court costs, expert witness fees, and the cost of appellate proceedings), relating to, arising out of, or resulting from the Consultant's work or services.

Consultant's duty to defend, hold harmless, and indemnify the District and Maricopa County, their agents, representatives, officers, directors, officials and employees shall arise in connection with any claim, damage, loss or expense that is attributable to bodily injury, sickness, disease, death, injury to, impairment or destruction of property including loss of use resulting therefrom, caused by any act or omission of the Consultant, anyone Consultant directly or indirectly employs or anyone for whose acts Consultant may be liable.

The amount and type of insurance coverage requirements set forth herein will in no way be construed as limiting the scope of the indemnity in this paragraph.

SECTION XVI - INSURANCE

General Clauses. The Consultant, at its own expense, shall purchase and maintain the minimum insurance specified below with companies duly licensed, with a current A.M. Best, Inc. rating of B++6, or approved unlicensed by the State of Arizona Department of Insurance.

Additional Insured. The insurance coverage, except Workers' Compensation and Professional Liability, required by this Contract shall name the District, its agents, representatives, officers, directors, officials, and employees as Additional Insureds.

Coverage Term. All insurance required herein shall be maintained in full force and effect until all work or service required to be performed under the terms of the Contract is satisfactorily completed and formally accepted; failure to do so may, at the sole discretion of the District constitute a material breach of this Contract.

Primary Coverage. The Consultant's insurance shall be primary insurance as respects the District, and any insurance or self insurance maintained by the District shall not contribute to it.

Claim Reporting. Any failure to comply with the claim reporting provisions of the policies or any breach of the policy warranty shall not affect coverage afforded under the policies to protect the District.

Waiver. The policies, except Workers' Compensation, shall contain a waiver of transfer rights of recovery (subrogation) against the District, its agents, representatives, directors, officers, and employees for any claims arising out of the Consultant's work or service.

Deductible/Retention. The policies may provide coverage, which contains deductibles or self-insured retention. Such deductible and/or self insured retention shall not be applicable with respect to the coverage provided to the District under such policies. The Consultant shall be solely responsible for the deductible and/or self-insured retention.

Copies of Policies. The District reserves the right to request and to receive, within 10 working days, certified copies of any or all of the above policies and/or endorsements. The District shall not be obligated, however, to review same or to advise Consultant of any deficiencies in such policies and endorsements, and such receipt shall not relieve Consultant from, or be deemed a waiver of the District's right to insist on strict fulfillment of the Consultant's obligations under this Contract.

Commercial General Liability. The Consultant shall maintain Commercial General Liability insurance with a limit of not less than $1,000,000 for each occurrence with a $1,000,000 General Aggregate limit. The policy shall include coverage for bodily injury, broad form property damage, personal injury, products and completed operations and blanket contractual covering, but not limited to, the liability assumed under the indemnification provisions of this Contract which coverage will be at least as broad as the Insurance Service Office, Inc. Policy Form CG 00011093 or any replacements thereof. The Commercial General liability additional insured endorsement will be at least as broad as the Insurance Service Office, Inc. Additional Insured, Form B, CG 20102093, or replacements thereof. Such policy shall contain a severability of interest provision, and shall not contain a sunset provision or commutation clause, nor any provision that would serve to limit third party action over claims.

Automobile Liability. The Consultant shall maintain Commercial/Business Automobile Liability insurance with a combined single limit for bodily injury and property damage of not less than $1,000,000 each occurrence with respect to the Consultant's any owned, hired, and non-owned vehicles assigned to or used in performance of the Consultant's work or services. Coverage will be at least as broad as coverage code 1, "any auto" (Insurance Services Office, Inc. Policy Form CA 00011293, or any replacements thereof).

Workers' Compensation. The Consultant shall carry Workers' Compensation insurance to cover obligations imposed by federal and state statutes having jurisdiction of Consultant's employees engaged in the performance of the work or services; and Employer's liability insurance of not less than $500,000 for each accident, $500,000 disease for each employee, and $500,000 disease policy limit.

In case any work is subcontracted, the Consultant will require the subcontractor to provide Workers' Compensation and Employer's Liability to at least the same extent as required of the Consultant.

Professional Liability. The Consultant retained by the District will maintain Professional Liability insurance covering errors and omissions arising out of the work or services performed by the Consultant or any person employed by the Consultant, with a limit of not less than $1,000,000 each claim.

Certificates of Insurance

Prior to commencing work or services under this Contract, the Consultant shall furnish the District with a Certificates of Insurance, Attachment No. 3, or formal endorsements, issued by the Consultant's insurer(s), as evidence that policies providing the required coverage, conditions and limits required by this Contract are in full force and effect. Such certificates shall identify this Contract number and title, as well as all other information on Attachment No. 3.

In the event any insurance policy(ies) required by this Contract is(are) written on a "claims made" basis, coverage shall extend for two years past completion and acceptance of the work or services and as evidenced by annual Certificates of Insurance. All Certificates of Insurance shall be identified with a contract number and title.

Cancellation and Expiration Notice

Insurance evidenced by this Certificate shall not expire, be canceled, or materially changed without thirty (30) days prior written notice to the District. If a policy does expire during the life of the contract, a renewal Certificate must be sent to the District at least fifteen (15) days prior to the expiration date.

IN WITNESS WHEREOF, the parties herein have executed this Contract.

JE FULLER/HYDROLOGY & GEOMORPHOLOGY, INC.

Principal (Signature)

Jonathan Fuller
Printed Name

Principal
Title

Date: 7/30/99

86-0785301
Federal Tax Identification Number

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

RECOMMENDED BY:

Michael S. Ellegood, P.E. Date
Chief Engineer and General Manager

ACCEPTED AND APPROVED:

Chairman, Board of Directors 9/1/99 Date

ATTEST:

Clerk of the Board 9/1/99 Date

LEGAL REVIEW

Approved as to form and within the powers and authority granted under the laws of the State of Arizona to the Flood Control District of Maricopa County.

General Counsel, District 7/27/99 Date

SCOPE OF WORK

for

FLOODPLAIN DELINEATION STUDY OF ANDORA HILLS AND GALLOWAY WASHES

CONTRACT FCD 99-14

SCOPE OF WORK
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
FLOODPLAIN DELINEATION STUDY OF ANDORA HILLS AND GALLOWAY WASHES
FCD 99-14

GENERAL

The project consists of approximately **7.6 river miles** of floodplain delineation covering about 2.8 miles on **Andora Hills Wash**, from the Cave Creek confluence to Carefree Drive at Lazy Burro Road, and 4.8 miles on **Galloway Wash** from the Cave Creek confluence to about 1/8 mile upstream of the Pima Road alignment. The limits of the contributory watershed are from section 29 of Township 6N Range 4E (on the west) to section 31 of Township 7N Range 5E (on the north) and section 15 of Township 6N Range 5E (on the east), as shown in Exhibit 1. The study requires new topographic strip mapping of approximately 2.5 square miles) at two-foot contour intervals, and the characterization of the hydrologic response of the approximately 20 square mile) watershed using this new topographic mapping and existing sources. In addition, approximately 11 square miles of digital ortho aerial photography will be required in the study watershed. The remaining portions of the watershed will be delineated from existing sources.

The consultant will analyze the watershed hydrology using the Corps of Engineer's HEC-1 computer model. The consultant will carry out floodplain and floodway delineation using the HEC-RAS computer model, if appropriate. The consultant must use sound engineering judgement in the development of the hydrologic and hydraulic models. Model results must be compared to those of earlier studies (which will be provided by the District). The results of the models must be analyzed carefully and refinements made to the input parameters in order to obtain the most realistic results. All work must meet or exceed Arizona Department of Water Resources (ADWR) and Federal Emergency Management Agency (FEMA) requirements for floodplain delineation. The results of this study must be reviewed and accepted by FEMA, prior to the finalization of this contract. All work under this scope of work (SOW) will be completed within **500 calendar days** from the date of Notice to Proceed, including **60 days** for District review and **180 days** for FEMA review.

TASK 1 - COORDINATION

1.1 The consultant shall submit a project schedule showing coordination meetings and completion dates for each of the tasks in the scope within **14 days** of Notice To Proceed. The consultant shall update this project schedule when appropriate.

1.2 The consultant shall participate in regular coordination meetings (at least **once every four weeks**) with the District's Project Manager and in milestone coordination meetings during the development of the hydrologic and hydraulic models and subsequent analyses. The consultant is responsible for the preparation of the minutes of any meetings. Minutes should be submitted to the District within **5 working days** of meetings. Whenever possible, coordination and milestone meetings should be combined.

1.3 The consultant shall submit a quarterly estimation of the projected billing within **14 days** of Notice to Proceed. Thereafter, this estimation will be updated as necessary and submitted to the District's Project Manager at least **10 days** prior to the end of each quarter.

1.4 The consultant shall submit monthly progress reports at least **5 working days** before submittal of monthly invoices. The monthly progress report should be no longer than two typed pages. At a minimum, the monthly report must contain the following:

a. A description of the **work accomplished** by task during the reporting month.

b. **Percent (%) completed** for the month and cumulative percent (%) completed for each task.

c. A brief description of the **work planned** to be accomplished in the following month.

d. A description of any **problems encountered**.

e. A highlight of **actions required** to be taken by the District.

1.5 The consultant is responsible for placing the legally mandated public announcement(s) at the beginning of the study, notifying the public of the study. The advertisement(s) will be published in a widely circulated newspaper twice, with approximately one week between publications. The advertisement must also appear two times in a local newspaper that serves the area being studied. After the advertisement is run, the consultant will supply the District with the original affidavit of publication from each of the newspapers for each day that the advertisement was published.

1.6 The consultant shall notify all property owners individually and obtain any necessary Rights of Entry for the Study Area. The consultant shall furnish the District with a list of the names and addresses of each property owner notified and a sample Right of Entry letter.

1.7 The consultant shall meet with officials from the local Public Works Department, if applicable. The purpose of this meeting is to identify local flooding problems and obtain information on current and planned public works projects, channel modifications, storm-drainage systems, development, and corporate boundaries.

1.8 The District (with assistance from the consultant) will plan and conduct two public meetings in conjunction with this study. The first meeting will be to inform the public of the **purpose and scope** of the study. The second meeting will be to inform the public of the**study results** and obtain public comment. This meeting will be convened prior to the submittal of the final report to FEMA. The consultant and the District shall be jointly responsible for the preparation of graphic displays for these meetings. One representative from the consultant shall attend **each** of the two meetings. The consultant shall respond to the public's comments and make revisions to the study if necessary, as guided by the District.

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

TASK 2 - DATA COLLECTION

2.1 The consultant shall collect and review pertinent data from the District andother outside sources. Data to be collected will include previous flood hazard reports and hydrology for the Study Area; existing

topographic mapping; historical flooding information; as-built plans for existing structures; FEMA Flood Hazard Boundary Maps and any Letters of Map Amendment and/or Revisions (LOMA/LOMRs), and other pertinent information.

2.2 A written report summarizing the data sources used and data collected shall be submitted to the District for information purposes. A preliminary draft of this report is due within **90 days** of Notice to Proceed.

TASK 3 - TOPOGRAPHIC MAPPING

3.1 The consultant as part of this contract shall retain an aerial survey subcontractor. The new topographic mapping is expected to cover selected portions of the contributing watersheds of (i) Andora Hills Wash, from its confluence with Cave Creek upstream or about **2.8 river miles** and (ii) Galloway Wash from its confluence with Cave Creek upstream for about **4.8 river miles**. The total area of aerial photography is estimated at **11 square miles**, of which about 2.5 square miles will be used for detailed contour mapping, as described below. Mapping limits for this study are shown in Exhibit 1.

3.2 The consultant shall coordinate all the aerial surveying work with the aerial surveying subcontractor to ensure that the specifications of the aerial surveying work are met. The consultant is responsible for ensuring that the topographic mapping covers the entire area of floodplain delineation. Quality control of surveys will be as per FEMA document 37, *Flood Insurance Study Guidelines and Specifications for Study Contractors*, January 1995.

3.3 Digital contour and planimetric data developed for this study shall be delivered according to the District's HIS specifications for review and approval prior to finalizing the Hydrology task (Task 5).

3.4 **Digital Terrain Models** shall be delivered following the guidelines stated in district's *HIS Data Delivery Specifications*, Rev. 3.1, June 1, 1998.

3.5 Topographic strip mapping will be prepared to a 2-foot contour interval, with a scale of 1 inch = 200 feet, with spot elevations and/or 1-foot supplemental contours on all section line and mid-section line roads (except as noted in Exhibit 1). The topographic mapping for the area shown in Exhibit 1 (about 2.5 **square miles**), will be prepared at a 2-foot contour interval, while the balance of the of the contributory watershed will be prepared at contour intervals available from existing sources—no new mapping will be required. The District shall provide DEM from USGS 7.5' series at no cost to consultant.

3.6 **Ground Control**:

a. The consultant shall provide all survey control using **1983 NAD**.

b. The consultant shall systematically set panel points and establish horizontal and vertical control throughout the areas to be mapped for use in compilation by the aerial survey contractor. Where readily available, surveys will tie into the State Plane Coordinate System. Field control shall be sufficient to readily allow for compilation of maps by the aerial survey contractor at the desired map scale and contour interval, and will be based on the National Geodetic Vertical Data of 1929 (NGVD). **A conversion factor, including documentation of how it was derived, will be provided by the consultant to allow comparison of NGVD 29 elevations to NAVD 88**

elevations and will be included in the Technical Data Notebook.

c. The horizontal and vertical control points shall be located and marked by the consultant. The controls for the aerial mapping shall be in sufficient numbers and shall be in locations compatible with the accuracy of the mapping requirements. The controls shall be of at least third order accuracy. Section corners, quarter corners, and mid-section points shall be used for control points wherever possible.

3.7 The consultant shall provide permanent non-erasable topographic mylars of the work study drawings. The drawings shall be 24" X 36" in size, with a scale of 1 inch = 200 feet at a contour interval of 2 feet for all mapping except for section lines of roads, which will have a contour interval of 1 foot. A cover sheet will be provided with the project title, date of topographic mapping, and a location map showing geographic range covered by each individual mapping sheet. Each drawing shall include separately floodplain and floodway delineation boundaries. All maps must display a north arrow, scale, section corners and quarter corners, current and proposed streets and highway names, State Plane Coordinate System, major drainage features, corporate boundaries, cross section lines, channel station center line(s), an index map, and a description and elevation of each elevation reference mark (ERM). A note explaining the proper means to convert the NGVD 29 elevations to NAVD 88 elevations shall be included in "NOTES" in the map border. The mapping will have accuracy such that ninety percent (90%) of all contours shall be within one-half contour of the true elevations and the remaining ten-percent (10%) of the contours shall not be in error by more than one contour interval.

3.8 Digital Orthophotos shall be provided per Flood Control District Digital Orthophotos Guidelines dated June 9, 1999, attached.

a. Digital Orthophotos covering the new detailed topographic mapping area along the washes will be rectified using the new topography, which is specified under Task 3.5.
b. Additional Digital Orthophotos covering the areas outside the washes will be rectified using existing USGS DEMs provided by the District, and horizontal control survey provided by the consultant.

TASK 4 - FIELD SURVEY

4.1 Prepare topographic mapping to a 2 foot contour interval with a scale of 1 inch = 200 feet, with spot elevations or 1 foot contours on all section line and mid-section line roads, for floodplain/floodway delineation areas as identified in Task 6 (and Exhibit 1), or FEMA criteria, whichever is more stringent. As described above, the topographic mapping for the remaining 15 square miles of watershed, shall be prepared at a contour interval determined by available existing data alone, not from photo interpretation.

4.2 Ground Control for Floodplain Delineations:

4.2.1 All topographic mapping and survey work shall meet or exceed Federal Emergency Management Agency (FEMA) minimum criteria as defined in FEMA Document 37, Flood Insurance Study Guidelines and Specifications for Study Contractors, January 1995. This would include, but is not necessarily limited to the establishment of "permanent" elevation reference marks (ERMs);

field control; and verification of profiles by the ground survey profile procedure.

4.2.2 Horizontal and Vertical Control: Systematically set panel points and establish horizontal and vertical control throughout the area to be mapped for use in compilation by the aerial survey contractor. Where readily available, surveys will tie into State Plane Coordinate System 1983 NAD. Field control shall be sufficient, at least one "permanent" point per mile, such point(s) being used as Elevation Reference Marks (ERMs). Surveys will be based on National Geodetic Vertical Datum (NGVD) 1929, per FEMA guidelines. A conversion factor, including documentation of how it was derived, will be provided by the consultant to allow comparison of NGVD 29 elevations to NAVD 88 elevations and will be included in the Technical Data Notebook. "Permanent" survey points shall consist of existing monument, such as brass caps or similar survey monuments. Where additional monument is needed, survey markers conforming to Maricopa Association of Governments (MAG) Uniform Standard Detail for Public Works Construction, detail 120-1, Type C, shall be placed 2" +/- above grade, and topped with a brass cap. Elevation Reference Marks will be labeled on available maps and described in a manner which allow them to be readily located in the field.

4.2.3 All aerial targets are to be removed following completion of the topographic mapping.

4.3 The consultant shall verify the accuracy of the mapping by the procedures called for in FEMA Document 37 or other methods approved by FEMA. This shall include the verification of cross sections used in the floodplain delineation.

4.4 Field surveys of bridges, culverts, and hydraulic structures are to be performed by the consultant when as-built plans are not available or when changes significant to the HEC-RAS modeling, such as sedimentation, have occurred since the date of as-built. This information should be reduced and compiled into an 11"x 17" (maximum size) drawing for inclusion in the final report. The information presented in the drawing should be in a format appropriate for use in the HEC-RAS model. Field surveys of bridges, culverts, hydraulic structures, and routing reaches must also be obtained where necessary for proper hydrologic modeling. It may be necessary to field survey some structures, if the as-built plans are not referenced to the 1929 NGVD.

TASK 5 - HYDROLOGY

5.1 The hydrologic study of the watershed shall be delivered to the District under separate cover from the hydraulic analysis. The consultant shall use the U.S. Army Corps of Engineers computer program HEC-1, 1990 Version 4.0, to develop a hydrologic model for the area. Using appropriate hydrologic judgement, sub-basins are to be identified that provide reasonable depiction of the watershed condition. The sub-basins must be as homogeneous as possible, using watershed area, watershed type (mountainous and flat lands or urban and undeveloped areas), and time of concentration as criteria. Sub-basin breakdowns will be done in sufficient detail to provide peak discharges at structures, major road crossings, each major confluence, and at boundary lines. An appropriate time step and number of ordinates is to be selected that allows for complete calculation of the flood hydrograph without sacrificing resolution of the flood peak. All calculations or assumptions used in developing sub-basin and routing parameters shall be documented and made a part of the appendix for the hydrology report. Field surveys may need to be taken for HEC-1 modeling purposes.

100-year discharge values for Andora Hills Wash will be obtained from the HEC-1 model prepared for the Cave Creek above Carefree Highway Floodplain Delineation Study (FCD 95-28; GVSCE, March 1997). A new HEC-1 model will be prepared for Galloway Wash. Concentration points in the local watershed in the Town of Carefree as shown in Exhibit 2 will be modeled using the rational method per the guidelines in the District's Drainage Design Manual, Volume I-Hydrology, January 1, 1995.

5.2 **Four meetings** associated with four tasks, and **two field trips** shall be held with the Flood Control District staff at the following milestones:

a. **One field trip at the start of the project** to scope out the critical points of the watershed and problem areas.

b. **Meeting number 1**: as soon as basic hydrologic data are gathered and the sub-basins have been delineated. Sample HEC-1 parameter estimations should also be presented and discussed at this meeting. A copy of the draft maps of the sub-basins must be delivered to the District at this meeting.

c. **Meeting number 2**: after all the parameters have been estimated. A draft copy of the parameters must be delivered to the District at least one week prior to this meeting.

d. **Meeting number 3**: after the preliminary HEC-1 results have been obtained and a draft report has been prepared. A copy of the draft report and the copy of the HEC-1 on a floppy disc, compatible with the Districts computers, must be delivered two weeks prior to the meeting.

e. **Meeting number 4**: to review comments by the District. A second field trip may be scheduled for the same day to discuss the results of the HEC-1 model.

5.3 The specific hydrologic techniques to be used in this study are:

a. Rainfall Depth: Point precipitation values shall be determined using the information and procedures described in the *Drainage Design Manual for Maricopa County, Arizona: Volume I - Hydrology*.

Rainfall Distribution: Peak discharges and peak volumes for the **100-year 6-hour** storm shall be estimated using the District's Distribution(s). **Peak discharges** and **peak volumes** for the **100-year 24-hour** storm shall be estimated using the **SCS Type II** rainfall distribution.

b. Areal Reduction: The point precipitation values shall be areally reduced for critical concentration points. Areal reduction for the **6-hour** rainfall duration shall be applied using the curves in the *Drainage Design Manual for Maricopa County, Arizona: Volume I - Hydrology*. NOAA HYDRO-40 shall be used with the **24-hour** rainfall reduction. Copies can be obtained from the District.

c. Rainfall Excess: The **Green and Ampt** methodology shall be utilized for estimation of rainfall

losses. The Lotus spreadsheet and procedures, provided by the District, shall be used to determine composite parameter values for each sub-basin.

d. Unit Hydrograph: The **Clark** and **S-Graph** methods shall be used following the procedures outlined in the *Drainage Design Manual for Maricopa County, Arizona: Volume I - Hydrology*. The choices in methodology shall be at the discretion of the consultant, with consent from the District.

e. Time of Concentration and S-Graph Lag Equation: The **Papadakis** method shall be used with the **Clark unit hydrograph**, along with the MCUHP1 computer program, to determine the time of concentration. If this method results in unsuitable times of concentration, other method(s) must be used and compared for the most realistic result. The S-graph lag equation, along with the MCUHP2 computer program, shall be used with the appropriate S-graph (Phoenix Mountain or Phoenix Valley).

f. Channel Routing: Channel routing shall be accomplished using either the **Muskingum-Cunge** or the **Normal-Depth** option of HEC-1. The choice of methodology shall be at the discretion of the consultant, with consent from the District. Average cross sections shall be developed utilizing available mapping and field reconnaissance data. Sufficient field cross sections shall be taken to ensure that routing reaches are reasonable and representative of field conditions.

The HEC-1 routing parameters for the reaches modeled using HEC-RAS shall be adjusted **after** the HEC-RAS cross sections become available. The resulting velocities and depths, for all reaches, must be assessed to ensure that realistic values are obtained.

g. Reservoir Routing: Detailed analysis of structures and ponding areas shall be accomplished using the **Modified Puls** reservoir routing option of HEC-1. **Stage versus discharge tables** for hydraulic structures shall be estimated using appropriate hydraulic methodology approved by the District.

h. Channel Transmission Losses: Attempts shall be made to estimate infiltration losses through channel bottoms based on existing field data or literature. If sufficient data is not available, the final report must acknowledge this, and explain how the peaks and volumes of flow are affected by not including the transmission losses.

5.4 The District shall provide available, appropriate references to facilitate parameter estimation.

5.5 Output of the computer model shall be reviewed to see if the peak rates of flow and discharge volumes are realistic. Flows will be tested for reasonableness using approximate methods, including ADWR regional regression equations, District's unit discharge relationships, and consistency with other hydrologic studies in the vicinity.

5.6 The consultant must make every attempt to recover historic stream gage data and compare actual recorded discharge values with the results obtained by the hydrologic model. Major differences must be discussed in the final report.

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

a. Soil maps, watershed boundary maps, and land use maps;

b. HEC-1 parameter estimation;

c. HEC-1 flow diagram and input parameters; and

d. HEC-1 results.

5.8 The Hydrologic Report

5.8.1 The findings of the hydrologic study shall be presented in Section 3 of the Technical Data Notebook and shall be prepared in accordance with *ADWR State Standards Attachment 1-97 (SSA 1-97)*. The report shall be organized as specified by the District, following SSA *1-97* format.

5.8.2 Tables and Figures for the appendices:

a. Topographic base map(s) showing the sub-basins, routing reaches, time of concentration (t_c), flow paths or lag flow paths, major man-made structures, and references (i.e. street names, Township, Range, Section, etc.) at a scale of 1 inch = 2000 feet.

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

c. Land use map(s) at the same scale as above.

d. Schematic map for the HEC-1 showing the sub-basins (area, t_c), the flow paths, the routing reaches (length, slope, friction, width, velocities, transmission losses, etc.), order of combining the hydrographs, channel, pipe or culvert dimensions (where appropriate).

e. Pertinent data on all structures (such as spillway elevation, rating curves, etc.).

f. One set of study maps (i.e. sub-basin boundary maps, flow path maps, soils maps, land use maps) to be folded and delivered in a binder.

5.8.3 HIS submittals pertinent to Task 5, must be reviewed and approved prior to finalizing the Floodplain Delineation Task (Task 6).

Any deviations from this hydrologic scope shall not be undertaken by the consultant without the **specific written concurrence** from the Flood Control District.

TASK 6 - FLOODPLAIN DELINEATION

6.1 Floodplain delineations must be performed using the most recent U.S. Army Corps of Engineers HEC-RAS River Analysis System computer model, Version 2.2, September 1998, or later, and methodology

acceptable to FEMA. This model will simulate the effects of floodplain geomorphology, flow changes, bridges, culverts, hydraulic roughness factors, effective flow limitations, split flows, and other considerations. The consultant shall prepare the study using the guidelines established in FEMA Document 37, *Flood Insurance Study Guidelines and Specification for Study Contractors*, January, 1995, and FIA Document 12, *Appeals, Revisions, and Amendments to Flood Insurance Maps*, January 1990.

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

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

6.4 The consultant is to make refinements to the HEC-RAS model based on review of the model results by the District, ADWR, FEMA, and the Technical Evaluation Contractor. The consultant shall review the HEC-RAS model results for reasonableness. Adjustment to the input parameters for obtaining the most realistic results is normal to the scope.

6.5 Floodways are to be determined using equal conveyance encroachment method 4 to start with, but only encroachment method 1 will be used in the final analysis. The floodway encroachment is to be as near the one-foot maximum rise in elevation as possible.

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

a. Field reconnaissance report and estimation of Manning's "n" values.

b. Proposed location and alignment of cross-sections, thalwegs, and channel centerline.

c. Floodplain (natural) delineation.

d. Floodway delineation using equal conveyance encroachment.

e. Floodway delineation using encroachment method 1.

f. Final Hydraulics Report.

6.7 Field Reconnaissance

6.7.1 The consultant shall conduct a field reconnaissance of the full study reach. This will include observation of channel and floodplain conditions for estimation of Manning's "n" values; photographic documentation of floodplain characteristics; determination of channel bank stations; observation of possible overflow areas; inspection of levees or other flood control structures; and measurement of bridge dimensions.

6.7.2 Manning "n" values are to be determined using the methodology in the USGS report, *Estimating Manning's Roughness Coefficients for Stream Channels and Flood Plains in Maricopa County*,

Arizona, April 1991. Copies of the report are available through the District.

6.7.3 A draft report on the field reconnaissance shall be submitted to the District for review and approval prior to beginning the HEC-RAS modeling. The report shall present the determination of channel and overbank "n" values using captioned color photographs or color photocopies. The report shall also discuss floodplain conditions affecting the delineation, describe structures and obstructions, and provide color photos or photocopies of major hydraulic structures. Photo locations, structures, and "n" values shall be displayed on reduced scale mapping and included in the Final Report.

6.8 Cross Sections

6.8.1 The location and alignment of cross sections and channel centerline shall be submitted for the District's review and approval prior to digitizing the cross section data. Cross section stationing shall be **from left to right looking downstream** with the thalweg as station 10,000. Cross sections will be spaced approximately every 200 feet, unless geographic or structural constraints dictate otherwise, and shall extend the full width of the area inundated by 100-year floodwaters. Identification of cross sections shall be in river miles, **increasing upstream**. The stationing shall, unless otherwise approved **in writing** by the District, tie into the appropriate river mile of previous FEMA floodplain delineation studies. Cross section orientation may need to be altered after running of HEC-RAS model to ensure that sections are perpendicular to flow in conformity with FEMA criteria.

6.8.2 All cross sections shall be plotted using a pen, laser, or electrostatic plotter. The cross section plots shall show water surface profiles, ineffective flow areas, "n" values, and encroachments, channel stationing and other pertinent information. Each individual plot sheet must contain a legend and a reference map to the entire Study Area, showing the location of the particular sheet. These plots are to be made available at all reviews.

6.8.3 Cross section plots are limited to one plot at the following three stages of work: (a.) a plot of digitized "GR", STCHL, STCHR, thalweg (station 10,000) to be used as a check of input data and for working sections during compilation of the **floodplain model**; (b.) a plot of the cross section for the completed **floodplain run,** which shows the floodplain water surface elevation, ineffective flow areas, "n" value, and encroachments to be used as working sections for development of the **floodway model**; (c.) a plot of the final floodway model cross sections which will show **Type 1 encroachments** and encroached water surface, in addition to data covered in items (a.) and (b.). The cross sections, detailed in (c.), will be submitted in the Final Report.

6.9 Bridges and culverts must be modeled in compliance with HEC-RAS modeling requirements for the selected routine. Where multiple bridges occur, each bridge shall be modeled separately. The HEC-RAS modeling results for bridges, culverts, and other hydraulic structures must be checked by using an independent method approved by the District to analyze these structures.

6.10 Ponding areas identified as floodplains must be analyzed using the HEC-1 model, and the consultant will provide the District with water surface elevations throughout these ponding areas at intervals to be specified during the study. In most such cases, the consultant will be required to delineate

conveyance areas (if any) joining two or more adjacent ponding areas to achieve continuity of flow.

6.11 Flood zones must be determined according to FEMA criteria and clearly labeled on the final drawings.

6.12 The total area of the floodplain and floodway must be determined for each reach in square miles and acres (hectares).

6.13 The findings of the floodplain/floodway delineation study shall be presented in Section 4 of the Technical Data Notebook and shall be prepared in accordance with *ADWR State Standards Attachment 1-97 (SSA 1-97)*. The report shall be organized as specified by the District standards, following SSA *1-97* format.

TASK 7 – CDS/HIS DATA

Digital data will be prepared in conformance with the district's HIS Data Delivery Specifications, Rev. 3.1, June 1, 1998, for the following themes:

Name	Page No.	Description
NDXPRJ	LP-40	Shows the map sheet boundaries of the project
PRJ	LP-60	Defines the boundary of the project
CARTO	LP-110	Planimetric features captured but not used by HIS (Fences, tree lines, etc)(if any)
CORNERS	LP-210	Section corners as defined by the PLSS (Public Land Survey System)
CTRL	LP-215	Other control points that are not corners
DQ	LP-410	Data Quality of Data: Scale, date, Vertical Datum, Projection
PRJ.REL	LP-430	Contractor name, Project Name, Project ID
FPBLN	LP-520	Floodway center line
FPCTLFCD	LP-523	Elevation Reference Marks
FPSRFFCD	LP-535	Surface Water Elevation
FPXFCD	LP-540	Cross sections used in HEC 2
FPZNFCD	LP-550	Floodplain Zones
FPZNHZ	LP-560	Floodplain Hazard Zones
FLTY	LP-620	FCD Project in the area (if any)
STRTDTL	LP-660	Edge of Pavement (if any)
ELV	LP-710	Contours and spot elevations

BRIDGE	LP-608	Bridges, including any headwalls or wing walls
CULVERT	LP-612	Culverts, including any headwalls or wing walls
DRNBSN	LP-920	Drainage basins
DRNPTH	LP-930	Drainage Path
RIVER	LP-960	Washes or streams in the area (if any)

This is a comprehensive listing of possible features. If there are no features collected under one of the categories mentioned, then the theme does not need to be delivered. Mapping should be done according to the district's *HIS Data Delivery Specifications*, Rev. 3.1, June 1, 1998. Digital data may be provided in CAD format in conformance with the District's *HIS Data Delivery Specifications*, Rev. 3.1, June 1, 1998.

The HIS data submittal under Task 7 will be subject to a quality control (QC) check by the District staff. The District makes use of a checklist and a computer program to document and automate the QC process. A hardcopy of the checklist is enclosed with this scope of work. The consultant shall use the checklist to review each HIS data submittal for compliance and deliver a completed copy of the checklist to the district along with the data submittal.

The computerized application that automates the QC process is available upon request at no charge to the Consultant. The Consultant is recommended to make use of the computer application to review the data prior to the HIS submittal. The application is available for Arc/Info on all UNIX platforms.

All required HIS submittals must be reviewed and accepted prior to finalizing the Technical Data Notebook for submittal to FEMA (Task 8.1).

TASK 8 - DELIVERABLES

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

8.1.1 Original Affidavits of Publication.

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

8.1.3 Two (2) complete copies of the Technical Data Notebook, including HEC-1 and HEC-RAS input/output files on diskettes. The Technical Data Notebook shall be prepared in accordance with ADWR State Standards Attachment 1-97 (SSA1-97). The notebook shall be organized as specified by the District, following SSA 1-97format.

8.1.4 Two (2) sets of completed FEMA forms shall be submitted in a notebook separate from the Final Report.

8.1.5 One (1) copy of the Digital Terrain Model (DTM) shall be submitted following the guidelines stated in the District's *HIS Data Delivery Specifications*, Rev. 3.1, June 1, 1998.

8.1.6 Three (3) sets of complete survey notes shall be submitted in a notebook separate from the Final Report.

8.1.7 Two (2) copies of the current FIRM panels showing the proposed delineation.

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

8.2.1 One (1) complete set of non-erasable topographic mylars of the work study drawings. Sheets shall be 24" X 36" in size and numbered to correspond to the delineation maps.

8.2.2 One (1) complete sets of mylars and four (4) complete sets of sealed blueline topographic base maps with the floodplain/floodway delineations shown. All drawings shall be signed and sealed by persons of appropriate professional registration(s). Each registrant will provide a specific statement as to what service they performed.

8.2.3 One (1) complete set of transparent overlays of photo-mylars. Sheet size, numbering, and layout shall correspond to the delineation work maps only for area of detailed mapping.

8.2.4 One (1) complete set of 9" X 9" contact prints of the aerial stereo photographs sequentially numbered and catalogued.

8.2.5 Digitized topographic data and floodplain/floodway data in conformance with the District's *HIS data Delivery Specifications*, Rev. 3.1, June 1, 1998.

8.2.6 Four (4) complete copies of the Technical Data Notebook including HEC-1 and HEC-RAS input/output files on diskettes. The Technical Data Notebook shall be prepared in accordance with ADWR State Standards Attachment 1- 97 (SSA 1-97). The notebook shall be organized as specified by the District, following SSA 1-97 format. This submittal of the Technical Data Notebook shall include any correspondence and/or meeting minutes with the reviewing agencies and shall reflect any revisions required by those reviewing agencies. Revisions may include, but are not limited to, modifications to the delineation maps, the HEC-1 model, the HEC-RAS model, and/or the **Final Report**.

8.2.7 Digital orthophotographs, as specified in Task 3.

JUNE 9, 1999
FLOOD CONTROL DISTRICT
DIGITAL ORTHOPHOTOS GUIDELINES

1.0 **AERIAL PHOTOGRAPHY**:
A maximum photo scale of 1:24000 (1"=2000') is to be used for project areas mapped at 1"=400'
All photos will be black and white.
All photogrammetric processes, products, and resultant by-products shall conform to the American Society of Photogrammetry and Remote Sensing (ASPRS), "ASPRS Accuracy Standards for large-Scaled Maps" (ASPRS 1990) Class I standards and specifications.

2.0 **LABEL & TILING**:
A separate CD with the ortho photos is to be delivered. All CD's will be labeled to designate Township, Range and Sections, with photo date and scale.

3.0 **PHOTOGRAMMETRIC SCANNING**:
Each photograph will be scanned such that each dot or pixel has a ground resolution of 2'x2' . If a scale of 1:24000 is used for the photos, then they will be scanned at a resolution of 1000 dots per inch (dpi) to generate the ground resolution of 2' x 2' pixels.

4.0 **ORTHO-PHOTOGRAPHIC RECTIFICATION**:
The scanned photography will be ortho rectified using the mapping and the control used for the project. The Horizontal datum will employ the North American Datum 1983 standards (NAD83) using the Arizona State plane Coordinate system for the central zone.

The images will be trimmed to cover a 1-mile by 1-mile area, with at least 100' of overlap. The data will extend to the edge of the image to allow for clean aerial mosaics. All adjacent tiles, and all join areas within tiles, should edge match.

5.0 **TONE MATCHING**:
Adjacent images will be tone and contrast matched to give the appearance of a continuous page. Localized adjustment of brightness values will be done to reduce tonal differences between join areas.

6.0 **DIGITAL DELIVERABLES**:
All digital images will be stored and delivered on CD-ROM disks. The file format should be TIF with corresponding TFW files registered and rectified per section 4.0.

7.0 **NAMING CONVENTIONS:**
Townships will be indicated with "T" followed by its corresponding number and north or south indicator. Range will be indicated with "R" followed by its corresponding number and east or West indicator. Section will be indicated with corresponding number 1 through 36.
Leading 0's for numbers less than 10. Project Rid to follow.
Example: T01NR01WS03_1634

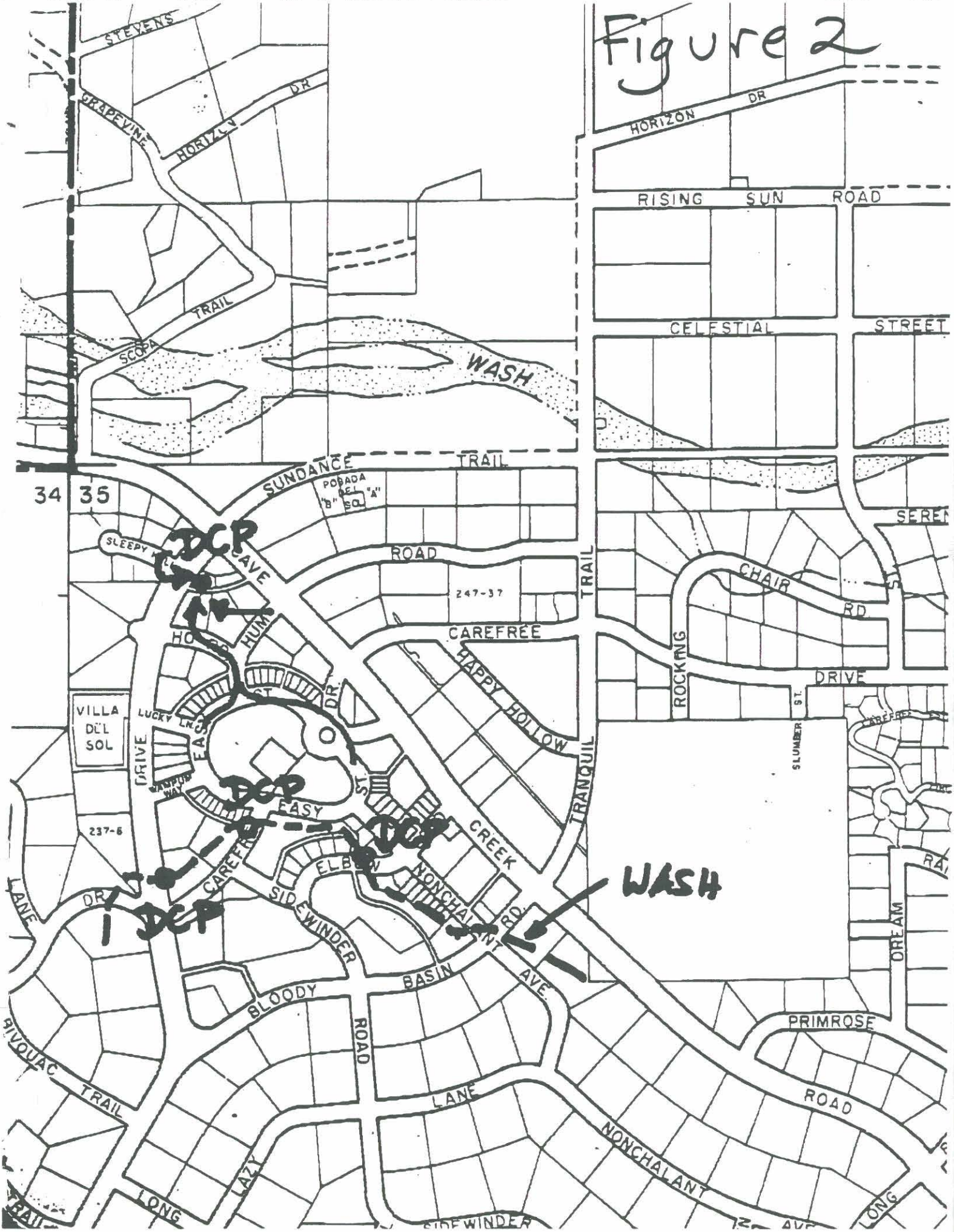
8.0 **QUALITY CONTROL:**
2 sample images of a TIF and TFW file will be submitted for quality control purposes at the beginning of the project cycle.

Any questions, please contact:

Mark Brewer	Database Administrator	506-2953
Jim Smith	Image Specialist	506-5190

Marta Dent	GIS Supervisor	506-8612

Figure 2


STEVENS
GRAPEVINE
HORIZON DR
HORIZON DR
RISING SUN ROAD
TRAIL
SCOPA
WASH
CELESTIAL STREET
SUNDANCE TRAIL
34
35
POBADA DEL "A" "B" SQ.
DCP
SLEEPY HOLLOW
CAVE
ROAD
247-37
TRAIL
CHAIR RD.
CAREFREE
HAPPY HOLLOW
ROCKING
DRIVE
VILLA DEL SOL
LUCKY LN.
EASY DRIVE
CAMPUS WAY
EASY ST.
DR.
237-6
CREEK
TRANQUIL
SLUMBER ST.
WASH
CAREFREE
ELBOW
NONCHALANT
SIDEWINDER
DR.
LANE
BASIN
AVE.
BLOODY
ROAD
PRIMROSE
RIVOLAC TRAIL
LANE
ROAD
LONG
LAZY
NONCHALANT
AVE.
SIDEWINDER

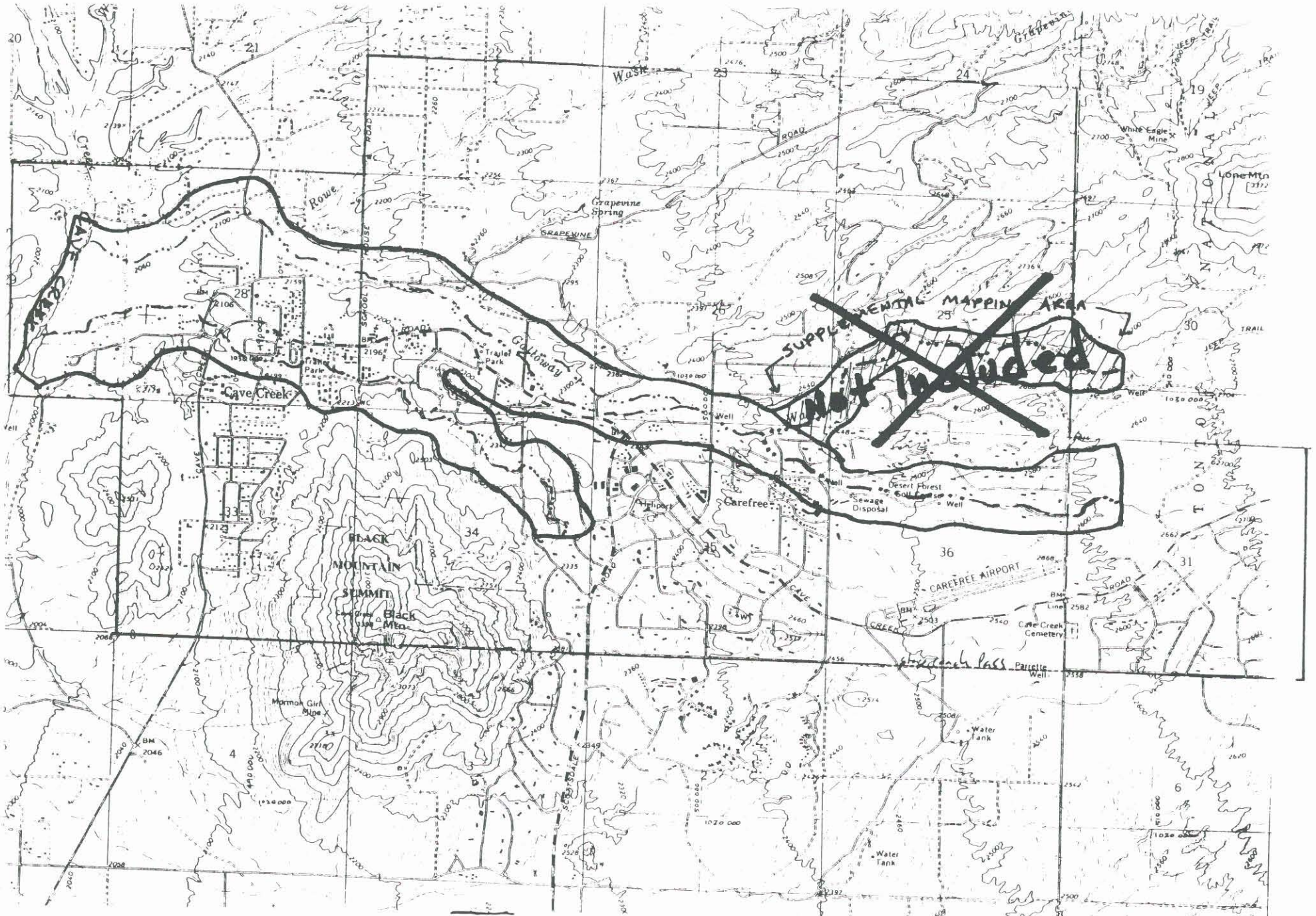


EXHIBIT 1

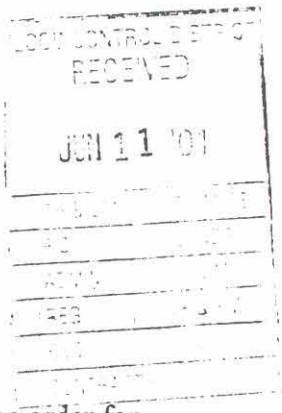
FCD 99-14

JE Fuller/ Hydrology & Geomorphology, Inc.

Jonathan Fuller, P.E., P.H.
Brian Iserman, P.E.
John Wallace, P.E.
Ted Lehman
Scott Ogden, P.E.

5235 S Kyrene Rd., Suite 205
Tempe, Arizona 85283
480-752-2124 (voice)
480-839-2193 (fax)
www.jefuller.com

June 8, 2001



Flood Control District of Maricopa County
ATT: Richard Harris, P.E.
2801 W. Durango
Phoenix, AZ 85009

RE: Floodplain Delineation Study of Andora Hills & Galloway Washes - FCD 99-14, Change Order 2

Dear Richard:

As we discussed, JE Fuller/Hydrology & Geomorphology, Inc., is requesting a change order for the referenced project. This change order is for a 150-day extension of the contract schedule for the following reasons:

1. **Delay in receiving review comments by the District and other communities:**

   - The original District project manager, David Boggs, was re-assigned to another section during the last review phase of the project (review by other communities impacted by the study; starting in February, 2001). During this review phase, there was no District project manager to follow up with the other communities in order to get their review comments back in a reasonable amount of time. As a result, review comments were not received from the communities.
   - Richard Harris was assigned as the new Project Manager in early April 2001. On April 5, Richard indicated that he had no further comments and directed JEF to generate two final copies for the FEMA submittal. The TDNs were delivered to the District by JEF on April 12, 2001.
   - Prior to forwarding the April 12 submittal to FEMA, District staff performed an extra review of the final submittal, and requested several minor revisions. These revisions required additional effort by JEF outside the original scope of services and two additional review meetings, which further delayed the project.

2. **Delay by JEF in responding to additional comments.**

   - JEF did not anticipate having to reserve company resources to address review comments after the already approved April 12 TDN submittal. However, while we were able to

make corrections within days after twice receiving new comments after the April 12 submittal, we were unable to address the third set of the review comments on the April 12 submittal in a timely fashion due to commitments on other District projects. Therefore, we delayed responding to the comments until those commitments could be fulfilled, and until the District could assure us that their review was complete and that no further comments were forthcoming.

For the reasons outlined above, JEF requests a change order extending the contract time by 150 days with no change in fee. Should you have questions regarding this change order request, please do not hesitate to contact me.

Sincerely,

JE Fuller/Hydrology & Geomorphology, Inc.

Brian R. Iserman

Brian R. Iserman, P.E.
Vice President

JE Fuller/ Hydrology & Geomorphology, Inc.

Jonathan Fuller, P.E., P.H.
Brian Iserman, P.E.
John Wallace, P.E.
W. Scott Ogden, P.E.
Ted Lehman, P.E.
Pat Deschamps, P.E.

6101 S. Rural Rd., Suite 110
Tempe, Arizona 85283
480-752-2124 (voice)
480-839-2193 (fax)
www.jefuller.com

July 27, 2001

Flood Control District of Maricopa County
ATT: Richard Harris, P.E.
2801 W. Durango
Phoenix, AZ 85009

RE: Floodplain Delineation Study of Andora Hills & Galloway Washes - FCD 99-14, Change Order 3

Dear Richard:

In response to direction from Mr. Joe Tram of the Flood Control District of Maricopa County (FCDMC) I have prepared a scope and fee estimate for the following change order tasks:

Table 1: Change-order Task Summary for Floodplain Delineation Study of Andora Hills & Galloway Washes

Task	Description
1	Coordination
2	Revise Floodway on Andora Hills Wash
3	Revise TDN and Workmaps

Background

This change order was prompted after the FCDMC was contacted by Mr. Bill Parker who expressed concern over the floodplain delineation of Andora Hills Wash between river stations 1.266 and 1.609 and the impact the delineation would have on his property value and his ability to develop his property located there. This contact came on June 15, 2001; the day that the TDN had been finalized by our office, and was ready for delivery to the FCDMC. As a result of the contact by the property owner, the FCDMC has directed JE Fuller/Hydrology & Geomorphology, Inc. to provide a fee proposal for the additional analysis described in this change order request letter.

Following is detailed scope, fee and schedule information for your review.

Scope

Task 1 – Coordination

Attend up to 2 additional coordination meetings at the FCDMC. Coordinate change order and coordinate with Mr. Parker's engineer (i.e., supplying topo, workmaps, etc.).

Task 2 – Modify Floodway Delineation

Re-analyze the floodway delineation on Andora Hills Wash (RS 1.266 to RS 1.609, 0.34 mile) and Andora Hills Wash Split 1 (RS 0.232 to 0.244), and make modifications as suggested by the District, which includes removal of the floodway delineation from Andora Hills Wash Split 1.

The floodway is to be determined using equal conveyance encroachment (Method 4) initially, but encroachment Method 1 will be used in the final analysis (after the District has approved the Method 4 results). The floodway encroachment shall generally maintain a one-foot maximum rise in elevation as a criteria, except for reaches which appear likely to be adversely impacted by such encroachments. It will also be based upon maintaining the braided stream network within the floodway limits. Adverse impacts include, but are not limited to, a likely increase in stream sinuosity, a significantly-increased erosion potential, or a decreased floodway width (as compared to the original study).

To avoid such impacts, the consultant shall decrease the Method 4 target until such impacts are mitigated; keeping in mind that a zero-rise floodway may be necessary in some cases. Additionally, the consultant shall take care to avoid abrupt changes in the floodway width and energy-grade surcharges greater than 1 foot.

Task 3 – Revise TDN and Workmaps

Re-draft workmaps, revise dates and re-plot mylars; re-plot reduced map sheet, re-draw and re-copy annotated FIRM panels. Re-date and reproduce selected TDN sheets (i.e., cover, table of contents), remove and replace all Andora Hills Wash HEC-RAS output, including tables and cross-sections. Re-burn CD with HEC-RAS data and re-seal TDN and workmaps. Add documentation explaining this deviation from the standard optimized floodway delineation. Add subsequent correspondence to Appendix B of the TDN. Update the CADD data delivery to reflect the changes in the floodway delineation.

Fee

The total fee for this change order is $ 8,888.36; standard FCDMC Fee Attachments A, B and C have been included.

Schedule

I anticipate that the additional work described in the above scope will take approximately 3 weeks to complete after the notice to proceed. The anticipated date for a submittal to FEMA is August 24, 2001. If 120 days are allowed for FEMA review and publication of notification, a contract closing date of February 8, 2002 is expected; this would allow time for addressing possible FEMA review comments, making revisions and preparing the CADD data for delivery. This would require amending the current contract closing date of November 27, 2001--extending it by 73 days.

Should you have questions regarding this change order request, please do not hesitate to contact me.

Sincerely,
JE Fuller/Hydrology & Geomorphology, Inc.

Brian R. Iserman, P.E.
Vice President

FLOOD CONTROL DISTRICT
of
Maricopa County

2801 West Durango Street • Phoenix, Arizona 85009-6399
Telephone (602) 506-1501
Fax (602) 506-4601
TT (602) 506-5897

BOARD OF DIRECTORS
Fulton Brock
Andrew Kunasek
Don Stapley
Mary Rose Garrido Wilcox
Max W. Wilson

Date: October 10, 2002

Mr. Wayne Anderson, P.E.
Town Engineer
Town of Cave Creek
37622 North Cave Creek Rd.
Cave Creek, Arizona 85331

Subject: Andora Hills and Galloway Washes FDS

Dear Mr. Anderson,

Please find enclosed a copy of the subject study Technical Data Notebook. The TDN contains most of the technical analysis documentation used in the re-delineation of the Andora Hills and Galloway Washes as defined in the copy of FEMA's Letter of Map Revision (LOMR) located at the end of Appendix B, Volume I. Study Maps are included within the TDN, that may be used as guidance for development along the study washes.

If you have any questions, please call me at (602) 506-4528.

Sincerely,

Richard P. Harris

Richard P. Harris, P.E.
Project Manager

FLOOD CONTROL DISTRICT
of
Maricopa County

2801 West Durango Street • Phoenix, Arizona 85009-6399
Telephone (602) 506-1501
Fax (602) 506-4601
TT (602) 506-5897

BOARD OF DIRECTORS
Fulton Brock
Andrew Kunasek
Don Stapley
Mary Rose Garrido Wilcox
Max W. Wilson

Date: October 10, 2002

Mr. Jonathan H. Pearson
Town Administrator
Town of Carefree
100 Easy Street
P.O. Box 740
Carefree, Arizona 85377

Subject: Andora Hills and Galloway Washes FDS

Dear Mr. Pearson,

Please find enclosed a copy of the subject study Technical Data Notebook. The TDN contains most of the technical analysis documentation used in the re-delineation of the Andora Hills and Galloway Washes as defined in the copy of FEMA's Letter of Map Revision (LOMR) located at the end of Appendix B, Volume I. Study Maps are included within the TDN, that may be used as guidance for development along the study washes.

If you have any questions, please call me at (602) 506-4528.

Sincerely,

Richard P. Harris

Richard P. Harris, P.E.
Project Manager

FLOOD CONTROL DISTRICT
of
Maricopa County

2801 West Durango Street • Phoenix, Arizona 85009-6399
Telephone (602) 506-1501
Fax (602) 506-4601
TT (602) 506-5897

BOARD OF DIRECTORS
Fulton Brock
Andrew Kunasek
Don Stapley
Mary Rose Garrido Wilcox
Max W. Wilson

Date: October 10, 2002

Mr. Bill Erickson, P.E.
Senior Public Works Planner
City of Scottsdale
7447 East Indian Rd.
Suite 205
Scottsdale, Arizona 85251

Subject: Andora Hills and Galloway Washes FDS

Dear Mr. Erickson,

Please find enclosed a copy of the subject study Technical Data Notebook. The TDN contains most of the technical analysis documentation used in the re-delineation of the Andora Hills and Galloway Washes as defined in the copy of FEMA's Letter of Map Revision (LOMR) located at the end of Appendix B, Volume I. Study Maps are included within the TDN, that may be used as guidance for development along the study washes.

If you have any questions, please call me at (602) 506-4528.

Sincerely,

Richard P. Harris

Richard P. Harris, P.E.
Project Manager

Federal Emergency Management Agency

Washington, D.C. 20472

DEC 11 2002

FLOOD CONTROL DISTRICT
RECEIVED
DEC 16 '02
CH & GM | FINANCE
PIO | LANDS
ADMIN | C & M
REG | P & PM
ENG | FILE
CONTRACTS
RPT

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

IN REPLY REFER TO:
Case No.: 02-09-1409X

The Honorable Edward C. Morgan
Mayor, Town of Carefree
P.O. Box 740
Carefree, AZ 85377

Community: Town of Carefree, AZ
Community No.: 040126
Map Panels Affected: 04013C0808 H and 0809 H

116

Dear Mayor Morgan:

In a Letter of Map Revision (LOMR) dated October 3, 2002, your community was notified of proposed modified flood elevation determinations affecting the Flood Insurance Rate Map (FIRM) and Flood Insurance Study (FIS) report for Maricopa County, Arizona and Incorporated Areas (effective FIRM and FIS report for your community). These determinations were along Andora Hills Wash from approximately 1,300 feet downstream of Piedra Grand Drive to just downstream of Carefree Drive; along Galloway Wash from approximately 200 feet downstream of Scopa Trail to just downstream of the confluence with Galloway Wash South Branch; and along Galloway Wash South Branch from just upstream of the confluence with Galloway Wash to approximately 50 feet upstream of Pima Road. The 90-day appeal period that was initiated on September 5, 2002, when the Federal Emergency Management Agency (FEMA) published a notice of proposed Base Flood Elevations (BFEs) in the *Arizona Business Gazette,* has elapsed.

FEMA received no valid requests for changes to the modified BFEs. Therefore, the modified BFEs that became effective on December 5, 2002, remain valid and revise the FIRM that was in effect prior to that date.

The modifications are pursuant to Section 206 of the Flood Disaster Protection Act of 1973 (Public Law 93-234) and are in accordance with the National Flood Insurance Act of 1968, as amended (Title XIII of the Housing and Urban Development Act of 1968, Public Law 90-448), 42 U.S.C. 4001-4128, and 44 CFR Part 65. The community number(s) and suffix code(s) are unaffected by this revision. The community number and appropriate suffix code as shown above will be used by the National Flood Insurance Program (NFIP) for all flood insurance policies and renewals issued for your community.

FEMA has developed criteria for floodplain management as required under the above-mentioned Acts of 1968 and 1973. To continue participation in the NFIP, your community must use the modified BFEs to carry out the floodplain management regulations for the NFIP. The modified BFEs will also be used to calculate the appropriate flood insurance premium rates for all new buildings and their contents and for the second layer of insurance on existing buildings and their contents.

If you have any questions regarding the necessary floodplain management measures for your community or the NFIP in general, please contact the Director, Mitigation Division of FEMA in Oakland, California at (510) 627-7184. If you have any questions regarding the LOMR, the proposed modified BFEs, or mapping issues in general, please contact the FEMA Map Assistance Center, toll free, at 1-877-FEMA MAP (1-877-336-2627).

Sincerely,

Michael M. Grimm, Acting Chief
Hazards Study Branch
Federal Insurance and Mitigation Administration

cc: The Honorable Mary Manross
Mayor, City of Scottsdale

The Honorable Vincent Francia
Mayor, Town of Cave Creek

Mr. Richard P. Harris, P.E.
Project Manager
Engineering Division
Flood Control District of Maricopa County

Ms. Shanna Yager
Branch Manager
Floodplain Administrator
Flood Control District of Maricopa County

Mr. Jonathan H. Pearson
Town Manager
Town of Carefree

Mr. Victor Calderon
Community Assistance Program Manager
Arizona Division of Emergency Management

Mr. Brian R. Iserman, P.E.
Hydrologist
JE Fuller Hydrology and Geomorphology, Inc.

Federal Emergency Management Agency

Washington, D.C. 20472

DEC 1 1 2002

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

IN REPLY REFER TO:
Case No.: 02-09-1409X

The Honorable Vincent Francia
Mayor, Town of Cave Creek
37622 North Cave Creek Road
Cave Creek, AZ 85331

Community: Town of Cave Creek, AZ
Community No.: 040129
Map Panels Affected: 04013C0805 G and 0808 H

116

Dear Mayor Francia:

In a Letter of Map Revision (LOMR) dated October 3, 2002, your community was notified of proposed modified flood elevation determinations affecting the Flood Insurance Rate Map (FIRM) and Flood Insurance Study (FIS) report for Maricopa County, Arizona and Incorporated Areas (effective FIRM and FIS report for your community). These determinations were along Andora Hills Wash from approximately 500 feet upstream of the confluence with Cave Creek Wash to approximately 1,300 feet downstream of Piedra Grand Drive; along Galloway Wash from approximately 200 feet upstream of the confluence with Cave Creek Wash to approximately 200 feet downstream Scopa Trail; and along an unnamed tributary to Galloway Wash (unnamed tributary) from just upstream to approximately 1,600 feet upstream of the confluence with Galloway Wash. The 90-day appeal period that was initiated on September 5, 2002, when the Federal Emergency Management Agency (FEMA) published a notice of proposed Base Flood Elevations (BFEs) in the *Arizona BusinessGazette*, has elapsed.

FEMA received no valid requests for changes to the modified BFEs. Therefore, the modified BFEs that became effective on December 5, 2002, remain valid and revise the FIRM that was in effect prior to that date.

The modifications are pursuant to Section 206 of the Flood Disaster Protection Act of 1973 (Public Law 93-234) and are in accordance with the National Flood Insurance Act of 1968, as amended (Title XIII of the Housing and Urban Development Act of 1968, Public Law 90-448), 42 U.S.C. 4001-4128, and 44 CFR Part 65. The community number(s) and suffix code(s) are unaffected by this revision. The community number and appropriate suffix code as shown above will be used by the National Flood Insurance Program (NFIP) for all flood insurance policies and renewals issued for your community.

FEMA has developed criteria for floodplain management as required under the above-mentioned Acts of 1968 and 1973. To continue participation in the NFIP, your community must use the modified BFEs to carry out the floodplain management regulations for the NFIP. The modified BFEs will also be used to calculate the appropriate flood insurance premium rates for all new buildings and their contents and for the second layer of insurance on existing buildings and their contents.

If you have any questions regarding the necessary floodplain management measures for your community or the NFIP in general, please contact the Director, Mitigation Division of FEMA in Oakland, California at (510) 627-7184. If you have any questions regarding the LOMR, the proposed modified BFEs, or mapping issues in general, please contact the FEMA Map Assistance Center, toll free, at 1-877-FEMA MAP (1-877-336-2627).

Sincerely,

Michael M. Grimm, Acting Chief
Hazards Study Branch
Federal Insurance and Mitigation Administration

cc: The Honorable Edward C. Morgan
Mayor, Town of Carefree

The Honorable Mary Manross
Mayor, City of Scottsdale

Mr. Richard P. Harris, P.E.
Project Manager
Engineering Division
Flood Control District of Maricopa County

Ms. Shanna Yager
Branch Manager
Floodplain Administrator
Flood Control District of Maricopa County

Mr. Wayne Anderson, P.E.
Town Engineer
Town of Cave Creek

Mr. Victor Calderon
Community Assistance Program Manager
Arizona Division of Emergency Management

Mr. Brian R. Iserman, P.E.
Hydrologist
JE Fuller Hydrology and Geomorphology, Inc.

Federal Emergency Management Agency

Washington, D.C. 20472

DEC 11 2002

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

IN REPLY REFER TO:
Case No.: 02-09-1409X

The Honorable Mary Manross
Mayor, City of Scottsdale
3939 North Drinkwater Boulevard
Scottsdale, AZ 85251

Community: City of Scottsdale, AZ
Community No.: 045012
Map Panels Affected: 04013C0809 H

116

Dear Mayor Manross:

In a Letter of Map Revision (LOMR) dated October 3, 2002, your community was notified of proposed modified flood elevation determinations affecting the Flood Insurance Rate Map (FIRM) and Flood Insurance Study (FIS) report for Maricopa County, Arizona and Incorporated Areas (effective FIRM and FIS report for your community). These determinations were along Galloway Wash South Branch from approximately 50 feet upstream to approximately 1,000 feet upstream of Pima Road. The 90-day appeal period that was initiated on September 5, 2002, when the Federal Emergency Management Agency (FEMA) published a notice of proposed Base Flood Elevations (BFEs) in the *Arizona BusinessGazette,* has elapsed.

FEMA received no valid requests for changes to the modified BFEs. Therefore, the modified BFEs that became effective on December 5, 2002, remain valid and revise the FIRM that was in effect prior to that date.

The modifications are pursuant to Section 206 of the Flood Disaster Protection Act of 1973 (Public Law 93-234) and are in accordance with the National Flood Insurance Act of 1968, as amended (Title XIII of the Housing and Urban Development Act of 1968, Public Law 90-448), 42 U.S.C. 4001-4128, and 44 CFR Part 65. The community number(s) and suffix code(s) are unaffected by this revision. The community number and appropriate suffix code as shown above will be used by the National Flood Insurance Program (NFIP) for all flood insurance policies and renewals issued for your community.

FEMA has developed criteria for floodplain management as required under the above-mentioned Acts of 1968 and 1973. To continue participation in the NFIP, your community must use the modified BFEs to carry out the floodplain management regulations for the NFIP. The modified BFEs will also be used to calculate the appropriate flood insurance premium rates for all new buildings and their contents and for the second layer of insurance on existing buildings and their contents.

If you have any questions regarding the necessary floodplain management measures for your community or the NFIP in general, please contact the Director, Mitigation Division of FEMA in Oakland, California at (510) 627-7184. If you have any questions regarding the LOMR, the proposed modified BFEs, or mapping issues in general, please contact the FEMA Map Assistance Center, toll free, at 1-877-FEMA MAP (1-877-336-2627).

Sincerely,

Michael M. Grimm, Acting Chief
Hazards Study Branch
Federal Insurance and Mitigation Administration

cc: The Honorable Edward C.Morgan
Mayor, Town of Carefree

The Honorable Vincent Francia
Mayor, Town of Cave Creek

Mr. Richard P. Harris, P.E.
Project Manager
Engineering Division
Flood Control District of Maricopa County

Ms. Shanna Yager
Branch Manager
Floodplain Administrator
Flood Control District of Maricopa County

Ms. Adina C. Lund, P.E.
Public Works Planner
City of Scottsdale

Mr. Victor Calderon
Community Assistance Program Manager
Arizona Division of Emergency Management

Mr. Brian R. Iserman, P.E.
Hydrologist
JE Fuller Hydrology and Geomorphology, Inc.

Federal Emergency Management Agency

Washington, D.C. 20472

OCT 03 2002

FLOOD CONTROL DISTRICT
RECEIVED
OCT 07 '02
LANDS
C&M
P&PM

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

IN REPLY REFER TO:
Case No.: 02-09-1409X

The Honorable Edward C. Morgan
Mayor, Town of Carefree
P.O. Box 740
Carefree, AZ 85377

Community: Town of Carefree, AZ
Community No.: 040126
Panels Affected: 04013C0808 H and 0809 H
Effective Date of This Revision: DEC 05 2002 RPH

102-I-A-C

Dear Mayor Morgan:

This responds to a request that the Federal Emergency Management Agency (FEMA) revise the effective Flood Insurance Rate Map (FIRM) and Flood Insurance Study (FIS) report for Maricopa County, Arizona and Incorporated Areas (the effective FIRM and FIS report for your community), in accordance with Part 65 of the National Flood Insurance Program (NFIP) regulations. In a letter dated August 26, 2002, Mr. Richard P. Harris, P.E., Project Manager, Engineering Division, Flood Control District of Maricopa County, requested that FEMA revise a Letter of Map Revision (LOMR) dated August 20, 2002, that will become effective on December 5, 2002 (Case No. 01-09-1157P), to show the correct elevation of the flood having a 1-percent chance of being equaled or exceeded in any given year (base flood) with a Base Flood Elevation (BFE) label of 2,164 along Galloway Wash approximately 400 feet downstream of School House Road; to include the correct names of Andora Hills Wash Split 1 and Andora Hills Wash Split 2; and to show corrected road names. The determination made in the December 5 LOMR remains valid. The determinations made for Case No. 01-09-1157P in separate LOMRs for the Town of Cave Creek and the City of Scottsdale that also were issued on August 20, 2002, and that will become effective on December 5, 2002, likewise remain valid.

All data required to complete our review of this request were submitted with letters from Mr. Brian R. Iserman, P.E., Hydrologist, JE Fuller Hydrology and Geomorphology, Inc., and Mr. Harris.

We have completed our review of the submitted data and the flood data shown on the effective FIRM and in the effective FIS report. We have revised the FIRM and FIS report to modify the elevations, floodplain and floodway boundary delineations, and zone designations of the base flood along Andora Hills Wash from approximately 1,300 feet downstream of Piedra Grand Drive to just downstream of Carefree Drive; along Galloway Wash from approximately 200 feet downstream of Scopa Trail to just downstream of the confluence with Galloway Wash South Branch; and along Galloway Wash South Branch from just upstream of the confluence with Galloway Wash to approximately 50 feet upstream of Pima Road. We also revised the December 5 LOMR to change the name of Cave Creek to Cave Creek Wash on the Summary of Discharges Table, Floodway Data Table, and Profile Panels 147P and 148P. As a result of the modifications, the BFEs for Andora Hills Wash increased, and the widths of the Special Flood Hazard Area (SFHA), the area that would be inundated by the base flood, and the regulatory floodway increased in some areas and decreased in other areas. As a result of the modifications, BFEs; an SFHA designated Zone AE, with BFEs determined; and a regulatory floodway were added along Andora Hills Wash from

approximately 400 feet downstream to just downstream of Carefree Drive. For both Galloway Wash and Galloway Wash South Branch, as a result of the modifications, the BFEs and the widths of the SFHAs and the regulatory floodways increased in some areas and decreased in other areas. The modifications are shown on the enclosed annotated copies of FIRM Panels 04013C0808 H and 04013C0809 H; Profile Panels 04P, 05P, 147P, 148P, 153P, 154P, and 155P; and affected portions of the Summary of Discharges Table and Floodway Data Table. Profile Panels 1213P and 1215P were added to the FIS report. This LOMR hereby revises the above-referenced panels of the effective FIRM and the affected portions of the FIS report, both dated July 19, 2001.

Because this revision request also affects the Town of Cave Creek and the City of Scottsdale, a separate LOMR for each of those communities was issued on the same date as this LOMR.

The modifications are effective as of the date shown above. The map panels as listed above and as modified by this letter will be used for all flood insurance policies and renewals issued for your community.

The following table is a partial listing of existing and modified BFEs:

Location	Existing BFE (feet)*	Modified BFE (feet)*
Andora Hills Wash:		
Approximately 200 feet downstream of Piedra Grand Drive	2,267	2,269
Just downstream of Carefree Drive	None	2,306
Galloway Wash:		
Approximately 100 feet upstream of Scopa Trail	2,314	2,315
Approximately 1,600 feet downstream of Tranquil Trail	2,340	2,335
Galloway Wash South Branch:		
Approximately 300 feet upstream of Dream Street	2,424	2,423
Approximately 1,100 feet downstream of Pima Road	2,550	2,555

*Referenced to the National Geodetic Vertical Datum, rounded to the nearest whole foot

In the LOMR that was issued on August 20, 2002, and that will become effective on December 5, 2002, you were notified of the proposed modified BFE determinations that affect your community. Public notification of the proposed modified BFEs were given in the *Arizona Business Gazette* on August 29 and September 5, 2002. Because the published BFEs are not modified by this LOMR, we will not republish notification of those proposed modified BFEs. In addition, a notice of changes will be published in the *Federal Register*. Within 90 days of the second publication in the *Arizona Business Gazette*, any interested party may request that FEMA reconsider the determination made by this LOMR. Any request for reconsideration must be based on scientific or technical data. All interested parties are on notice that, until the 90-day period elapses, the determination to modify the BFEs made by this LOMR may itself be modified.

Because this LOMR will not be printed and distributed to primary users, such as local insurance agents and mortgage lenders, your community will serve as a repository for these new data. We encourage you to disseminate the information reflected by this LOMR throughout the community, so that interested persons, such as property owners, local insurance agents, and mortgage lenders, may benefit from the information. We also encourage you to prepare a related article for publication in your community's local newspaper. This article should describe the assistance that officials of your community will give to interested persons by providing these data and interpreting the NFIP maps.

We will not physically revise and republish the FIRM and FIS report for your community to reflect the modifications made by this LOMR at this time. When changes to the previously cited FIRM panels and FIS report warrant physical revision and republication in the future, we will incorporate the modifications made by this LOMR at that time.

The floodway is provided to your community as a tool to regulate floodplain development. Therefore, the floodway modifications described in this LOMR, while acceptable to FEMA, must also be acceptable to your community and adopted by appropriate community action, as specified in Paragraph 60.3(d) of the NFIP regulations.

This LOMR is based on minimum floodplain management criteria established under the NFIP. Your community is responsible for approving all floodplain development and for ensuring all necessary permits required by Federal or State law have been received. State, county, and community officials, based on knowledge of local conditions and in the interest of safety, may set higher standards for construction in the SFHA. If the State, county, or community has adopted more restrictive or comprehensive floodplain management criteria, these criteria take precedence over the minimum NFIP criteria.

This determination has been made pursuant to Section 206 of the Flood Disaster Protection Act of 1973 (Public Law 93-234) and is in accordance with the National Flood Insurance Act of 1968, as amended (Title XIII of the Housing and Urban Development Act of 1968, Public Law 90-448), 42 U.S.C. 4001-4128, and 44 CFR Part 65. Pursuant to Section 1361 of the National Flood Insurance Act of 1968, as amended, communities participating in the NFIP are required to adopt and enforce floodplain management regulations that meet or exceed minimum NFIP criteria. These criteria are the minimum and do not supersede any State or local requirements of a more stringent nature. This includes adoption of the effective FIRM to which the regulations apply and the modifications described in this LOMR. Our records show that your community has met this requirement.

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

Mr. Jack Eldridge
Chief, Community Mitigation Programs Branch
Federal Emergency Management Agency, Region IX
1111 Broadway Street, Suite 1200
Oakland, CA 94607-4052
(510) 627-7184

If you have any questions regarding floodplain management regulations for your community or the NFIP in general, please call the CCO for your community at the telephone number cited above. If you have any questions regarding this LOMR, please call our Map Assistance Center, toll free, at 1-877-FEMA MAP (1-877-336-2627).

Sincerely,

Max H. Yuan, P.E., Project Engineer
Hazards Study Branch
Federal Insurance and
Mitigation Administration

For: Matthew B. Miller, P.E., Chief
Hazards Study Branch
Federal Insurance and
Mitigation Administration

Enclosures

cc: The Honorable Mary Manross
Mayor, City of Scottsdale

The Honorable Vincent Francia
Mayor, Town of Cave Creek

Mr. Richard P. Harris, P.E.
Project Manager
Engineering Division
Flood Control District of Maricopa County

Ms. Shanna Yager
Branch Manager
Floodplain Administrator
Flood Control District of Maricopa County

Mr. Jonathan H. Pearson
Town Manager
Town of Carefree

Mr. Victor Calderon
Community Assistance Program Manager
Arizona Division of Emergency
Management

Mr. Brian R. Iserman, P.E.
Hydrologist
JE Fuller Hydrology and
Geomorphology, Inc.

Federal Emergency Management Agency

Washington, D.C. 20472

OCT 03 2002

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

IN REPLY REFER TO:
Case No.: 02-09-1409X

The Honorable Vincent Francia
Mayor, Town of Cave Creek
37622 North Cave Creek Road
Cave Creek, AZ 85331

Community: Town of Cave Creek, AZ
Community No.: 040129
Panels Affected: 04013C0805 G and 0808 H
Effective Date of This Revision: **DEC 05 2002**

102-I-A-C

Dear Mayor Francia:

This responds to a request that the Federal Emergency Management Agency (FEMA) revise the effective Flood Insurance Rate Map (FIRM) and Flood Insurance Study (FIS) report for Maricopa County, Arizona and Incorporated Areas (the effective FIRM and FIS report for your community), in accordance with Part 65 of the National Flood Insurance Program (NFIP) regulations. In a letter dated August 26, 2002, Mr. Richard P. Harris, P.E., Project Manager, Engineering Division, Flood Control District of Maricopa County, requested that FEMA revise a Letter of Map Revision (LOMR) dated August 20, 2002, that will become effective on December 5, 2002 (Case No. 01-09-1157P), to show the correct elevation of the flood having a 1-percent chance of being equaled or exceeded in any given year (base flood) with a Base Flood Elevation (BFE) label of 2,164 along Galloway Wash approximately 400 feet downstream of School House Road; to include the correct names of Andora Hills Wash Split 1 and Andora Hills Wash Split 2; and to show corrected road names. The determination made in the December 5 LOMR remains valid. The determinations for Case No. 01-09-1157P made in separate LOMRs for the Town of Carefree and the City of Scottsdale that also were issued on August 20, 2002, and that will become effective on December 5, 2002, likewise remain valid.

All data required to complete our review of this request were submitted with letters from Mr. Brian R. Iserman, P.E., Hydrologist, JE Fuller Hydrology and Geomorphology, Inc., and Mr. Harris.

We have completed our review of the submitted data and the flood data shown on the effective FIRM and in the effective FIS report. We have revised the FIRM and FIS report to modify the elevations and floodplain and floodway boundary delineations of the base flood along Andora Hills Wash from approximately 500 feet upstream of the confluence with Cave Creek Wash to approximately 1,300 feet downstream of Piedra Grand Drive; along Galloway Wash from approximately 200 feet upstream of the confluence with Cave Creek Wash to approximately 200 feet downstream of Scopa Trail; and along an unnamed tributary to Galloway Wash (unnamed tributary) from just upstream to approximately 1,600 feet upstream of the confluence with Galloway Wash. We also revised the December 5 LOMR to change the name of Cave Creek to Cave Creek Wash on the Summary of Discharges Table, Floodway Data Table, and Profile Panels 142P through 147P. For Andora Hills Wash, as a result of the modifications, the BFEs and the widths of the Special Flood Hazard Area (SFHA), the area that would be inundated by the base flood, and the regulatory floodway increased in some areas and decreased in other areas. For Galloway

Wash, as a result of the modifications, the BFEs and the widths of the SFHA and the regulatory floodway increased in some areas and decreased in other areas. For the unnamed tributary, as a result of the modifications, the BFEs and the widths of the SFHA and the regulatory floodway increased. The modifications are shown on the enclosed annotated copies of FIRM Panels 04013C0805 G and 04013C0808 H; Profile Panels 01P through 04P, 142P through 147P, and 171P; and affected portions of the Summary of Discharges Table and Floodway Data Table. Profile Panels 1211P, 1212P, and 1214P were added to the FIS report. This LOMR hereby revises the above-referenced panels of the effective FIRM and the affected portions of the FIS report, both dated July 19, 2001.

Because this revision request also affects the Town of Carefree and the City of Scottsdale, a separate LOMR for each of those communities was issued on the same date as this LOMR.

The modifications are effective as of the date shown above. The map panels as listed above and as modified by this letter will be used for all flood insurance policies and renewals issued for your community.

The following table is a partial listing of existing and modified BFEs:

Location	Existing BFE (feet)*	Modified BFE (feet)*
Andora Hills Wash:		
Approximately 700 feet upstream of confluence with Cave Creek Wash	2,013	2,011
Approximately 1,700 feet downstream of Piedra Grand Drive	2,235	2,241
Galloway Wash:		
Approximately 600 feet upstream of confluence with Cave Creek Wash	2,041	2,040
Approximately 200 feet downstream of Vermeersch Road	2,258	2,262
Unnamed Tributary:		
Approximately 600 feet upstream of confluence with Galloway Wash	2,192	2,195
Approximately 1,600 feet upstream of confluence with Galloway Wash	2,216	2,217

*Referenced to the National Geodetic Vertical Datum, rounded to the nearest whole foot

In the LOMR that was issued on August 20, 2002, and that will become effective on December 5, 2002, you were notified of the proposed modified BFE determinations that affect your community. Public notification of the proposed modified BFEs were given in the *Arizona Business Gazette* on August 29 and September 5, 2002. Because the published BFEs are not modified by this LOMR, we will not republish notification of those proposed modified BFEs. In addition, a notice of changes will be published in the *Federal Register*. Within 90 days of the second publication in the *Arizona Business Gazette*, any interested party may request that FEMA reconsider the determination made by this LOMR. Any request

for reconsideration must be based on scientific or technical data. All interested parties are on notice that, until the 90-day period elapses, the determination to modify the BFEs made by this LOMR may itself be modified.

Because this LOMR will not be printed and distributed to primary users, such as local insurance agents and mortgage lenders, your community will serve as a repository for these new data. We encourage you to disseminate the information reflected by this LOMR throughout the community, so that interested persons, such as property owners, local insurance agents, and mortgage lenders, may benefit from the information. We also encourage you to prepare a related article for publication in your community's local newspaper. This article should describe the assistance that officials of your community will give to interested persons by providing these data and interpreting the NFIP maps.

We will not physically revise and republish the FIRM and FIS report for your community to reflect the modifications made by this LOMR at this time. When changes to the previously cited FIRM panels and FIS report warrant physical revision and republication in the future, we will incorporate the modifications made by this LOMR at that time.

The floodway is provided to your community as a tool to regulate floodplain development. Therefore, the floodway modifications described in this LOMR, while acceptable to FEMA, must also be acceptable to your community and adopted by appropriate community action, as specified in Paragraph 60.3(d) of the NFIP regulations.

This LOMR is based on minimum floodplain management criteria established under the NFIP. Your community is responsible for approving all floodplain development and for ensuring all necessary permits required by Federal or State law have been received. State, county, and community officials, based on knowledge of local conditions and in the interest of safety, may set higher standards for construction in the SFHA. If the State, county, or community has adopted more restrictive or comprehensive floodplain management criteria, these criteria take precedence over the minimum NFIP criteria.

This determination has been made pursuant to Section 206 of the Flood Disaster Protection Act of 1973 (Public Law 93-234) and is in accordance with the National Flood Insurance Act of 1968, as amended (Title XIII of the Housing and Urban Development Act of 1968, Public Law 90-448), 42 U.S.C. 4001-4128, and 44 CFR Part 65. Pursuant to Section 1361 of the National Flood Insurance Act of 1968, as amended, communities participating in the NFIP are required to adopt and enforce floodplain management regulations that meet or exceed minimum NFIP criteria. These criteria are the minimum and do not supersede any State or local requirements of a more stringent nature. This includes adoption of the effective FIRM to which the regulations apply and the modifications described in this LOMR. Our records show that your community has met this requirement.

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

Mr. Jack Eldridge
Chief, Community Mitigation Programs Branch
Federal Emergency Management Agency, Region IX
1111 Broadway Street, Suite 1200
Oakland, CA 94607-4052
(510) 627-7184

If you have any questions regarding floodplain management regulations for your community or the NFIP in general, please call the CCO for your community at the telephone number cited above. If you have any questions regarding this LOMR, please call our Map Assistance Center, toll free, at 1-877-FEMA MAP (1-877-336-2627).

Sincerely,

Max H. Yuan, P.E., Project Engineer
Hazards Study Branch
Federal Insurance and
Mitigation Administration

For: Matthew B. Miller, P.E., Chief
Hazards Study Branch
Federal Insurance and
Mitigation Administration

Enclosures

cc: The Honorable Edward C. Morgan
Mayor, Town of Carefree

The Honorable Mary Manross
Mayor, City of Scottsdale

Mr. Richard P. Harris, P.E.
Project Manager
Engineering Division
Flood Control District of Maricopa County

Ms. Shanna Yager
Branch Manager
Floodplain Administrator
Flood Control District of Maricopa County

Mr. Wayne Anderson, P.E.
Town Engineer
Town of Cave Creek

Mr. Victor Calderon
Community Assistance Program Manager
Arizona Division of Emergency
Management

Mr. Brian R. Iserman, P.E.
Hydrologist
JE Fuller Hydrology and
Geomorphology, Inc.

Federal Emergency Management Agency

Washington, D.C. 20472

OCT 03 2002

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

IN REPLY REFER TO:
Case No.: 02-09-1409X

The Honorable Mary Manross
Mayor, City of Scottsdale
3939 North Drinkwater Boulevard
Scottsdale, AZ 85251

Community: City of Scottsdale, AZ
Community No.: 045012
Panel Affected: 04013C0809 H
Effective Date of This Revision: DEC 05 2002

102-I-A-C

Dear Mayor Manross:

This responds to a request that the Federal Emergency Management Agency (FEMA) revise the effective Flood Insurance Rate Map (FIRM) and Flood Insurance Study (FIS) report for Maricopa County, Arizona and Incorporated Areas (the effective FIRM and FIS report for your community), in accordance with Part 65 of the National Flood Insurance Program (NFIP) regulations. In a letter dated August 26, 2002, Mr. Richard P. Harris, P.E., Project Manager, Engineering Division, Flood Control District of Maricopa County, requested that FEMA revise a Letter of Map Revision (LOMR) dated August 20, 2002, that will become effective on December 5, 2002 (Case No. 01-09-1157P), to show the correct elevation of the flood having a 1-percent chance of being equaled or exceeded in any given year (base flood) with a Base Flood Elevation (BFE) label of 2,164 along Galloway Wash approximately 400 feet downstream of School House Road; to include the correct names of Andora Hills Wash Split 1 and Andora Hills Wash Split 2; and to show corrected road names. The determination made in the December 5 LOMR remains valid. The determinations for Case No. 01-09-1157P made in separate LOMRs for the Towns of Carefree and Cave Creek that also were issued on August 20, 2002, and that will become effective on December 5, 2002, likewise remain valid.

All data required to complete our review of this request were submitted with letters from Mr. Brian R. Iserman, P.E., Hydrologist, JE Fuller Hydrology and Geomorphology, Inc., and Mr. Harris.

We have completed our review of the submitted data and the flood data shown on the effective FIRM and in the effective FIS report. We have revised the FIRM and FIS report to modify the elevations, floodplain and floodway boundary delineations, and zone designations of the base flood along Galloway Wash South Branch from approximately 50 feet upstream to approximately 1,000 feet upstream of Pima Road. We also revised the December 5 LOMR to include the correct name of Galloway Wash South Branch Split 1. As a result of the modifications, the BFEs for Galloway Wash South Branch decreased; the width of the Special Flood Hazard Area (SFHA), the area that would be inundated by the base flood, increased in some areas and decreased in other areas; and the width of the regulatory floodway increased from

approximately 50 feet upstream to approximately 1,000 feet upstream of Pima Road. As a result of the modifications, BFEs; an SFHA designated Zone AE, with BFEs determined; and a regulatory floodway were added along Galloway Wash South Branch from approximately 600 feet upstream to approximately 1,000 feet upstream of Pima Road. Also as a result of the modifications, an area designated Zone X (unshaded), an area of minimal flood hazard, was added along Galloway Wash South Branch from approximately 50 feet upstream to approximately 1,000 feet upstream of Pima Road. The modifications are shown on the enclosed annotated copies of FIRM Panel 04013C0809 H, Profile Panels 155P and 156P, and affected portions of the Summary of Discharges Table and Floodway Data Table. This LOMR hereby revises the above-referenced panel of the effective FIRM and the affected portions of the FIS report, both dated July 19, 2001.

Because this revision request also affects the Towns of Carefree and Cave Creek, a separate LOMR for each of those communities was issued on the same date as this LOMR.

The modifications are effective as of the date shown above. The map panel listed above and as modified by this letter will be used for all flood insurance policies and renewals issued for your community.

The following table is a partial listing of existing and modified BFEs:

Location	Existing BFE (feet)*	Modified BFE (feet)*
Approximately 300 feet upstream of Pima Road	2,592	2,591
Approximately 1,000 feet upstream of Pima Road	None	2,608

*Referenced to the National Geodetic Vertical Datum, rounded to the nearest whole foot

In the LOMR that was issued on August 20, 2002, and that will become effective on December 5, 2002, you were notified of the proposed modified BFE determinations that affect your community. Public notification of the proposed modified BFEs were given in the *Arizona Business Gazette* on August 29 and September 5, 2002. Because the published BFEs are not modified by this LOMR, we will not republish notification of those proposed modified BFEs. In addition, a notice of changes will be published in the *Federal Register*. Within 90 days of the second publication in the *Arizona Business Gazette*, any interested party may request that FEMA reconsider the determination made by this LOMR. Any request for reconsideration must be based on scientific or technical data. All interested parties are on notice that, until the 90-day period elapses, the determination to modify the BFEs made by this LOMR may itself be modified.

Because this LOMR will not be printed and distributed to primary users, such as local insurance agents and mortgage lenders, your community will serve as a repository for these new data. We encourage you to disseminate the information reflected by this LOMR throughout the community, so that interested persons, such as property owners, local insurance agents, and mortgage lenders, may benefit from the

information. We also encourage you to prepare a related article for publication in your community's local newspaper. This article should describe the assistance that officials of your community will give to interested persons by providing these data and interpreting the NFIP maps.

We will not physically revise and republish the FIRM and FIS report for your community to reflect the modifications made by this LOMR at this time. When changes to the previously cited FIRM panel and FIS report warrant physical revision and republication in the future, we will incorporate the modifications made by this LOMR at that time.

The floodway is provided to your community as a tool to regulate floodplain development. Therefore, the floodway modifications described in this LOMR, while acceptable to FEMA, must also be acceptable to your community and adopted by appropriate community action, as specified in Paragraph 60.3(d) of the NFIP regulations.

This LOMR is based on minimum floodplain management criteria established under the NFIP. Your community is responsible for approving all floodplain development and for ensuring all necessary permits required by Federal or State law have been received. State, county, and community officials, based on knowledge of local conditions and in the interest of safety, may set higher standards for construction in the SFHA. If the State, county, or community has adopted more restrictive or comprehensive floodplain management criteria, these criteria take precedence over the minimum NFIP criteria.

This determination has been made pursuant to Section 206 of the Flood Disaster Protection Act of 1973 (Public Law 93-234) and is in accordance with the National Flood Insurance Act of 1968, as amended (Title XIII of the Housing and Urban Development Act of 1968, Public Law 90-448), 42 U.S.C. 4001-4128, and 44 CFR Part 65. Pursuant to Section 1361 of the National Flood Insurance Act of 1968, as amended, communities participating in the NFIP are required to adopt and enforce floodplain management regulations that meet or exceed minimum NFIP criteria. These criteria are the minimum and do not supersede any State or local requirements of a more stringent nature. This includes adoption of the effective FIRM to which the regulations apply and the modifications described in this LOMR. Our records show that your community has met this requirement.

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

Mr. Jack Eldridge
Chief, Community Mitigation Programs Branch
Federal Emergency Management Agency, Region IX
1111 Broadway Street, Suite 1200
Oakland, CA 94607-4052
(510) 627-7184

If you have any questions regarding floodplain management regulations for your community or the NFIP in general, please call the CCO for your community at the telephone number cited above. If you have any questions regarding this LOMR, please call our Map Assistance Center, toll free, at 1-877-FEMA MAP (1-877-336-2627).

Sincerely,

Max H. Yuan, P.E., Project Engineer
Hazards Study Branch
Federal Insurance and
Mitigation Administration

For: Matthew B. Miller, P.E., Chief
Hazards Study Branch
Federal Insurance and
Mitigation Administration

Enclosures

cc: The Honorable Edward C. Morgan
Mayor, Town of Carefree

The Honorable Vincent Francia
Mayor, Town of Cave Creek

Mr. Richard P. Harris, P.E.
Project Manager
Engineering Division
Flood Control District of Maricopa County

Ms. Shanna Yager
Branch Manager
Floodplain Administrator
Flood Control District of Maricopa County

Ms. Adina C. Lund, P.E.
Public Works Planner
City of Scottsdale

Mr. Victor Calderon
Community Assistance Program Manager
Arizona Division of Emergency
Management

Mr. Brian R. Iserman, P.E.
Hydrologist
JE Fuller Hydrology and
Geomorphology, Inc.

REVISED TO REFLECT LOMR DATED DEC 05 2002

APPROXIMATE SCALE IN FEET

000 0 1000

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

MARICOPA COUNTY, ARIZONA AND INCORPORATED AREAS

PANEL 805 OF 4350

(SEE MAP INDEX FOR PANELS NOT PRINTED)

CONTAINS: COMMUNITY	NUMBER	PANEL	SUFFIX
CAREFREE, TOWN OF	040126	0805	G
CAVE CREEK, TOWN OF	040129	0805	G
MARICOPA COUNTY, UNINCORPORATED AREAS	040037	0805	G

MAP NUMBER
04013C0805 G

MAP REVISED:
JULY 19, 2001

Federal Emergency Management Agency

ZONE D

CAVE CREEK RECREATION AREA

ZONE X

ZONE AE

ZONE A

TOWN OF CAVE CREEK
040129

TOWN OF CAREFREE
040126

Black Mountain Summit Recreation Area

Andora Hills Wash Split 1

Andora Hills Wash Split 2

Galloway Wash — Split 2

Unnamed Tributary To Galloway Wash

Rowe Wash

Galloway Private Bridge

Golf Cart Path

100-YEAR FLOOD CONTAINED IN CULVERT

REVISED AREA

RM3112

RM3111

RM3110

RM129

RM128

RM132

RM130

RM131

Ocotillo Wash

Cave Creek

Galloway Wash

Rancho Manana

Sugar Loaf

Gunsight Rd

Miramonte Drive

Grapevine

Spur Cross Road

Spur Road

Hidden Valley Drive

Valley Way

El Indio Circle

Habitat Circle

East Ridge Road

East Mark Way

Canyon Road

Skyline Drive

Hidden Rock Ln

Military Rd

Blue Ridge Drive

Surrey Road

Carriage Street

Sunset Trail

N Linda Drive

Cave Creek Road

House Basin

School Basin

57th Pl

58th St

68th St

69th St

Ocotillo Road

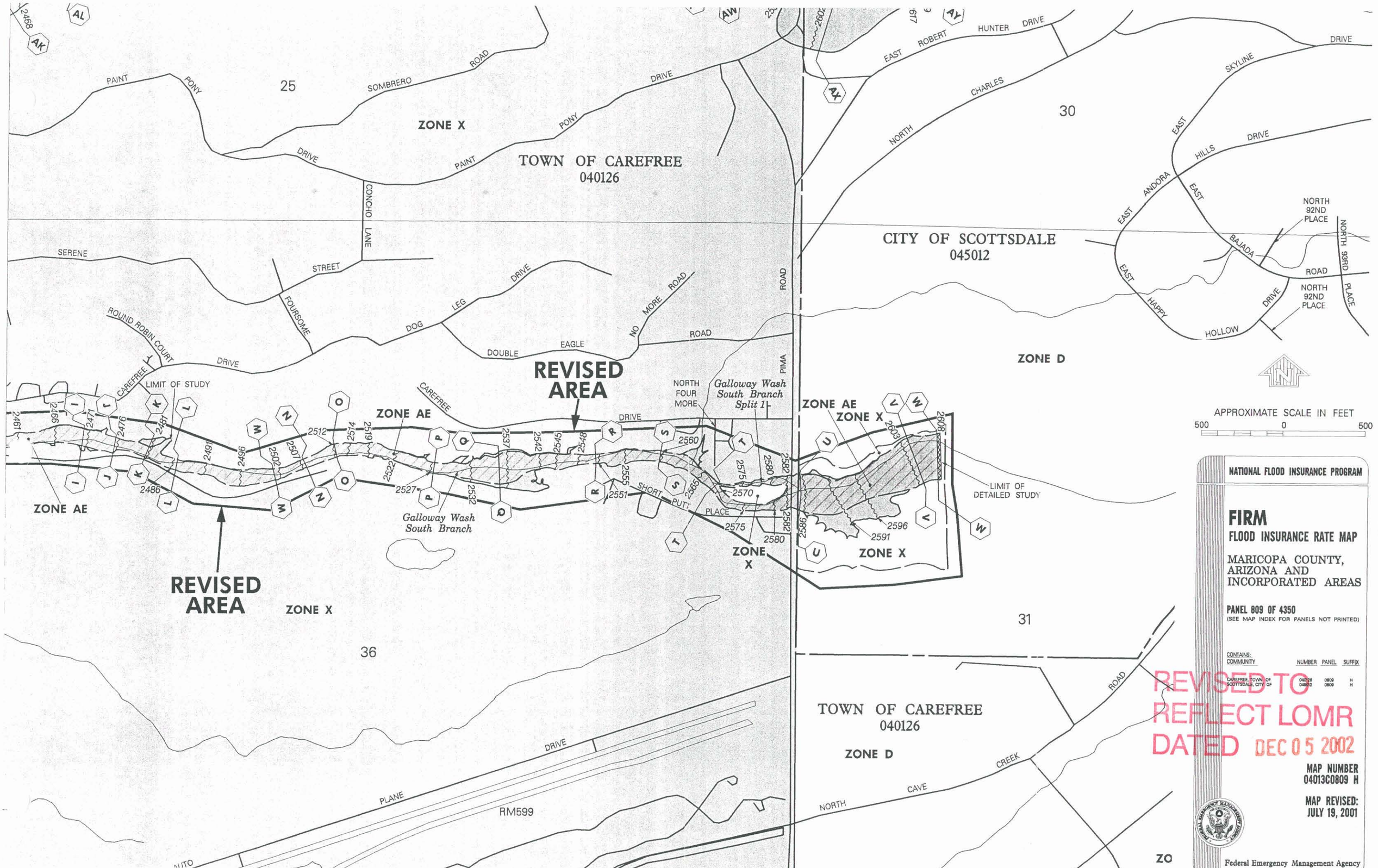
29

30

32

33

34



NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

MARICOPA COUNTY, ARIZONA AND INCORPORATED AREAS

PANEL 809 OF 4350
(SEE MAP INDEX FOR PANELS NOT PRINTED)

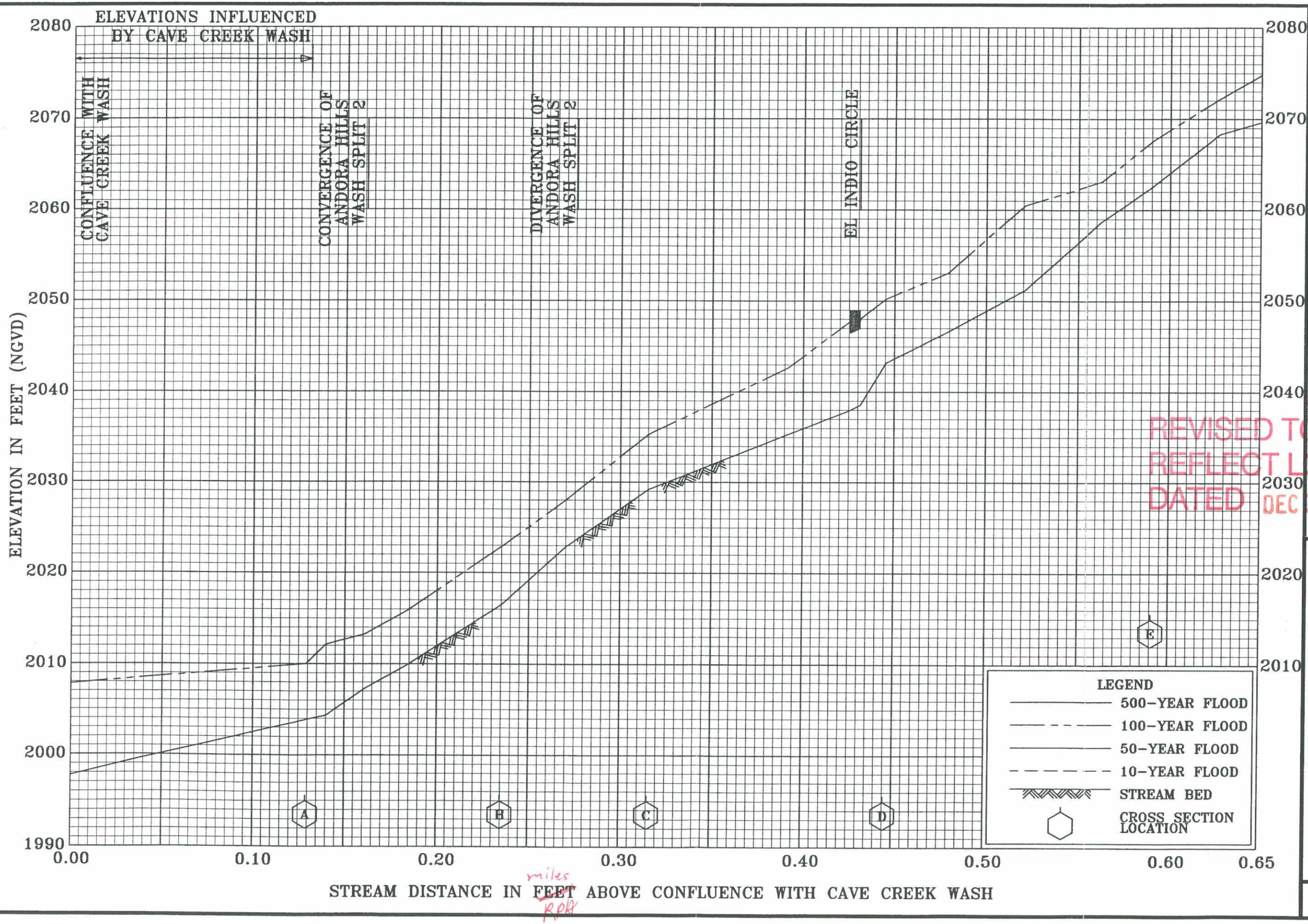
CONTAINS: COMMUNITY	NUMBER	PANEL	SUFFIX
CAREFREE, TOWN OF	040126	0809	H
SCOTTSDALE, CITY OF	045012	0809	H

REVISED TO REFLECT LOMR DATED DEC 05 2002

MAP NUMBER
04013C0809 H

MAP REVISED:
JULY 19, 2001

Federal Emergency Management Agency



REVISED TO REFLECT LOMR DATED DEC 05 2002

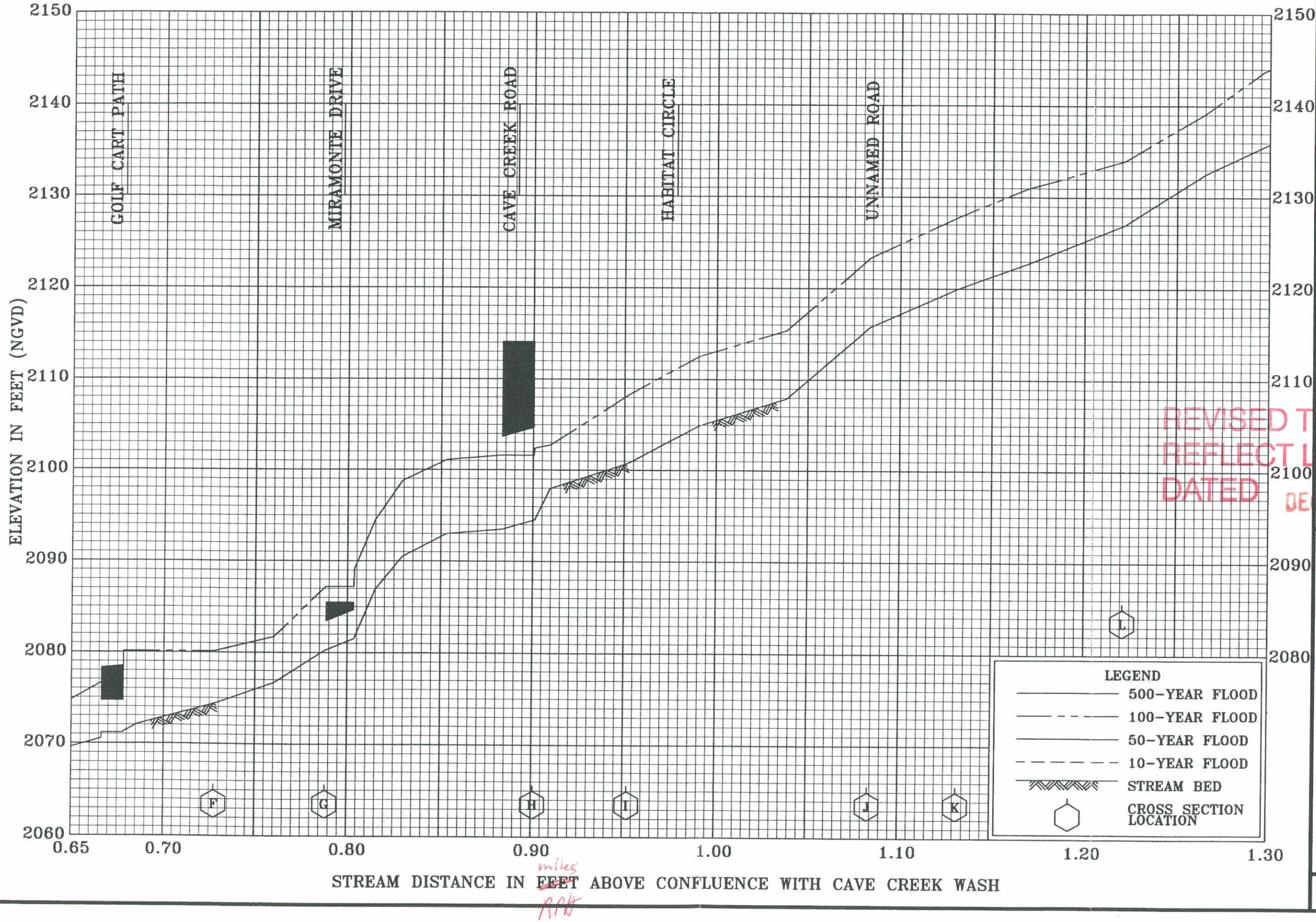
FLOOD PROFILES

ANDORA HILLS WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ AND INCORPORATED AREAS

01P



REVISED TO REFLECT LOMR DATED DEC 05 2002

FLOOD PROFILES

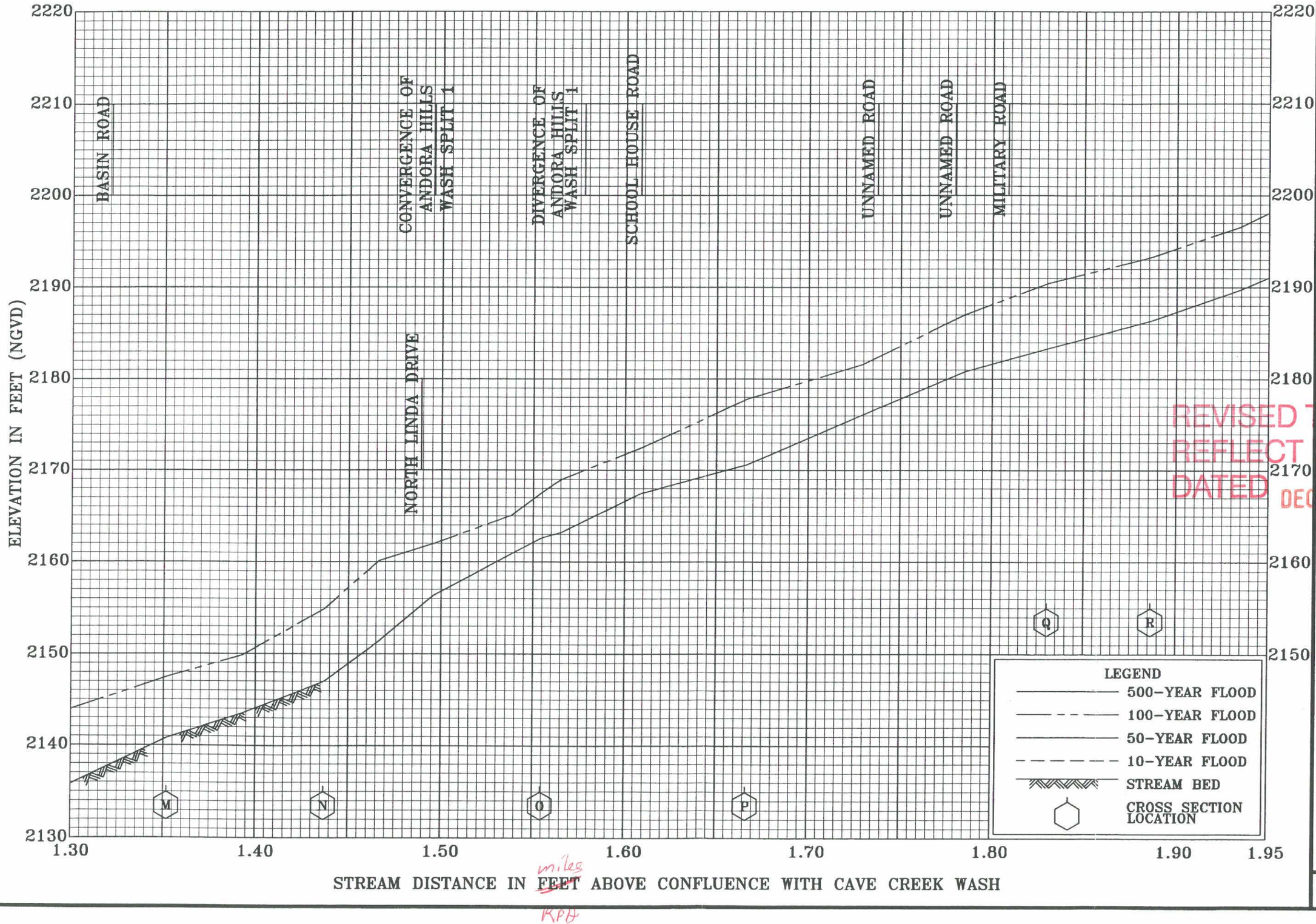
ANDORA HILLS WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ

AND INCORPORATED AREAS

02P



miles
RPB

REVISED TO REFLECT LOMR DATED DEC 05 2002

FLOOD PROFILES

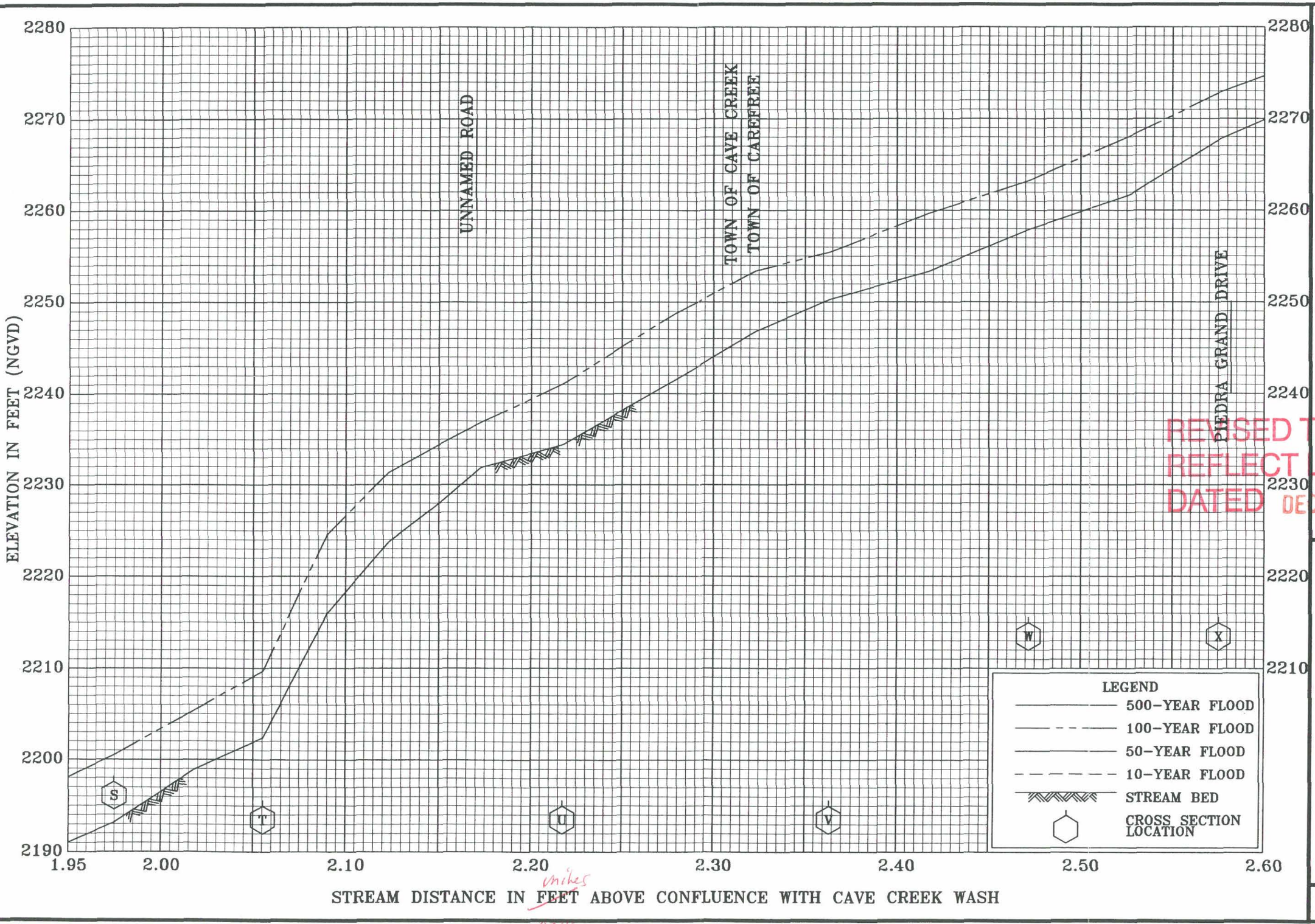
ANDORA HILLS WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ

AND INCORPORATED AREAS

03P



REVISED TO REFLECT LOMR DATED DEC 05 2002

FLOOD PROFILES

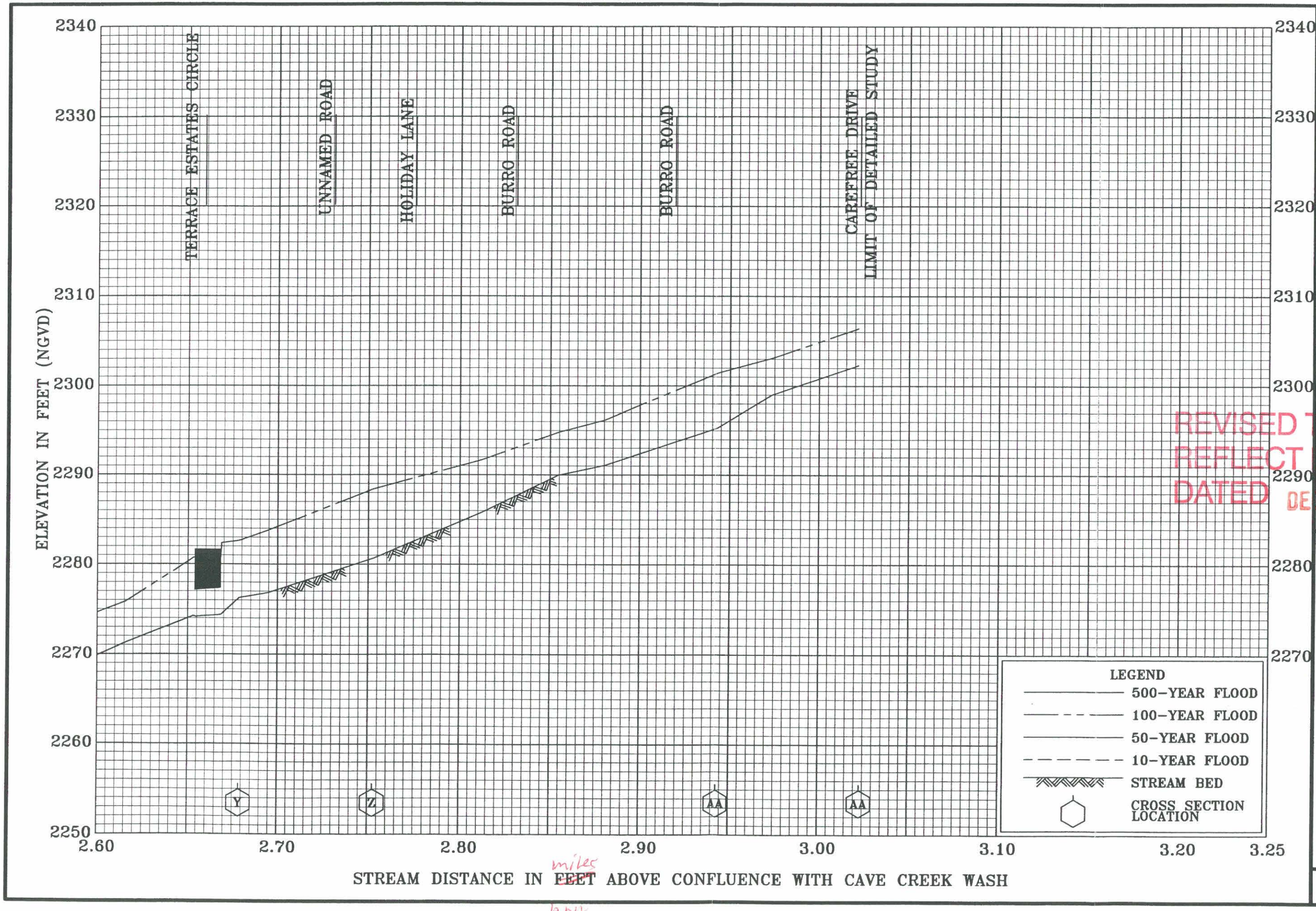
ANDORA HILLS WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ

AND INCORPORATED AREAS

04P



miles

RPH

REVISED TO REFLECT LOMR DATED DEC 05 2002

FLOOD PROFILES

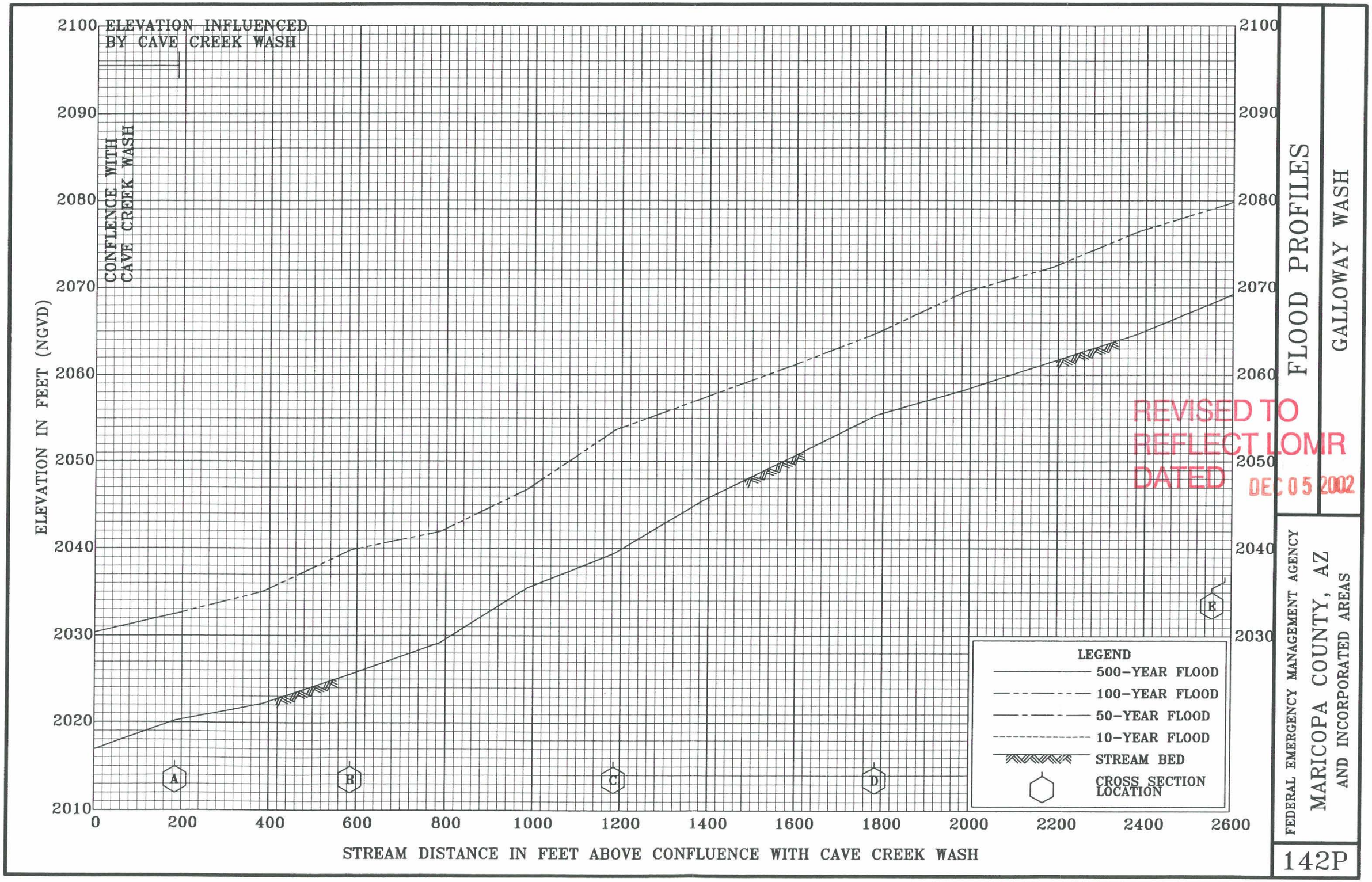
ANDORA HILLS WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ

AND INCORPORATED AREAS

05P



REVISED TO REFLECT LOMR DATED DEC 05 2002

FLOOD PROFILES

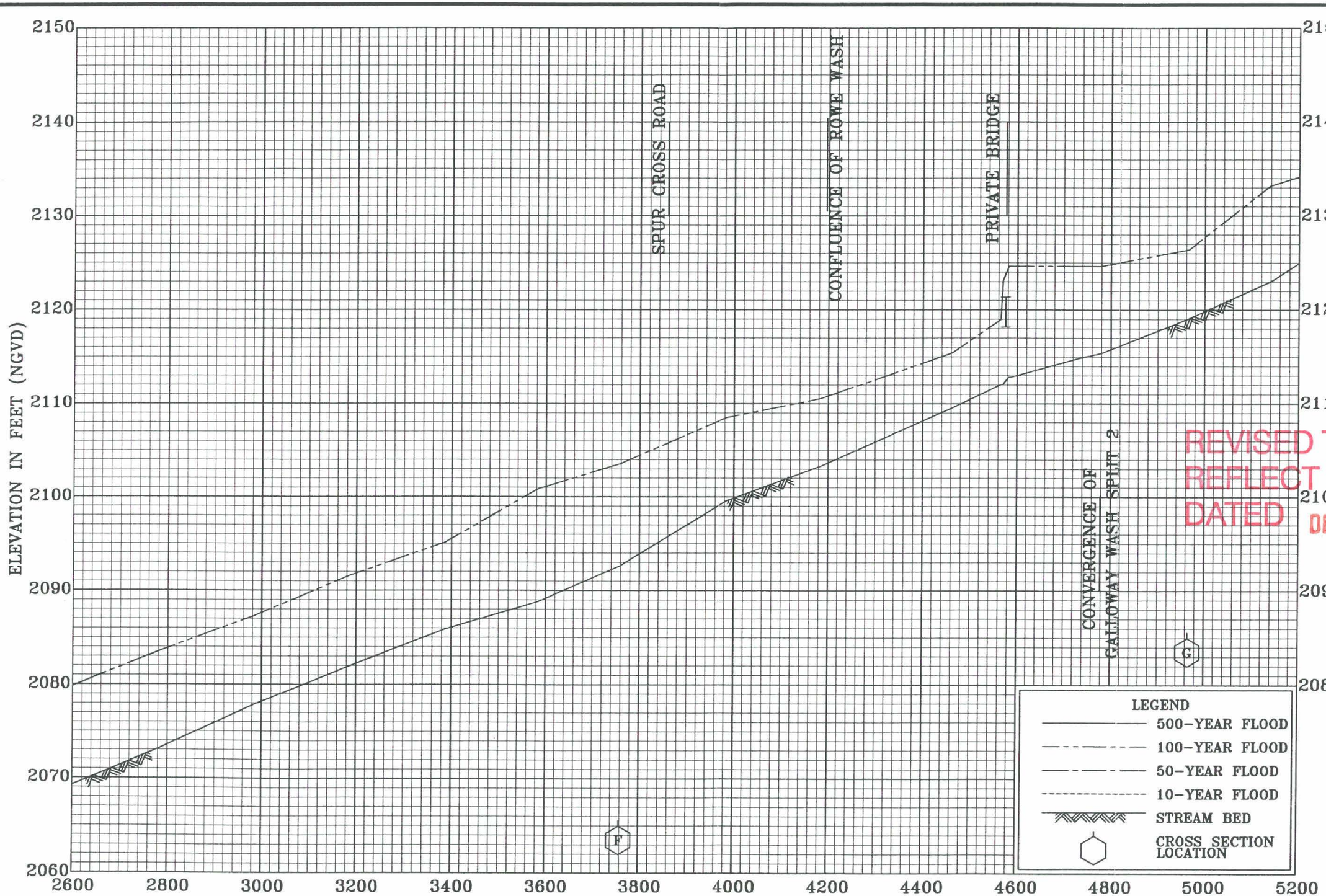
GALLOWAY WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ

AND INCORPORATED AREAS

142P



REVISED TO REFLECT LOMR DATED DEC 05 2002

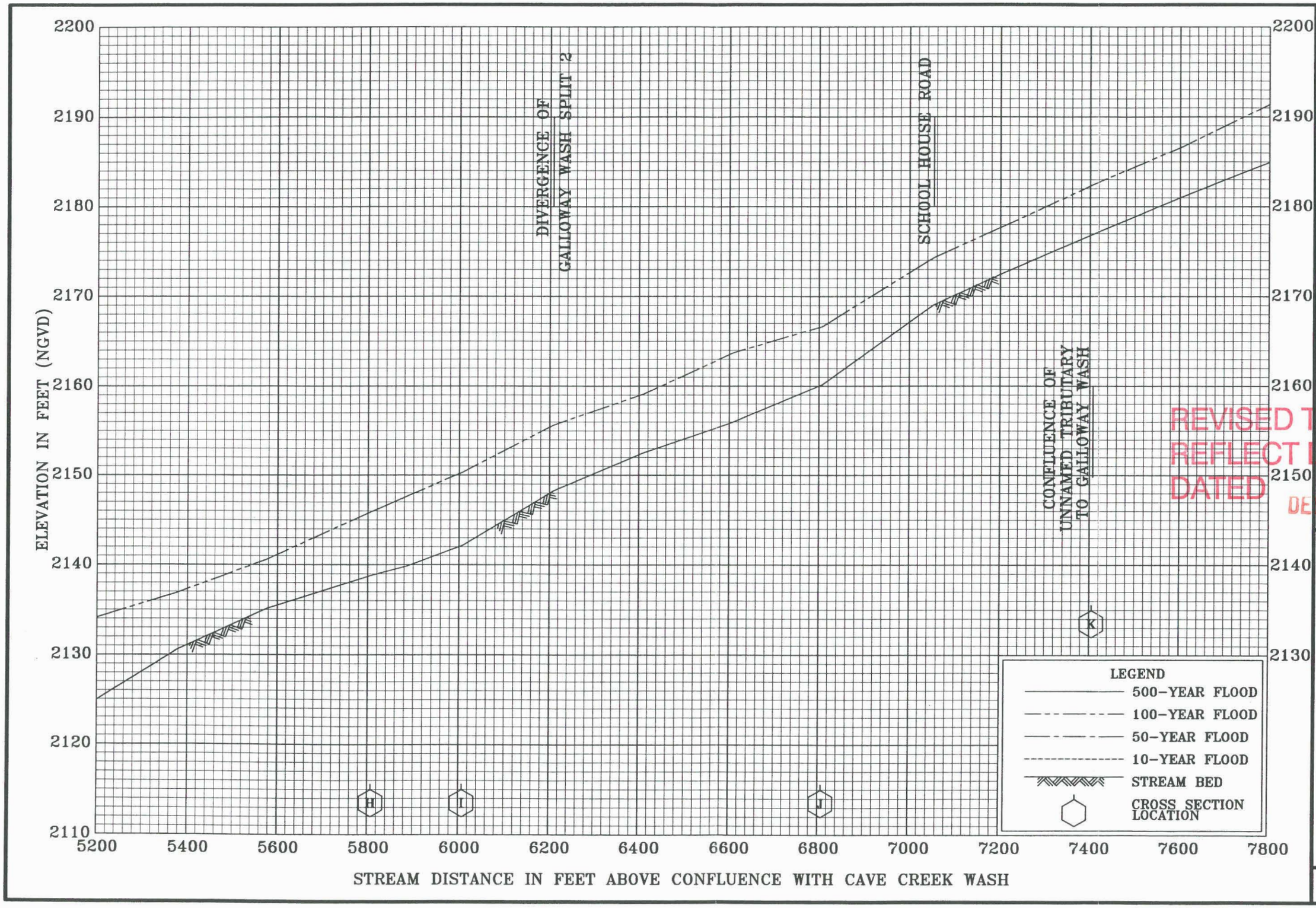
FLOOD PROFILES

GALLOWAY WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ
AND INCORPORATED AREAS

143P



REVISED TO REFLECT LOMR DATED DEC 05 2002

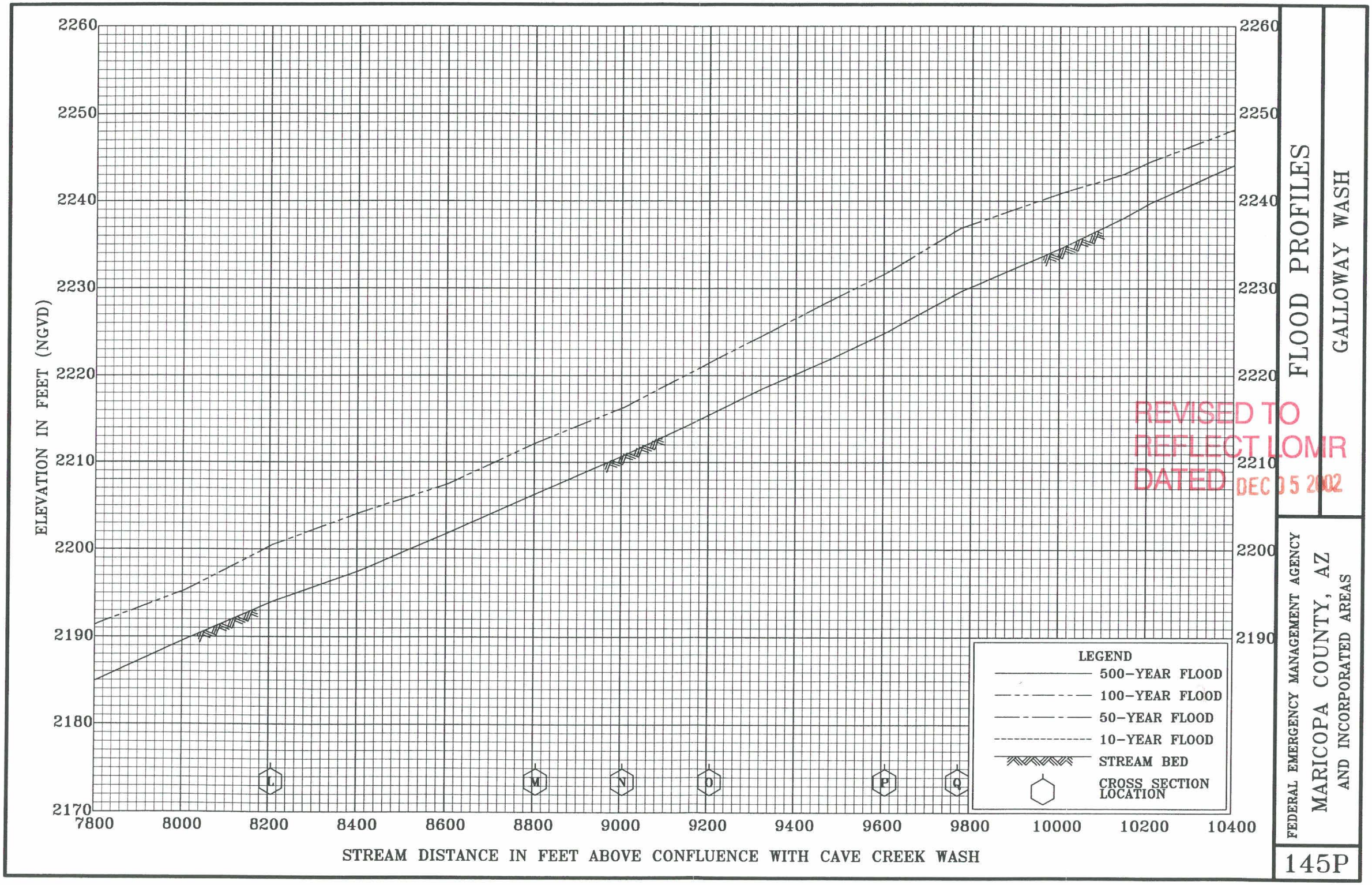
FLOOD PROFILES

GALLOWAY WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ
AND INCORPORATED AREAS

144P



REVISED TO REFLECT LOMR DATED DEC 05 2002

FLOOD PROFILES

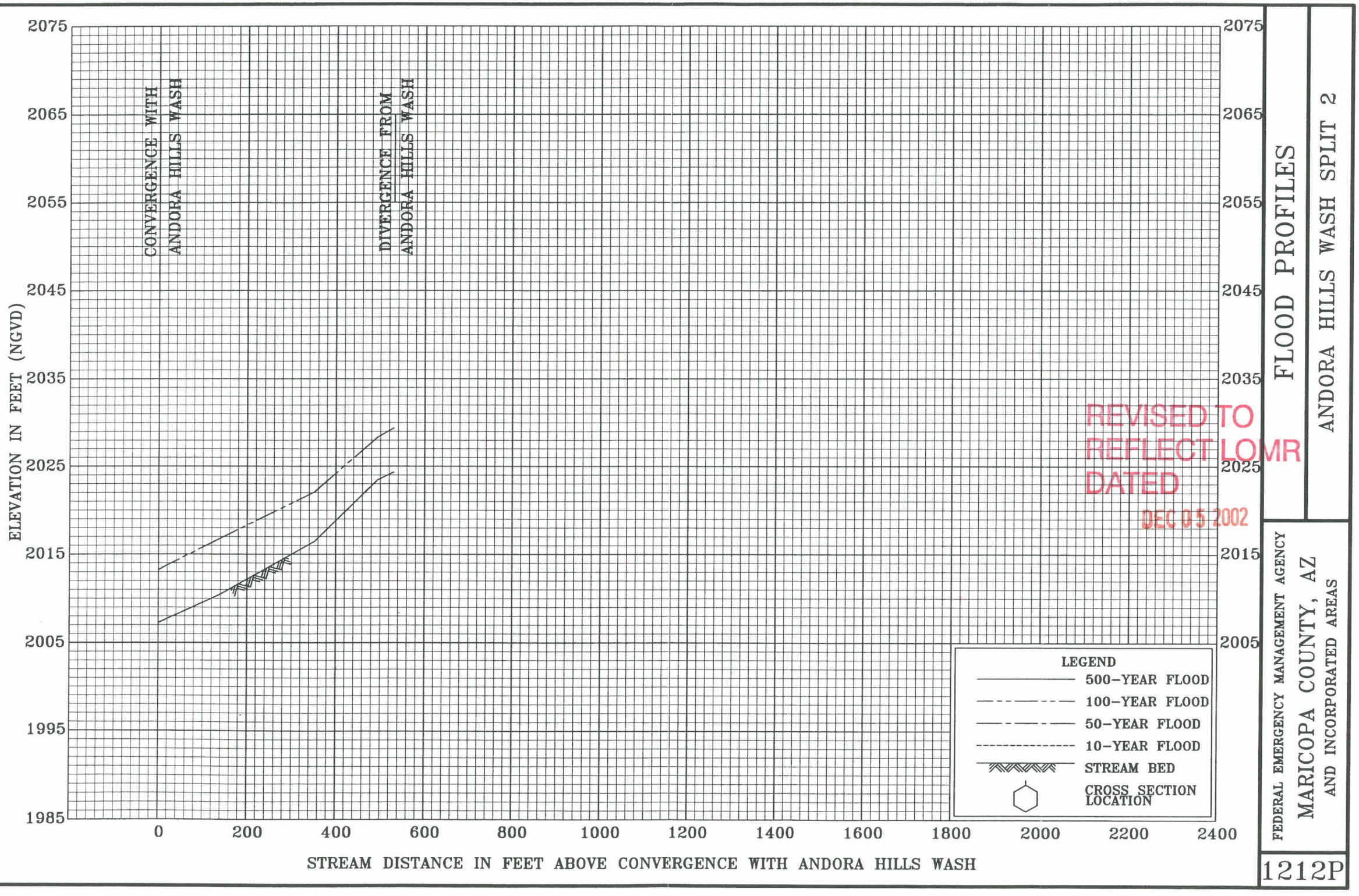
GALLOWAY WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ

AND INCORPORATED AREAS

145P



REVISED TO REFLECT LOMR DATED DEC 05 2002

FLOOD PROFILES

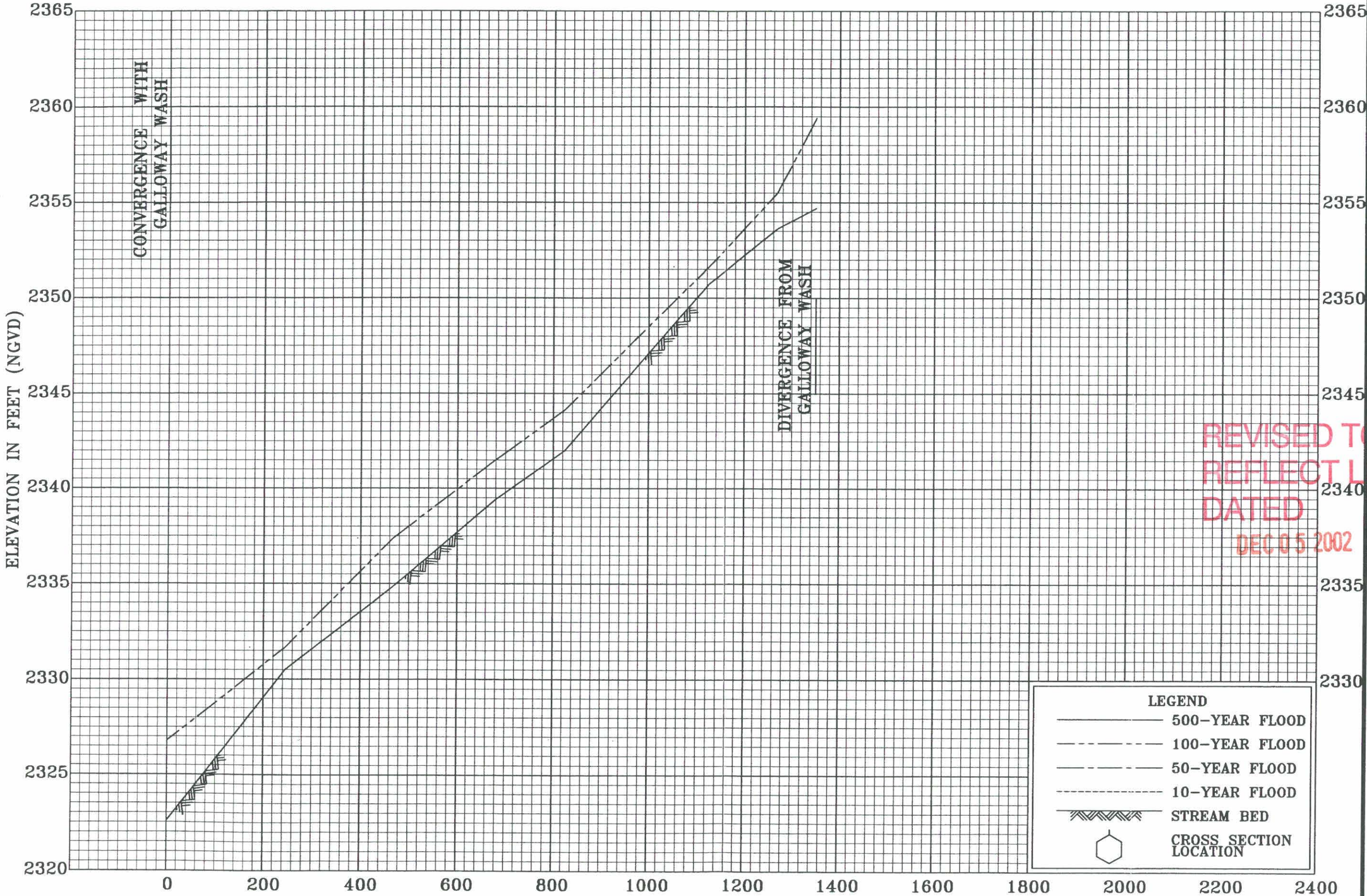
ANDORA HILLS WASH SPLIT 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ

AND INCORPORATED AREAS

1212P



REVISED TO REFLECT LOMR DATED DEC 05 2002

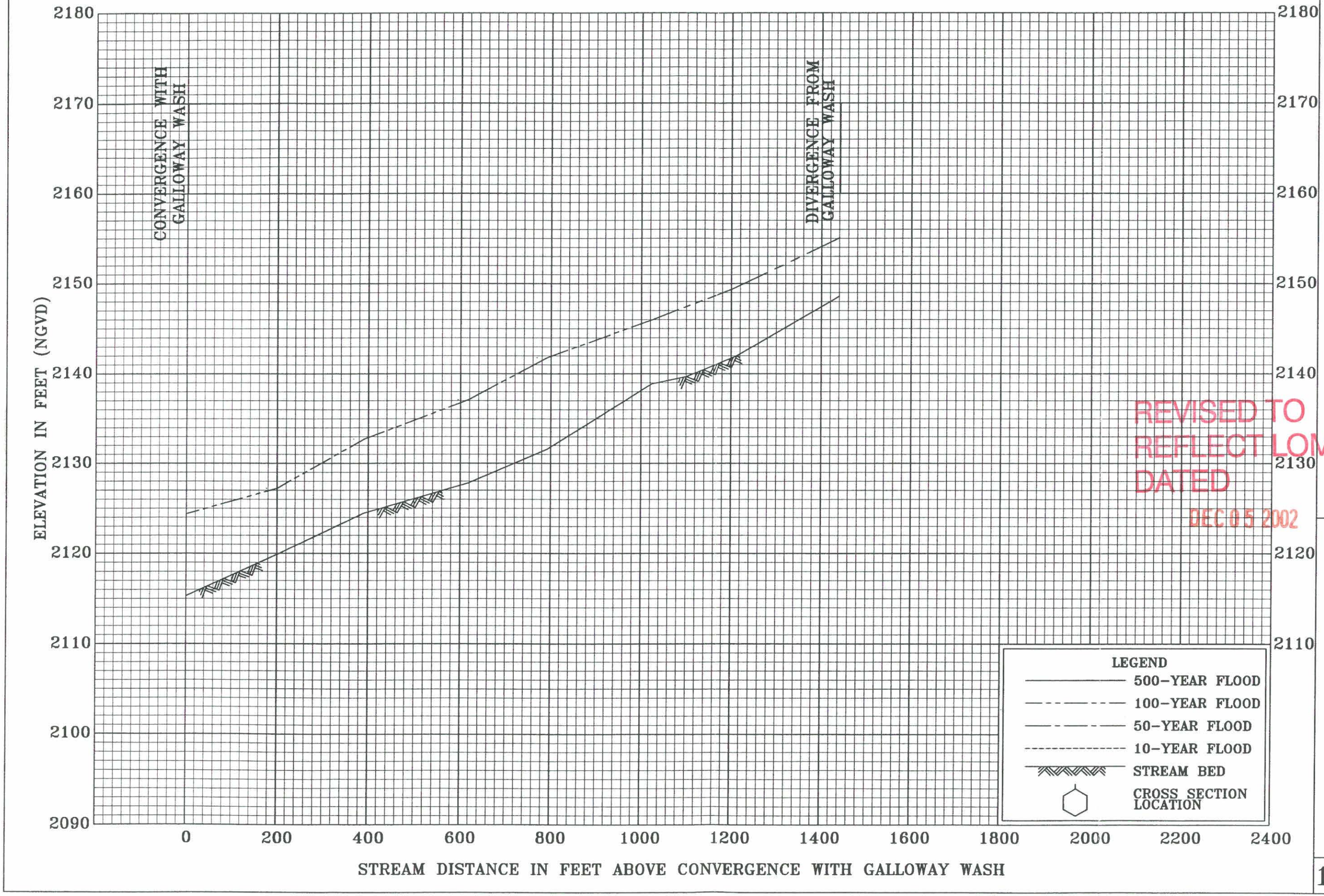
FLOOD PROFILES

GALLOWAY WASH SPLIT 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ
AND INCORPORATED AREAS

1213P



REVISED TO REFLECT LOMR DATED DEC 05 2002

FLOOD PROFILES

GALLOWAY WASH SPLIT 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ
AND INCORPORATED AREAS

1214P

CONVERGENCE WITH GALLOWAY WASH SOUTH BRANCH

DIVERGENCE FROM GALLOWAY WASH SOUTH BRANCH

ELEVATION IN FEET (NGVD)

2640
2630
2620
2610
2600
2590
2580
2570
2560
2550

0 200 400 600 800 1000 1200 1400 1800 2000

STREAM DISTANCE IN FEET ABOVE CONVERGENCE WITH GALLOWAY WASH SOUTH BRACH

REVISED TO REFLECT LOMR DATED DEC 05 2002

LEGEND
- 500-YEAR FLOOD
- 100-YEAR FLOOD
- 50-YEAR FLOOD
- 10-YEAR FLOOD
- STREAM BED
- CROSS SECTION LOCATION

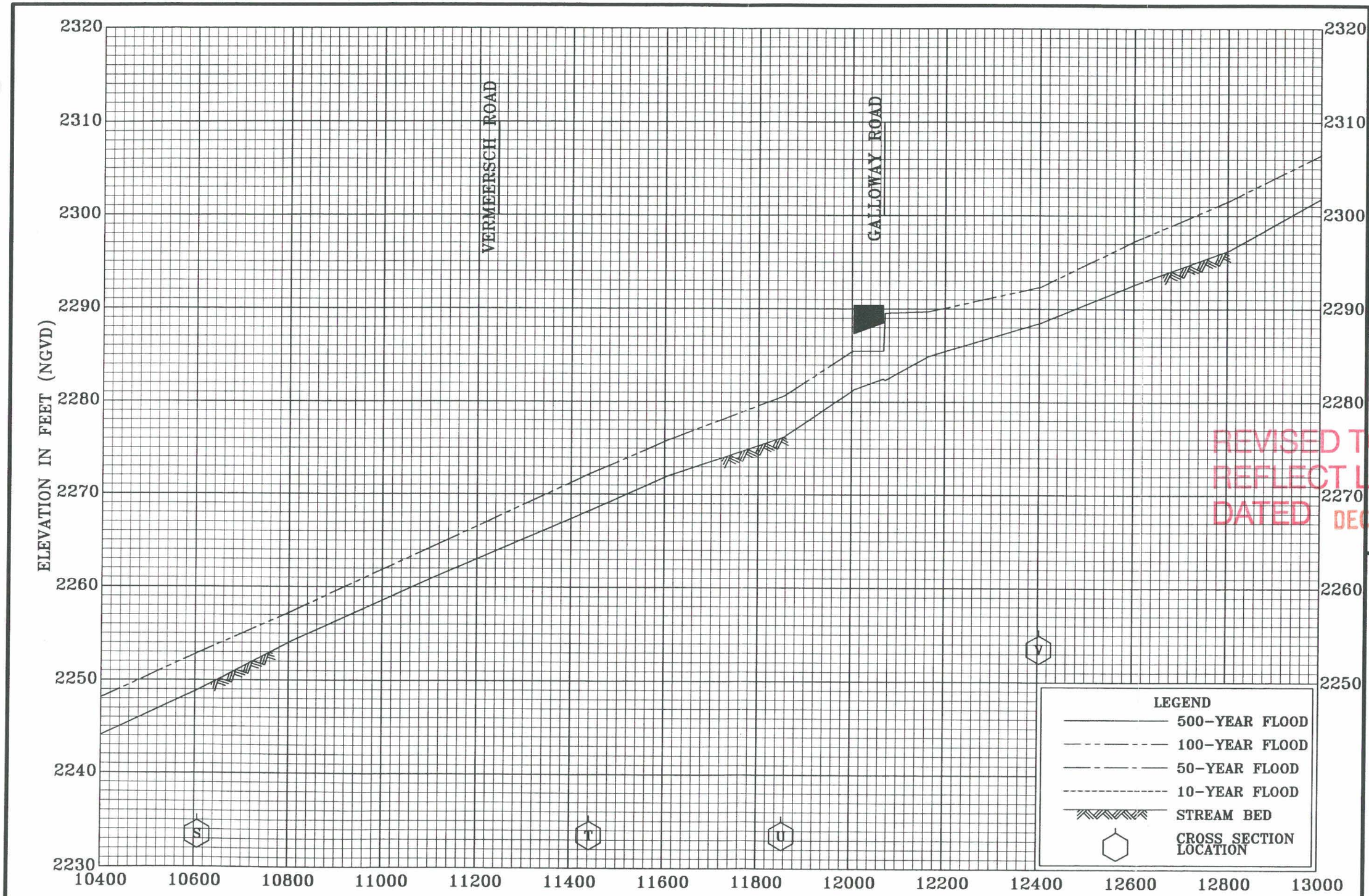
FLOOD PROFILES

GALLOWAY WASH SOUTH BRANCH SPLIT 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ
AND INCORPORATED AREAS

1215P



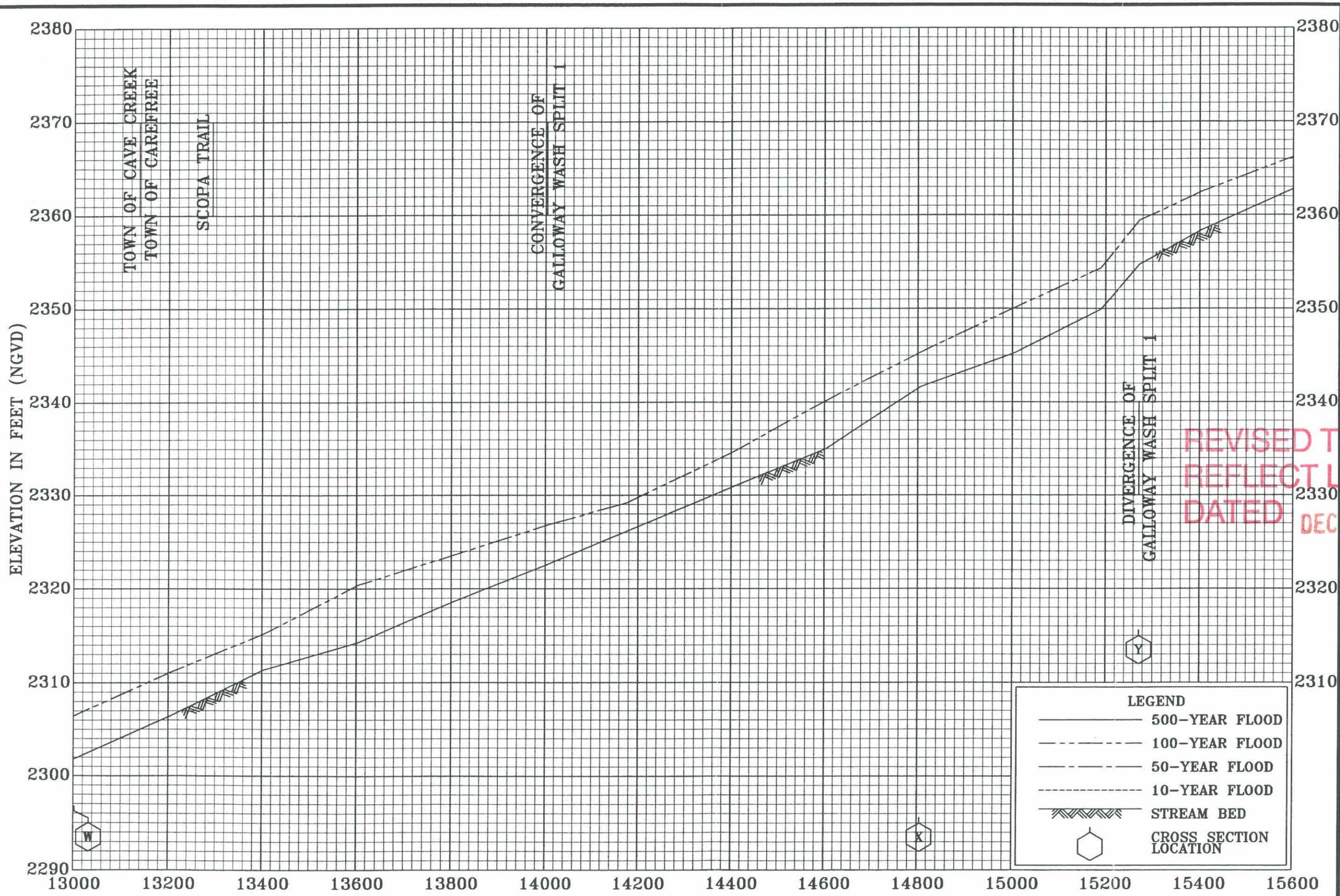
REVISED TO REFLECT LOMR DATED DEC 05 2002

FLOOD PROFILES

GALLOWAY WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ
AND INCORPORATED AREAS



REVISED TO REFLECT LOMR DATED DEC 05 2002

FLOOD PROFILES

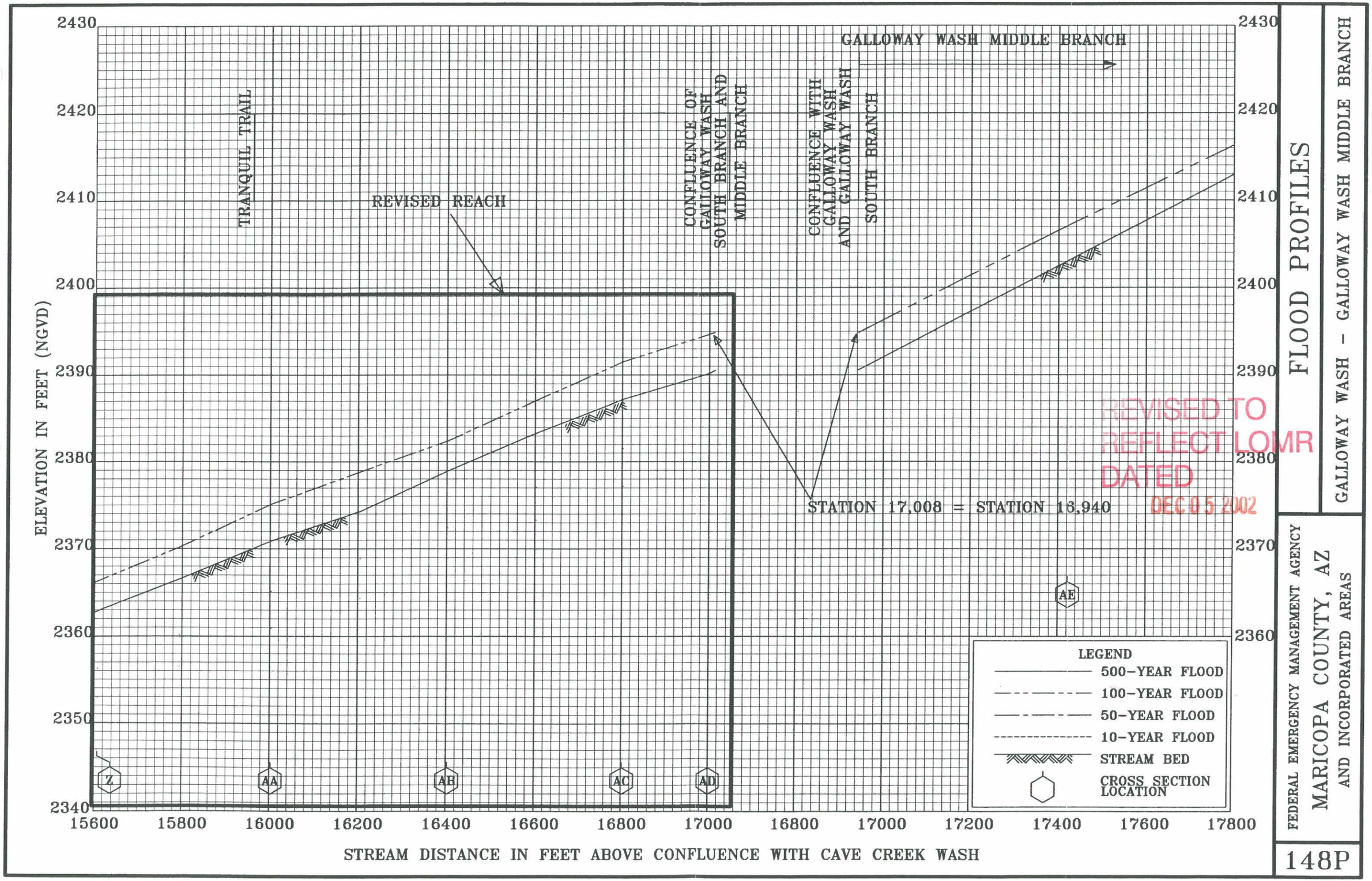
GALLOWAY WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ

AND INCORPORATED AREAS

147P



REVISED TO REFLECT LOMR DATED DEC 05 2002

FLOOD PROFILES

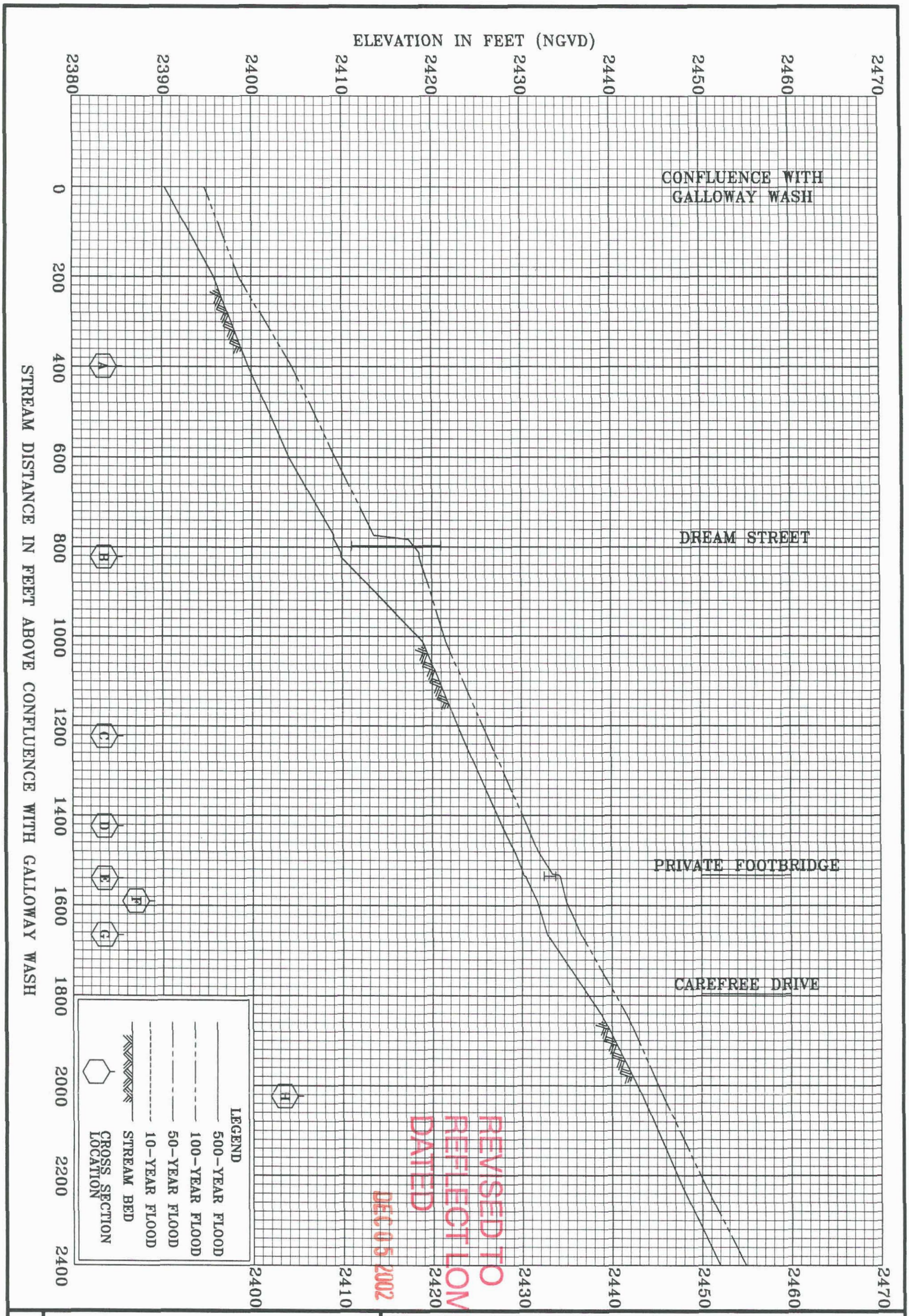
GALLOWAY WASH - GALLOWAY WASH MIDDLE BRANCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ

AND INCORPORATED AREAS

148P



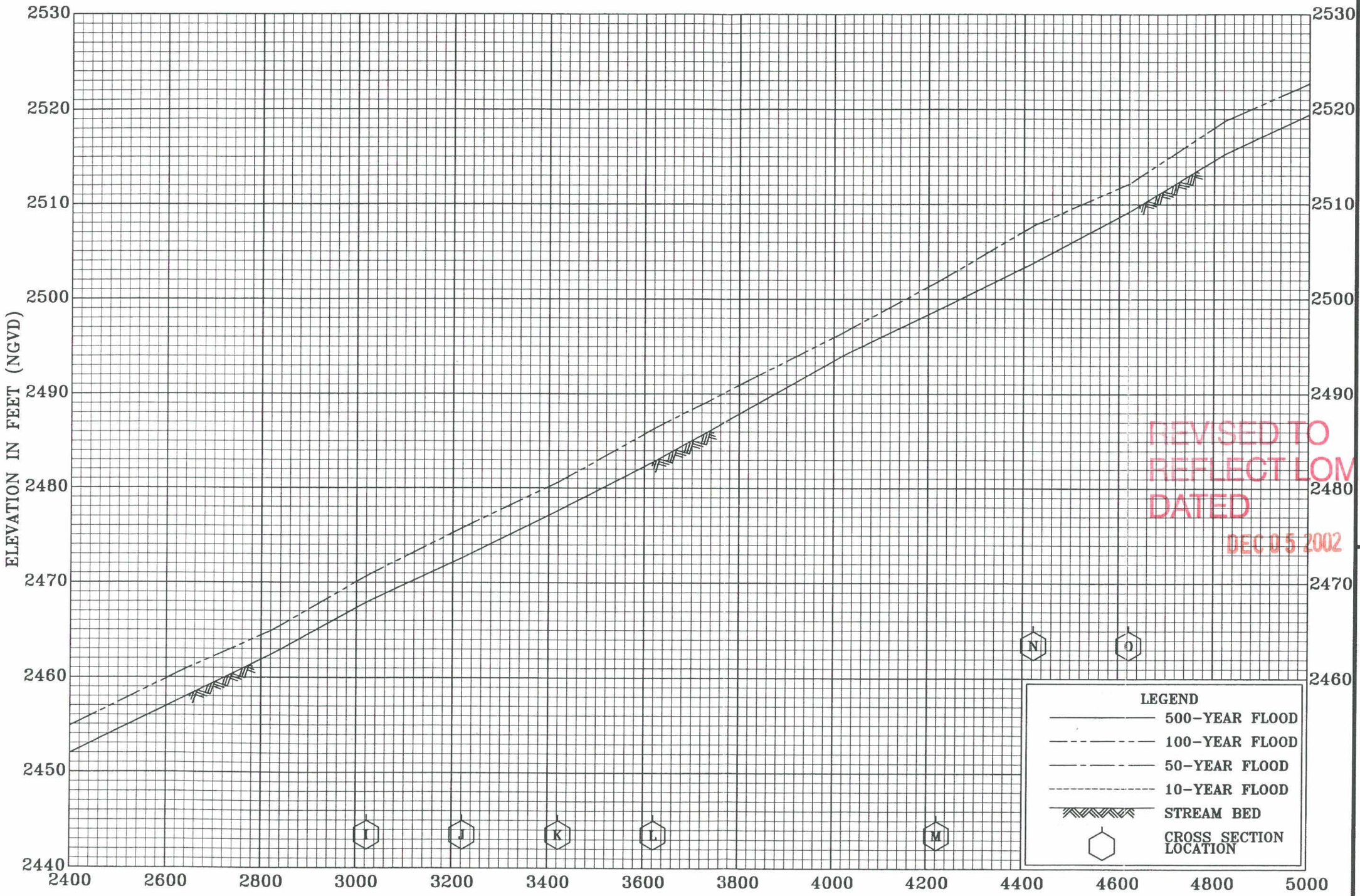
153P

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ
AND INCORPORATED AREAS

FLOOD PROFILES

GALLOWAY WASH SOUTH BRANCH



REVISED TO REFLECT LOMR DATED DEC 05 2002

FLOOD PROFILES

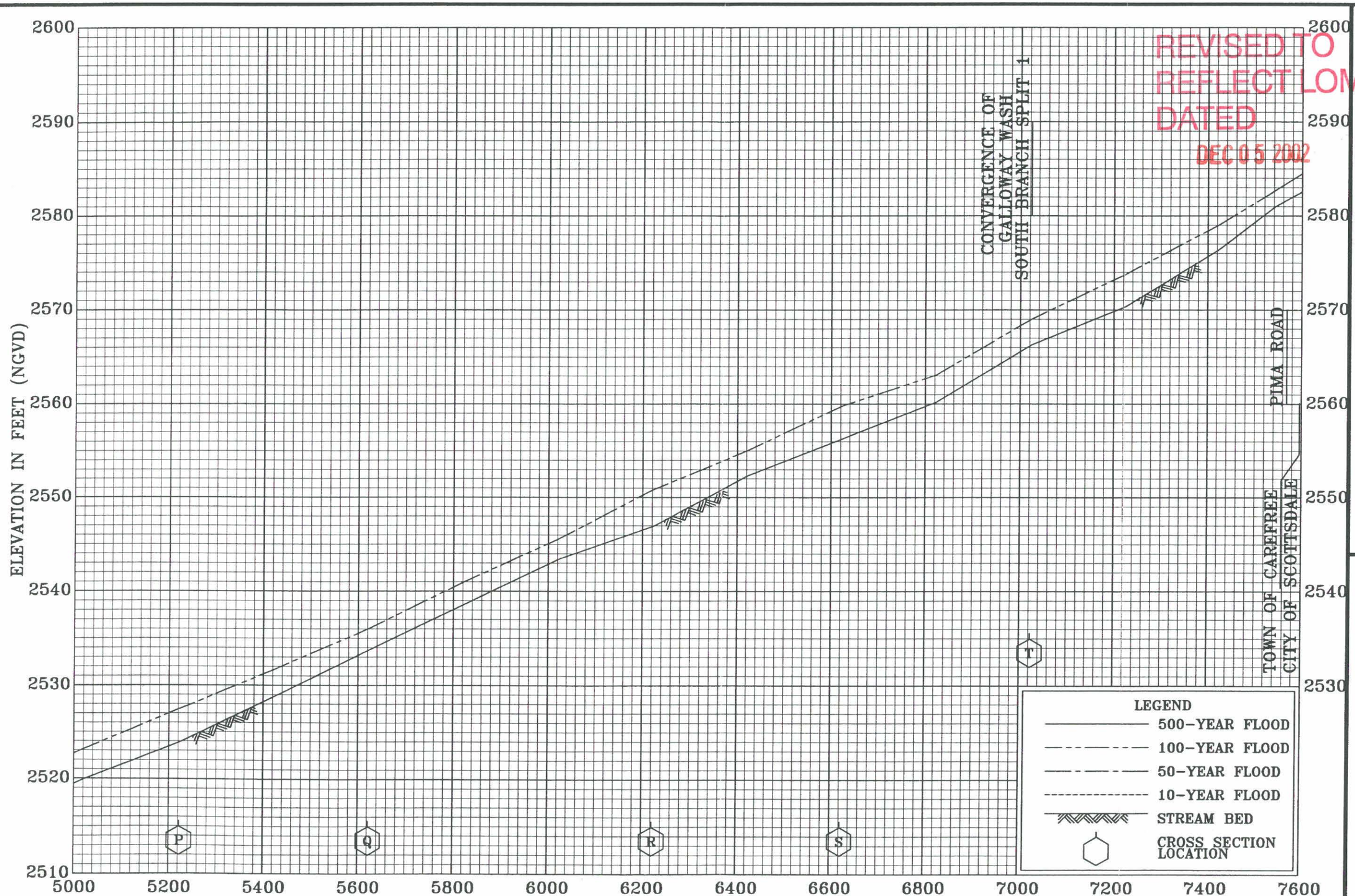
GALLOWAY WASH SOUTH BRANCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ

AND INCORPORATED AREAS

154P



REVISED TO REFLECT LOMR DATED DEC 05 2002

FLOOD PROFILES

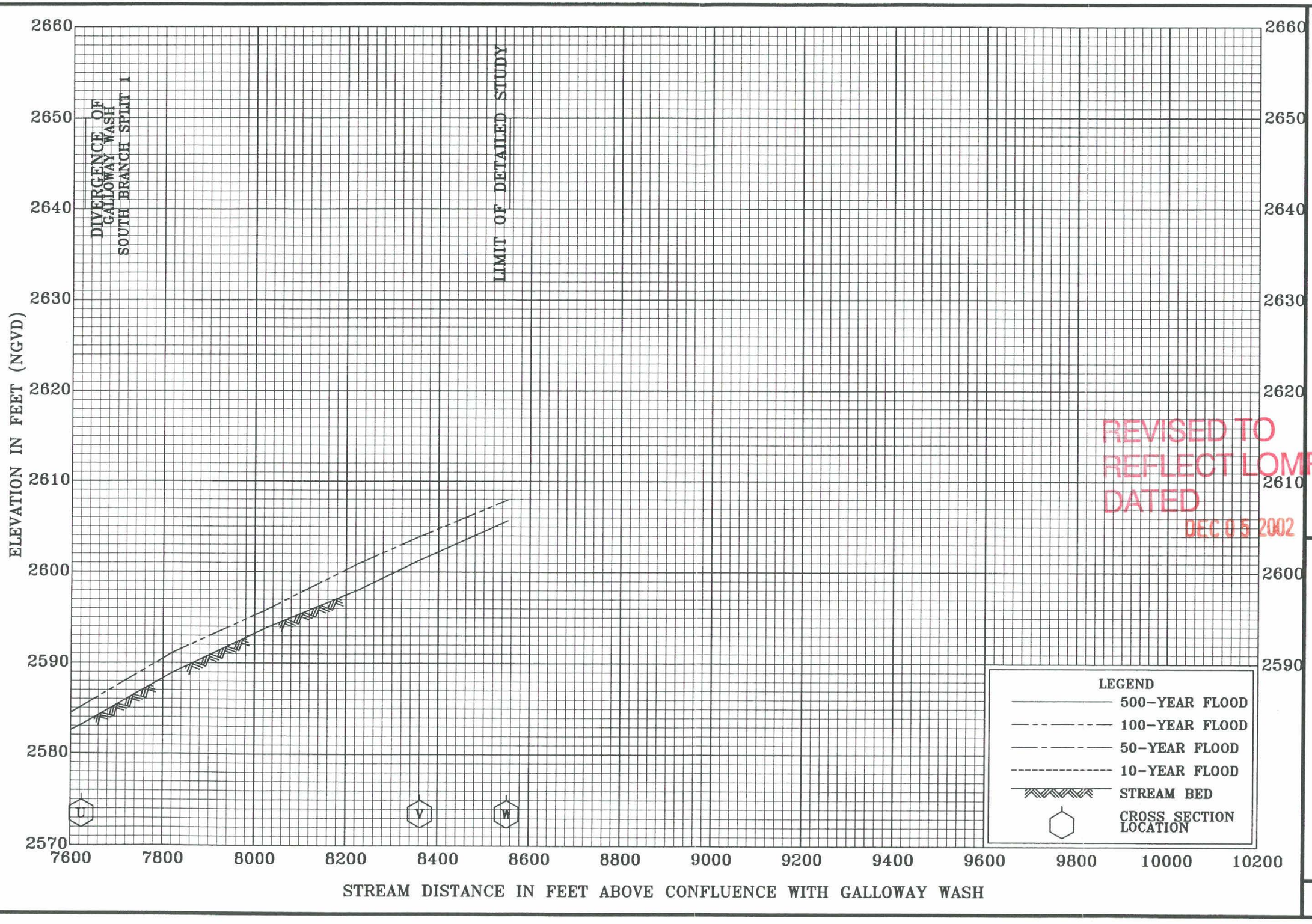
GALLOWAY WASH SOUTH BRANCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ

AND INCORPORATED AREAS

155P



REVISED TO REFLECT LOMR DATED DEC 05 2002

FLOOD PROFILES

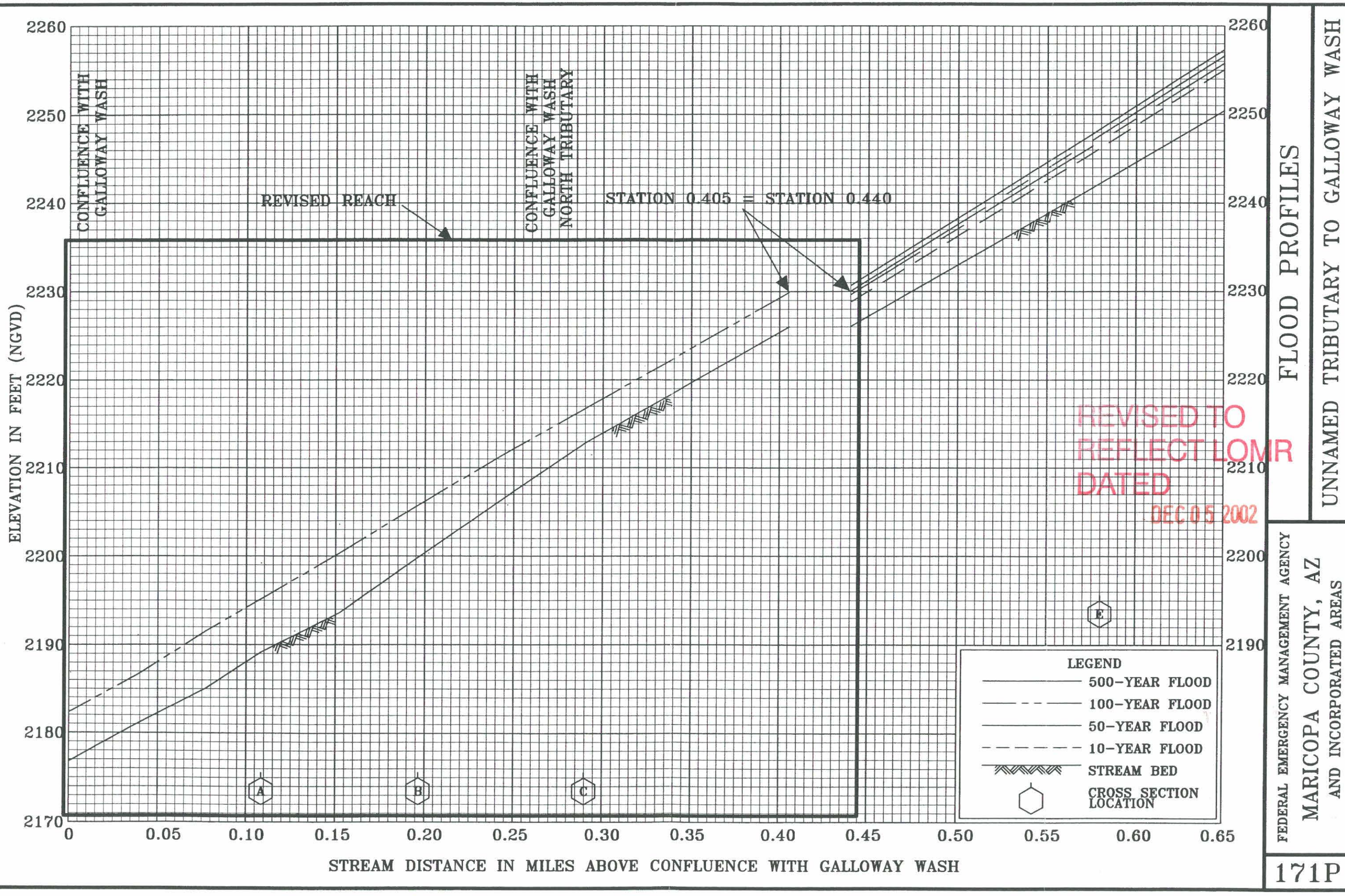
GALLOWAY WASH SOUTH BRANCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ

AND INCORPORATED AREAS

156P


2260
2250
2240
2230
2220
2210
2200
2190
2180
2170
ELEVATION IN FEET (NGVD)
CONFLUENCE WITH GALLOWAY WASH
REVISED REACH
CONFLUENCE WITH GALLOWAY WASH NORTH TRIBUTARY
STATION 0.405 = STATION 0.440
A
B
C
E
0
0.05
0.10
0.15
0.20
0.25
0.30
0.35
0.40
0.45
0.50
0.55
0.60
0.65
STREAM DISTANCE IN MILES ABOVE CONFLUENCE WITH GALLOWAY WASH
LEGEND
500-YEAR FLOOD
100-YEAR FLOOD
50-YEAR FLOOD
10-YEAR FLOOD
STREAM BED
CROSS SECTION LOCATION
REVISED TO REFLECT LOMR DATED DEC 05 2002
FLOOD PROFILES
UNNAMED TRIBUTARY TO GALLOWAY WASH
FEDERAL EMERGENCY MANAGEMENT AGENCY
MARICOPA COUNTY, AZ
AND INCORPORATED AREAS
171P

REVISED TO REFLECT LOMR DATED DEC 05 2002

FLOOD PROFILES

ANDORA HILLS WASH SPLIT 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ

AND INCORPORATED AREAS

1211P

REVISED TO REFLECT LOMR DATED DEC 05 2002

Table 3. Summary of Discharges (Cont'd)

Flooding Source and Location	Drainage Area (Square Miles)	Peak Discharges (cfs) 10-Year	50-Year	100-Year	500-Year
North Tributary of Galloway Wash					
At confluence with Unnamed Tributary to Galloway Wash	6.40	5,516	8,143	9,483	11,868
At River Mile 1.89 above Minor Tributary	4.98	3,751	5,632	6,593	8,303
Rowe Wash					
Above confluence with Galloway Wash	5.5	4,170	6,190	6,940	9,200
2.5 miles above confluence with Galloway Wash	4.8	4,030	5,940	6,650	8,800
At confluence of Grapevine Wash	4.63	3,033	4,531	5,307	6,687
Above confluence with Grapevine Wash	0.74	1,225	1,782	2,048	2,512
Above confluence with Rowe Wash Tributary 1	0.49	790	1,158	1,334	1,639
At River Mile 4.05	0.12	217	305	352	433
REVISED DATA → Unnamed Tributary to Galloway Wash					
At confluence with Galloway Wash	7.1	N/A	N/A	5,722	N/A
Ocotillo Wash					
Above confluence with Cave Creek	3.8	3,200	4,820	5,420	7,200
Near intersection of Rockaway Hills Drive and Fleming Springs Road	2.8	2,800	4,140	4,630	6,200
Cave Creek Wash					
At confluence with Salt River	25.0	N/A	N/A	2,257	N/A
At 35th Avenue	22.6	N/A	N/A	2,226	N/A
At Interstate 10 Freeway downstream of Durango Exit	21.0	N/A	N/A	2,217	N/A
At Interstate 10 Freeway upstream of Durango Exit	21.0	N/A	N/A	2,523	N/A
At Jackson Street	16.1	N/A	N/A	1,890	N/A
At Van Buren Street	15.3	N/A	N/A	1,865	N/A
At McDowell Road	12.9	N/A	N/A	1,691	N/A
At Encanto Street	9.3	N/A	N/A	1,375	N/A
At Thomas Road	7.9	N/A	N/A	1,210	N/A
At Indian School Road	7.2	N/A	N/A	1,237	N/A

[1]Not Available

Table 3. Summary of Discharges

Flooding Source and Location	Drainage Area (square miles)	Peak Discharges (cubic feet per second) 10-Year	50-Year	100-Year	500-Year
Andora Hills Wash					
Above confluence with Cave Creek Wash	2.8	N/A	N/A	3,568	N/A
Above School House Road	1.7	N/A	N/A	2,615	N/A
Above Carefree Drive	0.9	N/A	N/A	2,070	N/A
Below Scottsdale Road	0.6	420	640	720	980
Galloway Wash					
At Spur Cross Road	20.6	N/A	N/A	13,548	N/A
At School House Road	14.7	N/A	N/A	10,763	N/A
Approximately 800 feet downstream of Scopa Trail	6.1	N/A	N/A	4,412	N/A
Approximately 1000 feet upstream of Tranquil Trail	5.1	N/A	N/A	3,439	N/A
Immediately downstream of confluence of Middle Branch and South Branch	5.1	N/A	N/A	3,439	N/A
Hassayampa River					
At confluence with the Gila River	1,504	N/A	N/A	72,966	N/A
At Stream Gage Station 95170 (Arlington, Old U.S. Highway 80)	1,470	N/A	N/A	73,500	N/A
At Interstate 10	1,450	N/A	N/A	75,164	N/A
At confluence with Jack Rabbit Wash	1,362	N/A	N/A	76,120	N/A
Just above confluence with Jack Rabbit Wash	1,010	N/A	N/A	55,980	N/A
At Granite Reef Aqueduct	930	N/A	N/A	57,854	N/A
At Stream Gage Station 95165 (Morristown)	774	N/A	N/A	61,600	N/A
At Town of Wichenburg	711	N/A	N/A	71,000	N/A

REVISED DATA

REVISED TO REFLECT LOMR DATED DEC 05 2002

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY (FEET NGVD)	INCREASE
Unnamed Tributary to Galloway Wash				REVISED DATA				
A	0.109	501	988	5.8	2,195.2	2,195.2	2,195.2	0.0
B	0.197	429	942	6.1	2,205.8	2,205.8	2,205.8	0.0
C	0.290	476	787	7.3	2,216.7	2,216.7	2,216.7	0.0
D	0.44	500	495	7.5	2,229.8	2,229.8	2,229.8	0.0
E	0.58	125	413	9.0	2,248.1	2,248.1	2,248.1	0.0
F	0.71	127	393	9.5	2,263.6	2,263.6	2,263.6	0.0
G	0.78	96	348	10.7	2,270.9	2,270.9	2,270.9	0.0
H	0.84	90	105	2.1	2,277.5	2,277.5	2,277.5	0.0
I	0.89	27	28	5.8	2,283.1	2,283.1	2,283.1	0.0
J	0.99	55	42	4.0	2,296.8	2,296.8	2,296.8	0.0

REVISED TO REFLECT LOMR DATED DEC 05 2002

[1]Miles above confluence with Galloway Wash

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ AND INCORPORATED AREAS

FLOODWAY DATA

UNNAMED TRIBUTARY TO GALLOWAY WASH

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Andora Hills Wash								
A	0.129	53	279	11.5	2,010.0	2,010.0	2,010.0	0.0
B	0.236	54	204	9.4	2,022.9	2,022.9	2,022.9	0.0
C	0.317	136	356	8.7	2,035.3	2,035.3	2,035.3	0.0
D	0.447	236	323	9.6	2,050.2	2,050.2	2,050.2	0.0
E	0.592	341	440	7.1	2,067.6	2,067.6	2,067.6	0.0
F	0.729	105	423	8.8	2,079.9	2,079.9	2,079.9	0.0
G	0.789	147	391	7.4	2,087.2	2,087.2	2,087.2	0.0
H	0.902	52	426	6.8	2,102.4	2,102.4	2,102.7	0.3
I	0.954	63	263	10.5	2,108.3	2,108.3	2,108.3	0.0
J	1.085	126	338	8.0	2,123.3	2,123.3	2,123.3	0.0
K	1.133	34	239	11.3	2,127.8	2,127.8	2,128.3	0.5
L	1.222	44	292	9.3	2,134.0	2,134.0	2,135.0	1.0
M	1.353	189	692	3.9	2,147.5	2,147.5	2,147.5	0.0
N	1.438	32	208	13.0	2,154.9	2,154.9	2,155.0	0.1
O	1.555	59	267	9.0	2,167.5	2,167.5	2,167.9	0.4
P	1.668	86	419	6.3	2,177.8	2,177.8	2,177.9	0.1
Q	1.831	116	432	5.8	2,190.4	2,190.4	2,190.4	0.0
R	1.888	99	354	7.1	2,193.3	2,193.3	2,193.5	0.2
S	1.976	36	231	10.8	2,200.5	2,200.5	2,200.9	0.4
T	2.056	49	248	9.1	2,209.7	2,209.7	2,209.7	0.0
U	2.219	71	380	6.0	2,241.1	2,241.1	2,241.5	0.4
V	2.364	95	371	7.1	2,255.4	2,255.4	2,255.5	0.1
W	2.473	66	347	6.5	2,263.2	2,263.2	2,264.2	1.0
X	2.576	51	279	8.1	2,272.8	2,272.8	2,273.8	1.0
Y	2.679	46	228	9.1	2,282.7	2,282.7	2,283.2	0.5
Z	2.754	70	396	5.2	2,288.4	2,288.4	2,289.4	1.0
AA	2.944	59	350	5.9	2,301.4	2,301.4	2,302.4	1.0
AB	3.023	79	338	6.1	2,306.4	2,306.4	2,307.3	0.9

1Miles above confluence with Cave Creek Wash

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ AND INCORPORATED AREAS

REVISED TO REFLECT LOMR DATED DEC 05 2002

FLOODWAY DATA

ANDORA HILLS WASH

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY (FEET NGVD)	INCREASE
Galloway Wash (Cont'd)		REVISED DATA						
S	10,607	514	1,026	5.9	2,252.9	2,252.9	2,252.9	0.0
T	11,442	179	1,047	9.3	2,272.3	2,272.3	2,272.3	0.0
U	11,855	148	437	10.1	2,280.6	2,280.6	2,280.6	0.0
V	12,403	95	327	10.5	2,292.4	2,292.4	2,292.4	0.0
W	13,002	129	427	9.5	2,306.5	2,306.5	2,306.5	0.0
X	14,805	98	315	10.2	2,345.3	2,345.3	2,345.3	0.0
Y	15,272	265	509	6.8	2,359.4	2,359.4	2,359.4	0.0
Z	15,607	144	366	9.4	2,366.3	2,366.3	2,366.3	0.0
AA	16,002	90	323	10.7	2,375.2	2,375.2	2,375.2	0.0
AB	16,402	160	389	8.8	2,382.4	2,382.4	2,382.4	0.0
AC	16,802	92	321	10.7	2,391.5	2,391.5	2,391.5	0.0
AD	17,000	96	324	10.6	2,394.7	2,394.7	2,394.7	0.0
Galloway Wash (Middle Branch)								
AE	17,422	44	159	10.8	2,407.0	2,407.0	2,407.9	0.9
AF	17,912	38	151	11.4	2,419.3	2,419.3	2,420.1	0.8
AG	18,422	45	160	10.7	2,430.2	2,430.2	2,431.2	1.0
AH	18,912	35	139	11.4	2,442.4	2,442.4	2,443.0	0.6
AI	19,382	33	136	11.6	2,453.2	2,453.2	2,454.1	0.9
AJ	19,655	42	147	10.7	2,459.8	2,459.8	2,460.8	1.0
AK	19,890	72	179	8.8	2,465.6	2,465.6	2,466.5	0.9
AL	20,370	40	145	10.8	2,476.7	2,476.7	2,477.6	0.9
AM	20,830	80	193	8.2	2,487.6	2,487.6	2,488.3	0.7
AN	21,190	190	246	6.4	2,497.5	2,497.5	2,498.1	0.6
AO	21,395	40	145	10.8	2,505.3	2,505.3	2,505.8	0.5

1Feet above confluence with Cave Creek Wash

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ AND INCORPORATED AREAS

REVISED TO REFLECT LOMR DATED DEC 05 2002

FLOODWAY DATA

GALLOWAY WASH – GALLOWAY WASH MIDDLE BRANCH

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Andora Hills Wash								
A	0.129	53	279	11.5	2,010.0	2,010.0	2,010.0	0.0
B	0.236	54	204	9.4	2,022.9	2,022.9	2,022.9	0.0
C	0.317	136	356	8.7	2,035.3	2,035.3	2,035.3	0.0
D	0.447	236	323	9.6	2,050.2	2,050.2	2,050.2	0.0
E	0.592	341	440	7.1	2,067.6	2,067.6	2,067.6	0.0
F	0.729	105	423	8.8	2,079.9	2,079.9	2,079.9	0.0
G	0.789	147	391	7.4	2,087.2	2,087.2	2,087.2	0.0
H	0.902	52	426	6.8	2,102.4	2,102.4	2,102.7	0.3
I	0.954	63	263	10.5	2,108.3	2,108.3	2,108.3	0.0
J	1.085	126	338	8.0	2,123.3	2,123.3	2,123.3	0.0
K	1.133	34	239	11.3	2,127.8	2,127.8	2,128.3	0.5
L	1.222	44	292	9.3	2,134.0	2,134.0	2,135.0	1.0
M	1.353	189	692	3.9	2,147.5	2,147.5	2,147.5	0.0
N	1.438	32	208	13.0	2,154.9	2,154.9	2,155.0	0.1
O	1.555	59	267	9.0	2,167.5	2,167.5	2,167.9	0.4
P	1.668	86	419	6.3	2,177.8	2,177.8	2,177.9	0.1
Q	1.831	116	432	5.8	2,190.4	2,190.4	2,190.4	0.0
R	1.888	99	354	7.1	2,193.3	2,193.3	2,193.5	0.2
S	1.976	36	231	10.8	2,200.5	2,200.5	2,200.9	0.4
T	2.056	49	248	9.1	2,209.7	2,209.7	2,209.7	0.0
U	2.219	71	380	6.0	2,241.1	2,241.1	2,241.5	0.4
V	2.364	95	371	7.1	2,255.4	2,255.4	2,255.5	0.1
W	2.473	66	347	6.5	2,263.2	2,263.2	2,264.2	1.0
X	2.576	51	279	8.1	2,272.8	2,272.8	2,273.8	1.0
Y	2.679	46	228	9.1	2,282.7	2,282.7	2,283.2	0.5
Z	2.754	70	396	5.2	2,288.4	2,288.4	2,289.4	1.0
AA	2.944	59	350	5.9	2,301.4	2,301.4	2,302.4	1.0
AB	3.023	79	338	6.1	2,306.4	2,306.4	2,307.3	0.9

1Miles above confluence with Cave Creek Wash

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ AND INCORPORATED AREAS

REVISED TO REFLECT LOMR DATED DEC 05 2002

FLOODWAY DATA

ANDORA HILLS WASH

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Galloway Wash								
A	185	260	1,428	9.5	2,032.5	2,032.5	2,032.5	0.0
B	586	171	1,285	10.5	2,039.8	2,039.8	2,039.8	0.0
C	1,185	229	1,100	12.3	2,053.6	2,053.6	2,053.6	0.0
D	1,785	164	1,056	12.8	2,064.8	2,064.8	2,064.8	0.0
E	2,585	333	1,457	9.3	2,079.6	2,079.6	2,079.6	0.0
F	3,758	253	1,310	10.3	2,103.6	2,103.6	2,103.6	0.0
G	4,965	101	531	12.6	2,126.4	2,126.4	2,126.4	0.0
H	5,808	709	1,865	5.8	2,146.0	2,146.0	2,146.0	0.0
I	6,008	570	1,491	7.2	2,150.4	2,150.4	2,150.4	0.0
J	6,807	242	1,022	10.6	2,166.6	2,166.6	2,166.6	0.0
K	7,405	303	1,148	9.4	2,182.4	2,182.4	2,182.4	0.0
L	8,207	126	526	11.5	2,200.5	2,200.5	2,200.5	0.0
M	8,807	104	489	12.4	2,212.3	2,212.3	2,212.3	0.0
N	9,006	136	577	10.9	2,216.4	2,216.4	2,216.4	0.0
O	9,207	95	477	12.7	2,221.6	2,221.6	2,221.6	0.0
P	9,608	84	452	13.4	2,231.8	2,231.8	2,231.8	0.0
Q	9,774	79	444	13.6	2,236.8	2,236.8	2,236.8	0.0
R	10,207	368	895	7.1	2,244.5	2,244.5	2,244.5	0.0

1Feet above confluence with Cave Creek Wash

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ AND INCORPORATED AREAS

REVISED TO REFLECT LOMR DATED DEC 05 2002

FLOODWAY DATA

GALLOWAY WASH

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY (FEET NGVD)	INCREASE
Galloway Wash (Cont'd)		REVISED DATA						
S	10,607	514	1,026	5.9	2,252.9	2,252.9	2,252.9	0.0
T	11,442	179	1,047	9.3	2,272.3	2,272.3	2,272.3	0.0
U	11,855	148	437	10.1	2,280.6	2,280.6	2,280.6	0.0
V	12,403	95	327	10.5	2,292.4	2,292.4	2,292.4	0.0
W	13,002	129	427	9.5	2,306.5	2,306.5	2,306.5	0.0
X	14,805	98	315	10.2	2,345.3	2,345.3	2,345.3	0.0
Y	15,272	265	509	6.8	2,359.4	2,359.4	2,359.4	0.0
Z	15,607	144	366	9.4	2,366.3	2,366.3	2,366.3	0.0
AA	16,002	90	323	10.7	2,375.2	2,375.2	2,375.2	0.0
AB	16,402	160	389	8.8	2,382.4	2,382.4	2,382.4	0.0
AC	16,802	92	321	10.7	2,391.5	2,391.5	2,391.5	0.0
AD	17,000	96	324	10.6	2,394.7	2,394.7	2,394.7	0.0
Galloway Wash (Middle Branch)								
AE	17,422	44	159	10.8	2,407.0	2,407.0	2,407.9	0.9
AF	17,912	38	151	11.4	2,419.3	2,419.3	2,420.1	0.8
AG	18,422	45	160	10.7	2,430.2	2,430.2	2,431.2	1.0
AH	18,912	35	139	11.4	2,442.4	2,442.4	2,443.0	0.6
AI	19,382	33	136	11.6	2,453.2	2,453.2	2,454.1	0.9
AJ	19,655	42	147	10.7	2,459.8	2,459.8	2,460.8	1.0
AK	19,890	72	179	8.8	2,465.6	2,465.6	2,466.5	0.9
AL	20,370	40	145	10.8	2,476.7	2,476.7	2,477.6	0.9
AM	20,830	80	193	8.2	2,487.6	2,487.6	2,488.3	0.7
AN	21,190	190	246	6.4	2,497.5	2,497.5	2,498.1	0.6
AO	21,395	40	145	10.8	2,505.3	2,505.3	2,505.8	0.5

1Feet above confluence with Cave Creek Wash

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ AND INCORPORATED AREAS

REVISED TO REFLECT LOMR DATED DEC 05 2002

FLOODWAY DATA

GALLOWAY WASH – GALLOWAY WASH MIDDLE BRANCH

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY (FEET NGVD)	INCREASE
Galloway Wash (South Branch) (Cont'd)								
M	4,221	70	175	9.1	2,501.9	2,501.9	2,501.9	0.0
N	4,422	54	161	9.9	2,507.8	2,507.8	2,507.8	0.0
O	4,622	80	183	8.7	2,512.2	2,512.2	2,512.2	0.0
P	5,221	67	173	9.2	2,527.5	2,527.5	2,527.5	0.0
Q	5,621	186	242	6.6	2,536.0	2,536.0	2,536.1	0.1
R	6,221	56	152	9.5	2,550.9	2,550.9	2,550.9	0.0
S	6,621	66	160	9.0	2,559.8	2,559.8	2,559.8	0.0
T	7,022	57	129	8.6	2,569.0	2,569.0	2,569.0	0.0
U	7,623	224	211	5.3	2,585.2	2,585.2	2,585.2	0.0
V	8,361	300	261	4.2	2,604.0	2,604.0	2,604.0	0.0
W	8,551	250	229	4.9	2,608.0	2,608.0	2,608.0	0.0

1Feet above confluence with Galloway Wash

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ AND INCORPORATED AREAS

REVISED TO REFLECT LOMR DATED DEC 05 2002

FLOODWAY DATA

GALLOWAY WASH (SOUTH BRANCH)

REVISED TO REFLECT LOMR DATED DEC 05 2002

Table 3. Summary of Discharges (Cont'd)

Flooding Source and Location	Drainage Area (Square Miles)	Peak Discharges (cfs) 10-Year	50-Year	100-Year	500-Year
Trilby Wash-CAP to McMicken Dam					
At McMicken Dam	113.00	4,773	8,999	11,688	--[1]
At 195th Avenue (Extended)	112.40[2]	4,730	8,920	11,625	--[1]
650 feet upstream of 203rd Avenue (Extended)	111.77[2]	4,690	8,845	11,560	--[1]
500 feet downstream of Deer Valley Road (Extended)	103.94[2]	4,646	8,769	11,499	--[1]
150 feet downstream of Deer Valley Road (Extended)	67.16	3,065	5,750	7,430	--[1]
200 feet upstream of Deer Valley Road (Extended)	27.84	1,488	2,728	3,362	--[1]
1,000 feet upstream of Deer Valley Road (Extended)	--[1]	1,525[3]	2,775[3]	3,420[3]	--[1]
1,050 feet downstream of Pinnacle Peak Road (Extended)	--[1]	1,560[3]	2,825[3]	3,480[3]	--[1]
400 feet upstream of Pinnacle Peak Road (Extended)	--[1]	1,595[3]	2,875[3]	3,540[3]	--[1]
1,350 feet downstream of Happy Valley Road (Extended)	--[1]	1,665[3]	2,975[3]	3,660[3]	--[1]
200 feet downstream of Happy Valley Road (Extended)	--[1]	1,700[3]	3,025[3]	3,720[3]	--[1]
1,350 feet downstream of CAP Canal	--[1]	1,735[3]	3,075[3]	3,780[3]	--[1]
At CAP Canal	--[1]	1,775[3]	3,125[3]	3,845[3]	--[1]
Galloway Wash (Middle Branch)					
Upstream of confluence with South Branch	3.3	N/A	N/A	1,719	N/A
At Pima Road	2.8	N/A	N/A	1,574	N/A
Galloway Wash (South Branch)					
Upstream of confluence with Middle Branch	1.8	N/A	N/A	1,750	N/A
At 800 feet downstream of Pima Road	1.4	N/A	N/A	1,446	N/A
At Pima Road	1.0	N/A	N/A	1,155	N/A

REVISED DATA

[1]Not Computed
[2]Computed by Specific Discharge Transfer Equation
[3]Decrease Due to Storage Behind CAP Canal and Storage in Overbanks

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Galloway Wash (Middle Branch) (Cont'd)								
AP	21,882[1]	80	182	8.7	2,517.4	2,517.4	2,517.4	0.0
AQ	22,377[1]	50	159	9.9	2,529.9	2,529.9	2,530.3	0.4
AR	22,887[1]	250	227	6.9	2,539.8	2,539.8	2,540.2	0.4
AS	23,367[1]	103	204	7.7	2,553.6	2,553.6	2,554.5	0.9
AT	23,912[1]	105	210	7.5	2,564.9	2,564.9	2,565.9	1.0
AU	24,427[1]	91	197	8.0	2,576.9	2,576.9	2,577.6	0.7
AV	24,914[1]	145	232	6.8	2,589.0	2,589.0	2,589.7	0.7
AW	25,194[1]	190	217	7.3	2,595.8	2,595.8	2,596.8	1.0
AX	25,434[1]	193	214	7.4	2,605.1	2,605.1	2,606.0	0.9
AY	25,934[1]	158	203	7.8	2,619.3	2,619.3	2,619.4	0.1
Galloway Wash (South Branch)								
A	398[2]	61	181	10.2	2,404.5	2,404.5	2,404.5	0.0
B	821[2]	191	442	4.2	2,418.6	2,418.6	2,418.6	0.0
C	1,222[2]	92	212	8.7	2,426.2	2,426.2	2,426.2	0.0
D	1,422[2]	123	240	7.7	2,430.6	2,430.6	2,430.6	0.0
E	1,539[2]	107	375	5.1	2,434.3	2,434.3	2,434.9	0.6
F	1,589[2]	143	380	6.8	2,434.9	2,434.9	2,434.9	0.0
G	1,664[2]	106	228	7.7	2,436.6	2,436.6	2,436.6	0.0
H	2,022[2]	85	201	8.7	2,445.7	2,445.7	2,445.9	0.2
I	3,022[2]	105	221	7.9	2,470.8	2,470.8	2,470.9	0.1
J	3,221[2]	96	209	8.4	2,475.9	2,475.9	2,475.9	0.0
K	3,422[2]	74	192	9.1	2,480.7	2,480.7	2,480.8	0.1
L	3,621[2]	70	173	9.2	2,486.4	2,486.4	2,486.4	0.0

1Feet above confluence with Cave Creek Wash

2Feet above confluence with Galloway Wash

REVISED DATA

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ AND INCORPORATED AREAS

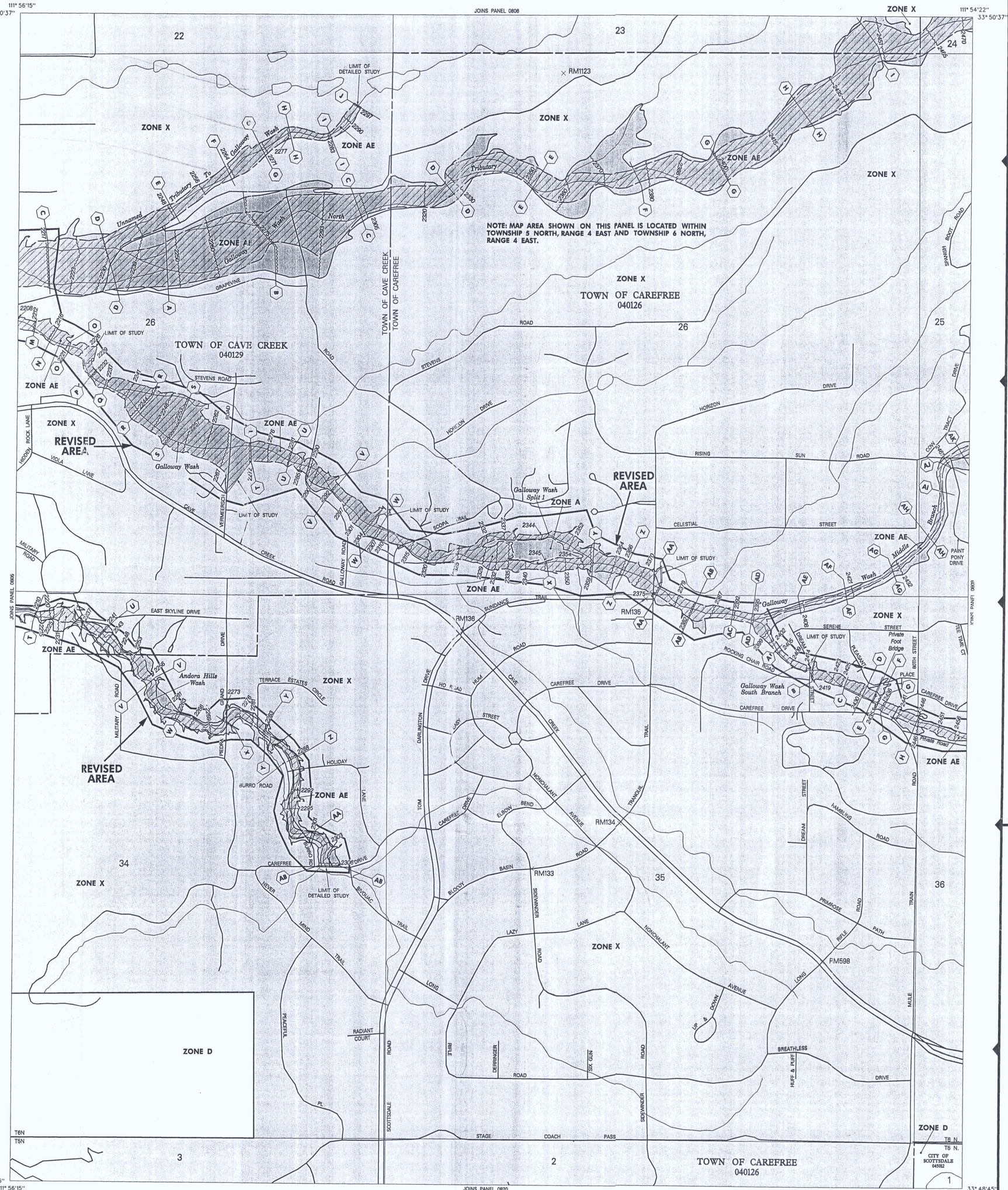
REVISED TO REFLECT LOMR DATED DEC 05 2002

FLOODWAY DATA

GALLOWAY WASH MIDDLE BRANCH – SOUTH BRANCH

ELEVATION REFERENCE MARKS

REFERENCE MARK	ELEVATION (FEET NGVD)	DESCRIPTION OF LOCATION
RM133	2373.54	Top of pavement at centerline intersection of Sidewinder and Bloody Basin Roads.
RM134	2389.00	Top of pavement at centerline intersection of Cave Creek and Bloody Basin Roads.
RM135	2375.04	Top square of concrete base at northwest corner of intersection of Sundance and Tranquil Trails.
RM136	2344.24	Rim of handhole at centerline intersection of Cave Creek and Scottsdale Roads.
RM598	2445.00	Intersection of Cave Creek Road and Long Rifle Road South, copper nail and washer.
RM1123	2406.61	Brass cap in headwall N85W, 1708 feet to the approximate northeast corner of section 27, T6N, R4E.



LEGEND

SPECIAL FLOOD HAZARD AREAS INUNDATED BY 100-YEAR FLOOD

- **ZONE A** — No base flood elevations determined.
- **ZONE AE** — Base flood elevations determined.
- **ZONE AH** — Flood depths of 1 to 3 feet (usually areas of ponding); base flood elevations determined.
- **ZONE AO** — Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
- **ZONE A99** — To be protected from 100-year flood by Federal flood protection system under construction; no base flood elevations determined.
- **ZONE V** — Coastal flood with velocity hazard (wave action); no base flood elevations determined.
- **ZONE VE** — Coastal flood with velocity hazard (wave action); base flood elevations determined.

FLOODWAY AREAS IN ZONE AE

OTHER FLOOD AREAS

- **ZONE X** — Areas of 500-year flood; areas of 100-year flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 100-year flood.

OTHER AREAS

- **ZONE X** — Areas determined to be outside 500-year floodplain.
- **ZONE D** — Areas in which flood hazards are undetermined.

UNDEVELOPED COASTAL BARRIERS

Identified 1983 | Identified 1990 | Otherwise Protected Areas

Coastal barrier areas are normally located within or adjacent to Special Flood Hazard Areas.

- Floodplain Boundary
- Floodway Boundary
- Zone D Boundary
- Boundary Dividing Special Flood Hazard Zones, and Boundary Dividing Areas of Different Coastal Base Flood Elevations Within Special Flood Hazard Zones.
- 513 — Base Flood Elevation Line; Elevation in Feet. See Map Index for Elevation Datum.
- D — D — Cross Section Line
- (EL 987) — Base Flood Elevation in Feet Where Uniform Within Zone. See Map Index for Elevation Datum.
- RM7 — Elevation Reference Mark
- M2 — River Mile
- 97° 07'30", 32° 22'30" — Horizontal Coordinates Based on North American Datum of 1927 (NAD 27) Projection.

NOTES

This map is for use in administering the National Flood Insurance Program; it does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size, or all planimetric features outside Special Flood Hazard Areas. The community map repository should be consulted for more detailed data on BFE's, and for any information on floodway delineations, prior to use of this map for property purchase or construction purposes.

Areas of Special Flood Hazard (100-year flood) include Zones A, AE, A1-A30, AH, AO, A99, V, VE and V1-V30.

Certain areas not in Special Flood Hazard Areas may be protected by flood control structures.

Boundaries of the floodways were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the Federal Emergency Management Agency.

Floodway widths in some areas may be too narrow to show to scale. Refer to Floodway Data Table where floodway width is shown at 120 inch.

Corporate limits shown are current as of the date of this map. The user should contact appropriate community officials to determine if corporate limits have changed subsequent to the issuance of this map.

This map may incorporate approximate boundaries of Coastal Barrier Resource System Units and /or Otherwise Protected Areas established under the Coastal Barrier Improvement Act of 1990 (PL 101-591).

For community map revision history prior to countywide mapping, see Section 6.0 of the Flood Insurance Study Report.

For adjoining map panels and base map source see separately printed Map Index.

MAP REPOSITORY
Refer to Repository Listing on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP:
APRIL 15, 1988

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL:
SEPTEMBER 29, 1989, SEPTEMBER 4, 1991, DECEMBER 3, 1993

Map revised July 19, 2001 to update corporate limits, to change base flood elevations, to add base flood elevations, to add Special Flood Hazard Areas, to change Special Flood Hazard Areas, to change zone designations, to update map format, to add roads and road names, and to incorporate previously issued Letters of Map Revision.

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
500 0 500

LEGEND

To obtain more detailed information in areas where Base Flood Elevations (BFE's) and /or floodways have been determined, users are encouraged to consult the Flood Profiles and Floodway Data tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFE's shown on the FIRM represent rounded whole-foot elevations and therefore may not exactly reflect the flood elevation data presented in the FIS. BFE's shown on the FIRM are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS should be utilized in conjunction with the FIRM for purposes of construction and /or floodplain management.

ERM elevations listed on this map were obtained and/or developed to establish vertical control for determination of flood elevations and floodplain boundaries portrayed on this map. Users should be aware that these ERM elevations may have changed since the publication of this map. To obtain up-to-date elevaton information on National Geodetic Survey (NGS) ERM's shown on this map, please contact the Information Services Branch of the NGS at (301) 713-3242, or visit their website at www.ngs.noaa.gov. Map users should seek verification of non-NGS ERM monument elevations when using these elevations for construction or floodplain management purposes.

Coastal BFE's shown on this map may apply only landward of 0.0' NGVD. Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this community. Elevations shown in the Summary of Stillwater Elevations table should be used for construction, and /or floodplain management purposes when they are higher than the elevations shown on this FIRM.

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

MARICOPA COUNTY, ARIZONA AND INCORPORATED AREAS

PANEL 808 OF 4350
(SEE MAP INDEX FOR PANELS NOT PRINTED)

CONTAINS: COMMUNITY	NUMBER	PANEL	SUFFIX
CAREFREE, TOWN OF	040128	0808	H
CAVE CREEK, TOWN OF	040129	0808	H
SCOTTSDALE, CITY OF	045012	0808	H

REVISED TO REFLECT LOMR DATED DEC 05 2002

MAP NUMBER
04013C0808 H

MAP REVISED:
JULY 19, 2001

Federal Emergency Management Agency

APPENDIX C: SURVEY FIELD NOTES

TABLE OF CONTENTS
APPENDIX C
VOLUME 1 OF 2 OF THE TDN

C.1 Survey field notes for aerial mapping control

C.2 Survey field notes for hydrologic modeling

C.3 Survey Field Notes for Hydraulic Modeling

C.1 Survey field notes for aerial mapping control

JE Fuller/ Hydrology & Geomorphology, Inc.

Jonathan Fuller, P.E., P.H.
Brian Iserman, P.E.
John Wallace, P.E.
Ted Lehman, M.A., E.I.T.

5235 So. Kyrene Rd., Suite 205
Tempe, Arizona 85283
480-752-2124 (voice)
480-839-2193 (fax)
www.jefuller.com

January 20, 2000

Flood Control District of Maricopa County
ATT: Mr. David Boggs, P.E.
2801 W. Durango
Phoenix, AZ 85009

RE: Andora Hills and Galloway Washes Floodplain Delineation Study; FCD 99-14, Topographic Mapping Quality Control and Results

Dear David:

JE Fuller/Hydrology & Geomorphology, Inc. (JEF) has completed quality control analyses for the new topographic mapping produced for the referenced project (see the attached figure). The survey control was provided by A Team Professional Associates, and the photogrametry was provided by M& B Aerial Mapping LLC. The new topographic mapping extends from just upstream of Pima Road on the east, to the edge of the existing mapping done under FCD 95-28 (approximately 2,300 feet west of the Spur Cross Road alignment) on the west.

Ground Control Results

Attached is a copy of the A Team ground control report with a cover letter dated December 7, 1999, which explains methodology and results (see attached). It should be noted that A Team discovered that there are two sets/datums of vertical reference markers that are currently listed on the FEMA maps; those located in and along the Cave Creek floodplain area, and those located to the east of Cave Creek in the current project area. The datum set in and along the Cave Creek floodplain area was calculated by A Team to be approximately 0.62 feet lower than the datum set used for this project. A Team was not able to determine the reason for the discrepancy, but notes that the new mapping produced for this project is based only on reference marks located east of Cave Creek.

Matching to Existing Mapping

According to M&B Aerial, the edge match to the existing topographic mapping (FCD 95-28) was very good.

Check Cross Section Results

JEF defined the location of 8 check cross-sections for A Team to survey using conventional field survey methodology. These 8 quality control cross sections, cross the floodplains of Andora Hills and Galloway Washes; together these cross sections have a total length of approximately 6,900 feet. The attached map shows the location of these 8 quality control check cross sections.

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

FLOODPLAIN DELINEATION STUDY OF ANDORA HILLS & GALLOWAY WASHES FCD 99-14

TOPOGRAPHIC MAPPING QUALITY CONTROL CHECK CROSS-SECTION LOCATION MAP

JANUARY, 2000

LEGEND

7 Check Cross Section Location

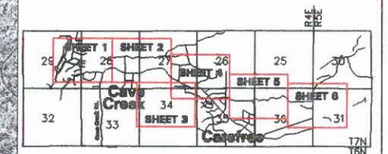
RM 130 Reference Mark

MK-4 2797.37 Survey Control Point

NOTES

1. USGS DIGITAL RASTER GRAPHICS PROJECTED TO STATEPLANE NORTH AMERICAN DATUM OF 1983 AND TILED BY FCDMC.
2. ALL ELEVATIONS ARE BASED ON NATIONAL GEODETIC VERTICAL DATUM OF 1929

INDEX MAP



Scale in Feet

0 900 1800

JE FULLER HYDROLOGY & GEOMORPHOLOGY, INC

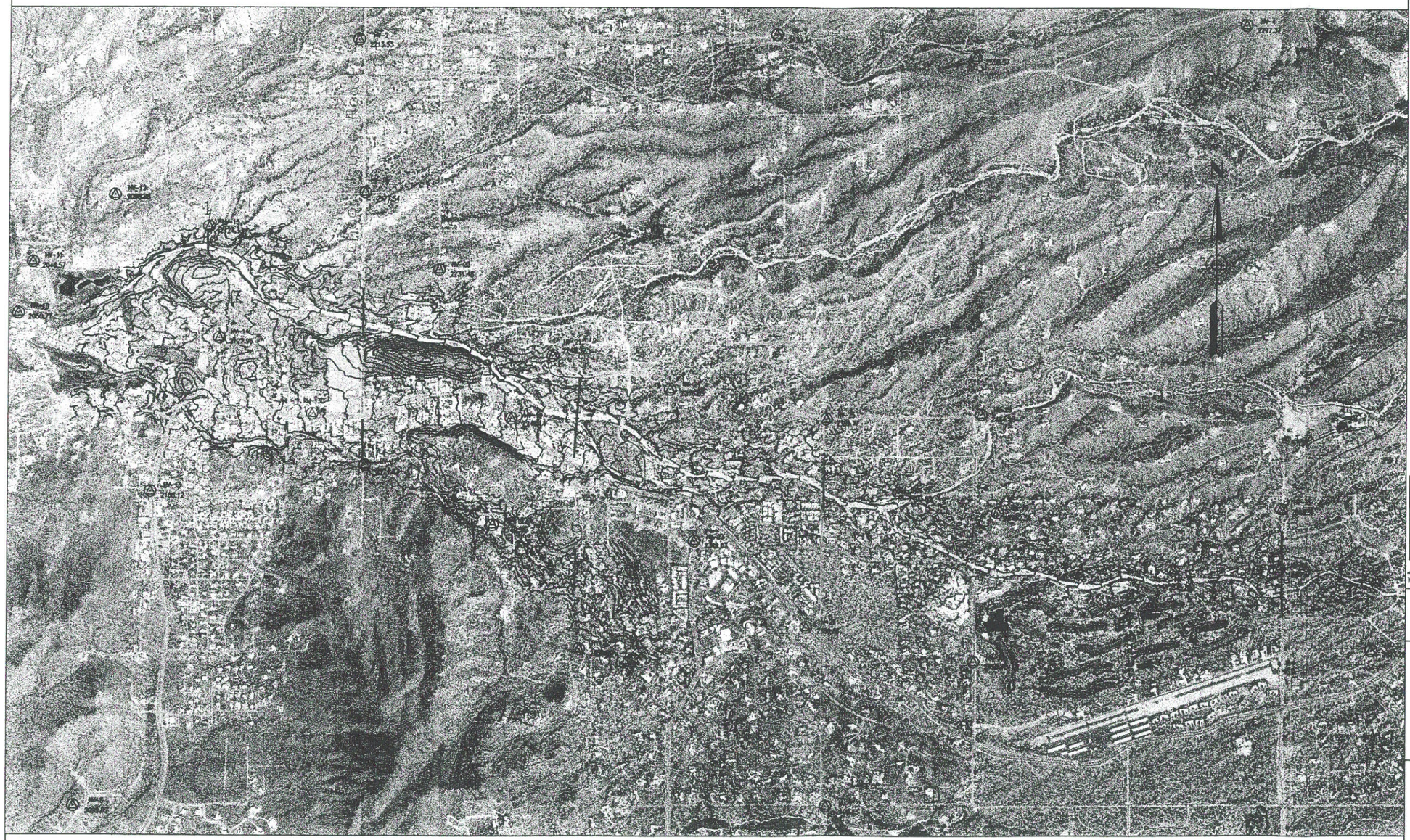
	BY	DATE
DESIGN	BRI	1-00
DESIGN CHK.	JEF	1-00
PLANS	TWL	1-00
PLANS CHK.	BRI	1-00
SUBMITTED BY:		DATE:

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

RECOMMENDED BY: _____ DATE

APPROVED BY: _____ DATE

CHIEF ENGINEER AND GENERAL MANAGER



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

FLOODPLAIN DELINEATION STUDY OF ANDORA HILLS & GALLOWAY WASHES FCD 99-14

TOPOGRAPHIC MAPPING QUALITY CONTROL CHECK CROSS-SECTION LOCATION MAP

JANUARY, 2000

LEGEND

7 Check Cross Section Location

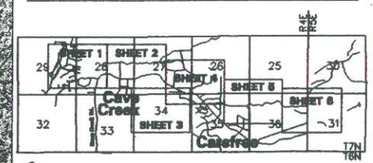
RM 130 Reference Mark

HH-4 2797.37 Survey Control Point

NOTES

1. USGS DIGITAL RASTER GRAPHICS PROJECTED TO STATEPLANE NORTH AMERICAN DATUM OF 1983 AND TILED BY FCDMC.
2. ALL ELEVATIONS ARE BASED ON NATIONAL GEODETIC VERTICAL DATUM OF 1929

INDEX MAP



Scale in Feet

0 900 1800

JE FULLER HYDROLOGY & GEOMORPHOLOGY, INC

DESIGN	BY: BRI	DATE: 1-00
DESIGN CHK.	JEF	1-00
PLANS	TWL	1-00
PLANS CHK.	BRI	1-00

SUBMITTED BY: DATE:

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

RECOMMENDED BY: DATE

APPROVED BY: DATE

CHIEF ENGINEER AND GENERAL MANAGER

A Team provided the coordinates and elevations for 237 points along the 8 quality-control cross sections to JEF using conventional digital-level survey methods.

Using RiverCAD 4.0, JEF determined the elevation of each surveyed point separately from the digital terrain model (DTM) provided by M&B. The root-mean-square error (RMSE) was then calculated between the surveyed elevations and the DTM elevations using FEMA 37 guidelines. The results of the RMSE calculations for each cross section are presented in Attachment 1. The RMSE varied between 0.22 foot (cross section 4) and 0.48 foot (cross section 7) without using any horizontal adjustment allowed under FEMA 37 guidelines.

Horizontal Accuracy

As stated in the attached letter from A Team Professional Associates, "The network solutions produced in the least squares adjustment had ratios better than 1 part in 100,000." This is equivalent to first order distance accuracy standards. JEF performed an additional test to compare the horizontal accuracy of the digital orthophotography to the panel network (see Figure 2). The RMSEs from this analysis are 1.57 feet northing, and 3.27 feet easting.

Reference Marks

As stated in the A Team letter, many of the FEMA referenced benchmarks noted on the current FIRM panels are very subjective. However, other benchmarks were found that are not referenced on the FIRM panels but are shown on work maps for the Cave Creek/Carefree Floodplain Delineation Study, FCD 88-53 (CH2M-Hill, 1990). A Team is currently evaluating the need, if any, for placement of additional reference marks in the current project area.

Final Results

The map accuracy verification methods described above demonstrate that the mapping for this project meets the Class 1 mapping standards set forth in FEMA 37 (Guidelines and Specifications for Study Contractors, FEMA 1995), and as summarized in the Flood Control District CADD Data Delivery Specifications, Revision 1.0 (FCDMC 2000). 100% of the test profile data deviate from the terrain model less than 1.0 foot (one-half contour), and 100% of the well-defined planimetric features deviate from true position less than 5 feet ($^{1}/_{40}{}^{th}$ of an inch of true position at Project Map Scale).

Please note that we found some last-minute grammatical errors in the attached A Team letter:

- The date is wrong
- The last line of the first page incorrectly referenced "New River wash" instead of Cave Creek
- The last sentence in the letter should read "Published **NGS** benchmarks ….".

A Team will be issuing a letter with the revisions by next week. However, I thought that in order to keep the project on schedule, it is important for you to receive the information contained in this letter right away. As soon as I receive the revised A Team letter, I will send you a copy.

Should you have questions regarding the map accuracy verification methodology or results presented in this letter, please do not hesitate to contact me.

Sincerely,
JE Fuller Hydrology & Geomorphology

Brian R. Iserman, P.E.
Hydrologist

Topographic Mapping Quality Control Results
Root Mean Square Error (RMSE) Calculations
Andora Hills & Galloway Washes, FCD
Figure 1

Quality Control Check Cross Section #1

Survey				DTM	Elevation	Squared
Point #	Northing	Easting	Elevation	Elevation	Discrepancy	Discrepancy
2089	1032962.64	689334.13	2110.54	2110.54	0.00	0.00
2088	1033022.48	689313.10	2106.86	2105.92	-0.94	0.88
2087	1033048.08	689274.22	2105.09	2104.31	-0.78	0.61
2086	1033088.19	689249.94	2102.07	2101.90	-0.18	0.03
2085	1033133.73	689249.79	2099.10	2098.92	-0.18	0.03
2084	1033181.68	689247.05	2098.00	2097.86	-0.15	0.02
2083	1033230.87	689245.01	2098.89	2099.02	0.13	0.02
2082	1033278.20	689241.61	2102.14	2102.46	0.32	0.10
2081	1033325.30	689240.07	2107.02	2106.93	-0.10	0.01
2080	1033370.25	689240.92	2111.50	2111.10	-0.40	0.16
2079	1033419.89	689243.32	2116.21	2115.93	-0.27	0.07
					Average of the Squared Discrepancies	**0.18**
					RMSE	**0.42**

Quality Control Check Cross Section #2

Survey				DTM	Elevation	Squared
Point #	Northing	Easting	Elevation	Elevation	Discrepancy	Discrepancy
2101	1030504.45	688330.16	2094.95	2095.10	0.15	0.02
2100	1030557.55	688338.52	2092.76	2092.66	-0.10	0.01
2099	1030606.92	688346.62	2089.68	2089.78	0.11	0.01
2098	1030656.19	688355.75	2086.91	2087.27	0.35	0.12
2097	1030705.16	688365.40	2085.39	2086.03	0.64	0.41
2096	1030752.78	688380.06	2085.50	2085.83	0.34	0.11
					Average of the Squared Discrepancies	**0.12**
					RMSE	**0.34**

Quality Control Check Cross Section #3

Survey				DTM	Elevation	Squared
Point #	Northing	Easting	Elevation	Elevation	Discrepancy	Discrepancy
2078	1031631.51	691920.86	2190.14	2190.18	0.10	0.01
2077	1031681.07	691921.19	2183.62	2183.62	0.06	0.00
2076	1031731.21	691921.33	2178.06	2178.22	0.22	0.05
2075	1031781.64	691920.58	2172.99	2172.91	-0.02	0.00
2074	1031831.52	691921.40	2169.39	2169.30	-0.03	0.00
2073	1031881.41	691920.91	2168.99	2169.08	0.15	0.02
2072	1031931.29	691921.16	2169.08	2169.10	0.07	0.01
2071	1031981.25	691920.80	2169.64	2169.54	-0.04	0.00
2070	1032031.59	691920.78	2170.61	2170.86	0.31	0.10
2069	1032081.61	691920.82	2172.84	2172.86	0.07	0.01
2068	1032131.47	691920.50	2176.31	2176.20	-0.06	0.00
2067	1032181.49	691920.63	2179.57	2179.09	-0.42	0.18
2066	1032231.50	691920.54	2181.35	2180.94	-0.36	0.13
2065	1032281.11	691920.55	2181.99	2181.67	-0.26	0.07
2064	1032330.72	691920.41	2181.91	2181.59	-0.27	0.07
2063	1032381.60	691920.19	2181.80	2181.31	-0.43	0.19
2062	1032430.79	691920.02	2181.18	2180.59	-0.53	0.28

Topographic Mapping Quality Control Results
Root Mean Square Error (RMSE) Calculations
Andora Hills & Galloway Washes, FCD
Figure 1

2061	1032480.35	691920.17	2180.21	2179.70	-0.46	0.21
					Average of the Squared Discrepancies	**0.07**
					RMSE	**0.27**

Quality Control Check Cross Section #4

Survey				DTM	Elevation	Squared
Point #	Northing	Easting	Elevation	Elevation	Discrepancy	Discrepancy
2043	1029424.71	691932.86	2175.07	2175.06	-0.02	0.00
2042	1029478.13	691924.98	2169.64	2169.67	0.03	0.00
2041	1029515.31	691923.26	2167.41	2167.49	0.09	0.01
2040	1029516.10	691923.33	2167.43	2167.50	0.07	0.01
2039	1029532.03	691924.09	2168.21	2168.30	0.09	0.01
2038	1029586.05	691925.62	2172.73	2172.66	-0.07	0.00
2037	1029640.77	691925.00	2174.50	2174.56	0.07	0.00
2036	1029697.22	691924.11	2175.21	2175.28	0.07	0.01
2035	1029753.37	691923.50	2175.98	2176.05	0.07	0.00
2034	1029807.91	691922.83	2175.90	2176.09	0.19	0.04
2033	1029863.45	691922.18	2174.82	2175.03	0.21	0.04
2032	1029916.75	691921.59	2174.46	2174.66	0.20	0.04
2031	1029970.07	691920.97	2175.93	2176.55	0.62	0.39
2030	1030022.75	691920.56	2179.45	2179.61	0.16	0.02
2027	1030027.47	691906.80	2179.41	2179.73	0.32	0.10
2029	1030076.80	691919.91	2182.98	2182.57	-0.42	0.17
2028	1030127.60	691923.56	2184.76	2184.77	0.01	0.00
2026	1030177.12	691921.63	2185.90	2185.92	0.02	0.00
2025	1030227.02	691919.96	2186.80	2187.08	0.27	0.07
					Average of the Squared Discrepancies	**0.05**
					RMSE	**0.22**

Quality Control Check Cross Section #5

Survey				DTM	Elevation	Squared
Point #	Northing	Easting	Elevation	Elevation	Discrepancy	Discrepancy
1172	1029570.17	695535.14	2275.77	2275.22	-0.55	0.30
1173	1029594.74	695536.17	2276.18	2275.97	-0.21	0.04
1174	1029619.63	695537.82	2276.24	2276.32	0.08	0.01
1175	1029644.62	695539.76	2276.20	2276.38	0.18	0.03
1176	1029669.46	695541.08	2276.24	2275.95	-0.29	0.09
1177	1029694.15	695542.70	2276.25	2276.24	0.00	0.00
1178	1029719.12	695544.67	2276.13	2276.00	-0.12	0.02
1179	1029743.75	695546.12	2275.86	2275.54	-0.32	0.10
1180	1029769.12	695547.46	2275.32	2275.08	-0.23	0.05
1181	1029793.87	695549.83	2274.77	2274.46	-0.31	0.10
1182	1029818.99	695550.83	2274.19	2273.99	-0.20	0.04
1183	1029843.48	695552.71	2273.57	2273.46	-0.10	0.01
1184	1029869.15	695554.35	2272.85	2272.63	-0.22	0.05
1185	1029893.94	695555.68	2272.08	2271.51	-0.56	0.31
1186	1029918.63	695557.74	2271.25	2270.65	-0.60	0.36
1187	1029943.56	695559.31	2270.52	2270.29	-0.23	0.05
1188	1029968.74	695560.48	2269.71	2269.49	-0.22	0.05

Topographic Mapping Quality Control Results
Root Mean Square Error (RMSE) Calculations
Andora Hills & Galloway Washes, FCD
Figure 1

1189	1029993.42	695562.34	2269.00	2268.81	-0.19	0.04
1190	1030018.50	695564.12	2268.28	2268.77	0.49	0.24
1191	1030043.25	695565.74	2267.69	2268.25	0.57	0.32
1192	1030068.33	695567.28	2266.91	2266.94	0.03	0.00
1193	1030093.42	695569.11	2266.22	2266.15	-0.07	0.01
1194	1030118.36	695570.39	2265.70	2265.68	-0.02	0.00
1195	1030143.26	695571.98	2265.24	2265.00	-0.24	0.06
1196	1030168.08	695573.65	2264.39	2264.05	-0.34	0.11
1197	1030193.26	695575.30	2263.88	2263.55	-0.33	0.11
1198	1030218.22	695576.84	2264.04	2263.50	-0.54	0.29
1199	1030242.93	695578.41	2264.07	2263.51	-0.55	0.31
1200	1030268.04	695580.11	2263.80	2263.40	-0.40	0.16
1201	1030292.78	695581.77	2263.62	2263.20	-0.42	0.18
1202	1030318.07	695583.33	2264.16	2263.79	-0.37	0.13
1203	1030342.82	695584.99	2264.81	2264.61	-0.20	0.04
1204	1030368.17	695586.86	2265.30	2264.89	-0.41	0.17
1205	1030392.62	695588.62	2265.69	2265.08	-0.61	0.37
1206	1030418.21	695590.16	2266.07	2265.93	-0.15	0.02
1207	1030442.51	695591.78	2267.00	2266.25	-0.75	0.57
1208	1030467.41	695593.13	2269.01	2268.72	-0.29	0.08
1209	1030492.39	695595.03	2271.77	2271.72	-0.05	0.00
1210	1030517.60	695596.51	2273.73	2273.30	-0.43	0.18
2020	1030540.20	695599.95	2273.96	2274.00	0.04	0.00
1211	1030542.50	695598.45	2273.81	2273.90	0.09	0.01
1212	1030567.20	695599.81	2272.09	2271.86	-0.23	0.05
2019	1030591.47	695602.79	2269.18	2269.39	0.21	0.04
1213	1030592.18	695601.22	2268.98	2269.08	0.10	0.01
1214	1030617.38	695603.18	2266.03	2266.05	0.02	0.00
2017	1030643.11	695605.92	2263.99	2263.90	-0.09	0.01
2018	1030643.13	695605.94	2263.98	2263.92	-0.07	0.00
1215	1030642.39	695604.57	2263.96	2263.93	-0.03	0.00
2016	1030696.98	695608.28	2261.72	2261.61	-0.11	0.01
2015	1030738.92	695610.15	2262.11	2261.93	-0.18	0.03
2014	1030788.52	695612.43	2266.13	2265.82	-0.31	0.10
2013	1030834.94	695615.47	2273.05	2272.77	-0.27	0.07
2012	1030881.69	695618.02	2279.28	2278.43	-0.85	0.71
2011	1030934.54	695621.49	2279.53	2279.36	-0.17	0.03
					Average of the Squared Discrepancies	**0.11**
					RMSE	**0.34**

Quality Control Check Cross Section #6

Survey				DTM	Elevation	Squared
Point #	Northing	Easting	Elevation	Elevation	Discrepancy	Discrepancy
1130	1027281.65	695552.99	2292.46	2291.92	-0.54	0.29
1166	1027306.36	695553.56	2291.09	2291.30	0.21	0.04
1165	1027331.25	695554.39	2290.30	2290.19	-0.11	0.01
1164	1027356.73	695555.31	2289.58	2289.30	-0.27	0.07
1163	1027381.51	695555.47	2288.40	2287.77	-0.63	0.40
1162	1027406.80	695555.95	2286.12	2285.80	-0.32	0.10

Topographic Mapping Quality Control Results
Root Mean Square Error (RMSE) Calculations
Andora Hills & Galloway Washes, FCD
Figure 1

1161	1027431.84	695557.19	2283.22	2282.83	-0.39	0.15
1160	1027456.67	695557.31	2280.06	2280.01	-0.04	0.00
1159	1027481.28	695558.11	2276.92	2276.90	-0.02	0.00
1158	1027506.58	695558.74	2273.99	2274.24	0.24	0.06
1157	1027531.50	695558.95	2271.61	2271.76	0.15	0.02
1156	1027556.87	695559.84	2269.98	2270.29	0.31	0.09
1155	1027581.50	695560.61	2269.22	2268.94	-0.28	0.08
1154	1027607.05	695561.18	2268.32	2268.39	0.07	0.01
1153	1027631.93	695561.59	2268.06	2267.86	-0.21	0.04
1152	1027656.51	695562.29	2267.81	2267.40	-0.41	0.17
1151	1027681.39	695562.96	2267.92	2267.81	-0.12	0.01
1150	1027706.24	695563.83	2268.70	2268.75	0.05	0.00
1149	1027731.73	695563.88	2270.30	2270.03	-0.27	0.07
1148	1027758.58	695565.21	2272.33	2271.72	-0.61	0.37
1147	1027781.63	695565.44	2274.10	2273.17	-0.93	0.86
1146	1027806.18	695566.00	2275.35	2274.71	-0.64	0.41
1145	1027831.67	695566.87	2275.99	2275.55	-0.44	0.19
1144	1027856.43	695566.82	2275.77	2275.15	-0.62	0.39
1143	1027881.33	695567.42	2275.00	2274.50	-0.51	0.26
1142	1027906.48	695568.43	2274.16	2274.14	-0.02	0.00
1141	1027931.47	695569.10	2273.65	2273.82	0.17	0.03
1140	1027955.90	695569.36	2273.39	2273.63	0.23	0.05
1139	1027981.22	695570.16	2273.59	2273.56	-0.03	0.00
				Average of the Squared Discrepancies		**0.14**
					RMSE	**0.38**

Quality Control Check Cross Section #7

Survey				DTM	Elevation	Squared
Point #	Northing	Easting	Elevation	Elevation	Discrepancy	Discrepancy
1083	1028648.32	699832.56	2382.07	2382.34	0.27	0.07
1127	1028673.45	699832.84	2381.39	2381.72	0.33	0.11
1126	1028698.72	699833.22	2380.73	2380.88	0.16	0.02
1125	1028723.20	699832.69	2379.62	2379.89	0.28	0.08
1124	1028748.27	699832.63	2378.71	2379.02	0.31	0.10
1123	1028773.48	699832.32	2378.10	2378.45	0.35	0.12
1122	1028798.13	699832.63	2377.44	2377.72	0.27	0.07
1121	1028823.23	699832.24	2376.73	2376.79	0.06	0.00
1120	1028848.27	699832.55	2375.78	2375.81	0.03	0.00
1119	1028873.24	699832.49	2374.72	2374.79	0.07	0.00
1084	1028874.35	699834.40	2374.64	2374.69	0.06	0.00
1118	1028898.26	699832.59	2373.31	2373.61	0.30	0.09
1117	1028923.87	699832.64	2372.00	2372.44	0.44	0.20
1116	1028948.92	699832.50	2371.01	2371.45	0.44	0.19
1115	1028973.49	699832.45	2370.28	2370.83	0.56	0.31
1114	1028998.36	699832.79	2369.83	2370.41	0.58	0.33
1113	1029023.63	699832.81	2369.66	2370.20	0.53	0.29
1112	1029048.34	699832.79	2369.86	2370.32	0.45	0.21
1111	1029073.07	699832.58	2370.47	2371.04	0.57	0.33
1110	1029097.85	699832.53	2371.47	2372.11	0.64	0.41

Topographic Mapping Quality Control Results
Root Mean Square Error (RMSE) Calculations
Andora Hills & Galloway Washes, FCD
Figure 1

1109	1029123.18	699832.36	2372.69	2373.25	0.56	0.31
1108	1029148.77	699832.24	2374.06	2374.34	0.28	0.08
1107	1029173.16	699832.30	2375.08	2375.55	0.47	0.22
1106	1029198.31	699832.24	2376.16	2376.73	0.57	0.32
1105	1029223.08	699832.22	2377.10	2377.69	0.59	0.35
1104	1029248.33	699832.25	2377.84	2378.58	0.74	0.54
1103	1029273.37	699832.25	2378.27	2378.99	0.72	0.52
1102	1029298.06	699832.32	2378.59	2379.28	0.69	0.47
1101	1029322.82	699832.32	2378.90	2379.57	0.67	0.45
1100	1029348.20	699832.14	2379.36	2379.98	0.62	0.38
1099	1029373.84	699832.09	2379.85	2380.42	0.57	0.32
1098	1029398.65	699832.04	2380.14	2380.57	0.43	0.19
1097	1029422.86	699832.05	2379.97	2380.40	0.43	0.19
1096	1029447.70	699831.90	2379.23	2379.54	0.31	0.10
1095	1029473.25	699831.95	2378.22	2378.70	0.48	0.23
1094	1029498.46	699831.99	2377.50	2378.03	0.53	0.28
1093	1029523.30	699831.99	2377.26	2377.79	0.53	0.28
1092	1029548.07	699832.01	2377.53	2377.98	0.45	0.20
1085	1029561.54	699831.57	2377.72	2378.25	0.53	0.28
1091	1029573.21	699831.88	2377.99	2378.49	0.49	0.24
					Average of the Squared Discrepancies	**0.22**
					RMSE	**0.47**

Quality Control Check Cross Section #8

Survey				DTM	Elevation	Squared
Point #	Northing	Easting	Elevation	Elevation	Discrepancy	Discrepancy
1003	1026833.42	707704.72	2587.98	2588.28	0.30	0.09
1079	1026856.16	707705.42	2587.88	2588.20	0.32	0.10
1078	1026882.42	707704.30	2587.68	2588.18	0.50	0.25
1077	1026908.51	707704.40	2587.51	2587.51	0.00	0.00
1076	1026932.82	707704.44	2587.09	2587.31	0.22	0.05
1075	1026956.80	707704.10	2587.24	2587.35	0.11	0.01
1074	1026982.56	707703.26	2587.14	2587.33	0.19	0.04
1073	1027009.23	707703.79	2586.72	2586.88	0.16	0.03
1072	1027033.54	707704.16	2586.97	2587.08	0.11	0.01
1071	1027058.66	707703.90	2586.75	2586.99	0.25	0.06
1070	1027083.65	707703.56	2586.76	2586.71	-0.05	0.00
1069	1027108.28	707703.55	2586.39	2586.34	-0.05	0.00
1068	1027133.44	707703.52	2585.83	2585.98	0.15	0.02
1067	1027158.19	707703.21	2585.20	2585.03	-0.16	0.03
1066	1027181.91	707702.98	2583.07	2583.30	0.23	0.05
1065	1027207.50	707702.31	2581.05	2581.03	-0.02	0.00
1064	1027220.99	707702.67	2580.78	2581.06	0.27	0.07
1063	1027258.46	707702.56	2581.62	2581.63	0.01	0.00
1062	1027283.64	707702.45	2582.06	2582.27	0.21	0.04
1061	1027300.31	707702.10	2582.40	2582.54	0.13	0.02
1060	1027333.36	707702.08	2582.86	2582.98	0.12	0.01
1059	1027358.26	707701.99	2583.40	2583.33	-0.06	0.00
1058	1027383.93	707701.67	2584.21	2584.21	0.01	0.00

Topographic Mapping Quality Control Results
Root Mean Square Error (RMSE) Calculations
Andora Hills & Galloway Washes, FCD
Figure 1

1057	1027408.06	707701.68	2584.92	2584.96	0.04	0.00
1056	1027433.38	707701.54	2584.91	2585.47	0.56	0.31
1055	1027459.04	707701.35	2585.55	2585.81	0.26	0.07
1054	1027483.26	707701.44	2585.40	2585.91	0.52	0.27
1053	1027508.66	707701.42	2585.06	2585.39	0.33	0.11
1052	1027533.26	707701.14	2584.65	2584.93	0.28	0.08
1051	1027558.04	707700.91	2584.46	2584.68	0.23	0.05
1050	1027582.88	707700.72	2584.89	2584.86	-0.04	0.00
1049	1027608.31	707700.72	2585.24	2585.40	0.17	0.03
1048	1027633.59	707700.44	2585.58	2585.78	0.20	0.04
1047	1027658.07	707700.53	2585.72	2585.80	0.08	0.01
1046	1027683.14	707700.19	2585.27	2585.68	0.41	0.17
1045	1027707.96	707700.36	2585.13	2585.10	-0.03	0.00
1043	1027733.17	707700.32	2584.75	2584.65	-0.11	0.01
1042	1027758.18	707699.71	2584.66	2584.51	-0.14	0.02
1041	1027783.41	707699.78	2584.64	2584.88	0.24	0.06
1040	1027808.48	707699.66	2585.64	2585.62	-0.02	0.00
1039	1027832.95	707698.96	2586.73	2586.82	0.09	0.01
1038	1027858.87	707699.45	2587.43	2587.50	0.07	0.00
1037	1027883.03	707699.36	2587.34	2587.49	0.15	0.02
1036	1027908.20	707699.44	2586.03	2586.71	0.67	0.45
1035	1027933.57	707699.13	2584.39	2584.56	0.17	0.03
1034	1027957.93	707698.74	2583.67	2583.53	-0.14	0.02
1033	1027968.89	707698.73	2583.55	2583.58	0.03	0.00
1032	1028008.57	707698.44	2585.29	2584.97	-0.32	0.10
1031	1028033.16	707698.50	2587.11	2587.03	-0.07	0.01
1030	1028058.51	707698.18	2589.24	2589.02	-0.22	0.05
1029	1028083.36	707698.11	2590.45	2591.02	0.58	0.33
1028	1028107.48	707698.06	2590.98	2591.55	0.57	0.33
1027	1028133.03	707698.13	2590.55	2591.13	0.58	0.34
1026	1028158.04	707698.06	2589.58	2589.71	0.12	0.01
1025	1028183.39	707697.81	2588.32	2588.32	0.00	0.00
1024	1028208.30	707697.74	2587.54	2587.53	-0.01	0.00
1023	1028233.31	707697.75	2587.39	2587.23	-0.15	0.02
1021	1028258.13	707697.56	2587.02	2587.12	0.10	0.01
1020	1028283.47	707697.41	2586.38	2586.30	-0.09	0.01
1019	1028308.16	707697.11	2585.22	2585.29	0.07	0.00
					Average of the Squared Discrepancies	**0.06**
					RMSE	**0.25**

Topographic Mapping Quality Control Results
Root Mean Square Error (RMSE) Calculations
Andora Hills & Galloway Washes, FCD
Attachment 2

Planimetric Quality Control (digital ortho photo and topo map compared to survey results at control points located in mapping area)

Survey				Measured from Countour Map			Discrepancy			Squared Discrepancy		
Point #	Northing	Easting	Elevation	Northing	Easting	Elevation	Northing	Easting	Elevation	Northing	Easting	Elevation
HV14	1031628.31	689448.86	2127.96	1031627.95	689446.56	2127.97	-0.35	-2.30	0.01	0.13	5.30	0.00
HV15	1033540.66	689264.04	2124.33	1033542.60	689261.03	2124.53	1.94	-3.01	0.20	3.78	9.05	0.04
HV17	1029444.14	691963.47	2174.82	1029443.37	691962.03	2174.35	-0.77	-1.44	-0.47	0.59	2.08	0.22
HV18	1028408.74	694154.15	2240.56	1028410.80	694150.03	2240.27	2.06	-4.11	-0.29	4.24	16.93	0.09
HV19	1030245.44	694455.17	2246.14	1030242.86	694451.42	2246.18	-2.58	-3.74	0.04	6.66	14.01	0.00
HV21	1031324.80	695157.56	2248.32	1031324.09	695152.97	2248.26	-0.71	-4.59	-0.06	0.50	21.05	0.00
HV31	1027635.09	705848.96	2545.85	1027633.97	705846.35	2546.00	-1.11	-2.62	0.15	1.24	6.85	0.02
HV32	1027656.69	707655.81	2589.37	1027658.29	707652.62	2589.47	1.60	-3.19	0.10	2.57	10.17	0.01
									Average of the Squared Discrepancies	**2.46**	**10.68**	**0.05**
									RMSE	**1.57**	**3.27**	**0.22**

TEAM PROFESSIONAL ASSOCIATES, INC.
LAND SURVEYING • GIS • UTILITY DESIGN • DRAFTING • PERMITTING

1920 WEST PEORIA AVENUE ■ PHOENIX, AZ 85029 ■ TEL (602) 906-0020 ■ FAX (602) 906-0019
1802 W. GRANT AVE., STE. 110-5 ■ TUCSON, AZ 85745 ■ TEL (520) 623-8503 ■ FAX (520) 623-8504

Loretta G. Wahl
President/CEO

David A. Rhine, PRLS
Executive Vice President

Stone E. Wahl, PRLS
Executive Vice President

January 21, 2000

Maricopa County Flood Control District
& J. E. Fuller / Hydrology & Geomorphology

Attn: Brian Iserman, P.E.

re: **Andora Hills & Galloway Washes Control Survey**

A TEAM Professional Associates has recently completed a photogrammetric survey of the above mentioned area for flood control district review.

Survey control for this project was researched with the understanding that this project was to be submitted to the Federal Emergency Management Agency (FEMA). Horizontal control was established using published triangulation stations from the National Geodetic Reference System. (NGRS/HARN). A minimum of three triangulation stations were used to develop the state plane coordinates used for this project.

Static occupations utilizing Global Positioning System (GPS) equipment were used throughout the control network. Standard methods and procedures in this project are encompassed in the outline for STANDARDS FOR GEODETIC CONTROL NETWORKS (Version 1.0, dated May 23, 1995) to establish the aerial ground control network. The network solutions produced in the least squares adjustment had ratios better than 1 part in 100,000. The adjustment also proved the position for triangulation station, 'WILDCAT' which has been reestablished with railroad spike in rock, did not fit the expected accuracy for this network.

The vertical control used in this network was based on previous mapping (in this same area). Published benchmarks were researched in this same area but were found to be destroyed by development and other roadway improvements. The FEMA benchmark listing in this area proved to be very subjective. A number of the reference benchmarks listed were referencing top of pavement at specified intersections. Other benchmarks in the immediate area proved to be a reliable source for previous mapping elevations. The leveling network was established on critical points of the GPS network. Instrumentation used was a Wild Na2000 (second order) digital level. This second order instrument has proved to be very reliable on previous projects.

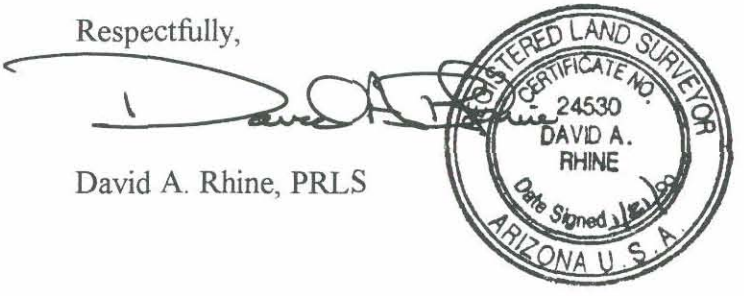
A TEAM also checked reference benchmarks listed on previous mapping benchmarks of the Cave Creek wash area. In reviewing our leveling network, it

appears that there are previous mapping network benchmarks 0.62' lower than other benchmarks listed on the same FEMA maps covering the Andora Hills and Galloway Wash areas.

There are clearly two sets/datums of vertical reference markers that are currently listed on the FEMA maps. Descriptions identifying the RM's can be traced to supporting documents of previous mapping sub-contracts completed in conjunction with FCD 95-28. In review of these documents, it is unclear if either set of data initiates and closes back into published benchmarks showing quality assurances and completeness.

In conclusion of this project, the horizontal control and mapping of this project is very reliable. The vertical control base used for this project is consistent to the previous mapping datum and reference markers east of the Cave Creek Wash area study. Published NGS benchmarks are not readily available in the immediate area.

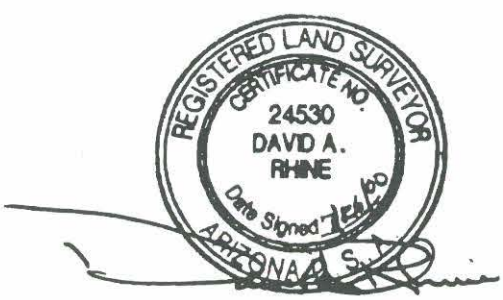
Respectfully,



David A. Rhine, PRLS

Maricopa County Flood Control District,
Gallaway and Andora Hills Washes,
Cave Creek, AZ.

ID	REPORTED ELEVATION	DESCRIPTION
1	2107.87	Top of brass cap at centerline intersection Cave Creek Road/Rancho Manana Blvd., Section 28, T6N, R4E. N1030225.88, E688635.02 (NAD83)
2	2128.59	Top of brass cap at centerline intersection Spur Cross Road, approximately 115 feet north of the centerline intersection of Cave Creek Road/Spur Cross Road, Section 28, T6N, R4E. N1030858.46, E689461.65 (NAD83)
3	2209.95 old ref-cl 2210.48	E1/4 Cor. Sec. 28, T6N, R4E, MCHD brass cap in handhole. Located at the centerline of School House Road, approximately 0.2 mile north of the intersection of Cave Creek Road/School House Road, Section 28, T6N, R4E. N1031481.10, E691918.75 (NAD83)
4	2290.43	Brass Cap in centerline of Burro Road, approximately 1000 feet north of intersection Burro Road/Holiday Lane, Section 34, T6N, R4E. N1028038.59, E695882.82 (NAD83)
AHW-1	2168.60	MCFCD brass cap on stone base at north end of cutoff wall, located on the west side of School House Road, at Andora Hills Wash, approximately 0.14 mile south of intersection Cave Creek Road/School House Road, Section 28, T6N, R4E. N1029534.74, E691901.80 (NAD83)
GW-1	2289.66	MCFCD brass cap, on top of the north end of culvert head wall located on east side of Galloway Road, approximately 0.25 mile north of Cave Creek Road, Section 27, T6N, R4E. N1030149.93, E696383.49 (NAD83)
5	2373.76	Brass cap stamped "RLS 11062, T6N, R4E, 1/426/35, 1997" located in pavement, approximately 10 feet west and 15 feet north of centerline intersection of Sundance Trail/Tranquil Trail, Section 35, T6N, R4E. N1028893.58, E699813.23 (NAD83)
6	2443.44 old ref-cl 2443.70	Brass cap on top of south end of culvert headwall, located approximately 25 feet north and 25 feet west of centerline intersection Mule Train Road/Serene Street, Section 35, T6N, R4E. N1028625.55, E702432.49 (NAD83)
7	2557.10	Brass Cap in center line of Carefree Drive, approximately 0.2 mile west of intersection Pima Road/Carefree Drive, Section 36, T6N, R4E. N1027710.79, E706517.19 (NAD83)
RM-3111	2005.81	Brass cap in concrete 10 north and 6 feet west of electric transformer #M66540 on the west side of Andora Hills Wash Drive, in the northeast quarter of Section 32, T6N, R4E, approximate coordinates N1028278.32, E485054.4 (NAD 27) and N1028632.64, E684838.07 (NAD83)
RM-130 (A Team RM 18)	2164.75	Chiseled square in concrete base for flag pole in front of American Legion Post 34 On north side of Cave Creek Road, 0.2 mile west of School House Road, Section 28, T6N, R4E. N1030324.40, E691046.55 (NAD83)



Coordinates listed in this document are consistant with standards and proceedures producing second order, second class leveling.

prepared for Maricopa county .Flood Control District
and J.E.Fuller / Hydrology and Geomorphology, Inc.

prepared by A TEAM Professional Associates, Inc.

Panel Point Description Summary				
Control Point ID	Easting NAD 83 Feet	Northing NAD 83 Feet	Elevation NGVD 29	Control Point Description
1	1034081.919	683970.991	2127.597	Panel Point, 60D Nail With Shiner
2	1036748.143	691816.699	2213.539	Panel Point, 40D Nail With Shiner
3	1036833.412	698975.942	2439.346	Panel Point, 60D Nail With Shiner
4	1036446.010	702431.880	2558.571	Panel Point, 40D Nail With Shiner
4A	1037026.263	707059.577	2797.370	Panel Point, 40D Nail With Shiner
5	1028733.707	712717.802	2730.779	Panel Point, 60D Nail With Shiner
6	1023606.654	712864.859	2672.219	Panel Point, 60D Nail With Shiner
7	1023594.764	699881.936	2400.133	Panel Point, 60D Nail With Shiner
8	1023590.673	687006.542	2099.015	Panel Point, 60D Nail With Shiner
9	1029470.679	684194.606	2013.789	Panel Point, 40D Nail With Shiner
10	1032050.407	686022.907	2050.773	Panel Point, 60D Nail With Shiner
11	1032927.428	686267.956	2046.574	Panel Point, 60D Nail With Shiner
12	1034086.539	687654.623	2098.861	Panel Point, 60D Nail With Shiner
13	1028974.511	688285.016	2108.122	Panel Point, 60D Nail With Shiner
14	1031628.307	689448.858	2127.958	Panel Point, 60D Nail With Shiner
15	1033540.659	689264.035	2124.326	Panel Point, 60D Nail With Shiner
16	1034131.703	691943.041	2177.535	Panel Point, 60D Nail With Shiner
17	1029444.140	691963.474	2174.822	Panel Point, 60D Nail With Shiner
18	1028408.740	694154.147	2240.563	Panel Point, 60D Nail With Shiner
19	1030245.436	694455.167	2246.144	Panel Point, 60D Nail With Shiner
20	1032801.946	693223.212	2231.478	Panel Point, 60D Nail With Shiner
21	1031324.803	695157.559	2248.319	Panel Point, 60D Nail With Shiner
22	1026282.979	695633.773	2359.887	Panel Point, 60D Nail With Shiner
23	1028133.668	697597.900	2349.073	Panel Point, 40D Nail With Shiner
24	1030748.684	697167.484	2316.846	Panel Point, 60D Nail With Shiner
25	1030233.927	699868.484	2389.769	Panel Point, 60D Nail With Shiner
26	1026652.723	699527.671	2389.661	Panel Point, 40D Nail With Shiner
27A	1028833.045	701102.310	2403.647	Panel Point, Top of CMP
28A	1030317.907	702556.621	2484.185	Panel Point, 60D Nail With Shiner
29	1028625.614	702839.951	2452.564	Panel Point, 60D Nail With Shiner
30	1026065.220	702440.121	2458.456	Panel Point, 60D Nail With Shiner
31	1027635.085	705848.963	2545.851	Panel Point, 60D Nail With Shiner
32	1027656.690	707655.810	2589.368	Panel Point, 60D Nail With Shiner
33	1028687.523	707689.390	2598.387	Panel Point, 60D Nail With Shiner
34	1026257.001	709259.505	2623.285	Panel Point, 60D Nail With Shiner

Maricopa County Flood Control District,
Gallaway and Andora Hills Washes,
Cave Creek, AZ.

Point Number	Latitude	Longitude	STATE Northing (I. FT.)	PLANE Easting (I. FT.)	Orthometric Height (S. FT.)	STATE Northing (M)	PLANE Easting (M)	Orthometric Height (M)	HGT. ABOVE ELLIPSOID (M)	ZONE	SCALE FACTOR
1	33 50 33.04448	111 58 10.05004	1034081.919	683970.991	2127.597	315188.169	208474.358	648.493	619.844	AZ C	0.99990029
2	33 50 59.45300	111 56 37.03468	1036748.143	691816.699	2213.539	316000.834	210865.730	674.688	646.130	AZ C	0.99990008
3	33 51 00.30705	111 55 12.14294	1036833.412	698975.942	2439.346	316026.824	213047.867	743.514	715.008	AZ C	0.99990000
4	33 50 56.47352	111 54 31.16392	1036446.010	702431.880	2558.571	315908.744	214101.237	779.854	751.370	AZ C	0.99990001
4A	33 51 02.20732	111 53 36.28931	1037026.263	707059.577	2797.370	316085.605	215511.759	852.640	824.201	AZ C	0.99990006
5	33 49 40.14663	111 52 29.23550	1028733.707	712717.802	2730.779	313558.034	217236.386	832.343	803.810	AZ C	0.99990019
6	33 48 49.42104	111 52 27.51722	1023606.654	712864.859	2672.219	311995.308	217281.209	814.494	785.899	AZ C	0.99990019
7	33 48 49.32958	111 55 01.39939	1023594.764	699881.936	2400.133	311991.684	213324.014	731.562	702.889	AZ C	0.99990000
8	33 48 49.26240	111 57 34.00696	1023590.673	687006.542	2099.015	311990.437	209399.594	639.781	611.017	AZ C	0.99990019
9	33 49 47.42398	111 58 07.37107	1029470.679	684194.606	2013.789	313782.663	208542.516	613.804	585.096	AZ C	0.99990029
10	33 50 12.95532	111 57 45.71049	1032050.407	686022.907	2050.773	314568.964	209099.782	625.077	596.415	AZ C	0.99990022
11	33 50 21.63328	111 57 42.80976	1032927.428	686267.956	2046.574	314836.280	209174.473	623.797	595.148	AZ C	0.99990022
12	33 50 33.10675	111 57 26.37463	1034086.539	687654.623	2098.861	315189.577	209597.129	639.734	611.110	AZ C	0.99990017
13	33 49 42.53291	111 57 18.87756	1028974.511	688285.016	2108.122	313631.431	209789.273	642.557	613.870	AZ C	0.99990016
14	33 50 08.79255	111 57 05.09120	1031628.307	689448.858	2127.958	314440.308	210144.012	648.603	619.959	AZ C	0.99990013
15	33 50 27.71193	111 57 07.29018	1033540.659	689264.035	2124.326	315023.193	210087.678	647.496	618.876	AZ C	0.99990013
16	33 50 33.56743	111 56 35.52855	1034131.703	691943.041	2177.535	315203.343	210904.239	663.714	635.121	AZ C	0.99990007
17	33 49 47.19075	111 56 35.27201	1029444.140	691963.474	2174.822	313774.574	210910.467	662.887	634.233	AZ C	0.99990007
18	33 49 36.95171	111 56 09.29956	1028408.740	694154.147	2240.563	313458.984	211578.184	682.925	654.272	AZ C	0.99990004
19	33 49 55.12377	111 56 05.73499	1030245.436	694455.167	2246.144	314018.809	211669.935	684.626	655.999	AZ C	0.99990004
20	33 50 20.41438	111 56 20.34659	1032801.946	693223.212	2231.478	314798.033	211294.435	680.156	651.554	AZ C	0.99990005
21	33 50 05.80373	111 55 57.40997	1031324.803	695157.559	2248.319	314347.800	211884.024	685.289	656.681	AZ C	0.99990003
22	33 49 15.92270	111 55 51.75585	1026282.979	695633.773	2359.887	312811.052	212029.174	719.295	690.625	AZ C	0.99990002
23	33 49 34.23478	111 55 28.47541	1028133.668	697597.900	2349.073	313375.142	212627.840	715.999	687.365	AZ C	0.99990001
24	33 50 00.10631	111 55 33.58053	1030748.684	697167.484	2316.846	314172.199	212496.649	706.176	677.573	AZ C	0.99990001
25	33 49 55.01479	111 55 01.55915	1030233.927	699868.484	2389.769	314015.301	213319.914	728.403	699.811	AZ C	0.99990000
26	33 49 19.58378	111 55 05.59891	1026652.723	699527.671	2389.661	312923.750	213216.034	728.370	699.729	AZ C	0.99990000
27A	33 49 41.15483	111 54 46.93253	1028833.045	701102.310	2403.647	313588.312	213695.984	732.633	704.031	AZ C	0.99990000
28A	33 49 55.84460	111 54 29.69072	1030317.907	702556.621	2484.185	314040.898	214139.258	757.181	728.608	AZ C	0.99990001
29	33 49 39.10151	111 54 26.33363	1028625.614	702839.951	2452.564	313525.087	214225.617	747.543	718.949	AZ C	0.99990001
30	33 49 13.77034	111 54 31.07579	1026065.220	702440.121	2458.456	312744.679	214103.749	749.339	720.709	AZ C	0.99990001
31	33 49 29.29751	111 53 50.66528	1027635.085	705848.963	2545.851	313223.174	215142.764	775.977	747.388	AZ C	0.99990004
32	33 49 29.50738	111 53 29.24653	1027656.690	707655.810	2589.368	313229.759	215693.491	789.241	760.663	AZ C	0.99990007
33	33 49 39.70595	111 53 28.84546	1028687.523	707689.390	2598.387	313543.957	215703.726	791.990	763.426	AZ C	0.99990007
34	33 49 15.65514	111 53 10.24095	1026257.001	709259.505	2623.285	312803.134	216182.297	799.579	770.993	AZ C	0.99990010

Photo Control

Prepared for Maricopa County Flood Control District
and J. E. Fuller / Hydrology and Geomorphology, Inc.
Prepared by A TEAM Professional Associates, Inc.

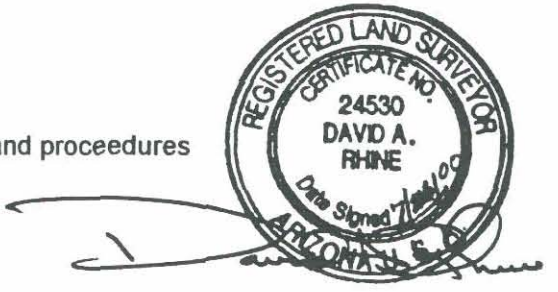
Culvert Control

101	33 49 58.91031	111 57 38.73348	1030630.538	686610.784	2048.011	314136.188	209278.967	624.235	595.558	AZ C	0.99990021
102	33 50 00.76380	111 57 41.15598	1030817.969	686406.526	2044.251	314193.317	209216.709	623.089	594.413	AZ C	0.99990021
201	33 50 00.14416	111 57 17.75002	1030754.544	688380.791	2085.540	314173.985	209818.465	635.674	607.011	AZ C	0.99990015
202	33 50 01.55647	111 57 16.70072	1030897.260	688469.354	2094.215	314217.485	209845.459	638.318	609.657	AZ C	0.99990015
301	33 49 57.52123	111 57 13.20156	1030489.288	688764.357	2109.704	314093.135	209935.376	643.039	614.375	AZ C	0.99990014
302	33 49 56.98424	111 57 12.46551	1030434.990	688826.424	2106.984	314076.585	209954.294	642.210	613.546	AZ C	0.99990014
401	33 49 33.29133	111 55 48.80613	1028038.488	695882.848	2290.481	313346.131	212105.092	698.140	669.494	AZ C	0.99990002
402	33 49 28.48925	111 55 48.80741	1027553.117	695882.674	2279.261	313198.190	212105.039	694.720	666.067	AZ C	0.99990002

Global Positioning Systems (GPS) was used to locate all control listed. Triangulation station 'NR 06' and 'NR 15' were the primary geodetic control used to rectify geoid modeling of vertical data. Control coordinates are in North American Datum of 1983 (NAD83) (HARN) Arizona State Plane, Central Zone (0202).
Elevations listed are based benchmarks listed 'Flood Insurance Rate Map' (FIRM) number 04013C0805 F being in NGVD29 datum.
Benchmark RM130 was the primary benchmark recovered from the above mentioned FIRM map.

RM130 Chiseled square in the concrete base of flag pole in front of American Legion Post 34 located on the north side of road 0.2 miles west of School House Road.

Coordinates listed in this document are consistant with standards and proceedures producing second order, second class positioning.



Prepared for

Maricopa County Flood Control District &
J.E.Fuller/Hydrology and Geomorphology, Inc.

Ground control for

Floodplain Delineation Study of Andora Hills and Gallaway Washes

FCD 99-14

near

Cave Creek, Arizona

A TEAM PROFESSIONAL ASSOCIATES, INC.
1920 W. Peoria Ave. Phoenix, Arizona 85029 1(602) 906-0020
1802 W. GRANT ROAD, SUITE 110-5 Tucson, arizona 85745 1(520) 623-8503

Gallaway and Andora Hills Washes,
Cave Creek, AZ.

Point Number	Latitude	Longitude	STATE Northing (I. FT.)	PLANE Easting (I. FT.)	Orthometric Height (S. FT.)	STATE Northing (M)	PLANE Easting (M)	Orthometric Height (M)	HGT. ABOVE ELLIPSOID (M)	ZONE	SCALE FACTOR
1	33 50 33.04448	111 58 10.05004	1034081.919	683970.991	2127.597	315188.169	208474.358	648.493	619.844	AZ C	0.99990029
2	33 50 59.45300	111 56 37.03468	1036748.143	691816.699	2213.539	316000.834	210865.730	674.688	646.130	AZ C	0.99990008
3	33 51 00.30705	111 55 12.14294	1036833.412	698975.942	2439.346	316026.824	213047.867	743.514	715.008	AZ C	0.99990000
4	33 50 56.47352	111 54 31.16392	1036446.010	702431.880	2558.571	315908.744	214101.237	779.854	751.370	AZ C	0.99990001
4A	33 51 02.20732	111 53 36.28931	1037026.263	707059.577	2797.370	316085.605	215511.759	852.640	824.201	AZ C	0.99990006
5	33 49 40.14663	111 52 29.23550	1028733.707	712717.802	2730.779	313558.034	217236.386	832.343	803.810	AZ C	0.99990019
6	33 48 49.42104	111 52 27.51722	1023606.654	712864.859	2672.219	311995.308	217281.209	814.494	785.899	AZ C	0.99990019
7	33 48 49.32958	111 55 01.39939	1023594.764	699881.936	2400.133	311991.684	213324.014	731.562	702.889	AZ C	0.99990000
8	33 48 49.26240	111 57 34.00696	1023590.673	687006.542	2099.015	311990.437	209399.594	639.781	611.017	AZ C	0.99990019
9	33 49 47.42398	111 58 07.37107	1029470.679	684194.606	2013.789	313782.663	208542.516	613.804	585.096	AZ C	0.99990029
10	33 50 12.95532	111 57 45.71049	1032050.407	686022.907	2050.773	314568.964	209099.782	625.077	596.415	AZ C	0.99990022
11	33 50 21.63328	111 57 42.80976	1032927.428	686267.956	2046.574	314836.280	209174.473	623.797	595.148	AZ C	0.99990022
12	33 50 33.10675	111 57 26.37463	1034086.539	687654.623	2098.861	315189.577	209597.129	639.734	611.110	AZ C	0.99990017
13	33 49 42.53291	111 57 18.87756	1028974.511	688285.016	2108.122	313631.431	209789.273	642.557	613.870	AZ C	0.99990016
14	33 50 08.79255	111 57 05.09120	1031628.307	689448.858	2127.958	314440.308	210144.012	648.603	619.959	AZ C	0.99990013
15	33 50 27.71193	111 57 07.29018	1033540.659	689264.035	2124.326	315023.193	210087.678	647.496	618.876	AZ C	0.99990013
16	33 50 33.56743	111 56 35.52855	1034131.703	691943.041	2177.535	315203.343	210904.239	663.714	635.121	AZ C	0.99990007
17	33 49 47.19075	111 56 35.27201	1029444.140	691963.474	2174.822	313774.574	210910.467	662.887	634.233	AZ C	0.99990007
18	33 49 36.95171	111 56 09.29956	1028408.740	694154.147	2240.563	313458.984	211578.184	682.925	654.272	AZ C	0.99990004
19	33 49 55.12377	111 56 05.73499	1030245.436	694455.167	2246.144	314018.809	211669.935	684.626	655.999	AZ C	0.99990004
20	33 50 20.41438	111 56 20.34659	1032801.946	693223.212	2231.478	314798.033	211294.435	680.156	651.554	AZ C	0.99990005
21	33 50 05.80373	111 55 57.40997	1031324.803	695157.559	2248.319	314347.800	211884.024	685.289	656.681	AZ C	0.99990003
22	33 49 15.92270	111 55 51.75585	1026282.979	695633.773	2359.887	312811.052	212029.174	719.295	690.625	AZ C	0.99990002
23	33 49 34.23478	111 55 28.47541	1028133.668	697597.900	2349.073	313375.142	212627.840	715.999	687.365	AZ C	0.99990001
24	33 50 00.10631	111 55 33.58053	1030748.684	697167.484	2316.846	314172.199	212496.649	706.176	677.573	AZ C	0.99990001
25	33 49 55.01479	111 55 01.55915	1030233.927	699868.484	2389.769	314015.301	213319.914	728.403	699.811	AZ C	0.99990000
26	33 49 19.58378	111 55 05.59891	1026652.723	699527.671	2389.661	312923.750	213216.034	728.370	699.729	AZ C	0.99990000
27A	33 49 41.15483	111 54 46.93253	1028833.045	701102.310	2403.647	313588.312	213695.984	732.633	704.031	AZ C	0.99990000
28A	33 49 55.84460	111 54 29.69072	1030317.907	702556.621	2484.185	314040.898	214139.258	757.181	728.608	AZ C	0.99990001
29	33 49 39.10151	111 54 26.33363	1028625.614	702839.951	2452.564	313525.087	214225.617	747.543	718.949	AZ C	0.99990001
30	33 49 13.77034	111 54 31.07579	1026065.220	702440.121	2458.456	312744.679	214103.749	749.339	720.709	AZ C	0.99990001
31	33 49 29.29751	111 53 50.66528	1027635.085	705848.963	2545.851	313223.174	215142.764	775.977	747.388	AZ C	0.99990004
32	33 49 29.50738	111 53 29.24653	1027656.690	707655.810	2589.368	313229.759	215693.491	789.241	760.663	AZ C	0.99990007
33	33 49 39.70595	111 53 28.84546	1028687.523	707689.390	2598.387	313543.957	215703.726	791.990	763.426	AZ C	0.99990007
34	33 49 15.65514	111 53 10.24095	1026257.001	709259.505	2623.285	312803.134	216182.297	799.579	770.993	AZ C	0.99990010

Photo Control

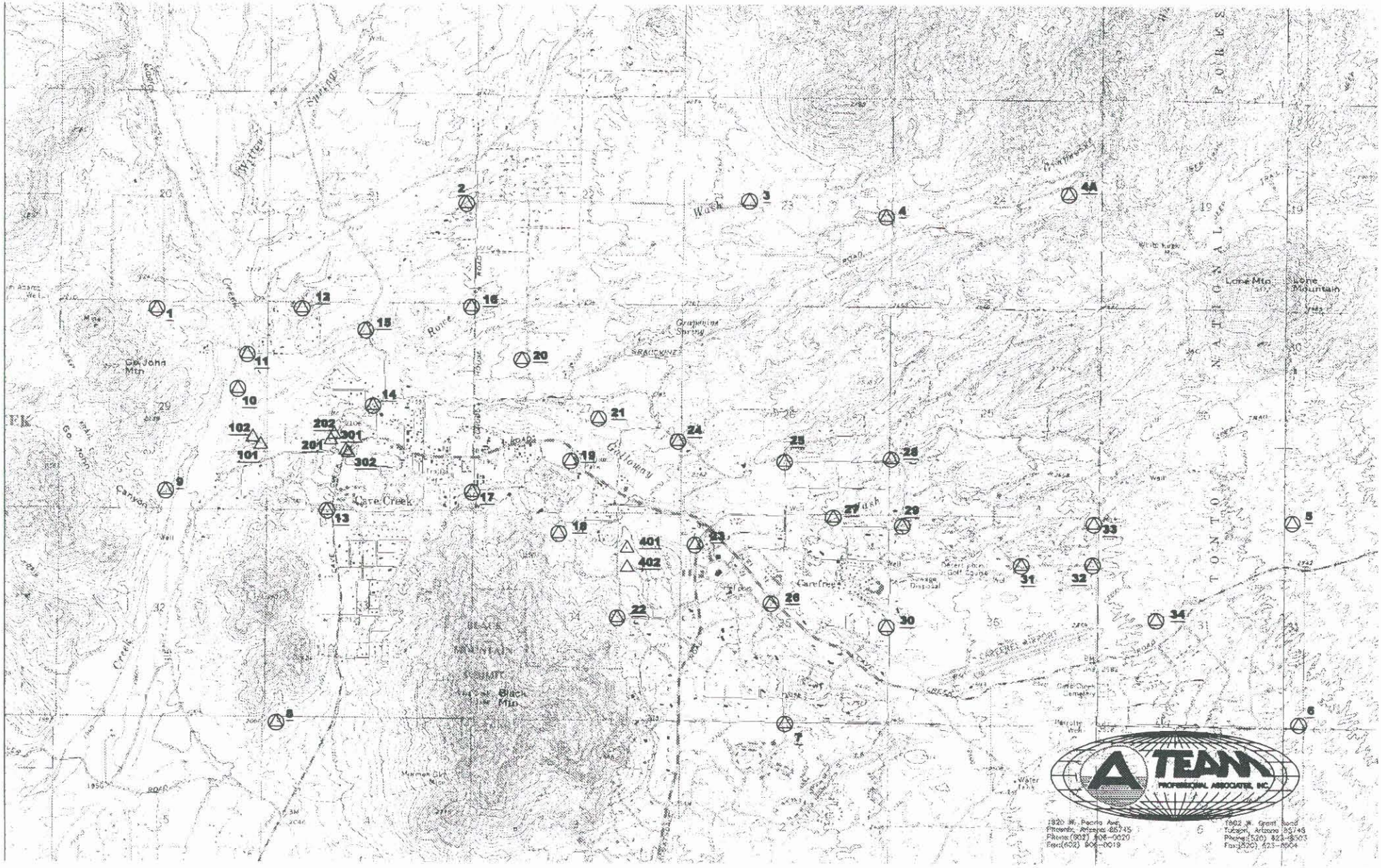
Prepared for Maricopa County Flood Control District
and J. E. Fuller / Hydrology and Geomorphology, Inc.
Prepared by A TEAM Professional Associates, Inc.

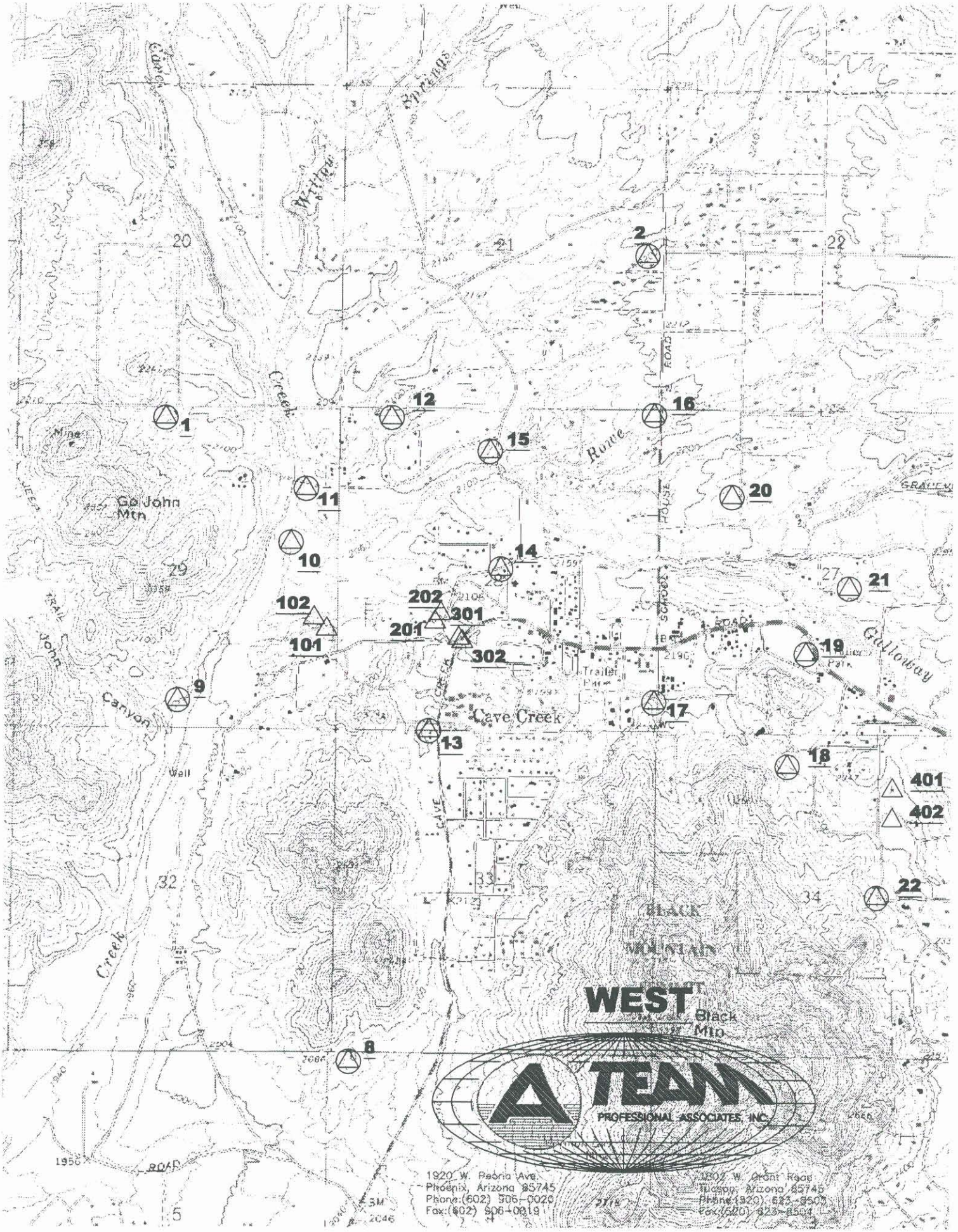
Culvert Control

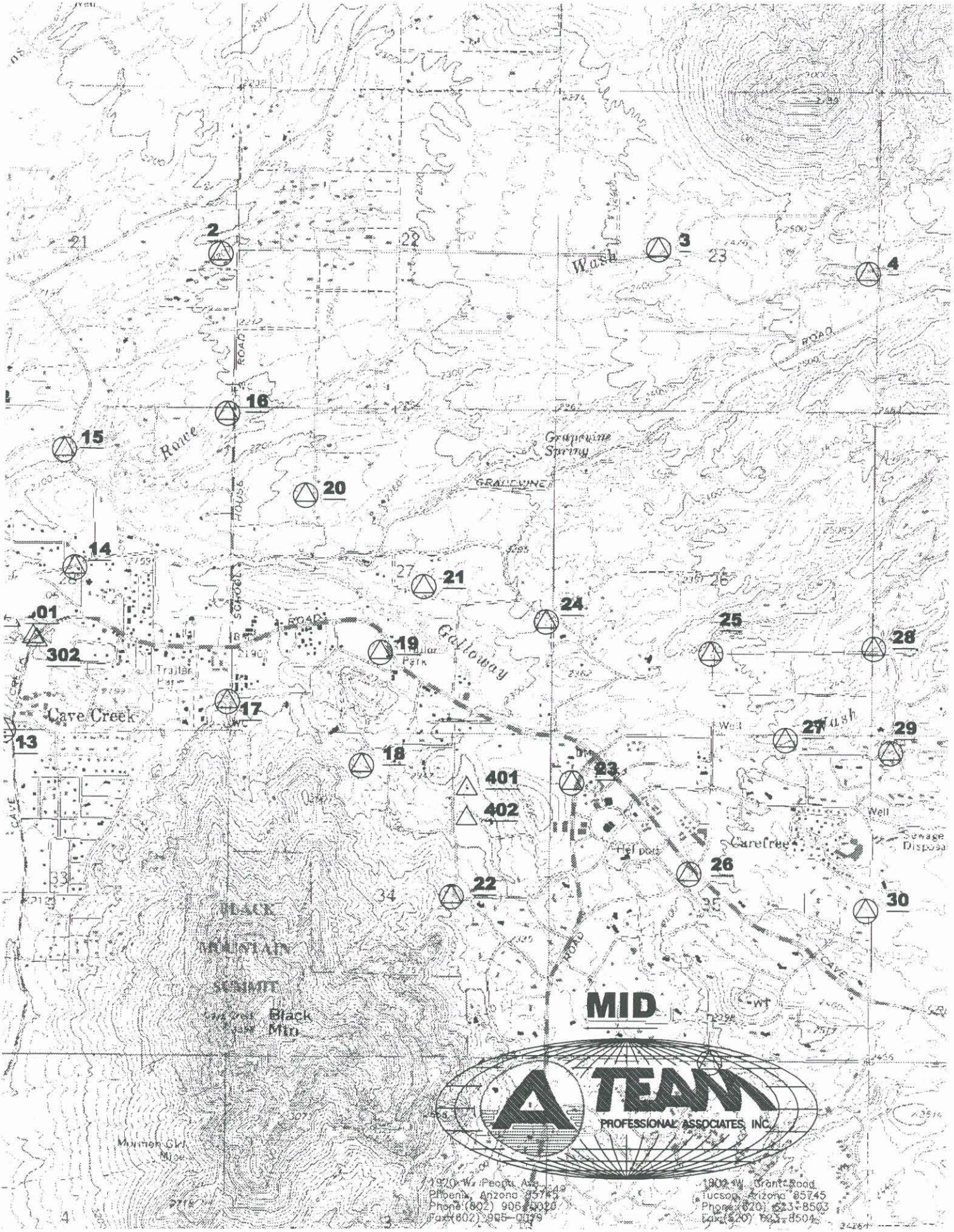
101	33 49 58.91031	111 57 38.73348	1030630.538	686610.784	2048.011	314136.188	209278.967	624.235	595.558	AZ C	0.99990021
102	33 50 00.76380	111 57 41.15598	1030817.969	686406.526	2044.251	314193.317	209216.709	623.089	594.413	AZ C	0.99990021
201	33 50 00.14416	111 57 17.75002	1030754.544	688380.791	2085.540	314173.985	209818.465	635.674	607.011	AZ C	0.99990015
202	33 50 01.55647	111 57 16.70072	1030897.260	688469.354	2094.215	314217.485	209845.459	638.318	609.657	AZ C	0.99990015
301	33 49 57.52123	111 57 13.20156	1030489.288	688764.357	2109.704	314093.135	209935.376	643.039	614.375	AZ C	0.99990014
302	33 49 56.98424	111 57 12.46551	1030434.990	688826.424	2106.984	314076.585	209954.294	642.210	613.546	AZ C	0.99990014
401	33 49 33.29133	111 55 48.80613	1028038.488	695882.848	2290.481	313346.131	212105.092	698.140	669.494	AZ C	0.99990002
402	33 49 28.48925	111 55 48.80741	1027553.117	695882.674	2279.261	313198.190	212105.039	694.720	666.067	AZ C	0.99990002

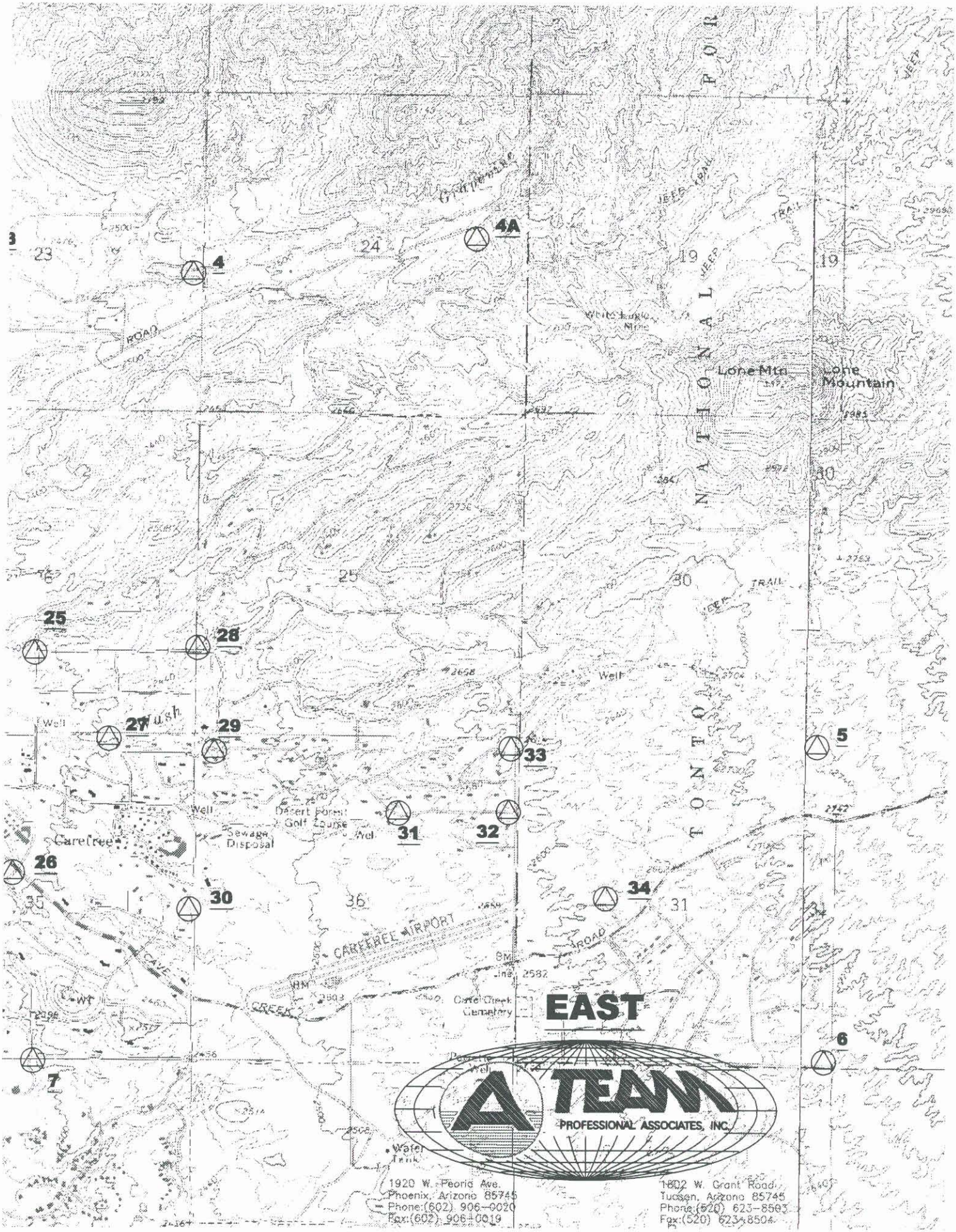
Global Positioning Systems (GPS) was used to locate all control listed. Triangulation station 'NR 06' and 'NR 15' were the primary geodetic control used to rectify geoid modeling of vertical data. Control coordinates are in North American Datum of 1983 (NAD83) (HARN) Arizona State Plane, Central Zone (0202).
Elevations listed are based benchmarks listed 'Flood Insurance Rate Map' (FIRM) number 04013C0805 F being in NGVD29 datum. Benchmark RM130 was the primary benchmark recovered from the above mentioned FIRM map.

RM130 Chiseled square in the concrete base of flag pole in front of American Legion Post 34 located on the north side of road 0.2 miles west of School House Road.


Cave Creek
Carefree
Black Mtn
Go John Mtn
Lone Mtn
Lone Mountain
TONTO NATIONAL FOREST
1
2
3
4
4A
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
101
102
201
202
301
302
401
402
TEAM
PROFESSIONAL ASSOCIATES, INC.


1
2
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
101
102
201
202
301
302
401
402
Go John Mtn
Cave Creek
Black Mtn
WEST
A TEAM
PROFESSIONAL ASSOCIATES, INC.
1920 W. Peoria Ave.
Phoenix, Arizona 85745
Phone:(602) 906-0020
Fax:(602) 906-0019
1202 W. Grant Road
Tucson, Arizona 85745
Phone:(520) 623-8500
Fax:(520) 623-8504


2
3
4
16
15
20
14
21
24
25
28
19
17
27
29
18
23
401
402
22
26
30
Wash
Road
Grapevine Spring
Galloway
Cave Creek
Trailer Park
Well
Carefree
Sewage Disposa
Black Mtn
Summit
MID
A TEAM
PROFESSIONAL ASSOCIATES, INC.
1970 W. Peoria Ave.
Phoenix, Arizona 85745
Phone (602) 905-0010
Fax (602) 905-0019
1802 W. Grant Road
Tucson, Arizona 85745
Phone (520) 623-8503
Fax (520) 623-8504


4A
4
25
28
27
29
33
5
31
32
26
30
34
6
7
EAST
A TEAM
PROFESSIONAL ASSOCIATES, INC.
1920 W. Peoria Ave.
Phoenix, Arizona 85745
Phone:(602) 906-0020
Fax:(602) 906-0019
1802 W. Grant Road
Tucson, Arizona 85745
Phone:(520) 623-8503
Fax:(520) 623-8504

A TEAM Professional Associates, INC.
GPS STATION LOG

1802 W. Grant Road - Ste 110-5 -Tucson, Arizona - 85745 - (520) 623-8503 - (520) 623-8504 Fax

Station Name: 0001
Receiver No: 6081
Day of Year: 273 1999
Session No: 0 (for fast static)

Project Name: MARICOPA COUNTY FCD
Job number: # 919
Local Date: mo. 9 day 30 year 1999
Operator: CHAD CLARK

C/A CODE POSITION

Beg:
Lat: : 33 ° 50 ' 33.60 " N
Long: 111 ° 58 ' 09.98 " W
Ellip. Height: 0624+ M PDOP: 2.0

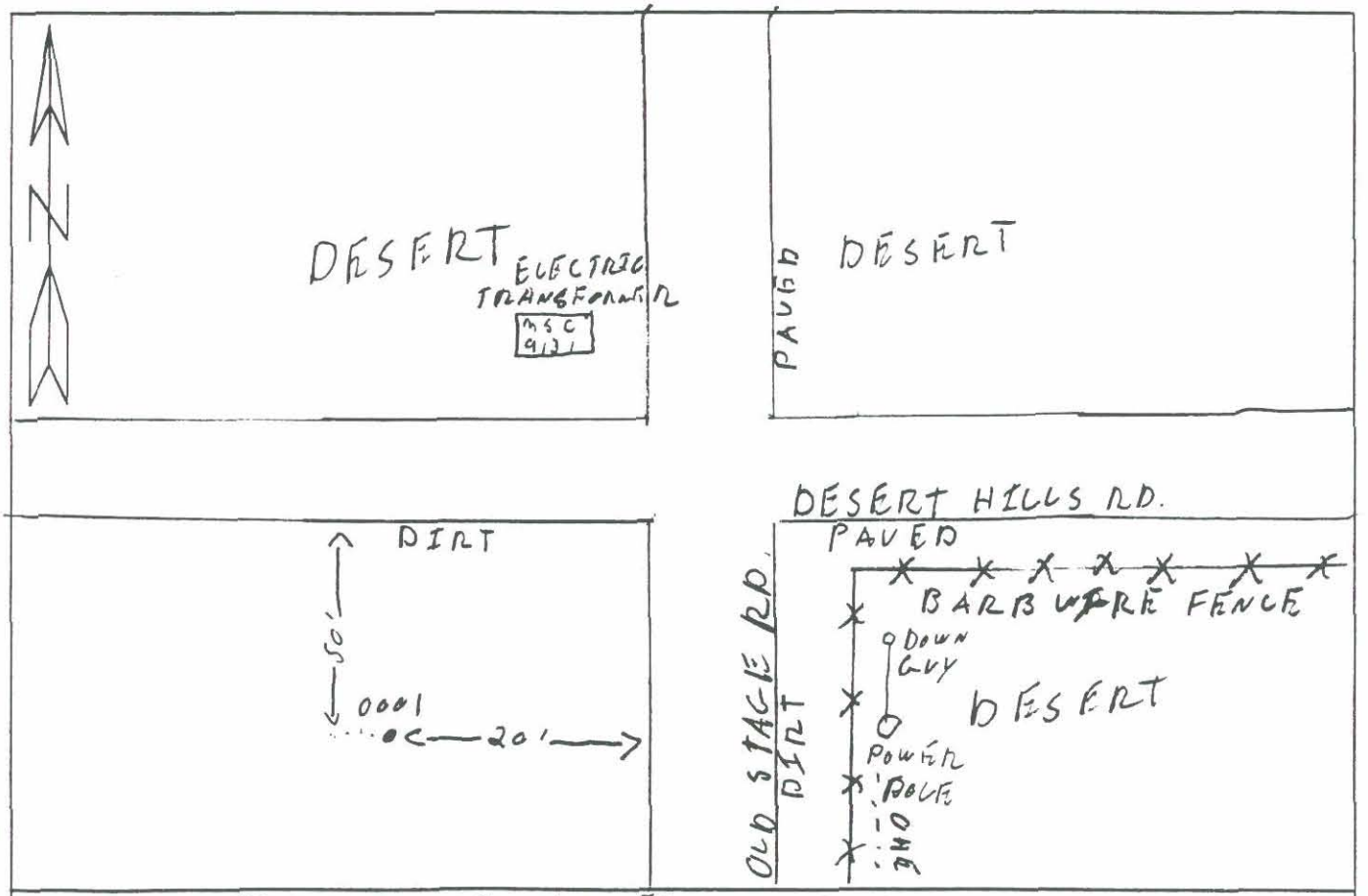
Ending:
Lat: 33 ° 50 ' 32.45 " N
Long: 111 ° 58 ' 09.75 " W
Ellip. Height: 0610- M PDOP: 2.3

Receiver Model: 4000 SSE (X) 4800 ( ) 4000 SE ( )
Antenna Type: CompL1/L2 w/GP (X) CompL1/L2 ( ) Geodetic( )
Tribrach: SoKKisha Wild (H/P) Topcon Pentax
Local-UTC Time Offset: MST= -7:00 08:51
Type of Survey: Fast Static (X) - Fast Static ( )
Actual= Start 15 :51 Stop: 16 :19 UTC
Beg. SV's Used: 03, 31, 08, 09, 17, 21, 23, 29
End SV's Used: 03, 31, 08, 09, 17, 21, 23, 29

Ant. Height (M) 1) 1.585 3) 1.584 5) 1.584 7) 1.584 9) 1.584 11) 1.585
2) 1.585 4) 1.584 6) 1.584 8) 1.584 10) 1.585 12) 1.585 Mean= 1.5845

(ft) 1) 5.20 3) 5.20
2) 5.19 Mean 5.20

Weather Conditions: (Clear) P. Cloudy Overcast Hot (Warm) Cool Cold Calm (Breezy) 85 °F +/-



Type of Monument: 60D NAIL WITH SHINER Stamping: —
Top of marker: (X) flush M ( ) above: ( ) below: Nat. Ground Detail Notes: END AT PANAL

Rubbing Performed ( )Yes (X)No

A TEAM Professional Associates, INC.

GPS STATION LOG

1802 W. Grant Road - Ste 110-5 -Tucson, Arizona - 85745 - (520) 623-8503 - (520) 623-8504 Fax

Station Name: #1
Receiver No: 7662
Day of Year: 274 1999
Session No: 0 (for fast static)

Project Name: Maricopa CO FOC
Job number: # 919
Local Date: mo. 10 day 1 year 1999
Operator: Jose Bonillas

C/A CODE POSITION

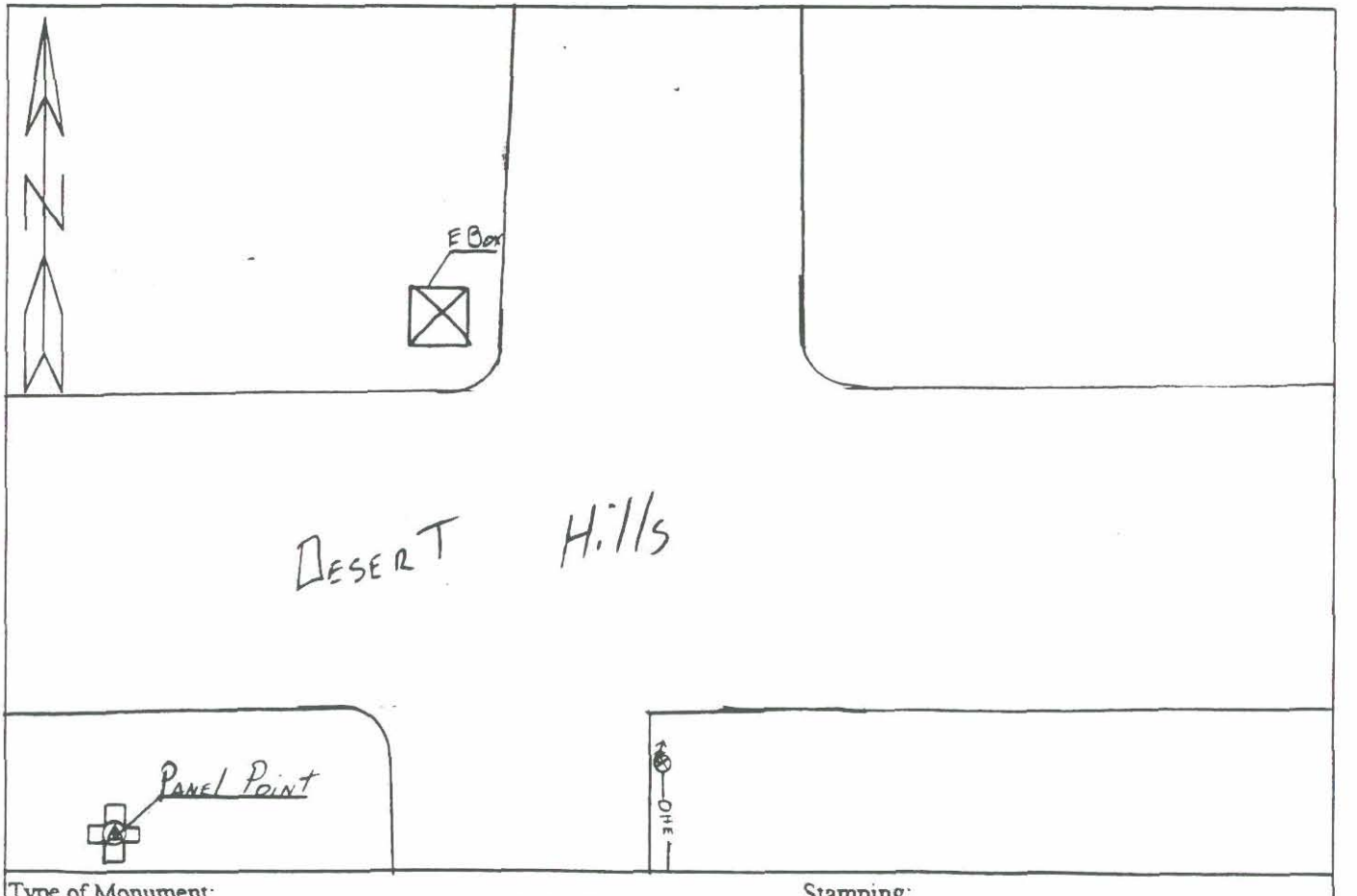
Beg:
Lat: : 33° 50 ' 31.29 " N
Long: 111 ° 58 ' 58.10 " W
Ellip. Height: 0555 + M PDOP: 3.0

Ending:
Lat: 33 ° 50 ' 32.89 " N
Long: 111 ° 58 ' 10.14 " W
Ellip. Height: 0610 - M PDOP: 2.1

Receiver Model: 4000 SSE (X) 4800 ( ) 4000 SE ( )
Antenna Type: CompL1/L2 w/GP (X) CompL1/L2 ( ) Geodetic( )
Tribrach: SoKKisha Wild H/P Topcon Pentax
Local-UTC Time Offset: MST= -7:00
Type of Survey: Fast Static (X) - Fast Static ( )
Actual= Start 19:14 Stop: 20:00 UTC
Beg. SV's Used: 01, 14, 15, 21, 25, 29, 30
End SV's Used: 01, 22, 14, 15, 21, 25, 29, 30

Ant. Height (M) 1) 1.566 2) 3) 4) 1.585 5) 1.585 6) 1.585 7) 8) 1.586 9) 1.586 10) 1.586 11) 1.566 12) 1.566 Mean= 1.586
(ft) 1) 3) 2) Mean

Weather Conditions: (Clear) P. Cloudy Overcast Hot (Warm) Cool Cold Calm (Breezy) °F +/-



Type of Monument: Stamping:
Top of marker: ( ) flush M ( ) above: ( ) below: Nat. Ground Detail Notes:

Rubbing Performed ( )Yes ( )No

A TEAM Professional Associates, INC.

GPS STATION LOG

1802 W. Grant Road - Ste 110-5 -Tucson, Arizona - 85745 - (520) 623-8503 - (520) 623-8504 Fax

Station Name: # 7
Receiver No: 7662
Day of Year: 274 1999
Session No: 0 (for fast static)

Project Name: MARICOPA CO FDC
Job number: # 919
Local Date: mo. 10 day 1 year 1999
Operator: JOSE BONILLAS

C/A CODE POSITION

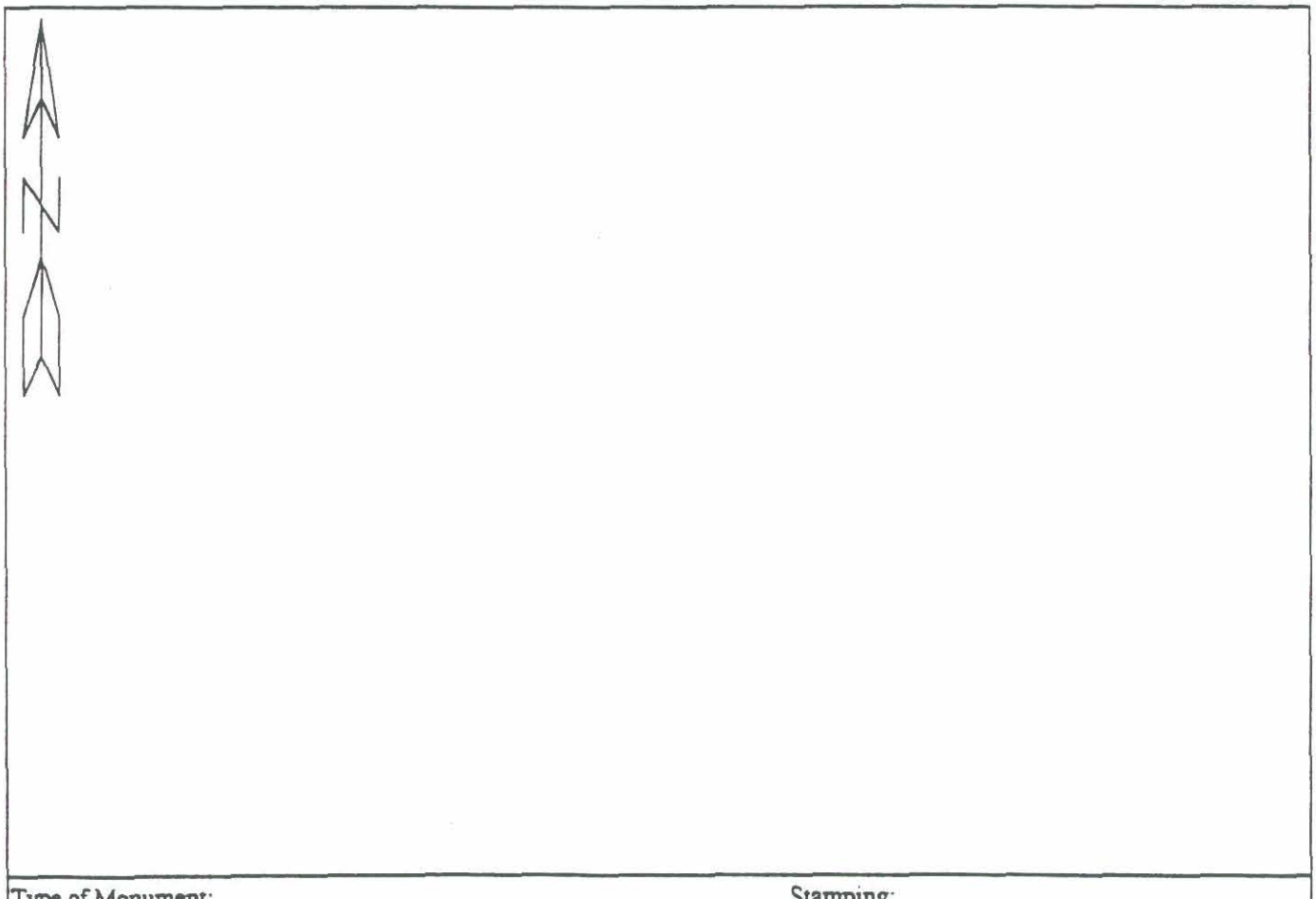
Beg:
Lat: : 33 ° 50 ' 32.41 " N
Long: 111 ° 58 ' 09.64 " W
Ellip. Height: -0583 M PDOP: 1.9

Ending:
Lat: 33 ° 50 ' 34.06 " N
Long: 111 ° 58 ' 10.86 " W
Ellip. Height: M PDOP: 3.0

Receiver Model: 4000 SSE (X) 4800 ( ) 4000 SE ( )
Antenna Type: CompL1/L2 w/GP (X) CompL1/L2 ( ) Geodetic( )
Tribrach: SoKKisha Wild H/P Topcon Pentax
Local-UTC Time Offset: MST= -7:00
Type of Survey: Fast Static (X) - Fast Static ( )
Actual= Start 20:39 Stop: 21:05 UTC
Beg. SV's Used: 01.14.15.16.22.25.29
End SV's Used: 01.14.15.16.22.25

Ant. Height (M): 1) 1.586 2) 1.586 3) 1.585 4) 1.585 5) 6) 7) 8) 9) 10) 11) 12) Mean= 1.585
(ft) 1) 3) 2) Mean

Weather Conditions: (Clear) P. Cloudy Overcast (Hot) Warm Cool Cold Calm (Breezy) °F +/-



Type of Monument: Stamping:
Top of marker: ( ) flush M ( ) above: ( ) below: Nat. Ground Detail Notes:

Rubbing Performed ( )Yes ( )No

A TEAM Professional Associates, INC.
GPS STATION LOG

1802 W. Grant Road - Ste 110-5 -Tucson, Arizona - 85745 - (520) 623-8503 - (520) 623-8504 Fax

Station Name: 1
Receiver No: 7662
Day of Year: 278 1999
Session No: 0 (for fast static)

Project Name: Maricopa County FCD
Job number: #
Local Date: mo. OCT day 4th year 1999
Operator: Clinton Fischer

C/A CODE POSITION

Beg:
Lat: : 33 ° 50 ' 33.19 " N
Long: 111 ° 58 ' 10.65 " W
Ellip. Height: 670 - M PDOP: 2.1

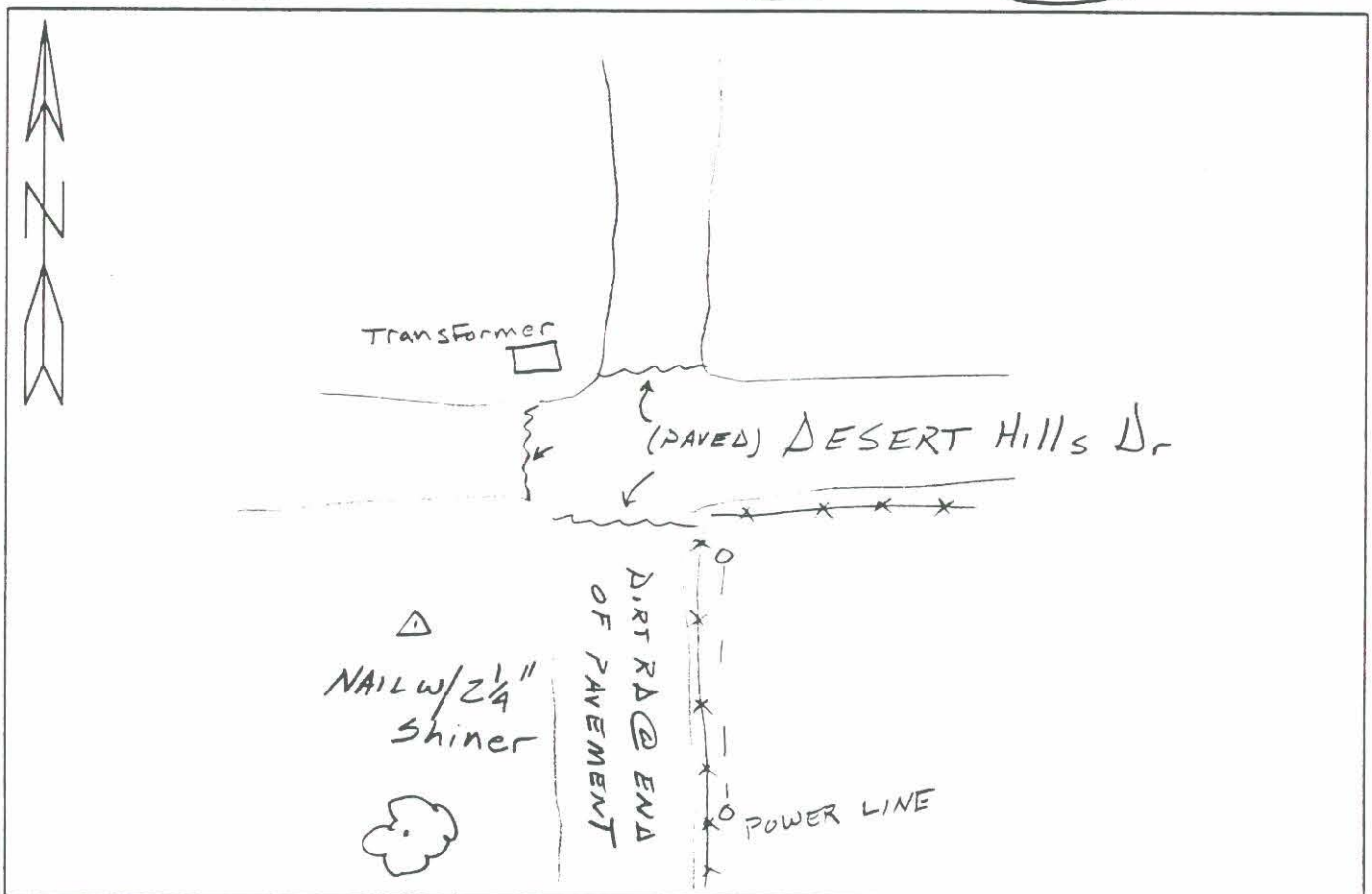
Ending:
Lat: 33 ° 50 ' 33.78 " N
Long: 111 ° 58 ' 10.33 " W
Ellip. Height: 609 + M PDOP: 2.0

Receiver Model: 4000 SSE (X) 4800 ( ) 4000 SE ( )
Antenna Type: CompL1/L2 w/GP (X) CompL1/L2 ( ) Geodetic( )
Tribrach: SoKKisha Wild H/P Topcon Pentax
Local-UTC Time Offset: MST= -7:00
Type of Survey: Fast Static (X) - Fast Static ( )
Actual= Start 17 : 45 Stop: 18 : 03 UTC
Beg. SV's Used: 01, 03, 08, 29, 15, 31, 21, 23, 25
End SV's Used: 01, 08, 29, 15, 31, 21, 23, 25

Ant. Height (M): 1) 1592 2) 1592 3) 1592 4) 1593 5) 1593 6) 1593 7) 1592 8) 1592 9) 1592 10) 1591 11) 1591 12) 1591 Mean= 1592

(ft) 1) 5.23 3) 5.22 2) 5.22 Mean

Weather Conditions: (Clear) P. Cloudy Overcast Hot (Warm) Cool Cold (Calm) Breezy °F +/-



Type of Monument: NAIL W 2 1/4" Shiner Stamping: —
Top of marker: (X) flush M ( ) above: ( ) below: Nat. Ground Detail Notes: —

Rubbing Performed ( )Yes (X)No

A TEAM Professional Associates, INC.
GPS STATION LOG

1802 W. Grant Road - Ste 110-5 -Tucson, Arizona - 85745 - (520) 623-8503 - (520) 623-8504 Fax

Station Name: 0002
Receiver No: 6081
Day of Year: 273 1999
Session No: 0 (for fast static)

Project Name: MARICOP COUNTY FCD
Job number: #919
Local Date: mo. 9 day 30 year 1999
Operator: CHAD CLARK

C/A CODE POSITION

Beg:
Lat:: 33 ° 50 ' 59.56 " N
Long: 111 ° 56 ' 38.05 " W
Ellip. Height: 0677+ M PDOP: 1.9

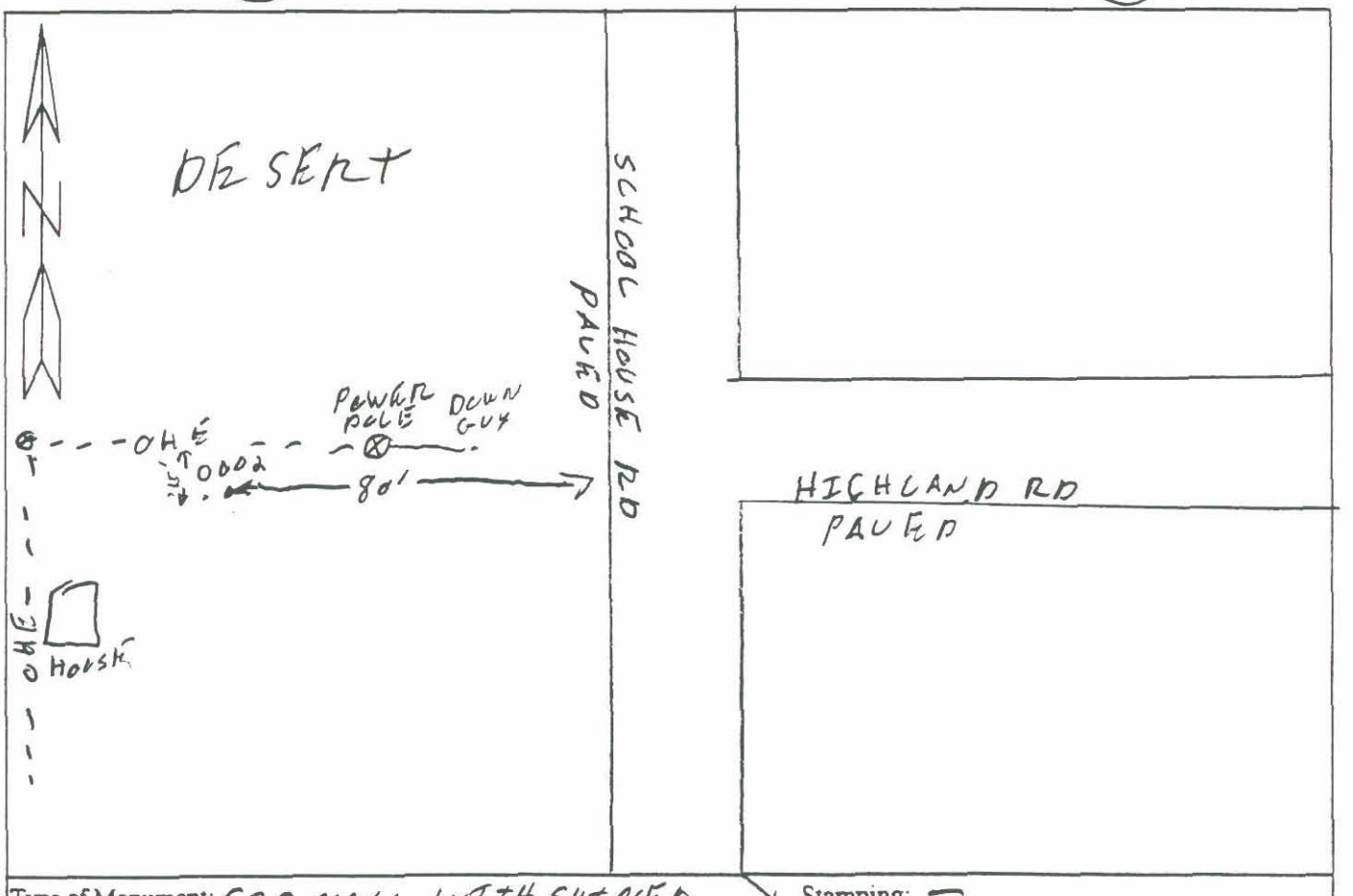
Ending:
Lat: 33 ° 50 ' 59.52 " N
Long: 111 ° 56 ' 36.91 " W
Ellip. Height: 0640 M PDOP: 1.9

Receiver Model: 4000 SSE (X) 4800 ( ) 4000 SE ( )
Antenna Type: CompL1/L2 w/GP (X) CompL1/L2 ( ) Geodetic( )
Tribrach: SoKKisha Wild (H/P) Topcon Pentax
Local-UTC Time Offset: MST= -7:00 10:28
Type of Survey: Fast Static (X) - Fast Static ( )
Actual= Start 17 : 28 Stop: 17 : 39 UTC
Beg. SV's Used: 03, 08, 31, 15, 17, 21, 23, 25
End SV's Used: 29, 03, 08, 31, 15, 17, 21, 23, 25

Ant. Height (M)
1) 1.550 3) 1.550 5) 1.549 7) 1.549 9) 1.551 11) 1.550
2) 1.550 4) 1.549 6) 1.5498) 1.551 10) 1.551 12) 1.550 Mean= 1.550

(ft) 1) 5.09 3) 5.10
2) 5.08 Mean 5.09

Weather Conditions: (Clear) P. Cloudy Overcast Hot (Warm) Cool Cold Calm (Breezy) 95 °F +/-



Type of Monument: GOOD NAIL WITH SHINER Stamping: —
Top of marker: (X) flush M ( ) above: ( ) below: Nat. Ground Detail Notes: FOUND AT PANEL

Rubbing Performed ( )Yes (X)No

A TEAM Professional Associates, INC.
GPS STATION LOG

1802 W. Grant Road - Ste 110-5 -Tucson, Arizona - 85745 - (520) 623-8503 - (520) 623-8504 Fax

Station Name: #02
Receiver No: 60282
Day of Year: 274 1999
Session No: 07 (for fast static)

Project Name: Maricopa Co. F.D.C.
Job number: # 919
Local Date: mo. 10 day 1 year 1999
Operator: Matt Dawson +2

C/A CODE POSITION

Beg:
Lat: : 33° 50 '57.93 "N
Long: 111° 56 '37.04 "W
Ellip. Height: 05606- M PDOP: 2.9

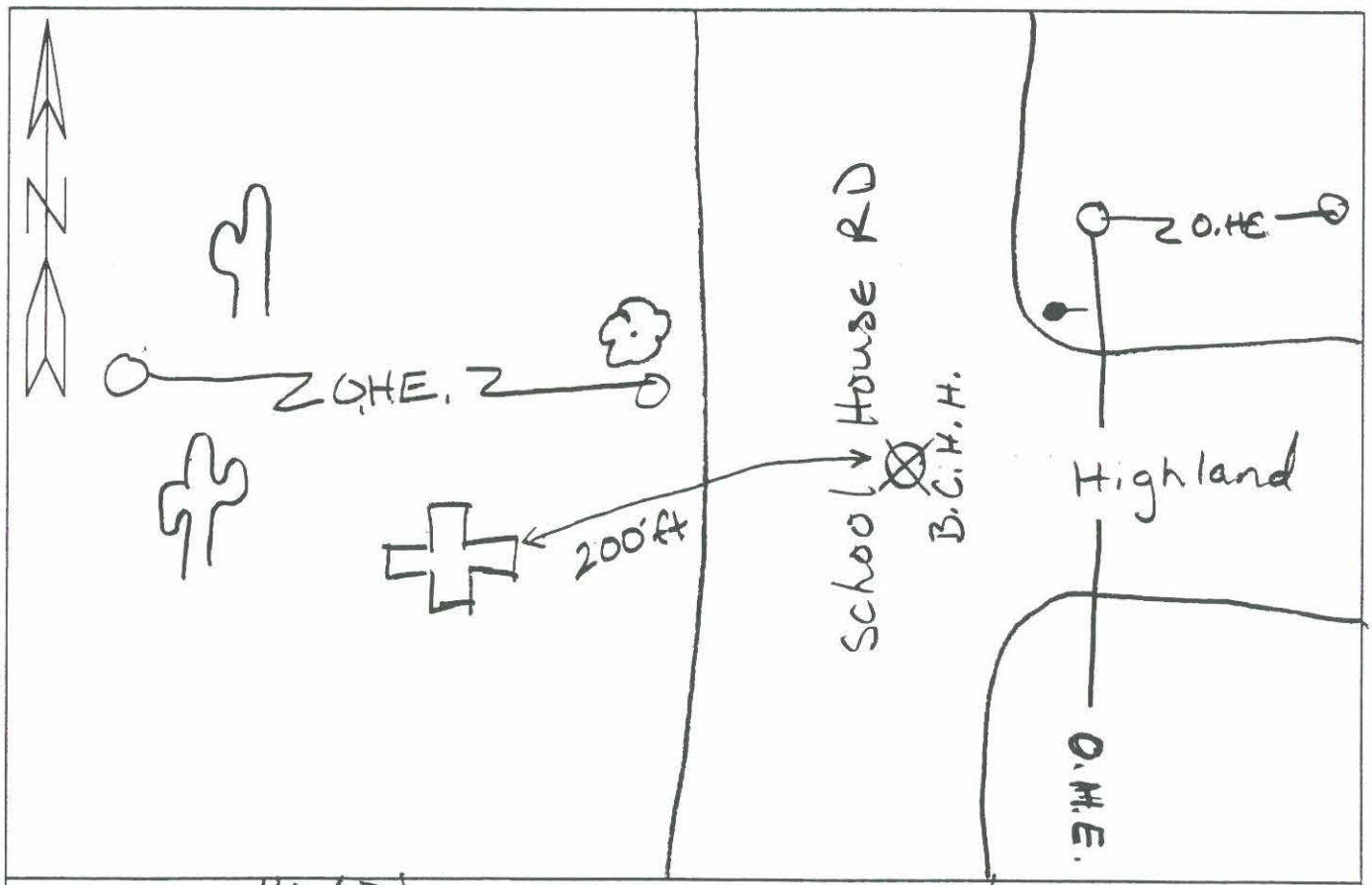
Ending:
Lat: 33° 50 '59.32 "N
Long: 111° 56 '37.08 "W
Ellip. Height: 06038+ M PDOP: 2.1

Receiver Model: 4000 SSE (X) 4800 ( ) 4000 SE ( )
Antenna Type: CompL1/L2 w/GP (X) CompL1/L2 ( ) Geodetic( )
Tribrach: SoKKisha Wild H/P Topcon Pentax
Local-UTC Time Offset: MST= -7:00 11:52
Type of Survey: Fast Static (X) - Fast Static ( )
Actual= Start 18:52 Stop: 20:00 UTC
Beg. SV's Used: 01, 29, 30, 14, 15, 21, 25
End SV's Used: 01, 29, 30, 22, 14, 15, 21, 25

Ant. Height (M)
1) 1.568 3) 1.570 5) 1.566 7) 1.567 9) 1.566 11) 1.566
2) 1.570 4) 1.570 6) 1.568 8) 1.567 10) 1.567 12) 1.566 Mean= 1.567.

(ft) 1) 5.14 3) 5.14
2) 5.15 Mean 5.14

Weather Conditions: Clear P. Cloudy Overcast Hot Warm Cool Cold Calm Breezy °F +/-



Type of Monument: 40(D) Stamping: None
Top of marker: (Y flush M ( ) above: ( ) below: Nat. Ground Detail Notes: At the intersection of School House & Highland on the West side of School House on P. Pole Line west of 1st Pole
Rubbing Performed ( )Yes ( )No

A TEAM Professional Associates, INC.
GPS STATION LOG

1802 W. Grant Road - Ste 110-5 -Tucson, Arizona - 85745 - (520) 623-8503 - (520) 623-8504 Fax

Station Name: # 02
Receiver No: 10082
Day of Year: 274 1999
Session No: 06 (for fast static)

Project Name: Maricopa Co. F.D.C.
Job number: # 91.7
Local Date: mo 10 day 1 year 1999
Operator: Matt Danetown, Jr.

C/A CODE POSITION

Beg:
Lat: : 33° 50 · 59.72" N
Long: 111° 56 · 36.81" W
Ellip. Height: 0649.- M PDOP: 2.7

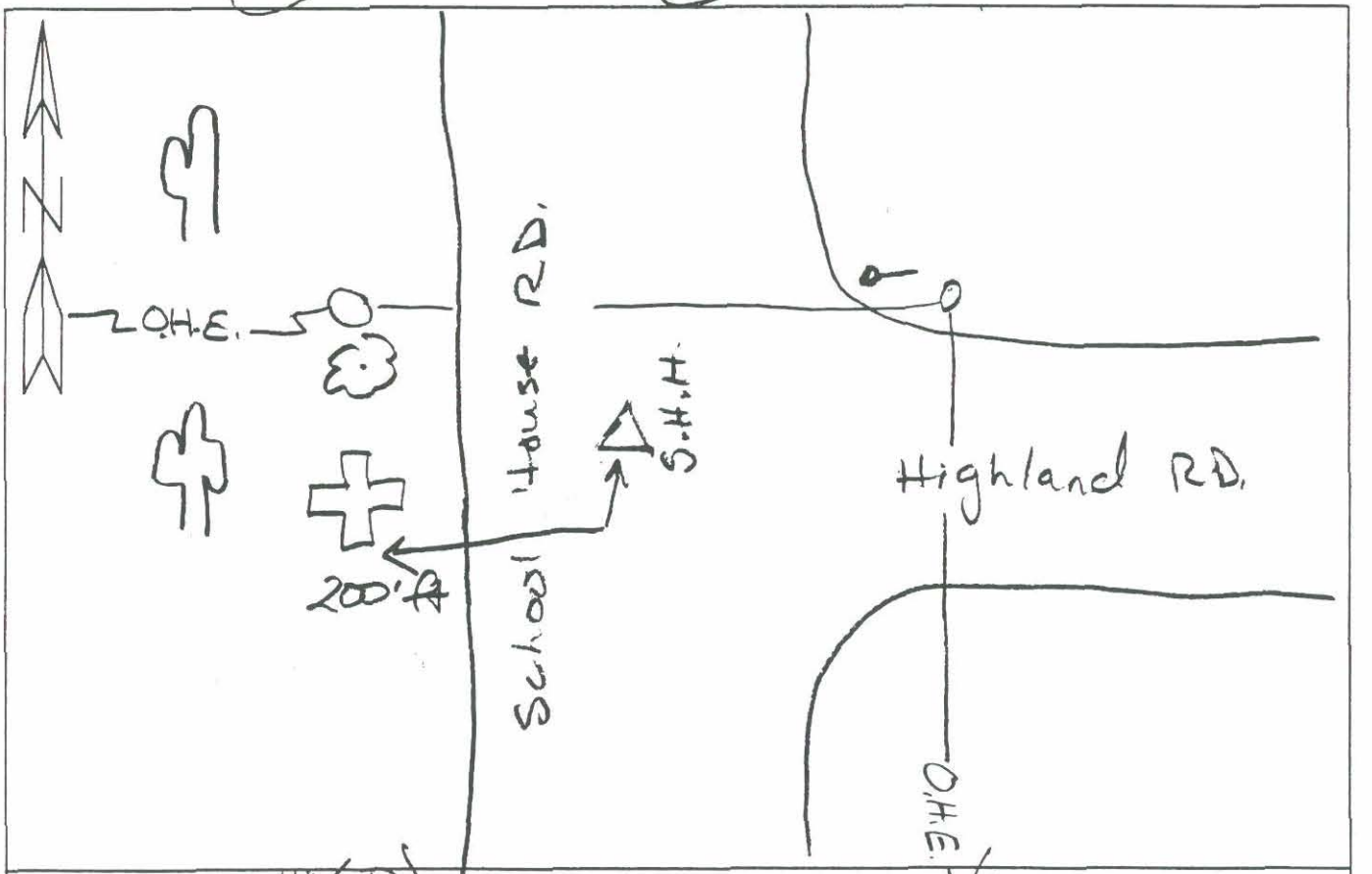
Ending:
Lat: 33° 51 · 00.46" N
Long: 111° 56 · 37.84" W
Ellip. Height: 0624.- M PDOP: 3.0

Receiver Model: 4000 SSE (X) 4800 ( ) 4000 SE ( )
Antenna Type: ~~CompL1/L2 w/GP~~ (X) CompL1/L2 ( ) Geodetic( )
Tribrach: SoKKisha Wild H/P Topcon Pentax
Local-UTC Time Offset: 3.37 MST= -7:00
Type of Survey: Fast Static (X) - Fast Static ( )
Actual= Start 20:37 Stop: 21:08 UTC
Beg. SV's Used: 01, 14, 15, 16, 22, 25
End SV's Used: 01, 14, 15, 16, 22, 25

Ant. Height (M) 1) 1.567 3) 1.567 5) 1.567 7) 1.567 9) 1.567 11) 1.567
2) 1.567 4) 1.567 6) 1.567 8) 1.567 10) 1.567 12) 1.567 Mean= 1.567

(ft) 1) ~~5.15~~ 3) 5.15
2) 5.15 Mean 5.15

Weather Conditions: (Clear) P. Cloudy Overcast (Hot) Warm Cool Cold Calm Breezy °F +/-



Type of Monument: 48(D) Stamping: None
Top of marker: (X) flush M ( ) above: ( ) below: Nat. Ground
Detail Notes: At the intersection of School House & Highland. On the west side of School House in Desert ON Power Pole line behind the 1ST Power Pole
Rubbing Performed ( ) Yes (X) No

A TEAM Professional Associates, INC.
GPS STATION LOG

1802 W. Grant Road - Ste 110-5 -Tucson, Arizona - 85745 - (520) 623-8503 - (520) 623-8504 Fax

Station Name: 003
Receiver No: 6082
Day of Year: 273 1999
Session No: 0 (for fast static)

Project Name: MC FLOOD
Job number: # 919
Local Date: mo. 09 day 30 year 1999
Operator: C. STUART

C/A CODE POSITION

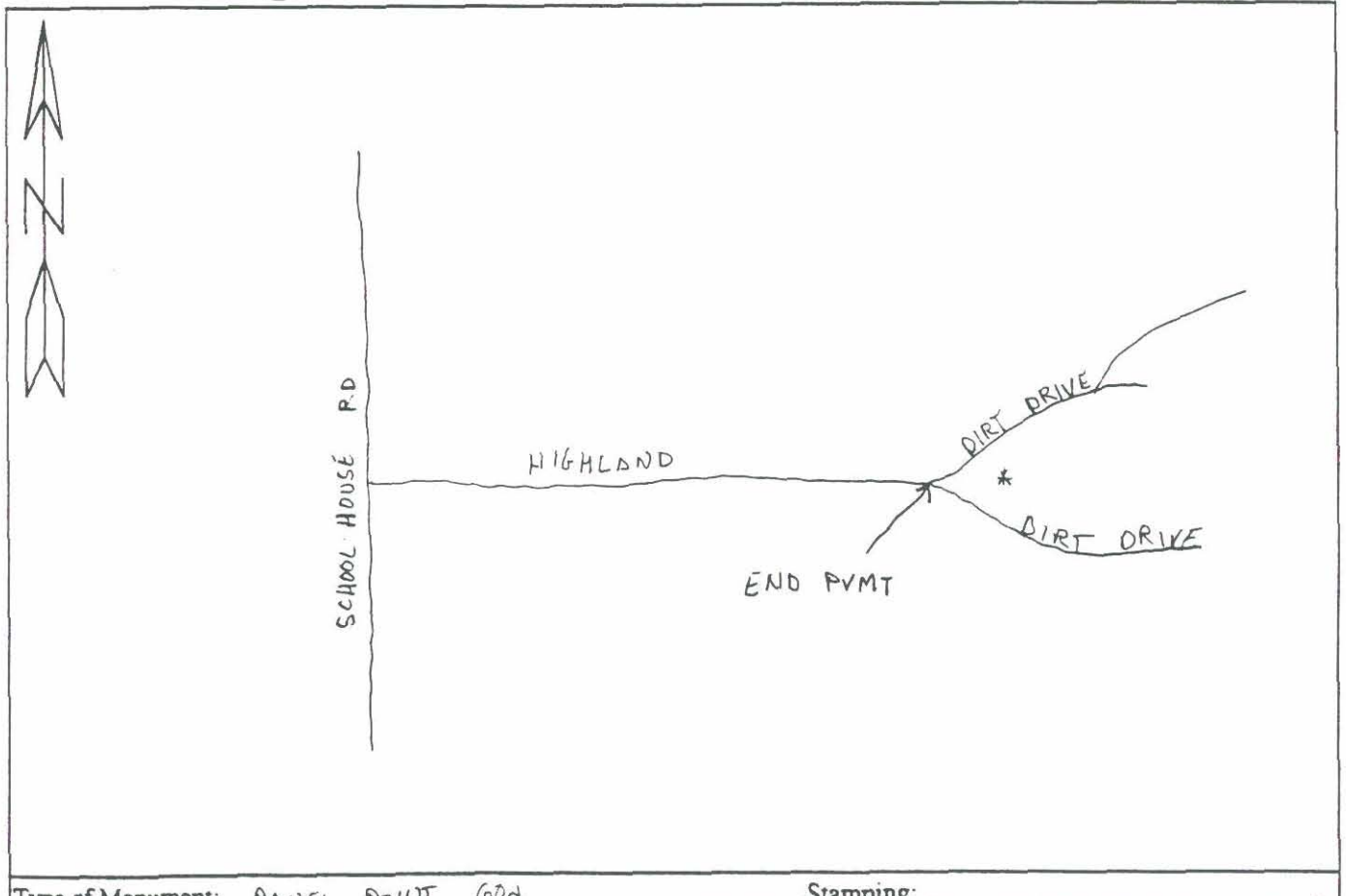
Beg:
Lat: : 33 ° 50 ' 58.82 " N
Long: 111 ° 55 ' 12.65 " W
Ellip. Height: +0716.2 – M PDOP: 2.21

Ending:
Lat: 33 ° 50 ' 00.61 " N
Long: 111 ° 55 ' 11.96 " W
Ellip. Height: +0765.5 + M PDOP: 3.21

Receiver Model: 4000 SSE (X) 4800 ( ) 4000 SE ( )
Antenna Type: CompL1/L2 w/GP (X) CompL1/L2 ( ) Geodetic( )
Tribrach: SoKKisha Wild H/P (Topcon) Pentax
Local-UTC Time Offset: MST= -7:00
Type of Survey: Fast Static (X) - Fast Static ( )
Actual= Start 19:01 Stop: 19:35 UTC
Beg. SV's Used: 01, 30, 08, 14, 15, 21, 25, 29
End SV's Used: 01, 30, 14, 15, 21, 25, 29

Ant. Height (M) 1) 1.589 3) 1.598 5) 1.588 7) 1.578 9) 1.579 11) 2) 1.60 4) 1.582 6) 1.5788) 1.576 10) 12) Mean= 1.585 (ft) 1) 3) 2) Mean

Weather Conditions: (Clear) P. Cloudy Overcast Hot (Warm) Cool Cold (Calm) Breezy 90 °F +/-



Type of Monument: PANEL POINT GOOD Stamping:
Top of marker: (X) flush M ( ) above: ( ) below: Nat. Ground Detail Notes:

Rubbing Performed ( )Yes (X)No

A TEAM Professional Associates, INC.
GPS STATION LOG

1802 W. Grant Road - Ste 110-5 -Tucson, Arizona - 85745 - (520) 623-8503 - (520) 623-8504 Fax

Station Name: 03
Receiver No: 6082
Day of Year: 273 1999
Session No: 0 (for fast static)

Project Name: Mc FLOOD
Job number: # 919
Local Date: mo. 09 day 30 year 1999
Operator: C. STUART

C/A CODE POSITION

Beg:
Lat: : 33 ° 51 ' 00.60 " N
Long: 111 ° 55 ' 11.56 " W
Ellip. Height: + 0726.4 + M PDOP: 1.1

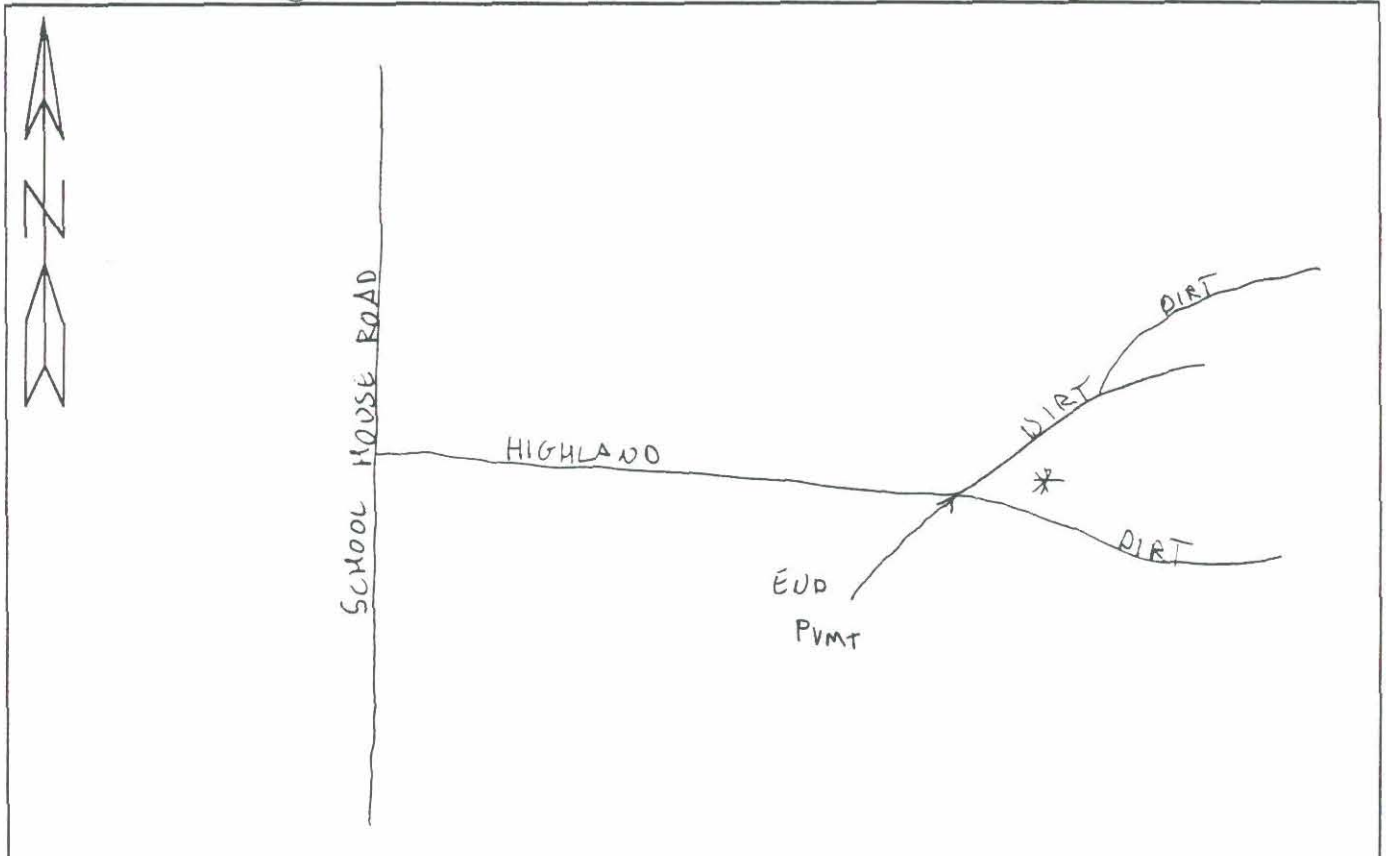
Ending:
Lat: 33 ° 51 ' 00.96 " N
Long: 111 ° 55 ' 12.11 " W
Ellip. Height: + 0728.6 + M PDOP: 2.21

Receiver Model: 4000 SSE (X) 4800 ( ) 4000 SE ( )
Antenna Type: CompL1/L2 w/GP (X) CompL1/L2 ( ) Geodetic( )
Tribrach: SoKKisha Wild H/P Topcon Pentax
Local-UTC Time Offset: MST= -7:00
Type of Survey: Fast Static (X) - Fast Static ( )
Actual= Start 20 : 20 Stop: 20.45 UTC
Beg. SV's Used: 01, 14, 15, 21, 22, 25, 29
End SV's Used: 01, 14, 15, 16, 22, 29

Ant. Height (M) 1) 1.500 3) 1.504 5) 1.494 7) 1.482 9) 1.485 11)
2) 1.5104) 1.4966) 1.4848) 1.48410) 12) Mean= 1.493

(ft) 1) 4.85 3) 4.89
2) 4.90 Mean 4.88

Weather Conditions: (Clear) P. Cloudy Overcast Hot (Warm) Cool Cold (Calm) Breezy 90 °F +/-



Type of Monument: PANEL POINT 6021/SHINER Stamping:
Top of marker: (X) flush M ( ) above: ( ) below: Nat. Ground Detail Notes:

Rubbing Performed ( )Yes (X)No

22:29
PDOP 6.1

A TEAM Professional Associates, INC.
GPS STATION LOG

1802 W. Grant Road - Ste 110-5 -Tucson, Arizona - 85745 - (520) 623-8503 - (520) 623-8504 Fax

Station Name: 3
Receiver No: 7662
Day of Year: 278 1999
Session No: 0 (for fast static)

Project Name: Maricopa County FCD
Job number: #
Local Date: mo. OCT day 4th year 1999
Operator: Clinton Fischer

C/A CODE POSITION

Beg:
Lat: : 33 ° 51 · 01.80 " N
Long: 111 ° 55 · 12.03 " W
Ellip. Height: 739 - M PDOP: 2.6

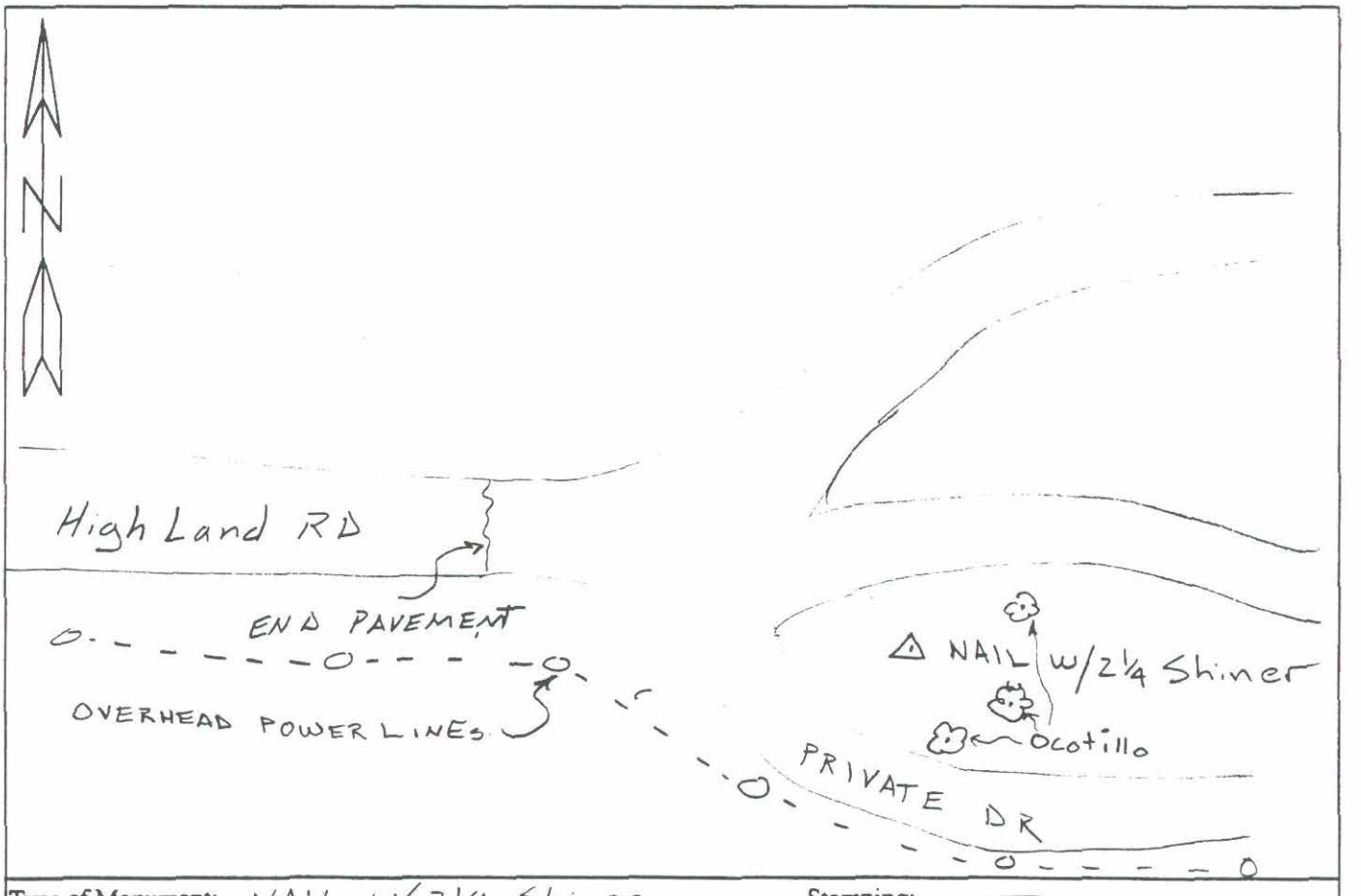
Ending:
Lat: 33 ° 51 · 01.60 " N
Long: 111 ° 55 · 12.45 " W
Ellip. Height: 833+ M PDOP: 3.2

Receiver Model: 4000 SSE (X) 4800 ( ) 4000 SE ( )
Antenna Type: CompL1/L2 w/GP (X) CompL1/L2 ( ) Geodetic( )
Tribrach: SoKKisha Wild H/P Topcon Pentax
Local-UTC Time Offset: MST= -7:00
Type of Survey: Fast Static (X) - Fast Static ( )
Actual= Start 18 :46 Stop: 19 :09 UTC
Beg. SV's Used: 01, 29, 30, 14, 15, 21, 25,
End SV's Used: 01, 29, 30, 14, 15, 21, 25

Ant. Height (M) 1)1563 3)1569 5)1567 7)1563 9)1563 11)1562
2)1563 4)1564 6)1567 8)1563 10)1562 12)1562 Mean= 1563

(ft) 1)5.12 3)5.13
2)5.12 Mean

Weather Conditions: (Clear) P. Cloudy Overcast (Hot) Warm Cool Cold (Calm) Breezy °F +/-



Type of Monument: NAIL w/2¼ Shiner Stamping: —
Top of marker: (X) flush M ( ) above: ( ) below: Nat. Ground Detail Notes: —

Rubbing Performed ( )Yes (X)No

20:44

A TEAM Professional Associates, INC.

GPS STATION LOG

1802 W. Grant Road - Ste 110-5 -Tucson, Arizona - 85745 - (520) 623-8503 - (520) 623-8504 Fax

Station Name: # 04
Receiver No: 7662
Day of Year: 273 1999
Session No: 0 (for fast static)

Project Name: Maricopa Co. F.C.D.
Job number: # 1919
Local Date: mo. 09 day 30 year 1999
Operator: Matt Danelow, TZ

File 7662-273-1

C/A CODE POSITION

Beg:
Lat: : 33° 50 57.04 "N
Long: 111° 54 32.26 "W
Ellip. Height: 0631+ M PDOP: 6.1

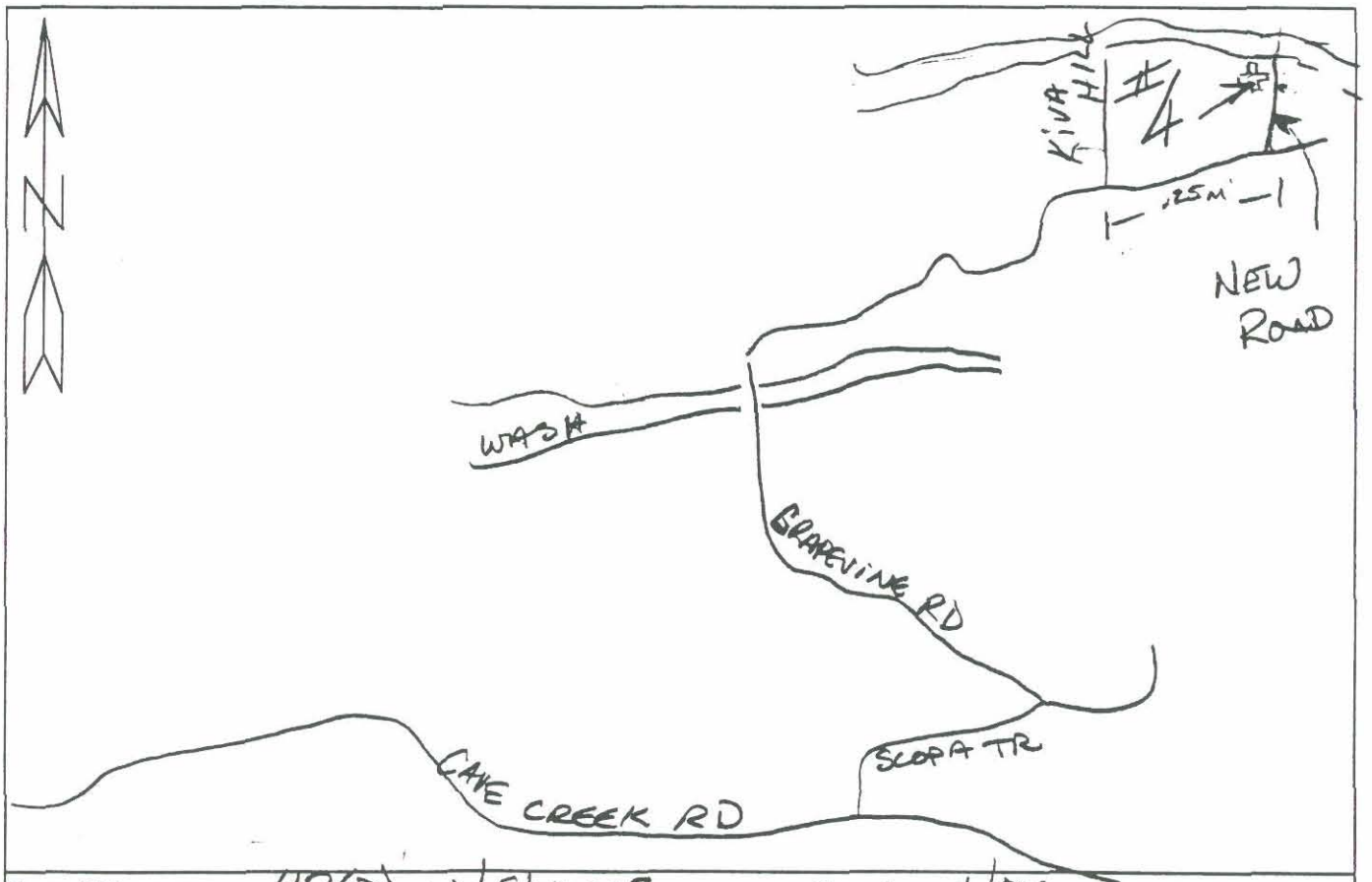
Ending:
Lat: 33° 50 56.33 "N
Long: 111° 54 30.21 "W
Ellip. Height: 0756+ M PDOP: 2.8

Receiver Model: 4000 SSE (X) 4800 ( ) 4000 SE ( )
Antenna Type: CompL1/L2 w/GP (X) CompL1/L2 ( ) Geodetic( )
Tribrach: SoKKisha Wild H/P (Topcon) Pentax
Local-UTC Time Offset: 12:16 MST= -7:00
Type of Survey: Fast Static (X) - Fast Static ( )
Actual= Start 20:16 Stop: : UTC
Beg. SV's Used: 01, 14, 15, 21, 22, 29
End SV's Used: 01, 14, 15, 16, 22

Ant. Height (M)
1) 14.40 2) 14.41 3) 14.41 4) 14.40 5) 14.40 6) 14.40 7) 14.40 8) 14.41 9) 14.40 10) 14.40 11) 14.41 12) 14.41 Mean= 14.40

(ft) 1) 4.72 2) 4.72 3) 4.73 Mean 4.72

Weather Conditions: (Clear) P. Cloudy Overcast (Hot) Warm Cool Cold Calm Breezy °F +/-



Type of Monument: 40(D) w/ Shinner Stamping: None
Top of marker: (Flush M ( ) above: ( ) below: Nat. Ground Detail Notes: 1/4 mi EAST KIVA HILL 2 mi west of tum cacari North on dirt Rd. 1/4 mi. before wash on west side of Rd.
Rubbing Performed ( )Yes ( )No

A TEAM Professional Associates, INC.
GPS STATION LOG

1802 W. Grant Road - Ste 110-5 -Tucson, Arizona - 85745 - (520) 623-8503 - (520) 623-8504 Fax

Station Name: #04A
Receiver No: 7662
Day of Year: 273 1999
Session No: 0 (for fast static)

Project Name: Maricopa Co F.D.C.
Job number: # 917
Local Date: mo 09 day 30 year 1999
Operator: Matt Danelowitz

C/A CODE POSITION

Beg:
Lat: : 33° 57 02: 30 "N
Long: 111 °53 36 12 "W
Ellip. Height: 0805 + M PDOP: 3.5

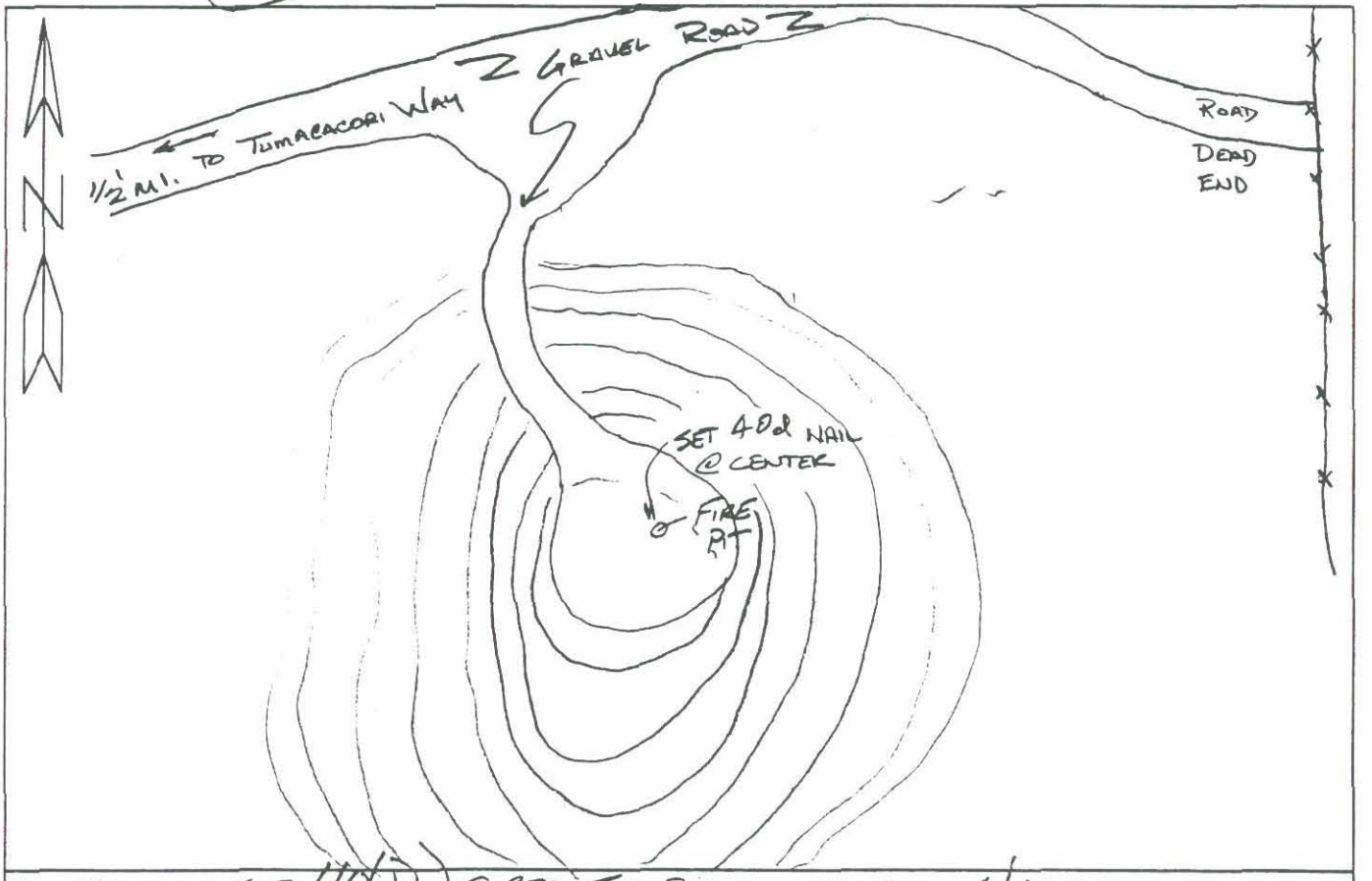
Ending:
Lat: 33 ° 51 01:36 "N
Long: 111 ° 53 37 87 "W
Ellip. Height: 0924 - M PDOP: 3.8

Receiver Model: 4000 SSE (X) 4800 ( ) 4000 SE ( )
Antenna Type: CompL1/L2 w/GP (X) CompL1/L2 ( ) Geodetic( )
Tribrach: SoKKisha Wild H/P Topcon Pentax
Local-UTC Time Offset: MST= -7:00
Type of Survey: Fast Static (X) - Fast Static ( )
Actual= Start 9 :17 Stop: 9 :41 UTC
Beg. SV's Used: 01, 14, 15, 16, 22
End SV's Used: 01, 14, 15, 16, 18, 22

Ant. Height (M) 1) 1.603 3) 1.603 5) 1.602 7) 1.602 9) 1.602 11) 1.602
2) 1.603 4) 1.602 6) 1.602 8) 1.602 10) 1.602 12) 1.602 Mean= 1.602

(ft) 1) 5.24 3) 5.23
2) 5.24 Mean 5.24

Weather Conditions: Clear P. Cloudy Overcast Hot Warm Cool Cold Calm Breezy °F +/-



Type of Monument: Set 40(D) @ CTR FIRE PIT Stamping: None
Top of marker: (X) flush M ( ) above: ( ) below: Nat. Ground Detail Notes:

Rubbing Performed ( )Yes ( )No

A TEAM Professional Associates, INC.
GPS STATION LOG

1802 W. Grant Road - Ste 110-5 -Tucson, Arizona - 85745 - (520) 623-8503 - (520) 623-8504 Fax

Station Name: 0005
Receiver No: 6081
Day of Year: 273 1999
Session No: 0 (for fast static)

Project Name: MARICOPA COUNTY FCD
Job number: #919
Local Date: mo. 9 day 30 year 1999
Operator: CHAD CLARK

C/A CODE POSITION

Beg:
Lat: : 33 ° 49 ' 40.67 " N
Long: 111 ° 52 ' 30.19 " W
Ellip. Height: 0707+ M PDOP: 6.1

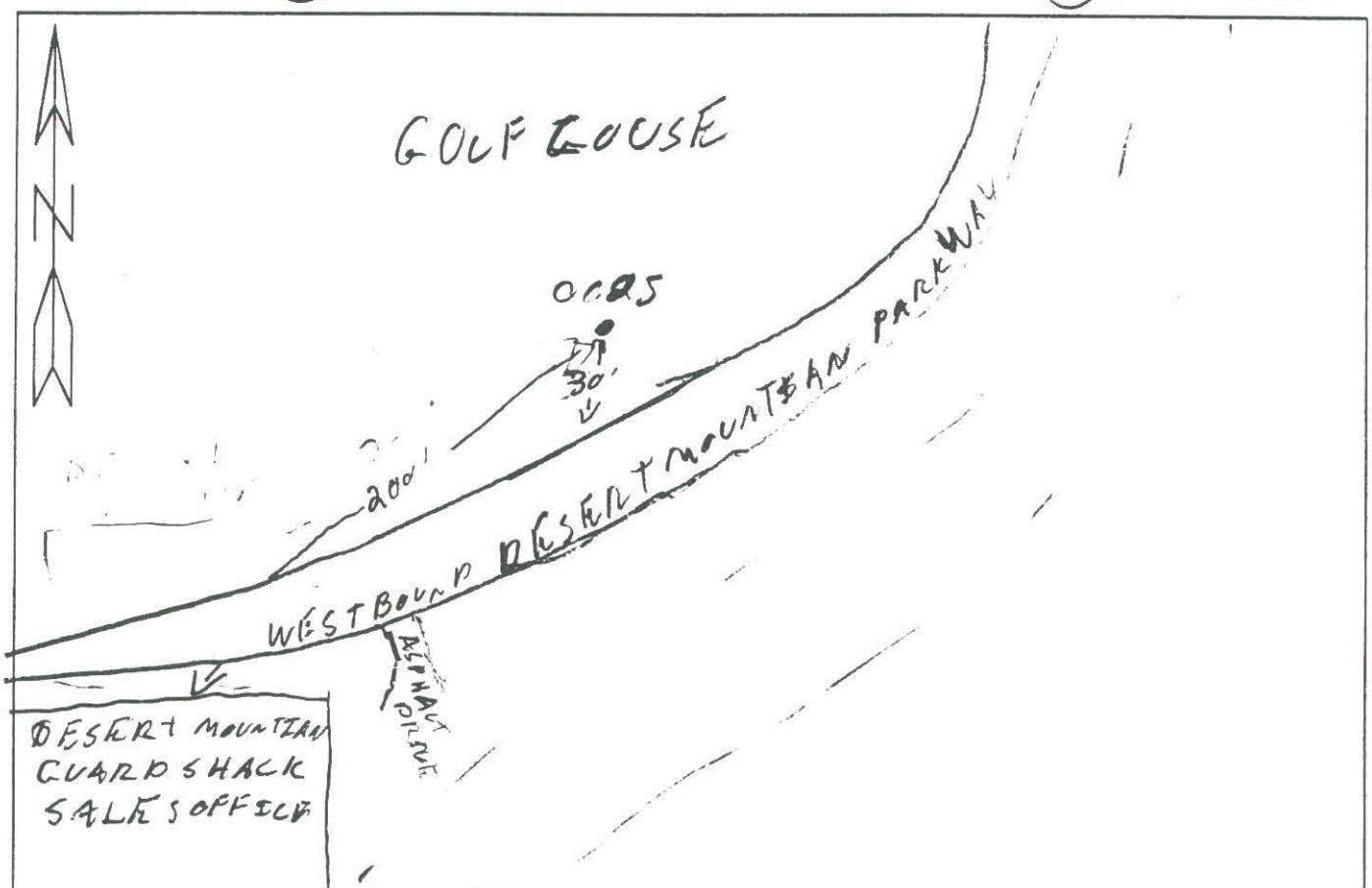
Ending:
Lat: 33 ° 49 ' 41 01 " N
Long: 111 ° 52 ' 29.05 " W
Ellip. Height: 0826- M PDOP: 2.2

Receiver Model: 4000 SSE (X) 4800 ( ) 4000 SE ( )
Antenna Type: CompL1/L2 w/GP (X) CompL1/L2 ( ) Geodetic( )
Tribrach: SoKKisha Wild (H/P) Topcon Pentax
Local-UTC Time Offset: MST= -7:00 13:29
Type of Survey: Fast Static (X) - Fast Static ( )
Actual= Start 20 : 29 Stop: 20 : 44 UTC
Beg. SV's Used: 01, 14, 15, 21, 22, 29
End SV's Used: 01, 14, 15, 16, 22, 29

Ant. Height (M) 1) 1.535 3) 1.535 5) 1.535 7) 1.537 9) 1.537 11) 1.536
2) 1.535 4) 1.536 6) 1.534 8) 1.537 10) 1.536 12) 1.536 Mean= 1.536

(ft) 1) 5.04 3) 5.04
2) 5.05 Mean 5.04

Weather Conditions: (Clear) P. Cloudy Overcast (Hot) Warm Cool Cold (Calm) Breezy 101 °F +/-



Type of Monument: 60D NAIL WIT. SHINER Stamping: —
Top of marker: (X) flush M ( ) above: ( ) below: Nat. Ground Detail Notes: FOUND AT PANAL

Rubbing Performed ( )Yes (X)No

A TEAM Professional Associates, INC.
GPS STATION LOG

1802 W. Grant Road - Ste 110-5 -Tucson, Arizona - 85745 - (520) 623-8503 - (520) 623-8504 Fax

Station Name: 006 . Project Name: McFLOOD .
Receiver No: 6082 . Job number: #919 .
Day of Year: 273 1999 . Local Date: mo. 09 day 30 year 1999 .
Session No: 0 (for fast static) . Operator: C. STODART .

C/A CODE POSITION

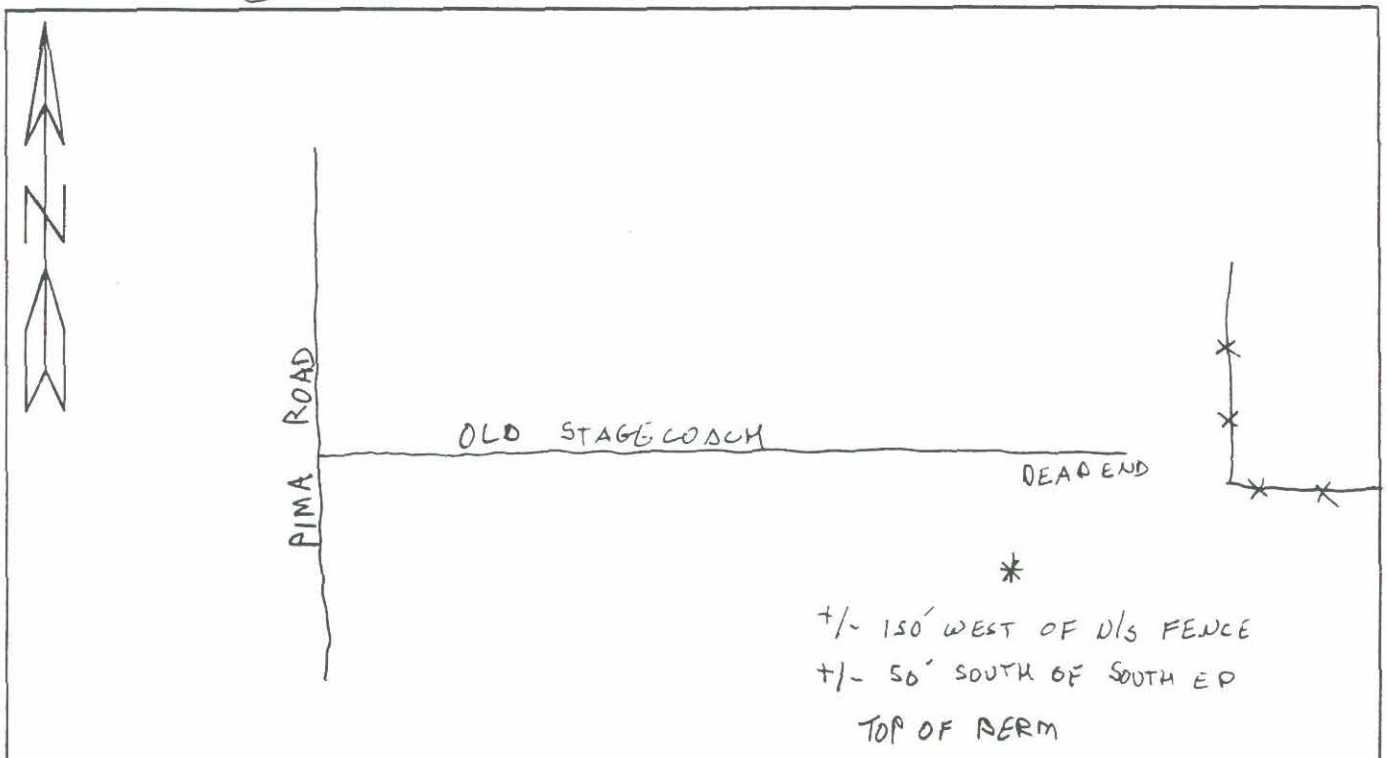
Beg:
Lat: : 33 ° 48 ' 49.09 " N
Long: 111 ° 52 ' 28.61 " W
Ellip. Height: +0824.7 - M PDOP: 3.71 .

Ending:
Lat: 33 ° 48 ' 50.15 " N
Long: 111 ° 52 ' 30.17 " W
Ellip. Height: +0794.5 - M PDOP: 3.01 .

Receiver Model: 4000 SSE (X) 4800 ( ) 4000 SE ( ) .
Antenna Type: CompL1/L2 w/GP (X) CompL1/L2 ( ) Geodetic( )
Tribrach: SoKKisha Wild H/P (Topcon) Pentax .
Local-UTC Time Offset: MST= -7:00 .
Type of Survey: Fast Static (X) - Fast Static ( ) .
Actual= Start 21:22 . Stop: 21:44 . UTC
Beg. SV's Used: 01, 14, 16, 15, 22 .
End SV's Used: 01, 14, 15, 16, 18, 22 .

Ant. Height (M) 1) 1.522 3) 1.524 5) 1.539 7) 1.522 9) 1.518 11) 12) Mean= 1.524 .
(ft) 1) 5.02 3) 4.96. 2) 4.98 Mean .

Weather Conditions: (Clear) P. Cloudy Overcast (Hot) Warm Cool Cold (Calm) Breezy 100 °F +/- .



Type of Monument: PP 60d / SHINER Stamping: .
Top of marker: (X) flush M ( ) above: ( ) below: Nat. Ground Detail Notes: .

Rubbing Performed ( )Yes (X)No .

A TEAM Professional Associates, INC.
GPS STATION LOG

1802 W. Grant Road - Ste 110-5 -Tucson, Arizona - 85745 - (520) 623-8503 - (520) 623-8504 Fax

Station Name: 007
Receiver No: 6082
Day of Year: 273 1999
Session No: 0 (for fast static)

Project Name: MC FLOOD
Job number: # 919
Local Date: mo. 09 day 20 year 1999
Operator: C. STUART

C/A CODE POSITION

Beg:
Lat: : 33 ° 48 ' 49.40 " N
Long: 111 ° 55 ' 00.27 " W
Ellip. Height: +0660.5 + M PDOP: 3.91

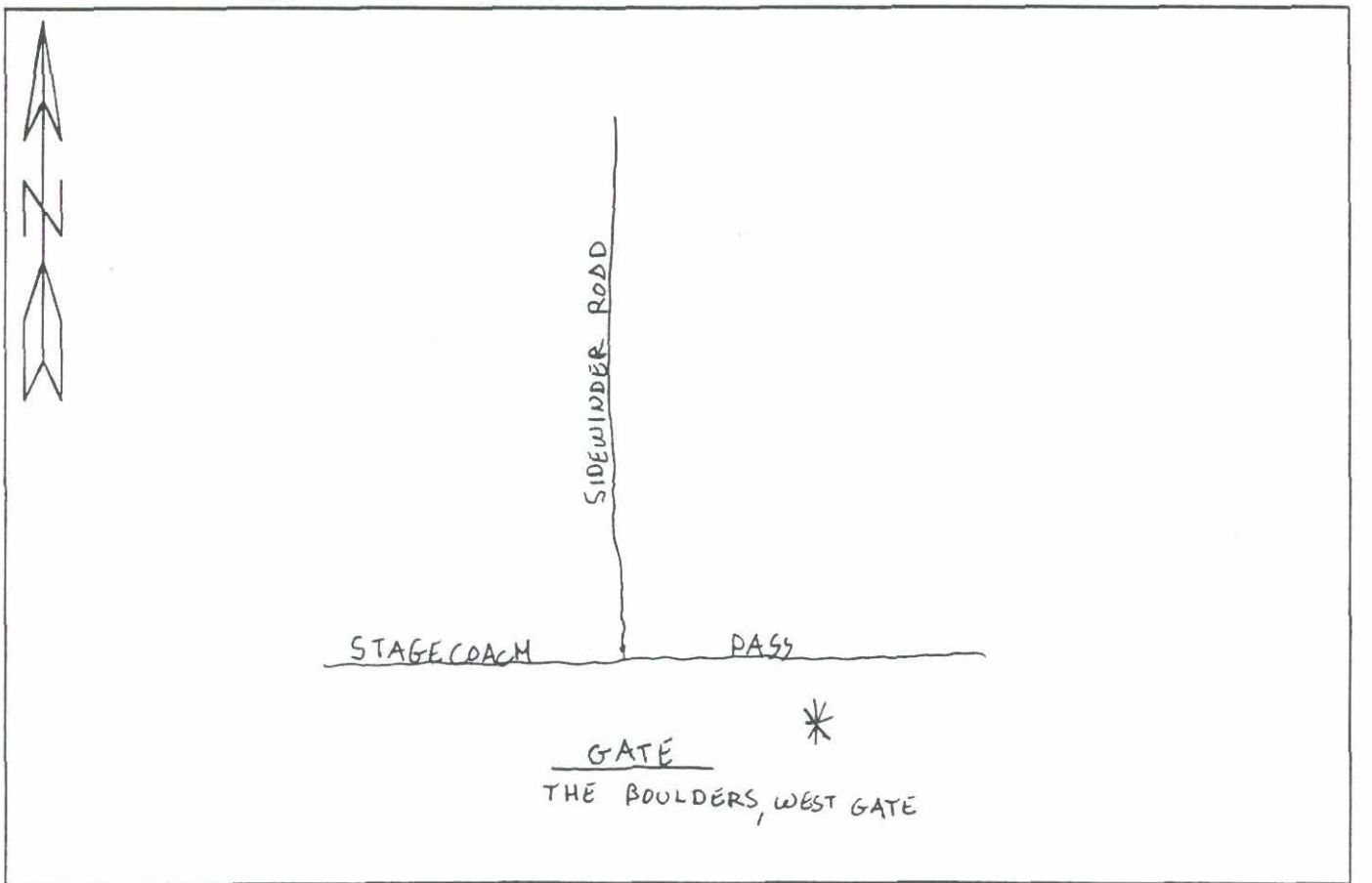
Ending:
Lat: 33 ° 48 ' 48.19 " N
Long: 111 ° 55 ' 01.31 " W
Ellip. Height: +0633.6 ~ M PDOP: 5.91

Receiver Model: 4000 SSE (X) 4800 ( ) 4000 SE ( )
Antenna Type: CompL1/L2 w/GP (X) CompL1/L2 ( ) Geodetic( )
Tribrach: SoKKisha Wild H/P Topcon Pentax
Local-UTC Time Offset: MST= -7:00
Type of Survey: Fast Static (X) - Fast Static ( )
Actual= Start 22:05 Stop: 22:36 UTC
Beg. SV's Used: 01, 19, 14, 16, 18, 22
End SV's Used: 01, 14, 16, 18, 22

Ant. Height (M) 1) 1.514 3) 1.510 5) 1.492 7) 1.460 9) 1.464 11)
2) 1.512 4) 1.5046) 1.4708) 1.45810) 12)
Mean= 1.487

(ft) 1) 4.76 3) 4.87
2) 4.78 Mean

Weather Conditions: (Clear) P. Cloudy Overcast (Hot) Warm Cool Cold (Calm) Breezy 100 °F +/-



Type of Monument: PANEL PT 6082/SHINER Stamping:
Top of marker: (X) flush M ( ) above: ( ) below: Nat. Ground Detail Notes:

Rubbing Performed ( )Yes (X) No

A TEAM Professional Associates, INC.
GPS STATION LOG

1802 W. Grant Road - Ste 110-5 -Tucson, Arizona - 85745 - (520) 623-8503 - (520) 623-8504 Fax

Station Name: 7
Receiver No: 4573 -5677 - 6076 - 6081 - 6082 - 6083
Day of Year: 274 1999
Session No: 0 (for fast static)

Project Name: MARICOPA Co. FCD.
Job number: #919
Local Date: mo. ~~SEPT~~ OCT day 01 year 1999
Operator: DAVE RHINE

C/A CODE POSITION

Beg:
Lat: : 33 ° 48 ' 49.78 " N
Long: 111 ° 55 ' 02.41 " W
Ellip. Height: 722 - M PDOP: 2.0

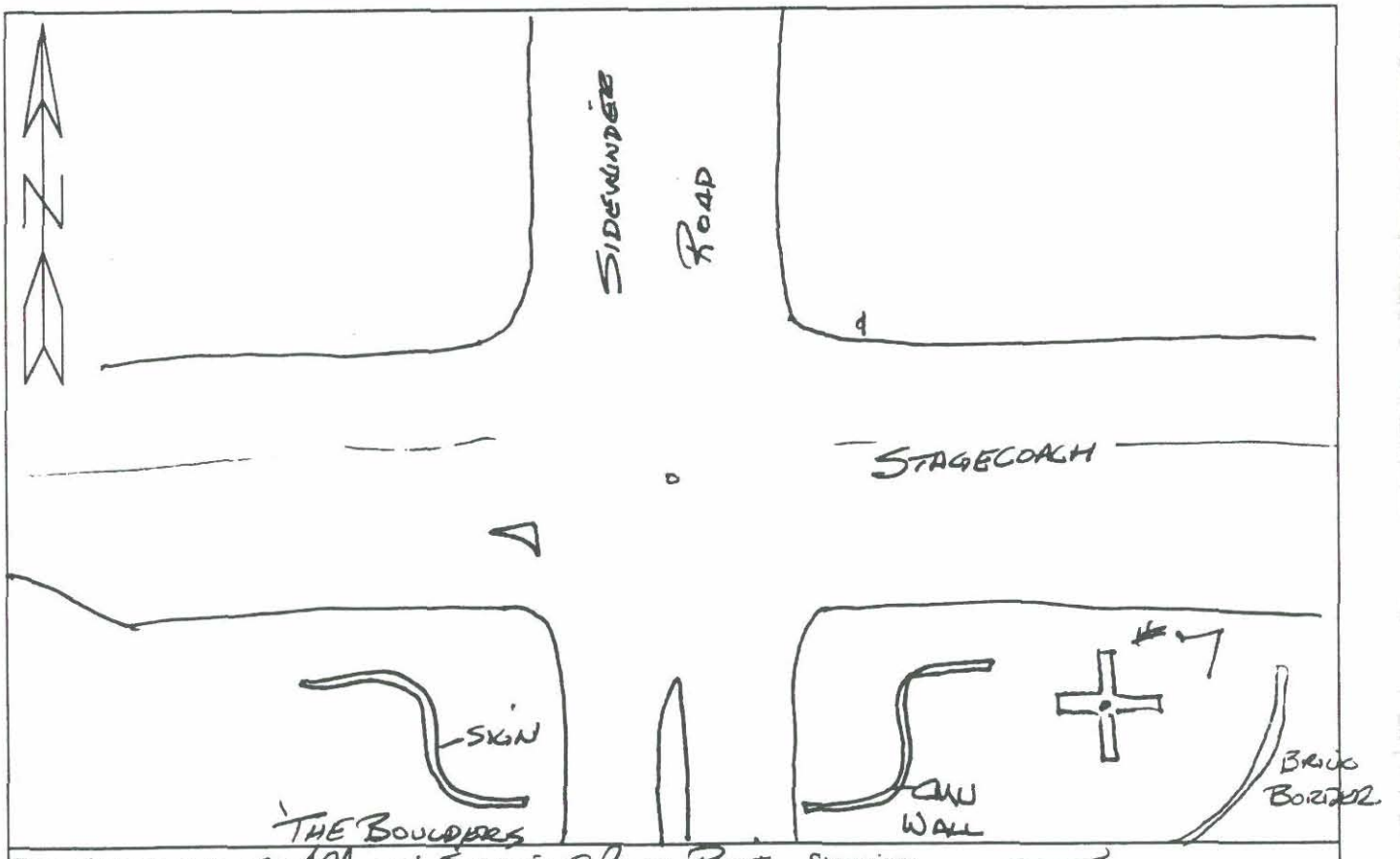
Ending:
Lat: 33 ° 48 ' 48.99 " N
Long: 111 ° 55 ' 02.26 " W
Ellip. Height: 667 + M PDOP: 1.9

Receiver Model: 4000 SSE (X) 000 SE ( )
Antenna Type: Comp L1/L2 W/GP (X) omp L1/L2 ( )
Tribrach: SoKKisha Wild H/P Topcon Pintax
Local-UTC Time Offset: MST= -7:00
Type of Survey: Fast Static (X) - Fast Static ( )
Actual= Start 14 : 54 Stop: 15 : 18 UTC
Beg. SV's Used: 03,06,29,09,17,21,23,26
End SV's Used: 03,06,29,09,17,21,08,23,26

Ant. Height (M) 1) 1.670 2) 1.669 3) 1.669 4) 1.669 5) 1.669 6) 1.669 7) 1.669 8) 1.669 9) 1.669 10) 1.669 11) 1.670 12) 1.670 Mean= 1.669

(ft) 1) 5.46 3) 2) 5.46 Mean

Weather Conditions: (Clear) P. Cloudy Overcast Hot ~~Warm~~ Cool Cold (Calm) Breezy °F +/-



Type of Monument: SET 40d NAIL EQUIDIST @ PANEL POINT Stamping:
Top of marker: ( ) flush M ( ) above: ( ) below: Nat. Ground Detail Notes:

Rubbing Performed ( )Yes ( )No

A TEAM Professional Associates, INC.
GPS STATION LOG

1802 W. Grant Road - Ste 110-5 -Tucson, Arizona - 85745 - (520) 623-8503 - (520) 623-8504 Fax

Station Name: 7
Receiver No: 7662
Day of Year: 278 1999
Session No: 0 (for fast static)

Project Name: Maricopa County FCD
Job number: #
Local Date: mo. OCT day 4th year 1999
Operator: Clinton Fischer

C/A CODE POSITION

Beg:
Lat: : 33 ° 48 · 48 85 " N
Long: 111 ° 55 · 01 56 " W
Ellip. Height: 680+ M PDOP: 2.3

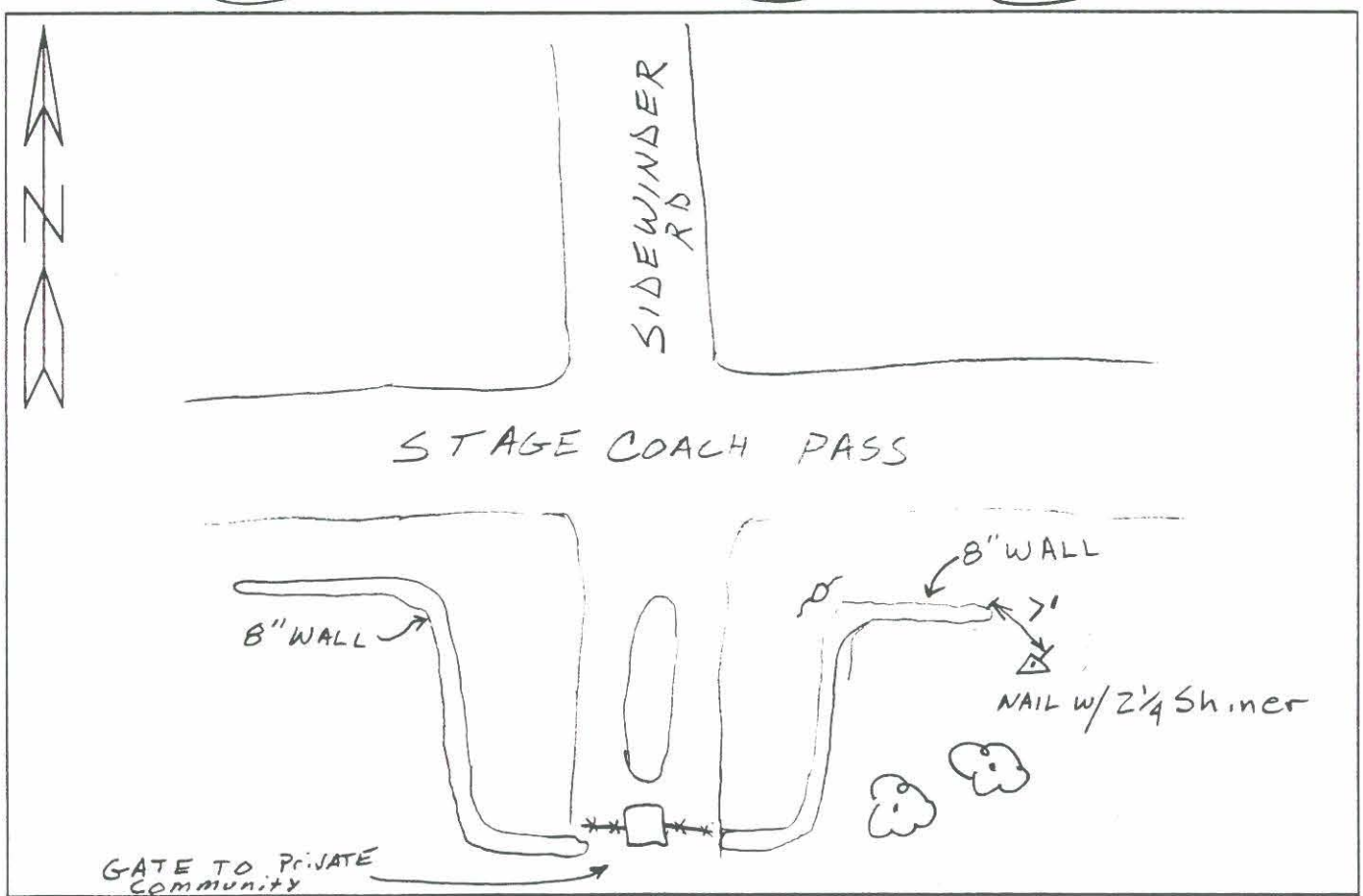
Ending:
Lat: 33 ° 48 · 49 51 " N
Long: 111 ° 55 · 01 90 " W
Ellip. Height: 729 - M PDOP: 1.8

Receiver Model: 4000 SSE (X) 4800 ( ) 4000 SE ( )
Antenna Type: CompL1/L2 w/GP (X) CompL1/L2 ( ) Geodetic( )
Tribrach: SoKKisha Wild H/P Topcon Pentax
Local-UTC Time Offset: MST= -7:00
Type of Survey: Fast Static (X) - Fast Static ( )
Actual= Start 16 : 16 Stop: 17 : 02 UTC
Beg. SV's Used: 03 08 09 17 21 23 29 31
End SV's Used: 03, 08, 25, 17, 21, 23, 29, 31, 15

Ant. Height (M): 1) 1.590 3) 1.591 5) 1.590 7) 1.590 9) 1.589 11) 1.590
2) 1.590 4) 1.591 6) 1.590 8) 1.589 10) 1.589 12) 1.590 Mean= 1.590

(ft) 1) 5.21 3) 5.21
2) 5.22 Mean

Weather Conditions: (Clear) P. Cloudy Overcast Hot (Warm) Cool Cold (Calm) Breezy °F +/-



Type of Monument: NAIL w/ 2½ Shiner Stamping: —
Top of marker: (X) flush M ( ) above: ( ) below: Nat. Ground Detail Notes: —

Rubbing Performed ( )Yes (X)No

A TEAM Professional Associates, INC.
GPS STATION LOG

1802 W. Grant Road - Ste 110-5 -Tucson, Arizona - 85745 - (520) 623-8503 - (520) 623-8504 Fax

Station Name: 8
Receiver No: 6082
Day of Year: 273 1999
Session No: 0 (for fast static)

Project Name: CAVE McFLOOD
Job number: # 919
Local Date: mo. 09 day 30 year 1999
Operator: C. STUART

C/A CODE POSITION

Beg:
Lat: : 33 ° 48 ' 48.88 " N
Long: 111 ° 57 ' 34.42 " W
Ellip. Height: +647.0+ M PDOP: 1.9

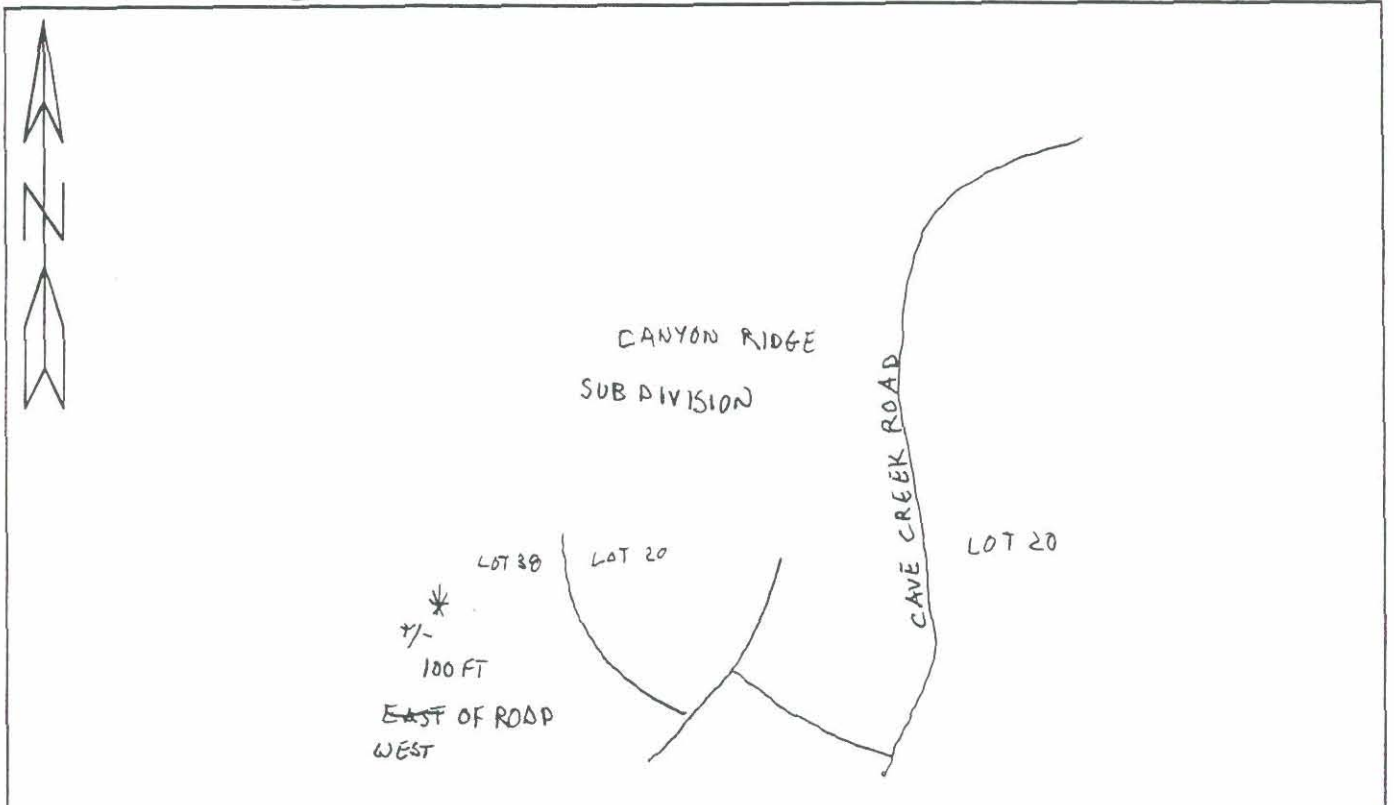
Ending:
Lat: 33 ° 48 ' 48.64 " N
Long: 111 ° 57 ' 33.69 " W
Ellip. Height: ~~+0.6~~ +600.1- M PDOP: 2.31

Receiver Model: 4000 SSE (X) 4800 ( ) 4000 SE ( )
Antenna Type: CompL1/L2 w/GP (X) CompL1/L2 ( ) Geodetic( )
Tribrach: SoKKisha Wild H/P Topcon Pentax
Local-UTC Time Offset: MST= -7:00
Type of Survey: Fast Static (X) - Fast Static ( )
Actual= Start 15 : 46 Stop: 16 : 18 UTC
Beg. SV's Used: 08, 09, 17, 21, 23, 29
End SV's Used: 08, 09, 17, 21, 23, 29, 31

Ant. Height (M) 1) 1.652 3) 1.651 5) 1.592 7) 1.580 9) 1.573 11)
2) 1.658 4) 1.658 6) 1.5638) 1.570 10) 12) Mean= 1.610

(ft) 1) 5.14 3)
2) 5.38 Mean

Weather Conditions: (Clear) P. Cloudy Overcast Hot (Warm) Cool Cold (Calm) Breezy 85 °F +/-



Type of Monument: PANEL POINT 60d/SHINER Stamping:
Top of marker: (X) flush M ( ) above: ( ) below: Nat. Ground Detail Notes:

Rubbing Performed ( )Yes (X)No

A TEAM Professional Associates, INC.
GPS STATION LOG

1802 W. Grant Road - Ste 110-5 -Tucson, Arizona - 85745 - (520) 623-8503 - (520) 623-8504 Fax

Station Name: 8
Receiver No: 6076
Day of Year: 274 1999
Session No: 0 (for fast static)

Project Name: MCFLOOD
Job number: # 919
Local Date: mo. 10 day 1 year 1999
Operator: C. STUART

C/A CODE POSITION

Beg:
Lat: : 33 ° 48 ' 49.88 " N
Long: 111 ° 57 ' 33.62 " W
Ellip. Height: +0565.0 - M PDOP: 2.01

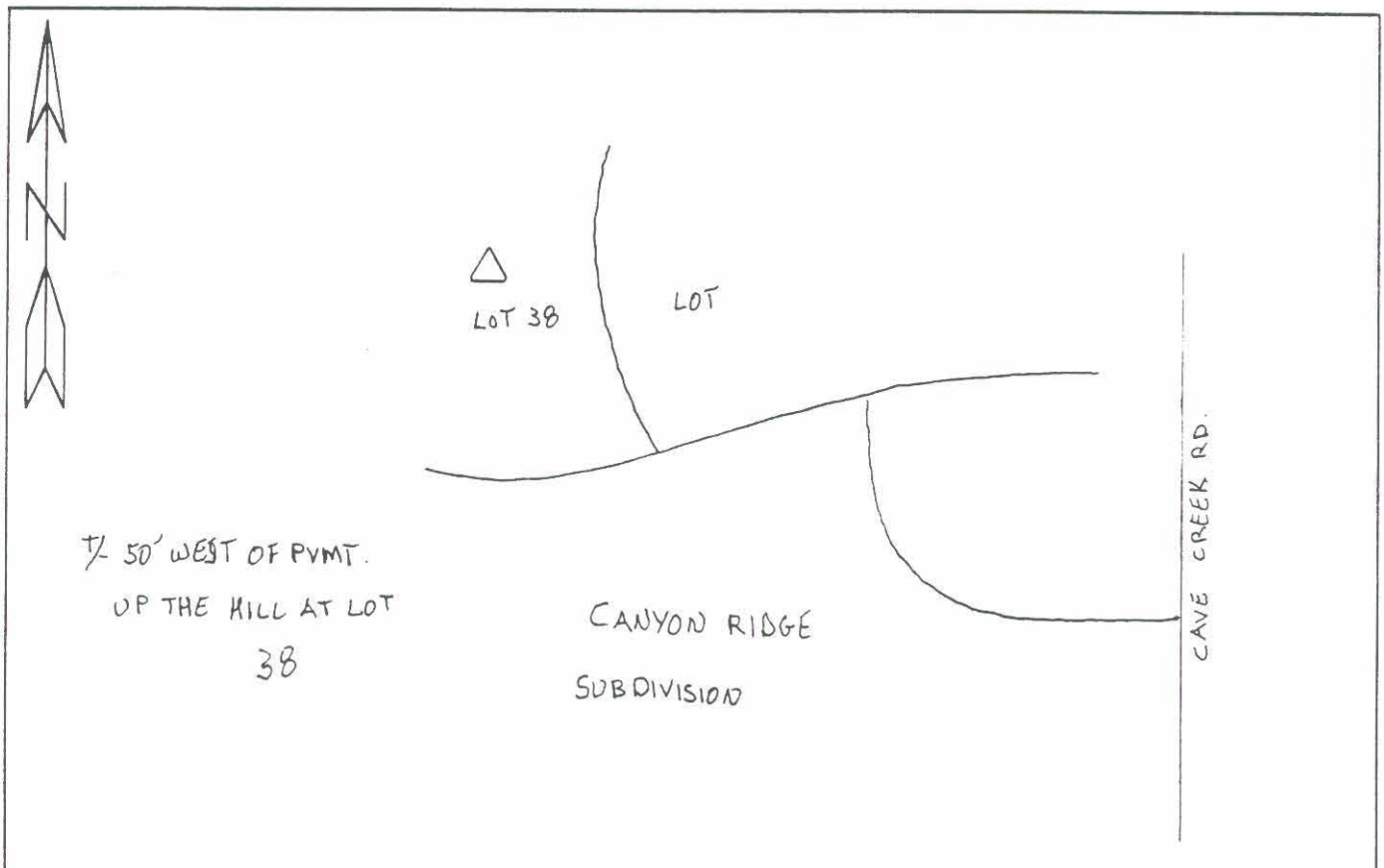
Ending:
Lat: 33 ° 48 ' 49.72 " N
Long: 111 ° 57 ' 33.37 " W
Ellip. Height: +0615.9+ M PDOP: ____

Receiver Model: 4000 SSE (X) 4800 ( ) 4000 SE ( )
Antenna Type: CompL1/L2 w/GP (X) CompL1/L2 ( ) Geodetic( )
Tribrach: SoKKisha Wild H/P Topcon Pentax
Local-UTC Time Offset: MST= -7:00
Type of Survey: Fast Static (X) - Fast Static ( )
Actual= Start 15 :06 Stop: 15 : 16 UTC
Beg. SV's Used: 03, 06, 29, 09, 17, 21, 23, 26
End SV's Used: 03, 06, 29, 09, 17, 21, 08, 23, 26

Ant. Height (M) 1) 1.674 3) 1.616 5) 1.592 7) 1.598 9) 1.640 11) ____
2) 1.652 4) 1.600 6) 1.598 8) 1.620 10) ____ 12) ____ Mean= 1.621

(ft) 1) 5.22 3) 5.45
2) 5.30 Mean 5.32

Weather Conditions: (Clear) P. Cloudy Overcast Hot (Warm) Cool Cold (Calm) Breezy 75 °F +/-



Type of Monument: GOOD / SHINER Stamping: ____
Top of marker: (X) flush M ( ) above: ( ) below: Nat. Ground Detail Notes: ____

Rubbing Performed ( )Yes (X)No

STOP 1610

A TEAM Professional Associates, INC.

GPS STATION LOG

1802 W. Grant Road - Ste 110-5 -Tucson, Arizona - 85745 - (520) 623-8503 - (520) 623-8504 Fax

Station Name: #9
Receiver No: 6083
Day of Year: 273 1999
Session No: 01 (for fast static)

Project Name: Maricopa flood
Job number: #
Local Date: mo. 09 day 30 year 1999
Operator: Matt Danehower

C/A CODE POSITION

Beg:
Lat: : 33 ° 49 48.16 " N
Long: 111 ° 58 .0788 " W
Ellip. Height: 0559 + M PDOP: 7.2

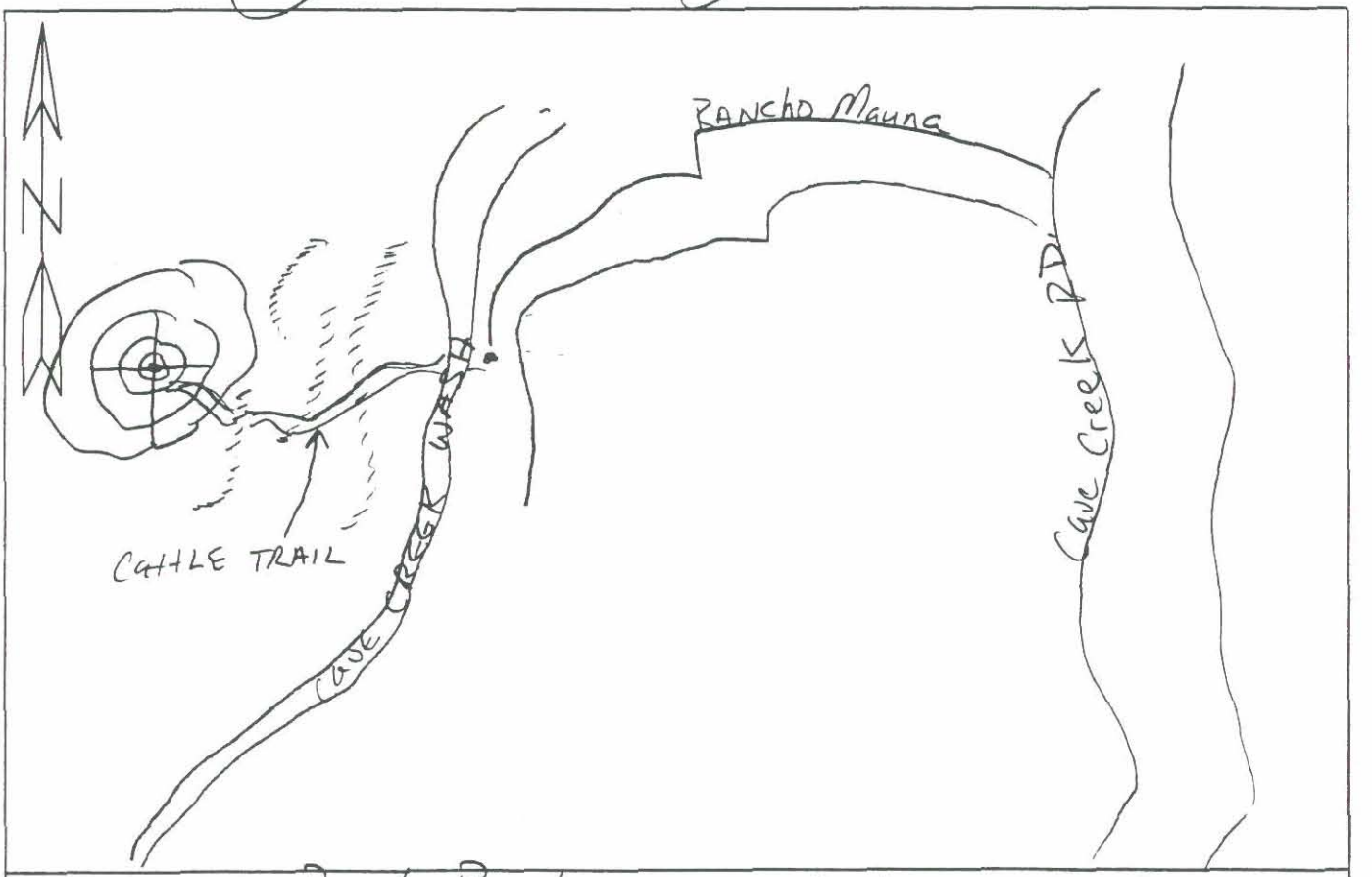
Ending:
Lat: 33 ° 49 46.90 " N
Long: 111 ° 58 07.20 " W
Ellip. Height: 0573 - M PDOP: 2.3

Receiver Model: 4000 SSE (X) 4800 ( ) 4000 SE ( )
Antenna Type: CompL1/L2 w/GP (X) CompL1/L2 ( ) Geodetic( )
Tribrach: SoKKisha Wild H/P Topcon Pentax
Local-UTC Time Offset: MST= -7:00
Type of Survey: Fast Static (X) - Fast Static ( )
Actual= Start 15:47 Stop: 16:12 UTC
Beg. SV's Used: 03, 31, 08, 09, 17, 21, 23, 29
End SV's Used: 03, 31, 08, 09, 17, 21, 23, 29

Ant. Height (M) 1) 14.46 3) 14.46 5) 14.45 7) 14.44 9) 14.45 11) 14.46
2) 14.46 4) 14.46 6) 14.45 8) 14.45 10) 14.47 12) 14.47 Mean= 14.46 (14.46)

(ft) 1) 4.73 3) 4.74
2) 4.74 Mean 4.74

Weather Conditions: (Clear) P. Cloudy Overcast (Hot) Warm Cool Cold Calm Breezy °F +/-



Type of Monument: Panel Point Stamping:
Top of marker: (Flush) M ( ) above: ( ) below: Nat. Ground Detail Notes: follow map some hiking through brush

Rubbing Performed ( )Yes (✓)No

A TEAM Professional Associates, INC.
GPS STATION LOG

1802 W. Grant Road - Ste 110-5 -Tucson, Arizona - 85745 - (520) 623-8503 - (520) 623-8504 Fax

Station Name: # 09
Receiver No: 6082
Day of Year: 278 1999
Session No: 0 (for fast static)

Project Name: Maricopa Co. F.D.C.
Job number: # 919
Local Date: mo 10 day 6 year 1999
Operator: Matt Danelson, TZ

C/A CODE POSITION

Beg:
Lat: : 33° 49 . 46.97" N
Long: 111° 58 . 07.65" W
Ellip. Height: 0595- M PDOP: 2.0

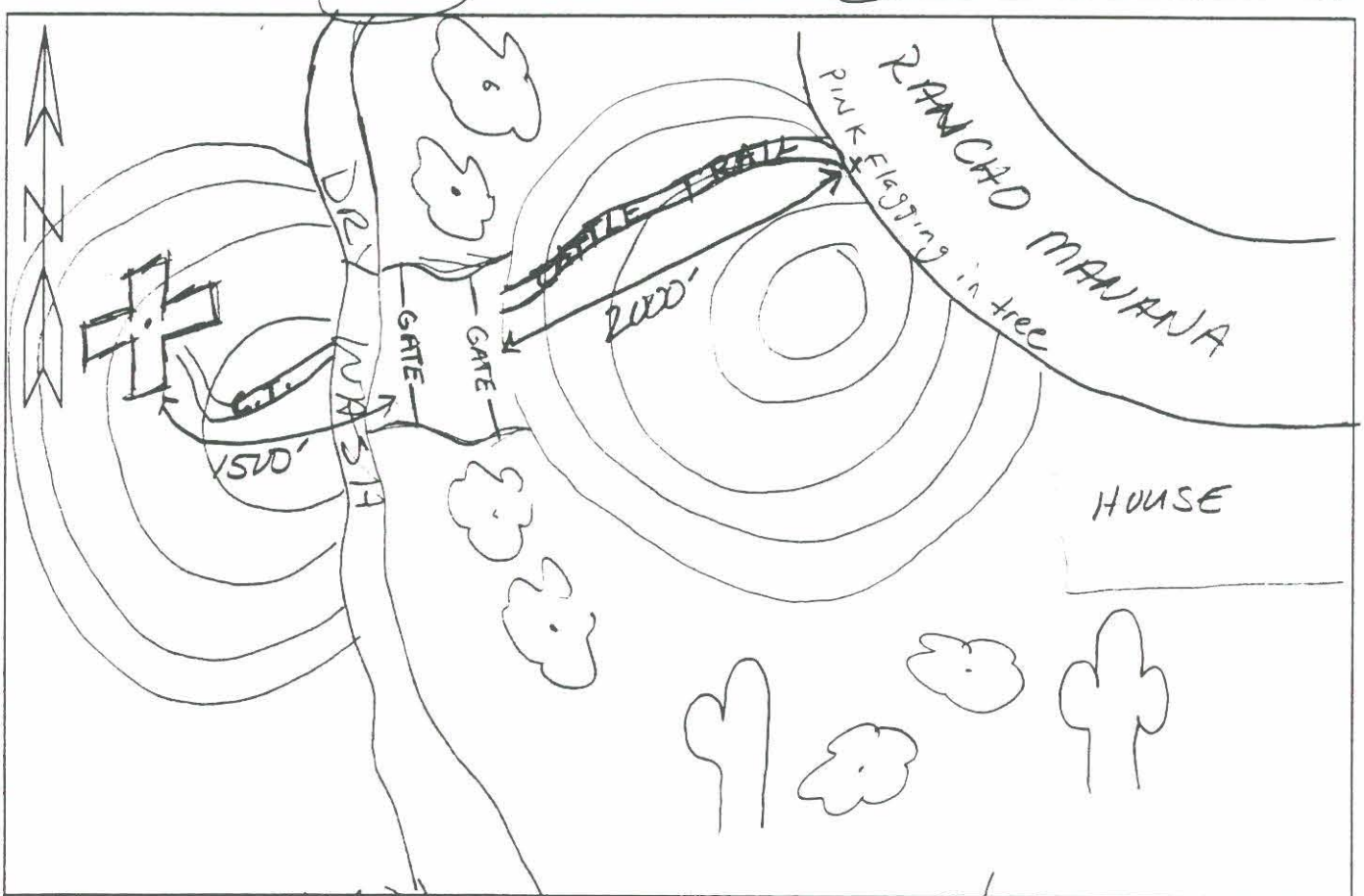
Ending:
Lat: 33° 49 . 47.50" N
Long: 111° 58 . 07.12" W
Ellip. Height: M PDOP:

Receiver Model: 4000 SSE (X) 4800 ( ) 4000 SE ( )
Antenna Type: CompL1/L2 w/GP (X) CompL1/L2 ( ) Geodetic( )
Tribrach: SoKKisha Wild H/P Topcon Pentax
Local-UTC Time Offset: MST= -7:00
Type of Survey: Fast Static (X) - Fast Static ( )
Actual= Start 15:24 Stop: 15:57 UTC
Beg. SV's Used: 03, 08, 09, 17, 21, 23, 29
End SV's Used: 03, 08, 31, 09, 17, 21, 23, 29

Ant. Height (M): 1) 1.610 3) 1.610 5) 1.610 7) 1.608 9) 1.608 11) 1.610
2) 1.610 4) 1.610 6) 1.608 8) 1.608 10) 1.610 12) 1.610 Mean= 1.610

(ft) 1) 5.273) 5.28
2) 5.27 Mean 5.27

Weather Conditions: Clear P. Cloudy Overcast Hot Warm Cool Cold Calm Breezy °F +/-



Type of Monument: 40 (D) Stamping: None
Top of marker: (X) flush M ( ) above: ( ) below: Nat. Ground Detail Notes: At the end of Rancho Manana through Desert .20 on Cattle trail

Rubbing Performed ( )Yes (X)No

A TEAM Professional Associates, INC.
GPS STATION LOG

1802 W. Grant Road - Ste 110-5 -Tucson, Arizona - 85745 - (520) 623-8503 - (520) 623-8504 Fax

Station Name: # 10
Receiver No: 6083
Day of Year: 09/30 1999
Session No: 02 (for fast static)

Project Name: Mc Flood
Job number: # 919
Local Date: mo. 09 day 30 year 1999
Operator: Matt Danelowitz

C/A CODE POSITION

Beg:
Lat: : 33° 50 '12.87 "N
Long: 111° 57 '45.28 "W
Ellip. Height: 0638+ M PDOP:

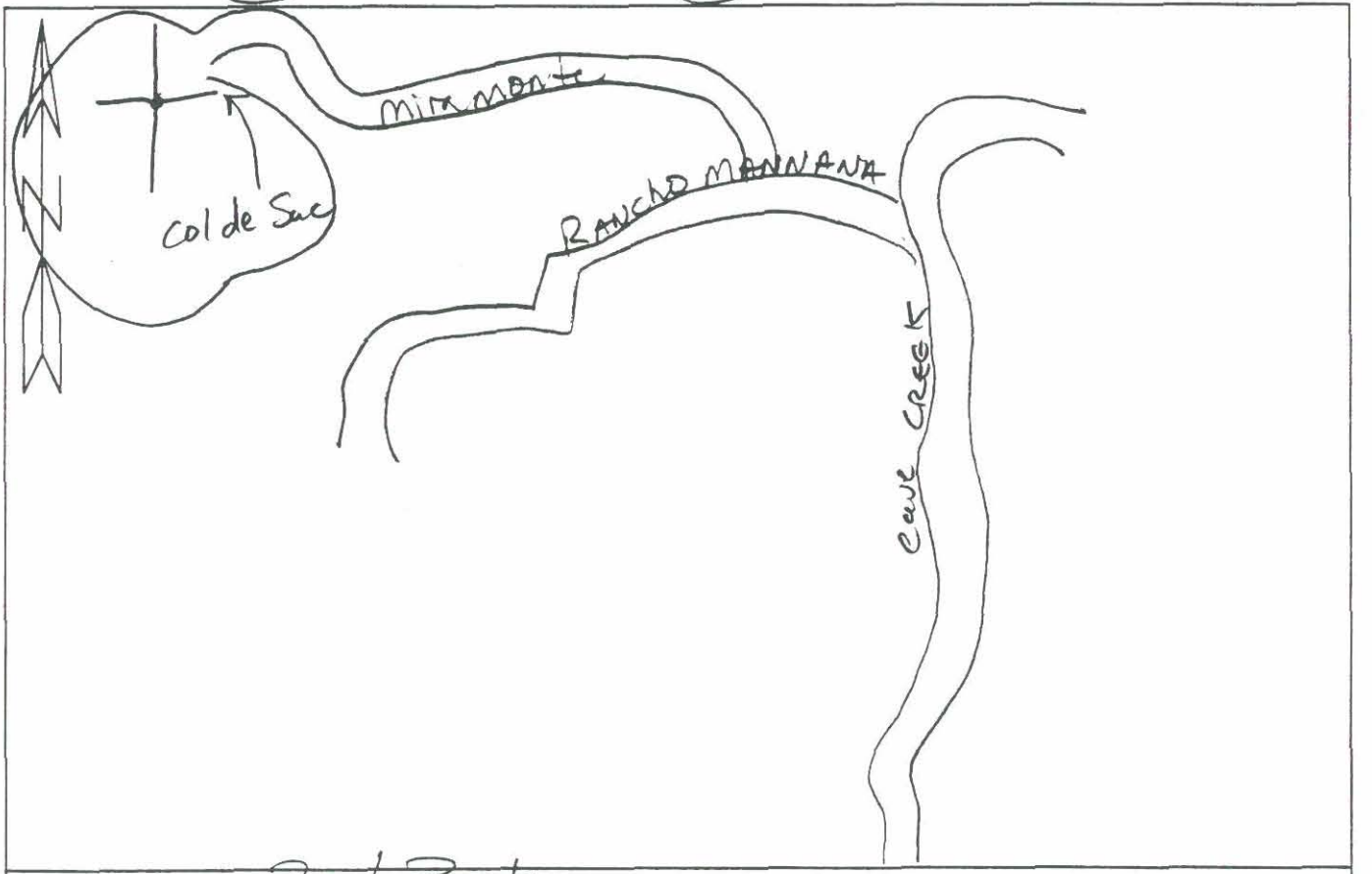
Ending:
Lat: 33° 50 '12.45 "N
Long: 111° 57 '4595 "W
Ellip. Height: 0689- M PDOP: 2.0

Receiver Model: 4000 SSE (X) 4800 ( ) 4000 SE ( )
Antenna Type: CompL1/L2 w/GP (X) CompL1/L2 ( ) Geodetic( )
Tribrach: SoKKisha Wild H/P Topcon Pentax
Local-UTC Time Offset: 9.39 MST= -7:00 16:39
Type of Survey: Fast Static (X) - Fast Static ( )
Actual= Start 16:39 Stop: 17:02 UTC
Beg. SV's Used: 03, 08, 09, 17, 21, 23, 29, 31
End SV's Used: 03, 08, 09, 17, 21, 23, 29, 31

Ant. Height (M) 1)5.01 3)5.00 5)5.00 7)5.00 9)5.00 11)5.01
2)5.00 4)5.00 6)5.00 8)5.00 10)5.00 12)5.01 Mean= 5.00

(ft) 1)4.71 3)4.92
2)4.93 Mean 4.92

Weather Conditions: (Clear) P. Cloudy Overcast (Hot) Warm Cool Cold Calm Breezy °F +/-



Type of Monument: Panel Point Stamping:
Top of marker: (X) flush M ( ) above: ( ) below: Nat. Ground Detail Notes: Paved Road

Rubbing Performed ( )Yes ( )No

A TEAM Professional Associates, INC.

GPS STATION LOG

1802 W. Grant Road - Ste 110-5 -Tucson, Arizona - 85745 - (520) 623-8503 - (520) 623-8504 Fax

Station Name: # 10
Receiver No: 7662
Day of Year: 274 1999
Session No: 0 (for fast static)

Project Name: MARICOPA CO FDC
Job number: # 919
Local Date: mo. 10 day 1 year 1999
Operator: Joe Bonillas

C/A CODE POSITION

Beg:
Lat: : 33 ° 50 ' 13.87 " N
Long: 111 ° 57 ' 45.62 " W
Ellip. Height: +0660+ M PDOP: 2.1

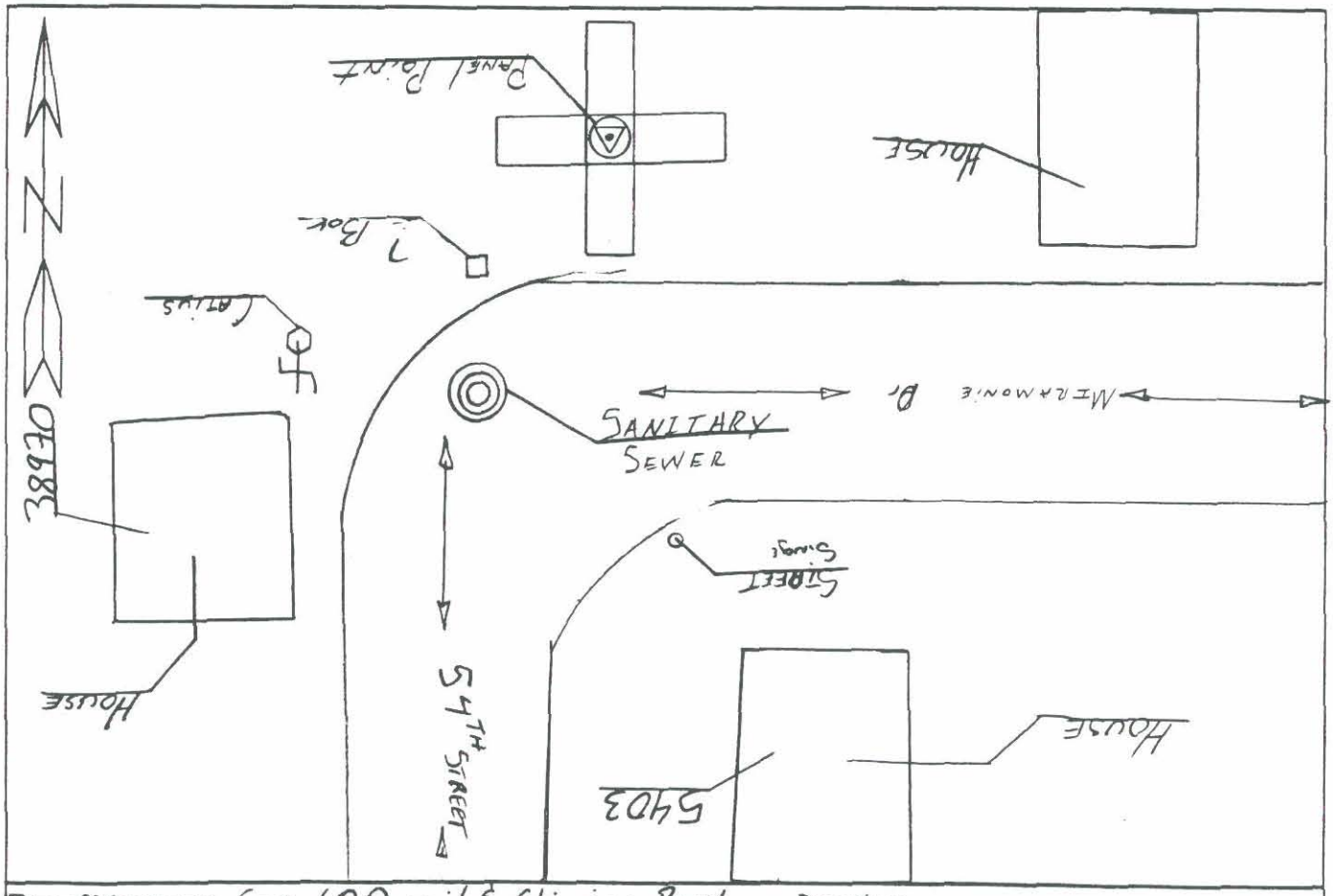
Ending:
Lat: 33 ° 50 ' 13 25 " N
Long: 111 ° 57 ' 45.54 " W
Ellip. Height: +0551- M PDOP: 2.3

Receiver Model: 4000 SSE (X) 4800 ( ) 4000 SE ( )
Antenna Type: CompL1/L2 w/GP (X) CompL1/L2 ( ) Geodetic( )
Tribrach: SoKKisha Wild H/P Topcon Pentax
Local-UTC Time Offset: MST= -7:00
Type of Survey: Fast Static (X) - Fast Static ( )
Actual= Start 16 :48 Stop: 18 :14 UTC
Beg. SV's Used: 03,08,09,31,17,21,23,29
End SV's Used: 03,25,31,01,21,23,15,29

Ant. Height (M): 1) 1.4273) 2) 1.4274) 5) 1.4277) 6) 1.4268) 1.4269) 10) 1.42711) 12) 1.427
Mean= 1.427

(ft) 1) 4.66 3) 4.66 2) 4.67 Mean 4.66

Weather Conditions: (Clear) P. Cloudy Overcast Hot (Warm) Cool Cold Calm (Breezy) °F +/-



Type of Monument: SET 60D NAIL & SHINNER PANEL Stamping:
Top of marker: (X) flush M ( ) above: ( ) below: Nat. Ground Detail Notes:

Rubbing Performed ( )Yes ( )No

A TEAM Professional Associates, INC.
GPS STATION LOG

1802 W. Grant Road - Ste 110-5 -Tucson, Arizona - 85745 - (520) 623-8503 - (520) 623-8504 Fax

Station Name: 0011
Receiver No: 5081
Day of Year: 273 1999
Session No: 0 (for fast static)

Project Name: MARICOPA COUNTY FCD
Job number: #919
Local Date: mo. 9 day 30 year 1999
Operator: CHAD CLARK

C/A CODE POSITION

Beg:
Lat: : 33 °50 '22.27 "N
Long: 111 °57 '42.15 "W
Ellip. Height: 0672- M PDOP: 2.2

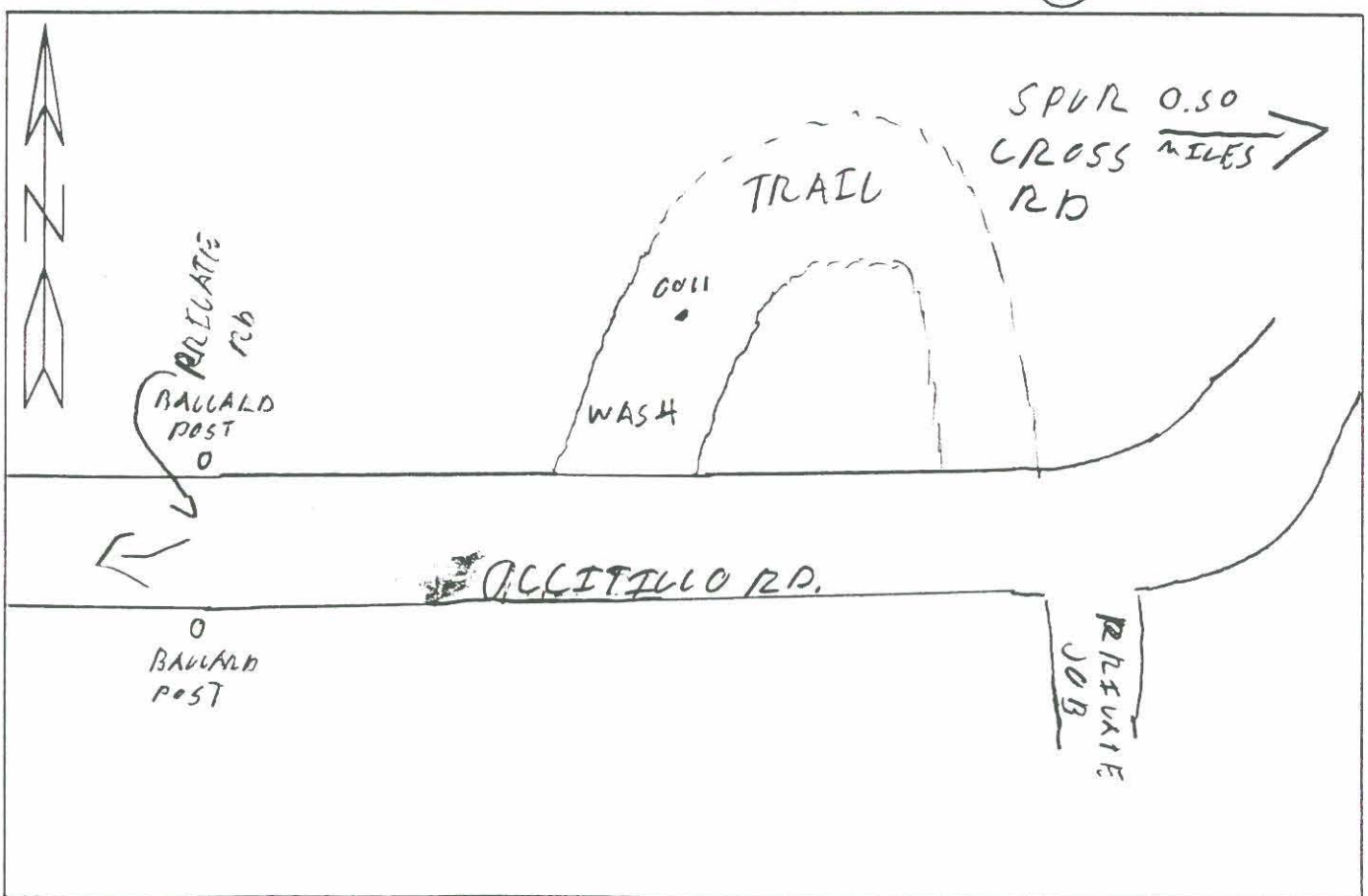
Ending:
Lat: 33 °50 '21.03 "N
Long: 111 °57 '42.97 "W
Ellip. Height: 06684 M PDOP: 2.0

Receiver Model: 4000 SSE (X) 4800 ( ) 4000 SE ( )
Antenna Type: CompL1/L2 w/GP (X) CompL1/L2 ( ) Geodetic( )
Tribrach: SoKKisha Wild (H/P) Topcon Pentax
Local-UTC Time Offset: MST= -7:00 09:43
Type of Survey: Fast Static (X) - Fast Static ( )
Actual= Start 16:43 Stop: 17:02 UTC
Beg. SV's Used: 03, 04, 09, 31, 17, 21, 23, 29
End SV's Used: 03, 04, 09, 31, 17, 21, 23, 29

Ant. Height (M): 1) 1.611 3) 1.611 5) 1.612 7) 1.613 9) 1.612 11) 1.613
2) 1.611 4) 1.612 6) 1.613 8) 1.613 10) 1.612 12) 1.612 Mean= 1.612

(ft) 1) 5.28 3) 5.28
2) 5.28 Mean 5.28

Weather Conditions: (Clear) P. Cloudy Overcast Hot (Warm) Cool Cold (Calm) Breezy 90 °F +/-



Type of Monument: 60D NAIL WITH SHINER Stamping: —
Top of marker: (X) flush M ( ) above: ( ) below: Nat. Ground Detail Notes: FOUND AT PANAL

Rubbing Performed ( )Yes (X)No

A TEAM Professional Associates, INC.
GPS STATION LOG

1802 W. Grant Road - Ste 110-5 -Tucson, Arizona - 85745 - (520) 623-8503 - (520) 623-8504 Fax

Station Name: 12 | Project Name: MARICOPA CO. FDC
Receiver No: 6076 | Job number: #
Day of Year: 273 1999 | Local Date: mo. SEPT day 30 year 1999
Session No: 0 (for fast static) | Operator: Clinton Fischer

C/A CODE POSITION

Beg:
Lat: : 33 ° 50 ' 34.21 " N
Long: 111 ° 57 ' 26.34 " W
Ellip. Height: 588 - M PDOP: 2.2

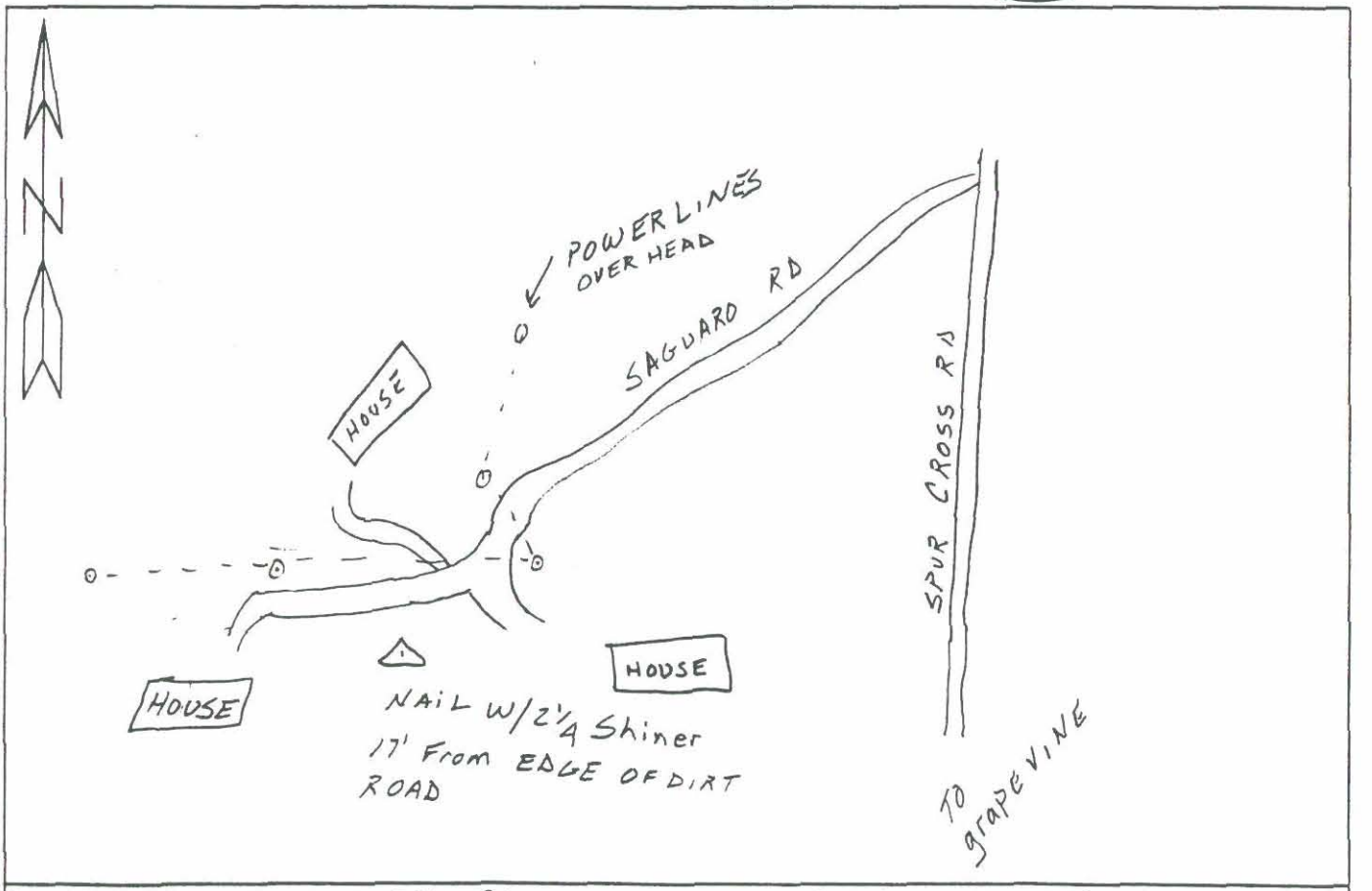
Ending:
Lat: 33 ° 50 ' 32.91 " N
Long: 111 ° 57 ' 26.69 " W
Ellip. Height: 583 - M PDOP: 2.3

Receiver Model: 4000 SSE (X) 4800 ( ) 4000 SE ( )
Antenna Type: CompL1/L2 w/GP (X) CompL1/L2 ( ) Geodetic( )
Tribrach: SoKKisha Wild H/P Topcon Pentax
Local-UTC Time Offset: MST= -7:00
Type of Survey: Fast Static (X) - Fast Static ( )
Actual= Start 15 :59 Stop: 16 :10 UTC
Beg. SV's Used: 03, 09, 17 21 23 29 31 08
End SV's Used: 03, 09 17 21 23 29 31 08

Ant. Height (M): 1) 1.540 3) 1.539 5) 1.537 7) 1.539 9) 1.540 11) 1.540
2) 1.537 4) 1.539 6) 1.539 8) 1.540 10) 1.540 12) 1.540 Mean= 1.539

(ft) 1) 5.09 3) 5.03
2) 5.09 Mean

Weather Conditions: (Clear) P. Cloudy Overcast Hot (Warm) Cool Cold (Calm) Breezy °F +/-



Type of Monument: NAIL W 2 1/4 Shiner | Stamping: NONE
Top of marker: (X) flush M ( ) above: ( ) below: Nat. Ground | Detail Notes:

Rubbing Performed ( )Yes (X)No

A TEAM Professional Associates, INC.
GPS STATION LOG

1802 W. Grant Road - Ste 110-5 -Tucson, Arizona - 85745 - (520) 623-8503 - (520) 623-8504 Fax

Station Name: 12
Receiver No: 6076
Day of Year: 273 1999
Session No: 0 (for fast static)

Project Name: MARICOPA County FCD
Job number: #
Local Date: mo. SEPT day 30 year 1999
Operator: Clinton Fischer

C/A CODE POSITION

Beg:
Lat: : 33 ° 50 ' 32.44 " N
Long: 111 ° 57 ' 25.86 " W
Ellip. Height: 603 - M PDOP: 2.3

Ending:
Lat: 33 ° 50 ' 32.65 " N
Long: 111 ° 57 ' 26.59 " W
Ellip. Height: 704 - M PDOP:

Receiver Model: 4000 SSE (X) 4800 ( ) 4000 SE ( )
Antenna Type: CompL1/L2 w/GP (X) CompL1/L2 ( ) Geodetic( )
Tribrach: SoKKisha Wild H/P Topcon Pentax
Local-UTC Time Offset: MST= -7:00
Type of Survey: Fast Static (X) - Fast Static ( )
Actual= Start 16 : 32 Stop: 17 :02 UTC
Beg. SV's Used: 03, 09, 17, 21, 23, 29, 31
End SV's Used: 03, 08, 09, 17, 21, 23, 29, 31

Ant. Height (M) 1)1.394 2)1.394 3)1.394 4)1.393 5)1.393 6)1.393 7)1.393 8)1.394 9)1.394 10)1.395 11)1.395 12)1.395 Mean= 1.394

(ft) 1)4.57 2)4.57 3)4.58 Mean

Weather Conditions: (Clear) P. Cloudy Overcast Hot (Warm) Cool Cold (Calm) Breezy °F +/-

Type of Monument: NAIL w/ 2¼ Shiner Stamping: —
Top of marker: (X) flush M ( ) above: ( ) below: Nat. Ground Detail Notes: —

Rubbing Performed ( )Yes (X)No

A TEAM Professional Associates, INC.
GPS STATION LOG

1802 W. Grant Road - Ste 110-5 -Tucson, Arizona - 85745 - (520) 623-8503 - (520) 623-8504 Fax

Station Name: # 13
Receiver No: 7662
Day of Year: 273 1999
Session No: 0 (for fast static)

Project Name: MARICOPA CO. FCD
Job number: #
Local Date: mo. 09 day 30 year 1999
Operator: JOE BENILLAS

C/A CODE POSITION

Beg:
Lat: : 33° 49 ' 42.33 " N
Long: 111° 57 ' 18.90 " W
Ellip. Height: +0654- M PDOP: 2.0

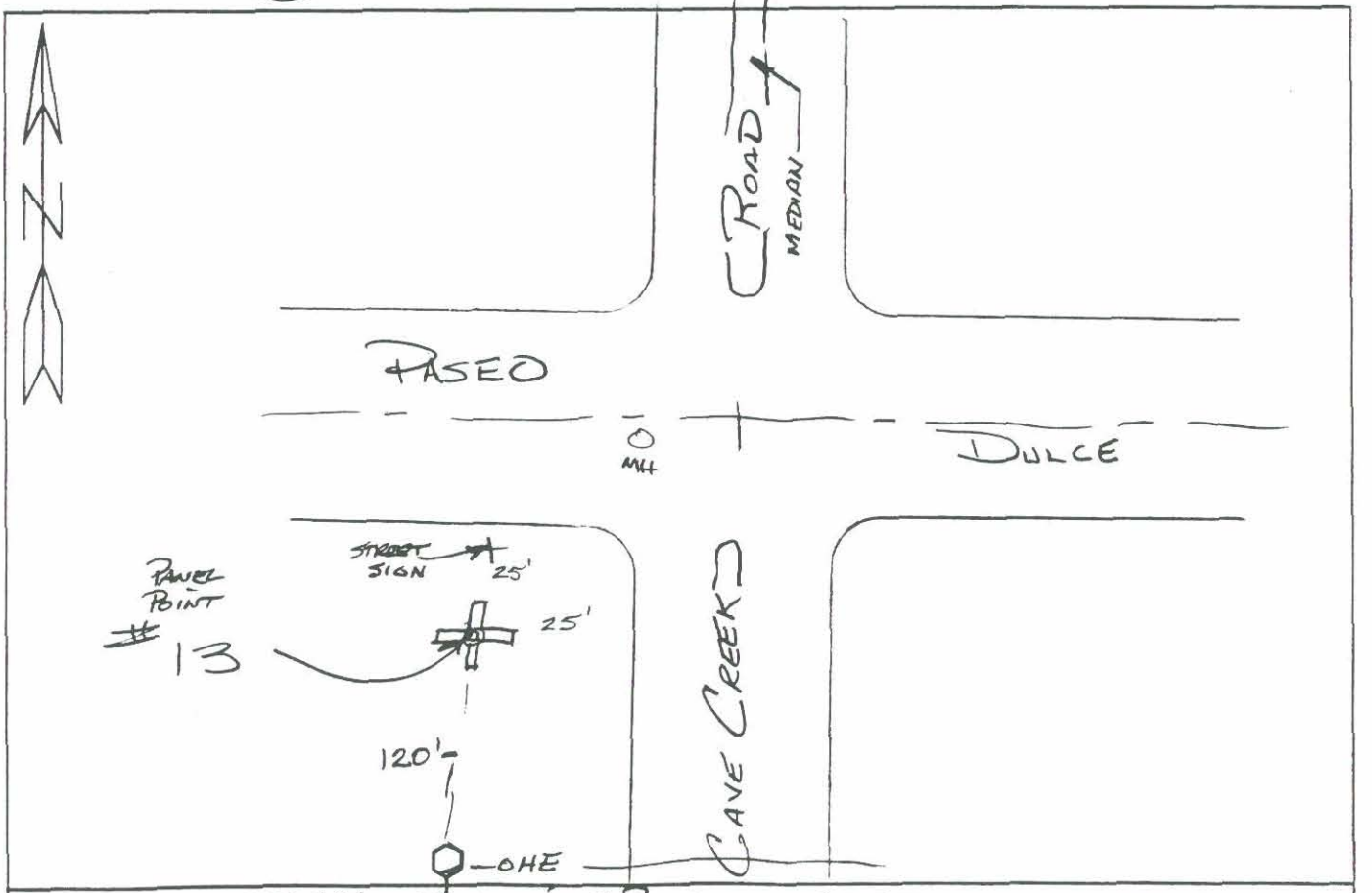
Ending:
Lat: 33 ° 49 ' 42.13 " N
Long: 111 ° 57 ' 18.48 " W
Ellip. Height: +0602.+ M PDOP: 2.2

Receiver Model: 4000 SSE (X) 4800 ( ) 4000 SE ( )
Antenna Type: CompL1/L2 w/GP (X) CompL1/L2 ( ) Geodetic( )
Tribrach: SoKKisha Wild H/P Topcon Pentax
Local-UTC Time Offset: MST= -7:00
Type of Survey: Fast Static (X) - Fast Static ( )
Actual= Start 15 : 48 Stop: 16 : 10 UTC
Beg. SV's Used: 03,29,08,09,17,21,31,23
End SV's Used: 03,29,08,09,17,21,31,23

Ant. Height (M) 1)1.641 3)1.640 5)1.640 7)1.640 9)1.640 11)1.640
2)1.641 4)1.640 6)1.640 8)1.640 10)1.640 12)1.640 Mean= 1.640

(ft) 1) 5.383
2) 5.38 Mean

Weather Conditions: (Clear) P. Cloudy Overcast Hot (Warm) Cool Cold Calm (Breezy) °F +/-



Type of Monument: SET 60d NAIL & SHINER @ POWER Stamping: ——
Top of marker: (X) flush M ( ) above: ( ) below: Nat. Ground Detail Notes:

Rubbing Performed ( )Yes ( )No

A TEAM Professional Associates, INC.
GPS STATION LOG

1802 W. Grant Road - Ste 110-5 -Tucson, Arizona - 85745 - (520) 623-8503 - (520) 623-8504 Fax

Station Name: 0013
Receiver No: 6081
Day of Year: 274 1999
Session No: 0 (for fast static)

Project Name: MARICOPA COUNTY FCD
Job number: # 919
Local Date: mo. 10 day 1 year 1999
Operator: CHAD CLARK

C/A CODE POSITION

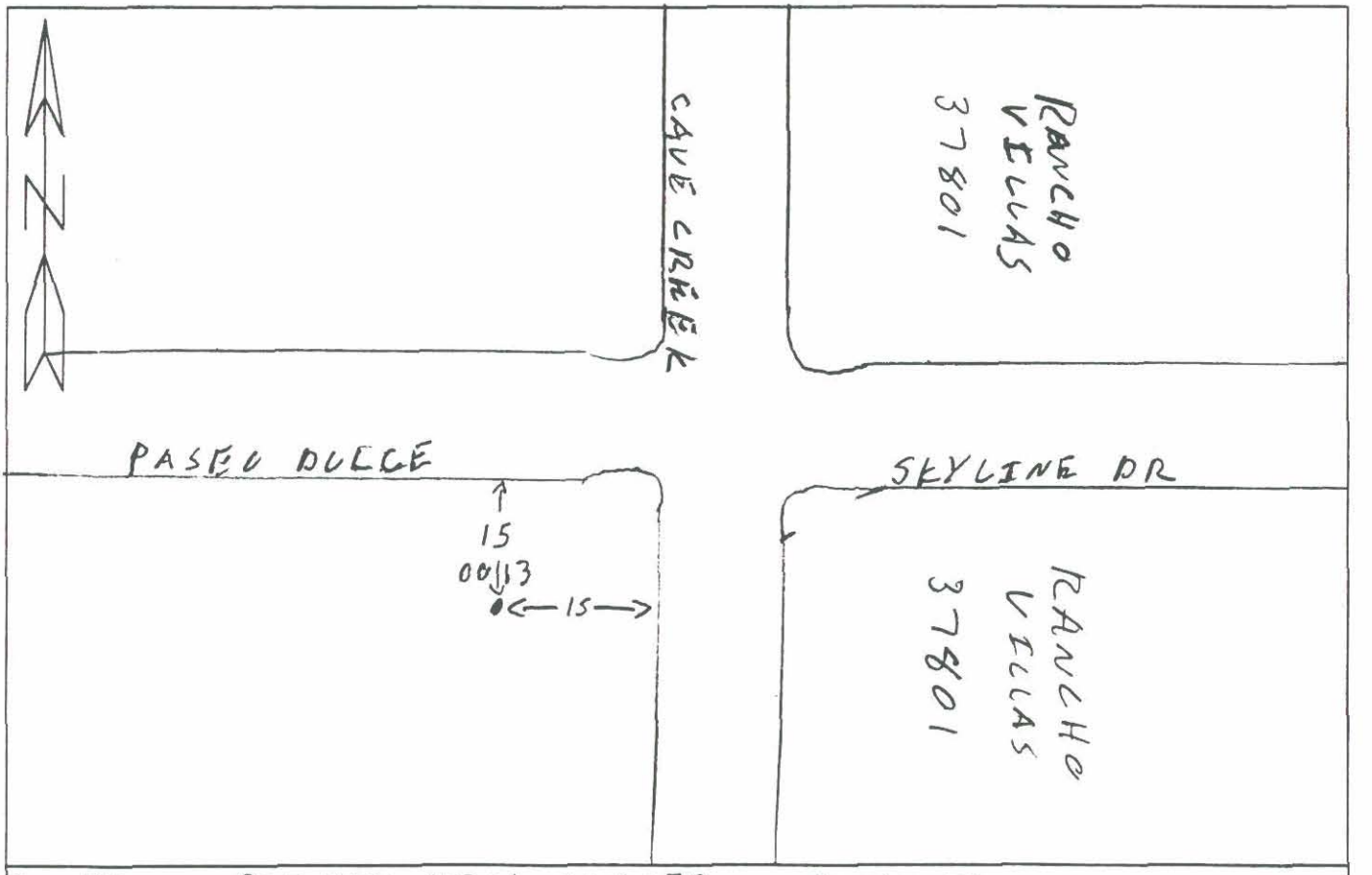
Beg:
Lat: : 33 ° 49 ' 43.58 " N
Long: 111 ° 57 ' 19.19 " W
Ellip. Height: +0654+ M PDOP: 2.1
Ending:
Lat: 33 ° 49 ' 42.68 " N
Long: 111 ° 57 ' 18.58 " W
Ellip. Height: 0545- M PDOP: 2.3

Receiver Model: 4000 SSE (X) 4800 ( ) 4000 SE ( )
Antenna Type: CompL1/L2 w/GP (X) CompL1/L2 ( ) Geodetic( )
Tribrach: SoKKisha Wild (H/P) Topcon Pentax
Local-UTC Time Offset: MST= -7:00 09:46
Type of Survey: Fast Static (X) - Fast Static ( )
Actual= Start 16 : 46 Stop: 18 : 14 UTC
Beg. SV's Used: 03, 08, 09, 31, 17, 21, 23, 29
End SV's Used: 03, 25, 31, 01, 21, 23, 15, 29

Ant. Height (M) 1) 1.565 3) 1.562 5) 1.567 7) 1.567 9) 1.566 11) 1.566
2) 1.565 4) 1.566 6) 1.567 8) 1.567 10) 1.566 12) 1.565 Mean= 1.566

(ft) 1) 5.14 3) 5.14
2) 5.14 Mean 5.14

Weather Conditions: (Clear) P. Cloudy Overcast Hot (Warm) Cool Cold Calm (Breezy) 100 °F +/-



Type of Monument: 60D NAIL WITH SHINER Stamping: —
Top of marker: (X) flush M ( ) above: ( ) below: Nat. Ground Detail Notes: FOUND AT PANAL

Rubbing Performed ( )Yes (X)No

A TEAM Professional Associates, INC.
GPS STATION LOG

1802 W. Grant Road - Ste 110-5 -Tucson, Arizona - 85745 - (520) 623-8503 - (520) 623-8504 Fax

Station Name: 13
Receiver No: 7662
Day of Year: 278 1999
Session No: 0 (for fast static)

Project Name: Maricopa County FCD
Job number: #
Local Date: mo. Oct day 4th year 1999
Operator: Clinton Fischer

C/A CODE POSITION

Beg:
Lat: : 33 ° 49 · 43.61 "N
Long: 111 ° 57 · 18.53 "W
Ellip. Height: 603 – M PDOP: 2.2

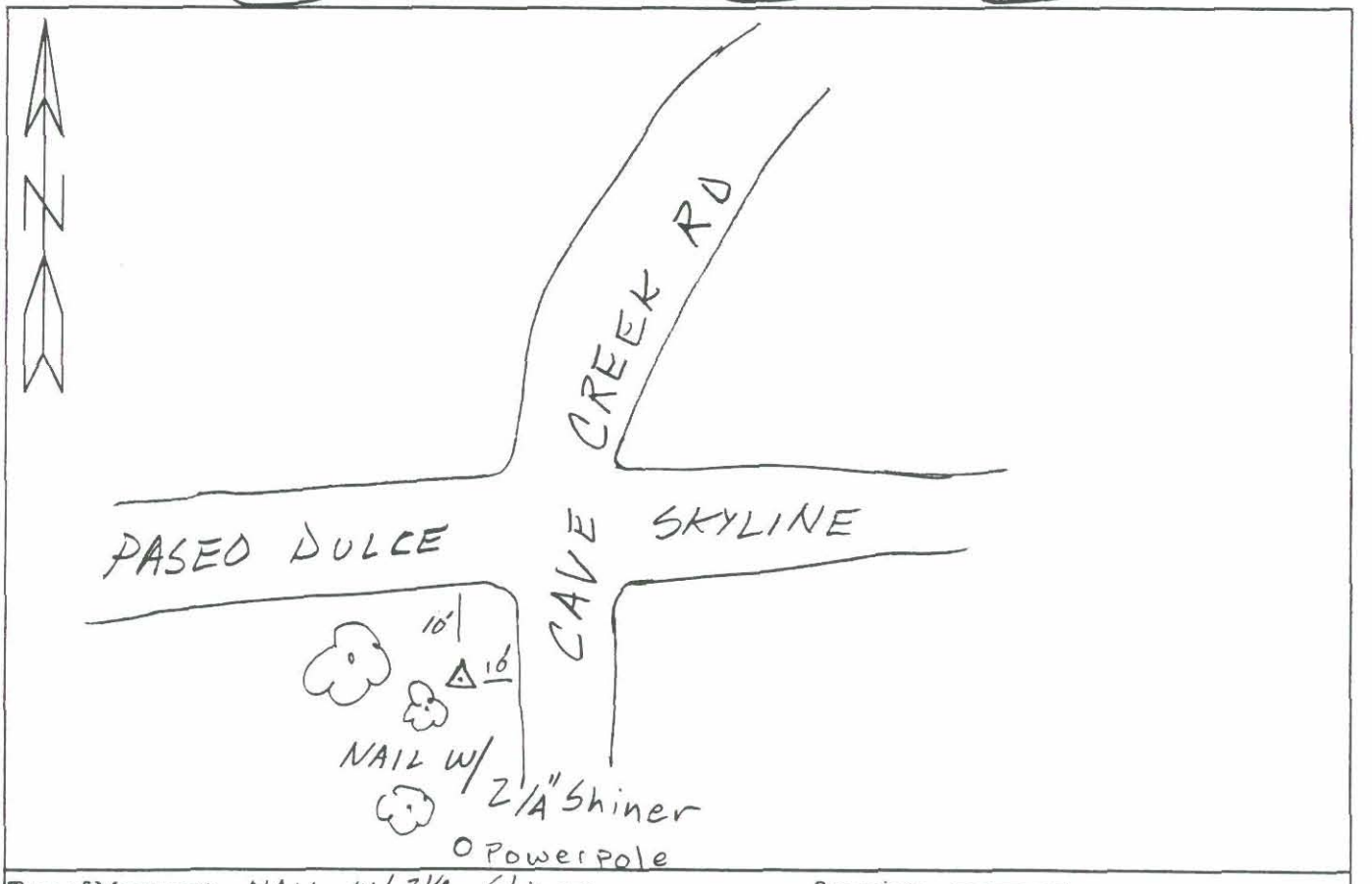
Ending:
Lat: 33 ° 49 · 42.71 "N
Long: 111 ° 57 · 18.85 "W
Ellip. Height: 610 – M PDOP: 2.4

Receiver Model: 4000 SSE (X) 4800 ( ) 4000 SE ( )
Antenna Type: CompL1/L2 w/GP (X) CompL1/L2 ( ) Geodetic( )
Tribrach: SoKKisha Wild H/P Topcon Pentax
Local-UTC Time Offset: MST= -7:00
Type of Survey: Fast Static (X) - Fast Static ( )
Actual= Start 15:38 Stop: 15:56 (UTC)
Beg. SV's Used: 03, 31, 08, 09, 17, 21, 23, 29
End SV's Used: 03, 31, 08, 09, 17, 21, 23, 29

Ant. Height (M)
1) 1.632 3) 1.635 5) 1.637 7) 1.632 9) 1.631 11) 1.631
2) 1.632 4) 1.633 6) 1.632 8) 1.632 10) 1.631 12) 1.632
Mean= 1.632

(ft) 1) 5.35 3) 5.34
2) 5.34 Mean

Weather Conditions: (Clear) P. Cloudy Overcast Hot (Warm) Cool Cold (Calm) Breezy °F +/-



Type of Monument: NAIL W/ 2 1/4 Shiner Stamping: —
Top of marker: (X) flush M ( ) above: ( ) below: Nat. Ground Detail Notes: —

Rubbing Performed ( )Yes (X)No

A TEAM Professional Associates, INC.

GPS STATION LOG

1802 W. Grant Road - Ste 110-5 -Tucson, Arizona - 85745 - (520) 623-8503 - (520) 623-8504 Fax

Station Name: #13
Receiver No: 6003
Day of Year: 278 1999
Session No: 0 (for fast static)

Project Name:
Job number: # 919
Local Date: mo. 10 day 5 year 1999
Operator: Jose Bonillas

C/A CODE POSITION

Beg:
Lat: : 33 ° 49 ' 42.93 " N
Long: 111 ° 57 ' 18.21 " W
Ellip. Height: +0616+ M PDOP: 2.0

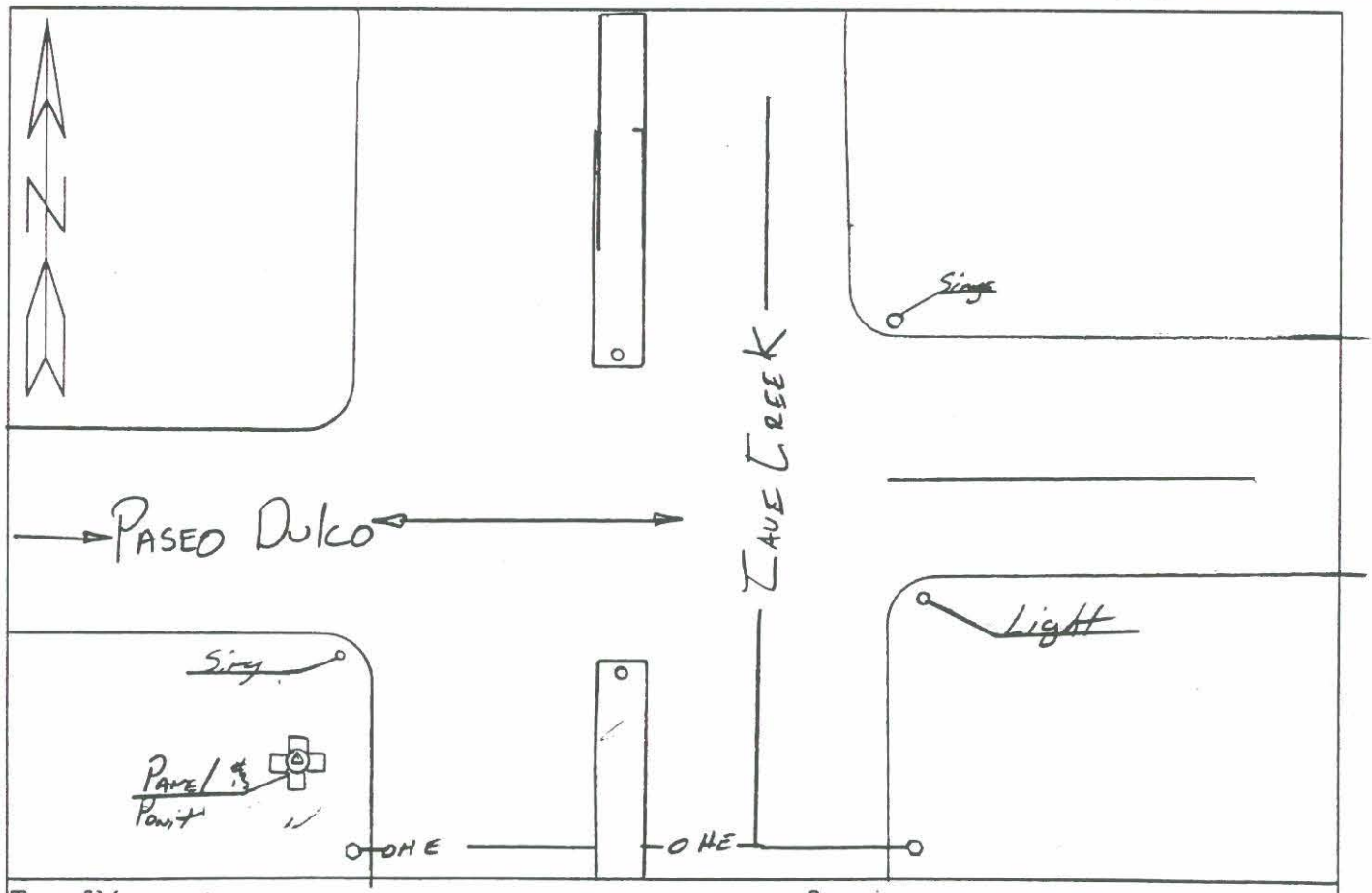
Ending:
Lat: 33 ° 49 ' 4265 " N
Long: 111 ° 57 ' 1892 " W
Ellip. Height: +0619- M PDOP: 2.0

Receiver Model: 4000 SSE (X) 4800 ( ) 4000 SE ( )
Antenna Type: CompL1/L2 w/GP (X) CompL1/L2 ( ) Geodetic( )
Tribrach: SoKKisha Wild H/P Topcon Pentax
Local-UTC Time Offset: MST= -7:00
Type of Survey: Fast Static (X) - Fast Static ( )
Actual= Start 17:31 Stop: 19 03 UTC
Beg. SV's Used: 01,03,29,08,13,31,21,23,25
End SV's Used: 01 29,08, 13, 31, 21, 23 25

Ant. Height (M): 1) 1.572 3) 1.572 5) 7) 1.572 9) 1.572 11) 1.573 2) 1.572 4) 6) 8) 1.572 10) 1.573 12) 1.573 Mean= 1.573

(ft) 1) 4.187 3) 2) 4.5? Mean 4.?

Weather Conditions: Clear (P. Cloudy) Overcast Hot (Warm) Cool Cold Calm (Breezy) °F +/-



Type of Monument: Stamping:
Top of marker: ( ) flush M ( ) above: ( ) below: Nat. Ground Detail Notes:

Rubbing Performed ( )Yes ( )No

A TEAM Professional Associates, INC.
GPS STATION LOG

1802 W. Grant Road - Ste 110-5 -Tucson, Arizona - 85745 - (520) 623-8503 - (520) 623-8504 Fax

Station Name: 14
Receiver No: 6082
Day of Year: 273 1999
Session No: 0 (for fast static)

Project Name: MC FLOOD
Job number: #
Local Date: mo. 09 day 30 year 1999
Operator: C. STUART

C/A CODE POSITION

Beg:
Lat: : 33 ° 50 ' 09.17 " N
Long: 111 ° 57 ' 04.73 " W
Ellip. Height: + 0685.1 - M PDOP: 2.1

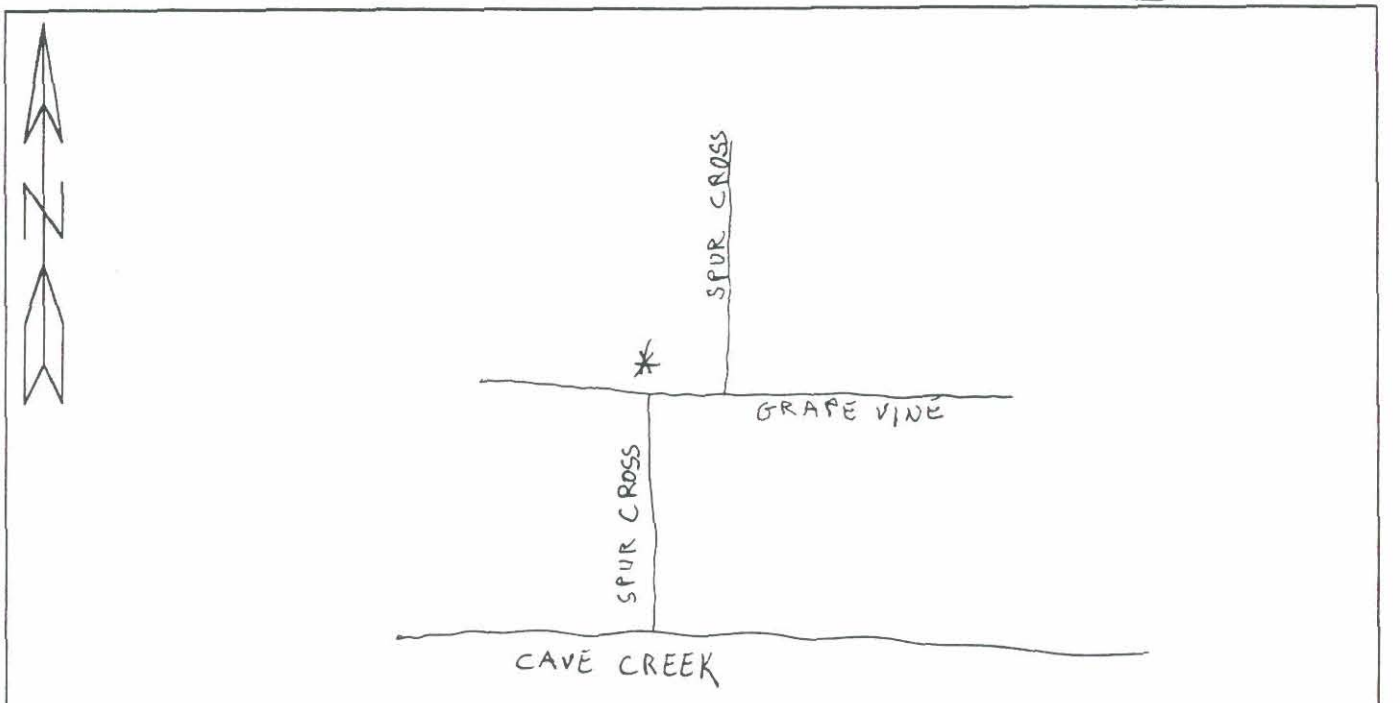
Ending:
Lat: 33 ° 50 ' 08.29 " N
Long: 111 ° 57 ' 05.34 " W
Ellip. Height: + 0713.4 - M PDOP: 2.01

Receiver Model: 4000 SSE (X) 4800 ( ) 4000 SE ( )
Antenna Type: CompL1/L2 w/GP (X) CompL1/L2 ( ) Geodetic( )
Tribrach: SoKKisha Wild H/P Topcon Pentax
Local-UTC Time Offset: MST= -7:00
Type of Survey: Fast Static (X) - Fast Static ( )
Actual= Start 16 :45 Stop: 17 :02 UTC
Beg. SV's Used: 08, 09, 17, 21, 23, 29, 31
End SV's Used: 08, 09, 17, 21, 23, 29, 31

Ant. Height (M) 1) 1.583 3) 1.582 5) 1.570 7) 1.540 9) 1.570 11)
2) 1.581 4) 1.574 6) 1.563 8) 1.563 10) 12)
Mean= 1.56 1.57

(ft) 1) 5.153 5.17
2) 5.14 Mean

Weather Conditions: (Clear) P. Cloudy Overcast Hot (Warm) Cool Cold Calm (Breezy) 85 °F +/-



Type of Monument: PANEL POINT GOA / SILVER Stamping:
Top of marker: (X) flush M ( ) above: ( ) below: Nat. Ground Detail Notes:

Rubbing Performed ( )Yes (X)No

A TEAM Professional Associates, INC.
GPS STATION LOG

1802 W. Grant Road - Ste 110-5 -Tucson, Arizona - 85745 - (520) 623-8503 - (520) 623-8504 Fax

Station Name: 014 | Project Name: MC FLOOD
Receiver No: 6082 | Job number: # 919
Day of Year: 273 1999 | Local Date: mo. 09 day 30 year 1999
Session No: 0 (for fast static) | Operator: C. STUART

C/A CODE POSITION

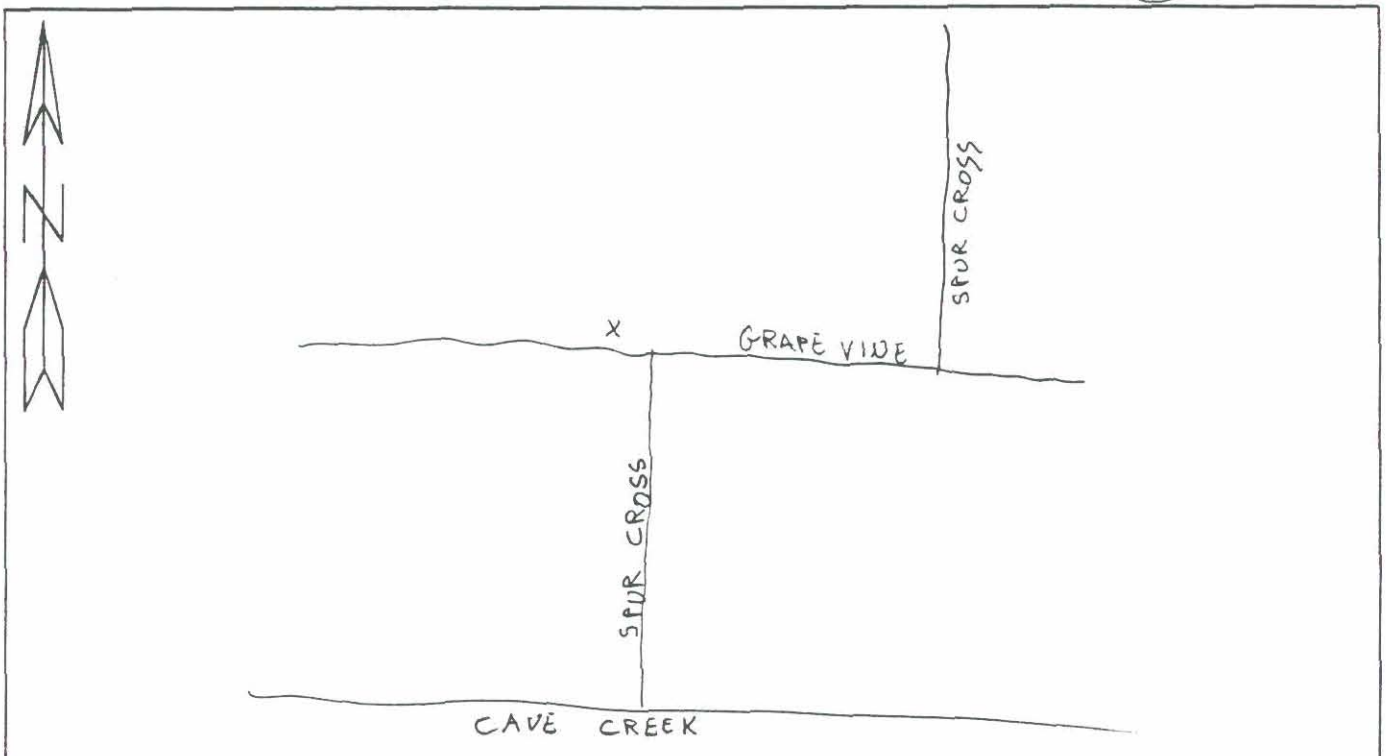
Beg:
Lat: : 33 ° 50 ' 09.14 " N
Long: 111 ° 57 ' 04.48 " W
Ellip. Height: +0634.0 - M PDOP: 1.6

Ending:
Lat: 33 ° 50 ' 09.91 " N
Long: 111 ° 57 ' 04.88 " W
Ellip. Height: +0604.1 - M PDOP: 2.0

Receiver Model: 4000 SSE (X) 4800 ( ) 4000 SE ( )
Antenna Type: CompL1/L2 w/GP (X) CompL1/L2 ( ) Geodetic( )
Tribrach: SoKKisha Wild H/P (Topcon) Pentax
Local-UTC Time Offset: MST= -7:00
Type of Survey: Fast Static (X) - Fast Static ( )
Actual= Start 17:15 Stop: 17:39 UTC
Beg. SV's Used: 03,08,09,15,17,21,23,31,29
End SV's Used: 03,08,25,15,17,21,23,31,29

Ant. Height (M): 1) 1.585 2) 1.585 3) 1.580 4) 1.5806) 5) 1.564 7) 1.570 9) 1.571 11) 12) Mean= 1.573
(ft) 1) 5.18 3) 5.19 2) 5.16 Mean

Weather Conditions: (Clear) P. Cloudy Overcast Hot (Warm) Cool Cold Calm (Breezy) 85 °F +/-



Type of Monument: PANEL PT GOOD / SHINER Stamping:
Top of marker: (X) flush M ( ) above: ( ) below: Nat. Ground Detail Notes:

Rubbing Performed ( )Yes (X)No

A TEAM Professional Associates, INC.
GPS STATION LOG

1802 W. Grant Road - Ste 110-5 -Tucson, Arizona - 85745 - (520) 623-8503 - (520) 623-8504 Fax

Station Name: 14
Receiver No: 6076
Day of Year: 274 1999
Session No: 0 (for fast static)

Project Name: MCFLOOD
Job number: # 919
Local Date: mo. 10 day 1 year 1999
Operator: C. STUART

C/A CODE POSITION

Beg:
Lat: : 33 ° 50 ' 09.49 " N
Long: 111 ° 57 ' 05.06 " W
Ellip. Height: +0647.2 + M PDOP: 2.11

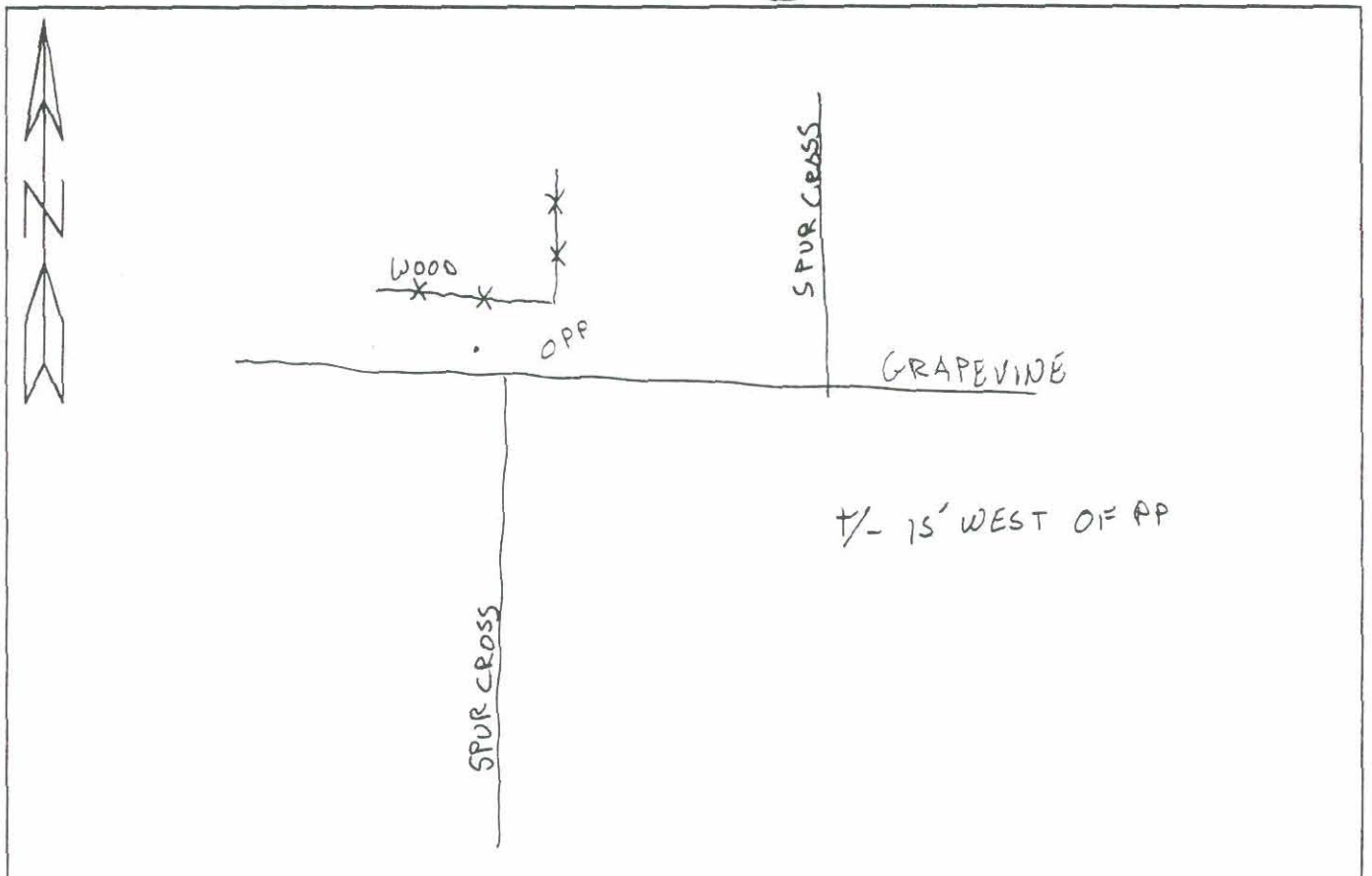
Ending:
Lat: ° ' " N
Long: ° ' " W
Ellip. Height: M PDOP:

Receiver Model: 4000 SSE (X) 4800 ( ) 4000 SE ( )
Antenna Type: CompL1/L2 w/GP (X) CompL1/L2 ( ) Geodetic( )
Tribrach: SoKKisha Wild H/P Topcon Pentax
Local-UTC Time Offset: MST= -7:00
Type of Survey: Fast Static (X) - Fast Static ( )
Actual= Start 16:43 Stop: : UTC
Beg. SV's Used: 02, 08, 09, 31, 17, 21, 23, 29
End SV's Used:

Ant. Height (M) 1) 1.582 3) 1.582 5) 1.574 7) 1.566 9) 1.576 11)
2) 1.588 4) 1.578 6) 1.570 8) 1.566 10) 12) Mean=

(ft) 1) 5.16 3) 5.18
2) 5.12 Mean

Weather Conditions: (Clear) P. Cloudy Overcast Hot (Warm) Cool Cold (Calm) Breezy 90 °F +/-



Type of Monument: PANEL PT 60d/SHINER Stamping:
Top of marker: (X) flush M ( ) above: ( ) below: Nat. Ground Detail Notes:

Rubbing Performed ( )Yes (X) No

A TEAM Professional Associates, INC.
GPS STATION LOG

1802 W. Grant Road - Ste 110-5 -Tucson, Arizona - 85745 - (520) 623-8503 - (520) 623-8504 Fax

Station Name: #014
Receiver No: 6082
Day of Year: 278 1999
Session No: 03 (for fast static)

Project Name: Maricopa Co F.D.C
Job number: # 917
Local Date: mo 10 day 10 year 1999
Operator: Matt Danes/Will Tz

C/A CODE POSITION

Beg:
Lat: : 33° 50 · 09 22 " N
Long: 111° 57 · 05.61 " W
Ellip. Height: 0593- M PDOP: 2.0

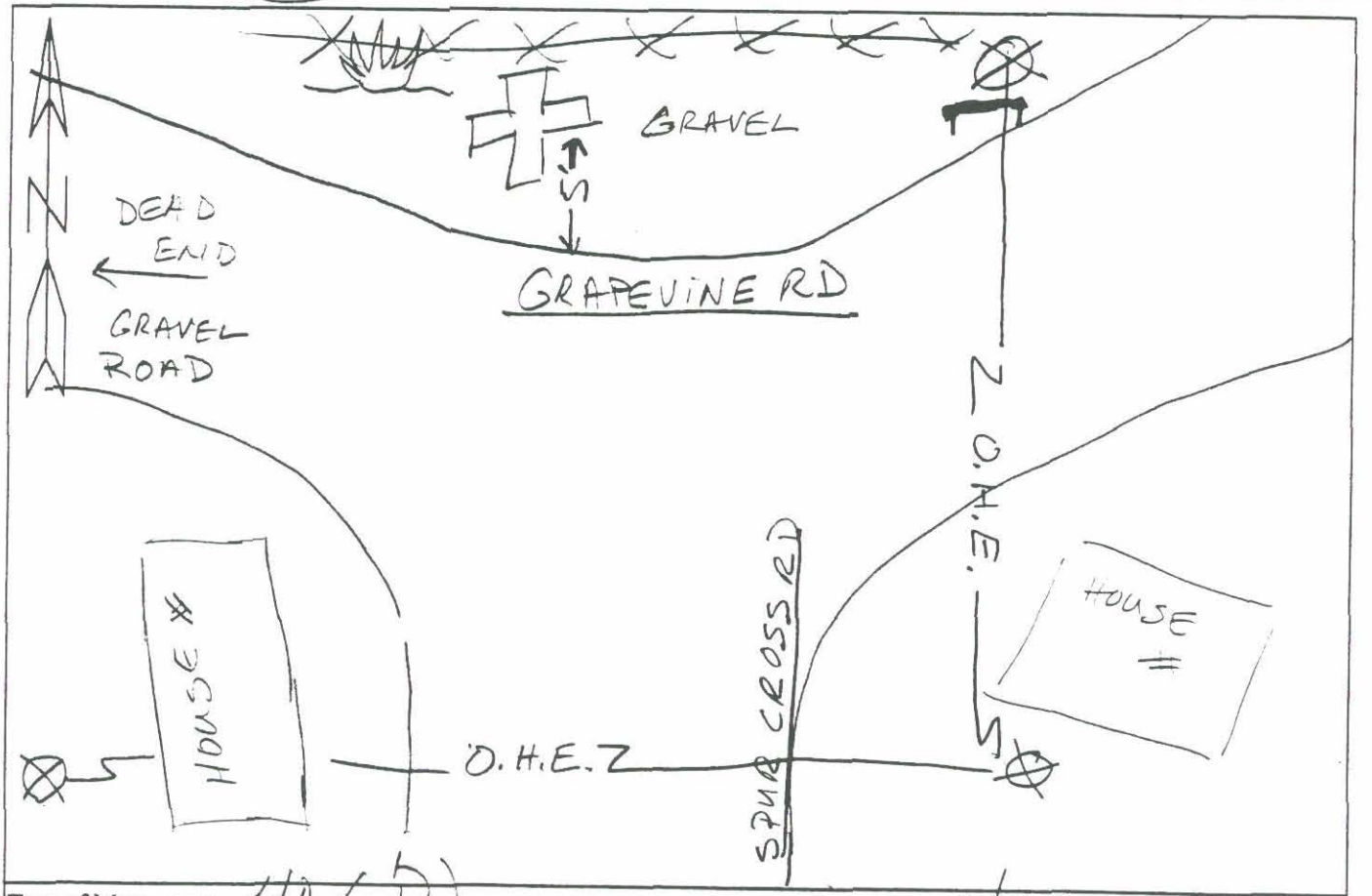
Ending:
Lat: 33° 50 · 08.90 " N
Long: 111° 57 · 05.03 " W
Ellip. Height: 0626- M PDOP: 2.0

Receiver Model: 4000 SSE (X) 4800 ( ) 4000 SE ( )
Antenna Type: CompL1/L2 w/GP (X) CompL1/L2 ( ) Geodetic( )
Tribrach: SoKKisha Wild H/P Topcon Pentax C.S.T.
Local-UTC Time Offset: MST= -7:00
Type of Survey: Fast Static (X) - Fast Static ( )
Actual= Start 17:51 Stop: 18:05 UTC
Beg. SV's Used: 01, 03, 29, 08, 15, 31, 21, 23, 25
End SV's Used: 01, 29, 08, 15, 31, 21, 23, 25

Ant. Height (M)
1) 1.536 3) 1.535 5) 1.533 7) 1.533 9) 1.533 11) 1.536
2) 1.536 4) 1.534 6) 1.533 8) 1.533 10) 1.534 12) 1.534
Mean= 1.534

(ft) 1) 5.05 3) 5.05
2) 5.03 Mean 5.04

Weather Conditions: (Clear) P. Cloudy Overcast (Hot) Warm Cool Cold Calm Breezy °F +/-



Type of Monument: 40 (D) Stamping: None
Top of marker: (X) flush M ( ) above: ( ) below: Nat. Ground Detail Notes: At the Intersection of Spur Cross & GRAPEVINE Just North of edge of pavement in gravel by homeowners front side yard.
Rubbing Performed ( ) Yes (X) No

A TEAM Professional Associates, INC.
GPS STATION LOG

1802 W. Grant Road - Ste 110-5 -Tucson, Arizona - 85745 - (520) 623-8503 - (520) 623-8504 Fax

Station Name: 15
Receiver No: 6076
Day of Year: 273 1999
Session No: 0 (for fast static)

Project Name: MARICOPA County FCD
Job number: #
Local Date: mo. SEPT day 30 year 1999
Operator: Clinton Fischer

C/A CODE POSITION

Beg:
Lat: : 33 ° 50 ' 28.26 " N
Long: 111 ° 57 ' 07.53 " W
Ellip. Height: 641 + M PDOP: 1.6

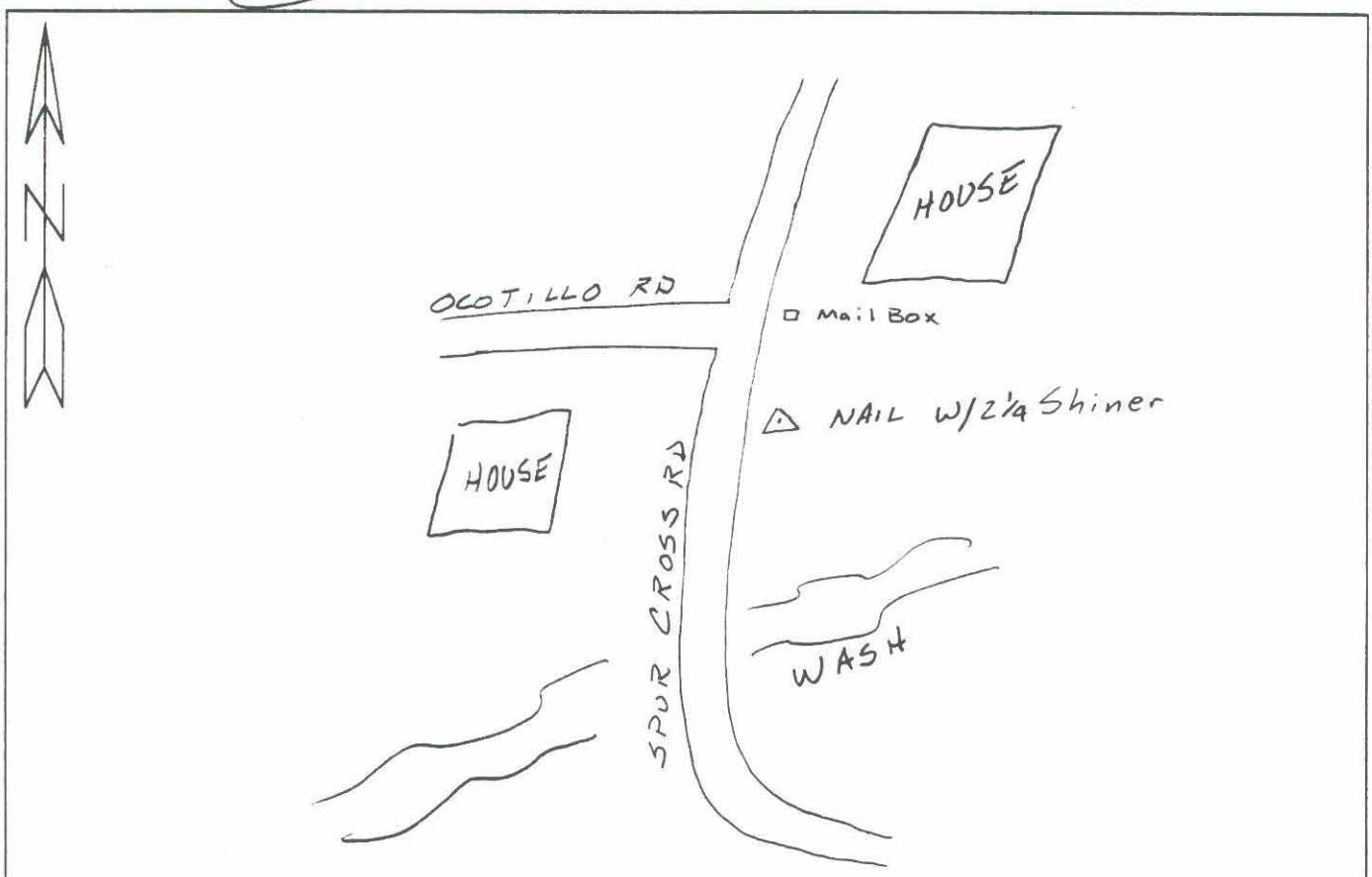
Ending:
Lat: 33 ° 50 ' 27.84 " N
Long: 111 ° 57 ' 7.39 " W
Ellip. Height: 604 + M PDOP: 1.9

Receiver Model: 4000 SSE (X) 4800 ( ) 4000 SE ( )
Antenna Type: CompL1/L2 w/GP (X) CompL1/L2 ( ) Geodetic( )
Tribrach: SoKKisha Wild H/P Topcon Pentax
Local-UTC Time Offset: MST= -7:00
Type of Survey: Fast Static (X) - Fast Static ( )
Actual= Start 17 :11 Stop: 17 :39 UTC
Beg. SV's Used: 03, 08, 09, 15, 17, 21, 23, 31, 29
End SV's Used: 03, 08, 25, 15, 17, 21 23, 31, 29

Ant. Height (M) 1) 1.553 3) 1.558 5) 1.557 7) 1.558 9) 1.559 11) 1.559
2) 1.558 4) 1.557 6) 1.557 8) 1.558 10) 1.559 12) 1.558 Mean= 1.558

(ft) 1) 5.11 3) 5.11
2) 5.10 Mean

Weather Conditions: (Clear) P. Cloudy Overcast Hot (Warm) Cool Cold Calm Breezy °F +/-



Type of Monument: NAIL W/2½ Shiner Stamping: —
Top of marker: (X) flush M ( ) above: ( ) below: Nat. Ground Detail Notes: —

Rubbing Performed ( )Yes (X)No

17:39
#21

A TEAM Professional Associates, INC.
GPS STATION LOG

1802 W. Grant Road - Ste 110-5 -Tucson, Arizona - 85745 - (520) 623-8503 - (520) 623-8504 Fax

Station Name: #16
Receiver No: 6083
Day of Year: 273 1999
Session No: 03 (for fast static)

Project Name: McFlood
Job number: # 919
Local Date: mo. 09 day 30 year 1999
Operator: Matt Danelowitz

C/A CODE POSITION

Beg:
Lat: : 33° 50 '3391 "N
Long: 111° 56 '3589 "W
Ellip. Height: 0627 - M PDOP: 2.1

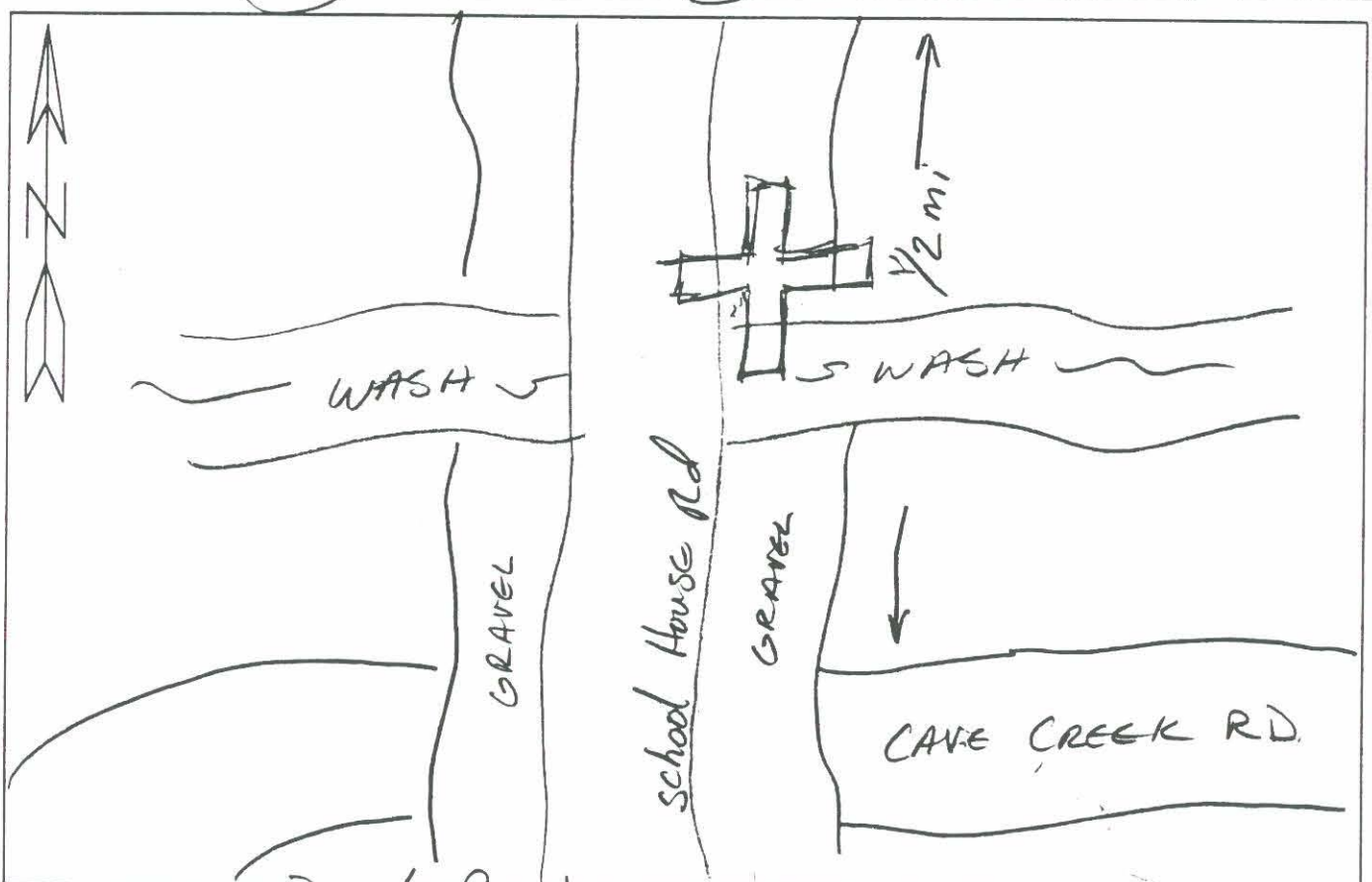
Ending:
Lat: 33° 50 '3404 "N
Long: 111° 56 '3530 "W
Ellip. Height: 0589 - M PDOP: 2.0

Receiver Model: 4000 SSE (X) 4800 ( ) 4000 SE ( )
Antenna Type: CompL1/L2 w/GP (X) CompL1/L2 ( ) Geodetic( )
Tribrach: SoKKisha Wild H/P Topcon Pentax
Local-UTC Time Offset: MST= -7:00
Type of Survey: Fast Static (X) - Fast Static ( )
Actual= Start 17:25 Stop: 17:41 UTC
Beg. SV's Used: 27, 03, 08, 31, 15, 17, 21, 23, 25
End SV's Used: 27, 03, 08, 31, 15, 17, 21, 23, 25

Ant. Height (M)
1) 1.578 3) 15.80 5) 15.77 7) 15.78 9) 15.80 11) 15.80
2) 15.80 4) 15.78 6) 15.78 8) 15.78 10) 15.80 12) 15.80 Mean= 15.78

(ft) 1) 4.76 3) 4.77
2) 4.77 Mean 4.77

Weather Conditions: (Clear) P. Cloudy Overcast (Hot) Warm Cool Cold Calm Breezy °F +/-



Type of Monument: Panel Point Stamping:
Top of marker: (X) flush M ( ) above: ( ) below: Nat. Ground Detail Notes: in the west on east side of Road

Rubbing Performed ( )Yes (X) No

A TEAM Professional Associates, INC.
GPS STATION LOG

1802 W. Grant Road - Ste 110-5 -Tucson, Arizona - 85745 - (520) 623-8503 - (520) 623-8504 Fax

Station Name: # 16
Receiver No: 6083
Day of Year: 278 1999
Session No: 0 (for fast static)

Project Name:
Job number: # 919
Local Date: mo. 10 day 5 year 1999
Operator: Jose Bonillas

C/A CODE POSITION

Beg:
Lat: : 33 ° 50 ' 34.97 " N
Long: 111 ° 56 ' 35.38 " W
Ellip. Height: + 0631 + M PDOP: 2.0

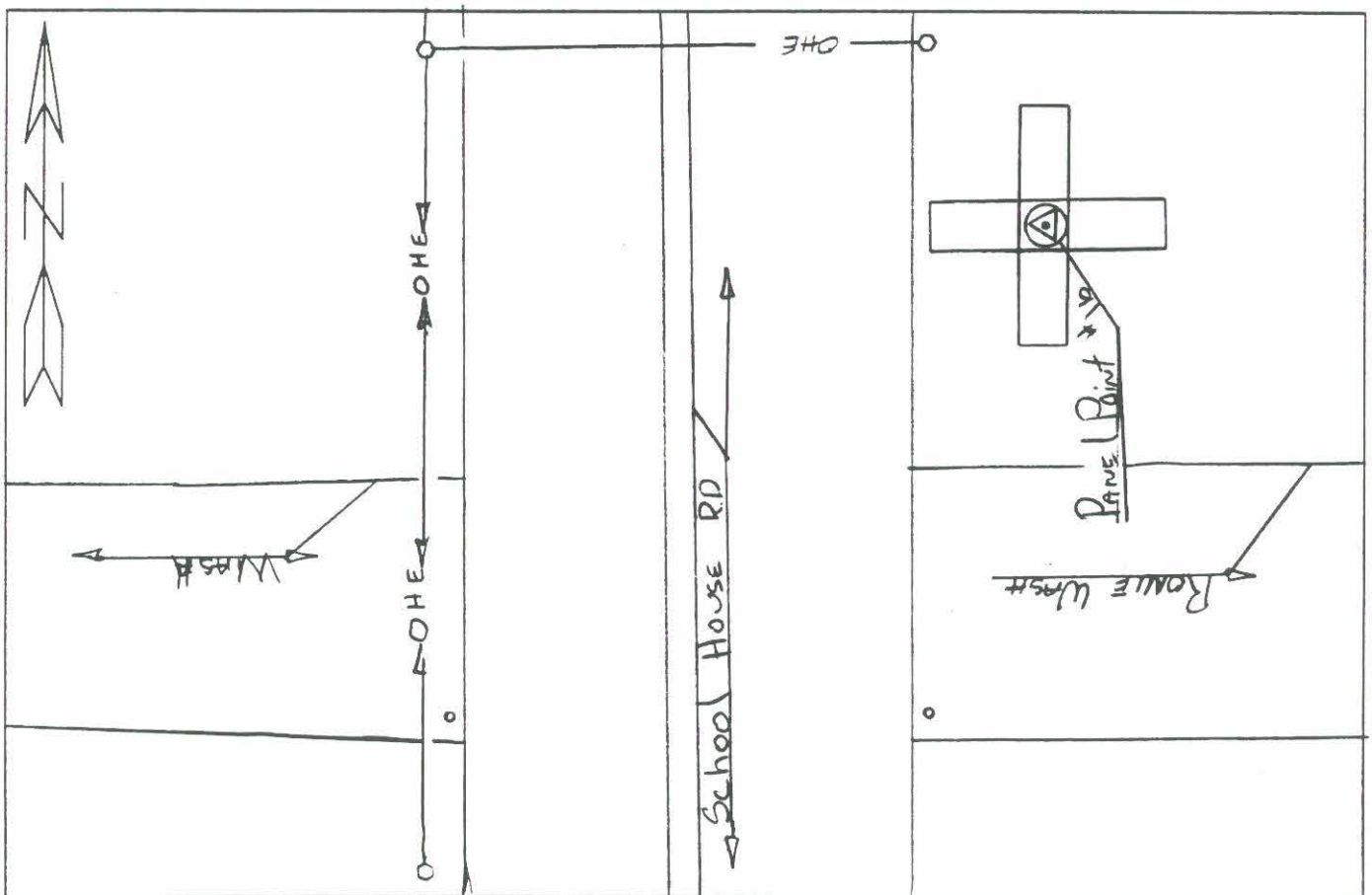
Ending:
Lat: 33 ° 50 ' 33.79 " N
Long: 111 ° 56 ' 35.11 " W
Ellip. Height: + 0619 - M PDOP: 2.4

Receiver Model: 4000 SSE (X) 4800 ( ) 4000 SE ( )
Antenna Type: CompL1/L2 w/GP (X) CompL1/L2 ( ) Geodetic( )
Tribrach: SoKKisha Wild H/P Topcon Pentax
Local-UTC Time Offset: MST= -7:00
Type of Survey: Fast Static (X) - Fast Static ( )
Actual= Start 15:26 Stop: 15:56 UTC
Beg. SV's Used: 03, 08, 09, 31, 17, 21, 23, 29
End SV's Used: 03, 08, 09, 31, 17, 21, 22, 29

Ant. Height (M)
1) 3) 1.630 5) 1.630 7) 1.630 9) 11) 1.631
2) 1.630 4) 1.630 6) 1.630 8) 10) 1.631 12) 1.631 Mean= 1.630

(ft) 1) 1.57 3)
2) 1.53 Mean 1.55

Weather Conditions: Clear (P. Cloudy) Overcast Hot (Warm) Cool Cold (Calm) Breezy °F +/-



Type of Monument: SET 60D NAIL WISHER ON PANEL Stamping:
Top of marker: (X) flush M ( ) above: ( ) below: Nat. Ground Detail Notes:

Rubbing Performed ( )Yes ( )No

A TEAM Professional Associates, INC.

GPS STATION LOG

1802 W. Grant Road - Ste 110-5 -Tucson, Arizona - 85745 - (520) 623-8503 - (520) 623-8504 Fax

Station Name: # 17
Receiver No: 7662
Day of Year: 273 1999
Session No: 0 (for fast static)

Project Name: MARICOPA Co. FCD
Job number: # 919
Local Date: mo. 09 day 30 year 1999
Operator: JOE BONILLA

C/A CODE POSITION

Beg:
Lat: : 33 ° 49 · 47.01 " N
Long: 111 ° 56 · 34.82 " W
Ellip. Height: +0607+ M PDOP: 2.2

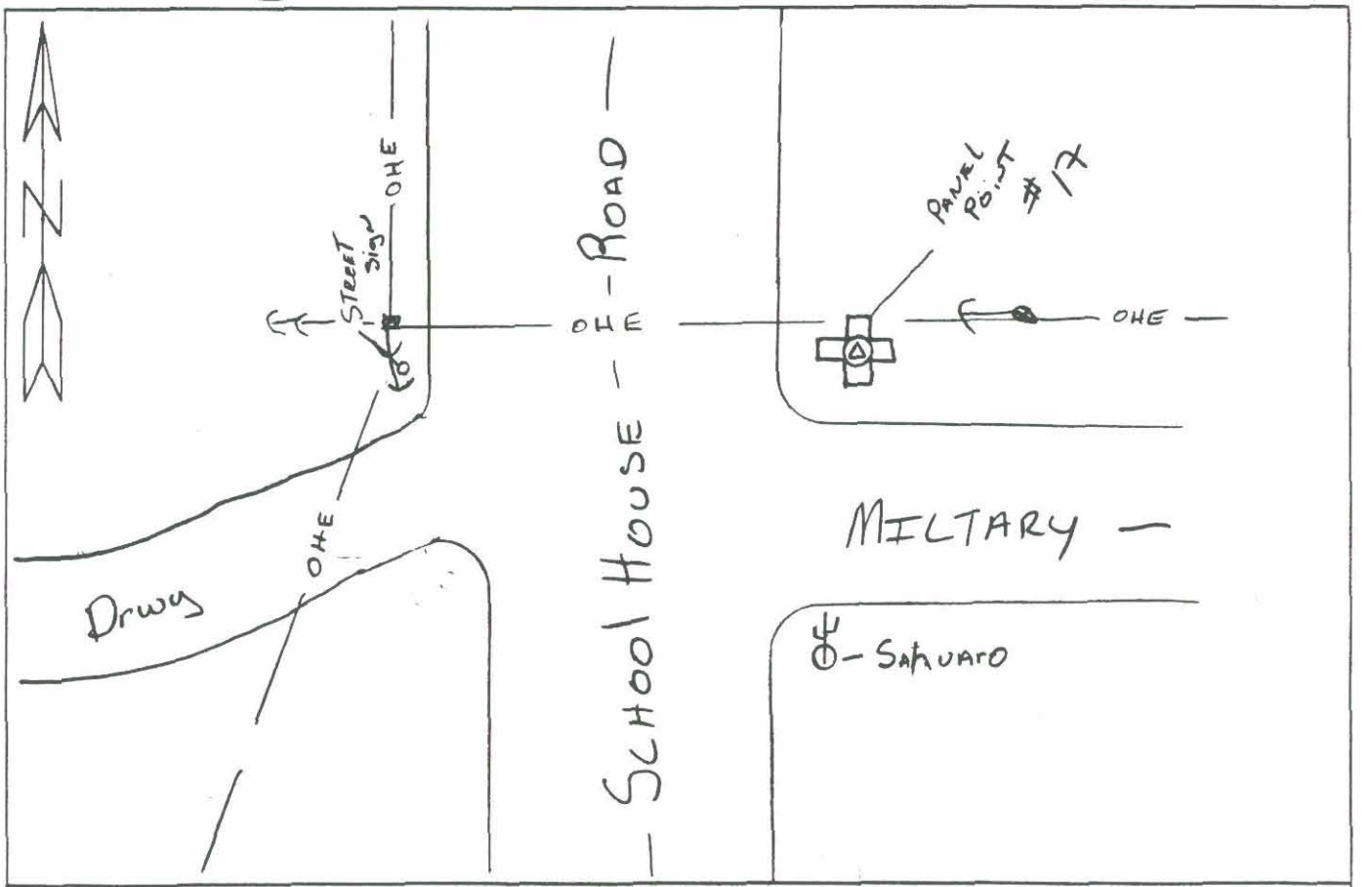
Ending:
Lat: 33 ° 49 · 46.43 " N
Long: 111 ° 56 · 35.35 " W
Ellip. Height: +0724+ M PDOP: 2.0

Receiver Model: 4000 SSE (X) 4800 ( ) 4000 SE ( )
Antenna Type: CompL1/L2 w/GP (X) CompL1/L2 ( ) Geodetic( )
Tribrach: SoKKisha Wild H/P Topcon Pentax
Local-UTC Time Offset: MST= -7:00
Type of Survey: Fast Static (X) - Fast Static ( )
Actual= Start 16 :28 Stop: 17 : 02 UTC
Beg. SV's Used: 03,09,17,21,23,29,31
End SV's Used: 03,08,09,17,21,23,29,31

Ant. Height (M) 1) 3)1.499 5) 7)1.498 9) 11)1.498
2)1.499 4)1.499 6)1.498 8)1.498 10)1.498 12)1.498 Mean= 1.498

(ft) 1) 4.91 3)
2) 4.91 Mean

Weather Conditions: (Clear) P. Cloudy Overcast Hot (Warm) Cool Cold Calm (Breezy) °F +/-



Type of Monument: SET 60D NAIL WITH WASHER Stamping:
Top of marker: (X) flush M ( ) above: ( ) below: Nat. Ground Detail Notes:

Rubbing Performed ( )Yes ( )No

A TEAM Professional Associates, INC.
GPS STATION LOG

1802 W. Grant Road - Ste 110-5 -Tucson, Arizona - 85745 - (520) 623-8503 - (520) 623-8504 Fax

Station Name: 0017 . Project Name: MARICOPA COUNTY FCD .
Receiver No: 6081 . Job number: # 919 .
Day of Year: 274 1999 . Local Date: mo. 10 day 1 year 1999 .
Session No: 0 (for fast static) . Operator: CHAD CLARK .

C/A CODE POSITION

Beg:
Lat: : 33 ° 49 ' 47.30 " N
Long: 111 ° 56 ' 34.67 " W
Ellip. Height: 0626 + M PDOP: 2.6 .

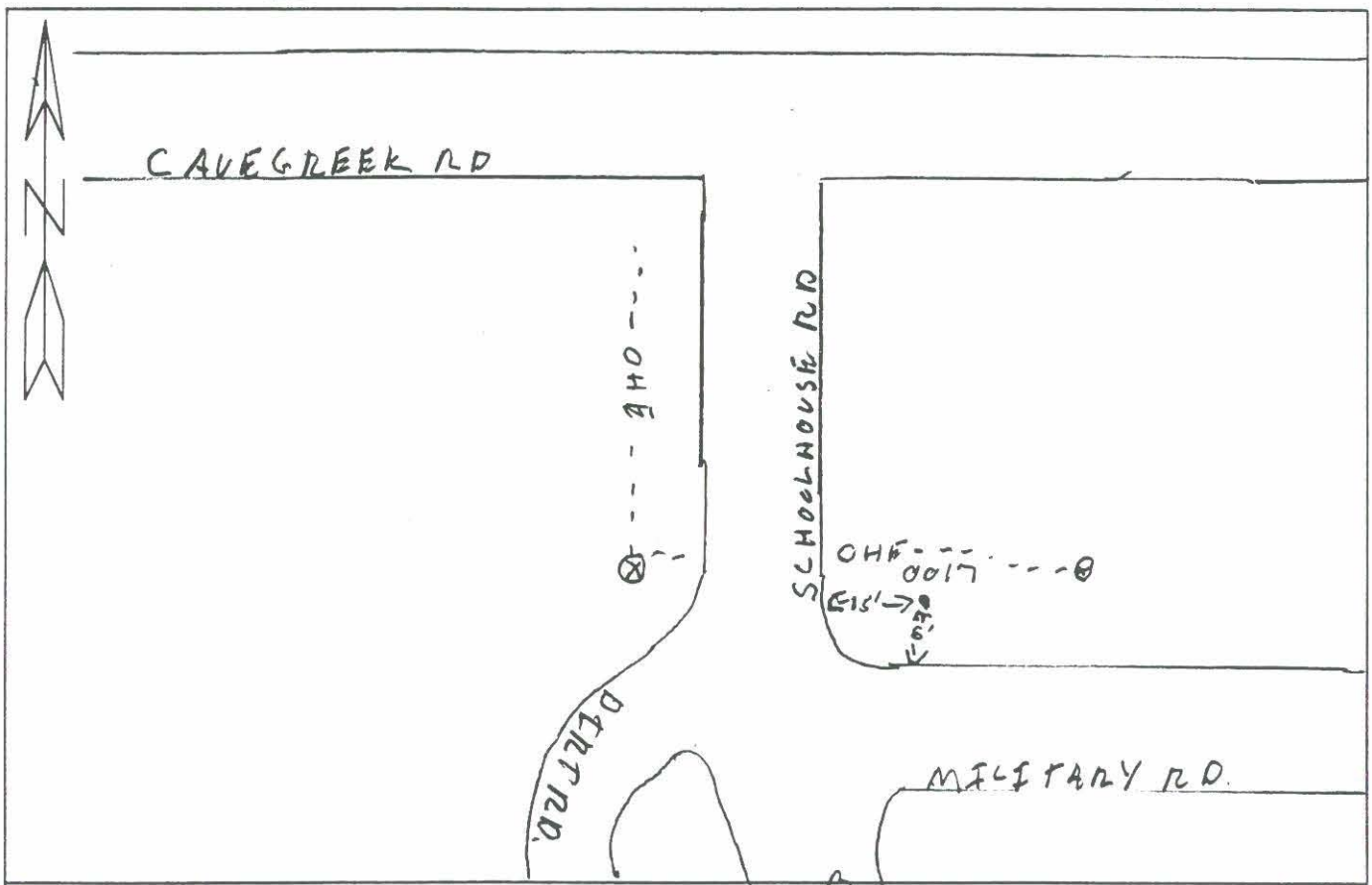
Ending:
Lat: 33 ° 49 ' 46.98 " N
Long: 111 ° 56 ' 35.55 " W
Ellip. Height: 0608 + M PDOP: 2.1 .

Receiver Model: 4000 SSE (X) 4800 ( ) 4000 SE ( ) .
Antenna Type: CompL1/L2 w/GP (X) CompL1/L2 ( ) Geodetic( )
Tribrach: SoKKisha Wild (H/P) Topcon Pentax .
Local-UTC Time Offset: MST= -7:00 12:04 .
Type of Survey: Fast Static (X) - Fast Static ( ) .
Actual= Start 19 : 04 . Stop: 20 : 00 . UTC
Beg. SV's Used: 01, 29, 14, 15, 2, 30, 25 .
End SV's Used: 01, 29, 22, 14, 15, 2, 30, 25 .

Ant. Height (M)
1) 1.513 3) 1.514 5) 1.513 7) 1.514 9) 1.514 11) 1.515
2) 1.513 4) 1.514 6) 1.513 8) 1.514 10) 1.513 12) 1.514 Mean= 1.514 .

(ft) 1) 4.97 3) 4.96
2) 4.97 Mean 4.97

Weather Conditions: (Clear) P. Cloudy Overcast (Hot) Warm Cool Cold Calm (Breezy) 100°F +/- .



Type of Monument: 60D NAIL WITH WHITE WHISKER Stamping: — .
Top of marker: (X) flush M ( ) above: ( ) below: Nat. Ground Detail Notes: FOUND AT PANAL .

Rubbing Performed ( )Yes (X)No .

A TEAM Professional Associates, INC.
GPS STATION LOG

1802 W. Grant Road - Ste 110-5 -Tucson, Arizona - 85745 - (520) 623-8503 - (520) 623-8504 Fax

Station Name: 0017
Receiver No: 6081
Day of Year: 274 1999
Session No: 0 (for fast static)

Project Name: MARICOPA COUNTY FCD
Job number: # 919
Local Date: mo. 10 day 1 year 1999
Operator: CHAD CLARK

C/A CODE POSITION

Beg:
Lat: : 33 ° 49 ' 47.64 " N
Long: 111 ° 56 ' 36.11 " W
Ellip. Height: 0679 - M PDOP: 1.9

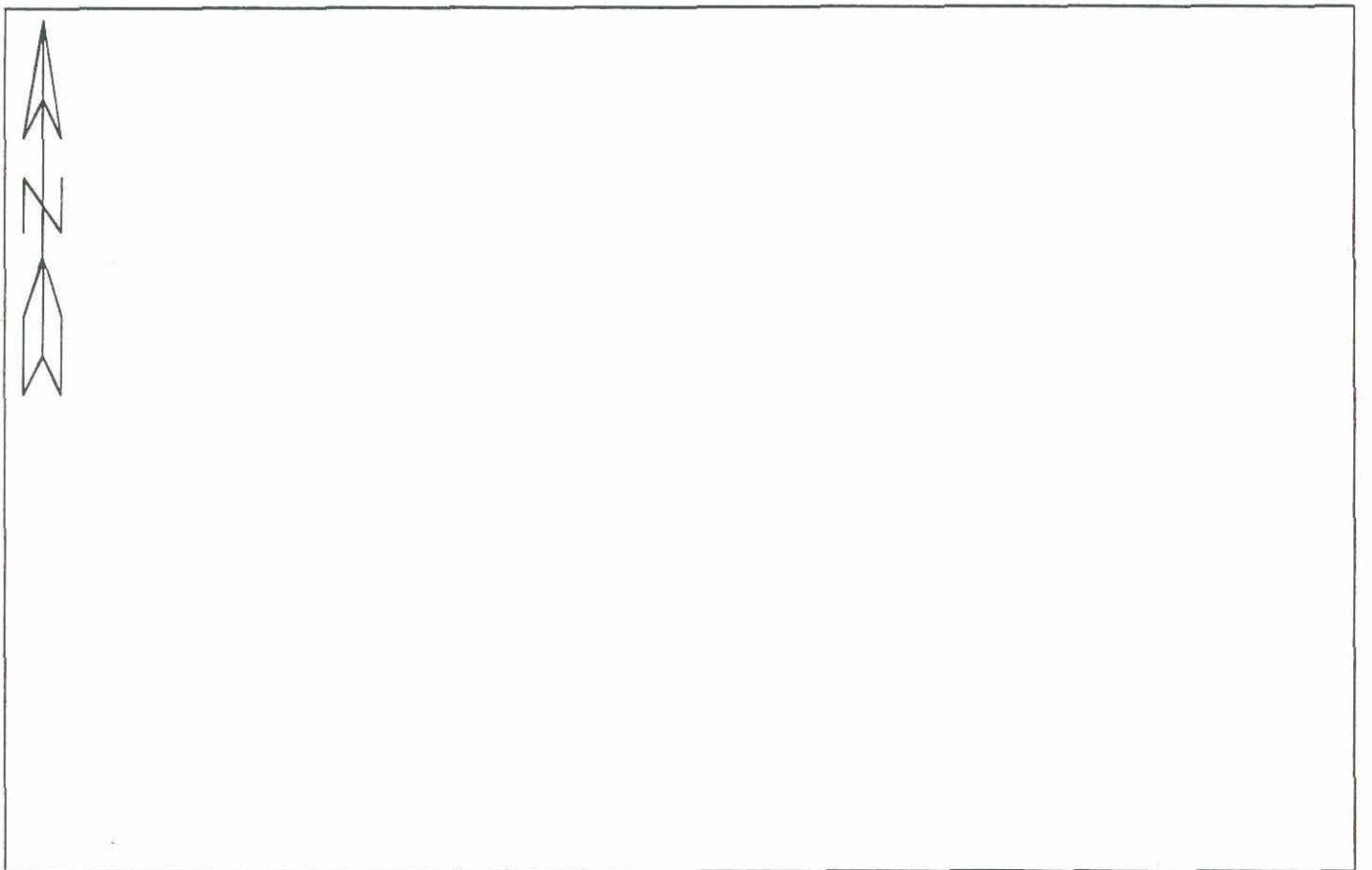
Ending:
Lat: 33 ° 49 ' 48.06 " N
Long: 111 ° 56 ' 35.54 " W
Ellip. Height: 0608 + M PDOP: 3.0

Receiver Model: 4000 SSE (X) 4800 ( ) 4000 SE ( )
Antenna Type: CompL1/L2 w/GP (X) CompL1/L2 ( ) Geodetic( )
Tribrach: SoKKisha Wild (H/P) Topcon Pentax
Local-UTC Time Offset: MST= -7:00 13:37
Type of Survey: Fast Static (X) - Fast Static ( )
Actual= Start 20 : 37 Stop: 21 : 05 UTC
Beg. SV's Used: 01, 14, 15, 16, 22, 25, 29
End SV's Used: 01, 14, 15, 16, 22, 25

Ant. Height (M)
1) 1.513 3) 1.514 5) 1.513 7) 1.514 9) 1.514 11) 1.515
2) 1.513 4) 1.514 6) 1.513 8) 1.514 10) 1.515 12) 1.514 Mean= 1.514

(ft) 1) 4.97 3) 4.97
2) 4.96 Mean 4.97

Weather Conditions: (Clear) P. Cloudy Overcast (Hot) Warm Cool Cold Calm (Breezy) 100 F +/-



Type of Monument: 60D NAIL WITH WHITE WHISKER Stamping: —
Top of marker: (X) flush M ( ) above: ( ) below: Nat. Ground Detail Notes: FOUND AT PANAL

Rubbing Performed ( )Yes (X)No

A TEAM Professional Associates, INC.
GPS STATION LOG

1802 W. Grant Road - Ste 110-5 -Tucson, Arizona - 85745 - (520) 623-8503 - (520) 623-8504 Fax

Station Name: 01B
Receiver No: 60082
Day of Year: 273 1999
Session No: 0 (for fast static)

Project Name: MC FLOOD
Job number: 919 #
Local Date: mo. 09 day 30 year 1999
Operator: C. STUART

C/A CODE POSITION

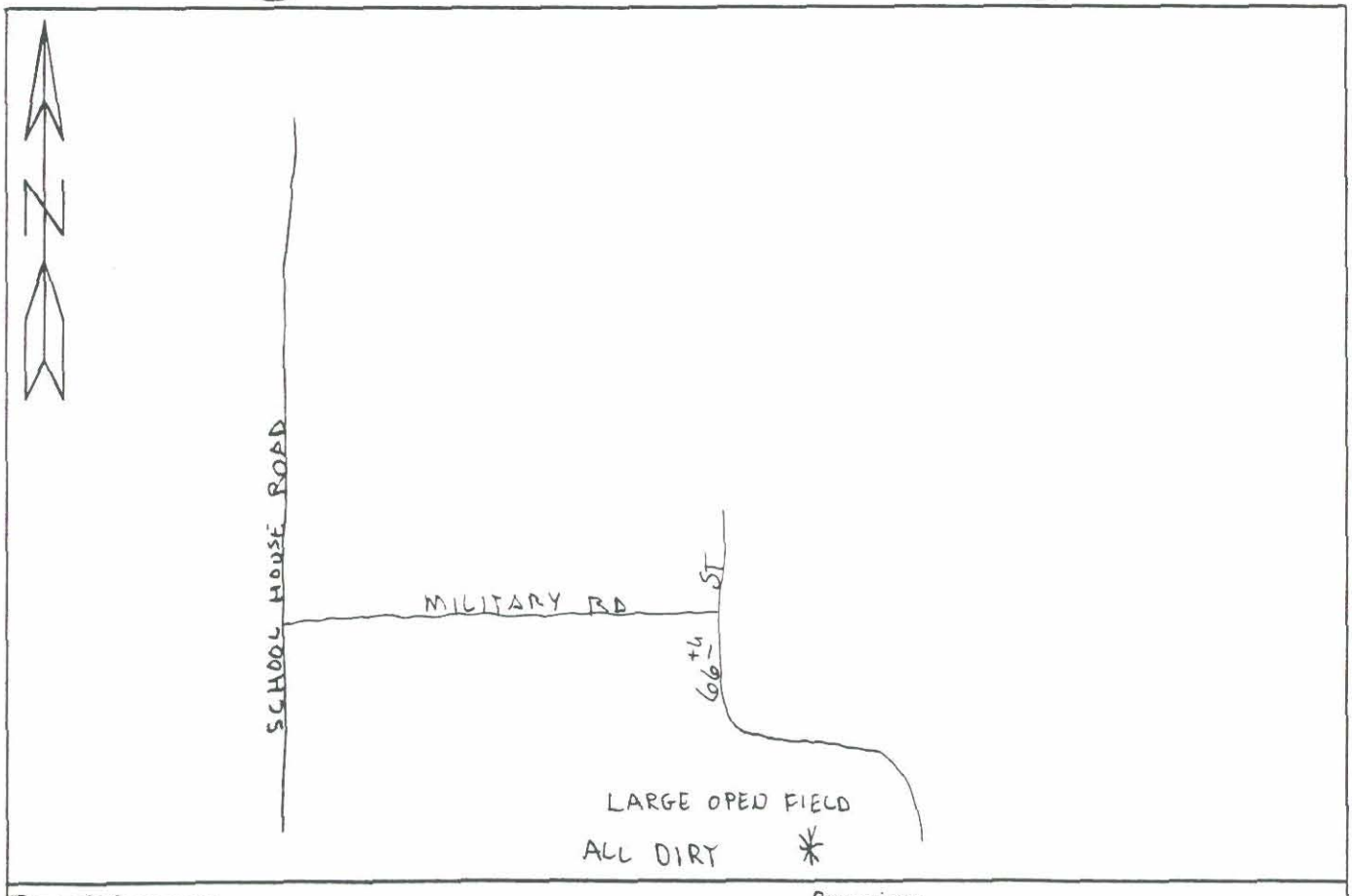
Beg:
Lat: : 33 ° 49 ' 36.79 " N
Long: 111 ° 58 56 ' 08.67 " W
Ellip. Height: +0680+ M PDOP: 2.1

Ending:
Lat: 33 ° 49 ' 37.61 " N
Long: 111 ° 56 ' 10-01 " W
Ellip. Height: +0616.5- M PDOP: 2.07

Receiver Model: 4000 SSE (X) 4800 ( ) 4000 SE ( )
Antenna Type: CompL1/L2 w/GP (X) CompL1/L2 ( ) Geodetic( )
Tribrach: SoKKisha Wild H/P Topcon Pentax
Local-UTC Time Offset: MST= -7:00
Type of Survey: Fast Static (X) - Fast Static ( )
Actual= Start 18 : 13 Stop: 18: 29 UTC
Beg. SV's Used: 08, 29, 15, 31, 21, 23, 25
End SV's Used: 01, 08, 29, 15, 31, 21, 23, 25

Ant. Height (M) 1) 1.568 3) 1.553 5) 1.446 7) 1.557 9) 1.580 11) 12) Mean= 1.56
(ft) 1) 1.548 3) 2) Mean

Weather Conditions: (Clear) P. Cloudy Overcast Hot (Warm) Cool Cold (Calm) Breezy 90 °F +/-



Type of Monument: Stamping:
Top of marker: ( ) flush M ( ) above: ( ) below: Nat. Ground Detail Notes:

Rubbing Performed ( )Yes ( )No

A TEAM Professional Associates, INC.

GPS STATION LOG

1802 W. Grant Road - Ste 110-5 -Tucson, Arizona - 85745 - (520) 623-8503 - (520) 623-8504 Fax

Station Name: 0018
Receiver No: 6081
Day of Year: 274 1999
Session No: 0 (for fast static)

Project Name: MRI COPA COUNTY FCD
Job number: # 919
Local Date: mo. 10 day 1 year 1999
Operator: CHAD CLARK

C/A CODE POSITION

Beg:
Lat: : 33 ° 49 ' 36.64 " N
Long: 111 ° 56 ' 10.35 " W
Ellip. Height: 0704- M PDOP: 2.0

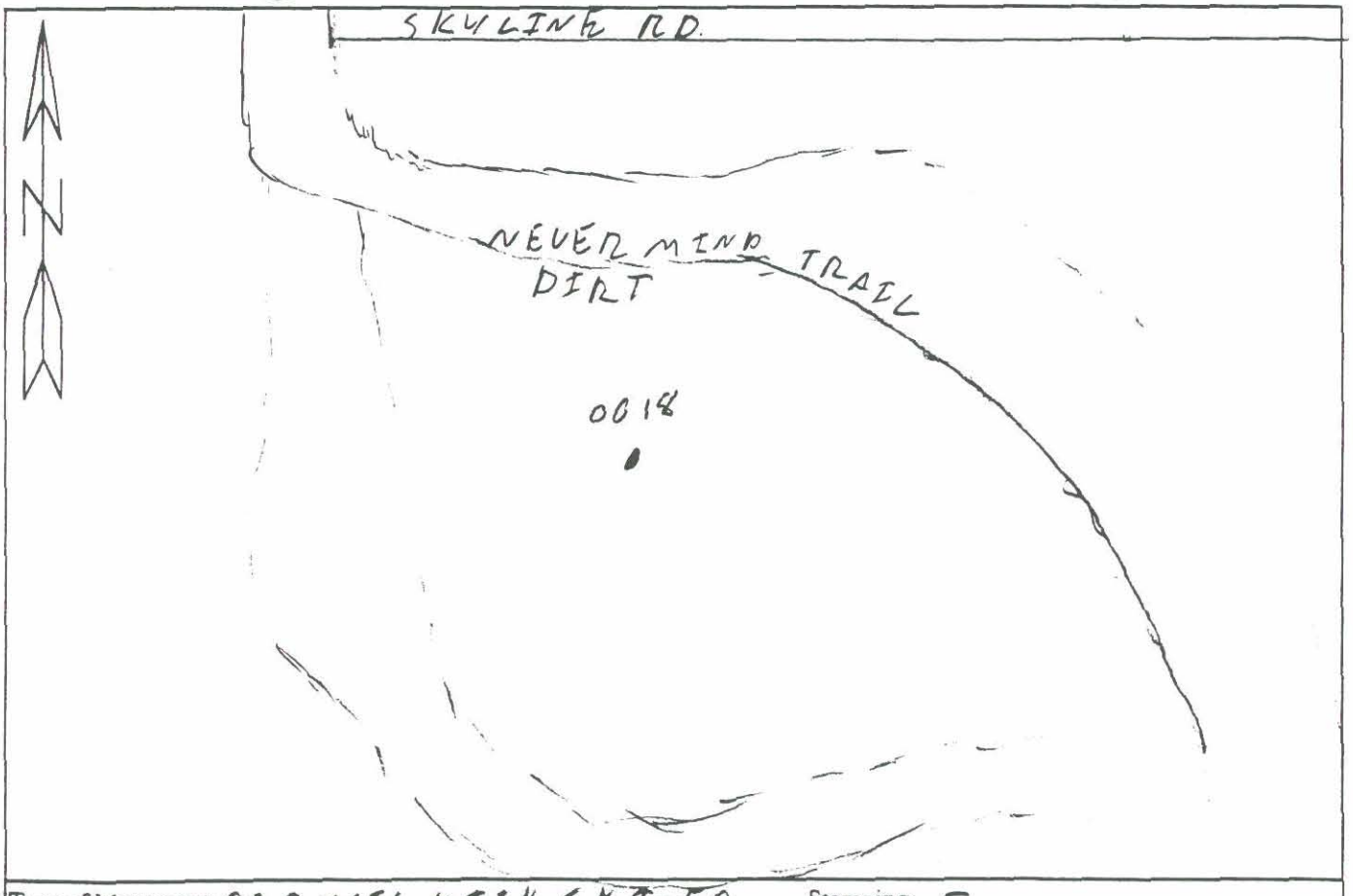
Ending:
Lat: 33 ° 49 ' 36.74 " N
Long: 111 ° 56 ' 09.35 " W
Ellip. Height: 0645+ M PDOP: 1.9

Receiver Model: 4000 SSE (X) 4800 ( ) 4000 SE ( )
Antenna Type: CompL1/L2 w/GP (X) CompL1/L2 ( ) Geodetic( )
Tribrach: SoKKisha Wild (H/P) Topcon Pentax
Local-UTC Time Offset: MST= -7:00 07:49
Type of Survey: Fast Static (X) - Fast Static ( )
Actual= Start 14 :49 Stop: 15 :17 UTC
Beg. SV's Used: 03, 06, 09, 29, 17, 21, 23, 26
End SV's Used: 03, 06, 09, 29, 17, 21, 08, 23, 26

Ant. Height (M) 1) 1.518 2) 1.518 3) 1.518 4) 1.518 5) 1.517 6) 1.518 7) 1.518 8) 1.518 9) 1.518 10) 1.517 11) 1.518 12) 1.518 Mean= 1.518

(ft) 1) 4.99 3) 4.99 2) 4.98 Mean 4.98

Weather Conditions: (Clear) P. Cloudy Overcast Hot (Warm) Cool Cold Calm (Breezy) 80 °F +/-



Type of Monument: GD NAIL WITH SHINER Stamping: -
Top of marker: (X) flush M ( ) above: ( ) below: Nat. Ground Detail Notes: FOUND BY PAUL

Rubbing Performed ( )Yes (X)No

A TEAM Professional Associates, INC.
GPS STATION LOG

1802 W. Grant Road - Ste 110-5 -Tucson, Arizona - 85745 - (520) 623-8503 - (520) 623-8504 Fax

Station Name: 19
Receiver No: 4573 -5677 - 6076 - 6081 - 6082 - 6083
Day of Year: 273 1999
Session No: 0 (for fast static)

Project Name: Maricopa County FCD
Job number:
Local Date: mo. SEPT day 30 year 1999
Operator: Clinton Fischer

C/A CODE POSITION

Beg:
Lat: : 33 ° 49 · 55 03 " N
Long: 111 ° 56 · 05 08 " W
Ellip. Height: 677 M PDOP: 2

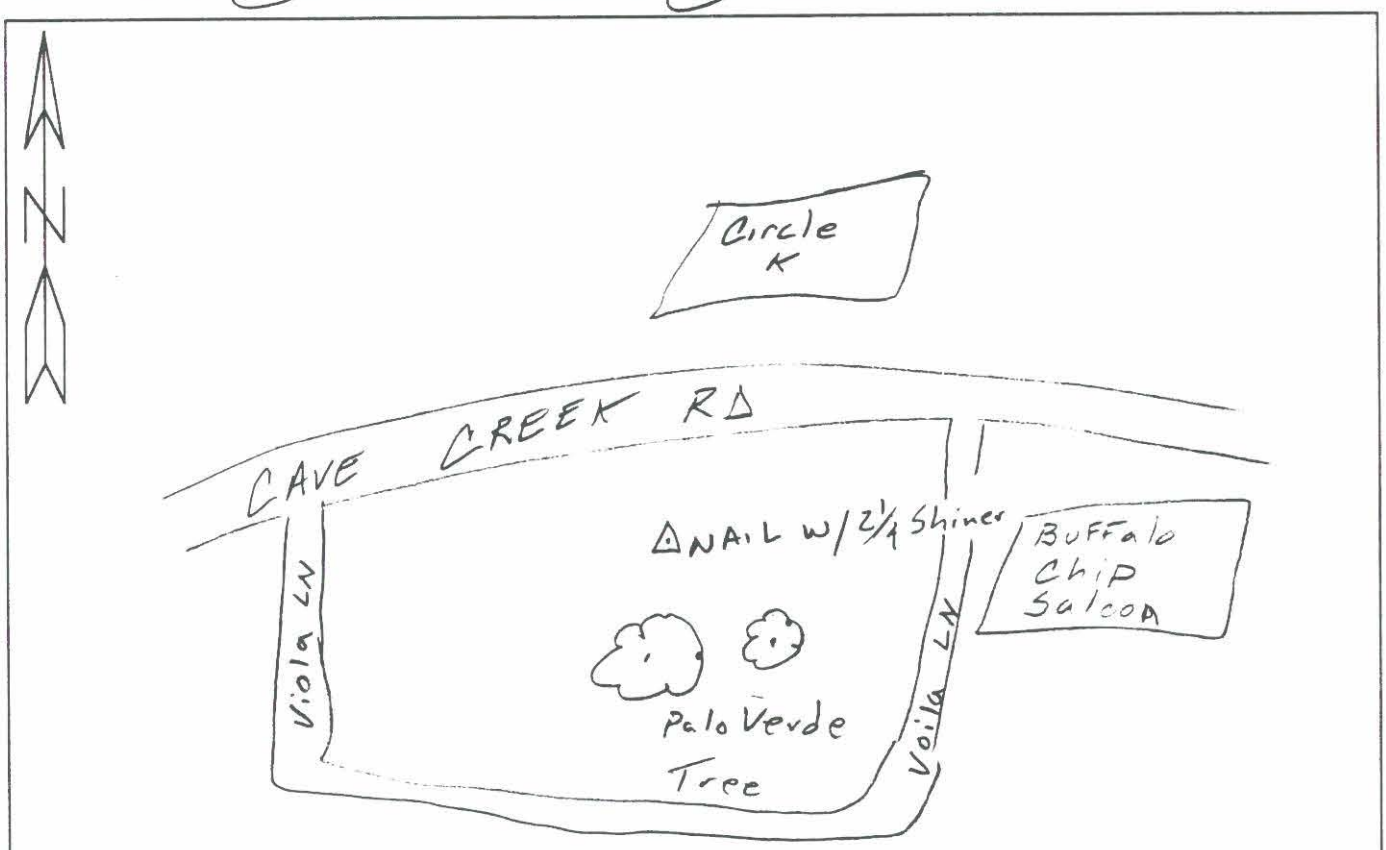
Ending:
Lat: 33 ° 49 · 55 52 " N
Long: 111 ° 56 · 05 67 " W
Ellip. Height: 697 M PDOP: 2.0

Receiver Model: 4000 SSE (X) 000 SE ( )
Antenna Type: Comp L1/L2 W/GP (X) omp L1/L2 ( )
Tribrach: SoKKisha Wild H/P Topcon Pintax
Local-UTC Time Offset: MST= -7:00
Type of Survey: Fast Static (X) - Fast Static ( )
Actual= Start 18 :19 Stop: 18 :26 UTC
Beg. SV's Used: 31, 08 15 01 21 23 25 29
End SV's Used: 08, 15, 01, 21, 23, 25, 29

Ant. Height (M) 1)1624 2)1624 3)1625 4)1625 5)1626 6)1626 7)1626 8)1625 9)1625 10)1625 11)1624 12)1624 Mean= 1625

(ft) 1)5 33 3) . 2) Mean

Weather Conditions: (Clear) P. Cloudy Overcast (Hot) Warm Cool Cold Calm Breezy °F +/-



Type of Monument: Nail 2¼" Shiner Stamping: —
Top of marker: (X) flush M ( ) above: ( ) below: Nat. Ground Detail Notes: —

Rubbing Performed (X) Yes ( ) No

A TEAM Professional Associates, INC.
GPS STATION LOG

1802 W. Grant Road - Ste 110-5 -Tucson, Arizona - 85745 - (520) 623-8503 - (520) 623-8504 Fax

Station Name: # 20
Receiver No: 7662
Day of Year: 273 1999
Session No: 0 (for fast static)

Project Name: MARICOPA Co. F.C.D.
Job number: # 919
Local Date: mo. SEPT day 30 year 1999
Operator: JOE BONIMAS

C/A CODE POSITION

Beg:
Lat: : 33 ° 50 ' 20.37 " N
Long: 111 ° 56 ' 21.43 " W
Ellip. Height: +0693 + M PDOP: 1.9

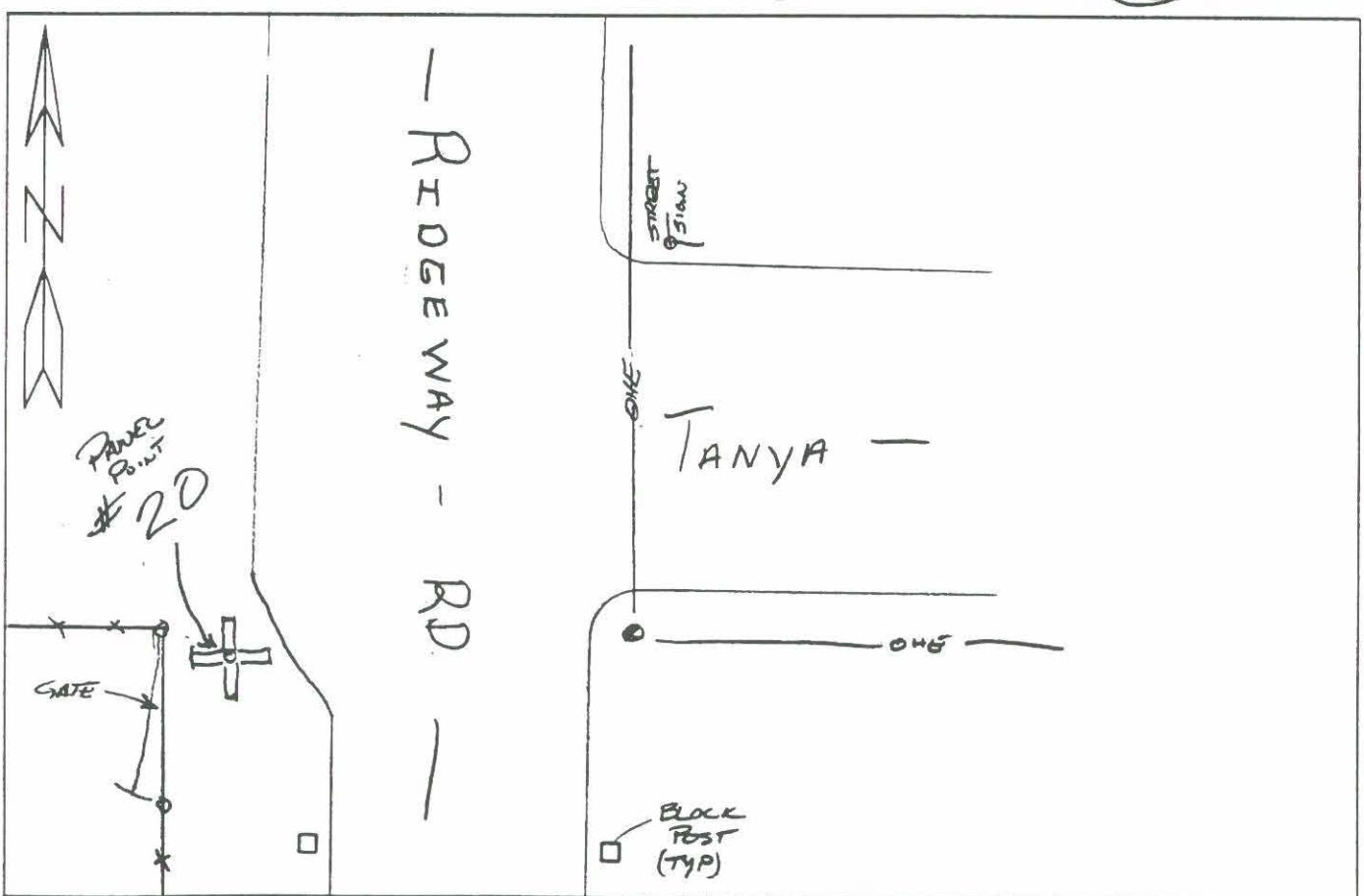
Ending:
Lat: 33 ° 50 ' 20.85 " N
Long: 111 ° 56 ' 20.10 " W
Ellip. Height: 605+ M PDOP: 2.0

Receiver Model: 4000 SSE (X) 4800 ( ) 4000 SE ( )
Antenna Type: CompL1/L2 w/GP (X) CompL1/L2 ( ) Geodetic( )
Tribrach: SoKKisha (Wild) H/P Topcon Pentax
Local-UTC Time Offset: MST= -7:00
Type of Survey: Fast Static (X) - Fast Static ( )
Actual= Start 17 : 26 Stop: 17 : 39 UTC
Beg. SV's Used: 29, 08, 31 15, 17, 21, 23, 25
End SV's Used: 29, 03, 08, 31, 15, 17, 21, 23, 25

Ant. Height (M): 1) 1.602 2) 3) 1.602 4) 1.602 5) 1.602 6) 7) 1.602 8) 1.602 9) 1.602 10) 11) 1.602 12) 1.602 Mean= 1.602

(ft) 1) 5.26 3) 5.26 2) 5.26 Mean 5.26

Weather Conditions: (Clear) P. Cloudy Overcast Hot (Warm) Cool Cold Calm (Breezy) °F +/-



Type of Monument: SET 60D NAIL W/WHITE WHISKER Stamping: —
Top of marker: (X) flush M ( ) above: ( ) below: Nat. Ground Detail Notes:

Rubbing Performed ( )Yes ( )No

A TEAM Professional Associates, INC.

GPS STATION LOG

1802 W. Grant Road - Ste 110-5 -Tucson, Arizona - 85745 - (520) 623-8503 - (520) 623-8504 Fax

Station Name: 20 | Project Name: Maricopa Co FCD

Receiver No: 7662 | Job number: #919

Day of Year: 273 1999 | Local Date: mo. 09 day 30 year 1999

Session No: 0 (for fast static) | Operator: Jose Bonillas

C/A CODE POSITION

Beg:

Lat: : 33 ° 50 ' 20.23 " N

Long: 111 ° 56 ' 19.77 " W

Ellip. Height: 0612.+ M PDOP: 2.2

Ending:

Lat: 33 ° 50 ' 21.15 " N

Long: 111 ° 56 ' 20.98 " W

Ellip. Height: 0617.- M PDOP: 2.0

Receiver Model: 4000 SSE (X) 4800 ( ) 4000 SE ( )

Antenna Type: CompL1/L2 w/GP (X) CompL1/L2 ( ) Geodetic( )

Tribrach: SoKKisha Wild H/P Topcon Pentax

Local-UTC Time Offset: MST= -7:00

Type of Survey: Fast Static (X) - Fast Static ( )

Actual= Start 17 :53 Stop: 18 :26 UTC

Beg. SV's Used: 01,03,08,29,15,31,21,23,25

End SV's Used: 01,08,29,15,31,21,23,25

Ant. Height (M) 1)1.508 3)1.509 5)1.509 7)1.509 9)1.509 11)1.508 (ft) 1)4.95 3)

2)1.509 4)1.509 6) 8)1.509 10) 12)1.508 Mean= 1.509 2)4.95 Mean 4.95

Weather Conditions: (Clear) P. Cloudy Overcast Hot (Warm) Cool Cold Calm (Breezy) °F +/-

Type of Monument: SET 60d Nail w/washer Stamping:

Top of marker: (X) flush M ( ) above: ( ) below: Nat. Ground Detail Notes:

Rubbing Performed ( )Yes ( )No

18:26

A TEAM Professional Associates, INC.
GPS STATION LOG

1802 W. Grant Road - Ste 110-5 -Tucson, Arizona - 85745 - (520) 623-8503 - (520) 623-8504 Fax

Station Name: # 21
Receiver No: 6083
Day of Year: 273 1999
Session No: 0 (for fast static)

Project Name: McFlood
Job number: # 919
Local Date: mo. 09 day 30 year 1999
Operator: Matt Danelowitz

C/A CODE POSITION

Beg:
Lat: : 33° 50 05.66 "N
Long: 111° 55 56.81 "W
Ellip. Height: 0655- M PDOP: 2.0

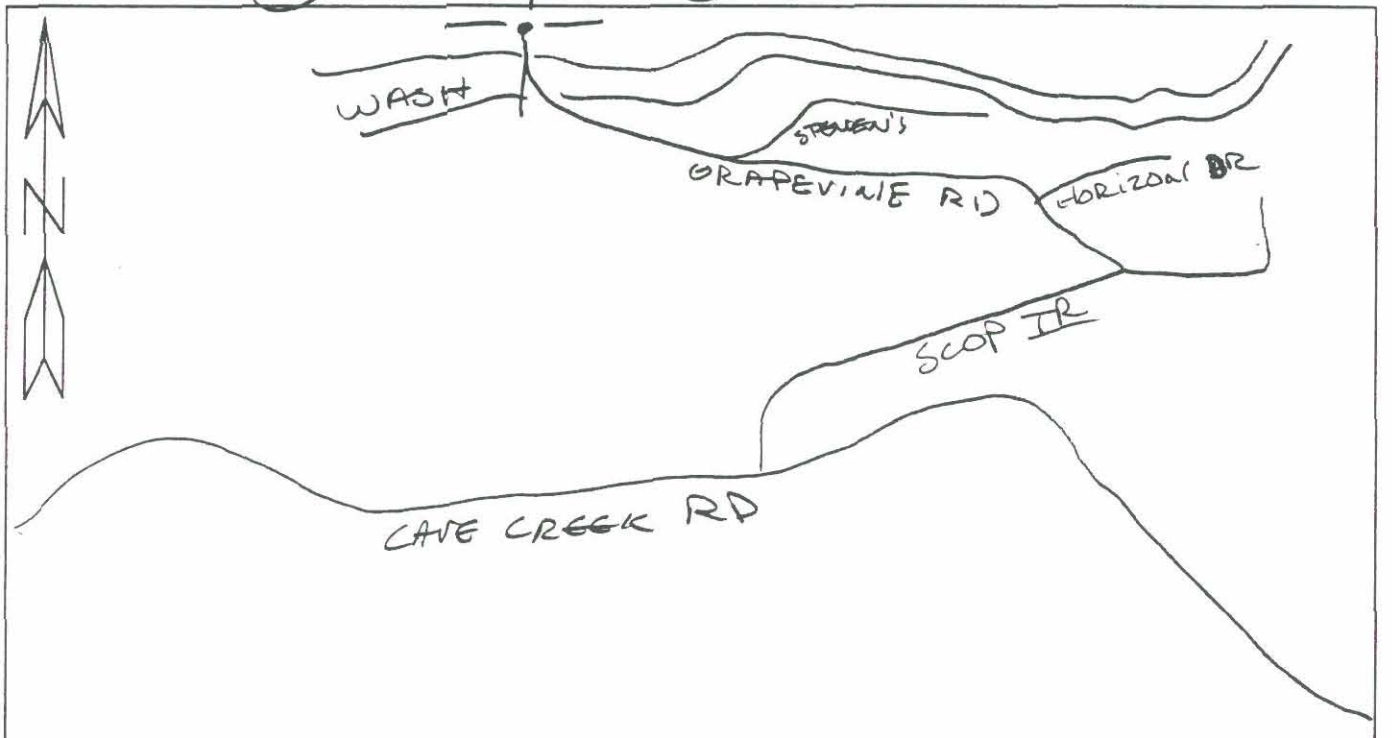
Ending:
Lat: 33° 50 06.18 "N
Long: 111° 55 58.17 "W
Ellip. Height: 0630+ M PDOP: 2.0

Receiver Model: 4000 SSE (X) 4800 ( ) 4000 SE ( )
Antenna Type: CompL1/L2 w/GP (X) CompL1/L2 ( ) Geodetic( )
Tribrach: SoKKisha Wild H/P Topcon Pentax
Local-UTC Time Offset: 10.07 MST= -7:00
Type of Survey: Fast Static (X) - Fast Static ( )
Actual= Start 18:07 Stop: 18:29 UTC
Beg. SV's Used: 01, 03, 29, 08, 15, 31, 21, 23, 25
End SV's Used: 01, 29, 08, 15, 31, 21, 23, 25

Ant. Height (M)
1)15.00 3)14.975)14.967)14.99 9)15.00 11)15.00
2)14.97 4)14.966)14.968)14.9510)15.00 12)15.00 Mean= 14.98

(ft) 1)4.92 3)4.91
2)4.92 Mean 4.92

Weather Conditions: Clear P. Cloudy Overcast Hot Warm Cool Cold Calm Breezy °F +/-



Type of Monument: Panel Point Stamping: None
Top of marker: (X) flush M ( ) above: ( ) below: Nat. Ground Detail Notes: At the end of grapevine in Cul de Sac to the North 10 yds through brush
Rubbing Performed ( )Yes ( )No

A TEAM Professional Associates, INC.
GPS STATION LOG

1802 W. Grant Road - Ste 110-5 -Tucson, Arizona - 85745 - (520) 623-8503 - (520) 623-8504 Fax

Station Name: 22
Receiver No: 6076
Day of Year: 1999
Session No: 0 (for fast static)

Project Name: McF1000
Job number: # 919
Local Date: mo. 10 day 1 year 1999
Operator: C. STUART

C/A CODE POSITION

Beg:
Lat: : 33 ° 49 ' 15.64 " N
Long: 111 ° 55 ' 52.19 " W
Ellip. Height: +0730.2 ~ M PDOP: 2.31

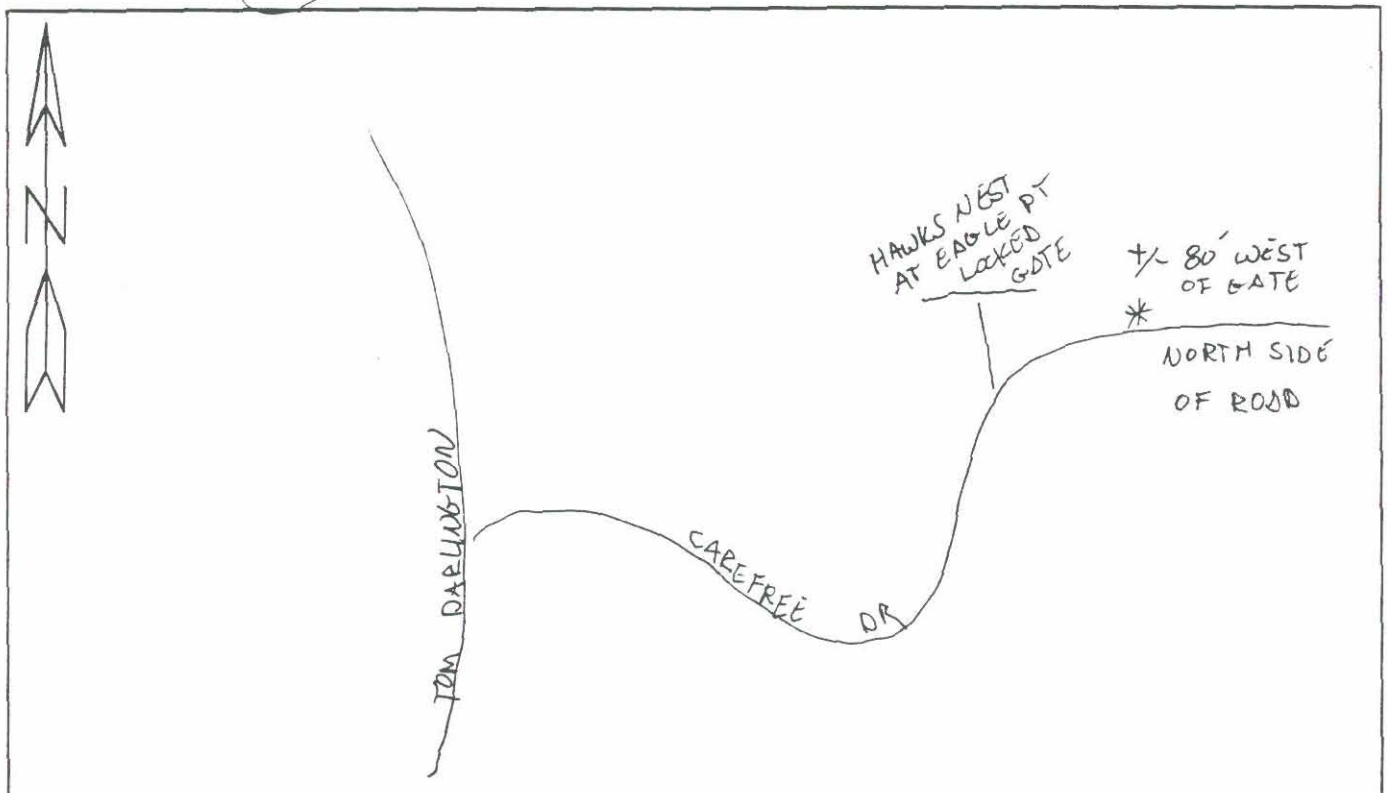
Ending:
Lat: 33 ° 49 ' 15.92 " N
Long: 111 ° 55 ' 51.46 " W
Ellip. Height: +0710.6 + M PDOP:

Receiver Model: 4000 SSE (X) 4800 ( ) 4000 SE ( )
Antenna Type: CompL1/L2 w/GP (X) CompL1/L2 ( ) Geodetic( )
Tribrach: SoKKisha Wild H/P Topcon Pentax
Local-UTC Time Offset: MST= -7:00
Type of Survey: Fast Static (X) - Fast Static ( )
Actual= Start 16:05 Stop: 16:18 UTC
Beg. SV's Used: 03,08,09,17,21,23,29,31
End SV's Used: 03,08,09,17,21,23,29,31

Ant. Height (M) 1) 1.537 2) 1.549 3) 1.502 4) 1.582 5) 1.588 6) 1.588 7) 1.616 8) 1.618 9) 1.598 10) 11) 12)
Mean= 1.575

(ft) 1) 5.18 2) 5.23 3) 5.10 Mean

Weather Conditions: (Clear) P. Cloudy Overcast Hot (Warm) Cool Cold (Calm) Breezy 85 °F +/-



Type of Monument: COR / SPINNER Stamping:
Top of marker: (X) flush M ( ) above: ( ) below: Nat. Ground Detail Notes:

Rubbing Performed ( )Yes (X)No

A TEAM Professional Associates, INC.

GPS STATION LOG

1802 W. Grant Road - Ste 110-5 -Tucson, Arizona - 85745 - (520) 623-8503 - (520) 623-8504 Fax

Station Name: # 22
Receiver No: 7662
Day of Year: 274 1999
Session No: 0 (for fast static)

Project Name: Maricopa CO EDC
Job number: # 919
Local Date: mo. 10 day 1 year 1999
Operator: Jose Bonillas

C/A CODE POSITION

Beg:
Lat: : 33 ° 49 ' 15.83 " N
Long: 111 ° 55 ' 52.69 " W
Ellip. Height: +0671+ M PDOP: 2.0

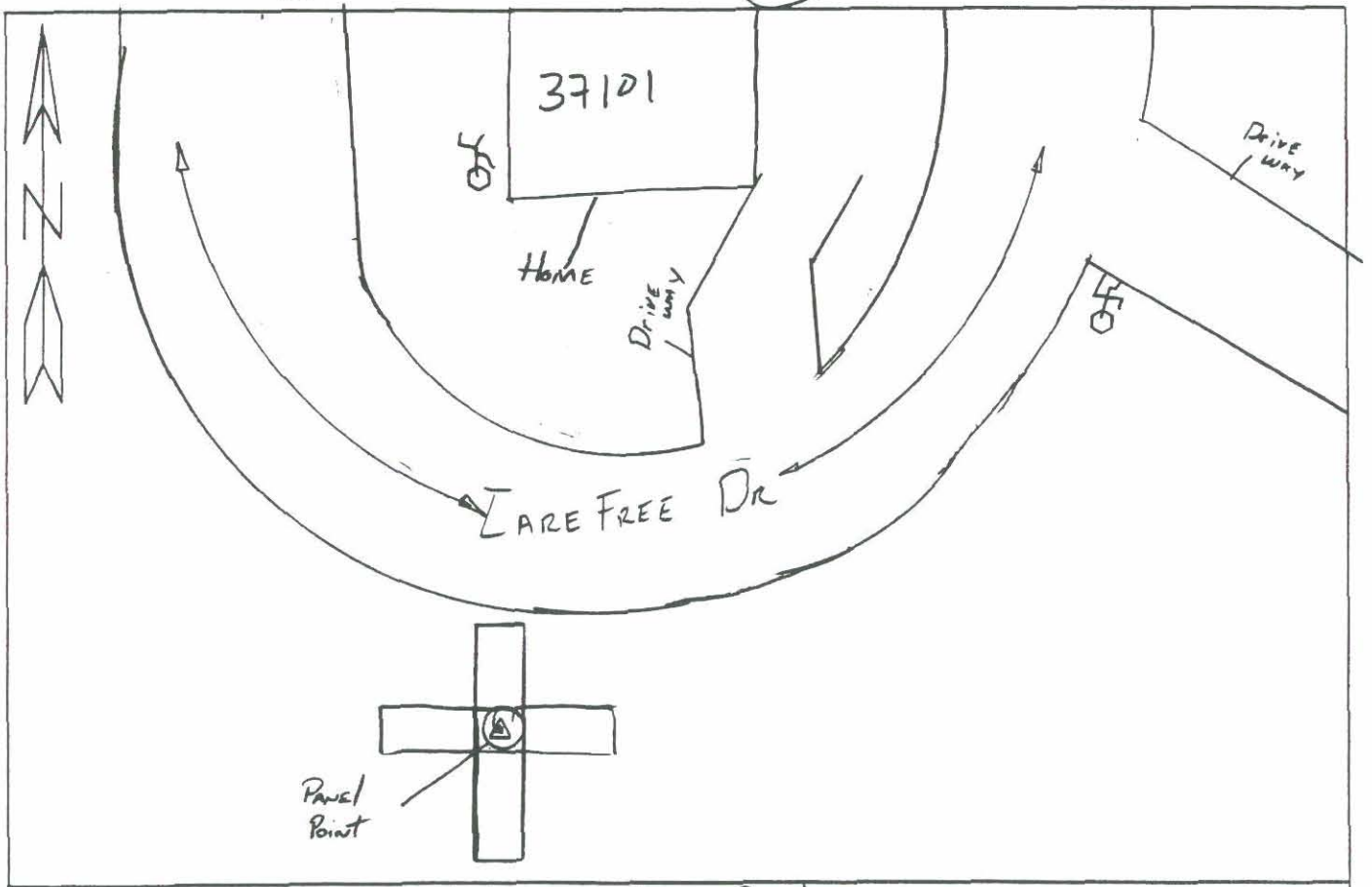
Ending:
Lat: 33 ° 49 ' 15.79 " N
Long: 111 ° 55 ' 51.38 " W
Ellip. Height: +0696- M PDOP: 1.9

Receiver Model: 4000 SSE (X) 4800 ( ) 4000 SE ( )
Antenna Type: CompL1/L2 w/GP (X) CompL1/L2 ( ) Geodetic( )
Tribrach: SoKKisha Wild H/P Topcon Pentax
Local-UTC Time Offset: MST= -7:00
Type of Survey: Fast Static (X) - Fast Static ( )
Actual= Start 14 : 55 Stop: 15.17 : UTC
Beg. SV's Used: 03.06.29.09.17.21.23.26
End SV's Used: 03.06.29.09.17.21.08.28 26

Ant. Height (M): 1)1.558 2)1.558 3) 4) 5)1.558 6)1.559 7) 8)1.558 9)1.559 10)1.559 11)1.559 12)1.559 Mean= 1.558

(ft) 1) 5.11 3) 2) 5.11 Mean 5.11

Weather Conditions: (Clear) P. Cloudy Overcast Hot (Warm) Cool Cold Calm (Breezy) °F +/-



Type of Monument: Set 60D Nail with Sinker Panel Stamping:
Top of marker: (X) flush M ( ) above: ( ) below: Nat. Ground Detail Notes: Panel Point on the East Side of Rd.

Rubbing Performed ( )Yes ( )No

A TEAM Professional Associates, INC.
GPS STATION LOG

1802 W. Grant Road - Ste 110-5 -Tucson, Arizona - 85745 - (520) 623-8503 - (520) 623-8504 Fax

Station Name: #023
Receiver No: 60082
Day of Year: 274 1999
Session No: 0 (for fast static)

Project Name: Maricopa Co F.D.C
Job number: # 919
Local Date: mo 10 day 11 year 1999
Operator: Matt Danelowitz

C/A CODE POSITION

Beg:
Lat: : 33° 49 34.74 " N
Long: 111° 55 29.57 " W
Ellip. Height: 0672- M PDOP: 2.0

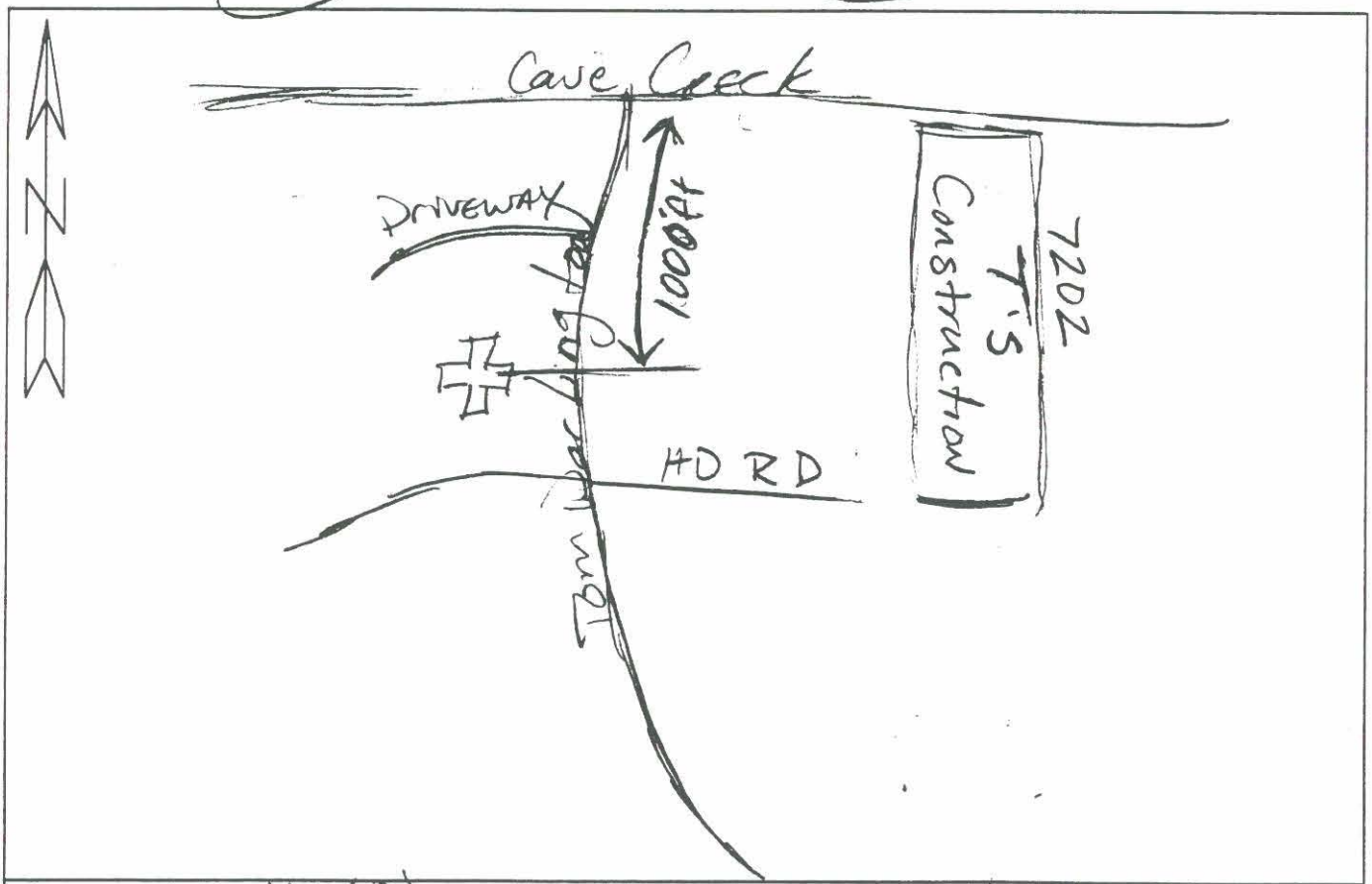
Ending:
Lat: 33° 49 34.01 " N
Long: 111° 55 28.79 " W
Ellip. Height: 0656+ M PDOP: 1.9

Receiver Model: 4000 SSE (X) 4800 ( ) 4000 SE ( )
Antenna Type: CompL1/L2 w/GP (X) CompL1/L2 ( ) Geodetic( )
Tribrach: SoKKisha Wild H/P Topcon Pentax
Local-UTC Time Offset: MST= -7:00
Type of Survey: Fast Static (X) - Fast Static ( )
Actual= Start 14:52 Stop: 15:17 UTC
Beg. SV's Used: 03, 06, 29, 09, 17, 21, 23, 26
End SV's Used: 03, 06, 29, 09, 17, 21, 08, 23, 2

Ant. Height (M) 1) 1.511 3) 1.512 5) 1.513 7) 1.510 9) 1.510 11) 1.510
2) 1.513 4) 1.510 6) 1.510 8) 1.510 10) 1.510 12) 1.510 Mean= 1.512

(ft) 1) 4.95 3) 4.95
2) 4.95 Mean 4.95

Weather Conditions: Clear P. Cloudy Overcast Hot Warm Cool Cold Calm Breezy °F +/-



Type of Monument: 40(D) Stamping: None
Top of marker: (X) Flush M ( ) above: ( ) below: Nat. Ground Detail Notes: Just south of intersection of Cave Creek & Tom Darlington on west side in gravel
Rubbing Performed ( ) Yes (X) No

A TEAM Professional Associates, INC.
GPS STATION LOG

1802 W. Grant Road - Ste 110-5 -Tucson, Arizona - 85745 - (520) 623-8503 - (520) 623-8504 Fax

Station Name: #23
Receiver No: 4573 -5677 - 6076 - 6081 - 6082 ~~-6083~~
Day of Year: 274 1999
Session No: 0 (for fast static)

Project Name: MARICOPA Co FLD.
Job number: 219
Local Date: mo. OCT day 01 year 1999
Operator: DAVE RUNK

C/A CODE POSITION

Beg:
Lat: : 33 ° 49 ' 34.28 " N
Long: 111 ° 55 ' 28.74 " W
Ellip. Height: 738- M PDOP: 2.3

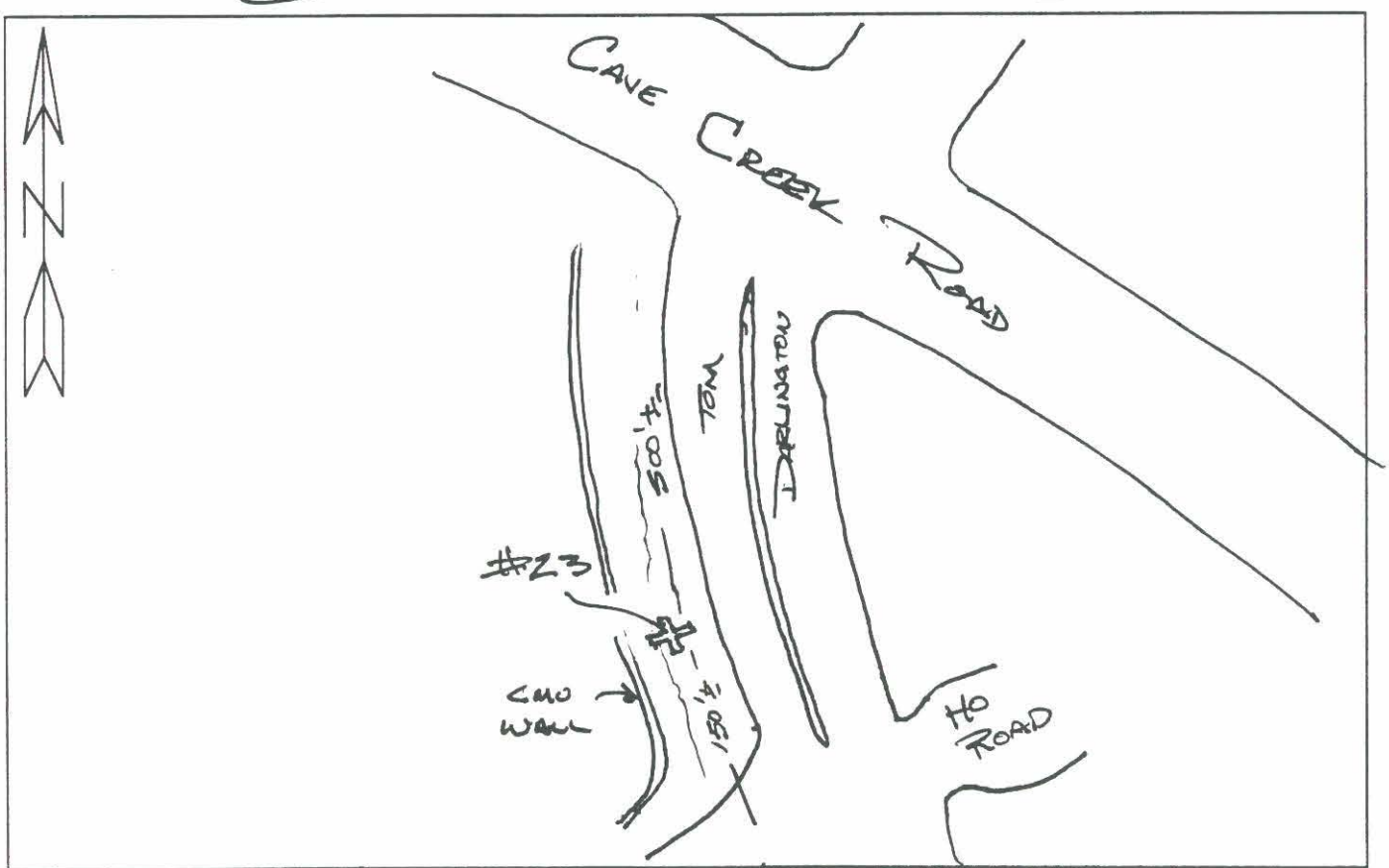
Ending:
Lat: 33 ° 49 ' 33.27 " N
Long: 111 ° 55 ' 29.47 " W
Ellip. Height: 721- M PDOP: 2.3

Receiver Model: 4000 SSE (X) 000 SE ( )
Antenna Type: Comp L1/L2 W/GP (X) omp L1/L2 ( )
Tribrach: SoKKisha Wild H/P Topcon Pintax
Local-UTC Time Offset: MST= -7:00
Type of Survey: Fast Static (X) - Fast Static ( )
Actual= Start 16 : 01 . Stop: 16 : 14 . UTC
Beg. SV's Used: 03,08,09,17,21,23,29,31
End SV's Used: 03,03,09,17,21,23,29,31

Ant. Height (M) 1)1.713 2)1.713 3)1.713 4)1.712 5)1.712 6)1.712 7)1.713 8)1.713 9)1.713 10)1.713 11)1.713 12)1.713 Mean= 1.713

(ft) 1) 5.61 2) 5.61 3) Mean

Weather Conditions: (Clear) P. Cloudy Overcast Hot (Warm) Cool Cold (Calm) Breezy °F +/-



Type of Monument: SET 4½ NAIL & WASHER @ PAINT POINT Stamping: —
Top of marker: ( ) flush M ( ) above: ( ) below: Nat. Ground Detail Notes:

Rubbing Performed ( )Yes ( )No

A TEAM Professional Associates, INC.
GPS STATION LOG

1802 W. Grant Road - Ste 110-5 -Tucson, Arizona - 85745 - (520) 623-8503 - (520) 623-8504 Fax

Station Name: 0024
Receiver No: 6061
Day of Year: 273 1999
Session No: 0 (for fast static)

Project Name: MARICOPA COUNTY FCD
Job number: # 919
Local Date: mo. 9 day 30 year 1999
Operator: C440 CLARK

C/A CODE POSITION

Beg:
Lat: : 33 ° 50 ' 00.29 " N
Long: 111 ° 55 ' 33.41 " W
Ellip. Height: M PDOP:

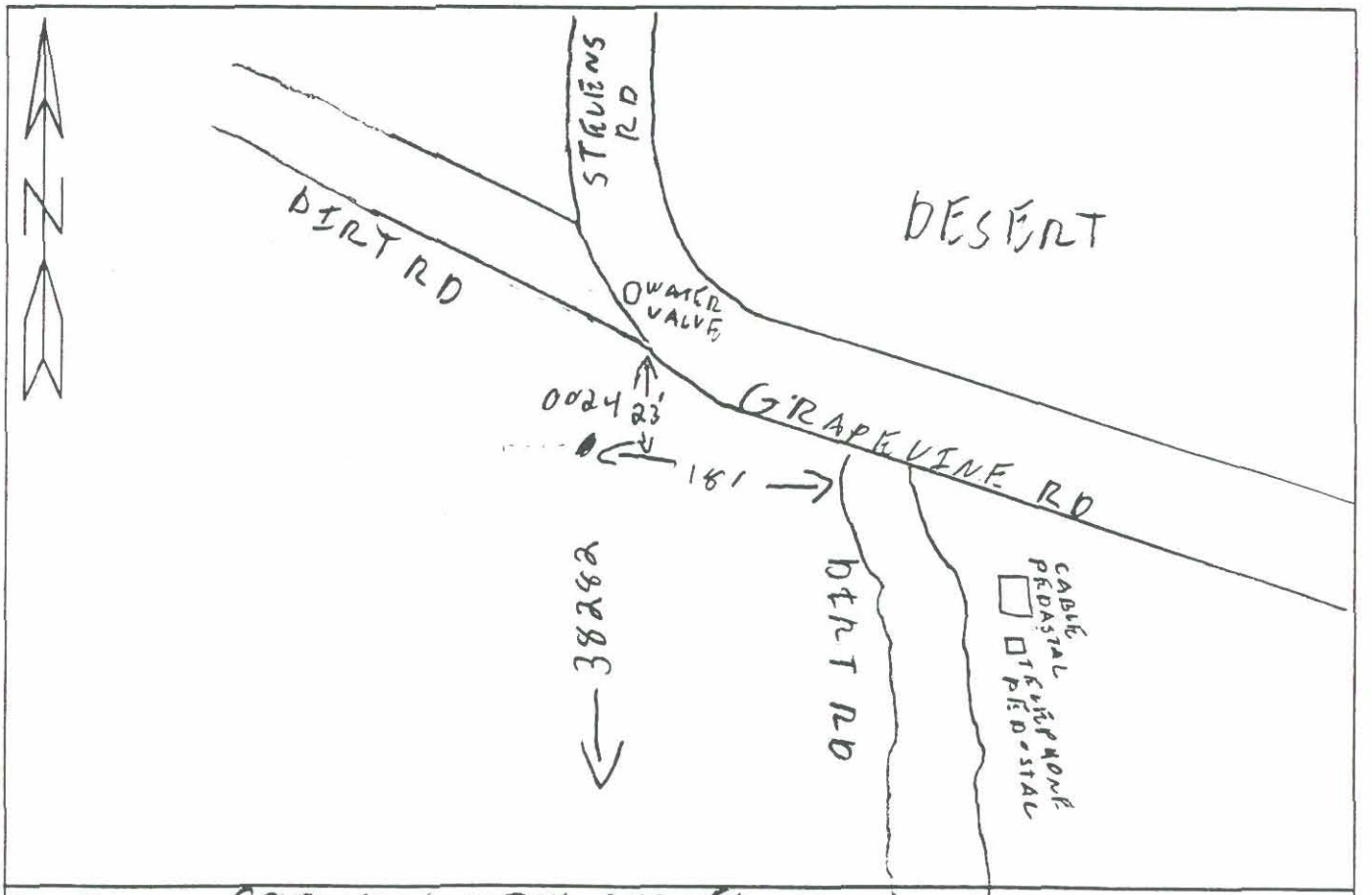
Ending:
Lat: 33 ° 50 ' 00.80 " N
Long: 111 ° 55 ' 34.32 " W
Ellip. Height: 0639- M PDOP: 2.0

Receiver Model: 4000 SSE (X) 4800 ( ) 4000 SE ( )
Antenna Type: CompL1/L2 w/GP (X) CompL1/L2 ( ) Geodetic( )
Tribrach: SoKKisha Wild (H/P) Topcon Pentax
Local-UTC Time Offset: MST= -7:00 11:04
Type of Survey: Fast Static (X) - Fast Static ( )
Actual= Start 18 :04 Stop: 18 :28 UTC
Beg. SV's Used: 01, 03, 08, 29, 15, 31, 21, 23, 25
End SV's Used: 01, 08, 29, 15, 31, 21, 23, 25

Ant. Height (M): 1) 1.630 3) 1.631 5) 1.631 7) 1.632 9) 1.632 11) 1.631
2) 1.630 4) 1.631 6) 1.631 8) 1.632 10) 1.632 12) 1.631 Mean= 1.631

(ft) 1) 5.35 3) 5.35
2) 5.36 Mean 5.35

Weather Conditions: (Clear) P. Cloudy Overcast Hot (Warm) Cool Cold Calm (Breezy) 95 °F +/-



Type of Monument: GOD NAIL WITH SHINER Stamping: —
Top of marker: (X) flush M ( ) above: ( ) below: Nat. Ground Detail Notes: FOUND AT PANAL

Rubbing Performed ( )Yes (X)No

A TEAM Professional Associates, INC.
GPS STATION LOG

1802 W. Grant Road - Ste 110-5 -Tucson, Arizona - 85745 - (520) 623-8503 - (520) 623-8504 Fax

Station Name: 7024 . Project Name: MARICOPA COUNTY FCD .
Receiver No: 6081 . Job number: # 919 .
Day of Year: 273 1999 . Local Date: mo. 9 day 30 year 1999 .
Session No: 0 (for fast static) . Operator: CHAD CLARK .

C/A CODE POSITION

Beg:
Lat: : 33 ° 49 ' 58.79 " N
Long: 111 ° 55 ' 34.03 " W
Ellip. Height: 0678 + M PDOP: 2.2 .

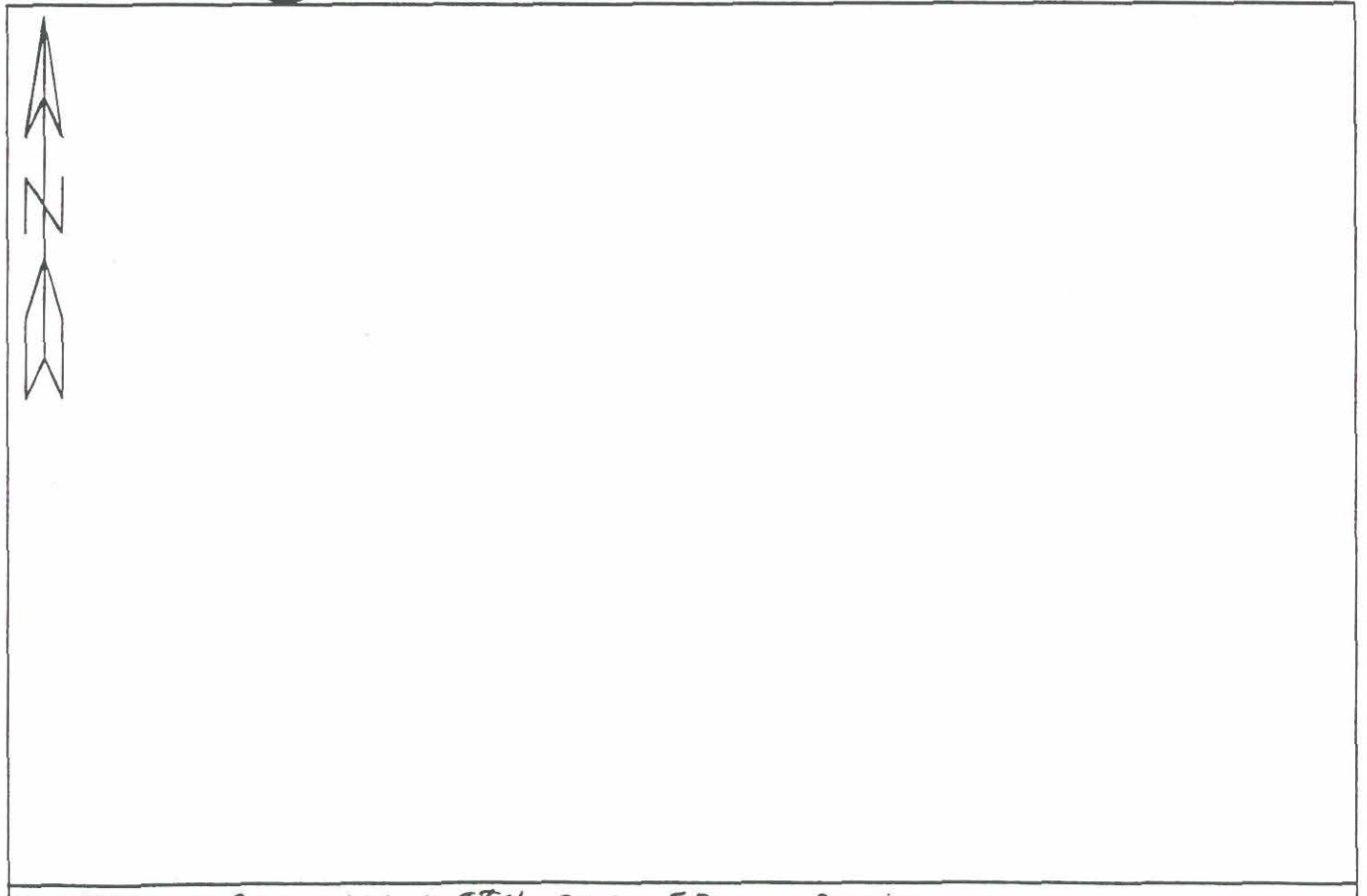
Ending:
Lat: 33 ° 50 ' 00.57 " N
Long: 111 ° 55 ' 33.87 " W
Ellip. Height: 0658 + M PDOP: 3.2 .

Receiver Model: 4000 SSE (X) 4800 ( ) 4000 SE ( ) .
Antenna Type: CompL1/L2 w/GP (X) CompL1/L2 ( ) Geodetic( )
Tribrach: SoKKisha Wild (H/P) Topcon Pentax .
Local-UTC Time Offset: MST= -7:00 11:50 .
Type of Survey: Fast Static (X) - Fast Static ( ) .
Actual= Start 19 : 02 . Stop: 19 : 35 UTC
Beg. SV's Used: 01, 29, 30, 04, 14, 15, 21, 25
End SV's Used: 01, 29, 30, 14, 15, 21, 25

Ant. Height (M) 1) 1.602 3) 1.601 5) 1.602 7) 1.602 9) 1.602 11) 1.603
2) 1.601 4) 1.601 6) 1.602 8) 1.602 10) 1.603 12) 1.603 Mean= 1.602 .

(ft) 1) 5.253 5.25
2) 5.254 Mean 5.25 .

Weather Conditions: (Clear) P. Cloudy Overcast Hot (Warm) Cool Cold Calm (Breezy) 98 °F +/- .



Type of Monument: 60D NAIL WITH SHINER Stamping: —
Top of marker: (X) flush M ( ) above: ( ) below: Nat. Ground Detail Notes: FOUND AT PANEL

Rubbing Performed ( )Yes (X) No

A TEAM Professional Associates, INC.
GPS STATION LOG

1802 W. Grant Road - Ste 110-5 -Tucson, Arizona - 85745 - (520) 623-8503 - (520) 623-8504 Fax

Station Name: #25
Receiver No: 6083
Day of Year: 273 1999
Session No: 05 (for fast static)

Project Name: Mc Flood
Job number: # 9,7
Local Date: mo. 09 day 30 year 1999
Operator: Matt Danforth

C/A CODE POSITION

Beg:
Lat: : 33°49 55 57 "N
Long: 111° 55 01 60 "W
Ellip. Height: 0731- M PDOP: 2.4

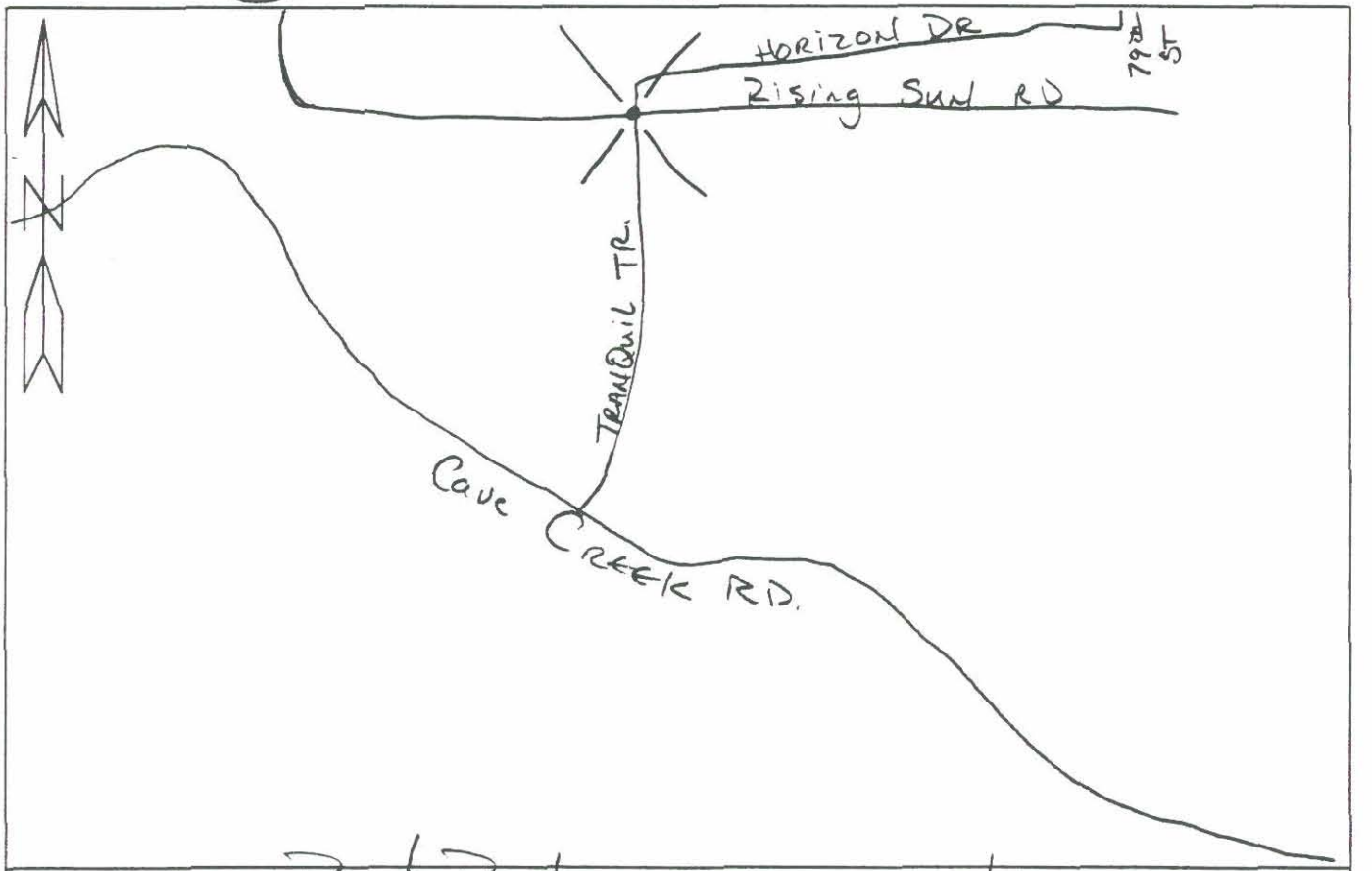
Ending:
Lat: 33°49 55 59 "N
Long: 111° 55 01.85 "W
Ellip. Height: 0678+ M PDOP: 3.2

Receiver Model: 4000 SSE (X) 4800 ( ) 4000 SE ( )
Antenna Type: CompL1/L2 w/GP (X) CompL1/L2 ( ) Geodetic( )
Tribrach: SoKKisha Wild H/P (Topcon) Pentax
Local-UTC Time Offset: 10 57 MST= -7:00
Type of Survey: Fast Static (X) - Fast Static ( )
Actual= Start 18 :57 Stop: 19 :25 UTC
Beg. SV's Used: 01, 29, 30, 08, 14, 15, 21, 25
End SV's Used: 01, 29, 30, 14, 15, 21, 25

Ant. Height (M): 1) 5.548 3) 5.485 5) 5.546 7) 5.479 9) 5.497 11) 5.545
2) 4) 5.547 6) 8) 5.547 10) 12) 5.545 Mean= 5.547

(ft) 1) 5.08 3) 5.07
2) 5.08 Mean 5.08

Weather Conditions: (Clear) P. Cloudy Overcast (Hot) Warm Cool Cold Calm Breezy °F +/-



Type of Monument: Panel Point Stamping: stone
Top of marker: (X) flush M ( ) above: ( ) below: Nat. Ground Detail Notes: At intersection of Tranquil TR & Rising Sun on S.W. quadrent on top of mound on Corner
Rubbing Performed ( )Yes (X) No

A TEAM Professional Associates, INC.
GPS STATION LOG

1802 W. Grant Road - Ste 110-5 -Tucson, Arizona - 85745 - (520) 623-8503 - (520) 623-8504 Fax

Station Name: #26
Receiver No: 76662
Day of Year: 273 1999
Session No: 07 (for fast static)

Project Name: Maricopa Co FDC
Job number: #919
Local Date: mo. 09 day 30 year 1999
Operator: Matt Danelowitz

C/A CODE POSITION

Beg:
Lat: : 33 ° 49 · 20.25 " N
Long: 111 ° 55 05 50 " W
Ellip. Height: 0673+ M PDOP: 4.7

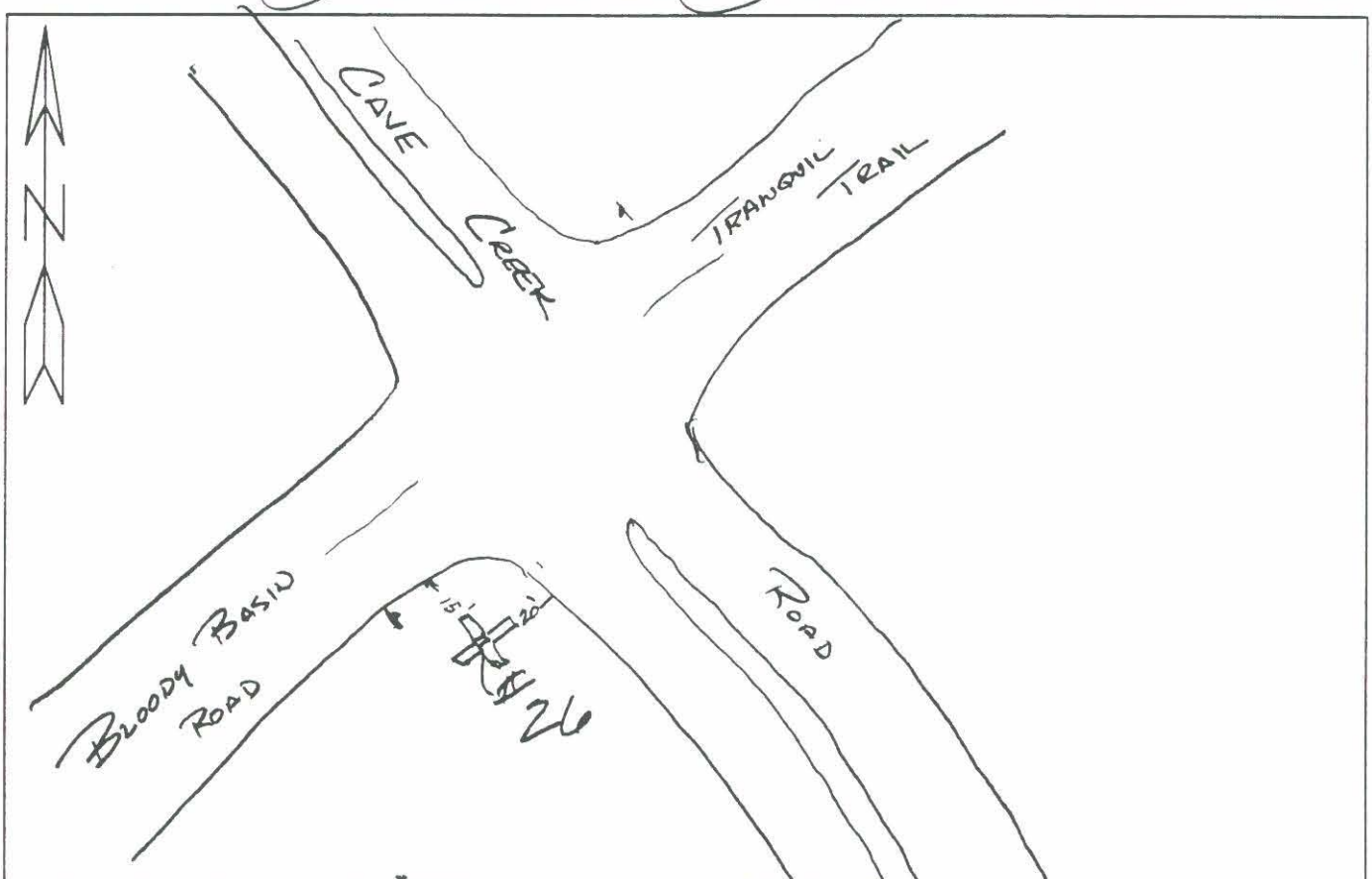
Ending:
Lat: 33 °49 ·1839 " N
Long: 111 ° 55 ·0547 " W
Ellip. Height: 0627 − M PDOP: 5.9

Receiver Model: 4000 SSE (X) 4800 ( ) 4000 SE ( )
Antenna Type: CompL1/L2 w/GP (X) CompL1/L2 ( ) Geodetic( )
Tribrach: SoKKisha Wild H/P Topcon Pentax
Local-UTC Time Offset: MST= -7:00
Type of Survey: Fast Static (X) - Fast Static ( )
Actual= Start 3 :15 Stop: 26:35 UTC
Beg. SV's Used: 01, 14, 16, 18, 22
End SV's Used: 01, 14, 16, 18, 22

Ant. Height (M)
1) 1.640 3) 1.640 5) 1.637 7) 1.637 9) 1.636 11) 1.637
2) 1.640 4) 1.640 6) 1.638 8) 1.636 10) 1.636 12) 1.637 Mean= 1.6388

(ft) 1) 5.37 3) 5.37
2) 5.37 Mean 5.37

Weather Conditions: Clear P. Cloudy Overcast Hot Warm Cool Cold Calm Breezy °F +/-



Type of Monument: 40(D) Stamping:
Top of marker: (X) flush M ( ) above: ( ) below: Nat. Ground Detail Notes: At intersection of Cave Creek Rd + Bloody Basin Rd

Rubbing Performed ( )Yes ( )No

A TEAM Professional Associates, INC.
GPS STATION LOG

1802 W. Grant Road - Ste 110-5 -Tucson, Arizona - 85745 - (520) 623-8503 - (520) 623-8504 Fax

Station Name: # 26
Receiver No: 6082
Day of Year: 274 1999
Session No: 02 (for fast static)

Project Name: Maricopa Co. F.D.C.
Job number: # 717
Local Date: mo. 10 day 1, year 1999
Operator: Matt Danehower, Jr.

C/A CODE POSITION

Beg:
Lat: 33° 49' 18.82" N
Long: 111° 55' 06.24" W
Ellip. Height: 0709- M PDOP: 2.3

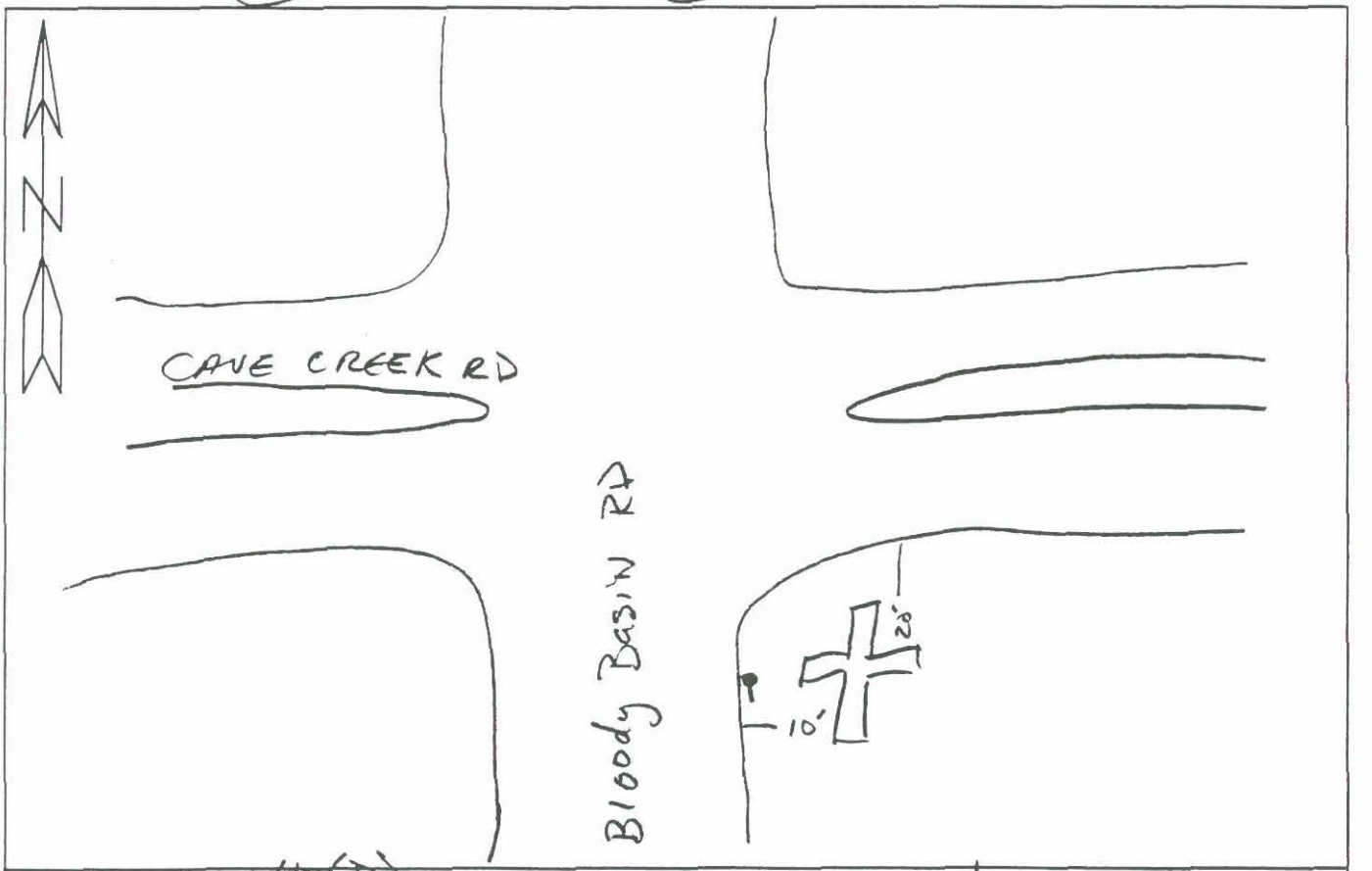
Ending:
Lat: 33° 49' 18.91" N
Long: 111° 55' 05.36" W
Ellip. Height: 06886- M PDOP: 2.3

Receiver Model: 4000 SSE (X) 4800 ( ) 4000 SE ( )
Antenna Type: CompL1/L2 w/GP (X) CompL1/L2 ( ) Geodetic( )
Tribrach: SoKKisha Wild H/P Topcon Pentax
Local-UTC Time Offset: 8:59 MST= -7:00 7:16
Type of Survey: Fast Static (X) - Fast Static ( )
Actual= Start 15:59 Stop: 16:16 UTC
Beg. SV's Used: 03, 08, 09, 17, 21, 23, 29, 31
End SV's Used: 03, 08, 09, 17, 21, 23, 29, 31

Ant. Height (M)
1) 1.543 3) 1.544 5) 1.541 7) 1.540 9) 1.541 11) 1.541
2) 1.544 4) 1.544 6) 1.540 8) 1.540 10) 1.541 12) 1.541 Mean= 1.542

(ft) 1) 5.063 5.06
2) 5.06 Mean 5.06

Weather Conditions: Clear P. Cloudy Overcast Hot Warm Cool Cold Calm Breezy °F +/-



Type of Monument: 40(D) Stamping: None
Top of marker: (X) flush M ( ) above: ( ) below: Nat. Ground Detail Notes: At the intersection of Cave Creek and Bloody Basin Rd in the S.E. Quadrent in the gravel return.
Rubbing Performed ( )Yes ( )No

A TEAM Professional Associates, INC.

GPS STATION LOG

1802 W. Grant Road - Ste 110-5 -Tucson, Arizona - 85745 - (520) 623-8503 - (520) 623-8504 Fax

Station Name: # 26
Receiver No: 6083
Day of Year: 278 1999
Session No: 0 (for fast static)
File NAM 6083-278-1

Project Name:
Job number: # 919
Local Date: mo. 10 day 5 year 1999
Operator: SOE Bonillas

C/A CODE POSITION

Beg:
Lat: : 33 ° 49 ' 19.78 " N
Long: 111 ° 55 ' 05.44 " W
Ellip. Height: +0695 + M PDOP: 2.5

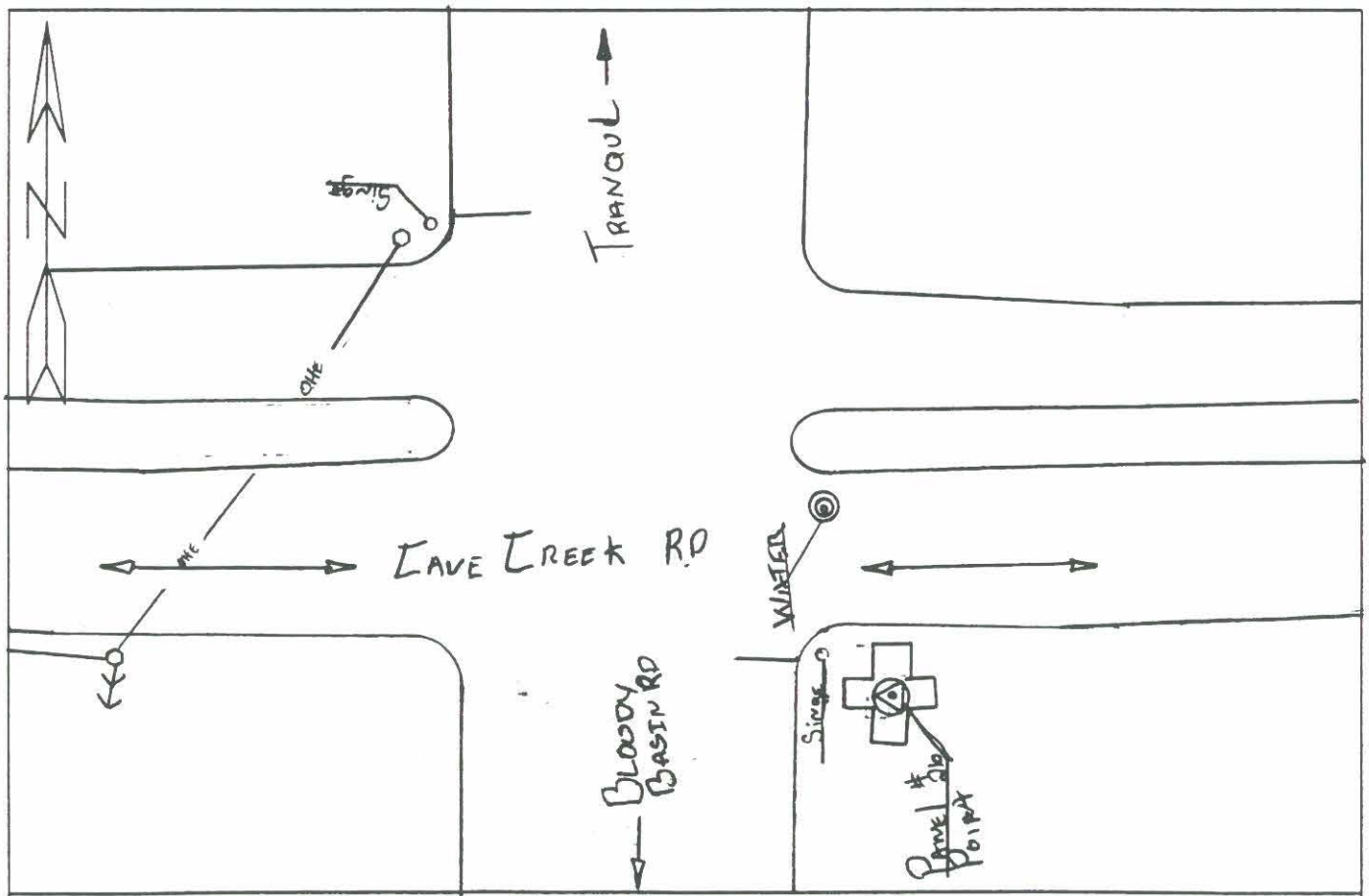
Ending:
Lat: 33 ° 49 ' 23.49 " N
Long: 111 ° 55 ' 04.80 " W
Ellip. Height: +0843 - M PDOP: 3.2

Receiver Model: 4000 SSE (X) 4800 ( ) 4000 SE ( )
Antenna Type: CompL1/L2 w/GP (X) CompL1/L2 ( ) Geodetic( )
Tribrach: SoKKisha Wild H/P Topcon Pentax
Local-UTC Time Offset: MST= -7:00
Type of Survey: Fast Static (X) - Fast Static ( )
Actual= Start 18:46 Stop: 19:08 UTC
Beg. SV's Used: 01 30 14 15 21 25 29
End SV's Used: 01 30 14 15 21 25 29

Ant. Height (M) 1) 1.677 3) 1.677 5) 1.677 7) 1.677 9) 1.677 11) 1.677
2) 1.677 4) 6) 1.677 8) 10) 1.677 12) Mean= 1.677

(ft) 1) 1.57 3)
2) 1.57 Mean 1.57

Weather Conditions: (Clear) P. Cloudy Overcast (Hot) Warm Cool Cold Calm (Breezy) °F +/-



Type of Monument: SET GOD NAIL with shiner Stamping:
Top of marker: (X) flush M ( ) above: ( ) below: Nat. Ground Detail Notes:

Rubbing Performed ( )Yes ( )No

A TEAM Professional Associates, INC.
GPS STATION LOG

1802 W. Grant Road - Ste 110-5 -Tucson, Arizona - 85745 - (520) 623-8503 - (520) 623-8504 Fax

Station Name: 27A
Receiver No: 4573 -5677 - (6076) - 6081 - 6082 - 6083
Day of Year: 273 1999
Session No: 0 (for fast static)

Project Name: Maricopa County FCD
Job number:
Local Date: mo. SEPT day 30 year 1999
Operator: Clinton Fischer

C/A CODE POSITION

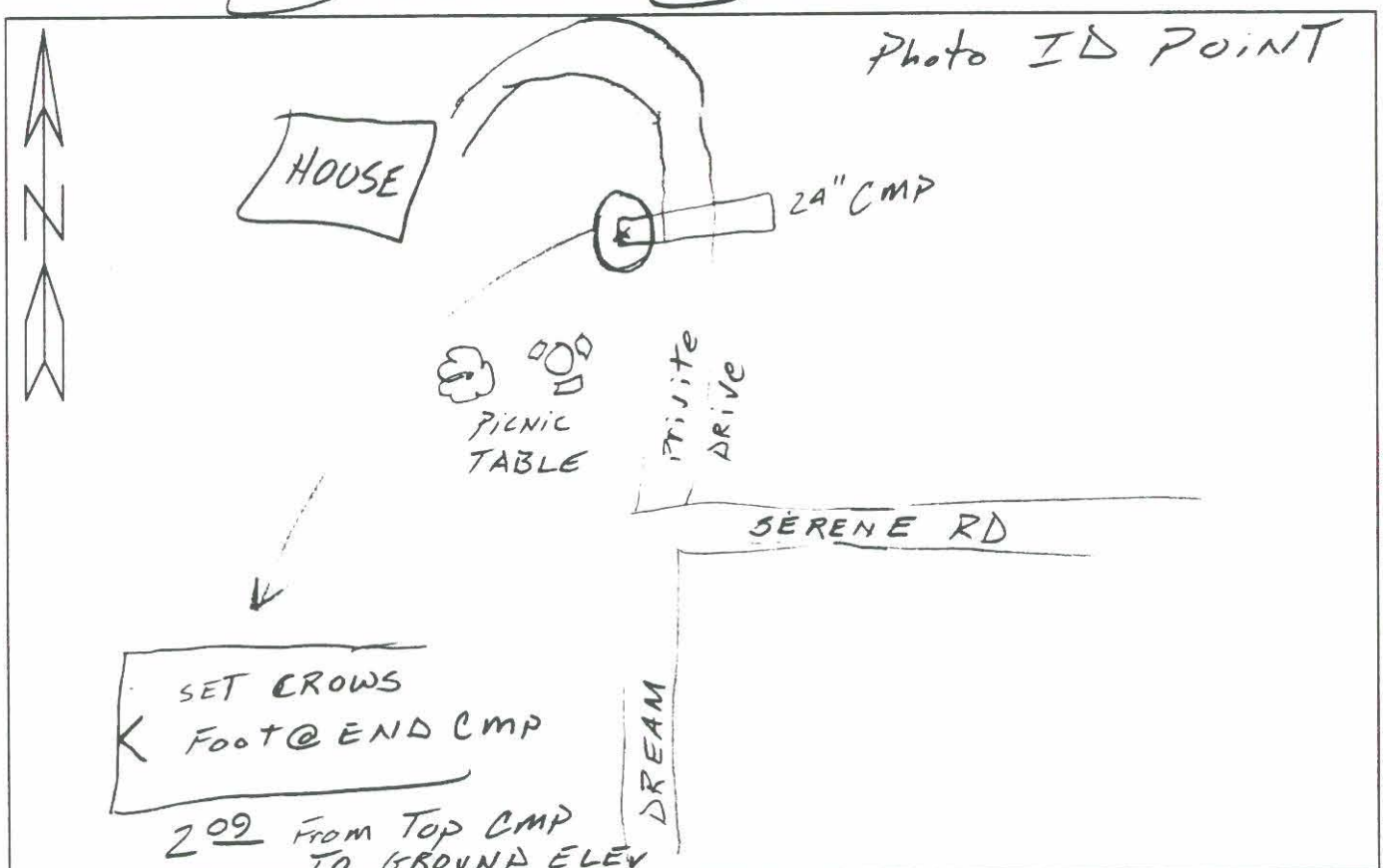
Beg:
Lat: : 33 ° 49 · 41.79 "N
Long: 111 ° 54 · 46.20 "W
Ellip. Height: 690+ M PDOP: 2.1

Ending:
Lat: 33 ° 49 · 41.00 "N
Long: 111 ° 54 · 46.50 "W
Ellip. Height: 760- M PDOP: 1.8

Receiver Model: 4000 SSE (X) 000 SE ( )
Antenna Type: Comp L1/L2 W/GP (X) omp L1/L2 ( )
Tribrach: SoKKisha Wild H/P Topcon Pintax
Local-UTC Time Offset: MST= -7:00
Type of Survey: Fast Static (X) - Fast Static ( )
Actual= Start 19 : 24 Stop: 19 : 43 UTC
Beg. SV's Used: 01, 21 25, 14, 29, 30, 15
End SV's Used: 01 21, 22, 25, 19, 29, 30 15

Ant. 1) 0981 3) 0981 5) 0980 7) 0980 9) 0981 11) 0981 (ft) 1) 3.21 3) 3.21
Height (M) 2) 0981 4) 0.9816) 0980 8) 0980 10) 0981 12) 0951 Mean= 0961 2) 3.21 Mean

Weather Conditions: (Clear) P. Cloudy Overcast (Hot) Warm Cool Cold Calm Breezy °F +/-



Type of Monument: TOP OF CMP Stamping: NONE
Top of marker: ( ) flush 209 (X) above: ( ) below: Nat. Ground Detail Notes: -209 To ground Elev

Rubbing Performed ( )Yes (X)No

A TEAM Professional Associates, INC.

GPS STATION LOG

1802 W. Grant Road - Ste 110-5 -Tucson, Arizona - 85745 - (520) 623-8503 - (520) 623-8504 Fax

Station Name: # 28 A
Receiver No: 7662
Day of Year: 273 1999
Session No: 0 (for fast static)

Project Name: MARICOPA CO FCD
Job number: # 919
Local Date: mo. 09 day year 1999
Operator: JOSE BONILLAS

C/A CODE POSITION

Beg:
Lat: : 33 ° 49 ' 56.42" N
Long: 111 ° 54 ' 30 99 " W
Ellip. Height: 0705+ M PDOP: 2.7

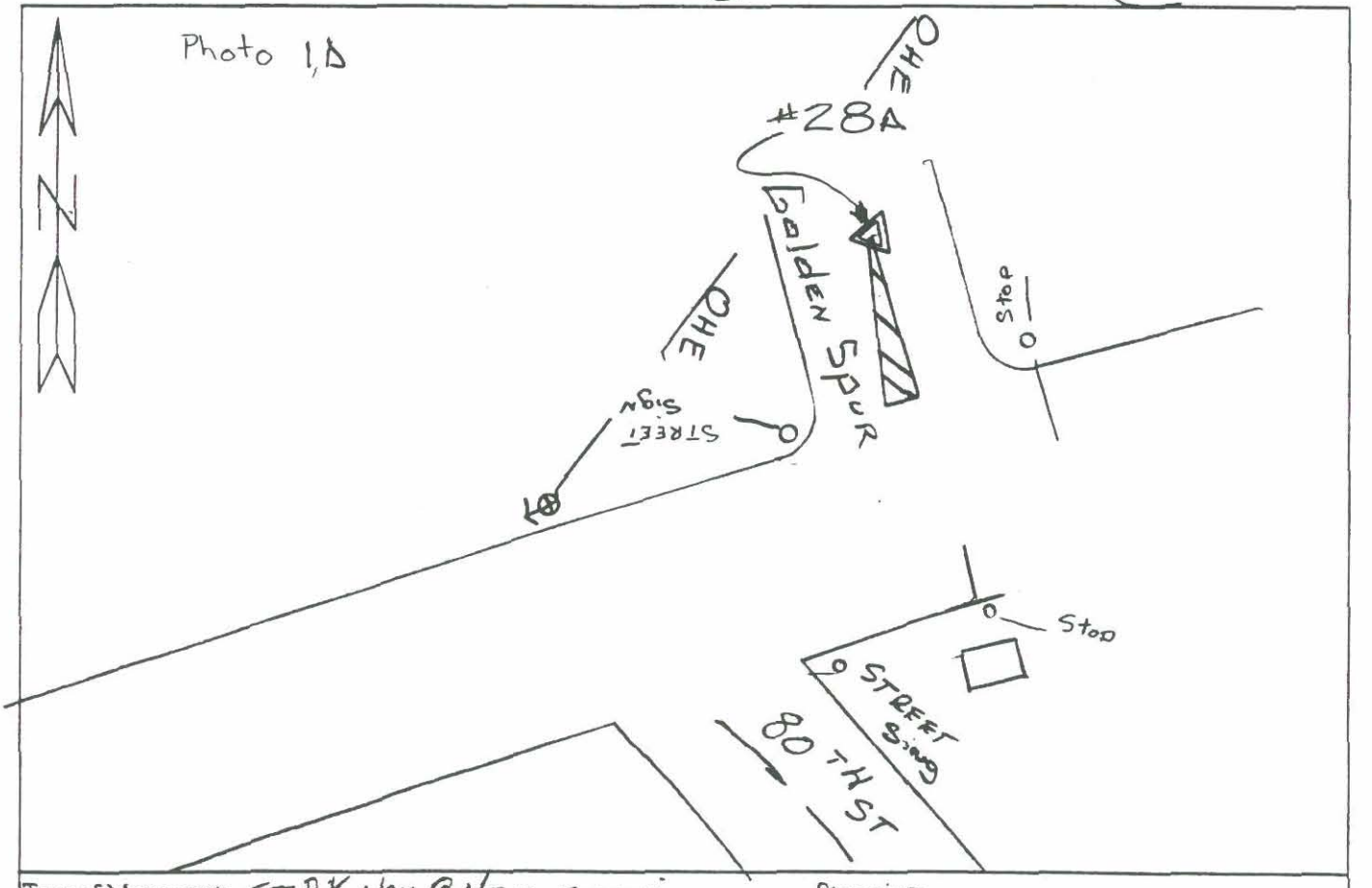
Ending:
Lat: 33 ° 49 ' 56 66 " N
Long: 111 ° 54 ' 29.98 " W
Ellip. Height: +0730.- M PDOP: 2.2

Receiver Model: 4000 SSE (X) 4800 ( ) 4000 SE ( )
Antenna Type: CompL1/L2 w/GP (X) CompL1/L2 ( ) Geodetic( )
Tribrach: SoKKisha Wild H/P Topcon Pentax
Local-UTC Time Offset: MST= -7:00
Type of Survey:: Fast Static (X) - Fast Static ( )
Actual= Start 17:02 Stop: 17 35 UTC
Beg. SV's Used: 01, 29, 14 15, 21 30, 25
End SV's Used: 01, 29, 14, 15, 21, 30, 25

Ant. Height (M)
1) 1.6073) 1.6075) 1.6088) 9) 1.6071 11) 1.607
2) 1.6078) 1.6076) 1.6078) 10) 12) 1.607 Mean= 1.607

(ft) 1) 5.48 3)
2) 5.48 Mean 5.48

Weather Conditions: (Clear) P. Cloudy Overcast (Hot) Warm Cool Cold Calm (Breezy) °F +/-



Type of Monument: SET PK NAIL & WASHER STRIPING Stamping:
Top of marker: ( ) flush M ( ) above: ( ) below: Nat. Ground Detail Notes:

Rubbing Performed ( )Yes ( )No

A TEAM Professional Associates, INC.
GPS STATION LOG

1802 W. Grant Road - Ste 110-5 -Tucson, Arizona - 85745 - (520) 623-8503 - (520) 623-8504 Fax

Station Name: 29
Receiver No: 4573 -5677- (6076) - 6081 - 6082 - 6083
Day of Year: 273 1999
Session No: 0 (for fast static)

Project Name: Maricopa County FCD
Job number:
Local Date: mo. SEPT day 30 year 1999
Operator: Clinton Fischer

C/A CODE POSITION

Beg:
Lat: : 33 ° 49 ' 39.92 " N
Long: 111 ° 54 ' 24.66 " W
Ellip. Height: 601 - M PDOP: 4.2

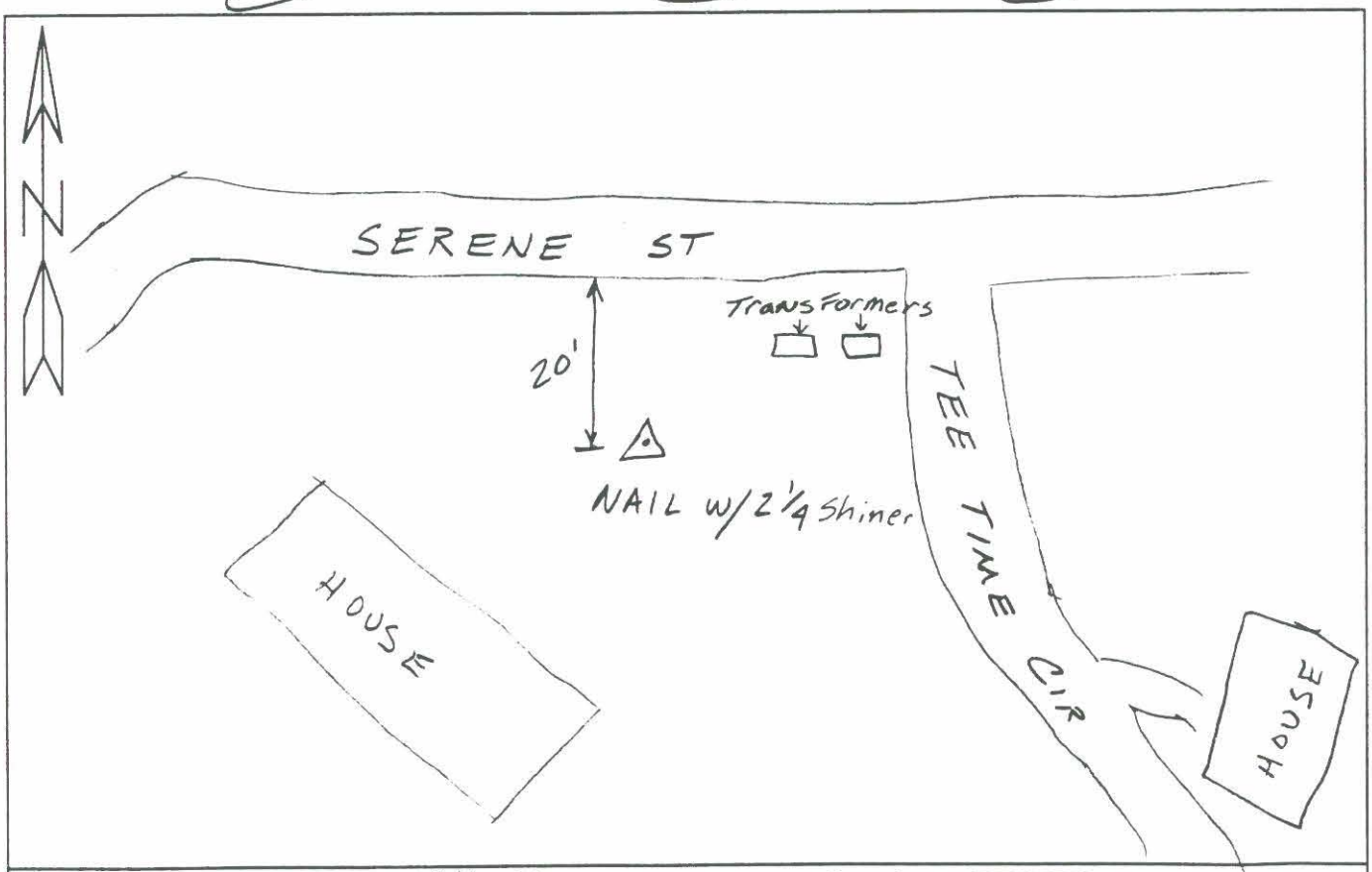
Ending:
Lat: 33 ° 49 ' 41.26 " N
Long: 111 ° 54 ' 27.91 " W
Ellip. Height: 871 - M PDOP: 5.0

Receiver Model: 4000 SSE (X) 000 SE ( )
Antenna Type: Comp L1/L2 W/GP (X) omp L1/L2 ( )
Tribrach: SoKKisha Wild H/P Topcon Pintax
Local-UTC Time Offset: MST= -7:00
Type of Survey: Fast Static (X) - Fast Static ( )
Actual= Start 21 : 58 Stop: 22 : 35 UTC
Beg. SV's Used: 01, 14, 16, 18, 22
End SV's Used: 01, 14, 16, 18, 22

Ant. Height (M) 1) 1.567 3) 1.566 5) 1.566 7) 1.567 9) 1.568 11) 1.568
2) 1.566 4) 1.566 6) 1.566 8) 1.568 10) 1.568 12) 1.567 Mean= 1.567

(ft) 1) 5.13 3) 5.13
2) 5.14 Mean

Weather Conditions: (Clear) P. Cloudy Overcast (Hot) Warm Cool Cold (Calm) Breezy °F +/-



Type of Monument: NAIL w/2 1/4 Shiner Stamping:
Top of marker: (X) flush M ( ) above: ( ) below: Nat. Ground Detail Notes:

Rubbing Performed ( )Yes (X)No

A TEAM Professional Associates, INC.

GPS STATION LOG

1802 W. Grant Road - Ste 110-5 -Tucson, Arizona - 85745 - (520) 623-8503 - (520) 623-8504 Fax

Station Name: # 30
Receiver No: 6083
Day of Year: 273 1999
Session No: 0 (for fast static)

Project Name: MARICOPA Co. FCD
Job number: # 919
Local Date: mo. 09 day 30 year 1999
Operator: JOSE BONILLAS

C/A CODE POSITION

Beg:
Lat: : 33 ° 49 ' 14.20 " N
Long: 111 ° 54 ' 30.90 " W
Ellip. Height: +07147 M PDOP: 4.0

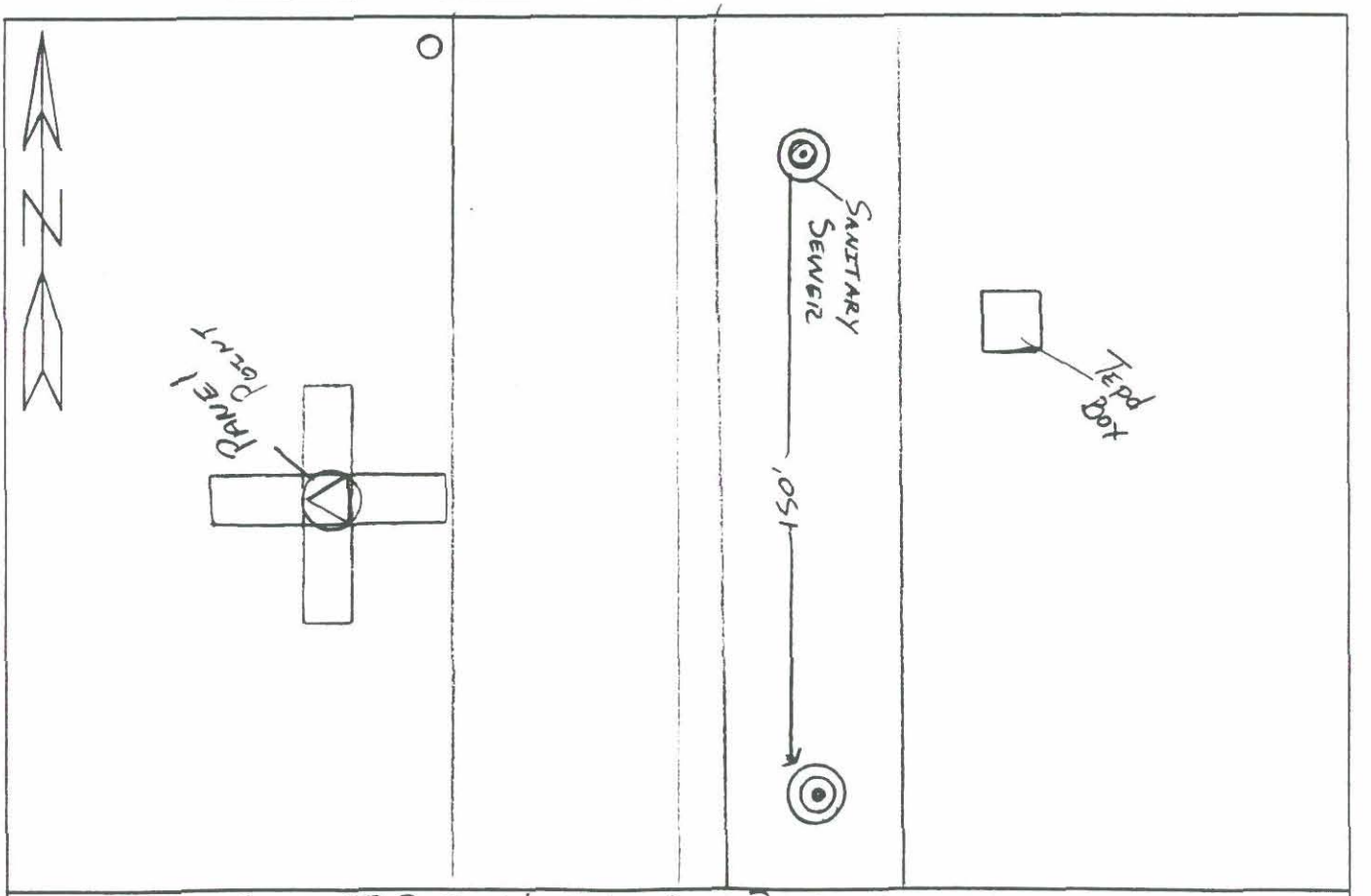
Ending:
Lat: 33 ° 49 ' 14.81 " N
Long: 111 ° 54 ' 31.90 " W
Ellip. Height: +07089- M PDOP: 5.8

Receiver Model: 4000 SSE (X) 4800 ( ) 4000 SE ( )
Antenna Type: CompL1/L2 w/GP (X) CompL1/L2 ( ) Geodetic( )
Tribrach: SoKKisha Wild H/P Topcon Pentax
Local-UTC Time Offset: MST= -7:00
Type of Survey: Fast Static (X) - Fast Static ( )
Actual= Start 22 : 03 Stop: 22 : 35 UTC
Beg. SV's Used: 01. 19. 14. 16. 18. 22
End SV's Used: 01. 14. 16. 18 22

Ant. Height (M) 1) 1.492 3) 5) 1.492 7) 1.492 9) 1.492 11) 1.493
2) 4) 1.492 6) 1.492 8) 1.492 10) 1.493 12) 1.493 Mean= 1.492

(ft) 1) 4.90 3)
2) 4.90 Mean= 4.90

Weather Conditions: (Clear) P. Cloudy Overcast (Hot) Warm Cool Cold Calm (Breezy) °F +/-



Type of Monument: SET 60D Nail & SHINNEL Punch Stamping:
Top of marker: (X) flush M ( ) above: ( ) below: Nat. Ground Detail Notes:

Rubbing Performed ( )Yes ( )No

A TEAM Professional Associates, INC.
GPS STATION LOG

1802 W. Grant Road - Ste 110-5 -Tucson, Arizona - 85745 - (520) 623-8503 - (520) 623-8504 Fax

Station Name: 31
Receiver No: 6076
Day of Year: 273 1999
Session No: 0 (for fast static)

Project Name: Maricopa County FCD
Job number: #
Local Date: mo. SEPT day 30 year 1999
Operator: Clinton Fischer

C/A CODE POSITION

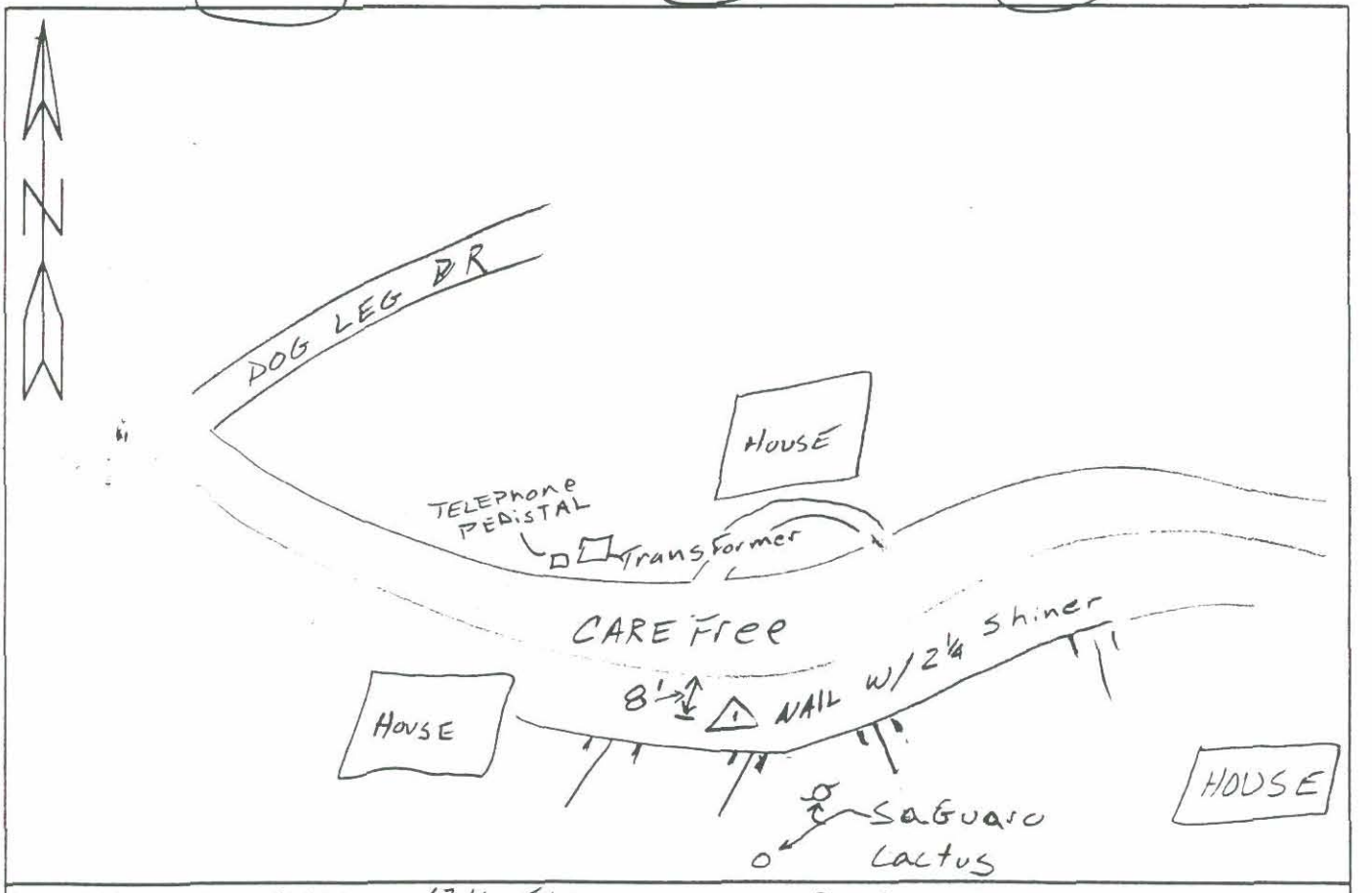
Beg:
Lat: : 33 ° 49 ' 29.12 " N
Long: 111 ° 53 ' 50.58 " W
Ellip. Height: 745 + M PDOP: 4.9

Ending:
Lat: 33 ° 49 ' 28 " N
Long: 111 ° 53 ' 50.00 " W
Ellip. Height: 731 - M PDOP: 2.9

Receiver Model: 4000 SSE (X) 4800 ( ) 4000 SE ( )
Antenna Type: CompL1/L2 w/GP (X) CompL1/L2 ( ) Geodetic( )
Tribrach: SoKKisha Wild H/P Topcon Pentax
Local-UTC Time Offset: MST= -7:00
Type of Survey: Fast Static (X) - Fast Static ( )
Actual= Start 20:05 Stop: 20:55 UTC
Beg. SV's Used: 01, 19, 15, 21, 22, 29, 30
End SV's Used: 01, 19, 15, 22, 16

Ant. Height (M) 1) 1.548 3) 1.549 5) 1.549 7) 1.550 9) 1.549 11) 1.548 (ft) 1) 5.07 3) 5.08
2) 1.548 4) 1.549 6) 1.550 8) 1.549 10) 1.548 12) 1.548 Mean= 1.549 2) 5.07 Mean

Weather Conditions: ~~Clear~~ P. Cloudy Overcast Hot Warm Cool Cold Calm Breezy °F +/-



Type of Monument: NAIL w/2¼ Shiner Stamping: —
Top of marker: (X) flush M ( ) above: ( ) below: Nat. Ground Detail Notes: —

Rubbing Performed ( )Yes (X)No

A TEAM Professional Associates, INC.
GPS STATION LOG

1802 W. Grant Road - Ste 110-5 -Tucson, Arizona - 85745 - (520) 623-8503 - (520) 623-8504 Fax

Station Name: 0032
Receiver No: 6081
Day of Year: 273 1999
Session No: 0 (for fast static)

Project Name: MARICOPA COUNTY FCD
Job number: # 919
Local Date: mo. 9 day 30 year 1999
Operator: CHAD CLARK

C/A CODE POSITION

Beg:
Lat: : 33 ° 49 ' 29.53 " N
Long: 111 ° 53 ' 29.13 " W
Ellip. Height: 0730- M PDOP: 3.3

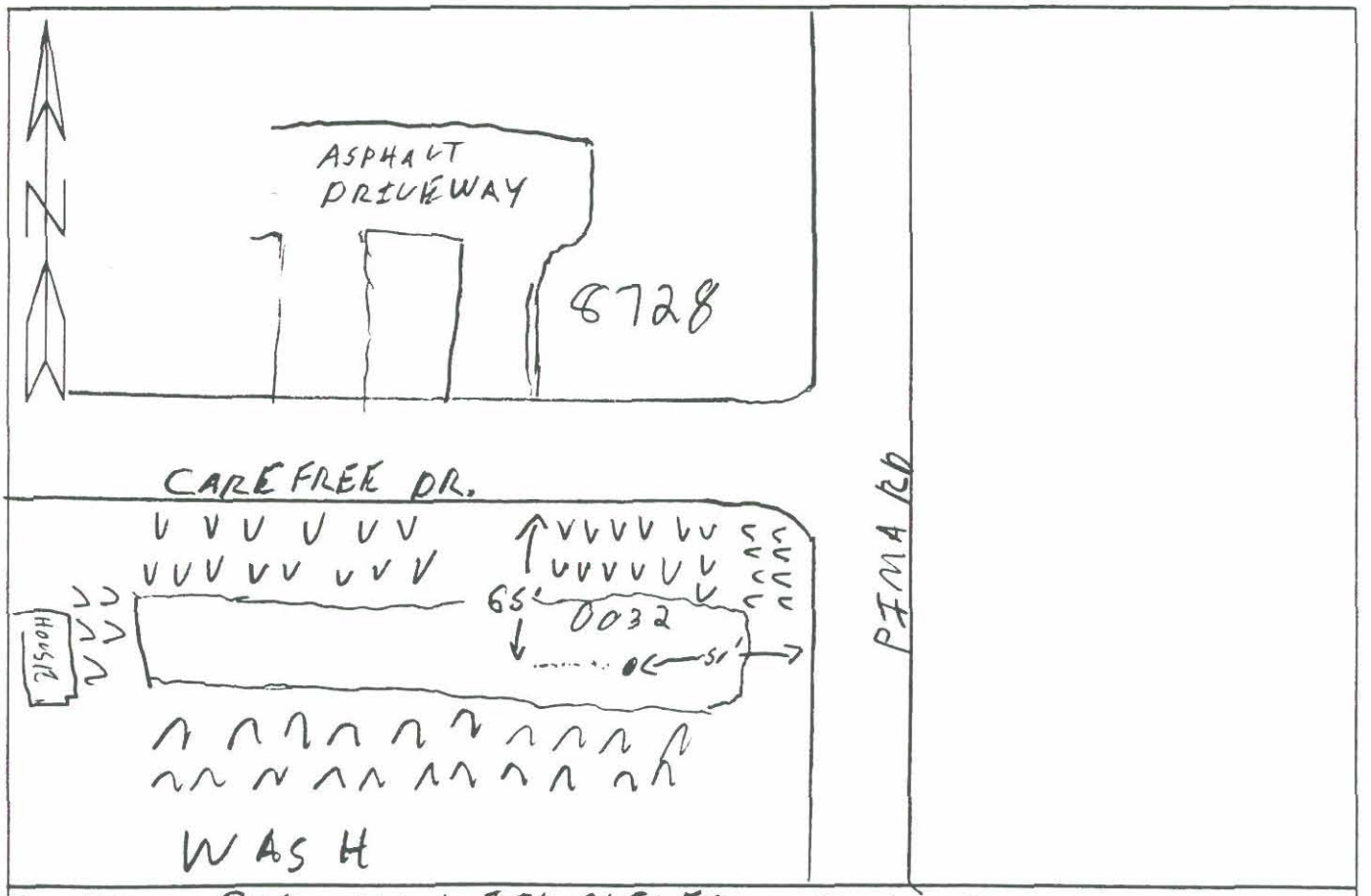
Ending:
Lat: 33 ° 49 ' 28.50 " N
Long: 111 ° 53 ' 29.66 " W
Ellip. Height: 0464- M PDOP: 3.8

Receiver Model: 4000 SSE (X) 4800 ( ) 4000 SE ( )
Antenna Type: CompL1/L2 w/GP (X) CompL1/L2 ( ) Geodetic( )
Tribrach: SoKKisha Wild (H/P) Topcon Pentax
Local-UTC Time Offset: MST= -7:00 14:08
Type of Survey: Fast Static (X) - Fast Static ( )
Actual= Start 21 : 08 Stop: 21 : 41 UTC
Beg. SV's Used: 01, 14, 15, 16, 22
End SV's Used: 01, 14, 15, 16, 18, 22

Ant. Height (M)
1)(.5293)(.5305)(.5307)(.5319)(.5301)1).530
2)(.5294)(.5306)(.5318)(.5310)(.5312)(.530 Mean= 1.530

(ft) 1) 5.01 3) 5.01
2) 5.02 Mean 5.01

Weather Conditions: (Clear) P. Cloudy Overcast (Hot) Warm Cool Cold Calm (Breezy) 105 °F +/-



Type of Monument: GOD NAIL WITH SHINER Stamping: —
Top of marker: (X) flush M ( ) above: ( ) below: Nat. Ground Detail Notes: FOUND AT PANEL

Rubbing Performed ( )Yes (X)No

A TEAM Professional Associates, INC.
GPS STATION LOG

1802 W. Grant Road - Ste 110-5 -Tucson, Arizona - 85745 - (520) 623-8503 - (520) 623-8504 Fax

Station Name: 0032 | Project Name: MARICOPA COUNTY FCD
Receiver No: 6008 | Job number: # 919
Day of Year: 273 1999 | Local Date: mo. 9 day 30 year 1999
Session No: 0 (for fast static) | Operator: CHAD CLARK

C/A CODE POSITION

Beg:
Lat: : 33 ° 49 ' 29.37 " N
Long: 111 ° 53 ' 29.25 " W
Ellip. Height: 0705 - M PDOP: 4.1

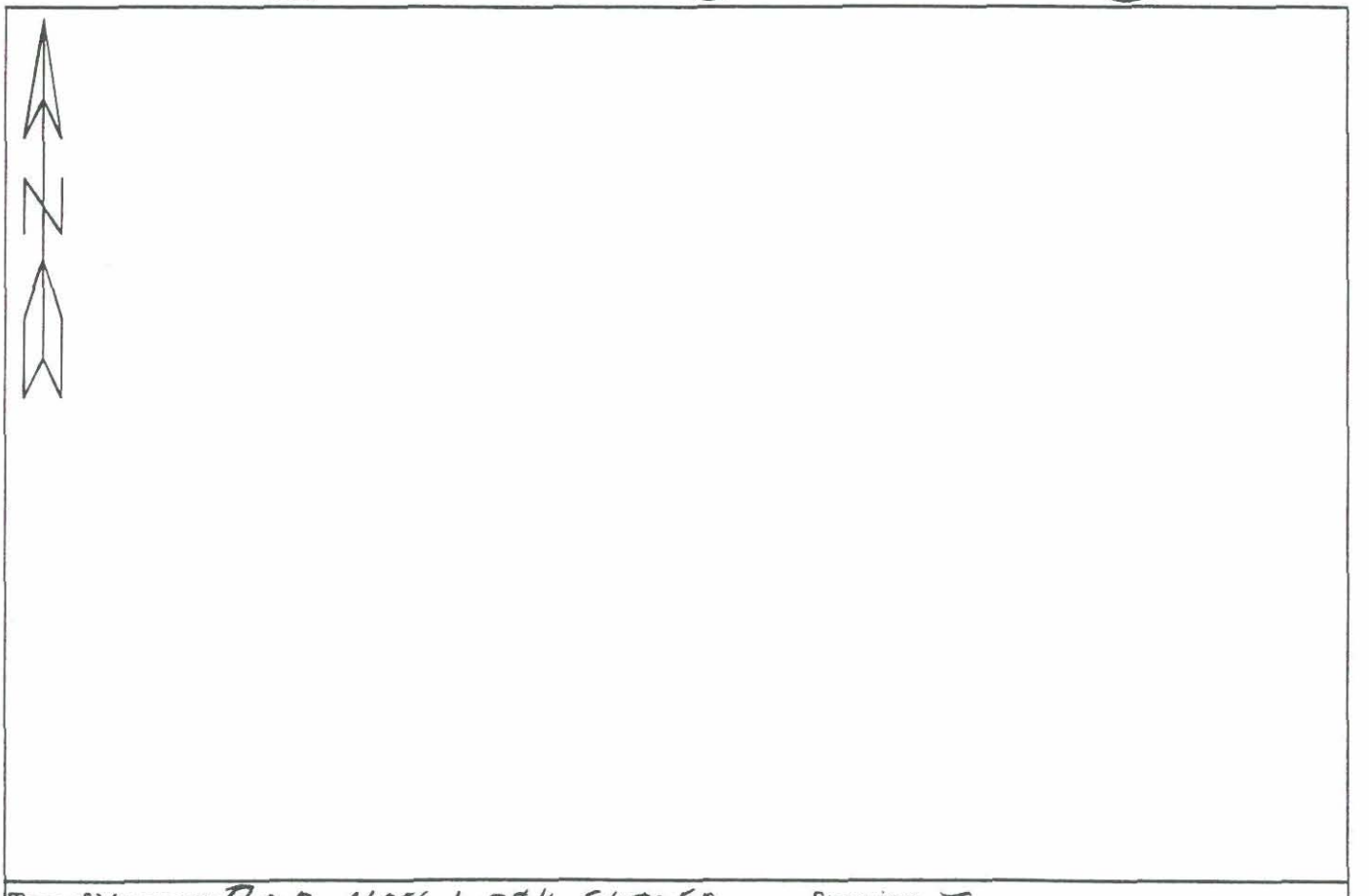
Ending:
Lat: 33 ° 49 ' 31.03 " N
Long: 111 ° 53 ' 30.34 " W
Ellip. Height: 0705. - M PDOP: 5.8

Receiver Model: 4000 SSE (X) 4800 ( ) 4000 SE ( )
Antenna Type: CompL1/L2 w/GP (X) CompL1/L2 ( ) Geodetic( )
Tribrach: SoKKisha Wild (H/P) Topcon Pentax
Local-UTC Time Offset: MST= -7:00 15:02
Type of Survey:: Fast Static (X) - Fast Static ( )
Actual= Start 22 : 02 Stop: : 35 UTC
Beg. SV's Used: 01, 14, 16, 18, 22
End SV's Used: 01, 14, 16, 18, 22

Ant. Height (M) 1) 1.566 3) 1.567 5) 1.568 7) 1.568 9) 1.567 11) 1.566
2) 1.567 4) 1.568 6) 1.568 8) 1.567 10) 1.567 12) 1.566 Mean= 1.567

(ft) 1) 5.14 3) 5.14
2) 5.15 Mean 5.14

Weather Conditions: (Clear) P. Cloudy Overcast (Hot) Warm Cool Cold Calm (Breezy) 105 °F +/-



Type of Monument: BOD NAIL WITH SHINER Stamping: -
Top of marker: (X) flush M ( ) above: ( ) below: Nat. Ground Detail Notes: FOUND AT PANAL

Rubbing Performed ( )Yes (X) No

A TEAM Professional Associates, INC.

GPS STATION LOG

1802 W. Grant Road - Ste 110-5 -Tucson, Arizona - 85745 - (520) 623-8503 - (520) 623-8504 Fax

Station Name: 1 #33
Receiver No: 6083
Day of Year: 273 1999
Session No: 0 (for fast static)

Project Name: Maricopa Co FLD
Job number: # 919
Local Date: mo. 09 day 30 year 1999
Operator: Jose Bonillas

C/A CODE POSITION

Beg:
Lat: : 33 ° 49 ' 49.39 " N
Long: 111 ° 53 ' 53.27 " W
Ellip. Height: 08697 M PDOP: 5.7

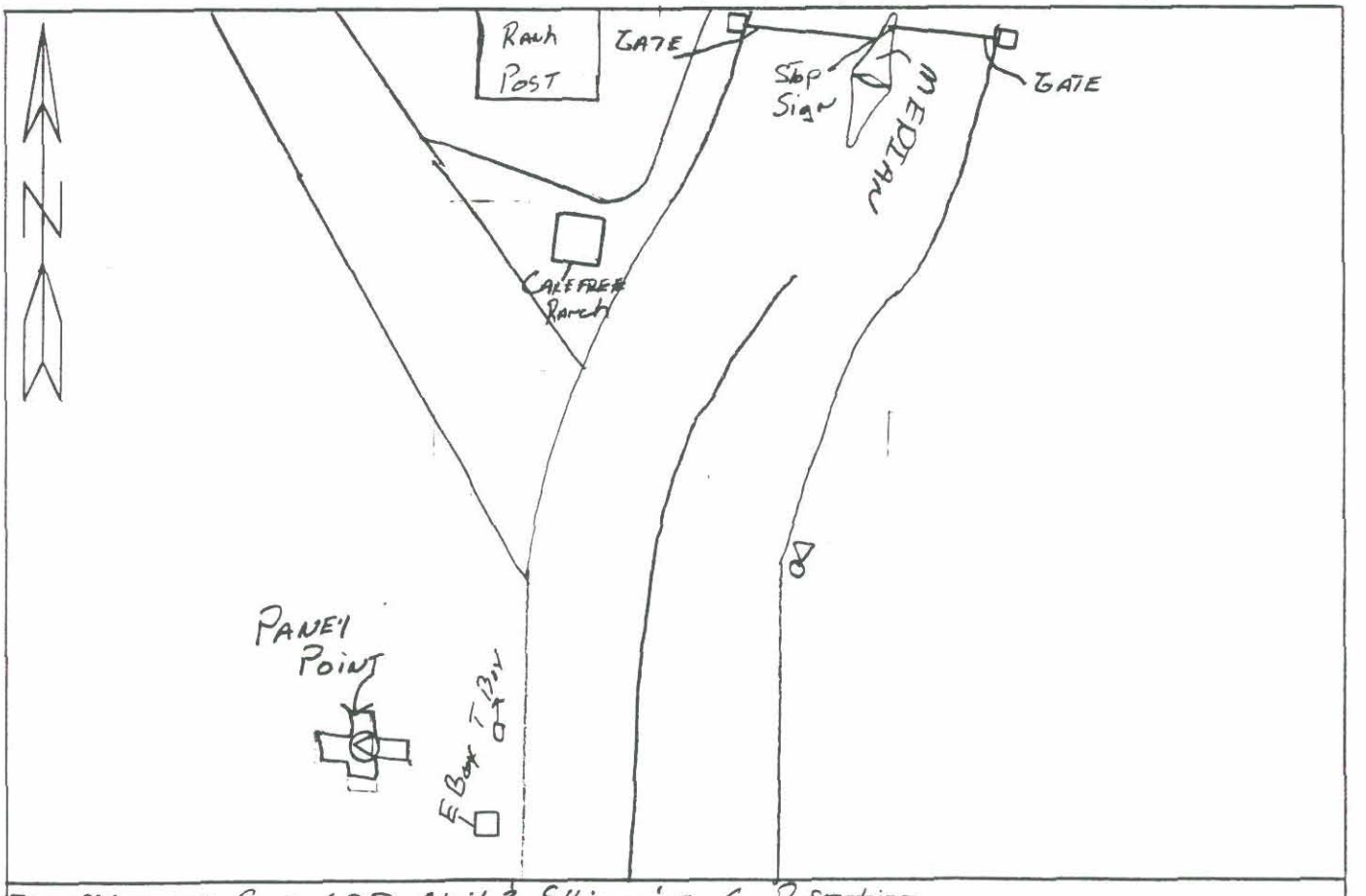
Ending:
Lat: 33 ° 49 ' 40.65 " N
Long: 111 ° 53 ' 28.57 " W
Ellip. Height: +08800- M PDOP: 2.2

Receiver Model: 4000 SSE (X) 4800 ( ) 4000 SE ( )
Antenna Type: CompL1/L2 w/GP (X) CompL1/L2 ( ) Geodetic( )
Tribrach: SoKKisha Wild H/P Topcon Pentax
Local-UTC Time Offset: MST= -7:00
Type of Survey: Fast Static (X) - Fast Static ( )
Actual= Start 20:13 Stop: 20:44 UTC
Beg. SV's Used: 01, 14, 15, 21, 23, 29, 30
End SV's Used: 01, 14, 15, 16, 22, 29

Ant. Height (M) 1) 1.533 2) 1.533 3) 4) 1.533 5) 1.533 6) 1.533 7) 8) 1.533 9) 1.534 10) 1.534 11) 1.534 12) 1.533 Mean= 1.533

(ft) 1) 5.50 2) 5.50 3) Mean 5.50

Weather Conditions: (Clear) P. Cloudy Overcast (Hot) Warm Cool Cold Calm (Breezy) °F +/-



Type of Monument: SET 60D NAIL & SHINER C Pt Stamping:
Top of marker: (X) flush M ( ) above: ( ) below: Nat. Ground Detail Notes:

Rubbing Performed ( )Yes ( )No

A TEAM Professional Associates, INC.
GPS STATION LOG

1802 W. Grant Road - Ste 110-5 -Tucson, Arizona - 85745 - (520) 623-8503 - (520) 623-8504 Fax

Station Name: #33
Receiver No: 6083
Day of Year: 273 1999
Session No: 0 (for fast static)

Project Name: MARICOPA Co FCD
Job number: # 919
Local Date: mo. 09 day 30 year 1999
Operator: JOSE BONILLAS

C/A CODE POSITION

Beg:
Lat: : 33 ° 49 ' 40.58 " N
Long: 111 ° 53 ' 29.30 " W
Ellip. Height: +0711- M PDOP: 3.1

Ending:
Lat: 33 ° 49 ' 38.80 " N
Long: 111 ° 53 ' 29.79 " W
Ellip. Height: +0864- M PDOP: 3.8

Receiver Model: 4000 SSE (X) 4800 ( ) 4000 SE ( )
Antenna Type: CompL1/L2 w/GP (X) CompL1/L2 ( ) Geodetic( )
Tribrach: SoKKisha Wild H/P Topcon Pentax
Local-UTC Time Offset: MST= -7:00
Type of Survey: Fast Static (X) - Fast Static ( )
Actual= Start 20 :58 Stop: 21 :41 UTC
Beg. SV's Used: 01, 14, 15, 16, 22
End SV's Used: 01, 14, 15, 16, 18, 22

Ant. Height (M) 1) 1.532 2) 1.532 3) 1.531 4) 1.531 5) 1.531 6) 7) 1.531 8) 1.531 9) 1.531 10) 11) 12) 1.532 Mean= 1.532

(ft) 1) 5.51 2) 5.51 3) 5.51 Mean 5.51

Weather Conditions: (Clear) P. Cloudy Overcast (Hot) Warm Cool Cold Calm (Breezy) °F +/-

Type of Monument: SET GOD NAIL SHINNER C PANEL Stamping:
Top of marker: (X) flush M ( ) above: ( ) below: Nat. Ground Detail Notes:

Rubbing Performed ( )Yes ( )No

A TEAM Professional Associates, INC.
GPS STATION LOG

1802 W. Grant Road - Ste 110-5 -Tucson, Arizona - 85745 - (520) 623-8503 - (520) 623-8504 Fax

Station Name: #34
Receiver No: 6083
Day of Year: 278 1999
Session No: 0 (for fast static)

Project Name:
Job number: # 919
Local Date: mo. 10 day 5 year 1999
Operator: Jose Bonillas

C/A CODE POSITION

Beg:
Lat: : 33 ° 49 · 15.25 " N
Long: 111 ° 53 · 10.03 " W
Ellip. Height: +0795+ M PDOP: 2.0

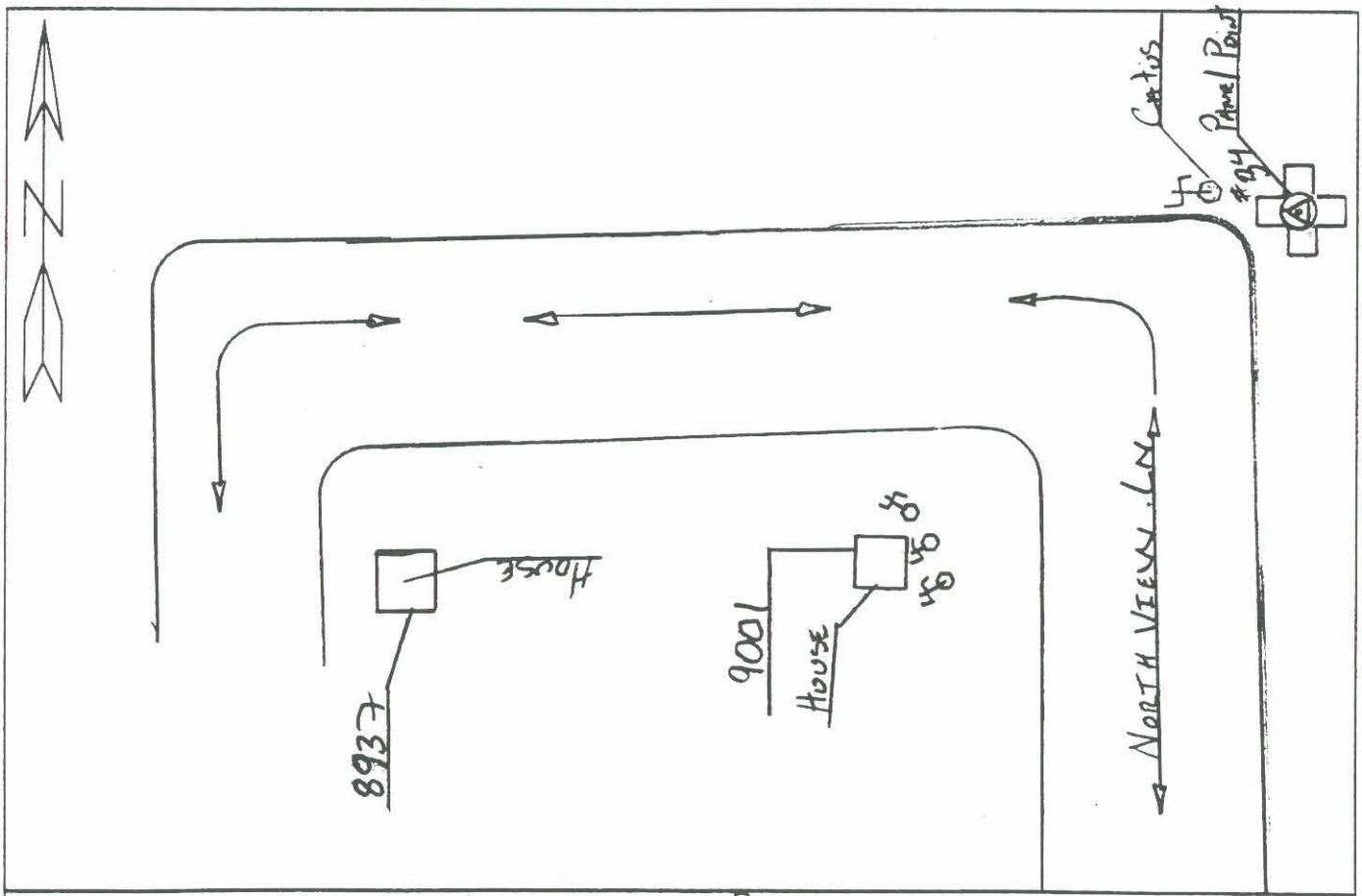
Ending:
Lat: 33 ° 49 · 15.85 " N
Long: 111 ° 53 · 10.75 " W
Ellip. Height: +0795- M PDOP: 1.8

Receiver Model: 4000 SSE (X) 4800 ( ) 4000 SE ( )
Antenna Type: CompL1/L2 w/GP (X) CompL1/L2 ( ) Geodetic( )
Tribrach: SoKKisha Wild H/P Topcon Pentax
Local-UTC Time Offset: MST= -7:00
Type of Survey: Fast Static (X) - Fast Static ( )
Actual= Start 16 : 35 Stop: 17 :00 UTC
# Beg. SV's Used: 03, 08, 09, 31, 17, 21, 23, 29
End SV's Used: 03, 08, 31, 17, 21, 23, 15, 29

Ant. Height (M): 1) 1.539 2) 1.539 3) 4) 1.538 5) 1.534 6) 1.539 7) 8) 1.538 9) 1.538 10) 1.538 11) 12) 1.539 Mean= 1.537

(ft) 1) 1.55 3) 2) 1.53 Mean 1.55

Weather Conditions: Clear (P. Cloudy) Overcast Hot (Warm) Cool Cold Calm (Breezy) °F +/-



Type of Monument: SET 60D nail with Shiner Panel Stamping:
Top of marker: (X) flush M ( ) above: ( ) below: Nat. Ground Detail Notes: OFF

Rubbing Performed ( )Yes ( )No

A TEAM Professional Associates, INC.
GPS STATION LOG

1802 W. Grant Road - Ste 110-5 -Tucson, Arizona - 85745 - (520) 623-8503 - (520) 623-8504 Fax

Station Name: 34
Receiver No: 4573 -5677 - 6076 - 6081 - 6082 - 6083
Day of Year: 273 1999
Session No: 0 (for fast static)

Project Name: Maricopa County FCD
Job number:
Local Date: mo. SEPT day 30 year 1999
Operator: Clinton Fischer

C/A CODE POSITION

Beg:
Lat: : 33° 49 ' 15.58 " N
Long: 111 ° 53 ' 10.00 " W
Ellip. Height: 789 + M PDOP: 3.5

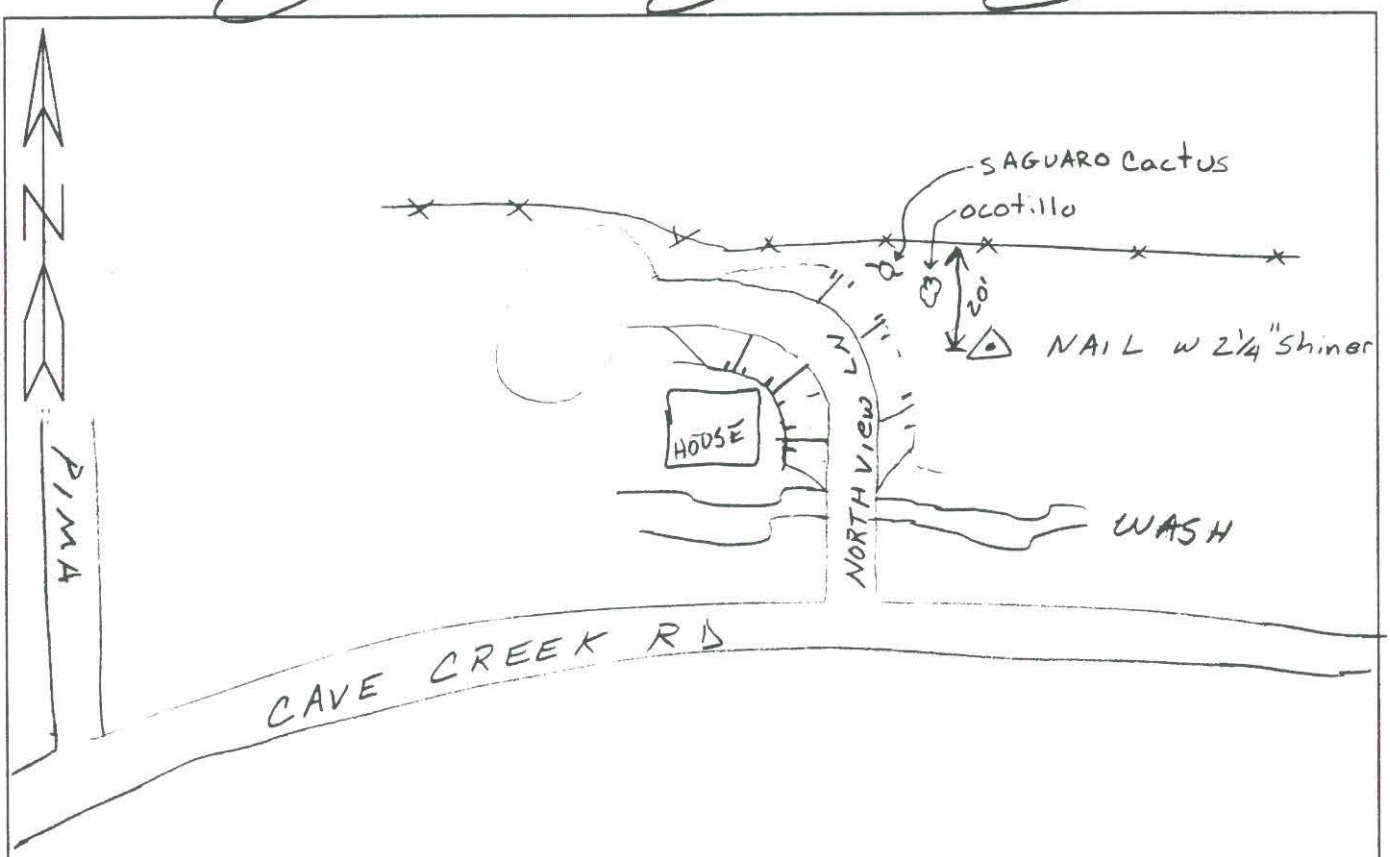
Ending:
Lat: 33 ° 49 ' 14.15 " N
Long: 111 ° 53 ' 11.90 " W
Ellip. Height: 803 + M PDOP: 3.1

Receiver Model: 4000 SSE (X) 000 SE ( )
Antenna Type: Comp L1/L2 W/GP (X) omp L1/L2 ( )
Tribrach: SoKKisha Wild H/P Topcon Pintax
Local-UTC Time Offset: MST= -7:00
Type of Survey: Fast Static (X) - Fast Static ( )
Actual= Start 21 : 10 Stop: 21 : 41 UTC
Beg. SV's Used: 01, 14, 15, 16, 22
End SV's Used: 01, 19, 15, 16, 22

Ant. Height (M) 1) 1.574 3) 1.575 5) 1.575 7) 1.574 9) 1.573 11) 1.573
2) 1.574 4) 1.575 6) 1.574 8) 1.574 10) 1.573 12) 1.574 Mean= 1.574

(ft) 1) 5.15 3) 5.16
2) 5.15 Mean

Weather Conditions: (Clear) P. Cloudy Overcast (Hot) Warm Cool Cold (Calm) Breezy °F +/-



Type of Monument: NAIL w/ 2¼" Shiner Stamping: —
Top of marker: (X) flush M ( ) above: ( ) below: Nat. Ground Detail Notes: —

Rubbing Performed ( )Yes (X)No

A TEAM Professional Associates, INC.
GPS STATION LOG

1802 W. Grant Road - Ste 110-5 -Tucson, Arizona - 85745 - (520) 623-8503 - (520) 623-8504 Fax

Station Name: * 101
Receiver No: 6082
Day of Year: 274 1999
Session No: 0 6 (for fast static)

Project Name: Maricopa Co. F.D.C.
Job number: # 919
Local Date: mo. 10 day 1 year 1999
Operator: Matt Danelowitz

C/A CODE POSITION

Beg:
Lat: : 33° 49 59.17 "N
Long: 111 ° 57 38.55 "W
Ellip. Height: 0560- M PDOP: 2.3

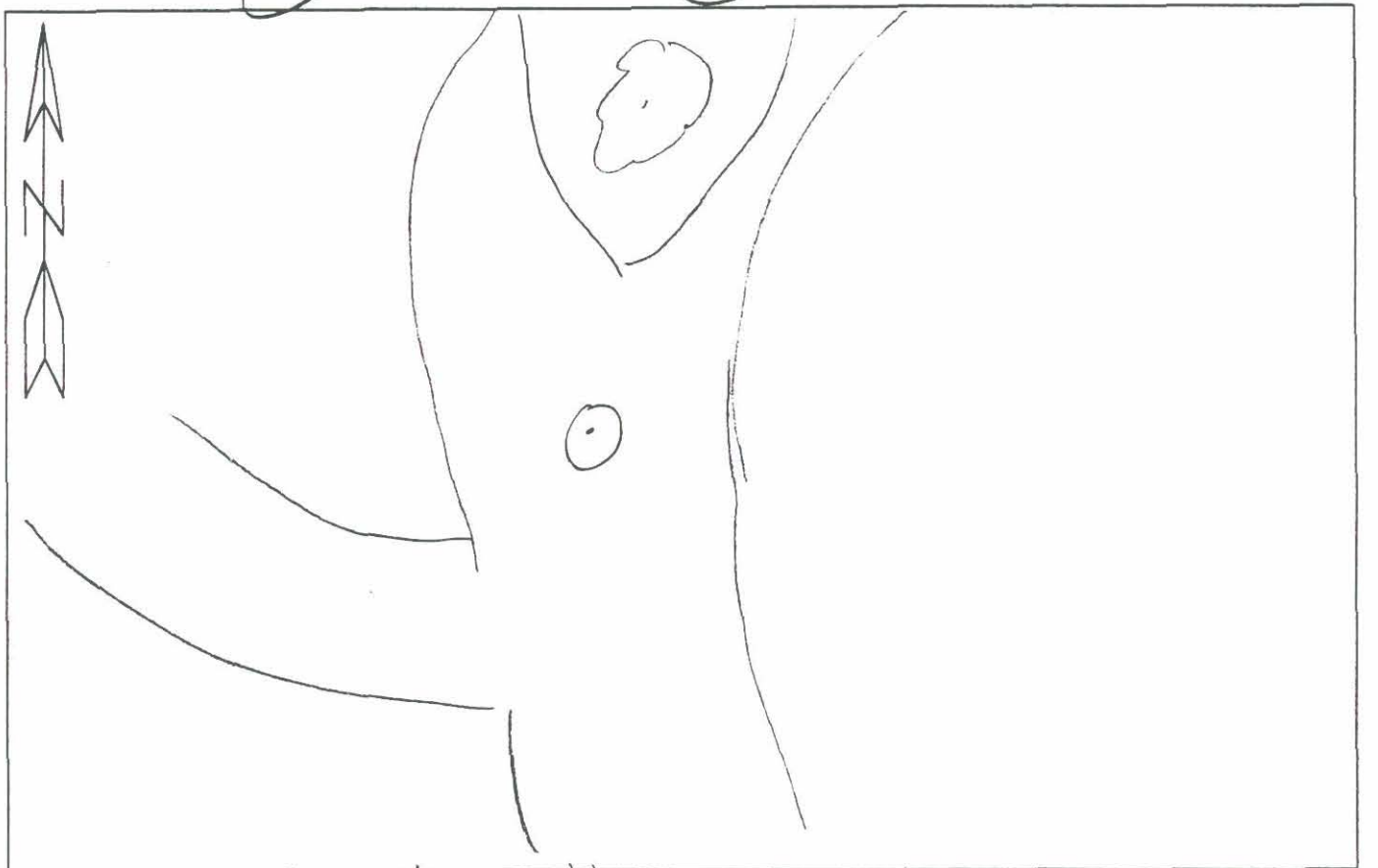
Ending:
Lat: 33° 49 59.71 "N
Long: 111 ° 57 38.93 "W
Ellip. Height: 0485- M PDOP: 2.2

Receiver Model: 4000 SSE (X) 4800 ( ) 4000 SE ( )
Antenna Type: ~~Compl~~ L1/L2 w/GP (X) CompL1/L2 ( ) Geodetic( )
Tribrach: ~~SoKKisha~~ Wild H/P Topcon Pentax
Local-UTC Time Offset: 11:03 MST= -7:00
Type of Survey: Fast Static (X) - Fast Static ( )
Actual= Start 18:03 Stop: 18:15 UTC
Beg. SV's Used: 01, 03, 29, 15, 31, 23, 21, 25
End SV's Used: 01, 03, 29, 15, 31, 23, 21, 25

Ant. Height (M) 1) 1.6423 1.6435 1.641 7) 1.641 9) 1.642 11) 1.642
2) 1.644 4) 1.6426 1.641 8) 1.642 10) 1.642 12) 1.642 Mean= 1.642

(ft) 1) 5.38 3) 5.37
2) 5.39 Mean 5.39

Weather Conditions: (Clear) P. Cloudy Overcast (Hot) Warm Cool Cold Calm Breezy °F +/-



Type of Monument: Concrete nail Stamping: None
Top of marker: (X) Flush M ( ) above: ( ) below: Nat. Ground Detail Notes: Concrete nail
℄ of

Rubbing Performed ( )Yes ( )No

A TEAM Professional Associates, INC.

GPS STATION LOG

1802 W. Grant Road - Ste 110-5 -Tucson, Arizona - 85745 - (520) 623-8503 - (520) 623-8504 Fax

Station Name: 102
Receiver No: 6083
Day of Year: 274 1999
Session No: 0 (for fast static)

Project Name: MARICOPA CO. FCD
Job number: # 919
Local Date: mo. OCT day 01 year 1999
Operator: DAVE RHINE

C/A CODE POSITION

Beg:
Lat: : 33 ° 50 ' 00.21 " N
Long: 111 ° 57 ' 41.50 " W
Ellip. Height: M PDOP: 2.3

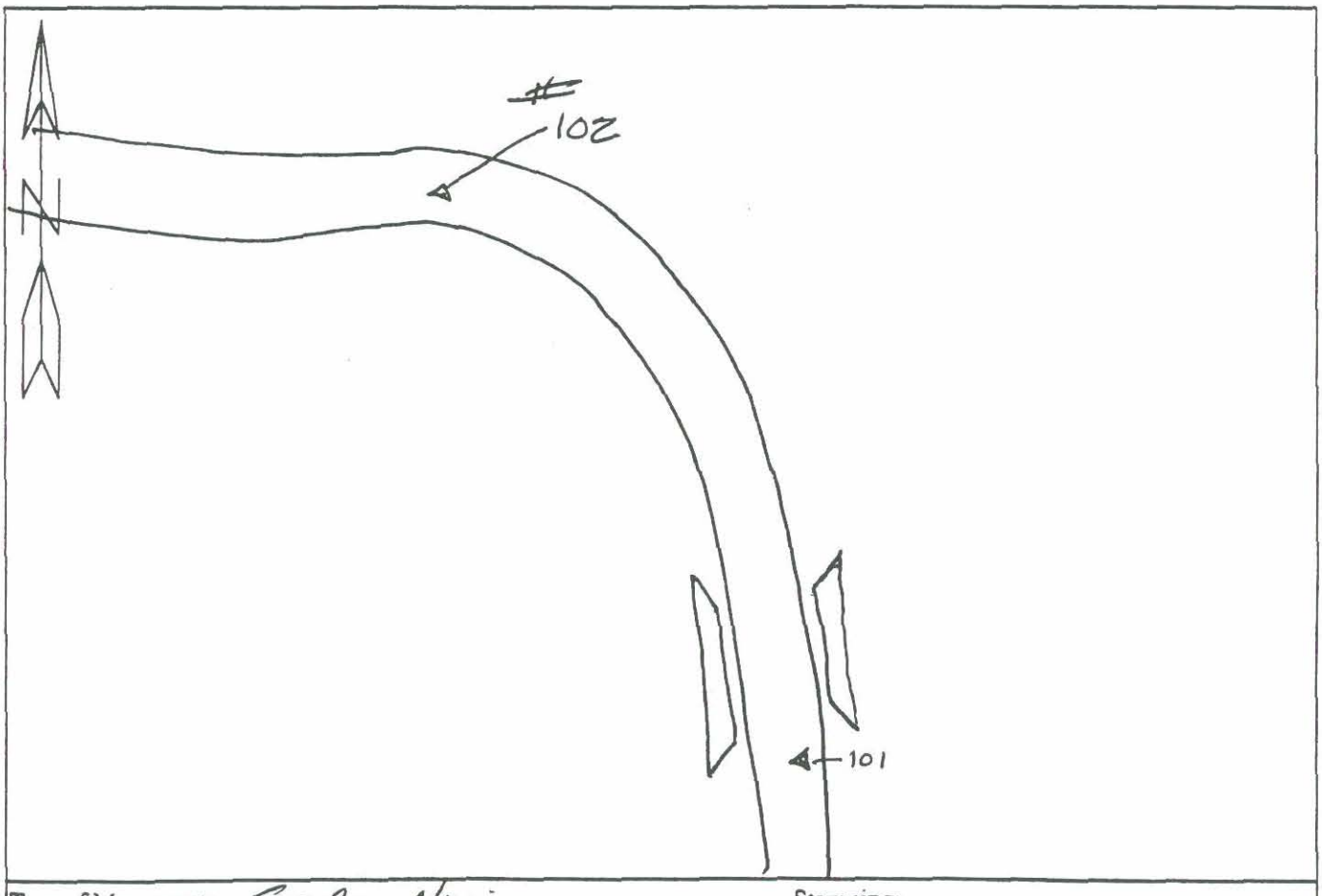
Ending:
Lat: 33 ° 50 ' 00.51 " N
Long: 111 ° 57 ' 40.608 " W
Ellip. Height: 612.— M PDOP: 2.3

Receiver Model: 4000 SSE (X) 4800 ( ) 4000 SE ( )
Antenna Type: CompL1/L2 w/GP (X) CompL1/L2 ( ) Geodetic( )
Tribrach: SoKKisha Wild H/P Topcon Pentax
Local-UTC Time Offset: MST= -7:00
Type of Survey: Fast Static (X) - Fast Static ( )
Actual= Start 18 : 03 Stop: 18 : 14 UTC
Beg. SV's Used: 01,03,15,31,21,23,25,29
End SV's Used: 01,03,15,31,21,23,25,29

Ant. Height (M) 1)1.658 3)1.659 5)1.659 7)1.659 9)1.659 11)1.658
2)1.659 4)1.659 6)1.659 8)1.659 10)1.659 12)1.658 Mean= 1.659

(ft) 1) 5.43 3)
2) 5.43 Mean

Weather Conditions: (Clear) P. Cloudy Overcast Hot (Warm) Cool Cold (Calm) Breezy °F +/-



Type of Monument: Ford Conc Nail Stamping:
Top of marker: ( ) flush M ( ) above: ( ) below: Nat. Ground Detail Notes:

Rubbing Performed ( )Yes ( )No

A TEAM Professional Associates, INC.
GPS STATION LOG

1802 W. Grant Road - Ste 110-5 -Tucson, Arizona - 85745 - (520) 623-8503 - (520) 623-8504 Fax

Station Name: # 201 or Project Name: Maricopa Co F.D.C.
Receiver No: 6082 Job number: # 9.17
Day of Year: 274 1999 Local Date: mo. 10 day 1 year 1999
Session No: 05 (for fast static) Operator: Matt Danelowitz

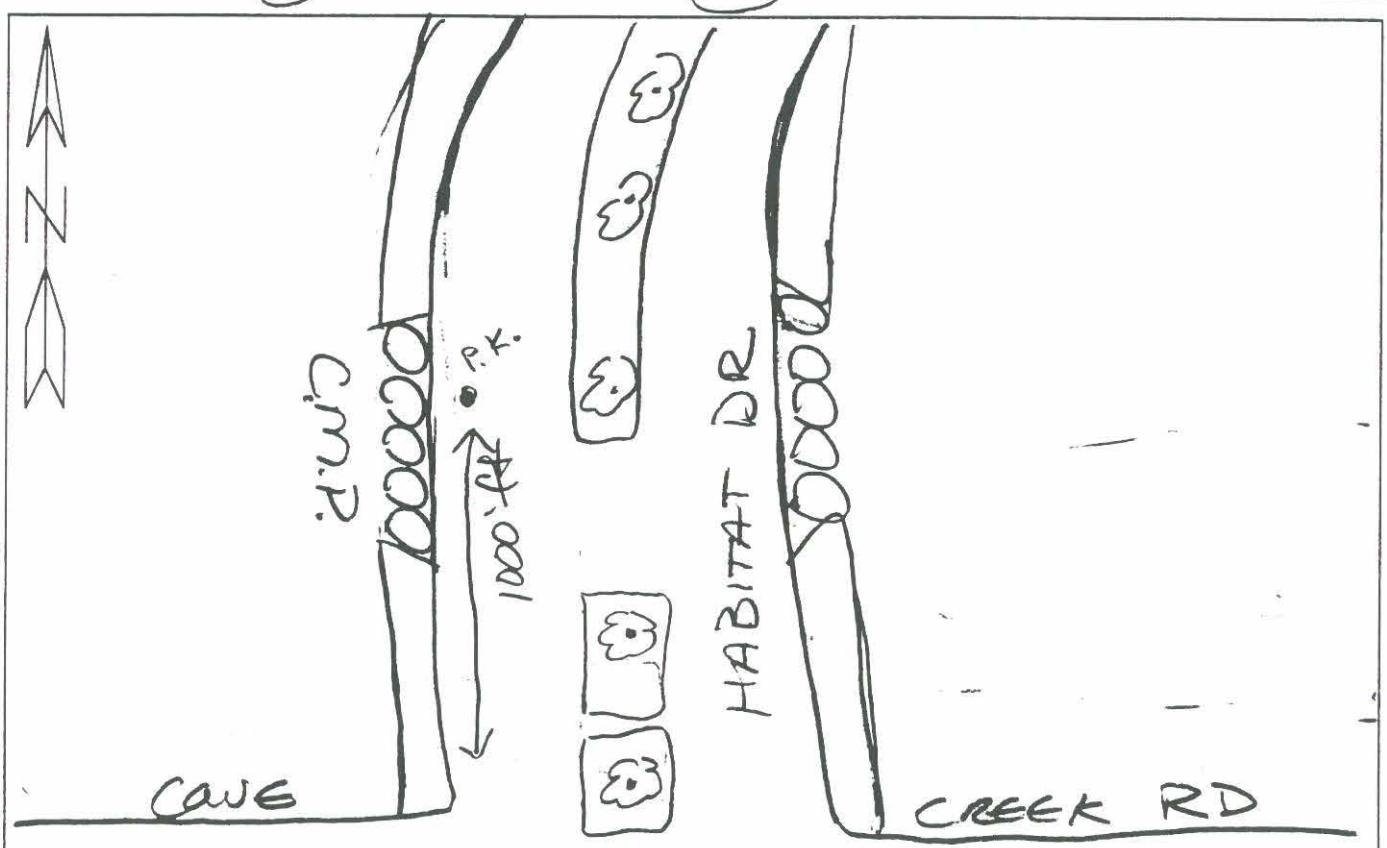
C/A CODE POSITION

Beg:
Lat: : 33° 50' 00.72" N
Long: 111° 57' 18.03" W
Ellip. Height: 0627- M PDOP: 1.6
Ending:
Lat: 33° 49' 59.77 N
Long: 111° 57' 18.37" W
Ellip. Height: 0593- M PDOP: 2.0

Receiver Model: 4000 SSE (X) 4800 ( ) 4000 SE ( )
Antenna Type: CompL1/L2 w/GP (X) CompL1/L2 ( ) Geodetic( )
Tribrach: SoKKisha Wild H/P Topcon Pentax
Local-UTC Time Offset: 10.14 MST= -7:00 10:34
Type of Survey: Fast Static (X) - Fast Static ( )
Actual= Start 17:14 Stop: 17:34 UTC
Beg. SV's Used: 03, 08 09 15, 17, 21, 23, 31, 29
End SV's Used: 03, 25, 15, 17, 21, 23, 31, 29

Ant. Height (M) 1) 1.654 3) 1.653 5) 1.650 7) 1.657 9) 1.657 11) 1.652
2) 1.654 4) 1.658 6) 1.652 8) 1.657 10) 1.657 12) 1.653 Mean= 1.653.
(ft) 1) 5.42 3) 5.43
2) 5.42 Mean 5.42

Weather Conditions: (Clear) P. Cloudy Overcast (Hot) Warm Cool Cold Calm Breezy °F +/-



Type of Monument: P.K. Stamping: None
Top of marker: (1) Flush M ( ) above: ( ) below: Nat. Ground Detail Notes: Set P.K. in Asphalt west HABITAT DR. North of Cave Creek

Rubbing Performed ( )Yes (✓)No

A TEAM Professional Associates, INC.

GPS STATION LOG

1802 W. Grant Road - Ste 110-5 -Tucson, Arizona - 85745 - (520) 623-8503 - (520) 623-8504 Fax

Station Name: 202 | Project Name: MARICOPA Co FCD
Receiver No: 6083 | Job number: # 919
Day of Year: 274 1999 | Local Date: mo. OCT day 01 year 1999
Session No: 0 (for fast static) | Operator: DAVE RHINE

C/A CODE POSITION

Beg:
Lat: : 33 ° 50 ' 01.44 " N
Long: 111 ° 57 ' 16.22 " W
Ellip. Height: 562- M PDOP: 1.9

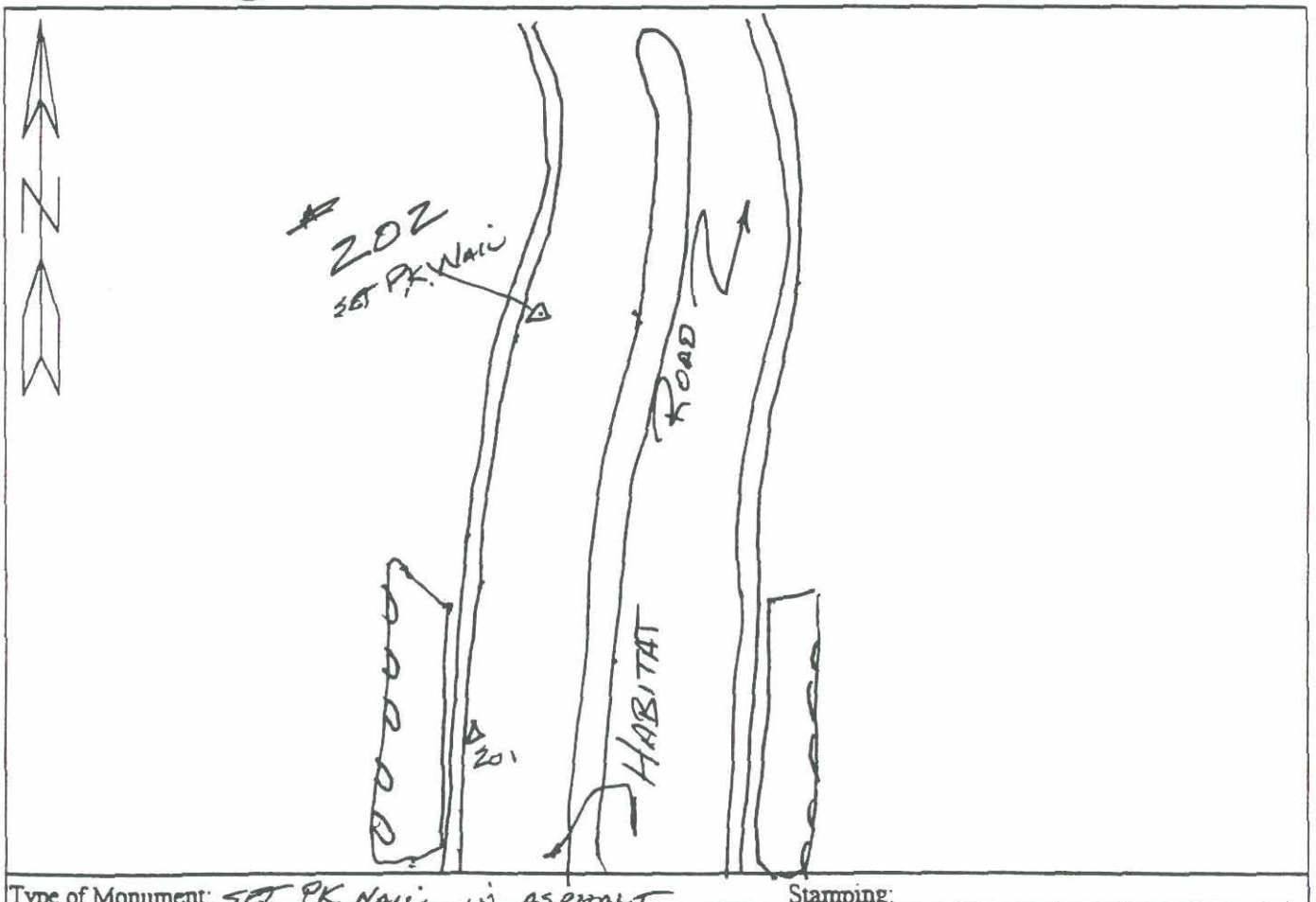
Ending:
Lat: 33 ° 50 ' 01.72 " N
Long: 111 ° 57 ' 17.34 " W
Ellip. Height: 582+ M PDOP: 1.9

Receiver Model: 4000 SSE (X) 4800 ( ) 4000 SE ( )
Antenna Type: CompL1/L2 w/GP (X) CompL1/L2 ( ) Geodetic( )
Tribrach: SoKKisha Wild H/P Topcon Pentax
Local-UTC Time Offset: MST= -7:00
Type of Survey: Fast Static (X) - Fast Static ( )
Actual= Start 17 : 15 Stop: 17 : 33 UTC
Beg. SV's Used: 03,08,09,15,17,21,23,31,29
End SV's Used: 03,08,09,15,17,21,23,31,29

Ant. Height (M) 1)1.695 3)1.694 5)1.695 7)1.695 9)1.695 11)1.695
2)1.694 4)1.694 6)1.695 8)1.695 10)1.695 12)1.695 Mean= 1.695

(ft) 1) 5.55 3)
2) 5.55 Mean

Weather Conditions: (Clear) P. Cloudy Overcast Hot (Warm) Cool Cold (Calm) Breezy °F +/-



Type of Monument: SET PK NAIL IN ASPHALT Stamping:
Top of marker: ( ) flush M ( ) above: ( ) below: Nat. Ground Detail Notes:

Rubbing Performed ( )Yes ( )No

A TEAM Professional Associates, INC.
GPS STATION LOG

1802 W. Grant Road - Ste 110-5 -Tucson, Arizona - 85745 - (520) 623-8503 - (520) 623-8504 Fax

Station Name: #301
Receiver No: 6087
Day of Year: 274 1999
Session No: 04 (for fast static)

Project Name: Maricopa Co. F.D.C.
Job number: # 919
Local Date: mo. 10 day 1, year 1999
Operator: Matt Danelon, Jr.

C/A CODE POSITION

Beg:
Lat: : 33° 49 '58.28" N
Long: 111° 57 '13.64" W
Ellip. Height: 0623+ M PDOP: 2.1

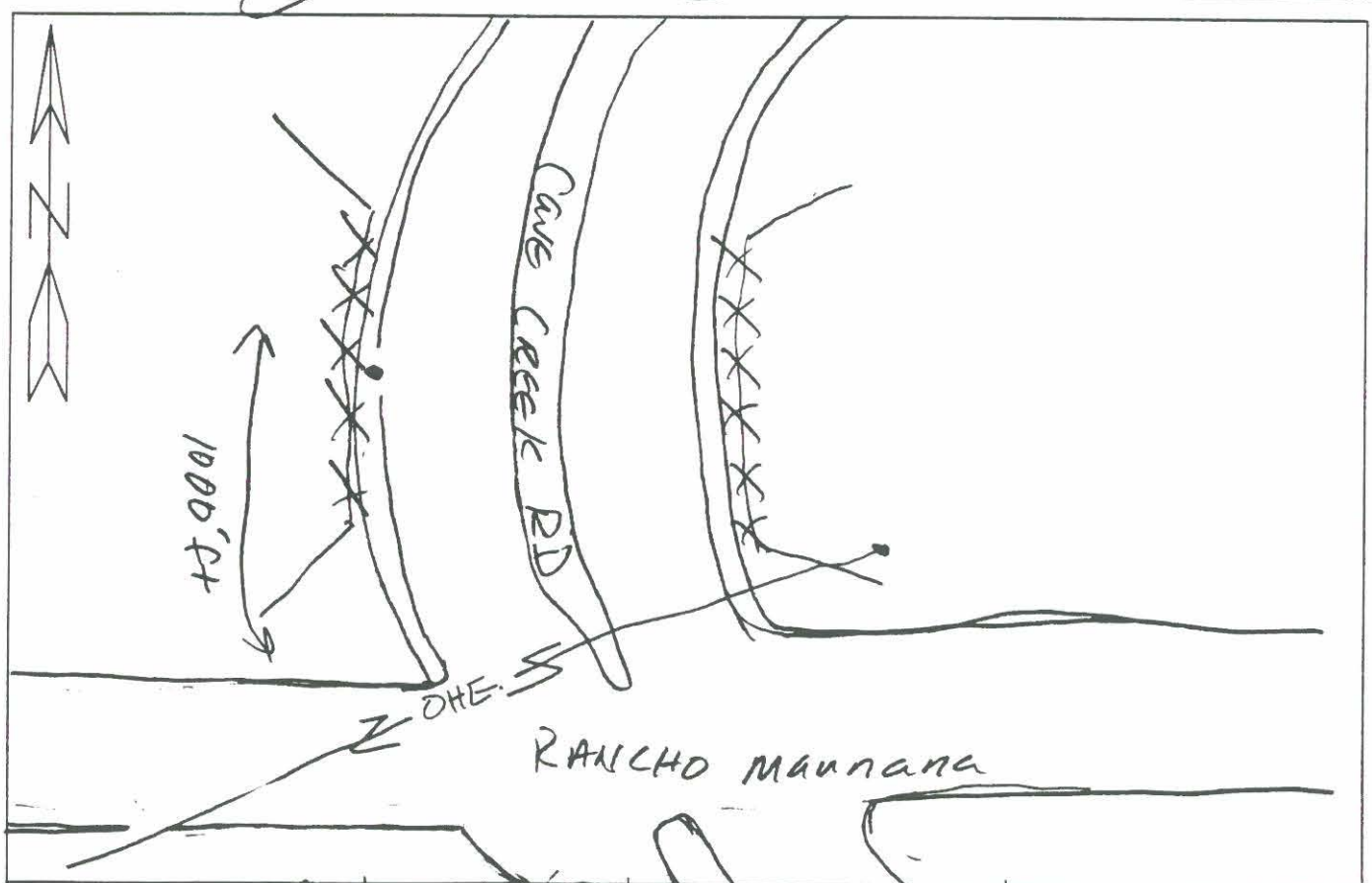
Ending:
Lat: 33°49 '57.08" N
Long: 111° 57 '13.24" W
Ellip. Height: 0687+ M PDOP: 1.9

Receiver Model: 4000 SSE (X) 4800 ( ) 4000 SE ( )
Antenna Type: ~~CompL1/L2 w/GP~~ (X) CompL1/L2 ( ) Geodetic( )
Tribrach: SoKKisha Wild H/P Topcon Pentax
Local-UTC Time Offset: 7:00 MST= -7:00
Type of Survey: Fast Static (X) - Fast Static ( )
Actual= Start 16:40 Stop: 16:59 UTC
Beg. SV's Used: 03, 08, 09, 31, 17, 21, 23, 29
End SV's Used: 03, 08, 09, 31, 17, 21, 23, 29

Ant. Height (M) 1) 1.630 3) 1.630 5) 1.630 7) 1.630 9) 1.630 11) 1.630
2) 1.630 4) 1.630 6) 1.630 8) 1.630 10) 1.630 12) 1.630 Mean= 1.630

(ft) 1) 5.34 3) 5.35
2) 5.34 Mean 5.34

Weather Conditions: Clear P. Cloudy Overcast Hot Warm Cool Cold Calm Breezy °F +/-



Type of Monument: Culvert (P.K.) NAIL Stamping: None
Top of marker: (X) flush M ( ) above: ( ) below: Nat. Ground Detail Notes: On the west side of Cave Creek, just North of Rancho Manana in the center of Culvert
Rubbing Performed ( )Yes ( )No

A TEAM Professional Associates, INC.
GPS STATION LOG

1802 W. Grant Road - Ste 110-5 -Tucson, Arizona - 85745 - (520) 623-8503 - (520) 623-8504 Fax

Station Name: 303
Receiver No: 60083
Day of Year: 274 1999
Session No: 0 (for fast static)

Project Name: MARICOPA Co. FCD
Job number: # 919
Local Date: mo. OCT day 01 year 1999
Operator: DAVE RHINE

C/A CODE POSITION

Beg:
Lat: : 33 ° 49 ' 56.93 " N
Long: 111 ° 57 ' 11.76 " W
Ellip. Height: 585 – M PDOP: 2.0

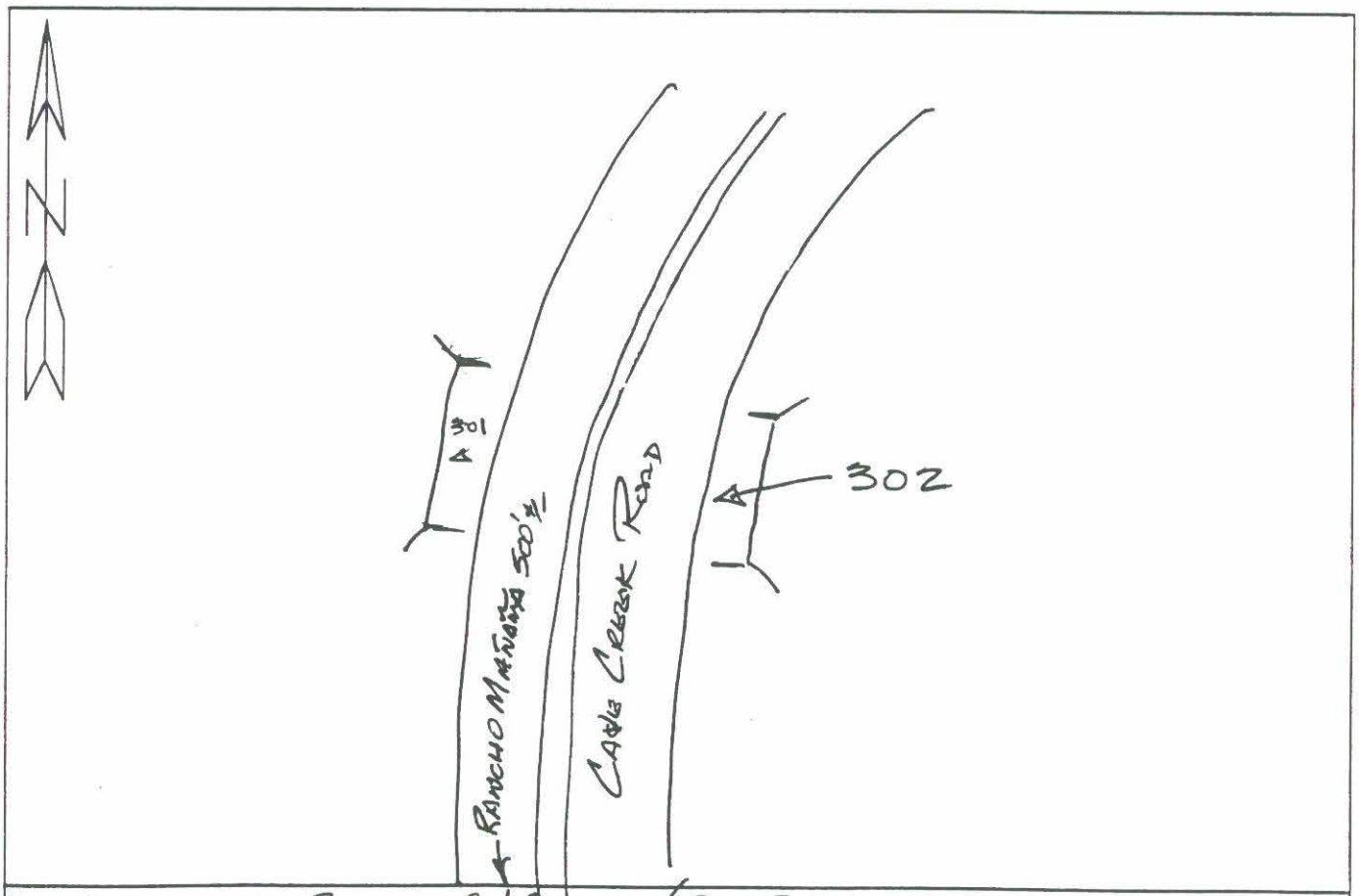
Ending:
Lat: 33 ° 49 ' 56.11 " N
Long: 111 ° 57 ' 12.14 " W
Ellip. Height: 6098 + M PDOP: 2.0

Receiver Model: 4000 SSE (X) 4800 ( ) 4000 SE ( )
Antenna Type: CompL1/L2 w/GP (X) CompL1/L2 ( ) Geodetic( )
Tribrach: SoKKisha Wild H/P Topcon Pentax
Local-UTC Time Offset: MST= -7:00
Type of Survey: Fast Static (X) - Fast Static ( )
Actual= Start 16 : 44 Stop: 16 : 59 UTC
Beg. SV's Used: 03, 08, 09, 31, 17, 21, 23 29
End SV's Used: 03, 08, 09, 31, 17, 21, 23, 29

Ant. Height (M) 1) 3) 5) 7) 9) 1.729 11) 1.729
2) 4) 6) 8) 10) 12) Mean= 1.729.

(ft) 1) 5.67 3)
2) 5.67 Mean

Weather Conditions: (Clear) P. Cloudy Overcast Hot (Warm) Cool Cold (Calm) Breezy °F +/-



Type of Monument: SET PK NAIL @ 4 COLVERT (EAST Stamping:
Top of marker: ( ) flush M ( ) above: ( ) below: Nat. Ground Detail Notes:

Rubbing Performed ( )Yes ( )No

A TEAM Professional Associates, INC.

GPS STATION LOG

1802 W. Grant Road - Ste 110-5 -Tucson, Arizona - 85745 - (520) 623-8503 - (520) 623-8504 Fax

Station Name: 0401
Receiver No: 6081
Day of Year: 274 1999
Session No: 0 (for fast static)

Project Name: MARICOPA COUNTY FCD.
Job number: # 919
Local Date: mo. 10 day 1 year 1999
Operator: CHAD CLARK

C/A CODE POSITION

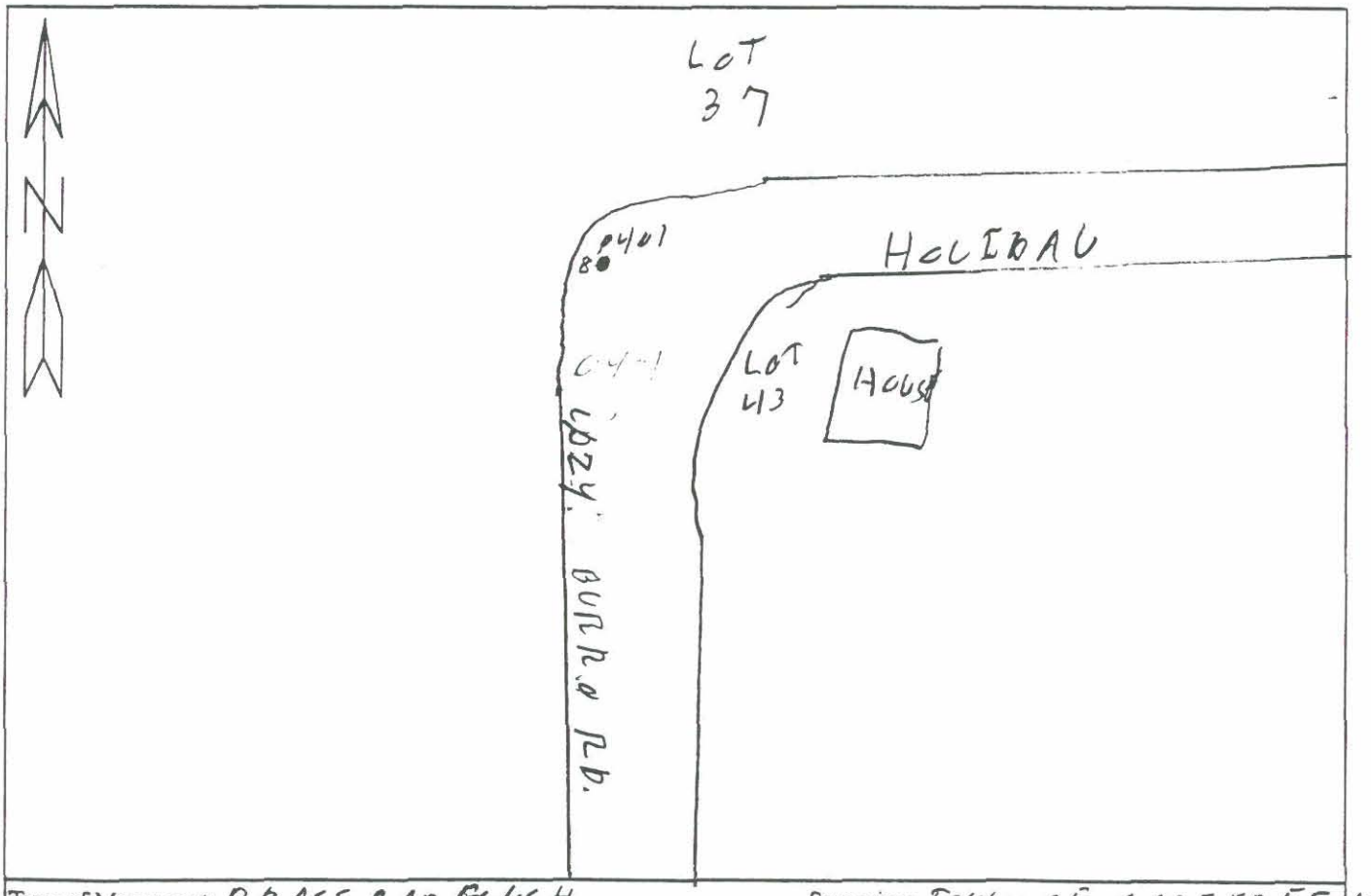
Beg:
Lat: : 33 ° 49 ' 33.80 " N
Long: 111 ° 55 ' 48.91 " W
Ellip. Height: 0718 + M PDOP: 2.2
Ending:
Lat: 33 ° 49 ' 33.01 " N
Long: 111 ° 55 ' 48.44 " W
Ellip. Height: 0663 + M PDOP: 2.3

Receiver Model: 4000 SSE (X) 4800 ( ) 4000 SE ( )
Antenna Type: CompL1/L2 w/GP (X) CompL1/L2 ( ) Geodetic( )
Tribrach: SoKKisha Wild H/P Topcon Pentax
Local-UTC Time Offset: MST= -7:00
Type of Survey: Fast Static (X) - Fast Static ( )
Actual= Start 16 : 05 Stop: 16 : 16 UTC
Beg. SV's Used: 03, 08, 09, 17, 21, 23, 29, 31
End SV's Used: 03, 08, 09, 17, 21, 23, 29, 31

Ant. Height (M) 1)1.542 3)1.542 5)1.541 7)1.641 9)1.541 11)1.540
2)1.542 4)1.542 6)1.541 8)1.541 10)1.540 12)1.540 Mean= 1.541

(ft) 1)5.06 3)5.06
2)5.05 Mean 5.06

Weather Conditions: (Clear) P. Cloudy Overcast Hot (Warm) Cool Cold (Calm) Breezy 90 °F +/-



Type of Monument: BRASS CAP FLUSH Stamping: TOWN OF CAREFREE 19
Top of marker: (X) flush M ( ) above: ( ) below: Nat. Ground Detail Notes: 0.20' DEA

Rubbing Performed ( )Yes (X)No

A TEAM Professional Associates, INC.

GPS STATION LOG

1802 W. Grant Road - Ste 110-5 -Tucson, Arizona - 85745 - (520) 623-8503 - (520) 623-8504 Fax

Station Name: #402
Receiver No: 7662
Day of Year: 274 1999
Session No: 0 (for fast static)

Project Name: Maricopa C.O FDC
Job number: #919
Local Date: mo. 10 day 1 year 1999
Operator: Jose Bonillas

C/A CODE POSITION

Beg:
Lat: : 33 ° 49 · 28.96 " N
Long: 111 ° 55 · 48.91 " W
Ellip. Height: +0715+ M PDOP: 2.3

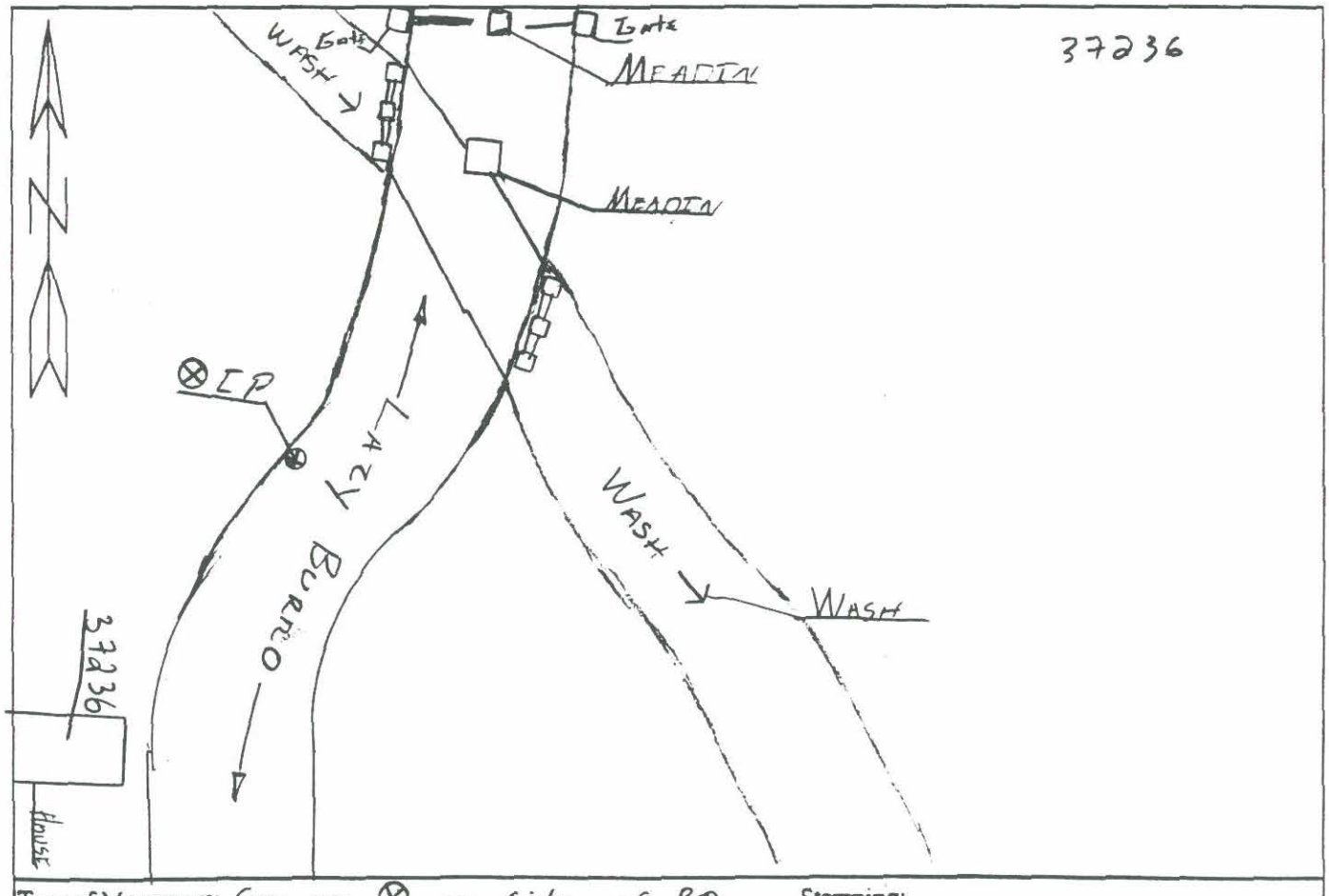
Ending:
Lat: 33 ° 49 · 28 39 " N
Long: 111 ° 55 · 49 10 " W
Ellip. Height: M PDOP:

Receiver Model: 4000 SSE (X) 4800 ( ) 4000 SE ( )
Antenna Type: CompL1/L2 w/GP (X) CompL1/L2 ( ) Geodetic( )
Tribrach: SoKKisha Wild H/P Topcon Pentax
Local-UTC Time Offset: MST= -7:00
Type of Survey: Fast Static (X) - Fast Static ( )
Actual= Start 16 : 02 Stop: 16 : 16 UTC
Beg. SV's Used: 03, 08, 09, 17, 21, 23, 29, 31
End SV's Used:

Ant. Height (M): 1)1.588 2)1.588 3) 4) 5)1.587 6)1.587 7)1.587 8)1.588 9)1.587 10)1.588 11)1.588 12)1.588 Mean= 1.588

(ft) 1)5.10 2)5.10 3) Mean5.10

Weather Conditions: Clear P. Cloudy Overcast Hot Warm Cool Cold Calm Breezy °F +/-



Type of Monument: Set on ⊗ on side of RD Stamping:
Top of marker: (X) flush M ( ) above: ( ) below: Nat. Ground Detail Notes:

Rubbing Performed ( )Yes ( )No

A TEAM Professional Associates, INC.
GPS STATION LOG

1802 W. Grant Road - Ste 110-5 -Tucson, Arizona - 85745 - (520) 623-8503 - (520) 623-8504 Fax

Station Name: 8 HRP
Receiver No: 6076
Day of Year: 278 1999
Session No: 0 (for fast static)

Project Name: Maricopa Co. FCD
Job number: # 919
Local Date: mo. Oct day 5 year 1999
Operator: Dave Ruiz

C/A CODE POSITION

Beg:
Lat: : 33 ° 48 ' 41.05 " N
Long: 111 ° 59 ' 44.51 " W
Ellip. Height: 629 - M PDOP: 2.1

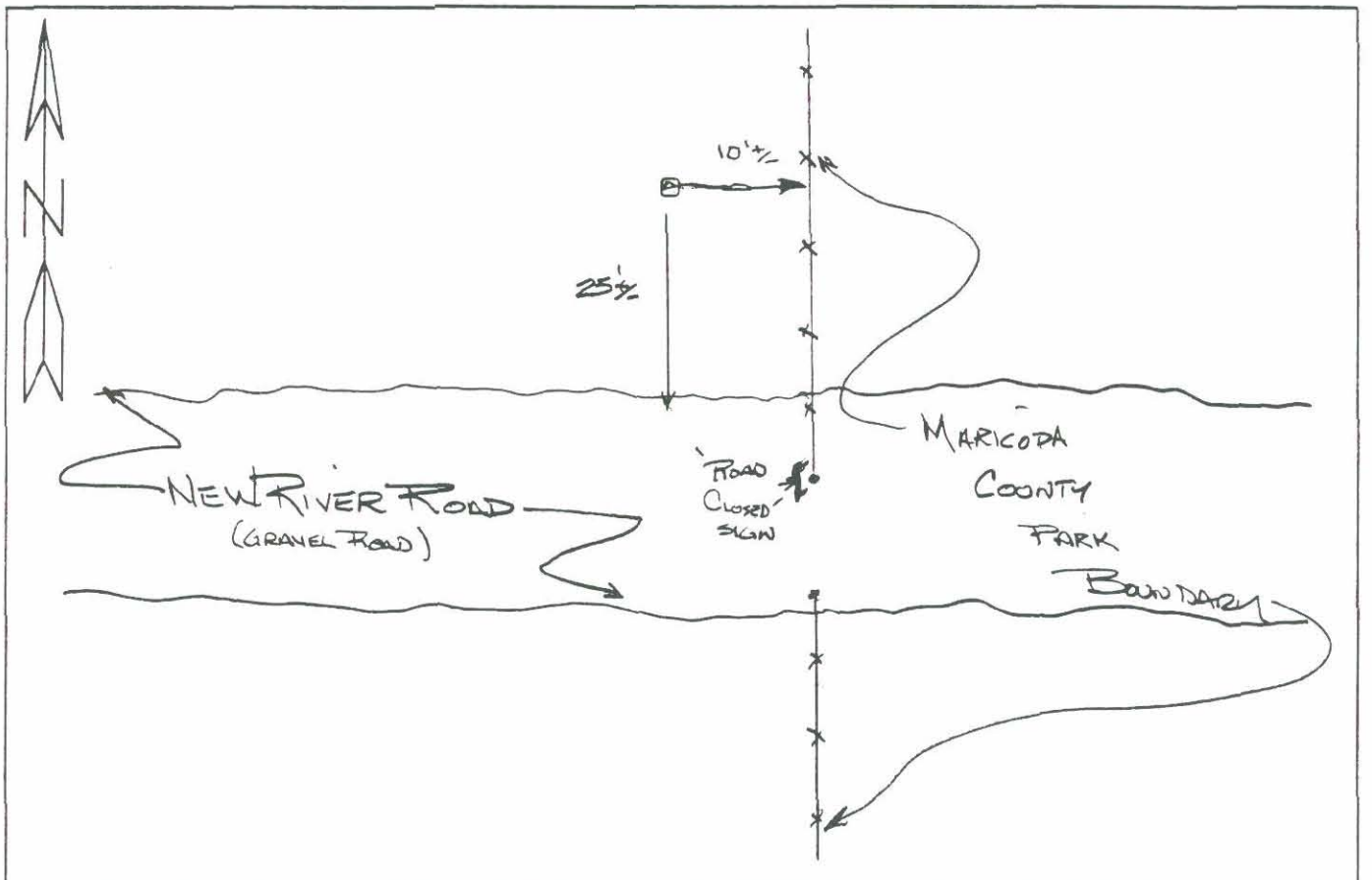
Ending:
Lat: 33 ° 48 ' 41.63 " N
Long: 111 ° 59 ' 44.32 " W
Ellip. Height: 559 + M PDOP: 2.0

Receiver Model: 4000 SSE (X) 4800 ( ) 4000 SE ( )
Antenna Type: CompL1/L2 w/GP (X) CompL1/L2 ( ) Geodetic( )
Tribrach: SoKKisha Wild H/P Topcon Pentax
Local-UTC Time Offset: MST= -7:00
Type of Survey: Fast Static (X) - Fast Static ( )
Actual= Start 17 : 35 Stop: 18 : 04 UTC
Beg. SV's Used: 01, 03, 08, 29, 15, 31, 21, 23, 25
End SV's Used: 01, 08, 29, 15, 31, 21, 23, 25

Ant. Height (M) 1) 1.467 3) 1.467 5) 1.466 7) 1.466 9) 1.466 11) 1.466
2) 1.467 4) 1.466 6) 1.466 8) 1.466 10) 1.466 12) 1.466 Mean= 1.466

(ft) 1) 4.80 3)
2) 4.80 Mean

Weather Conditions: Clear ~~P. Cloudy~~ Overcast Hot ~~Warm~~ Cool Cold ~~Calm~~ Breezy °F +/-



Type of Monument: 4" BRONZE CAP IN 6" □ CONC MON Stamping: △
Top of marker: ( ) flush M ( ) above: ( ) below: Nat. Ground Detail Notes: 1924 8-HRP 1963

Rubbing Performed ( )Yes ( )No

A TEAM Professional Associates, INC.
GPS STATION LOG

1802 W. Grant Road - Ste 110-5 -Tucson, Arizona - 85745 - (520) 623-8503 - (520) 623-8504 Fax

Station Name: CC322 . Project Name: MC FLOOD .
Receiver No: 6076 . Job number: # 919 .
Day of Year: 274 1999 . Local Date: mo. 10 day 1 year 1999 .
Session No: 0 (for fast static) . Operator: C. STUART .

C/A CODE POSITION

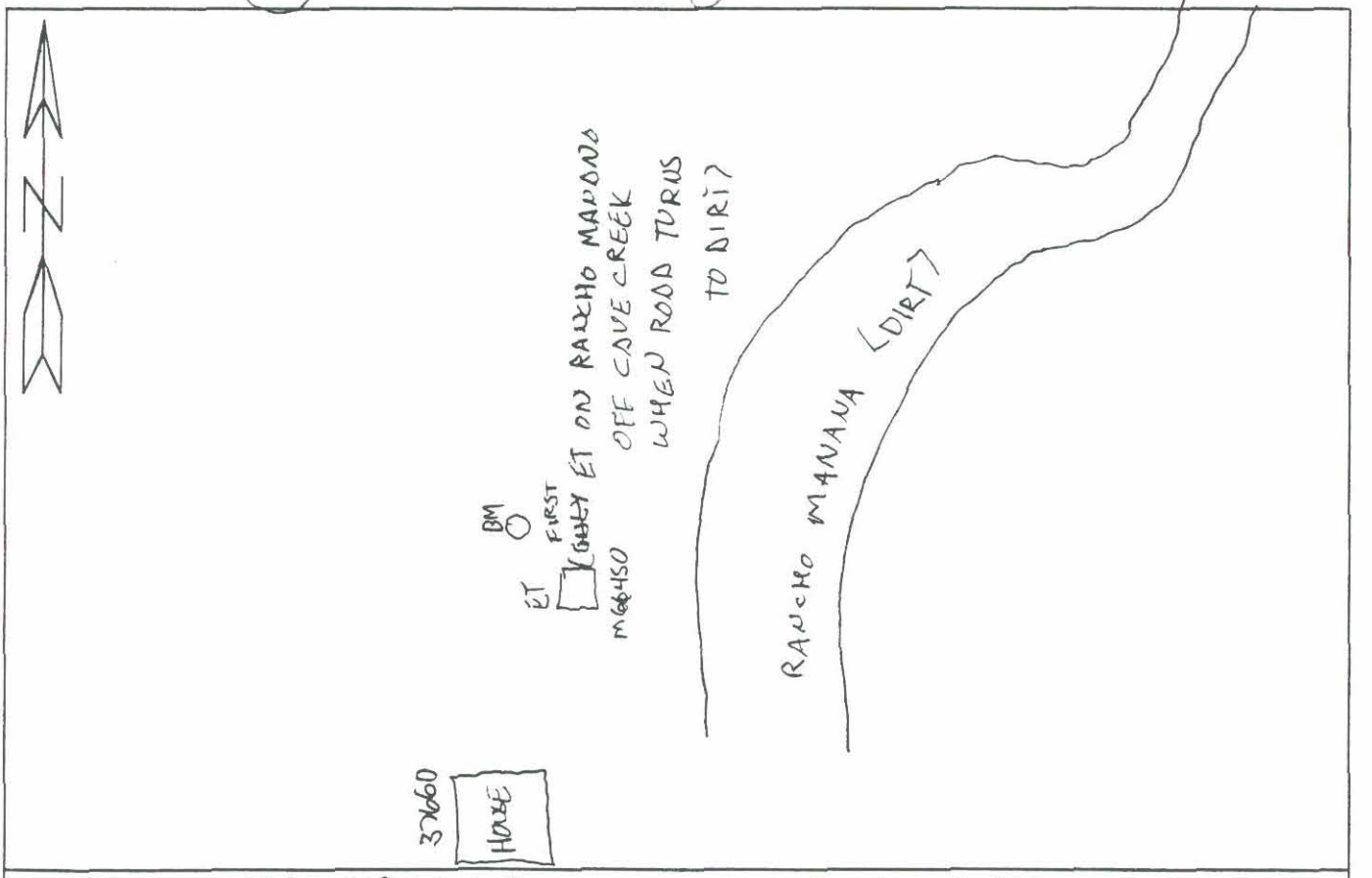
Beg:
Lat: : 33 ° 49 ' 39.39 " N
Long: 111 ° 57 ' 59.93 " W
Ellip. Height: +0612.4 + M PDOP: 2.91.

Ending:
Lat: 33 ° 49 ' 39.86 " N
Long: 111 ° 58 ' 00.90 " W
Ellip. Height: +0566.9 + M PDOP: 3.11.

Receiver Model: 4000 SSE (X) 4800 ( ) 4000 SE ( ) .
Antenna Type: CompL1/L2 w/GP (X) CompL1/L2 ( ) Geodetic( )
Tribrach: SoKKisha Wild H/P Topcon Pentax .
Local-UTC Time Offset: MST= -7:00 .
Type of Survey: Fast Static (X) - Fast Static ( ) .
Actual= Start 20:53 . Stop: 21:06 . UTC
Beg. SV's Used: 01, 14, 15, 16, 22, 25 .
End SV's Used: 01, 14, 15, 16, 22, 25 .

Ant. Height (M) 1) 1.644 3) 1.646 5) 1.634 7) 1.638 9) 1.654 11) 12) Mean= 1.640 .
(ft) 1) 5.33 3) 5.36. 2) 5.33 Mean .

Weather Conditions: (Clear) P. Cloudy Overcast (Hot) Warm Cool Cold (Calm) Breezy 100 °F +/- .



Type of Monument: BRASS CAP IN CONC. Stamping: CC332 .
Top of marker: ( ) flush 0.17 M (X) above: ( ) below: Nat. Ground Detail Notes: ELEVATION 2005-81 .

Rubbing Performed ( )Yes (X)No .

A TEAM Professional Associates, INC.
GPS STATION LOG

1802 W. Grant Road - Ste 110-5 -Tucson, Arizona - 85745 - (520) 623-8503 - (520) 623-8504 Fax

Station Name: NR06
Receiver No: 60076
Day of Year: 278 1999
Session No: 0 (for fast static)

Project Name: MARICOPA CO FCD.
Job number: # 919
Local Date: mo. OCT day 5 year 1999
Operator: DAVE RHINE

C/A CODE POSITION

Beg:
Lat: : 33 ° 49 ' 14.82 " N
Long: 112 ° 00 ' 47.25" W
Ellip. Height: 593 - M PDOP: 1.9

Ending:
Lat: 33 ° 49 ' 15.00 " N
Long: 112 ° 00 ' 47.25 " W
Ellip. Height: 595 - M PDOP: 1.8

Receiver Model: 4000 SSE (X) 4800 ( ) 4000 SE ( )
Antenna Type: CompL1/L2 w/GP (X) CompL1/L2 ( ) Geodetic( )
Tribrach: SoKKisha Wild H/P Topcon Pentax
Local-UTC Time Offset: MST= -7:00
Type of Survey: Fast Static (X) - Fast Static ( )
Actual= Start 14 : 59 Stop: 17 : 02 UTC
Beg. SV's Used: 03 08 09 26 17 21 04 23 29
End SV's Used: 03 08 25 31 17 21 15 23 29

Ant. Height (M) 1) 1.695 3) 1.694 5) 1.694 7) 1.694 9) 1.694 11) 1.694
2) 1.695 4) 1.694 6) 1.694 8) 1.694 10) 1.694 12) 1.694 Mean= 1.694.

(ft) 1) 5.50 3)
2) 5.50 Mean

Weather Conditions: Clear P. Cloudy Overcast Hot Warm Cool Cold Calm Breezy °F +/-

Type of Monument: END 9/16" SS ROD IN HANDHOLE Stamping: NR-06
Top of marker: ( ) flush M ( ) above: ( ) below: Nat. Ground Detail Notes:

EAST OF PARK ENTRANCE

Rubbing Performed ( )Yes ( )No

A TEAM Professional Associates, INC.
GPS STATION LOG

1802 W. Grant Road - Ste 110-5 -Tucson, Arizona - 85745 - (520) 623-8503 - (520) 623-8504 Fax

Station Name: NR 15
Receiver No: 6081
Day of Year: 278 1999
Session No: 0 (for fast static)

Project Name: MARICOPA COUNTY FCD
Job number: #919
Local Date: mo. 10 day 5 year 1999
Operator: CHAD CLARK

C/A CODE POSITION

Beg:
Lat: : 33 ° 53 ' 10.40 " N
Long: 112 ° 02 ' 04.39 " W
Ellip. Height: 0724+ M PDOP: 2.7

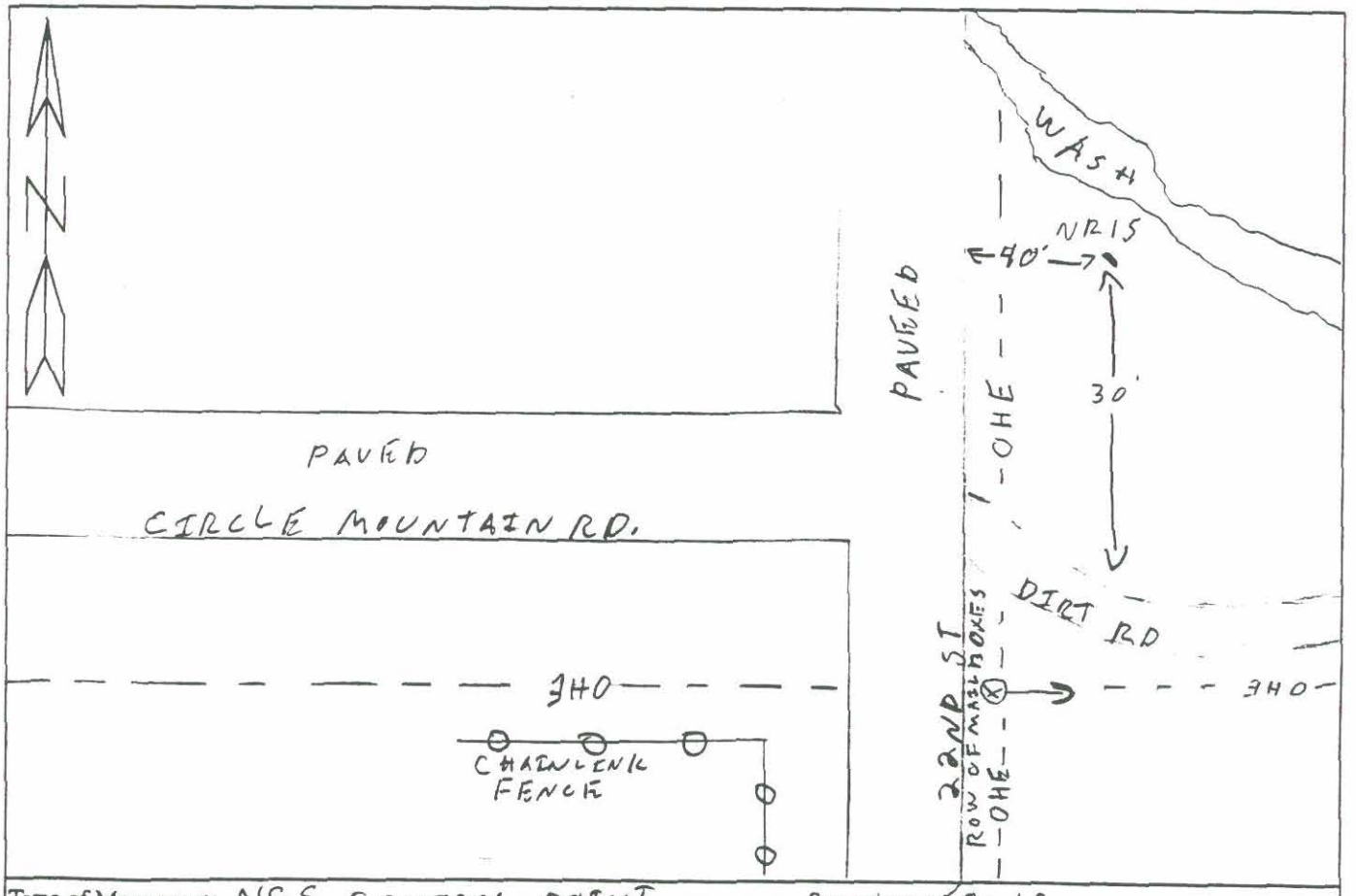
Ending:
Lat: 33 ° 53 ' 10.91 " N
Long: 112 ° 02 ' 03.94 " W
Ellip. Height: 0697+ M PDOP: 1.8

Receiver Model: 4000 SSE (X) 4800 ( ) 4000 SE ( )
Antenna Type: CompL1/L2 w/GP (X) CompL1/L2 ( ) Geodetic( )
Tribrach: SoKKisha Wild (H/P) Topcon Pentax
Local-UTC Time Offset: MST= -7:00 08 : 15
Type of Survey: Fast Static (X) - Fast Static ( )
Actual= Start 15 : 15 Stop: 17 : 02 UTC
Beg. SV's Used: 03, 08, 09, 17, 21, 29, 23
End SV's Used: 03, 08, 05, 31, 17, 21, 29, 23, 15

Ant. Height (M) 1)1.614 3)1.614 5)1.615 7)1.615 9)1.615 11)1.614 2)1.614 4)1.615 6)1.615 8)1.615 10)1.615 12)1.614 Mean= 1.6145

(ft) 1)5.25 3)5.25 2)5.26 Mean 5.25

Weather Conditions: Clear (P. Cloudy) Overcast Hot (Warm) Cool Cold (Calm) Breezy 80 °F +/-



Type of Monument: NGS CONTROL POINT Stamping: NR-15
Top of marker: ( ) flush 0.27'M ( ) above: (X) below: Nat. Ground FT
Detail Notes: 9/16" STAINLESS STEEL ROD SET IN 6" HANDHOLE IN 18" DIA CONC.

Rubbing Performed ( )Yes (X)No –

A TEAM Professional Associates, INC.
GPS STATION LOG

1802 W. Grant Road - Ste 110-5 -Tucson, Arizona - 85745 - (520) 623-8503 - (520) 623-8504 Fax

Station Name: RM # 15
Receiver No: 6082
Day of Year: 278 1999
Session No: 04 (for fast static)

Project Name: Maricopa Co F.D.C.
Job number: # 919
Local Date: mo. 10 day 6 / year 1999
Operator: Matt Danielowitz

C/A CODE POSITION

Beg:
Lat: : 33° 49 · 56.77" N
Long: 111° 56 · 45.81" W
Ellip. Height: 0655 + M PDOP: 2.5

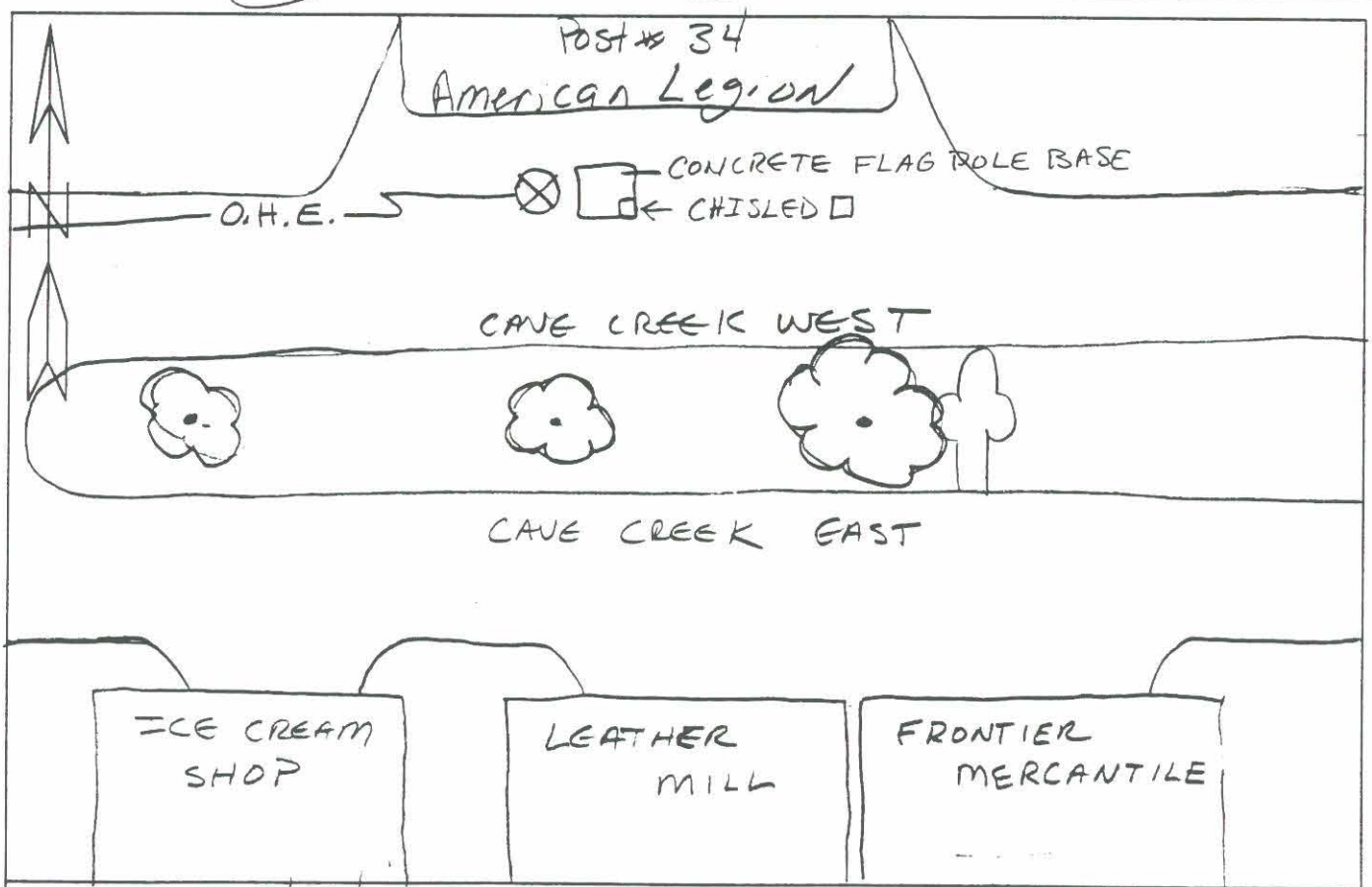
Ending:
Lat: 33° 49 · 58.54" N
Long: 111° 56 · 44.85" W
Ellip. Height: 0829 + M PDOP: 3.4

Receiver Model: 4000 SSE (X) 4800 ( ) 4000 SE ( )
Antenna Type: CompL1/L2 w/GP (X) CompL1/L2 ( ) Geodetic( )
Tribrach: SoKKisha Wild H/P Topcon Pentax
Local-UTC Time Offset: 11:42 MST= -7:00
Type of Survey: Fast Static (X) - Fast Static ( )
Actual= Start 18:42 Stop: 19:15 UTC
Beg. SV's Used: 01, 14, 15, 21, 25, 29
End SV's Used: 01, 30, 14, 15, 21, 25, 29

Ant. Height (M)
1) 1.454 3) 1.454 5) 1.452 7) 1.452 9) 1.452 11) 1.453
2) 1.454 4) 1.454 6) 1.452 8) 1.452 10) 1.453 12) 1.453 Mean= 1.452

(ft) 1) 4.77 3) 4.78
2) 4.77 Mean 4.77

Weather Conditions: (Clear) P. Cloudy Overcast (Hot) Warm Cool Cold Calm Breezy °F +/-



Type of Monument: Chiseled Square Stamping: None
Top of marker: ( ) flush M (~~4~~ above: ( ) below: Nat. Ground Detail Notes: IN THE FRONT PARKING LOT OF THE AMERICAN LEGION. CHISELED SQUARE IN THE S.E. CORNER OF CONCRETE FLAG POLE BASE
Rubbing Performed ( )Yes (~~4~~ No

A TEAM Professional Associates, INC.
GPS STATION LOG

1802 W. Grant Road - Ste 110-5 -Tucson, Arizona - 85745 - (520) 623-8503 - (520) 623-8504 Fax

Station Name: RM-23 . Project Name: McFLOOD .
Receiver No: 6076 . Job number: # 919 .
Day of Year: 274 1999 . Local Date: mo. 10 day 1 year 1999 .
Session No: 0 (for fast static) . Operator: C. STUART .

C/A CODE POSITION

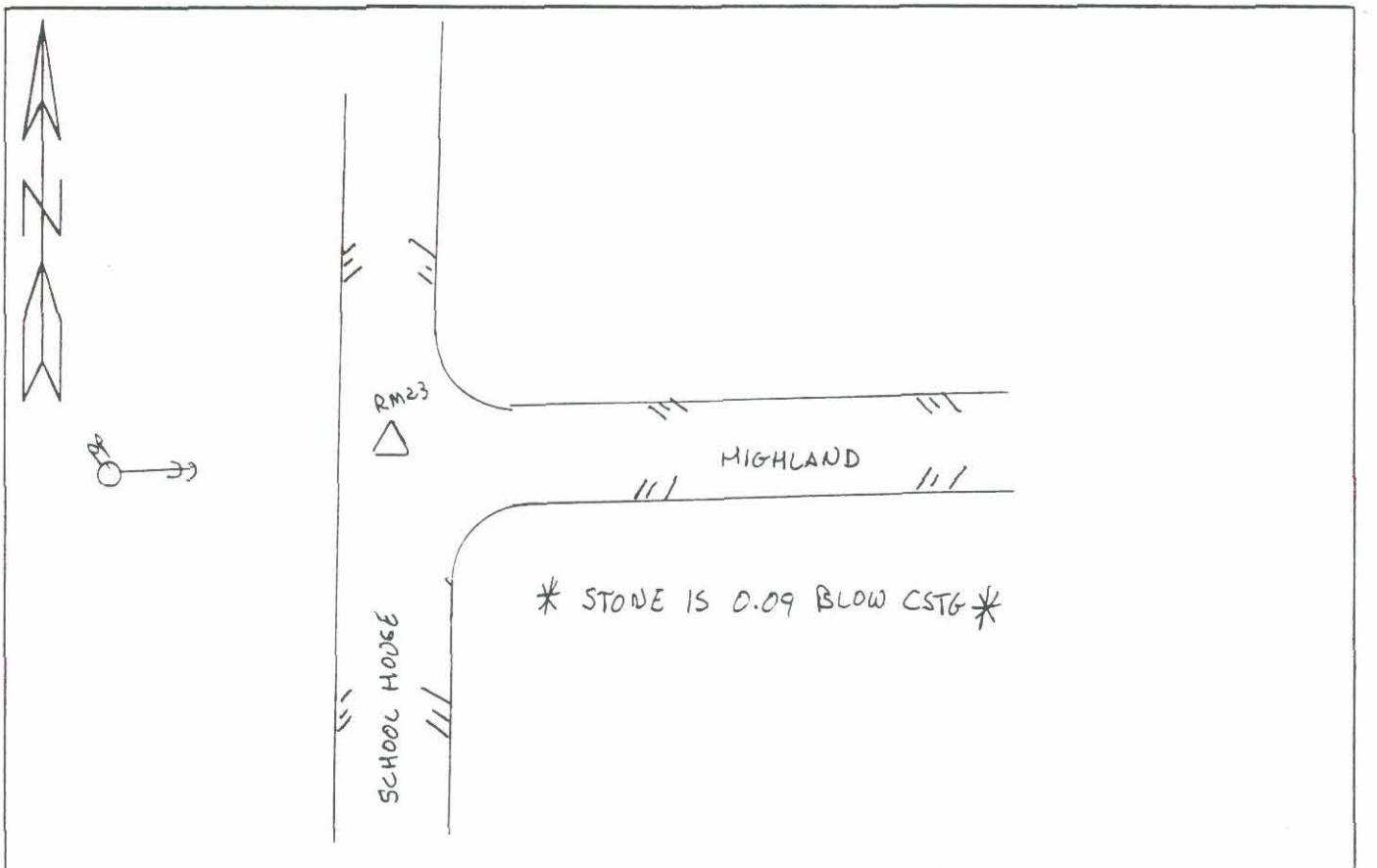
Beg:
Lat: : 33 ° 50 ' 58.80 " N
Long: 111 ° 56 ' 33.69 " W
Ellip. Height: + 0634.6 ~ M PDOP: 3.21 .

Ending:
Lat: 33 ° 50 ' 59.31 " N
Long: 111 ° 56 ' 36.07 " W
Ellip. Height: + 0624.5 + M PDOP: 2.11 .

Receiver Model: 4000 SSE (X) 4800 ( ) 4000 SE ( ) .
Antenna Type: CompL1/L2 w/GP (X) CompL1/L2 ( ) Geodetic( )
Tribrach: SoKKisha Wild H/P Topcon Pentax .
Local-UTC Time Offset: MST= -7:00 .
Type of Survey: Fast Static (X) - Fast Static ( ) .
Actual= Start 19 : 24 . Stop: 20: 00 . UTC
Beg. SV's Used: 01, 14, 15, 21, 25, 29, 30 .
End SV's Used: 01, 22, 14, 15, 25, 25, 29, 30 .

Ant. Height (M) 1) 1.634 3) 1.622 5) 1.620 7) 1.632 9) 1.645 11) 12) Mean= ~~1.6297~~ 1.6297 .
(ft) 1) 5.34 3) 5.37 2) 5.17 Mean .

Weather Conditions: (Clear) P. Cloudy Overcast (Hot) Warm Cool Cold (Calm) Breezy 99 °F +/- .



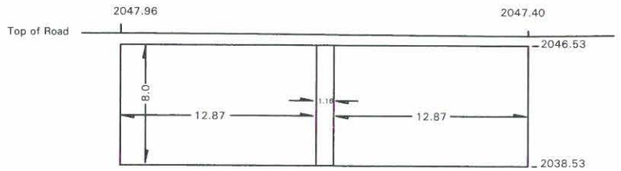
Type of Monument: STONE Stamping: .
Top of marker: ( ) flush M ( ) above: (X) below: Nat. Ground Detail Notes: RM 23 IS A STONE IN HH. HH RIM IS 0.09 ABOVE STONE RIM ELEVATION = 2212.70 .

Rubbing Performed ( )Yes (X)No .

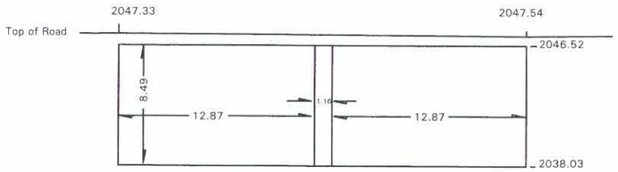
C.2 Survey field notes for hydrologic modeling

No surveying was performed for hydrologic modeling.

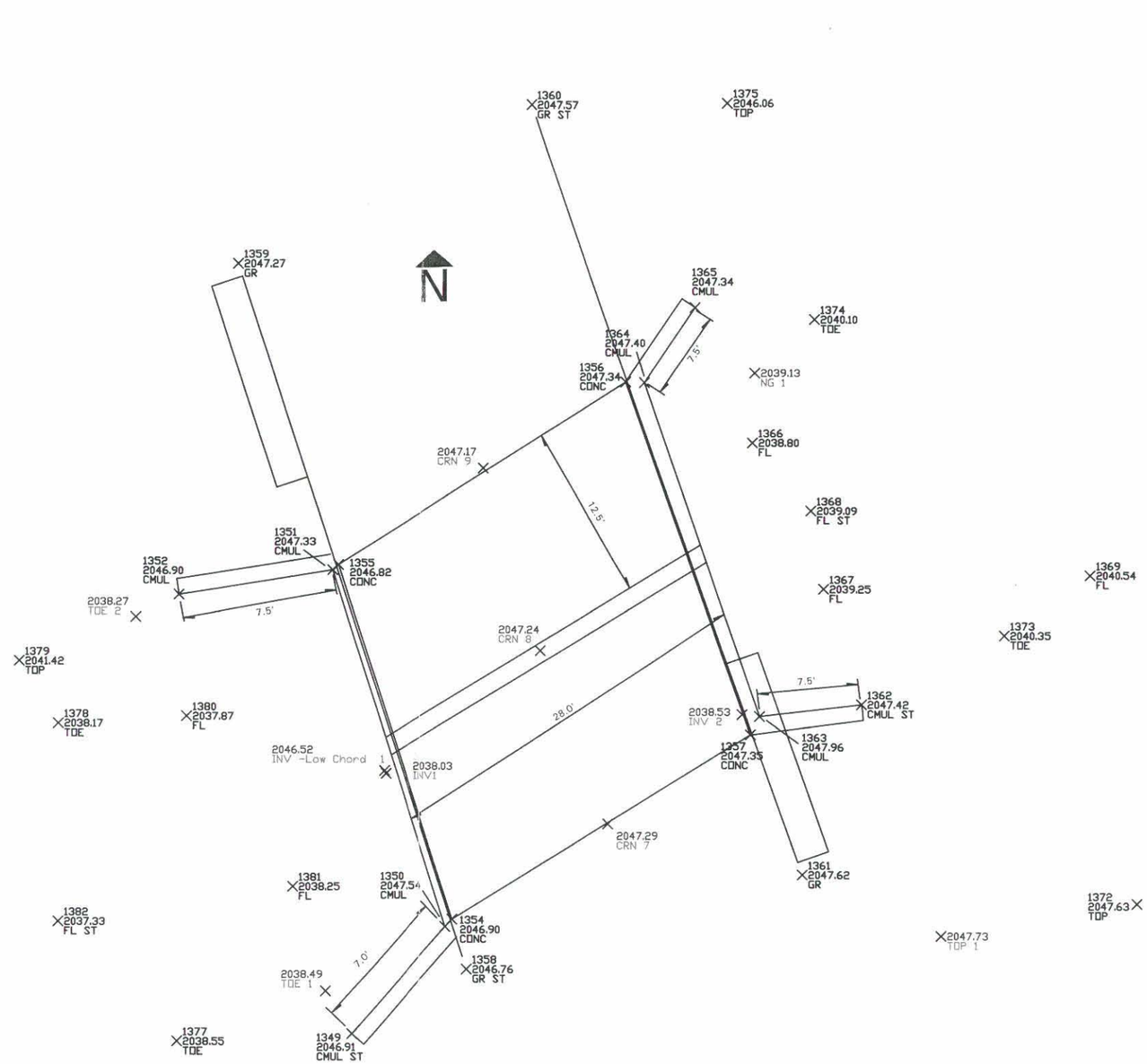
C.3 Survey Field Notes for Hydraulic Modeling



Elevation Upstream Face



Elevation Downstream Face



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

FLOODPLAIN DELINEATION STUDY OF ANDORA HILLS & GALLOWAY WASHES FCD 99-14

AS-BUILT DRAWING
STRUCTURE 1

JULY, 2000

STRUCTURE 1: 2-cell 12'X8' concrete box culvert on Andora Hills Wash, at El Indio Circle

INSET SCALE IN FEET

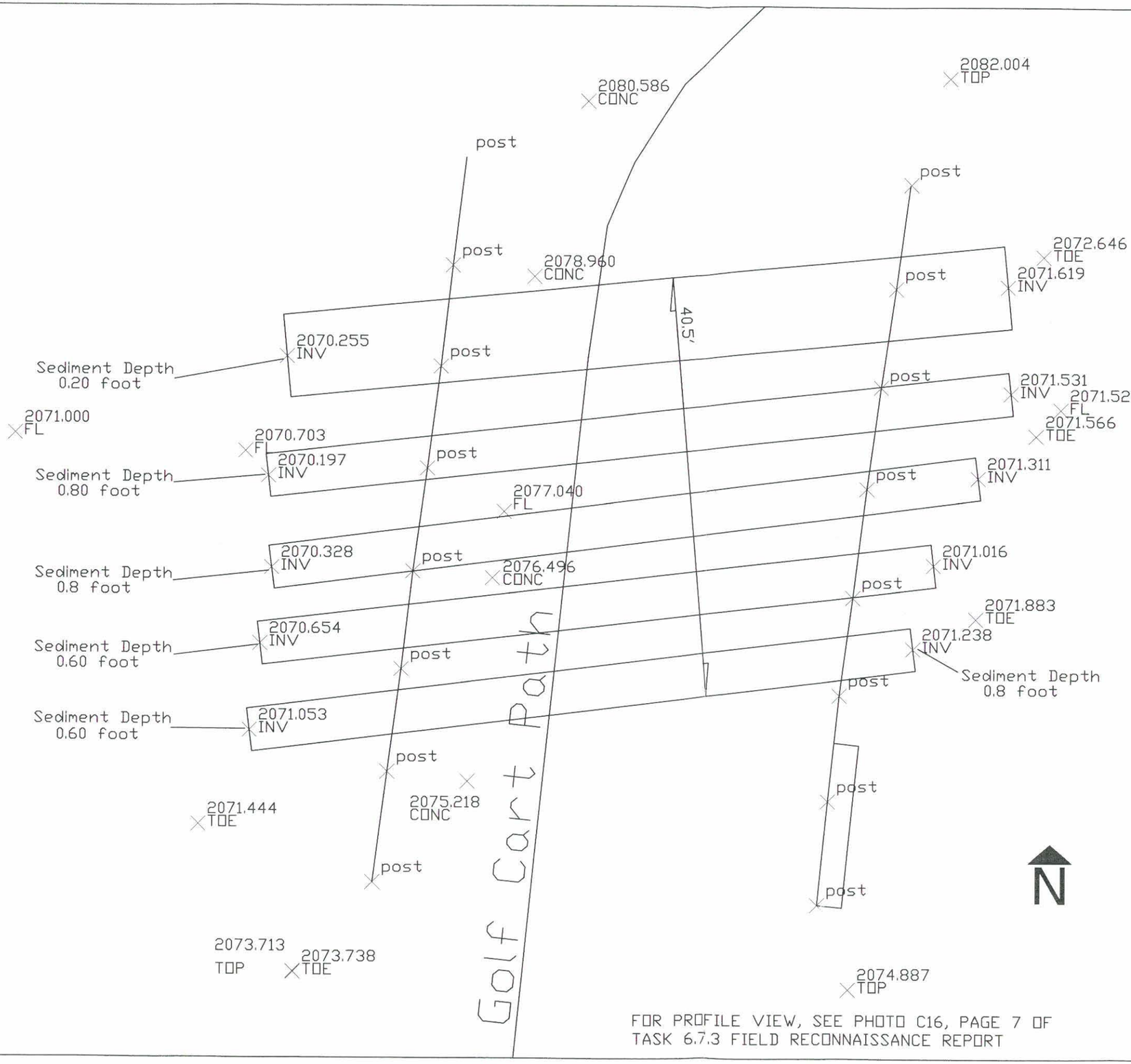
0 100 200

This as-built drawing was prepared under my direct supervision for the purpose of hydraulic modeling. Survey data were provided by A Team Professional Associates, Inc., Phoenix, Arizona, June, 2000.

SCALE IN FEET

0 5 10

JE FULLER
HYDROLOGY & GEOMORPHOLOGY, INC.
5235 SOUTH KYRENE ROAD, SUITE 205
TEMPE, ARIZONA 85283
480-752-2124



FOR PROFILE VIEW, SEE PHOTO C16, PAGE 7 OF
TASK 6.7.3 FIELD RECONNAISSANCE REPORT

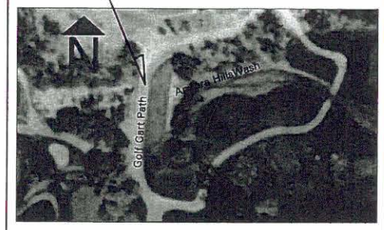
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

FLOODPLAIN DELINEATION STUDY OF ANDORA HILLS & GALLOWAY WASHES FCD 99-14

AS-BUILT DRAWING
STRUCTURE 2

JULY, 2000

STRUCTURE 2: 4-50"x42" Horizontally-elliptical corrugated metal pipes (HECMPs), and 1-96"x72" HECMP on Andora Hills Wash, at Golf Cart Path, located approximately 670 feetdownstream of Grapevine Road.



INSET SCALE IN FEET

0 100 200

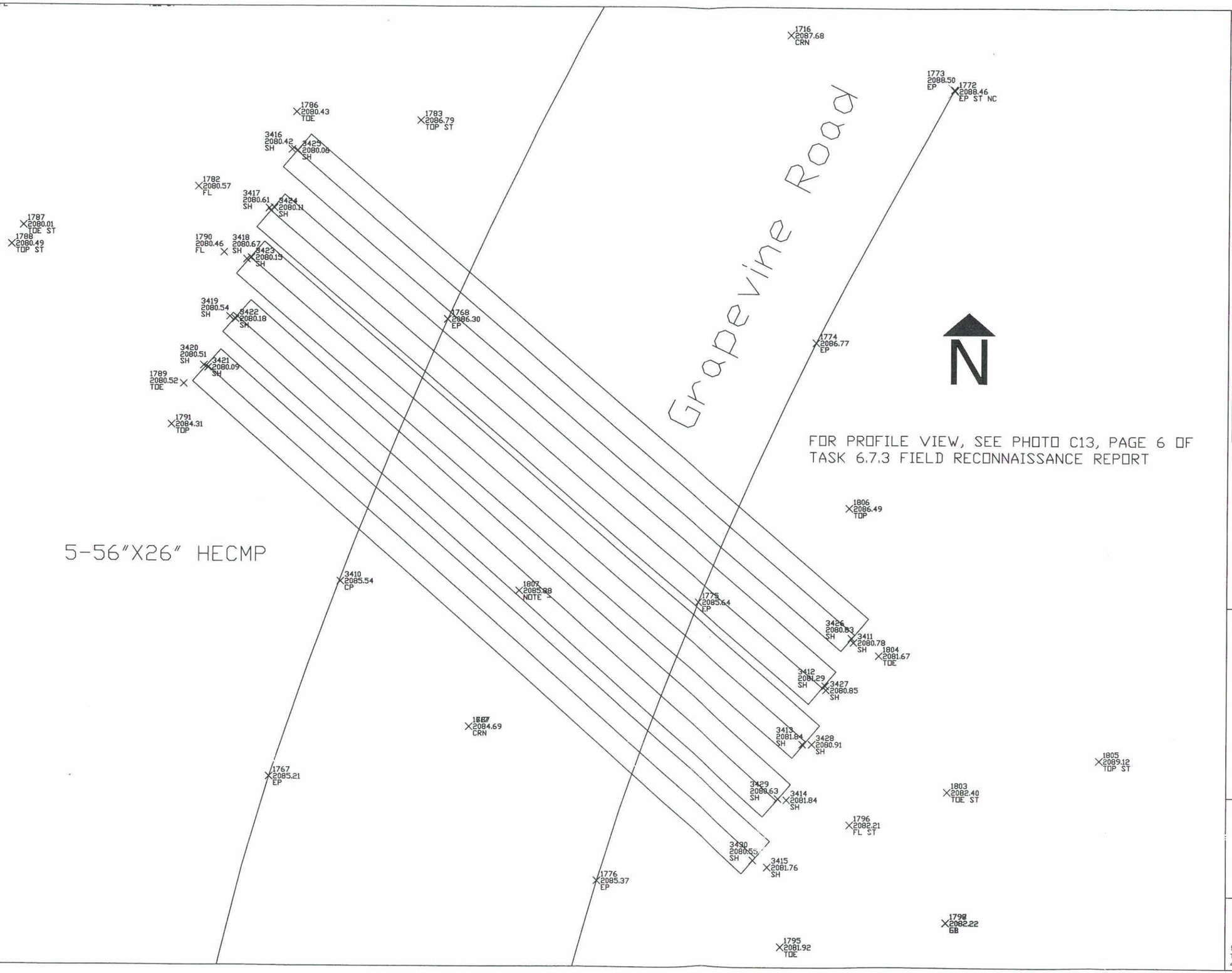
This as-built drawing was prepared under my direct supervision for the purpose of hydraulic modeling. Survey data were provided by A Team Professional Associates, Inc., Phoenix, Arizona, June, 2000.

Registered Professional Engineer (Civil)
CERTIFICATE NO.
29325
BRIAN R.
ISERMAN
Date Signed 6/22/00
ARIZONA U.S.A.

SCALE IN FEET

0 5 10

JE FULLER
HYDROLOGY & GEOMORPHOLOGY, INC.
5235 SOUTH KYRENE ROAD, SUITE 205
TEMPE, ARIZONA 85283
480-752-2124



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

FLOODPLAIN DELINEATION STUDY OF ANDORA HILLS & GALLOWAY WASHES FCD 99-14

AS-BUILT DRAWING
STRUCTURE 3

JULY, 2000

STRUCTURE 3: 5-56"x26" horizontall-eliptical corrugated metal pipe on Andora Hills Wash, at Grapevine Road.

INSET SCALE IN FEET

0 100 200

This as-built drawing was prepared under my direct supervision for the purpose of hydraulic modeling. Survey data were provided by A Team Professional Associates, Inc., Phoenix, Arizona, June, 2000.

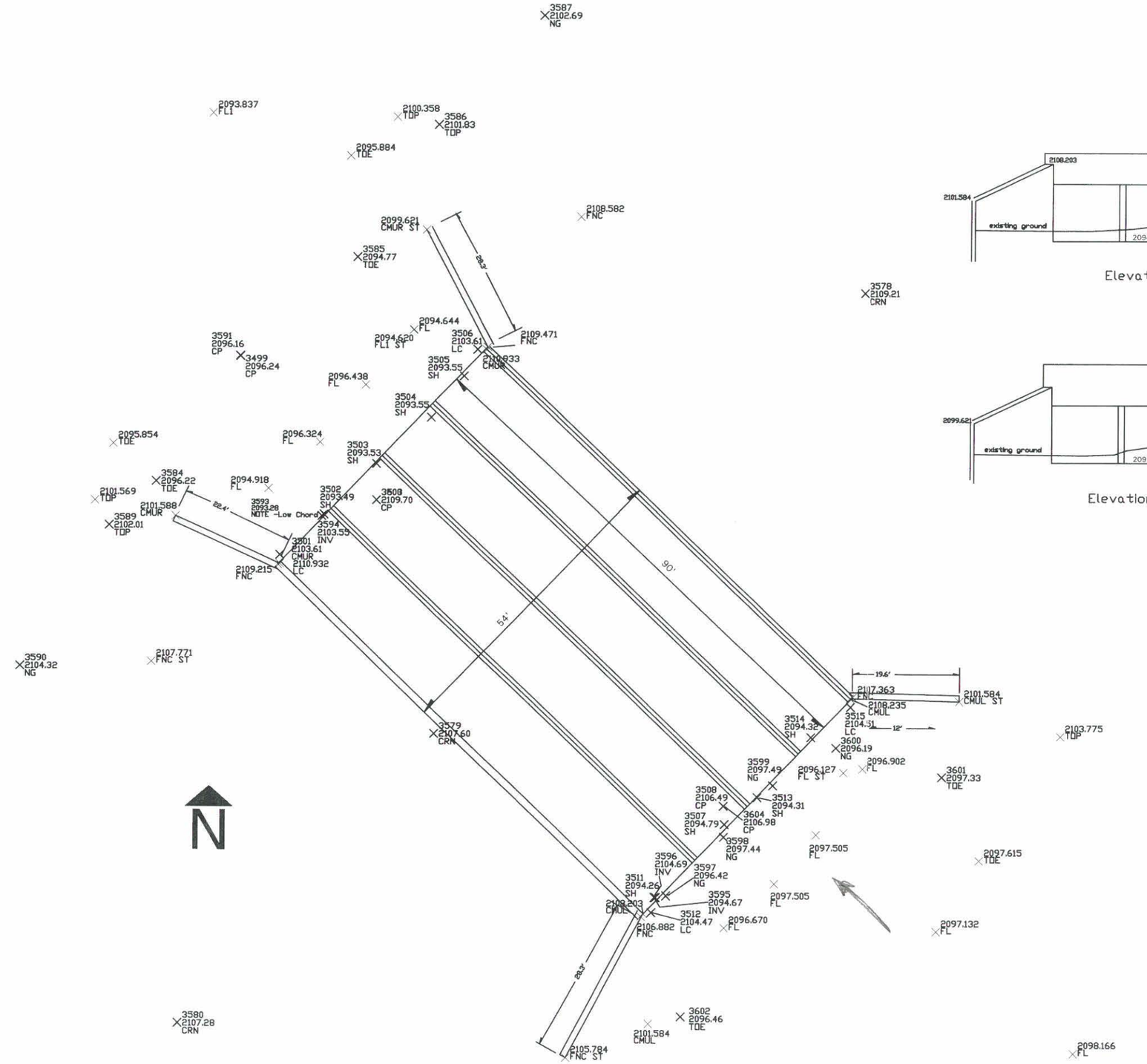
Registered Professional Engineer (Civil)
CERTIFICATE NO.
29325
BRIAN R.
ISERMAN
Date Signed 10/23/00
ARIZONA, U.S.A.

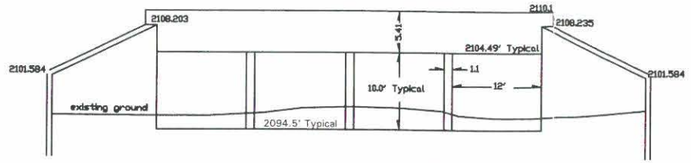
SCALE IN FEET

0 5 10

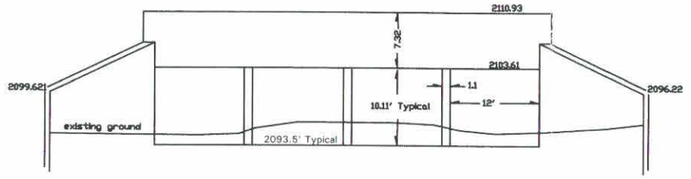
JE FULLER
HYDROLOGY & GEOMORPHOLOGY, INC.

5235 SOUTH KYRENE ROAD, SUITE 205
TEMPE, ARIZONA 85283
480-752-2124





Elevation Upstream Face



Elevation Downstream Face

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

FLOODPLAIN DELINEATION STUDY OF ANDORA HILLS & GALLOWAY WASHES FCD 99-14

AS-BUILT DRAWING
STRUCTURE 4

JULY, 2000

STRUCTURE 4: 4-cell 12'x7' concrete box culvert on Andora Hills Wash at Cave Creek Road.

INSET SCALE IN FEET

0 100 200

This as-built drawing was prepared under my direct supervision for the purpose of hydraulic modeling. Survey data were provided by A Team Professional Associates, Inc., Phoenix, Arizona, June, 2000.

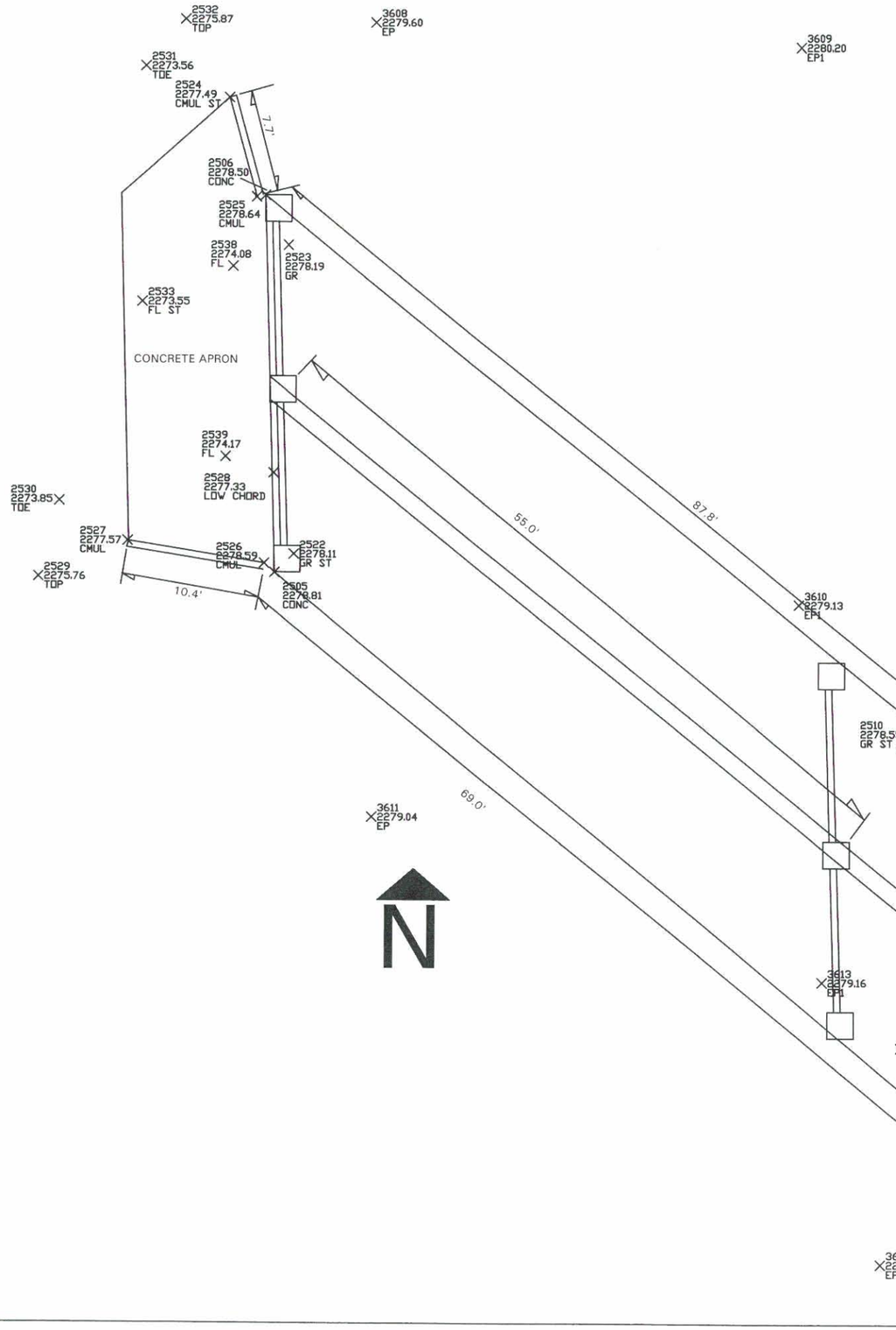
Registered Professional Engineer (Civil)
CERTIFICATE NO.
29325
BRIAN R.
ISERMAN
Date Signed 7/12/00
ARIZONA, U.S.A.

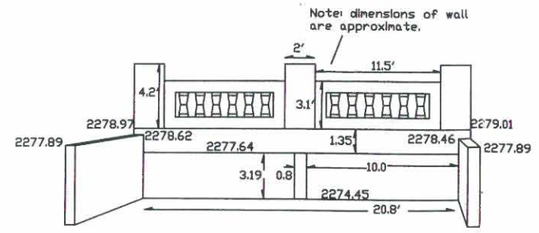
SCALE IN FEET

0 10 20

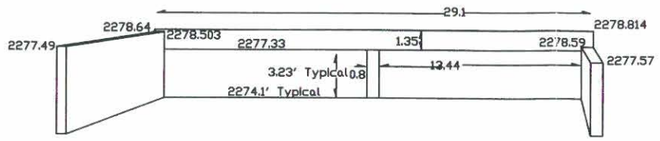
JE FULLER
HYDROLOGY & GEOMORPHOLOGY, INC.

5235 SOUTH KYRENE ROAD, SUITE 205
TEMPE, ARIZONA 85283
480-752-2124





Elevation of Upstream Face



Elevation of Skewed Downstream Face

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

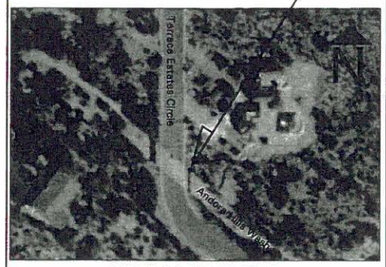
FLOODPLAIN DELINEATION STUDY OF ANDORA HILLS & GALLOWAY WASHES FCD 99-14

AS-BUILT DRAWING

STRUCTURE 5

JULY, 2000

STRUCUTE 5: 2-cell 10'x3' concrete box culvert on Andora Hills Wash at Terrace Estates Circle.



INSET SCALE IN FEET

0 100 200

This as-built drawing was prepared under my direct supervision for the purpose of hydraulic modeling. Survey data were provided by A Team Professional Associates, Inc., Phoenix, Arizona, June, 2000.

Registered Professional Engineer (Civil)
CERTIFICATE NO.
29325
BRIAN R.
ISERMAN
Date Signed 7/13/00
ARIZONA U.S.A.

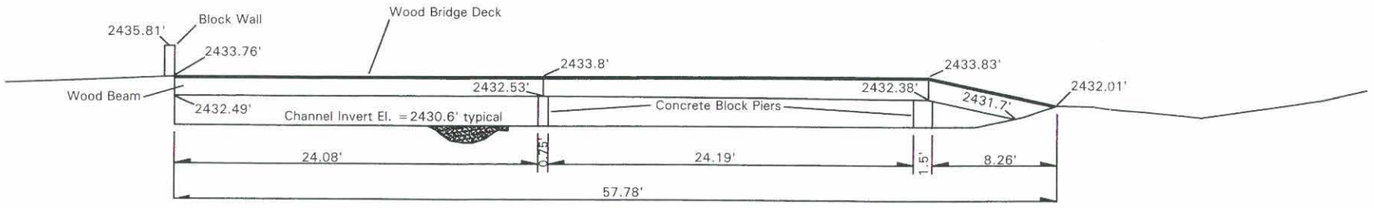
Brian R. Iserman

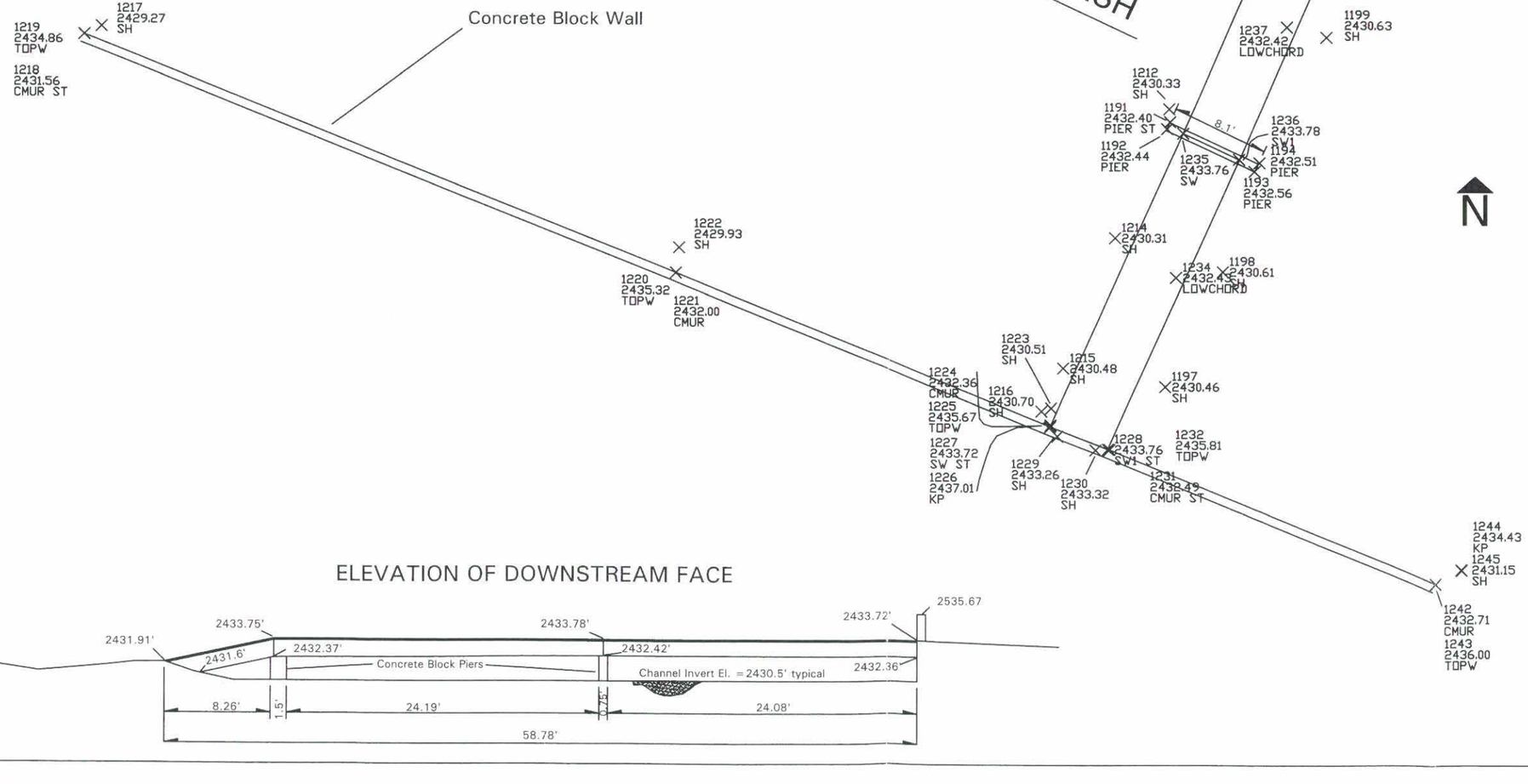
SCALE IN FEET

0 5 10

IE FULLER
HYDROLOGY & GEOMORPHOLOGY, INC.
5235 SOUTH KYRENE ROAD, SUITE 205
TEMPE, ARIZONA 85283
480-752-2124

ELEVATION OF UPSTREAM FACE





ELEVATION OF DOWNSTREAM FACE

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

FLOODPLAIN DELINEATION STUDY OF ANDORA HILLS & GALLOWAY WASHES FCD 99-14

AS-BUILT DRAWING
STRUCTURE 6

JUNE, 2000

STRUCTURE 6: Private, wood footbridge across Galloway Wash, approximately 250 feet downstream of Wild Burro Road.

INSET SCALE IN FEET

0 100 200

This as-built drawing was prepared under my direct supervision for the purpose of hydraulic modeling. Survey data were provided by A Team Professional Associates, Inc., Phoenix, Arizona, June, 2000.

Registered Professional Engineer (Civil) CERTIFICATE NO. 29325 BRIAN R. ISERMAN Date Signed 6/9/00 ARIZONA U.S.A.

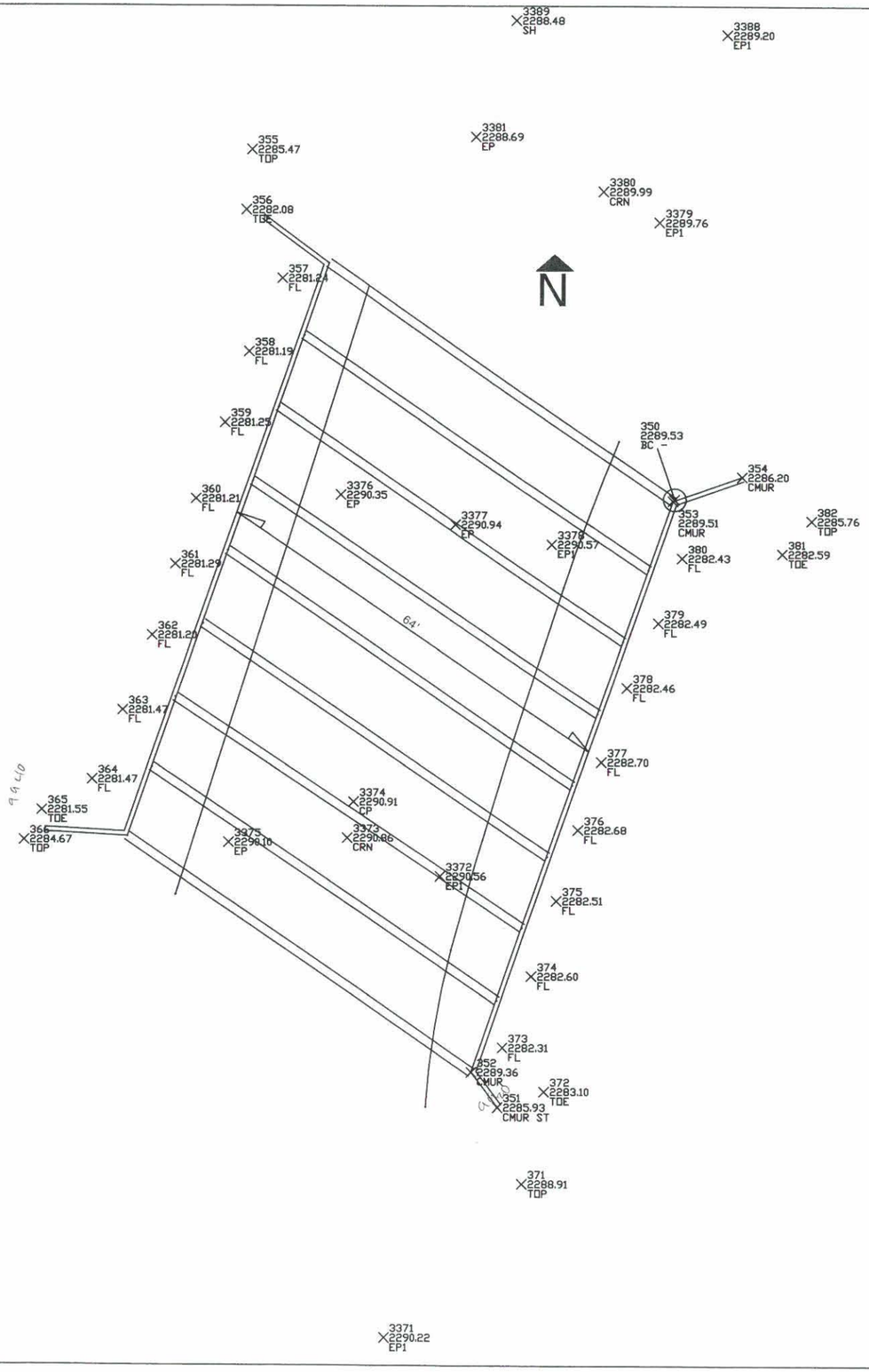
Brian R. Iserman

SCALE IN FEET

0 5 10

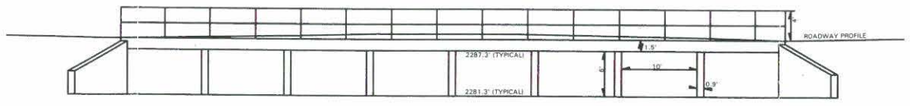
JE FULLER
HYDROLOGY & GEOMORPHOLOGY, INC.

5235 SOUTH KYRENE ROAD, SUITE 205
TEMPE, ARIZONA 85283
480-752-2124



Some adaptations here

ELEVATION UPSTREAM FACE



ELEVATION DOWNSTREAM FACE

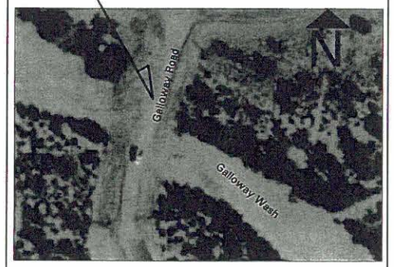
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

FLOODPLAIN DELINEATION STUDY OF ANDORA HILLS & GALLOWAY WASHES FCD 99-14

AS-BUILT DRAWING
STRUCTURE 7

JUNE, 2000

STRUCTURE 7: Private 8-cell, 10'x6' concrete box culvert across Galloway Wash, at Galloway Road.



INSET SCALE IN FEET

0 100 200

This as-built drawing was prepared under my direct supervision for the purpose of hydraulic modeling. Survey data were provided by A Team Professional Associates, Inc., Phoenix, Arizona, June, 2000.

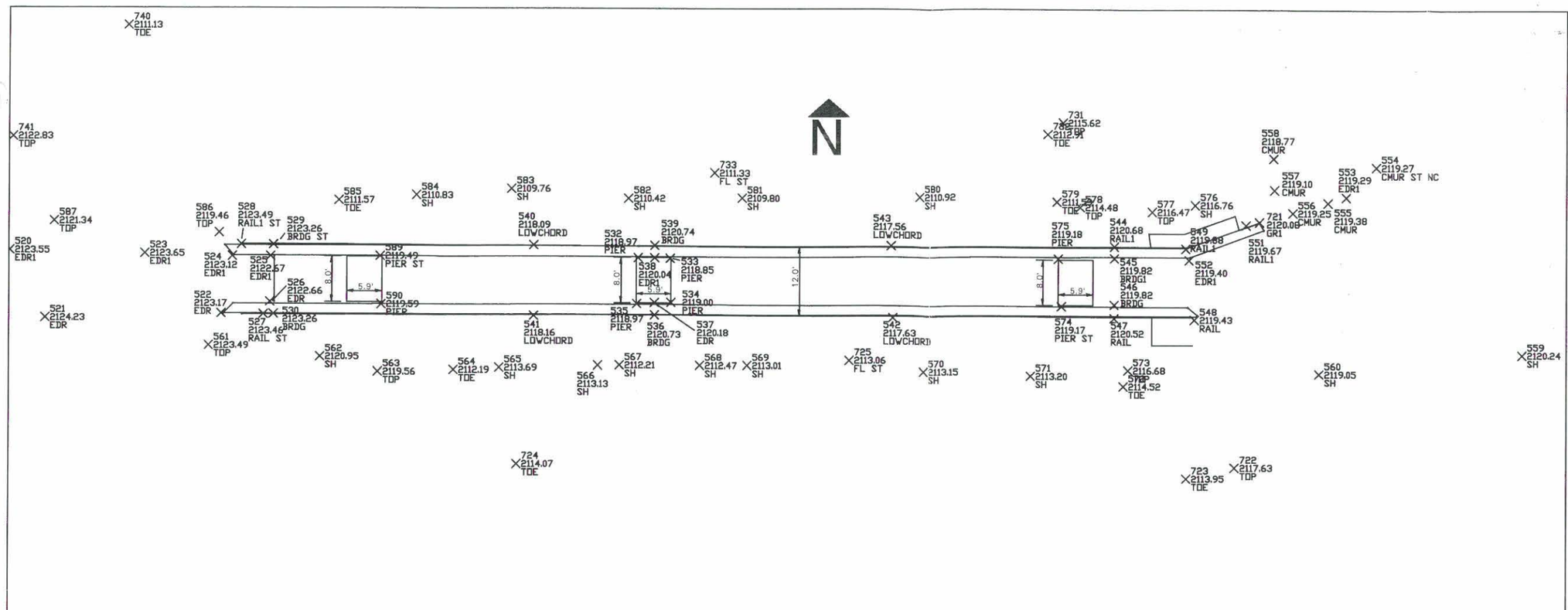
Registered Professional Engineer (Civil)
CERTIFICATE NO.
29325
BRIAN R.
ISERMAN
Date Signed 11/10/00
ARIZONA U.S.A.

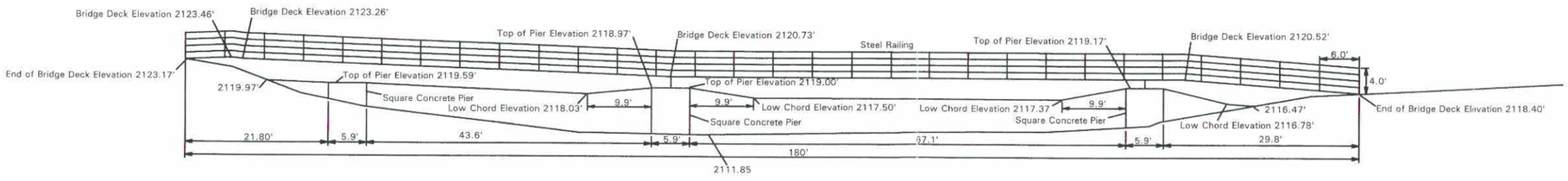
Brian R. Iserman

SCALE IN FEET

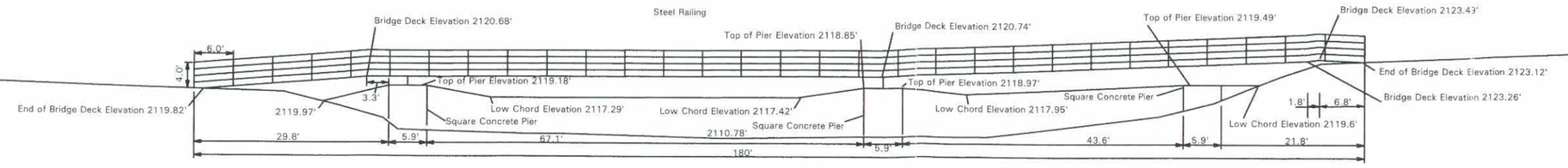
0 10 20

JE FULLER
HYDROLOGY & GEOMORPHOLOGY, INC.
5235 SOUTH KYRENE ROAD, SUITE 205
TEMPE, ARIZONA 85283
480-752-2124





ELEVATION OF UPSTREAM FACE



ELEVATION OF DOWNSTREAM FACE

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

FLOODPLAIN DELINEATION STUDY OF ANDORA HILLS & GALLOWAY WASHES FCD 99-14

AS-BUILT DRAWING
STRUCTURE 8

JUNE, 2000

STRUCTURE 8: Private wood and steel bridge across Galloway Wash, approximately 750 feet upstream of Spur Cross Road.

INSET SCALE IN FEET

0 100 200

This as-built drawing was prepared under my direct supervision for the purpose of hydraulic modeling. Survey data were provided by A Team Professional Associates, Inc., Phoenix, Arizona, June, 2000.

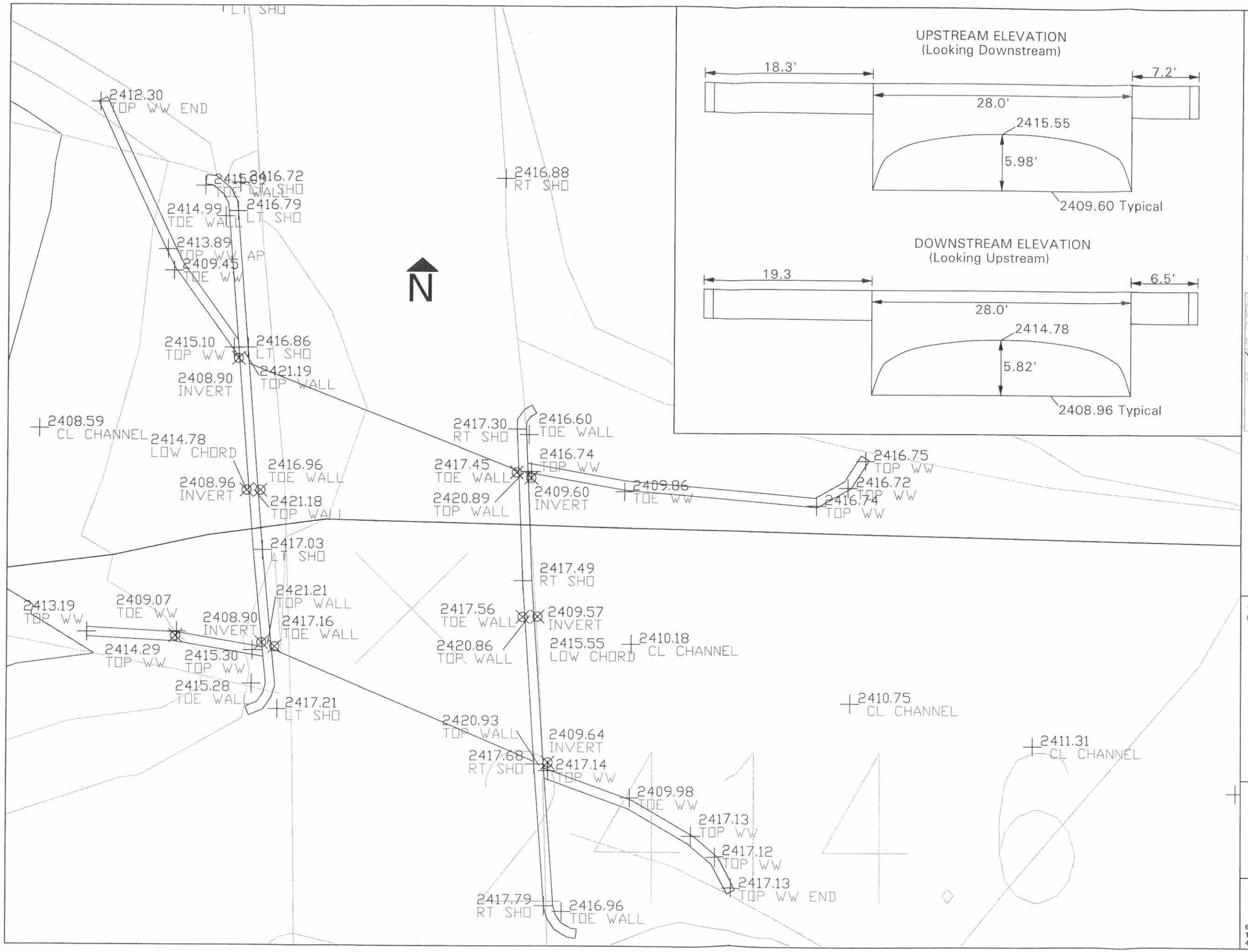
Registered Professional Engineer (Civil)
CERTIFICATE NO.
29325
BRIAN R.
ISERMAN
Date Signed 6/9/00
ARIZONA U.S.A.

Brian R. Iserman

SCALE IN FEET

0 10 20

JE FULLER
HYDROLOGY & GEOMORPHOLOGY, INC
5235 SOUTH KYRENE ROAD, SUITE 205
TEMPE, ARIZONA 85283
480-752-2124



UPSTREAM ELEVATION
(Looking Downstream)

DOWNSTREAM ELEVATION
(Looking Upstream)

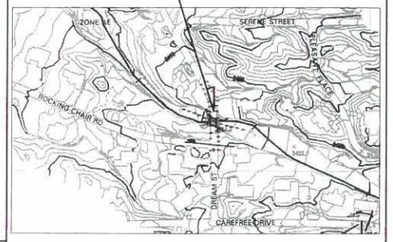
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

FLOODPLAIN DELINEATION STUDY OF ANDORA HILLS & GALLOWAY WASHES FCD 99-14

AS-BUILT DRAWING
STRUCTURE 9

FEBRUARY, 2001

STRUCTURE 9: Dream Street Con Arch Bridge at Galloway Wash



INSET SCALE IN FEET

0 150 300

This as-built drawing was prepared under my direct supervision for the purpose of hydraulic modeling. Survey data were provided by The Flood Control District of Maricopa County, January, 2001.

SCALE IN FEET

0 2.5 5

JE FULLER
HYDROLOGY & GEOMORPHOLOGY, INC.
6101 SOUTH RURAL ROAD, SUITE 110
TEMPE, ARIZONA 85283
480-752-2124

APPENDIX D: HYDROLOGIC ANALYSIS SUPPORTING DOCUMENTATION

TABLE OF CONTENTS
APPENDIX D
VOLUME 2 OF 2 OF THE TDN

D.1: Precipitation Data

D.2 Physical Parameter Calculations

D.3 Hydrograph Routing Data

D.4 Reservoir Routing Data

D.5 Hydrologic Calculations

D.1: Precipitation Data

1

*** O U T P U T D A T A ***

REVISED JUNE 1988 TO UPDATE COMPUTATION OF SHORT-DURATION VALUES

PRECIPITATION FREQUENCY VALUES FOR GALLOWAY WASH FDS, FCD NO. 99-14
PRIMARY ZONE NUMBER= 7
SHORT-DURATION ZONE NUMBER= 8

POINT VALUES

DURATION	RETURN PERIOD 2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	500-YR	
5-MIN	.37	.45	.51	.59	.66	.73	.88	5-MIN
10-MIN	.55	.68	.78	.91	1.01	1.11	1.35	10-MIN
15-MIN	.67	.85	.98	1.15	1.29	1.43	1.75	15-MIN
30-MIN	.89	1.14	1.31	1.56	1.75	1.94	2.37	30-MIN
1-HR	1.09	1.41	1.63	1.94	2.18	2.42	2.98	1-HR
2-HR	1.26	1.63	1.88	2.23	2.51	2.79	3.43	2-HR
3-HR	1.38	1.77	2.05	2.43	2.74	3.03	3.73	3-HR
6-HR	1.60	2.05	2.37	2.81	3.16	3.50	4.29	6-HR
12-HR	1.90	2.44	2.81	3.33	3.74	4.15	5.09	12-HR
24-HR	2.20	2.82	3.25	3.86	4.33	4.80	5.89	24-HR

* IF YOUR SITE IS IN ARIZONA OR NEW MEXICO, PLEASE CONSULT THE FOLLOWING PAPER FOR REVISED DEPTH-AREA VALUES:
DEPTH-AREA RATIOS IN THE SEMI-ARID SOUTHWEST UNITED STATES
NOAA TECHNICAL MEMORANDUM NWS HYDRO-40
ZEHR AND MYERS
AUGUST 1984

INPUT DATA

PROJECT NAME=GALLOWAY WASH FDS, FCD NO. 99-14
ZONE= 7 SHORT-DURATION ZONE= 8
LATITUDE= .00 LONGITUDE= 100.00 ELEVATION= 0
2-YR, 6-HR PCPN= 1.60 100-YR, 6-HR PCPN= 3.50
2-YR, 24-HR PCPN= 2.20 100-YR, 24-HR PCPN= 4.80

* * * * E N D OF R U N * * * *

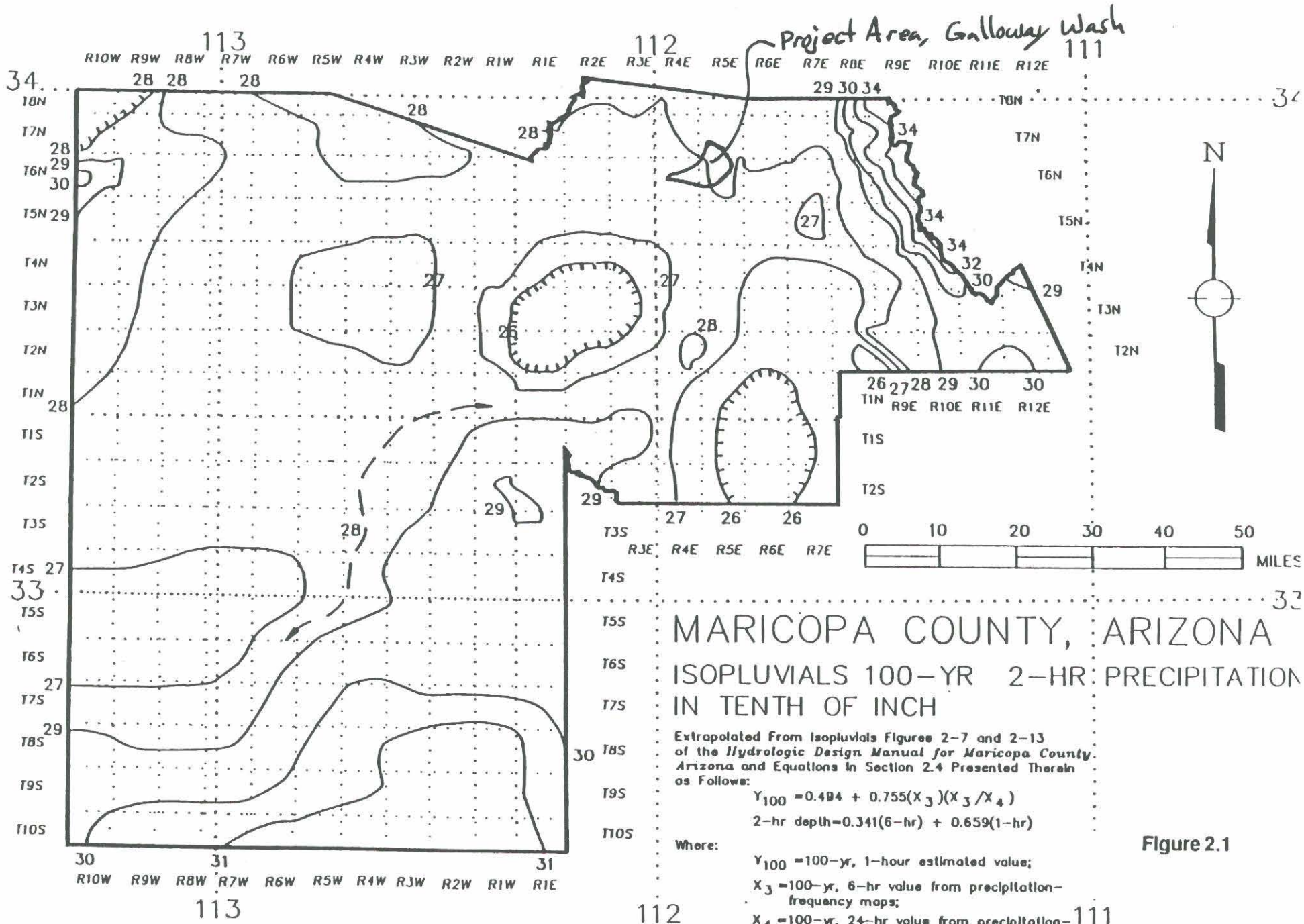
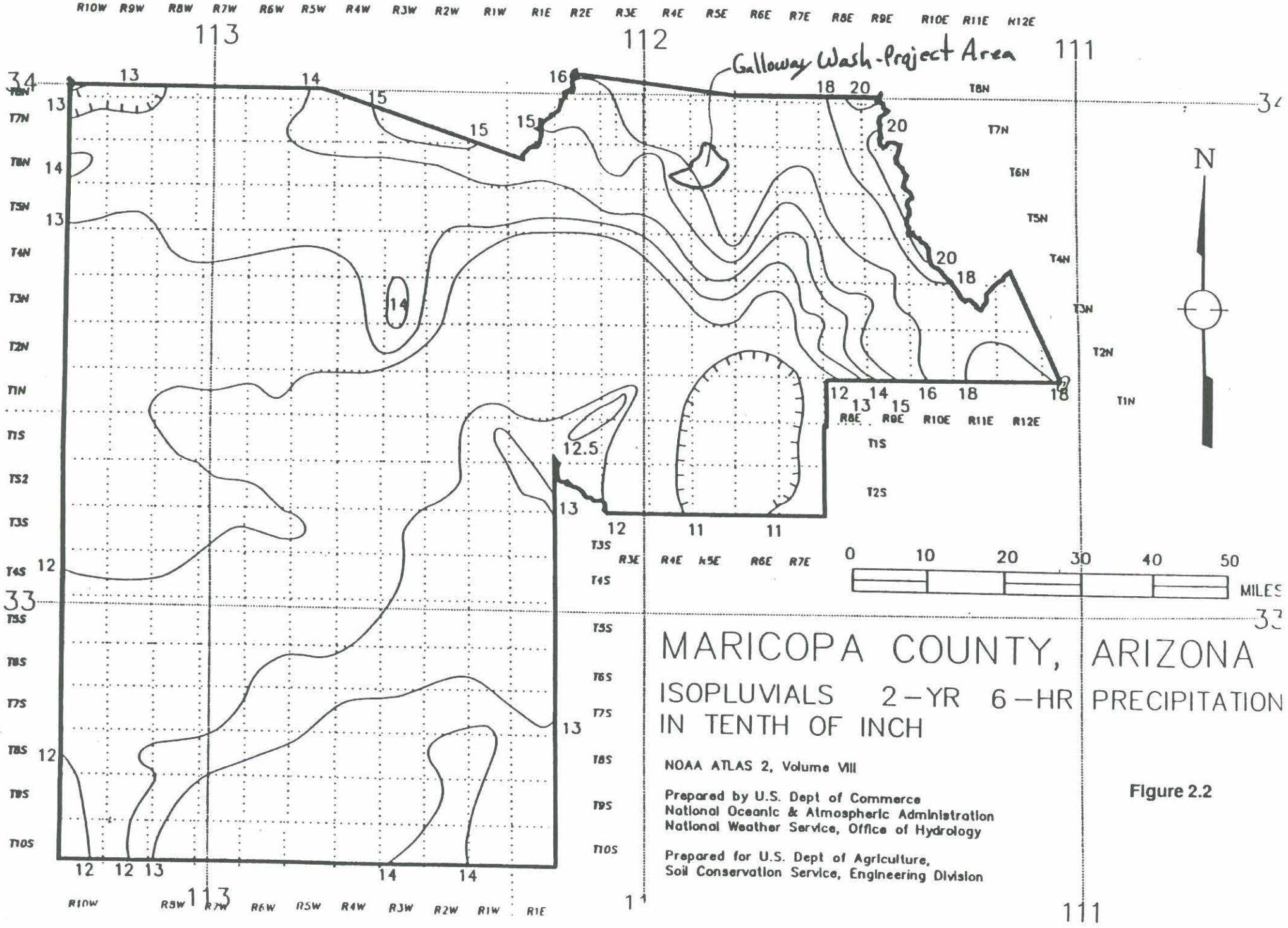

Project Area, Galloway Wash
113
112
111
R10W R9W R8W R7W R6W R5W R4W R3W R2W R1W R1E R2E R3E R4E R5E R6E R7E R8E R9E R10E R11E R12E
T8N
T7N
T6N
T5N
T4N
T3N
T2N
T1N
T1S
T2S
T3S
T4S
T5S
T6S
T7S
T8S
T9S
T10S
34
33
32
N
0 10 20 30 40 50
MILES
MARICOPA COUNTY, ARIZONA
ISOPLUVIALS 100-YR 2-HR PRECIPITATION
IN TENTH OF INCH
Extrapolated From Isopluvials Figures 2-7 and 2-13
of the Hydrologic Design Manual for Maricopa County,
Arizona and Equations in Section 2.4 Presented Therein
as Follows:
$Y_{100} = 0.494 + 0.755(X_3)(X_3/X_4)$
2-hr depth = 0.341(6-hr) + 0.659(1-hr)
Where:
Y_{100} = 100-yr, 1-hour estimated value;
X_3 = 100-yr, 6-hr value from precipitation-frequency maps;
X_4 = 100-yr, 24-hr value from precipitation-frequency maps;
6-hr = Isopluvial values from figure 2.7;
1-hr = Y_{100} value as computed above.

Figure 2.1



MARICOPA COUNTY, ARIZONA

ISOPLUVIALS 2-YR 6-HR PRECIPITATION IN TENTH OF INCH

NOAA ATLAS 2, Volume VIII

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

Prepared for U.S. Dept of Agriculture,
Soil Conservation Service, Engineering Division

Figure 2.2

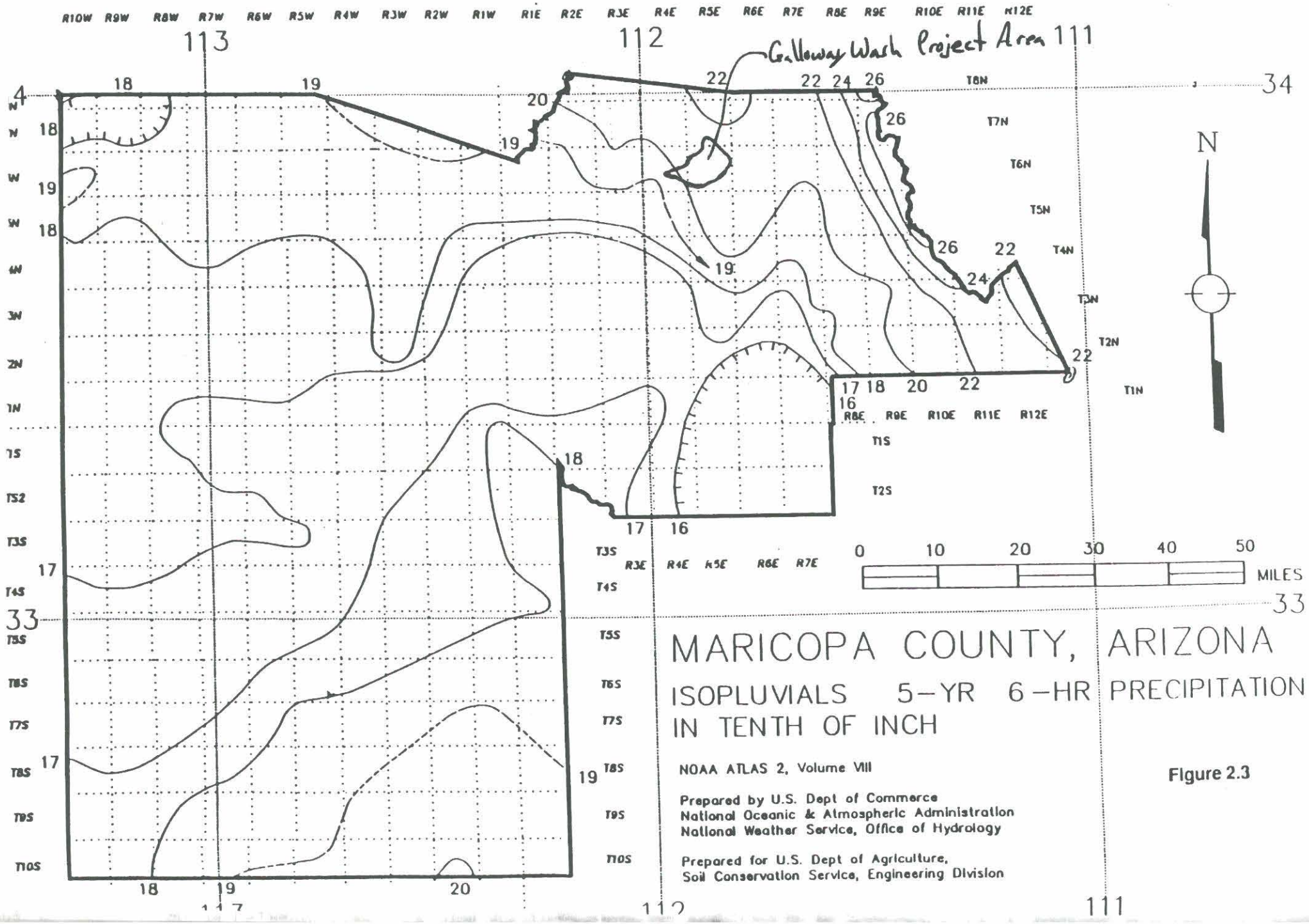

Galloway Wash Project Area
R10W R9W R8W R7W R6W R5W R4W R3W R2W R1W R1E R2E R3E R4E R5E R6E R7E R8E R9E R10E R11E R12E
113
112
111
T8N
T7N
T6N
T5N
T4N
T3N
T2N
T1N
T1S
T2S
T3S
T4S
T5S
T6S
T7S
T8S
T9S
T10S
34
33
N
0 10 20 30 40 50
MILES
MARICOPA COUNTY, ARIZONA
ISOPLUVIALS 5-YR 6-HR PRECIPITATION
IN TENTH OF INCH
NOAA ATLAS 2, Volume VIII
Prepared by U.S. Dept of Commerce
National Oceanic & Atmospheric Administration
National Weather Service, Office of Hydrology
Prepared for U.S. Dept of Agriculture,
Soil Conservation Service, Engineering Division

Figure 2.3

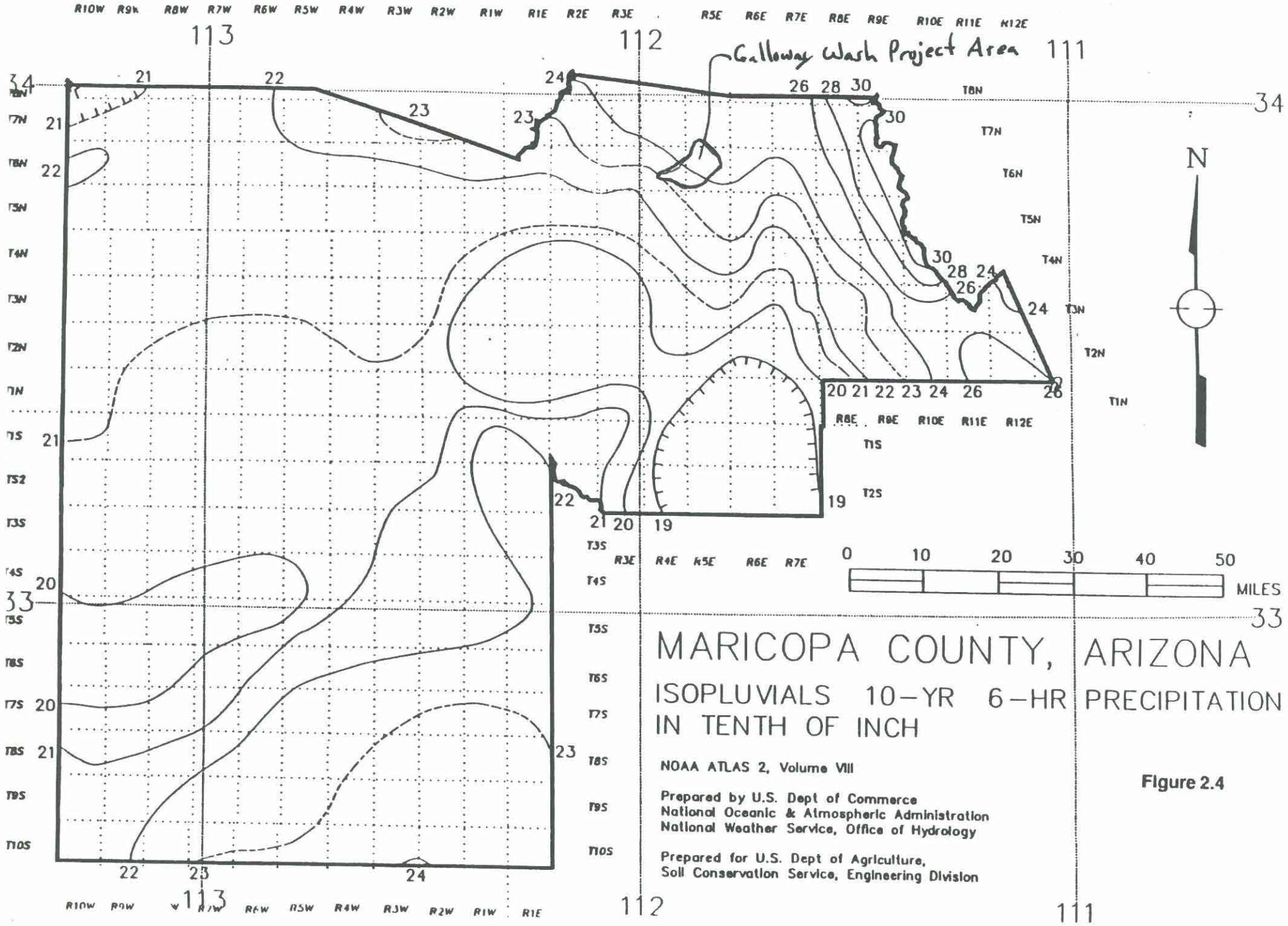

Galloway Wash Project Area
113
112
111
34
33
N
0 10 20 30 40 50
MILES
MARICOPA COUNTY, ARIZONA
ISOPLUVIALS 10-YR 6-HR PRECIPITATION
IN TENTH OF INCH
NOAA ATLAS 2, Volume VIII
Prepared by U.S. Dept of Commerce
National Oceanic & Atmospheric Administration
National Weather Service, Office of Hydrology
Prepared for U.S. Dept of Agriculture,
Soil Conservation Service, Engineering Division

Figure 2.4

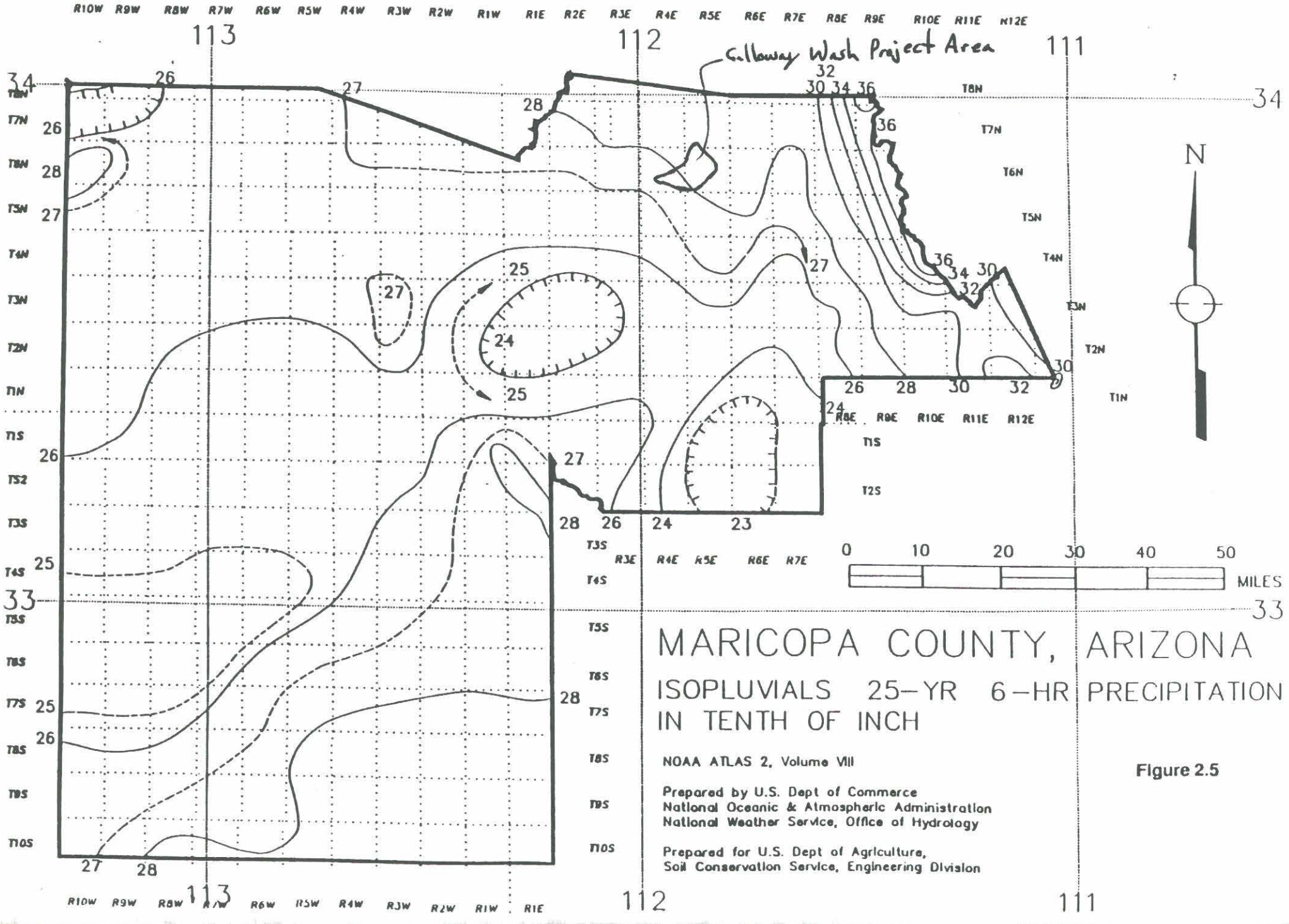

Gilbway Wash Project Area
N
0 10 20 30 40 50
MILES
MARICOPA COUNTY, ARIZONA
ISOPLUVIALS 25-YR 6-HR PRECIPITATION
IN TENTH OF INCH
NOAA ATLAS 2, Volume VIII
Prepared by U.S. Dept of Commerce
National Oceanic & Atmospheric Administration
National Weather Service, Office of Hydrology
Prepared for U.S. Dept of Agriculture,
Soil Conservation Service, Engineering Division

Figure 2.5

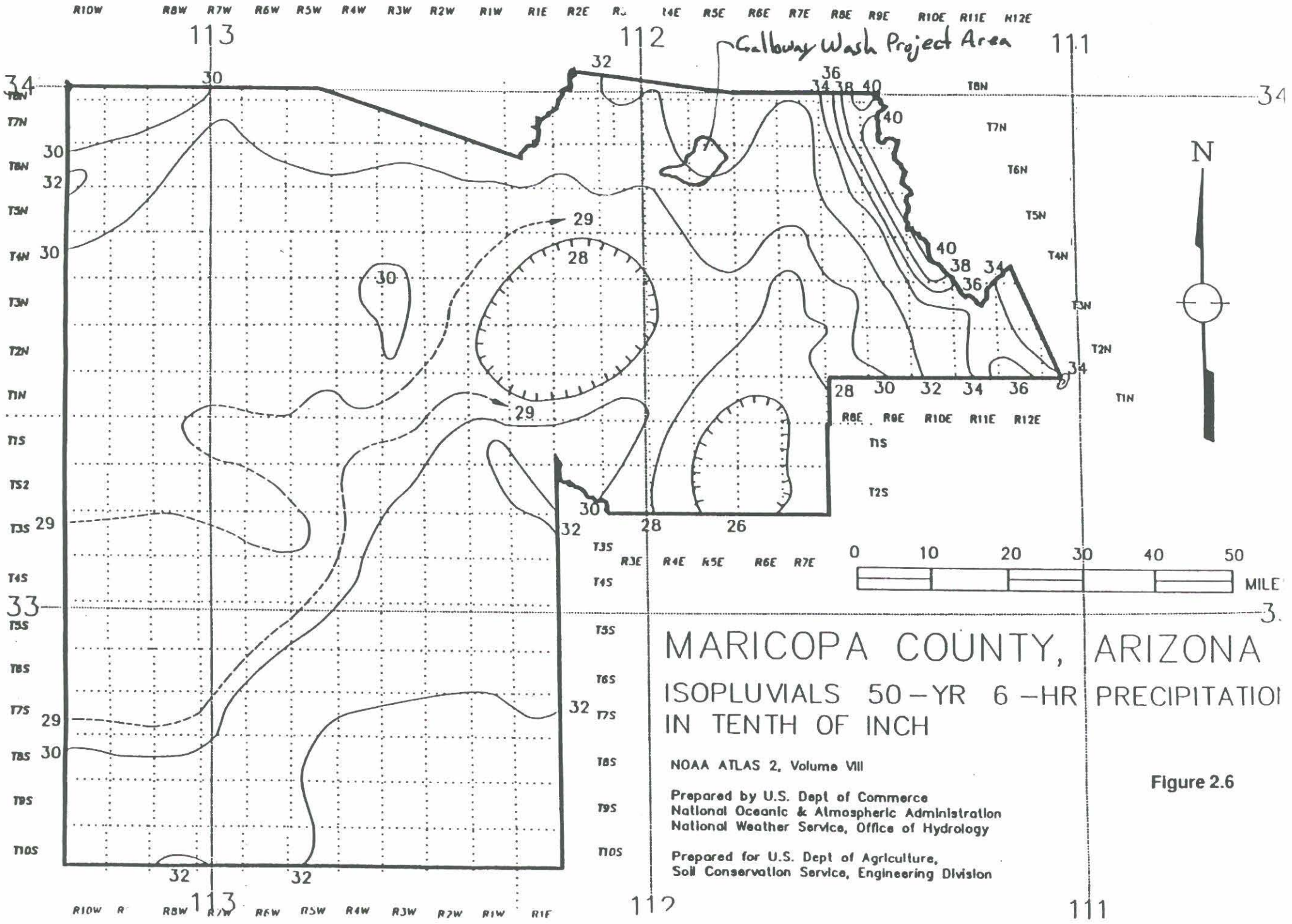

Calloway Wash Project Area
N
0 10 20 30 40 50
MILE
MARICOPA COUNTY, ARIZONA
ISOPLUVIALS 50-YR 6-HR PRECIPITATIOI
IN TENTH OF INCH
NOAA ATLAS 2, Volume VIII
Prepared by U.S. Dept of Commerce
National Oceanic & Atmospheric Administration
National Weather Service, Office of Hydrology
Prepared for U.S. Dept of Agriculture,
Soil Conservation Service, Engineering Division

Figure 2.6

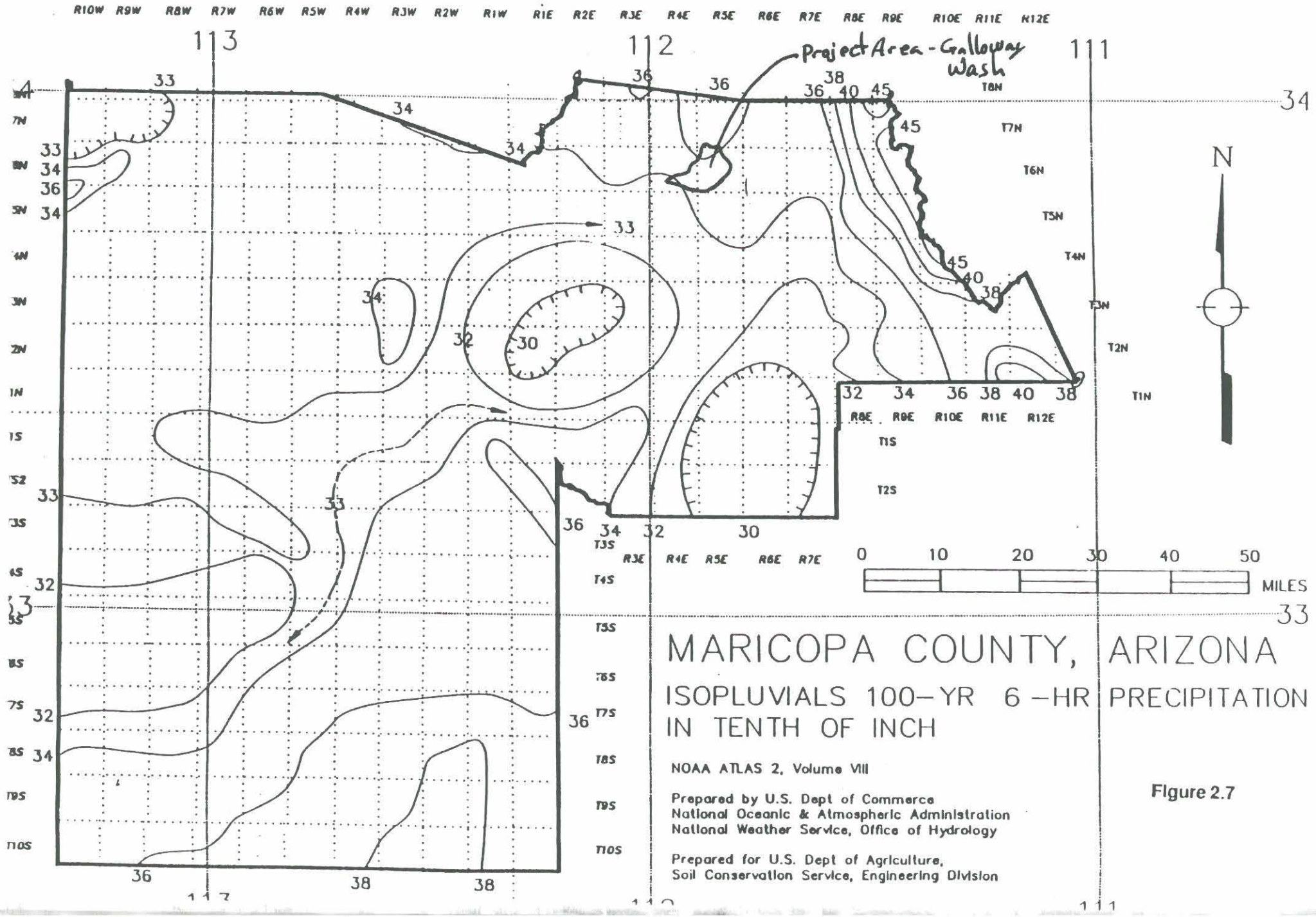

Project Area - Galloway Wash
R10W R9W R8W R7W R6W R5W R4W R3W R2W R1W R1E R2E R3E R4E R5E R6E R7E R8E R9E R10E R11E R12E
113
112
111
T8N
T7N
T6N
T5N
T4N
T3N
T2N
T1N
T1S
T2S
T3S
T4S
T5S
T6S
T7S
T8S
T9S
T10S
N
0 10 20 30 40 50
MILES
MARICOPA COUNTY, ARIZONA
ISOPLUVIALS 100-YR 6-HR PRECIPITATION
IN TENTH OF INCH
NOAA ATLAS 2, Volume VIII
Prepared by U.S. Dept of Commerce
National Oceanic & Atmospheric Administration
National Weather Service, Office of Hydrology
Prepared for U.S. Dept of Agriculture,
Soil Conservation Service, Engineering Division

Figure 2.7

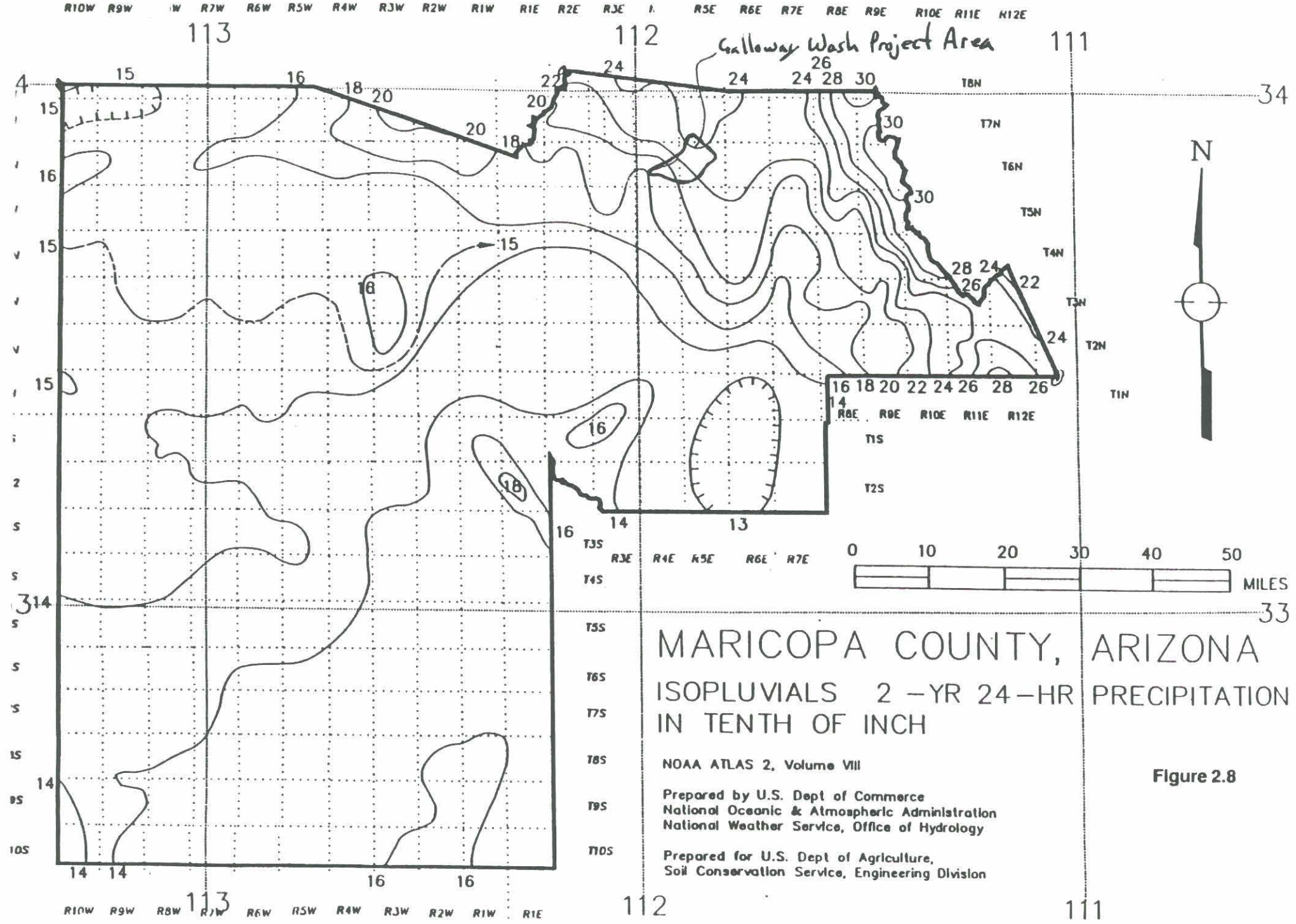

Galloway Wash Project Area
MARICOPA COUNTY, ARIZONA
ISOPLUVIALS 2-YR 24-HR PRECIPITATION
IN TENTH OF INCH
NOAA ATLAS 2, Volume VIII
Prepared by U.S. Dept of Commerce
National Oceanic & Atmospheric Administration
National Weather Service, Office of Hydrology
Prepared for U.S. Dept of Agriculture,
Soil Conservation Service, Engineering Division
0 10 20 30 40 50
MILES
N

Figure 2.8

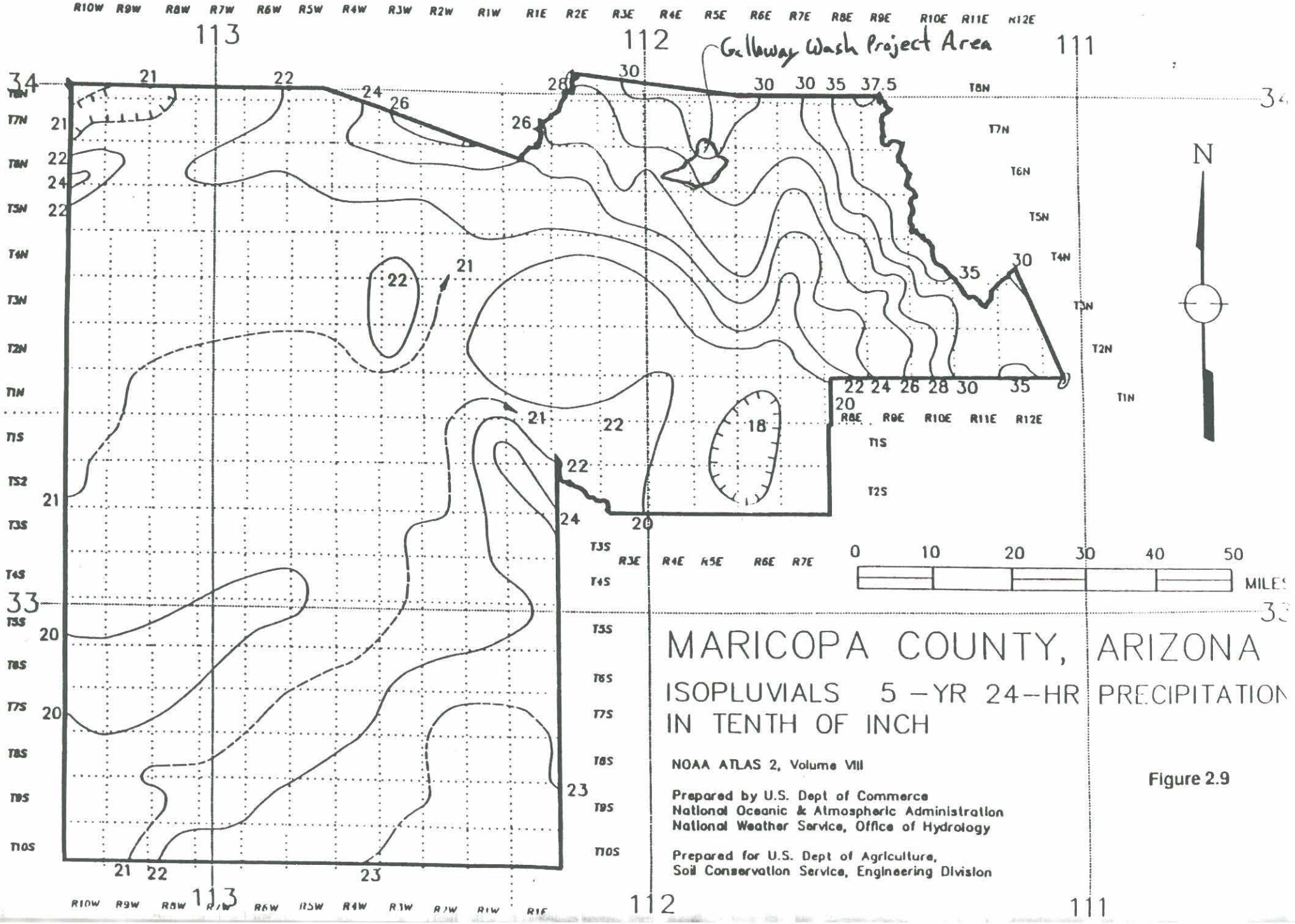

Gallaway Wash Project Area
N
0 10 20 30 40 50
MILES
MARICOPA COUNTY, ARIZONA
ISOPLUVIALS 5-YR 24-HR PRECIPITATION
IN TENTH OF INCH
NOAA ATLAS 2, Volume VIII
Prepared by U.S. Dept of Commerce
National Oceanic & Atmospheric Administration
National Weather Service, Office of Hydrology
Prepared for U.S. Dept of Agriculture,
Soil Conservation Service, Engineering Division

Figure 2.9

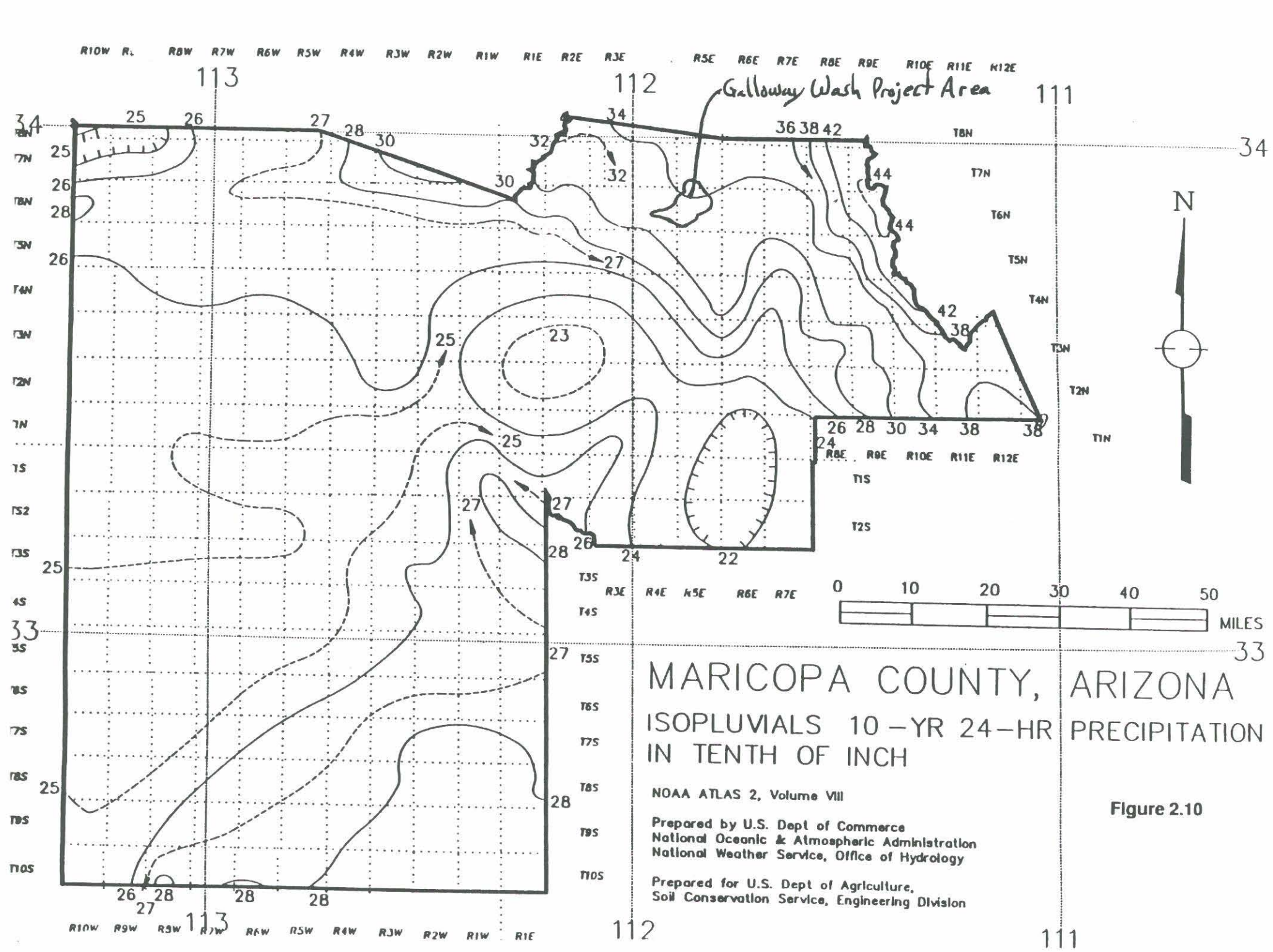

Galloway Wash Project Area
N
0 10 20 30 40 50
MILES
MARICOPA COUNTY, ARIZONA
ISOPLUVIALS 10-YR 24-HR PRECIPITATION
IN TENTH OF INCH
NOAA ATLAS 2, Volume VIII
Prepared by U.S. Dept of Commerce
National Oceanic & Atmospheric Administration
National Weather Service, Office of Hydrology
Prepared for U.S. Dept of Agriculture,
Soil Conservation Service, Engineering Division

Figure 2.10

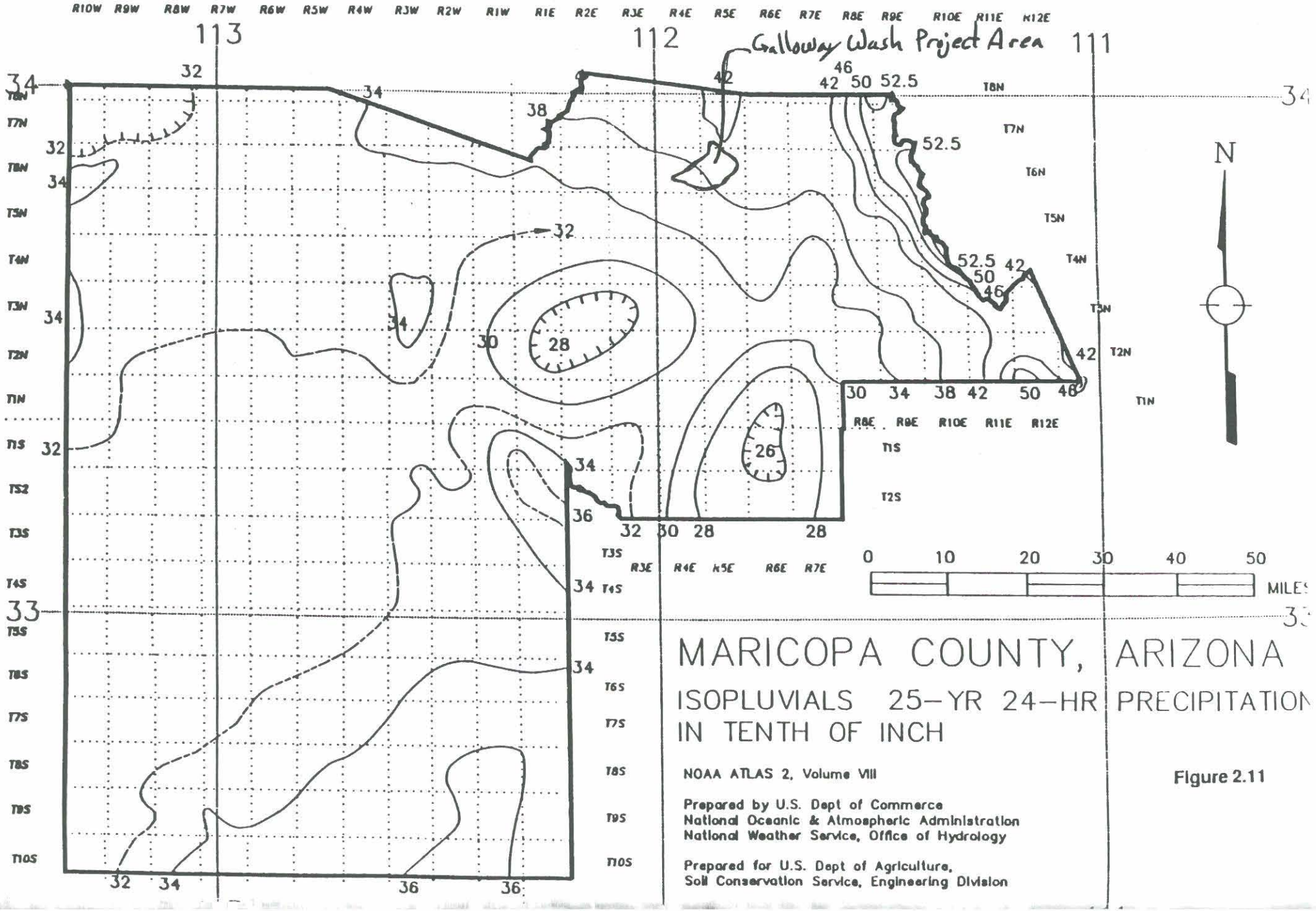

Galloway Wash Project Area
113
112
111
34
33
N
0 10 20 30 40 50
MILES
MARICOPA COUNTY, ARIZONA
ISOPLUVIALS 25-YR 24-HR PRECIPITATION
IN TENTH OF INCH
NOAA ATLAS 2, Volume VIII
Prepared by U.S. Dept of Commerce
National Oceanic & Atmospheric Administration
National Weather Service, Office of Hydrology
Prepared for U.S. Dept of Agriculture,
Soil Conservation Service, Engineering Division

Figure 2.11

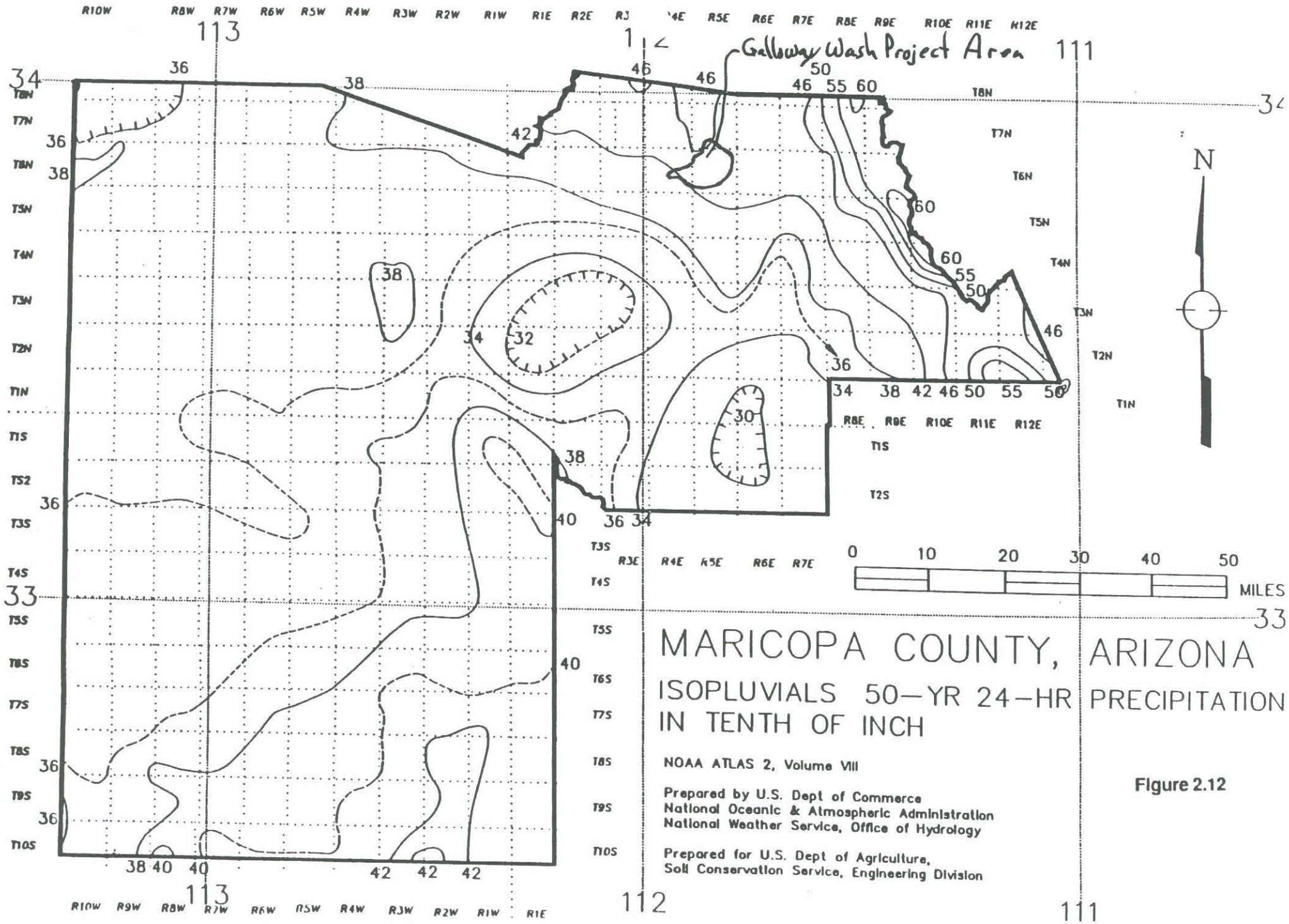

Galloway Wash Project Area
MARICOPA COUNTY, ARIZONA
ISOPLUVIALS 50—YR 24—HR PRECIPITATION
IN TENTH OF INCH
NOAA ATLAS 2, Volume VIII
Prepared by U.S. Dept of Commerce
National Oceanic & Atmospheric Administration
National Weather Service, Office of Hydrology
Prepared for U.S. Dept of Agriculture,
Soil Conservation Service, Engineering Division
0 10 20 30 40 50
MILES
N

Figure 2.12

Project Area - Galloway Wash
MARICOPA COUNTY, ARIZONA
ISOPLUVIALS 100-YR 24-HR PRECIPITATION
IN TENTH OF INCH
NOAA ATLAS 2, Volume VIII
Prepared by U.S. Dept of Commerce
National Oceanic & Atmospheric Administration
National Weather Service, Office of Hydrology
Prepared for U.S. Dept of Agriculture,
Soil Conservation Service, Engineering Division
N
0 10 20 30 40 50
MILES

Figure 2.13

D.2 Physical Parameter Calculations

Table D.2.1 Soils Data

BK_NM	SLTYP_(	RO (%)	SLTYP_DFN	XKSAT_ (in/hr)	DRNBSN_UL	AREA (sq. ft)	Area (sq. mi.)
Aguila-Carefree Area,	6	0	Anthony-Arizo complex	0.62	GVW1	1792022	0.064
Aguila-Carefree Area,	8	0	Arizo cobbly sandy loam	0.96	GVW1	3275780	0.118
Aguila-Carefree Area,	26	0	Continental cobbly clay loam, 1 to 8 percent slop	0.01	GVW1	635620	0.023
Aguila-Carefree Area,	26	0	Continental cobbly clay loam, 1 to 8 percent slop	0.01	GVW1	331650	0.012
Aguila-Carefree Area,	26	0	Continental cobbly clay loam, 1 to 8 percent slop	0.01	GVW1	379147	0.014
Total	26					1346417	0.048
Aguila-Carefree Area,	33	0	Eba very gravelly loam, 1 to 8 percent slopes	0.23	GVW1	18714	0.001
Aguila-Carefree Area,	34	0	Eba very gravelly loam, 8 to 20 percent slopes	0.23	GVW1	3353672	0.120
Aguila-Carefree Area,	34	0	Eba very gravelly loam, 8 to 20 percent slopes	0.23	GVW1	2894399	0.104
Total	34					6248070	0.224
Aguila-Carefree Area,	41	0	Eba-Pinaleno complex, 20 to 40 percent slopes	0.17	GVW1	3041434	0.109
Aguila-Carefree Area,	72	30	Lehmans-Rock outcrop complex, 8 to 65 percen	0.09	GVW1	90232441	3.237
Aguila-Carefree Area,	72	30	Lehmans-Rock outcrop complex, 8 to 65 percen	0.09	GVW1	695591	0.025
Total	72					90928031	3.262
Aguila-Carefree Area,	93	0	Nickel-Cave complex, 8 to 30 percent slopes	0.33	GVW1	242306	0.009
Aguila-Carefree Area,	104	60	Rock outcrop-Lehmans complex, 15 to 65 perce	0.14	GVW1	28274956	1.014
USFS, Tonto National	303	15	Sandy Loam	0.40	GVW1	1535860	0.055
					Basin Total Area	136703591	4.904
Aguila-Carefree Area,	8	0	Arizo cobbly sandy loam	0.96	GVW2	6049992	0.217
Aguila-Carefree Area,	26	0	Continental cobbly clay loam, 1 to 8 percent slop	0.01	GVW2	3804	0.000
Aguila-Carefree Area,	34	0	Eba very gravelly loam, 8 to 20 percent slopes	0.23	GVW2	458436	0.016
Aguila-Carefree Area,	41	0	Eba-Pinaleno complex, 20 to 40 percent slopes	0.17	GVW2	6871847	0.246
Aguila-Carefree Area,	41	0	Eba-Pinaleno complex, 20 to 40 percent slopes	0.17	GVW2	4639471	0.166
Aguila-Carefree Area,	41	0	Eba-Pinaleno complex, 20 to 40 percent slopes	0.17	GVW2	2425598	0.087
Aguila-Carefree Area,	41	0	Eba-Pinaleno complex, 20 to 40 percent slopes	0.17	GVW2	1441246	0.052
Aguila-Carefree Area,	41	0	Eba-Pinaleno complex, 20 to 40 percent slopes	0.17	GVW2	2167326	0.078
Aguila-Carefree Area,	41	0	Eba-Pinaleno complex, 20 to 40 percent slopes	0.17	GVW2	233990	0.008
Aguila-Carefree Area,	41	0	Eba-Pinaleno complex, 20 to 40 percent slopes	0.17	GVW2	2792255	0.100
Total	41					20571732	0.738
Aguila-Carefree Area,	61	0	Gran-Wickenburg complex, 1 to 10 percent slop	0.15	GVW2	1324160	0.047
Aguila-Carefree Area,	63	25	Gran-Wickenburg-Rock outcrop complex, 1 to 7	0.14	GVW2	70209535	2.518
Aguila-Carefree Area,	72	30	Lehmans-Rock outcrop complex, 8 to 65 percen	0.09	GVW2	54900994	1.969
Aguila-Carefree Area,	72	30	Lehmans-Rock outcrop complex, 8 to 65 percen	0.09	GVW2	2241712	0.080
Total	72					57142705	2.050

Table D.2.1 Soils Data

BK_NM	SLTYP_(	RO	SLTYP_DFN	XKSAT_	DRNBSN_UL	AREA	Area
		(%)		(in/hr)		(sq. ft)	(sq. mi.)
Aguila-Carefree Area,	93	0	Nickel-Cave complex, 8 to 30 percent slopes	0.33	GVW2	3619563	0.130
Aguila-Carefree Area,	93	0	Nickel-Cave complex, 8 to 30 percent slopes	0.33	GVW2	640814	0.023
Total	93					4260377	0.153
Aguila-Carefree Area,	104	60	Rock outcrop-Lehmans complex, 15 to 65 perce	0.14	GVW2	12099	0.000
Aguila-Carefree Area,	104	60	Rock outcrop-Lehmans complex, 15 to 65 perce	0.14	GVW2	2241095	0.080
Total	104					2253194	0.081
USFS, Tonto National	301	0	Sandy Loam	0.40	GVW2	5595559	0.201
USFS, Tonto National	303	15	Sandy Loam	0.40	GVW2	48756	0.002
					Basin Total Area	167918251	6.023
Aguila-Carefree Area,	6	0	Anthony-Arizo complex	0.62	GVW3_1	3155036	0.113
Aguila-Carefree Area,	8	0	Arizo cobbly sandy loam	0.96	GVW3_1	1503529	0.054
Aguila-Carefree Area,	26	0	Continental cobbly clay loam, 1 to 8 percent slop	0.01	GVW3_1	5092	0.000
Aguila-Carefree Area,	26	0	Continental cobbly clay loam, 1 to 8 percent slop	0.01	GVW3_1	1924997	0.069
Aguila-Carefree Area,	26	0	Continental cobbly clay loam, 1 to 8 percent slop	0.01	GVW3_1	6	0.000
Total	26					1930094	0.069
Aguila-Carefree Area,	33	0	Eba very gravelly loam, 1 to 8 percent slopes	0.23	GVW3_1	478051	0.017
Aguila-Carefree Area,	34	0	Eba very gravelly loam, 8 to 20 percent slopes	0.23	GVW3_1	10316267	0.370
Aguila-Carefree Area,	34	0	Eba very gravelly loam, 8 to 20 percent slopes	0.23	GVW3_1	4043885	0.145
Aguila-Carefree Area,	34	0	Eba very gravelly loam, 8 to 20 percent slopes	0.23	GVW3_1	707479	0.025
Total	34					15067630	0.540
Aguila-Carefree Area,	41	0	Eba-Pinaleno complex, 20 to 40 percent slopes	0.17	GVW3_1	482518	0.017
Aguila-Carefree Area,	41	0	Eba-Pinaleno complex, 20 to 40 percent slopes	0.17	GVW3_1	2857028	0.102
Total	41					3339546	0.120
Aguila-Carefree Area,	93	0	Nickel-Cave complex, 8 to 30 percent slopes	0.33	GVW3_1	174860	0.006
Aguila-Carefree Area,	93	0	Nickel-Cave complex, 8 to 30 percent slopes	0.33	GVW3_1	1684550	0.060
Total	93					1859410	0.067
Aguila-Carefree Area,	96	0	Pinaleno-Tres Hermanos complex, 1 to 10 perce	0.07	GVW3_1	130603	0.005
Aguila-Carefree Area,	96	0	Pinaleno-Tres Hermanos complex, 1 to 10 perce	0.07	GVW3_1	1092533	0.039
Aguila-Carefree Area,	96	0	Pinaleno-Tres Hermanos complex, 1 to 10 perce	0.07	GVW3_1	5258	0.000
Aguila-Carefree Area,	96	0	Pinaleno-Tres Hermanos complex, 1 to 10 perce	0.07	GVW3_1	31145	0.001
Total	96					1259538	0.045
Aguila-Carefree Area,	121	0	Tres Hermanos-Anthony complex, 1 to 5 percen	0.12	GVW3_1	485805	0.017
					Basin Total Area	29078640	1.043

Table D.2.1 Soils Data

BK_NM	SLTYP_(	RO (%)	SLTYP_DFN	XKSAT_ (in/hr)	DRNBSN_UL	AREA (sq. ft)	Area (sq. mi.)
Aguila-Carefree Area,	6	0	Anthony-Arizo complex	0.62	GVW3_2	1212860	0.044
Aguila-Carefree Area,	8	0	Arizo cobbly sandy loam	0.96	GVW3_2	6024837	0.216
Aguila-Carefree Area,	26	0	Continental cobbly clay loam, 1 to 8 percent slop	0.01	GVW3_2	3631126	0.130
Aguila-Carefree Area,	26	0	Continental cobbly clay loam, 1 to 8 percent slop	0.01	GVW3_2	338020	0.012
Aguila-Carefree Area,	26	0	Continental cobbly clay loam, 1 to 8 percent slop	0.01	GVW3_2	473341	0.017
Aguila-Carefree Area,	26	0	Continental cobbly clay loam, 1 to 8 percent slop	0.01	GVW3_2	35040	0.001
Aguila-Carefree Area,	26	0	Continental cobbly clay loam, 1 to 8 percent slop	0.01	GVW3_2	113375	0.004
Total	26					4590901	0.165
Aguila-Carefree Area,	33	0	Eba very gravelly loam, 1 to 8 percent slopes	0.23	GVW3_2	2068611	0.074
Aguila-Carefree Area,	34	0	Eba very gravelly loam, 8 to 20 percent slopes	0.23	GVW3_2	11648370	0.418
Aguila-Carefree Area,	34	0	Eba very gravelly loam, 8 to 20 percent slopes	0.23	GVW3_2	316658	0.011
Total	34					11965028	0.429
Aguila-Carefree Area,	41	0	Eba-Pinaleno complex, 20 to 40 percent slopes	0.17	GVW3_2	1735	0.000
Aguila-Carefree Area,	93	0	Nickel-Cave complex, 8 to 30 percent slopes	0.33	GVW3_2	1206358	0.043
Aguila-Carefree Area,	93	0	Nickel-Cave complex, 8 to 30 percent slopes	0.33	GVW3_2	13595	0.000
Total	93					1219953	0.044
					Basin Total Area	27083926	0.972
Aguila-Carefree Area,	6	0	Anthony-Arizo complex	0.62	GVW3_3	17460	0.001
Aguila-Carefree Area,	8	0	Arizo cobbly sandy loam	0.96	GVW3_3	851242	0.031
Aguila-Carefree Area,	8	0	Arizo cobbly sandy loam	0.96	GVW3_3	68	0.000
Total	8					851310	0.031
Aguila-Carefree Area,	12	0	Carefree cobbly clay loam, 1 to 8 percent slopes	0.01	GVW3_3	602494	0.022
Aguila-Carefree Area,	26	0	Continental cobbly clay loam, 1 to 8 percent slop	0.01	GVW3_3	335002	0.012
Aguila-Carefree Area,	26	0	Continental cobbly clay loam, 1 to 8 percent slop	0.01	GVW3_3	479940	0.017
Total	26					814942	0.029
Aguila-Carefree Area,	33	0	Eba very gravelly loam, 1 to 8 percent slopes	0.23	GVW3_3	4761108	0.171
Aguila-Carefree Area,	33	0	Eba very gravelly loam, 1 to 8 percent slopes	0.23	GVW3_3	210897	0.008
Total	33					4972005	0.178
Aguila-Carefree Area,	34	0	Eba very gravelly loam, 8 to 20 percent slopes	0.23	GVW3_3	541229	0.019
Aguila-Carefree Area,	72	30	Lehmans-Rock outcrop complex, 8 to 65 percen	0.09	GVW3_3	130323	0.005
Aguila-Carefree Area,	72	30	Lehmans-Rock outcrop complex, 8 to 65 percen	0.09	GVW3_3	314273	0.011
Total	72					444596	0.016

Table D.2.1 Soils Data

BK_NM	SLTYP_(	RO (%)	SLTYP_DFN	XKSAT_ (in/hr)	DRNBSN_UL	AREA (sq. ft)	Area (sq. mi.)
Aguila-Carefree Area,	93	0	Nickel-Cave complex, 8 to 30 percent slopes	0.33	GVW3_3	328638	0.012
Aguila-Carefree Area,	93	0	Nickel-Cave complex, 8 to 30 percent slopes	0.33	GVW3_3	377558	0.014
Aguila-Carefree Area,	93	0	Nickel-Cave complex, 8 to 30 percent slopes	0.33	GVW3_3	110775	0.004
Total	93					816970	0.029
Aguila-Carefree Area,	96	0	Pinaleno-Tres Hermanos complex, 1 to 10 perce	0.07	GVW3_3	52188	0.002
Aguila-Carefree Area,	96	0	Pinaleno-Tres Hermanos complex, 1 to 10 perce	0.07	GVW3_3	131542	0.005
Aguila-Carefree Area,	96	0	Pinaleno-Tres Hermanos complex, 1 to 10 perce	0.07	GVW3_3	260189	0.009
Total	96					443919	0.016
					Basin Total Area	9504925	0.341
Aguila-Carefree Area,	6	0	Anthony-Arizo complex	0.62	GWW1_1	8837149	0.317
Aguila-Carefree Area,	24	0	continental clay loam, 0 to 3 percent slopes	0.02	GWW1_1	268092	0.010
Aguila-Carefree Area,	33	0	Eba very gravelly loam, 1 to 8 percent slopes	0.23	GWW1_1	3763040	0.135
Aguila-Carefree Area,	40	0	Eba-Pinaleno complex, 3 to 20 percent slopes	0.17	GWW1_1	2810298	0.101
Aguila-Carefree Area,	40	0	Eba-Pinaleno complex, 3 to 20 percent slopes	0.17	GWW1_1	2291724	0.082
Total	40					5102022	0.183
Aguila-Carefree Area,	41	0	Eba-Pinaleno complex, 20 to 40 percent slopes	0.17	GWW1_1	2833801	0.102
Aguila-Carefree Area,	61	0	Gran-Wickenburg complex, 1 to 10 percent slop	0.15	GWW1_1	2301404	0.083
Aguila-Carefree Area,	63	25	Gran-Wickenburg-Rock outcrop complex, 1 to 7	0.14	GWW1_1	31986913	1.147
Aguila-Carefree Area,	72	30	Lehmans-Rock outcrop complex, 8 to 65 percen	0.09	GWW1_1	2686145	0.096
Aguila-Carefree Area,	93	0	Nickel-Cave complex, 8 to 30 percent slopes	0.33	GWW1_1	190252	0.007
Aguila-Carefree Area,	96	0	Pinaleno-Tres Hermanos complex, 1 to 10 perce	0.07	GWW1_1	493049	0.018
Aguila-Carefree Area,	96	0	Pinaleno-Tres Hermanos complex, 1 to 10 perce	0.07	GWW1_1	1697778	0.061
Total	96					2190827	0.079
USFS, Tonto National	301	0	Sandy Loam	0.40	GWW1_1	10952578	0.393
					Basin Total Area	71112224	2.551

Table D.2.1 Soils Data

BK_NM	SLTYP_(	RO	SLTYP_DFN	XKSAT_	DRNBSN_UL	AREA	Area
		(%)		(in/hr)		(sq. ft)	(sq. mi.)
Aguila-Carefree Area,	6	0	Anthony-Arizo complex	0.62	GWW1_2	1677688	0.060
Aguila-Carefree Area,	33	0	Eba very gravelly loam, 1 to 8 percent slopes	0.23	GWW1_2	21788404	0.782
Aguila-Carefree Area,	34	0	Eba very gravelly loam, 8 to 20 percent slopes	0.23	GWW1_2	381883	0.014
Aguila-Carefree Area,	40	0	Eba-Pinaleno complex, 3 to 20 percent slopes	0.17	GWW1_2	300476	0.011
Aguila-Carefree Area,	63	25	Gran-Wickenburg-Rock outcrop complex, 1 to 7	0.14	GWW1_2	2107092	0.076
Aguila-Carefree Area,	93	0	Nickel-Cave complex, 8 to 30 percent slopes	0.33	GWW1_2	207505	0.007
Aguila-Carefree Area,	96	0	Pinaleno-Tres Hermanos complex, 1 to 10 perce	0.07	GWW1_2	642504	0.023
Aguila-Carefree Area,	96	0	Pinaleno-Tres Hermanos complex, 1 to 10 perce	0.07	GWW1_2	1152798	0.041
Aguila-Carefree Area,	96	0	Pinaleno-Tres Hermanos complex, 1 to 10 perce	0.07	GWW1_2	770540	0.028
Total	96					2565841	0.092
USFS, Tonto National	301	0	Sandy Loam	0.40	GWW1_2	56923	0.002
					Basin Total Area	29085812	1.043
Aguila-Carefree Area,	6	0	Anthony-Arizo complex	0.62	GWW131	1903146	0.068
Aguila-Carefree Area,	6	0	Anthony-Arizo complex	0.62	GWW131	146295	0.005
Total	6	0				2049441	0.074
Aguila-Carefree Area,	24	0	continental clay loam, 0 to 3 percent slopes	0.02	GWW131	413839	0.015
Aguila-Carefree Area,	34	0	Eba very gravelly loam, 8 to 20 percent slopes	0.23	GWW131	778160	0.028
Aguila-Carefree Area,	40	0	Eba-Pinaleno complex, 3 to 20 percent slopes	0.17	GWW131	71461	0.003
Aguila-Carefree Area,	40	0	Eba-Pinaleno complex, 3 to 20 percent slopes	0.17	GWW131	4946198	0.177
Total	40	0				5017658	0.180
Aguila-Carefree Area,	41	0	Eba-Pinaleno complex, 20 to 40 percent slopes	0.17	GWW131	4625648	0.166
Aguila-Carefree Area,	41	0	Eba-Pinaleno complex, 20 to 40 percent slopes	0.17	GWW131	4770478	0.171
Total	41	0				9396126	0.337
Aguila-Carefree Area,	72	30	Lehmans-Rock outcrop complex, 8 to 65 percen	0.09	GWW131	517423	0.019
Aguila-Carefree Area,	93	0	Nickel-Cave complex, 8 to 30 percent slopes	0.33	GWW131	2410132	0.086
Aguila-Carefree Area,	96	0	Pinaleno-Tres Hermanos complex, 1 to 10 perce	0.07	GWW131	313930	0.011
Aguila-Carefree Area,	96	0	Pinaleno-Tres Hermanos complex, 1 to 10 perce	0.07	GWW131	670151	0.024
Aguila-Carefree Area,	96	0	Pinaleno-Tres Hermanos complex, 1 to 10 perce	0.07	GWW131	429	0.000
Total	96	0				984510	0.035
					Basin Total Area	21567291	0.774

Table D.2.1 Soils Data

BK_NM	SLTYP_(	RO (%)	SLTYP_DFN	XKSAT_ (in/hr)	DRNBSN_UL	AREA (sq. ft)	Area (sq. mi.)
Aguila-Carefree Area,	6	0	Anthony-Arizo complex	0.62	GWW132	222412	0.008
Aguila-Carefree Area,	33	0	Eba very gravelly loam, 1 to 8 percent slopes	0.23	GWW132	2371930	0.085
Aguila-Carefree Area,	34	0	Eba very gravelly loam, 8 to 20 percent slopes	0.23	GWW132	823430	0.030
Aguila-Carefree Area,	34	0	Eba very gravelly loam, 8 to 20 percent slopes	0.23	GWW132	44209	0.002
Total	34	0				867639	0.031
Aguila-Carefree Area,	40	0	Eba-Pinaleno complex, 3 to 20 percent slopes	0.17	GWW132	3076426	0.110
Aguila-Carefree Area,	40	0	Eba-Pinaleno complex, 3 to 20 percent slopes	0.17	GWW132	160	0.000
Total	40	0				3076586	0.110
Aguila-Carefree Area,	93	0	Nickel-Cave complex, 8 to 30 percent slopes	0.33	GWW132	2087049	0.075
Aguila-Carefree Area,	96	0	Pinaleno-Tres Hermanos complex, 1 to 10 perce	0.07	GWW132	1041593	0.037
Aguila-Carefree Area,	96	0	Pinaleno-Tres Hermanos complex, 1 to 10 perce	0.07	GWW132	16376	0.001
Total	96	0				1057968	0.038
					Basin Total Area	9683584	0.347
Aguila-Carefree Area,	6	0	Anthony-Arizo complex	0.62	GWW133	1420236	0.051
Aguila-Carefree Area,	34	0	Eba very gravelly loam, 8 to 20 percent slopes	0.23	GWW133	972391	0.035
Aguila-Carefree Area,	34	0	Eba very gravelly loam, 8 to 20 percent slopes	0.23	GWW133	589919	0.021
Total	34	0				1562310	0.056
Aguila-Carefree Area,	40	0	Eba-Pinaleno complex, 3 to 20 percent slopes	0.17	GWW133	2934081	0.105
Aguila-Carefree Area,	40	0	Eba-Pinaleno complex, 3 to 20 percent slopes	0.17	GWW133	1740215	0.062
Total	40	0				4674295	0.168
Aguila-Carefree Area,	93	0	Nickel-Cave complex, 8 to 30 percent slopes	0.33	GWW133	38165	0.001
Aguila-Carefree Area,	96	0	Pinaleno-Tres Hermanos complex, 1 to 10 perce	0.07	GWW133	166054	0.006
Aguila-Carefree Area,	96	0	Pinaleno-Tres Hermanos complex, 1 to 10 perce	0.07	GWW133	2470629	0.089
Aguila-Carefree Area,	96	0	Pinaleno-Tres Hermanos complex, 1 to 10 perce	0.07	GWW133	749501	0.027
Total	96	0				3386184	0.121
					Basin Total Area	11081190	0.397

Table D.2.1 Soils Data

BK_NM	SLTYP_(	RO (%)	SLTYP_DFN	XKSAT_ (in/hr)	DRNBSN_UL	AREA (sq. ft)	Area (sq. mi.)
Aguila-Carefree Area,	6	0	Anthony-Arizo complex	0.62	GWW1_4	1095853	0.039
Aguila-Carefree Area,	33	0	Eba very gravelly loam, 1 to 8 percent slopes	0.23	GWW1_4	950734	0.034
Aguila-Carefree Area,	40	0	Eba-Pinaleno complex, 3 to 20 percent slopes	0.17	GWW1_4	2343404	0.084
Aguila-Carefree Area,	41	0	Eba-Pinaleno complex, 20 to 40 percent slopes	0.17	GWW1_4	16115109	0.578
Aguila-Carefree Area,	72	30	Lehmans-Rock outcrop complex, 8 to 65 percen	0.09	GWW1_4	34080	0.001
Aguila-Carefree Area,	93	0	Nickel-Cave complex, 8 to 30 percent slopes	0.33	GWW1_4	1775179	0.064
Aguila-Carefree Area,	93	0	Nickel-Cave complex, 8 to 30 percent slopes	0.33	GWW1_4	282443	0.010
Aguila-Carefree Area,	93	0	Nickel-Cave complex, 8 to 30 percent slopes	0.33	GWW1_4	271762	0.010
Total	93					2329385	0.084
Aguila-Carefree Area,	96	0	Pinaleno-Tres Hermanos complex, 1 to 10 perce	0.07	GWW1_4	3628729	0.130
Aguila-Carefree Area,	96	0	Pinaleno-Tres Hermanos complex, 1 to 10 perce	0.07	GWW1_4	188703	0.007
Aguila-Carefree Area,	96	0	Pinaleno-Tres Hermanos complex, 1 to 10 perce	0.07	GWW1_4	1224340	0.044
Total	96					5041772	0.181
Aguila-Carefree Area,	121	0	Tres Hermanos-Anthony complex, 1 to 5 percen	0.12	GWW1_4	66527	0.002
					Basin Total Area	27976863	1.004
Aguila-Carefree Area,	6	0	Anthony-Arizo complex	0.62	GWW1_5	400209	0.014
Aguila-Carefree Area,	28	0	Continental-Ohaco complex	0.02	GWW1_5	265163	0.010
Aguila-Carefree Area,	33	0	Eba very gravelly loam, 1 to 8 percent slopes	0.23	GWW1_5	4480490	0.161
Aguila-Carefree Area,	33	0	Eba very gravelly loam, 1 to 8 percent slopes	0.23	GWW1_5	216019	0.008
Aguila-Carefree Area,	33	0	Eba very gravelly loam, 1 to 8 percent slopes	0.23	GWW1_5	521963	0.019
Total	33					5218472	0.187
Aguila-Carefree Area,	34	0	Eba very gravelly loam, 8 to 20 percent slopes	0.23	GWW1_5	1770053	0.063
Aguila-Carefree Area,	40	0	Eba-Pinaleno complex, 3 to 20 percent slopes	0.17	GWW1_5	1228426	0.044
Aguila-Carefree Area,	72	30	Lehmans-Rock outcrop complex, 8 to 65 percen	0.09	GWW1_5	134174	0.005
Aguila-Carefree Area,	93	0	Nickel-Cave complex, 8 to 30 percent slopes	0.33	GWW1_5	5360280	0.192
Aguila-Carefree Area,	96	0	Pinaleno-Tres Hermanos complex, 1 to 10 perce	0.07	GWW1_5	534413	0.019
Aguila-Carefree Area,	96	0	Pinaleno-Tres Hermanos complex, 1 to 10 perce	0.07	GWW1_5	253923	0.009
Aguila-Carefree Area,	96	0	Pinaleno-Tres Hermanos complex, 1 to 10 perce	0.07	GWW1_5	12239379	0.439
Total	96					13027716	0.467
					Basin Total Area	27404493	0.983

Table D.2.1 Soils Data

BK_NM	SLTYP_(	RO (%)	SLTYP_DFN	XKSAT_ (in/hr)	DRNBSN_UL	AREA (sq. ft)	Area (sq. mi.)
Aguila-Carefree Area,	6	0	Anthony-Arizo complex	0.62	GWW1_6	532234	0.019
Aguila-Carefree Area,	33	0	Eba very gravelly loam, 1 to 8 percent slopes	0.23	GWW1_6	940818	0.034
Aguila-Carefree Area,	34	0	Eba very gravelly loam, 8 to 20 percent slopes	0.23	GWW1_6	8537647	0.306
Aguila-Carefree Area,	41	0	Eba-Pinaleno complex, 20 to 40 percent slopes	0.17	GWW1_6	4867931	0.175
Aguila-Carefree Area,	93	0	Nickel-Cave complex, 8 to 30 percent slopes	0.33	GWW1_6	191531	0.007
Aguila-Carefree Area,	96	0	Pinaleno-Tres Hermanos complex, 1 to 10 perce	0.07	GWW1_6	447400	0.016
Aguila-Carefree Area,	96	0	Pinaleno-Tres Hermanos complex, 1 to 10 perce	0.07	GWW1_6	216713	0.008
Aguila-Carefree Area,	96	0	Pinaleno-Tres Hermanos complex, 1 to 10 perce	0.07	GWW1_6	468074	0.017
Aguila-Carefree Area,	96	0	Pinaleno-Tres Hermanos complex, 1 to 10 perce	0.07	GWW1_6	105162	0.004
Total	96					1237349	0.044
Aguila-Carefree Area,	121	0	Tres Hermanos-Anthony complex, 1 to 5 percen	0.12	GWW1_6	213760	0.008
					Basin Total Area	16521268	0.593
					Galloway Wash Total Basin Area	584740772	20.975

Table D.2.2 Land Use Data				
LDUSE_DFN	AREA	DRNBSN_UL	Area (sq. mi.)	Cumulative Area (sq.mi.)
Dedicated or Non-developable Open Space	1341474.544	GVW1	0.048	
Rural (1 dwelling unit per acre or less)	47019.870	GVW1	0.002	
Vacant	135315096.094	GVW1	4.854	
Total (square feet)	136703590.508		4.904	
Total (square miles)	4.904			GVW1
Neighborhood Retail Center (<100,000 sq.ft.)	88805.781	GVW2	0.003	
Recreational Open Space	18.910	GVW2	0.000	
Recreational Open Space	14002.848	GVW2	0.001	
Recreational Open Space	31621.472	GVW2	0.001	
Recreational Open Space	34247.238	GVW2	0.001	
Recreational Open Space	37149.338	GVW2	0.001	
Recreational Open Space	42883.687	GVW2	0.002	
Recreational Open Space	57812.209	GVW2	0.002	
Recreational Open Space	60521.095	GVW2	0.002	
Recreational Open Space	63342.920	GVW2	0.002	
Recreational Open Space	65537.033	GVW2	0.002	
Recreational Open Space	66209.301	GVW2	0.002	
Recreational Open Space	68209.697	GVW2	0.002	
Recreational Open Space	81225.068	GVW2	0.003	
Recreational Open Space	81608.014	GVW2	0.003	
Recreational Open Space	85824.281	GVW2	0.003	
Recreational Open Space	91109.756	GVW2	0.003	
Recreational Open Space	106623.869	GVW2	0.004	
Recreational Open Space	111554.691	GVW2	0.004	
Recreational Open Space	113372.180	GVW2	0.004	
Recreational Open Space	113526.355	GVW2	0.004	
Recreational Open Space	116046.400	GVW2	0.004	
Recreational Open Space	145494.094	GVW2	0.005	
Recreational Open Space	153453.031	GVW2	0.006	
Recreational Open Space	153521.411	GVW2	0.006	
Recreational Open Space	157016.279	GVW2	0.006	
Recreational Open Space	162629.391	GVW2	0.006	
Recreational Open Space	188138.863	GVW2	0.007	
Recreational Open Space	213726.631	GVW2	0.008	
Recreational Open Space	217254.986	GVW2	0.008	
Recreational Open Space	225502.451	GVW2	0.008	
Recreational Open Space	230022.818	GVW2	0.008	
Recreational Open Space	246045.332	GVW2	0.009	
Recreational Open Space	265458.676	GVW2	0.010	
Recreational Open Space	269783.283	GVW2	0.010	
Recreational Open Space	271405.532	GVW2	0.010	
Recreational Open Space	315032.145	GVW2	0.011	
Recreational Open Space	336707.379	GVW2	0.012	
Recreational Open Space	339067.462	GVW2	0.012	
Recreational Open Space	347410.608	GVW2	0.012	
Recreational Open Space	378116.566	GVW2	0.014	
Recreational Open Space	484018.962	GVW2	0.017	
Recreational Open Space	547826.119	GVW2	0.020	
Recreational Open Space	817233.730	GVW2	0.029	
Recreational Open Space	1156461.057	GVW2	0.041	
Recreational Open Space	3545348.017	GVW2	0.127	0.452

Table D.2.2 Land Use Data				
LDUSE_DFN	AREA	DRNBSN_UL	Area (sq. mi.)	Cumulative Area (sq.mi.)
Rural (1 dwelling unit per acre or less)	216791.887	GVW2	0.008	
Rural (1 dwelling unit per acre or less)	683437.502	GVW2	0.025	
Rural (1 dwelling unit per acre or less)	1207136.902	GVW2	0.043	
Rural (1 dwelling unit per acre or less)	12345258.216	GVW2	0.443	
Rural (1 dwelling unit per acre or less)	18043521.497	GVW2	0.647	1.166
Small Lot Residential (>2 and <=5 du/acre)	3364664.567	GVW2	0.121	
Vacant	141.433	GVW2	0.000	
Vacant	119059482.836	GVW2	4.271	4.271
Water	7646.006	GVW2	0.000	
Water	20448.240	GVW2	0.001	
Water	74903.495	GVW2	0.003	
Water	79535.983	GVW2	0.003	
Water	117295.471	GVW2	0.004	0.011
Total (square feet)	167918191.000		6.023	
Total (square miles)	6.023			GVW2
Large Lot Residential (>1 and <=2 du/acre)	10964.802	GVW3_1	0.000	
Large Lot Residential (>1 and <=2 du/acre)	73563.280	GVW3_1	0.003	0.003
Neighborhood Retail Center (<100,000 sq.ft.)	26541.594	GVW3_1	0.001	
Neighborhood Retail Center (<100,000 sq.ft.)	31036.238	GVW3_1	0.001	0.002
Rural (1 dwelling unit per acre or less)	237366.333	GVW3_1	0.009	
Rural (1 dwelling unit per acre or less)	11872340.149	GVW3_1	0.426	0.434
Vacant	16826393.468	GVW3_1	0.604	
Total (square feet)	29078205.864		1.043	
Total (square miles)	1.043			GVW3_1
Rural (1 dwelling unit per acre or less)	4857.092	GVW3_2	0.000	
Rural (1 dwelling unit per acre or less)	8098.860	GVW3_2	0.000	
Rural (1 dwelling unit per acre or less)	12620.735	GVW3_2	0.000	
Rural (1 dwelling unit per acre or less)	54245.708	GVW3_2	0.002	
Rural (1 dwelling unit per acre or less)	64684.221	GVW3_2	0.002	
Rural (1 dwelling unit per acre or less)	174953.836	GVW3_2	0.006	
Rural (1 dwelling unit per acre or less)	288805.273	GVW3_2	0.010	
Rural (1 dwelling unit per acre or less)	337509.217	GVW3_2	0.012	
Rural (1 dwelling unit per acre or less)	3671712.503	GVW3_2	0.132	
Rural (1 dwelling unit per acre or less)	6567228.640	GVW3_2	0.236	0.401
Vacant	78639.546	GVW3_2	0.003	
Vacant	15820503.223	GVW3_2	0.567	0.570
Total (square feet)	27083858.854		0.971	
Total (square miles)	0.971			GVW3_2
Recreational Open Space	111431.892	GVW3_3	0.004	
Recreational Open Space	162402.643	GVW3_3	0.006	
Recreational Open Space	637200.811	GVW3_3	0.023	0.033
Rural (1 dwelling unit per acre or less)	239324.919	GVW3_3	0.009	
Rural (1 dwelling unit per acre or less)	1293513.243	GVW3_3	0.046	
Rural (1 dwelling unit per acre or less)	1373837.479	GVW3_3	0.049	
Rural (1 dwelling unit per acre or less)	2565715.731	GVW3_3	0.092	0.196
Small Lot Residential (>2 and <=5 du/acre)	502104.660	GVW3_3	0.018	
Vacant	2619392.986	GVW3_3	0.094	
Total (square feet)	9504924.365		0.341	
Total (square miles)	0.341			GVW3_3

Table D.2.2 Land Use Data				
LDUSE_DFN	AREA	DRNBSN_UL	Area (sq. mi.)	Cumulative Area (sq.mi.)
Dedicated or Non-developable Open Space	123491.544	GWW1_1	0.004	
Dedicated or Non-developable Open Space	177515.433	GWW1_1	0.006	0.011
Hotel, Motel or Resort	414437.608	GWW1_1	0.015	
Large Lot Residential (>1 and <=2 du/acre)	12.031	GWW1_1	0.000	
Large Lot Residential (>1 and <=2 du/acre)	6638.024	GWW1_1	0.000	
Large Lot Residential (>1 and <=2 du/acre)	72778.617	GWW1_1	0.003	
Large Lot Residential (>1 and <=2 du/acre)	7765932.449	GWW1_1	0.279	0.281
Recreational Open Space	28941.477	GWW1_1	0.001	
Recreational Open Space	29621.548	GWW1_1	0.001	
Recreational Open Space	39003.340	GWW1_1	0.001	
Recreational Open Space	73907.908	GWW1_1	0.003	
Recreational Open Space	76596.435	GWW1_1	0.003	
Recreational Open Space	404265.805	GWW1_1	0.015	
Recreational Open Space	2969063.010	GWW1_1	0.107	
Recreational Open Space	6384581.850	GWW1_1	0.229	0.359
Rural (1 dwelling unit per acre or less)	0.018	GWW1_1	0.000	
Rural (1 dwelling unit per acre or less)	0.208	GWW1_1	0.000	
Rural (1 dwelling unit per acre or less)	0.931	GWW1_1	0.000	
Rural (1 dwelling unit per acre or less)	7.355	GWW1_1	0.000	
Rural (1 dwelling unit per acre or less)	9.043	GWW1_1	0.000	
Rural (1 dwelling unit per acre or less)	21008.426	GWW1_1	0.001	
Rural (1 dwelling unit per acre or less)	648372.526	GWW1_1	0.023	
Rural (1 dwelling unit per acre or less)	4827133.785	GWW1_1	0.173	
Rural (1 dwelling unit per acre or less)	5036987.443	GWW1_1	0.181	
Rural (1 dwelling unit per acre or less)	31529069.855	GWW1_1	1.131	1.509
Small Lot Residential (>2 and <=5 du/acre)	903266.207	GWW1_1	0.032	
Small Lot Residential (>2 and <=5 du/acre)	1127022.296	GWW1_1	0.040	
Small Lot Residential (>2 and <=5 du/acre)	1414377.060	GWW1_1	0.051	0.124
Vacant	301757.051	GWW1_1	0.011	
Vacant	320101.666	GWW1_1	0.011	
Vacant	714388.407	GWW1_1	0.026	
Vacant	5626241.516	GWW1_1	0.202	0.250
Water	75692.665	GWW1_1	0.003	
Total (square feet)	71112223.539		2.551	
Total (square miles)	2.551			GWW1_1

Table D.2.2 Land Use Data

LDUSE_DFN	AREA	DRNBSN_UL	Area (sq. mi.)	Cumulative Area (sq.mi.)
Dedicated or Non-developable Open Space	184045.324	GWW1_2	0.007	
Large Lot Residential (>1 and <=2 du/acre)	205309.364	GWW1_2	0.007	
Neighborhood Retail Center (<100,000 sq.ft.)	187830.918	GWW1_2	0.007	
Recreational Open Space	4.518	GWW1_2	0.000	
Recreational Open Space	1163049.160	GWW1_2	0.042	
Recreational Open Space	4827822.698	GWW1_2	0.173	0.215
Rural (1 dwelling unit per acre or less)	0.771	GWW1_2	0.000	
Rural (1 dwelling unit per acre or less)	57.156	GWW1_2	0.000	
Rural (1 dwelling unit per acre or less)	6631070.472	GWW1_2	0.238	
Rural (1 dwelling unit per acre or less)	9775796.440	GWW1_2	0.351	0.589
Small Lot Residential (>2 and <=5 du/acre)	695911.549	GWW1_2	0.025	
Vacant	59.036	GWW1_2	0.000	
Vacant	247.280	GWW1_2	0.000	
Vacant	21369.137	GWW1_2	0.001	
Vacant	28410.395	GWW1_2	0.001	
Vacant	101623.937	GWW1_2	0.004	
Vacant	182522.074	GWW1_2	0.007	
Vacant	271986.432	GWW1_2	0.010	
Vacant	2260368.632	GWW1_2	0.081	
Vacant	2546429.372	GWW1_2	0.091	0.194
Total (square feet)	29083914.667		1.043	
Total (square miles)	1.043			GWW1_2
Large Lot Residential (>1 and <=2 du/acre)	3373939.69051	GWW131	0.121	
Large Lot Residential (>1 and <=2 du/acre)	181522.21159	GWW131	0.007	0.128
Recreational Open Space	21009.99453	GWW131	0.001	0.001
Rural (1 dwelling unit per acre or less)	7150518.33766	GWW131	0.256	
Rural (1 dwelling unit per acre or less)	9494167.85766	GWW131	0.341	
Rural (1 dwelling unit per acre or less)	287276.41797	GWW131	0.010	
Rural (1 dwelling unit per acre or less)	512673.63281	GWW131	0.018	
Rural (1 dwelling unit per acre or less)	315459.19472	GWW131	0.011	0.637
Vacant	227030.88867	GWW131	0.008	
Vacant	3692.67712	GWW131	0.000	0.008
Total (square feet)	21567290.903		0.774	
Total (square miles)	0.774			GWW131
Large Lot Residential (>1 and <=2 du/acre)	868864.43720	GWW132	0.031	
Large Lot Residential (>1 and <=2 du/acre)	70143.60481	GWW132	0.003	0.034
Recreational Open Space	283.32065	GWW132	0.000	
Recreational Open Space	841676.68269	GWW132	0.030	
Recreational Open Space	40922.45305	GWW132	0.001	
Recreational Open Space	986.34611	GWW132	0.000	0.032
Rural (1 dwelling unit per acre or less)	2735832.47085	GWW132	0.098	
Rural (1 dwelling unit per acre or less)	1652.55387	GWW132	0.000	
Rural (1 dwelling unit per acre or less)	5059465.18894	GWW132	0.181	0.280
Vacant	63757.31702	GWW132	0.002	0
Total (square feet)	9683584.375		0.347	
Total (square miles)	0.347			GWW132
Hotel, Motel or Resort	251811.80562	GWW133	0.009	0.009
Large Lot Residential (>1 and <=2 du/acre)	8091627.99397	GWW133	0.290	0.290
Medium Density Residential (>5 and <=15 du/acre)	68762.60758	GWW133	0.002	0.002
Recreational Open Space	2616894.67611	GWW133	0.094	0.094
Rural (1 dwelling unit per acre or less)	26957.58775	GWW133	0.001	
Rural (1 dwelling unit per acre or less)	25135.54541	GWW133	0.001	0.002
Total (square feet)	11081190.216		0.397	
Total (square miles)	0.397			GWW133

Table D.2.2 Land Use Data				
LDUSE_DFN	AREA	DRNBSN_UL	Area (sq. mi.)	Cumulative Area (sq.mi.)
Large Lot Residential (>1 and <=2 du/acre)	120762.006	GWW1_4	0.004	
Large Lot Residential (>1 and <=2 du/acre)	592482.619	GWW1_4	0.021	0.026
Medium Density Residential (>5 and <=15 du/acre)	56166.108	GWW1_4	0.002	
Medium Density Residential (>5 and <=15 du/acre)	246894.157	GWW1_4	0.009	0.011
Rural (1 dwelling unit per acre or less)	0.004	GWW1_4	0.000	
Rural (1 dwelling unit per acre or less)	62184.050	GWW1_4	0.002	
Rural (1 dwelling unit per acre or less)	25176153.614	GWW1_4	0.903	0.905
Vacant	0.565	GWW1_4	0.000	
Vacant	210287.514	GWW1_4	0.008	
Vacant	1511933.124	GWW1_4	0.054	0.062
Total (square feet)	27976863.760		1.004	
Total (square miles)	1.004			GWW1_4
Airport	2233333.392	GWW1_5	0.080	
Hotel, Motel or Resort	717585.351	GWW1_5	0.026	
Large Lot Residential (>1 and <=2 du/acre)	3734.746	GWW1_5	0.000	
Large Lot Residential (>1 and <=2 du/acre)	176897.105	GWW1_5	0.006	
Large Lot Residential (>1 and <=2 du/acre)	366999.070	GWW1_5	0.013	
Large Lot Residential (>1 and <=2 du/acre)	469701.091	GWW1_5	0.017	
Large Lot Residential (>1 and <=2 du/acre)	1033898.039	GWW1_5	0.037	
Large Lot Residential (>1 and <=2 du/acre)	2645161.254	GWW1_5	0.095	0.168
Medium Density Residential (>5 and <=15 du/acre)	168177.082	GWW1_5	0.006	
Medium Density Residential (>5 and <=15 du/acre)	698469.688	GWW1_5	0.025	
Medium Density Residential (>5 and <=15 du/acre)	1476061.180	GWW1_5	0.053	
Medium Density Residential (>5 and <=15 du/acre)	2183539.852	GWW1_5	0.078	0.162
Neighborhood Retail Center (<100,000 sq.ft.)	125174.813	GWW1_5	0.004	
Neighborhood Retail Center (<100,000 sq.ft.)	174831.541	GWW1_5	0.006	
Neighborhood Retail Center (<100,000 sq.ft.)	507953.491	GWW1_5	0.018	
Neighborhood Retail Center (<100,000 sq.ft.)	1698829.219	GWW1_5	0.061	0.090
Recreational Open Space	5688703.958	GWW1_5	0.204	
Rural (1 dwelling unit per acre or less)	63854.372	GWW1_5	0.002	
Small Lot Residential (>2 and <=5 du/acre)	27963.549	GWW1_5	0.001	
Small Lot Residential (>2 and <=5 du/acre)	357534.142	GWW1_5	0.013	0.014
Vacant	12008.489	GWW1_5	0.000	
Vacant	58257.634	GWW1_5	0.002	
Vacant	87764.656	GWW1_5	0.003	
Vacant	324279.553	GWW1_5	0.012	
Vacant	629654.870	GWW1_5	0.023	
Vacant	1547422.818	GWW1_5	0.056	
Vacant	1639239.052	GWW1_5	0.059	
Vacant	2284887.414	GWW1_5	0.082	0.236
Total (square feet)	27401917.423		0.983	
Total (square miles)	0.983			GWW1_5
Rural (1 dwelling unit per acre or less)	15001271.488	GWW1_6	0.538	
Vacant	220479.941	GWW1_6	0.008	
Vacant	264850.536	GWW1_6	0.010	
Vacant	388618.362	GWW1_6	0.014	
Vacant	646048.039	GWW1_6	0.023	0.055
Total (square feet)	16521268.367		0.593	
Total (square miles)	0.593			GWW1_6

Table D.2.2 Land Use Data				
LDUSE_DFN	AREA	DRNBSN_UL	Area (sq. mi.)	Cumulative Area (sq.mi.)
Dedicated or Non-developable Open Space	1341474.544	GVW1	0.048	
Rural (1 dwelling unit per acre or less)	47019.870	GVW1	0.002	
Vacant	135315096.094	GVW1	4.854	
Total (square feet)	136703590.508		4.904	
Total (square miles)	4.904			GVW1
Neighborhood Retail Center (<100,000 sq.ft.)	88805.781	GVW2	0.003	
Recreational Open Space	18.910	GVW2	0.000	
Recreational Open Space	14002.848	GVW2	0.001	
Recreational Open Space	31621.472	GVW2	0.001	
Recreational Open Space	34247.238	GVW2	0.001	
Recreational Open Space	37149.338	GVW2	0.001	
Recreational Open Space	42883.687	GVW2	0.002	
Recreational Open Space	57812.209	GVW2	0.002	
Recreational Open Space	60521.095	GVW2	0.002	
Recreational Open Space	63342.920	GVW2	0.002	
Recreational Open Space	65537.033	GVW2	0.002	
Recreational Open Space	66209.301	GVW2	0.002	
Recreational Open Space	68209.697	GVW2	0.002	
Recreational Open Space	81225.068	GVW2	0.003	
Recreational Open Space	81608.014	GVW2	0.003	
Recreational Open Space	85824.281	GVW2	0.003	
Recreational Open Space	91109.756	GVW2	0.003	
Recreational Open Space	106623.869	GVW2	0.004	
Recreational Open Space	111554.691	GVW2	0.004	
Recreational Open Space	113372.180	GVW2	0.004	
Recreational Open Space	113526.355	GVW2	0.004	
Recreational Open Space	116046.400	GVW2	0.004	
Recreational Open Space	145494.094	GVW2	0.005	
Recreational Open Space	153453.031	GVW2	0.006	
Recreational Open Space	153521.411	GVW2	0.006	
Recreational Open Space	157016.279	GVW2	0.006	
Recreational Open Space	162629.391	GVW2	0.006	
Recreational Open Space	188138.863	GVW2	0.007	
Recreational Open Space	213726.631	GVW2	0.008	
Recreational Open Space	217254.986	GVW2	0.008	
Recreational Open Space	225502.451	GVW2	0.008	
Recreational Open Space	230022.818	GVW2	0.008	
Recreational Open Space	246045.332	GVW2	0.009	
Recreational Open Space	265458.676	GVW2	0.010	
Recreational Open Space	269783.283	GVW2	0.010	
Recreational Open Space	271405.532	GVW2	0.010	
Recreational Open Space	315032.145	GVW2	0.011	
Recreational Open Space	336707.379	GVW2	0.012	
Recreational Open Space	339067.462	GVW2	0.012	
Recreational Open Space	347410.608	GVW2	0.012	
Recreational Open Space	378116.566	GVW2	0.014	
Recreational Open Space	484018.962	GVW2	0.017	
Recreational Open Space	547826.119	GVW2	0.020	
Recreational Open Space	817233.730	GVW2	0.029	
Recreational Open Space	1156461.057	GVW2	0.041	
Recreational Open Space	3545348.017	GVW2	0.127	0.452

Table D.2.2 Land Use Data

LDUSE_DFN	AREA	DRNBSN_UL	Area (sq. mi.)	Cumulative Area (sq.mi.)
Rural (1 dwelling unit per acre or less)	216791.887	GVW2	0.008	
Rural (1 dwelling unit per acre or less)	683437.502	GVW2	0.025	
Rural (1 dwelling unit per acre or less)	1207136.902	GVW2	0.043	
Rural (1 dwelling unit per acre or less)	12345258.216	GVW2	0.443	
Rural (1 dwelling unit per acre or less)	18043521.497	GVW2	0.647	1.166
Small Lot Residential (>2 and <=5 du/acre)	3364664.567	GVW2	0.121	
Vacant	141.433	GVW2	0.000	
Vacant	119059482.836	GVW2	4.271	4.271
Water	7646.006	GVW2	0.000	
Water	20448.240	GVW2	0.001	
Water	74903.495	GVW2	0.003	
Water	79535.983	GVW2	0.003	
Water	117295.471	GVW2	0.004	0.011
Total (square feet)	167918191.000		6.023	
Total (square miles)	6.023			GVW2
Large Lot Residential (>1 and <=2 du/acre)	10964.802	GVW3_1	0.000	
Large Lot Residential (>1 and <=2 du/acre)	73563.280	GVW3_1	0.003	0.003
Neighborhood Retail Center (<100,000 sq.ft.)	26541.594	GVW3_1	0.001	
Neighborhood Retail Center (<100,000 sq.ft.)	31036.238	GVW3_1	0.001	0.002
Rural (1 dwelling unit per acre or less)	237366.333	GVW3_1	0.009	
Rural (1 dwelling unit per acre or less)	11872340.149	GVW3_1	0.426	0.434
Vacant	16826393.468	GVW3_1	0.604	
Total (square feet)	29078205.864		1.043	
Total (square miles)	1.043			GVW3_1
Rural (1 dwelling unit per acre or less)	4857.092	GVW3_2	0.000	
Rural (1 dwelling unit per acre or less)	8098.860	GVW3_2	0.000	
Rural (1 dwelling unit per acre or less)	12620.735	GVW3_2	0.000	
Rural (1 dwelling unit per acre or less)	54245.708	GVW3_2	0.002	
Rural (1 dwelling unit per acre or less)	64684.221	GVW3_2	0.002	
Rural (1 dwelling unit per acre or less)	174953.836	GVW3_2	0.006	
Rural (1 dwelling unit per acre or less)	288805.273	GVW3_2	0.010	
Rural (1 dwelling unit per acre or less)	337509.217	GVW3_2	0.012	
Rural (1 dwelling unit per acre or less)	3671712.503	GVW3_2	0.132	
Rural (1 dwelling unit per acre or less)	6567228.640	GVW3_2	0.236	0.401
Vacant	78639.546	GVW3_2	0.003	
Vacant	15820503.223	GVW3_2	0.567	0.570
Total (square feet)	27083858.854		0.971	
Total (square miles)	0.971			GVW3_2
Recreational Open Space	111431.892	GVW3_3	0.004	
Recreational Open Space	162402.643	GVW3_3	0.006	
Recreational Open Space	637200.811	GVW3_3	0.023	0.033
Rural (1 dwelling unit per acre or less)	239324.919	GVW3_3	0.009	
Rural (1 dwelling unit per acre or less)	1293513.243	GVW3_3	0.046	
Rural (1 dwelling unit per acre or less)	1373837.479	GVW3_3	0.049	
Rural (1 dwelling unit per acre or less)	2565715.731	GVW3_3	0.092	0.196
Small Lot Residential (>2 and <=5 du/acre)	502104.660	GVW3_3	0.018	
Vacant	2619392.986	GVW3_3	0.094	
Total (square feet)	9504924.365		0.341	
Total (square miles)	0.341			GVW3_3

Table D.2.2 Land Use Data				
LDUSE_DFN	AREA	DRNBSN_UL	Area (sq. mi.)	Cumulative Area (sq.mi.)
Dedicated or Non-developable Open Space	123491.544	GWW1_1	0.004	
Dedicated or Non-developable Open Space	177515.433	GWW1_1	0.006	0.011
Hotel, Motel or Resort	414437.608	GWW1_1	0.015	
Large Lot Residential (>1 and <=2 du/acre)	12.031	GWW1_1	0.000	
Large Lot Residential (>1 and <=2 du/acre)	6638.024	GWW1_1	0.000	
Large Lot Residential (>1 and <=2 du/acre)	72778.617	GWW1_1	0.003	
Large Lot Residential (>1 and <=2 du/acre)	7765932.449	GWW1_1	0.279	0.281
Recreational Open Space	28941.477	GWW1_1	0.001	
Recreational Open Space	29621.548	GWW1_1	0.001	
Recreational Open Space	39003.340	GWW1_1	0.001	
Recreational Open Space	73907.908	GWW1_1	0.003	
Recreational Open Space	76596.435	GWW1_1	0.003	
Recreational Open Space	404265.805	GWW1_1	0.015	
Recreational Open Space	2969063.010	GWW1_1	0.107	
Recreational Open Space	6384581.850	GWW1_1	0.229	0.359
Rural (1 dwelling unit per acre or less)	0.018	GWW1_1	0.000	
Rural (1 dwelling unit per acre or less)	0.208	GWW1_1	0.000	
Rural (1 dwelling unit per acre or less)	0.931	GWW1_1	0.000	
Rural (1 dwelling unit per acre or less)	7.355	GWW1_1	0.000	
Rural (1 dwelling unit per acre or less)	9.043	GWW1_1	0.000	
Rural (1 dwelling unit per acre or less)	21008.426	GWW1_1	0.001	
Rural (1 dwelling unit per acre or less)	648372.526	GWW1_1	0.023	
Rural (1 dwelling unit per acre or less)	4827133.785	GWW1_1	0.173	
Rural (1 dwelling unit per acre or less)	5036987.443	GWW1_1	0.181	
Rural (1 dwelling unit per acre or less)	31529069.855	GWW1_1	1.131	1.509
Small Lot Residential (>2 and <=5 du/acre)	903266.207	GWW1_1	0.032	
Small Lot Residential (>2 and <=5 du/acre)	1127022.296	GWW1_1	0.040	
Small Lot Residential (>2 and <=5 du/acre)	1414377.060	GWW1_1	0.051	0.124
Vacant	301757.051	GWW1_1	0.011	
Vacant	320101.666	GWW1_1	0.011	
Vacant	714388.407	GWW1_1	0.026	
Vacant	5626241.516	GWW1_1	0.202	0.250
Water	75692.665	GWW1_1	0.003	
Total (square feet)	71112223.539		2.551	
Total (square miles)	2.551			GWW1_1

Table D.2.2 Land Use Data

LDUSE_DFN	AREA	DRNBSN_UL	Area (sq. mi.)	Cumulative Area (sq.mi.)
Dedicated or Non-developable Open Space	184045.324	GWW1_2	0.007	
Large Lot Residential (>1 and <=2 du/acre)	205309.364	GWW1_2	0.007	
Neighborhood Retail Center (<100,000 sq.ft.)	187830.918	GWW1_2	0.007	
Recreational Open Space	4.518	GWW1_2	0.000	
Recreational Open Space	1163049.160	GWW1_2	0.042	
Recreational Open Space	4827822.698	GWW1_2	0.173	0.215
Rural (1 dwelling unit per acre or less)	0.771	GWW1_2	0.000	
Rural (1 dwelling unit per acre or less)	57.156	GWW1_2	0.000	
Rural (1 dwelling unit per acre or less)	6631070.472	GWW1_2	0.238	
Rural (1 dwelling unit per acre or less)	9775796.440	GWW1_2	0.351	0.589
Small Lot Residential (>2 and <=5 du/acre)	695911.549	GWW1_2	0.025	
Vacant	59.036	GWW1_2	0.000	
Vacant	247.280	GWW1_2	0.000	
Vacant	21369.137	GWW1_2	0.001	
Vacant	28410.395	GWW1_2	0.001	
Vacant	101623.937	GWW1_2	0.004	
Vacant	182522.074	GWW1_2	0.007	
Vacant	271986.432	GWW1_2	0.010	
Vacant	2260368.632	GWW1_2	0.081	
Vacant	2546429.372	GWW1_2	0.091	0.194
Total (square feet)	29083914.667		1.043	
Total (square miles)	1.043			GWW1_2
Large Lot Residential (>1 and <=2 du/acre)	3373939.69051	GWW131	0.121	
Large Lot Residential (>1 and <=2 du/acre)	181522.21159	GWW131	0.007	0.007
Recreational Open Space	21009.99453	GWW131	0.001	0.001
Rural (1 dwelling unit per acre or less)	7150518.33766	GWW131	0.256	
Rural (1 dwelling unit per acre or less)	9494167.85766	GWW131	0.341	
Rural (1 dwelling unit per acre or less)	287276.41797	GWW131	0.010	
Rural (1 dwelling unit per acre or less)	512673.63281	GWW131	0.018	
Rural (1 dwelling unit per acre or less)	315459.19472	GWW131	0.011	0.637
Vacant	227030.88867	GWW131	0.008	
Vacant	3692.67712	GWW131	0.000	0.008
Total (square feet)	21567290.903		0.774	
Total (square miles)	0.774			GWW131
Large Lot Residential (>1 and <=2 du/acre)	868864.43720	GWW132	0.031	
Large Lot Residential (>1 and <=2 du/acre)	70143.60481	GWW132	0.003	0.034
Recreational Open Space	283.32065	GWW132	0.000	
Recreational Open Space	841676.68269	GWW132	0.030	
Recreational Open Space	40922.45305	GWW132	0.001	
Recreational Open Space	986.34611	GWW132	0.000	0.032
Rural (1 dwelling unit per acre or less)	2735832.47085	GWW132	0.098	
Rural (1 dwelling unit per acre or less)	1652.55387	GWW132	0.000	
Rural (1 dwelling unit per acre or less)	5059465.18894	GWW132	0.181	0.280
Vacant	63757.31702	GWW132	0.002	0
Total (square feet)	9683584.375		0.347	
Total (square miles)	0.347			GWW132
Hotel, Motel or Resort	251811.80562	GWW133	0.009	0.009
Large Lot Residential (>1 and <=2 du/acre)	8091627.99397	GWW133	0.290	0.290
Medium Density Residential (>5 and <=15 du/acre)	68762.60758	GWW133	0.002	0.002
Recreational Open Space	2616894.67611	GWW133	0.094	0.094
Rural (1 dwelling unit per acre or less)	26957.58775	GWW133	0.001	
Rural (1 dwelling unit per acre or less)	25135.54541	GWW133	0.001	0.002
Total (square feet)	11081190.216		0.397	
Total (square miles)	0.397			GWW133

Table D.2.2 Land Use Data

LDUSE_DFN	AREA	DRNBSN_UL	Area (sq. mi.)	Cumulative Area (sq.mi.)
Large Lot Residential (>1 and <=2 du/acre)	120762.006	GWW1_4	0.004	
Large Lot Residential (>1 and <=2 du/acre)	592482.619	GWW1_4	0.021	0.026
Medium Density Residential (>5 and <=15 du/acre)	56166.108	GWW1_4	0.002	
Medium Density Residential (>5 and <=15 du/acre)	246894.157	GWW1_4	0.009	0.011
Rural (1 dwelling unit per acre or less)	0.004	GWW1_4	0.000	
Rural (1 dwelling unit per acre or less)	62184.050	GWW1_4	0.002	
Rural (1 dwelling unit per acre or less)	25176153.614	GWW1_4	0.903	0.905
Vacant	0.565	GWW1_4	0.000	
Vacant	210287.514	GWW1_4	0.008	
Vacant	1511933.124	GWW1_4	0.054	0.062
Total (square feet)	27976863.760		1.004	
Total (square miles)	1.004			GWW1_4
Airport	2233333.392	GWW1_5	0.080	
Hotel, Motel or Resort	717585.351	GWW1_5	0.026	
Large Lot Residential (>1 and <=2 du/acre)	3734.746	GWW1_5	0.000	
Large Lot Residential (>1 and <=2 du/acre)	176897.105	GWW1_5	0.006	
Large Lot Residential (>1 and <=2 du/acre)	366999.070	GWW1_5	0.013	
Large Lot Residential (>1 and <=2 du/acre)	469701.091	GWW1_5	0.017	
Large Lot Residential (>1 and <=2 du/acre)	1033898.039	GWW1_5	0.037	
Large Lot Residential (>1 and <=2 du/acre)	2645161.254	GWW1_5	0.095	0.168
Medium Density Residential (>5 and <=15 du/acre)	168177.082	GWW1_5	0.006	
Medium Density Residential (>5 and <=15 du/acre)	698469.688	GWW1_5	0.025	
Medium Density Residential (>5 and <=15 du/acre)	1476061.180	GWW1_5	0.053	
Medium Density Residential (>5 and <=15 du/acre)	2183539.852	GWW1_5	0.078	0.162
Neighborhood Retail Center (<100,000 sq.ft.)	125174.813	GWW1_5	0.004	
Neighborhood Retail Center (<100,000 sq.ft.)	174831.541	GWW1_5	0.006	
Neighborhood Retail Center (<100,000 sq.ft.)	507953.491	GWW1_5	0.018	
Neighborhood Retail Center (<100,000 sq.ft.)	1698829.219	GWW1_5	0.061	0.090
Recreational Open Space	5688703.958	GWW1_5	0.204	
Rural (1 dwelling unit per acre or less)	63854.372	GWW1_5	0.002	
Small Lot Residential (>2 and <=5 du/acre)	27963.549	GWW1_5	0.001	
Small Lot Residential (>2 and <=5 du/acre)	357534.142	GWW1_5	0.013	0.014
Vacant	12008.489	GWW1_5	0.000	
Vacant	58257.634	GWW1_5	0.002	
Vacant	87764.656	GWW1_5	0.003	
Vacant	324279.553	GWW1_5	0.012	
Vacant	629654.870	GWW1_5	0.023	
Vacant	1547422.818	GWW1_5	0.056	
Vacant	1639239.052	GWW1_5	0.059	
Vacant	2284887.414	GWW1_5	0.082	0.236
Total (square feet)	27401917.423		0.983	
Total (square miles)	0.983			GWW1_5
Rural (1 dwelling unit per acre or less)	15001271.488	GWW1_6	0.538	
Vacant	220479.941	GWW1_6	0.008	
Vacant	264850.536	GWW1_6	0.010	
Vacant	388618.362	GWW1_6	0.014	
Vacant	646048.039	GWW1_6	0.023	0.055
Total (square feet)	16521268.367		0.593	
Total (square miles)	0.593			GWW1_6

LOSS PARAMETERS FOR SUBBASIN: GWW1_1

Soil Survey Used Maricopa

XKSAT

Map Unit	AREA Sq.Miles	% Area	XKSAT	% Rock Outcrop
A_6	0.317	12.4	0.62	0
A_24	0.010	0.4	0.02	0
A_33	0.135	5.3	0.23	0
A_40	0.183	7.2	0.17	0
A_41	0.102	4.0	0.17	0
A_61	0.083	3.3	0.15	0
A_63	1.146	44.9	0.14	25
A_72	0.096	3.8	0.09	30
A_93	0.007	0.3	0.33	0
A_96	0.079	3.1	0.07	0
T_301	0.393	15.4	0.40	0

TOTAL = 2.551 Sq.Miles XKSAT = 0.20 %Rock = 12

DTHETA

Dry = 0.37 PSIF = 5.30
Normal = 0.25
Wet = 0.00

LAND USE

AREA Sq.Miles	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
	Airport		NORMAL	8	85	0.07	0.02	Min	
0.011	DedOpSpc	0.4	NORMAL	35	0	0.20	0.05	Hi	0.13
0.281	LgLotRes	11.0	NORMAL	35	15	0.18	0.04	Low	0.05
	MedDRes		NORMAL	25	30	0.15	0.03	Low	
	NRC		NORMAL	10	80	0.07	0.02	Min	
0.359	RecOpSc	14.1	NORMAL	75	0	0.20	0.03	Low	0.05
0.015	Resort	0.6	NORMAL	32	60	0.11	0.03	Low	0.07
1.508	Rural	59.1	NORMAL	30	0	0.20	0.04	Low	0.04
0.124	SmLotRes	4.9	NORMAL	30	25	0.15	0.04	Low	0.05
0.250	Vacant	9.8	NORMAL	30	0	0.20	0.05	Hi	0.09
0.003	Water	0.1	NORMAL	0	10	0.00	0.00	Min	0.04
2.551 = Total Area			Avg. =	37	3%	0.190			

PERCENT OF SUBBASIN DRY = 0.0 %
NORMAL = 100. %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.25

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.26

IMPERVIOUS AREA: URBAN @ 100 % effective = 3
ROCK OUTCROP @ 50 % effective = 12
% EFFECTIVE IMP. = 9

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	Area sq. mi.	Length mi.	Lca	Kn	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %	Lag min.
GWW1_1	2.552	4.64	2.04	0.04	196.1	0.19	0.25	5.30	0.26	9	48

LOSS PARAMETERS FOR SUBBASIN: GWW1_2

Soil Survey Used Maricopa

XKSAT

Map Unit	AREA Sq.Miles	% Area	XKSAT	% Rock Outcrop
A_6	0.060	5.8	0.62	0
A_33	0.781	74.9	0.23	0
A_34	0.014	1.3	0.23	0
A_40	0.011	1.1	0.17	0
A_63	0.076	7.3	0.14	25
A_93	0.007	0.7	0.33	0
A_96	0.092	8.8	0.07	0
T_301	0.002	0.2	0.40	0
TOTAL =	1.043 Sq.Miles	XKSAT = 0.21	%Rock =	2

DTHETA

Dry = 0.37 PSIF = 5.20
Normal = 0.25
Wet = 0.00

LAND USE

AREA Sq.Miles	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
	Airport		NORMAL	8	85	0.07	0.02	Min	
0.007	DedOpSpc	0.7	NORMAL	35	0	0.20	0.05	Hi	0.13
0.007	LgLotRes	0.7	NORMAL	35	15	0.18	0.04	Low	0.07
	MedDRes		NORMAL	25	30	0.15	0.03	Low	
0.007	NRC	0.7	NORMAL	10	80	0.07	0.02	Min	0.04
0.215	RecOpSc	20.6	NORMAL	75	0	0.20	0.03	Low	0.05
	Resort		NORMAL	32	60	0.11	0.03	Low	
0.588	Rural	56.4	NORMAL	30	0	0.20	0.04	Low	0.04
0.025	SmLotRes	2.4	NORMAL	30	25	0.15	0.04	Low	0.06
0.194	Vacant	18.6	NORMAL	30	0	0.20	0.05	Hi	0.10
	Water		NORMAL	0	10	0.00	0.00	Min	
1.043 = Total Area			Avg. =	39	1%	0.200			

PERCENT OF SUBBASIN DRY = 0.0 %
NORMAL = 100. %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.25

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.28

IMPERVIOUS AREA: URBAN @ 100 % effective = 1
ROCK OUTCROP @ 50 % effective = 2
% EFFECTIVE IMP. = 2

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	Area sq. mi.	Length mi.	Lca	Kn	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %	Lag min.
GWW1_2	1.043	3.88	1.87	0.04	164.9	0.20	0.25	5.20	0.28	2	45

LOSS PARAMETERS FOR SUBBASIN: GWW131

Soil Survey Used Maricopa

XKSAT

Map Unit	AREA Sq.Miles	% Area	XKSAT	% Rock Outcrop
A_6	0.074	9.6	0.62	0
A_24	0.015	1.9	0.02	0
A_34	0.028	3.6	0.23	0
A_40	0.180	23.3	0.17	0
A_41	0.337	43.5	0.17	0
A_72	0.019	2.5	0.09	30
A_93	0.086	11.1	0.33	0
A_96	0.035	4.5	0.07	0
TOTAL =	0.774 Sq.Miles	XKSAT = 0.19	%Rock = 1	

DTHETA

Dry = 0.38 PSIF = 5.40
Normal = 0.25
Wet = 0.00

LAND USE

AREA Sq.Miles	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
	Airport		NORMAL	8	85	0.07	0.02	Min	
	DedOpSpc		NORMAL	35	0	0.20	0.05	Hi	
0.128	LgLotRes	16.5	NORMAL	35	15	0.18	0.04	Low	0.05
	MedDRes		NORMAL	25	30	0.15	0.03	Low	
	NRC		NORMAL	10	80	0.07	0.02	Min	
0.001	RecOpSc	0.1	NORMAL	75	0	0.20	0.03	Low	0.08
	Resort		NORMAL	32	60	0.11	0.03	Low	
0.637	Rural	82.3	NORMAL	30	0	0.20	0.04	Low	0.04
	SmLotRes		NORMAL	30	25	0.15	0.04	Low	
0.008	Vacant	1.0	NORMAL	30	0	0.20	0.05	Hi	0.13
	Water		NORMAL	0	10	0.00	0.00	Min	
0.774 = Total Area			Avg. =	31	2%	0.200			

PERCENT OF SUBBASIN DRY = 0.0 %
NORMAL = 100. %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.25

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.23

IMPERVIOUS AREA: URBAN @ 100 % effective = 2
ROCK OUTCROP @ 50 % effective = 1
% EFFECTIVE IMP. = 3

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	Area sq. mi.	Length mi.	Lca	Kn	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %	Lag min.
GWW131	0.774	2.58	1.28	0.04	158.9	0.20	0.25	5.40	0.23	3	35

LOSS PARAMETERS FOR SUBBASIN: GWW132

Soil Survey Used Maricopa

XKSAT

Map Unit	AREA Sq.Miles	% Area	XKSAT	% Rock Outcrop
A_6	0.008	2.3	0.62	0
A_33	0.085	24.5	0.23	0
A_34	0.031	8.9	0.23	0
A_40	0.110	31.7	0.17	0
A_93	0.075	21.6	0.33	0
A_96	0.038	10.9	0.07	0
TOTAL =	0.347 Sq.Miles	XKSAT = 0.20	%Rock =	0

DTHETA

Dry = 0.37 PSIF = 5.30
Normal = 0.25
Wet = 0.00

LAND USE

AREA Sq.Miles	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
	Airport		NORMAL	8	85	0.07	0.02	Min	
	DedOpSpc		NORMAL	35	0	0.20	0.05	Hi	
0.034	LgLotRes	9.8	NORMAL	35	15	0.18	0.04	Low	0.06
	MedDRes		NORMAL	25	30	0.15	0.03	Low	
	NRC		NORMAL	10	80	0.07	0.02	Min	
0.032	RecOpSc	9.2	NORMAL	75	0	0.20	0.03	Low	0.06
	Resort		NORMAL	32	60	0.11	0.03	Low	
0.280	Rural	80.7	NORMAL	30	0	0.20	0.04	Low	0.05
	SmLotRes		NORMAL	30	25	0.15	0.04	Low	
0.001	Vacant	0.3	NORMAL	30	0	0.20	0.05	Hi	0.15
	Water		NORMAL	0	10	0.00	0.00	Min	
0.347 = Total Area			Avg. =	35	1%	0.200			

PERCENT OF SUBBASIN DRY = 0.0 %
NORMAL = 100. %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.25

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.26

IMPERVIOUS AREA: URBAN @ 100 % effective = 1
ROCK OUTCROP @ 100 % effective = 0
% EFFECTIVE IMP. = 1

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	Area sq. mi.	Length mi.	Lca	Kn	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %	Lag min.
GWW132	0.347	1.56	0.70	0.04	141.0	0.20	0.25	5.30	0.26	1	23

LOSS PARAMETERS FOR SUBBASIN: GWW133

Soil Survey Used Maricopa

XKSAT

Map Unit	AREA Sq.Miles	% Area	XKSAT	% Rock Outcrop
A_6	0.051	12.9	0.62	0
A_34	0.056	14.1	0.23	0
A_40	0.168	42.3	0.17	0
A_93	0.001	0.3	0.33	0
A_96	0.121	30.5	0.07	0
TOTAL =	0.397 Sq.Miles		XKSAT = 0.16	%Rock = 0

DTHETA

Dry = 0.39 PSIF = 5.80
Normal = 0.25
Wet = 0.00

LAND USE

AREA Sq.Miles	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
	Airport		NORMAL	8	85	0.07	0.02	Min	
	DedOpSpc		NORMAL	35	0	0.20	0.05	Hi	
0.290	LgLotRes	73.1	NORMAL	35	15	0.18	0.04	Low	0.05
0.002	MedDRes	0.5	NORMAL	25	30	0.15	0.03	Low	0.08
	NRC		NORMAL	10	80	0.07	0.02	Min	
0.094	RecOpSc	23.7	NORMAL	75	0	0.20	0.03	Low	0.06
0.009	Resort	2.3	NORMAL	32	60	0.11	0.03	Low	0.07
0.002	Rural	0.5	NORMAL	30	0	0.20	0.04	Low	0.08
	SmLotRes		NORMAL	30	25	0.15	0.04	Low	
	Vacant		NORMAL	30	0	0.20	0.05	Hi	
	Water		NORMAL	0	10	0.00	0.00	Min	
0.397 = Total Area			Avg. =	46	12%	0.180			

PERCENT OF SUBBASIN DRY = 0.0 %
NORMAL = 100. %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.25

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.22

IMPERVIOUS AREA: URBAN @ 100 % effective = 12
ROCK OUTCROP @ 100 % effective = 0
% EFFECTIVE IMP. = 12

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	Area sq. mi.	Length mi.	Lca	Kn	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %	Lag min.
GWW133	0.397	1.59	0.90	0.04	157.2	0.18	0.25	5.80	0.22	12	23

LOSS PARAMETERS FOR SUBBASIN: GWW1_4

Soil Survey Used Maricopa

XKSAT

Map Unit	AREA Sq.Miles	% Area	XKSAT	% Rock Outcrop
A_6	0.039	3.9	0.62	0
A_33	0.034	3.4	0.23	0
A_40	0.084	8.4	0.17	0
A_41	0.579	57.7	0.17	0
A_72	0.001	0.1	0.09	30
A_93	0.084	8.4	0.33	0
A_96	0.181	18.0	0.07	0
A_121	0.002	0.2	0.12	0
TOTAL =	1.004 Sq.Miles	XKSAT = 0.16	%Rock =	0

DTHETA

Dry = 0.39 PSIF = 5.80
Normal = 0.25
Wet = 0.00

LAND USE

AREA Sq.Miles	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
	Airport		NORMAL	8	85	0.07	0.02	Min	
	DedOpSpc		NORMAL	35	0	0.20	0.05	Hi	
0.026	LgLotRes	2.6	NORMAL	35	15	0.18	0.04	Low	0.06
0.011	MedDRes	1.1	NORMAL	25	30	0.15	0.03	Low	0.07
	NRC		NORMAL	10	80	0.07	0.02	Min	
	RecOpSc		NORMAL	75	0	0.20	0.03	Low	
	Resort		NORMAL	32	60	0.11	0.03	Low	
0.905	Rural	90.1	NORMAL	30	0	0.20	0.04	Low	0.04
	SmLotRes		NORMAL	30	25	0.15	0.04	Low	
0.062	Vacant	6.2	NORMAL	30	0	0.20	0.05	Hi	0.11
	Water		NORMAL	0	10	0.00	0.00	Min	
1.004 = Total Area			Avg. =	30	1%	0.200			

PERCENT OF SUBBASIN DRY = 0.0 %
NORMAL = 100. %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.25

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.20

IMPERVIOUS AREA: URBAN @ 100 % effective = 1
ROCK OUTCROP @ 50 % effective = 0
% EFFECTIVE IMP. = 1

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	Area sq. mi.	Length mi.	Lca	Kn	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %	Lag min.
GWW1_4	1.004	3.64	2.11	0.04	274.7	0.20	0.25	5.80	0.20	1	43

LOSS PARAMETERS FOR SUBBASIN: GWW1_5

Soil Survey Used Maricopa

XKSAT

Map Unit	AREA Sq.Miles	% Area	XKSAT	% Rock Outcrop
A_6	0.014	1.4	0.62	0
A_28	0.010	1.0	0.02	0
A_33	0.187	19.0	0.23	0
A_34	0.063	6.4	0.23	0
A_40	0.044	4.5	0.17	0
A_72	0.005	0.5	0.09	30
A_93	0.192	19.5	0.33	0
A_96	0.468	47.6	0.07	0
TOTAL =	0.983 Sq.Miles		XKSAT = 0.14	%Rock = 0

DTHETA

Dry = 0.39 PSIF = 6.20
Normal = 0.23
Wet = 0.00

LAND USE

AREA Sq.Miles	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
0.080	Airport	8.1	NORMAL	8	85	0.07	0.02	Min	0.03
	DedOpSpc		NORMAL	35	0	0.20	0.05	Hi	
0.168	LgLotRes	17.1	NORMAL	35	15	0.18	0.04	Low	0.05
0.162	MedDRes	16.5	NORMAL	25	30	0.15	0.03	Low	0.05
0.090	NRC	9.2	NORMAL	10	80	0.07	0.02	Min	0.03
0.204	RecOpSc	20.8	NORMAL	75	0	0.20	0.03	Low	0.05
0.026	Resort	2.6	NORMAL	32	60	0.11	0.03	Low	0.06
0.002	Rural	0.2	NORMAL	30	0	0.20	0.04	Low	0.08
0.014	SmLotRes	1.4	NORMAL	30	25	0.15	0.04	Low	0.07
0.237	Vacant	24.1	NORMAL	30	0	0.20	0.05	Hi	0.10
	Water		NORMAL	0	10	0.00	0.00	Min	
0.983 = Total Area			Avg. =	42	24%	0.160			

PERCENT OF SUBBASIN DRY = 0.0 %
NORMAL = 100. %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.23

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.19

IMPERVIOUS AREA: URBAN @ 100 % effective = 24
ROCK OUTCROP @ 50 % effective = 0
% EFFECTIVE IMP. = 24

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	Area sq. mi.	Length mi.	Lca	Kn	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %	Lag min.
GWW1_5	0.983	3.57	1.89	0.03	112.6	0.16	0.23	6.20	0.19	24	41

LOSS PARAMETERS FOR SUBBASIN: GWW1_6

Soil Survey Used Maricopa

XKSAT

Map Unit	AREA Sq.Miles	% Area	XKSAT	% Rock Outcrop
A_6	0.019	3.2	0.62	0
A_33	0.034	5.7	0.23	0
A_34	0.306	51.6	0.23	0
A_41	0.175	29.5	0.17	0
A_93	0.007	1.2	0.33	0
A_96	0.044	7.4	0.07	0
A_121	0.008	1.3	0.12	0
TOTAL =	0.593 Sq.Miles		XKSAT = 0.20	%Rock = 0

DTHETA

Dry = 0.37 PSIF = 5.30
Normal = 0.25
Wet = 0.00

LAND USE

AREA Sq.Miles	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
	Airport		NORMAL	8	85	0.07	0.02	Min	
	DedOpSpc		NORMAL	35	0	0.20	0.05	Hi	
	LgLotRes		NORMAL	35	15	0.18	0.04	Low	
	MedDRes		NORMAL	25	30	0.15	0.03	Low	
	NRC		NORMAL	10	80	0.07	0.02	Min	
	RecOpSc		NORMAL	75	0	0.20	0.03	Low	
	Resort		NORMAL	32	60	0.11	0.03	Low	
0.539	Rural	90.9	NORMAL	30	0	0.20	0.04	Low	0.05
	SmLotRes		NORMAL	30	25	0.15	0.04	Low	
0.054	Vacant	9.1	NORMAL	30	0	0.20	0.05	Hi	0.11
	Water		NORMAL	0	10	0.00	0.00	Min	
0.593 = Total Area			Avg. =	30	0%	0.200			

PERCENT OF SUBBASIN DRY = 0.0 %
NORMAL = 100. %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.25

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.24

IMPERVIOUS AREA: URBAN @ 100 % effective = 0
ROCK OUTCROP @ 50 % effective = 0
% EFFECTIVE IMP. = 0

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	Area sq. mi.	Length mi.	Lca	Kn	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %	Lag min.
GWW1_6	0.593	2.61	1.31	0.04	164.8	0.20	0.25	5.30	0.24	0	35

LOSS PARAMETERS FOR SUBBASIN: GVW2

Soil Survey Used Custom

XKSAT

Map Unit	AREA Sq.Miles	% Area	XKSAT	% Rock Outcrop
A_8	0.217	3.6	0.00	0
A_26	0.000	0.0	0.01	0
A_34	0.016	0.3	0.23	0
A_41	0.738	12.2	0.17	0
A_61	0.047	0.8	0.15	0
A_63	2.518	41.8	0.14	25
A_72	2.050	34.0	0.09	30
A_93	0.153	2.5	0.33	0
A_104	0.081	1.3	0.14	60
T_301	0.201	3.3	0.40	0
T_303	0.002	0.0	0.40	15
TOTAL =	6.023 Sq.Miles	XKSAT = 0.14	%Rock = 21	

DTHETA

Dry = 0.39 PSIF = 6.20
Normal = 0.23
Wet = 0.00

LAND USE

AREA Sq.Miles	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
	Airport		NORMAL	8	85	0.07	0.02	Min	
	DedOpSpc		NORMAL	35	0	0.20	0.05	Hi	
	LgLotRes		NORMAL	35	15	0.18	0.04	Low	
	MedDRes		NORMAL	25	30	0.15	0.03	Low	
0.003	NRC	0.0	NORMAL	10	80	0.07	0.02	Min	0.04
0.452	RecOpSc	7.5	NORMAL	75	0	0.20	0.03	Low	0.05
	Resort		NORMAL	32	60	0.11	0.03	Low	
1.166	Rural	19.4	NORMAL	30	0	0.20	0.04	Low	0.04
0.121	SmLotRes	2.0	NORMAL	30	25	0.15	0.04	Low	0.05
4.270	Vacant	70.9	NORMAL	30	0	0.20	0.05	Hi	0.06
0.011	Water	0.2	NORMAL	0	10	0.00	0.00	Min	0.03
6.023 = Total Area			Avg. =	33	1%	0.200			

PERCENT OF SUBBASIN DRY = 0.0 %
NORMAL = 100. %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.23

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.18

IMPERVIOUS AREA: URBAN @ 100 % effective = 1
ROCK OUTCROP @ 50 % effective = 21
% EFFECTIVE IMP. = 12

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	Area sq. mi.	Length mi.	Lca	Kn	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %	Lag min.
GVW2	6.023	5.51	2.77	0.04	371.1	0.20	0.23	6.20	0.18	12	57

LOSS PARAMETERS FOR SUBBASIN: GVW3_1

Soil Survey Used Maricopa

XKSAT

Map Unit	AREA Sq.Miles	% Area	XKSAT	% Rock Outcrop
A_6	0.113	10.8	0.62	0
A_8	0.054	5.2	0.96	0
A_26	0.069	6.6	0.01	0
A_33	0.017	1.6	0.23	0
A_34	0.541	51.9	0.23	0
A_41	0.120	11.5	0.17	0
A_93	0.067	6.4	0.33	0
A_96	0.045	4.3	0.07	0
A_121	0.017	1.6	0.12	0
TOTAL =	1.043 Sq.Miles		XKSAT = 0.21	%Rock = 0

DTHETA

Dry = 0.37 PSIF = 5.20
Normal = 0.25
Wet = 0.00

LAND USE

AREA Sq.Miles	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
	Airport		NORMAL	8	85	0.07	0.02	Min	
	DedOpSpc		NORMAL	35	0	0.20	0.05	Hi	
0.003	LgLotRes	0.3	NORMAL	35	15	0.18	0.04	Low	0.08
	MedDRes		NORMAL	25	30	0.15	0.03	Low	
0.002	NRC	0.2	NORMAL	10	80	0.07	0.02	Min	0.04
	RecOpSc		NORMAL	75	0	0.20	0.03	Low	
	Resort		NORMAL	32	60	0.11	0.03	Low	
0.434	Rural	41.6	NORMAL	30	0	0.20	0.04	Low	0.05
	SmLotRes		NORMAL	30	25	0.15	0.04	Low	
0.604	Vacant	57.9	NORMAL	30	0	0.20	0.05	Hi	0.09
	Water		NORMAL	0	10	0.00	0.00	Min	
1.043 = Total Area			Avg. =	30	0%	0.200			

PERCENT OF SUBBASIN DRY = 0.0 %
NORMAL = 100. %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.25

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.26

IMPERVIOUS AREA: URBAN @ 100 % effective = 0
ROCK OUTCROP @ 50 % effective = 0
% EFFECTIVE IMP. = 0

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	Area sq. mi.	Length mi.	Lca	Kn	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %	Lag min.
GVW3_1	1.043	3.31	1.51	0.04	184.3	0.20	0.25	5.20	0.26	0	42

LOSS PARAMETERS FOR SUBBASIN: GVW1

Soil Survey Used Maricopa

XKSAT

Map Unit	AREA Sq.Miles	% Area	XKSAT	% Rock Outcrop
A_6	0.064	1.3	0.62	0
A_8	0.118	2.4	0.96	0
A_26	0.048	1.0	0.01	0
A_33	0.001	0.0	0.23	0
A_34	0.224	4.6	0.23	0
A_41	0.109	2.2	0.17	0
A_72	3.262	66.5	0.09	30
A_93	0.009	0.2	0.33	0
A_104	1.014	20.7	0.14	60
T_303	0.055	1.1	0.40	15

TOTAL = 4.904 Sq.Miles XKSAT = 0.11 %Rock = 33

DTHETA

Dry = 0.36 PSIF = 6.80
Normal = 0.17
Wet = 0.00

LAND USE

AREA Sq.Miles	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
	Airport		NORMAL	8	85	0.07	0.02	Min	
0.048	DedOpSpc	1.0	NORMAL	35	0	0.20	0.05	Hi	0.11
	LgLotRes		NORMAL	35	15	0.18	0.04	Low	
	MedDRes		NORMAL	25	30	0.15	0.03	Low	
	NRC		NORMAL	10	80	0.07	0.02	Min	
	RecOpSc		NORMAL	75	0	0.20	0.03	Low	
	Resort		NORMAL	32	60	0.11	0.03	Low	
0.002	Rural	0.0	NORMAL	30	0	0.20	0.04	Low	0.08
	SmLotRes		NORMAL	30	25	0.15	0.04	Low	
4.854	Vacant	99.0	NORMAL	30	0	0.20	0.05	Hi	0.06
	Water		NORMAL	0	10	0.00	0.00	Min	
4.904 = Total Area			Avg. =	30	0%	0.200			

PERCENT OF SUBBASIN DRY = 0.0 %
NORMAL = 100. %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.17

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.13

IMPERVIOUS AREA: URBAN @ 100 % effective = 0
ROCK OUTCROP @ 50 % effective = 33
% EFFECTIVE IMP. = 17

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	Area sq. mi.	Length mi.	Lca	Kn	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %	Lag min.
GVW1	4.904	6.19	3.56	0.05	298.9	0.20	0.17	6.80	0.13	17	71

LOSS PARAMETERS FOR SUBBASIN: GVW3_2

Soil Survey Used Maricopa

XKSAT

Map Unit	AREA Sq.Miles	% Area	XKSAT	% Rock Outcrop
A_6	0.044	4.5	0.62	0
A_8	0.216	22.2	0.96	0
A_26	0.165	17.0	0.01	0
A_33	0.074	7.6	0.23	0
A_34	0.429	44.1	0.23	0
A_41	0.000	0.0	0.17	0
A_93	0.044	4.5	0.33	0
TOTAL =	0.972 Sq.Miles		XKSAT = 0.20	%Rock = 0

DTHETA

Dry = 0.37 PSIF = 5.30
Normal = 0.25
Wet = 0.00

LAND USE

AREA Sq.Miles	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
	Airport		NORMAL	8	85	0.07	0.02	Min	
	DedOpSpc		NORMAL	35	0	0.20	0.05	Hi	
	LgLotRes		NORMAL	35	15	0.18	0.04	Low	
	MedDRes		NORMAL	25	30	0.15	0.03	Low	
	NRC		NORMAL	10	80	0.07	0.02	Min	
	RecOpSc		NORMAL	75	0	0.20	0.03	Low	
	Resort		NORMAL	32	60	0.11	0.03	Low	
0.401	Rural	41.3	NORMAL	30	0	0.20	0.04	Low	0.05
	SmLotRes		NORMAL	30	25	0.15	0.04	Low	
0.571	Vacant	58.7	NORMAL	30	0	0.20	0.05	Hi	0.09
	Water		NORMAL	0	10	0.00	0.00	Min	
0.972 = Total Area			Avg. =	30	0%	0.200			

PERCENT OF SUBBASIN DRY = 0.0 %
NORMAL = 100. %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.25

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.24

IMPERVIOUS AREA: URBAN @ 100 % effective = 0
ROCK OUTCROP @ 50 % effective = 0
% EFFECTIVE IMP. = 0

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	Area sq. mi.	Length mi.	Lca	Kn	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %	Lag min.
GVW3_2	0.972	2.42	1.26	0.04	144.6	0.20	0.25	5.30	0.24	0	37

LOSS PARAMETERS FOR SUBBASIN: GVW3_3

Soil Survey Used Maricopa

XKSAT

Map Unit	AREA Sq.Miles	% Area	XKSAT	% Rock Outcrop
A_6	0.001	0.3	0.62	0
A_8	0.031	9.1	0.96	0
A_12	0.022	6.5	0.01	0
A_26	0.029	8.5	0.01	0
A_33	0.178	52.2	0.23	0
A_34	0.019	5.6	0.23	0
A_72	0.016	4.7	0.09	30
A_93	0.029	8.5	0.33	0
A_96	0.016	4.7	0.07	0
TOTAL =	0.341 Sq.Miles	XKSAT = 0.15	%Rock = 1	

DTHETA

Dry = 0.40 PSIF = 6.00
Normal = 0.25
Wet = 0.00

LAND USE

AREA Sq.Miles	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
	Airport		NORMAL	8	85	0.07	0.02	Min	
	DedOpSpc		NORMAL	35	0	0.20	0.05	Hi	
	LgLotRes		NORMAL	35	15	0.18	0.04	Low	
	MedDRes		NORMAL	25	30	0.15	0.03	Low	
	NRC		NORMAL	10	80	0.07	0.02	Min	
0.033	RecOpSc	9.7	NORMAL	75	0	0.20	0.03	Low	0.06
	Resort		NORMAL	32	60	0.11	0.03	Low	
0.196	Rural	57.5	NORMAL	30	0	0.20	0.04	Low	0.05
0.018	SmLotRes	5.3	NORMAL	30	25	0.15	0.04	Low	0.07
0.094	Vacant	27.6	NORMAL	30	0	0.20	0.05	Hi	0.11
	Water		NORMAL	0	10	0.00	0.00	Min	
0.341 = Total Area			Avg. =	34	1%	0.200			

PERCENT OF SUBBASIN DRY = 0.0 %
NORMAL = 100. %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.25

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.19

IMPERVIOUS AREA: URBAN @ 100 % effective = 1
ROCK OUTCROP @ 50 % effective = 1
% EFFECTIVE IMP. = 2

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	Area sq. mi.	Length mi.	Lca	Kn	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %	Lag min.
GVW3_3	0.341	1.88	0.95	0.04	135.6	0.20	0.25	6.00	0.19	2	28

D.3 Hydrograph Routing Data

```
     Storage Routing through SUBBASIN : 282286
     ========================================

     Parameters Used:
        NSTPS        6  Number of subreaches
         ITYP     FLOW  Type of Initial Condition
       RSVRIC    -1.00  Initial Condition
            X     0.00  Working R and D coefficient

Peak Flow:    2312 cfs  Peak Storage:      12 ac-ft  Peak Stage:   98.54 ft

           Volume at 33.25 hrs is 249.00

     Normal Depth Data
     =================
71 RC          NORMAL DEPTH CHANNEL
                     ANL        .055  LEFT OVERBANK N-VALUE
                    ANCH        .045  MAIN CHANNEL N-VALUE
                     ANR        .055  RIGHT OVERBANK N-VALUE
                   RLNTH       11240  REACH LENGTH
                     SEL       .0231  ENERGY SLOPE
                   ELMAX          .0  MAX. ELEV. FOR STORAGE/OUTFLOW CALCULATION

                                    CROSS-SECTION DATA
                        --- LEFT OVERBANK --- + ------ MAIN CHANNEL ------- + --- RIGHT OVERBANK ---
73 RY       ELEVATION    100.00    100.00     96.50     95.00     95.00     96.50    100.00    100.00
72 RX       DISTANCE        .00       .00    102.00    105.00    145.00    148.00    250.00    250.00

                                             ***

                                    COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

         STORAGE        .00      2.75      5.58      8.47     11.44     14.47     17.63     21.58     26.58      32.6
         OUTFLOW        .00     21.81     69.42    136.86    221.76    322.76    441.09    583.51    751.83     950.7
       ELEVATION      95.00     95.26     95.53     95.79     96.05     96.32     96.58     96.84     97.11      97.3

         STORAGE      39.70     47.83     56.99     67.20     78.45     90.74    104.07    118.44    133.85     150.3
         OUTFLOW    1184.18   1455.79   1768.95   2126.81   2532.42   2988.69   3498.45   4064.42   4689.26    5375.5
       ELEVATION      97.63     97.89     98.16     98.42     98.68     98.95     99.21     99.47     99.74      100.0
```

```
     Storage Routing through SUBBASIN : 284285
     =========================================

     Parameters Used:
        NSTPS        1  Number of subreaches
         ITYP     FLOW  Type of Initial Condition
       RSVRIC    -1.00  Initial Condition
            X     0.00  Working R and D coefficient

Peak Flow:    1112 cfs  Peak Storage:       2 ac-ft  Peak Stage:   97.04 ft

           Volume at 33.25 hrs is 93.00

     Normal Depth Data
     =================
91 RC          NORMAL DEPTH CHANNEL
                     ANL        .050  LEFT OVERBANK N-VALUE
                    ANCH        .045  MAIN CHANNEL N-VALUE
                     ANR        .050  RIGHT OVERBANK N-VALUE
                   RLNTH        830.  REACH LENGTH
                     SEL       .0300  ENERGY SLOPE
                   ELMAX          .0  MAX. ELEV. FOR STORAGE/OUTFLOW CALCULATION

                                  CROSS-SECTION DATA
                        --- LEFT OVERBANK --- + ------ MAIN CHANNEL ------- + --- RIGHT OVERBANK ---
93 RY       ELEVATION    100.00    100.00     96.00     95.00     95.00     96.00    100.00    100.00
92 RX       DISTANCE        .00       .00     40.00     42.00     97.00     99.00    139.00    139.00

                                           ***

                                  COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

         STORAGE         .00       .28       .56       .85      1.15      1.46      1.80      2.17      2.56      2.9
         OUTFLOW         .00     34.15    108.62    213.93    347.17    510.64    702.56    923.80   1175.20   1457.5
       ELEVATION       95.00     95.26     95.53     95.79     96.05     96.32     96.58     96.84     97.11     97.3

         STORAGE        3.43      3.90      4.40      4.92      5.48      6.05      6.66      7.29      7.95      8.6
         OUTFLOW     1771.77   2118.63   2499.01   2913.77   3363.75   3849.82   4372.83   4933.63   5533.07   6171.9
       ELEVATION       97.63     97.89     98.16     98.42     98.68     98.95     99.21     99.47     99.74     100.0
```

```
      Storage Routing through SUBBASIN : 285286
      =========================================

      Parameters Used:
         NSTPS        2  Number of subreaches
          ITYP    FLOW  Type of Initial Condition
        RSVRIC    -1.00  Initial Condition
             X     0.00  Working R and D coefficient

 Peak Flow:    1388 cfs  Peak Storage:      13 ac-ft  Peak Stage:   97.42 ft

              Volume at 33.25 hrs is 121.00

      Normal Depth Data
      =================
113 RC          NORMAL DEPTH CHANNEL
                       ANL        .050  LEFT OVERBANK N-VALUE
                      ANCH        .045  MAIN CHANNEL N-VALUE
                       ANR        .050  RIGHT OVERBANK N-VALUE
                     RLNTH       6765.  REACH LENGTH
                       SEL       .0250  ENERGY SLOPE
                     ELMAX          .0  MAX. ELEV. FOR STORAGE/OUTFLOW CALCULATION

                                    CROSS-SECTION DATA
                          --- LEFT OVERBANK --- + ------ MAIN CHANNEL ------- + --- RIGHT OVERBANK ---
115 RY        ELEVATION    100.00    100.00     96.00     95.00     95.00     96.00    100.00    100.00
114 RX        DISTANCE        .00       .00     40.00     42.00     97.00     99.00    139.00    139.00

                                              ***

                                    COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

          STORAGE        .00      2.27      4.58      6.94      9.34     11.90     14.68     17.67     20.88      24.3
          OUTFLOW        .00     31.17     99.15    195.29    316.92    466.15    641.34    843.31   1072.80    1330.5
        ELEVATION      95.00     95.26     95.53     95.79     96.05     96.32     96.58     96.84     97.11      97.3

          STORAGE      27.94     31.79     35.86     40.14     44.64     49.35     54.28     59.42     64.78      70.3
          OUTFLOW    1617.40   1934.04   2281.28   2659.89   3070.67   3514.39   3991.83   4503.77   5050.98    5634.2
        ELEVATION      97.63     97.89     98.16     98.42     98.68     98.95     99.21     99.47     99.74      100.0
```

```
      Storage Routing through SUBBASIN : 286287
      =========================================

      Parameters Used:
         NSTPS        2  Number of subreaches
          ITYP    FLOW  Type of Initial Condition
        RSVRIC    -1.00  Initial Condition
             X     0.00  Working R and D coefficient

 Peak Flow:    3593 cfs  Peak Storage:      19 ac-ft  Peak Stage:   98.96 ft

             Volume at 33.25 hrs is 480.00

      Normal Depth Data
      =================
152 RC          NORMAL DEPTH CHANNEL
                       ANL        .050  LEFT OVERBANK N-VALUE
                      ANCH        .045  MAIN CHANNEL N-VALUE
                       ANR        .050  RIGHT OVERBANK N-VALUE
                     RLNTH       4410.  REACH LENGTH
                       SEL       .0204  ENERGY SLOPE
                     ELMAX          .0  MAX. ELEV. FOR STORAGE/OUTFLOW CALCULATION

                                    CROSS-SECTION DATA
                          --- LEFT OVERBANK --- + ------ MAIN CHANNEL ------- + --- RIGHT OVERBANK ---
154 RY        ELEVATION    100.00    100.00     97.00     95.00     95.00     97.00    100.00    100.00
153 RX        DISTANCE        .00       .00     90.00     92.00    157.00    159.00    249.00    249.00

                                              ***

                                    COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

          STORAGE         .00      1.74      3.49      5.26      7.04      8.83     10.64     12.47     14.34     16.5
          OUTFLOW         .00     33.19    105.29    206.81    333.81    483.88    655.32    846.84   1060.45   1302.6
        ELEVATION       95.00     95.26     95.53     95.79     96.05     96.32     96.58     96.84     97.11     97.3

          STORAGE        19.19     22.25     25.73     29.63     33.95     38.69     43.85     49.43     55.44     61.8
          OUTFLOW      1576.05   1885.70   2235.75   2630.03   3072.07   3565.22   4112.67   4717.49   5382.63   6110.9
        ELEVATION        97.63     97.89     98.16     98.42     98.68     98.95     99.21     99.47     99.74     100.0
```

```
      Storage Routing through SUBBASIN : 287288
      =========================================

      Parameters Used:
         NSTPS         1  Number of subreaches
          ITYP    FLOW  Type of Initial Condition
        RSVRIC     -1.00  Initial Condition
             X      0.00  Working R and D coefficient

 Peak Flow:     4687 cfs  Peak Storage:       12 ac-ft  Peak Stage:    96.65 ft

              Volume at 33.25 hrs is 574.00

      Normal Depth Data
      =================
175 RC           NORMAL DEPTH CHANNEL
                        ANL         .050  LEFT OVERBANK N-VALUE
                       ANCH         .040  MAIN CHANNEL N-VALUE
                        ANR         .050  RIGHT OVERBANK N-VALUE
                      RLNTH        1370.  REACH LENGTH
                        SEL        .0292  ENERGY SLOPE
                      ELMAX           .0  MAX. ELEV. FOR STORAGE/OUTFLOW CALCULATION

                                    CROSS-SECTION DATA
                          --- LEFT OVERBANK --- + ------ MAIN CHANNEL ------- + --- RIGHT OVERBANK ---
177 RY         ELEVATION   100.00    100.00     95.00     93.50     93.50     95.00    100.00    100.00
176 RX         DISTANCE       .00       .00    125.00    127.00    227.00    229.00    354.00    354.00

                                           ***

                                COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

          STORAGE        .00      1.08      2.17      3.27      4.38      5.54      6.86      8.37     10.06     11.9
          OUTFLOW        .00    106.52    338.20    664.83   1074.03   1565.53   2146.33   2822.69   3601.90   4490.4
        ELEVATION      93.50     93.84     94.18     94.53     94.87     95.21     95.55     95.89     96.24     96.5

          STORAGE      14.00     16.24     18.67     21.28     24.08     27.06     30.22     33.57     37.11     40.8
          OUTFLOW    5494.55   6619.97   7872.37   9257.24  10779.94  12445.69  14259.62  16226.76  18352.06  20640.3
        ELEVATION      96.92     97.26     97.61     97.95     98.29     98.63     98.97     99.32     99.66     100.0
```

```
      Storage Routing through SUBBASIN : 290295
      =========================================

      Parameters Used:
         NSTPS        1  Number of subreaches
          ITYP     FLOW  Type of Initial Condition
        RSVRIC    -1.00  Initial Condition
             X     0.00  Working R and D coefficient

 Peak Flow:    6503 cfs  Peak Storage:      25 ac-ft  Peak Stage:   94.40 ft

             Volume at 33.25 hrs is 753.00

      Normal Depth Data
      =================
213 RC          NORMAL DEPTH CHANNEL
                      ANL        .050  LEFT OVERBANK N-VALUE
                     ANCH        .035  MAIN CHANNEL N-VALUE
                      ANR        .050  RIGHT OVERBANK N-VALUE
                    RLNTH       2620.  REACH LENGTH
                      SEL       .0229  ENERGY SLOPE
                    ELMAX          .0  MAX. ELEV. FOR STORAGE/OUTFLOW CALCULATION

                                    CROSS-SECTION DATA
                          --- LEFT OVERBANK --- + ------ MAIN CHANNEL ------- + --- RIGHT OVERBANK ---
215 RY        ELEVATION    100.00    100.00     92.00     90.00     90.00     92.00    100.00    100.00
214 RX        DISTANCE        .00       .00     80.00     82.00    162.00    164.00    244.00    244.00

                                           ***

                                    COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

          STORAGE        .00      2.55      5.13      7.75     10.40     13.29     16.52     20.08     23.97     28.2
          OUTFLOW        .00    176.58    559.93   1099.40   1778.11   2607.28   3581.74   4707.24   5988.98   7432.0
        ELEVATION      90.00     90.53     91.05     91.58     92.11     92.63     93.16     93.68     94.21     94.7

          STORAGE      32.76     37.65     42.87     48.43     54.32     60.55     67.10     73.99     81.22     88.7
          OUTFLOW    9041.59  10822.59  12780.13  14919.24  17244.92  19762.14  22475.83  25390.91  28512.23  31844.6
        ELEVATION      95.26     95.79     96.32     96.84     97.37     97.89     98.42     98.95     99.47     100.0
```

```
      Storage Routing through SUBBASIN : 280295
      =========================================

      Parameters Used:
         NSTPS        5  Number of subreaches
          ITYP     FLOW  Type of Initial Condition
        RSVRIC     -1.00  Initial Condition
             X      0.00  Working R and D coefficient

 Peak Flow:    5471 cfs  Peak Storage:      34 ac-ft  Peak Stage:   93.20 ft

              Volume at 33.25 hrs is 635.00

      Normal Depth Data
      =================
239 RC          NORMAL DEPTH CHANNEL
                       ANL        .080  LEFT OVERBANK N-VALUE
                      ANCH        .050  MAIN CHANNEL N-VALUE
                       ANR        .070  RIGHT OVERBANK N-VALUE
                     RLNTH      13560.  REACH LENGTH
                       SEL       .0254  ENERGY SLOPE
                     ELMAX          .0  MAX. ELEV. FOR STORAGE/OUTFLOW CALCULATION

                                    CROSS-SECTION DATA
                          --- LEFT OVERBANK --- + ------ MAIN CHANNEL ------- + --- RIGHT OVERBANK ---
241 RY        ELEVATION    110.00    100.00     90.00     90.00     90.00     90.00    100.00    110.00
240 RX        DISTANCE    1000.00   1020.00   1040.00   1040.10   1202.90   1203.00   1223.00   1243.00

                                             ***

                                    COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

          STORAGE         .00     54.10    109.58    166.44    224.68    284.31    345.31    407.69    471.45    536.5
          OUTFLOW         .00    847.50   2704.20   5341.87   8671.27  12640.00  17212.86  22364.43  28075.49  34331.0
        ELEVATION       90.00     91.05     92.11     93.16     94.21     95.26     96.32     97.37     98.42     99.4

          STORAGE       603.10    671.00    740.28    810.94    882.98    956.39   1031.19   1107.37   1184.93   1263.8
          OUTFLOW     41119.33  48430.59  56257.00  64592.11  73430.55  82767.92  92600.55 102925.40 113740.00 125042.4
        ELEVATION       100.53    101.58    102.63    103.68    104.74    105.79    106.84    107.89    108.95    110.0
```

```
      Storage Routing through SUBBASIN : 295300
      =========================================

      Parameters Used:
         NSTPS        1  Number of subreaches
          ITYP     FLOW  Type of Initial Condition
        RSVRIC    -1.00  Initial Condition
             X     0.00  Working R and D coefficient

 Peak Flow:   11980 cfs  Peak Storage:      40 ac-ft  Peak Stage:   97.51 ft

              Volume at 33.25 hrs is 1475.00

      Normal Depth Data
      =================
270 RC          NORMAL DEPTH CHANNEL
                      ANL        .050  LEFT OVERBANK N-VALUE
                     ANCH        .035  MAIN CHANNEL N-VALUE
                      ANR        .050  RIGHT OVERBANK N-VALUE
                    RLNTH       2895.  REACH LENGTH
                      SEL       .0242  ENERGY SLOPE
                    ELMAX          .0  MAX. ELEV. FOR STORAGE/OUTFLOW CALCULATION

                                    CROSS-SECTION DATA
                          --- LEFT OVERBANK --- + ------ MAIN CHANNEL ------- + --- RIGHT OVERBANK ---
272 RY        ELEVATION    100.00    100.00     95.00     91.00     91.00     95.00    100.00    100.00
271 RX        DISTANCE        .00       .00     60.00     64.00    139.00    143.00    203.00    203.00

                                              ***

                                    COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

          STORAGE         .00      2.38      4.78      7.22      9.68     12.18     14.70     17.26     19.84      22.5
          OUTFLOW         .00    142.78    452.77    889.02   1434.66   2079.33   2815.79   3638.61   4543.51   5557.8
        ELEVATION       91.00     91.47     91.95     92.42     92.89     93.37     93.84     94.32     94.79      95.2

          STORAGE       25.50     28.85     32.55     36.62     41.04     45.82     50.96     56.46     62.31      68.5
          OUTFLOW     6691.46   7933.89   9293.81  10778.71  12395.42  14150.32  16049.51  18098.82  20303.89   22670.2
        ELEVATION       95.74     96.21     96.68     97.16     97.63     98.11     98.58     99.05     99.53      100.0
```

```
      Storage Routing through SUBBASIN : 270300
      =========================================

      Parameters Used:
         NSTPS         4  Number of subreaches
          ITYP    FLOW  Type of Initial Condition
        RSVRIC     -1.00  Initial Condition
             X      0.00  Working R and D coefficient

 Peak Flow:     3892 cfs  Peak Storage:       26 ac-ft  Peak Stage:    94.71 ft

              Volume at 33.25 hrs is 649.00

      Normal Depth Data
      =================
297 RC           NORMAL DEPTH CHANNEL
                        ANL        .100  LEFT OVERBANK N-VALUE
                       ANCH        .030  MAIN CHANNEL N-VALUE
                        ANR        .100  RIGHT OVERBANK N-VALUE
                      RLNTH      12750.  REACH LENGTH
                        SEL       .0275  ENERGY SLOPE
                      ELMAX          .0  MAX. ELEV. FOR STORAGE/OUTFLOW CALCULATION

                                    CROSS-SECTION DATA
                          --- LEFT OVERBANK --- + ------ MAIN CHANNEL ------- + --- RIGHT OVERBANK ---
299 RY        ELEVATION    104.00     94.00     93.00     90.00     90.00     93.00     94.00    104.00
298 RX        DISTANCE    1000.00   1015.00   1095.00   1095.50   1128.50   1129.00   1209.00   1224.00

                                             ***

                                    COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

          STORAGE        .00      7.14     14.34     21.59     28.89     47.19     86.77    129.12    171.95    215.2
          OUTFLOW        .00    159.61    495.66    954.04   1510.56   2243.41   3332.27   4787.38   6534.44   8546.1
        ELEVATION      90.00     90.74     91.47     92.21     92.95     93.68     94.42     95.16     95.89     96.6

          STORAGE     259.04    303.29    348.03    393.24    438.93    485.09    531.74    578.86    626.45    674.5
          OUTFLOW   10804.41  13295.89  16010.20  18938.96  22075.20  25413.05  28947.44  32674.00  36588.91  40688.7
        ELEVATION      97.37     98.11     98.84     99.58    100.32    101.05    101.79    102.53    103.26    104.0
```

```
      Storage Routing through SUBBASIN : 300310
      =========================================

      Parameters Used:
         NSTPS        2  Number of subreaches
          ITYP    FLOW  Type of Initial Condition
        RSVRIC    -1.00  Initial Condition
             X     0.00  Working R and D coefficient

 Peak Flow:   15288 cfs  Peak Storage:      58 ac-ft  Peak Stage:  100.00 ft

              Volume at 33.25 hrs is 2205.00

      Normal Depth Data
      =================
324 RC          NORMAL DEPTH CHANNEL
                      ANL        .085  LEFT OVERBANK N-VALUE
                     ANCH        .040  MAIN CHANNEL N-VALUE
                      ANR        .085  RIGHT OVERBANK N-VALUE
                    RLNTH       4080.  REACH LENGTH
                      SEL       .0184  ENERGY SLOPE
                    ELMAX          .0  MAX. ELEV. FOR STORAGE/OUTFLOW CALCULATION

                                    CROSS-SECTION DATA
                          --- LEFT OVERBANK --- + ------ MAIN CHANNEL ------- + --- RIGHT OVERBANK ---
326 RY        ELEVATION    100.00    100.00     93.00     90.00     90.00     93.00    100.00    100.00
325 RX        DISTANCE        .00       .00    105.00    114.00    149.00    158.00    263.00    263.00

                                              ***

                                    COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

          STORAGE        .00      1.80      3.76      5.88      8.15     10.57     13.18     16.42     20.43      25.2
          OUTFLOW        .00     61.47    198.08    395.74    650.40    960.63   1341.46   1822.52   2380.24    3021.9
        ELEVATION      90.00     90.53     91.05     91.58     92.11     92.63     93.16     93.68     94.21      94.7

          STORAGE      30.79     37.14     44.27     52.18     60.86     70.32     80.56     91.58    103.38     115.9
          OUTFLOW    3753.79   4581.70   5511.09   6547.19   7695.05   8959.56  10345.51  11857.56  13500.26   15278.1
        ELEVATION      95.26     95.79     96.32     96.84     97.37     97.89     98.42     98.95     99.47      100.0
```

Galloway Wash FDS NSTEPS Check
100-Year 24-Hour and 6-Hour Discharges

24-hour, 100-year

Routing Reach	HEC-1 Discharge	Reach Length (ft)	HEC-1 Route Time (hour)	HEC-1 Velocity (fps)	Manning Velocity (fps)	NSTEPS
270-300	4141	12750	0.34	10.6	10.9	4
280-295	5492	13560	0.25	15.1	9.8	5
282-286	2407	11240	0.41	7.6	6.6	6
284-285	1110	830	0	-	7.9	1
285-286	1444	6765	0.17	11.1	7.9	2
286-287	3392	4410	0.17	7.2	7.4	2
287-288	4412	1370	0	-	9.7	1
290-295	6056	2620	0.08	9.1	12.3	1
295-300	10763	2895	0	-	14.5	1
300-310	13548	4080	0.17	6.7	12.2	2

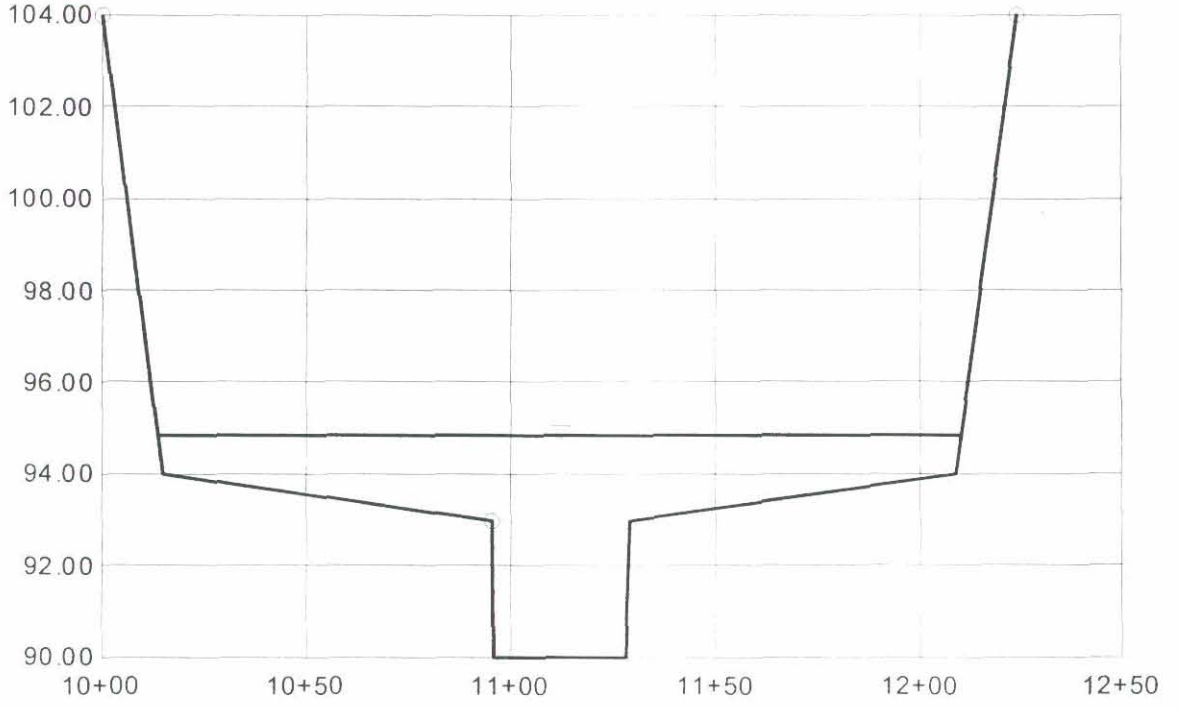
6-hour, 100-year

Routing Reach	HEC-1 Discharge	Reach Length (ft)	HEC-1 Route Time (hour)	HEC-1 Velocity (fps)	Manning Velocity (fps)	NSTEPS
270-300	3749	12750	0.42	8.4	11.0	4
280-295	4686	13560	0.25	15.1	9.2	5
282-286	2287	11240	0.33	9.5	6.5	6
284-285	1155	830	0	-	8.0	1
285-286	1446	6765	0.17	11.1	7.9	2
286-287	3231	4410	0.17	7.2	7.3	2
287-288	3955	1370	0	-	9.5	1
290-295	5187	2620	0.08	9.1	12.0	1
295-300	9018	2895	0.08	10.1	14.3	1
300-310	11333	4080	0.08	14.2	12.1	2

24_270_300
Cross Section for Irregular Channel

Project Description	
Worksheet	24_270_300
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.035	
Slope	0.027500	ft/ft
Water Surface Elevation	94.86	ft
Elevation Range	90.00 to 104.00	
Discharge	4,141.00	cfs



24_270_300
Worksheet for Irregular Channel

Project Description	
Worksheet	24_270_300
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.027500	ft/ft
Discharge	4,141.00	cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Metho	Horton's Method

Results		
Mannings Coefficient	0.035	
Water Surface Elevation	94.86	ft
Elevation Range	90.00 to 104.00	
Flow Area	381.2	ft²
Wetted Perimeter	201.81	ft
Top Width	196.57	ft
Actual Depth	4.86	ft
Critical Elevation	95.32	ft
Critical Slope	0.013585	ft/ft
Velocity	10.86	ft/s
Velocity Head	1.83	ft
Specific Energy	96.69	ft
Froude Number	1.38	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	10+95	0.100
10+95	11+29	0.030
11+29	12+24	0.100

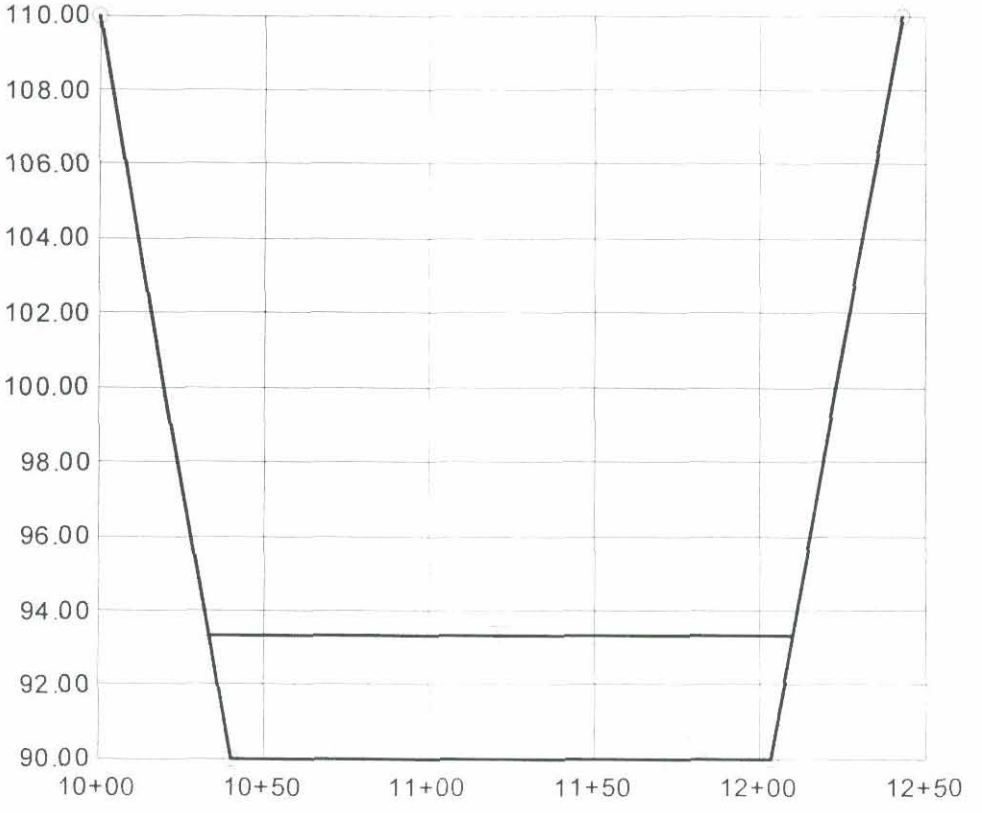
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	104.00
10+15	94.00
10+95	93.00
10+96	90.00
11+28	90.00
11+29	93.00
12+09	94.00
12+24	104.00

24_280_295
Cross Section for Irregular Channel

Project Description	
Worksheet	24_280_295
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.052	
Slope	0.025400	ft/ft
Water Surface Elevation	93.32	ft
Elevation Range	90.00 to 110.00	
Discharge	5,492.00	cfs



24_280_295
Worksheet for Irregular Channel

Project Description	
Worksheet	24_280_295
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.025400	ft/ft
Discharge	5,492.00	cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Metho	Horton's Method

Results		
Mannings Coefficient	0.052	
Water Surface Elevation	93.32	ft
Elevation Range	90.00 to 110.00	
Flow Area	562.8	ft²
Wetted Perimeter	177.84	ft
Top Width	176.27	ft
Actual Depth	3.32	ft
Critical Elevation	93.24	ft
Critical Slope	0.027613	ft/ft
Velocity	9.76	ft/s
Velocity Head	1.48	ft
Specific Energy	94.80	ft
Froude Number	0.96	
Flow Type	Subcritical	

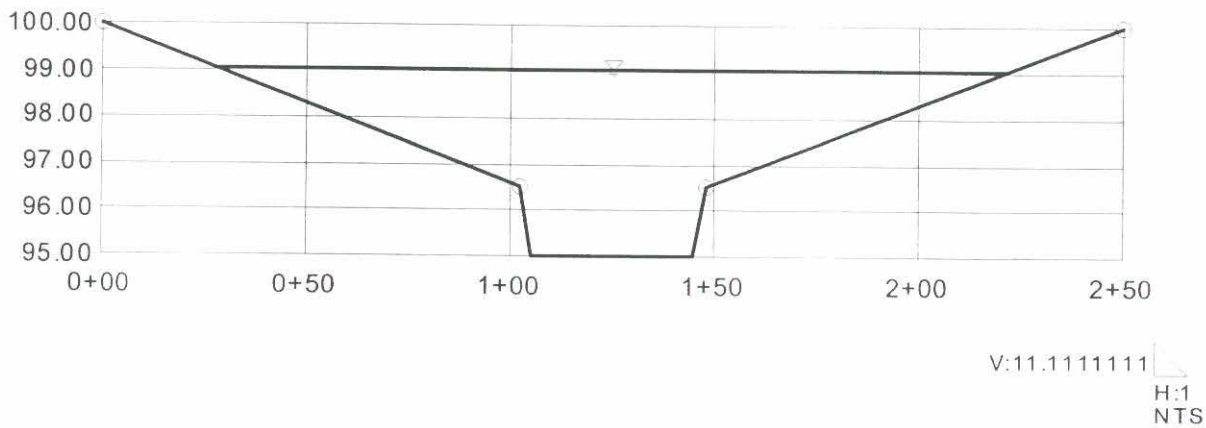
Roughness Segments		
Start Station	End Station	Mannings Coefficient
10+00	10+40	0.080
10+40	12+03	0.050
12+03	12+43	0.070

Natural Channel Points	
Station (ft)	Elevation (ft)
10+00	110.00
10+20	100.00
10+40	90.00
10+40	90.00
12+03	90.00
12+03	90.00
12+23	100.00
12+43	110.00

24_282_286
Cross Section for Irregular Channel

Project Description	
Worksheet	24_282_286
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.053	
Slope	0.023100	ft/ft
Water Surface Elevation	99.03	ft
Elevation Range	95.00 to 100.00	
Discharge	2,407.00	cfs



24_282_286
Worksheet for Irregular Channel

Project Description	
Worksheet	24_282_286
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.023100	ft/ft
Discharge	2,407.00	cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Metho	Horton's Method

Results		
Mannings Coefficient	0.053	
Water Surface Elevation	99.03	ft
Elevation Range	95.00 to 100.00	
Flow Area	367.2	ft²
Wetted Perimeter	194.19	ft
Top Width	193.40	ft
Actual Depth	4.03	ft
Critical Elevation	98.76	ft
Critical Slope	0.033532	ft/ft
Velocity	6.56	ft/s
Velocity Head	0.67	ft
Specific Energy	99.70	ft
Froude Number	0.84	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00	1+02	0.055
1+02	1+48	0.045
1+48	2+50	0.055

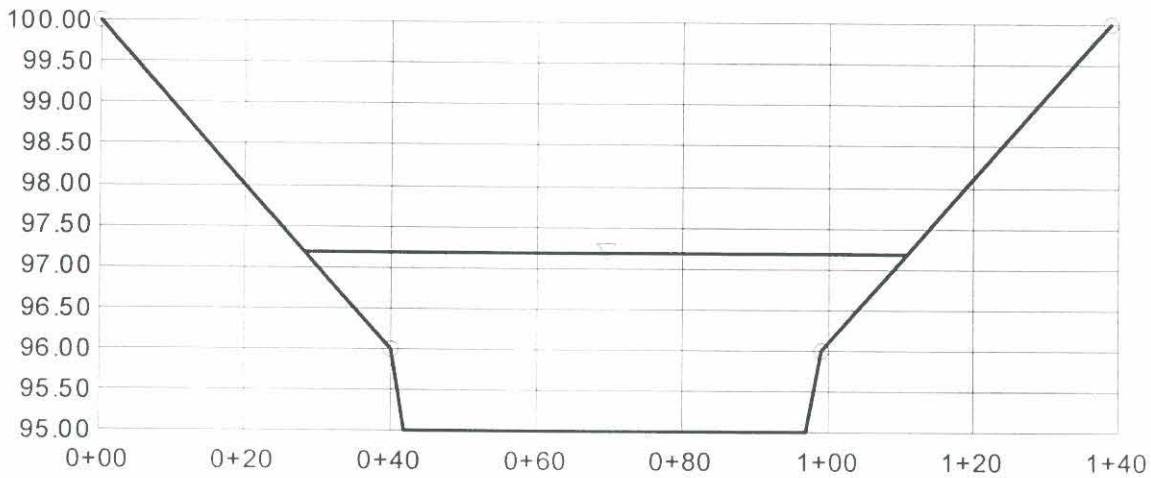
Natural Channel Points

Station (ft)	Elevation (ft)
0+00	100.00
1+02	96.50
1+05	95.00
1+45	95.00
1+48	96.50
2+50	100.00

24_284_285
Cross Section for Irregular Channel

Project Description	
Worksheet	24_284_285
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.046	
Slope	0.030000	ft/ft
Water Surface Elevation	97.19	ft
Elevation Range	95.00 to 100.00	
Discharge	1,110.00	cfs



24_284_285
Worksheet for Irregular Channel

Project Description	
Worksheet	24_284_285
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.030000	ft/ft
Discharge	1,110.00	cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Metho	Horton's Method

Results		
Mannings Coefficient	0.046	
Water Surface Elevation	97.19	ft
Elevation Range	95.00 to 100.00	
Flow Area	141.1	ft²
Wetted Perimeter	83.31	ft
Top Width	82.72	ft
Actual Depth	2.19	ft
Critical Elevation	97.27	ft
Critical Slope	0.026333	ft/ft
Velocity	7.87	ft/s
Velocity Head	0.96	ft
Specific Energy	98.15	ft
Froude Number	1.06	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00	0+40	0.050
0+40	0+99	0.045
0+99	1+39	0.050

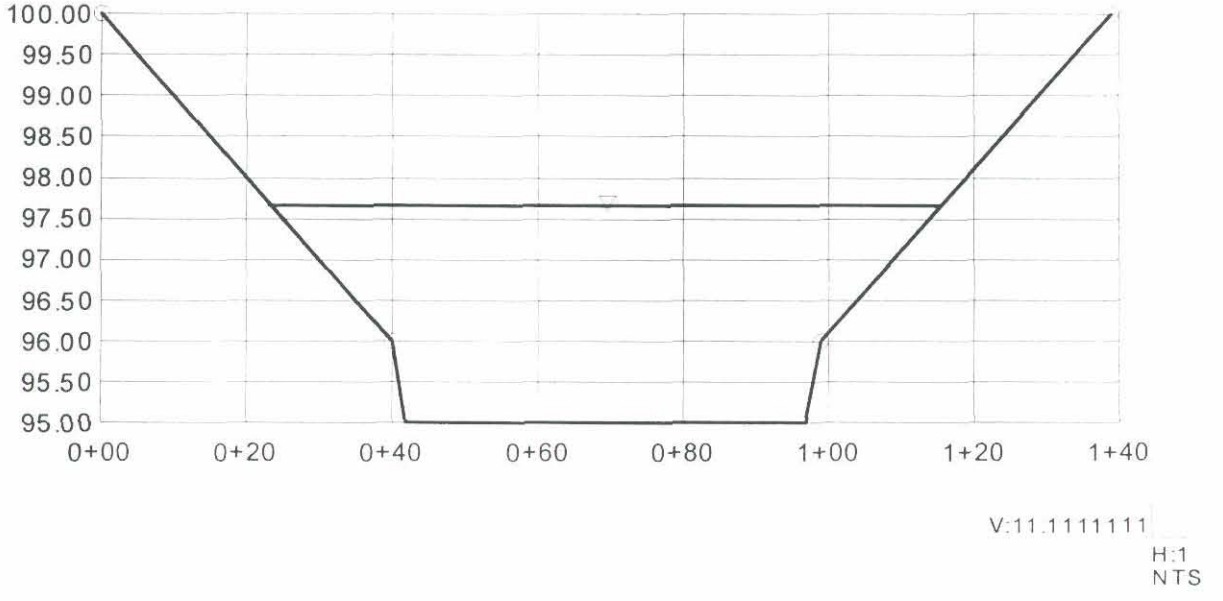
Natural Channel Points

Station (ft)	Elevation (ft)
0+00	100.00
0+40	96.00
0+42	95.00
0+97	95.00
0+99	96.00
1+39	100.00

24_285_286
Cross Section for Irregular Channel

Project Description	
Worksheet	24_285_286
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.047	
Slope	0.025000	ft/ft
Water Surface Elevation	97.67	ft
Elevation Range	95.00 to 100.00	
Discharge	1,444.00	cfs



24_285_286
Worksheet for Irregular Channel

Project Description	
Worksheet	24_285_286
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.025000	ft/ft
Discharge	1,444.00	cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Metho	Horton's Method

Results		
Mannings Coefficient	0.047	
Water Surface Elevation	97.67	ft
Elevation Range	95.00 to 100.00	
Flow Area	183.2	ft²
Wetted Perimeter	92.98	ft
Top Width	92.35	ft
Actual Depth	2.67	ft
Critical Elevation	97.65	ft
Critical Slope	0.025722	ft/ft
Velocity	7.88	ft/s
Velocity Head	0.97	ft
Specific Energy	98.63	ft
Froude Number	0.99	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00	0+40	0.050
0+40	0+99	0.045
0+99	1+39	0.050

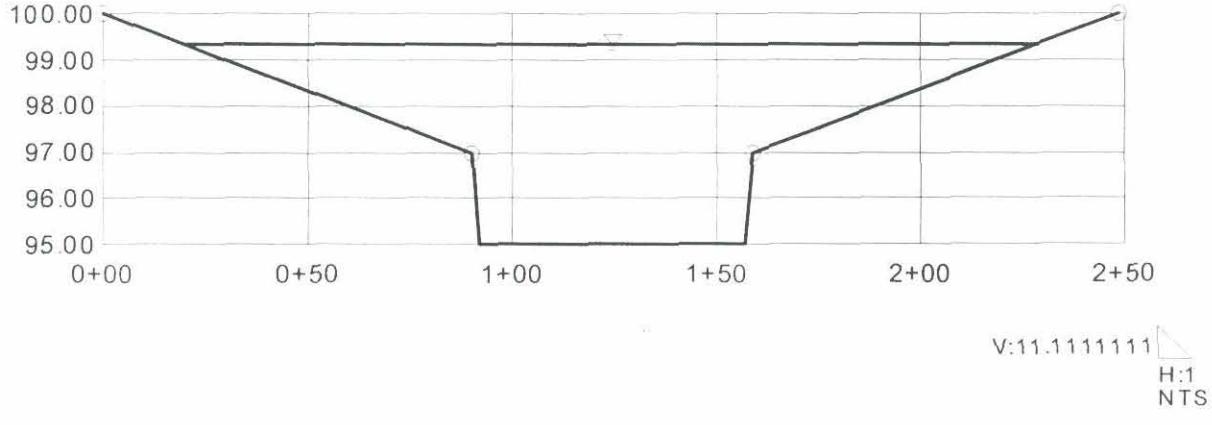
Natural Channel Points

Station (ft)	Elevation (ft)
0+00	100.00
0+40	96.00
0+42	95.00
0+97	95.00
0+99	96.00
1+39	100.00

24_286_287
Cross Section for Irregular Channel

Project Description	
Worksheet	24_286_287
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.048	
Slope	0.020400	ft/ft
Water Surface Elevation	99.34	ft
Elevation Range	95.00 to 100.00	
Discharge	3,392.00	cfs



24_286_287
Worksheet for Irregular Channel

Project Description	
Worksheet	24_286_287
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.020400	ft/ft
Discharge	3,392.00	cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Metho	Horton's Method

Results		
Mannings Coefficient	0.048	
Water Surface Elevation	99.34	ft
Elevation Range	95.00 to 100.00	
Flow Area	460.0	ft²
Wetted Perimeter	211.21	ft
Top Width	209.47	ft
Actual Depth	4.34	ft
Critical Elevation	99.10	ft
Critical Slope	0.026881	ft/ft
Velocity	7.37	ft/s
Velocity Head	0.85	ft
Specific Energy	100.19	ft
Froude Number	0.88	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00	0+90	0.050
0+90	1+59	0.045
1+59	2+49	0.050

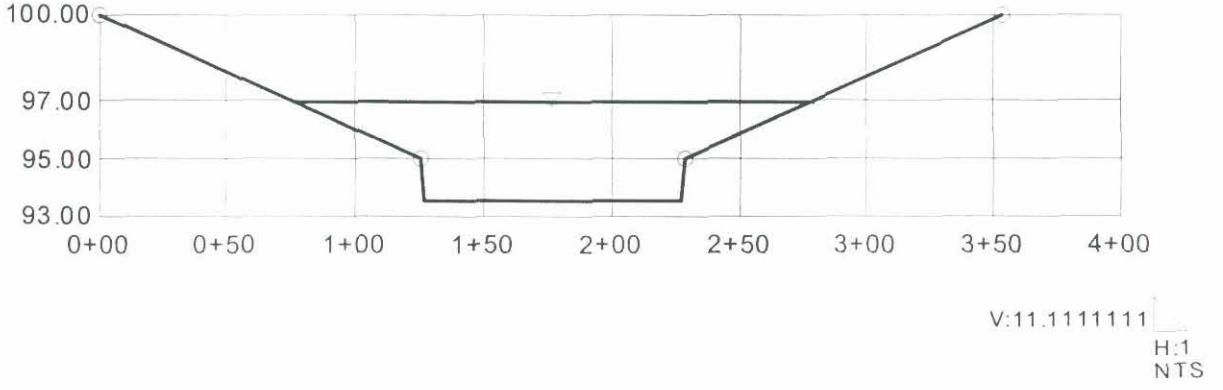
Natural Channel Points

Station (ft)	Elevation (ft)
0+00	100.00
0+90	97.00
0+92	95.00
1+57	95.00
1+59	97.00
2+49	100.00

24_287_288
Cross Section for Irregular Channel

Project Description	
Worksheet	24_287_288
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.045	
Slope	0.029200	ft/ft
Water Surface Elevation	96.98	ft
Elevation Range	93.50 to 100.00	
Discharge	4,412.00	cfs



24_287_288
Worksheet for Irregular Channel

Project Description	
Worksheet	24_287_288
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.029200	ft/ft
Discharge	4,412.00	cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Metho	Horton's Method

Results		
Mannings Coefficient	0.045	
Water Surface Elevation	96.98	ft
Elevation Range	93.50 to 100.00	
Flow Area	456.8	ft²
Wetted Perimeter	204.06	ft
Top Width	202.98	ft
Actual Depth	3.48	ft
Critical Elevation	97.22	ft
Critical Slope	0.022315	ft/ft
Velocity	9.66	ft/s
Velocity Head	1.45	ft
Specific Energy	98.43	ft
Froude Number	1.13	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00	1+25	0.050
1+25	2+29	0.040
2+29	3+54	0.050

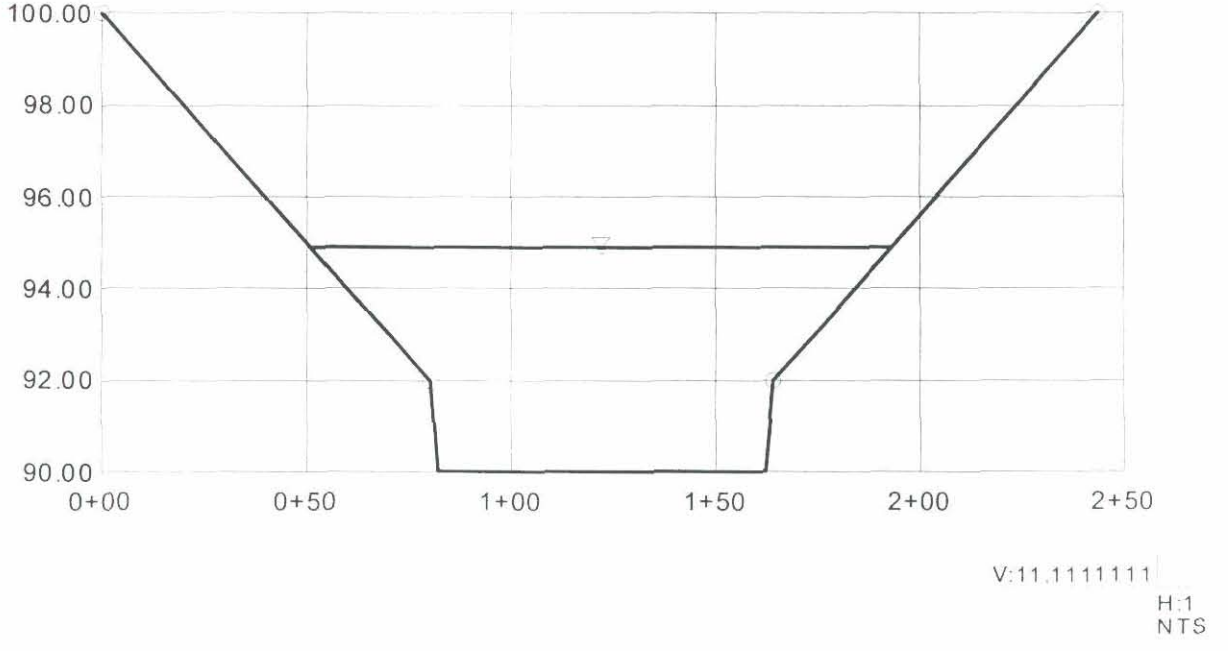
Natural Channel Points

Station (ft)	Elevation (ft)
0+00	100.00
1+25	95.00
1+27	93.50
2+27	93.50
2+29	95.00
3+54	100.00

24_290_295
Cross Section for Irregular Channel

Project Description	
Worksheet	24_290_295
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.041	
Slope	0.022900	ft/ft
Water Surface Elevation	94.90	ft
Elevation Range	90.00 to 100.00	
Discharge	6,056.00	cfs



24_290_295
Worksheet for Irregular Channel

Project Description	
Worksheet	24_290_295
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.022900	ft/ft
Discharge	6,056.00	cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Metho	Horton's Method

Results		
Mannings Coefficient	0.041	
Water Surface Elevation	94.90	ft
Elevation Range	90.00 to 100.00	
Flow Area	491.6	ft²
Wetted Perimeter	143.93	ft
Top Width	141.99	ft
Actual Depth	4.90	ft
Critical Elevation	95.34	ft
Critical Slope	0.016451	ft/ft
Velocity	12.32	ft/s
Velocity Head	2.36	ft
Specific Energy	97.26	ft
Froude Number	1.17	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00	0+80	0.050
0+80	1+64	0.035
1+64	2+44	0.050

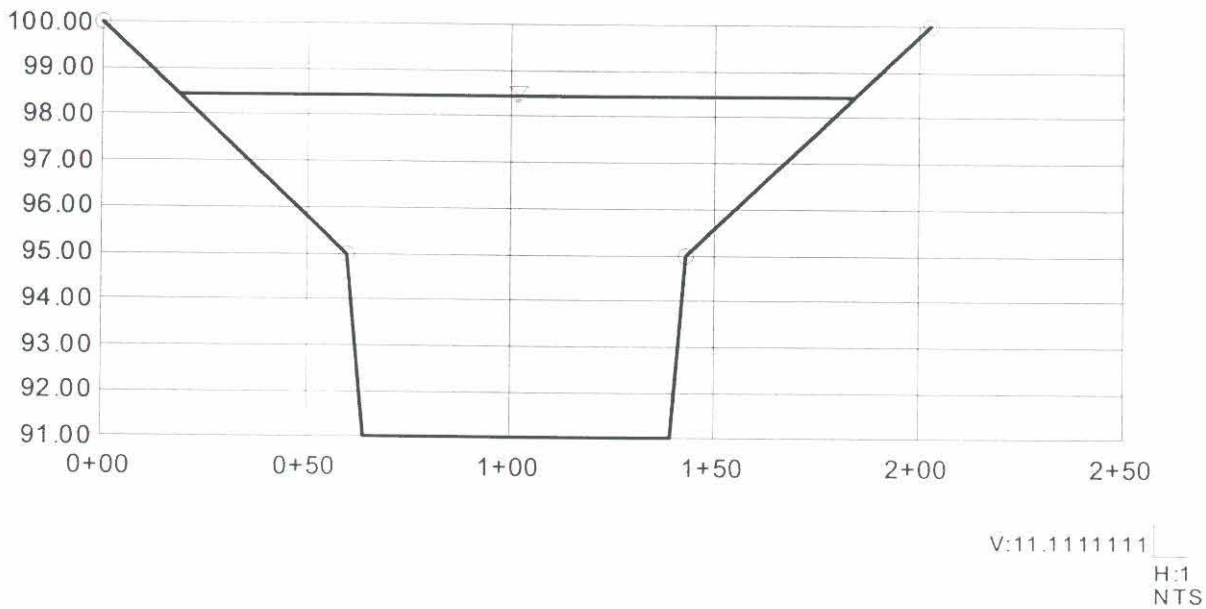
Natural Channel Points

Station (ft)	Elevation (ft)
0+00	100.00
0+80	92.00
0+82	90.00
1+62	90.00
1+64	92.00
2+44	100.00

24_295_300
Cross Section for Irregular Channel

Project Description	
Worksheet	24_295_300
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.043	
Slope	0.024200	ft/ft
Water Surface Elevation	98.42	ft
Elevation Range	91.00 to 100.00	
Discharge	10,763.00	cfs



24_295_300
Worksheet for Irregular Channel

Project Description	
Worksheet	24_295_300
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.024200	ft/ft
Discharge	10,763.00	cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Metho	Horton's Method

Results		
Mannings Coefficient	0.043	
Water Surface Elevation	98.42	ft
Elevation Range	91.00 to 100.00	
Flow Area	740.9	ft²
Wetted Perimeter	168.78	ft
Top Width	165.18	ft
Actual Depth	7.42	ft
Critical Elevation	99.17	ft
Critical Slope	0.016193	ft/ft
Velocity	14.53	ft/s
Velocity Head	3.28	ft
Specific Energy	101.70	ft
Froude Number	1.21	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00	0+60	0.050
0+60	1+43	0.035
1+43	2+03	0.050

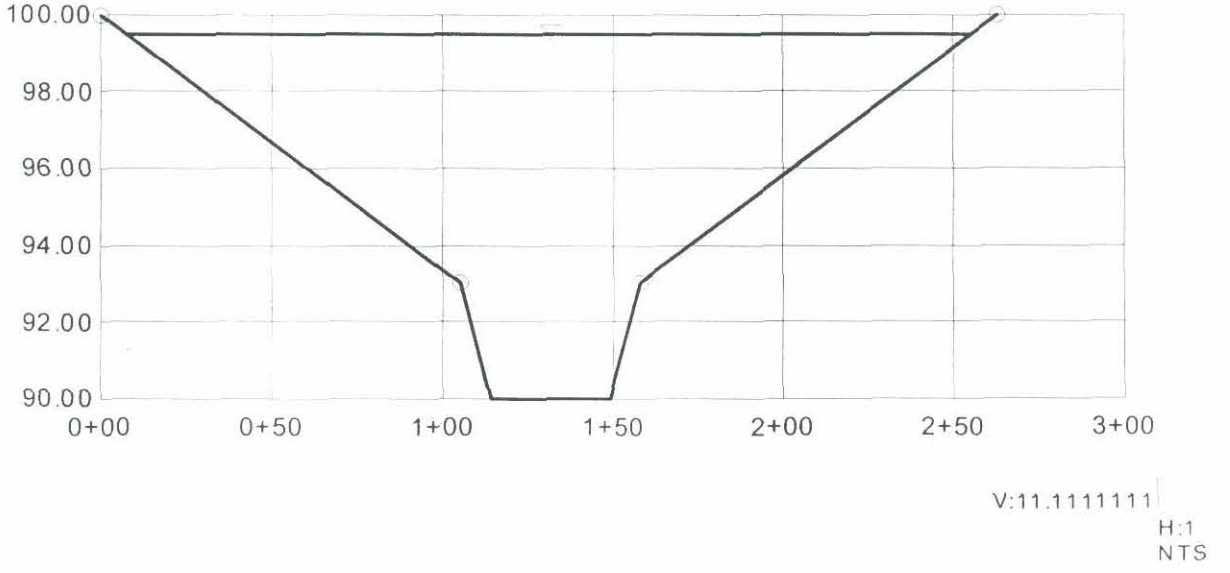
Natural Channel Points

Station (ft)	Elevation (ft)
0+00	100.00
0+60	95.00
0+64	91.00
1+39	91.00
1+43	95.00
2+03	100.00

24_300_310
Cross Section for Irregular Channel

Project Description	
Worksheet	24_300_310
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.045	
Slope	0.018400	ft/ft
Water Surface Elevation	99.50	ft
Elevation Range	90.00 to 100.00	
Discharge	13,548.00	cfs



24_300_310
Worksheet for Irregular Channel

Project Description	
Worksheet	24_300_310
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.018400	ft/ft
Discharge	13,548.00	cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Metho	Horton's Method

Results		
Mannings Coefficient	0.045	
Water Surface Elevation	99.50	ft
Elevation Range	90.00 to 100.00	
Flow Area	1,110.2	ft²
Wetted Perimeter	249.40	ft
Top Width	247.99	ft
Actual Depth	9.50	ft
Critical Elevation	99.56	ft
Critical Slope	0.017759	ft/ft
Velocity	12.20	ft/s
Velocity Head	2.31	ft
Specific Energy	101.81	ft
Froude Number	1.02	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00	1+05	0.085
1+05	1+58	0.040
1+58	2+63	0.085

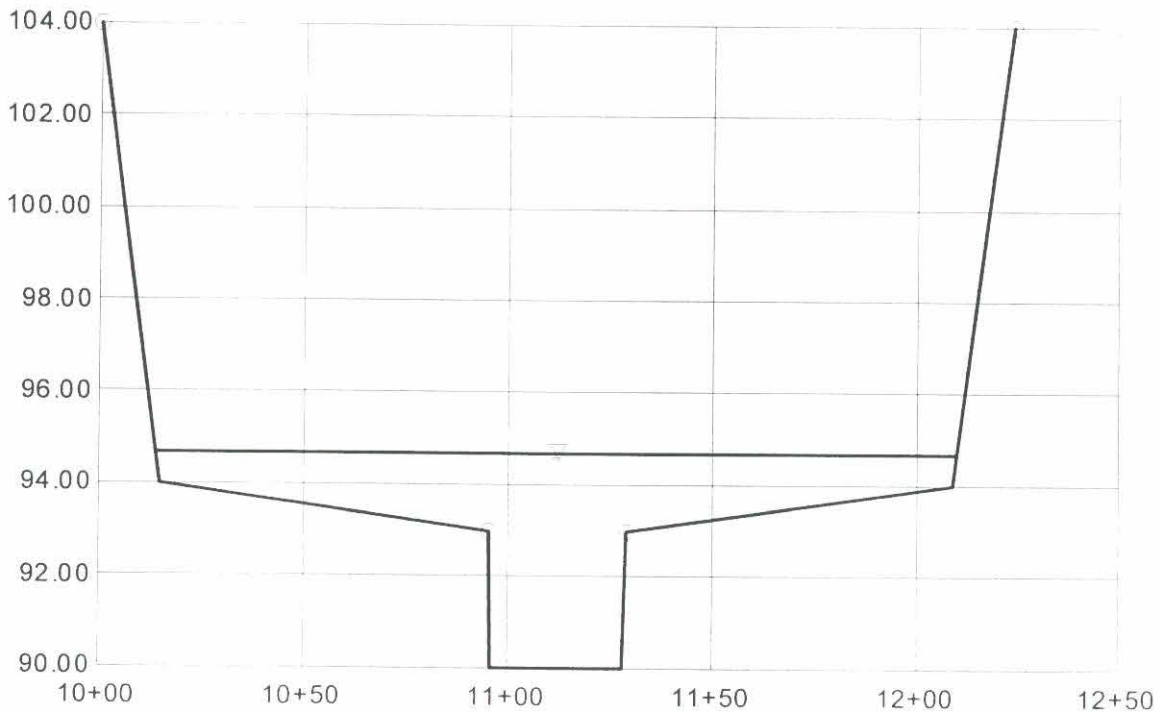
Natural Channel Points

Station (ft)	Elevation (ft)
0+00	100.00
1+05	93.00
1+14	90.00
1+49	90.00
1+58	93.00
2+63	100.00

6_270_300
Cross Section for Irregular Channel

Project Description	
Worksheet	6_270_300
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.032	
Slope	0.027500	ft/ft
Water Surface Elevation	94.66	ft
Elevation Range	90.00 to 104.00	
Discharge	3,749.00	cfs



6_270_300
Worksheet for Irregular Channel

Project Description	
Worksheet	6_270_300
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.027500	ft/ft
Discharge	3,749.00	cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Metho	Horton's Method

Results		
Mannings Coefficient	0.032	
Water Surface Elevation	94.66	ft
Elevation Range	90.00 to 104.00	
Flow Area	341.9	ft²
Wetted Perimeter	201.09	ft
Top Width	195.97	ft
Actual Depth	4.66	ft
Critical Elevation	95.17	ft
Critical Slope	0.011833	ft/ft
Velocity	10.97	ft/s
Velocity Head	1.87	ft
Specific Energy	96.53	ft
Froude Number	1.46	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	10+95	0.100
10+95	11+29	0.030
11+29	12+24	0.100

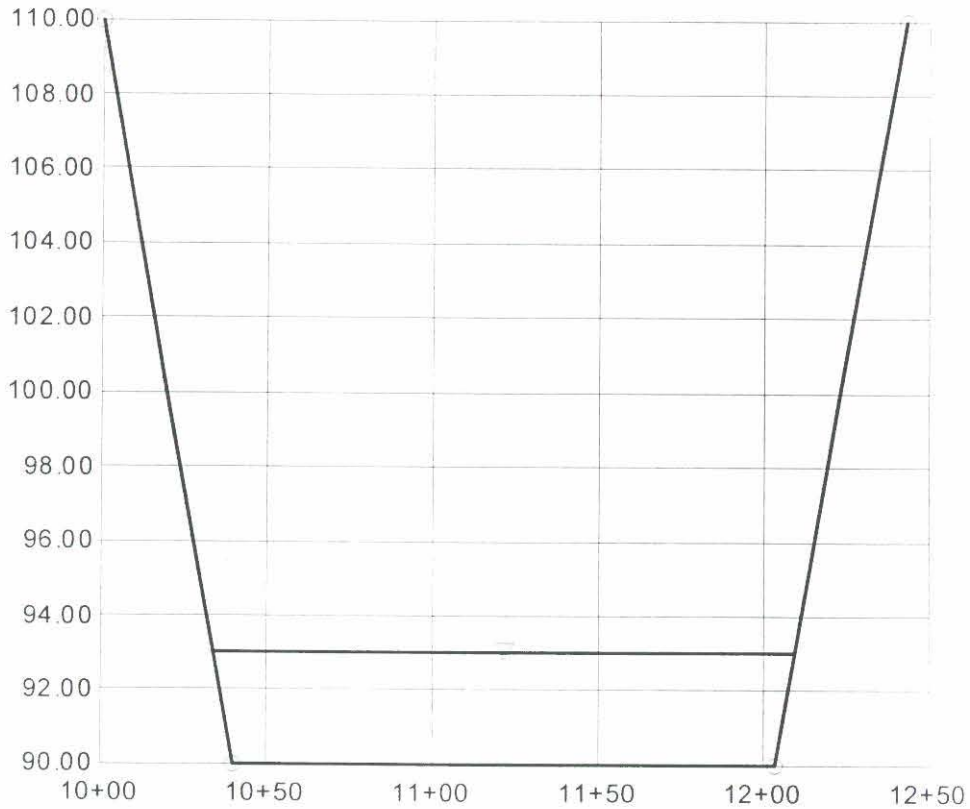
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	104.00
10+15	94.00
10+95	93.00
10+96	90.00
11+28	90.00
11+29	93.00
12+09	94.00
12+24	104.00

6_280_295
Cross Section for Irregular Channel

Project Description	
Worksheet	6_280_295.
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.052	
Slope	0.025400	ft/ft
Water Surface Elevation	93.01	ft
Elevation Range	90.00 to 110.00	
Discharge	4,686.00	cfs



V:11.1111111
H:1
NTS

6_280_295
Worksheet for Irregular Channel

Project Description	
Worksheet	6_280_295
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.025400	ft/ft
Discharge	4,686.00	cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Metho	Horton's Method

Results		
Mannings Coefficient	0.052	
Water Surface Elevation	93.01	ft
Elevation Range	90.00 to 110.00	
Flow Area	509.0	ft²
Wetted Perimeter	176.47	ft
Top Width	175.04	ft
Actual Depth	3.01	ft
Critical Elevation	92.92	ft
Critical Slope	0.028315	ft/ft
Velocity	9.21	ft/s
Velocity Head	1.32	ft
Specific Energy	94.33	ft
Froude Number	0.95	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
10+00	10+40	0.080
10+40	12+03	0.050
12+03	12+43	0.070

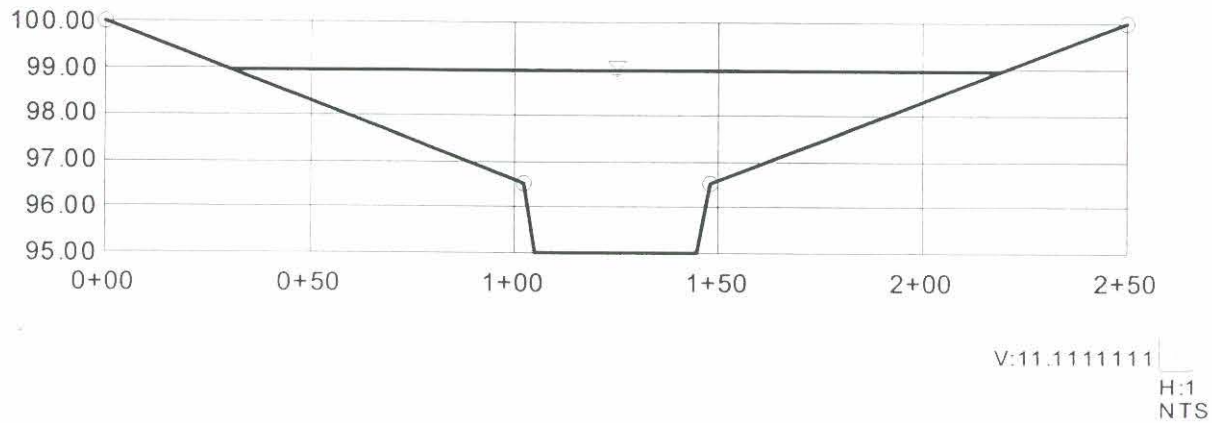
Natural Channel Points

Station (ft)	Elevation (ft)
10+00	110.00
10+20	100.00
10+40	90.00
10+40	90.00
12+03	90.00
12+03	90.00
12+23	100.00
12+43	110.00

6_282_286
Cross Section for Irregular Channel

Project Description	
Worksheet	6_282_286
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.053	
Slope	0.023100	ft/ft
Water Surface Elevation	98.95	ft
Elevation Range	95.00 to 100.00	
Discharge	2,287.00	cfs



6_282_286
Worksheet for Irregular Channel

Project Description	
Worksheet	6_282_286
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.023100	ft/ft
Discharge	2,287.00	cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Metho	Horton's Method

Results		
Mannings Coefficient	0.053	
Water Surface Elevation	98.95	ft
Elevation Range	95.00 to 100.00	
Flow Area	352.6	ft²
Wetted Perimeter	189.73	ft
Top Width	188.94	ft
Actual Depth	3.95	ft
Critical Elevation	98.69	ft
Critical Slope	0.033662	ft/ft
Velocity	6.49	ft/s
Velocity Head	0.65	ft
Specific Energy	99.61	ft
Froude Number	0.84	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00	1+02	0.055
1+02	1+48	0.045
1+48	2+50	0.055

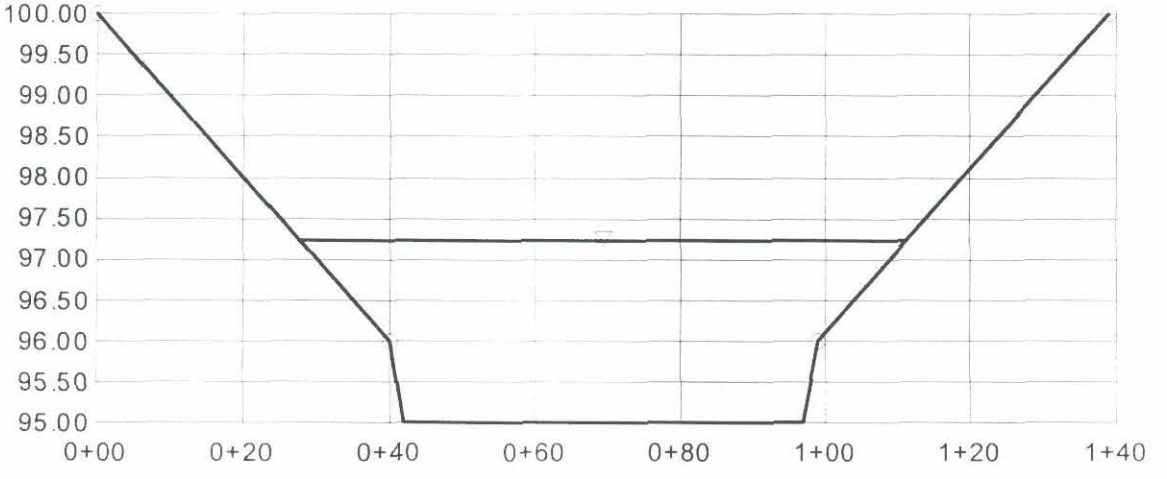
Natural Channel Points

Station (ft)	Elevation (ft)
0+00	100.00
1+02	96.50
1+05	95.00
1+45	95.00
1+48	96.50
2+50	100.00

6_284_285
Cross Section for Irregular Channel

Project Description	
Worksheet	6_284_285
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.047	
Slope	0.030000	ft/ft
Water Surface Elevation	97.24	ft
Elevation Range	95.00 to 100.00	
Discharge	1,155.00	cfs



V:11.1111111
H:1
NTS

6_284_285
Worksheet for Irregular Channel

Project Description	
Worksheet	6_284_285
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.030000	ft/ft
Discharge	1,155.00	cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Metho	Horton's Method

Results		
Mannings Coefficient	0.047	
Water Surface Elevation	97.24	ft
Elevation Range	95.00 to 100.00	
Flow Area	145.2	ft²
Wetted Perimeter	84.32	ft
Top Width	83.73	ft
Actual Depth	2.24	ft
Critical Elevation	97.32	ft
Critical Slope	0.026224	ft/ft
Velocity	7.95	ft/s
Velocity Head	0.98	ft
Specific Energy	98.22	ft
Froude Number	1.06	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00	0+40	0.050
0+40	0+99	0.045
0+99	1+39	0.050

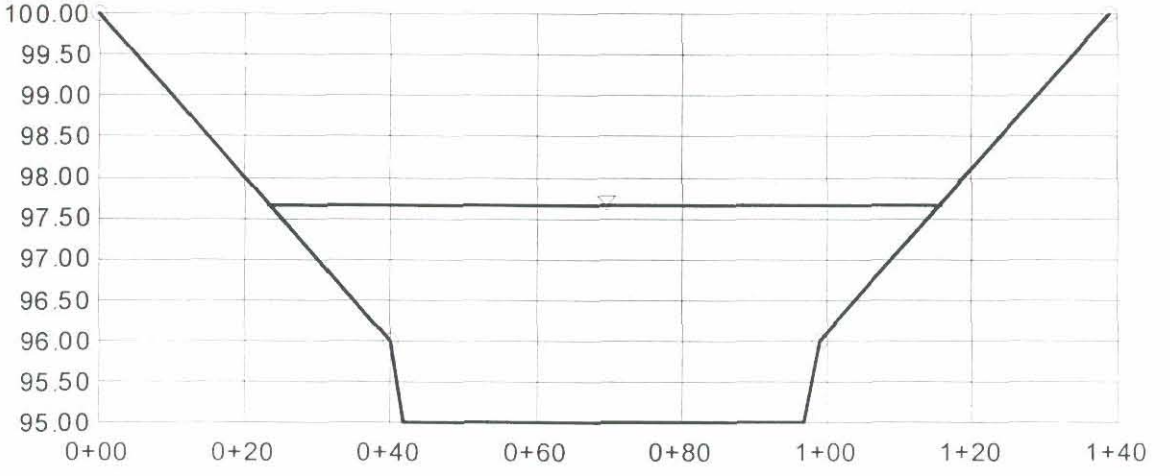
Natural Channel Points

Station (ft)	Elevation (ft)
0+00	100.00
0+40	96.00
0+42	95.00
0+97	95.00
0+99	96.00
1+39	100.00

6_285_286
Cross Section for Irregular Channel

Project Description	
Worksheet	6_285_286
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.047	
Slope	0.025000	ft/ft
Water Surface Elevation	97.67	ft
Elevation Range	95.00 to 100.00	
Discharge	1,446.00	cfs



V:11.1111111
H:1
NTS

6_285_286
Worksheet for Irregular Channel

Project Description	
Worksheet	6_285_286
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.025000	ft/ft
Discharge	1,446.00	cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Metho	Horton's Method

Results		
Mannings Coefficient	0.047	
Water Surface Elevation	97.67	ft
Elevation Range	95.00 to 100.00	
Flow Area	183.4	ft²
Wetted Perimeter	93.03	ft
Top Width	92.39	ft
Actual Depth	2.67	ft
Critical Elevation	97.65	ft
Critical Slope	0.025719	ft/ft
Velocity	7.89	ft/s
Velocity Head	0.97	ft
Specific Energy	98.64	ft
Froude Number	0.99	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00	0+40	0.050
0+40	0+99	0.045
0+99	1+39	0.050

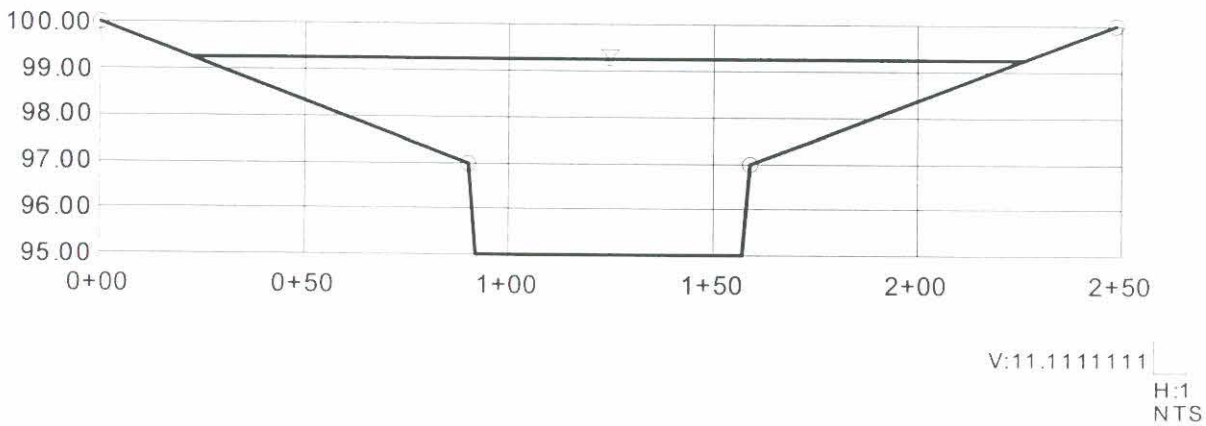
Natural Channel Points

Station (ft)	Elevation (ft)
0+00	100.00
0+40	96.00
0+42	95.00
0+97	95.00
0+99	96.00
1+39	100.00

6_286_287
Cross Section for Irregular Channel

Project Description	
Worksheet	6_286_287
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.048	
Slope	0.020400	ft/ft
Water Surface Elevation	99.25	ft
Elevation Range	95.00 to 100.00	
Discharge	3,231.00	cfs



6_286_287
Worksheet for Irregular Channel

Project Description	
Worksheet	6_286_287
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.020400	ft/ft
Discharge	3,231.00	cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Metho	Horton's Method

Results		
Mannings Coefficient	0.048	
Water Surface Elevation	99.25	ft
Elevation Range	95.00 to 100.00	
Flow Area	442.1	ft²
Wetted Perimeter	206.02	ft
Top Width	204.29	ft
Actual Depth	4.25	ft
Critical Elevation	99.02	ft
Critical Slope	0.026972	ft/ft
Velocity	7.31	ft/s
Velocity Head	0.83	ft
Specific Energy	100.08	ft
Froude Number	0.88	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00	0+90	0.050
0+90	1+59	0.045
1+59	2+49	0.050

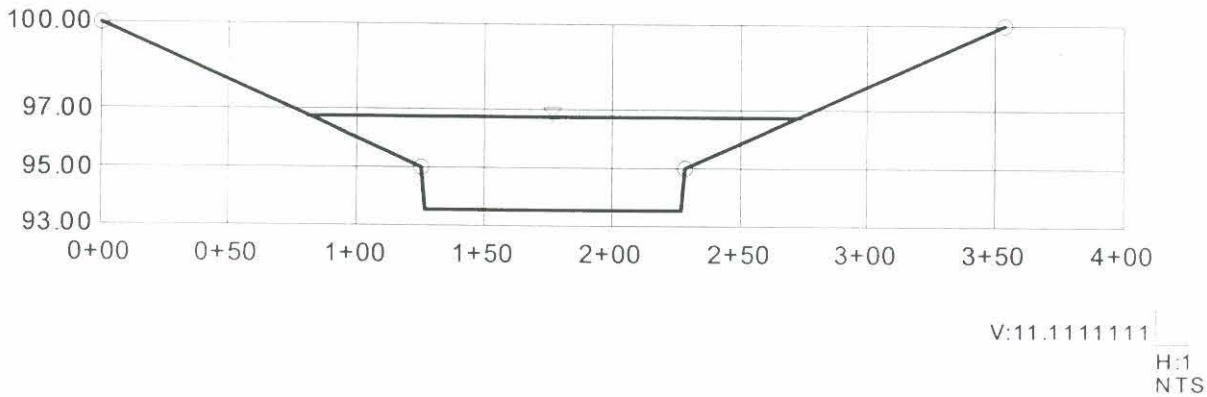
Natural Channel Points

Station (ft)	Elevation (ft)
0+00	100.00
0+90	97.00
0+92	95.00
1+57	95.00
1+59	97.00
2+49	100.00

6_287_288
Cross Section for Irregular Channel

Project Description	
Worksheet	6_287_288
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.045	
Slope	0.029200	ft/ft
Water Surface Elevation	96.78	ft
Elevation Range	93.50 to 100.00	
Discharge	3,955.00	cfs



6_287_288
Worksheet for Irregular Channel

Project Description	
Worksheet	6_287_288
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.029200	ft/ft
Discharge	3,955.00	cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Metho	Horton's Method

Results		
Mannings Coefficient	0.045	
Water Surface Elevation	96.78	ft
Elevation Range	93.50 to 100.00	
Flow Area	418.0	ft²
Wetted Perimeter	194.25	ft
Top Width	193.18	ft
Actual Depth	3.28	ft
Critical Elevation	97.01	ft
Critical Slope	0.022361	ft/ft
Velocity	9.46	ft/s
Velocity Head	1.39	ft
Specific Energy	98.17	ft
Froude Number	1.13	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00	1+25	0.050
1+25	2+29	0.040
2+29	3+54	0.050

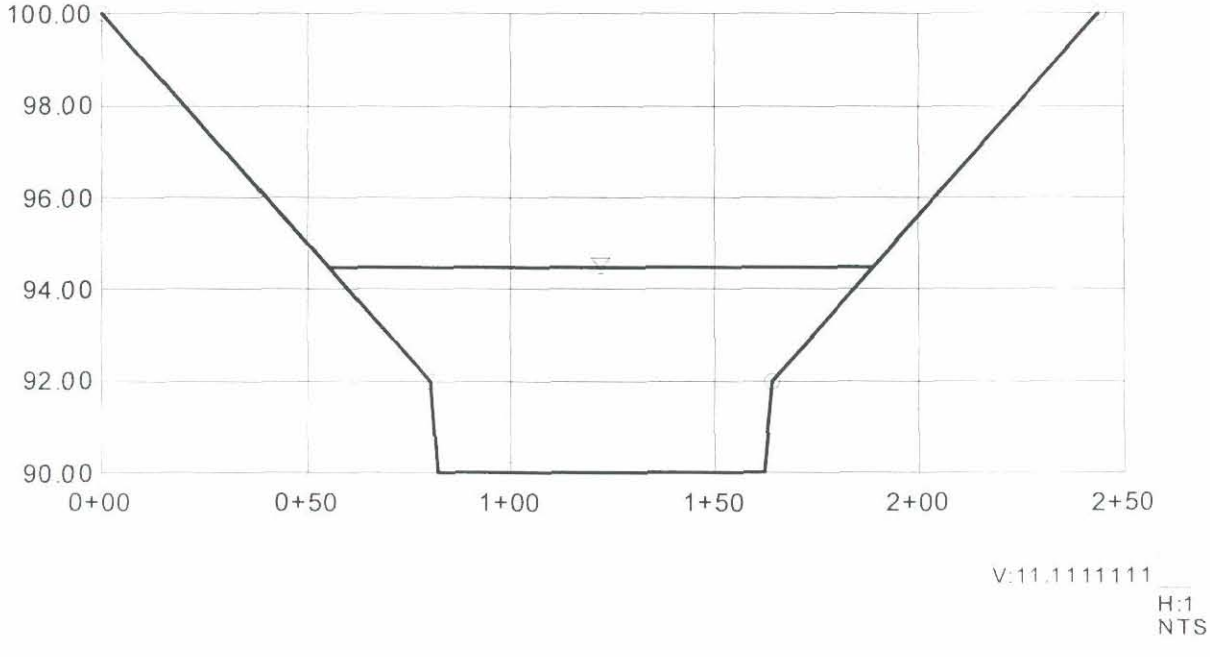
Natural Channel Points

Station (ft)	Elevation (ft)
0+00	100.00
1+25	95.00
1+27	93.50
2+27	93.50
2+29	95.00
3+54	100.00

6_290_295
Cross Section for Irregular Channel

Project Description	
Worksheet	6_290_295
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.041	
Slope	0.022900	ft/ft
Water Surface Elevation	94.48	ft
Elevation Range	90.00 to 100.00	
Discharge	5,187.00	cfs



6_290_295
Worksheet for Irregular Channel

Project Description	
Worksheet	6_290_295
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.022900	ft/ft
Discharge	5,187.00	cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Metho	Horton's Method

Results		
Mannings Coefficient	0.041	
Water Surface Elevation	94.48	ft
Elevation Range	90.00 to 100.00	
Flow Area	433.7	ft²
Wetted Perimeter	135.48	ft
Top Width	133.58	ft
Actual Depth	4.48	ft
Critical Elevation	94.90	ft
Critical Slope	0.016356	ft/ft
Velocity	11.96	ft/s
Velocity Head	2.22	ft
Specific Energy	96.70	ft
Froude Number	1.17	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00	0+80	0.050
0+80	1+64	0.035
1+64	2+44	0.050

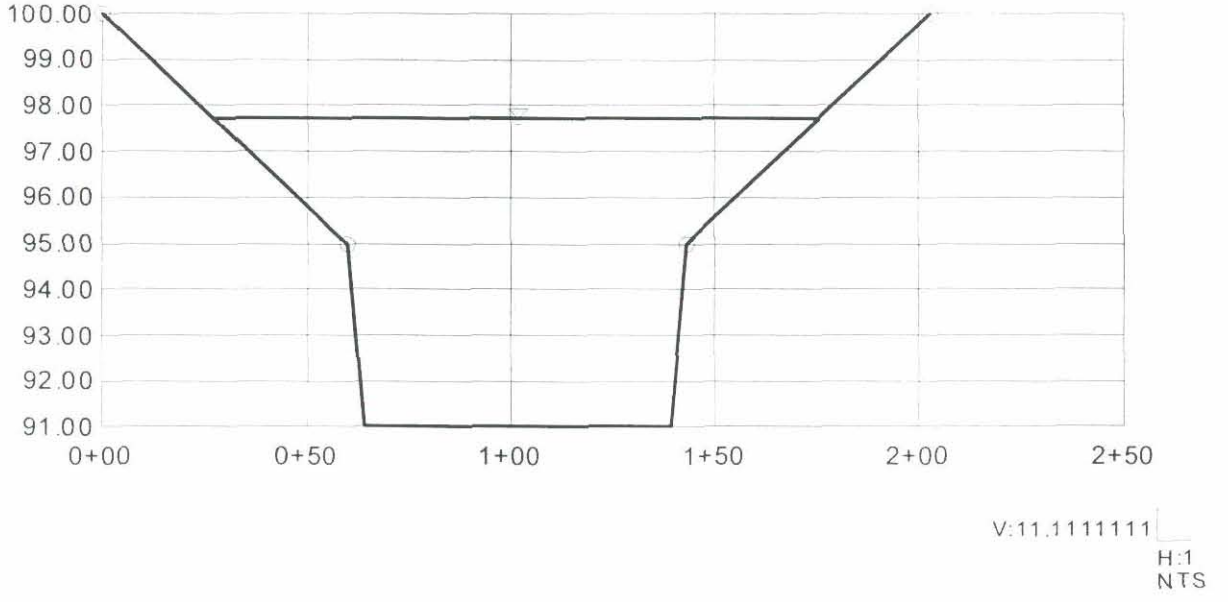
Natural Channel Points

Station (ft)	Elevation (ft)
0+00	100.00
0+80	92.00
0+82	90.00
1+62	90.00
1+64	92.00
2+44	100.00

6_295_300
Cross Section for Irregular Channel

Project Description	
Worksheet	6_295_300
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.042	
Slope	0.024200	ft/ft
Water Surface Elevation	97.72	ft
Elevation Range	91.00 to 100.00	
Discharge	9,018.00	cfs



6_295_300
Worksheet for Irregular Channel

Project Description	
Worksheet	6_295_300
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.024200	ft/ft
Discharge	9,018.00	cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Metho	Horton's Method

Results		
Mannings Coefficient	0.042	
Water Surface Elevation	97.72	ft
Elevation Range	91.00 to 100.00	
Flow Area	631.1	ft²
Wetted Perimeter	151.92	ft
Top Width	148.37	ft
Actual Depth	6.72	ft
Critical Elevation	98.47	ft
Critical Slope	0.015871	ft/ft
Velocity	14.29	ft/s
Velocity Head	3.17	ft
Specific Energy	100.90	ft
Froude Number	1.22	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00	0+60	0.050
0+60	1+43	0.035
1+43	2+03	0.050

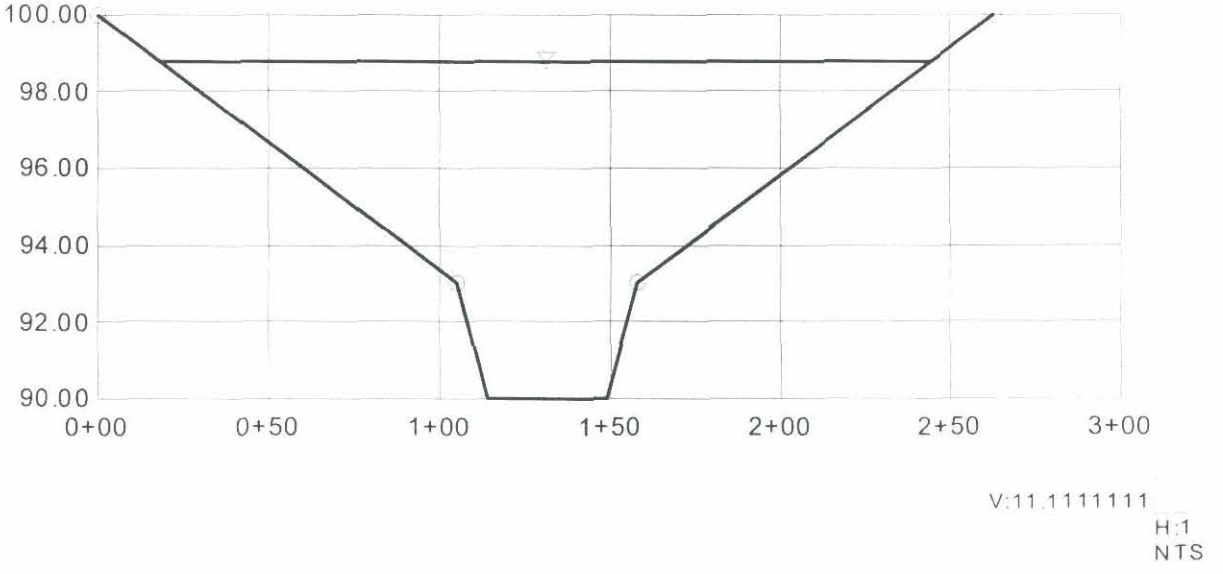
Natural Channel Points

Station (ft)	Elevation (ft)
0+00	100.00
0+60	95.00
0+64	91.00
1+39	91.00
1+43	95.00
2+03	100.00

6_300_310
Cross Section for Irregular Channel

Project Description	
Worksheet	6_300_310
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.043	
Slope	0.018400	ft/ft
Water Surface Elevation	98.78	ft
Elevation Range	90.00 to 100.00	
Discharge	11,333.00	cfs



6_300_310
Worksheet for Irregular Channel

Project Description	
Worksheet	6_300_310
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.018400	ft/ft
Discharge	11,333.00	cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Metho	Horton's Method

Results		
Mannings Coefficient	0.043	
Water Surface Elevation	98.78	ft
Elevation Range	90.00 to 100.00	
Flow Area	939.6	ft²
Wetted Perimeter	227.77	ft
Top Width	226.41	ft
Actual Depth	8.78	ft
Critical Elevation	98.93	ft
Critical Slope	0.016795	ft/ft
Velocity	12.06	ft/s
Velocity Head	2.26	ft
Specific Energy	101.04	ft
Froude Number	1.04	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00	1+05	0.085
1+05	1+58	0.040
1+58	2+63	0.085

Natural Channel Points

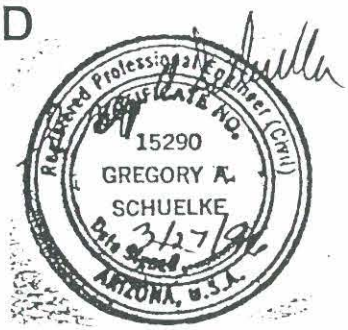
Station (ft)	Elevation (ft)
0+00	100.00
1+05	93.00
1+14	90.00
1+49	90.00
1+58	93.00
2+63	100.00

D.4 Reservoir Routing Data

DETAILED DRAINAGE DESIGN REPORT
FOR
DESERT MOUNTAIN PROPERTIES
PROPOSED DETENTION BASIN NO. S-1

JULY, 1995
REVISED: MARCH, 1996
REVISED: MARCH 26, 1996

PREPARED FOR:
DESERT MOUNTAIN PROPERTIES
6263 NORTH SCOTTSDALE ROAD
SCOTTSDALE ARIZONA 85250



A-N WEST NO. 4628-55

A-N WEST INC.
Consulting Engineers
7600 North 15th Street, Suite 200
Phoenix, Arizona 85020
(602) 861-2200

• "Most Livable City" U.S. Conference of Mayors •

NOTICE OF WARRANTEE COMPLIANCE

December 4, 1997

CS Construction
22023 N. 20th Ave. Ste A.
Phoenix, AZ. 85027

References:
Permit Number: 16798 Q.S.: 61-49
Other References: 1941 E 95 11 DR 95

Project data:
Name: Desert Mountain S-1 Detention Basin
Location: CB 34-Donald / Pima Rd.
Improvement: Drainage

On December 4, 1997 John Knabl, public works inspector, performed an inspection for defective workmanship or materials of subject project improvement. Findings of that inspection indicated that there were no apparent deficiencies observed, or that improvements requiring corrections were repaired to the satisfaction of the inspector.

As such, inspector, received all obligations for warranty purposes as cited in Section 108.8 of the Maricopa Association of Governments (MAG) specifications regarding improvements on this project.

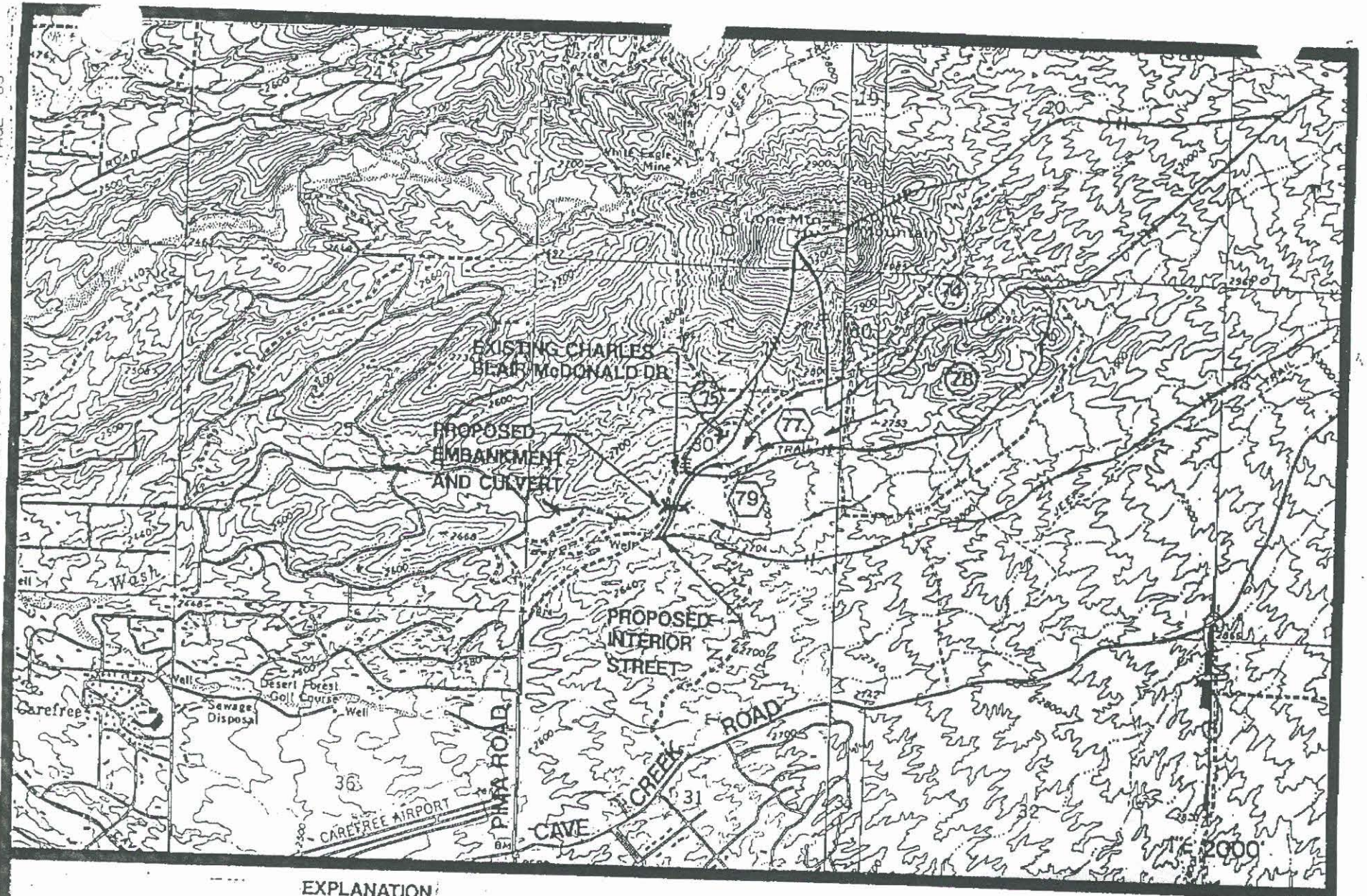
Sincerely,

[signature]

Jim Burns
Field Engineering Manager

cc: Project manager
Chief Deputy Inspector
File
Inspection Services
Water and Sewer Plans
Traffic Engineering
Field Services

10/20/1999 15:30 6029431989 A-N WEST, INC. PAGE 03



NO. 4628-55

A-N WEST INC. Consulting Engineers

DESERT MOUNTAIN PROPERTIES
PROPOSED DETENTION BASIN No. S-1
IN SECTION 30, T6N, R5E
VICINITY MAP

FIGURE 2

DETAILED DRAINAGE DESIGN REPORT
FOR
DESERT MOUNTAIN PROPERTIES
PROPOSED DETENTION BASIN NO. S-1

JULY, 1995
REVISED: MARCH, 1996
REVISED: MARCH 26, 1996

PREPARED FOR:
DESERT MOUNTAIN PROPERTIES
6263 NORTH SCOTTSDALE ROAD
SCOTTSDALE ARIZONA 85250

A-N WEST NO. 4628-55

A-N WEST INC.
Consulting Engineers
7600 North 15th Street, Suite 200
Phoenix, Arizona 85020
(602) 861-2200

PREFACE

The original site location concept design and hydrologic analysis for the S-1 detention basin were established by the Master Drainage Report for Desert Mountain Development, dated May, 1992 by A-N West, Inc.

The Detailed Drainage Design Report for the S-1 Basin was prepared in July, 1995 which refined the hydraulic design for the proposed basin, based on and in reference to the May, 1992 Master Drainage Plan hydrology methodology.

City of Scottsdale review comments of 2/15/96 regarding the Detailed Drainage Design Report, recommended hydrologic methodology changes. This revised March, 1996 Detailed Drainage Design Report contains all pertinent hydrologic analysis for the proposed basin. Reference to the May, 1992 Master Plan is only for establishing basis and date of original concept basin siting.

DETAILED DRAINAGE DESIGN REPORT
FOR
DESERT MOUNTAIN PROPERTIES
PROPOSED DETENTION BASIN NO. S-1

1.0 INTRODUCTION:

This report presents the detailed drainage design and analysis results for the proposed Detention Basin No. S-1 (see Location Maps, Figures 1 and 2). This detention basin was originally proposed and identified in the May, 1992 Master Drainage Report by A-N West, Inc. (Reference 1).

2.0 DETENTION BASIN PURPOSE:

The Detention Basin No. S-1 was proposed as part of the May, 1992 Master Drainage Plan (Reference 1) to prevent increases in storm water runoff due to development for the 10-, 25- and 100-year 6-hour storm events. The Master Drainage Report was submitted to the City of Scottsdale on September 15, 1992 in response to the City's request for a proposed development detention plan.

3.0 GENERAL DETENTION BASIN REVISIONS FROM MASTER PLAN:

The May, 1992 Master Drainage Report proposed raising Charles Blair McDonald Drive at the location where the unnamed wash exited the Desert Mountain Development. The road is currently at-grade and subject to flooding. The raised roadway embankment was proposed to have a 3 barrel 12 foot span x 9 foot rise box culvert through the embankment to convey up to 100-year storm discharges under the road, while causing sufficient temporary storage to maintain developed condition peak discharges below existing condition discharges for the 10-, 25- and 100-year 6-hour storm events.

As final design for the detention basin was initiated, Desert Mountain Properties met with adjacent property owners to discuss the project and also began to refine the land use plan for the Desert Mountain Development in the vicinity of the basin.

Adjacent property owners objected to the 9 foot height of the proposed box culverts under Charles Blair McDonald and the extent of modifications to this road which is private and just outside the Desert Mountain property line.

An internal access street within the Desert Mountain Development property line with raised embankment was proposed to retain the stormwater. Lower 4 foot height (6 barrel 12 foot span) box culverts were proposed under the internal street and Charles Blair McDonald Drive to minimize the improvements to Charles Blair McDonald Drive, while still providing 100-year access on both streets.

4.0 DETENTION BASIN BASIS OF DESIGN:

The Detention Basin No. S-1 basis of design was as follows:

a. Peak discharge attenuation to maintain or reduce developed condition discharges from existing conditions for the 10-, 25-, 50- and 100-year 6- and 24-hour storms.
b. Pass the 100-year 24-hour storm flow through box culverts before overtopping of embankment.
c. Maintain basin height and storage volume relationship outside ADWR's Jurisdictional Dam Classification.

5.0 HYDROLOGY:

5.1 General: The U.S. Army Corps of Engineers HEC-1 computer program (Reference 6) was used to generate peak discharges in the study watershed. The north and south watersheds (see Exhibit 1) were divided into 18 and 9 subareas respectively. Only the south watershed contributing to the S-1 basin was modeled for this report analysis.

5.2 Precipitation and Rainfall Distribution: The precipitation values were computed using procedures and equations from the ADOT manual (Reference 9) which are compatible with a PREFRE computer program (U.S.B.O.R., 1988). These calculations are included in the Appendix.

The PH record of the HEC-1 model was used to create the hypothetical rainfall distribution for the storm events up to the 100-year storm.

A tabulation interval (Field 1, IT record) of 3-minutes was used for 6-hour duration storms, including the PMF analysis and 5-minutes for 24-hour duration storms.

5.3 Hydrograph Computation: The Kinematic wave option of the HEC-1 model was used to compute watershed lag. The Kinematic wave input parameters are included in the Appendix.

In applying the Kinematic wave option to the drainage subareas, it was generally noted that after initial overland flow (UK record), numerous small channels (collector channels) contributed to a main channel. Although the main channel may have conveyed upstream subareas through the subarea, the main channel did not generally begin to receive small (collector) channel flow until midpoint or lower within the subarea.

Therefore, in generating Kinematic wave input parameters, the overland flow (UK record) was always used for each subarea. Generally, two RK records were used to model the numerous long small collector channels flowing into the shorter length of the main channel.

soil was assigned a hydrologic soil Type B, as shown on Exhibit 1. Permeability's of 2- to 60-inches/hour were estimated for the upper 8- to 40-inches of soil for this soil type by the Soil Survey (Reference 1).

Although not always detailed in the Soil Survey, the majority of the streambeds where channel routing was modeled, were estimated to have sand or gravel streambeds. This estimation is based on review of the 500-scale aerial photo of Desert Mountain and on pervious field visits. The thickness of the permeable sand gravel layer of the streambed was estimated to decrease toward the upper ends of washes.

Transmission losses were therefore modeled as part of the channel routing, subroutine of the HEC-1 model. The third field of the RL record of the HEC-1 model allows a cfs/acre loss rate to be entered to model infiltration losses of the routed hydrograph into the channel streambed. One inch/hour permeability translates into 1 cfs/acre loss rate. A 4 cfs/acre wash rate was considered a reasonable rate and was chosen as an average of the 2- and 6-inches/hour permeability's of these soils.

A loss rate of 2 cfs/acre was applied to the lower reaches of the southern wash which contained identified hydrologic soil Type B soils, per the Soil Survey.

The upper channel reaches were modeled with progressively lower loss rates as the routing reach approached the upper ends of the watershed. The upper reaches were modeled with a 0.5 cfs/acre loss rate. This lower loss rate of the upper channel reaches was chosen to reflect assumed thinner layer of permeable streambed material in these reaches with lower transmission loss capabilities.

Literature on reasonable channel transmission loss rates is limited. The Corps of Engineers estimated average channel bed transmission losses of 1.25 cfs/acre for a 11.5 mile channel reach of Cave Creek Wash downstream of Cave Creek Dam from observed flood data from a 9/4/70 storm (Reference 15). Since this was a longer duration stream flow, from a larger watershed, the average transmission losses were considered to be lower than what would be estimated for a shorter duration storm on a smaller watershed. In the case of Cave Creek Wash below Cave Creek Dam, the streambed would likely become saturated at some point, thereby providing average transmission losses less that initial losses.

The NSTPS values (field 1 of RS record) for normal depth routing were adjusted for the 100-year 6-hour developed condition storm results using the eqn: NSTPS = (diff. Peak Time x 60)/Time Interval. The NSTPS values were checked for 24-hour storm events and not found to vary significantly.

5.6 Reservoir Routing: Reservoir routing by the level pool method utilizing the RS, SQ, SV and SE records in the HEC-1, was performed to model the affect of proposed detention basin.

Elevation vs. volume data was generated at proposed detention basin sites from 40 scale one foot CI mapping. Elevation versus discharge data was generated from the Hydraulic Charts for Selection of Highway Culverts, HEC-5 (Reference 4) and by weir and orifice equations.

a. Envelope Curve of peak 100-year discharges from FIS studies in Maricopa County, plotted by ADWR and submitted at an AFMA meeting in Tucson on 2/21/92.

b. Figure 10-1, Peak Discharge Relations and Envelope Curves from ADOT Hydrology Manual (3/93), including curves C, G and H which are more specific to Arizona.

c. Figure 10-4, 100-year Peak Discharge Regression Analysis of Stream Gage Data in Arizona from the ADOT Hydrology Manual (3/93).

The A-N West 100-year peak discharge as a ratio of cfs per square mile drainage area (CSM) for this study are higher than the FIS results, 1,190.4 csm versus 562 csm, respectively or 215.8 percent higher. The FIS study computations were not available for review to allow more comments on the reasons for the difference in discharges. The A-N West results tend to plot within the upper confidence limits of the above described plots which would be expected for a drainage watershed of 3+ percent slopes and a majority of Type D hydrologic soils.

The developed condition PMF discharges of 27,911 and 31,879 cfs (D.A. 2.4 $mi.^2$) computed by the curve number versus uniform loss methods, respectively, were also plotted on a graph in the Appendix. This Figure 24, Maximum Peak Discharges for Stream Gages in Arizona, was obtained from the City of Scottsdale, which was in turn obtained from the Denver office of the Bureau of Reclamation as part of the hydrologic analysis of Dikes 1-4 along the CAP in Phoenix and Scottsdale.

This reports PMF flood results plot within the band of local PMF discharges, shown on this Figure 24.

6.0 HYDRAULICS:

6.1 Description of Basin and Outlet Structure: The outlet structure will involve a 6 barrel 12 foot span x 4 foot rise reinforced box culvert which will pass under a raised Charles Blair McDonald Drive and the proposed interior street of the Desert Mountain Development.

Two of the six barrels will be a continuous 157.8 feet long and will have an inlet directly to the upstream basin and wash at inlet invert elevation = 2,656.5, conveying initial flows. The inlet face will be a vertical concrete wall which will form an overflow weir for ponded water to weir over and flow into the other four box culvert barrels (two barrels on each side).

Two 3.3 foot span x 2.16 foot rise orifices in the inlet vertical wall at invert elevation 2,658.5 will also allow flow to enter the four box culvert barrels when flow reaches the orifice invert.

Flow over the front vertical concrete overflow wall can begin at the top of wall elevation of 2667.0 for this 77.4 L.F. section of wall. The side walls (20 L.F. each side) and the back wall (77.4 L.F.) are at top of wall elevation of 2,669.0 and provide additional overflow capacity.

Overflow capacity for storms greater than the 100-year 24-hour storm is provided by the proposed interior street between stations 15+00± to 18+00± which will act as a controlling emergency overflow weir. The low top of road of this interior street is 2,670.33.

Additional overflow capacity for the larger storm occurs at Station 8+10± of the interior street, where flow can drain south in the road which has low pavement elevation of 70.48 and high pavement elevation of 71.01 across its 38 foot width as well as a berm of 50± feet length and top elevation = 70.50.

6.2 Hydraulic Analysis of Basin Outlet Culvert Structure and Emergency Overflow: The two center 12 foot span x 4 foot rise x 157.8 foot long reinforced concrete box (RCB) culvert barrels receive initial low flows. The hydraulic capacity of these two barrels was computed for a number of water surface elevations using the procedure from HEC-5 (Reference 4). The Appendix shows these calculations. The inlet of the two center barrels was proposed to have essentially square corners.

The outside four 12 foot x 4 foot x 135.5 foot RCB culvert barrels receive flow from the two 3.3 foot span x 2.16 foot rise orifices in the front vertical wall, in addition to overflow weiring over the top of the vertical walls around the inlet of these four barrels.

As weir flows to these four RCB culvert barrels increases, the discharge versus elevation capacity relationship will change from the orifice and weir flow to the capacity of the four outside RCB culverts. Therefore, the HEC-5 (Reference 4) procedure was used to compute the capacity of the four RCB barrels at a number of different WSEL's, as shown in the Appendix. The inlet soffit of the four barrels was proposed to have a 45 degree bevel to increase capacity for overflow from the weir walls.

In order to establish the combined capacity versus water surface elevation (WSEL) for the proposed basin outlet structure box culverts, weir and orifices, Table A-1 in the Appendix was prepared. Referring to this table;

- Column 1 shows water surface elevation (WSEL).
- Column 2 shows the capacity of the center two box culvert barrels.
- Column 3 shows the capacity of the outside four box culvert barrels.
- Columns 4 and 5 show the estimated Head (H) in feet and discharge (Q) in cfs for the two orifices which contribute flow to the outside four RCB culverts.
- Columns 6, 7 and 8 show the front wall head (H), weir coeff. (c) and weir discharge (cfs) estimated to contribute to the outside four RCB culverts.
- Columns 9, 10, 11, 12, 13 and 14 show the side and back wall head (H), weir coeff. (c) and weir discharge (cfs) estimated to contribute to the outside four RCB culverts.
- Column 15 shows the total flow for a given WSEL passing through the six barrel RCB culvert structure.

For a given WSEL, the smaller of the four RCB culvert's capacity or the combined orifice and weir flows (sum of columns 5, 8, 11, and 14) controls. Therefore, at WSEL 72.0 and higher the four RCB culvert's capacity controls over orifice and weir flows.

At WSEL 70.0 and higher, the orifice head was decreased to account for submergence of the orifice.

- Column 16 shows the RCB culvert capacity with the two orifices removed for checking the impact of potential debris plugging.
- Column 17 shows emergency overflow weir discharge from a separate HEC-2 model analysis.
- Column 18 shows the combine culverts (unplugged) and weir capacity.

The HEC-2 model was utilized (File: S1WRRC) to model the interior street profile and berm (Sta. 8+06), controlling weir flow. The energy grade elevations versus discharge were obtained for numerous discharges using critical depth starting water surface method (see Appendix).

The Appendix shows the storage volume versus elevation relationship for the basin determined from the Exhibit 3. The Appendix shows the discharge versus elevation curve for the RCB outlet structure and emergency overflow weir. The Appendix shows the HEC-1 input parameters utilized to route the various 2-, 10-, 25-, 50-, and 100-year 6-hour and 24-hour hydrographs through the basin. Since water surface elevations did not exceed the low top of road elevation of 70.33, no emergency overflow discharge over the street was modeled in the HEC-1 model for the 2 - 100-year storm events.

6.3 Drain Time for Basin S-1: The Appendix contains the outflow hydrograph for the developed condition 100-year 6-hour and 24-hour storm event routings through the proposed Detention Basin S-1.

From the 100-year 6-hour storm hydrograph, the basin will fill to peak elevation in approximately 0.5 hours and drain to essentially empty in 2.5 more hours. The 100-year 24-hour hydrograph will fill the basin to peak elevation in approximately one hour and drain to essentially empty in three more hours. Several intermediate ponded WSEL's and time duration, water is ponded at the respective elevation, are also shown on the hydrographs.

6.4 Sediment Transport Storage and Long Term Scour/Aggradation:

6.4.1 General: As proposed, the S-1 detention basin outlet structure conveys the developed condition 2-year 6-hour storm peak discharge of 486 cfs through the basin without attenuation.

An analysis was made to determine if this storm hydrograph was capable of transporting the average annual sediment yield through the basin also.

6.4.2 Sediment Yield: The Pacific Southwest Interagency Committee Method (PSIAC) was chosen to estimate the potential average annual sediment yield to the proposed basin. This method was considered applicable based on the Reference 17 study. A total PSIAC rating number of 35 was computed with a related average annual sediment yield of 0.29 acre-feet/square mile of drainage area/year. For the 2.4 square mile drainage area for the S-1 basin, the total potential average annual sediment yield was 0.29 x 2.4 or 0.70 acre-feet/year.

PROJECT: 4628-55 Basin Site S-1 On Charles Blair McDonald 4- Overflow Weir Culverts 12'x4'x 135' DESIGNER: GAS DATE: 6/6/95

HYDROLOGIC AND CHANNEL INFORMATION

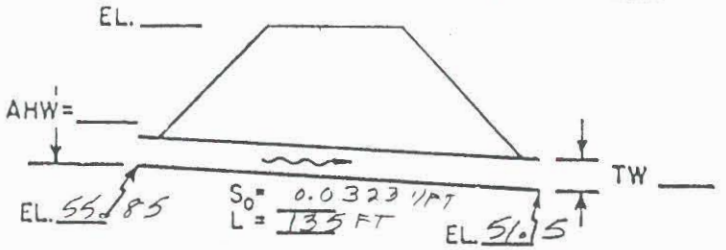
Q_1 = _____ TW_1 = _____

Q_2 = _____ TW_2 = _____

(Q_1 = DESIGN DISCHARGE, SAY Q_{25}
Q_2 = CHECK DISCHARGE, SAY Q_{50} OR Q_{100})

SKETCH

STATION : _____



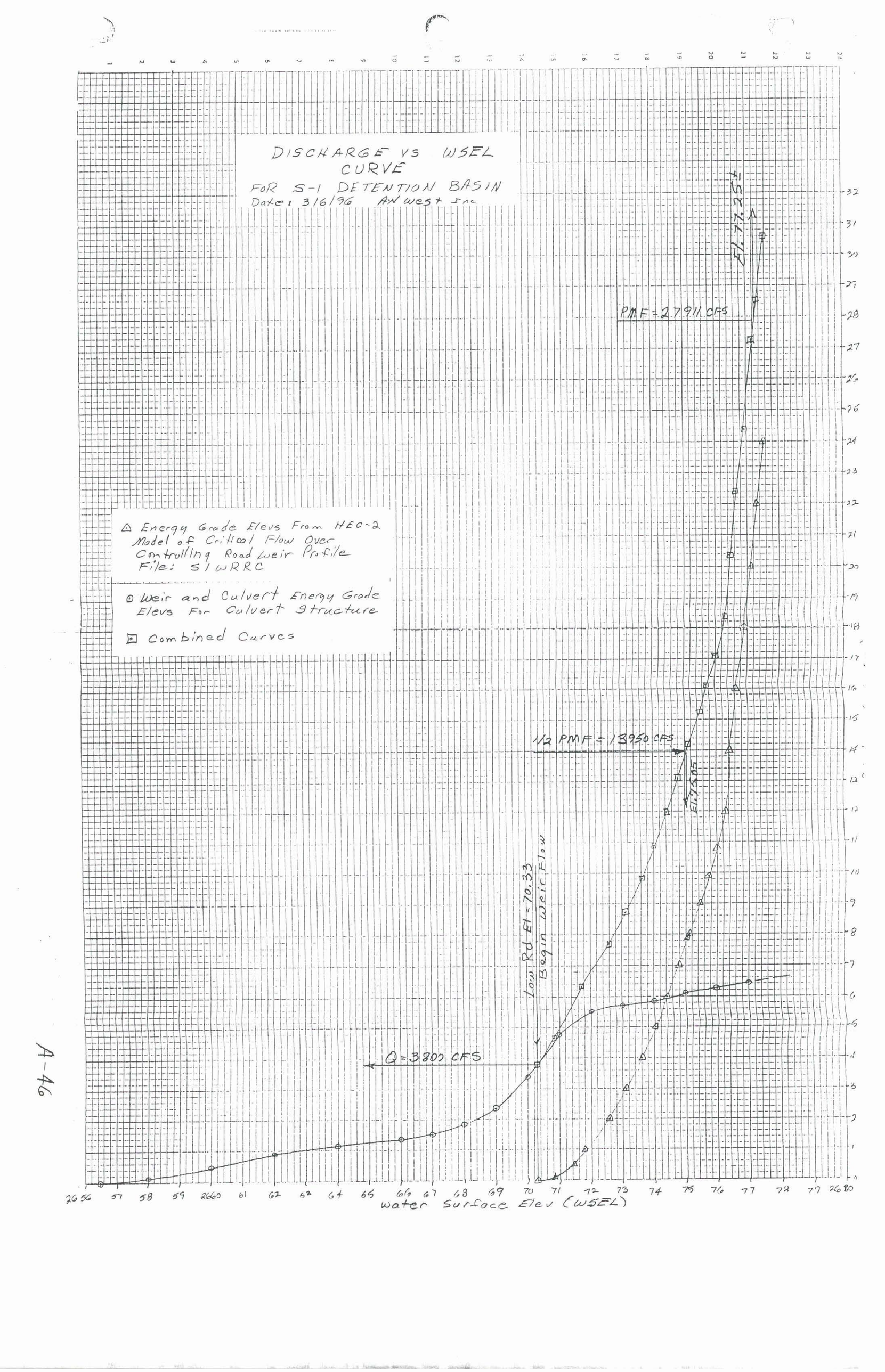
MEAN STREAM VELOCITY = _____

MAX. STREAM VELOCITY = _____

	CULVERT DESCRIPTION (ENTRANCE TYPE)	Q -	SIZE	HEADWATER COMPUTATION: INLET CONT. HW/D	INLET CONT. HW	OUTLET CONTROL HW=H+h_o-LS_o: K_e	H	d_c	$\frac{d_c+D}{2}$	TW	h_o	LS_o	HW	CONTROLLING HW	OUTLET VELOCITY	COST	COMMENTS
58	Head wall 90°	96	1-12'x4'	0.54	2.15	0.5						4.35					
60	Flare Angle	260		1.04	4.15	"						"					
62	*45° Angle	420	*466	1.54	6.15	"						"					
64	Beveled Top	~~552~~	*600	2.01	8.15	"						"					
66	of Inlet *696	630		2.54	10.15	"						"					
67	*750	~~684~~		2.79	11.16												
68	*816	720		3.04	12.15	"						"					
69	*840	~~744~~		3.29	13.15												
70	*870	~~780~~		3.54	14.15	"						"					
71	*936	~~834~~		3.78	15.15												
72	*960	~~864~~		4.04	16.15	"	9.4		4	4	4.35	"	9.05				Inlet control
73	*990	910		4.29	17.15												
74	*1032	924		4.54	18.15	0.5	~~10.8~~ 11	~~Crit.~~	4.5	—	4.0	4.35	10.7	18.15			Inlet control
75	*1065			4.79	19.15												
	SUMMARY & RECOMMENDATIONS:			*													
76		1092		5.038	20.15												
77		1116		5.298	21.15												

* From HDS-5, FHWA, Sept. 1985, Chart 9, Scale 1

A-43


DISCHARGE VS WSEL CURVE
FOR S-1 DETENTION BASIN
Date: 3/6/96 AN west Inc
△ Energy Grade Elevs From HEC-2 Model of Critical Flow Over Controlling Road Weir Profile File: S1WRRC
⊙ Weir and Culvert Energy Grade Elevs For Culvert Structure
⊡ Combined Curves
PMF = 27911 CFS
El. 77.5 ft
1/2 PMF = 18950 CFS
El. 75.05
Low Rd El = 70.33
Begin Weir Flow
Q = 3800 CFS
water surface Elev (WSEL)

Water Surface Elev. WSE	(Note 1) Two center thru culvts. conveying Initial Flow	(Note 2) Four Outside Culvts. conveying overflow	(Note 3) Two 3.3' span x 2.16' Rise orifices To Outside RCBs I.E. = 58.5 A = 14.2 sf		(Note 5) Front wall weir Flow Length = 77.4 FT I.E. = 67.0			(Note 5) Side Wall weir Flow Length = 40.FT I.E. = 69.0			(Note 5) Back wall weir Flow Length = 77.4 FT I.E. = 69.0			Total Culvt. Outlet Struc.	Emergency Weir Overflow over Interior Street From HEC-2 File: SIWRRC Model Rating Curve of critical Depth Energy Grade El. vs. Q		Total Basin Outflows
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	Q (15)	Q (16)		(17)	(18)
	(cfs)	(cfs)	H(FT)	Q(cfs)	#(ft)	C	Q(cfs)	H(FT)	C	Q(cfs)	H(FT)	C	Q(cfs)	(cfs)	Note 7 cfs		Q cfs	Q cfs
58	110	384	—	—	—	—	—	—	—	—	—	—	—	110	(110)			110
60	401	1040	H=1.5'	32	—	—	—	—	—	—	—	—	—	433	(401)			433
62	768	1824	2.4	107	—	—	—	—	—	—	—	—	—	875	(768)			875
64	1008	2400	4.4	149	—	—	—	—	—	—	—	—	—	1157	(1008)			1157
66	1200	2784	6.4	180	—	—	—	—	—	—	—	—	—	1380	(1200)			1380
67	1296	3000	7.4	193	—	—	—	—	—	—	—	—	—	1489	(1296)			1489
68	1392	3264	8.4	206	1	3.1	240	—	—	—	—	—	—	1838	(1632)			1838
69	1440	3360	9.5	219	2	3.32	727	—	—	—	—	—	—	2386	(2167)			2386
69.5																		
70	1512	3480	(Note 4) 7.4	188	3	3.32	1335	1	3.1	124	1.0	3.1	240	3399	(3211)		0	3399
71	1620	3744	note 4 0	0	4	3.32	2056	2	3.32	376	2.0	3.32	726	4778	(4778)		210	4988
72	1680	3840	0	0	5	3.32	2873	3	3.32	690	3.0	3.32	1335	(note 6) 5520			1174	6694
73	1740	3960	0	0	6									5700			2768	8468
74	1800	4128			7									5928			4907	10835
75	1884	4272												6156			7630	13786
76	1920	4368												6288			10712	17200
77	1968	4464												6432			19090	25522

Notes 1.) Two 12'x4' (Rise) x 155+' Culverts capacity Based on HEC-5 Calculations (See Appdx.)

2.) Four outside 12' x 4' (Rise) x 135' Culverts capacity Based on HEC-5 Cules (see Appdx.)
For a given WSE, the smaller of the sum of Columns 5, 8, 11 and 15 or Column 3 govern

3.) Orifice Flow Based on Eqn. $Q = C A \sqrt{2gH}$, where C = 0.61 (Brater and King, Tables 4-4 and 4-5, Complete Contraction, A = 14.2 FT² and H = Height From WSE To Orifice Center (No Submergence) or Difference in WSE's For Submerged Condition. Weir Flow (C = 2.63) Used For WSEL = 60.0.

4.) Submergence of Orifice Based on Adjusted (H) Value

5.) Weir Flow Based on Eqn. = $Q = CL(H)^{3/2}$, where C = Varies by Head Per Brater and King, Table 5-3, Breadth of Crest = 0.75 FT.

6.) Outside Four Culvert Capacity Controls Over Weir and Orifice Capacity

7.) Column 16 Values in (__) were used to model Affect of 2-orifices Blocked By Debris

Table A-1
Hydraulic capacity Summary
Basin outlet Structure (RCB's) and
Emergency Overflow Weir

THIS RUN EXECUTED 27MAR96 09:11:56

```
**************************************
 HEC-2 WATER SURFACE PROFILES

 Version  4.6.2;  May 1991
**************************************

T1      S-1 DETENTION BASIN- DESERT MOUNT. PROP.              FILE:S1WARC
T2      OVERFLOW OVER STREET AND BERM EMBANKMENTS      BY A-N WEST,INC.
T3      WEIR FLOW RATING CURVE ANALYSIS           DATE:2/4/96  REV.3/26/96
T4      THE 3/26/96 REVISION MODELS THE CHANN.'A' BERM PORTION OF WEIR FLOW

J1  ICHECK    INQ      NINV     IDIR     STRT     METRIC   HVINS    Q        WSEL     FQ

      10        2                         -1<                                2671

J2  NPROF     IPLOT    PRFVS    XSECV    XSECH    FN       ALLOC    IBW      CHNIM    ITRACE

      1                 -1

J3  VARIABLE CODES FOR SUMMARY PRINTOUT

    150

J3  LPRNT    NUMSEC                 ********REQUESTED SECTION NUMBERS********

    -10      -10

ZT       7      6000      7000      7900      9000      9600      9900     10800
NC    .030      .015      .015       .3        .5
X1       0        11        66       105         0         7         0
GR  2677.0         0    2670.5        22    2670.5        60    2670.5        66    2671.0       104
GR    2675       105      2675       782    2670.5       817    2671.5       959    2673.6      1119
GR  2676.9      1159
```

← Q's Very

Critical Depth starting WSEL

Section along controlling weir along Interior Steet (Covey Trail) and Channel. 'A' Berm.

THIS RUN EXECUTED 27MAR96 09:08:16

```
**************************************
 HEC-2 WATER SURFACE PROFILES

 Version  4.6.2:  May 1991
**************************************


T1      S-1 DETENTION BASIN- DESERT MOUNT. PROP.                FILE:S1WRRC
T2      OVERFLOW OVER STREET AND BERM EMBANKMENTS       BY A-N WEST.INC.
T3      WEIR FLOW RATING CURVE ANALYSIS            DATE:2/4/96  REV.3/26/96
T4      THE 3/26/96 REVISION MODELS THE CHANN.'A' BERM PORTION OF WEIR FLOW

J1  ICHECK    INQ       NINV      IDIR      STRT      METRIC    HVINS     Q         WSEL      FQ

      10        2                             -1                                    2671

J2  NPROF     IPLOT     PRFVS     XSECV     XSECH     FN        ALLDC     IBW       CHNIM     ITRACE

      1                 -1

J3  VARIABLE CODES FOR SUMMARY PRINTOUT

    150

J5  LPRNT     NUMSEC                    *********REQUESTED SECTION NUMBERS*********

    -10       -10

QT        7     12000     14000     16000     18000     20000     22000     24000
NC     .030      .015      .015        .3        .5
X1        0        11        66       105         0         0         0
GR   2677.0         0    2670.5        22    2670.5        60    2670.5        66    2671.0       104
GR     2675       105      2675       782    2670.5       817    2671.5       959    2673.6      1119
GR   2676.9      1159
```

THIS RUN EXECUTED 27MAR96 09:24:30

****
HEC-2 WATER SURFACE PROFILES

Version 4.6.2: May 1991
****

NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

Plotted Values

WEIR FLOW RATING CURVE A

SUMMARY PRINTOUT TABLE 150

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K
*	.000	.00	.00	.00	2670.50	100.00	2670.89	2670.89	2671.03	92.09	3.21	34.87	10.42
*	.000	.00	.00	.00	2670.50	500.00	2671.38	2671.38	2671.66	54.30	5.31	121.16	67.85
*	.000	.00	.00	.00	2670.50	1000.00	2671.73	2671.73	2672.13	42.11	6.25	204.29	154.11
*	.000	.00	.00	.00	2670.50	2000.00	2672.23	2672.23	2672.81	33.49	7.29	343.26	345.59
*	.000	.00	.00	.00	2670.50	3000.00	2672.61	2672.61	2673.32	30.26	8.04	465.42	545.35
	.000	.00	.00	.00	2670.50	4000.00	2672.94	2672.94	2673.75	28.31	8.63	576.17	751.76
	.000	.00	.00	.00	2670.50	5000.00	2673.23	2673.23	2674.13	26.95	9.10	687.24	963.11

THIS RUN EXECUTED 27MAR96 09:11:56

****
HEC-2 WATER SURFACE PROFILES

Version 4.6.2: May 1991
****

NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

WEIR FLOW RATING CURVE A

SUMMARY PRINTOUT TABLE 150

Plotted Values

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10**KS	VCH	AREA	.01K
*	.000	.00	.00	.00	2670.50	6000.00	2673.49	2673.49	2674.46	25.87	9.50	791.68	1179.69
*	.000	.00	.00	.00	2670.50	7000.00	2673.71	2673.71	2674.77	25.62	9.91	882.20	1382.96
*	.000	.00	.00	.00	2670.50	7900.00	2673.90	2673.90	2675.03	25.06	10.19	962.02	1578.06
*	.000	.00	.00	.00	2670.50	8000.00	2673.92	2673.92	2675.06	24.98	10.21	970.98	1600.39
*	.000	.00	.00	.00	2670.50	9000.00	2674.12	2674.12	2675.34	24.30	10.47	1057.93	1825.80
*	.000	.00	.00	.00	2670.50	9900.00	2674.27	2674.27	2675.58	24.46	10.79	1122.99	2001.69
*	.000	.00	.00	.00	2670.50	10800.00	2674.44	2674.44	2675.81	23.94	10.98	1196.39	2207.42

THIS RUN EXECUTED 27MAR96 09:08:17

****
HEC-2 WATER SURFACE PROFILES

Version 4.6.2: May 1991
****

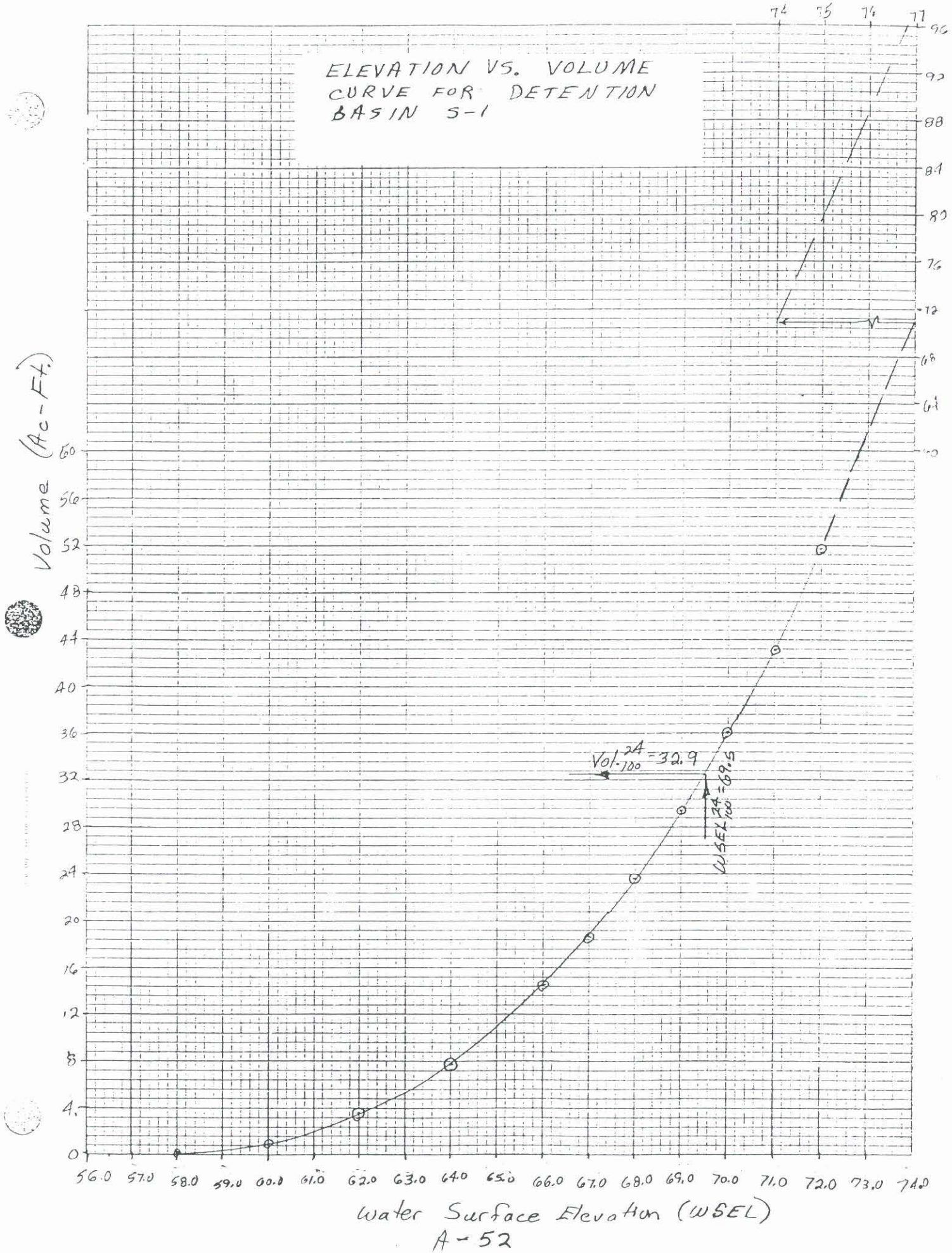
NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

Plotted values

WEIR FLOW RATING CURVE A

SUMMARY PRINTOUT TABLE 150

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10**KS	VCH	AREA	.01K
*	.000	.00	.00	.00	2670.50	12000.00	2674.59	2674.59	2676.11	25.09	11.51	1261.38	2895.75
*	.000	.00	.00	.00	2670.50	14000.00	2675.47	2675.47	2676.30	13.08	9.50	1976.57	3870.69
*	.000	.00	.00	.00	2670.50	16000.00	2675.58	2675.58	2676.54	15.02	10.33	2100.97	4128.26
*	.000	.00	.00	.00	2670.50	18000.00	2675.74	2675.74	2676.77	15.81	10.84	2281.50	4526.78
*	.000	.00	.00	.00	2670.50	20000.00	2675.89	2675.89	2676.99	16.43	11.27	2454.33	4934.28
	.000	.00	.00	.00	2670.50	22000.00	2676.08	2676.08	2677.20	16.12	11.44	2671.14	5479.26
	.000	.00	.00	.00	2670.50	24000.00	2676.12	2676.12	2677.41	18.29	12.25	2721.79	5611.78


ELEVATION VS. VOLUME CURVE FOR DETENTION BASIN S-1
Volume (Ac-Ft.)
0
4
8
12
16
20
24
28
32
36
40
44
48
52
56
60
56.0
57.0
58.0
59.0
60.0
61.0
62.0
63.0
64.0
65.0
66.0
67.0
68.0
69.0
70.0
71.0
72.0
73.0
74.0
Water Surface Elevation (WSEL)
Vol.$_{100}^{24}$ = 32.9
WSEL$_{100}^{24}$ = 69.5

A-52

PMWEST INC. Consulting Engineers

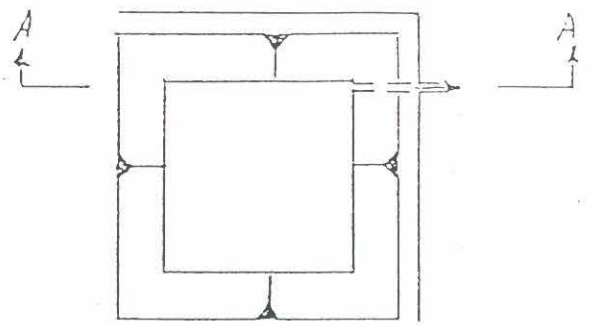
Desert Mountain Development — Project 4623-55 — Sht. ___ of ___
Basin Site No. S-1 — Calc. By GAS — Date 6/7/95
On Charles Blair McDonald — Chkd. ___ — Date ___

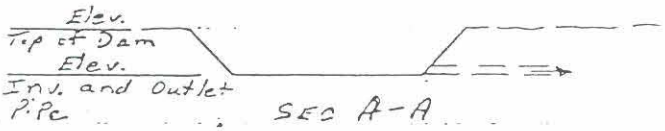
Retention / Detention Basin Data

Location : Basin site No. S-1 at Charles Blair McDonald Dr.

Basin I.D. No. C079
HEC-1 Concentration Point (C.P.) No. C079.1

Elevation	Area (Ac.)	Accumulated Vol. (Ac-Ft)	Pipe Discharge (cfs)
2655	0	0	0
58	0.129	0.097	110.4
60	0.766	0.992	447
62	1.670	3.128	870
64	2.733	7.831	1145
66	3.869	14.133	1364
67	4.608	18.672	1473
68	5.346	23.649	1820
69	6.205	29.425	2366
70	7.069	36.060	3381
71		43.2	
72	8.61	51.79	





SEC A-A

HEC-1 Routing Input Data

Field 1	Field 2	Field 3	Field 4	Field 5	Field 6	Field 7	Field 8	Field 9	Field 10
RS Record - Storage Routing									
RS	1	STOR or ELEV	0 -1						
SV Record - Reservoir Storage									
SV									
SQ Record - Discharge									
SQ									
SE Record - Elevation									
SE									
SS Record - Spillway Characteristics									
SS									
ST Record - Top of Dam Overflow									
ST									

STATION RO79.1

(I) INFLOW, (O) OUTFLOW DISCHARGE (CFS).

0. 400. 800. 1200. 1600. 2000. 2400. 2800. 3200.

(S) STORAGE (AC FT.)

0. 0. 0. 0. 0. 0. 0. 10. 20. 30. 40.

Days Hours Minutes

DAHRMN PER

10242 55
10245 56
10248 57
10251 58
10254 59
10257 60
10300 61
10303 62
10306 63
10309 64
10312 65
10315 66
10318 67
10321 68
10324 69
10327 70
10330 71
10333 72
10336 73
10339 74
10342 75
10345 76
10348 77
10351 78
10354 79
10357 80
10400 81
10403 82
10406 83
10409 84
10412 85
10415 86
10418 87
10421 88
10424 89
10427 90
10430 91
10433 92
10436 93
10439 94
10442 95
10445 96
10448 97
10451 98
10454 99
10457 100
10500 101
10503 102
10506 103
10509 104
10512 105
10515 106
10518 107
10521 108
10524 109
10527 110
10530 111
10533 112
10536 113
10539 114
10542 115
10545 116
10548 117
10551 118
10554 119
10557 120
10600 121
10603 122
10606 123
10609 124
10612 125
10615 126
10618 127
10621 128
10624 129
10627 130
10630 131
10633 132
10636 133
10639 134
10642 135
10645 136
10648 137
10651 138
10654 139
10657 140
10700 141
10703 142

3 Hr

4 Hr

5 Hr

6 Hr

7 Hr

TIME

In Flow Hydrograph

HEC-1 I.D. RO 79

Qpeak (In) = 3088

Time 3.35 hrs.

3.5 hrs. Time

0.48 Hr.

0.29 Hr.

100 Year - 6 Hour

Q = 2000 CFS WSEL = 68.30

Qpeak (out) = 2400 CFS WSEL = 69.01

Developed Cond. Out flow Hydrograph

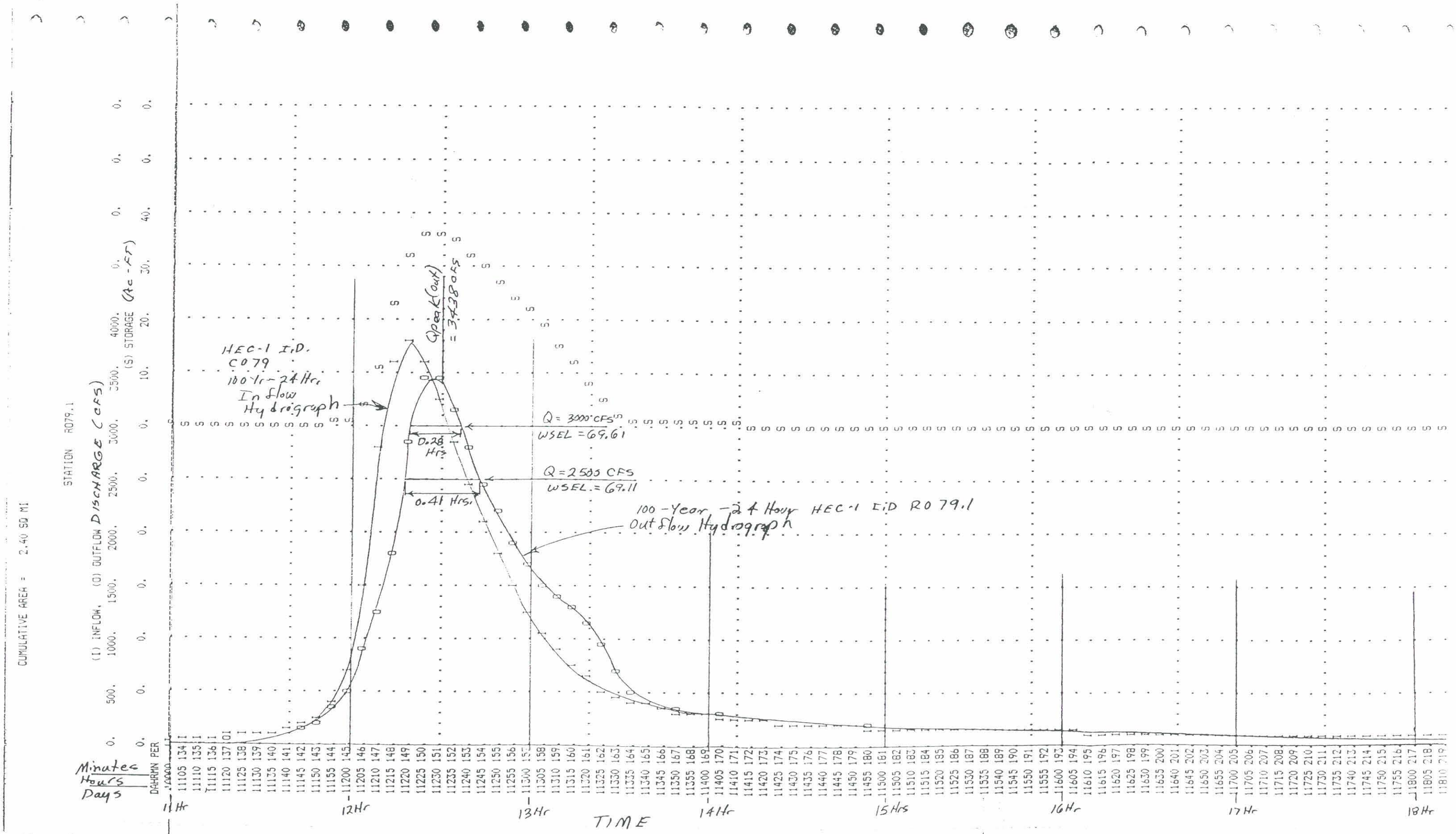
HEC-1 I.D. RO 79.1

Desert Mtn Prop. - St Det. Basin

100 Year - 6 Hr Developed Condition

Hydrograph Inflow and outflow

A-54



HEC-1 File: S1 DMTMDV

Desert Mtn Prop. - S-1 Det. Basin
100 Year - 24 Hr. Developed Cond.
Hydrograph Inflow and Outflow

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

          *DIAGRAM*
    1     ID       DEVELOPED CONDITION HYDROLOGY     BY:A-N WEST,INC.PHX.AZ.  FILE:S1DMTNDV
    2     ID       DESERT MOUNTAIN DEVELOPMENT S-1 DETENTION BASIN     BY:A-N WEST,INC
    3     ID       100-YEAR  6-HOUR STORM            DATE:4\10\92   REV.2/22/96 REV.3/26/96
    4     ID       INCLUDES PROPOSED S-1 DET. BASIN AT CHARLES BLAIR MCDONALD DR.
    5     IT      3                    300
    6     IO      5

    7     KK   SUB50
    8     KM        COMPUTE HYDROGRAPH
    9     KM     *******
   10     KM        THE FOLLOWING VALUES ARE ENTERED ON THE PH RECORD FOR THE RESPECTIVE
   11     KM        2, 10, 25, 50, 100, YR. STORMS.
   12     KM     ****CAUTION*** THE VALUES IN ( ) ARE TO BE USED FOR 24-HR.STORMS ONLY.IN
   13     KM                     FIELDS 9 AND 10 RESPECTIVELY OF PH RECORD.
   14     KM     ****CAUTION*** ALSO A 5 MINUTE TIME ORDINATE (FIELD 1 OF IT RECORD) SHALL
   15     KM                    BE USED FOR 24 - HR STORMS  AND A 3 MINUTE ORDINATE FOR
   16     KM                    6- HOUR STORMS.
   17     KM    2:50   2.419    0.37    0.68    1.09    1.27    1.39    1.62   (1.94) (2.25)
   18     KM   10:10   2.419    0.52    1.01    1.68    1.93    2.10    2.42   (2.85) (3.27)
   19     KM   25:     2.419    0.62    1.20    2.01    2.31    2.51    2.88   (3.38) (3.87)
   20     KM      ***
   21     KM   50:     2.419    0.69    1.34    2.27    2.60    2.82    3.24   (3.79) (4.34)
   22     KM  100:     2.419    0.76    1.49    2.53    2.89    3.14    3.60   (4.20) (4.80)
   23     BA   0.450
   24     PH           2.419    0.76    1.49    2.53    2.89    3.14    3.60
   25     LS      0    85.8      10    Curve No. Method.
   26     UK    100     .05     .25     100
   27     RK   2200   0.040    .045    .075    TRAP      10      10
   28     RK   4000    .033    .045     1.0    TRAP      25      10

   29     KK   R051
   30     KM        ROUTE SUB50 TO CO51
   31     RS      1   FLOW      -1
   32     RC    .05    .035     .05    1500    .035
   33     RX      0       5      50      85     115     120     195     200
   34     RY      4       2     1.5       0       0     1.5       2       4

   35     KK   SUB54
   36     KM        COMPUTE HYDROGRAPH
   37     BA   0.177
   38     LS      0      86      10
   39     UK    100     .05     .25     100
   40     RK   1700    .032    .045    .075    TRAP      10      10
   41     RK   2900    .037    .045     1.0    TRAP      15      10

   42     KK   CO51
   43     KM        COMBINE SUB 50 AND SUB 54
   44     HC      2
```

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

  45      KK   R053
  46      KM       ROUTE C051 TO C057
  47      RL                    3.0       0
  48      RS      1   FLOW      -1
  49      RC   0.05  0.035     0.05    5100   0.037
  50      RX      0      5       80      85     115     120     195     200
  51      RY      4      2      1.5       0       0     1.5       2       4

  52      KK   SUB58
  53      KM       COMPUTE HYDROGRAPH
  54      BA  0.316
  55      LS      0   83.1       10
  56      UK    100    .05      .25     100
  57      RK   3725    .05     .045    .079    TRAP      10      10
  58      RK   2600    .04     .045     1.0    TRAP      30      10

  59      KK   C057
  60      KM       COMBINE SUB 58 AND R053
  61      HC       2

  62      KK   R059
  63      KM       ROUTE C057 TO C061
  64      RL                    2.0       0
  65      RS      1   FLOW      -1
  66      RC  0.045  0.035   0.045    2450   0.033
  67      RX      0      5       80      85     115     120     195     200
  68      RY      4      2      1.5       0       0     1.5       2       4

  69      KK   SUB62
  70      KM       COMPUTE HYDROGRAPH
  71      BA  0.212
  72      LS      0   81.4       10
  73      UK    100    .05      .25     100
  74      RK   3800    .04     .045    .071    TRAP      10      10
  75      RK   1000    .035    .045     1.0    TRAP      30      10

  76      KK   C061
  77      KM       COMBINE SUB 62 AND R059
  78      HC       2

  79      KK   R063
  80      KM       ROUTE C061 TO C067
  81      RL                    3.0       0
  82      RS      1   FLOW      -1
  83      RC  0.045  0.035   0.045    6300   0.029
  84      RX      0      5       80      85     115     120     195     200
  85      RY      4      2      1.5       0       0     1.5       2       4

  86      KK   SUB66
  87      KM       COMPUTE HYDROGRAPH
  88      BA  0.212
  89      LS      0   83.5       10
  90      UK    100    .05      .25     100
  91      RK   5000    .04     .045    .106    TRAP      10      10
```

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

  92      RK   1600    .036    .045     1.0    TRAP      30      10

  93      KK   RO65
  94      KM        ROUTE SUB 66 TO CO67
  95      RL                    3.0       0
  96      RS      3    FLOW      -1
  97      RC  0.045   0.035   0.045    6300   0.029
  98      RX      0       5      60      85     115     120     155     200
  99      RY      4       2     1.5       0       0     1.5       2       4

 100      KK   SUB70
 101      KM        COMPUTE HYDROGRAPH
 102      BA   0.315
 103      LS       0    77.8      10
 104      UK     100     .05     .25     100
 105      RK    6200    .033    .045     1.0    TRAP      50      10

 106      KK   CO67
 107      KM        COMBINE SUB 70, RO63 AT WEST BDY, SOUTH OF LONE MTN.
 108      HC        3

 109      KK   SUB74
 110      KM        COMPUTE HYDROGRAPH
 111      BA   0.475
 112      LS       0    84.6      10
 113      UK     100     .05     .25     100
 114      RK    3400    .038    .045    .079    TRAP      15      10
 115      RK    2300    .035    .045     1.0    TRAP      25      10

 116      KK   RO75
 117      KM        ROUTE SUB 74 TO CO77
 118      KM        MODIFIED 3/14/96 TO REFLECT CHANNEL PROP. BY GILBERTSON ENGR. FOR UNIT 4
 119      KM       ROUTE SUB74 TO CULVERTS UNDER INTERIOR STREET AT EDGE OF BASIN FLOOD POOL
 120      RL                    2.0       0
 121      RS      1    FLOW      -1
 122      RC  0.045   0.035   0.045    2500   0.028
 123      RX      0       3      13      25      65      77      87      90
 124      RY      4     3.1       3       0       0       3     3.1       4

 125      KK   SUB75
 126      KM        COMPUTE HYDROGRAPH
 127      BA   0.02
 128      LS       0    80.2      10
 129      UK     100     .05     .25     100
 130      RK    1600    .055    .045     1.0    TRAP      10      10

 131      KK   CO76
 132      KM        COMBINE SUB75 AND RO75 AT PROP. CHANN. 'A' AND COVEY TRAIL (INTERIOR ST)
 133      HC        2
```

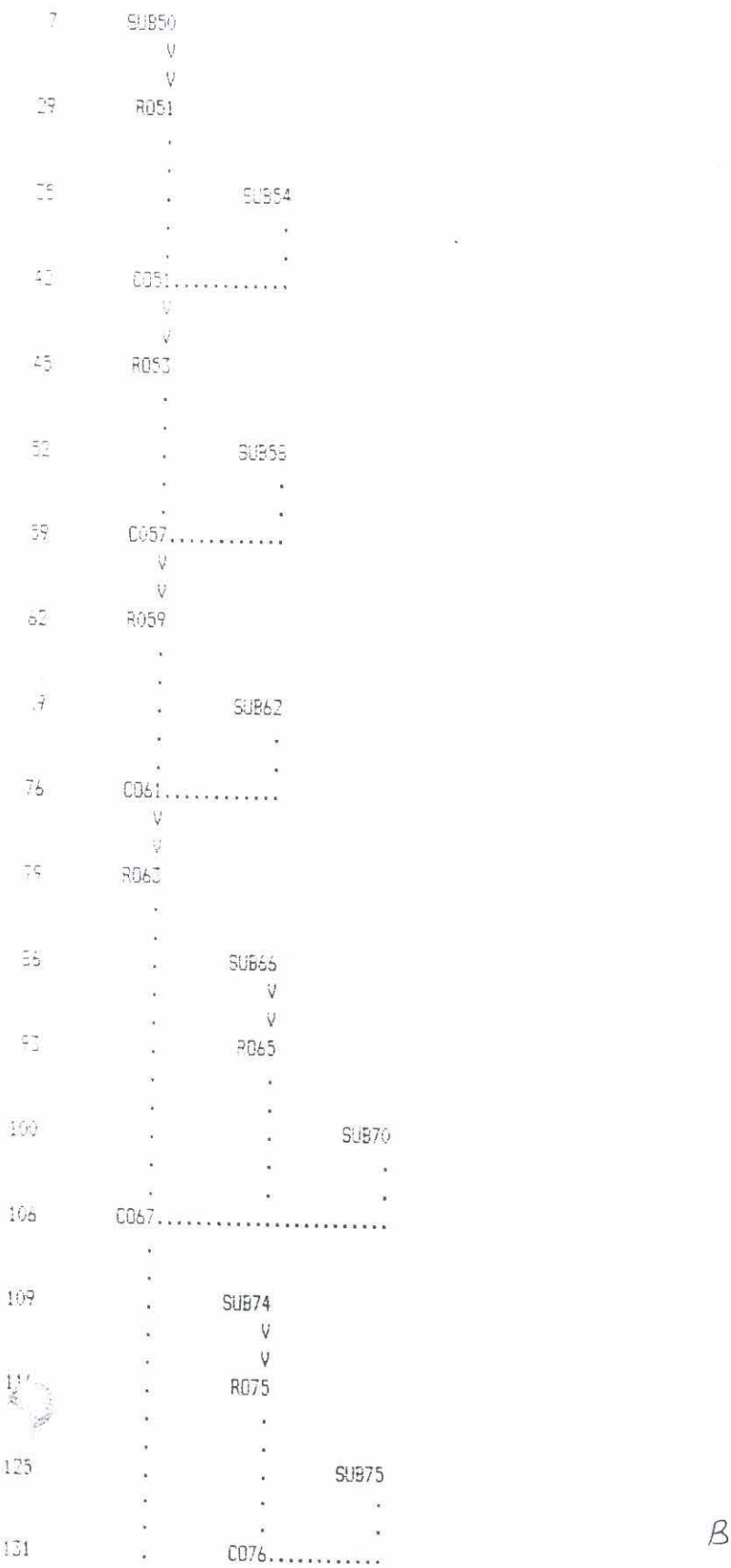
```
LINE      ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

  134     KK  SUB78
  135     KM       COMPUTE HYDROGRAPH
  136     BA  0.245
  137     LS       0    80.2      10
  138     UK     100     .05     .25     100
  139     RK    3200    .055    .045    .082    TRAP      10      10
  140     RK    2400    .030    .045     1.0    TRAP      30      10

  141     KK    C077
  142     KM       COMBINE SUB 73 AND C076 AT WEST BDY. SOUTH OF LONE MTN.
  143     HC       2

  144     KK    C079
  145     KM       COMBINE C077  AND C067 AT WEST BDY. SOUTH OF LONE MTN.
  146     KM       TOTAL FLOW ACROSS C.B.M.
  147     HC       2

  148     KK  RO79.1
  149     KM       ROUTE C079 THROUGH PROP. DET. BASIN NO.S-1 AT CHARLES BLAIR MCDONALD DR.
  150     KM       BASIN OUTLET INVOLVES 6-12'X 4' RCB'S WITH 2 BARRELS FLOW-THRU AND
  151     KM       4 BARRELS RECEIVING FLOW FROM FRONT, BACK AND SIDE WEIR
  152     RS       1    STOR       0
  153     SV       0    .097   0.992   3.428   7.831  14.433  18.672  23.649  29.425  36.060
  154     SV    43.2
  155     SQ       0     110     433     875    1157    1380    1489    1838    2386    3379
  156     SQ    4778
  157     SE  2656.5    2658    2660    2662    2664    2666    2667    2668    2669    2670
  158     SE    2671
  159     ZZ
```

SCHEMATIC DIAGRAM OF STREAM NETWORK

INPUT

(V) ROUTING (---->) DIVERSION OR PUMP FLOW

(.) CONNECTOR (<----) RETURN OF DIVERTED OR PUMPED FLOW



```
                .           .
  134           .           .       R079
                .           .         .
                .           .         .
  141           .       C077.............
                .           .
                .           .
  144       C079.............
                V
                V
  148      R079.1
```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

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

Output File: SIDMTNDV
100 Yr - 6 Hr Storm
Dev. Cond. w/Basin

OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
HYDROGRAPH AT	SUB50	1301.	3.20	110.	44.	44.	.45		
ROUTED TO	RD51	1167.	3.25	110.	44.	44.	.45	2.15	3.25
HYDROGRAPH AT	SUB54	533.	3.15	44.	18.	18.	.18		
2 COMBINED AT	CD51	1645.	3.20	154.	62.	62.	.63		
ROUTED TO	RD53	1128.	3.35	143.	57.	57.	.63	2.18	3.35
HYDROGRAPH AT	SUB58	808.	3.20	71.	29.	29.	.32		
2 COMBINED AT	CD57	1711.	3.25	213.	86.	86.	.94		
ROUTED TO	RD59	1579.	3.35	209.	84.	84.	.94	2.39	3.35
HYDROGRAPH AT	SUB62	475.	3.20	41.	17.	17.	.21		
2 COMBINED AT	CD61	1869.	3.30	251.	101.	101.	1.15		
ROUTED TO	RD63	1398.	3.55	236.	95.	95.	1.15	2.36	3.55
HYDROGRAPH AT	SUB66	498.	3.20	48.	19.	19.	.21		
ROUTED TO	RD65	383.	3.40	38.	15.	15.	.21	1.37	3.40
HYDROGRAPH AT	SUB70	540.	3.25	58.	24.	24.	.31		
3 COMBINED AT	CD67	1991.	3.45	332.	133.	133.	1.68		
HYDROGRAPH AT	SUB74	1264.	3.20	112.	45.	45.	.47		
ROUTED TO	RD75	1163.	3.25	107.	43.	43.	.47	2.22	3.25
HYDROGRAPH AT	SUB75	52.	3.10	4.	2.	2.	.02		
2 COMBINED AT	CD76	1193.	3.25	111.	45.	45.	.50		
HYDROGRAPH AT	SUB78	578.	3.20	50.	20.	20.	.25		
2 COMBINED AT	CD77	1695.	3.20	161.	65.	65.	.74		
2 COMBINED AT	CD79	3189.	3.30	493.	198.	198.	2.42		
ROUTED TO	RD79.1	2731.	3.50	493.	198.	198.	2.42	2669.34	3.50

Flow To Channel 'A' Culverts under Covey Trail

Peak Inflow to Basin

Peak Outflow - Basin

Peak 100 Yr - 6 Hr Ponding WSEL

SUMMARY OF : KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
(FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)

ISTAO	ELEMENT	DT	PEAK	TIME TO PEAK	VOLUME	INTERPOLATED TO COMPUTATION INTERVAL DT	PEAK	TIME TO PEAK	VOLUME
		(MIN)	(CFS)	(MIN)	(IN)	(MIN)	(CFS)	(MIN)	(IN)
SUB50	MANE	1.80	1345.76	189.87	2.29	3.00	1301.08	192.00	2.29

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .5504E+02 OUTFLOW= .5494E+02 BASIN STORAGE= .6235E-02 PERCENT ERROR= .2

SUB54	MANE	1.64	548.71	190.05	2.31	3.00	532.83	189.00	2.30

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .2179E+02 OUTFLOW= .2176E+02 BASIN STORAGE= .2174E-02 PERCENT ERROR= .1

SUB58	MANE	1.24	816.35	191.08	2.09	3.00	808.33	192.00	2.09

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .3534E+02 OUTFLOW= .3527E+02 BASIN STORAGE= .5391E-02 PERCENT ERROR= .2

SUB62	MANE	.69	475.21	191.60	1.81	3.00	474.98	192.00	1.81

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .2057E+02 OUTFLOW= .2051E+02 BASIN STORAGE= .3507E-02 PERCENT ERROR= .3

SUB66	MANE	.94	507.63	193.46	2.11	3.00	497.74	192.00	2.11

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .2403E+02 OUTFLOW= .2388E+02 BASIN STORAGE= .4737E-02 PERCENT ERROR= .6

SUB70	MANE	2.52	544.04	195.36	1.74	3.00	539.72	195.00	1.74

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .2934E+02 OUTFLOW= .2922E+02 BASIN STORAGE= .1608E-01 PERCENT ERROR= .4

SUB74	MANE	1.25	1287.64	191.91	2.20	3.00	1283.55	192.00	2.20

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .5585E+02 OUTFLOW= .5573E+02 BASIN STORAGE= .7846E-02 PERCENT ERROR= .2

SUB75	MANE	1.35	54.92	186.85	1.90	3.00	52.06	186.00	1.90

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .2026E+01 OUTFLOW= .2024E+01 BASIN STORAGE= .4607E-03 PERCENT ERROR= .1

SUB78	MANE	1.35	584.25	191.56	1.90	3.00	578.01	192.00	1.90

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .2482E+02 OUTFLOW= .2479E+02 BASIN STORAGE= .4284E-02 PERCENT ERROR= .1

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

    1     ID       DEVELOPED CONDITION HYDROLOGY     BY:A-N WEST.INC.PHX.AZ.  FILE:S1DMTNDV
    2     ID       DESERT MOUNTAIN DEVELOPMENT S-1 DETENTION BASIN     BY:A-N WEST,INC
    3     ID       100-YEAR 24-HOUR STORM              DATE:4\10\92   REV.2/22/96 REV.3/26/96
    4     ID       INCLUDES PROPOSED S-1 DET. BASIN AT CHARLES BLAIR MCDONALD DR.
    5     IT     5                    300
    6     ID     5

    7     KK   SUB50
    8     KM       COMPUTE HYDROGRAPH
    9     KM    *******
   10     KM       THE FOLLOWING VALUES ARE ENTERED ON THE PH RECORD FOR THE RESPECTIVE
   11     KM       2, 10, 25, 50, 100. YR. STORMS.
   12     KM    ****CAUTION*** THE VALUES IN ( ) ARE TO BE USED FOR 24-HR.STORMS ONLY,IN
   13     KM                    FIELDS 9 AND 10 RESPECTIVELY OF PH RECORD.
   14     KM    ****CAUTION*** ALSO A 5 MINUTE TIME ORDINATE (FIELD 1 OF IT RECORD) SHALL
   15     KM                   BE USED FOR 24 - HR STORMS  AND A 3 MINUTE ORDINATE FOR
   16     KM                   6- HOUR STORMS.
   17     KM   2:50   2.419   0.37   0.68   1.09   1.27   1.39   1.62  (1.94) (2.25)
   18     KM  10:10   2.419   0.52   1.01   1.68   1.93   2.10   2.42  (2.85) (3.27)
   19     KM  25:     2.419   0.62   1.20   2.01   2.31   2.51   2.88  (3.38) (3.87)
   20     KM     ***
   21     KM  50:     2.419   0.69   1.34   2.27   2.60   2.82   3.24  (3.79) (4.34)
   22     KM 100:     2.419   0.76   1.49   2.53   2.89   3.14   3.60  (4.20) (4.80)
   23     BA  0.450
   24     PH          2.419   0.76   1.49   2.53   2.89   3.14   3.60   4.20   4.80
   25     LS     0    85.8     10   - Curve Number Method
   26     UK   100     .05    .25    100
   27     RK  2200   0.040    .045   .075   TRAP     10     10
   28     RK  4000    .033    .045   1.0    TRAP     25     10

   29     KK   RO51
   30     KM       ROUTE SUB50 TO CO51
   31     RS     1   FLOW     -1
   32     RC   .05   .035     .05   1500   .035
   33     RX     0      5      80     85    115    120    195    200
   34     RY     4      2     1.5      0      0    1.5      2      4

   35     KK   SUB54
   36     KM       COMPUTE HYDROGRAPH
   37     BA  0.177
   38     LS     0     86      10
   39     UK   100    .05     .25    100
   40     RK  1700   .032    .045   .035   TRAP     10     10
   41     RK  2900   .037    .045   1.0    TRAP     15     10

   42     KK   CO51
   43     KM       COMBINE SUB 50 AND SUB 54
   44     HC     2

   45     KK   RO53
   46     KM       ROUTE CO51 TO CO57
   47     RL                   3.0      0
   48     RS     1   FLOW     -1
   49     RC  0.05  0.035    0.05   5100  0.037
   50     RX     0      5      80     85    115    120    195    200
```

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

  51      RY      4       2     1.5       0       0     1.5       2       4

  52      KK   SUB58
  53      KM        COMPUTE HYDROGRAPH
  54      BA   0.316
  55      LS       0    83.1      10
  56      UK     100     .05     .25     100
  57      RK    3725     .05     .045    .079    TRAP      10      10
  58      RK    2600     .04     .045    1.0     TRAP      30      10

  59      KK    C057
  60      KM        COMBINE SUB 58 AND R053
  61      HC       2

  62      KK    R059
  63      KM        ROUTE C057 TO C061
  64      RL                      2.0       0
  65      RS       1    FLOW      -1
  66      RC   0.045   0.035   0.045    2450   0.033
  67      RX       0       5      80      85     115     120     195     200
  68      RY       4       2     1.5       0       0     1.5       2       4

  69      KK   SUB62
  70      KM        COMPUTE HYDROGRAPH
  71      BA   0.212
  72      LS       0    81.4      10
  73      UK     100     .05     .25     100
  74      RK    3800     .04     .045    .071    TRAP      10      10
  75      RK    1000     .035    .045    1.0     TRAP      30      10

  76      KK    C061
  77      KM        COMBINE SUB 62 AND R059
  78      HC       2

  79      KK    R063
  80      KM        ROUTE C061 TO C067
  81      RL                      3.0       0
  82      RS       1    FLOW      -1
  83      RC   0.045   0.035   0.045    6300   0.029
  84      RX       0       5      80      85     115     120     195     200
  85      RY       4       2     1.5       0       0     1.5       2       4

  86      KK   SUB66
  87      KM        COMPUTE HYDROGRAPH
  88      BA   0.212
  89      LS       0    83.5      10
  90      UK     100     .05     .25     100
  91      RK    5000     .04     .045    .106    TRAP      10      10
  92      RK    1600     .036    .045    1.0     TRAP      30      10
```

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

  93      KK   RO65
  94      KM       ROUTE SUB 66 TO CO67
  95      RL                    3.0       0
  96      RS      3   FLOW      -1
  97      RC  0.045   0.035   0.045    6300   0.029
  98      RX      0       5      80      95     115     120     195     200
  99      RY      4       2     1.5       0       0     1.5       2       4

 100      KK   SUB70
 101      KM       COMPUTE HYDROGRAPH
 102      BA  0.315
 103      LS      0    77.8      10
 104      UK    100     .05     .25     100
 105      RK   6200    .032    .045     1.0    TRAP      30      10

 106      KK   CO67
 107      KM       COMBINE SUB 70, RO63 AT WEST EDY. SOUTH OF LONE MTN.
 108      HC       3

 109      KK   SUB74
 110      KM       COMPUTE HYDROGRAPH
 111      BA  0.475
 112      LS      0    84.6      10
 113      UK    100     .05     .25     100
 114      RK   3400    .038    .045    .079    TRAP      15      10
 115      RK   2800    .035    .045     1.0    TRAP      25      10

 116      KK   RO75
 117      KM       ROUTE SUB 74 TO CO77
 118      KM       MODIFIED 3/14/96 TO REFLECT CHANNEL PROP. BY GILBERTSON ENGR. FOR UNIT 4
 119      KM      ROUTE SUB74 TO CULVERTS UNDER INTERIOR STREET AT EDGE OF BASIN FLOOD POOL
 120      RL                    2.0       0
 121      RS      1   FLOW      -1
 122      RC  0.045   0.035   0.045    2500   0.028
 123      RX      0       3      13      25      65      77      87      90
 124      RY      4     3.1       3       0       0       3     3.1       4

 125      KK   SUB75
 126      KM       COMPUTE HYDROGRAPH
 127      BA   0.02
 128      LS      0    80.2      10
 129      UK    100     .05     .25     100
 130      RK   1600    .055    .045     1.0    TRAP      10      10

 131      KK   CO76
 132      KM       COMBINE SUB75 AND RO75 AT PROP. CHANN. 'A' AND COVEY TRAIL (INTERIOR ST)
 133      HC       2

 134      KK   SUB78
 135      KM       COMPUTE HYDROGRAPH
 136      BA  0.245
 137      LS      0    80.2      10
 138      UK    100     .05     .25     100
 139      RK   3200    .055    .045    .082    TRAP      10      10
```

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

  140     RK    2400    .030    .045     1.0    TRAP      30      10

  141     KK    C077
  142     KM        COMBINE SUB 7B AND C076 AT WEST BDY. SOUTH OF LONE MTN.
  143     HC        2

  144     KK    C079
  145     KM        COMBINE C077  AND C067 AT WEST BDY, SOUTH OF LONE MTN.
  146     KM        TOTAL FLOW ACROSS C.B.M.
  147     HC        2

  148     KK  R079.1
  149     KM        ROUTE C079 THROUGH PROP. DET. BASIN NO.S-1 AT CHARLES BLAIR MCDONALD DR.
  150     KM        BASIN OUTLET INVOLVES 6-12'X 4' RCB'S WITH 2 BARRELS FLOW-THRU AND
  151     KM        4 BARRELS RECEIVING FLOW FROM FRONT, BACK AND SIDE WEIR
  152     RS        1    STOR       0
  153     SV        0    .097   0.992   3.428   7.831  14.433  19.672  23.649  29.425  36.060
  154     SV     43.2
  155     SQ        0     110     433     879    1157    1380    1489    1838    2386    3099
  156     SQ     4778
  157     SE  2636.5    2658    2660    2662    2664    2666    2667    2668    2669    2670
  158     SE     2671
  159     ZZ
```

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

OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
HYDROGRAPH AT	SUB50	1521.	12.17	136.	41.	39.	.45		
ROUTED TO	R051	1348.	12.25	136.	41.	39.	.45	2.26	12.25
HYDROGRAPH AT	SUB54	618.	12.17	54.	16.	16.	.18		
2 COMBINED AT	C051	1815.	12.25	190.	57.	55.	.63		
ROUTED TO	R053	1310.	12.33	177.	49.	47.	.63	2.23	12.33
HYDROGRAPH AT	SUB58	931.	12.17	89.	27.	26.	.32		
2 COMBINED AT	C057	1969.	12.25	266.	75.	73.	.94		
ROUTED TO	R059	1848.	12.33	262.	73.	70.	.94	2.52	12.33
HYDROGRAPH AT	SUB62	560.	12.17	55.	16.	16.	.21		
2 COMBINED AT	C061	2169.	12.33	317.	89.	86.	1.15		
ROUTED TO	R063	1701.	12.50	300.	79.	77.	1.15	2.53	12.50
HYDROGRAPH AT	SUB66	564.	12.25	60.	18.	17.	.21		
ROUTED TO	R065	455.	12.42	47.	12.	11.	.21	1.51	12.42
HYDROGRAPH AT	SUB70	675.	12.25	77.	23.	22.	.31		
2 COMBINED AT	C067	2464.	12.42	424.	114.	110.	1.68		
HYDROGRAPH AT	SUB74	1459.	12.17	139.	42.	40.	.47		
ROUTED TO	R075	1365.	12.25	135.	38.	37.	.47	2.42	12.25
HYDROGRAPH AT	SUB75	58.	12.17	5.	2.	2.	.02		
2 COMBINED AT	C076	1400.	12.25	140.	40.	38.	.50		
HYDROGRAPH AT	SUB78	689.	12.17	64.	19.	18.	.25		
2 COMBINED AT	C077	1992.	12.25	204.	59.	57.	.74		
2 COMBINED AT	C079	3967.	12.25	627.	173.	167.	2.42		
ROUTED TO	R079.1	3549.	12.42	627.	173.	167.	2.42	2670.11	12.42

Peak Flow To channel 'A' Culverts under Covey Trail

Peak Inflow To Basin

Peak outflow From Basin

Peak 100 Yr - 24 Hr Ponded WSEL

SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
(FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)

ISTAQ	ELEMENT	DT	PEAK	TIME TO PEAK	VOLUME	INTERPOLATED TO COMPUTATION INTERVAL DT	PEAK	TIME TO PEAK	VOLUME
		(MIN)	(CFS)	(MIN)	(IN)	(MIN)	(CFS)	(MIN)	(IN)
SUB50	MANE	1.64	1547.48	730.42	3.39	5.00	1521.44	730.00	3.39

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .8161E+02 OUTFLOW= .8122E+02 BASIN STORAGE= .2001E+00 PERCENT ERROR= .1

SUB54	MANE	1.47	623.72	730.68	3.41	5.00	618.22	730.00	3.41

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .3227E+02 OUTFLOW= .3216E+02 BASIN STORAGE= .7139E-01 PERCENT ERROR= .1

SUB58	MANE	1.23	975.94	731.61	3.15	5.00	930.85	730.00	3.15

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .5340E+02 OUTFLOW= .5314E+02 BASIN STORAGE= .1559E+00 PERCENT ERROR= .2

SUB62	MANE	.53	584.21	731.82	2.84	5.00	559.94	730.00	2.84

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .3224E+02 OUTFLOW= .3208E+02 BASIN STORAGE= .9324E-01 PERCENT ERROR= .2

SUB66	MANE	.85	603.61	732.91	3.18	5.00	564.20	735.00	3.18

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .3621E+02 OUTFLOW= .3600E+02 BASIN STORAGE= .1312E+00 PERCENT ERROR= .2

SUB70	MANE	3.75	676.00	731.43	2.71	5.00	674.81	735.00	2.72

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .4602E+02 OUTFLOW= .4560E+02 BASIN STORAGE= .3075E+00 PERCENT ERROR= .3

SUB74	MANE	1.26	1502.08	732.07	3.28	5.00	1458.96	730.00	3.28

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .8351E+02 OUTFLOW= .8314E+02 BASIN STORAGE= .2271E+00 PERCENT ERROR= .2

SUB75	MANE	1.35	66.45	727.29	2.92	5.00	58.12	730.00	2.92

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .3125E+01 OUTFLOW= .3118E+01 BASIN STORAGE= .8755E-02 PERCENT ERROR= -.1

SUB78	MANE	1.26	712.70	730.84	2.92	5.00	689.29	730.00	2.91

CITY OF SCOTTSDALE
DESERT MOUNTAIN PROPERTIES
DETENTION BASIN NO. S-1

LEGAL DESCRIPTION

That portion of Section 30, Township 6 North, Range 5 East of the Gila and Salt River Base and Meridian, Maricopa County, Arizona, described as follows:

COMMENCING at the West quarter corner of Section 31, Township 6 North, Range 5 East;
Thence N 00° 03' 55" W, along the west line of said Section 31, a distance of 2,243.71 feet to the southeasterly line of RANCH HIGHLAND, according to Book 218 of Maps, at Page 26, records of Maricopa County and the arc of a curve, concave easterly and having a radius of 382.61 feet;
Thence northeasterly 227.31 feet, along said southeasterly line and the arc of said curve, through a central angle of 34° 02' 23";
Thence N 34° 04' 52" E, along said southeasterly line, 413.44 feet, to the arc of a curve, concave southeasterly and having a radius of 326.16 feet;
Thence northeasterly 92.36 feet along said southeasterly line and the arc of said curve, through a central angle of 16° 13' 28";
Thence N 50° 10' 10" E, along said southeasterly line, 292.51 feet, to the arc of a curve, concave southerly and having a radius of 2,339.57 feet;
Thence northeasterly 821.53 feet along said southeasterly line and the arc of said curve, through a central angle of 20° 07' 09", to the arc of a curve, concave northerly and having a radius of 877.98 feet;
Thence northeasterly 111.91 feet, along said southeasterly line and the arc of said curve, through a central angle of 07° 18' 10";
Thence N 62° 59' 46" E, along said southeasterly line, 402.54 feet, to the arc of a curve, concave northwesterly and having a radius of 823.47 feet;
Thence northeasterly 368.13 feet, along said southeasterly line and the arc of said curve, through a central angle of 25° 36' 50";
Thence N 37° 25' 38" E, along said southeasterly line, 148.87 feet, to the arc of a curve, concave westerly and having a radius of 346.42 feet;
Thence northerly 33.98 feet along said southeasterly line and the arc of said curve, through a central angle of 05° 37' 15", to the POINT OF BEGINNING;
Thence continuing northerly 166.88 feet along said southeasterly line and the arc of said curve, through a central angle of 27° 36' 02";
Thence N 04° 10' 39" E, along said southeasterly line, 351.24 feet, to the arc of a curve, concave easterly and having a radius of 325.20 feet;
Thence northerly 89.84 feet along said southeasterly line and the arc of said curve, through a central angle of 15° 49' 40", to the arc of a curve, concave easterly and having a radius of 2,089.38 feet;
Thence northerly 404.78 feet, along said southeasterly line and the arc of said curve, through a central angle of 11° 06' 00";
Thence S 58° 42' 40" E, 200.00 feet;
Thence S 37° 54' 49" W, 202.59 feet, to the arc of a tangent curve, concave southwesterly and having a radius of 500.00 feet;
Thence southwesterly 156.60 feet along said curve, through a central angle of 17° 56' 41";
Thence S 19° 58' 08" W, 16.06 feet, to a line 150.00 feet easterly of and parallel or concentric with said southwesterly line and the arc of a curve, concave southwesterly and having a radius of 175.20 feet;
Thence southwesterly 48.40 feet, along said parallel line and said curve through a central angle of 15° 49' 40";
Thence S 04° 10' 39" W, along said parallel line 351.24 feet, to the arc of a curve, concave westerly and having a radius of 496.42 feet;
Thence southerly 239.14 feet, along said parallel line and the arc of said curve through a central angle of 27° 36' 02";
Thence N 58° 12' 25" W, 150.00 feet, to the POINT OF BEGINNING.

QUANTITY ESTIMATE

Item No.	Description	Quantity	Unit
1.	Stockpiled Material On-site	36,000	C.Y.
2.	Fill	36,000	C.Y.
3.	Modified 6-Barrel - 12' Span x 4 Rise Reinforced Concrete Box Culverts, Incl. Special Inlet Structure and Outlet Headwalls (Estimated Concrete 1226.4 C.Y.) Basin Structure	1	L.S.
4.	2-1/2 AC/6" ABC - Charles Blair McDonald - Sta. 11+22 to 16+67	1,392	S.Y.
5.	6" ABC Shoulder - Charles Blair McDonald - 11+22 to 16+67	484	S.Y.
6.	Detour Road = 1,675 S.Y., Incl. Traffic Control Signs	1	L.S.
7.	Modified Concrete Half Barrier Per ADOT C-10.60 with Transitions (Int.Str.)	757	L.F.
8.	Modified 1.5' Wide Ribbon Curb Per C.O.S. Std. Det. 222.0 (C.B.M.)	1,090	L.F.
9.	Concrete Half Barrier Per ADOT C-10.61 with Transitions (C.B.M.)	121	L.F.
10.	Loose Rock Riprap (D50 = 1.5 ft) Incl. Filter Fabric	185	C.Y.
11.	Pollution Prevention Plan	1	L.S.
12.	Seven Boulders at RCB Outlet	1	L.S.
13.	Loose Rock Riprap (D50 = 1.0 ft) Incl. Filter fabric	950	C.Y.
14.	Covey Trail at Chann. "A" box Culverts (4-10'x4.5'x80' Skewed) with Wingwalls Est. Conc. 373 C.Y.	1	L.S.
15.	Split Rail Fencing	1155	L.F.

SHEET INDEX

1. INDEX SHEET.
2. PLAN VIEW AND CHARLES BLAIR MCDONALD DRIVE PROFILE.
3. INTERIOR STREET - PROFILE/CROSS-SECTIONS.
4. BOX CULVERT PLAN AND PROFILE.
5. OUTLET STRUCTURE CROSS-SECTIONS.
6. OUTLET STRUCTURE CROSS-SECTIONS/DETAILS.
7. NATIVE PLAN SURVEY - EXISTING SITE.
8. LANDSCAPE PLAN.
9. POLLUTION PREVENTION/CONSTRUCTION PHASING AND DETOUR ROAD.
10. REVISED EXISTING GROUND TOPOGRAPHY.

Note: This signature is from the City of Scottsdale Survey Section and is underlain by a stamp which is not visible due to poor printing from the City's microfiche printer. The stamp reads: "City of Scottsdale Survey Section As-Built. Note: See GIS system for additional information." The GIS department was contacted on 3/1/02, and they confirmed on 3/4/02 that no additional as-built data are available and that this map, with its notations, is the as-built plan. Elevations were verified by the City of Scottsdale, and any differences are noted on this map.

UTILITY COMPANIES

CABLE TELEVISION	TCI INC.
TELEPHONE	U.S.WEST
ELECTRIC	ARIZONA PUBLIC SERVICE
GAS	BLACK MOUNTAIN GAS
WATER	CITY OF SCOTTSDALE
SEWER	CITY OF SCOTTSDALE

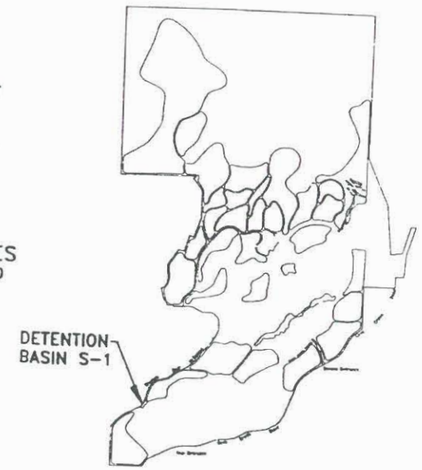
ZONING = R1-190 HD/HC

NOTES

ALL MAPPING AND ELEVATIONS CONTAINED HEREIN ARE DESERT MOUNTAIN DATUM WHICH IS 0.95' ABOVE C.O.S. DATUM.

ENGINEERING CONSULTANT
A-N WEST, INC.
7600 N. 15TH STREET, SUITE 200
PHOENIX, ARIZONA 85020
(602) 861-2200

OWNER
DESERT MOUNTAIN PROPERTIES
6263 N. SCOTTSDALE ROAD, SUITE 200
SCOTTSDALE, ARIZONA 85250
PHONE NO. (602) 488-0785



VICINITY MAP

BENCHMARKS

1. BRASS CAP AT INTERSECTION OF CAVE CREEK ROAD & DESERT MOUNTAIN PARKWAY EL = 2716.78 C.O.S. DATUM
2. BRASS CAP FLUSH AT DESERT MOUNTAIN PARKWAY & PROSPECT POINT DRIVE EL = 3180.25 C.O.S. DATUM

GENERAL NOTES

1. All construction in the public rights-of-way or in easements granted for public use must conform to the latest Maricopa Association of Governments (MAG) Uniform Standard Specifications and Uniform Standard Details for Public Works Construction as amended by the latest version of the City of Scottsdale (COS) Supplemental Standard Specifications and Supplemental Standard Details. If there is a conflict, the latter shall govern.

2. The engineering designs on these plans are only approved by the City in scope and not in detail. If construction quantities are shown on these plans, they are not verified by the City.

3. Approval of plans is valid for six (6) months. If an encroachment permit for the construction has not been issued within six months, the plans shall be resubmitted to the City for reapproval.

4. A Public Works Inspector will inspect all works within the City of Scottsdale rights-of-way and in easements. Notify Inspection Services 24 hours prior to starting of construction (telephone 391-5750).

5. Whenever excavation is to be done, call the "Blue Stake Center," 263-1100, two working days before excavation is to begin. The Center will see that the location of the underground utility lines is identified for the project. Call "collect" if necessary.

6. Encroachment permits are required for all work in public rights-of-way and easements granted for public purposes. An encroachment permit will be issued by the City upon receipt of payment of a base fee plus a fee for inspection services to be provided by the City. Copies of all permits shall be retained on-site and shall be available for inspection at all times. Failure to produce the required permits will result in immediate work stoppage until the proper permit documentation is obtained.

7. All excavation and grading which is not in the public rights-of-way or not in easements granted or public use must conform to Chapter 70, Excavation and Grading, of the latest edition of the Uniform Building Code prepared by the International Conference of Building Officials. A permit of this grading must be secured from the City for a fee established by the Uniform Building Code.

8. The contractor shall be responsible for the location, protection and repair of all utilities, existing and proposed, during construction. The engineer assumes no responsibility for existing utility locations. The utilities shown on these plans have been plotted from best available information. Contractor shall contact representatives of the respective utility companies to have all utilities field located prior to construction.

9. Signs require separate approval and permit.

NATIVE PLANTS PERMIT NO. 137NP95 (FILE NO. 98588)

NOTICE TO CONTRACTORS

ANY AND ALL POTENTIAL EXTRA CHARGES WILL BE BROUGHT TO THE ATTENTION

BUILDING REVIEW	
ELECTRICAL	N/A
MECHANICAL	N/A
BUILDING	8/30/96
PLUMBING	N/A

CITY OF SCOTTSDALE
REVIEW & RECOMMENDED APPROVAL BY:

FIRE DEPT.	N/A	GRADING & DRAINAGE	8/28/96
PLANNING	Carlos Lujan 8-30-96	WATER & SEWER	8/28/96
TRAFFIC	8/28/96	PAVING	8/ 9/96

APPROVED BY:

ENGINEERING CONSULTANT
A-N WEST, INC.
7600 N. 15TH STREET
PHOENIX, AZ 85020
(602) 861-2200

5-10-97

CITY OF SCOTTSDALE
DESERT MOUNTAIN PROPERTIES

DR-95 1941-E-95

RANCH HIGHLAND
BK 218 PG. 26

EX. 55' PRIVATE ROAD R/W & PUE (DEDICATED PER RANCH HIGHLANDS, BOOK 218, PAGE 26 M.C.R.)

TRACT C (NOTE 1)

25' PUBLIC TRAIL EASEMENT (NOTE 1)

SAWCUT & MATCH EXIST 2' MIN. WIDTH

Δ=16°39'22" R=549.11' L=159.63'

Δ=39°20'33" R=549.11' L=377.05' (TOTAL)

LOT 4

LOT 5

LOT 6

100 YEAR FLOODPLAIN LIMITS

EX. 75' DRAINAGE EASEMENT

12" D.I.P. 6-12'x4'RCB'S 2 BARRELS-157.8'LONG 4 BARRELS-135.48'LONG

Q 100 YR = 719 CFS

EX. DRAINAGE EASEMENT

RIPRAP (SEE SHT. 4)

WINGWALLS

CHARLES BLAIR McDONALD RD. (EXIST) 16+00

EX. W./FILL

EX. ELEC.

EX. 8" W.

EX. S.S.M.H.

PROPOSED PRIVATE STREET

BARRIER WALL TOP WALL 75.0

TRACT A (NOTE 1)

TRACT D (NOTE 1)

TRACT H (NOTE 1)

TRACT G (NOTE 1)

TRACT G NAOS (NOTE 1)

LIMIT OF CONSTRUCTION

Δ=12°31'37" R=809.14' L=176.91'

Δ=19°21'24" R=809.14' L=273.36'

Δ=60°00'00" R=551.90' L=577.95

Δ=33°14'59" R=500.00' L=290.16'

Δ=21°31'49" R=500.00' L=187.89'

20' W.L.E. (NOTE 1)

20' S.L.E. (NOTE 1)

100 YR. 24 HR. FLOODPLAIN LIMITS ELEV. 2670.11 FT. VOL=32 AC-FT

CONC. CART PATH

GOLF COURSE

LOT 226

LOT 227

LOT 235

PHASE 1, UNIT 4, C.O.S.#1895-E-95

PROPOSED 25' PUBLIC TRAIL EASEMENT (FUTURE)

STA. 4+10 BEGIN PROJECT MATCH SUBDIVISION PLANS

STA. 5+00 TO STA. 6+00 TRANSITION 5' CONC. TRAIL TO 8' ASPHALT TRAIL

STA. 7+50, 17' RT. BEGIN TRANSITION TO 4' SHOULDER

STA. 7+50, 17 LT. BEGIN CONC. BARRIER SHOULDER WIDTH TRANSITION

STA. 7+66.42' RT BEGIN & 12' WIDE BERM END SKEW LT STA. 8+06.21' RT.

STA. 8+10 END SHOULDER WIDTH TRANSITIONS

STA. 14+87.17' LT. END 4' HIGH CONC. BARRIER BEGIN SHOULDER TRANSITIONS LT. & RT. (AT &LT.) IN 85'

STA. 15+30 10'x4' 5 BARREL RCB'S PER ADOT STD. B-02.4 SKEW 52.5° RT. OF RADIUS LINE-BOX INCL. SKEWED 45° FROM BOX CENTERLINE SEE SHT.12 FOR DETAILS

STA. 18+50 END PROJECT MATCH SUBDIVISION PLANS

STA. 8+20(ANW) 5'x3' RCB'S ENGINEERING(GILBERT) MATCH CHANNEL PLAN

100 YR. 24 HR. FLOODPLAIN LIMITS ELEV. 2670.11 FT.

CHANNEL 'A' (SEE SHT. 11)

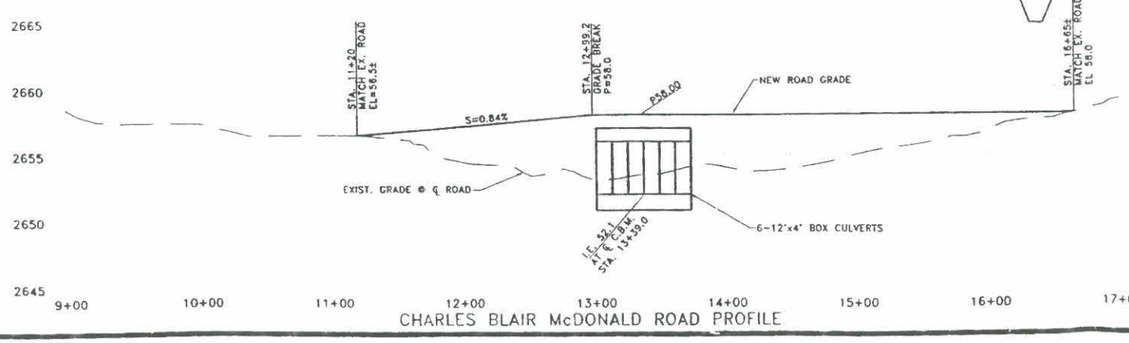
CHANNEL 'B' (SEE SHT. 11)

GRAPHIC SCALE

(IN FEET)
1 inch = 50 ft

NOTES

1. TRACTS A, C, D, G AND H, THE 25 FOOT PUBLIC TRAIL EASEMENT, AND PUBLIC UTILITY WATER & SEWER EASEMENTS, REFERED TO ABOVE ARE PROPOSED TO BE DEDICATED BY THE FINAL PLAT FOR DESERT MOUNTAIN PHASE I, UNIT 4, THE GAMBEL QUAIL PRESERVE, C.O.S. NO. 1895-E-95.



CHARLES BLAIR McDONALD ROAD PROFILE

PLAN VIEW AND CHARLES BLAIR McDONALD RD. PROFILE

NO.	DATE	DESCRIPTION	BY
5	07/11/96	PER CITY COMMENTS	GAS
4	05/06/96	PER CITY COMMENTS	GAS
3	04/09/96	PER CITY/CLIENT COMMENTS	GAS
2	03/26/96	ADD W/S, CHANNEL 'A' & 'B' PER UNIT 4 PLANS	GAS
1	02/26/96	DELETE N. BERM AND 36" CMP. RAISE INT. STR. PROFILE 0.2'	GAS

CALL TWO WORKING DAYS BEFORE YOU DIG
263-1100
1-800-STAKE-IT
(OUTSIDE MARICOPA COUNTY)

DESERT MOUNTAIN PROPERTIES
DETENTION BASIN S-1
AT CHARLES BLAIR McDONALD RD.

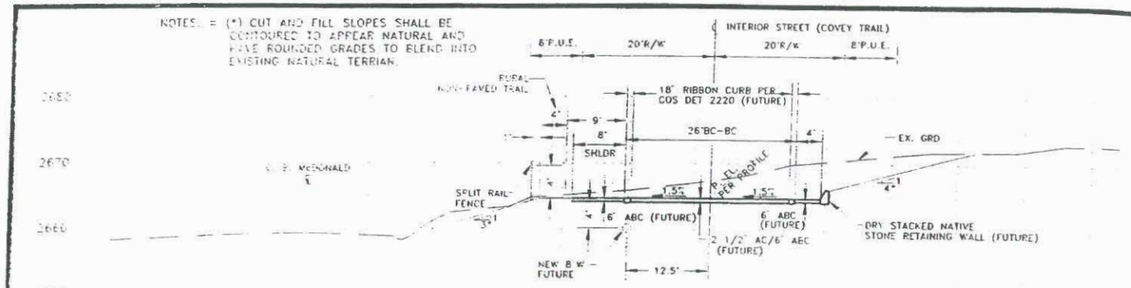
DESIGN GAS	SCALE	JOB NO. 4628-55	SHEET
DRAWN PSS/RCD	HORIZ. 1"=50'	DWG. ID. CBMPROF	2 of 12
CHECK LLT	VERT. 1"=5'	DATE JULY 95	

A-N WEST INC. Consulting Engineers
7600 N. 15th Street, Suite 200
Phoenix, Arizona 85020
(602)861-2200

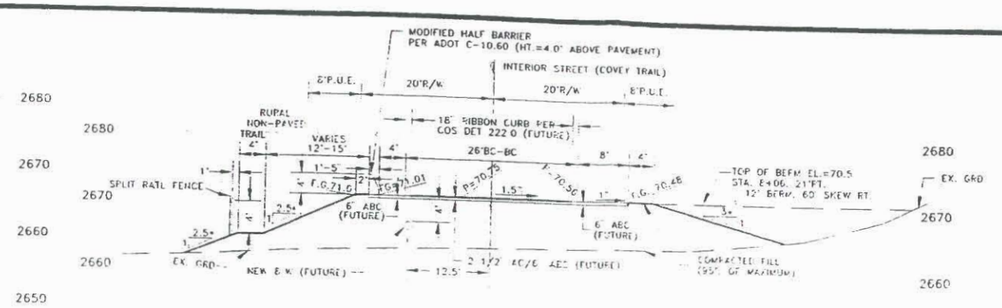
115-DR-95 1941-E-95

26867

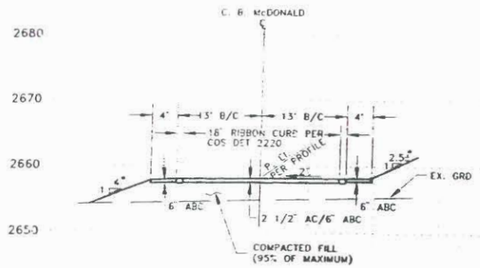
NOTES: = (*) CUT AND FILL SLOPES SHALL BE CONTOURED TO APPEAR NATURAL AND HAVE ROUNDED GRADES TO BLEND INTO EXISTING NATURAL TERRIAN.



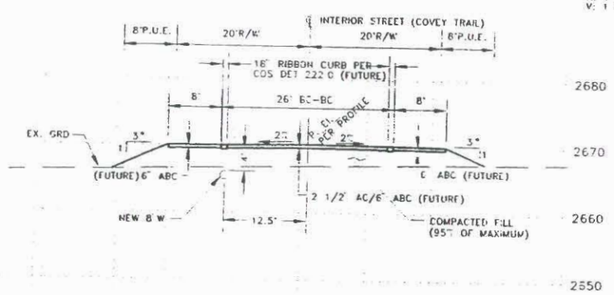
TYPICAL INTERIOR STREET (COVEY TRAIL) SECTION. STA. 4+10± TO 7+50
(AT STA. 5+75)
H: 1"=10'
V: 1"=10'



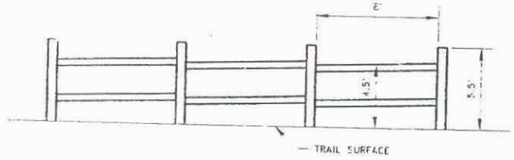
TYPICAL INTERIOR STREET (COVEY TRIAL). STA. 8+10 TO 14+87
(AT STA. 14+00)
H: 1"=10'
V: 1"=10'



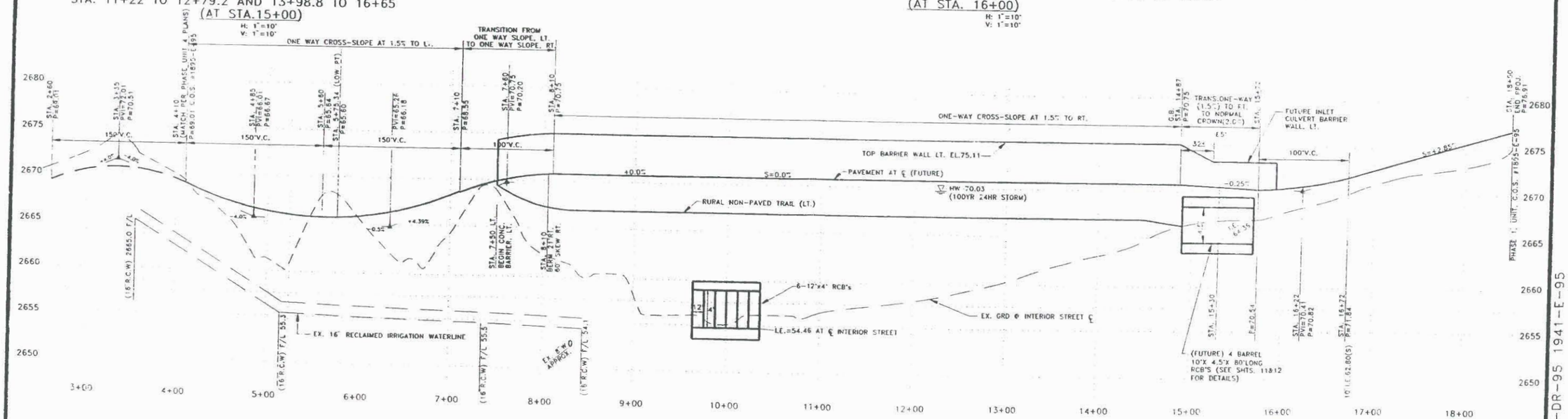
TYPICAL SECTION CHARLES BLAIR McDONALD
STA. 11+22 TO 12+79.2 AND 13+98.8 TO 16+65
(AT STA.15+00)
H: 1"=10'
V: 1"=10'



TYPICAL INTERIOR STREET (COVEY TRAIL) SECTION. STA. 15+72 TO 18+50
(AT STA. 16+00)
H: 1"=10'
V: 1"=10'



SPLIT RAIL FENCE DETAIL (FUTURE)
(COVEY TRIAL STA. 4+10 TO 14+87, LEFT SIDE OF NON PAVED TRAIL)
NTS



INTERIOR STREET (COVEY TRAIL) PROFILE

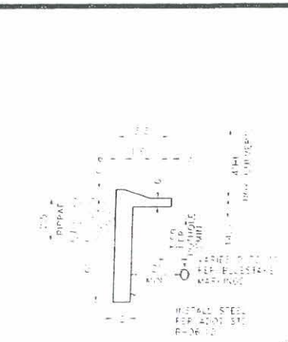
3	4/9/96	PER CITY/REVISION COMMENTS	GAS
2	3/26/96	ADD W/S ,CHANN. & LI RCB'S PER UNIT 4 PLANS	GAS

DESERT MOUNTAIN PROPERTIES
DETENTION BASIN SITE S-1
INTERIOR STREET (COVEY TRAIL)
PROFILE/CROSS-SECTIONS

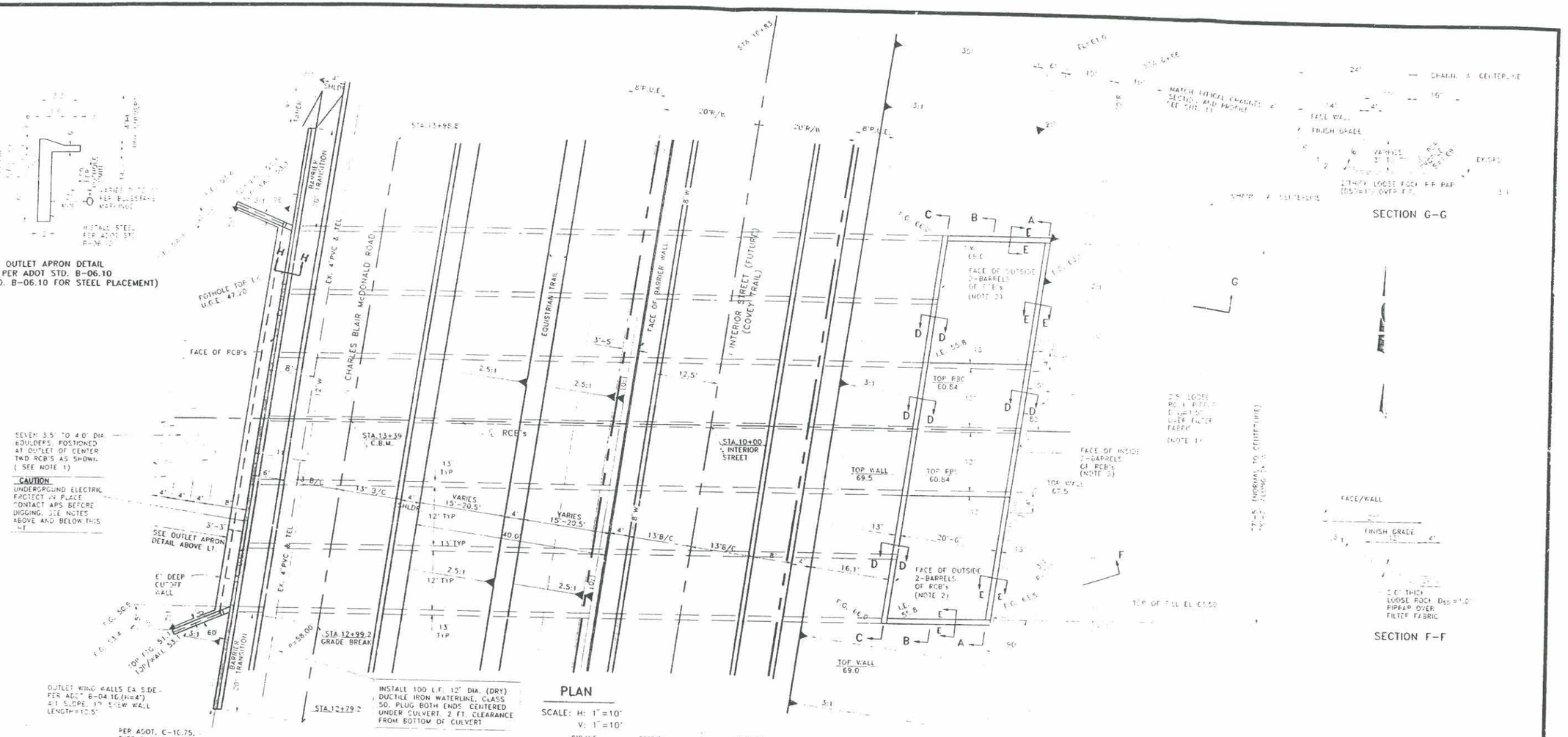
SCALE: HOR. 1"=40' VERT. 1"=10'
JOB NO. 4626-55

8.0

115-DR-95 1941-E-95



OUTLET APRON DETAIL
PER ADOT STD. B-06.10
(SEE STD. B-06.10 FOR STEEL PLACEMENT)



NOTE 1: ALL ROCKS AND RIPRAP SHALL BE NATIVE STONE, INDIGENOUS TO THE SITE AND SHALL BE TREATED WITH A DESERT VANISH (EONITE OR EQUAL.)

NOTE 2: PROVIDE BEVELED EDGE OF MINIMUM 3" x 3" OR 6" RADIUS ON THE TOP OF THE INLET OF OUTSIDE 4 BARRELS

NOTE 3: PROVIDE 3/4" x 3/4" BEVEL ALL AROUND INLET FACE OF CENTER 2 BARRELS

4	5/7/96	PER CITY/APS COMMENTS	GAS
3	4/9/96	PER CITY/CLIENT COMMENTS	GAS
2	5/26/96	ADD W/S, CHANNEL 'Z' & RCB'S PER DWT 4 PLANS	GAS
1	12/28/95	ADD INLET RIPRAP, ADJ. GRADES	GAS
NO.	DATE	DESCRIPTION	BY

5/14/96

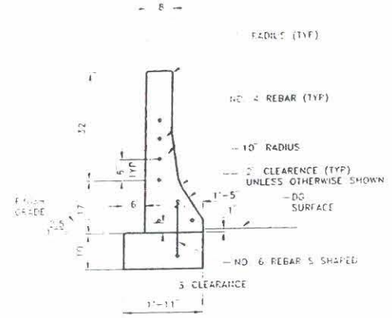
DESERT MOUNTAIN PROPERTIES
DETENTION BASIN NO. S-1 AT
CHARLES BLAIR McDONALD DR.
OUTLET STRUCTURE PLAN / PROFILE

DESIGN	GAS	SCALE		JOB NO.	2628-55
DRAWN	KLD	HORIZ.	1"=10'	DWG. NO.	S1OUTLET
CHECK	LLT	VERT.	1"=10'	DATE	6/95

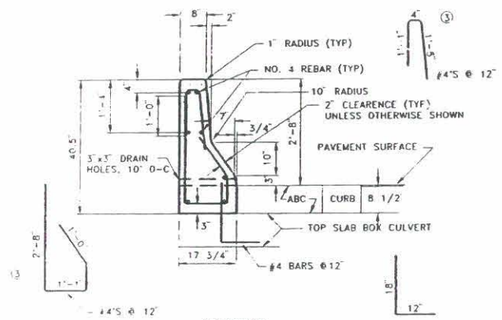
SHEET 4 OF 12

A-N WEST INC.
Consulting Engineers
7600 N. 15th Street, Suite 200
Phoenix, Arizona 85020
(602)861-2200

115-DR-95 1941-E-95

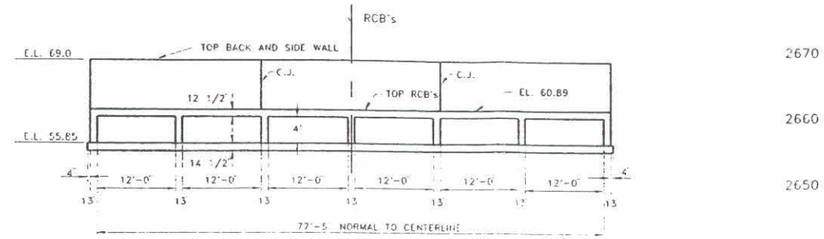


BARRIER WALL-LEFT SIDE INTERIOR STR.,
STA. 7+50 TO 14+87
ADOT STD. 10.60 (MODIFIED)

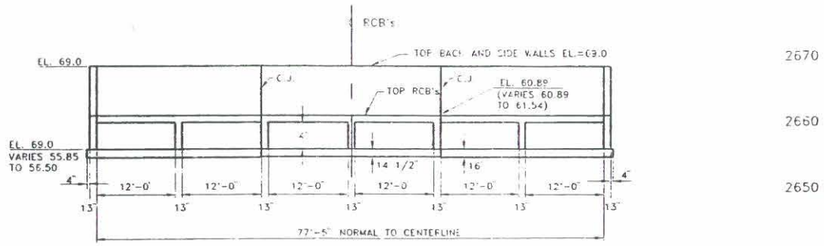


CHARLES BLAIR McDONALD CAST IN PLACE HALF BARRIER
AT CULVERT OUTLET
MODIFIED ADOT STD. 10.61

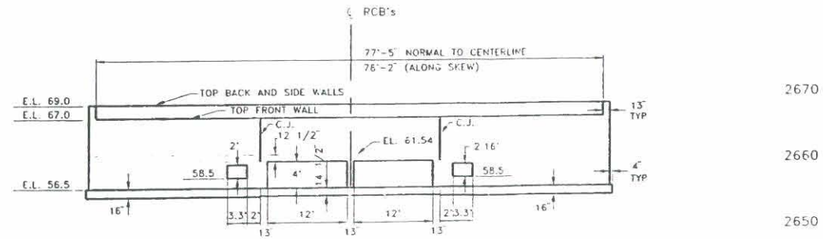
ALSO AT COVEY TRAIL CULVERTS AT CHANN. 'A'



SECTION C - C



SECTION B - B



SECTION A - A

2	4/9/96	PER CITY/CLIENT COMMENTS	GAS	
1	2/26/96	BARR. WALL-INT. STR. REV.	GAS	

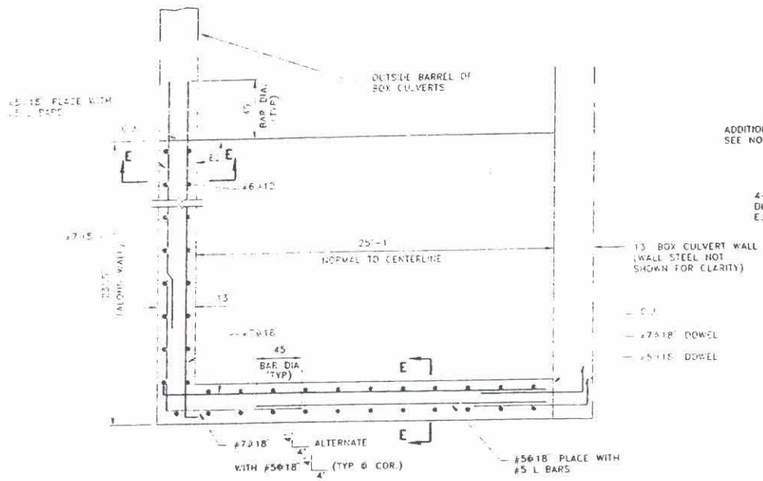
DESERT MOUNTAIN PROPERTIES
DETENTION BASIN NO. S-1 AT
CHARLES BLAIR McDONALD DR.
OUTLET STRUCTURE CROSS-SECTIONS/DETAILS

DESIGN		SCALE	JOB NO.	4828-55	
DRAWN		HOR. 1"=5'	ENG. NO.	STEEL	
CHECK		VERT. -	DATE	6/95	

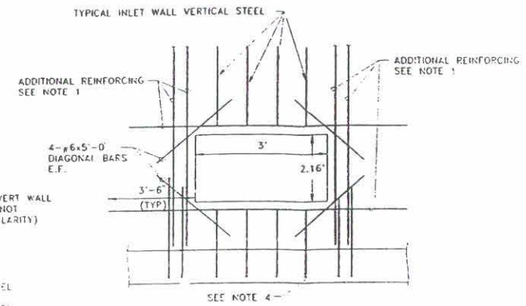
A-N WEST INC.
Consulting Engineer:
1500 N. 15th Street, Suite 200
Phoenix, Arizona 85013
(602)561-2200

115-DR-95 1941-E-95

26870

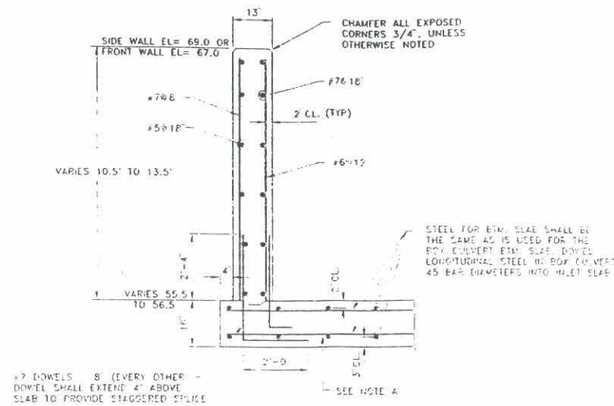


TYPICAL INLET WALL DETAIL
PLAN VIEW (BELOW TOP OF BOX CULVERT)
(SIMLAR FOR OPPOSITE SIDE)



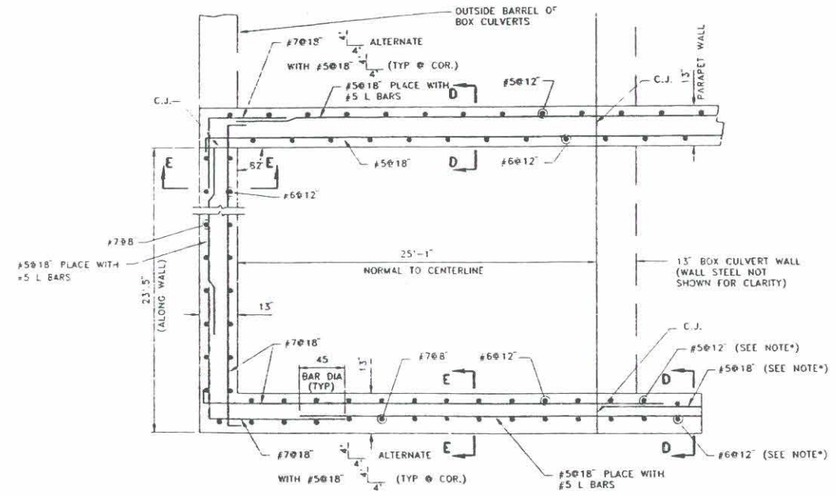
WALL OPENING REINFORCEMENT

NOTES:
1) ADD REINFORCING EQUAL TO THAT WHICH INTERSECTS THE OPENING AND PLACE HALF OF THE ADDED REINFORCING ON EACH SIDE OF THE OPENING.
2) STOP ALL REGULAR REINFORCING WHICH INTERSECTS THE OPENING 2" CLEAR OF THE OPENING ON ALL SIDES.
3) ADDED REINFORCING SHALL BE SPACED AT NO LESS THAN 4" O.C.
4) VERTICAL DOWEL BARS TO BE SAME SIZE AND SPACING AS SHOWN ON THE TYPICAL INLET WALL DETAIL.
5) TYPICAL HORIZONTAL STEEL IS NOT SHOWN FOR CLARITY.



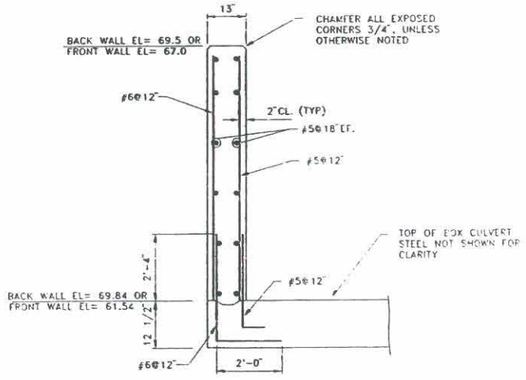
SECTION E-E
TYPICAL INLET WALL SECTION

NOTE A: ADDITIONAL #7 @ 12"x10'-0" STEEL REINFORCING WILL BE REQUIRED FOR THE BOTTOM MAT OF STEEL IN THE FLOOR SLAB AT THE FRONT OF THE INLET STRUCTURE. BARS WILL BE PARALLEL TO THE EXTENDED 2 BARREL BOX CULVERT AND LOCATED ACROSS THE FRONT OF THE STRUCTU EXCEPT UNDER THE 2 BARREL BOX CULVERT.



TYPICAL INLET WALL DETAIL
PLAN VIEW (ABOVE TOP OF BOX CULVERT)
(SIMLAR FOR OPPOSITE BARREL)

NOTE* TYPICAL STEEL REINFORCING OVER THE 2 EXTENDED MIDDLE BARRELS OF THE BOX CULVERT ONLY. (I.E. PARAPET WALL)



SECTION D-D
TYPICAL PARAPET WALL DETAIL

GENERAL STRUCTURAL NOTES

1. CONCRETE FOR BOX CULVERT INLET WALLS AND PARAPET WALLS SHALL HAVE A MINIMUM 28 DAY COMPRESSIVE STRENGTH OF 3000 PSI, U.N.O.
2. REINFORCING STEEL: A615, GRADE 60. FOR BOX CULVERT INLET WALLS AND PARAPET WALLS
3. PROVIDE 2" CONCRETE COVER OVER REINFORCING STEEL, U.N.O.
4. LAP SPLICE LENGTHS FOR REINFORCING STEEL NOT DIMENSIONED SHALL BE 45 DIAMETERS OF SMALLER BAR LAPPED
5. ALL HOOKS FOR REINFORCING STEEL SHALL BE ACI STANDARD HOOKS, U.N.O.
6. ALL EXPOSED CORNERS SHALL BE CHAMFERED 3/4" U.N.O.
7. ALL VISIBLE EXPOSED CONCRETE TO BE DAVIS WESTERN GOLD COLORED CONCRETE

2	4/9/96	PER CITY/CLIENT COMMENTS	GAS
1	2/26/96	REVISED BACK WALL HT. 0.5' AT INLET	GAS

4/10/96

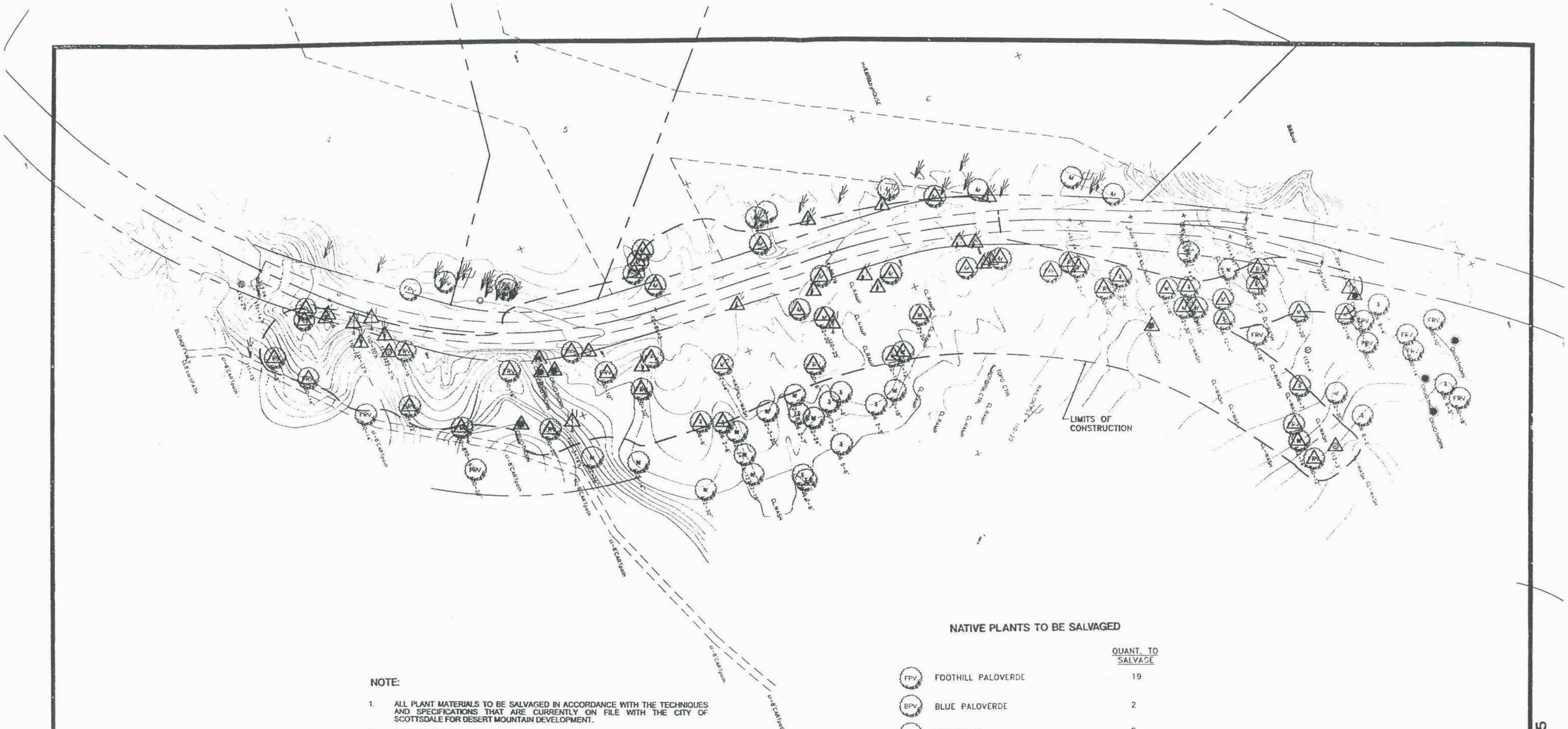
DESERT MOUNTAIN PROPERTIES
DETENTION BASIN NO. S-1 AT
CHARLES BLAIR McDONALD DR.
OUTLET STRUCTURE CROSS-SECTIONS/DETAILS

SCALE | DATE 4/10/96 | SHEET

A-D WESTINC. Consulting Engineers
[illegible] 15th Street, Suite 200
[illegible], Arizona 85020
(602)861-2200

115-DR-95 1941-F-95

26871



NATIVE PLANTS TO BE SALVAGED

Symbol	Plant	QUANT. TO SALVAGE
FPV	FOOTHILL PALOVERDE	19
BPV	BLUE PALOVERDE	2
T	IRONWOOD	8
M	MESQUITE TREE	22
	OCOTILLO	15
	BARREL CACTUS	5
	CRUCIFIXION THORN	6
	SAGUARO CACTUS	5
△	PLANT MATERIALS TO SALVAGE	

NOTE:

1. ALL PLANT MATERIALS TO BE SALVAGED IN ACCORDANCE WITH THE TECHNIQUES AND SPECIFICATIONS THAT ARE CURRENTLY ON FILE WITH THE CITY OF SCOTTSDALE FOR DESERT MOUNTAIN DEVELOPMENT.
2. CONTRACTOR TO BE RESPONSIBLE FOR EROSION CONTROL THROUGHOUT THE CONSTRUCTION OF THE PROJECT.
3. SEE CONCEPT LANDSCAPE PLANS FOR PLANTING OF SALVAGED MATERIAL.

26872

115-DR-95 1941-E-95

CALL TWO WORKING DAYS BEFORE YOU DIG
263-1100
1-800-STAKE-IT
(OUTSIDE MARICOPA COUNTY)

NO.	DATE	DESCRIPTION	BY

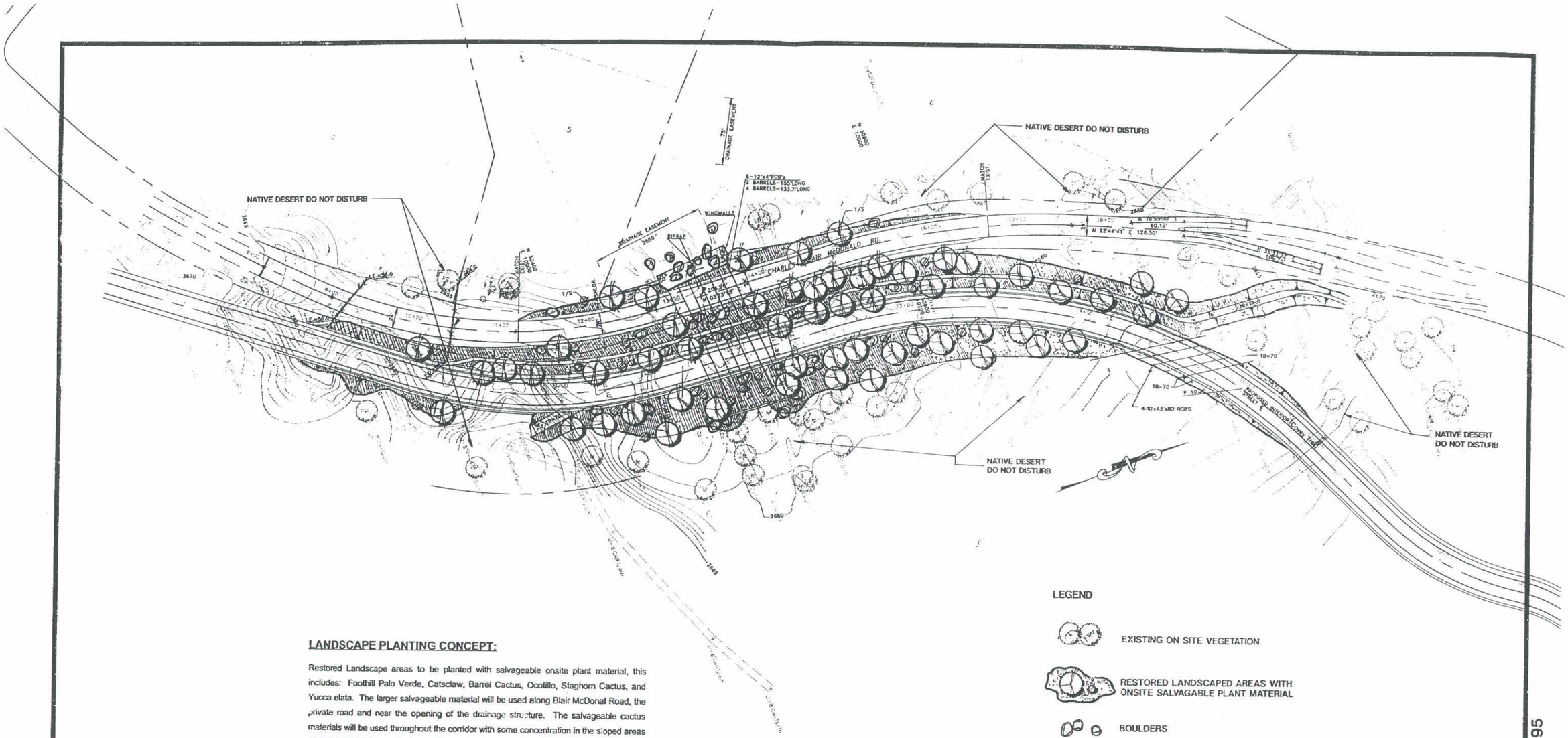
9/8/95

NATIVE PLANT SURVEY - EX. SITE

DESERT MOUNTAIN PROPERTIES
DETENTION BASIN S-1
AT CHARLES BLAIR McDONALD RD.

DESIGN GAS	SCALE	JOB NO. 4628-50	SHEET
DRAWN PSS/RCO	HORIZ. 1"=50'	DWG. ID. CBMCULV	7 OF 12
CHECK LLT	VERT. -	DATE JULY 95	

A-N WEST INC.
Consulting Engineers
7600 N. 15th Street, Suite 200
Phoenix, Arizona 85020
(602)861-2200



LANDSCAPE PLANTING CONCEPT:

Restored Landscape areas to be planted with salvageable onsite plant material, this includes: Foothill Palo Verde, Catsclaw, Barrel Cactus, Ocotillo, Staghorn Cactus, and Yucca elata. The larger salvageable material will be used along Blair McDonal Road, the private road and near the opening of the drainage structure. The salvageable cactus materials will be used throughout the corridor with some concentration in the sloped areas on top of the drainage structure. The newer plant material will be consistent with existing plant palette of the site. The restored areas will be seeded with low ground cover material similar to the existing, this would include: Creosote Bush, Brittle Bush, Triangle Leaf Bursage, Desert Senna, Purple Three Awn, Globe Mallow, Indian Wheat, and Desert Marigold. Existing boulders that were removed during excavation will be used throughout the restored landscaped areas. **Desert Mountain will moniter plant conditions daily and hand water plants as needed, using a hose attached to a water truck as has been done on project for the past 10 years.**

LEGEND

EXISTING ON SITE VEGETATION

RESTORED LANDSCAPED AREAS WITH ONSITE SALVAGABLE PLANT MATERIAL

BOULDERS

115-DR-95 1941-E-95

26873

CALL TWO WORKING DAYS BEFORE YOU DIG
263-1100
1-800-STAKE-IT
(OUTSIDE MARICOPA COUNTY)

NO.	DATE	DESCRIPTION	BY
2	4/10/96	Per City/Client	GAS
1	3/8/96	Delete North Berm, and Culverts (CMP)	GAS

LAWRENCE L. TYSIAC 13925 9/9/95 ARIZONA, U.S.A.

LANDSCAPE PLAN

DESERT MOUNTAIN PROPERTIES
DETENTION BASIN S-1
AT CHARLES BLAIR McDONALD RD.

DESIGN GAS	SCALE	JOB NO. 4628-50	SHEET
DRAWN PSS/RCO	HORIZ. 1"=50'	DWG. ID. CBMCULV	8 OF 12
CHECK LLT	VERT. -	DATE JULY 95	

A-N WEST INC. Consulting Engineers
7600 N. 15th Street, Suite 200
Phoenix, Arizona 85020
(602)561-2200

STORMWATER POLLUTION PREVENTION KEYNOTES

(1) SILT FENCE ACROSS EXISTING DRAINAGE CHANNEL – INSTALL PRIOR TO DETOUR ROAD CONSTRUCTION. TO REMAIN FOR PROJECT DURATION.

(SR) SURFACE ROUGHENING SHALL BE GRADED ON ALL PERMANENT AND TEMPORARY SLOPES.

(2) THE PERMANENT BOX CULVERT OUTLET, INCLUDING WINGWALLS AND RIPRAP PROTECTION, SHALL BE CONSTRUCTED AS PART OF PHASE 3.

(3) SILT FENCE ALONG BOX CULVERT EXCAVATION/TOE OF DETENTION BASIN EMBANKMENT – INSTALL AT BEGINNING OF PHASE 1. SILT FENCE ACROSS INLET TO REMAIN THRU PHASE 8.

(4) STRAW BALE BARRIERS – INSTALL AT BEGINNING OF PHASE 5. TO REMAIN THRU PHASE 8.

DETOUR ROAD AND TRAFFIC CONTROL NOTES

1. TRAFFIC CONTROL DEVICES AND ACTIVITIES DURING CONSTRUCTION SHALL CONFORM TO THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES, LATEST EDITION.

2. PRIOR TO COMMENCING WORK, THE CONTRACTOR SHALL PREPARE TRAFFIC CONTROL PLANS AND SUBMIT TO THE ENGINEER FOR APPROVAL.

SEQUENCE OF CONSTRUCTION

1. PHASE 1: CONSTRUCT UPSTREAM 117± LINEAR FEET OF 6 BARREL CONCRETE BOX CULVERT CROSSING C.B.McDONALD.
2. PHASE 2: CONSTRUCT DETOUR ROAD (C.M.B.OVER CULVERT.
3. PHASE 3: COMPLETE DOWNSTREAM 40 L.F. OF BOX CULVERT CONSTRUCTION.
4. PHASE 4: RECONSTRUCT C.B.McDONALD OVER NEW BOX CULVERTS AND REMOVE DETOUR ROAD.
5. PHASE 5: BEGIN CONSTRUCTION OF DETENTION BASIN EMBANKMENT.
6. PHASE 6: COMPLETE EMBANKMENT CONSTRUCTION.
7. PHASE 7: COMPLETE REVEG AND LANDSCAPE CONSTRUCTION. INCL. SPLIT RAIL FENCE AND TRAIL CONSTRUCTION.

(FUTURE) 8. PHASE 8: CONSTRUCT ROADWAY ON TOP OF EMBANKMENT FOR SUBDIVISION ACCESS.

STORMWATER POLLUTION PREVENTION CONSTRUCTION PHASING AND DETOUR ROAD PLAN

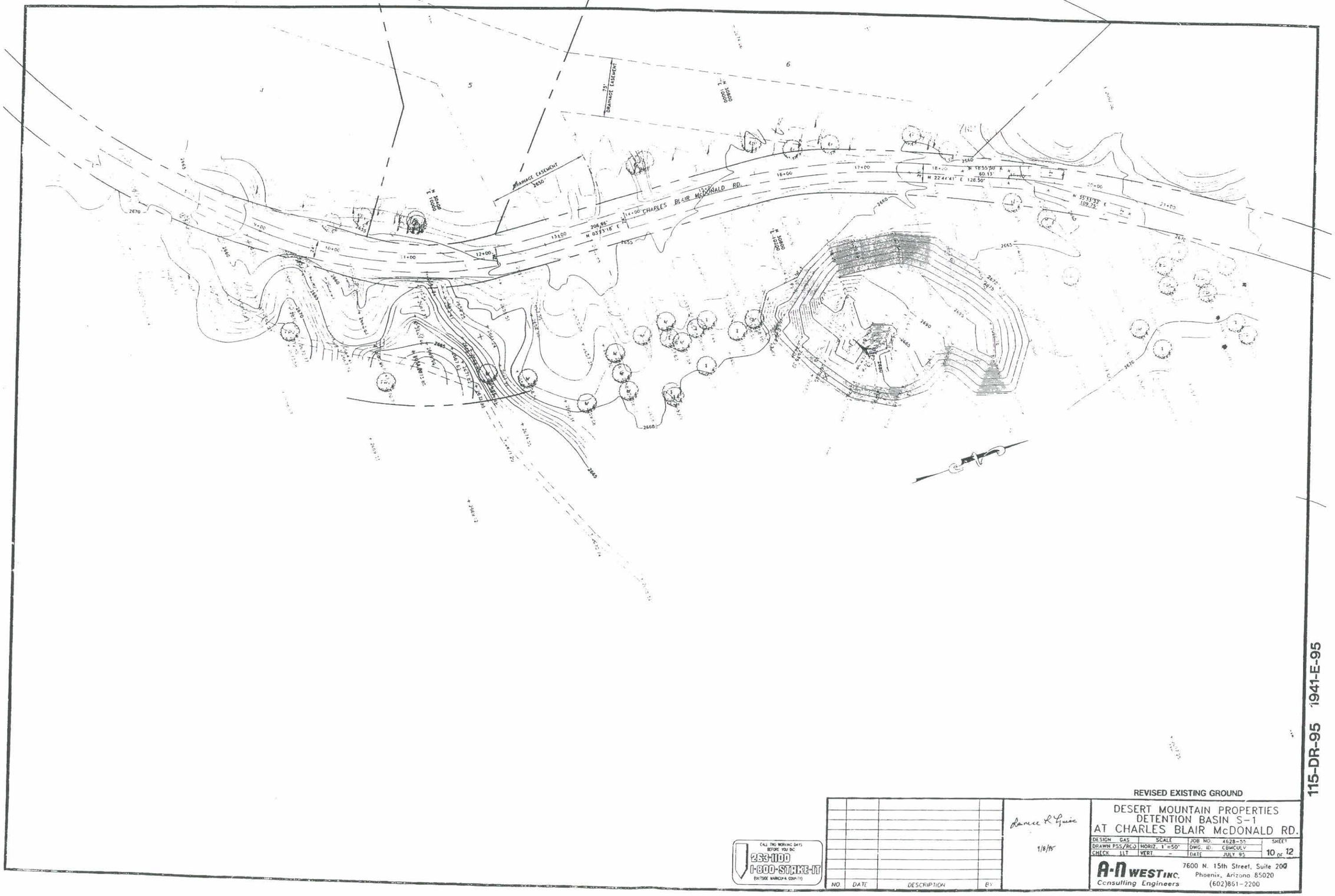
2	5/6/96	DETOUR RD. SURF. PER CITY/CLIENT	GAS
1	4/9/96	PER CITY/CLIENT COMMENTS	GAS

5/13/96

DESERT MOUNTAIN PROPERTIES
DETENTION BASIN S-1
AT CHARLES BLAIR McDONALD RD.

DESIGN GAS | SCALE | JOB NO. 4628-55 | SHEET
DRAWN PCO | HORIZ. 1"=50' | DWG. ID. CBMDTUR | 9 OF 12
CHECK LLT | VERT. – | DATE JULY 95

A-N WEST INC.
Consulting Engineers
7600 N. 15th Street, Suite 200
Phoenix, Arizona 85020
(602)861-2200



REVISED EXISTING GROUND

115-DR-95 1941-E-95

CALL TWO WORKING DAYS BEFORE YOU DIG
263-1100
1-800-STAKE-IT
(OUTSIDE MARICOPA COUNTY)

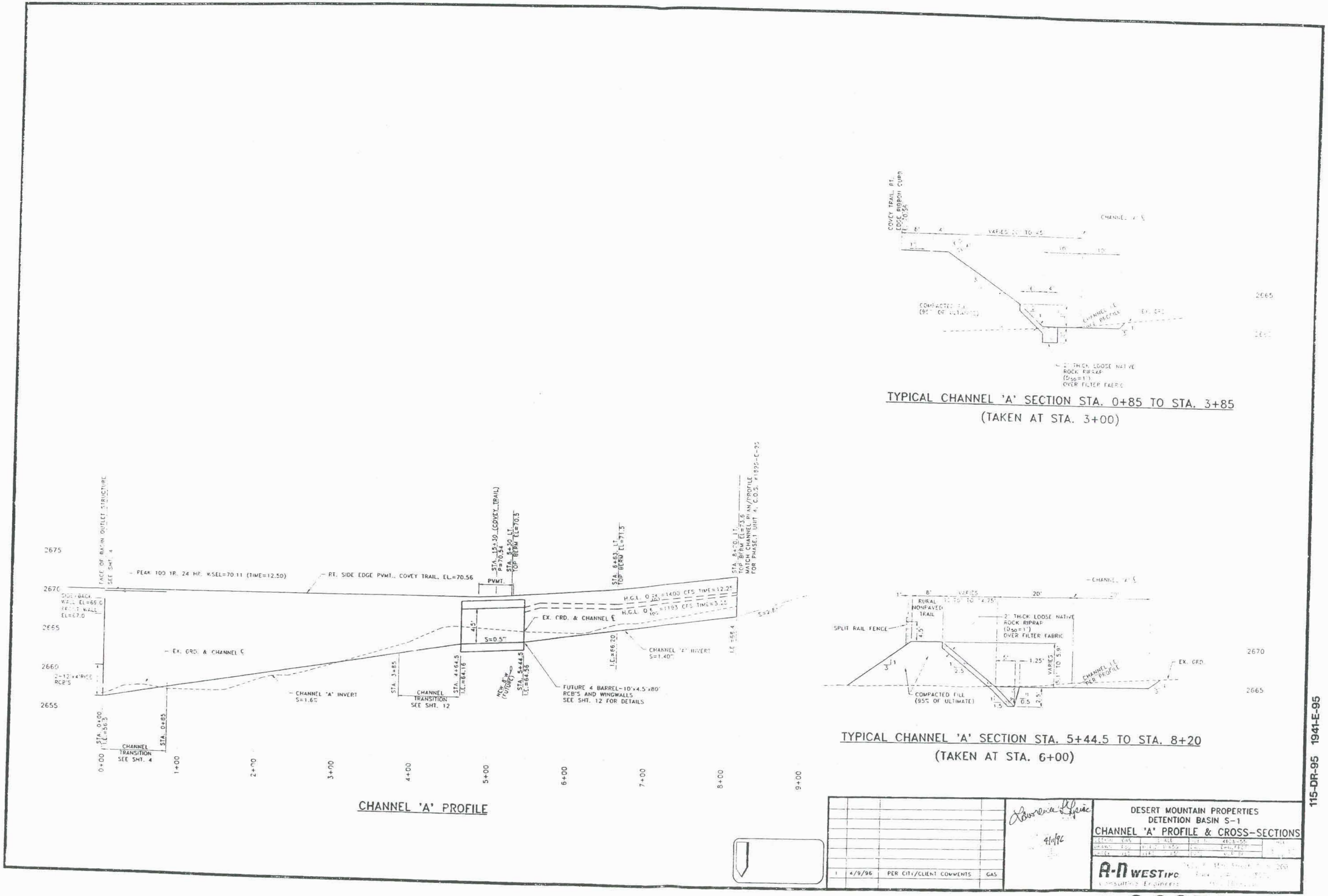
NO.	DATE	DESCRIPTION	BY

Laurence R. Gunio
1/8/95

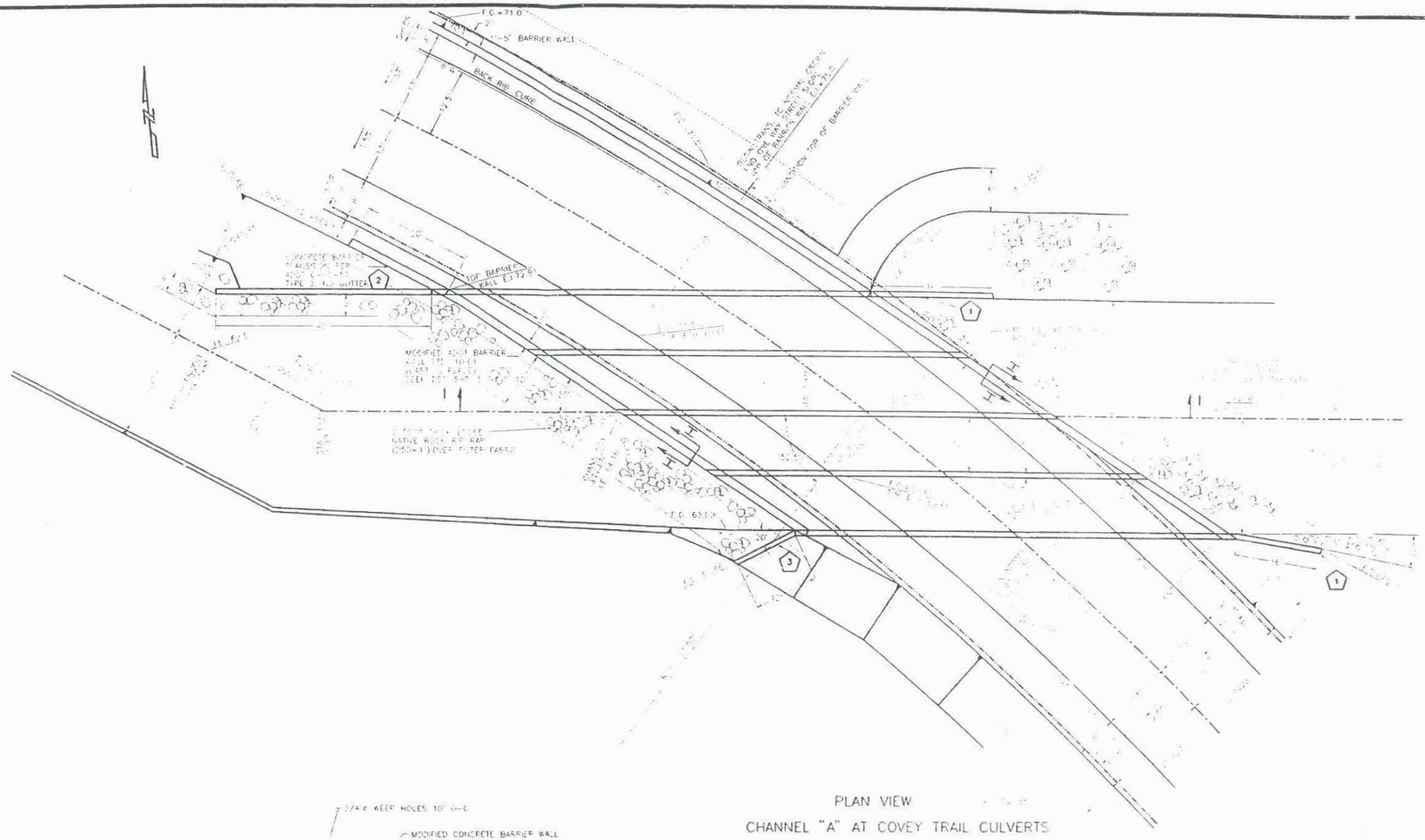
DESERT MOUNTAIN PROPERTIES
DETENTION BASIN S-1
AT CHARLES BLAIR McDONALD RD.

DESIGN	GAS	SCALE	JOB NO.	4628-55	SHEET
DRAWN	PSS/RCQ	HORIZ. 1"=50'	DWG. NO.	CBMCULV	10 OF 12
CHECK	LLT	VERT. –	DATE	JULY 95	

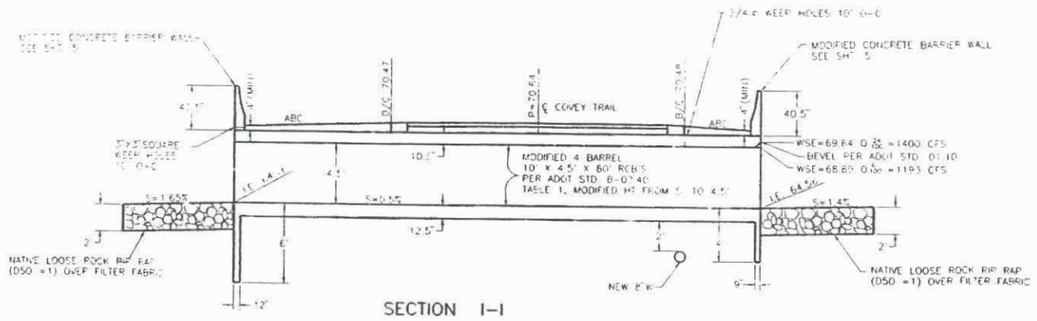
A-N WEST INC.
Consulting Engineers
7600 N. 15th Street, Suite 200
Phoenix, Arizona 85020
(602)861-2200


TYPICAL CHANNEL 'A' SECTION STA. 0+85 TO STA. 3+85
(TAKEN AT STA. 3+00)
TYPICAL CHANNEL 'A' SECTION STA. 5+44.5 TO STA. 8+20
(TAKEN AT STA. 6+00)
SPLIT RAIL FENCE
COMPACTED FILL (95% OF ULTIMATE)
EX. GRD.
CHANNEL 'A' PROFILE
PEAK 100 YR. 24 HR. WSEL=70.11 (TIME=12.50)
RT. SIDE EDGE PVMT., COVEY TRAIL, EL.=70.56
EX. GRD. & CHANNEL ℄
CHANNEL 'A' INVERT S=1.6%
CHANNEL TRANSITION SEE SHT. 12
CHANNEL TRANSITION SEE SHT. 4
FUTURE 4 BARREL-10'x4.5'x80' RCB'S AND WINGWALLS SEE SHT. 12 FOR DETAILS
S=0.5%
0+00
1+00
2+00
3+00
4+00
5+00
6+00
7+00
8+00
9+00
2675
2670
2665
2660
2655
DESERT MOUNTAIN PROPERTIES
DETENTION BASIN S-1
CHANNEL 'A' PROFILE & CROSS-SECTIONS
1 4/9/96 PER CITY/CLIENT COMMENTS GAS
A-N WEST inc
Consulting Engineers
115-DR-95 1941-E-95

26876



PLAN VIEW
CHANNEL "A" AT COVEY TRAIL CULVERTS



SECTION I-I
ALONG CHANNEL ℄

1. CONSTRUCT 100 YR MOD. OUTLET WALL PER ADOT STD. B-04.70, SHEW 20H: 4 V SLOPE, HT. 5FT, EXPOSED WALL WIDTH LENGTH FROM 11'-6" TO 16'-0" AND ADJUST FLARE ANGLE PER PLANS.
2. CONSTRUCT MODIFIED OUTLET W.W. PER ADOT STD. B-04.51, 10' DIA, 3H: 4V SLOPE, HT. 5FT, WING WALL WIDTH LENGTH FROM 11'-6" TO 40'-0" AND ADJUST FLARE ANGLE PER PLANS.
3. CONSTRUCT MODIFIED OUTLET WING PER ADOT STD. B-04.51, SHEW 20H: 4 V SLOPE, HT. 5FT, EXPOSED WALL WIDTH LENGTH FROM 11'-6" TO 16'-0" AND ADJUST FLARE ANGLE PER PLANS.

1	10% SUBMITTAL PER CITY/CLIENT COMMENTS	CAS

Lawrence R. Lysiak
11/9/95

DESERT MOUNTAIN PROPERTIES
DETENTION BOGIN S-1
COVEY TRAIL CULVERT AT CHANNEL A

SHEET 12

W-D WEST INC.

115-DR-95 1941-E-95

26877

D.5 Hydrologic Calculations

```
1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*              JUN  1998                *
*            VERSION 4.1                *
*                                       *
* RUN DATE   05MAR02  TIME  09:39:50    *
*                                       *
*****************************************
```

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

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

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

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

1

HEC-1 INPUT


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

   1      ID          FLOODPLAIN DELINEATION STUDY OF ANDORA HILLS & GALLOWAY WASHES
   2      ID          FCD 99-14
   3      ID          BY JE FULLER/HYDROLOGY & GEOMORPHOLOGY, INC.
   4      ID          FOR THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
   5      ID          REVISED MARCH 2002     FILENAME: GWM224R.DAT
   6      ID     ************************************************************
   7      ID          100 YEAR ANALYSIS 24-HOUR STORM USING JD RECORDS
   8      ID          MCUHP2 USED FOR UNIT HYDROGRAPHS
   9      ID     ************************************************************
  10      ID
  11      ID     DDM MCUHP2 GALLOWAY WASH FLOODPLAIN DELINEATION STUDY, FCD NO. 99-14
  12      ID
  13      ID    March 2002 revisions to original Dec. 1999 model include:
  14      ID
  15      ID    HC BLOCK ADDED FOR GRAPEVINE WASH (CP 295A)
  16      ID
  17      ID    SUBBASIN GWW1_3 FURTHER SUBDIVIDED ALONG GALLOWAY WASH PER FEMA COMMENTS
  18      ID    IN LETTER DATED FEB. 8, 2002
  19      ID
  20      ID   DDM MCUHP2 GALLOWAY WASH FLOODPLAIN DELINEATION STUDY, FCD NO. 99-14
          *DIAGRAM
  21      IT       5 01DEC99     0005      400
  22      IO       5
  23      IN      15
  24      JD    4.80     0.01
  25      PC    .000     .002     .005     .008     .011     .014     .017     .020     .023     .026
  26      PC    .029     .032     .035     .038     .041     .044     .048     .052     .056     .060
  27      PC    .064     .068     .072     .076     .080     .085     .090     .095     .100     .105
  28      PC    .110     .115     .120     .126     .133     .140     .147     .155     .163     .172
  29      PC    .181     .191     .203     .218     .236     .257     .283     .387     .663     .707
  30      PC    .735     .758     .776     .791     .804     .815     .825     .834     .842     .849
  31      PC    .856     .863     .869     .875     .881     .887     .893     .898     .903     .908
  32      PC    .913     .918     .922     .926     .930     .934     .938     .942     .946     .950
  33      PC    .953     .956     .959     .962     .965     .968     .971     .974     .977     .980
  34      PC    .983     .986     .989     .992     .995     .998    1.000
  35      JD    4.78     1.00
  36      JD    4.51    10.00
  37      JD    4.37    20.00
  38      JD    4.11    70.00
          *
          * DDM    ***** Preserved *****

  39      KK  GWW1_1
  40      KM   BASIN GWW1_1
  41      KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
  42      KM    L=       4.6  Lca=      2.0   S=  196.1  Kn= .039  LAG=  48.4
  43      KM    DESERT/RANGELAND S-GRAPH WAS USED FOR THE BASIN
  44      BA    2.55
  45      LG     .19      .25     5.30      .26     9.00
  46      UI    178.     178.     435.     760.    1042.    1288.    1519.    1641.    1701.    1658.
  47      UI   1545.    1299.    1089.     907.     762.     641.     524.     438.     363.     312.
  48      UI    272.     196.     188.     134.     122.     122.      78.      43.      43.      43.
  49      UI     43.      43.      43.      43.      43.       0.       0.       0.       0.       0.
  50      UI      0.       0.       0.       0.       0.       0.       0.       0.       0.       0.
          *
          * DDM    ***** Preserved *****
```

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

  51      KK   RR282
  52      KM    STORAGE ROUTING AT CHARLES BLAIR MCDONALD DRIVE
  53      KM    FROM A-N WEST, INC., AS_BUILT ON FILE AT CITY OF SCOTTSDALE DATED 5-15-97
  54      KM    DESERT MOUNTAIN PROPERTIES DETENTION BASIN NO. S-1
  55      KM    Culvert is 6-12'x4' CBC with 2 unregulated boxes and 4 which are regulated
  56      KM    by 2-3'x2' orifices and front, and side weir inlets.  The orifice entrance
  57      KM    inverts are 2' above the invert of the 2 unregulated culverts.  The weir
  58      KM    inlet invert is approximately 11' above the invert of the 4 regulated
  59      KM    culvert openings.
  60      RS       1    STOR      -1
  61      SV       0    .097    0.992    3.428    7.831   14.433   18.672   23.649   29.425   36.060
  62      SV    43.2
  63      SQ       0     110      433      875     1157     1380     1489     1838     2386     3399
  64      SQ    4778
  65      SE  2656.5    2658     2660     2662     2664     2666     2667     2668     2669     2670
  66      SE    2671
          *
          * DDM    ***** Preserved *****

  67      KK  282286
  68      KM    ROUTING REACH FROM CP 282 TO 286 THROUGH SUBBASIN GWW133
  69      KM    SLOPE = (2650-2390)/11240
  70      RS       6    FLOW      -1
  71      RC   0.055   0.045   0.055   11240  0.0231
  72      RX       0       0     102     105     145     148     250     250
  73      RY     100     100    96.5      95      95    96.5     100     100
  74      RL                    0.70      95
          *
          * DDM    ***** Preserved *****

  75      KK  GWW1_2
  76      KM   BASIN GWW1_2
  77      KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
  78      KM    L=      3.9  Lca=      1.9   S=  164.9  Kn= .039  LAG=  45.2
  79      KM    DESERT/RANGELAND S-GRAPH WAS USED FOR THE BASIN
  80      BA    1.04
  81      LG     .20     .25    5.20     .28    2.00
  82      UI     78.     78.    228.     361.   493.    604.    690.    740.    739.    694.
  83      UI    597.    496.    405.     336.   278.    227.    186.    153.    128.    108.
  84      UI     82.     72.     53.      53.    43.     19.     19.     19.     19.     19.
  85      UI     19.     19.     19.       0.     0.      0.      0.      0.      0.      0.
  86      UI      0.      0.      0.       0.     0.      0.      0.      0.      0.      0.
          *
          * DDM    ***** Preserved *****

  87      KK  284285
  88      KM    ROUTING REACH FROM CP 284 TO 285 THROUGH A PORTION OF SUBBASIN GWW132
  89      KM    SLOPE = (2585-2560)/830
  90      RS       1    FLOW      -1
  91      RC    0.05   0.045    0.05      830    0.03
  92      RX       0       0      40       42      97      99     139     139
  93      RY     100     100      96       95      95      96     100     100
  94      RL                    0.70       95
  95      ZW      C=FLOW
          *
          * DDM    ***** Preserved *****
```



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

  96      KK  GWW132
  97      KM   BASIN GWW132
  98      KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
  99      KM    L=      1.6  Lca=       .7   S=  141.0  Kn= .039  LAG=  22.7
 100      KM    DESERT/RANGELAND S-GRAPH WAS USED FOR THE BASIN
 101      BA     .35
 102      LG     .20     .25    5.30     .26    1.00
 103      UI     51.    194.    362.     473.   476.    365.    248.    169.    114.     80.
 104      UI     52.     35.     22.      13.    13.     13.      0.      0.      0.      0.
 105      UI      0.      0.      0.       0.     0.      0.      0.      0.      0.      0.
          *
          * DDM    ***** Preserved *****

 106      KK   CP285
 107      KM    COMBINE RUNOFF FROM SUBBASIN GWW132 WITH ROUTED FLOW FROM 284
 108      HC       2
          *
          * DDM    ***** Preserved *****

 109      KK  285286
 110      KM    ROUTING REACH FROM CP 285 TO 286 THROUGH SUBBASIN GWW133
 111      KM   SAME CHANNEL AS ORIGINAL 284286 ASSUMED.  LENGTH AND SLOPE ADJUSTED.
 112      KM    SLOPE = (2560-2390)/6765
 113      RS       2    FLOW      -1
 114      RC    0.05   0.045    0.05     6765   0.025
 115      RX       0       0      40       42      97      99     139     139
 116      RY     100     100      96       95      95      96     100     100
 117      RL                    0.70       95
          *
```

```
                * DDM   ***** Preserved *****

  118           KK  GWW133
  119           KM   BASIN GWW133
  120           KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
  121           KM    L=      1.6  Lca=       .9   S=  157.2  Kn= .037  LAG=  23.4
  122           KM    DESERT/RANGELAND S-GRAPH WAS USED FOR THE BASIN
  123           BA     .40
  124           LG     .18     .25    5.80     .22   12.00
  125           UI     57.    204.    389.    517.    535.    431.    296.    205.    140.     98.
  126           UI     66.     44.     34.     14.     14.     14.     14.      0.      0.      0.
  127           UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
                *
                * DDM   ***** Preserved *****

  128           KK  CP286A
  129           KM    COMBINE ROUTED FLOW FROM 285 WITH RUNOFF FROM GWW133
  130           KM    TOTAL FLOW IN GALLOWAY WASH UPSTREAM OF NORTH GALLOWAY WASH
  131           HC      2
                *
                * DDM   ***** Preserved *****
1                                        HEC-1 INPUT                                                PAGE  4

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

  132           KK  GWW131
  133           KM   BASIN GWW131
  134           KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
  135           KM    L=      2.6  Lca=      1.3   S=  158.9  Kn= .040  LAG=  34.6
  136           KM    DESERT/RANGELAND S-GRAPH WAS USED FOR THE BASIN
  137           BA     .77
  138           LG     .20     .25    5.40     .23   3.00
  139           UI     75.    133.    318.    483.    625.    703.    714.    652.    515.    400.
  140           UI    314.    242.    187.    147.    117.     83.     68.     52.     48.     18.
  141           UI     18.     18.     18.     18.     18.      0.      0.      0.      0.      0.
  142           UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
                *
                * DDM   ***** Preserved *****

  143           KK   CP286
  144           KM     COMBINE ROUTED FLOW FROM GWW1_2 WITH RUNOFF FROM SUBBASIN GWW1_3
  145           KM     AND COMBINED FLOW AT CP286A (GALLOWAY WASH)
  146           KM     THIS IS THE TOTAL FLOW IN GALLOWAY WASH JUST BELOW THE CONFLUENCE
  147           KM     WITH NORTH GALLOWAY WASH.
  148           HC      3
                *
                * DDM   ***** Preserved *****

  149           KK  286287
  150           KM    ROUTING REACH FROM CP 286 TO 287 THROUGH SUBBASIN GWW1_4
  151           KM    SLOPE = (2390-2300)/4410
  152           RS      2    FLOW      -1
  153           RC   0.05   0.045    0.05    4410  0.0204
  154           RX      0       0      90      92     157     159     249     249
  155           RY    100     100      97      95      95      97     100     100
  156           RL                   0.70      95
                *
                * DDM   ***** Preserved *****

  157           KK  GWW1_4
  158           KM   BASIN GWW1_4
  159           KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
  160           KM    L=      3.6  Lca=      2.1   S=  274.7  Kn= .040  LAG=  43.0
  161           KM    DESERT/RANGELAND S-GRAPH WAS USED FOR THE BASIN
  162           BA    1.00
  163           LG     .20     .25    5.80     .20   1.00
  164           UI     79.     82.    253.    389.    523.    646.    717.    753.    730.    668.
  165           UI    544.    443.    365.    298.    241.    196.    159.    133.    111.     83.
  166           UI     72.     54.     54.     36.     19.     19.     19.     19.     19.     19.
  167           UI     19.      0.      0.      0.      0.      0.      0.      0.      0.      0.
  168           UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
                *
                * DDM   ***** Preserved *****
1                                        HEC-1 INPUT                                                PAGE  5

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

  169           KK   CP287
  170           KM     COMBINE ROUTED FLOW FROM CP286 WITH RUNOFF FROM SUBBASIN GWW1_4
  171           HC      2
                *
                * DDM   ***** Preserved *****

  172           KK  287288
  173           KM    ROUTING REACH FROM CP 287 TO 288 THROUGH SUBBASIN GWW1_6
  174           KM    SLOPE = (2300-2260)/1370
  175           RS      1    FLOW      -1
  176           RC   0.05   0.04    0.05    1370  0.0292
  177           RX      0       0     125     127     227     229     354     354
  178           RY    100     100      95    93.5    93.5      95     100     100
  179           RL                   0.70    93.5
  180           ZW      C=FLOW
                *
```

```
                * DDM   ***** Preserved *****

  181           KK  GWW1_5
  182           KM   BASIN GWW1_5
  183           KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
  184           KM    L=       3.6  Lca=       1.9   S=  112.6  Kn= .034  LAG=  41.2
  185           KM    DESERT/RANGELAND S-GRAPH WAS USED FOR THE BASIN
  186           BA     .98
  187           LG     .16      .23     6.20      .19   24.00
  188           UI    80.      96.     268.     423.    556.    685.    749.    770.    727.    626.
  189           UI   511.     410.     335.     268.    219.    171.    144.    121.     85.     77.
  190           UI    55.      55.      38.      20.     20.     20.     20.     20.     20.     20.
  191           UI     0.       0.       0.       0.      0.      0.      0.      0.      0.      0.
  192           UI     0.       0.       0.       0.      0.      0.      0.      0.      0.      0.
                *
                * DDM   ***** Preserved *****

  193           KK   CP288
  194           KM     COMBINE ROUTED FLOW FROM CP287 WITH RUNOFF FROM SUBBASIN GWW1_5
  195           HC       2
                *
                * DDM   ***** Preserved *****

  196           KK  GWW1_6
  197           KM   BASIN GWW1_6
  198           KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
  199           KM    L=       2.6  Lca=       1.3   S=  164.8  Kn= .040  LAG=  34.8
  200           KM    DESERT/RANGELAND S-GRAPH WAS USED FOR THE BASIN
  201           BA     .59
  202           LG     .20      .25     5.30      .24     .00
  203           UI    57.     100.     240.     366.    473.    534.    545.    500.    398.    309.
  204           UI   243.     188.     144.     114.     90.     65.     54.     39.     39.     14.
  205           UI    14.      14.      14.      14.     14.      0.      0.      0.      0.      0.
  206           UI     0.       0.       0.       0.      0.      0.      0.      0.      0.      0.
                *
                * DDM   ***** Preserved *****
1                                          HEC-1 INPUT                                          PAGE  6

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

  207           KK   CP290
  208           KM     COMBINE RUNOFF FROM SUBBASIN GWW1_6 WITH ROUTED FLOW FROM CP288
  209           HC       2
  210           ZW      C=FLOW
                *
                * DDM   ***** Preserved *****

  211           KK  290295
  212           KM    ROUTING REACH FROM CP290 TO CP295 THROUGH SUBBASIN GWW3_1
  213           KM    SLOPE = (2230-2170)/2620
  214           RS       1    FLOW       -1
  215           RC    0.05   0.035     0.05     2620  0.0229
  216           RX       0       0       80       82     162     164     244     244
  217           RY     100     100       92       90      90      92     100     100
  218           RL                     0.70       90
  219           ZW      C=FLOW
                *
                * DDM   ***** Preserved *****

  220           KK    GVW2
  221           KM   BASIN GVW2
  222           KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
  223           KM    L=       5.5  Lca=       2.8   S=  371.1  Kn= .043  LAG=  56.7
  224           KM    PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN
  225           BA    6.02
  226           LG     .20      .23     6.20      .18   12.00
  227           UI   358.     358.     620.    1194.   1689.   2184.   2513.   2794.   3334.   4259.
  228           UI  3145.    2434.    2157.    1998.   1821.   1680.   1506.   1395.   1202.   1046.
  229           UI   917.     857.     807.     748.    594.    539.    457.    435.    392.    392.
  230           UI   280.     274.     274.     220.    175.    175.    175.    175.    152.     69.
  231           UI    69.      69.      69.      69.     69.     69.     69.     69.     69.     69.
  232           UI    69.      69.       0.       0.      0.      0.      0.      0.      0.      0.
  233           UI     0.       0.       0.       0.      0.      0.      0.      0.      0.      0.
  234           ZW      C=FLOW
                *
                * DDM   ***** Preserved *****

  235           KK  280295
  236           KM    Normal depth channel route from CP280 to CP295 through subbasin GVW3_1
  237           KM      Source:  modified from GVSCE (1997) HEC-1 for FCD 95-28
  238           KM               Hydrology Field Reconnaissance, page 12
  239           KM               slope and length revised by JEF
  240           KM    SLOPE = (2515-2170)/13560
  241           RS       5    FLOW       -1
  242           RC   0.080   0.050   0.070    13560  0.0254
  243           RX  1000.0  1020.0  1040.0  1040.1  1202.9  1203.0  1223.0  1243.0
  244           RY   110.0   100.0    90.0    90.0    90.0    90.0   100.0   110.0
  245           RL                    0.80    90.0
  246           ZW      C=FLOW
                *
                * DDM   ***** Preserved *****
1                                          HEC-1 INPUT                                          PAGE  7

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

```
KK  GVW3_1
KM   BASIN GVW3_1
KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
KM    L=      3.3  Lca=      1.5   S=  184.3  Kn= .043  LAG=  42.3
KM    DESERT/RANGELAND S-GRAPH WAS USED FOR THE BASIN
BA    1.04
LG     .20     .25    5.20     .26     .00
UI     83.     91.    271.    421.    558.    695.    764.    796.    765.    683.
UI    556.    453.    368.    301.    242.    196.    160.    132.    105.     88.
UI     65.     57.     57.     24.     20.     20.     20.     20.     20.     20.
UI     20.      0.      0.      0.      0.      0.      0.      0.      0.      0.
UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
*
* DDM   ***** Preserved *****

KK  CP295A
KM    COMBINE ROUTED FLOW AND GVW3_1 FOR TOTAL FLOW FROM GRAPEVINE WASH
HC      2
*
* DDM   ***** Preserved *****

KK   CP295
KM    COMBINE FLOW FROM GRAPEVINE WASH WITH GALLOWAY WASH ROUTED FLOW FROM
KM    CP280
HC      2
*
* DDM   ***** Preserved *****

KK  295300
KM   Normal depth channel route from CP295 to CP300 through subbasin GWW3_2
KM      Source:  modified from GVSCE (1997) HEC-1 for FCD 95-28
KM               Hydrology Field Reconnaissance, page 10
KM               Elevations were adjusted up 0.3' from field book
KM               slope and length revised by JEF
KM    SLOPE = (2170-2100)/2895
RS      1    FLOW      -1
RC  0.050   0.035   0.050    2895  0.0242
RX      0       0      60      64     139     143     203     203
RY    100     100      95      91      91      95     100     100
RL                   0.60      91
ZW      C=FLOW
* DDM   ***** Preserved *****

KK    GVW1
KM   BASIN GVW1
KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
KM    L=      6.2  Lca=      3.6   S=  298.9  Kn= .045  LAG=  71.1
KM    PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN
BA    4.90
LG     .20     .17    6.80     .13   17.00
UI    232.    232.    232.    550.    799.   1029.   1368.   1513.   1688.   1830.
UI   2103.   2570.   2677.   1797.   1567.   1414.   1338.   1241.   1155.   1088.
UI    997.    924.    851.    762.    677.    606.    568.    540.    514.    486.
UI    397.    382.    308.    297.    284.    254.    254.    230.    178.    178.
1                              HEC-1 INPUT                                    PAGE   8
LINE      ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
UI    178.    175.    114.    114.    114.    114.    114.    114.     88.     45.
UI     45.     45.     45.     45.     45.     45.     45.     45.     45.     45.
UI     45.     45.     45.     45.     45.      0.      0.      0.      0.      0.
UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
ZW      C=FLOW
*
* DDM   ***** Preserved *****

KK  270300
KM     Normal depth channel route from CP270 to CP300 through subbasin GVW3_2
KM      Source:  modified from GVSCE (1997) HEC-1 for FCD 95-28
KM               Hydrology Field Reconnaissance, page 13
KM               slope and length revised by JEF
KM    SLOPE = (2450-2100)/12750
RS      4    FLOW      -1
RC  0.100   0.030   0.100   12750  0.0275
RX 1000.0  1015.0  1095.0  1095.5  1128.5  1129.0  1209.0  1224.0
RY  104.0    94.0    93.0    90.0    90.0    93.0    94.0   104.0
RL                   0.95    90.0
ZW         C=FLOW
* DDM   ***** Preserved *****

KK  GVW3_2
KM   BASIN GVW3_2
KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
KM    L=      2.4  Lca=      1.3   S=  144.6  Kn= .043  LAG=  36.8
KM    DESERT/RANGELAND S-GRAPH WAS USED FOR THE BASIN
BA     .97
LG     .20     .25    5.30     .24     .00
UI     89.    140.    344.    535.    695.    808.    852.    813.    691.    548.
UI    431.    342.    267.    211.    167.    134.     96.     82.     61.     61.
UI     26.     22.     22.     22.     22.     22.     22.      0.      0.      0.
UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
*
* DDM   ***** Preserved *****
```

```
318           KK   CP300
319           KM    COMBINE SUBBASIN RUNOFF FROM GVW3_2 WITH ROUTED FLOWS FROM
320           KM    CP295 AND CP270
321           HC       3
              *
              * DDM   ***** Preserved *****

322           KK  300310
323           KM    Normal depth channel route from CP300 to CP310.
324           KM      Source:  modified from GVSCE (1997) HEC-1 for FCD 95-28
325           KM               Hydrology Field Reconnaissance, page 9
326           KM               slope and length revised by JEF
327           KM    SLOPE = (2100-2025)/4080
328           RS       2    FLOW       -1
329           RC   0.085   0.040   0.085    4080  0.0184
330           RX       0       0     105     114     149     158     263     263
331           RY     100     100      93    90.0    90.0      93     100     100
332           RL                     0.95    90.0
333           ZW      C=FLOW
              *
              * DDM   ***** Preserved *****
1                                          HEC-1 INPUT                                                    PAGE  9

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


334           KK  GVW3_3
335           KM   BASIN GVW3_3
336           KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
337           KM    L=      1.9  Lca=       .9   S=  135.6  Kn= .040  LAG=  28.2
338           KM    DESERT/RANGELAND S-GRAPH WAS USED FOR THE BASIN
339           BA     .34
340           LG     .20     .25    6.00     .19    2.00
341           UI     41.    105.    224.    324.    380.    380.    319.    234.    172.    126.
342           UI     91.     69.     49.     36.     28.     17.     10.     10.     10.     10.
343           UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
344           UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
              *
              * DDM   ***** Preserved *****

345           KK   CP310
346           KM    COMBINE SUBBASIN RUNOFF FROM GVW3_3 WITH ROUTED FLOWS FROM CP300
347           KM     TOTAL FLOW IN GALLOWAY WASH AT ITS CONFLUENCE WITH CAVE CREEK
348           HC       2
349           ZW      C=FLOW
350           ZZ
1
          SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING          (---->) DIVERSION OR PUMP FLOW

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

    39      GWW1_1
              V
              V
    51       RR282
              V
              V
    67      282286
              .
              .
    75            .      GWW1_2
                  .          V
                  .          V
    87            .      284285
                  .          .
                  .          .
    96            .          .      GWW132
                  .          .          .
                  .          .          .
   106            .       CP285..........
                  .          V
                  .          V
   109            .      285286
                  .          .
                  .          .
   118            .          .      GWW133
                  .          .          .
                  .          .          .
   128            .      CP286A..........
                  .          .
                  .          .
   132            .          .      GWW131
                  .          .          .
                  .          .          .
   143       CP286..........................
              V
              V
   149      286287
              .
              .
   157            .      GWW1_4
                  .          .
```

```
                .           .
169         CP287............
              V
              V
172         287288
                .
                .
181             .       GWW1_5
                .           .
                .           .
193         CP288............
                .
                .
196             .       GWW1_6
                .           .
                .           .
207         CP290............
              V
              V
211         290295
                .
                .
220             .         GVW2
                .           V
                .           V
235             .       280295
                .           .
                .           .
247             .           .       GVW3_1
                .           .           .
                .           .           .
259             .       CP295A...........
                .           .
                .           .
262         CP295............
              V
              V
266         295300
                .
                .
279             .         GVW1
                .           V
                .           V
295             .       270300
                .           .
                .           .
307             .           .       GVW3_2
                .           .           .
                .           .           .
318         CP300.......................
              V
              V
322         300310
                .
                .
334             .       GVW3_3
                .           .
                .           .
345         CP310............
```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*             JUN  1998                 *
*          VERSION 4.1                  *
*                                       *
*  RUN DATE   05MAR02  TIME  09:39:50   *
*                                       *
*****************************************
```

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

FLOODPLAIN DELINEATION STUDY OF ANDORA HILLS & GALLOWAY WASHES
FCD 99-14
BY JE FULLER/HYDROLOGY & GEOMORPHOLOGY, INC.
FOR THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
REVISED MARCH 2002 FILENAME: GWM224R.DAT

100 YEAR ANALYSIS 24-HOUR STORM USING JD RECORDS
MCUHP2 USED FOR UNIT HYDROGRAPHS

DDM MCUHP2 GALLOWAY WASH FLOODPLAIN DELINEATION STUDY, FCD NO. 99-14

March 2002 revisions to original Dec. 1999 model include:

HC BLOCK ADDED FOR GRAPEVINE WASH (CP 295A)

SUBBASIN GWW1_3 FURTHER SUBDIVIDED ALONG GALLOWAY WASH PER FEMA COMMENTS IN LETTER DATED FEB. 8, 2002

DDM MCUHP2 GALLOWAY WASH FLOODPLAIN DELINEATION STUDY, FCD NO. 99-14

22 IO OUTPUT CONTROL VARIABLES

IPRNT	5	PRINT CONTROL
IPLOT	0	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE

IT HYDROGRAPH TIME DATA

NMIN	5	MINUTES IN COMPUTATION INTERVAL
IDATE	1DEC99	STARTING DATE
ITIME	0005	STARTING TIME
NQ	400	NUMBER OF HYDROGRAPH ORDINATES
NDDATE	2DEC99	ENDING DATE
NDTIME	0920	ENDING TIME
ICENT	19	CENTURY MARK

COMPUTATION INTERVAL .08 HOURS
TOTAL TIME BASE 33.25 HOURS

ENGLISH UNITS

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

24 JD INDEX STORM NO. 1

STRM	4.80	PRECIPITATION DEPTH
TRDA	.01	TRANSPOSITION DRAINAGE AREA

25 PI PRECIPITATION PATTERN

.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.01	.00	.01
.01	.01	.01	.01	.01	.01	.01	.01	.03	.03
.03	.09	.09	.09	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00		

35 JD INDEX STORM NO. 2

STRM	4.78	PRECIPITATION DEPTH
TRDA	1.00	TRANSPOSITION DRAINAGE AREA

0 PI PRECIPITATION PATTERN

.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.01	.00	.01
.01	.01	.01	.01	.01	.01	.01	.01	.03	.03
.03	.09	.09	.09	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00

.00	.00	.00	.00	.00	.00	.00	.00

36 JD INDEX STORM NO. 3

STRM 4.51 PRECIPITATION DEPTH

TRDA 10.00 TRANSPOSITION DRAINAGE AREA

0 PI PRECIPITATION PATTERN

.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.01	.00	.01
.01	.01	.01	.01	.01	.01	.01	.01	.03	.03
.03	.09	.09	.09	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00		

37 JD INDEX STORM NO. 4

STRM 4.37 PRECIPITATION DEPTH

TRDA 20.00 TRANSPOSITION DRAINAGE AREA

0 PI PRECIPITATION PATTERN

.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.01	.00	.01
.01	.01	.01	.01	.01	.01	.01	.01	.03	.03
.03	.09	.09	.09	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00		

38 JD INDEX STORM NO. 5

STRM 4.11 PRECIPITATION DEPTH

TRDA 70.00 TRANSPOSITION DRAINAGE AREA

0 PI PRECIPITATION PATTERN

.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.01	.00	.01
.01	.01	.01	.01	.01	.01	.01	.01	.03	.03
.03	.09	.09	.09	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00

```
                    .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                    .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                    .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                    .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                    .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                    .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                    .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                    .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                    .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                    .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                    .00      .00      .00      .00      .00      .00      .00      .00
 -----DSS---ZOPEN:  Existing File Opened,  File: GWM224R.DSS
                    Unit:  71;  DSS Version: 6-JG
 -----DSS---ZWRITE Unit  71; Vers.    2:  //284285/FLOW/01DEC1999/5MIN//
 -----DSS---ZWRITE Unit  71; Vers.    2:  //284285/FLOW/02DEC1999/5MIN//
 -----DSS---ZWRITE Unit  71; Vers.    2:  //287288/FLOW/01DEC1999/5MIN//
 -----DSS---ZWRITE Unit  71; Vers.    2:  //287288/FLOW/02DEC1999/5MIN//
 -----DSS---ZWRITE Unit  71; Vers.   15:  //CP290/FLOW/01DEC1999/5MIN//
 -----DSS---ZWRITE Unit  71; Vers.   15:  //CP290/FLOW/02DEC1999/5MIN//
 -----DSS---ZWRITE Unit  71; Vers.    2:  //290295/FLOW/01DEC1999/5MIN//
 -----DSS---ZWRITE Unit  71; Vers.    2:  //290295/FLOW/02DEC1999/5MIN//
 -----DSS---ZWRITE Unit  71; Vers.   15:  //GVW2/FLOW/01DEC1999/5MIN//
 -----DSS---ZWRITE Unit  71; Vers.   15:  //GVW2/FLOW/02DEC1999/5MIN//
 -----DSS---ZWRITE Unit  71; Vers.    2:  //280295/FLOW/01DEC1999/5MIN//
 -----DSS---ZWRITE Unit  71; Vers.    2:  //280295/FLOW/02DEC1999/5MIN//
 -----DSS---ZWRITE Unit  71; Vers.    2:  //295300/FLOW/01DEC1999/5MIN//
 -----DSS---ZWRITE Unit  71; Vers.    2:  //295300/FLOW/02DEC1999/5MIN//
 -----DSS---ZWRITE Unit  71; Vers.   15:  //GVW1/FLOW/01DEC1999/5MIN//
 -----DSS---ZWRITE Unit  71; Vers.   15:  //GVW1/FLOW/02DEC1999/5MIN//
 -----DSS---ZWRITE Unit  71; Vers.   15:  //270300/FLOW/01DEC1999/5MIN//
 -----DSS---ZWRITE Unit  71; Vers.   15:  //270300/FLOW/02DEC1999/5MIN//

 WARNING --- ROUTED OUTFLOW (  15326.) IS GREATER THAN MAXIMUM OUTFLOW (  15278.) IN STORAGE-OUTFLOW TABLE

 WARNING --- ROUTED OUTFLOW (  15293.) IS GREATER THAN MAXIMUM OUTFLOW (  15278.) IN STORAGE-OUTFLOW TABLE
 -----DSS---ZWRITE Unit  71; Vers.    2:  //300310/FLOW/01DEC1999/5MIN//
 -----DSS---ZWRITE Unit  71; Vers.    2:  //300310/FLOW/02DEC1999/5MIN//
 -----DSS---ZWRITE Unit  71; Vers.   15:  //CP310/FLOW/01DEC1999/5MIN//
 -----DSS---ZWRITE Unit  71; Vers.   15:  //CP310/FLOW/02DEC1999/5MIN//
1
```

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

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+	HYDROGRAPH AT	GWW1_1	2571.	12.58	481.	129.	93.	2.55		
+	ROUTED TO	RR282	2407.	12.67	481.	129.	93.	2.55		
+	ROUTED TO	282286	2220.	13.08	472.	121.	87.	2.55		
+	HYDROGRAPH AT	GWW1_2	1110.	12.50	186.	47.	34.	1.04		
+	ROUTED TO	284285	1105.	12.50	185.	46.	34.	1.04		
+	HYDROGRAPH AT	GWW132	624.	12.17	62.	16.	11.	.35		
+	2 COMBINED AT	CP285	1444.	12.33	245.	61.	44.	1.39		
+	ROUTED TO	285286	1364.	12.50	239.	60.	43.	1.39		
+	HYDROGRAPH AT	GWW133	720.	12.17	82.	22.	16.	.40		
+	2 COMBINED AT	CP286A	1750.	12.42	317.	81.	58.	1.79		
+	HYDROGRAPH AT	GWW131	1054.	12.33	146.	37.	27.	.77		
+	3 COMBINED AT	CP286	3439.	12.50	903.	231.	167.	5.11		
+	ROUTED TO	286287	3392.	12.67	897.	227.	164.	5.11		
+	HYDROGRAPH AT	GWW1_4	1170.	12.50	192.	48.	35.	1.00		
+	2 COMBINED AT	CP287	4412.	12.58	1071.	271.	195.	6.11		
+	ROUTED TO	287288	4396.	12.58	1069.	269.	194.	6.11		

	HYDROGRAPH AT						
+	GWW1_5	1258.	12.42	231.	67.	48.	.98
	2 COMBINED AT						
+	CP288	5485.	12.58	1278.	330.	238.	7.09
	HYDROGRAPH AT						
+	GWW1_6	794.	12.33	108.	27.	19.	.59
	2 COMBINED AT						
+	CP290	6056.	12.50	1374.	354.	256.	7.68
	ROUTED TO						
+	290295	6051.	12.58	1370.	351.	253.	7.68
	HYDROGRAPH AT						
+	GVW2	5492.	12.67	1225.	332.	240.	6.02
	ROUTED TO						
+	280295	5107.	12.92	1183.	298.	215.	6.02
	HYDROGRAPH AT						
+	GVW3_1	1178.	12.50	186.	46.	34.	1.04
	2 COMBINED AT						
+	CP295A	5722.	12.83	1349.	339.	245.	7.06
	2 COMBINED AT						
+	CP295	10763.	12.75	2620.	665.	480.	14.74
	ROUTED TO						
+	295300	10757.	12.75	2617.	662.	478.	14.74
	HYDROGRAPH AT						
+	GVW1	4141.	12.83	1148.	318.	230.	4.90
	ROUTED TO						
+	270300	3672.	13.17	1135.	308.	223.	4.90
	HYDROGRAPH AT						
+	GVW3_2	1248.	12.42	177.	44.	32.	.97
	3 COMBINED AT						
+	CP300	13548.	12.75	3770.	973.	702.	20.61
	ROUTED TO						
+	300310	13470.	12.92	3764.	969.	699.	20.61
	HYDROGRAPH AT						
+	GVW3_3	551.	12.25	67.	17.	12.	.34
	2 COMBINED AT						
+	CP310	13541.	12.92	3818.	983.	709.	20.95

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

-----DSS---ZCLOSE Unit: 71. File: GWM224R.DSS
Pointer Utilization: .28
Number of Records: 22
File Size: 49.7 Kbytes
Percent Inactive: .0

```
1*************************************
*                                   *
*   FLOOD HYDROGRAPH PACKAGE (HEC-1)  *
*             JUN  1998             *
*           VERSION 4.1             *
*                                   *
*  RUN DATE   05MAR02  TIME  09:40:01  *
*                                   *
*************************************
```

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

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

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

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

1

HEC-1 INPUT PAGE 1

```
LINE      ID.......1.......2.......3.......4.......5.......6.......7.......8.......9.......10
    1     ID          FLOODPLAIN DELINEATION STUDY OF ANDORA HILLS & GALLOWAY WASHES
    2     ID          FCD 99-14
    3     ID          BY JE FULLER/HYDROLOGY & GEOMORPHOLOGY, INC.
    4     ID          FOR THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
    5     ID          REVISED MARCH 2002     FILENAME: GWM26R.DAT
    6     ID      ************************************************************
    7     ID          100 YEAR ANALYSIS 6-HOUR STORM USING JD RECORDS
    8     ID          MCUHP2 USED FOR UNIT HYDROGRAPHS
    9     ID      ************************************************************
   10     ID
   11     ID     DDM MCUHP2 GALLOWAY WASH FLOODPLAIN DELINEATION STUDY, FCD NO. 99-14
   12     ID
   13     ID    March 2002 revisions to original Dec. 1999 model include:
   14     ID
   15     ID    HC BLOCK ADDED FOR GRAPEVINE WASH (CP 295A)
   16     ID
   17     ID    SUBBASIN GWW1_3 FURTHER SUBDIVIDED ALONG GALLOWAY WASH PER FEMA COMMENTS
   18     ID    IN LETTER DATED FEB. 8, 2002
   19     ID
   20     ID   DDM MCUHP2 GALLOWAY WASH FLOODPLAIN DELINEATION STUDY, FCD NO. 99-14
          *DIAGRAM
   21     IT       5 01DEC99    0005     300
   22     IO       5
   23     IN      15
   24     JD    3.50    0.01
   25     PC    .000    .008    .016    .025    .033    .041    .050    .058    .066    .074
   26     PC    .087    .099    .118    .138    .216    .377    .834    .911    .931    .950
   27     PC    .962    .972    .983    .991   1.000
   28     JD    3.48    0.50
   29     JD    3.43    2.80
   30     PC    .000    .009    .016    .025    .034    .042    .051    .059    .067    .076
   31     PC    .087    .100    .120    .163    .252    .451    .694    .837    .900    .938
   32     PC    .950    .963    .975    .988   1.000
   33     JD    3.23   16.0
   34     PC    .000    .015    .020    .030    .048    .063    .076    .090    .105    .119
   35     PC    .135    .152    .175    .222    .304    .472    .670    .796    .868    .912
   36     PC    .946    .960    .973    .987   1.000
   37     JD    2.84   90.0
   38     PC    .000    .021    .035    .051    .071    .087    .105    .125    .143    .160
   39     PC    .179    .201    .232    .281    .364    .500    .658    .773    .841    .888
   40     PC    .927    .945    .964    .982   1.000
          *
          * DDM    ***** Preserved *****
   41     KK  GWW1_1
   42     KM   BASIN GWW1_1
   43     KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
   44     KM    L=      4.6  Lca=      2.0   S=  196.1  Kn= .039  LAG=  48.4
   45     KM    DESERT/RANGELAND S-GRAPH WAS USED FOR THE BASIN
   46     BA    2.55
   47     LG     .19     .25    5.30     .26    9.00
   48     UI   178.    178.    435.    760.   1042.   1288.   1519.   1641.   1701.   1658.
   49     UI  1545.   1299.   1089.    907.    762.    641.    524.    438.    363.    312.
   50     UI   272.    196.    188.    134.    122.    122.     78.     43.     43.     43.
   51     UI    43.     43.     43.     43.     43.      0.      0.      0.      0.      0.
```

1

HEC-1 INPUT PAGE 2

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

```
UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
*
* DDM   ***** Preserved *****

KK   RR282
KM    STORAGE ROUTING AT CHARLES BLAIR MCDONALD DRIVE
KM    FROM A-N WEST, INC., AS_BUILT ON FILE AT CITY OF SCOTTSDALE DATED 5-15-97
KM    DESERT MOUNTAIN PROPERTIES DETENTION BASIN NO. S-1
KM    Culvert is 6-12'x4' CBC with 2 unregulated boxes and 4 which are regulated
KM    by 2-3'x2' orifices and front, and side weir inlets.  The orifice entrance
KM    inverts are 2' above the invert of the 2 unregulated culverts.  The weir
KM    inlet invert is approximately 11' above the invert of the 4 regulated
KM    culvert openings.
RS      1    STOR      -1
SV      0    .097   0.992   3.428   7.831  14.433  18.672  23.649  29.425  36.060
SV   43.2
SQ      0     110     433     875    1157    1380    1489    1838    2386    3399
SQ   4778
SE 2656.5    2658    2660    2662    2664    2666    2667    2668    2669    2670
SE   2671
*
* DDM   ***** Preserved *****

KK  282286
KM    ROUTING REACH FROM CP 282 TO 286 THROUGH SUBBASIN GWW133
KM    SLOPE = (2650-2390)/11240
RS      6    FLOW      -1
RC  0.055   0.045   0.055   11240  0.0231
RX      0       0     102     105     145     148     250     250
RY    100     100    96.5      95      95    96.5     100     100
RL                   0.70      95
*
* DDM   ***** Preserved *****

KK  GWW1_2
KM   BASIN GWW1_2
KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
KM    L=      3.9  Lca=      1.9   S=  164.9  Kn= .039  LAG=  45.2
KM    DESERT/RANGELAND S-GRAPH WAS USED FOR THE BASIN
BA    1.04
LG     .20     .25    5.20     .28    2.00
UI     78.     78.    228.    361.    493.    604.    690.    740.    739.    694.
UI    597.    496.    405.    336.    278.    227.    186.    153.    128.    108.
UI     82.     72.     53.     53.     43.     19.     19.     19.     19.     19.
UI     19.     19.     19.      0.      0.      0.      0.      0.      0.      0.
UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
*
* DDM   ***** Preserved *****

KK  284285
KM    ROUTING REACH FROM CP 284 TO 285 THROUGH A PORTION OF SUBBASIN GWW132
KM    SLOPE = (2585-2560)/830
RS      1    FLOW      -1
RC   0.05   0.045    0.05     830    0.03
RX      0       0      40      42      97      99     139     139
1                              HEC-1 INPUT                                    PAGE  3

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

RY    100     100      96      95      95      96     100     100
RL                   0.70      95
*
* DDM   ***** Preserved *****

KK  GWW132
KM   BASIN GWW132
KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
KM    L=      1.6  Lca=       .7   S=  141.0  Kn= .039  LAG=  22.7
KM    DESERT/RANGELAND S-GRAPH WAS USED FOR THE BASIN
BA     .35
LG     .20     .25    5.30     .26    1.00
UI     51.    194.    362.    473.    476.    365.    248.    169.    114.     80.
UI     52.     35.     22.     13.     13.     13.      0.      0.      0.      0.
UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
*
* DDM   ***** Preserved *****

KK   CP285
KM    COMBINE RUNOFF FROM SUBBASIN GWW132 WITH ROUTED FLOW FROM 284
HC      2
*
* DDM   ***** Preserved *****

KK  285286
KM    ROUTING REACH FROM CP 285 TO 286 THROUGH SUBBASIN GWW133
KM   SAME CHANNEL AS ORIGINAL 284286 ASSUMED.  LENGTH AND SLOPE ADJUSTED.
KM    SLOPE = (2560-2390)/6765
RS      2    FLOW      -1
RC   0.05   0.045    0.05    6765   0.025
RX      0       0      40      42      97      99     139     139
RY    100     100      96      95      95      96     100     100
RL                   0.70      95
*
* DDM   ***** Preserved *****
```

```
119          KK  GWW133
120          KM   BASIN GWW133
121          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
122          KM    L=      1.6  Lca=       .9   S=  157.2  Kn= .037  LAG=  23.4
123          KM    DESERT/RANGELAND S-GRAPH WAS USED FOR THE BASIN
124          BA     .40
125          LG     .18     .25    5.80     .22   12.00
126          UI     57.    204.    389.    517.    535.    431.    296.    205.    140.     98.
127          UI     66.     44.     34.     14.     14.     14.     14.      0.      0.      0.
128          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *
             * DDM   ***** Preserved *****

129          KK  CP286A
130          KM    COMBINE ROUTED FLOW FROM 285 WITH RUNOFF FROM GWW133
131          KM    TOTAL FLOW IN GALLOWAY WASH UPSTREAM OF NORTH GALLOWAY WASH
132          HC      2
             *
             * DDM   ***** Preserved *****
```



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

133          KK  GWW131
134          KM   BASIN GWW131
135          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
136          KM    L=      2.6  Lca=      1.3   S=  158.9  Kn= .040  LAG=  34.6
137          KM    DESERT/RANGELAND S-GRAPH WAS USED FOR THE BASIN
138          BA     .77
139          LG     .20     .25    5.40     .23    3.00
140          UI     75.    133.    318.    483.    625.    703.    714.    652.    515.    400.
141          UI    314.    242.    187.    147.    117.     83.     68.     52.     48.     18.
142          UI     18.     18.     18.     18.     18.      0.      0.      0.      0.      0.
143          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *
             * DDM   ***** Preserved *****

144          KK   CP286
145          KM     COMBINE ROUTED FLOW FROM GWW1_2 WITH RUNOFF FROM SUBBASIN GWW1_3
146          KM     AND COMBINED FLOW AT CP286A (GALLOWAY WASH)
147          KM     THIS IS THE TOTAL FLOW IN GALLOWAY WASH JUST BELOW THE CONFLUENCE
148          KM     WITH NORTH GALLOWAY WASH.
149          HC       3
             *
             * DDM   ***** Preserved *****

150          KK  286287
151          KM    ROUTING REACH FROM CP 286 TO 287 THROUGH SUBBASIN GWW1_4
152          KM    SLOPE = (2390-2300)/4410
153          RS       2    FLOW       -1
154          RC    0.05   0.045    0.05     4410  0.0204
155          RX       0       0      90       92     157     159     249     249
156          RY     100     100      97       95      95      97     100     100
157          RL                   0.70       95
             *
             * DDM   ***** Preserved *****

158          KK  GWW1_4
159          KM   BASIN GWW1_4
160          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
161          KM    L=      3.6  Lca=      2.1   S=  274.7  Kn= .040  LAG=  43.0
162          KM    DESERT/RANGELAND S-GRAPH WAS USED FOR THE BASIN
163          BA    1.00
164          LG     .20     .25    5.80     .20    1.00
165          UI     79.     82.    253.    389.    523.    646.    717.    753.    730.    668.
166          UI    544.    443.    365.    298.    241.    196.    159.    133.    111.     83.
167          UI     72.     54.     54.     36.     19.     19.     19.     19.     19.     19.
168          UI     19.      0.      0.      0.      0.      0.      0.      0.      0.      0.
169          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *
             * DDM   ***** Preserved *****
```



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

170          KK   CP287
171          KM     COMBINE ROUTED FLOW FROM CP286 WITH RUNOFF FROM SUBBASIN GWW1_4
172          HC       2
             *
             * DDM   ***** Preserved *****

173          KK  287288
174          KM    ROUTING REACH FROM CP 287 TO 288 THROUGH SUBBASIN GWW1_6
175          KM    SLOPE = (2300-2260)/1370
176          RS       1    FLOW       -1
177          RC    0.05    0.04    0.05     1370  0.0292
178          RX       0       0     125      127     227     229     354     354
179          RY     100     100      95     93.5    93.5      95     100     100
180          RL                   0.70     93.5
             *
             * DDM   ***** Preserved *****
```

```
KK  GWW1_5
KM   BASIN GWW1_5
KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
KM    L=      3.6  Lca=      1.9   S=  112.6  Kn= .034  LAG=  41.2
KM    DESERT/RANGELAND S-GRAPH WAS USED FOR THE BASIN
BA     .98
LG     .16     .23    6.20     .19   24.00
UI    80.     96.    268.    423.    556.    685.    749.    770.    727.    626.
UI   511.    410.    335.    268.    219.    171.    144.    121.     85.     77.
UI    55.     55.     38.     20.     20.     20.     20.     20.     20.     20.
UI     0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
UI     0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
*
* DDM   ***** Preserved *****

KK   CP288
KM     COMBINE ROUTED FLOW FROM CP287 WITH RUNOFF FROM SUBBASIN GWW1_5
HC       2
*
* DDM   ***** Preserved *****

KK  GWW1_6
KM   BASIN GWW1_6
KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
KM    L=      2.6  Lca=      1.3   S=  164.8  Kn= .040  LAG=  34.8
KM    DESERT/RANGELAND S-GRAPH WAS USED FOR THE BASIN
BA     .59
LG     .20     .25    5.30     .24     .00
UI    57.    100.    240.    366.    473.    534.    545.    500.    398.    309.
UI   243.    188.    144.    114.     90.     65.     54.     39.     39.     14.
UI    14.     14.     14.     14.     14.      0.      0.      0.      0.      0.
UI     0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
*
* DDM   ***** Preserved *****
```

1 HEC-1 INPUT PAGE 6

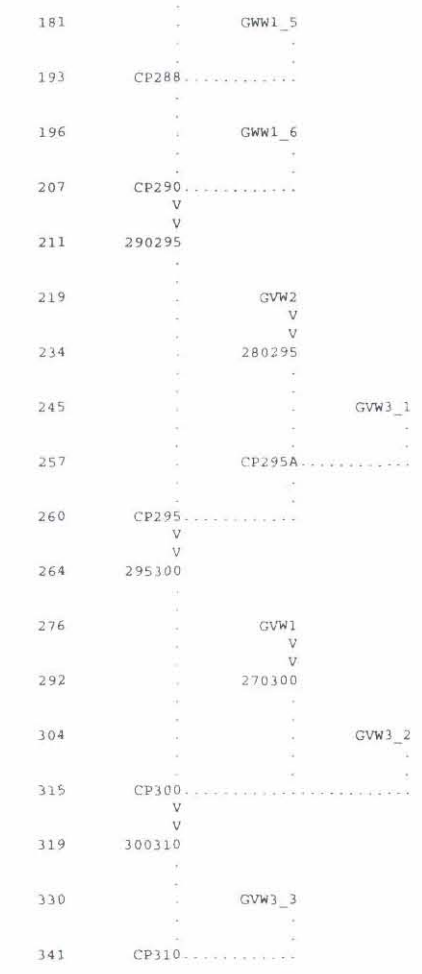
```
LINE  ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

KK   CP290
KM     COMBINE RUNOFF FROM SUBBASIN GWW1_6 WITH ROUTED FLOW FROM CP288
HC       2
ZW      C=FLOW
*
* DDM   ***** Preserved *****

KK  290295
KM    ROUTING REACH FROM CP290 TO CP295 THROUGH SUBBASIN GWW3_1
KM    SLOPE = (2230-2170)/2620
RS       1    FLOW      -1
RC    0.05   0.035    0.05    2620  0.0229
RX       0       0      80      82     162     164     244     244
RY     100     100      92      90      90      92     100     100
RL                    0.70      90
*
* DDM   ***** Preserved *****

KK    GVW2
KM   BASIN GVW2
KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
KM    L=      5.5  Lca=      2.8   S=  371.1  Kn= .043  LAG=  56.7
KM    PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN
BA    6.02
LG     .20     .23    6.20     .18   12.00
UI    358.    358.    620.   1194.   1689.   2184.   2513.   2794.   3334.   4259.
UI   3145.   2434.   2157.   1998.   1821.   1680.   1506.   1395.   1202.   1046.
UI    917.    857.    807.    748.    594.    539.    457.    435.    392.    392.
UI    280.    274.    274.    220.    175.    175.    175.    175.    152.     69.
UI     69.     69.     69.     69.     69.     69.     69.     69.     69.     69.
UI     69.     69.      0.      0.      0.      0.      0.      0.      0.      0.
UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
ZW      C=FLOW
*
* DDM   ***** Preserved *****

KK  280295
KM    Normal depth channel route from CP280 to CP295 through subbasin GVW3_1
KM      Source:  modified from GVSCE (1997) HEC 1 for FCD 95-28
KM               Hydrology Field Reconnaissance, page 12
KM               slope and length revised by JEP
KM    SLOPE = (2515-2170)/13560
RS       5    FLOW      -1
RC   0.080   0.050   0.070   13560  0.0254
RX  1000.0  1020.0  1040.0  1040.1  1202.9  1203.0  1223.0  1243.0
RY   110.0   100.0    90.0    90.0    90.0    90.0   100.0   110.0
RL                    0.80    90.0
*
* DDM   ***** Preserved *****
```

1 HEC-1 INPUT PAGE 7

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

KK  GVW3_1
KM   BASIN GVW3_1
```

```
247          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
248          KM    L=      3.3  Lca=      1.5   S=  184.3  Kn= .043  LAG=  42.3
249          KM    DESERT/RANGELAND S-GRAPH WAS USED FOR THE BASIN
250          BA    1.04
251          LG     .20     .25    5.20     .26     .00
252          UI     83.     91.    271.    421.    558.    695.    764.    796.    765.    683.
253          UI    556.    453.    368.    301.    242.    196.    160.    132.    105.     88.
254          UI     65.     57.     57.     24.     20.     20.     20.     20.     20.     20.
255          UI     20.      0.      0.      0.      0.      0.      0.      0.      0.      0.
256          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *
             * DDM    ***** Preserved *****

257          KK  CP295A
258          KM    COMBINE ROUTED FLOW AND GVW3_1 FOR TOTAL FLOW FROM GRAPEVINE WASH
259          HC      2
             *
             * DDM    ***** Preserved *****

260          KK   CP295
261          KM    COMBINE FLOW FROM GRAPEVINE WASH WITH GALLOWAY WASH ROUTED FLOW FROM
262          KM    CP280
263          HC      2
             *
             * DDM    ***** Preserved *****

264          KK  295300
265          KM   Normal depth channel route from CP295 to CP300 through subbasin GWW3_2
266          KM      Source:  modified from GVSCE (1997) HEC-1 for FCD 95-28
267          KM               Hydrology Field Reconnaissance, page 10
268          KM               Elevations were adjusted up 0.3' from field book
269          KM               slope and length revised by JEF
270          KM    SLOPE = (2170-2100)/2895
271          RS      1    FLOW      -1
272          RC   0.050   0.035   0.050    2895  0.0242
273          RX       0       0      60      64     139     143     203     203
274          RY     100     100      95      91      91      95     100     100
275          RL                   0.60      91
             * DDM    ***** Preserved *****

276          KK    GVW1
277          KM   BASIN GVW1
278          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
279          KM    L=      6.2  Lca=      3.6   S=  298.9  Kn= .045  LAG=  71.1
280          KM    PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN
281          BA    4.90
282          LG     .20     .17    6.80     .13   17.00
283          UI    232.    232.    232.    550.    799.   1029.   1368.   1513.   1688.   1830.
284          UI   2103.   2570.   2677.   1797.   1567.   1414.   1338.   1241.   1155.   1088.
285          UI    997.    924.    851.    762.    677.    606.    568.    540.    514.    486.
286          UI    397.    382.    308.    297.    284.    254.    254.    230.    178.    178.
287          UI    178.    175.    114.    114.    114.    114.    114.     88.     45.

1                                          HEC-1 INPUT                                    PAGE  8

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

288          UI     45.     45.     45.     45.     45.     45.     45.     45.     45.     45.
289          UI     45.     45.     45.     45.     45.      0.      0.      0.      0.      0.
290          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
291          ZW     C=FLOW
             *
             * DDM    ***** Preserved *****

292          KK  270300
293          KM     Normal depth channel route from CP270 to CP300 through subbasin GVW3_2
294          KM      Source:  modified from GVSCE (1997) HEC-1 for FCD 95-28
295          KM               Hydrology Field Reconnaissance, page 13
296          KM               slope and length revised by JEF
297          KM    SLOPE = (2450-2100)/12750
298          RS      4    FLOW      -1
299          RC   0.100   0.030   0.100   12750  0.0275
300          RX  1000.0  1015.0  1095.0  1095.5  1128.5  1129.0  1209.0  1224.0
301          RY   104.0    94.0    93.0    90.0    90.0    93.0    94.0   104.0
302          RL                   0.95    90.0
303          ZW         C=FLOW
             * DDM    ***** Preserved *****

304          KK  GVW3_2
305          KM   BASIN GVW3_2
306          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
307          KM    L=      2.4  Lca=      1.3   S=  144.6  Kn= .043  LAG=  36.8
308          KM    DESERT/RANGELAND S-GRAPH WAS USED FOR THE BASIN
309          BA     .97
310          LG     .20     .25    5.30     .24     .00
311          UI     89.    140.    344.    535.    695.    808.    852.    813.    691.    548.
312          UI    431.    342.    267.    211.    167.    136.     96.     82.     61.     61.
313          UI     26.     22.     22.     22.     22.     22.     22.      0.      0.      0.
314          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *
             * DDM    ***** Preserved *****

315          KK   CP300
316          KM    COMBINE SUBBASIN RUNOFF FROM GVW3_2 WITH ROUTED FLOWS FROM
317          KM    CP295 AND CP270
318          HC      3
```

```
                    *
                    * DDM   ***** Preserved *****

  319               KK  300310
  320               KM    Normal depth channel route from CP300 to CP310.
  321               KM      Source:  modified from GVSCE (1997) HEC-1 for FCD 95-28
  322               KM               Hydrology Field Reconnaissance, page 9
  323               KM               slope and length revised by JEF
  324               KM    SLOPE = (2100-2025)/4080
  325               RS       2    FLOW      -1
  326               RC   0.085   0.040   0.085    4080  0.0184
  327               RX       0       0     105     114     149     158     263     263
  328               RY     100     100      93    90.0    90.0      93     100     100
  329               RL                    0.95    90.0
                    *
                    * DDM   ***** Preserved *****
1                                          HEC-1 INPUT                                                    PAGE  9

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


  330               KK  GVW3_3
  331               KM   BASIN GVW3_3
  332               KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
  333               KM    L=       1.9  Lca=        .9   S=  135.6  Kn= .040  LAG=  28.2
  334               KM    DESERT/RANGELAND S-GRAPH WAS USED FOR THE BASIN
  335               BA     .34
  336               LG     .20     .25    6.00     .19    2.00
  337               UI     41.    105.    224.     324.    380.    380.    319.    234.    172.    126.
  338               UI     91.     69.     49.      36.     28.     17.     10.     10.     10.     10.
  339               UI      0.      0.      0.       0.      0.      0.      0.      0.      0.      0.
  340               UI      0.      0.      0.       0.      0.      0.      0.      0.      0.      0.
                    *
                    * DDM   ***** Preserved *****

  341               KK   CP310
  342               KM    COMBINE SUBBASIN RUNOFF FROM GVW3_3 WITH ROUTED FLOWS FROM CP300
  343               KM     TOTAL FLOW IN GALLOWAY WASH AT ITS CONFLUENCE WITH CAVE CREEK
  344               HC       2
  345               ZW      C=FLOW
  346               ZZ
1
          SCHEMATIC DIAGRAM OF STREAM NETWORK

 INPUT
 LINE      (V) ROUTING           (---->) DIVERSION OR PUMP FLOW

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

   41      GWW1_1
             V
             V
   53       RR282
             V
             V
   69      282286
             .
             .
   77           .       GWW1_2
                .         V
                .         V
   89           .       284285
                .           .
                .           .
   97           .           .       GWW132
                .           .         .
                .           .         .
  107           .        CP285.........
                .           V
                .           V
  110           .       285286
                .           .
                .           .
  119           .           .       GWW133
                .           .         .
                .           .         .
  129           .       CP286A........
                .           .
                .           .
  133           .           .       GWW131
                .           .         .
                .           .         .
  144       CP286.....................
              V
              V
  150      286287
             .
             .
  158           .       GWW1_4
                .         .
                .         .
  170       CP287.........
              V
              V
  173      287288
```



(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1**************************************
*                                    *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*               JUN  1998            *
*            VERSION 4.1             *
*                                    *
*  RUN DATE   05MAR02  TIME  09:40:01   *
*                                    *
**************************************
```

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

FLOODPLAIN DELINEATION STUDY OF ANDORA HILLS & GALLOWAY WASHES
FCD 99-14
BY JE FULLER/HYDROLOGY & GEOMORPHOLOGY, INC.
FOR THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
REVISED MARCH 2002 FILENAME: GWM26R.DAT

100 YEAR ANALYSIS 6-HOUR STORM USING JD RECORDS
MCUHP2 USED FOR UNIT HYDROGRAPHS

DDM MCUHP2 GALLOWAY WASH FLOODPLAIN DELINEATION STUDY, FCD NO. 99-14

March 2002 revisions to original Dec. 1999 model include:

HC BLOCK ADDED FOR GRAPEVINE WASH (CP 295A)

SUBBASIN GWW1_3 FURTHER SUBDIVIDED ALONG GALLOWAY WASH PER FEMA COMMENTS IN LETTER DATED FEB. 8, 2002

DDM MCUHP2 GALLOWAY WASH FLOODPLAIN DELINEATION STUDY, FCD NO. 99-14

22 IO OUTPUT CONTROL VARIABLES

IPRNT	5	PRINT CONTROL
IPLOT	0	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE

```
 IT          HYDROGRAPH TIME DATA
                   NMIN          5  MINUTES IN COMPUTATION INTERVAL
                  IDATE     1DEC99  STARTING DATE
                  ITIME       0005  STARTING TIME
                     NQ        300  NUMBER OF HYDROGRAPH ORDINATES
                 NDDATE     2DEC99  ENDING DATE
                 NDTIME       0100  ENDING TIME
                 ICENT         19  CENTURY MARK

               COMPUTATION INTERVAL      .08 HOURS
                   TOTAL TIME BASE   24.92 HOURS

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

 24 JD       INDEX STORM NO. 1
                   STRM        3.50  PRECIPITATION DEPTH
                   TRDA         .01  TRANSPOSITION DRAINAGE AREA

 25 PI        PRECIPITATION PATTERN
                .00   .00   .00   .00   .00   .00   .00   .00   .00   .00
                .00   .00   .00   .00   .00   .00   .00   .00   .00   .00
                .00   .00   .00   .00   .00   .00   .00   .00   .00   .00
                .00   .00   .00   .01   .01   .01   .01   .01   .01   .03
                .03   .03   .05   .05   .05   .15   .15   .15   .03   .03
                .03   .01   .01   .01   .01   .01   .01   .00   .00   .00
                .00   .00   .00   .00   .00   .00   .00   .00   .00   .00
                .00   .00

 28 JD       INDEX STORM NO. 2
                   STRM        3.48  PRECIPITATION DEPTH
                   TRDA         .50  TRANSPOSITION DRAINAGE AREA

  0 PI        PRECIPITATION PATTERN
                .00   .00   .00   .00   .00   .00   .00   .00   .00   .00
                .00   .00   .00   .00   .00   .00   .00   .00   .00   .00
                .00   .00   .00   .00   .00   .00   .00   .00   .00   .00
                .00   .00   .00   .01   .01   .01   .01   .01   .01   .03
                .03   .03   .05   .05   .05   .15   .15   .15   .03   .03
                .03   .01   .01   .01   .01   .01   .01   .00   .00   .00
                .00   .00   .00   .00   .00   .00   .00   .00   .00   .00
                .00   .00

 29 JD       INDEX STORM NO. 3
                   STRM        3.43  PRECIPITATION DEPTH
                   TRDA        2.80  TRANSPOSITION DRAINAGE AREA

 30 PI        PRECIPITATION PATTERN
                .00   .00   .00   .00   .00   .00   .00   .00   .00   .00
                .00   .00   .00   .00   .00   .00   .00   .00   .00   .00
                .00   .00   .00   .00   .00   .00   .00   .00   .00   .00
                .00   .00   .00   .01   .01   .01   .01   .01   .01   .03
                .03   .03   .07   .07   .07   .08   .08   .08   .05   .05
                .05   .02   .02   .02   .01   .01   .01   .00   .00   .00
                .00   .00   .00   .00   .00   .00   .00   .00   .00   .00
                .00   .00

 33 JD       INDEX STORM NO. 4
                   STRM        3.23  PRECIPITATION DEPTH
                   TRDA       16.00  TRANSPOSITION DRAINAGE AREA

 34 PI        PRECIPITATION PATTERN
                .01   .01   .00   .00   .00   .00   .00   .00   .00   .01
                .01   .01   .00   .01   .00   .00   .00   .00   .00   .00
                .00   .00   .01   .00   .00   .00   .00   .01   .01   .01
                .01   .01   .01   .01   .01   .01   .02   .02   .02   .03
                .03   .03   .06   .06   .06   .07   .07   .07   .04   .04
                .04   .02   .02   .02   .01   .01   .01   .01   .01   .01
                .00   .00   .00   .00   .00   .00   .00   .00   .00   .00
                .00   .00

 37 JD       INDEX STORM NO. 5
                   STRM        2.84  PRECIPITATION DEPTH
                   TRDA       90.00  TRANSPOSITION DRAINAGE AREA

 38 PI        PRECIPITATION PATTERN
                .01   .01   .01   .00   .00   .00   .01   .01   .01   .01
                .01   .01   .01   .01   .01   .01   .01   .01   .01   .01
                .01   .01   .01   .01   .01   .01   .01   .01   .01   .01
                .01   .01   .01   .01   .01   .01   .02   .02   .02   .03
                .03   .03   .05   .05   .05   .05   .05   .05   .04   .04
                .04   .02   .02   .02   .02   .02   .02   .01   .01   .01
                .01   .01   .01   .01   .01   .01   .01   .01   .01   .01
                .01   .01
 -----DSS---ZOPEN:  Existing File Opened.  File: GWM26R.DSS
                    Unit:  71;  DSS Version: 6-JG
 -----DSS---ZWRITE Unit  71; Vers.    5:  //CP290/FLOW/01DEC1999/5MIN//
 -----DSS---ZWRITE Unit  71; Vers.    5:  //CP290/FLOW/02DEC1999/5MIN//
 -----DSS---ZWRITE Unit  71; Vers.    5:  //GVW2/FLOW/01DEC1999/5MIN//
```

```
     -----DSS---ZWRITE Unit  71; Vers.    5:  //GVW2/FLOW/02DEC1999/5MIN//
     -----DSS---ZWRITE Unit  71; Vers.    5:  //GVW1/FLOW/01DEC1999/5MIN//
     -----DSS---ZWRITE Unit  71; Vers.    5:  //GVW1/FLOW/02DEC1999/5MIN//
     -----DSS---ZWRITE Unit  71; Vers.    5:  //270300/FLOW/01DEC1999/5MIN//
     -----DSS---ZWRITE Unit  71; Vers.    5:  //270300/FLOW/02DEC1999/5MIN//

  WARNING --- ROUTED OUTFLOW (  15785.) IS GREATER THAN MAXIMUM OUTFLOW (  15278.) IN STORAGE-OUTFLOW TABLE

  WARNING --- ROUTED OUTFLOW (  17089.) IS GREATER THAN MAXIMUM OUTFLOW (  15278.) IN STORAGE-OUTFLOW TABLE

  WARNING --- ROUTED OUTFLOW (  17766.) IS GREATER THAN MAXIMUM OUTFLOW (  15278.) IN STORAGE-OUTFLOW TABLE

  WARNING --- ROUTED OUTFLOW (  18032.) IS GREATER THAN MAXIMUM OUTFLOW (  15278.) IN STORAGE-OUTFLOW TABLE

  WARNING --- ROUTED OUTFLOW (  17959.) IS GREATER THAN MAXIMUM OUTFLOW (  15278.) IN STORAGE-OUTFLOW TABLE

  WARNING --- ROUTED OUTFLOW (  17532.) IS GREATER THAN MAXIMUM OUTFLOW (  15278.) IN STORAGE-OUTFLOW TABLE

  WARNING --- ROUTED OUTFLOW (  16795.) IS GREATER THAN MAXIMUM OUTFLOW (  15278.) IN STORAGE-OUTFLOW TABLE

  WARNING --- ROUTED OUTFLOW (  15875.) IS GREATER THAN MAXIMUM OUTFLOW (  15278.) IN STORAGE-OUTFLOW TABLE

  WARNING --- ROUTED OUTFLOW (  16409.) IS GREATER THAN MAXIMUM OUTFLOW (  15278.) IN STORAGE-OUTFLOW TABLE

  WARNING --- ROUTED OUTFLOW (  17408.) IS GREATER THAN MAXIMUM OUTFLOW (  15278.) IN STORAGE-OUTFLOW TABLE

  WARNING --- ROUTED OUTFLOW (  17887.) IS GREATER THAN MAXIMUM OUTFLOW (  15278.) IN STORAGE-OUTFLOW TABLE

  WARNING --- ROUTED OUTFLOW (  17988.) IS GREATER THAN MAXIMUM OUTFLOW (  15278.) IN STORAGE-OUTFLOW TABLE

  WARNING --- ROUTED OUTFLOW (  17743.) IS GREATER THAN MAXIMUM OUTFLOW (  15278.) IN STORAGE-OUTFLOW TABLE

  WARNING --- ROUTED OUTFLOW (  17166.) IS GREATER THAN MAXIMUM OUTFLOW (  15278.) IN STORAGE-OUTFLOW TABLE

  WARNING --- ROUTED OUTFLOW (  16341.) IS GREATER THAN MAXIMUM OUTFLOW (  15278.) IN STORAGE-OUTFLOW TABLE

  WARNING --- ROUTED OUTFLOW (  15360.) IS GREATER THAN MAXIMUM OUTFLOW (  15278.) IN STORAGE-OUTFLOW TABLE

  WARNING --- ROUTED OUTFLOW (  15641.) IS GREATER THAN MAXIMUM OUTFLOW (  15278.) IN STORAGE-OUTFLOW TABLE

  WARNING --- ROUTED OUTFLOW (  16947.) IS GREATER THAN MAXIMUM OUTFLOW (  15278.) IN STORAGE-OUTFLOW TABLE

  WARNING --- ROUTED OUTFLOW (  17621.) IS GREATER THAN MAXIMUM OUTFLOW (  15278.) IN STORAGE-OUTFLOW TABLE

  WARNING --- ROUTED OUTFLOW (  17884.) IS GREATER THAN MAXIMUM OUTFLOW (  15278.) IN STORAGE-OUTFLOW TABLE

  WARNING --- ROUTED OUTFLOW (  17814.) IS GREATER THAN MAXIMUM OUTFLOW (  15278.) IN STORAGE-OUTFLOW TABLE

  WARNING --- ROUTED OUTFLOW (  17393.) IS GREATER THAN MAXIMUM OUTFLOW (  15278.) IN STORAGE-OUTFLOW TABLE

  WARNING --- ROUTED OUTFLOW (  16667.) IS GREATER THAN MAXIMUM OUTFLOW (  15278.) IN STORAGE-OUTFLOW TABLE

  WARNING --- ROUTED OUTFLOW (  15759.) IS GREATER THAN MAXIMUM OUTFLOW (  15278.) IN STORAGE-OUTFLOW TABLE

  WARNING --- ROUTED OUTFLOW (  16266.) IS GREATER THAN MAXIMUM OUTFLOW (  15278.) IN STORAGE-OUTFLOW TABLE

  WARNING --- ROUTED OUTFLOW (  17265.) IS GREATER THAN MAXIMUM OUTFLOW (  15278.) IN STORAGE-OUTFLOW TABLE

  WARNING --- ROUTED OUTFLOW (  17740.) IS GREATER THAN MAXIMUM OUTFLOW (  15278.) IN STORAGE-OUTFLOW TABLE

  WARNING --- ROUTED OUTFLOW (  17842.) IS GREATER THAN MAXIMUM OUTFLOW (  15278.) IN STORAGE-OUTFLOW TABLE

  WARNING --- ROUTED OUTFLOW (  17601.) IS GREATER THAN MAXIMUM OUTFLOW (  15278.) IN STORAGE-OUTFLOW TABLE

  WARNING --- ROUTED OUTFLOW (  17032.) IS GREATER THAN MAXIMUM OUTFLOW (  15278.) IN STORAGE-OUTFLOW TABLE

  WARNING --- ROUTED OUTFLOW (  16218.) IS GREATER THAN MAXIMUM OUTFLOW (  15278.) IN STORAGE-OUTFLOW TABLE
     -----DSS---ZWRITE Unit  71; Vers.    5:  //CP310/FLOW/01DEC1999/5MIN//
     -----DSS---ZWRITE Unit  71; Vers.    5:  //CP310/FLOW/02DEC1999/5MIN//
1
```

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

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+	HYDROGRAPH AT	GWW1_1	2427.	4.58	498.	125.	120.	2.55		
+	ROUTED TO	RR282	2287.	4.75	498.	125.	120.	2.55		
+	ROUTED TO	282286	2146.	5.08	489.	122.	118.	2.55		
+	HYDROGRAPH AT	GWW1_2	1155.	4.50	201.	50.	48.	1.04		
+	ROUTED TO	284285	1149.	4.50	200.	50.	48.	1.04		
+	HYDROGRAPH AT	GWW132	728.	4.17	72.	18.	17.	.35		

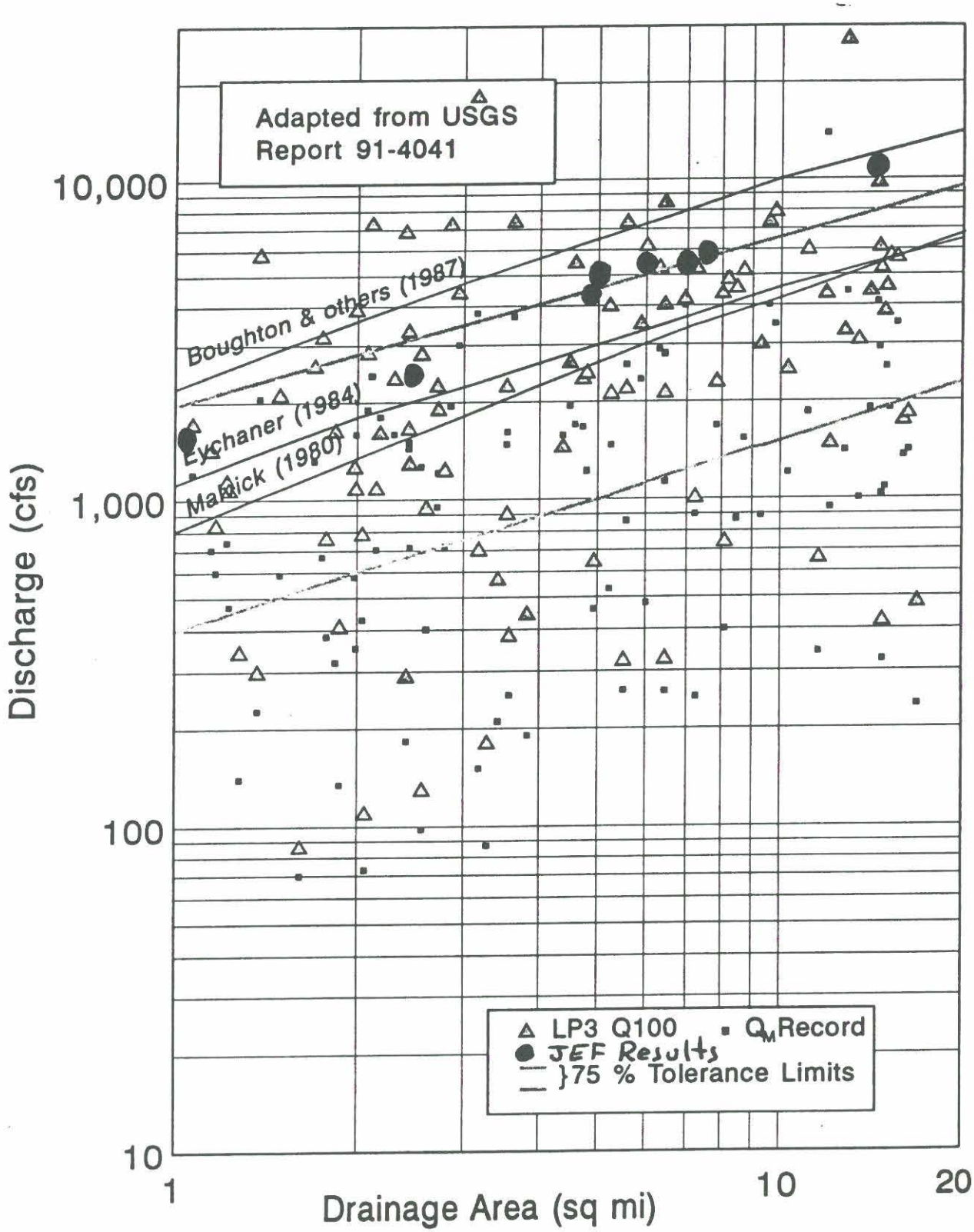
+	2 COMBINED AT CP285	1446.	4.42	261.	65.	63.	1.39
+	ROUTED TO 285286	1389.	4.58	255.	64.	62.	1.39
+	HYDROGRAPH AT GWW133	843.	4.17	92.	23.	22.	.40
+	2 COMBINED AT CP286A	1717.	4.42	334.	84.	81.	1.79
+	HYDROGRAPH AT GWW131	1141.	4.33	162.	41.	39.	.77
+	3 COMBINED AT CP286	3231.	4.67	887.	223.	214.	5.11
+	ROUTED TO 286287	3209.	4.83	882.	221.	213.	5.11
+	HYDROGRAPH AT GWW1_4	1229.	4.50	209.	52.	50.	1.00
+	2 COMBINED AT CP287	3955.	4.67	1041.	260.	251.	6.11
+	ROUTED TO 287288	3941.	4.67	1038.	260.	250.	6.11
+	HYDROGRAPH AT GWW1_5	1345.	4.42	246.	62.	59.	.98
+	2 COMBINED AT CP288	4779.	4.67	1230.	309.	298.	7.09
+	HYDROGRAPH AT GWW1_6	899.	4.33	123.	31.	30.	.59
+	2 COMBINED AT CP290	5187.	4.58	1314.	330.	318.	7.68
+	ROUTED TO 290295	5179.	4.67	1310.	329.	317.	7.68
+	HYDROGRAPH AT GVW2	4686.	4.67	1222.	309.	298.	6.02
+	ROUTED TO 280295	4503.	4.92	1179.	295.	284.	6.02
+	HYDROGRAPH AT GVW3_1	1227.	4.50	202.	51.	49.	1.04
+	2 COMBINED AT CP295A	5014.	4.83	1324.	332.	319.	7.06
+	2 COMBINED AT CP295	9018.	4.75	2422.	608.	586.	14.74
+	ROUTED TO 295300	9016.	4.83	2418.	607.	585.	14.74
+	HYDROGRAPH AT GVW1	3749.	4.83	1153.	295.	284.	4.90
+	ROUTED TO 270300	3497.	5.25	1141.	290.	280.	4.90
+	HYDROGRAPH AT GVW3_2	1303.	4.42	194.	48.	47.	.97
+	3 COMBINED AT CP300	11333.	4.83	3417.	863.	831.	20.61
+	ROUTED TO 300310	11258.	4.92	3412.	861.	830.	20.61
+	HYDROGRAPH AT GVW3_3	643.	4.25	75.	19.	18.	.34
+	2 COMBINED AT CP310	11341.	4.92	3454.	872.	840.	20.95

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

-----DSS---ZCLOSE Unit: 71, File: GWM26R.DSS
Pointer Utilization: .25
Number of Records: 10
File Size: 24.5 Kbytes
Percent Inactive: .0

FIGURE 10-4

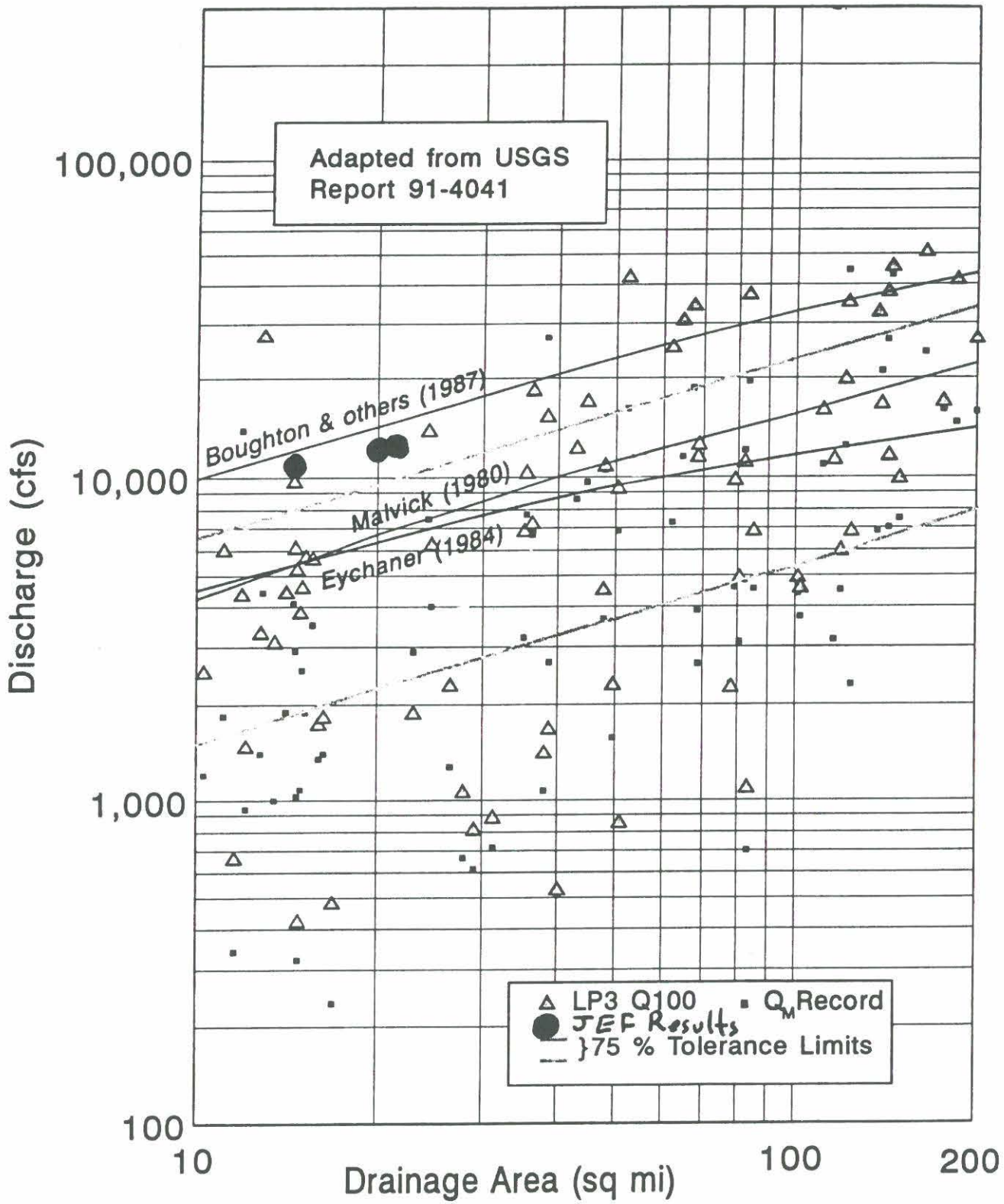
100-YEAR PEAK DISCHARGE BY LP3 ANALYSIS (LP3 Q100) AND MAXIMUM RECORDED DISCHARGE (Q_M RECORD) vs. DRAINAGE AREA FOR 1 TO 20 SQUARE MILES



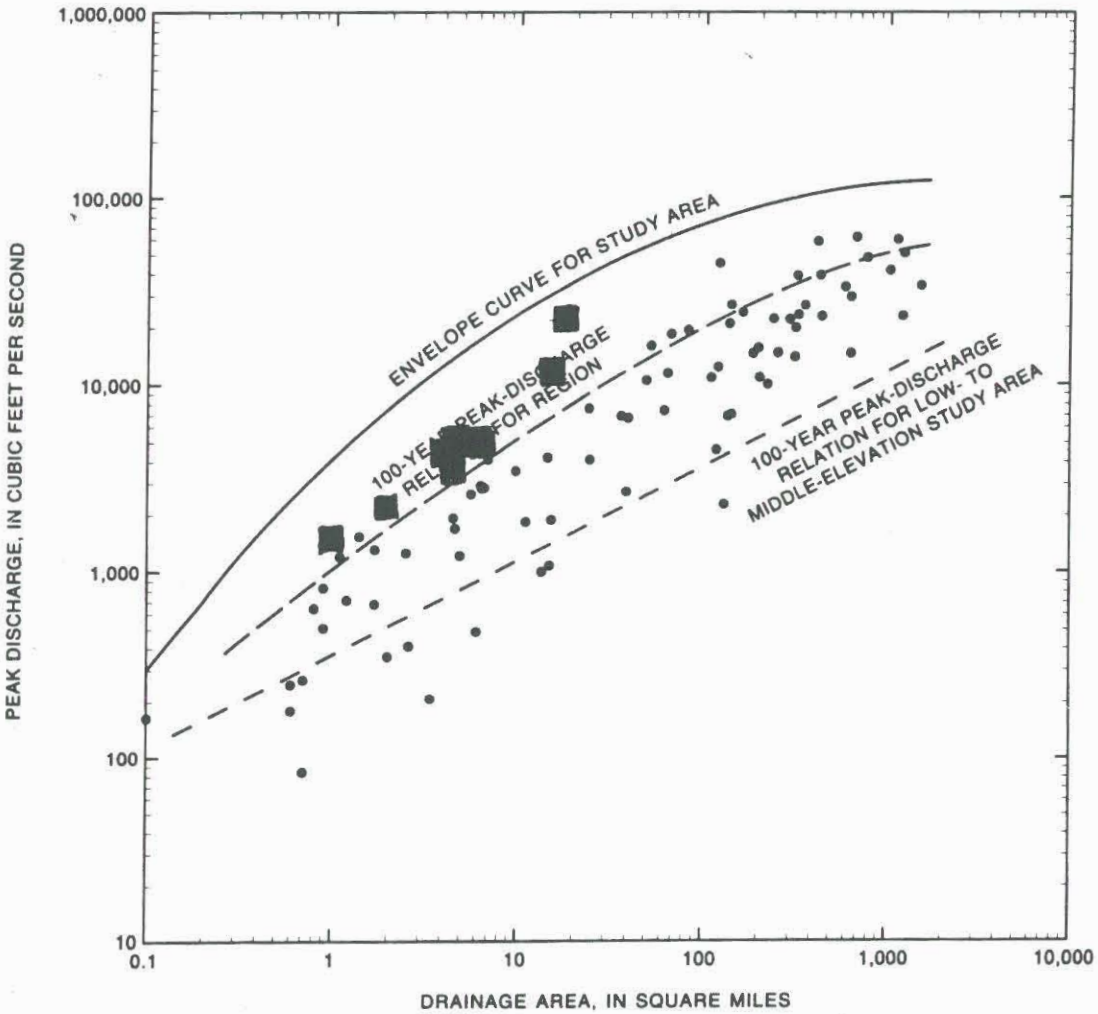
From: ADOT Highway Drainage Design Manual, Hydrology

FIGURE 10-5

100-YEAR PEAK DISCHARGE BY LP3 ANALYSIS (LP3 Q100) AND MAXIMUM RECORDED DISCHARGE (Q_M RECORD) vs. DRAINAGE AREA FOR 10 TO 200 SQUARE MILES



From: ADOT Highway Drainage Design Manual, Hydrology.



From: U.S. Geological Survey, Open File Report 93-419

Figure 41. Relations between 100-year peak discharge and drainage area and plot of maximum peak discharge of record and drainage area for gaged sites in the Central Arizona Region 12.