

# TECHNICAL DATA NOTEBOOK:

**Letter of Map Revision  
For the Morris Property  
APN 503-86-007X**

**Circle City Wash 1  
RM 0.000 to 0.344**

Work Assignment No. 2

CONTRACT FCD 2011C002

**ON-CALL FLOODPLAIN DELINEATION &  
GENERAL ENGINEERING SERVICES**



Expires 3/31/2013

September 2011

Prepared for:

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

Prepared by:

JE Fuller/ Hydrology & Geomorphology  
8400 S. Kyrene Rd., Suite 201  
Tempe, Arizona 85284  
480) 752-2124



# Flood Control District of Maricopa County

## INTEROFFICE MEMORANDUM

**Date:** October 5, 2011

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

**From:** John Hathaway, P.E., CFM

**Subject:** Morris LOMR Request and Technical Data Notebook, Contract FCD 2011C002 – WA #2

The floodplain and floodway re-study for the Morris LOMR is ready for use as the best available technical information. The study documentation will be sent to FEMA for review and incorporation into the County's FIRM panels.

The background for the study includes the following:

The study re-delineates approximately 0.34 linear miles of Zone AE floodplain and floodway originally delineated as part of the 1989 Wittmann ADMS. The topographic basis for the re-study is new 2-foot contour interval mapping in NAVD88 vertical datum by Stewart Geo Technologies, Inc. The study area was flown April 18, 2002. The study Consultant was JE Fuller/Hydrology & Geomorphology, Inc. The project manager for the Consultant was Ted Lehman, P.E. The project manager for the District was John Hathaway, P.E., CFM.

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

 Date: <u>10/6/11</u>	 Date: <u>10/11/11</u>
John Hathaway, P.E., CFM Project Manager	Timothy S. Phillips, P.E., Chief Engineer and General Manager
 Date: <u>10/6/11</u>	 Date: <u>10/6/11</u>
Amir Motamedi Hydrology/Hydraulics Branch Manager	Richard Harris, P.E., CFM Assistant Project Manager
 Date: <u>10/12/11</u>	Date: _____
Kelli Sertich, AICP Floodplain Management & Services Division Manager	Assistant Project Manager
 Date: <u>10/7/11</u>	Date: _____
Ed Raleigh, P.E. Engineering Division Manager	Assistant Project Manager
File Copies: 1. _____ 2. _____	YES <input type="checkbox"/> GIS Posted (Pending Floodplain Only)      Date: _____ N/A

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Expires 3/31/2013

**ENCLOSED DATA CD INCLUDES:**

- **Digital Copy of Report in PDF Format**
- **Digital Copies of HEC-RAS Files**
- **GIS Shapefiles of Project Elements**



Expires 3/31/2013



## SECTION 1: INTRODUCTION

### 1.1 Study Purpose

The purpose of this floodplain delineation study is to reevaluate the floodplain and floodway delineations for a portion of Circle City Wash 1 in Circle City, Arizona. The effective FIS delineation was performed by WLB Group in 1989 as part of the Wittmann Area Drainage Master Study (ADMS) for the Flood Control District of Maricopa County (District). The effective flood discharges and flood profiles were provided by the District in the form of work study maps and HEC-2 input files.

### 1.2 Study Authority

The current study was authorized by the Flood Control District of Maricopa County (District) under contract FCD 2011 C002, Work Assignment No. 2. The study was performed by JE Fuller/Hydrology & Geomorphology, Inc. on behalf of the District.

### 1.3 Study Location

Figure 1.1 shows the location of the study area. The study area is located in unincorporated Maricopa County near Circle City, Arizona. Circle City Wash 1 drains under US Highway 60 about one half mile upstream of the start of the study reach which starts near the south boundary of the developed area of Circle City.

The reach being restudied runs from the start of the existing FIS at river mile 0.000 near the Black Mountain Road alignment upstream to a river mile 0.344 in the effective FIS.

It should also be acknowledged that there is currently another study under review at FEMA which contains new delineation of the reach of Circle City Wash 1 downstream from the Effective FIS model reach (Entellus, 2007). That study connects the current Effective reach downstream to the Trilby Wash floodplain. In this study cross sections have been added near Black Mountain Road and the preliminary results of the Entellus study have been consulted in examination of the tie-in of the revised floodplain and floodway proposed as part of this current map revision analysis.

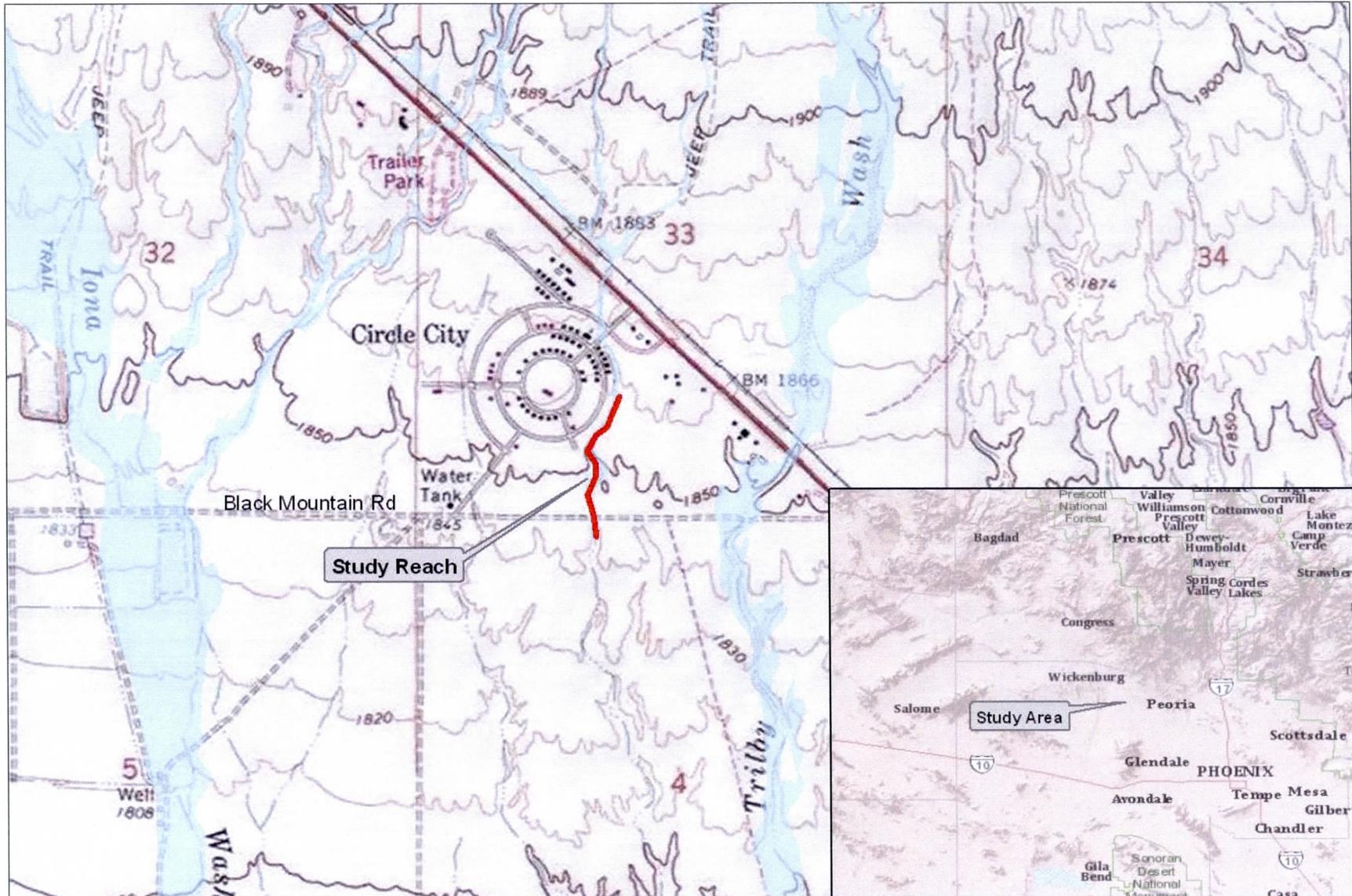


Figure 1.1 Location of Study Area

## **1.4 Methodology**

This study used the Effective FIS data to the extent possible with updated topography and the newest HEC-RAS software version. As noted in Section 1.3, the downstream tie-in also looked at the Entellus (2007) study mapping limits to facilitate coordination of this study with the Effective FIS as well as the pending Entellus work.

### *1.4.1 Hydrology*

The 10-year, 50-year and 100-year discharges used in this study were taken from the Effective FIS. The 10-year, 50-year and 100-discharge values in the Effective HEC-2 model for this reach are 33 cfs, 159 cfs and 276 cfs respectively. These values were continued for use in this LOMR.

### *1.4.2 Hydraulics*

The U.S Army Corps of Engineers HEC-RAS model (version 4.1.0) was used to compute the water surface profiles and floodway encroachments. A description of the floodplain delineation is provided in Section 5.0 of this TDN.

## **1.5 Acknowledgements**

This study was funded entirely by the Flood Control District of Maricopa County. Assistance and review from their staff was critical to the success of this project.

## **1.6 Study results**

The study resulted in the redelineation of about 0.3 miles of the 100-year floodplain and floodway of Circle City Wash 1. The inundation areas for the newly delineated floodplains are shown on the maps in Section 6 and 7 and the Exhibit Maps at the end of this notebook.



## SECTION 2: ADWR/FEMA FORMS

### 2.1 Study Documentation Abstract for FEMA Submittals

Study Documentation Abstract For FEMA Submittals	Initial Study	Restudy	CLOMR	LOMR	X	Other
2.1.1	Date Study Accepted					
2.1.2	Study Prime Contractor	JE Fuller / Hydrology and Geomorphology, Inc.				
	Contact(s)	Ted Lehman, P.E.				
	Address	8400 S. Kyrene Rd., Suite 201 Tempe, AZ 85284				
	Phone	(480) 752-2124				
	Internal Reference Number	FCDMC 2011C002 – Assignment No. 2				
2.1.2	Study Sub-Contractor	None				
	Contact(s)					
	Address					
	Phone					
	Internal Reference Number					
2.1.2	Sub Study Sub-Contractor					
	Contact(s)					
	Address					
	Phone					
	Internal Reference Number					
2.1.3	FEMA Technical Review Contractor	Jaclyn Bloor				
	Contact(s)	FEMA Production and Technical Services Contractor				
	Address	355 Union Blvd Suite 200 Lakewood CO 80288				
	Phone	(720)-514-1116				
	Internal Reference Number					
2.1.4	FEMA Regional Reviewer	Not Applicable				
	Phone					
2.1.5	State Technical Reviewer	None				
	Phone					
2.1.6	Local Technical Reviewer	Flood Control District of Maricopa County (FCDMC)				
		John Hathaway, P.E.				
	Phone	(602) 506-1501				
2.1.7	Reach Description	Circle City Wash 1 RM 0.000 to 0.344				
2.1.8	USGS Quad Sheet(s) with original photo date & latest photo revision date					
2.1.9	Unique Conditions and Problems					
2.1.10	Coordination of Peak Discharges (Agency, Date, Comments)					

**2.2 FEMA Forms**

U.S. DEPARTMENT OF HOMELAND SECURITY  
 FEDERAL EMERGENCY MANAGEMENT AGENCY  
**OVERVIEW & CONCURRENCE FORM**

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

**PAPERWORK BURDEN DISCLOSURE NOTICE**

Public reporting burden for this form is estimated to average 1 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing, reviewing, and submitting the form. You are not required to respond to this collection of information unless it displays a valid OMB control number. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Department of Homeland Security, Federal Emergency Management Agency, 1800 South Bell Street, Arlington, VA 20958-3005, Paperwork Reduction Project (1660-0016). Submission of the form is required to obtain or retain benefits under the National Flood Insurance Program. **Please do not send your completed survey to the above address.**

**PRIVACY ACT STATEMENT**

**AUTHORITY:** The National Flood Insurance Act of 1968, Public Law 90-448, as amended by the Flood Disaster Protection Act of 1973, Public Law 93-234.

**PRINCIPAL PURPOSE(S):** This information is being collected for the purpose of determining an applicant's eligibility to request changes to National Flood Insurance Program (NFIP) Flood Insurance Rate Maps (FIRM).

**ROUTINE USE(S):** The information on this form may be disclosed as generally permitted under 5 U.S.C § 552a(b) of the Privacy Act of 1974, as amended. This includes using this information as necessary and authorized by the routine uses published in DHS/FEMA/NFIP/LOMA-1 National Flood Insurance Program (NFIP); Letter of Map Amendment (LOMA) February 15, 2006, 71 FR 7990.

**DISCLOSURE:** The disclosure of information on this form is voluntary; however, failure to provide the information requested may delay or prevent FEMA from processing a determination regarding a requested change to a (NFIP) Flood Insurance Rate Maps (FIRM).

**A. REQUESTED RESPONSE FROM DHS-FEMA**

This request is for a (check one):

- CLOMR: A letter from DHS-FEMA commenting on whether a proposed project, if built as proposed, would justify a map revision, or proposed hydrology changes (See 44 CFR Ch. 1, Parts 60, 65 & 72).
- LOMR: A letter from DHS-FEMA officially revising the current NFIP map to show the changes to floodplains, regulatory floodway or flood elevations. (See 44 CFR Ch. 1, Parts 60, 65 & 72)

**B. OVERVIEW**

1. The NFIP map panel(s) affected for all impacted communities is (are):

Community No.	Community Name	State	Map No.	Panel No.	Effective Date
040037	Maricopa County and Unincorporated Areas	AZ	04013C	0679H	09/30/2005
040037	Maricopa County and Unincorporated Areas	AZ	04013C	0687H	09/30/2005

2. a. Flooding Source:

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

3. Project Name/Identifier: Circle City Wash 1 RM 0.000 to 0.344

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

5. Basis for Request and Type of Revision:

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

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

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

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



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

Form Name and (Number)

Required if ...

- |   |   |
|---|---|
| <input checked="" type="checkbox"/> Riverine Hydrology and Hydraulics Form (Form 2) | New or revised discharges or water-surface elevations   |
| <input type="checkbox"/> Riverine Structures Form (Form 3)                          | Channel is modified, addition/revision of bridge/culverts, addition/revision of levee/floodwall, addition/revision of dam |
| <input type="checkbox"/> Coastal Analysis Form (Form 4)                             | New or revised coastal elevations   |
| <input type="checkbox"/> Coastal Structures Form (Form 5)                           | Addition/revision of coastal structure  |
| <input type="checkbox"/> Alluvial Fan Flooding Form (Form 6)                        | Flood control measures on alluvial fans   |

Seal (Optional)

**U.S. DEPARTMENT OF HOMELAND SECURITY  
FEDERAL EMERGENCY MANAGEMENT AGENCY  
RIVERINE HYDROLOGY & HYDRAULICS FORM**

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

Flooding Source: Circle City Wash 1

**Note:** Fill out one form for each flooding source studied

**A. HYDROLOGY**

1. Reason for New Hydrologic Analysis (check all that apply)

- Not revised (skip to section B)       No existing analysis       Improved data  
 Alternative methodology       Proposed Conditions (CLOMR)       Changed physical condition of watershed

2. Comparison of Representative 1%-Annual-Chance Discharges

Location	Drainage Area (Sq. Mi.)	Effective/FIS (cfs)	Revised (cfs)
----------	-------------------------	---------------------	---------------

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

- Statistical Analysis of Gage Records       Precipitation/Runoff Model → Specify Model: \_\_\_\_\_  
 Regional Regression Equations       Other (please attach description)

Please enclose all relevant models in digital format, maps, computations (including computation of parameters), and documentation to support the new analysis.

4. Review/Approval of Analysis

If your community requires a regional, state, or federal agency to review the hydrologic analysis, please attach evidence of approval/review.

5. Impacts of Sediment Transport on Hydrology

Is the hydrology for the revised flooding source(s) affected by sediment transport?     Yes     No

If yes, then fill out Section F (Sediment Transport) of Form 3. If No, then attach your explanation..

**B. HYDRAULICS**

1. Reach to be Revised

	Description	Cross Section	Water-Surface Elevations (ft.)	
			Effective	Proposed/Revised
Downstream Limit*	<u>Circle City Wash 1</u>	<u>0.000</u>	<u>1844.57**</u>	<u>1844.57</u>
Upstream Limit*	<u>Same</u>	<u>0.344</u>	<u>1864.4**</u>	<u>1864.72</u>

\*Proposed/Revised elevations must tie-into the Effective elevations within 0.5 foot at the downstream and upstream limits of revision.  
 \*\* Effective WSE shown adjusted to NAVD 1988 vertical datum using local VERTCON adjustment of +2.03 feet from original NGVD 1929 elevation.

2. Hydraulic Method/Model Used: HEC-RAS version 4.1.0

3. Pre-Submittal Review of Hydraulic Models\*

DHS-FEMA has developed two review programs, CHECK-2 and CHECK-RAS, to aid in the review of HEC-2 and HEC-RAS hydraulic models, respectively. We recommend that you review your HEC-2 and HEC-RAS models with CHECK-2 and CHECK-RAS.

4.

<u>Models Submitted</u>	<u>Natural Run</u>		<u>Floodway Run</u>		<u>Datum</u>
	File Name:	Plan Name:	File Name:	Plan Name:	
Duplicate Effective Model*	_____	_____	_____	_____	_____
Corrected Effective Model*	File Name: _____	Plan Name: _____	File Name: _____	Plan Name: _____	_____
Existing or Pre-Project Conditions Model	File Name: _____	Plan Name: _____	File Name: _____	Plan Name: _____	_____
Revised or Post-Project Conditions Model	File Name: <u>MorrisLOMR.prj</u>	Plan Name: <u>FinalDraft</u>	File Name: <u>MorrisLOMR.prj</u>	Plan Name: <u>FinalDraft</u>	<u>NAVD88</u>
Other - (attach description)	File Name: _____	Plan Name: _____	File Name: _____	Plan Name: _____	_____

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

Digital Models Submitted? (Required)

**C. MAPPING REQUIREMENTS**

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

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

Topographic Information: Wittmann ADMSU mapping project 1209

Source: Flood Control District of Maricopa County Date: flight date 4/18/2002

Accuracy: 2-foot contour interval DTM

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

Annotated FIRM and/or FBFM (Required)

**D. COMMON REGULATORY REQUIREMENTS\***

1. For LOMR/CLOMR requests, do Base Flood Elevations (BFEs) increase?  Yes  No
- a. For CLOMR requests, if either of the following is true, please submit **evidence of compliance with Section 65.12 of the NFIP regulations**:
- The proposed project encroaches upon a regulatory floodway and would result in increases above 0.00 foot compared to pre-project conditions.
  - The proposed project encroaches upon a SFHA with or without BFEs established and would result in increases above 1.00 foot compared to pre-project conditions.
- b. Does this LOMR request cause increase in the BFE and/or SFHA compared with the effective BFEs and/or SFHA?  Yes  No
- If Yes, please attach **proof of property owner notification and acceptance (if available)**. Elements of and examples of property owner notifications can be found in the MT-2 Form 2 Instructions.
2. Does the request involve the placement or proposed placement of fill?  Yes  No
- If Yes, the community must be able to certify that the area to be removed from the special flood hazard area, to include any structures or proposed structures, meets all of the standards of the local floodplain ordinances, and is reasonably safe from flooding in accordance with the NFIP regulations set forth at 44 CFR 60.3(A)(3), 65.5(a)(4), and 65.6(a)(14). Please see the MT-2 instructions for more information.
3. For LOMR requests, is the regulatory floodway being revised?  Yes  No
- If Yes, attach **evidence of regulatory floodway revision notification**. As per Paragraph 65.7(b)(1) of the NFIP Regulations, notification is required for requests involving revisions to the regulatory floodway. (Not required for revisions to approximate 1%-annual-chance floodplains [studied Zone A designation] unless a regulatory floodway is being established. Elements and examples of regulatory floodway revision notification can be found in the MT-2 Form 2 Instructions.)
4. For CLOMR requests, please submit documentation to FEMA and the community to show that you have complied with Sections 9 and 10 of the Endangered Species Act (ESA).

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

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



## **SECTION 3: MAPPING AND SURVEY INFORMATION**

### **3.1 Field Survey Information**

Field survey of the area of the Morris property was conducted by District personnel on March 3, 2011. Survey was performed in NAVD88 vertical datum. Additional Information on Field Survey is included within Appendix C.1.

### **3.2 Mapping**

Topographic mapping from the Wittmann ADMSU Mapping project (FCD 01-21), with a flight date of April 18, 2002 was provided by the District for use in the development of the cross section geometry. Two-foot contours from this data set were also provided by the District for use in the work study maps. The vertical datum of the topographic data is NAVD88. Its horizontal datum is State Plane Arizona Central, NAD 1983. Additional Information on Topographical mapping is included on disk in Appendix C.2.



## SECTION 4: HYDROLOGY

### 4.1 Method Description

Hydrology for use in this study was taken from the Effective FIS. The 10-year, 50-year and 100-year discharges in the Effective model are 33 cfs, 159 cfs and 276 cfs respectively for this reach.

### 4.2 References

FCDMC, 1989, Wittmann Area Drainage Master Study, performed by WLB Group for FCDMC under contract FCD 86-24.



## SECTION 5: HYDRAULIC ANALYSIS

### 5.1 Method Description

HEC-RAS version 4.1.0 was used to compute water surface profiles for the 100-year Effective FIS discharge for the study reach from River Mile 0.000 upstream to River Mile 0.344. Geometric data was developed from 2002 2-foot topography provided by the District. Floodway boundaries were also delineated using HEC-RAS.

### 5.2 Work Study Maps

The revised floodplain and floodway delineation for the study reach is shown on 1 inch = 200 feet, 2-foot contour interval base mapping with orthographic aerial photography. A copy of the work study map is included on Figure 5.1 as well as provided in Appendix E.

The work study maps include cross-section locations, proposed and pending floodplain boundaries, zone designations, road names, state plane coordinate grid, section lines, and stream names/numbers.

497600 497800 498000 498200 498400 498600 498800 499000 499200

# Circle City Wash 1 Floodplain Work Map

## Legend

- Base Flood Elevation
- Limit of Study
- HEC-RAS Cross Sections
- Thalweg
- Section Lines
- Proposed Revised Floodway
- Proposed Revised Zone AE Floodplain
- Effective DFIRM Cross Section
- Pending Floodway
- Pending Fringe
- Effective Floodway
- Effective Fringe
- Index contours
- Intermediate Contours

**EFFECTIVE DELINEATION  
(NOT PART OF THIS STUDY)**

**LIMIT OF STUDY**  
RM 0.34  
FP = 1864.71  
FW = 1864.83

RM 0.289  
FP = 1861.11  
FW = 1861.13

RM 0.223  
FP = 1858.54  
FW = 1858.83

RM 0.24  
FP = 1859.15  
FW = 1859.29

RM 0.204  
FP = 1856.45  
FW = 1856.47

RM 0.175  
FP = 1854.87  
FW = 1855.40

RM 0.149  
FP = 1853.63  
FW = 1853.78

RM 0.107  
FP = 1850.20  
FW = 1850.70

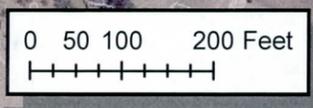
RM 0.065  
FP = 1846.77  
FW = 1846.90

RM 0.052  
FP = 1846.09  
FW = 1846.37

RM 0.045  
FP = 1845.40  
FW = 1846.26

RM 0  
FP = 1844.57  
FW = 1844.57

**PENDING DELINEATION  
FROM FEMA CASE # 07-09-1634P  
(NOT PART OF THIS STUDY)**



Aerial Photography Date: October 2, 2010

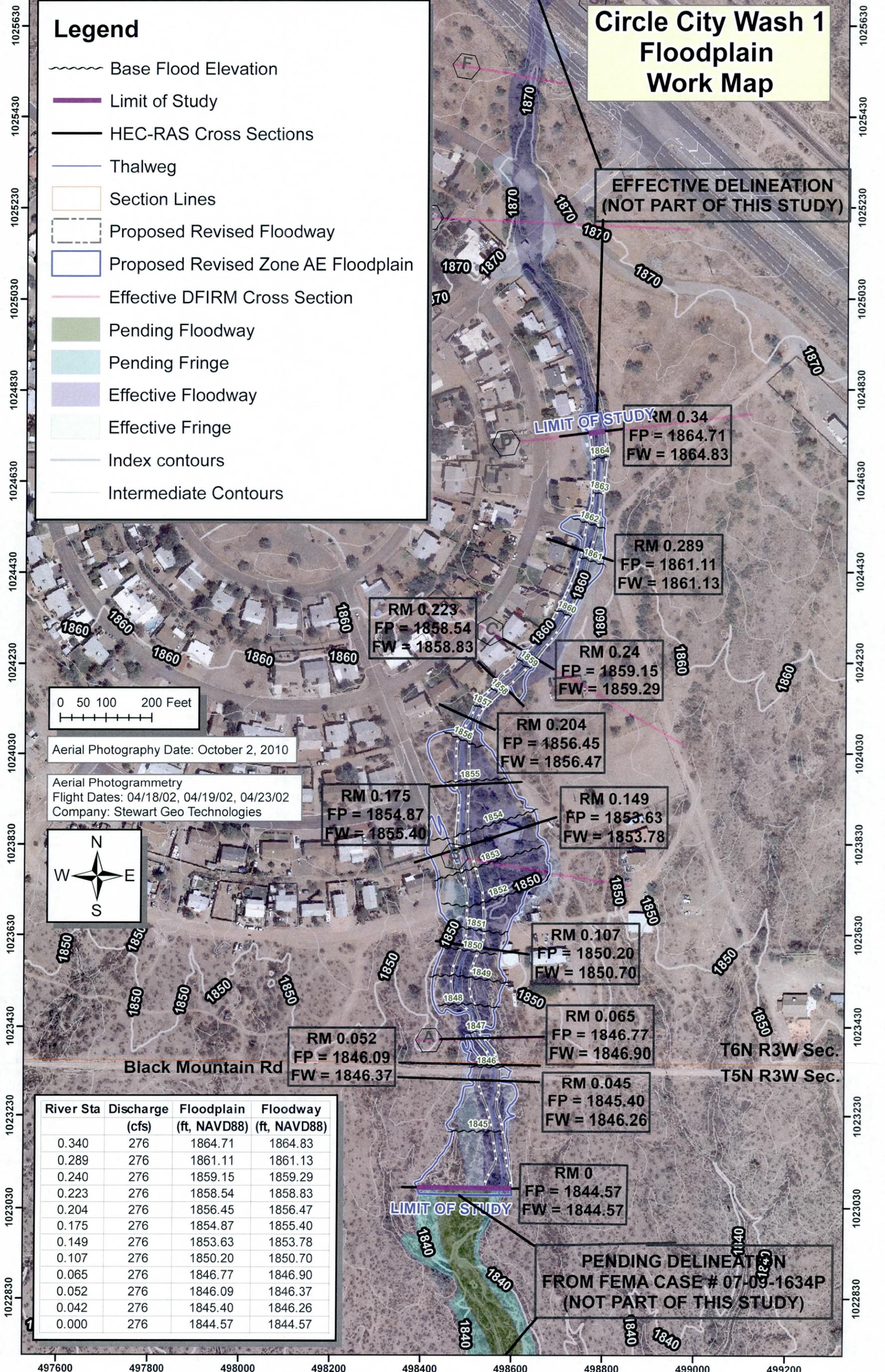
Aerial Photogrammetry  
Flight Dates: 04/18/02, 04/19/02, 04/23/02  
Company: Stewart Geo Technologies



**Black Mountain Rd**

T6N R3W Sec.  
T5N R3W Sec.

River Sta	Discharge (cfs)	Floodplain (ft, NAVD88)	Floodway (ft, NAVD88)
0.340	276	1864.71	1864.83
0.289	276	1861.11	1861.13
0.240	276	1859.15	1859.29
0.223	276	1858.54	1858.83
0.204	276	1856.45	1856.47
0.175	276	1854.87	1855.40
0.149	276	1853.63	1853.78
0.107	276	1850.20	1850.70
0.065	276	1846.77	1846.90
0.052	276	1846.09	1846.37
0.042	276	1845.40	1846.26
0.000	276	1844.57	1844.57



### 5.3 Parameter Estimation

HEC-RAS v4.1.0 was used to determine water surface elevations for the reach. The model was run in the sub-critical flow regime for both the floodplain and floodway profiles. The downstream boundary conditions were set equal to the effective water surface elevation at RM 0.000. The effective water surface elevations were adjusted to NAVD88 by adding 2.03 feet per VERTCON for the local area.

#### 5.3.1 Roughness Coefficients

Manning's roughness coefficient (n value) for the channel, banks and overbank areas were maintained from the Effective FIS HEC-2 model. Channel n-value of 0.05 and overbank n-value of 0.08 were assigned in the 1989 study. Field observations suggest these values remain reasonable estimates for use in this reach.

#### 5.3.2 Expansion and Contraction Coefficients

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

### 5.4 Cross-section descriptions

Cross section data geometry was developed in HEC-GeoRAS version 4.2.93 from a digital elevation model developed from 2002 data provided by Flood Control District of Maricopa County. Cross sections were taken about every 100 to 300 feet depending on the width and orientation of the floodplain. Additional cross sections were added in the vicinity of the Morris property. The starting and ending cross sections from the Effective FIS were maintained in their original location and orientation, but cut newly from the new topography. Cross section stationing is from left to right if viewed in the downstream direction. Cross section stations were adjusted from the initial GeoRAS output to make the approximate thalweg station set to 10,000 per District standards. The latest 2010 aerial photos were also examined to assist in determination of cross section locations, orientation, and blocked obstructions and ineffective flow areas.

### 5.5 Modeling Considerations

#### 5.5.1 Hydraulic Jump and drop analysis

No hydraulic jump or drop analyses were conducted in this study.

#### 5.5.2 Bridge or Culverts

No culverts or bridges were included in this reach.

### 5.5.3 *Levees and Dikes*

There are no levees or dikes within the project area.

### 5.5.4 *Islands and Flow Splits*

There were no islands or split flows modeled in this study.

### 5.5.5 *Ineffective Flow Areas*

No ineffective flow areas were added in this model reach.

### 5.5.6 *Supercritical Flow*

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

## 5.6 **Floodway modeling**

Floodway modeling was performed in HEC-RAS using Method 4 with a target rise of 1 foot. The initial run found several locations that exceeded the 1 foot surcharge or produced negative surcharge. These were adjusted one at a time reducing the target elevation and then examining the surcharge results. Eventually a set of encroachments were determined that met the maximum 1 foot restriction. The results were then imported to Method 1 to set the encroachment stations for each cross section.

## 5.7 **Special problems encountered during the study**

The proposed revised floodplain delineations are based on improved topographical mapping and use of the latest version of HEC-RAS. These factors have resulted in horizontal floodplain boundary differences between the effective and proposed floodplain delineations at the downstream and upstream tie-in locations. At the downstream end, the proposed floodplain is significantly wider than the effective plain on the right hand side of cross-section 0.00. At the upstream end, a smaller difference is observed at the right hand side of cross-section 0.34. Graphical horizontal tie-ins are used to outside the limit of study (downstream of cross-section 0.00 and upstream of 0.34) to connect the proposed delineation with the effective delineation. These graphical tie-ins have been developed using topographic contours and aerial photography arriving at an appropriate tie-in within a shortest possible distance from the limit of study lines.

## 5.8 **Calibration**

No hydraulic calibration was performed during this study.

## 5.9 Final Results

### 5.9.1 Hydraulic analysis results

A summary of the hydraulic analysis results are provided in the following HEC-RAS Summary table below. A comparison of the effective water surface elevations and revised water surface elevations are presented in Table 5.2. Appendix E contains cross section plots, detailed geometry input data and detailed output tables.

The adjoining reach at the upstream end of the study consists of Effective floodplain and floodway delineations performed by WLB (contract FCD 86-24). A pending floodplain delineation study performed by Entellus (contract FCD 2002C029 and FEMA Case number 07-09-1634P) consists of floodplain and floodway delineations in the adjoining reach at the downstream end of the study. The hydraulic modeling results and the floodplain delineations developed by this study will likely be later tied into adjoining pending study data previously done by Entellus downstream and upstream to effective data previously done by WLB.

**Table 5.1 Hydraulic Results Summary**

River Sta	Profile	Q Total	Min Ch EI	W.S. Elev	Vel Total	Flow Area	Top Width	Froude # XS
		(cfs)	(ft)	(ft)	(ft/s)	(sq ft)	(ft)	
0.34	Floodplain	276	1860.68	1864.71	5.3	53.21	33.79	0.64
0.34	Floodway	276	1860.68	1864.83	5.01	56.77	31.66	0.59
0.34	50YR	159	1860.68	1864.13	4.16	38.19	22.4	0.56
0.34	10YR	33	1860.68	1862.77	2.42	13.65	13.49	0.42
0.289	Floodplain	276	1857.73	1861.11	5.88	56.59	54.54	0.7
0.289	Floodway	276	1857.73	1861.13	6.11	45.14	20.28	0.72
0.289	50YR	159	1857.73	1860.42	5.17	31.77	27.32	0.74
0.289	10YR	33	1857.73	1859.09	4.14	7.97	11.7	0.88
0.24	Floodplain	276	1853.96	1859.15	4.05	70.3	37.53	0.43
0.24	Floodway	276	1853.96	1859.29	3.86	71.52	24.98	0.4
0.24	50YR	159	1853.96	1858.21	3.47	45.84	21.37	0.42
0.24	10YR	33	1853.96	1856.3	2.34	14.1	11.98	0.38
0.223	Floodplain	276	1853.4	1858.54	4.47	61.86	42.06	0.48
0.223	Floodway	276	1853.4	1858.83	4.02	68.62	23.28	0.41
0.223	50YR	159	1853.4	1857.61	3.84	41.39	19.76	0.47
0.223	10YR	33	1853.4	1855.69	2.7	12.2	10.68	0.45
0.204	Floodplain	276	1852.67	1856.45	8.76	37.25	20.53	0.94
0.204	Floodway	276	1852.67	1856.47	9.39	29.4	10.73	1
0.204	50YR	159	1852.67	1855.65	7.46	23.13	15.66	0.95
0.204	10YR	33	1852.67	1854.7	3.13	10.61	10.56	0.54
0.175	Floodplain	276	1852.51	1854.87	2.9	156.76	135.89	0.37
0.175	Floodway	276	1852.51	1855.4	3.85	71.71	28.97	0.43
0.175	50YR	159	1852.51	1854.48	2.46	104.49	131.08	0.35
0.175	10YR	33	1852.51	1853.49	1.91	17.31	35.97	0.4
0.149	Floodplain	276	1851.46	1853.63	5.22	81.06	182.63	0.72
0.149	Floodway	276	1851.46	1853.78	5.76	47.9	27.05	0.76
0.149	50YR	159	1851.46	1853.3	4.44	41.93	138.78	0.69
0.149	10YR	33	1851.46	1852.51	2.09	15.76	24.16	0.43
0.107	Floodplain	276	1848.51	1850.2	3.33	117.02	127	0.56
0.107	Floodway	276	1848.51	1850.7	4.19	65.84	41.4	0.59
0.107	50YR	159	1848.51	1849.84	2.99	72.86	116.31	0.62
0.107	10YR	33	1848.51	1849.28	3.16	10.46	59.94	0.85

**Table 5.1 Hydraulic Results Summary (contd.)**

River Sta	Profile	Q Total	Min Ch EI	W.S. Elev	Vel Total	Flow Area	Top Width	Froude # XS
		(cfs)	(ft)	(ft)	(ft/s)	(sq ft)	(ft)	
0.065	Floodplain	276	1843.81	1846.77	6.37	52.48	34.39	0.76
0.065	Floodway	276	1843.81	1846.9	7.13	41.07	18.19	0.82
0.065	50YR	159	1843.81	1846.17	5.19	36.39	25.95	0.7
0.065	10YR	33	1843.81	1845.07	2.92	12.44	17.9	0.55
0.052	Floodplain	276	1843.32	1846.09	5.24	79.93	58.92	0.59
0.052	Floodway	276	1843.32	1846.37	5.23	67.85	33.15	0.56
0.052	50YR	159	1843.32	1845.58	4.03	54.5	43.22	0.51
0.052	10YR	33	1843.32	1844.53	2.19	17.22	26.26	0.41
0.045	Floodplain	276	1842.86	1845.4	7.03	69.19	65.39	0.84
0.045	Floodway	276	1842.86	1846.26	4.41	99.61	46.4	0.45
0.045	50YR	159	1842.86	1845.14	5.06	53.18	59.43	0.64
0.045	10YR	33	1842.86	1844.18	2.92	12.37	18.31	0.52
0	Floodplain	276	1841	1844.57	1	426.44	195.11	0.11
0	Floodway	276	1841	1844.57	4.85	77.68	49.03	0.55
0	50YR	159	1841	1842.46	2.53	87.37	107.05	0.52
0	10YR	33	1841	1841.66	1.54	23.25	40.87	0.46

**Table 5.2 Comparison of Effective and Proposed Revised Water Surface Elevations**

Effective Cross-Section Label	HEC-RAS Cross-section ID	Effective Water Surface Elevation	Effective Water Surface Elevation	Revised Water Surface Elevation	Changes to Water Surface Elevation
		NGVD29 (ft)	NAVD88 (ft)	NAVD88 (ft)	(ft)
A	0.065	1846.00	1848.03	1846.77	-1.26
B	n/a	n/a	n/a	n/a	n/a
C	0.24	1856.00	1858.03	1859.15	1.12
D	0.34	1862.40	1864.43	1864.71	0.28

**5.10 References**

1. U.S. Army Corps of Engineers, HEC-RAS River Analysis System Users Manual, Version 4.1, January 2010.
2. U.S. Army Corps of Engineers, HEC-RAS River Analysis System Hydraulic Reference Manual, Version 4.1, January 2010.
3. U.S. Army Corps of Engineers, HEC-RAS River Analysis System, Version 4.1.0, Jan 2010



## **SECTION 6: SEDIMENT TRANSPORT/EROSION**

### **SECTION 6A: EROSION AND SEDIMENT TRANSPORT**

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



## SECTION 7: DRAFT FIS

### 7.1 Summary of Discharges

Discharges were taken from the Effective FIS for Circle City Wash 1.

**Table 7.1 FIS Discharges**

Flooding Source and Location	Drainage Area (Square Miles)	Peak Discharges (cfs)			
		10-Year	50-year	100-Year	500-Year
Circle City Wash 1 at Black Mountain Road	0.20	33	159	276	

### 7.2 Floodway Data

Floodway data table for the study reach is presented below. The table summarizes floodway variables by cross section. All elevations are presented in NGVD29 vertical datum and have been converted from NAVD88 using a conversion factor of -2.03 ft.

**Table 7.2 Floodway Data Table**

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION				
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE	
<b>LIMIT OF STUDY</b>		(Feet NGVD)							
Circle City Area Wash 1		0.000	195	426	0.7	1,842.5	1,842.5	1,842.5	0.0
---	0.045	65	69	4.0	1,843.4	1,843.4	1,844.2	0.8	
---	0.052	59	80	3.5	1,844.1	1,844.1	1,844.3	0.2	
A	0.065	29	52	5.3	1,844.7	1,844.7	1,844.9	0.2	
---	0.107	127	117	2.4	1,848.2	1,848.2	1,848.7	0.5	
B	0.149	133	81	3.4	1,851.6	1,851.6	1,851.8	0.2	
---	0.175	136	157	1.8	1,852.8	1,852.8	1,853.4	0.6	
---	0.204	21	37	7.4	1,854.4	1,854.4	1,854.4	0.0	
---	0.223	24	62	4.5	1,856.5	1,856.5	1,856.8	0.3	
C	0.240	38	70	3.9	1,857.1	1,857.1	1,857.3	0.2	
---	0.289	55	57	4.9	1,859.1	1,859.1	1,859.1	0.0	
D	0.344	34	53	5.2	1,862.7	1,862.7	1,862.8	0.1	
E	0.439	67	64	4.3	1,867.3	1,867.3	1,867.4	0.1	
F	0.498	57	82	3.4	1,871.4	1,871.4	1,871.4	0.0	
G	0.540	101	187	1.8	1,874.8	1,874.8	1,874.8	0.0	
H	0.600	50	114	2.2	1,879.0	1,879.0	1,879.0	0.0	
I	0.683	26	16	4.6	1,881.8	1,881.8	1,881.8	0.0	
J	0.848	27	21	3.6	1,892.5	1,892.5	1,892.5	0.0	
K	0.985	51	26	2.9	1,902.7	1,902.7	1,902.7	0.0	
L	1.116	50	30	2.9	1,912.9	1,912.9	1,912.9	0.0	
M	1.234	38	27	2.8	1,921.9	1,921.9	1,921.9	0.0	
Circle City Area Wash 2		VALUES RELATED TO CIRCLE CITY AREA WASH 2 ARE NOT INCLUDED IN THIS TABLE							
A									
B									
C									
D									
E									

<sup>1</sup>Miles above downstream Limit of Detailed Study

NOTE: VALUES PRESENTED IN THIS TABLE ARE IN NGVD. THE VALUES HAVE BEEN CONVERTED FROM NAVD88 USING A CONVERSION FACTOR OF -2.03 FT

T A B L E  S	FEDERAL EMERGENCY MANAGEMENT AGENCY  MARICOPA COUNTY, AZ AND INCORPORATED AREAS	<b>FLOODWAY DATA</b>  CIRCLE CITY AREA WASH 1 - CIRCLE CITY AREA WASH 2
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### 7.3 Annotated Flood Insurance Rate Maps

The redline FIRM panels are shown on the following pages.





## 7.4 Flood Profiles

Flood profiles are presented below.





## Appendix A

### References

SOURCE: FLOOD INSURANCE STUDY, MARICOPA COUNTY,  
ARIZONA AND INCORPORATED AREAS  
FLOOD INSURANCE STUDY NUMBER: 04013CV002A

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Circle City Area Wash 1								
A	0.064 <sup>1</sup>	65	88	3.1	1,846.0	1,846.0	1,846.0	0.0
B	0.142 <sup>1</sup>	148	99	2.8	1,850.7	1,850.7	1,850.7	0.0
C	0.246 <sup>1</sup>	60	74	3.7	1,856.0	1,856.0	1,850.0	0.0
D	0.344 <sup>1</sup>	25	53	5.2	1,862.4	1,862.4	1,862.5	0.1
E	0.439 <sup>1</sup>	67	64	4.3	1,867.3	1,867.3	1,867.4	0.1
F	0.498 <sup>1</sup>	57	82	3.4	1,871.4	1,871.4	1,871.4	0.0
G	0.540 <sup>1</sup>	101	187	1.5	1,874.8	1,874.8	1,874.8	0.0
H	0.600 <sup>1</sup>	50	114	2.4	1,879.0	1,879.0	1,879.0	0.0
I	0.683 <sup>1</sup>	26	16	4.6	1,881.8	1,881.8	1,881.8	0.0
J	0.848 <sup>1</sup>	27	21	3.6	1,892.5	1,892.5	1,892.5	0.0
K	0.985 <sup>1</sup>	51	26	2.9	1,902.7	1,902.7	1,902.7	0.0
L	1.116 <sup>1</sup>	50	30	2.5	1,912.9	1,912.9	1,912.9	0.0
M	1.234 <sup>1</sup>	38	27	2.8	1,921.9	1,921.9	1,921.9	0.0
Circle City Area Wash 2								
A	0.074 <sup>2</sup>	54	69	3.8	1,879.5	1,879.5	1,879.5	0.0
B	0.220 <sup>2</sup>	40	18	4.2	1,887.3	1,887.3	1,887.3	0.0
C	0.414 <sup>2</sup>	31	22	3.4	1,900.9	1,900.9	1,900.9	0.0
D	0.589 <sup>2</sup>	29	20	3.8	1,912.9	1,912.9	1,912.9	0.0
E	0.661 <sup>2</sup>	22	26	2.8	1,917.9	1,917.9	1,917.9	0.0

<sup>1</sup>Miles above downstream Limit of Detailed Study    <sup>2</sup>Miles above confluence with Circle City Area Wash 1

T  
A  
B  
L  
E  
S

FEDERAL EMERGENCY MANAGEMENT AGENCY

**MARICOPA COUNTY, AZ  
AND INCORPORATED AREAS**

**FLOODWAY DATA**

**CIRCLE CITY AREA WASH 1 -  
CIRCLE CITY AREA WASH 2**

**NOTES TO USERS**

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The community map repository should be consulted for possible updates or additional flood hazard information.

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

**Coastal Base Flood Elevations** shown on this map apply only to landward of 0.0 National Geodetic Vertical Datum of 1929 (NGVD 29). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Arizona State Plane Zone 3176 (central Arizona). The **horizontal datum** was NAD83 GRS80 spheroid. Differences in datum, spheroid, projection or State Plane zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the **National Geodetic Vertical Datum of 1929**. These flood elevations must be compared to structure and ground elevations referenced to the same vertical datum. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at <http://www.ngs.noaa.gov>, or contact the National Geodetic Survey at the following address:

Spatial Reference System Division  
National Geodetic Survey, NOAA  
Silver Spring Metro Center  
1315 East-West Highway  
Silver Spring, Maryland 20910  
(301) 713-3181

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at (301) 713-3242, or visit its website at <http://www.ngs.noaa.gov>.

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

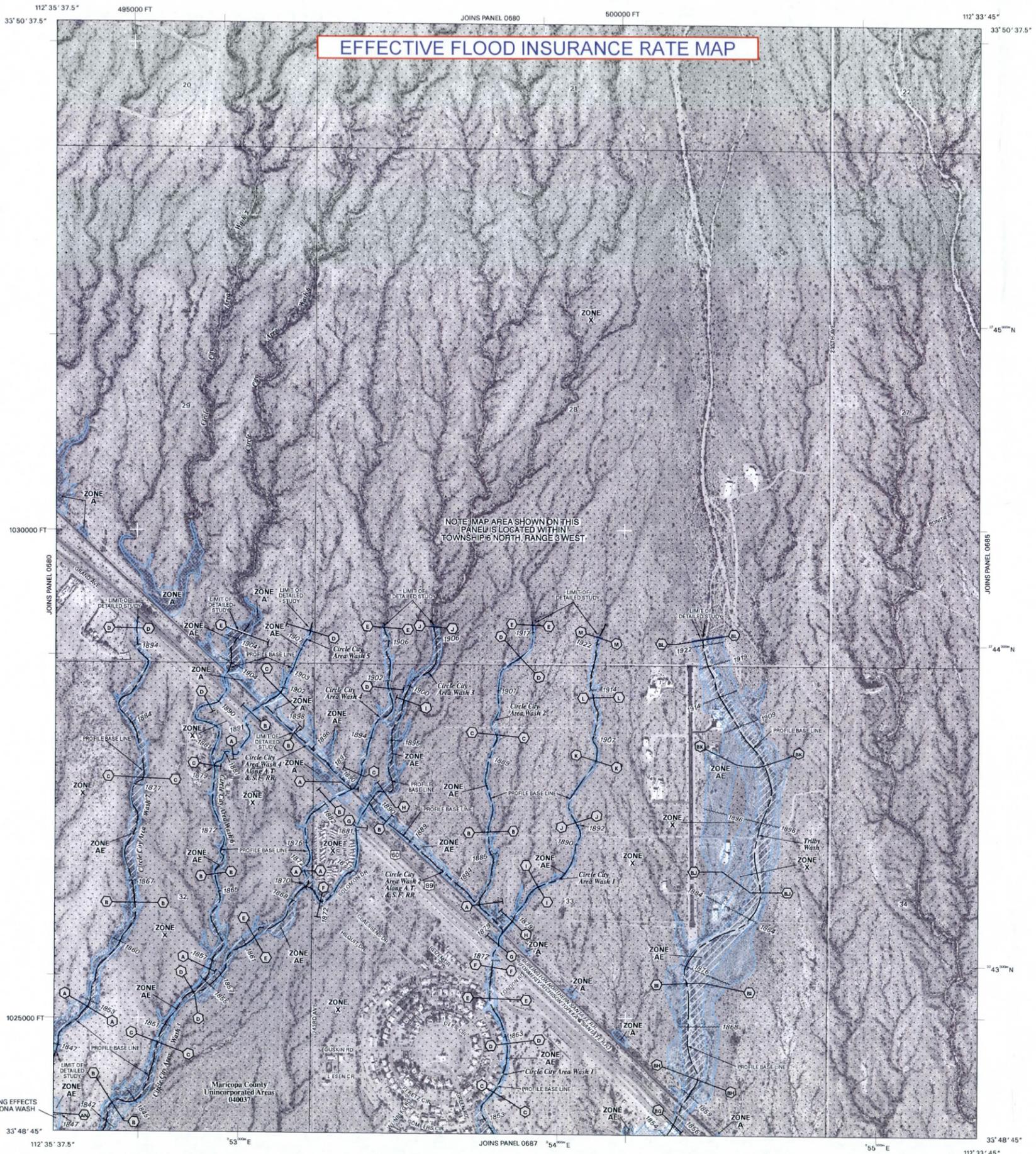
This map reflects more detailed and up-to-date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result,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

**Corporate limits** shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels, community map repository addresses, and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels or which each community is located.

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

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



**LEGEND**

**SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD**  
The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AD, AR, AV, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

- ZONE A** No Base Flood Elevations determined.
- ZONE AE** Base Flood Elevations determined.
- ZONE AH** Flood depths of 1 to 3 feet (usually areas of ponding). Base Flood Elevations determined.
- ZONE AD** Flood depths of 1 to 3 feet (usually along low on sloping terrain); average depths determined. For areas of shallow fan flooding, velocities also determined.
- ZONE AR** Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently described. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
- ZONE AV** Area to be protected from 1% annual chance flood by a Federal flood protection system under construction. No Base Flood Elevations determined.
- ZONE V** Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
- ZONE VE** Coastal flood zone with velocity hazard (wave action). Base Flood Elevations determined.

**FLOODWAY AREAS IN ZONE AE**  
The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

**OTHER FLOOD AREAS**

- ZONE X** Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.
- OTHER AREAS**
- ZONE X** Areas determined to be outside the 0.2% annual chance floodplain.
- ZONE D** Areas in which flood hazards are undetermined, but possible.
- COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS**
- OTHERWISE PROTECTED AREAS (OPAs)**

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

- 1% annual chance floodplain boundary
- 0.2% annual chance floodplain boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Area Zones, and boundary dividing Special Flood Hazard Area of different Base Flood Elevations, flood depths, or flood velocities
- Base Flood Elevation line and value, elevation in feet\*
- Base Flood Elevation value where uniform within zone, elevation in feet\*

\* Referenced to the National Geodetic Vertical Datum of 1929

- Cross section line
- Transect line

112° 07' 08" 33' 25" 41" Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere

76°-E 1000-meter Universal Transverse Mercator grid tick values zone 12

875000 FT 5000-foot grid tick values; Arizona State Plane coordinate system, central zone (FIPS ZONE 3176) NAD83 (Transverse Mercator)

XDVZ313 Batch mark (see explanation in Notes to Users section of this FIRM case)

M1.5 River Mile

**MAP REPOSITORY**  
Refer to Repositories Listing on Map Index

**EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP**  
April 15, 1988

**EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL**  
September 4, 1991; December 3, 1993; July 19, 2001

September 30, 2005 - to update corporate limits, to change Base Flood Elevations, to add Special Flood Hazard Areas, to change Special Flood Hazard Areas, to change zone designations, to add roads and road names, to incorporate previously issued Letters of Map Revision, and to incorporate previously issued Letters of Map Amendment.

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

**MAP SCALE 1" = 500'**  
250 0 500 1000 FEET  
150 0 150 300 METERS

**NATIONAL FLOOD INSURANCE PROGRAM**

**PANEL O679H**

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

**PANEL 679 OF 4350**

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

**CONTAINS:**

COMMUNITY	NUMBER	PANEL	SUFFIX
MARICOPA COUNTY	040037	0679H	H

Notice to User: The Map Number shown below should be used when filing map orders. The Community Number shown above should be used on insurance applications for the subject community.

**MAP NUMBER 04013C0679H**

**MAP REVISED SEPTEMBER 30, 2005**

Federal Emergency Management Agency

**NOTES TO USERS**

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The community map repository should be consulted for possible updated or additional flood hazard information.

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

**Coastal Base Flood Elevations** shown on this map apply only to landward of 0.0' National Geodetic Vertical Datum of 1929 (NGVD 29). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Arizona State Plane Zone 3176 (central Arizona). The horizontal datum was NAD83 GRS80 spheroid. Differences in datum, spheroid, projection or State Plane zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the National Geodetic Vertical Datum of 1929. These flood elevations must be compared to structure and ground elevations referenced to the same vertical datum. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at <http://www.ngs.noaa.gov> or contact the National Geodetic Survey at the following address:

Spatial Reference System Division  
National Geodetic Survey, NOAA  
Silver Spring Metro Center  
1315 East-West Highway  
Silver Spring, Maryland 20910  
(301) 713-3191

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at (301) 713-3242, or visit its website at <http://www.ngs.noaa.gov>.

**Base map** information shown on this FIRM was derived from multiple sources. Base map files were provided in digital format by Maricopa County. Orthophoto images were produced at a scale of 1:5000 using HARM for control. Aerial photography is dated December 2000 to December 2002.

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

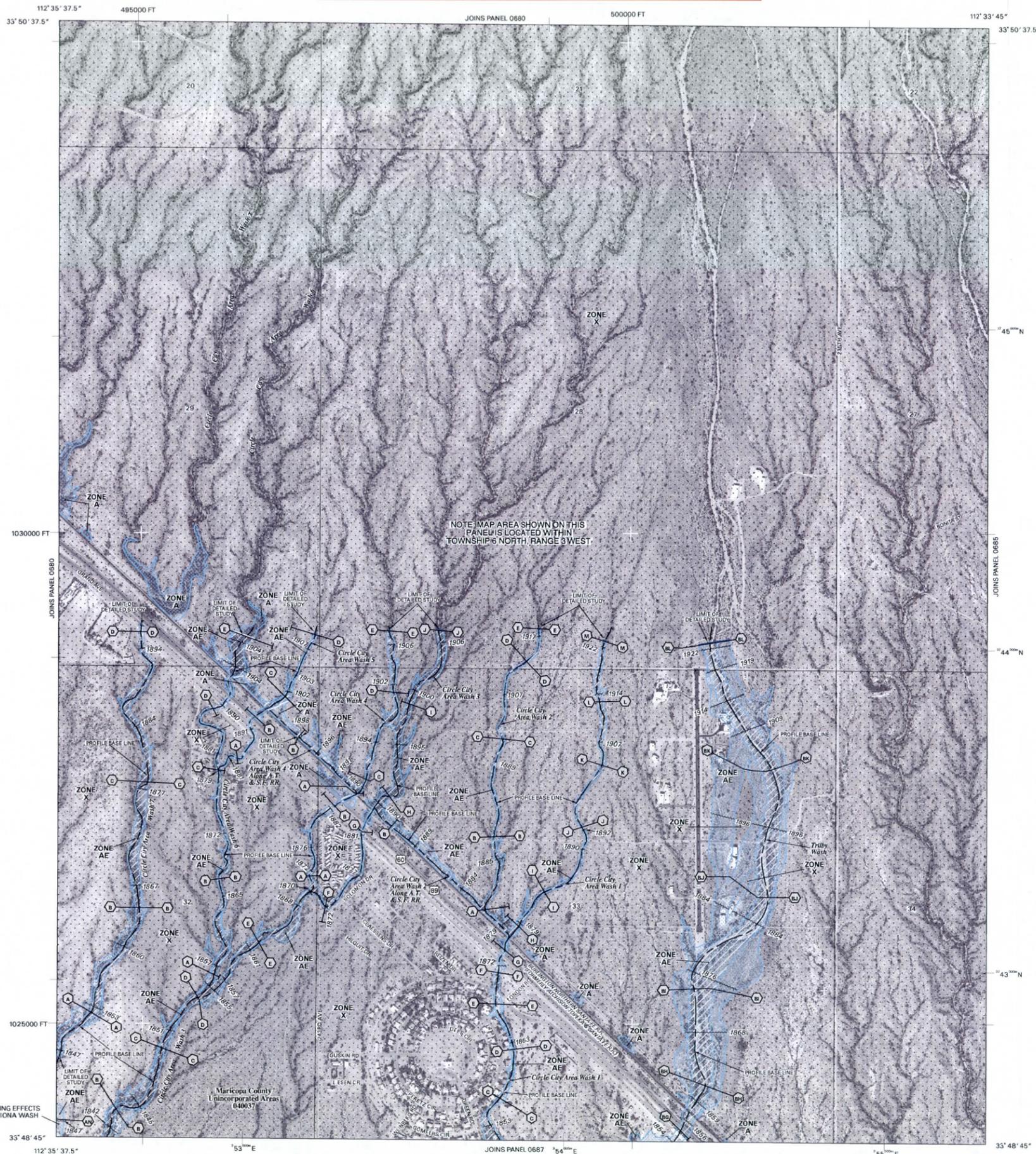
**Corporate limits** shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels, community map repository addresses, and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

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

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

**EFFECTIVE FLOOD INSURANCE RATE MAP**



**LEGEND**

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

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AD, AR, AB, V and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

**ZONE A** No Base Flood Elevations determined.

**ZONE AE** Base Flood Elevations determined.

**ZONE AH** Flood depths of 1 to 2 feet (usually areas of ponding); Base Flood Elevations determined.

**ZONE AD** Flood depths of 1 to 3 feet (usually steel flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.

**ZONE AR** Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently described. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.

**ZONE AB** Area to be protected from 1% annual chance flood by a federal flood protection system under construction. No Base Flood Elevations determined.

**ZONE V** Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.

**ZONE VE** Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

**FLOODWAY AREAS IN ZONE AE**

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

**OTHER FLOOD AREAS**

**ZONE X** Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile and areas protected by levees from 1% annual chance flood.

**OTHER AREAS**

**ZONE X** Areas determined to be outside the 0.2% annual chance floodplain.

**ZONE D** Areas in which flood hazards are undetermined, but possible.

**COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS**

**OTHERWISE PROTECTED AREAS (OPAs)**

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

1% annual chance floodplain boundary  
0.2% annual chance floodplain boundary  
Floodway boundary  
Zone D boundary  
CBRS and OPA boundary

Boundary dividing Special Flood Hazard Area Zones, and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities.  
Base Flood Elevation tag and value, elevation in feet.  
Base Flood Elevation value where uniform within zone; elevation in feet.

\* Referenced to the National Geodetic Vertical Datum of 1929

A-A Cross section line  
B-B Transect line

112° 07' 08", 33° 25' 41" Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere  
43° 43' 00" N  
43° 44' 00" N  
43° 45' 00" N  
76° 00" E  
875000 FT  
43° 45' 00" N  
43° 44' 00" N  
43° 43' 00" N

**MAP REPOSITORY**  
Refer to Repositories Listing on Map Index

**EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP**  
April 16, 1988

**EFFECTIVE DATES OF REVISIONS TO THIS PANEL**  
September 4, 1991, December 3, 1993, July 19, 2001

September 30, 2005 - to update corporate limits, to change Base Flood Elevations, to add Special Flood Hazard Areas, to change Special Flood Hazard Areas, to change zone designations, to add roads and road names, to incorporate previously issued Letters of Map Revision, and to incorporate previously issued Letters of Map Amendment.

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6622.

**MAP SCALE 1" = 500'**

250 0 500 1000 FEET  
150 0 150 300 METERS

**NATIONAL FLOOD INSURANCE PROGRAM**

**PANEL 0679H**

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

**PANEL 679 OF 4350**

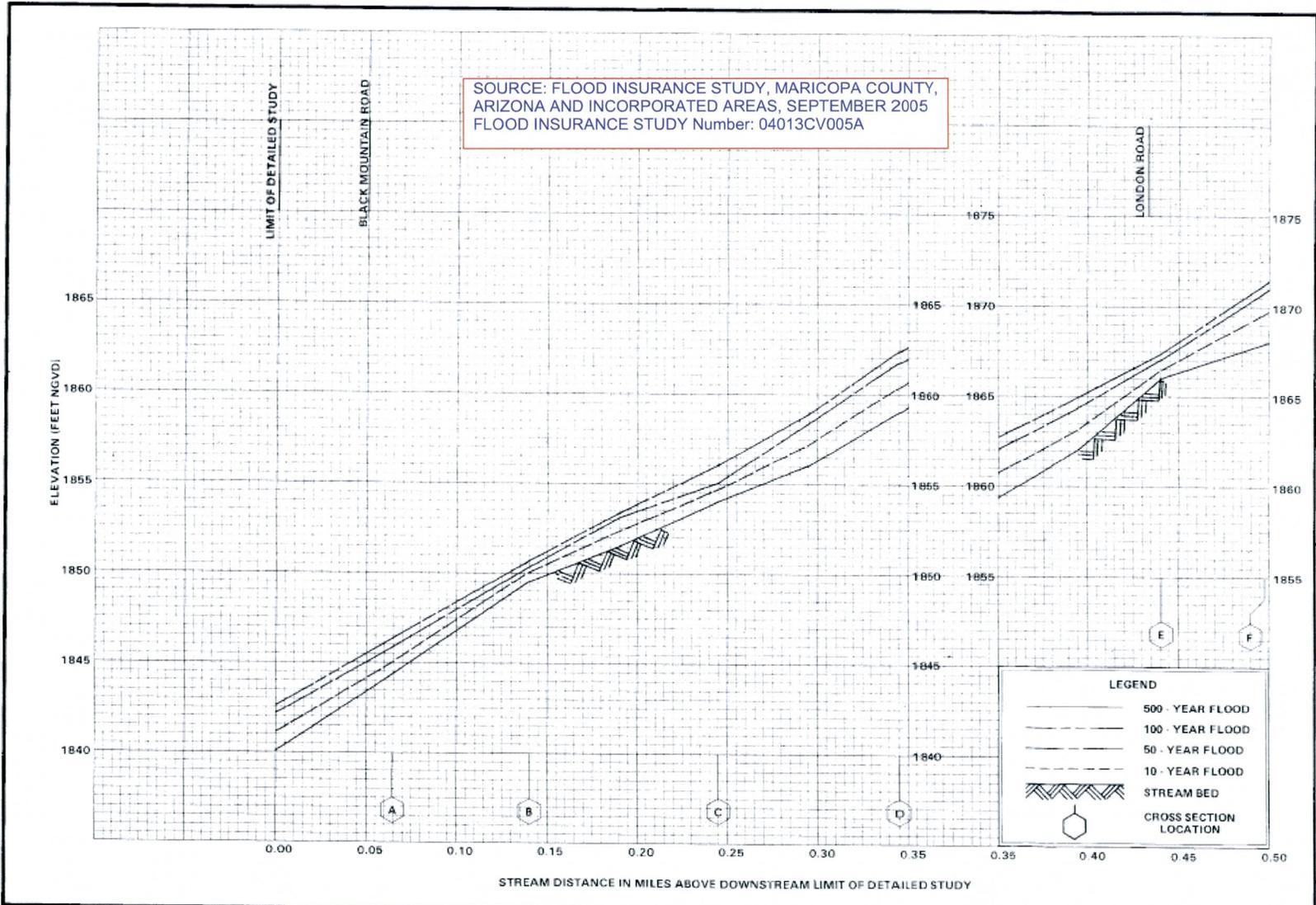
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

**CONTAINS:**

COMMUNITY	NUMBER	PANEL	SUFFIX
MARICOPA COUNTY	040032	0679	H

Notice to User: The Map Number shown below should be used when placing map orders. The Community Number shown above should be used on insurance applications for the subject community.

**MAP NUMBER**  
**04013C0679H**  
**MAP REVISED**  
**SEPTEMBER 30, 2005**  
Federal Emergency Management Agency



**FLOOD PROFILES**

CIRCLE CITY AREA - WASH 1

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FEDERAL EMERGENCY MANAGEMENT AGENCY  
MARICOPA COUNTY - AZ  
AND INCORPORATED AREAS

**114P**

## Appendix B

### Correspondence



**B.1 General Correspondence**

**Date: 7/18/11**

**Subject: Morris FPAP Draft Hydraulics Analysis and TDN**

Hi John,

I have reviewed the subject updated materials and offer the below comments. I am also returning the red-lined TDN report text to support the review comments. Not every red-lined remark is also a review comment. Therefore, please consider both types of materials for revisions. Please request that the consultant return the red-lined text and responses to my review comments as part of the next submittal package. The convention I have come up with for responding to my comments has been to insert textual responses below each of my comments.

If you have any questions or suggestions regarding the comments, please let me know at 64528.

Thanks,

Richard

## Study Approach

As you know there is pending FP information (Wittmann ADMS, contract FCD 02-29) currently being processed through a Countywide FIS Update (CFU) for the study reach below Black Mountain Road. Within the District's data base and within what has been shown as the Preliminary FIS revision, this pending information has been merged with the effective information into one continuous reach. While the JEF analysis does not consider that data in their submittal, I recommend that the JEF analysis use the results to help define the "best" floodplain and floodway tie-in locations so that the sequential extent of map changes between the sought-after LOMR and the Countywide FIS update is minimized.

For example, as an alternative it may prove wise to locate the downstream tie-in location further upstream, closer to the Black Mountain Road. This may require adding a few more cross sections @ the crossing (but doesn't mean the modeling should necessarily be changed to begin there). For reference I have attached two ".bmp" images to illustrate the described locations. Please address.

## Modeling

The currently submitted model does not show any blocks in the cross section plots, yet the TDN hard copy shows them. Please rectify.

Within the model Description, please add information to clarify the draft FIS changes. For example, if there are changes to a WSEL at any Effective data cross section, it should be shown and stated that these are FEMA cross sections based upon the FIS revised September 30<sup>th</sup>, 2005, etc.

A Last or Final Run Date should be added to the model description.

The modeled encroachment stationing with respect to the plotted FP and FW boundaries at several cross section locations do not agree with respect to the cross section shape file. Please check the plots and encroachment stations accordingly (I have attached a spreadsheet that shows some of the discrepancies, for your reference). FEMA standards call for a resolution between modeling and plotting to be 1/20<sup>th</sup> of the associated mapping scale. For a study plotted at 1" = 100', this would amount to an "allowable" difference of 5'. Please address.

It is assumed that the River Mile (RM) IDs in the shape file "FIS\_sections.shp" should relate to the modeling for checking purposes, but there are discrepancies between the cross section RM ID labels in the shape file vs. the model. Also, there appear to be differences between the modeled RM IDs and the Effective distances. This prompts a need to rectify or otherwise explain the differences within the TDN text (and this may be useful in the model Description, too). Please address.

There is a home shown near within the proposed FP modeled @ cross section 0.149. The model should include a block in the relative location, even though it will be a "shadow", to account for the reduced conveyance @ that location. Also, the FP plot shows a channel extension on the right-hand side which suggests a need to horizontally extend the cross section geometry. Please address.

An ineffective flow area should be added to the right-hand side of modeled cross section 0.065 near station 160. Please address.

## Report Contents

The draft TDN will have to include comprehensive documentation to support the analysis, including MT-2 concurrence forms, study work sheets at full size in engineering scale (may be 11" x 17" size – for more details see below under "Plots"), annotated FIRM panels, Checkras model results, etc. Please provide.

All TDN sections should be completed. This means such things as the field survey information: list the methodology within text sub-section 3.1, with reference to actual data to be available within appendix C. If survey field notes are available they should be included in appendix C and be sealed/signed, etc. Appendix B typically includes sub-appendices for General Correspondence, Contract Documents, Public Notification, FEMA Correspondence, etc.. Such changes should be reflected in changes to the Table of Contents, etc. Please address.

The cross-section plots currently do not have cross-section ID labels. Please provide.

A table will be needed to identify the effective cross section elevations relative to model cross sections and the locations of both the upstream and downstream tie-ins. The table should compare WSELs in order to check for BFE changes and to validate that FEMA tie-in criteria will be met. Please address.

In order to update the FIS for this location, the profiles for all the return intervals that are already part of the effective information must be provided as well. This means that the 10-year and 50-year profiles will need to be provided in the FIS update for the portion of study reach above Black Mountain Road. Please provide the profiles in both hard copy and dxf format.

Public map change notifications that affect more than one property are conventionally included in the TDN supporting documentation, appendix B. This normally includes a legal advertisement for intent to study, individual property notifications of changes in boundary depths and widths, and legal advertisement for changes in floodway. The latter documentation will have to include an Affidavit of Publication to be part of the TDN. The intent to study may be waived in this case. Please refer to the MT-2 instructions for details and provide in the draft TDN.

Many similar studies have been well prepared by including as much of the effective information as possible, as supporting documentation. I am providing some such materials as enclosures to these comments for use by the consultant.

Once a draft-final TDN document has been prepared, I suggest changing all the page numbers in the TOC to reflect actual page numbers. Please address.

## Plots

There is a need for post-processing of the floodplain/floodway results in order to ensure smooth boundary plots along the study reach and at tie-ins. Please address

Please provide a larger study map 9 (at least 11" x 17" size) with more conventional features. Such features have:

- A. A larger sheet size at a regular engineering scale such as 1" = 100' .
- B. Line types that show the Floodway as a dash-dot-dot that has pre-eminence when it is coincident with the floodplain boundary.
- C. Labeled cross sections that have both FP and FW elevations as well as the river mile ID.
- D. Limit of Detailed Study labels at both study limit endpoints.
- E. Labels of the dates of Aerial Photography and Aerial Photography (if aerial photographic background).

In the current revisions plot, it appears that the proposed floodplain plot does not extend all the way down to the effective zone detailed limit of study. This may cause FEMA reviewers to require a floodplain horizontal tie-in that tapers into the effective data rather than replacing it completely (as it apparently seems to suggest, now). Please address.

## GIS

The next submittal should include all the cross sections used in the analysis, updated floodplain and floodway zones, and the project files (as I call them: prj.shp, prjdat.dbf, dq.dbf) in shape file, sufficient to update the District's pending Floodplain layer.

The GIS files in the next submittal should meet the District's specifications for data delivery. This means such things like a single flood zone file for both floodplain and floodway, with codes for Zone such as AE and FW, etc. Please provide.

# Memorandum

JE Fuller/ Hydrology & Geomorphology, Inc.

**DATE:** July 29, 2011  
**TO:** John Hathaway, PE, FCDMC  
**FROM:** Ted Lehman, PE, JEF & Hari Raghavan, PhD, PE, JEF  
**RE:** review of first TDN submittal for Morris FPAP LOMR  
**CC:** Richard Harris, PE, FCDMC

This memorandum presents our responses to comments provided by Mr. Harris. His original comments are included for ease of reference followed by our responses in italics. Mr. Harris also provided redline comments on a hard copy of the TDN which will also be addressed.

## **Study Approach**

As you know there is pending FP information (Wittmann ADMS, contract FCD 02-29) currently being processed through a Countywide FIS Update (CFU) for the study reach below Black Mountain Road. Within the District's data base and within what has been shown as the Preliminary FIS revision, this pending information has been merged with the effective information into one continuous reach. While the JEF analysis does not consider that data in their submittal, I recommend that the JEF analysis use the results to help define the "best" floodplain and floodway tie-in locations so that the sequential extent of map changes between the sought-after LOMR and the Countywide FIS update is minimized.

For example, as an alternative it may prove wise to locate the downstream tie-in location further upstream, closer to the Black Mountain Road. This may require adding a few more cross sections @ the crossing (but doesn't mean the modeling should necessarily be changed to begin there). For reference I have attached two ".bmp" images to illustrate the described locations. Please address.

*We will add cross section(s) as suggested by Mr. Harris and consult the pending FP results in our final delineation. We will also add discussion of the pending study into the TDN so that FEMA recognizes the differences and hopefully this will ease the blending of the two studies on the future FIRMs.*

## **Modeling**

The currently submitted model does not show any blocks in the cross section plots, yet the TDN hard copy shows them. Please rectify.

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

*The HECRAS model submitted was not the correct one. We sent the correct one to Mr. Harris by email on July 22<sup>nd</sup>. The correct model included the blocks and some other differences as reflected in the printed results in the draft TDN.*

Within the model Description, please add information to clarify the draft FIS changes. For example, if there are changes to a WSEL at any Effective data cross section, it should be shown and stated that these are FEMA cross sections based upon the FIS revised September 30<sup>th</sup>, 2005, etc.

*We will make the suggested clarification to the model description in RAS.*

A Last or Final Run Date should be added to the model description.

*We will add as suggested.*

The modeled encroachment stationing with respect to the plotted FP and FW boundaries at several cross section locations do not agree with respect to the cross section shape file. Please check the plots and encroachment stations accordingly (I have attached a spreadsheet that shows some of the discrepancies, for your reference). FEMA standards call for a resolution between modeling and plotting to be 1/20<sup>th</sup> of the associated mapping scale. For a study plotted at 1" = 100', this would amount to an "allowable" difference of 5'. Please address.

*Part of the reason for this comment stems from the incorrect RAS model submitted. However, we will check the encroachment stationing in the final model submitted as suggested.*

It is assumed that the River Mile (RM) IDs in the shape file "FIS\_sections.shp" should relate to the modeling for checking purposes, but there are discrepancies between the cross section RM ID labels in the shape file vs. the model. Also, there appear to be differences between the modeled RM IDs and the Effective distances. This prompts a need to rectify or otherwise explain the differences within the TDN text (and this may be useful in the model Description, too). Please address.

*The FIS\_section.shp is the FEMA sections from the District GIS database for the effective study, not the new LOMR RAS sections. Those were also sent to Mr. Harris by email on July 22<sup>nd</sup>. The file GIS data including the new cross sections, floodplain boundaries, etc. will also be included in the revised submittal.*

There is a home shown near within the proposed FP modeled @ cross section 0.149. The model should include a block in the relative location, even though it will be a "shadow", to account for the reduced conveyance @ that location. Also, the FP plot shows a channel extension on the right-hand side which suggests a need to horizontally extend the cross section geometry. Please address.

*Again, this is due to the incorrect model version submitted. The corrected model has a block for the home structures at this location as well as a few other sections. The cross section extension issue relates to the FIS\_section.shp file. The new cross section at this location does extend beyond the inundation limits.*

An ineffective flow area should be added to the right-hand side of modeled cross section 0.065 near station 160. Please address.

*The ineffective flow area will be added as suggested*

### **Report Contents**

The draft TDN will have to include comprehensive documentation to support the analysis, including MT-2 concurrence forms, study work sheets at full size in engineering scale (may be 11" x 17" size – for more details see below under "Plots"), annotated FIRM panels, Checkras model results, etc. Please provide.

*The MT-2 concurrence forms and other items listed above will be added to the revised TDN.*

All TDN sections should be completed. This means such things as the field survey information: list the methodology within text sub-section 3.1, with reference to actual data to be available within appendix C. If survey field notes are available they should be included in appendix C and be sealed/signed, etc. Appendix B typically includes sub-appendices for General Correspondence, Contract Documents, Public Notification, FEMA Correspondence, etc.. Such changes should be reflected in changes to the Table of Contents, etc. Please address.

*All the empty section will be filled with a statement that it's not applicable, etc. as appropriate.*

The cross-section plots currently do not have cross-section ID labels. Please provide.

*IDs will be added to the cross section plots.*

A table will be needed to identify the effective cross section elevations relative to model cross sections and the locations of both the upstream and downstream tie-ins. The table should compare WSELs in order to check for BFE changes and to validate that FEMA tie-in criteria will be met. Please address.

*A table comparing effective and revised BFEs and changes will be added to the revised report.*

In order to update the FIS for this location, the profiles for all the return intervals that are already part of the effective information must be provided as well. This means that the 10-year and 50-year

# Memorandum

# JE Fuller/ Hydrology & Geomorphology, Inc.

profiles will need to be provided in the FIS update for the portion of study reach above Black Mountain Road. Please provide the profiles in both hard copy and dxf format.

*The 10-yr and 50-yr profiles will be added.*

Public map change notifications that affect more than one property are conventionally included in the TDN supporting documentation, appendix B. This normally includes a legal advertisement for intent to study, individual property notifications of changes in boundary depths and widths, and legal advertisement for changes in floodway. The latter documentation will have to include an Affidavit of Publication to be part of the TDN. The intent to study may be waived in this case. Please refer to the MT-2 instructions for details and provide in the draft TDN.

*JEF will assist District with public notice text and provide. District will advertise and once published we will include copies in the TDN.*

Many similar studies have been well prepared by including as much of the effective information as possible, as supporting documentation. I am providing some such materials as enclosures to these comments for use by the consultant.

*Additional effective study info will be added to Appendix A.*

Once a draft-final TDN document has been prepared, I suggest changing all the page numbers in the TOC to reflect actual page numbers. Please address.

*Page numbers will be corrected.*

## **Plots**

There is a need for post-processing of the floodplain/floodway results in order to ensure smooth boundary plots along the study reach and at tie-ins. Please address

*Will do.*

Please provide a larger study map 9 (at least 11" x 17" size) with more conventional features. Such features have:

- A. A larger sheet size at a regular engineering scale such as 1" = 100' .
- B. Line types that show the Floodway as a dash-dot-dot that has pre-eminence when it is coincident with the floodplain boundary.
- C. Labeled cross sections that have both FP and FW elevations as well as the river mile ID.
- D. Limit of Detailed Study labels at both study limit endpoints.

# Memorandum

JE Fuller/ Hydrology & Geomorphology, Inc.

E. Labels of the dates of Aerial Photography and Aerial Photography (if aerial photographic background).

*The above changes to the work study map(s) will be made as suggested.*

In the current revisions plot, it appears that the proposed floodplain plot does not extend all the way down to the effective zone detailed limit of study. This may cause FEMA reviewers to require a floodplain horizontal tie-in that tapers into the effective data rather than replacing it completely (as it apparently seems to suggest, now). Please address.

*The revised floodplain/floodway boundary will be extended downstream to match the extent of the effect boundary lines on the effective FIRM*

## **GIS**

The next submittal should include all the cross sections used in the analysis, updated floodplain and floodway zones, and the project files (as I call them: prj.shp, prjdat.dbf, dq.dbf) in shape file, sufficient to update the District's pending Floodplain layer.

*We will provide.*

The GIS files in the next submittal should meet the District's specifications for data delivery. This means such things like a single flood zone file for both floodplain and floodway, with codes for Zone such as AE and FW, etc. Please provide.

*We will provide these files according to the District specs.*

**Red lines from Mr. Harris' copy of draft TDN**

**Date: 9/06/11**

**Subject: Morris FPAP Revised Draft Hydraulics Analysis and TDN dated August 2011**

Hi Hari and Ted,

I have reviewed the subject updated materials and offer the below comments. I am also returning the red-lined TDN report text to support the review comments. Not every red-lined remark is also a review comment, and vice versa. Therefore, please consider both types of materials for revisions. Please return the red-lined text and responses to my review comments as part of the next submittal package. The convention I have come up with for responding to my comments has been to insert textual responses below each of my comments.

If you have any questions or suggestions regarding the comments, please let me know at 602 506 4528.

Thanks,

Richard

## Modeling

Please state the vertical datum of the modeling in the model Description.

I suggest that the encroachment stations for cross sections 0.00 and 0.34 be re-set to match the effective floodway exactly. Doing so will indicate smoother horizontal tie-ins. Ideally it would be great to have two modeling and mapping efforts to address both the effective data and pending effective data, but this is not a requirement.

## Report Contents

For the Report Draft Final, copies of which will be put in the District library and also sent to FEMA, please provide a more durable type of materials. Suggestions include a 3-ring binder, plastic disk sleeves, tabbed report and appendix section dividers, colored pages between sub-appendices, etc.

Section 3, Mapping and Surveying Information should be upgraded as shown in the review copy red-line to reference additional items that should be added to related sub-appendices that are yet to be created. I am including a disk of the Wittmann Survey report for copying/placement in future sub-appendix C.2 Topographic Mapping. Sub-section C.1 should contain any survey data regarding the field survey itself. Typical materials include a disk with the survey point data in CADD format, sealed and signed survey notes, and description of survey equipment used and methods/ties to bench marks, etc. Please address.

I have several suggestions towards finalizing the Work Map:

- A. Please show the pending FP below cross section RM 0.00 because details of the tie-in should be shown. Please show the pending FP as grayed-out and labeled "(not part of this study)". Labeling the FEMA case number for the Entellus' study would be a nice touch. The FEMA case number was 07-09-1634P.
- B. Please do not show any revisions (proposed FP/FW) below the last cross section RM 0.00. This means the Limit of Study Line must be exactly at the cross section
- C. Please add and specify the Pending Floodplain Zones to cover the WLB study information.

I suggest that for clarification there be the words "pending" in front of what is currently called "effective" as in table 5.2 where it references the Entellus data (and elsewhere, see red-lined report), and the word "proposed" ahead of "revised". There is effective data at the upstream of the tie-in reach for delineations done by WLB for the District under contract FCD 86-24. Please address.

I suggest adding text to subsection 5.7 to describe the horizontal floodplain boundary differences between effective and proposed data at the tie-ins (i.e., at the downstream tie-in the proposed floodplain is significantly wider than the effective data - right-hand side of cross section 0.00). I would

attribute this to improved topographical mapping and technological advances in study methods since the time of the effective study previously done by WLB.

In order to improve the acceptance of floodway modeling where there are minor negative surcharge results, I suggest that the report mention that these were found and every reasonable effort was made to eliminate them (I tried modifying the expansion and contraction coefficients but no change), and that the draft FIS will recommend "0" rise at these locations. This should be explained in both subsection 5.9 and ahead of table 7.2 (where the "0" rise will be shown). Please address.

A note that relates to the above should be added to the Checkras encroachment run

Describing the study will likely be later tied into the adjoining pending study data previously done by Entellus downstream (contract FCD 2002C029 and FEMA case number 07-09-1634P) and upstream to effective data previously done by WLB (contract FCD 86-24) would be a nice addition to subsection 5.9 Final Results of the report.

For Table 7.2, please show all the cross sections modeled. Those that don't relate to an already lettered cross section can be indicated by a dash under "Flooding Source, Cross section".

For the Table 7.2, the WSEL values shown as Regulatory should be those in the current modeling effort, not the Entellus data, for cross sections A-D because this is a draft FIS product to display revisions to the pending effective and effective data. While we here at the District currently regulate using the pending effective information, it is not considered effective as such by FEMA at this time in terms of FIS data. Please update the elevation increases in the table accordingly.

To populate the public notification section of Appendix B, we will, as already discussed, provide notice of intent advertisement to change Floodway with regards to this study, and copy will be given to you. Hopefully your copy will be included in the next and final submittal. Please include as available.

There are quite a few subsections in section 4 Hydrology that have no content. I suggest they be removed as shown and the TOC updated accordingly. If you choose to maintain them, please add, "not applicable" to each (the data came from the FIS anyway) so the report doesn't have the appearance of not being finished.

As discussed, the legal advertisement for change in floodway needs to be posted and copy of the legal affidavit placed in sub-appendix B.2. Please provide a table to show both the maximum and minimum width changes for the floodway with respect to River Mile location, and the District will take the lead formalizing the rest.

Please add the project Work Assignment #2 Notice to Proceed with the attendant Scope of Work to sub-appendix B.3.

The future FEMA correspondence will consist of a cover letter for the submittal and subsequent letters from them regarding their review and processing of the study data. Therefore please remove the statement on the B.4 cover sheet as shown in the red-line review copy.

## Plots

The detailed zone floodplain plot is shown to extend below cross section 0.0 and it should be trimmed to end at the cross section, instead. Please address. By doing this there will be a mismatch potential between the proposed FP boundary on the right-hand side and the pending effective FP just below that cross section. I suggest adding a filet of Zone A in that location to allow a better horizontal tie-in. Please address.

Please provide revisions to the Study Map as follows:

- A. The effective zones, such as above FEMA cross section "D" should be grayed-out or lightened otherwise, with the note callout added: "(not part of this study)".
- B. The pending effective zones, such as below the downstream limit of study, should be grayed-out or lightened otherwise, with the note callout added: "(not part of this study)".
- C. I suggest adding the word "Effective" in front of DFIRM Cross Section in the legend.
- D. Please make the cross section halo-ing either transparent or eliminate it. The idea is to not cover anything up, if possible.

For clarity and completeness, the pending effective data downstream of the current limit of study may be shown on the annotated firm panel sheet 2 and labeled in terms of FEMA case number 07-09-1634P.

For the proposed profile in section 7, the plotting position of the proposed FEMA cross section A is not in-line with cross section icon for River Mile 0.065, although I believe it should be according to all other cross references. Please rectify.

FEMA floodplain boundary plotting standards require model-to-page rectification of 1/20<sup>th</sup> mapping scale. In this case that would mean that the measured FP boundary vs. calculated should agree within 10'. There are two cross sections where this should be checked per my calculations and measurements (see enclosed spreadsheet with highlighted values). Please address.

## GIS

The file "dq.xls" should be in a .dbf format file instead to conform to the rest of the shape file deliverable. Please address.

The prjdat.dbf and dq.dbf file will need to have the "prj\_rid" added. This number should be obtained by calling the District's Data Base manager, Mark Brewer at 602 506 2953.

# Memorandum

JE Fuller/ Hydrology & Geomorphology, Inc.

**DATE:** September 14, 2011  
**TO:** John Hathaway, PE, FCDMC  
**FROM:** Ted Lehman, PE, JEF & Hari Raghavan, PhD, PE, JEF  
**RE:** review of first TDN submittal for Morris FPAP LOMR  
**CC:** Richard Harris, PE, FCDMC

This memorandum presents our responses to comments provided by Mr. Harris dated 9/6/2011. His original comments are included for ease of reference followed by our responses in italics. Mr. Harris also provided redline comments on a hard copy of the TDN which will also be addressed.

## **Modeling**

Please state the vertical datum of the modeling in the model Description.

*JEF Response: JE Fuller has added the vertical datum information to model description.*

I suggest that the encroachment stations for cross sections 0.00 and 0.34 be re-set to match the effective floodway exactly. Doing so will indicate smoother horizontal tie-ins. Ideally it would be great to have two modeling and mapping efforts to address both the effective data and pending effective data, but this is not a requirement.

*JEF Response: JE Fuller has set the encroachment stations to coincide with the floodway shown on the workmap. The proposed revised floodway is set same as the effective tie-in at cross-sections 0.00 and 0.34.*

## **Report Contents**

For the Report Draft Final, copies of which will be put in the District library and also sent to FEMA, please provide a more durable type of materials. Suggestions include a 3-ring binder, plastic disk sleeves, tabbed report and appendix section dividers, colored pages between sub-appendices, etc.

*JEF Response: JE Fuller will provide the Draft Final Report in the format recommended by the District.*

Section 3, Mapping and Surveying Information should be upgraded as shown in the review copy red-line to reference additional items that should be added to related sub-appendices that are yet to be created.

# Memorandum

# JE Fuller/ Hydrology & Geomorphology, Inc.

I am including a disk of the Wittmann Survey report for copying/placement in future sub-appendix C.2 Topographic Mapping. Sub-section C.1 should contain any survey data regarding the field survey itself. Typical materials include a disk with the survey point data in CADD format, sealed and signed survey notes, and description of survey equipment used and methods/ties to bench marks, etc. Please address.

*JEF Response: JE Fuller has included the Wittman Survey Report in Appendix C2. A request for the sealed Field survey information for Appendix C.1 has been made to the District. The survey report will be included in Appendix C.2 after obtaining the sealed survey report from the District.*

I have several suggestions towards finalizing the Work Map:

- A. Please show the pending FP below cross section RM 0.00 because details of the tie-in should be shown. Please show the pending FP as grayed-out and labeled "(not part of this study)". Labeling the FEMA case number for the Entellus' study would be a nice touch. The FEMA case number was 07-09-1634P.

*JEF Response: JE Fuller has included the pending floodplain/floodway information from the Entellus study to the reach adjoining the study reach in the downstream end. The pending floodplain/floodway information has been provided using reduced transparency level to obtain the "grayed-out" effect. A label, identifying the delineation as pending with FEMA case number, with a callout pointing to the pending reach has been added to the workmap.*

- B. Please do not show any revisions (proposed FP/FW) below the last cross section RM 0.00. This means the Limit of Study Line must be exactly at the cross section

*JEF Response: JE Fuller has moved the "LIMIT OF STUDY" to cross-section 0.00. A graphical floodplain tie-in is displayed downstream of RM 0.00 to provide appropriate horizontal tie-in to effective floodplain.*

- C. Please add and specify the Pending Floodplain Zones to cover the WLB study information.

*JEF Response: JE Fuller has added the grayed-out pending floodplain and floodway to the map for the reach adjoining the study reach at the downstream end of the study reach. The map legend has been updated to show the pending delineations. The grayed-out effective floodplain is shown in the background of the study reach as well as in the reach adjoining the study reach at the upstream end. The map legend has been updated to identify the grayed-out effective delineations.*

I suggest that for clarification there be the words "pending" in front of what is currently called "effective" as in table 5.2 where it references the Entellus data (and elsewhere, see red-lined report), and the word "proposed" ahead of "revised". There is effective data at the upstream of the tie-in reach for delineations done by WLB for the District under contract FCD 86-24. Please address.

# Memorandum

# JE Fuller/ Hydrology & Geomorphology, Inc.

*JEF Response: JE Fuller has added the word "pending" to identify the pending delineations at the downstream adjoining reach (Entellus Study). JE Fuller has added the word "effective" to identify delineations from the effective FIS study. JE Fuller has added the word "proposed" to identify the delineations performed in this LOMR.*

I suggest adding text to subsection 5.7 to describe the horizontal floodplain boundary differences between effective and proposed data at the tie-ins (i.e., at the downstream tie-in the proposed floodplain is significantly wider than the effective data - right-hand side of cross section 0.00). I would attribute this to improved topographical mapping and technological advances in study methods since the time of the effective study previously done by WLB.

*JEF Response: JE Fuller has added text to subsection 5.7 as per District recommendation.*

In order to improve the acceptance of floodway modeling where there are minor negative surcharge results, I suggest that the report mention that these were found and every reasonable effort was made to eliminate them (I tried modifying the expansion and contraction coefficients but no change), and that the draft FIS will recommend "0" rise at these locations. This should be explained in both subsection 5.9 and ahead of table 7.2 (where the "0" rise will be shown). Please address.

*JEF Response: JE Fuller has made minor modifications to the HECRAS model to eliminate the negative surcharges.*

A note that relates to the above should be added to the Checkras encroachment run

*JEF Response: JE Fuller has made minor modifications to the HECRAS model to eliminate the negative surcharges.*

Describing the study will likely be later tied into the adjoining pending study data previously done by Entellus downstream (contract FCD 2002C029 and FEMA case number 07-09-1634P) and upstream to effective data previously done by WLB (contract FCD 86-24) would be a nice addition to subsection 5.9 Final Results of the report.

*JEF Response: JE Fuller has added text to subsection 5.9 as per District recommendation.*

For Table 7.2, please show all the cross sections modeled. Those that don't relate to an already lettered cross section can be indicated by a dash under "Flooding Source, Cross section".

*JEF Response: JE Fuller has included all cross-sections to Table 7.2 as recommended by the District.*

For the Table 7.2, the WSEL values shown as Regulatory should be those in the current modeling effort, not the Entellus data, for cross sections A-D because this is a draft FIS product to display revisions to the

# ***Memorandum***

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

pending effective and effective data. While we here at the District currently regulate using the pending effective information, it is not considered effective as such by FEMA at this time in terms of FIS data. Please update the elevation increases in the table accordingly.

*JEF Response: JE Fuller has updated the Floodway Data Table to include all values from the latest HECRAS results used in the proposed revised delineations.*

To populate the public notification section of Appendix B, we will, as already discussed, provide notice of intent advertisement to change Floodway with regards to this study, and copy will be given to you. Hopefully your copy will be included in the next and final submittal. Please include as available.

*JEF Response: JE Fuller has updated the Floodway Data Table to include all values from the latest HECRAS results used in the proposed revised delineations.*

There are quite a few subsections in section 4 Hydrology that have no content. I suggest they be removed as shown and the TOC updated accordingly. If you choose to maintain them, please add, "not applicable" to each (the data came from the FIS anyway) so the report doesn't have the appearance of not being finished.

*JEF Response: JE Fuller has removed empty subsections and has updated the Table of Contents accordingly.*

As discussed, the legal advertisement for change in floodway needs to be posted and copy of the legal affidavit placed in sub-appendix B.2. Please provide a table to show both the maximum and minimum width changes for the floodway with respect to River Mile location, and the District will take the lead formalizing the rest.

*JEF Response: JE Fuller has included the legal affidavit in Appendix B.2.*

Please add the project Work Assignment #2 Notice to Proceed with the attendant Scope of Work to sub-appendix B.3.

*JEF Response: JE Fuller has included the project Works Assignment #2 NTP to Appendix B.3.*

The future FEMA correspondence will consist of a cover letter for the submittal and subsequent letters from them regarding their review and processing of the study data. Therefore please remove the statement on the B.4 cover sheet as shown in the red-line review copy.

*JEF Response: JE Fuller has removed the statement in B.4 cover as recommended by the District.*

**Plots**

The detailed zone floodplain plot is shown to extend below cross section 0.0 and it should be trimmed to end at the cross section, instead. Please address. By doing this there will be a mismatch potential between the proposed FP boundary on the right-hand side and the pending effective FP just below that cross section. I suggest adding a filet of Zone A in that location to allow a better horizontal tie-in. Please address.

*JEF Response: JE Fuller has moved the Limit of study to RM 0.00. A graphical tie-in is provided from RM 0.0 to effective floodplain. Section 5.7 has been modified describing the details of the tie-in.*

Please provide revisions to the Study Map as follows:

- A. The effective zones, such as above FEMA cross section "D" should be grayed-out or lightened otherwise, with the note callout added: "(not part of this study)".

*JEF Response: JE Fuller has grayed-out the FEMA cross-section labeling.*

- B. The pending effective zones, such as below the downstream limit of study, should be grayed-out or lightened otherwise, with the note callout added: "(not part of this study)".

*JEF Response: JE Fuller has lightened the pending as well as effective delineations shown in the background of the workmap.*

- C. I suggest adding the word "Effective" in front of DFIRM Cross Section in the legend.

*JEF Response: JE Fuller has added the word "Effective" in front of DFIRM Cross Section in the legend.*

- D. Please make the cross section halo-ing either transparent or eliminate it. The idea is to not cover anything up, if possible.

*JEF Response: JE Fuller has removed the halo on the cross-section labeling.*

For clarity and completeness, the pending effective data downstream of the current limit of study may be shown on the annotated firm panel sheet 2 and labeled in terms of FEMA case number 07-09-1634P.

*JEF Response: JE Fuller has included the pending effective data to firm panel sheet 2.*

## Memorandum

JE Fuller/ Hydrology & Geomorphology, Inc.

For the proposed profile in section 7, the plotting position of the proposed FEMA cross section A is not in-line with cross section icon for River Mile 0.065, although I believe it should be according to all other cross references. Please rectify.

*JEF Response: JE Fuller has updated the profile plot to show the correct location for cross-section A.*

FEMA floodplain boundary plotting standards require model-to-page rectification of 1/20<sup>th</sup> mapping scale. In this case that would mean that the measured FP boundary vs. calculated should agree within 10'. There are two cross sections where this should be checked per my calculations and measurements (see enclosed spreadsheet with highlighted values). Please address.

*JEF Response: JE Fuller has updated floodplain and floodway delineations to match HEC-RAS computations at all the cross-sections.*

### **GIS**

The file "dq.xls" should be in a .dbf format file instead to conform to the rest of the shape file deliverable. Please address.

*JEF Response: JE Fuller has created the file dq.dbf in lieu of dq.xls.*

The prjdat.dbf and dq.dbf file will need to have the "prj\_rid" added. This number should be obtained by calling the District's Data Base manager, Mark Brewer at 602 506 2953.

*JEF Response: JE Fuller has updated the table with prj\_rid values.*

**Date: 9/30/11**

**Subject: Morris FPAP Revised Draft Hydraulics Analysis and TDN dated September 2011**

Hi Ted,

I have reviewed the subject updated materials and offer the below comments. I am also returning the red-lined TDN report text to support the review comments. Not every red-lined remark is also a review comment, and vice versa. Therefore, please consider both types of materials for revisions. Please return the red-lined text and responses to my review comments as part of the next submittal package. The convention I have come up with for responding to my comments has been to insert textual responses below each of my comments.

If you have any questions or suggestions regarding the comments, please let me know at 602 506 4528.

Thanks,

Richard

## **Report Contents**

In the TOC, the order of sub-appendices B.2 and B.3, as listed, is reversed in the actual appendix. Please rectify.

Regarding your question about the MT-2 form 1 page 2, Community Official's Name, it is "Mr. Tim Phillips, Chief Engineer and General Manager".

The study work map has a photogrammetric flight date listed as in 2010 by Sanborn. This is not correct. Please update and state the correct flight date and company. We customarily also list the date of the aerial photo, which often is more recent. Please make sure to update both copies of the study work map in the TDN, accordingly.

Since the values in Table 7.2 for floodplain and floodway elevations are rounded, the listed increases should be checked so the math adds-up. Please address.

## **GIS**

In this submittal I could not find the file "dq.dbf. Please add.

The HIS package will have to have a RAS ".REP" file generated that has flow distribution for each cross-section. I recommend setting up at least four partitions for each cross section element.

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

**DATE:** September 30, 2011  
**TO:** John Hathaway, PE, FCDMC  
**FROM:** Ted Lehman, PE, JEF & Hari Raghavan, PhD, PE, JEF  
**RE:** review of first TDN submittal for Morris FPAP LOMR  
**CC:** Richard Harris, PE, FCDMC

This memorandum presents our responses to comments provided by Mr. Harris dated 9/6/2011. His original comments are included for ease of reference followed by our responses in italics. Mr. Harris also provided redline comments on a hard copy of the TDN which will also be addressed.

**Report Contents**

In the TOC, the order of sub-appendices B.2 and B.3, as listed, is reversed in the actual appendix. Please rectify.

*JEF Response: The table of contents has been revised to show the B.2 and B.3 in the correct order.*

Regarding your question about the MT-2 form 1 page 2, Community Official's Name, it is "Mr. Tim Phillips, Chief Engineer and General Manager".

*JEF Response: The MT-2 form page2 has been modified to reflect the change.*

The study work map has a photogrammetric flight date listed as in 2010 by Sanborn. This is not correct. Please update and state the correct flight date and company. We customarily also list the date of the aerial photo, which often is more recent. Please make sure to update both copies of the study work map in the TDN, accordingly.

*JEF Response: The study workmap has been modified to include Aerial photogrammetric flight date as well as Aerial photography date.*

Since the values in Table 7.2 for floodplain and floodway elevations are rounded, the listed increases should be checked so the math adds-up. Please address.

*JEF Response: The Floodway data table has been modified to fix the problem related to rounding of numbers.*

**Memorandum**

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

GIS

In this submittal I could not find the file "dq.dbf. Please add.

*JEF Response: dq.dbf has been included.*

The HIS package will have to have a RAS ".REP" file generated that has flow distribution for each cross-section. I recommend setting up at least four partitions for each cross section

*JEF Response: HECRAS report file was previously included as ".txt" file. The file has been renamed as ".REP" file.*

**B.2 Public Notification**

01

# Arizona BUSINESS The business resource Gazette

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

**Announcement of Intent to Revise the Circle City Wash I Floodway**  
The Flood Control District of Maricopa County, in accordance with the National Flood Insurance Program regulation 66.70(b)(3), hereby gives notice of the County's intent to revise the Circle City Wash I floodway from about Black Mountain Road to S. Solomon Drive. Specifically, the floodway will narrow from about 20 to 60 feet along the study reach from River Mile 0.00 to 0.34. Maps and detailed analysis of the floodway revision can be reviewed at the Flood Control District of Maricopa County office, located at 2901 West Durango Street, in Phoenix, AZ 85008. Interested persons may call Mr. Richard P. Harris, P.E., CFM at 602-506-4528 for additional information.  
Published: August 18, 2011

STATE OF ARIZONA  
COUNTY OF MARICOPA

} SS.

Mark Gilmore, being first duly sworn, upon oath deposes and says: That he is the Legal Ad Rep of the Arizona Business Gazette, a newspaper of general circulation in the county of Maricopa, State of Arizona, published weekly at Phoenix, Arizona, and that the copy hereto attached is a true copy of the advertisement published in the said paper on the dates indicated.

8/18/2011

*Mark Gilmore*

Sworn to before me this  
18TH day of  
AUGUST 2011

*Melissa Poekstra*  
Notary Public





# Flood Control District of Maricopa County

## Board of Directors

Fulton Brock, District 1  
Don Stapley, District 2  
Andrew Kunasek, District 3  
Max Wilson, District 4  
Mary Rose Wilcox, District 5

[www.fcd.maricopa.gov](http://www.fcd.maricopa.gov)

2801 West Durango Street  
Phoenix, Arizona 85009  
Phone: 602-506-1501  
Fax: 602-506-4601  
TT: 602-505-5897

September 30, 2011

John & Jane Doe  
123 Sample Circle  
Morristown, AZ 85342

APN: 503-86-396

To Whom It May Concern:

The Flood Control District of Maricopa County (District) is preparing a Letter of Map Revision (LOMR) to update the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) along Circle City Wash 1.

The floodplain/floodway was revised from approximately 300 feet downstream of Black Mountain Road to approximately 200 feet upstream of Solomon Drive. The revision results in increases and decreases to flood widths and depths of both the floodplain and floodway.

You are receiving this letter because your property will be impacted by the updated floodplain information when FEMA issues the LOMR. These changes may impact the requirements for flood insurance.

The District anticipates that FEMA will issue the LOMR between four and seven months from now. Once issued, FEMA requires a mandatory 90-day appeal period. After the 90 days, the FIRM panels will be considered effective, and flood insurance requirements may then change.

If a structure is located on the property, you may be required to purchase flood insurance; or, if you already carry flood insurance, you may need a rate modification based on the updated floodplain information. After the time-frame described above, it is recommended that you contact an insurance agent familiar with flood insurance to determine the appropriate insurance coverage for your property.

If you have any questions regarding the study and its impacts to your property, or have questions regarding the LOMR process, please contact me at (602) 506-0503 or [joh@mail.maricopa.gov](mailto:joh@mail.maricopa.gov).

Sincerely,

John Hathaway, P.E.  
Watercourse Planning Manager

**Letter of Map Revision for the Morris Property  
 Portion of Circle City Wash 1  
 Wittmann Area, Maricopa County, Arizona  
 Public Notice –Mailing List**

APN	Owner/Address	APN	Owner/Address
50386396 50386395	372 Peretz Circle Morristown, AZ 85342	50386482	351 S. Solomon Drive Morristown, AZ 85342
50386394	356 Peretz Circle Morristown, AZ 85342	50386007X	343 Peretz Circle Morristown, AZ 85342
50386393	P.O. Box 473 Morristown, AZ 85342	50386007W	P.O. Box 537 Morristown, AZ 85342
50386392	342 Peretz Circle Morristown, AZ 85342	50386281 50386282 50386283 50386284	287 Gompers Circle Morristown, AZ 85342

### B.3 Contract Documentation

**EXHIBIT A**



**SCOPE OF WORK**

**WORK ASSIGNMENT No. 2  
MORRIS PROPERTY APN 503-86-0007X  
LETTER OF MAP REVISION**

**CONTRACT FCD 2011C002**

**ON-CALL FLOODPLAIN DELINEATION &  
GENERAL ENGINEERING SERVICES**

# **EXHIBIT A**

## **SCOPE OF WORK**

### **WORK ASSIGNMENT NO. 2 Morris Property APN 503-86-007X Letter of Map Revision**

#### **CONTRACT FCD 2011C002**

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#### **Objective**

The objective of Work Assignment No. 2 is to evaluate the feasibility of floodway revision for parcel APN 503-86-007X, aka the Morris Property, on an upper reach of Circle Wash 1 in Circle City, Arizona. If beneficial floodway revision can be reasonably accomplished, this task will also develop the documentation in support of a Letter of Map Revision (LOMR) submittal to FEMA. I

In order to accomplish this objective, the following tasks will be performed as part of Work Assignment No.2.

#### **Task 1 – Data Collection**

The CONSULTANT will collect the digital topographic data, aerial photographs and other pertinent GIS data from the DISTRICT for use in the floodway evaluation and LOMR documentation development. The DISTRICT will also supply any the data from the effective floodplain, e.g. HEC-RAS models, GeoRAS databases, topographic survey, as-builts, etc.. Any new topographic information needed to support the evaluation or LOMR submittal will be provided by the DISTRICT at no cost to the CONSULTANT.

#### **Task 2 – Field Visit**

One site visit is budgeted for the CONSULTANT to verify conditions on the ground and familiarize themselves with the conditions in the reach to be evaluated.

#### **Task 3 – Project Coordination**

The CONSULTANT will coordinate and meet with the DISTRICT on items related to the evaluation and development and review of the LOMR submittal package if feasible. At least four (4) meetings are anticipated as part of this task.

#### **Task 4 – Floodway Revision Evaluation**

The CONSULTANT will review the effective floodplain HEC-RAS modeling to evaluate whether a beneficial floodway revision on APN 503-86-007X can reasonably be accomplished. Sufficient modifications will be made to the effective model (e.g. additional cross sections, reevaluation of channel bank stations, n-values, encroachment limits, etc.) to assess whether a revision of the floodway in this area is possible that will beneficially impact the existing residence on this property. A brief written memorandum will be provided to the DISTRICT in support of the conclusions of this evaluation. A meeting with DISTRICT staff is anticipated at the conclusion of Task 4. If a beneficial revision of the

floodway is found reasonable, documentation in support of a LOMR submittal package will be developed as part of Task 5.

#### **Task 5 – Technical Data Notebook**

The CONSULTANT will develop a Technical Data Notebook (TDN) in support of a LOMR package according to State Standard SS1-97. The TDN will include completion of the FEMA forms and technical information provided in support of the HEC-RAS modeling and revised floodplain and floodway delineation.

#### **Task 6 – Agency Review & Comment Response**

The CONSULTANT will respond and revise the TDN accordingly to address agency comments of the draft LOMR submittal.

#### **Task 7 – Deliverables**

Three (3) copies of the draft and final TDN's will be provided in hard copy and electronically. Each TDN will include electronic discs of the model data and reports.

#### **Assumptions & Limitations**

The DISTRICT will supply any needed topographic data such as supplemental survey on the Morris property to the CONSULTANT at no cost to the CONSULTANT.

The fee estimate for this work assignment does not include any agency review fees that may be charged as part the LOMR submittal.

**B.4 FEMA Correspondance**



# Federal Emergency Management Agency

Washington, D.C. 20472

February 28, 2012

CERTIFIED MAIL  
RETURN RECEIPT REQUESTED

The Honorable Max Wilson  
Chairman, Maricopa County  
Board of Supervisors  
301 West Jefferson, 10th Floor  
Phoenix, AZ 85003

IN REPLY REFER TO:

Case No.: 12-09-0273P  
Community Name: Maricopa County, AZ  
Community No.: 040037  
Effective Date of  
This Revision: **July 13, 2012**

Dear Mr. Wilson:

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

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

Sincerely,

Siamak Esfandiary, Ph.D., P.E., Program Specialist  
Engineering Management Branch  
Federal Insurance and Mitigation Administration

For: Luis Rodriguez, P.E., Chief  
Engineering Management Branch  
Federal Insurance and Mitigation Administration

List of Enclosures:

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

cc: See attached list

List of Courtesy Copies - Maricopa County, AZ

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

Mr. Tim Murphy, P.E.  
Mitigation Planning & Technical Programs Manager  
Floodplain Management and Services Division  
Flood Control District of Maricopa County

Ms. Kelli Sertich, AICP, CFM  
FMS Division Manger  
Flood Control District of Maricopa County

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

Mr. Kevin Lavallo  
GIS Analyst  
Flood Control District of Maricopa County

Mr. John Hathaway, P.E., CFM  
Project Manager  
Flood Control District of Maricopa County

Mr. Ted Lehman, P.E.  
Project Engineer  
JE Fuller Hydrology and Geomorphology, Incorporation



# Federal Emergency Management Agency

Washington, D.C. 20472

## LETTER OF MAP REVISION DETERMINATION DOCUMENT

COMMUNITY AND REVISION INFORMATION		PROJECT DESCRIPTION	BASIS OF REQUEST
COMMUNITY	Maricopa County Arizona (Unincorporated Areas)	NO PROJECT	FLOODWAY HYDRAULIC ANALYSIS NEW TOPOGRAPHIC DATA
	COMMUNITY NO.: 040037		
IDENTIFIER	Circle City Wash 1 Rm 0.000 To 0.344	APPROXIMATE LATITUDE & LONGITUDE: 33.817, -112.581 SOURCE: USGS QUADRANGLE DATUM: NAD 83	
ANNOTATED MAPPING ENCLOSURES		ANNOTATED STUDY ENCLOSURES	
TYPE: FIRM* NO.: 04013C0687H DATE: September 30, 2005 TYPE: FIRM* NO.: 04013C0679H DATE: September 30, 2005		DATE OF EFFECTIVE FLOOD INSURANCE STUDY: September 30, 2005 PROFILE(S): 114P FLOODWAY DATA TABLE: 5	

Enclosures reflect changes to flooding sources affected by this revision.

\* FIRM - Flood Insurance Rate Map; \*\* FBFM - Flood Boundary and Floodway Map; \*\*\* FHBM - Flood Hazard Boundary Map

### FLOODING SOURCE(S) & REVISED REACH(ES)

Circle City Area Wash 1 - from approximately 270 feet downstream of Black Mountain Road to approximately 420 feet downstream of London Road

### SUMMARY OF REVISIONS

Flooding Source	Effective Flooding	Revised Flooding	Increases	Decreases
Circle City Area Wash 1	Zone AE	Zone AE	YES	YES
	BFEs	BFEs	YES	YES
	Floodway	Floodway	YES	YES

\* BFEs - Base Flood Elevations

### DETERMINATION

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

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Information eXchange (FMIX) toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMC Clearinghouse, 7390 Coca Cola Drive, Suite 204, Hanover, MD 21076. Additional information about the NFIP is available on our website at <http://www.fema.gov/nfip>.

Siamak Esfandiary, Ph.D., P.E., Program Specialist  
Engineering Management Branch  
Federal Insurance and Mitigation Administration



# Federal Emergency Management Agency

Washington, D.C. 20472

## LETTER OF MAP REVISION DETERMINATION DOCUMENT (CONTINUED)

### COMMUNITY INFORMATION

#### APPLICABLE NFIP REGULATIONS/COMMUNITY OBLIGATION

We have made this determination pursuant to Section 206 of the Flood Disaster Protection Act of 1973 (P.L. 93-234) and in accordance with the National Flood Insurance Act of 1968, as amended (Title XIII of the Housing and Urban Development Act of 1968, P.L. 90-448), 42 U.S.C. 4001-4128, and 44 CFR Part 65. Pursuant to Section 1361 of the National Flood Insurance Act of 1968, as amended, communities participating in the NFIP are required to adopt and enforce floodplain management regulations that meet or exceed NFIP criteria. These criteria, including adoption of the FIS report and FIRM, and the modifications made by this LOMR, are the minimum requirements for continued NFIP participation and do not supersede more stringent State/Commonwealth or local requirements to which the regulations apply.

We provide the floodway designation to your community as a tool to regulate floodplain development. Therefore, the floodway revision we have described in this letter, while acceptable to us, must also be acceptable to your community and adopted by appropriate community action, as specified in Paragraph 60.3(d) of the NFIP regulations.

#### COMMUNITY REMINDERS

We based this determination on the 1-percent-annual-chance flood discharges computed in the FIS for your community without considering frequent changes in watershed characteristics that could increase flood discharges. Future development of projects upstream could cause increased flood discharges, which could cause increased flood hazards. A comprehensive restudy of your community's flood hazards would consider the cumulative effects of development on flood discharges subsequent to the publication of the FIS report for your community and could, therefore, establish greater flood hazards in this area.

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

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

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Information eXchange (FMIX) toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMC Clearinghouse, 7390 Coca Cola Drive, Suite 204, Hanover, MD 21076. Additional information about the NFIP is available on our website at <http://www.fema.gov/nfip>.

A handwritten signature in black ink, appearing to read "Siamak Esfandiary".

Siamak Esfandiary, Ph.D., P.E., Program Specialist  
Engineering Management Branch  
Federal Insurance and Mitigation Administration



# Federal Emergency Management Agency

Washington, D.C. 20472

## LETTER OF MAP REVISION DETERMINATION DOCUMENT (CONTINUED)

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

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

### STATUS OF THE COMMUNITY NFIP MAPS

We are processing a revised FIRM and FIS report for Maricopa County in our countywide format; therefore, we will not physically revise and republish the FIRM and FIS report for your community to incorporate the modifications made by this LOMR at this time. Preliminary copies of the countywide FIRM and FIS report, which present information from the effective FIRMs and FIS reports for your community and other incorporated communities in Maricopa County, were submitted to your community for review on December 3, 2010.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Information eXchange (FMIX) toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMC Clearinghouse, 7390 Coca Cola Drive, Suite 204, Hanover, MD 21076. Additional information about the NFIP is available on our website at <http://www.fema.gov/nfip>.

A handwritten signature in black ink, appearing to read "Siamak Esfandiary".

Siamak Esfandiary, Ph.D., P.E., Program Specialist  
Engineering Management Branch  
Federal Insurance and Mitigation Administration



FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Circle City Area Wash 1								
A	0.065 <sup>1</sup>	71	123	2.3	1,846.0	1,846.0	1,846.0	0.0
B	0.177 <sup>1</sup>	29	70	3.9	1,852.8	1,852.8	1,853.3	0.5
C	0.244 <sup>1</sup>	25	72	3.9	1,857.1	1,857.1	1,857.3	0.2
D	0.344 <sup>1</sup>	25	53	5.2	1,862.4	1,862.4	1,862.5	0.1
E	0.439 <sup>1</sup>	67	64	4.3	1,867.3	1,867.3	1,867.4	0.1
F	0.498 <sup>1</sup>	57	82	3.4	1,871.4	1,871.4	1,871.4	0.0
G	0.540 <sup>1</sup>	101	187	1.5	1,874.8	1,874.8	1,874.8	0.0
H	0.600 <sup>1</sup>	50	114	2.4	1,879.0	1,879.0	1,879.0	0.0
I	0.683 <sup>1</sup>	26	16	4.6	1,881.8	1,881.8	1,881.8	0.0
J	0.848 <sup>1</sup>	27	21	3.6	1,892.5	1,892.5	1,892.5	0.0
K	0.985 <sup>1</sup>	51	26	2.9	1,902.7	1,902.7	1,902.7	0.0
L	1.116 <sup>1</sup>	50	30	2.5	1,912.9	1,912.9	1,912.9	0.0
M	1.234 <sup>1</sup>	38	27	2.8	1,921.9	1,921.9	1,921.9	0.0
Circle City Area Wash 2								
A	0.074 <sup>2</sup>	54	69	3.8	1,879.5	1,879.5	1,879.5	0.0
B	0.220 <sup>2</sup>	40	18	4.2	1,887.3	1,887.3	1,887.3	0.0
C	0.414 <sup>2</sup>	31	22	3.4	1,900.9	1,900.9	1,900.9	0.0
D	0.589 <sup>2</sup>	29	20	3.8	1,912.9	1,912.9	1,912.9	0.0
E	0.661 <sup>2</sup>	22	26	2.8	1,917.9	1,917.9	1,917.9	0.0

REVISED DATA →

<sup>1</sup>Miles above downstream Limit of Detailed Study    <sup>2</sup>Miles above confluence with Circle City Area Wash 1

REVISED TO REFLECT LOMR EFFECTIVE: July 13, 2012

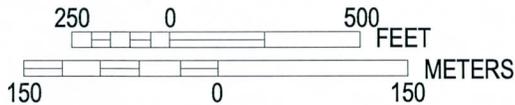
T A B L E  5	FEDERAL EMERGENCY MANAGEMENT AGENCY	FLOODWAY DATA
	MARICOPA COUNTY, AZ AND INCORPORATED AREAS	CIRCLE CITY AREA WASH 1 - CIRCLE CITY AREA WASH 2

Legend

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



MAP SCALE 1" = 500'



NFIP

PANEL 0679H

**FIRM**  
FLOOD INSURANCE RATE MAP

MARICOPA COUNTY,  
ARIZONA  
AND INCORPORATED AREAS

PANEL 679 OF 4350

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)  
CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
MARICOPA COUNTY	040037	0679	H

**REVISED TO  
REFLECT LOMR  
EFFECTIVE: July 13, 2012**

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.



MAP NUMBER  
04013C0679H

MAP REVISED  
SEPTEMBER 30, 2005

Federal Emergency Management Agency



243RD AVE

32

33

B

C

D

E

F

G

ZONE A

ZONE A

ZONE A

REVISED AREA

ZONE AE

ZONE AE

JOINS PANEL 0687

354<sup>000m</sup> E

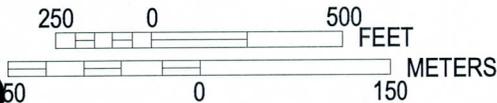
GLAESSENS DR  
REZEN DR  
1872  
89  
LONDON RD  
60  
BURLINGTON NORTHERN SANTA FE R.R. (FORMERLY ATCHAFISON TOPEKA & SANTA FE R.R.)  
1863  
1862  
1860  
1859  
1858  
1857  
1856  
1855  
1854  
1853  
1852  
1851  
GUSKIN RD  
DEES CIR  
LIESEN CIR  
WEINBERG RD  
PERETZ CIR  
GOMPERS CIR

Legend

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



MAP SCALE 1" = 500'



NFIP

PANEL 0687H

**FIRM**  
FLOOD INSURANCE RATE MAP

MARICOPA COUNTY,  
ARIZONA  
AND INCORPORATED AREAS

**PANEL 687 OF 4350**  
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)  
CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
MARICOPA COUNTY	040037	0687	H

**REVISED TO  
REFLECT LOMR  
EFFECTIVE: July 13, 2012**

Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.



MAP NUMBER  
04013C0687H  
MAP REVISED  
SEPTEMBER 30, 2005

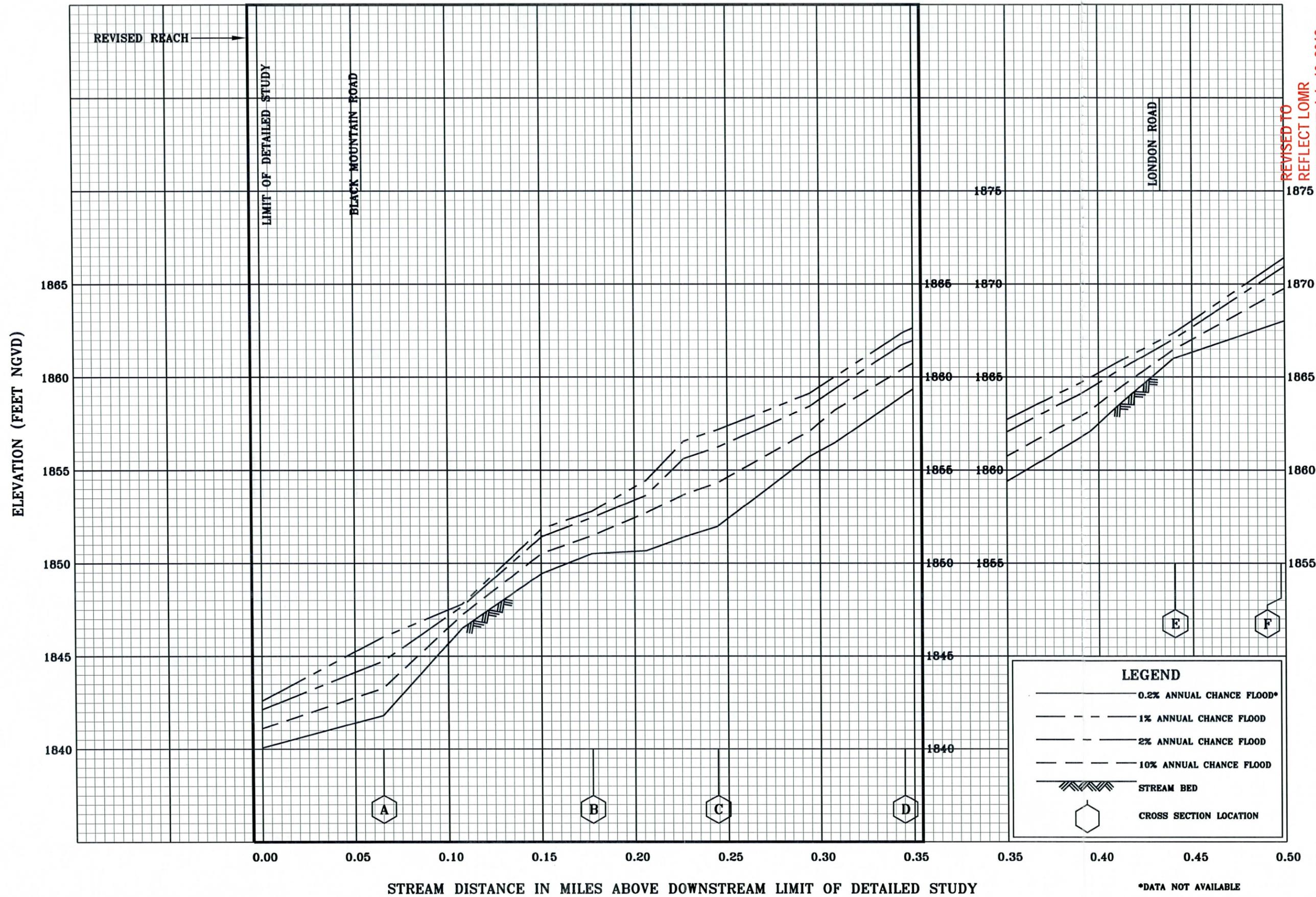
Federal Emergency Management Agency

NATIONAL FLOOD INSURANCE PROGRAM

JOINS PANEL 0679



**NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED  
WITHIN TOWNSHIP 5 NORTH, RANGE 3 WEST AND  
TOWNSHIP 6 NORTH, RANGE 3 WEST.**



REVISED TO  
REFLECT LOMR  
EFFECTIVE: July 13, 2012

FLOOD PROFILES  
CIRCLE CITY AREA - WASH 1

FEDERAL EMERGENCY MANAGEMENT AGENCY  
MARICOPA COUNTY, AZ  
AND INCORPORATED AREAS



**NATIONAL FLOOD INSURANCE PROGRAM**  
FEMA PRODUCTION AND TECHNICAL SERVICES CONTRACTOR

December 22, 2011

Mr. John Hathaway, P.E., CFM  
Project Manager  
Flood Control District of Maricopa County  
2801 West Durango Street  
Phoenix, AZ 85009

IN REPLY REFER TO:  
Case No.: 12-09-0273P  
Community: Maricopa County, AZ  
Community No.: 040037

316-AD

Dear Mr. Hathaway:

This responds to your request dated October 21, 2011, that the Department of Homeland Security's Federal Emergency Management Agency (FEMA) issue a revision to the Flood Insurance Rate Map (FIRM) for Maricopa County, Arizona and Incorporated Areas. Pertinent information about the request is listed below.

Identifier:	Circle City Wash 1 RM 0.000 to 0.344
Flooding Source:	Circle City Wash 1
FIRM Panel(s) Affected:	04013C0310 L and 04013C0328 L

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.

FEMA receives a very large volume of requests and cannot maintain inactive requests for an indefinite period of time. Therefore, we are unable to grant extensions for the submission of required data/fee for revision requests. If a requester is informed by letter that additional data are required to complete our review of a request, the data/fee **must** be submitted within 90 days of the date of the letter.

---

*LOMC Clearinghouse, 7390 Coca Cola Drive, Suite 204, Hanover, MD 21076 PH: 1-877-FEMA MAP*

BakerAECOM, under contract with the FEDERAL EMERGENCY MANAGEMENT AGENCY, is a  
Production and Technical Services Contractor for the National Flood Insurance Program

If you have general questions about your request, FEMA policy, or the National Flood Insurance Program, please call the FEMA Map Information eXchange (FMIX), toll free, at 1-877-FEMA MAP (1-877-336-2627). If you have specific questions concerning your request, please contact your case reviewer, Mr. James Lindsay, by e-mail at [JGLindsay@mbakercorp.com](mailto:JGLindsay@mbakercorp.com) or by telephone at 720-514-1122, or the Revisions Coordinator for your request, Mrs. Jaclyn Bloor, CFM, at [jbloor@mbakercorp.com](mailto:jbloor@mbakercorp.com) or at (720) 479-3160.

Sincerely,



Syed Qayum, CFM  
LOMR Technical Manager  
BakerAECOM

Enclosures

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

Mr. Ted Lehman, P.E.  
Project Engineer  
JE Fuller Hydrology and Geomorphology, Incorporation



# NATIONAL FLOOD INSURANCE PROGRAM

FEMA PRODUCTION AND TECHNICAL SERVICES CONTRACTOR

## Summary of Additional Data Required to Support a Letter of Map Revision (LOMR)

Case No.: 12-09-0273P

Requester: Mr. John Hathaway, P.E., CFM

Community: Maricopa County, AZ

Community No.: 040037

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

1. As required on page 10 of the instructions for the MT-2 application/certification forms (copy enclosed), please provide a copy of the duplicate effective model for Circle City Wash 1. This is required to ensure that the effective model's input data has been transferred correctly to the requester's equipment and to ensure that the revised data will be integrated into the effective data to provide a continuous Flood Insurance Study model upstream and downstream of the revised reach.
2. From our technical review it appears as though the base floodplain delineation is not mapped correctly at Cross Section 0.000. For example, the base flood elevation (BFE) at Cross Section 0.000, is approximately 1844.57 feet in the submitted hydraulic model, however on the submitted topographic work map entitled "Circle City Wash 1 Floodplain Work Map," prepared by JE Fuller, received in submittal dated October 21, 2011 the base floodplain is mapped to approximately 1846. Please provide an explanation for these discrepancies, or make the appropriate revisions.
3. Please provide a hydraulic analysis that ties into the currently effective information for Circle City Wash 1 and a separate hydraulic analysis that ties into the updated study for Circle City Wash 1 that is part of the ongoing countywide update for Maricopa County, Arizona and Incorporated Areas.

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

---

*LOMC Clearinghouse, 7390 Coca Cola Drive, Suite 204, Hanover, MD 21076 PH: 1-877-FEMA MAP*

BakerAECOM, under contract with the FEDERAL EMERGENCY MANAGEMENT AGENCY, is a  
Production and Technical Services Contractor for the National Flood Insurance Program

## Appendix C

### Mapping & Survey



## Appendix C.1

### Field Survey

# ELEVATION CERTIFICATE

OMB No. 1660-0008  
Expires March 31, 2012

Important: Read the instructions on pages 1-9.

## SECTION A - PROPERTY INFORMATION

A1. Building Owner's Name Sharon Dena Morris		For Insurance Company Use:
		Policy Number
A2. Building Street Address (including Apt., Unit, Suite, and/or Bldg. No.) or P.O. Route and Box No. 455 W Green Road		Company NAIC Number
City Morristown State AZ ZIP Code 85342		
A3. Property Description (Lot and Block Numbers, Tax Parcel Number, Legal Description, etc.) APN: 503-86-007X		
A4. Building Use (e.g., Residential, Non-Residential, Addition, Accessory, etc.) <u>Residential</u>		
A5. Latitude/Longitude: Lat. <u>33.8130</u> Long. <u>-112.5799</u>		Horizontal Datum: <input type="checkbox"/> NAD 1927 <input checked="" type="checkbox"/> NAD 1983
A6. Attach at least 2 photographs of the building if the Certificate is being used to obtain flood insurance.		
A7. Building Diagram Number <u>6</u>		
A8. For a building with a crawlspace or enclosure(s):		A9. For a building with an attached garage:
a) Square footage of crawlspace or enclosure(s) <u>1125</u> sq ft		a) Square footage of attached garage <u>N/A</u> sq ft
b) No. of permanent flood openings in the crawlspace or enclosure(s) within 1.0 foot above adjacent grade <u>0</u>		b) No. of permanent flood openings in the attached garage within 1.0 foot above adjacent grade _____
c) Total net area of flood openings in A8.b <u>0</u> sq in		c) Total net area of flood openings in A9.b _____ sq in
d) Engineered flood openings? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		d) Engineered flood openings? <input type="checkbox"/> Yes <input type="checkbox"/> No

## SECTION B - FLOOD INSURANCE RATE MAP (FIRM) INFORMATION

B1. NFIP Community Name & Community Number Unincorporated Maricopa County, 040037		B2. County Name Maricopa		B3. State AZ	
B4. Map/Panel Number 04013C / 0679	B5. Suffix H	B6. FIRM Index Date Sept 30, 2005	B7. FIRM Panel Effective/Revised Date 9-30-2005	B8. Flood Zone(s) AE / FW	B9. Base Flood Elevation(s) (Zone AO, use base flood depth) 1851.91
B10. Indicate the source of the Base Flood Elevation (BFE) data or base flood depth entered in Item B9. <input type="checkbox"/> FIS Profile <input type="checkbox"/> FIRM <input type="checkbox"/> Community Determined <input checked="" type="checkbox"/> Other (Describe) <u>Floodway Data FIS Vol 2.</u>					
Indicate elevation datum used for BFE in Item B9: <input checked="" type="checkbox"/> NGVD 1929 <input type="checkbox"/> NAVD 1988 <input type="checkbox"/> Other (Describe) _____					
B12. Is the building located in a Coastal Barrier Resources System (CBRS) area or Otherwise Protected Area (OPA)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Designation Date _____ <input type="checkbox"/> CBRS <input type="checkbox"/> OPA					

## SECTION C - BUILDING ELEVATION INFORMATION (SURVEY REQUIRED)

C1. Building elevations are based on:  Construction Drawings\*  Building Under Construction\*  Finished Construction  
\*A new Elevation Certificate will be required when construction of the building is complete.

C2. Elevations – Zones A1-A30, AE, AH, A (with BFE), VE, V1-V30, V (with BFE), AR, AR/A, AR/AE, AR/A1-A30, AR/AH, AR/AO. Complete Items C2.a-h below according to the building diagram specified in Item A7. Use the same datum as the BFE.  
Benchmark Utilized AZGPS VRS Network Vertical Datum NAVD 88  
Conversion/Comments -2.03 VERTCON conversion to NGVD 29 Datum

Check the measurement used.

a) Top of bottom floor (including basement, crawlspace, or enclosure floor) <u>1853.61</u>	<input checked="" type="checkbox"/> feet	<input type="checkbox"/> meters (Puerto Rico only)
b) Top of the next higher floor <u>N/A</u>	<input type="checkbox"/> feet	<input type="checkbox"/> meters (Puerto Rico only)
c) Bottom of the lowest horizontal structural member (V Zones only) <u>N/A</u>	<input type="checkbox"/> feet	<input type="checkbox"/> meters (Puerto Rico only)
d) Attached garage (top of slab) <u>N/A</u>	<input type="checkbox"/> feet	<input type="checkbox"/> meters (Puerto Rico only)
e) Lowest elevation of machinery or equipment servicing the building (Describe type of equipment and location in Comments) <u>1851.07</u>	<input checked="" type="checkbox"/> feet	<input type="checkbox"/> meters (Puerto Rico only)
f) Lowest adjacent (finished) grade next to building (LAG) <u>1850.64</u>	<input checked="" type="checkbox"/> feet	<input type="checkbox"/> meters (Puerto Rico only)
g) Highest adjacent (finished) grade next to building (HAG) <u>1850.99</u>	<input checked="" type="checkbox"/> feet	<input type="checkbox"/> meters (Puerto Rico only)
h) Lowest adjacent grade at lowest elevation of deck or stairs, including structural support <u>1850.92</u>	<input checked="" type="checkbox"/> feet	<input type="checkbox"/> meters (Puerto Rico only)

## SECTION D - SURVEYOR, ENGINEER, OR ARCHITECT CERTIFICATION

This certification is to be signed and sealed by a land surveyor, engineer, or architect authorized by law to certify elevation information. I certify that the information on this Certificate represents my best efforts to interpret the data available. I understand that any false statement may be punishable by fine or imprisonment under 18 U.S. Code, Section 1001.

Check here if comments are provided on back of form. Were latitude and longitude in Section A provided by a licensed land surveyor?  Yes  No

Certifier's Name John R. Stock, R.L.S. License Number 25087

Title Mapping & Survey Branch Manager Company Name Flood Control District of Maricopa County

Address 2801 W Durango St City Phoenix State AZ ZIP Code 85009

Signature John R. Stock Date 6/15/2011 Telephone (602)506-1501



<b>IMPORTANT: In these spaces, copy the corresponding information from Section A.</b>	For Insurance Company Use:
Building Street Address (including Apt., Unit, Suite, and/or Bldg. No.) or P.O. Route and Box No. 455 W Green Rd	Policy Number
City, Morristown State AZ ZIP Code 85342	Company NAIC Number

**SECTION D - SURVEYOR, ENGINEER, OR ARCHITECT CERTIFICATION (CONTINUED)**

Copy both sides of this Elevation Certificate for (1) community official, (2) insurance agent/company, and (3) building owner.

Comments C.2.e - Air Condition Pad

\*C.2.c - This building is not located in a V Zone. However, it is a manufactured home, so a lowest structural member elevation has been established as 1852.55 ft.

Signature \_\_\_\_\_ Date \_\_\_\_\_  Check here if attachments

**SECTION E - BUILDING ELEVATION INFORMATION (SURVEY NOT REQUIRED) FOR ZONE AO AND ZONE A (WITHOUT BFE)**

For Zones AO and A (without BFE), complete Items E1-E5. If the Certificate is intended to support a LOMA or LOMR-F request, complete Sections A, B, and C. For Items E1-E4, use natural grade, if available. Check the measurement used. In Puerto Rico only, enter meters.

- E1. Provide elevation information for the following and check the appropriate boxes to show whether the elevation is above or below the highest adjacent grade (HAG) and the lowest adjacent grade (LAG).
- a) Top of bottom floor (including basement, crawlspace, or enclosure) is \_\_\_\_\_  feet  meters  above or  below the HAG.
- b) Top of bottom floor (including basement, crawlspace, or enclosure) is \_\_\_\_\_  feet  meters  above or  below the LAG.
- E2. For Building Diagrams 6-9 with permanent flood openings provided in Section A Items 8 and/or 9 (see pages 8-9 of Instructions), the next higher floor (elevation C2.b in the diagrams) of the building is \_\_\_\_\_  feet  meters  above or  below the HAG.
- E3. Attached garage (top of slab) is \_\_\_\_\_  feet  meters  above or  below the HAG.
- E4. Top of platform of machinery and/or equipment servicing the building is \_\_\_\_\_  feet  meters  above or  below the HAG.
- E5. Zone AO only: If no flood depth number is available, is the top of the bottom floor elevated in accordance with the community's floodplain management ordinance?  Yes  No  Unknown. The local official must certify this information in Section G.

**SECTION F - PROPERTY OWNER (OR OWNER'S REPRESENTATIVE) CERTIFICATION**

The property owner or owner's authorized representative who completes Sections A, B, and E for Zone A (without a FEMA-issued or community-issued BFE) or Zone AO must sign here. *The statements in Sections A, B, and E are correct to the best of my knowledge.*

Property Owner's or Owner's Authorized Representative's Name \_\_\_\_\_

Address \_\_\_\_\_ City \_\_\_\_\_ State \_\_\_\_\_ ZIP Code \_\_\_\_\_

Signature \_\_\_\_\_ Date \_\_\_\_\_ Telephone \_\_\_\_\_

Comments \_\_\_\_\_

Check here if attachments

**SECTION G - COMMUNITY INFORMATION (OPTIONAL)**

The local official who is authorized by law or ordinance to administer the community's floodplain management ordinance can complete Sections A, B, C (or E), and G of this Elevation Certificate. Complete the applicable item(s) and sign below. Check the measurement used in Items G8 and G9.

- G1.  The information in Section C was taken from other documentation that has been signed and sealed by a licensed surveyor, engineer, or architect who is authorized by law to certify elevation information. (Indicate the source and date of the elevation data in the Comments area below.)
- G2.  A community official completed Section E for a building located in Zone A (without a FEMA-issued or community-issued BFE) or Zone AO.
- G3.  The following information (Items G4-G9) is provided for community floodplain management purposes.

G4. Permit Number _____	G5. Date Permit Issued _____	G6. Date Certificate Of Compliance/Occupancy Issued _____
-------------------------	------------------------------	---

- G7. This permit has been issued for:  New Construction  Substantial Improvement
- G8. Elevation of as-built lowest floor (including basement) of the building: \_\_\_\_\_  feet  meters (PR) Datum \_\_\_\_\_
- G9. BFE or (in Zone AO) depth of flooding at the building site: \_\_\_\_\_  feet  meters (PR) Datum \_\_\_\_\_
- G10. Community's design flood elevation \_\_\_\_\_  feet  meters (PR) Datum \_\_\_\_\_

Local Official's Name \_\_\_\_\_ Title \_\_\_\_\_

Community Name \_\_\_\_\_ Telephone \_\_\_\_\_

Signature \_\_\_\_\_ Date \_\_\_\_\_

Comments \_\_\_\_\_

Check here if attachments

# Building Photographs

See Instructions for Item A6.

Building Street Address (including Apt., Unit, Suite, and/or Bldg. No.) or P.O. Route and Box No. 455 W Green Rd	For Insurance Company Use: Policy Number
City Morristown State AZ ZIP Code 85342	Company NAIC Number
If using the Elevation Certificate to obtain NFIP flood insurance, affix at least two building photographs below according to the instructions for Item A6. Identify all photographs with: date taken; "Front View" and "Rear View"; and, if required, "Right Side View" and "Left Side View." If submitting more photographs than will fit on this page, use the Continuation Page on the reverse.	

Front View – March 3, 2011



Side View (East) – March 3, 2011



# Building Photographs

Continuation Page

Building Street Address (including Apt., Unit, Suite, and/or Bldg. No.) or P.O. Route and Box No. 455 W Green Rd	For Insurance Company Use: Policy Number
City Morrystown State AZ ZIP Code 85342	Company NAIC Number
If submitting more photographs than will fit on the preceding page, affix the additional photographs below. Identify all photographs with: date taken; "Front View" and "Rear View"; and, if required, "Right Side View" and "Left Side View."	

Rear View (From an Angle) – March 3, 2011



Side View (West) – March 3, 2011



## **Appendix C.2**

### **Topographic Mapping**

A Portion of the following reference is included in this hardcopy report.

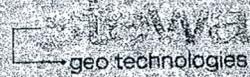
**“Mapping Services for Wittmann Area Drainage Master Plan”, FCD 2001C2**

### **Technical Data Notebook**

(The above mentioned reference document in its entirety is included in the electronic media accompanying the report)



Maricopa County



**Mapping Services for Wittmann  
Area Drainage Master Plan  
FCD 2001C2**

**Technical Data Notebook – Volume I  
Aerial Ground Control Survey Reports**

Stewart Geo Technologies  
(Formerly: Landata Airborne Systems, Inc.)  
17361 Armstrong Avenue  
Irvine, CA 92614  
949.784.4100



Maricopa County

Stewart of  
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## EXECUTIVE SUMMARY

This report documents the results of surveys near Surprise, Arizona in 2002. The intent of these surveys is to support two- and four-foot contour interval mapping for the Flood Control District of Maricopa County (FCDMC).

This report is organized into two volumes. The first volume details results of the ground control survey. The second volume gives results of the airborne GPS and aerotriangulation. This document can be read with either Adobe Acrobat<sup>®</sup> or Adobe Acrobat Reader<sup>®</sup>. A hardcopy version of this report is also on file with FCDMC.



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Maricopa County



**VOLUME II. AIRBORNE GPS AND AEROTRIANGULATION TECHNICAL DATA  
NOTEBOOK**

- Section A**      Surveyor's certification
- Section B**      Airborne GPS report
- Section C**      Aerotriangulation report



Maricopa County

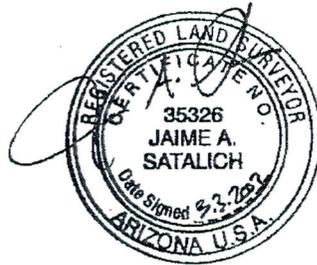


## VOLUME I. PHOTOGRAMMETRIC CONTROL SURVEY TECHNICAL DATA NOTEBOOK

### Section A. Surveyor's certification

The following report represents a survey made by me or under my direction in the County of Maricopa, State of Arizona. I, Jaime A. Satalich, an Arizona registered land surveyor (N<sup>o</sup>. 35326, expires 9/30/2003), hereby certify the following results of my survey in and around the vicinity of Surprise, Arizona.

The intent of this survey is to provide photogrammetric ground control using GPS methods in and around the town of Surprise, Arizona. This densification survey is based upon NAD 83 (1992 epoch) and NAVD 88 control values published by the National Geodetic Survey. Horizontal positions are expressed in the Arizona Coordinate System, 1983, Central Zone. Results of the constrained NAD 83 (1992 epoch) network adjustments give horizontal uncertainties for stations in these networks of better than  $\pm 0.07'$  ( $2\sigma$ ) in position, and vertical uncertainties for stations in this network of better than  $\pm 0.06'$  ( $2\sigma$ ) in height.





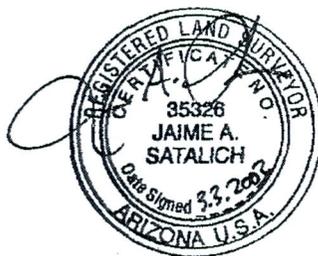
## VOLUME II. AIRBORNE GPS AND AEROTRIANGULATION TECHNICAL DATA NOTEBOOK

### Section A. Surveyor's certification

The following report represents a survey made by me or under my direction in the County of Maricopa, State of Arizona. I, Jaime A. Satalich, an Arizona registered land surveyor (N<sup>o</sup>. 35326, expires 9/30/2003), hereby certify the following results of my survey near Surprise, Arizona.

The intent of this survey is to densify photogrammetric ground control using airborne GPS and aerotriangulation methods near the town of Surprise, Arizona. This densification survey is based upon NAD 83 (1992 epoch) and NAVD 88 control values published by the National Geodetic Survey. Horizontal positions are expressed in the Arizona Coordinate System, 1983, Central Zone.

Results of the airborne GPS positions give horizontal uncertainties (*a priori*) for the airborne GPS stations of better than  $\pm 0.21'$  ( $1\sigma$ ) and vertical uncertainties (*a priori*) for stations of better than  $\pm 0.35'$  ( $1\sigma$ ) in height. All airborne GPS was processed using GrafNav<sup>®</sup> V. 6.03. Results of the aerotriangulation adjustment indicate the following statistics for this project. The aerotriangulation adjustment indicates that the maximum residuals at the ground control stations are: x (easting) =  $+0.42'$ , y (northing) =  $+0.03'$ , and z (elevation) =  $-0.26'$ . Results of the aerotriangulation adjustment indicates that the maximum residuals for object coordinates (pass points) are: x =  $+0.51'$ , y =  $+0.48'$ , and z =  $+0.75'$ . The RMS fit for all object coordinates are: x =  $\pm 0.10'$ , y =  $\pm 0.10'$ , and z =  $\pm 0.19'$ . The RMS fit (*a posteriori*) of all airborne GPS stations are: x =  $\pm 0.33'$ , y =  $\pm 0.23'$ , and z =  $\pm 0.31'$ . All aerotriangulation was performed using ORIMA-SOCET-TE/GPS<sup>®</sup> V. 4.06.





## Section B. Narrative

### Introduction

This report describes the results of a survey using Global Positioning System (GPS) surveying techniques near Surprise, County of Maricopa, State of Arizona. The intent of this survey is to provide photogrammetric ground control.

The listing of final coordinate values is shown in Section D of this report. Diagram showing the GPS control networks is shown in Section C. The narrative you are now reading is Section B of this report.

### Geodetic Control

One of the requirements of this contract is to make all ties through the Geodetic Densification and Cadastral Survey (GDACS) network established by Maricopa County. The bases of this system are geodetic values published by the National Geodetic Survey (NGS) in NAD 83 (1992 epoch) and NAVD 88. For this project, horizontal positions are expressed in the Arizona Coordinate System, NAD 83, Central Zone. NGS control stations shown as the basis for this survey are shown in Section E of this report.

### Field Observations

RBF Consulting, Phoenix, Arizona, made GPS observations in April and May 2002. The survey consisted of fast-static and real-time kinematic (RTK) observations. The survey used Trimble 4700 (with compact L<sub>1</sub>/L<sub>2</sub> geodetic antennae) and 4800 receivers. These receivers are dual-frequency (L<sub>1</sub>/L<sub>2</sub>), full-wavelength, P-code receivers. These receivers are capable of tracking at least ten satellites simultaneously on both frequencies. GPS receivers logged data at a five-second epoch rate. All stations in the final network adjustments were occupied on two separate occupation sessions. Fixed-height tripods were used at all setups.

### GPS Baseline Reduction

*Reduction methodology.* Raw GPS data was processed using Trimble Geomatics Office<sup>®</sup>, which is manufactured by Trimble Navigation, Ltd. Only the independent baselines from each session were computed and included in the network adjustments.

All data was reduced using broadcast orbits and a modified Hopfield tropospheric model. No zenith delay parameters were estimated for these reductions. Baselines were initially reduced using a 15-degree elevation mask. If an acceptable solution was not calculated, the elevations mask was raised to either 20- or 25-degrees, and the baseline was re-calculated. All NAVSTAR satellites in view were used except those that exhibited large ranging errors. Those satellites exhibiting "noisy" data were removed for the baseline processing. All remaining baselines achieved fixed integer solutions.

*Problems encountered.* Only one significant problem occurred during the field survey. One GDACS station that was intended to be used during the survey was FRIA RM 4. The field surveyor blundered and misoccupied the mark, and instead occupied the nearby primary triangulation station (FRIA). This



blunder was discovered when Stewart Geo Technologies (SGT) did its analysis of the network adjustments for the McMicken Dam priority area. As the mapping for the McMicken Dam area was of very high priority for FCDMC, SGT chose to not send RBF Consulting back to reoccupy FRIA RM 4 and its adjacent connecting stations, as it would have delayed the much needed mapping at the dam.

The impact of this blunder on the mapping accuracy for this project is negligible. However, it should be said that stations in the vicinity of the blunder, especially station FRIA, are poorly connected to the GDACS network compared to other stations in the network. Future users of this data should keep this in mind, and are recommended to prove all the control values in the immediate vicinity of station FRIA.

### Network Adjustments

*Adjustment methodology.* STAR\*NET PRO<sup>®</sup> (version 6.0.23e) was used for all network adjustments. STAR\*NET PRO<sup>®</sup>, produced by Starplus Software, is a least-squares package capable of adjusting both terrestrial and GPS observations. GPS vector files produced by Trimble Geomatics Office<sup>®</sup> were imported into STAR\*NET PRO<sup>®</sup>. The vector files contain dx, dy, and dz values in an Earth-centered, Cartesian coordinate system. The vector files also contain *a priori* covariance information regarding the statistical characteristics of the GPS baselines. Often times, vector covariances need to be scaled because the weights are too optimistic. In the case of the network of McMicken Dam priority area, the *a priori* vector covariances were scaled by a factor of 4.50 to bring the network observations into statistical unity. For the Wittmann area main network, the *a priori* vector covariances were scaled by a factor of 7.84 to bring the network observations into statistical unity. During the network adjustments, antenna height and centering errors were assigned a global standard error ( $1\sigma$ ) of  $\pm 1$  mm ( $\pm 0.003'$ ).

Geoid heights were derived from the GEOID99 geoid height model published by the National Geodetic Survey (NGS). GEOID99 is the most recent geoid height model published by NGS. No transformations were applied to the GEOID99 geoid heights. Various network adjustments were solved separately as they use distinctly different mathematical models to account for scale and rotation parameters. A summary of the network parameters and adjustment statistics is shown in Appendix I of the narrative (Section B).

The entire Wittmann ADMP project was adjusted in two parts. The portion of the network near McMicken Dam was adjusted before the remainder of the network. This was done to accommodate the needs of FCDMC to "fast track" mapping near McMicken Dam. As a result, two sets of network adjustments were performed and are documented in this report.

*Minimally constrained adjustment – McMicken Dam priority area network.* After demonstrating that the network vectors are free of blunders, it is customary to perform a minimally constrained (also known as "free" or internal) least-squares network adjustment. This ensures that the network closes upon itself. In the minimally constrained network adjustment, one station is constrained in latitude, longitude and ellipsoid height. In the case of the McMicken dam priority area network, GDACS station 4DD1 was constrained by its published latitude, longitude, and height. The variance of unit weight for the minimally constrained adjustment is 1.00.

According to the minimally constrained network adjustment for the McMicken Dam priority area, the positional uncertainty of all stations is better than  $\pm 0.05'$  ( $2\sigma$ ) in horizontal position, and better than  $\pm 0.06'$  ( $2\sigma$ ) in vertical position. All stations conform to a relative horizontal precision of better than 6 ppm (1:166,000). Results of the minimally constrained adjustment for the McMicken Dam priority area are shown in Section I.



*Constrained NAD 83 (1992 epoch) adjustment – McMicken Dam priority area network.* A constrained least-squares network adjustment determines the proper scale and rotation parameters for the GPS vectors to make them conform to the local control. The network constrained five nearby GDACS control stations in latitude, longitude, and ellipsoid height. This is known as external network adjustment, and determines the accuracy of the GPS control network. After solving for scale and rotations, the variance of unit weight for the constrained NAD 83 (1992 epoch) horizontal network adjustment is 1.12. A variance factor between 1.0 and 1.5 in a constrained network adjustment indicates that the observations check with the local control. In the case of the McMicken dam priority area network, it means that the GPS network agrees substantially with the local horizontal control, and that neither is being influenced by systematic effects.

According to the constrained horizontal network adjustment for the McMicken Dam priority area, the positional uncertainty of all stations is better than  $\pm 0.05'$  ( $2\sigma$ ) in horizontal position. All stations conform to a relative horizontal precision of 7 ppm (1:143,000) or better. Results of the constrained horizontal network adjustment for the McMicken Dam priority area are shown in Section J.

*Constrained NAVD 88 adjustment – McMicken Dam priority area network.* This network constrained the five previous GDACS control stations – five by their published NAVD 88 orthometric heights and two by their published NAD 83 (1992 epoch) positions. In the classical sense, this adjustment solves for rotations along the north and east axes, and for scale. No rotations were solved along the north axis, as it would have over-parameterized the solution. The geoid slope is absorbed the two rotation angles, while the geoid heights are absorbed by the scale correction. The variance factor for the constrained NAVD 88 network adjustment for the McMicken Dam priority area is 1.03, showing substantial agreement with the published GDACS control. The maximum vertical uncertainty for any station in the network is better than  $\pm 0.05'$ . Results of the vertical network adjustment for the McMicken Dam priority area are shown in Section K.

*Special constrained NAD 83 (1992 epoch) adjustment using station FRIA – McMicken Dam priority area network.* This network adjustment constrained station FRIA by its published NGS' NAD 83 position. Please note that station FRIA RM 4 is the GDACS station, and is located approximately 11.8 meters (39 feet) away from station FRIA. After solving for scale and rotations, the variance of unit weight for the special constrained NAD 83 (1992 epoch) horizontal network adjustment is 4.86. This indicates that either the control or the network is being influenced by some sort of systematic effect. In all likelihood, this systematic effect is a result of a highly precise network (GPS) being constrained to control (second-order classical triangulation) of lesser accuracy.

According to the constrained horizontal network adjustment for the McMicken Dam priority area, the positional uncertainty of all stations is better than  $\pm 0.18'$  ( $2\sigma$ ) in horizontal position. All stations conform to a relative horizontal precision of 28 ppm (1:35,000) or better. It should be noted that inverting between the published NGS (Section L) value and the value from the constrained NAD 83 adjustment (Section J) gives a difference of approximately 0.19' at station FRIA. Results of the special constrained horizontal network adjustment for the McMicken Dam priority area are shown in Section L.



*Minimally constrained adjustment – Wittmann main area network.* In this adjustment, GDACS station Q 366 was constrained by its published latitude, longitude, and height. The variance of unit weight for the minimally constrained adjustment is 1.00.

According to the minimally constrained network adjustment for the Wittmann main area network, the positional uncertainty of all stations is better than  $\pm 0.11'$  ( $2\sigma$ ) in horizontal position, and better than  $\pm 0.15'$  ( $2\sigma$ ) in vertical position. All stations conform to a relative horizontal precision of better than 10 ppm (1:100,000). Results of the minimally constrained adjustment for the Wittmann main area network are shown in Section M.

*Constrained NAD 83 (1992 epoch) adjustment – Wittmann main area network.* Twenty-five stations were constrained in this adjustment for the main area network. These stations consist of published GDACS stations and ties from the McMicken Dam network. After solving for scale and rotations, the variance of unit weight for the constrained NAD 83 (1992 epoch) horizontal network adjustment is 1.35. This means that the GPS network agrees substantially with the local horizontal control, and that neither is being influenced by systematic effects.

According to the constrained horizontal network adjustment for the Wittmann main area network, the positional uncertainty of all stations is better than  $\pm 0.03'$  ( $2\sigma$ ) in horizontal position. All stations conform to a relative horizontal precision of 13 ppm (1:76,000) or better. Results of the constrained horizontal network adjustment for the Wittmann main area network are shown in Section N.

*Constrained NAVD 88 adjustment – Wittmann main area network.* Twenty-five stations were constrained vertically in this adjustment for the main area network. Two stations were constrained in horizontal position. These stations consist of published GDACS stations and ties from the McMicken Dam network. After solving for scale and rotations, the variance of unit weight for the constrained NAVD 88 vertical network adjustment is 1.08. This means that the GPS network agrees substantially with the local horizontal control, and that neither is being influenced by systematic effects.

According to the constrained vertical network adjustment for the Wittmann main area network, the positional uncertainty of all stations is better than  $\pm 0.06'$  ( $2\sigma$ ) in vertical position. Results of the constrained vertical network adjustment for the Wittmann main area network are shown in Section O.

## **Discussion and Conclusion**

*Conclusion.* The methodology and procedures of the GPS survey are presented in this report. NAD 83 (1992 epoch) and NAVD 88 values are estimated for control stations at the project site. All geodetic control originates from the NGS and GDACS networks. Control stations were surveyed with tolerance to support the photogrammetric mapping, and achieve what was requested per the scope of work.



**Appendix I. Network parameters and adjustment statistics.**

**Minimally constrained adjustment – McMicken Dam priority area network**

Number of stations: 21  
Number of GPS vector observations: 44  
Variance factor: 1.00

**Constrained NAD 83 (1992 epoch) adjustment – McMicken Dam priority area network**

Number of stations: 21  
Number of GPS vector observations: 44  
Variance factor: 1.12  
Scale (ppm): +0.441 ( $\pm 0.068$ )  
North rotation: -0.413 ( $\pm 0.174$ )  
East rotation: -0.380 ( $\pm 0.068$ )  
Up rotation: -0.116 ( $\pm 0.015$ )

**Constrained NAVD 88 adjustment – McMicken Dam priority area network**

Number of stations: 21  
Number of GPS vector observations: 44  
Variance factor: 1.03  
Scale (ppm): +0.583 ( $\pm 0.151$ )  
East rotation: -0.162 ( $\pm 0.043$ )

**Special constrained NAD 83 (1992 epoch) FRIA adjustment – McMicken Dam priority area network**

Number of stations: 21  
Number of GPS vectors: 44  
Variance factor: 4.86  
Scale (ppm): +2.447 ( $\pm 0.056$ )  
North rotation: -0.806 ( $\pm 0.174$ )  
East rotation: -0.286 ( $\pm 0.068$ )  
Up rotation: +0.120 ( $\pm 0.112$ )

**Minimally constrained adjustment – Wittmann main area network**

Number of stations: 48  
Number of GPS vectors: 120  
Variance factor: 1.00

**Constrained NAD 83 (1992 epoch) adjustment – Wittmann main area network**

Number of stations: 48  
Number of GPS vectors: 120  
Variance factors: 1.35  
Scale (ppm): +0.635 ( $\pm 0.089$ )  
North rotation: +0.135 ( $\pm 0.082$ )  
East rotation: +0.121 ( $\pm 0.081$ )  
Up rotation: -0.019 ( $\pm 0.018$ )



Maricopa County



**Constrained NAVD 88 adjustment – Wittmann main area network**

Number of stations: 48  
Number of GPS vectors: 120  
Variance factors: 1.08  
Scale (ppm): +0.481 ( $\pm 0.255$ )  
North rotation: +0.156 ( $\pm 0.082$ )



Maricopa County



### Section C. Network Diagrams

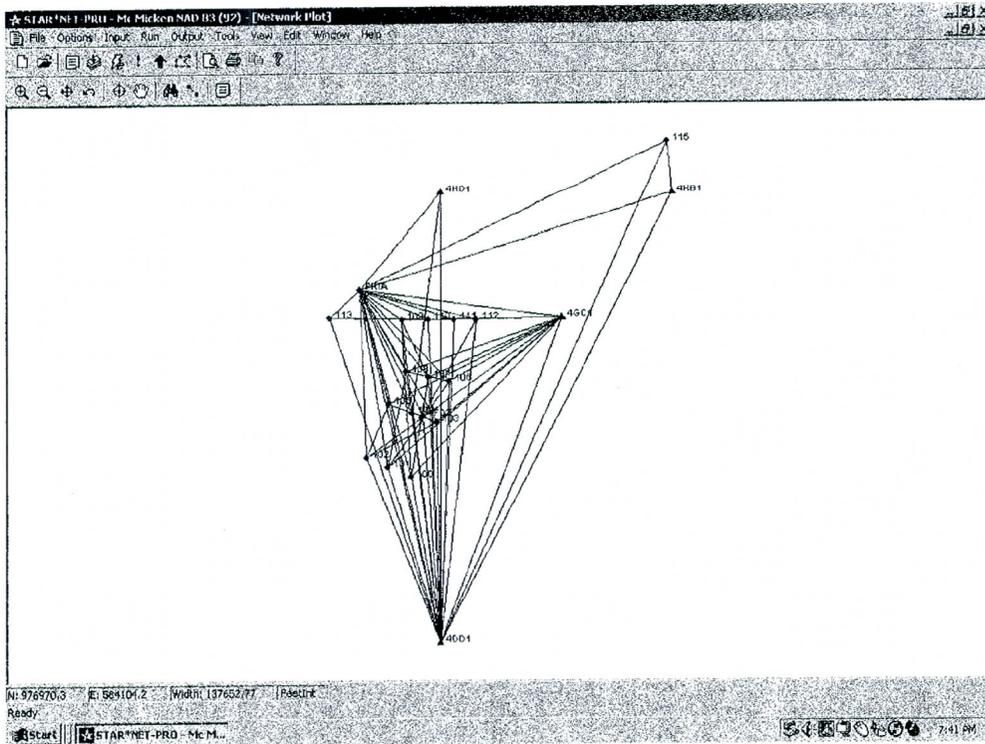


Figure 1. McMicken Dam priority area network.

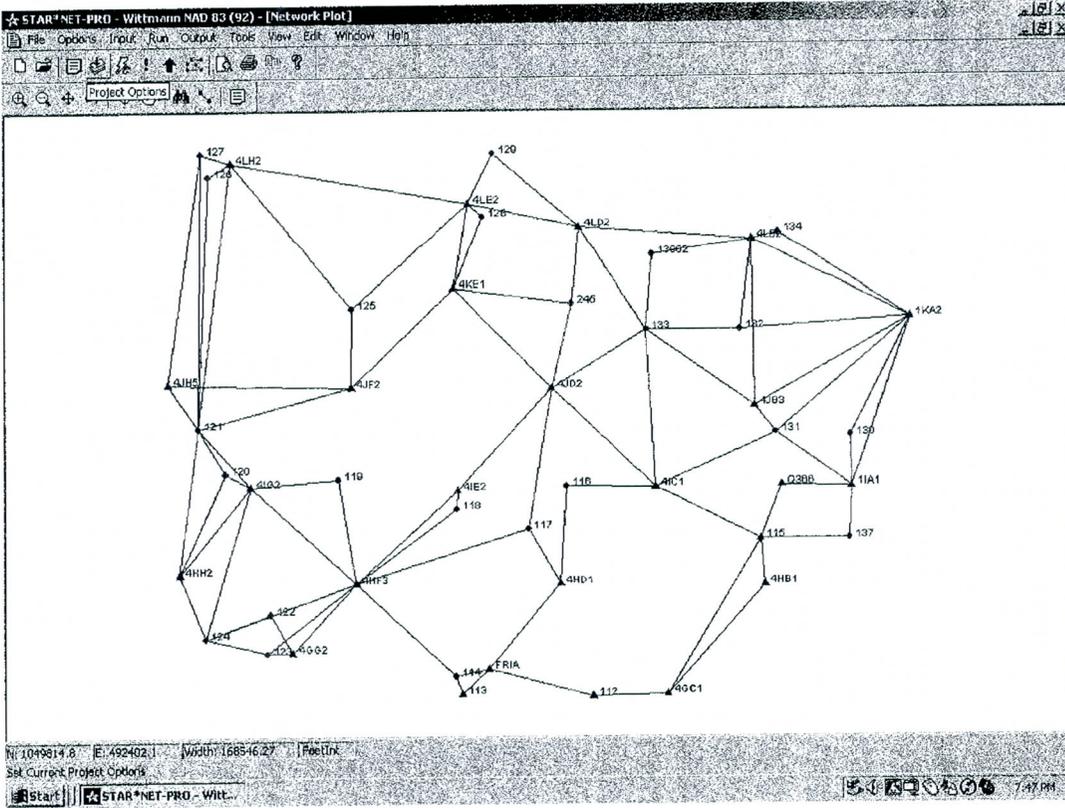


Figure 2. Wittmann main network.

Stewart Geo Technologies  
 Mapping Services for Wittmann Area Drainage Master Plan  
 FCD 2001C2  
 Photogrammetric Control Survey

Horizontal Datum: NAD 83 (1992.0 epoch) through the Arizona Coordinate System, 1983, Central Zone  
 Vertical Datum: NAVD 88

Station	Northing (International feet)	Eastings (International feet)	Monument Height	Offset (Monument - target)	Target Height
112	958452.95	540017.53	1298.7	0.0	1298.7
113	958771.77	519399.45	2085.6	0.3	2085.4
114	961584.60	518397.88	1623.0	0.0	1623.0
115	983293.34	566541.40	1312.6	0.0	1312.6
116	991625.23	535919.41	1467.0	0.0	1467.0
117	984909.98	529823.85	1448.1	0.0	1448.1
118	988037.14	518493.23	1508.5	0.0	1508.5
119	992775.57	499833.43	1602.2	0.0	1602.2
120	993862.06	481975.74	1662.3	0.0	1662.3
121	1001096.55	477657.41	1721.2	0.0	1721.2
122	971553.57	489029.78	1634.1	0.0	1634.1
123	965298.79	488635.07	1726.7	-0.2	1726.9
124	967649.58	478768.44	1570.8	0.0	1570.8
125	1020021.48	501917.84	1812.2	0.0	1812.2
126	1041045.78	479267.70	1920.9	0.4	1920.5
127	1044665.88	478219.15	1927.4	0.3	1927.1
128	1034421.42	522605.87	1984.2	0.0	1984.2
129	1044524.04	524245.03	2250.2	0.4	2249.9
130	999511.61	580740.42	1401.0	0.0	1401.0
131	1000152.61	569029.80	1417.4	0.0	1417.4
132	1016603.31	563353.50	1672.3	0.0	1672.3
133	1016629.80	548496.90	1694.4	0.0	1694.4
134	1031804.93	569399.38	1810.0	0.0	1810.0
137	983160.82	580696.32	1256.7	0.0	1256.7
245	1020767.91	536631.22	1773.8	0.0	1773.8
13002	1028338.01	549457.24	1844.5	-0.1	1844.6
11A1	991544.68	580918.50	1331.2	0.0	1331.2
1KA2	1018369.36	590177.69	1384.1	0.0	1384.1
4GC1	958797.24	551879.89	1252.6	0.0	1252.6
4GG2	965445.28	492570.59	1717.0	0.0	1717.0
4HB1	976019.96	567292.45	1275.9	0.0	1275.9
4HD1	976209.66	534920.55	1393.3	0.0	1393.3
4HF3	976278.72	502692.98	1526.7	0.0	1526.7
4HH2	977709.67	474786.89	1566.6	0.0	1566.6
4IC1	991524.65	549957.22	1423.8	0.0	1423.8
4IE2	990979.76	518661.71	1521.9	0.0	1521.9
4IG2	991657.06	485912.23	1642.6	0.0	1642.6
4JB3	1004387.52	565531.68	1476.4	0.0	1476.4
4JD2	1007321.92	533522.21	1612.5	0.0	1612.5
4JF2	1007550.88	501878.58	1679.9	-0.3	1680.2
4JH5	1008155.84	472945.54	1707.5	0.0	1707.5
4KE1	1023250.03	517954.29	1819.4	0.0	1819.4
4LB2	1030809.02	565182.33	1855.3	0.0	1855.3
4LD2	1032767.38	537779.69	1998.7	0.0	1998.7
4LE2	1036581.86	520311.62	2020.2	0.0	2020.2
4LH2	1043247.57	482867.08	1978.8	0.0	1978.8
FRI4	962716.15	523586.96	1593.8	0.0	1593.8
Q366	991733.77	569967.03	1392.5	0.0	1392.5



## Appendix D

### Supporting Documentation for Hydrology

**Table 3. Summary of Discharges (Continued)**

<u>Flooding Source and Location</u>	<u>Drainage Area (Square Miles)</u>	<u>Peak Discharges (cfs)</u>			
		<u>10-Year</u>	<u>50-Year</u>	<u>100-Year</u>	<u>500-Year</u>
<b>Circle City Area Wash 1</b>					
At Black Mountain Road	0.26	33	159	276	-- <sup>1</sup>
Upstream of AT&SFRR	0.13	19	53	76	-- <sup>1</sup>
<b>Circle City Area Wash 2</b>					
At confluence with Circle City Area Wash 1	0.26	37	158	276	-- <sup>1</sup>
Upstream of AT&SFRR	0.13	19	53	72	-- <sup>1</sup>
<b>Circle City Area Wash 2 Along Atchison Topeka &amp; Santa Fe Railway</b>					
Upstream of confluence with Circle City Area Wash 2 (area not computed because of overflow from Circle City Area Wash 3)	-- <sup>1</sup>	-- <sup>1</sup>	105	200	-- <sup>1</sup>
<b>Circle City Area Wash 3</b>					
Black Mountain Road	2.07	304	490	545	-- <sup>1</sup>
At confluence with Circle City Area Wash 6	1.35	181	286	330	-- <sup>1</sup>
At confluence with Circle City Area Wash 4 (flows decrease due to storage behind AT&SFRR)	1.19	136	201	205	-- <sup>1</sup>
Upstream of railroad	0.70	139	320	422	-- <sup>1</sup>
<b>Circle City Area Wash 4</b>					
At confluence with Circle City Area Wash 3 (flows decrease due to storage behind AT&SFRR)	0.16	51	85	125	-- <sup>1</sup>
Downstream of Grand Avenue (U.S. Highway 89 (flows decrease due to storage behind AT&SFRR)	0.14	41	65	78	-- <sup>1</sup>
-- <sup>1</sup> Not Computed					



## Appendix E

### Supporting Documentation for Hydraulic Analysis

**Project:** FCDMC 2011C002  
**Stream:** Circle City Wash 1  
**Location:** Maricopa County, Arizona

Typical Photo of Reach



Channel Conditions		Manning's n Adjustment		n Value
Channel Material	Concrete	n <sub>b</sub>	0.012-0.018	0.03
	Firm Soil		0.025-0.032	
	Coarse Sand		0.026-0.035	
	Gravel		0.028-0.035	
	Cobble		0.030-0.050	
	Boulder		0.040-0.070	
Degree of Irregularity	Smooth	n <sub>1</sub>	0.000	
	Minor		0.001-0.005	
	Moderate		0.006-0.010	
	Severe		0.011-0.020	
Effects of Obstruction	Negligible	n <sub>2</sub>	0.000-0.004	
	Minor		0.005-0.015	
	Appreciable		0.020-0.030	
	Severe		0.040-0.060	
Vegetation	Small	n <sub>3</sub>	0.002-0.010	0.02
	Medium		0.010-0.025	
	Large		0.025-0.050	
	Very Large		0.050-0.100	
Variations in Channel Cross Section	Gradual	n <sub>4</sub>	0.000	
	Occ. Alt.		0.001-0.005	
	Frequently Alt.		0.010-0.015	
Intermediate Sum				0.05
Degree of Meandering	Minor	m	1	1
	Appreciable		1.15	
	Severe		1.3	
$n=(n_b+n_1+n_2+n_3+n_4)m$				<b>0.050</b>

**Project:** FCDMC 2011C002  
**Stream:** Circle City Wash 1  
**Location:** Maricopa County, Arizona

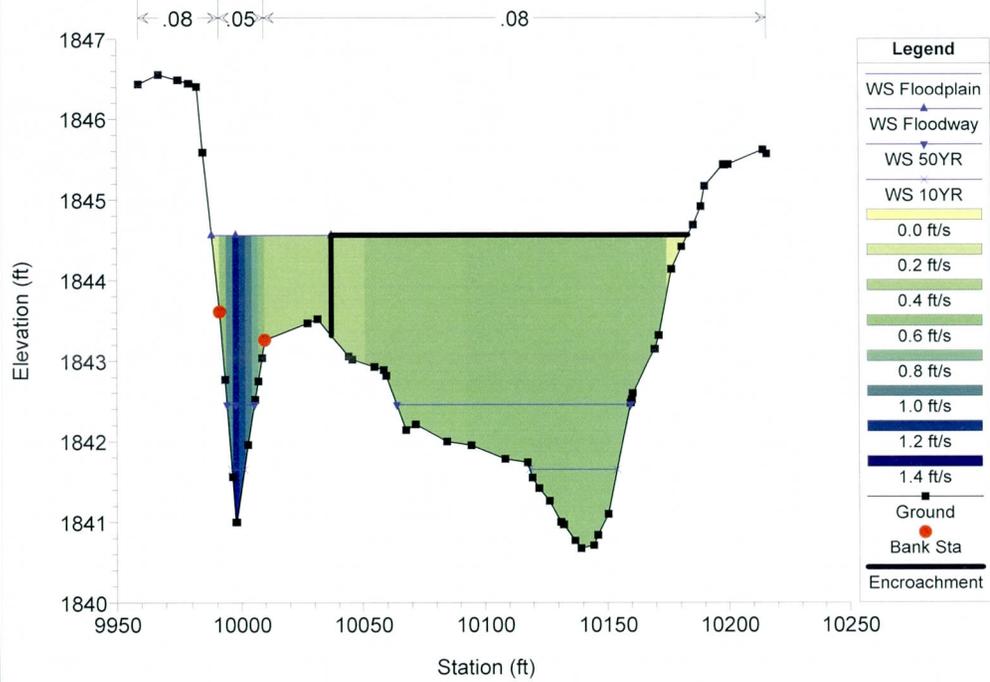
Typical Photo of Reach



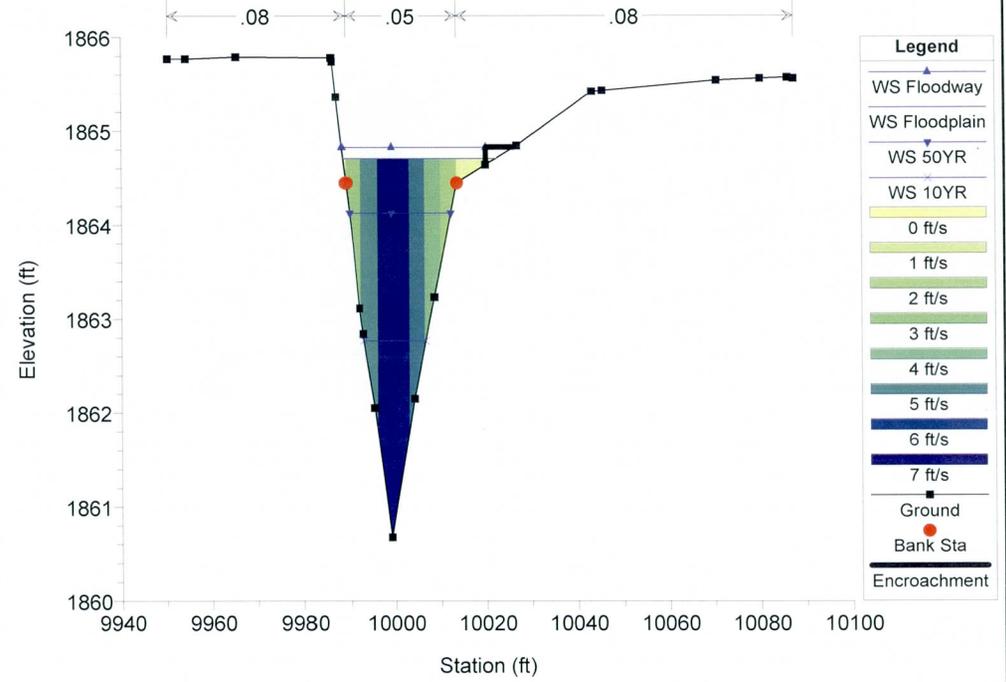
Channel Conditions		Manning's n Adjustment		n Value
Channel Material	Concrete	n <sub>b</sub>	0.012-0.018	0.03
	Firm Soil		0.025-0.032	
	Coarse Sand		0.026-0.035	
	Gravel		0.028-0.035	
	Cobble		0.030-0.050	
	Boulder		0.040-0.070	
Degree of Irregularity	Smooth	n <sub>1</sub>	0.000	
	Minor		0.001-0.005	
	Moderate		0.006-0.010	
	Severe		0.011-0.020	
Effects of Obstruction	Negligible	n <sub>2</sub>	0.000-0.004	
	Minor		0.005-0.015	
	Appreciable		0.020-0.030	
	Severe		0.040-0.060	
Vegetation	Small	n <sub>3</sub>	0.002-0.010	0.05
	Medium		0.010-0.025	
	Large		0.025-0.050	
	Very Large		0.050-0.100	
Variations in Channel Cross Section	Gradual	n <sub>4</sub>	0.000	
	Occ. Alt.		0.001-0.005	
	Frequently Alt.		0.010-0.015	
Intermediate Sum				0.08
Degree of Meandering	Minor	m	1	1
	Appreciable		1.15	
	Severe		1.3	
$n=(n_b+n_1+n_2+n_3+n_4)m$				<b>0.080</b>

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Morris	0.34	Floodplain	276	1860.68	1864.71	1864.1	1865.15	0.012345	5.3	53.21	33.79	0.64
Morris	0.34	Floodway	276	1860.68	1864.83	1864.11	1865.21	0.010288	5.01	56.77	31.66	0.59
Morris	0.34	50YR	159	1860.68	1864.13	1863.44	1864.4	0.010257	4.16	38.19	22.4	0.56
Morris	0.34	10YR	33	1860.68	1862.77	1862.16	1862.86	0.006932	2.42	13.65	13.49	0.42
Morris	0.289	Floodplain	276	1857.73	1861.11	1860.78	1861.63	0.014172	5.88	56.59	54.54	0.7
Morris	0.289	Floodway	276	1857.73	1861.13	1860.7	1861.71	0.017181	6.11	45.14	20.28	0.72
Morris	0.289	50YR	159	1857.73	1860.42	1860.15	1860.83	0.018118	5.17	31.77	27.32	0.74
Morris	0.289	10YR	33	1857.73	1859.09	1859.03	1859.36	0.033668	4.14	7.97	11.7	0.88
Morris	0.24	Floodplain	276	1853.96	1859.15	1857.69	1859.4	0.005366	4.05	70.3	37.53	0.43
Morris	0.24	Floodway	276	1853.96	1859.29	1857.7	1859.52	0.004608	3.86	71.52	24.98	0.4
Morris	0.24	50YR	159	1853.96	1858.21	1856.95	1858.4	0.005441	3.47	45.84	21.37	0.42
Morris	0.24	10YR	33	1853.96	1856.3	1855.56	1856.39	0.005507	2.34	14.1	11.98	0.38
Morris	0.223	Floodplain	276	1853.4	1858.54	1857.28	1858.85	0.006907	4.47	61.86	42.06	0.48
Morris	0.223	Floodway	276	1853.4	1858.83	1857.28	1859.08	0.005117	4.02	68.62	23.28	0.41
Morris	0.223	50YR	159	1853.4	1857.61	1856.51	1857.84	0.007004	3.84	41.39	19.76	0.47
Morris	0.223	10YR	33	1853.4	1855.69	1855.05	1855.8	0.0078	2.7	12.2	10.68	0.45
Morris	0.204	Floodplain	276	1852.67	1856.45	1856.45	1857.56	0.025056	8.76	37.25	20.53	0.94
Morris	0.204	Floodway	276	1852.67	1856.47	1856.47	1857.84	0.040586	9.39	29.4	10.73	1
Morris	0.204	50YR	159	1852.67	1855.65	1855.65	1856.49	0.028772	7.46	23.13	15.66	0.95
Morris	0.204	10YR	33	1852.67	1854.7	1854.26	1854.85	0.011247	3.13	10.61	10.56	0.54
Morris	0.175	Floodplain	276	1852.51	1854.87	1854.33	1854.96	0.003956	2.9	156.76	135.89	0.37
Morris	0.175	Floodway	276	1852.51	1855.4	1854.34	1855.63	0.005767	3.85	71.71	28.97	0.43
Morris	0.175	50YR	159	1852.51	1854.48	1853.9	1854.55	0.003864	2.46	104.49	131.08	0.35
Morris	0.175	10YR	33	1852.51	1853.49	1853.1	1853.54	0.006632	1.91	17.31	35.97	0.4
Morris	0.149	Floodplain	276	1851.46	1853.63	1853.63	1853.99	0.016434	5.22	81.06	182.63	0.72
Morris	0.149	Floodway	276	1851.46	1853.78	1853.49	1854.29	0.01902	5.76	47.9	27.05	0.76
Morris	0.149	50YR	159	1851.46	1853.3	1853	1853.6	0.016137	4.44	41.93	138.78	0.69
Morris	0.149	10YR	33	1851.46	1852.51	1852.15	1852.58	0.007535	2.09	15.76	24.16	0.43
Morris	0.107	Floodplain	276	1848.51	1850.2	1849.8	1850.32	0.011218	3.33	117.02	127	0.56
Morris	0.107	Floodway	276	1848.51	1850.7	1850.23	1850.98	0.011453	4.19	65.84	41.4	0.59
Morris	0.107	50YR	159	1848.51	1849.84	1849.69	1849.94	0.015562	2.99	72.86	116.31	0.62
Morris	0.107	10YR	33	1848.51	1849.28	1849.23	1849.44	0.034736	3.16	10.46	59.94	0.85
Morris	0.065	Floodplain	276	1843.81	1846.77	1846.4	1847.31	0.017085	6.37	52.48	34.39	0.76
Morris	0.065	Floodway	276	1843.81	1846.9	1846.6	1847.67	0.019835	7.13	41.07	18.19	0.82
Morris	0.065	50YR	159	1843.81	1846.17	1845.83	1846.54	0.015571	5.19	36.39	25.95	0.7
Morris	0.065	10YR	33	1843.81	1845.07	1844.81	1845.19	0.012166	2.92	12.44	17.9	0.55
Morris	0.052	Floodplain	276	1843.32	1846.09	1845.53	1846.42	0.00949	5.24	79.93	58.92	0.59
Morris	0.052	Floodway	276	1843.32	1846.37	1845.56	1846.73	0.008179	5.23	67.85	33.15	0.56
Morris	0.052	50YR	159	1843.32	1845.58	1845.03	1845.79	0.007651	4.03	54.5	43.22	0.51
Morris	0.052	10YR	33	1843.32	1844.53	1844.15	1844.6	0.00628	2.19	17.22	26.26	0.41
Morris	0.045	Floodplain	276	1842.86	1845.4	1845.4	1845.91	0.020024	7.03	69.19	65.39	0.84
Morris	0.045	Floodway	276	1842.86	1846.26	1845.41	1846.45	0.005077	4.41	99.61	46.4	0.45
Morris	0.045	50YR	159	1842.86	1845.14	1844.98	1845.43	0.012286	5.06	53.18	59.43	0.64
Morris	0.045	10YR	33	1842.86	1844.18	1843.85	1844.31	0.010171	2.92	12.37	18.31	0.52
Morris	0	Floodplain	276	1841	1844.57	1842.24	1844.58	0.000376	1	426.44	195.11	0.11
Morris	0	Floodway	276	1841	1844.57	1844.09	1844.87	0.008826	4.85	77.68	49.03	0.55
Morris	0	50YR	159	1841	1842.46	1841.93	1842.52	0.011415	2.53	87.37	107.05	0.52
Morris	0	10YR	33	1841	1841.66	1841.27	1841.69	0.011406	1.54	23.25	40.87	0.46

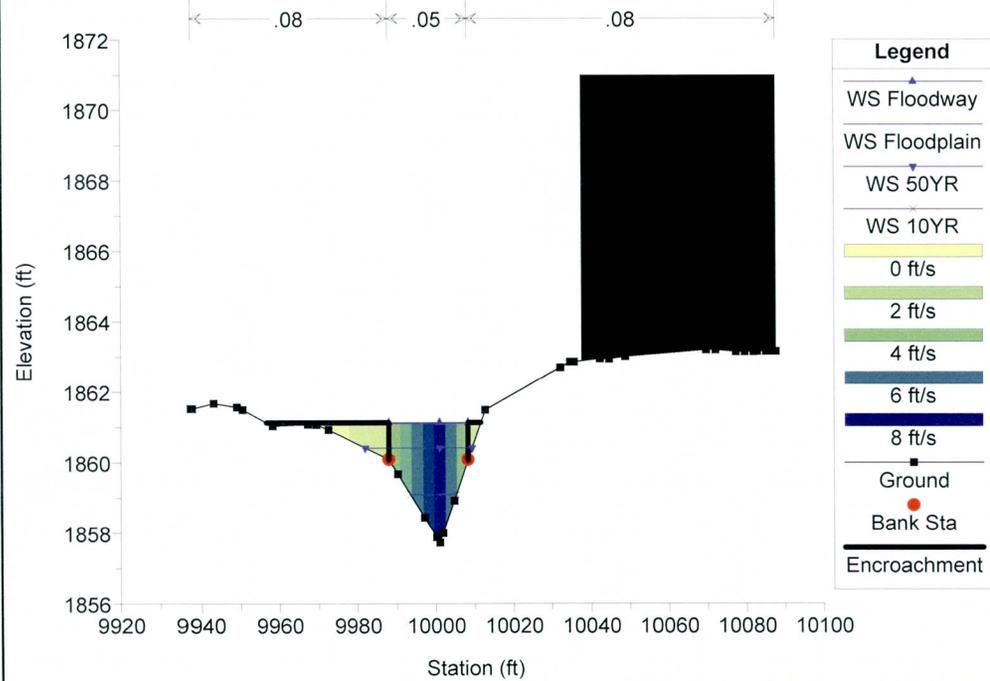
Morris LOMR Plan: Final Draft 9/14/2011  
 River = CCWash1 Reach = Morris RS = 0.000



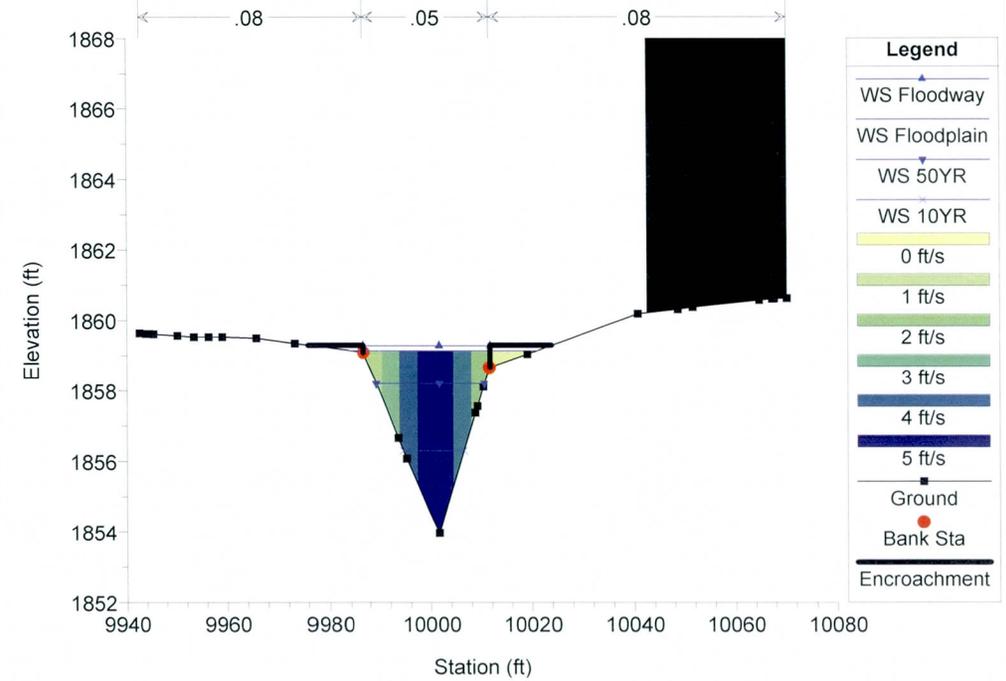
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 River = CCWash1 Reach = Morris RS = 0.340



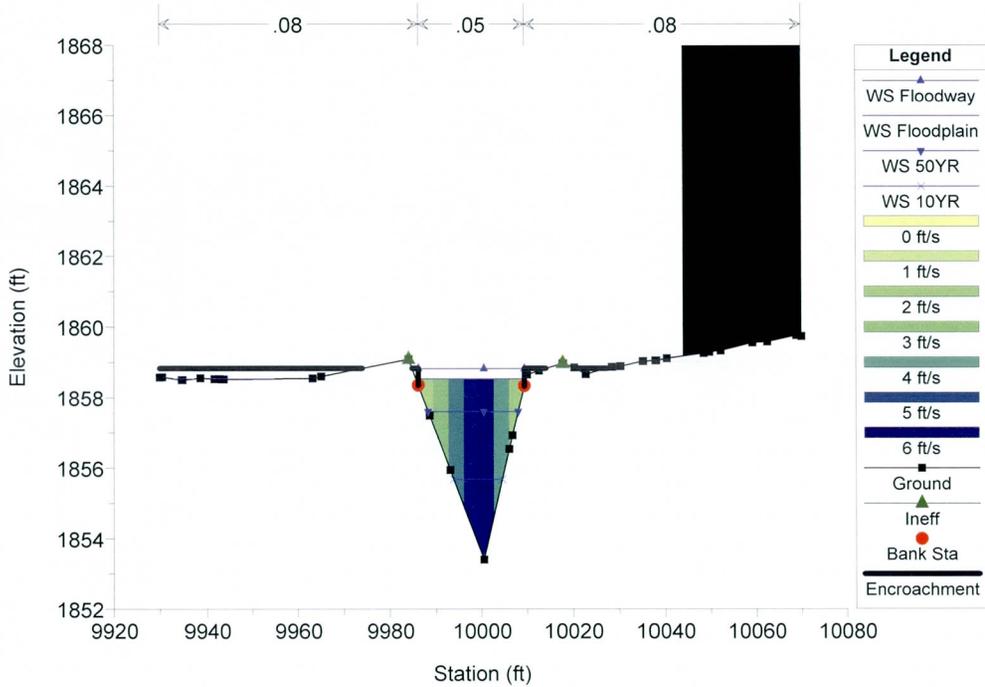
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 River = CCWash1 Reach = Morris RS = 0.289



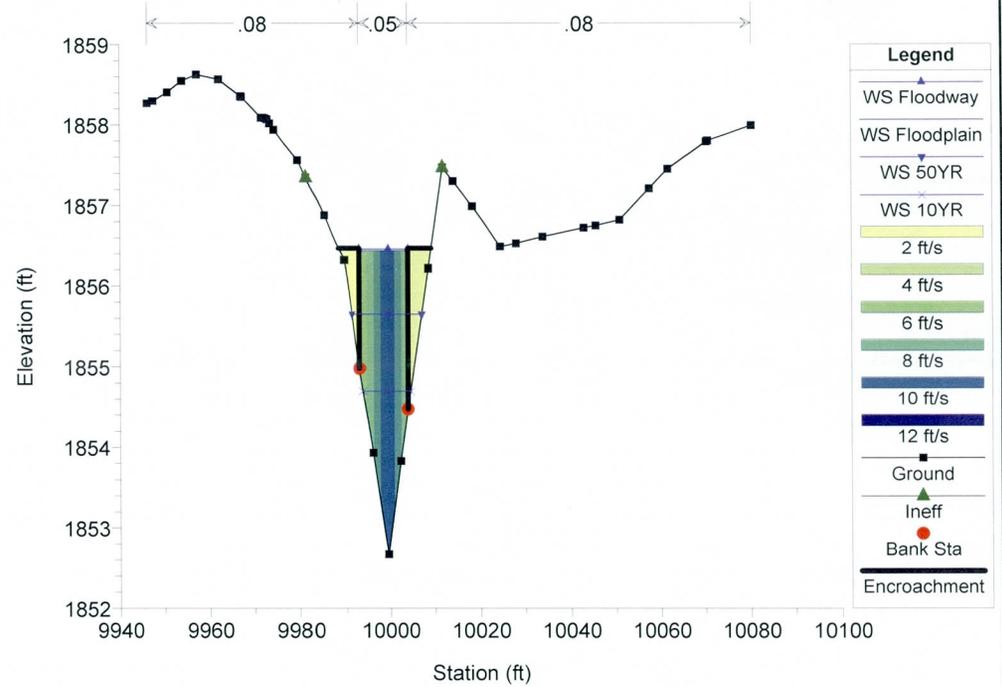
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 River = CCWash1 Reach = Morris RS = 0.240



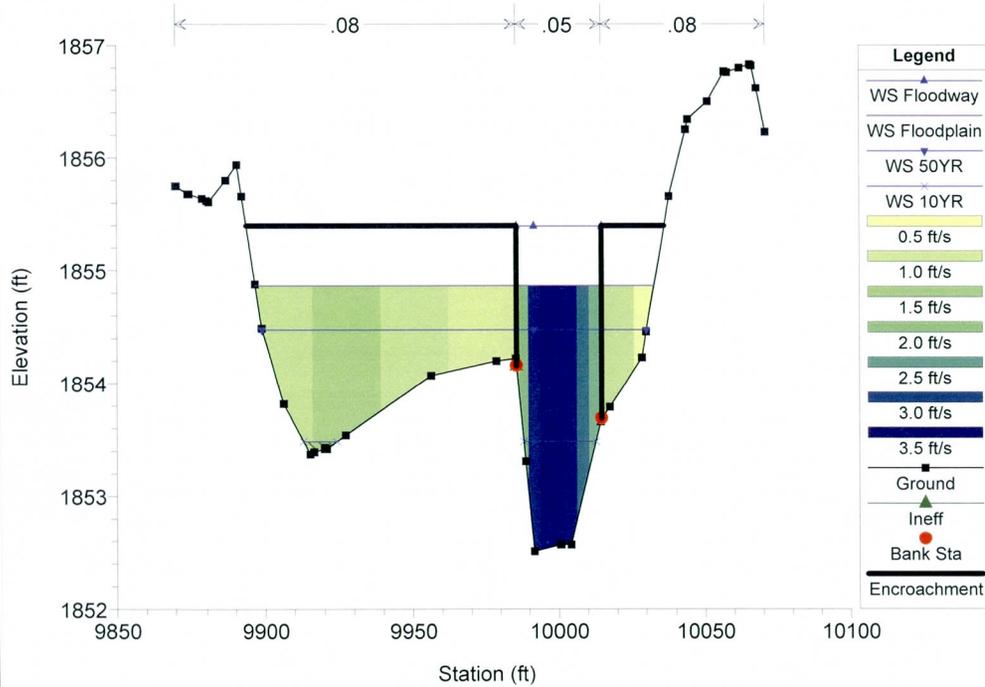
Morris LOMR Plan: Final Draft 9/14/2011  
 River = CCWash1 Reach = Morris RS = 0.223



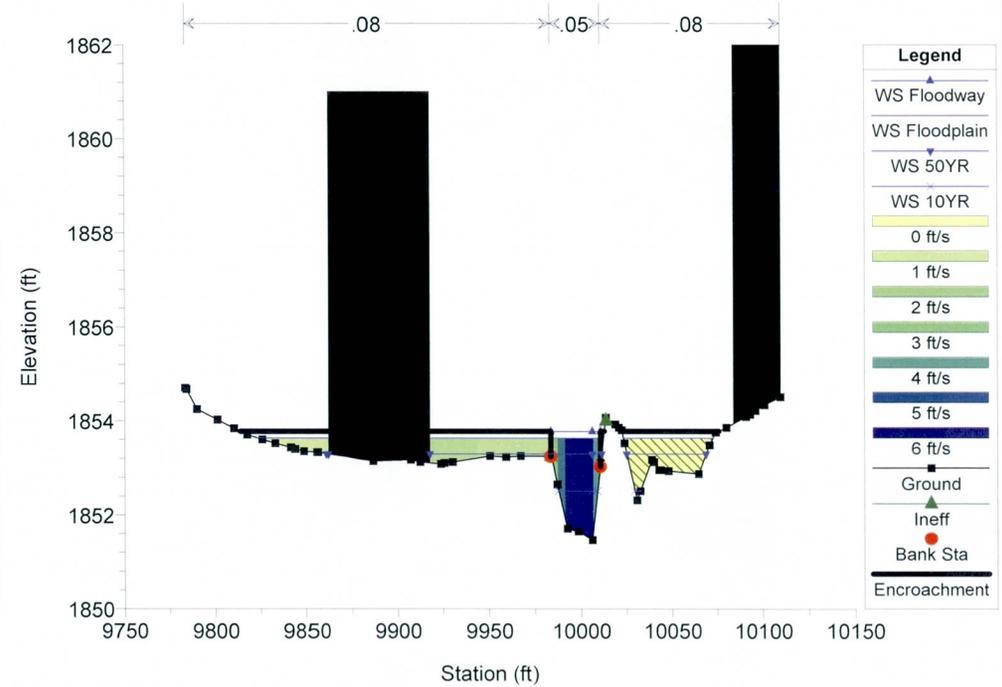
Morris LOMR Plan: Final Draft 9/14/2011  
 River = CCWash1 Reach = Morris RS = 0.204



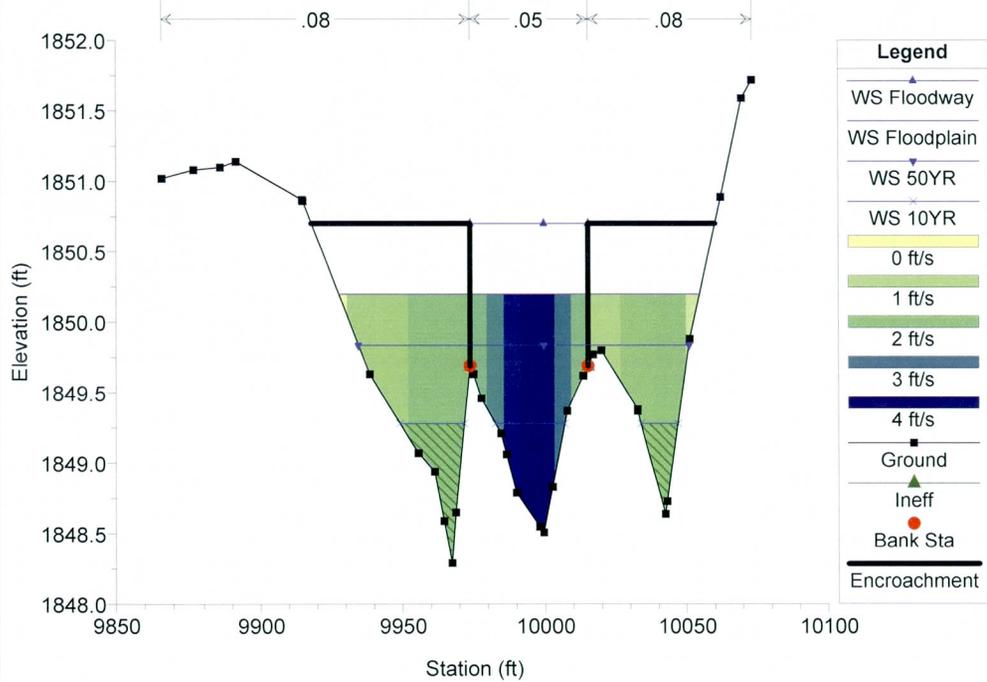
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 River = CCWash1 Reach = Morris RS = 0.175



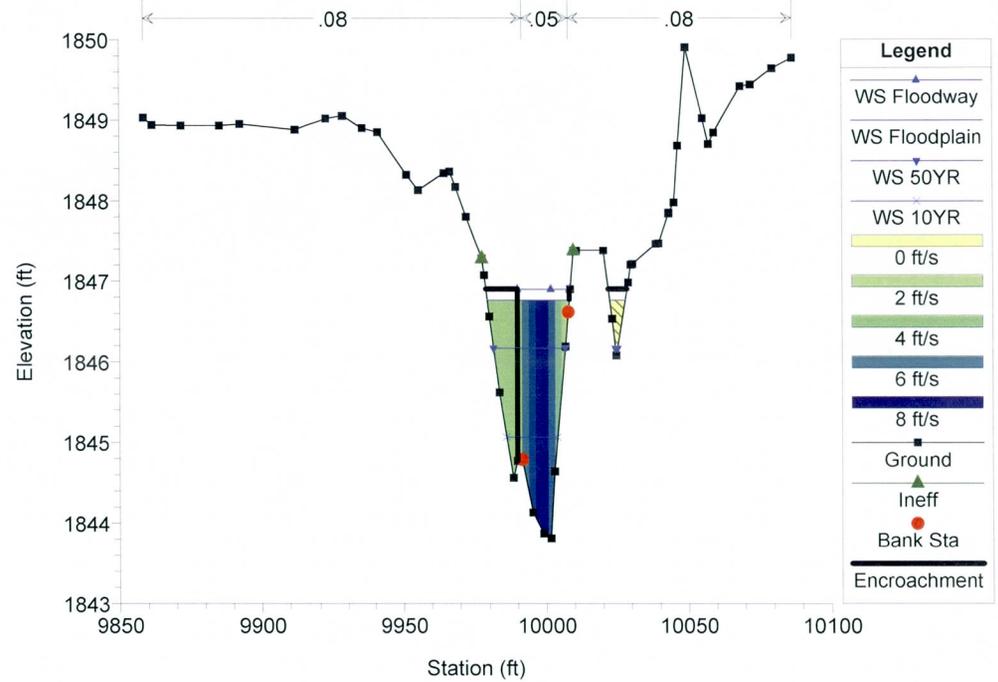
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 River = CCWash1 Reach = Morris RS = 0.149



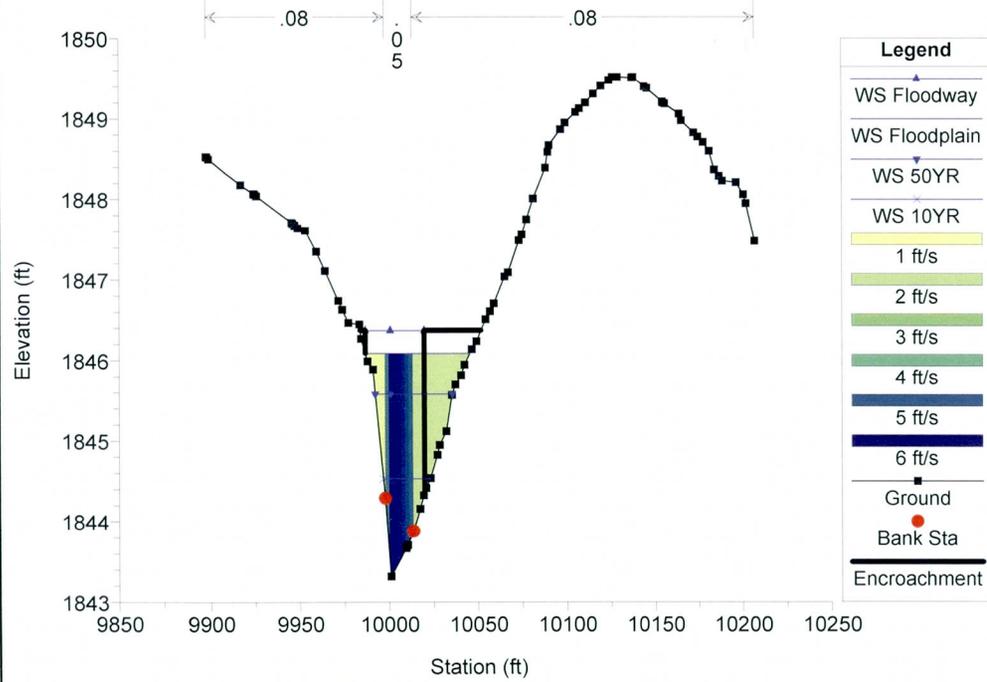
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 River = CCWash1 Reach = Morris RS = 0.107



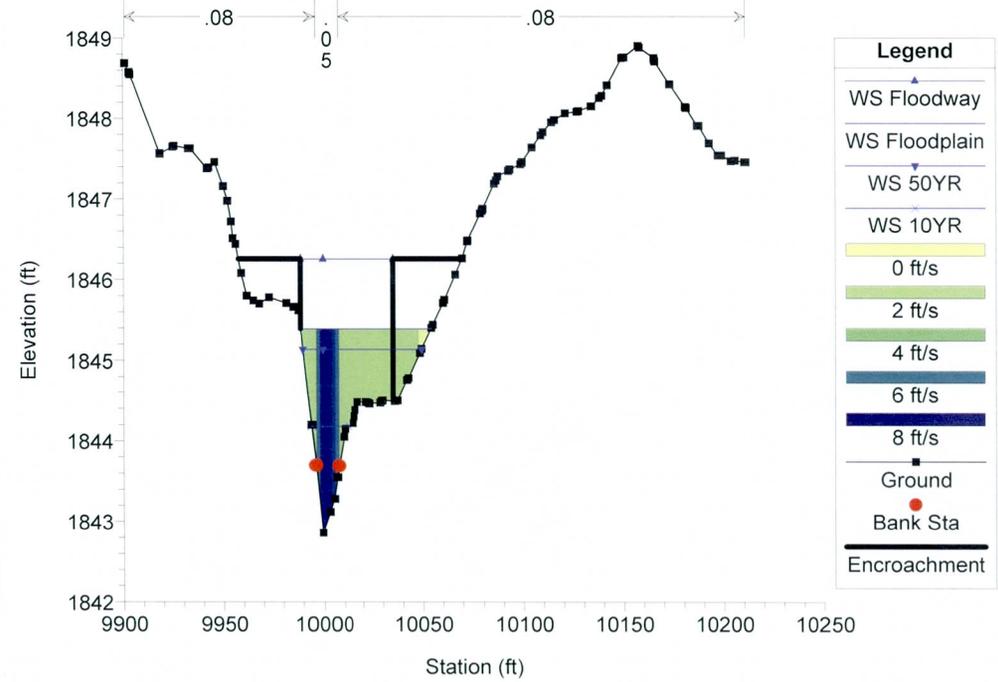
Morris LOMR Plan: Final Draft 9/14/2011  
 River = CCWash1 Reach = Morris RS = 0.065



Morris LOMR Plan: Final Draft 9/14/2011  
 River = CCWash1 Reach = Morris RS = 0.052



Morris LOMR Plan: Final Draft 9/14/2011  
 River = CCWash1 Reach = Morris RS = 0.045



CHECK-RAS Program: NT Check  
Manning's n Value and Transition Loss Coefficient Review

Project File: C:\Users\Hari.JEFULLER\Documents\Projects\Ted\Morris\submittal\CD\hecras\MorrisLOMR.prj  
 Plan File: C:\Users\Hari.JEFULLER\Documents\Projects\Ted\Morris\submittal\CD\hecras\MorrisLOMR.p03  
 Geometry File: C:\Users\Hari.JEFULLER\Documents\Projects\Ted\Morris\submittal\CD\hecras\MorrisLOMR.g03  
 Flow File: C:\Users\Hari.JEFULLER\Documents\Projects\Ted\Morris\submittal\CD\hecras\MorrisLOMR.f01  
 Report File: C:\Users\Hari.JEFULLER\Documents\Projects\Ted\Morris\submittal\CD\hecras\MorrisLOMR.nt  
 Selected profiles: Floodplain;Floodway  
 Date: 9/14/2011  
 Time: 12:00:02 PM

SECNO	STRUCTURE	NLOB	NCHL	NROB	CNTR	EXP
-----						
CCWash1,Morris						
.34		0.08	0.05	0.08	0.1	0.3
.289		0.08	0.05	0.08	0.1	0.3
.24		0.08	0.05	0.08	0.1	0.3
.223		0.08	0.05	0.08	0.1	0.3
.204		0.08	0.05	0.08	0.1	0.3
.175		0.08	0.05	0.08	0.1	0.3
.149		0.08	0.05	0.08	0.1	0.3
.107		0.08	0.05	0.08	0.1	0.3
.065		0.08	0.05	0.08	0.1	0.3
.052		0.08	0.05	0.08	0.1	0.3
.045		0.08	0.05	0.08	0.1	0.3
0		0.08	0.05	0.08	0.1	0.3
-----						

---Summary of Statistics---

	Minimum	Maximum
Left Overbank n Value:	0.08	0.08
Right Overbank n Value:	0.08	0.08
Channel n Value:	0.05	0.05
Contraction Coefficient:	0.1	0.1
Expansion Coefficient:	0.3	0.3

ROUGHNESS COEFFICIENT CHECK

TRANSITION LOSS COEFFICIENT CHECK

ROUGHNESS COEFFICIENT AT STRUCTURES

---END---

CHECK-RAS Program, XS Check  
Cross Section Location and Alignment Review

Project File: C:\Users\Hari.JEFULLER\Documents\Projects\Ted\Morris\submittal\CD\hecras\MorrisLOMR.prj  
 Plan File: C:\Users\Hari.JEFULLER\Documents\Projects\Ted\Morris\submittal\CD\hecras\MorrisLOMR.p03  
 Geometry File: C:\Users\Hari.JEFULLER\Documents\Projects\Ted\Morris\submittal\CD\hecras\MorrisLOMR.g03  
 Flow File: C:\Users\Hari.JEFULLER\Documents\Projects\Ted\Morris\submittal\CD\hecras\MorrisLOMR.f01  
 Report File: C:\Users\Hari.JEFULLER\Documents\Projects\Ted\Morris\submittal\CD\hecras\MorrisLOMR.xls  
 Selected profiles: Floodplain;Floodway  
 Date: 9/14/2011  
 Time: 12:00:04 PM

SECNO	Len Lob	Len Chl	Len Rob	TopWdthAct	Q Total	Flow Code
-----						
CCWash1,Morris						
.34	273.51	266.06	261.3	33.79	276	
.289	264.43	260.73	259.49	54.54	276	B
.24	93.57	90.38	87.92	37.53	276	B
.223	97.73	101.88	105.14	24.21	276	B
.204	141.64	150.77	159.76	20.53	276	C
.175	119.71	135.89	139.6	135.86	276	
.149	250.9	223.36	213.28	133.23	276	D,C,B
.107	204.79	220.48	219.48	125.03	276	B
.065	65.65	67.71	57.98	28.87	276	
.052	37.62	36.97	36.22	58.92	276	
.045	238.58	239.88	240.17	65.39	276	C
0	17.75	17.48	22.05	195.11	276	

-----  
 B=blocked obstruction       XS SC 05  
 C=critical depth            XS SC 03  
 D=divided flow              XS SC 01  
 E=cross section extended    XS SC 02  
 K=known water-surface      XS SC 04

DISTANCE CHECK  
-----

SPACING CHECK  
-----

INEFFECTIVE FLOW CHECK  
-----

DISCHARGE CHECK  
-----

XS DC 02 Constant discharge used for the CCWash1,Morris

LOCATION CHECK  
-----

RS:           0.223  
 XS LC 01 Lenchl Up/TopwdthAct Dn = 4.96  
           MaxChlDpth Up/MaxChlDpth Dn = 1.36  
           TopwdthAct Up/TopwdthAct Dn = 1.18  
           This cross section is located too far upstream from the  
           critical depth cross section.

\*\*\*\*\*  
 Modeler Note: Added interpolated sections, at 50 foot spacing, to evaluate  
 impacts. Less than a 0.08 ft change in the water surface elevation at the cross section.  
 Impact found to be insignificant. Interpolated sections removed for final model.  
 \*\*\*\*\*

BOUNDARY CONDITION CHECK

XS BC 02 The name of the stream is CCWash1,Morris  
Known WS = 1844.57 is specified as the downstream boundary  
for profile Floodplain

XS BC 02 The name of the stream is CCWash1,Morris  
Critical is specified as the upstream boundary  
for profile Floodplain

XS BC 02 The name of the stream is CCWash1,Morris  
Known WS = 1844.57 is specified as the downstream boundary  
for profile Floodway

XS BC 02 The name of the stream is CCWash1,Morris  
Critical is specified as the upstream boundary  
for profile Floodway

XS BC 03 Maximum number of iterations is 0  
It should not be less than 20.

\*\*\*\*\*  
Modeler Note #16: Maximum number of iterations is 0 because the starting  
water surface elevation is "Known".  
\*\*\*\*\*

LATERAL WEIRS CHECK

---END---

CHECK-RAS Program: Floodway Check

Encroachment Method, Starting WSEL, Floodway Width, and Surcharge Review

Project File: C:\Users\Hari.JEFULLER\Documents\Projects\Ted\Morris\submittal\CD\hecras\MorrisLOMR.prj  
 Plan File: C:\Users\Hari.JEFULLER\Documents\Projects\Ted\Morris\submittal\CD\hecras\MorrisLOMR.p03  
 Geometry File: C:\Users\Hari.JEFULLER\Documents\Projects\Ted\Morris\submittal\CD\hecras\MorrisLOMR.g03  
 Flow File: C:\Users\Hari.JEFULLER\Documents\Projects\Ted\Morris\submittal\CD\hecras\MorrisLOMR.f01  
 Report File: C:\Users\Hari.JEFULLER\Documents\Projects\Ted\Morris\submittal\CD\hecras\MorrisLOMR.fw  
 Selected profiles: Floodplain;Floodway  
 Date: 9/14/2011  
 Time: 1:36:34 PM

SECNO	Method	Surcharge	EncStaL	EncStaR	LStaEff	RStaEff	Structure
CCWash1,Morris							
0.34					9988.43	10022.22	
0.34	19	0.12	9986.95	10019.83	9988.17	10019.83	
0.289					9957.02	10011.56	
0.289	19	0.02	9988.06	10008.34	9988.06	10008.34	
0.24					9983.63	10021.16	
0.24	19	0.14	9986.72	10011.7	9986.72	10011.7	
0.223					9985.56	10009.77	
0.223	1	0.29	9986.1	10009.38	9986.1	10009.38	
0.204					9988.57	10009.09	
0.204	19	0.02	9993.22	10003.95	9993.22	10003.95	
0.175					9896.67	10032.56	
0.175	19	0.53	9985.62	10014.59	9985.62	10014.59	
0.149					9823.1	10012.33	
0.149	19	0.14	9983.57	10010.62	9983.57	10010.62	
0.107					9927.56	10054.56	
0.107	19	0.5	9973.66	10015.06	9973.66	10015.06	
0.065					9979.28	10008.1	
0.065	19	0.13	9989.91	10008.1	9989.91	10008.1	
0.052					9986.85	10045.77	
0.052	19	0.28	9986.85	10020	9986.85	10020	
0.045					9988.6	10053.99	
0.045	1	0.86	9988.6	10035	9988.6	10035	
0					9987.97	10183.08	
0	19	0	9975.75	10037	9987.97	10037	

ENCROACHMENT METHOD CHECK

FLOODWAY WIDTH CHECK

RS: 0.34  
 FW FW 03 The Left channel bank station may not be at the proper location.

RS: 0.34  
 FW FW 04 The left station effective of 9988.43 for 1% annual chance floodplain is less than the left channel bank station 9989.02  
 The 1% annual chance floodplain is outside the channel.  
 However, the left encroachment station (9986.95) is outside of 1% annual chance floodplain.  
 The left encroachment station should be adjusted.

\*\*\*\*\*  
 Modeler Note: The model ties into existing floodplain/floodway.  
 \*\*\*\*\*

RS: 0.223  
 FW FW 03 The Left channel bank station may not be at the proper location.

RS: 0.204

FW FW 03 The Left channel bank station may not be at the proper location.

RS: 0.175  
FW FW 03 The Left channel bank station may not be at the proper location.

RS: 0.149  
FW FW 03 The Left channel bank station may not be at the proper location.

RS: 0.149  
FW FW 03 The right channel bank station may not be at the proper location.

RS: 0.107  
FW FW 03 The Left channel bank station may not be at the proper location.

RS: 0.107  
FW FW 03 The right channel bank station may not be at the proper location.

RS: 0.052  
FW FW 03 The right channel bank station may not be at the proper location.

RS: 0  
FW FW 04 The left station effective of 9987.97 for 1% annual chance floodplain is less than the left channel bank station 9991.21  
The 1% annual chance floodplain is outside the channel.  
However, the left encroachment station (9975.75) is outside of 1% annual chance floodplain.  
The left encroachment station should be adjusted.

\*\*\*\*\*  
Modeler Note: The model ties into existing floodplain/floodway.  
\*\*\*\*\*

SURCHARGE CHECK  
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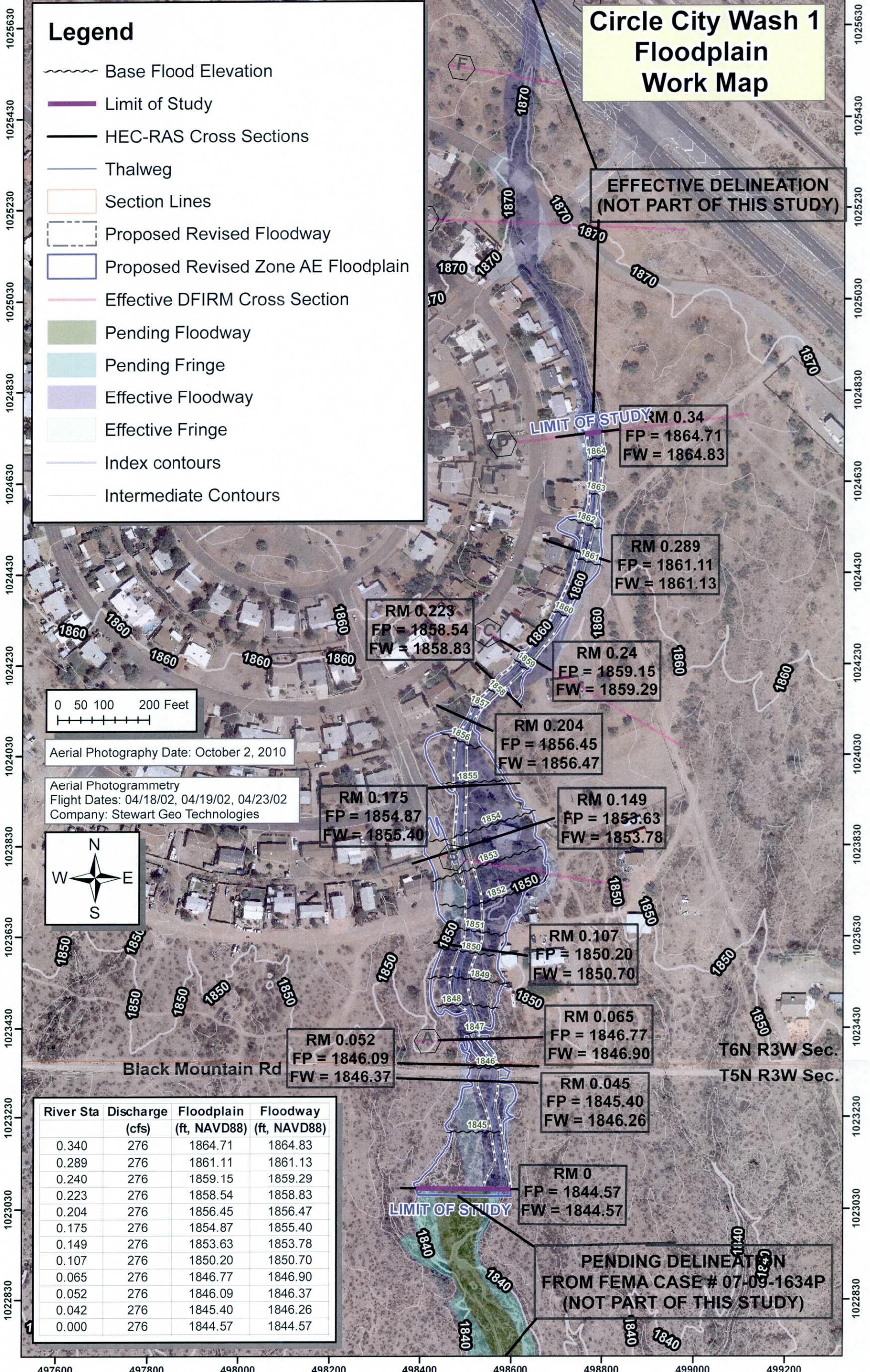
DISCHARGE CHECK  
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STARTING WATER-SURFACE ELEVATION CHECK  
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---END---



497600 497800 498000 498200 498400 498600 498800 499000 499200



### Legend

- Base Flood Elevation
- Limit of Study
- HEC-RAS Cross Sections
- Thalweg
- Section Lines
- Proposed Revised Floodway
- Proposed Revised Zone AE Floodplain
- Effective DFIRM Cross Section
- Pending Floodway
- Pending Fringe
- Effective Floodway
- Effective Fringe
- Index contours
- Intermediate Contours

## Circle City Wash 1 Floodplain Work Map

**EFFECTIVE DELINEATION  
(NOT PART OF THIS STUDY)**

**LIMIT OF STUDY**

RM 0.34  
FP = 1864.71  
FW = 1864.83

RM 0.289  
FP = 1861.11  
FW = 1861.13

RM 0.223  
FP = 1858.54  
FW = 1858.83

RM 0.24  
FP = 1859.15  
FW = 1859.29

RM 0.204  
FP = 1856.45  
FW = 1856.47

RM 0.175  
FP = 1854.87  
FW = 1855.40

RM 0.149  
FP = 1853.63  
FW = 1853.78

RM 0.107  
FP = 1850.20  
FW = 1850.70

RM 0.052  
FP = 1846.09  
FW = 1846.37

RM 0.065  
FP = 1846.77  
FW = 1846.90

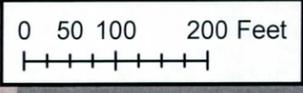
T6N R3W Sec.  
T5N R3W Sec.

RM 0.045  
FP = 1845.40  
FW = 1846.26

RM 0  
FP = 1844.57  
FW = 1844.57

**LIMIT OF STUDY**

**PENDING DELINEATION  
FROM FEMA CASE # 07-09-1634P  
(NOT PART OF THIS STUDY)**



Aerial Photography Date: October 2, 2010

Aerial Photogrammetry  
Flight Dates: 04/18/02, 04/19/02, 04/23/02  
Company: Stewart Geo Technologies



River Sta	Discharge (cfs)	Floodplain (ft, NAVD88)	Floodway (ft, NAVD88)
0.340	276	1864.71	1864.83
0.289	276	1861.11	1861.13
0.240	276	1859.15	1859.29
0.223	276	1858.54	1858.83
0.204	276	1856.45	1856.47
0.175	276	1854.87	1855.40
0.149	276	1853.63	1853.78
0.107	276	1850.20	1850.70
0.065	276	1846.77	1846.90
0.052	276	1846.09	1846.37
0.042	276	1845.40	1846.26
0.000	276	1844.57	1844.57

497600 497800 498000 498200 498400 498600 498800 499000 499200



## Appendix F

### Supporting Documentation for Erosion/Sediment Transport

There is no applicable information related to Erosion/Sediment Transport.

497600 497800 498000 498200 498400 498600 498800 499000 499200

### Legend

-  Base Flood Elevation
-  Limit of Study
-  HEC-RAS Cross Sections
-  Thalweg
-  Section Lines
-  Proposed Revised Floodway
-  Proposed Revised Zone AE Floodplain
-  Effective DFIRM Cross Section
-  Pending Floodway
-  Pending Fringe
-  Effective Floodway
-  Effective Fringe
-  Index contours
-  Intermediate Contours

## Circle City Wash 1 Floodplain Work Map

**EFFECTIVE DELINEATION  
(NOT PART OF THIS STUDY)**

**LIMIT OF STUDY**  
RM 0.34  
FP = 1864.71  
FW = 1864.83

RM 0.289  
FP = 1861.11  
FW = 1861.13

RM 0.223  
FP = 1858.54  
FW = 1858.83

RM 0.24  
FP = 1859.15  
FW = 1859.29

RM 0.204  
FP = 1856.45  
FW = 1856.47

RM 0.175  
FP = 1854.87  
FW = 1855.40

RM 0.149  
FP = 1853.63  
FW = 1853.78

RM 0.107  
FP = 1850.20  
FW = 1850.70

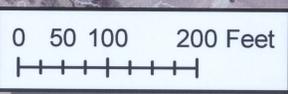
RM 0.052  
FP = 1846.09  
FW = 1846.37

RM 0.065  
FP = 1846.77  
FW = 1846.90

RM 0.045  
FP = 1845.40  
FW = 1846.26

RM 0  
FP = 1844.57  
FW = 1844.57

**PENDING DELINEATION  
FROM FEMA CASE # 07-09-1634P  
(NOT PART OF THIS STUDY)**



Aerial Photography Date: October 2, 2010

Aerial Photogrammetry  
Flight Dates: 04/18/02, 04/19/02, 04/23/02  
Company: Stewart Geo Technologies



**Black Mountain Rd**

T6N R3W Sec.  
T5N R3W Sec.

River Sta	Discharge (cfs)	Floodplain (ft, NAVD88)	Floodway (ft, NAVD88)
0.340	276	1864.71	1864.83
0.289	276	1861.11	1861.13
0.240	276	1859.15	1859.29
0.223	276	1858.54	1858.83
0.204	276	1856.45	1856.47
0.175	276	1854.87	1855.40
0.149	276	1853.63	1853.78
0.107	276	1850.20	1850.70
0.065	276	1846.77	1846.90
0.052	276	1846.09	1846.37
0.042	276	1845.40	1846.26
0.000	276	1844.57	1844.57

1025630  
1025430  
1025230  
1025030  
1024830  
1024630  
1024430  
1024230  
1024030  
1023830  
1023630  
1023430  
1023230  
1023030  
1022830

1025630  
1025430  
1025230  
1025030  
1024830  
1024630  
1024430  
1024230  
1024030  
1023830  
1023630  
1023430  
1023230  
1023030  
1022830

497600 497800 498000 498200 498400 498600 498800 499000 499200