TECHNICAL SUPPORT DATA NOTEBOOK

McMICKEN DAM OUTLET WASH FLOODPLAIN DELINEATION STUDY (FDS)

Contract FCD 2011C003

June 2013

Prepared for:
The Flood Control District of Maricopa County
2801 West Durango Street
Phoenix, Arizona 85009
602.506.1501

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Nathan Ford, P.E.
Engineer

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)	CULVERT	HYDRAULIC ANALYSIS HYDROLOGIC ANALYSIS NEW TOPOGRAPHIC DATA
	COMMUNITY NO.: 040037		
IDENTIFIER	Mcmicken Dam Outlet Wash Floodplain Delineation Study	APPROXIMATE LATITUDE & LONGITUDE: 33.586, -112.478 SOURCE: USGS QUADRANGLE DATUM: NAD 83	

ANNOTATED MAPPING ENCLOSURES	ANNOTATED STUDY ENCLOSURES
TYPE: FIRM* NO.: 04013C1230L DATE: October 16, 2013 TYPE: FIRM* NO.: 04013C1240L DATE: October 16, 2013	DATE OF EFFECTIVE FLOOD INSURANCE STUDY: October 16, 2013 PROFILE(S): 753P, 754P, 755P, 756P, 757P FLOODWAY DATA TABLE: 6 SUMMARY OF DISCHARGES TABLE: 3

closures reflect changes to flooding sources affected by this revision.
FIRM - Flood Insurance Rate Map

FLOODING SOURCE & REVISED REACH

Mcmicken Dam Outlet Wash – From approximately 565 feet upstream of the confluence of Agua Fria River to approximately 8,600 feet upstream of W. Happy Valley Parkway.

SUMMARY OF REVISIONS

Flooding Source	Effective Flooding	Revised Flooding	Increases	Decreases
Mcmicken Dam Outlet Wash	Zone AE	Zone AE	YES	YES
	Zone X (unshaded)	Zone X (unshaded)	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 toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMC Clearinghouse, 847 South Pickett Street, Alexandria, VA 22304-4605. Additional Information about the NFIP is available on our website at http://www.fema.gov/nfip.

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

13-09-2729P
102-I-A-C

Federal Emergency Management Agency
Washington, D.C. 20472

LETTER OF MAP REVISION
DETERMINATION DOCUMENT (CONTINUED)

COMMUNITY INFORMATION

APPLICABLE NFIP REGULATIONS/COMMUNITY OBLIGATION

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

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.

NFIP regulations Subparagraph 60.3(b)(7) requires communities to ensure that the flood-carrying capacity within the altered or relocated portion of any watercourse is maintained. This provision is incorporated into your community's existing floodplain management ordinances; therefore, responsibility for maintenance of the altered or relocated watercourse, including any related appurtenances such as bridges, culverts, and other drainage structures, rests with your community. We may request that your community submit a description and schedule of maintenance activities necessary to ensure this requirement.

COMMUNITY REMINDERS

We based this determination on the 1-percent-annual-chance discharges computed in the submitted hydrologic model. Future development of projects upstream could cause increased discharges, which could cause increased flood hazards. A comprehensive restudy of your community's flood hazards would consider the cumulative effects of development on discharges and could, therefore, indicate that greater flood hazards exist 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 toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMC Clearinghouse, 847 South Pickett Street, Alexandria, VA 22304-4605. Additional Information about the NFIP is available on our website at http://www.fema.gov/nfip.

Luis Rodriguez, P.E., Chief
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 will not physically revise and republish the FIRM and FIS report for your community to reflect the modifications made by this LOMR at this time. When changes to the previously cited FIRM panel(s) and FIS report warrant physical revision and republication in the future, we will incorporate the modifications made by this LOMR at that time.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Information eXchange toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMC Clearinghouse, 847 South Pickett Street, Alexandria, VA 22304-4605. Additional Information about the NFIP is available on our website at http://www.fema.gov/nfip.

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

Federal Emergency Management Agency
Washington, D.C. 20472

LETTER OF MAP REVISION
DETERMINATION DOCUMENT (CONTINUED)

PUBLIC NOTIFICATION OF REVISION

A notice of changes will be published in the Federal Register. This information will be published in your local newspaper on or about the dates listed below and through FEMA's Flood Hazard Mapping website at https://www.floodmaps.fema.gov/fhm/Scripts/bfe_main.asp.

LOCAL NEWSPAPER Name: Arizona Republic

Dates: February 20, 2014 and February 27, 2014

Within 90 days of the second publication in the local newspaper, a citizen may request that we reconsider this determination. Any request for reconsideration must be based on scientific or technical data. Therefore, this letter will be effective only after the 90-day appeal period has elapsed and we have resolved any appeals that we receive during this appeal period. Until this LOMR is effective, the revised flood hazard information presented in this LOMR may be changed.

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 toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMC Clearinghouse, 847 South Pickett Street, Alexandria, VA 22304-4605. Additional Information about the NFIP is available on our website at http://www.fema.gov/nfip.

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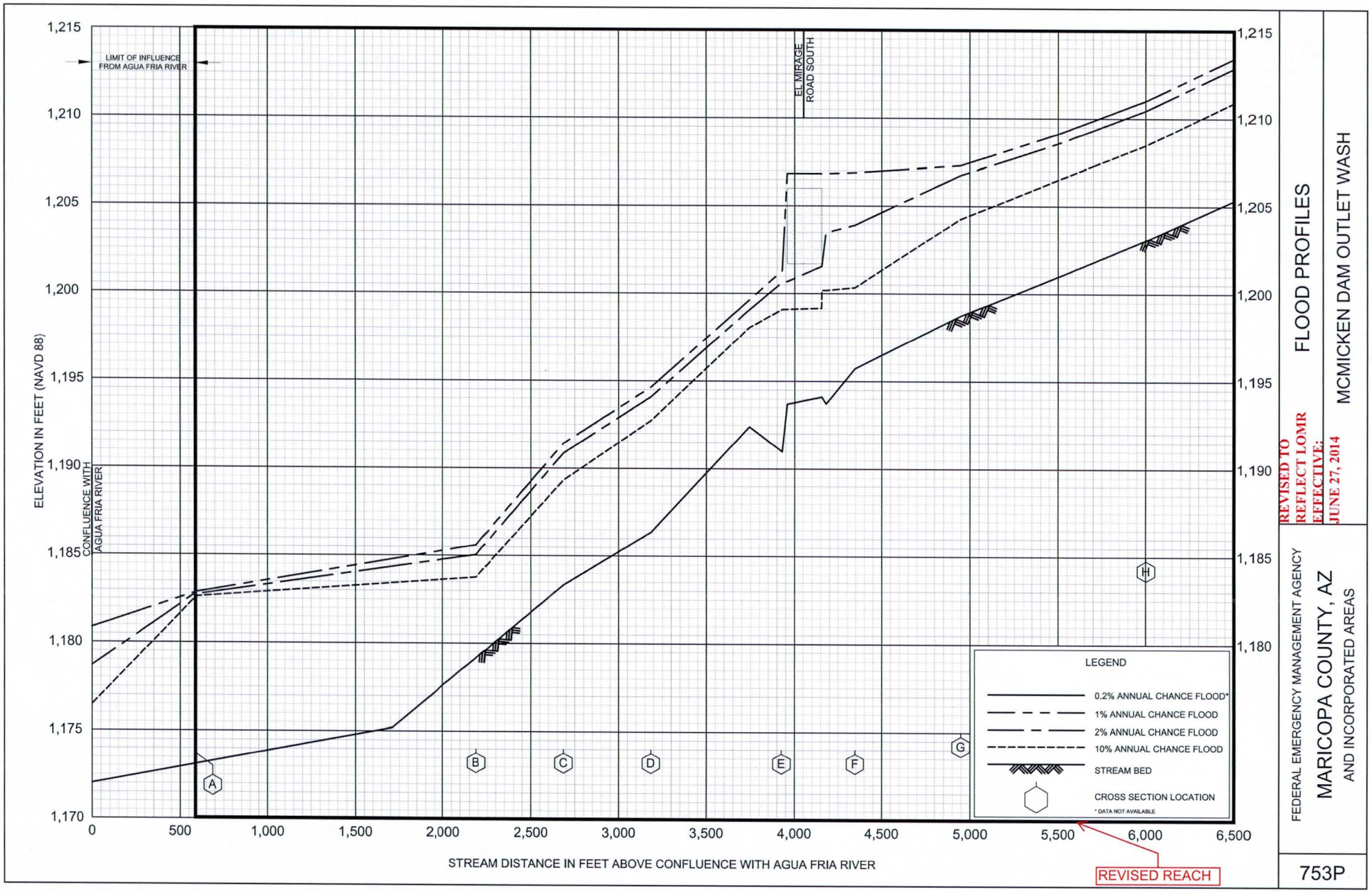


FLOOD PROFILES

REVISED TO REFLECT LOMR EFFECTIVE: JUNE 27, 2014

MCMICKEN DAM OUTLET WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ

AND INCORPORATED AREAS

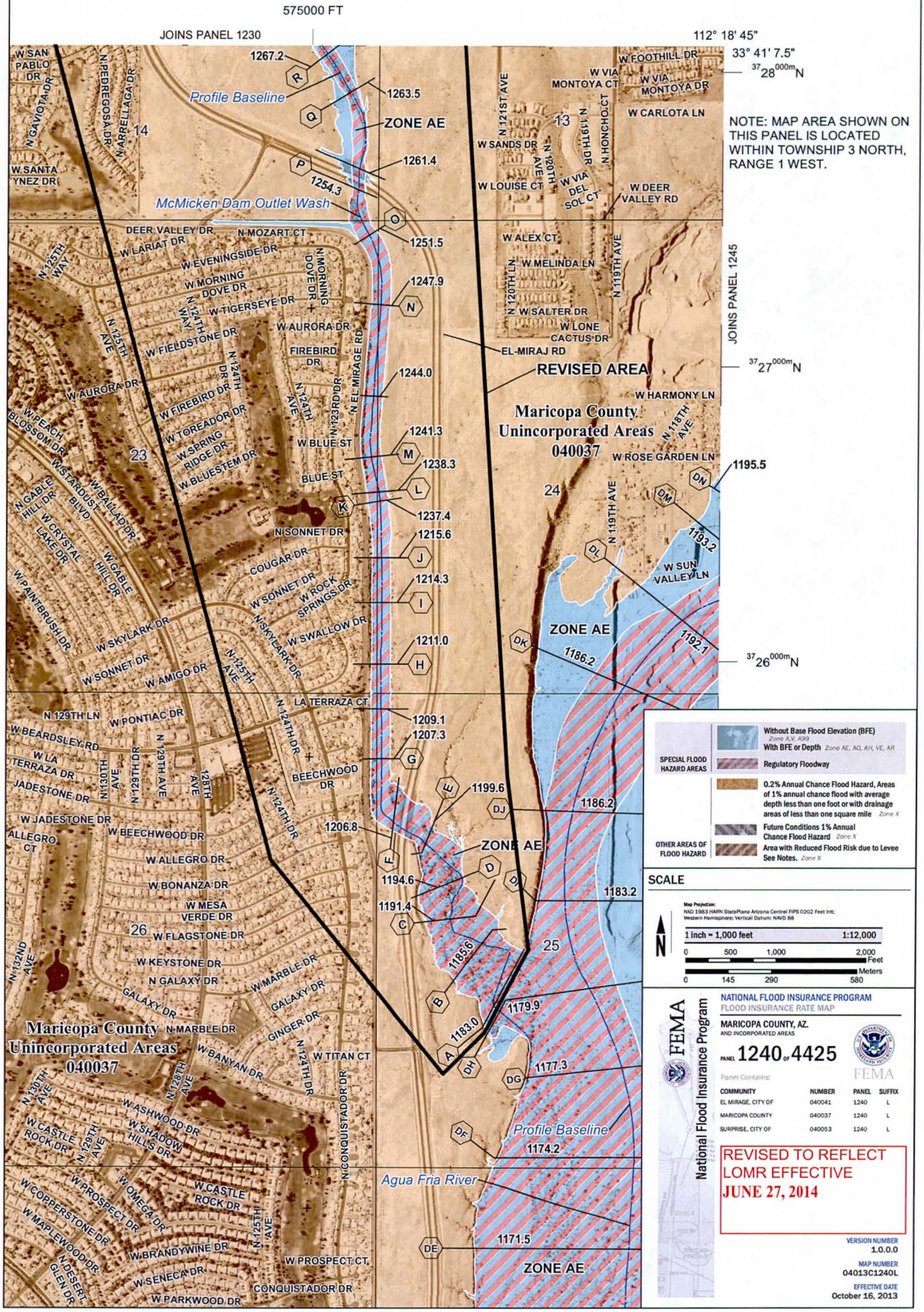
753P

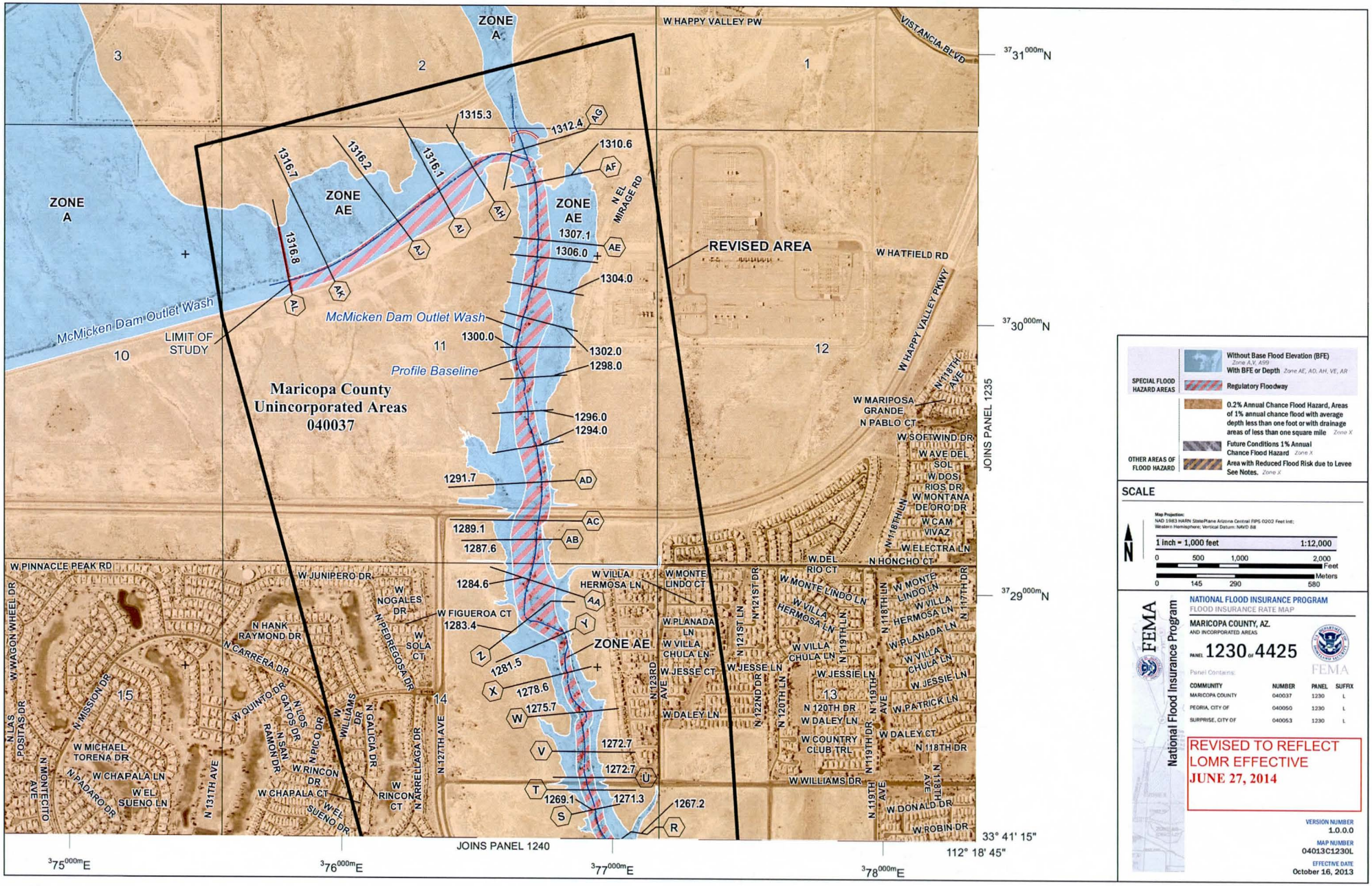
REVISED TO REFLECT LOMR
EFFECTIVE **JUNE 27, 2014**

Table 3. Summary of Discharges

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (Sq. Miles)	PEAK DISCHARGES (cfs) 10-PERCENT ANNUAL CHANCE	2-PERCENT ANNUAL CHANCE	1-PERCENT ANNUAL CHANCE	0.2-PERCENT ANNUAL CHANCE
Malta Drain					
Upstream of Emerald Wash	0.24	--[1]	--[1]	466	--[1]
Upstream of Rand Drive	0.17	--[1]	--[1]	366	--[1]
Mangrum Wash					
Upstream of Jacklin Wash	0.12	--[1]	--[1]	562	--[1]
Martinez Wash					
At mouth	103	9,220	27,400	32,000	45,000
McCormick Ranch Lakes East Branch					
Downstream of McCormick Parkway	12.4	--[1]	--[1]	9,280	--[1]
McCormick Ranch Lakes West Branch					
Upstream of the confluence with McCormick Ranch Lakes East Branch	5.49	--[1]	--[1]	3,650	--[1]
McMicken Dam Outlet Channel					
Confluence with McMicken Dam Outlet Wash	304.92	2,613	4,279	5,087	--[1]
McMicken Dam Outlet Wash					
Approximately 800 feet downstream of W. Happy Valley Pkwy	108.42	2,667	5,555	7,620	--[1]
Discharges from Mcmicken Dam	101.08	2,618	5,454	7,481	
Approximately 4,200 feet south of Deer Valley Drive	320.56	2,876	4,916	6,273	--[1]
Approximately 1,700 feet north of Deer Valley Drive	318.13	2,835	4,747	6,023	--[1]
Mesquite Tank Wash					
At Cave Butte Recreation Area	--[1]	--[1]	--[1]	1,000	--[1]

--[1] Data Not Computed
--[2] Data Not Available


575000 FT
JOINS PANEL 1230
112° 18' 45"
33° 41' 7.5"
37 28 000m N
37 27 000m N
37 26 000m N
JOINS PANEL 1245
NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 3 NORTH, RANGE 1 WEST.
Profile Baseline
McMicken Dam Outlet Wash
Agua Fria River
ZONE AE
REVISED AREA
EL-MIRAJ RD
Maricopa County Unincorporated Areas 040037
1267.2
1263.5
1261.4
1254.3
1251.5
1247.9
1244.0
1241.3
1238.3
1237.4
1215.6
1214.3
1211.0
1209.1
1207.3
1206.8
1199.6
1195.5
1194.6
1193.2
1192.1
1191.4
1186.2
1185.6
1183.2
1183.0
1179.9
1177.3
1174.2
1171.5
W SAN PABLO DR
N GAVIOTA DR
N REDREGOSA DR
N ARRELLAGA DR
W SANTA YNEZ DR
W FOOTHILL DR
W VIA MONTOYA CT
W VIA MONTOYA DR
W CARLOTA LN
N 121ST AVE
N 119TH DR
N HONCHO CT
W SANDS DR
N 120TH AVE
W LOUISE CT
W VIA DEL SOL CT
W DEER VALLEY RD
DEER VALLEY DR
N MOZART CT
W LARIAT DR
W EVENINGSIDE DR
W MORNING DOVE DR
N MORNING DOVE DR
W TIGERSEYE DR
N 125TH WAY
N 125TH AVE
W FIELDSTONE DR
N 124TH DR
N 124TH WAY
W AURORA DR
FIREBIRD DR
N 123RD DR
N 124TH AVE
W FIREBIRD DR
W TOREADOR DR
W SPRING RIDGE DR
W BLUESTEM DR
W BLUE ST
BLUE ST
W PEACH BLOSSOM DR
W STARDUST BLVD
W BALLAD DR
N GABLE HILL DR
W CRYSTAL LAKE DR
W GABLE HILL DR
W PAINTBRUSH DR
N SONNET DR
COUGAR DR
W SONNET DR
W ROCK SPRINGS DR
N SKYLARK DR
W SKYLARK DR
W SWALLOW DR
W SONNET DR
W AMIGO DR
N 125TH AVE
W ALEX CT
W MELINDA LN
N 120TH LN
N 119TH AVE
W SALTER DR
W LONE CACTUS DR
W HARMONY LN
N 118TH AVE
W ROSE GARDEN LN
W SUN VALLEY LN
LA TERRAZA CT
N 129TH LN
W PONTIAC DR
W BEARDSLEY RD
W LA TERRAZA DR
JADESTONE DR
N 130TH AVE
N 129TH DR
N 129TH AVE
128TH AVE
N 124TH DR
BEECHWOOD DR
W JADESTONE DR
W BEECHWOOD DR
ALLEGRO CT
W ALLEGRO DR
W BONANZA DR
W MESA VERDE DR
W FLAGSTONE DR
W KEYSTONE DR
N GALAXY DR
W MARBLE DR
GALAXY DR
N MARBLE DR
GINGER DR
W BANYAN DR
W TITAN CT
N 132ND AVE
N 130TH AVE
N 128TH AVE
N 124TH DR
W ASHWOOD DR
W SHADOW HILLS DR
W CASTLE ROCK DR
N 125TH AVE
N CONQUISTADOR DR
W CASTLE ROCK DR
W PROSPECT DR
W OMEGA DR
W COPPERSTONE DR
W MAPLEWOOD DR
N DESERT GLEN DR
W BRANDYWINE DR
W SENECA DR
W PARKWOOD DR
N 125TH AVE
W PROSPECT CT
CONQUISTADOR DR
Without Base Flood Elevation (BFE) Zone A,V, A99
With BFE or Depth Zone AE, AO, AH, VE, AR
SPECIAL FLOOD HAZARD AREAS
Regulatory Floodway
0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X
Future Conditions 1% Annual Chance Flood Hazard Zone X
OTHER AREAS OF FLOOD HAZARD
Area with Reduced Flood Risk due to Levee See Notes. Zone X
SCALE
Map Projection: NAD 1983 HARN StatePlane Arizona Central FIPS 0202 Feet Intl; Western Hemisphere; Vertical Datum: NAVD 88
1 inch = 1,000 feet 1:12,000
0 500 1,000 2,000 Feet
0 145 290 580 Meters
FEMA
National Flood Insurance Program
NATIONAL FLOOD INSURANCE PROGRAM
FLOOD INSURANCE RATE MAP
MARICOPA COUNTY, AZ.
AND INCORPORATED AREAS
PANEL 1240 OF 4425
Panel Contains:
COMMUNITY NUMBER PANEL SUFFIX
EL MIRAGE, CITY OF 040041 1240 L
MARICOPA COUNTY 040037 1240 L
SURPRISE, CITY OF 040053 1240 L
REVISED TO REFLECT LOMR EFFECTIVE JUNE 27, 2014
VERSION NUMBER 1.0.0.0
MAP NUMBER 04013C1240L
EFFECTIVE DATE October 16, 2013



SPECIAL FLOOD HAZARD AREAS

- Without Base Flood Elevation (BFE) — Zone A,V, A99
- With BFE or Depth — Zone AE, AO, AH, VE, AR
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD

- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile — Zone X
- Future Conditions 1% Annual Chance Flood Hazard — Zone X
- Area with Reduced Flood Risk due to Levee See Notes. — Zone X

SCALE

Map Projection: NAD 1983 HARN StatePlane Arizona Central FIPS 0202 Feet Intl; Western Hemisphere; Vertical Datum: NAVD 88

1 inch = 1,000 feet 1:12,000

0 500 1,000 2,000 Feet

0 145 290 580 Meters

FEMA

National Flood Insurance Program

NATIONAL FLOOD INSURANCE PROGRAM

FLOOD INSURANCE RATE MAP

MARICOPA COUNTY, AZ.
AND INCORPORATED AREAS

PANEL 1230 OF 4425

Panel Contains:

COMMUNITY	NUMBER	PANEL	SUFFIX
MARICOPA COUNTY	040037	1230	L
PEORIA, CITY OF	040050	1230	L
SURPRISE, CITY OF	040053	1230	L

REVISED TO REFLECT LOMR EFFECTIVE JUNE 27, 2014

VERSION NUMBER 1.0.0.0

MAP NUMBER 04013C1230L

EFFECTIVE DATE October 16, 2013

REVISED TO REFLECT LOMR
EFFECTIVE JUNE 27, 2014

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
McMicken Dam Outlet Wash								
Z	16,245	466	1821	4.2	1283.3	1283.3	1283.9	0.6
AA	16,745	533	1405	5.4	1284.6	1284.6	1285.6	1.0
AB	17,478	395	1408	5.3	1287.6	1287.6	1288.4	0.8
AC	17,496	407	1518	4.9	1289.1	1289.1	1289.6	0.5
AD	17,948	268	1488	5.0	1291.7	1291.7	1292.1	0.4
AE	20,976	282	1706	4.4	1307.1	1307.1	1307.5	0.4
AF	21,669	196	1206	6.2	1310.5	1310.5	1311.5	1.0
AG	22,169	114	633	11.8	1312.4	1312.4	1313.1	0.7
AH	22,669	235	1467	5.1	1315.3	1315.3	1315.3	0.0
AI	23,169	425	4056	1.8	1316.1	1316.1	1316.3	0.2
AJ	24,293	320	2805	2.6	1316.2	1316.2	1316.3	0.1
AK	24,793	196	4469	1.6	1316.7	1316.7	1317.0	0.3
AL	25,813	174	3548	2.1	1316.8	1316.8	1317.3	0.5

REVISED DATA

1 Stream Distance in Feet Above Confluence With Agua Fria River

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ
AND INCORPORATED AREAS

FLOODWAY DATA

McMICKEN DAM OUTLET WASH

VISED TO REFLECT LOMR
EFFECTIVE JUNE 27, 2014

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
McMicken Dam Outlet Wash								
A	565	916	2811	2.7	1183.0	1183.0	1183.0	0.0
B	2,187	553	1080	7.0	1185.6	1185.6	1185.6	0.0
C	2,685	608	1614	4.7	1191.4	1191.4	1191.4	0.0
D	3,184	480.7	1473	5.1	1194.6	1194.6	1194.6	0.0
E	3,926	378	1223	6.2	1199.6	1199.6	1199.6	0.0
F	4,350	496	2737	2.8	1206.8	1206.8	1206.8	0.0
G	4,948	212	1123	6.8	1207.1	1207.3	1207.3	0.0
H	6,000	205	994	7.6	1211.0	1211.0	1211.0	0.0
I	6,689	206	968	7.8	1214.3	1214.3	1214.3	0.0
J	7,424	201	921	8.2	1215.6	1215.6	1215.6	0.0
K	7,821	235	751	10.1	1237.4	1237.4	1237.4	0.0
L	7,924	223	843	9.0	1238.3	1238.3	1238.3	0.0
M	8,323	222	1100	6.9	1241.3	1241.3	1241.3	0.0
N	10,026	204	997	7.6	1247.9	1247.9	1247.9	0.0
O	11,359	224	964	7.9	1251.5	1251.5	1251.5	0.0
P	11,391	85	859	12.9	1254.3	1254.3	1254.3	0.0
Q	12,500	147	915	8.3	1263.5	1263.5	1263.6	0.1
R	12,996	185	1692	4.5	1267.2	1267.2	1267.9	0.7
S	13,496	188	1022	7.4	1269.1	1269.1	1270.1	1.0
T	13,744	191	1962	3.8	1271.3	1271.3	1271.9	0.6
U	13,783	196	2269	3.4	1272.7	1272.7	1273.4	0.7
V	14,215	167	1258	6.0	1272.7	1272.7	1273.2	0.5
W	14,715	208	1213	6.3	1275.7	1275.7	1276.5	0.8
X	15,266	130	1109	6.8	1278.6	1278.6	1278.9	0.3
Y	15,766	214	1588	4.8	1281.5	1281.5	1282.1	0.6

REVISED DATA

1 Stream Distance in Feet Above Confluence With Agua Fria River

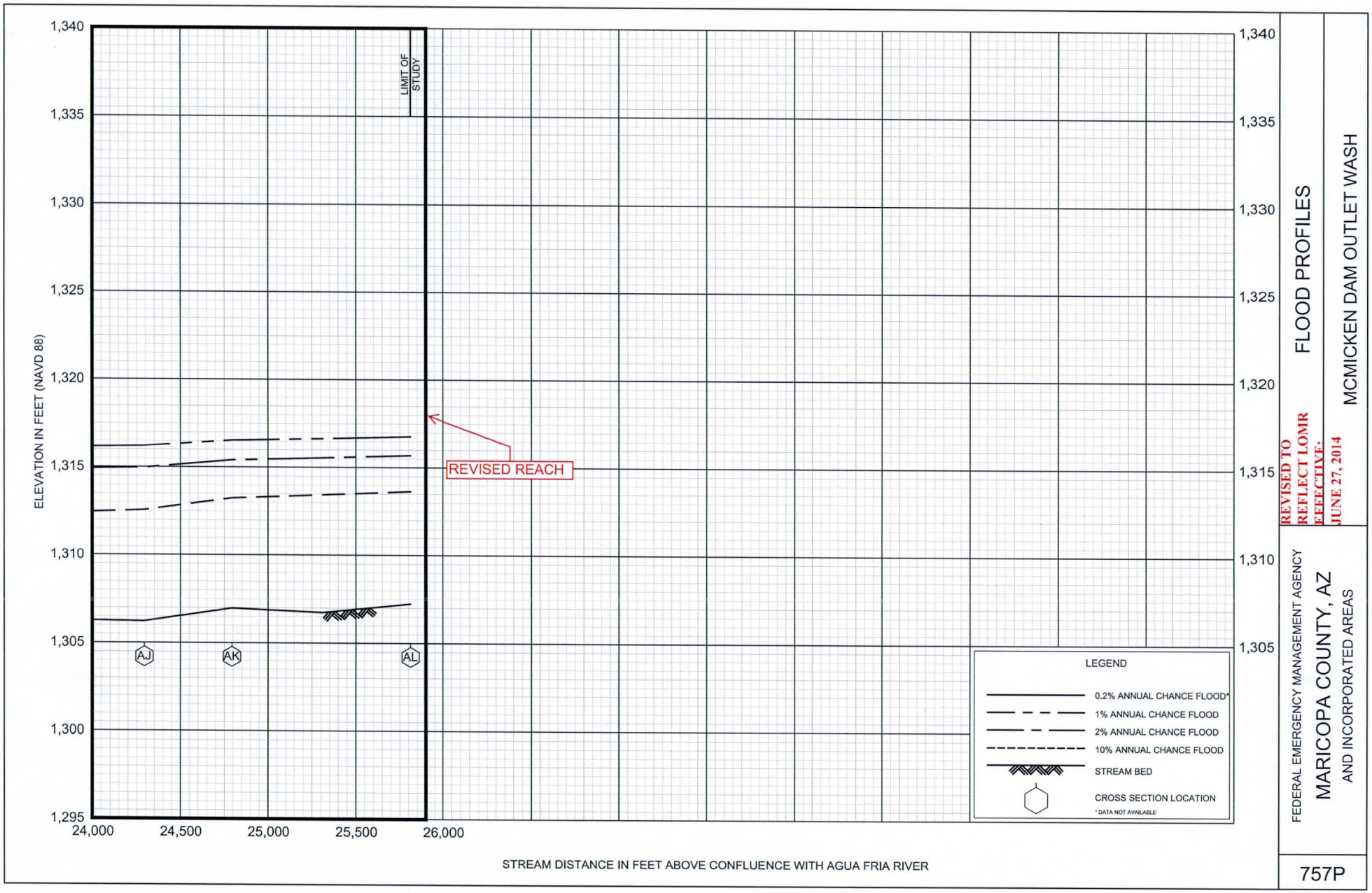
TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ
AND INCORPORATED AREAS

FLOODWAY DATA

McMICKEN DAM OUTLET WASH



FLOOD PROFILES

REVISED TO REFLECT LOMR EFFECTIVE: JUNE 27, 2014

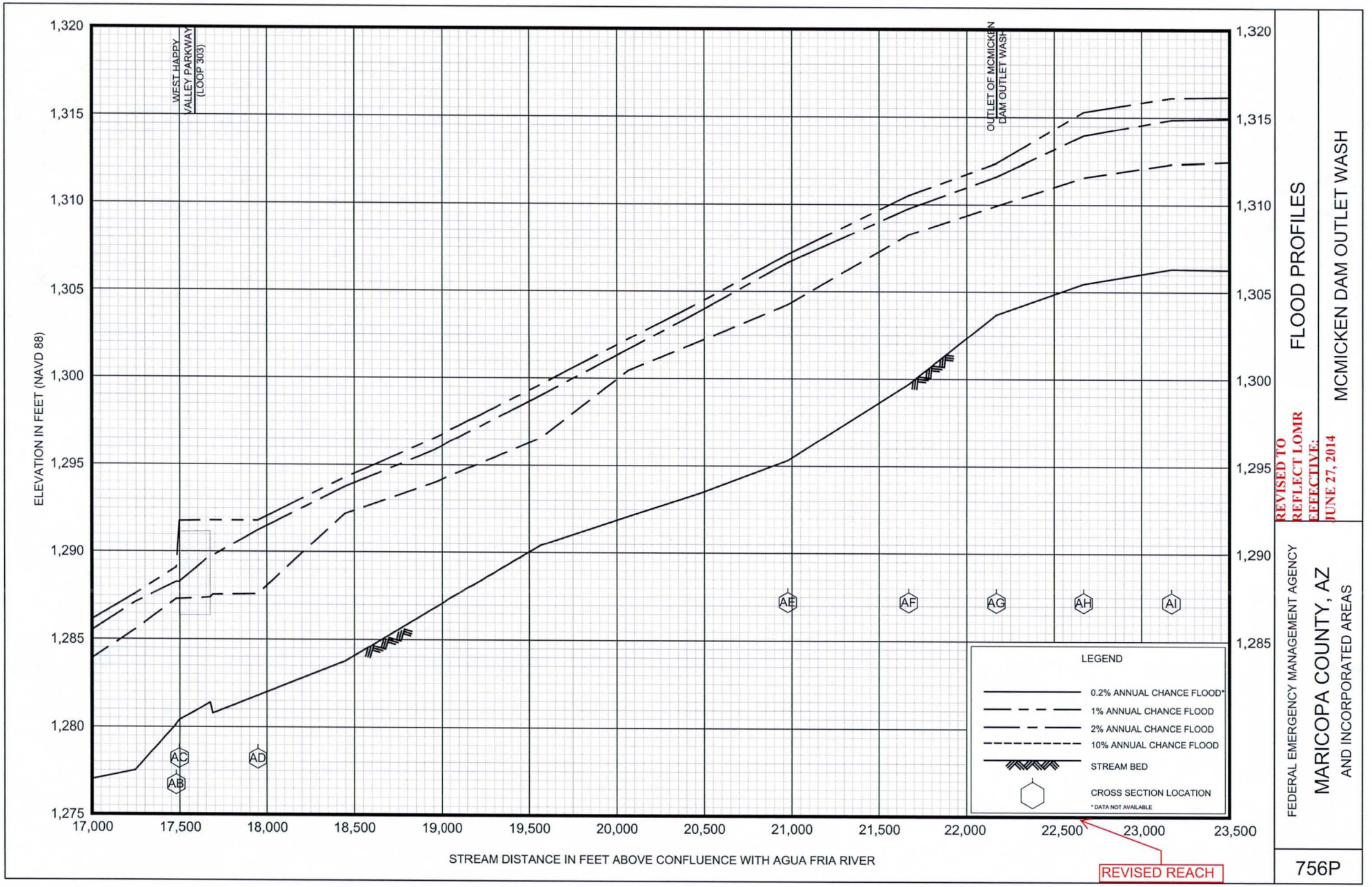
MCMICKEN DAM OUTLET WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ

AND INCORPORATED AREAS

757P



FLOOD PROFILES

REVISED TO REFLECT LOMR EFFECTIVE: JUNE 27, 2014

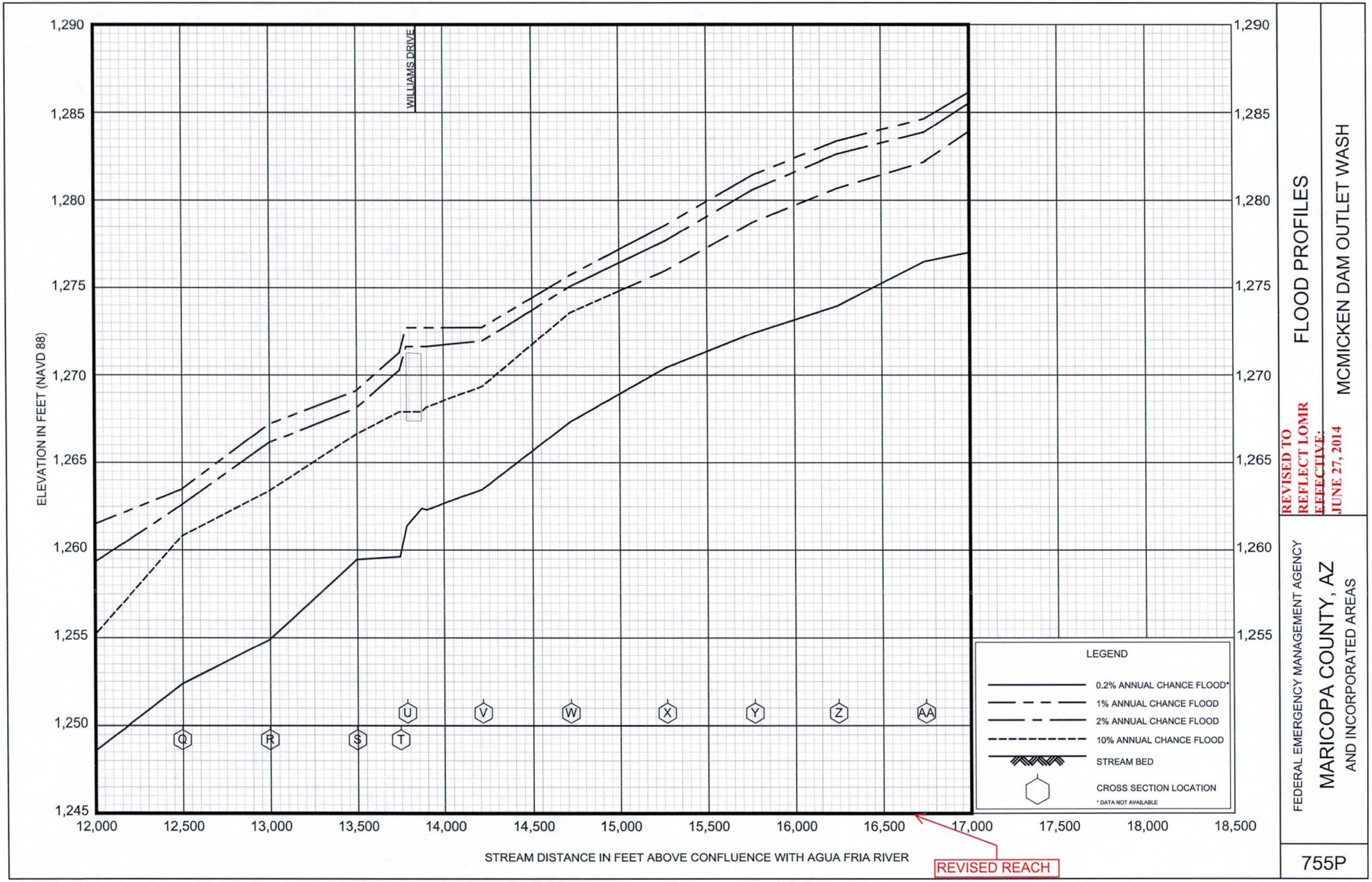
MCMICKEN DAM OUTLET WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ

AND INCORPORATED AREAS

756P



FLOOD PROFILES

REVISED TO REFLECT LOMR EFFECTIVE: JUNE 27, 2014

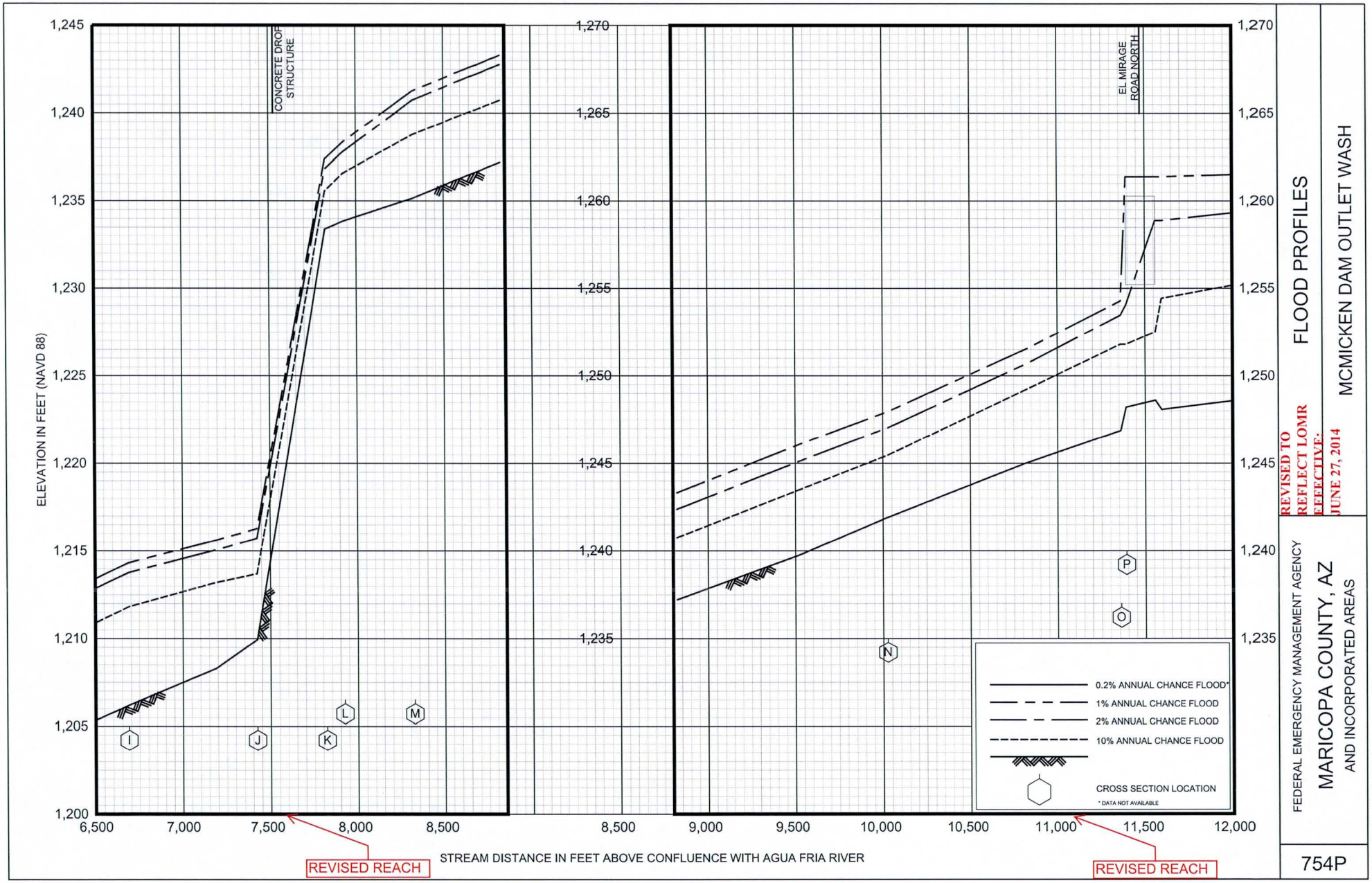
MCMICKEN DAM OUTLET WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ

AND INCORPORATED AREAS

755P



FLOOD PROFILES

MCMICKEN DAM OUTLET WASH

REVISED TO REFLECT LOMR EFFECTIVE: JUNE 27, 2014

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ

AND INCORPORATED AREAS

754P

Technical Support Data Notebook

McMICKEN DAM OUTLET WASH FLOODPLAIN DELINEATION STUDY (FDS)

CONTRACT FCD 2011C003

Prepared for:
The Flood Control District of Maricopa County
2801 West Durango Street
Phoenix, Arizona 85009
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Project Manager:
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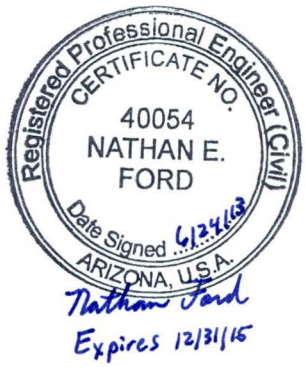
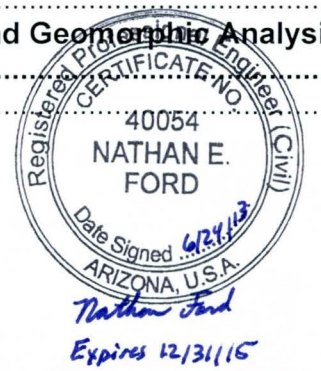
(602) 279-1234



Engineer:
Nathan Ford, P.E.
June 24, 2013

Table of Contents

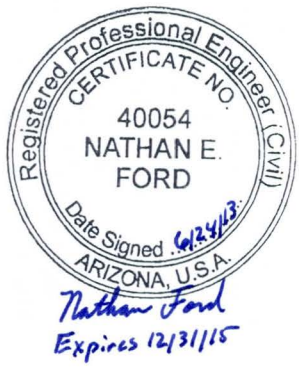
Section 1 Introduction 1-1
1.1. Purpose of Study 1-1
1.2. Authority for the Study 1-1
1.3. Site Location and Description 1-1
1.4. Methodology 1-2
1.4.1. Hydrology 1-2
1.4.2. Hydraulics and Floodplain Delineation 1-2
1.5. Summary of Results 1-2
Section 2 FEMA Forms 2-1
Section 3 Survey and Mapping Information 3-1
3.1. Digital Projection Information 3-1
3.2. Field Survey Information 3-1
3.3. Mapping 3-1
Section 4 Hydrology 4-1
4.1 Method Description 4-1
4.2 Parameter Estimation 4-2
4.2.1 Drainage Area Boundaries 4-2
4.2.2 Watershed Work Maps 4-2
4.2.3 Gage Data 4-3
4.2.4 Statistical Parameters 4-3
4.2.5 Precipitation 4-3
4.2.6 Physical Parameters 4-3
4.3 Issues Encountered During the Study 4-9
4.3.1 Special Issues and Solutions 4-9
4.3.2 Modeling Warning and Error Messages 4-9
4.4 Calibration 4-9
4.5 Final Results 4-9
4.5.1 Hydrologic Analysis Results 4-9
4.5.2 Verification of Results 4-10
Section 5 Hydraulics 5-1
5.1. Method Description 5-1
5.2. Work Study Maps 5-2
5.3. Parameter Estimation 5-2
5.3.1. Roughness Coefficients 5-2
5.3.2. Expansion and Contraction Coefficients 5-2
5.4. Cross Section Description 5-2
5.5. Modeling Considerations 5-2
5.6. Floodway Modeling 5-3
5.7. Issues Encountered During the Study 5-3
5.8. Calibration 5-4
5.9. Final Results 5-4
Section 6 Erosion, Sediment Transport, and Geomorphic Analysis 6-1
Section 7 Draft FIS Report Data 7-1
7.1. Summary of Discharges 7-1



7.2. Floodway Data....7-2
7.3. Annotated FIRMs....7-3
7.4. Flood Profiles....7-4

Appendix A References
A.1 Data Collection Summary
A.2 Referenced Documents
Appendix B General Documentation and Correspondence
B.1 General Project Documentation and Correspondence
B.2 Contract Documents
B.3 Public Notification
B.4 FEMA Correspondence
Appendix C Survey Field Notes
Appendix D Hydrologic Analysis Supporting Documentation
D.1 Precipitation Data
D.2 Physical Parameter Calculations
D.3 Hydrograph Routing Data
D.4 Reservoir Routing Data
D.5 Flow Splits and Diversion Data
D.6 Hydrologic Calculations
Appendix E Hydraulic Analysis Supporting Documentation
E.1 Roughness Coefficient Estimation
E.2 Cross Section Plots
E.3 Expansion and Contraction Coefficients
E.4 Analysis of Structures
E.5 Hydraulic Calculations

Digital Files

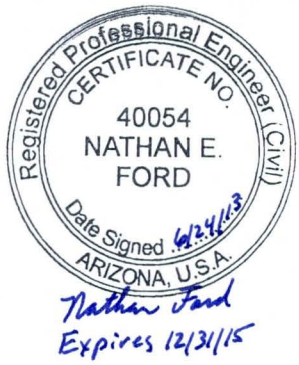


List of Figures

Figure 1 – McMicken Dam Outlet Wash FDS Location Map 1-3
Figure 4.1 – Sub-Basin Boundaries W/Aerial 4-11
Figure 4.1A – Sub-Basin Boundaries W/Aerial 4-12
Figure 4.2 – Sub-Basin Boundaries W/Topo 4-13
Figure 4.3 – Sub-Basin Boundaries W/Soils 4-14
Figure 4.4 – Sub-Basin Boundaries W/Land Use 4-15
Figure 4.5 – Gage Locations 4-16
Annotated Firms 7-3
Flood Profiles 7-4

List of Tables

Table 4.1 Soils Characteristics for Green-Ampt Parameters 4-4
Table 4.2 Land Use Characteristics for Green-Ampt Parameters 4-7
Table 4.3 Green-Ampt Parameters 4-8
Table 4.4 Sub-Basin Time of Concentration Parameters 4-8
Table 4.5 Channel Routing Summary 4-8
Table 4.6 Hydrologic Analysis Results 4-9
Table 4.7 Discharges Used for Floodplain Delineation 4-10
Table 4.8 USGS Regional Regression Peak Discharge Comparison 4-10
Table 5.1 Coincident Peak Criteria 5-1
Table 7.1 Summary of Discharges 7-1
Table 7.2 Floodway Data 7-2



Nathan Ford
Expires 12/31/15

Section 1 Introduction

1.1. Purpose of Study

The purpose of this study is to re-delineate detailed Zone AE 100-year floodplain and floodway for the McMicken Dam Outlet Wash. The study area is located within unincorporated Maricopa County (Refer to Figure 1).

1.2. Authority for the Study

The Flood Control District of Maricopa County (FCDMC) contracted RBF Consulting to perform the study based on recently acquired one foot contour interval topographic mapping and updated hydrologic analysis. The main contacts, addresses, and other information about the FCDMC and RBF Consulting are:

Flood Control District of Maricopa County

Address:	2801 West Durango Street Phoenix, Arizona 85009
Phone:	(602) 506-1501
Project Manager:	Kenneth Rakestraw

RBF Consulting, A Baker Company

Address:	2929 North Central Avenue, Suite 800 Phoenix, Arizona 85012
Phone:	(602) 279-1234
Principal-in-Charge:	Bruce Larson, P.E.
Project Manager:	Nathan Ford, P.E.

1.3. Site Location and Description

The McMicken Dam Outlet Wash watershed has a drainage area of about 323 square miles and is located in Maricopa County, Arizona (Refer to Figure 4.1). McMicken Dam Outlet Wash is tributary to the Agua Fria River. The Agua Fria River has a delineated 100-year floodplain and floodway with a 100-year peak discharge of approximately 37,500 cfs near the confluence with McMicken Dam Outlet Wash.

This report is organized according to Arizona State Standard 1 *Instructions for Organizing and Submitting Technical Support Data Notebooks (TSDN) for Flood Studies* developed by the Arizona Department of Water Resources (ADWR), dated August 2012 (ADWR, 2012).

1.4. Methodology

1.4.1. Hydrology

Peak flows were computed for the 100-year 24-hour storm using the U.S. Army Corps of Engineers HEC-1 software package, version 4.1, dated June 1998, from the Wittmann Area Drainage Master Study Update (WADMSU) Hydrology Addendum and the Final Hydrology Report Loop 303 / White Tanks Area Drainage Master Plan Update (ADMPU) Area Hydrologic Analysis. Minor modifications were incorporated into the combined model. Refer to Section 4 for a more detailed explanation of the hydrologic methodology and results.

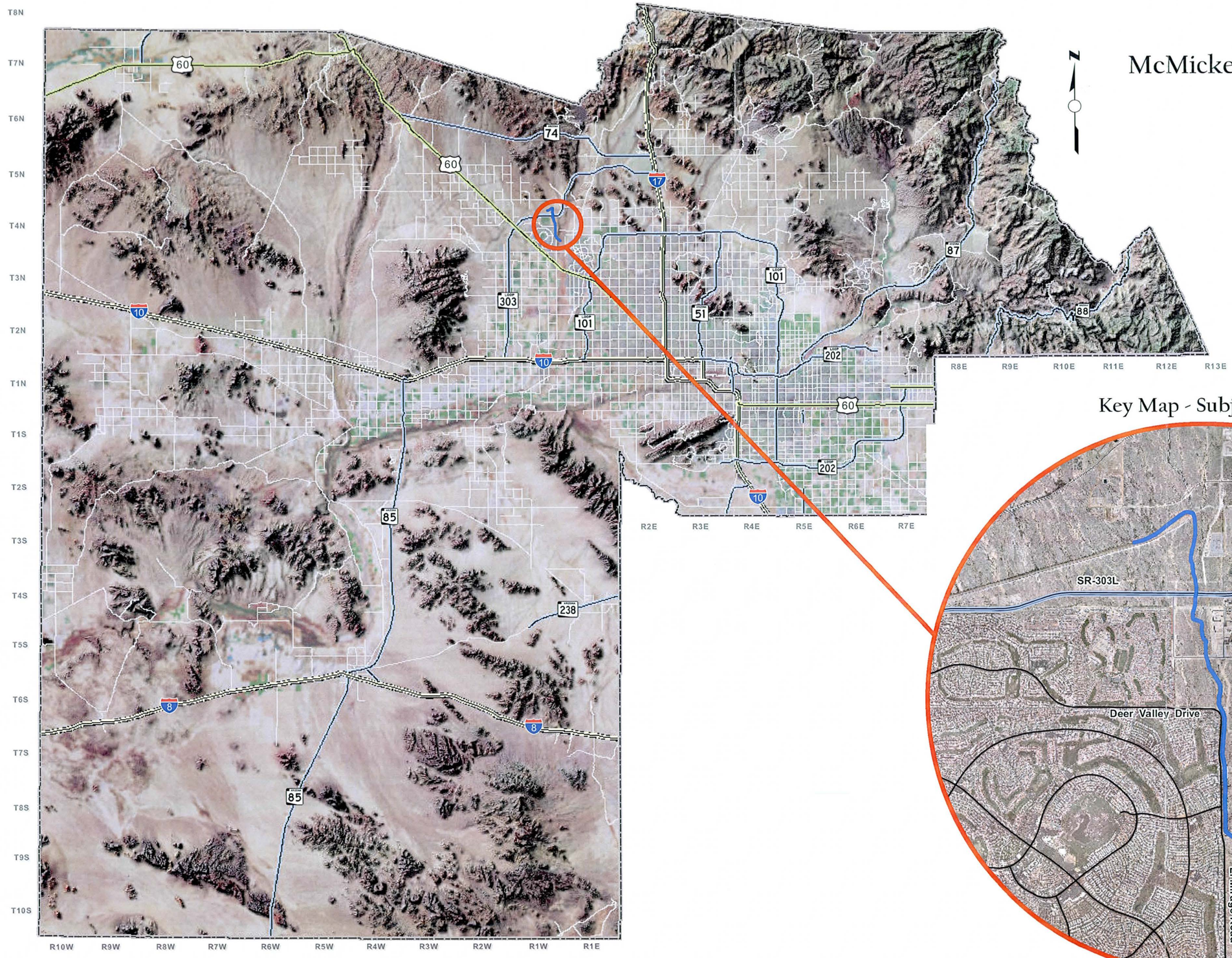
1.4.2. Hydraulics and Floodplain Delineation

The higher peak flow for concentration point CAF820 from the WADMSU 100-year 6-hour and 100-year 24-hour HEC-1 model were compared to determine the governing storm. The 100-year 24-hour storm was the governing storm for the McMicken Dam Outlet Wash and was used to update the hydrology model used to delineate the floodplain and floodway. The Zone AE floodplains and floodways were delineated using the U.S. Army Corps of Engineers Hydrologic Engineering Center River Analysis System (HEC-RAS) version 4.1.0 dated January 2010.

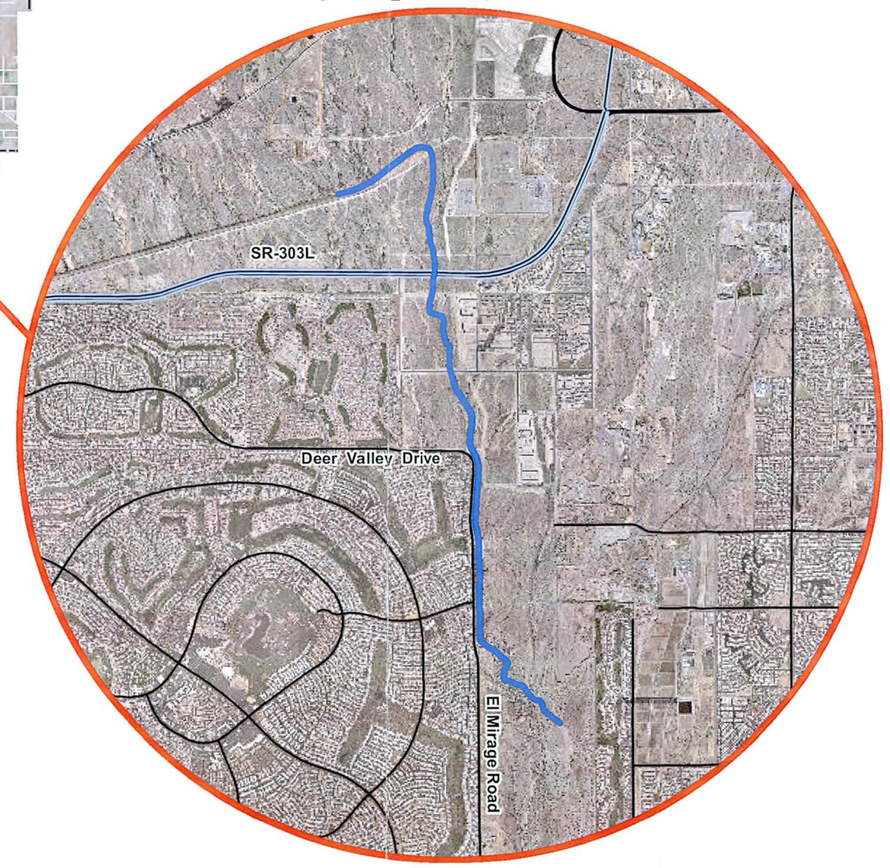
1.5. Summary of Results

The study resulted in the delineation of over four and three quarter miles of detailed Zone AE floodplain and floodway. The floodplain and floodway have been plotted on the Hydraulic Study Maps, located at the end of Appendix E.

McMicken Dam Outlet Wash FDS
Location Map
Figure 1



Key Map - Subject Area



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Section 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
Example: 480301 480287	City of Katy Harris County	TX TX	48473C 48201C	0005D 0220G	02/08/83 09/28/90
040037	Maricopa County	AZ	04013C	1155H	09/30/05
040037	Maricopa County	AZ	04013C	1165J	09/30/05

2. a. Flooding Source: McMicken Dam Outlet Wash

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

3. Project Name/Identifier: McMicken Dam Outlet Wash Floodplain Delineation Study

4. FEMA zone designations affected: AE, A, X (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)

Structures: ☐ Channelization ☐ Levee/Floodwall ☒ Bridge/Culvert
☐ Dam ☐ Fill ☐ Other (Attach Description)

6. ☐ Documentation of ESA compliance is submitted (required to initiate CLOMR review). Please refer to the instructions for more information.

C. REVIEW FEE

Has the review fee for the appropriate request category been included? ☒ Yes Fee amount: $5,300
☐ No, Attach Explanation

Please see the DHS-FEMA Web site at http://www.fema.gov/plan/prevent/fhm/frm_fees.shtm **for Fee Amounts and Exemptions.**

D. SIGNATURE

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

Name: Kenneth Rakestraw	Company: FCDMC	
Mailing Address: 2801 W. Durango St Phoenix, AZ 85009	Daytime Telephone No.: (602) 506-2201	Fax No.: (602) 506-4601
	E-Mail Address: kennethrakestraw@mail.maricopa.gov	
Signature of Requester (required): Kenneth Rakestraw	Date: 6/26/2013	

As the community official responsible for floodplain management, I hereby acknowledge that we have received and reviewed this Letter of Map Revision (LOMR) or conditional LOMR request. Based upon the community's review, we find the completed or proposed project meets or is designed to meet all of the community floodplain management requirements, including the requirements for when fill is placed in the regulatory floodway, and that all necessary Federal, State, and local permits have been, or in the case of a conditional LOMR, will be obtained. For Conditional LOMR requests, the applicant has documented Endangered Species Act (ESA) compliance to FEMA prior to FEMA's review of the Conditional LOMR application. For LOMR requests, I acknowledge that compliance with Sections 9 and 10 of the ESA has been achieved independently of FEMA's process. For actions authorized, funded, or being carried out by Federal or State agencies, documentation from the agency showing its compliance with Section 7(a)(2) of the ESA will be submitted. In addition, we have determined that the land and any existing or proposed structures to be removed from the SFHA are or will be reasonably safe from flooding as defined in 44CFR 65.2(c), and that we have available upon request by FEMA, all analyses and documentation used to make this determination.

Community Official's Name and Title: Timothy S. Phillips, P.E. Chief Engineer & General Manager	Community Name: FCDMC	
Mailing Address: 2801 W. Durango St Phoenix, AZ 85009	Daytime Telephone No.: (602) 506-4701	Fax No.: (602) 506-4601
	E-Mail Address: tsp@mail.maricopa.gov	
Community Official's Signature (required):	Date: 6/27/13	

CERTIFICATION BY REGISTERED PROFESSIONAL ENGINEER AND/OR LAND SURVEYOR

This certification is to be signed and sealed by a licensed land surveyor, registered professional engineer, or architect authorized by law to certify elevation information data, hydrologic and hydraulic analysis, and any other supporting information as per NFIP regulations paragraph 65.2(b) and as described in the MT-2 Forms Instructions. All documents submitted in support of this request are correct to the best of my knowledge. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Certifier's Name: Nathan Ford	License No.: 40054		Expiration Date: 12/31/15
Company Name: RBF Consulting	Telephone No.: (602) 279-1234		Fax No.: (602) 279-1411
Signature: Nathan Ford	Date: 6/24/13	E-Mail Address: nford@rbf.com	

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

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

Seal (Optional)

U.S. DEPARTMENT OF HOMELAND SECURITY
FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE HYDROLOGY & HYDRAULICS FORM

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

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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).

Flooding Source: McMicken Dam Outlet Wash

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)
Confluence with Agua Fria	323 / 109	6,522	7,620

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

☐ Statistical Analysis of Gage Records ☒ Precipitation/Runoff Model → Specify Model: HEC-1
☐ 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*	Confluence w/ Agua Fria River	0.324	1183.6	1183.0
Upstream Limit*	McMicken Dam Outlet Channel	4.794	1316.1	1316.8

*Proposed/Revised elevations must tie-into the Effective elevations within 0.5 foot at the downstream and upstream limits of revision.

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.

Models Submitted	Natural Run		Floodway Run		Datum
Duplicate Effective Model*	File Name:	Plan Name:	File Name:	Plan Name:	
Corrected Effective Model*	File Name:	Plan Name:	File Name:	Plan Name:	
Existing or Pre-Project Conditions Model	File Name: MDOWFP.prj	Plan Name: MDOWFP.p01	File Name: MDOWFP.prj	Plan Name: MDOWFP.p01	NAVD88
Revised or Post-Project Conditions Model	File Name:	Plan Name:	File Name:	Plan Name:	
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: 1 ft contour data

Source: Woolpert for the FCDMC Date: Flown on October 8, 2012

Accuracy: 1 Inch = 240 Feet

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.

DEPARTMENT OF HOMELAND SECURITY
FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE STRUCTURES FORM

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

PAPERWORK BURDEN DISCLOSURE NOTICE

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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).

Flooding Source: McMicken Dam Outlet Wash

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

A. GENERAL

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

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

Description Of Modeled Structure

1. Name of Structure: Loop 303 Culvert

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

   Location of Structure: Sta 3.330 (Loop 303 and McMicken Dam Outlet Wash)

   Downstream Limit/Cross Section: 3.310

   Upstream Limit/Cross Section: 3.350

2. Name of Structure: Williams Drive Culvert

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

   Location of Structure: Sta 2.618 (Williams Drive and McMicken Dam Outlet Wash)

   Downstream Limit/Cross Section: 2.603

   Upstream Limit/Cross Section: 2.632

3. Name of Structure: El Mirage Road North Culvert

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

   Location of Structure: Sta 2.174 (El Mirage Road and McMicken Dam Outelt Wash)

   Downstream Limit/Cross Section: 2.151

   Upstream Limit/Cross Section: 2.196

NOTE: FOR MORE STRUCTURES, ATTACH ADDITIONAL PAGES AS NEEDED.

DEPARTMENT OF HOMELAND SECURITY
FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE STRUCTURES 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 7 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing, reviewing, and submitting the form. You are not required to respond to this collection of information unless a valid OMB control number appears in the upper right corner of this form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Department of Homeland Security, Federal Emergency Management Agency, 1800 South Bell Street, Arlington, VA 20598-3005, 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; 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).

Flooding Source: McMicken Dam Outlet Wash

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

A. GENERAL

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

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

Description Of Modeled Structure

1. Name of Structure: El Mirage Road South Culvert

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

   Location of Structure: Sta 0.768 (El Mirage Road and McMicken Dam Outlet Wash)

   Downstream Limit/Cross Section: 0.744

   Upstream Limit/Cross Section: 0.792

2. Name of Structure: _____

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

   Location of Structure: _____

   Downstream Limit/Cross Section: _____

   Upstream Limit/Cross Section: _____

3. Name of Structure: _____

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

   Location of Structure: _____

   Downstream Limit/Cross Section: _____

   Upstream Limit/Cross Section: _____

NOTE: FOR MORE STRUCTURES, ATTACH ADDITIONAL PAGES AS NEEDED.

B. CHANNELIZATION

Flooding Source: _____

Name of Structure: _____

1. Hydraulic Considerations

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

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

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

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

☐ Inlet to channel ☐ Outlet of channel ☐ At Drop Structures ☐ At Transitions

☐ Other locations (specify): _____

2. Channel Design Plans

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

3. Accessory Structures

The channelization includes (check one):

☐ Levees [Attach Section E (Levee/Floodwall)] ☐ Drop structures ☐ Superelevated sections

☐ Transitions in cross sectional geometry ☐ Debris basin/detention basin [Attach Section D (Dam/Basin)] ☐ Energy dissipator

☐ Weir ☐ Other (Describe):

4. Sediment Transport Considerations

Are the hydraulics of the channel affected by sediment transport? ☐ Yes ☐ No

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

C. BRIDGE/CULVERT

Flooding Source: McMicken Dam Outlet Wash

Name of Structure: Loop 303 culvert, Williams Drive culvert, El Mirage North and South culvert

1. This revision reflects (check one):

☒ Bridge/culvert not modeled in the FIS

☐ Modified bridge/culvert previously modeled in the FIS

☐ Revised analysis of bridge/culvert previously modeled in the FIS

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

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

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

4. Sediment Transport Considerations

Are the hydraulics of the structure affected by sediment transport? ☐ Yes ☒ No

If Yes, then fill out Section F (Sediment Transport) of Form 3. If no, then attach an explanation.

D. DAM/BASIN

Flooding Source: _____
Name of Structure: _____

1. This request is for (check one): ☐ Existing dam/basin ☐ New dam/basin ☐ Modification of existing dam/basin

2. The dam/basin was designed by (check one): ☐ Federal agency ☐ State agency ☐ Private organization ☐ Local government agency

   Name of the agency or organization: _____

3. The Dam was permitted as (check one): ☐ Federal Dam ☐ State Dam

   Provide the permit or identification number (ID) for the dam and the appropriate permitting agency or organization

   Permit or ID number _____ Permitting Agency or Organization _____

   a. ☐ Local Government Dam ☐ Private Dam

   Provided related drawings, specification and supporting design information.

4. Does the project involve revised hydrology? ☐ Yes ☐ No

   If Yes, complete the Riverine Hydrology & Hydraulics Form (Form 2).

   Was the dam/basin designed using critical duration storm? (must account for the maximum volume of runoff)

   ☐ Yes, provide supporting documentation with your completed Form 2.

   ☐ No, provide a written explanation and justification for not using the critical duration storm.

5. Does the submittal include debris/sediment yield analysis? ☐ Yes ☐ No

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

6. Does the Base Flood Elevation behind the dam/basin or downstream of the dam/basin change? ☐ Yes ☐ No

   If Yes, complete the Riverine Hydrology & Hydraulics Form (Form 2) and complete the table below.

FREQUENCY (% annual chance)	Stillwater Elevation Behind the Dam/Basin FIS	REVISED
10-year (10%)	_____	_____
50-year (2%)	_____	_____
100-year (1%)	_____	_____
500-year (0.2%)	_____	_____
Normal Pool Elevation	_____	_____

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

E. LEVEE/FLOODWALL

1. System Elements

a. This Levee/Floodwall analysis is based on (check one): ☐ upgrading of an existing levee/floodwall system ☐ a newly constructed levee/floodwall system ☐ reanalysis of an existing levee/floodwall system

b. Levee elements and locations are (check one):

☐ earthen embankment, dike, berm, etc. Station _____ to _____
☐ structural floodwall Station _____ to _____
☐ Other (describe): Station _____ to _____

c. Structural Type (check one): ☐ monolithic cast-in place reinforced concrete ☐ reinforced concrete masonry block ☐ sheet piling ☐ Other (describe): _____

d. Has this levee/floodwall system been certified by a Federal agency to provide protection from the base flood?

☐ Yes ☐ No

If Yes, by which agency? _____

e. Attach certified drawings containing the following information (indicate drawing sheet numbers):

1. Plan of the levee embankment and floodwall structures. Sheet Numbers: _____
2. A profile of the levee/floodwall system showing the Base Flood Elevation (BFE), levee and/or wall crest and foundation, and closure locations for the total levee system. Sheet Numbers: _____
3. A profile of the BFE, closure opening outlet and inlet invert elevations, type and size of opening, and kind of closure. Sheet Numbers: _____
4. A layout detail for the embankment protection measures. Sheet Numbers: _____
5. Location, layout, and size and shape of the levee embankment features, foundation treatment, Floodwall structure, closure structures, and pump stations. Sheet Numbers: _____

2. Freeboard

a. The minimum freeboard provided above the BFE is:

Riverine

3.0 feet or more at the downstream end and throughout	☐ Yes	☐ No
3.5 feet or more at the upstream end	☐ Yes	☐ No
4.0 feet within 100 feet upstream of all structures and/or constrictions	☐ Yes	☐ No

Coastal

1.0 foot above the height of the one percent wave associated with the 1%-annual-chance stillwater surge elevation or maximum wave runup (whichever is greater).	☐ Yes	☐ No
2.0 feet above the 1%-annual-chance stillwater surge elevation	☐ Yes	☐ No

Please note, occasionally exceptions are made to the minimum freeboard requirement. If an exception is requested, attach documentation addressing Paragraph 65.10(b)(1)(ii) of the NFIP Regulations.

If No is answered to any of the above, please attach an explanation.

b. Is there an indication from historical records that ice-jamming can affect the BFE? ☐ Yes ☐ No

If Yes, provide ice-jam analysis profile and evidence that the minimum freeboard discussed above still exists.

3. Closures

a. Openings through the levee system (check one): ☐ exists ☐ does not exist

If opening exists, list all closures:

Channel Station	Left or Right Bank	Opening Type	Highest Elevation for Opening Invert	Type of Closure Device

(Extend table on an added sheet as needed and reference)

Note: Geotechnical and geologic data

In addition to the required detailed analysis reports, data obtained during field and laboratory investigations and used in the design analysis for the following system features should be submitted in a tabulated summary form. (Reference U.S. Army Corps of Engineers [USACE] EM-1110-2-1906 Form 2086.)

4. Embankment Protection

a. The maximum levee slope land side is: _____

b. The maximum levee slope flood side is: _____

c. The range of velocities along the levee during the base flood is: _____ (min.) to _____ (max.)

d. Embankment material is protected by (describe what kind): _____

e. Riprap Design Parameters (check one): ☐ Velocity ☐ Tractive stress
Attach references

Reach		Sideslope	Flow Depth	Velocity	Curve or Straight	Stone Riprap			Depth of Toedown
						D_{100}	D_{50}	Thickness	
Sta	to								
Sta	to								
Sta	to								
Sta	to								
Sta	to								
Sta	to								

(Extend table on an added sheet as needed and reference each entry)

f. Is a bedding/filter analysis and design attached? ☐ Yes ☐ No

g. Describe the analysis used for other kinds of protection used (include copies of the design analysis):

Attach engineering analysis to support construction plans.

5. Embankment And Foundation Stability

a. Identify locations and describe the basis for selection of critical location for analysis:
_____

☐ Overall height: Sta.: _____, height _____ ft.

☐ Limiting foundation soil strength:

Strength ϕ = _____ degrees, c = _____ psf

Slope: SS = _____ (h) to _____ (v)

(Repeat as needed on an added sheet for additional locations)

b. Specify the embankment stability analysis methodology used (e.g., circular arc, sliding block, infinite slope, etc.):
_____

c. Summary of stability analysis results:

E. LEVEE/FLOODWALL (CONTINUED)

5. Embankment And Foundation Stability (continued)

Case	Loading Conditions	Critical Safety Factor	Criteria (Min.)
I	End of construction		1.3
II	Sudden drawdown		1.0
III	Critical flood stage		1.4
IV	Steady seepage at flood stage		1.4
VI	Earthquake (Case I)		1.0

(Reference: USACE EM-1110-2-1913 Table 6-1)

d. Was a seepage analysis for the embankment performed? ☐ Yes ☐ No

If Yes, describe methodology used:

e. Was a seepage analysis for the foundation performed? ☐ Yes ☐ No

f. Were uplift pressures at the embankment landside toe checked? ☐ Yes ☐ No

g. Were seepage exit gradients checked for piping potential? ☐ Yes ☐ No

h. The duration of the base flood hydrograph against the embankment is _____ hours.

Attach engineering analysis to support construction plans.

6. Floodwall And Foundation Stability

a. Describe analysis submittal based on Code (check one): ☐ UBC (1988) ☐ Other (specify): _____

b. Stability analysis submitted provides for: ☐ Overturning ☐ Sliding If not, explain: _____

c. Loading included in the analyses were: ☐ Lateral earth @ P_A = _____ psf; P_p = _____ psf

☐ Surcharge-Slope @ _____, ☐ surface _____ psf

☐ Wind @ P_w = _____ psf

☐ Seepage (Uplift); _____ ☐ Earthquake @ P_{eq} = _____ %g

☐ 1%-annual-chance significant wave height: _____ ft.

☐ 1%-annual-chance significant wave period: _____ sec.

d. Summary of Stability Analysis Results: Factors of Safety.
Itemize for each range in site layout dimension and loading condition limitation for each respective reach.

Loading Condition	Criteria (Min)		Sta	To	Sta	To
	Overturn	Sliding	Overturn	Sliding	Overturn	Sliding
Dead & Wind	1.5	1.5				
Dead & Soil	1.5	1.5				
Dead, Soil, Flood, & Impact	1.5	1.5				
Dead, Soil, & Seismic	1.3	1.3				

(Ref: FEMA 114 Sept 1986; USACE EM 1110-2-2502)
Note: (Extend table on an added sheet as needed and reference)

E. LEVEE/FLOODWALL (CONTINUED)

6. Floodwall And Foundation Stability (continued)

e. Foundation bearing strength for each soil type:

Bearing Pressure	Sustained Load (psf)	Short Term Load (psf)
Computed design maximum		
Maximum allowable		

f. Foundation scour protection ☐ is, ☐ is not provided. If provided, attach explanation and supporting documentation:

Attach engineering analysis to support construction plans.

7. Settlement

a. Has anticipated potential settlement been determined and incorporated into the specified construction elevations to maintain the established freeboard margin? ☐ Yes ☐ No

b. The computed range of settlement is _____ ft. to _____ ft.

c. Settlement of the levee crest is determined to be primarily from : ☐ Foundation consolidation ☐ Embankment compression ☐ Other (Describe): _____

d. Differential settlement of floodwalls ☐ has ☐ has not been accommodated in the structural design and construction.

Attach engineering analysis to support construction plans.

8. Interior Drainage

a. Specify size of each interior watershed:

Draining to pressure conduit: _____ acres
Draining to ponding area: _____ acres

b. Relationships Established

Ponding elevation vs. storage	☐ Yes	☐ No
Ponding elevation vs. gravity flow	☐ Yes	☐ No
Differential head vs. gravity flow	☐ Yes	☐ No

c. The river flow duration curve is enclosed: ☐ Yes ☐ No

d. Specify the discharge capacity of the head pressure conduit: _____ cfs

e. Which flooding conditions were analyzed?

• Gravity flow (Interior Watershed)	☐ Yes	☐ No
• Common storm (River Watershed)	☐ Yes	☐ No
• Historical ponding probability	☐ Yes	☐ No
• Coastal wave overtopping	☐ Yes	☐ No

If No for any of the above, attach explanation.

e. Interior drainage has been analyzed based on joint probability of interior and exterior flooding and the capacities of pumping and outlet facilities to provide the established level of flood protection. ☐ Yes ☐ No If No, attach explanation.

g. The rate of seepage through the levee system for the base flood is _____ cfs

h. The length of levee system used to drive this seepage rate in item g: _____ ft.

E. LEVEE/FLOODWALL (CONTINUED)

8. Interior Drainage (continued)

i. Will pumping plants be used for interior drainage? ☐ Yes ☐ No

If Yes, include the number of pumping plants: _____ For each pumping plant, list:

	Plant #1	Plant #2
The number of pumps		
The ponding storage capacity		
The maximum pumping rate		
The maximum pumping head		
The pumping starting elevation		
The pumping stopping elevation		
Is the discharge facility protected?		
Is there a flood warning plan?		
How much time is available between warning and flooding?		

Will the operation be automatic? ☐ Yes ☐ No

If the pumps are electric, are there backup power sources? ☐ Yes ☐ No

(Reference: USACE EM-1110-2-3101, 3102, 3103, 3104, and 3105)

Include a copy of supporting documentation of data and analysis. Provide a map showing the flooded area and maximum ponding elevations for all interior watersheds that result in flooding.

9. Other Design Criteria

a. The following items have been addressed as stated:

Liquefaction ☐ is ☐ is not a problem

Hydrocompaction ☐ is ☐ is not a problem

Heave differential movement due to soils of high shrink/swell ☐ is ☐ is not a problem

b. For each of these problems, state the basic facts and corrective action taken:

Attach supporting documentation

c. If the levee/floodwall is new or enlarged, will the structure adversely impact flood levels and/or flow velocities floodside of the structure?
☐ Yes ☐ No Attach supporting documentation

d. Sediment Transport Considerations:

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

10. Operational Plan And Criteria

a. Are the planned/installed works in full compliance with Part 65.10 of the NFIP Regulations? ☐ Yes ☐ No

b. Does the operation plan incorporate all the provisions for closure devices as required in Paragraph 65.10(c)(1) of the NFIP regulations?
☐ Yes ☐ No

c. Does the operation plan incorporate all the provisions for interior drainage as required in Paragraph 65.10(c)(2) of the NFIP regulations?
☐ Yes ☐ No If the answer is No to any of the above, please attach supporting documentation.

E. LEVEE/FLOODWALL (CONTINUED)

11. Maintenance Plan

Please attach a copy of the fomal maintenance plan for the levee/floodwall

12. Operations and Maintenance Plan

Please attach a copy of the formal Operations and Maintenance Plan for the levee/floodwall.

CERTIFICATION OF THE LEVEE DOCUMENTION

This certification is to be signed and sealed by a licensed registered professional engineer authorized by law to certify elevation information data, hydrologic and hydraulic analysis, and any other supporting information as per NFIP regulations paragraph 65.10(e) and as described in the MT-2 Forms Instructions. All documents submitted in support of this request are correct to the best of my knowledge. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Certifier's Name: _____ License No.: _____ Expiration Date: _____

Company Name: _____ Telephone No.: _____ Fax No.: _____

Signature: _____ Date: _____ E-Mail Address: _____

F. SEDIMENT TRANSPORT

Flooding Source: _____

Name of Structure: _____

If there is any indication from historical records that sediment transport (including scour and deposition) can affect the Base Flood Elevation (BFE); and/or based on the stream morphology, vegetative cover, development of the watershed and bank conditions, there is a potential for debris and sediment transport (including scour and deposition) to affect the BFEs, then provide the following information along with the supporting documentation:

Sediment load associated with the base flood discharge: Volume _____ acre-feet

Debris load associated with the base flood discharge: Volume _____ acre-feet

Sediment transport rate _____ (percent concentration by volume)

Method used to estimate sediment transport: _____

Most sediment transport formulas are intended for a range of hydraulic conditions and sediment sizes; attach a detailed explanation for using the selected method.

Method used to estimate scour and/or deposition: _____

Method used to revise hydraulic or hydrologic analysis (model) to account for sediment transport: _____

Please note that bulked flows are used to evaluate the performance of a structure during the base flood; however, FEMA does not map BFEs based on bulked flows.

If a sediment analysis has not been performed, an explanation as to why sediment transport (including scour and deposition) will not affect the BFEs or structures must be provided.

Section 3 Survey and Mapping Information

3.1. Digital Projection Information

Drainage basins boundaries, cross sections, floodplain, and floodway shapefiles have been included on the CD. The projection has been included with the files. The projection is North American Datum (NAD) 1983 High Accuracy Resolution Network (HARN) Arizona State Plane Central Zone International Feet.

3.2. Field Survey Information

RBF used the existing record drawings provided by FCDMC, MCDOT, or Parsons Brinckerhoff to obtain the culvert dimensions and invert elevations for the four culverts along the McMicken Dam Outlet Wash. The vertical coordinate system of the hydraulic model is North American Vertical Datum (NAVD) 1988. The Williams Drive culvert plans were based on National Geodetic Vertical Datum (NGVD) 1929. The benchmark from the Williams Drive culvert plans was used to obtain the difference between NAVD 1988 and NGVD 1929. NAVD 1988 is 1.96 ft higher than NGVD 1929.

3.3. Mapping

RBF used the existing digital terrain models (DTM) and 1-foot contour data provided by the FCDMC for hydraulic modeling. Woolpert created the DTM from digital ortho-photos that were flown on October 8, 2012 for the McMicken Outfall Channel Aerial Mapping (FCD Contract 2011C033 Assignment 1). The coordinate system is based on NAD 1983 (2010 epoch), Arizona State Plane – Central Zone using international feet. The vertical coordinate system is NAVD 1988. Refer to the Survey Report in Appendix C for more detailed information.

Section 4 Hydrology

4.1 Method Description

The Wittmann Area Drainage Master Study Update (WADMSU) Addendum dated July 2005 prepared by Entellus as part of the WADMSU Contract FCD 2002C029 and the Final Hydrology Report Loop 303 / White Tanks Area Drainage Master Plan Update (ADMPU) Area Hydrologic Analysis Contract FCD 2007C031 dated September 2009 prepared by HDR Engineering, Inc. was used as the source of the hydrologic analysis. Additional compilation was performed to create a combined model for the McMicken Dam Outlet Wash. The peak flows for the existing conditions 100-year 24-hour storm were computed due to the watershed size.

The WADMSU hydrology model forms the framework for the McMicken Dam Outlet Wash hydrologic model. The FCDMC updated the WADMSU hydrology rainfall depths from NOAA Atlas 2 to NOAA Atlas 14. Two scenarios were modeled to determine the peak flow entering the McMicken Dam Outlet Wash near the end of the McMicken Dam Outlet Channel (Concentration Point CPD700). One scenario modeled the rainfall for the entire drainage area for both the McMicken Dam and the McMicken Dam Outlet Channel. This model includes outflow from the McMicken Dam through the McMicken Dam Principal Spillway into the McMicken Dam Outlet Channel. The other scenario modeled the rainfall for only the drainage area contributing to the McMicken Dam Outlet Channel. In other words, the peak flow from the McMicken Dam through the McMicken Dam Principal Spillway was zero because the connection was removed in the model. The McMicken Dam Outlet Channel drainage area generated a higher peak flow than the entire drainage area. The hydrograph at CPD700 was included in the McMicken Dam Outlet Wash hydrology model as MDOC.

The Loop 303 / White Tanks ADMPU Area Hydrologic Analysis Northeast Region (N) sub-basins include the drainage area south of the McMicken Dam Outlet Channel and west of the McMicken Dam Outlet Wash including Sun City West that contribute to the study wash. The WADMSU also covers most of this same area. It was determined to include the Loop 303 / White Tanks ADMPU basins instead of the three WADMSU basins (AF803, AF805, and AF807) for this area because the Loop 303 / White Tanks ADMPU was more recent. These 13 sub-basins were incorporated with only one adjustment made to the routing of Sub-basin N07. There is an existing channel along the north side of SR303L approximately one mile west of El Mirage Road that directs flow east toward the McMicken Dam Outlet Wash. The original model includes three flow splits into Corte Bella which is south of the existing channel and SR303L. These flow splits were removed to better represent the existing and proposed SR303L / El Mirage improvements.

Three additional WADMSU Addendum drainage areas (AF802, AF810, and AF820) not included in the inflow hydrograph (MDOC) drain to the McMicken

Dam Outlet Wash. The following adjustments were made to these sub-basins. Sub-basin AF802 was redelineated to extend to the SR303L culvert and includes all of AF802 and a portion of AF810. Sub-basin AF810 was redelineated to exclude Sub-basin N06 and include the new boundary associated with Sub-basin AF802. Sub-basin AF820 was essentially the same with only a trivial change to eliminate the small sliver between the Sub-basin N08 and Sub-basin AF820 boundaries. The Green and Ampt parameters and Clark unit hydrograph were all computed for these three sub-basins. The length of the longest watercourse and routing reaches were obtained from the WADMSU Addendum and modified as needed for the McMicken Dam Outlet Wash.

4.2 Parameter Estimation

The McMicken Dam Outlet Wash hydrology model used NOAA Atlas 14 rainfall with depth-area reduction, Green and Ampt loss method, S-Graph for the Loop 303 basins and Clark unit hydrograph for the WADMSU basins, and Normal Depth routing. Hydrologic parameters were obtained from the WADMSU and Loop 303 / White Tanks ADMPU Area Hydrologic Analysis and are provided in the Appendix for convenience. The following sections briefly discuss the parameter estimation. For more detail refer to the WADMSU or Loop 303 / White Tanks ADMPU reports.

4.2.1 Drainage Area Boundaries

The WADMSU hydrology model delineates the watershed into seven major sub-areas. These sub-areas include White Tank Mountain (WT), Picacho Wash (PI), Padelford Wash (PD), Trilby Wash (TW), Iona Wash (IW), Wittmann Wash (WI), Sun Valley Parkway (SV), and Agua Fria River (AF). Each sub-area was further divided into sub-basins. There are 294 sub-basins used to model the approximately 313 square mile watershed for the McMicken Dam and McMicken Dam Outlet Channel. An additional three square mile drainage area contributes to the McMicken Dam Outlet Wash downstream of the McMicken Dam Outlet Channel. These three sub-basins, although modified for this project, maintain the same naming convention from the WADMSU.

Thirteen sub-basins from the Loop 303 / White Tanks ADMPU Area Hydrologic Analysis Northeast Region (N) were used to model the six and one-half square mile watershed located south of the McMicken Dam Outlet Channel and west of the McMicken Dam Outlet Wash.

Figures 4.1 and 4.2 depict the sub-basin delineation for McMicken Dam Outlet Wash. Figure 4.1 overlays the sub-basins on aerial photos and Figure 4.2 overlays them on topographic contour lines.

4.2.2 Watershed Work Maps

Figure 4.3 shows the sub-basin boundaries overlain on top of the soil map units, according to the Aguila-Carefree Area, Parts of Maricopa and Pinal Counties Arizona Soil Survey and Maricopa County, Arizona Central Part Soil Survey.

Figure 4.4 shows the land use designation obtained from the Maricopa Association of Governments (MAG).

4.2.3 Gage Data

There is a stream gage (FCDMC No. 5483) and precipitation gage (FCDMC No. 5480) located on the McMicken Dam Outlet Wash. The name of this gage is El Mirage Drain and it is located in Section 14 of Township 4 North Range 1 West (latitude: 33°41'26.6"N; longitude: 112°19'41.0"W). The gage was installed February 16, 2006. The peak flow recorded since installation is 475 cfs. There are many precipitation gages and a few stream gages within and near the McMicken Dam Outlet Wash watershed. Refer to Figure 4.5 which shows the gage name and location in relationship to the watershed.

4.2.4 Statistical Parameters

Statistical parameters were not considered as part of this study.

4.2.5 Precipitation

The McMicken Dam Outlet Wash hydrology model used the NOAA Atlas 14 rainfall depths. The point rainfall depth of the 100-year 24-hour storm is 3.48 inches for the drainage area downstream of the McMicken Dam Outlet Channel. As previously discussed, two scenarios were modeled for the McMicken Dam Outlet Channel. Each scenario used the 100-year 24-hour storm point rainfall depth computed using the respective drainage area shapefile in DDMSW. The entire McMicken Dam drainage area (313 square miles) used a 100-year 24-hour point rainfall depth of 4.147 inches. The McMicken Dam Outlet Channel drainage area (100 square miles) used a 100-year 24-hour point rainfall depth of 4.209 inches. The point rainfall depths were adjusted by areal reduction factors as outlined in the Drainage Design Manual and previous studies.

4.2.6 Physical Parameters

Rainfall Losses

Both previous models used the Green-Ampt infiltration equations within HEC-1 to estimate rainfall losses. Table 4.1 lists the map unit values that were used in the study area to compute the rainfall losses for the sub-basins within the McMicken Dam Outlet Wash watershed.

Table 4.1 Soil Characteristics for Green-Ampt Parameters

Soil ID	Description	XKSAT (in/hr)	% Impervious	% Effective
6512021	Agualt loam	0.26	0	100
6512029	Antho-Brios sandy loams	0.39	0	100
6453	Antho-Carrizo-Maripo complex	0.58	0	100
651203222	Antho-Carrizo complex, 0 to 3 percent slopes	0.40	0	100
651204122	Antho-Tremant-Mohall complex, 1 to 5 percent slopes	0.27	0	100
651203424	Antho-Tremant complex, 1 to 5 percent slopes	0.38	0	100
6512042	Antho association	0.40	0	100
651202720	Antho gravelly sandy loam, 0 to 1 percent slopes	0.40	0	100
651202722	Antho gravelly sandy loam, 1 to 3 percent slopes	0.40	0	100
6452	Antho gravelly sandy loams	0.41	0	100
651202322	Antho sandy loam, 1 to 3 percent slopes	0.39	0	100
6451	Antho sandy loams	0.41	0	100
6457	Anthony-Arizo complex, low precipitation	0.62	0	100
651202320	Anthosandy loam, 0 to 1 percent slopes	0.38	0	100
6458	Arizo cobbly sandy loam	0.96	0	100
6512228	Beardsley loam	0.24	0	100
64510	Brios-Carrizo complex, 1 to 5 percent slopes	0.94	0	100
6512259	Brios loam	0.25	0	100
6512255	Brios loamy sand	1.05	0	100
6512257	Brios sandy loam	0.39	0	100
65124202	Calciorthids and Torriorthents, eroded	0.38	0	100
64513	Carefree-Beardsley complex	0.01	0	100
6512423	Carrizo gravelly sandy loam	0.40	0	100
64516	Cellar-Rock outcrop complex, 10 to 70 percent slopes	0.44	15	100
6512448	Cheriono-Rock outcrop complex	0.29	20	100
64518	Cheriono-Rock outcrop complex, 5 to 60 percent slopes	0.33	15	100
64521	Cipriano very gravelly loam	0.38	0	100
64523	Contine clay	0.01	0	100
64522	Contine clay loam	0.04	0	100
64528	Continental-Ohaco complex	0.02	0	100
6512457	Coolidge-Tremant complex	0.19	0	100
651245522	Coolidge gravelly sandy loam, 1 to 3 percent slopes	0.40	0	100
6512451	Coolidge sandy loam	0.40	0	100
64529	Denure-Momoli-Carrizo complex	0.34	0	100
64531	Dixaleta-Rock outcrop complex, 25 to 65 percent slopes	0.33	35	100
64538	Eba-Continental-Cave association, low precipitation, 3 to 20 percent	0.13	0	100
64536	Eba-Continental complex, 1 to 8 percent slopes	0.07	0	100
64539	Eba-Nickel-Cave association, 3 to 25 percent slopes	0.29	0	100
64543	Eba-Pinaleno complex, low precipitation, 20 to 40 percent slopes	0.17	0	100
64542	Eba-Pinaleno complex, low precipitation, 3 to 20 percent slopes	0.17	0	100

Table 4.1 Soil Characteristics for Green-Ampt Parameters (Continued)

Soil ID	Description	XKSAT (in/hr)	% Impervious	% Effective
64533	Eba very gravelly loam, 1 to 8 percent slopes	0.23	0	100
64534	Eba very gravelly loam, 8 to 20 percent slopes	0.23	0	100
64535	Eba very gravelly loam, low precipitation, 8 to 20 percent slopes	0.23	0	100
64546	Ebon-Contine complex, 1 to 8 percent	0.03	0	100
64547	Ebon-Gunsight-Cipriano association, 3 to 25 percent slopes	0.11	0	100
651285026	Ebon-Pinamt complex, 0 to 10 percent slopes	0.12	0	100
64549	Ebon-Pinamt complex, 20 to 40 percent slopes	0.06	0	100
64548	Ebon-Pinamt complex, 3 to 20 percent slopes	0.06	0	100
64544	Ebon very gravelly loam, 1 to 8 percent slopes	0.03	0	100
64545	Ebon very gravelly loam, 8 to 20 percent slopes	0.03	0	100
6512857	Estrella loam	0.25	0	100
64550	Estrella loams	0.26	0	100
64552	Gachado-Lomitas-Rock outcrop complex, 7 to 55 percent slopes	0.16	20	100
64553	Gadsden clay	0.02	0	100
651323320	Gilman loam, 0 to 1 percent slopes	0.25	0	100
6513244	Gilman-Antho association	0.29	0	100
64558	Gilman-Momoli-Denure complex	0.34	0	100
64557	Gilman clay loam	0.06	0	100
64555	Gilman loams	0.27	0	100
64560	Glenbar loams	0.26	0	100
64563	Gran-Wickenburg-Rock outcrop complex, 1 to 7 percent slopes	0.14	25	100
64564	Gran-Wickenburg-Rock outcrop complex, low precipitation, 10 to 65 percent slopes	0.14	25	100
64562	Gran-Wickenburg complex, low precipitation, 1 to 10 percent slopes	0.15	0	100
651325036	Gravel Pit	0.00	0	100
64566	Greyeagle-Suncity Variant complex, 1 to 7 percent slopes	0.23	0	100
64568	Gunsight-Cipriano complex, 1 to 7 percent slopes	0.63	0	100
651326426	Gunsight-Pinal complex, 1 to 10 percent slopes	0.35	0	100
651326826	Gunsight-Rillito complex, 0 to 10 percent slopes	0.26	0	100
64570	Gunsight-Rillito complex, 1 to 25 percent slopes	0.36	0	100
651326722	Gunsight-Rillito complex, 1 to 3 percent slopes	0.24	0	100
645126	Lakes, ponds, reservoirs – perennial	0	0	100
6514229	Laveen clay loam	0.40	0	100
651422520	Laveen Loam, 0 to 1 percent slopes	0.25	0	100
6514223	Laveen sandy loam	0.40	0	100
64572	Lehmans-Rock outcrop complex, 8 to 65 percent slopes	0.09	30	100
64573	Lehmans-Rock outcrop complex, low precipitation, 8 to 65 percent slopes	0.09	30	100
64574	Luke-Cipriano association, 1 to 15 percent slopes	0.08	0	100
6514421	Maripo sandy loam	0.40	0	100
6514462	Mohall-Laveen association	0.15	0	100
651445822	Mohall-Tremant complex, 0 to 3 percent slopes	0.15	0	100

Table 4.1 Soil Characteristics for Green-Ampt Parameters (Continued)

Soil ID	Description	XKSAT (in/hr)	% Impervious	% Effective
64580	Mohall-Tremant complex, 1 to 8 percent slopes	0.08	0	100
64577	Mohall clay loam	0.05	0	100
6514455	Mohall clay loam	0.05	0	100
64578	Mohall clay loam, calcareous solum	0.05	0	100
64575	Mohall loam	0.23	0	100
6514451	Mohall loam	0.25	0	100
64576	Mohall loam, calcareous solum	0.23	0	100
6514449	Mohall sandy loam	0.39	0	100
64594	Nickel-Cave complex, low precipitation, 8 to 30 percent slopes	0.33	0	100
651505422	Perryville-Rillito complex, 0 to 3 percent slopes	0.28	0	100
651502920	Perryville gravelly loam, 0 to 1 percent slopes	0.37	0	100
651502922	Perryville gravelly loam, 1 to 3 percent slopes	0.38	0	100
651506422	Pinal-Suncity complex, 0 to 3 percent slopes	0.38	0	100
6515058	Pinal gravelly loam	0.40	0	100
64597	Pinaleno-Tres Hermanos complex, low precipitation, 1 to 10 percent slopes	0.07	0	100
64598	Pinamt-Tremant complex, 1 to 10 percent slopes	0.37	0	100
651506826	Pinamt-Tremant complex, 1 to 10 percent slopes	0.20	0	100
645100	Quilotosa-Vaiva rock outcrop complex, 20 to 65 percent slopes	0.40	20	100
651545128	Rillito-Perryville complex, 5 to 20 percent slopes	0.29	0	100
651542320	Rillito loam, 0 to 1 percent slopes	0.26	0	100
651542120	Rillito sandy loam, 0 to 1 percent slopes	0.39	0	100
6515456	Rock Outcrop – Cherioni complex	0.40	65	100
645103	Rock Outcrop-Gachado complex, 5 to 55 percent slope	0.10	65	100
645104	Rock Outcrop-Lehmans complex, 15 to 65 percent slope	0.14	60	100
645109	Schenco-Rock outcrop complex, 25 to 60 percent slopes	0.35	35	100
645108	Schenco-Rock outcrop complex, 3 to 25 percent slopes	0.31	30	100
645110	Suncity-Cipriano complex, 1 to 7 percent slopes	0.13	0	100
6515822	Torrifluvents	0.40	0	100
6515826	Torripsamments and Torrifluvents, frequently flooded	1.20	0	100
645115	Tremant-Antho complex, 1 to 5 percent slopes	0.39	0	100
645118	Tremant-Rillito complex	0.42	0	100
651585520	Tremant-Rillito complex, 0 to 1 percent slopes	0.11	0	100
651585624	Tremant-Rillito complex, 0 to 5 percent slopes	0.14	0	100
651585522	Tremant-Rillito complex, 1 to 3 percent slopes	0.13	0	100
645119	Tremant-Suncity complex, 1 to 8 percent slopes	0.14	0	100
6515833	Tremant clay loam	0.04	0	100
651585022	Tremant complex, 0 to 3 percent slopes	0.12	0	100
6515835	Tremant gravelly clay loam	0.04	0	100
651583122	Tremant gravelly loams, 1 to 3 percent slopes	0.36	0	100

Table 4.1 Soil Characteristics for Green-Ampt Parameters (Continued)

Soil ID	Description	XKSAT (in/hr)	% Impervious	% Effective
651583120	Tremant gravelly loams, 0 to 1 percent slopes	0.37	0	100
645113	Tremant gravelly loams	0.39	0	100
645114	Tremant gravelly loams, low precipitation	0.39	0	100
645112	Tremant gravelly sandy loams	0.39	0	100
6515829	Tremant loam	0.25	0	100
645121	Tres Hermanos-Anthony complex, 1 to 5 percent slopes	0.12	0	100
6515865	Tucson clay loam	0.05	0	100
6516225	Valencia gravelly sandy loam	0.39	0	100
6516221	Valencia sandy loam	0.39	0	100
645124	Valencia sandy loams	0.39	0	100
6516231	Vecont clay	0.01	0	100
6516229	Vecont loam	0.25	0	100
6516255	Vint-Carrizo Complex	0.63	0	100
6516235	Vint fine sandy loam	0.27	0	100
6516233	Vint loamy fine sand	0.91	0	100
CmD	Cellar very gravelly sandy loam, 8 to 30 percent slopes	0.27	5	100
CnF	Cellar very rocky sandy loam, 15 to 60 percent slopes	0.32	20	100
Le	Lehmans gravelly clay loam, 8 to 45 percent slopes	0.02	4	100
Lh	Lehmans extremely rocky clay loam, 8 to 60 percent slopes	0.03	40	100
MkF	Moano very rocky loam	0.20	20	100
Rr	Rock land, low rainfall	0.01	60	100

The WADMSU used a modified Maricopa Association of Governments (MAG) Land Use. Some adjustments were made to the default land use parameters. Refer to the reports for more detail. The Loop 303 / White Tanks ADMPU model used the default values from DDMSW. The values used for surface retention loss values, percent impervious, and vegetation cover are shown in Table 4.2 for the modified sub-basins. These are the same as the default values in DDMSW with the exception of the % Vegetation for Passive Open Space was reduced from 90% to 30%.

Table 4.2 Land Use Characteristics for Green-Ampt Parameters

Land Use Description	Initial Abstraction (in)	% Impervious	% Vegetation	Soil Condition
Passive/Restricted Open Space	0.10	5	30	Normal
Public Facilities	0.10	25	75	Normal
Single Family High Density – Greater than 4 du/ac	0.25	30	50	Normal
Single Family Low Density - Less than 1 du/ac	0.30	5	30	Normal
Single Family Medium Density – 1 to 4 du/ac	0.25	25	50	Normal
Vacant	0.35	0	25	Dry
Water	0	0	0	Wet

The Green-Ampt rainfall loss parameters from the previous models drainage sub-basins can be found in the Appendix. Refer to Table 4.3 for Sub-basins modified from the original studies.

Table 4.3 Green-Ampt Parameters

Study	SUB-BASIN	IA (in)	DTHETA	PSIF	XKSAT (in/hr)	RTIMP (%)
WADMSU	AF802*	0.27	0.31	4.80	0.31	5
WADMSU	AF810*	0.24	0.29	4.40	0.43	21
WADMSU	AF820*	0.30	0.25	4.20	0.45	7

*Sub-basins modified for the McMicken Dam Outlet Wash FDS.

Unit Hydrograph Procedure

The WADMSU used Clark unit hydrograph to route excess runoff within a sub-basin to its concentration point. The length, slope, K_b values, T_c, R, and time area for the basins modified as part of this study are listed in Table 4.4.

The Loop 303 / White Tanks ADMPU Area Hydrologic Analysis used the S-graph method to compute the unit hydrographs. The Loop 303 / White Tanks ADMPU sub-basins used Phoenix Valley or Desert/Rangeland.

Table 4.4 Sub-Basin Time of Concentration Parameters

Study	SUB-BASIN	L (mi)	Slope (ft/mi)	K_b	T_c (hrs)	R (hrs)	Time Area
WADMSU	AF802*	2.117	31.2	0.050	1.085	0.804	Natural
WADMSU	AF810*	3.026	31.1	0.039	1.130	0.839	Urban
WADMSU	AF820*	2.358	42.4	0.024	0.725	0.631	Natural

* Sub-basins modified for the McMicken Dam Outlet Wash FDS.

Channel Routing

The normal depth channel routing is used to route runoff hydrographs through sub-basins. The routing reach length, slope, and Manning's *n* values for the sub-basins are shown in Table 4.5.

Table 4.5 Channel Routing Summary

Study Area	Reach	Reach Length (ft)	Slope (ft/ft)	LOB *n* value	Channel *n* value	ROB *n* value
WADMSU	R810A*	4,932	0.0058	0.043	0.035	0.043
WADMSU	R810B*	5,755	0.0058	0.043	0.035	0.043
WADMSU	AF810A*	6,368	0.0084	0.043	0.035	0.043
WADMSU	AF810B*	2,005	0.0084	0.043	0.035	0.043

* Routing reaches length modified for the McMicken Dam Outlet Wash FDS.

4.3 Issues Encountered During the Study

4.3.1 Special Issues and Solutions

No special issues were encountered.

4.3.2 Modeling Warning and Error Messages

The following warning appeared:

> *MODIFIED PULS ROUTING MAY BE NUMERICALLY UNSTABLE FOR OUTFLOWS BETWEEN (VALUE) TO (VALUE).*

The WADMSU examined the hydrographs where this error occurred. According to their analysis, no instability was determined and therefore this error was ignored.

4.4 Calibration

Calibration was not performed as part of this study since there is inadequate stream gage data to calibrate the HEC-1 model.

4.5 Final Results

4.5.1 Hydrologic Analysis Results

The peak discharge results associated with the McMicken Dam Outlet Wash are shown in Table 4.6. The 10-year peak flow was estimated using the ratio of 35% of the 100-year flow based on Table 6.1 in the Drainage Design Manual. The 50-year peak flow was estimated using the ratio of 72.9% based on the relationship of the 10-year and 100-year plotted on a log-log graph. Table 4.7 shows the discharges used for the floodplain delineation.

Table 4.6 Hydrologic Analysis Results

Drainage ID	Area (sq mi)	10-YR 24-HR Peak Discharge (cfs)	50-YR 24-HR Peak Discharge (cfs)	100-YR 24-HR Peak Discharge (cfs)	24-Hr Unit Peak (cfs/sq mi)
MDOC*	99.65	2,615	5,446	7,471	75.0
CP802*	101.08	2,618	5,454	7,481	74.0
CP810*	106.69	2,662	5,544	7,605	71.3
CPN08*	108.42	2,667	5,555	7,620	70.3
CAF820*	109.11	2,667	5,554	7,619	69.8

* Modified for the McMicken Dam Outlet Wash FDS.

Table 4.7 Discharges Used for Floodplain Delineation

Wash	Upstream Cross Section	Downstream Cross Section	100-Year Flow (cfs)
McMicken Dam Outlet Wash	4.794	3.266	7,481
McMicken Dam Outlet Wash	3.171	0.324	7,620

4.5.2 Verification of Results

The verification of results was performed using three indirect methods. Indirect Method No. 1 makes a comparison between seven envelope curves of maximum observed flood discharges. The five point values as shown in Table 4.6 from the McMicken Dam Outlet Wash were lower than all seven envelope curves (Refer to the graphs located in Appendix D.6). Indirect Method No. 2 compares USGS data for Arizona. The five point values from the McMicken Dam Outlet Wash are located near the Log Pearson Type 3 Curve and within the 75% Tolerance Limits. Indirect Method No. 3 compares USGS Regional Regression Equations. The watershed for McMicken Dam Outlet Wash is located within the Central Arizona Region (R12). This regional equation computes the 100-year discharge by relating the 100-year peak discharge with drainage area where AREA is the drainage area in square miles and ELEV is the mean basin elevation in feet divided by 1,000.

Regional Regression Equation for Central Arizona Region (R12)

$$Q_{100} = 10^{(6.55-3.17\,AREA^{-0.11}-0.454\,LOGELEV)}$$

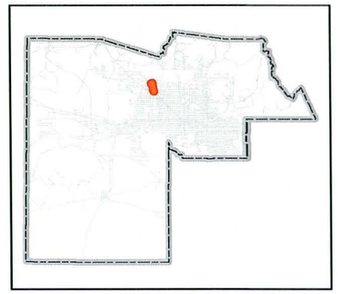
As can be seen in Table 4.8, the comparison shows the results from this study are lower than the USGS regional regression equation. It should be mentioned that the results of the McMicken Dam Outlet Wash should be more accurate than those using the regression equation because the study was more detailed.

Table 4.8 USGS Regional Regression Peak Discharge Comparison (Indirect Method No. 3)

Drainage ID	Area (sq mi)	Mean Elev (ft)	100-YR 24-HR Peak Discharge (cfs)	USGS Regional Regression Equation (R12) 100-YR
MDOC*	99.65	2,060	7,471	31,380
CP802*	101.08	2,060	7,481	31,597
CP810*	106.69	2,060	7,605	32,430
CPN08*	108.42	2,060	7,620	32,681
CAF820*	109.11	2,060	7,619	32,781

* Modified for the McMicken Dam Outlet Wash FDS.

Flood Control District of Maricopa County



McMicken Dam Outlet Wash
Floodplain Delineation Study

Legend

- Flowline
- County Boundary
- Sub-basins

0 0.5 1 2 3 Miles

1 inch = 3 miles

Sub-basin Boundaries W/ Aerial

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DATE 4.15.13

FIGURE 4.1

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PD732
PI606A
PD740
PD736
PD726A
PD712A
PD708
PD726B
PD712
AF800
PI615
PI612
PI609
PI604
PD704
PD716
PD726
PI606
PI624A
PI603
PD744
PD700
AF802
PI621
PI600A
PD720
AF810
PI624
PI600
N07
N04B
N04A
N03A
PI636
PI633
N02A
N03
N04
N05
N06
N02
N01
N03B
PI635
N08
AF820
US60

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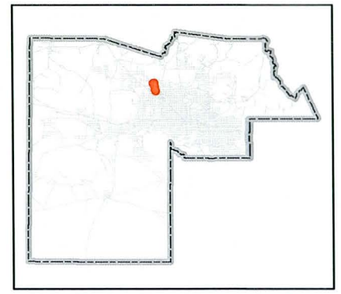

McMicken Dam Outlet Wash
Floodplain Delineation Study

Legend

- Flowline
- County Boundary
- Sub-basins

Note: This exhibit shows the N and AF sub-basins in more detail than Figure 4.1.

0 2,000 4,000 Feet

1 inch = 4,000 feet

Sub-basin Boundaries W/ Aerial

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FIGURE 4.1A

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Yavapai County

Maricopa County

US 60

SR 74

Interstate 17

SR 303L

SR 101L

US 60

SR 303L

Flood Control District of Maricopa County

McMicken Dam Outlet Wash Floodplain Delineation Study

Legend

- Flowline
- Sub-basins
- County Boundary
- Contours

0 0.5 1 2 3 Miles

1 inch = 3 miles

Sub-basin Boundaries W/ Topo

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FIGURE 4.2

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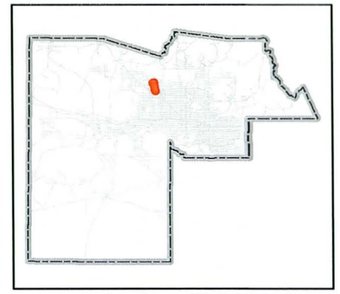
Flood Control District of Maricopa County



McMicken Dam Outlet Wash
Floodplain Delineation Study

Legend

- Flowline
- Sub-basins
- County Boundary

Refer to Aguila-Carefee Area and Maricopa County Central Area soils studies.

0 0.5 1 2 3 Miles

1 inch = 3 miles

Sub-basin Boundaries W/ Soils

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FIGURE 4.3

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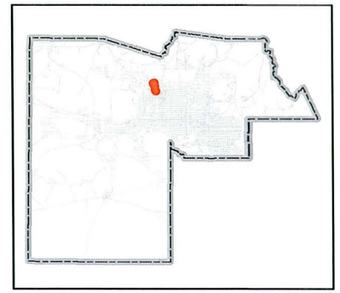
Flood Control District of Maricopa County



McMicken Dam Outlet Wash
Floodplain Delineation Study

Legend

- Flowline
- Sub-basins
- County Boundary

0 0.5 1 2 3 Miles

1 inch = 3 miles

Legend

DESCRIPTION

- Active Open Space
- Agriculture
- Cemetery
- Commercial Low - Amusement/Movie Theatre/Specialty Retail/Neighborhood Retail
- Developing Employment Generating
- Developing Residential
- Educational/Religious
- Golf Course
- Industrial
- Medical/Nursing Home
- Multi Family - Apartment/Condo
- Office
- Other Employment - Landfill/Proving Grounds/Sand and Gravel/etc.
- Passive/Restricted Open Space/Undevelopable
- Public/Special Event/Military
- Religious
- Single Family High Density - Greater than 4 du/ac - Includes Mobile Homes
- Single Family Low Density - Less than 1 du/ac
- Single Family Medium Density - 1 to 4 du/ac
- Vacant
- Water

Sub-basin Boundaries W/ Land Use

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FIGURE 4.4

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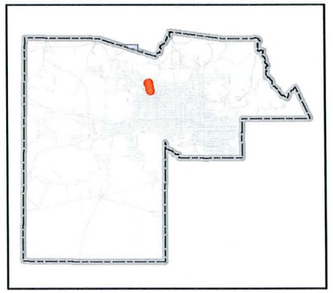
Sols Wash nr Matthie
Powder House Wash
Wickenburg Airport
Constellation Road
lartman Wash
Casandro Dam
Hassy R. @ US 60
Sunset FRS
Casandro Wash
Flying E Wash
Sunny Cove FRS
Vulture Mine Road
Flying E Tank
Twin Peaks
Hassy nr Morristown
Box Wash
Morristown
SR-74
Picacho Wash
Circle City
US-60
Chrysler P. Ground
Wittmann
Daggs Wash
Patton Rd.
CAP @ 163rd Ave.
Garfias Mountain
Upper Trilby Wash
Castle Hot Springs
Yavapai County
Maricopa County
Sunup Ranch
New River Landfill
Lake Pleasant
I-17
New River Dam
McMicken Floodway
El Mirage Drain
NW Regional Landfill
McMicken Dam
Sun City West
Adobe Dam
SR-101
Scatter Wash
SR-303
Dysart @ Bell Rd.
New River @ Bell Rd.
Greenway @ 32nd Ave.
Agua Fria @ Grand Ave.
ACDC @ 67th Ave.
Ford Canyon Wash
Grand @ Peoria Ave.
McMicken Dam South
ACDC @ 43rd Ave.

Flood Control District of Maricopa County



McMicken Dam Outlet Wash
Floodplain Delineation Study

Legend

Gage Type

- Rain
- Rain/Stream
- Stream

Flowline

Streets

- Sub-basins
- County Boundary

0 4,0008,000 16,000 Feet

1 inch = 16,000 feet

Gage Locations

RBF CONSULTING
PLANNING ■ DESIGN ■ CONSTRUCTION
2929 NORTH CENTRAL AVENUE, SUITE 800
PHOENIX, ARIZONA 85012-2794
602-279-1234 FAX 602-279-1411 www.RBF.com

DRAFTED	CHECKED
DLP	NEF

PROJECT NUMBER 133347

DATE 4.15.13

FIGURE 4.5

File: H:\PDATA\133347\GIS\MXD\Figure4.5Final.mxd

Section 5 Hydraulics

5.1. Method Description

The purpose of this study is to re-delineate detailed 100-year Zone AE floodplain and floodway for McMicken Dam Outlet Wash using recent one foot contour data and updated hydrology. This study upgrades existing Zone AE floodplain and floodway delineated by WLB as part of the Wittmann Area Drainage Master Study (May 1989) using HEC-2. The floodplain and floodway delineations used the 100-year 24-hour flow.

The U.S. Army Corps of Engineers Hydrologic Engineering Center River Analysis System (HEC-RAS) version 4.1.0 dated January 2010 was used to create the hydraulic model for the floodplain / floodway delineation. There is one HEC-RAS model for the study area. Cross sections were created from the existing elevation data provided by the FCDMC.

As stated by Appendix C of FEMA's Guidelines and Specifications for Flood Hazard Mapping Partners, starting water-surface elevations for tributaries should be based on normal depth (i.e., slope-area method) unless a coincident peak situation is assumed, or the tributary flow depths are higher than the corresponding main stream events. Table 5.1 describes the three conditions that must be met to assume coincident peaks.

Table 5.1 Coincident Peak Criteria

Reach	Drainage Area (sq mi)	Drainage Area Ratio	Does the ratio fall between 0.6 and 1.4?	Are times of concentration similar?	Is the likelihood of both watersheds being covered by the same storm high?
McMicken Dam Outlet Wash	109*	0.07	No	No	No
Agua Fria River	1,561	No criteria met – model using normal depth			

*Unregulated watershed generated more flow than total watershed area of 323 mi^2

The Agua Fria River is regulated by the New Waddell Dam, which has a drainage area of approximately 1,459 square miles. There is an unregulated watershed area of approximately 102 square miles between the New Waddell Dam and the confluence with the McMicken Dam Outlet Wash. According to the July 1995 *Hydrologic Evaluation of Impacts of New Waddell Dam on Downstream Peak Discharges in the Agua Fria River* "no contributing flow from the McMicken Dam was included in the discharge-frequency evaluation of the Agua Fria River because it either occurs at a different time than local flow due to longer time of concentration, or a different season than New Waddell Dam outflow". For these reasons, the downstream boundary condition of the McMicken Dam Outlet Wash used normal depth instead of the known water surface elevation.

5.2. Work Study Maps

Work Study Maps that show the floodplain and floodway delineations have been prepared at a scale of 1 inch = 200 feet, according to FEMA standards using the one foot contour interval topographic mapping. A cover sheet shows the location of the study area. Each Work Study Map shows the floodplain baseline, zone boundaries, and cross sections used in the delineation.

5.3. Parameter Estimation

5.3.1. Roughness Coefficients

The procedure used to determine the Manning's "n" value roughness coefficients is outlined in the USGS publication *Selection of Manning's Roughness Coefficients for Natural and Constructed Vegetated and Non-Vegetated Channels and Vegetation Maintenance Plan Guidelines for Vegetated Channels in Central Arizona* (USGS, 2006). Based on field observations, the Manning's roughness coefficients were fairly similar for the channel and overbanks particularly between constructed features. A list of the roughness coefficients for each wash segment, wash photos, and a description of how the roughness coefficients were obtained is provided in Appendix E.1

5.3.2. Expansion and Contraction Coefficients

The expansion and contraction coefficients used in the HEC-RAS model are 0.1 and 0.3, respectively except at culverts. There are four culverts included in the McMicken Dam Outlet Wash model. The cross sections associated with the culverts use expansion and contraction coefficients of 0.3 and 0.5, respectively.

5.4. Cross Section Description

Cross sections were placed at the same location as the effective cross sections to the extent possible. Additional cross section locations were added for the four culverts modeled since the effective study was completed and to maintain a distance between cross sections of approximately 500 ft intervals along the wash. The cross sections are oriented left to right looking downstream. The intersection of the cross section and floodplain baseline is set to station 10,000. A plot of each cross section is provided in Appendix E.2.

5.5. Modeling Considerations

There are four culvert crossings located along the McMicken Dam Outlet Wash. They are located at SR303L, Williams Drive, and two crossings of El Mirage Road. The SR303L culvert crossing is currently an 11-10'x6' reinforced concrete box culvert. The SR303L, US60 to Happy Valley Parkway Stage II Design (30%) proposes adding two additional barrels at this crossing. The design was based on conveying the 100-year flow without overtopping SR303L. The 100-year peak

flow used for the culvert design was 6,023 cfs obtained from the Flood Insurance Study. ADOT has recently selected a consultant for the design of the SR303L/El Mirage Road Traffic Interchange Final Design. The Williams Drive crossing is an 11-10'x6' reinforced concrete box culvert. The north El Mirage Road crossings is a 7-10'x7' reinforced concrete box culvert and the south El Mirage Road crossing is a 7-10'x8' reinforced concrete box culvert.

There are a few locations within the study area that show divided flow conditions creating islands of higher ground. The elevation difference between the island and the adjacent water surface elevation at the majority of these locations are trivial and include relatively small areas. Therefore, these island areas were shown as floodplain.

The ineffective flow option was used at some locations to avoid including areas not effectively conveying flow downstream such as tributary back water areas and at culverts.

5.6. Floodway Modeling

The floodway re-delineation followed the precedent of the existing floodway delineation as much as possible. For example, the floodplain and floodway were coincident for cross sections located downstream of the channelized section south of Deer Valley Drive to the Agua Fria River. The updated floodway is the same as the floodplain downstream of Cross Section 2.151 to the Agua Fria River with the exception of some minor smoothing to eliminate the floodway from a few side tributaries. Also, the previous floodway delineation only encroached on the left overbank area for Cross Sections 4.388-4.794. These cross sections are within the McMicken Dam Outlet Channel. The right overbank is the McMicken Dam Outlet Channel embankment. This same approach was maintained for this study. The floodway delineation for these cross sections encroached to the left bank station and maintained the floodplain limits for the right overbank. The floodway for the remaining cross sections was determined using the equal conveyance reduction methodology with a 1-foot target for the rise in water surface elevations. A few of the floodway limits defaulted to the bank stations for some of the cross sections particularly at culverts and one of the narrowest cross section in the McMicken Dam Outlet Channel.

5.7. Issues Encountered During the Study

The constructed channel in the left overbank that discharges into the McMicken Dam Outlet Wash south of Pinnacle Peak Rd was included in Cross Section 3.077-3.171. It was preferred to exclude this adjacent channel from the floodway. However, a portion of this channel had to be included to not exceed the 1 foot of rise requirement.

5.8. Calibration

Calibration was not performed as part of this study due to a lack of gage history on the delineated wash.

5.9. Final Results

Refer to the floodplain maps located in the Appendix E.5.

Section 6 Erosion, Sediment Transport, and Geomorphic Analysis

Erosion, sediment transport, geomorphic analysis were not considered in this study.

Section 7 Draft FIS Report Data

7.1. Summary of Discharges

A summary of discharges is shown in Table 7.1 below. Please note that the drainage area corresponds to the unregulated drainage area and is less than the regulated drainage area of 323 square miles at the confluence with the Agua Fria River.

Table 7.1 Summary of Discharges

Flood Source and Location	Concentration Point	Drainage Area (sq. mi.)	10-year	50-year	100-year	500-year
McMicken Dam Outlet Wash						
At confluence with Agua Fria River	CAF820	109.1	2,667	5,554	7,620	--[1]
Downstream of SR303L	CP802	101.1	2,618	5,454	7,481	--[1]

--[1] Not Computed.

7.2. Floodway Data

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (FEET NAVD 88)	WITHOUT FLOODWAY (FEET NAVD 88)	WITH FLOODWAY (FEET NAVD 88)	INCREASE (FEET)
McMicken Dam Outlet Wash								
0.324	1,712	916	2,812	3.5	1183.0	1183.0	1183.0	0.0
0.414	2,187	553	1,080	9.1	1185.6	1185.6	1185.6	0.0
0.509	2,685	608	1,614	5.5	1191.4	1191.4	1191.4	0.0
0.603	3,185	481	1,473	7.2	1194.7	1194.7	1194.7	0.0
0.709	3,744	378	1,223	7.6	1199.6	1199.6	1199.6	0.0
0.744	3,930	385	675	11.3	1201.3	1201.3	1201.3	0.0
0.792	4,181	509	2,695	2.8	1206.8	1206.8	1206.8	0.0
0.823	4,347	364	1,903	4.0	1206.9	1206.9	1206.9	0.0
0.937	4,948	212	1,123	6.8	1207.3	1207.3	1207.3	0.0
1.042	5,503	213	1,046	7.3	1209.1	1209.1	1209.1	0.0
1.137	6,003	205	994	7.7	1211.0	1211.0	1211.0	0.0
1.267	6,689	206	968	7.9	1214.3	1214.3	1214.3	0.0
1.362	7,189	201	921	8.3	1215.6	1215.6	1215.6	0.0
1.406	7,424	211	1,129	6.8	1216.3	1216.3	1216.3	0.0
1.481	7,821	235	751	10.2	1237.4	1237.4	1237.4	0.0
1.501	7,924	223	843	9.0	1238.3	1238.3	1238.3	0.0
1.576	8,323	222	1,100	6.9	1241.3	1241.3	1241.3	0.0
1.671	8,823	216	1,082	7.0	1243.3	1243.3	1243.3	0.0
1.804	9,526	215	1,102	6.9	1246.1	1246.1	1246.1	0.0
1.899	10,026	204	997	7.6	1247.9	1247.9	1247.9	0.0
2.050	10,823	224	964	7.9	1251.5	1251.5	1251.5	0.0
2.151	11,360	155	587	13.0	1254.3	1254.3	1254.3	0.0

[1] Stream Distance in Feet Above Confluence With Agua Fria River

TABLE 7.2

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ

AND INCORPORATED AREAS

FLOODWAY DATA

McMicken Dam Outlet Wash

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (FEET NAVD 88)	WITHOUT FLOODWAY (FEET NAVD 88)	WITH FLOODWAY (FEET NAVD 88)	INCREASE (FEET)
McMicken Dam Outlet Wash								
2.196	11,595	175	1,896	4.0	1261.4	1261.4	1261.4	0.0
2.272	11,996	187	1,047	8.6	1261.5	1261.5	1261.5	0.0
2.367	12,496	147	721	13.7	1263.5	1263.5	1263.6	0.1
2.461	12,996	185	1,009	10.3	1267.2	1267.2	1267.9	0.7
2.556	13,496	188	965	10.4	1269.1	1269.1	1270.1	1.0
2.603	13,744	191	1,628	4.8	1271.3	1271.3	1271.9	0.6
2.632	13,898	196	1,884	4.0	1272.7	1272.7	1273.5	0.8
2.692	14,216	167	853	11.3	1272.7	1272.7	1273.2	0.5
2.787	14,716	208	1,072	8.6	1275.7	1275.7	1276.5	0.8
2.891	15,267	130	798	9.6	1278.6	1278.6	1279.0	0.4
2.986	15,767	214	1,169	8.3	1281.5	1281.5	1282.1	0.6
3.077	16,245	466	1,662	6.5	1283.4	1283.4	1283.9	0.5
3.171	16,745	533	1,430	9.7	1284.6	1284.6	1285.6	1.0
3.266	17,245	395	1,376	9.6	1287.6	1287.6	1288.4	0.8
3.310	17,479	407	1,673	4.8	1289.1	1289.1	1289.6	0.5
3.350	17,687	343	2,812	3.5	1291.8	1291.8	1292.2	0.4
3.399	17,948	268	959	11.7	1291.7	1291.7	1292.1	0.4
3.494	18,448	312	1,225	9.3	1294.3	1294.3	1295.2	0.9
3.589	18,948	219	1,050	8.5	1296.5	1296.5	1297.1	0.6
3.706	19,566	321	1,083	10.7	1299.7	1299.7	1299.9	0.2
3.800	20,066	376	1,158	10.7	1302.3	1302.3	1302.9	0.6
3.878	20,476	272	1,164	10.3	1304.4	1304.4	1305.1	0.7

[1] Stream Distance in Feet Above Confluence With Agua Fria River

TABLE 7.2

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ

AND INCORPORATED AREAS

FLOODWAY DATA

McMicken Dam Outlet Wash

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (FEET NAVD 88)	WITHOUT FLOODWAY (FEET NAVD 88)	WITH FLOODWAY (FEET NAVD 88)	INCREASE (FEET)
McMicken Dam Outlet Wash								
3.973	20,976	282	1,014	11.6	1307.1	1307.1	1307.5	0.4
4.104	21,669	196	1,024	9.7	1310.6	1310.6	1311.6	1.0
4.199	22,169	114	714	10.5	1312.4	1312.4	1313.1	0.7
4.293	22,669	235	1,141	7.3	1315.3	1315.3	1315.3	0.0
4.388	23,169	426	2,818	3.0	1316.1	1316.1	1316.3	0.2
4.506	23,794	320	1,693	5.2	1316.2	1316.2	1316.4	0.2
4.601	24,294	243	1,733	4.7	1316.6	1316.6	1316.8	0.2
4.699	24,813	196	1,492	5.3	1316.7	1316.7	1317.0	0.3
4.794	25,313	174	1,350	5.9	1316.8	1316.8	1317.3	0.5

[1] Stream Distance in Feet Above Confluence With Agua Fria River

TABLE 7.2

FEDERAL EMERGENCY MANAGEMENT AGENCY

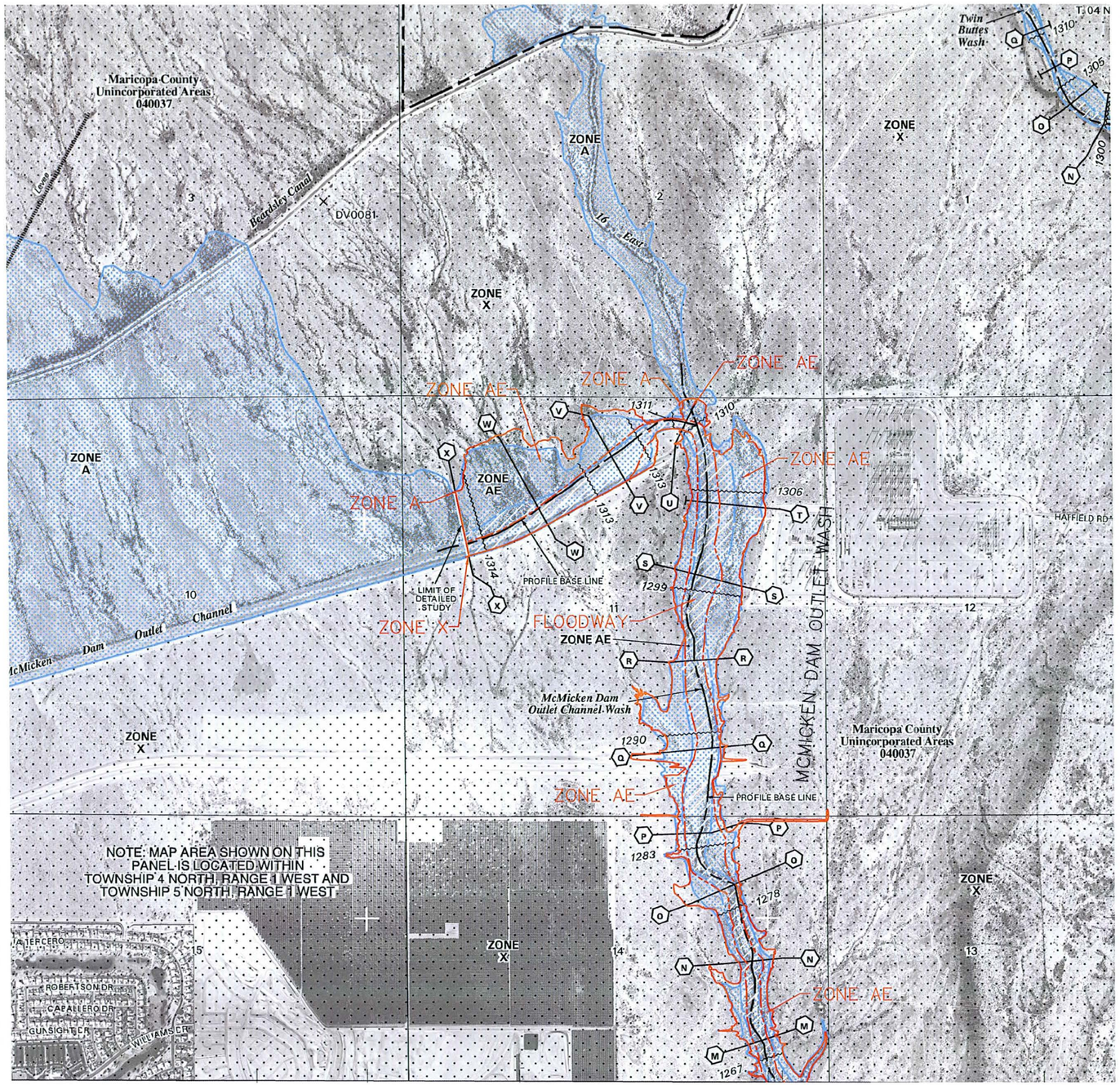
MARICOPA COUNTY, AZ

AND INCORPORATED AREAS

FLOODWAY DATA

McMicken Dam Outlet Wash

7.3. Annotated FIRMs



1500 750 0 1500 3000 4500

SCALE: 1"=1500'

SCALE: 1"=1500'

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1155H

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

PANEL 1155 OF 4350

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
MARICOPA COUNTY	040037	1155	H
PEORIA, CITY OF	040050	1155	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
04013C1155H
MAP REVISED
SEPTEMBER 30, 2005

Federal Emergency Management Agency

MCMICKEN DAM OUTLET WASH FDS
ANNOTATED FIRM PANEL 1155H

REVISED ZONE AE FLOODPLAIN
REVISED ZONE A FLOODPLAIN
REVISED FLOODWAY

RBF CONSULTING
PLANNING ■ DESIGN ■ CONSTRUCTION
2929 NORTH CENTRAL AVENUE, SUITE 800
PHOENIX, ARIZONA 85012-2794
602.279.1234 ▪ FAX 602.279.1411 ▪ www.RBF.com

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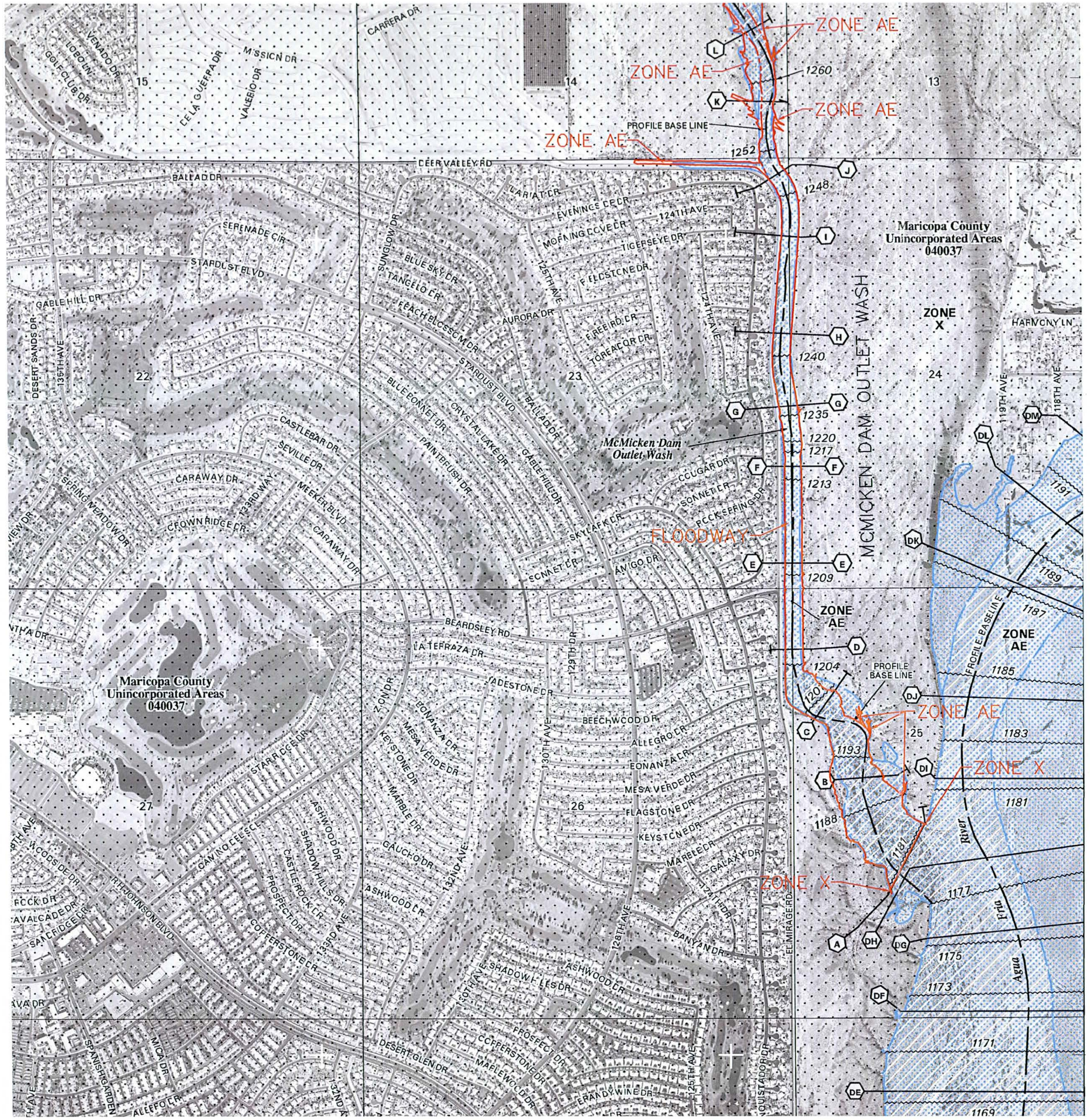

1500 750 0 1500 3000 4500

SCALE: 1"=1500'

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1165J

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

PANEL 1165 OF 4350

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
EL MIRAGE, CITY OF	040041	1165	J
MARICOPA COUNTY	040037	1165	J
SURPRISE, CITY OF	040053	1165	J

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
04013C1165J
MAP REVISED
SEPTEMBER 30, 2005

Federal Emergency Management Agency

MCMICKEN DAM OUTLET WASH FDS ANNOTATED FIRM PANEL 1165J

REVISED ZONE AE FLOODPLAIN

REVISED ZONE A FLOODPLAIN

REVISED FLOODWAY

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PHOENIX, ARIZONA 85012-2794
602.279.1234 ▪ FAX 602.279.1411 ▪ www.RBF.com

7.4. Flood Profiles

FLOOD PROFILES

MCMICKEN DAM OUTLET WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ

MARICOPA

01P

FLOOD PROFILES

MCMICKEN DAM OUTLET WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ

MARICOPA

02P

FLOOD PROFILES

MCMICKEN DAM OUTLET WASH

ELEVATION IN FEET (NAVD 88)

STREAM DISTANCE IN FEET ABOVE CONFLUENCE WITH AGUA FRIA RIVER

1280
1275
1270
1265
1260
1255
1250
1245
1240
1235

8500
9000
9500
10000
10500
11000
11500
12000
12500
13000
13500
14000
14500
15000

℄ EL MIRAGE RD ALIGNMENT

℄ WILLIAMS DR ALIGNMENT

1.671
1.804
1.899
2.050
2.151
2.196
2.272
2.367
2.461
2.556
2.603
2.632
2.692
2.787

LEGEND

- 1% ANNUAL CHANCE FLOOD
- 2% ANNUAL CHANCE FLOOD
- 10% ANNUAL CHANCE FLOOD
- STREAM BED
- 0.000 CROSS SECTION LOCATION

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ

MARICOPA

03P

FLOOD PROFILES

MCMICKEN DAM OUTLET WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ

MARICOPA

04P

FLOOD PROFILES

MCMICKEN DAM OUTLET WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ

MARICOPA

05P

Appendix A References

A.1 Data Collection Summary

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

Agua Fria River Study New Waddell Dam to Gila River Confluence, Arizona Hydrologic Evaluation of Impacts of New Waddell Dam on Downstream Peak Discharges in the Agua Fria River prepared by the U.S. Army Corps of Engineers Los Angeles District (July 1995).

Final Hydrology Report Loop 303/White Tanks ADMPU Area Hydrologic Analysis in Maricopa County, Arizona (September 2009) prepared by HDR for the Flood Control District of Maricopa County.

Mason, Robert R. Jr., King, Jeffrey N, and Thomas, Wilbert O. Jr. (1999). "National Flood-Frequency Program – Methods for Estimating Flood Magnitude and Frequency in Rural Areas In Arizona" U.S. Geological Survey Fact Sheet 111-98.

Maricopa Association of Goverments (MAG). The digital GIS land use maps for Maricopa County.

SR303L Initial Drainage Report Volume 1 of 2 (Offsite) Stage II Design (30%) SR303L, US60 to Happy Valley Parkway (April 2012) prepared by Parson Brinckerhoff for the Arizona Department of Transportation.

SR303L Initial Drainage Report Volume 2 of 2 (On-site) Stage II Design (30%) SR303L, US60 to Happy Valley Parkway (April 2012) prepared by J2 Engineering & Environmental Design, LLC for the Arizona Department of Transportation.

SR303L Final Design Memorandum Stage II Design (30%) SR303L, US60 to Happy Valley Parkway (August 24, 2012) prepared by Parson Brinckerhoff for the Arizona Department of Transportation.

Wittmann Area Drainage Master Study Update Hydrology Report Final Addendum (July 2005) prepared by Entellus for the Flood Control District of Maricopa County.

Wittmann Area Drainage Master Study Update McMicken Dam Hydrology Report (May 2004) prepared by Entellus for the Flood Control District of Maricopa County.

A.2 Referenced Documents

Arizona Department of Water Resources (August 2012). "State Standard 1 Instructions for Organizing and Submitting Technical Support Data Notebooks (TSDN) for Flood Studies".

Hydrologic Engineering Center (1991). "HEC-1 Flood Hydrograph Package, User's Manual," US Army Corps of Engineers.

Sabol, G. V., Rumann, J. M., Khalili, D., Waters, S. D., Lehman, T., Gerlach, R.M., Motamedi, A. M., and Loomis, T.R. (February 2011). "Drainage Design Manual for Maricopa County, Arizona, Hydrology," prepared for Flood Control District of Maricopa County.

United States Geological Survey (2006). "Selection of Manning's Roughness Coefficients for Natural and Constructed Vegetated and Non-Vegetated Channels, and Vegetation Maintenance Plan Guidelines for Vegetated Channels in Central Arizona".

McMicken Dam Outlet Wash
Floodplain Delineation Study (FDS)
DATA COLLECTION REPORT

Prepared for

Flood Control District of Maricopa County
2801 West Durango Street
Phoenix, AZ 85009

Prepared by

RBF Consulting
2929 North Central Avenue, Suite 800
Phoenix, Arizona 85012

January 2013

FCD 2011C003
Assignment 4
RBF 133347

Table of Contents

1. Data Collection and Findings 1
2. Data Sources 1
3. Data Types Obtained 1
4. Preliminary Findings of Fact 1
   - *4.1 Property Ownership 1*
   - *4.2 Existing Floodplain 2*
   - *4.3 Proposed Floodplain 2*
   - *4.4 Reported Flooding 2*
   - *4.5 GIS Database, Topography, and Aerial Photography 2*
   - *4.6 Reports and Models 2*
   - *4.7 Gages 3*
   - *4.8 Structures 4*
   - *4.9 Site Visit 4*

List of Figures

Figure 1 – Property Ownership 5
Figure 2 – Existing FEMA Floodplain 6
Figure 3 – McMicken Dam Hydrology 7
Figure 4 – WADMSU Hydrology 8
Figure 5 – Loop 303 / White Tanks ADMPU Area Hydrology Analysis 9
Figure 6 – Gage Locations 10
Site Visit Photos 11

List of Tables

Table 1 – List of Project Contacts 12
Table 2 – List of Collected Reports and Electronic Files 13

1. DATA COLLECTION AND FINDINGS

This section is intended to describe the data collection efforts for the McMicken Dam Outlet Wash Floodplain Delineation Study (FDS) and provide a list of the data materials received from agencies and stakeholders. The McMicken Dam Outlet Wash is approximately four and one-half miles long beginning at the end of the McMicken Dam Outlet Channel and terminating at the Agua Fria River. Background information was gathered from the FCDMC and requested from other agencies. This report also outlines observations gathered during the project site visit on December 20, 2012.

2. DATA SOURCES

An extensive amount of information was sought and received from a variety of government agencies and stakeholders. Refer to Table 1 *List of Project Contacts* for those contacted during the data collection portion of the project. Some information was provided first hand from project stakeholders, supplemental information was also derived via email or through websites to complement the primary data sources. These stakeholders include:

- Arizona Department of Transportation (ADOT)
- Arizona State Land Department (ASLD)
- Federal Emergency Management Agency (FEMA)
- Flood Control District of Maricopa County (FCDMC)
- Maricopa Association of Governments (MAG)
- Maricopa County Assessor
- Maricopa County Department of Transportation (MCDOT)
- Maricopa County Planning & Development

3. DATA TYPES OBTAINED

The data received was provided in a variety of different formats. Table 2 *List of Collected Reports and Electronic Files* identifies and summarizes the data obtained and data types associated with each report, map, or piece of data received. A few examples of the various data types include:

- GIS Database layers
- Aerial Photography
- Area Topography
- Site Visit Photos
- Flood Insurance Rate Maps
- Land Ownership Data
- Hydrology and Hydraulic Models and Reports
- Land Use Plans

4. PRELIMINARY FINDINGS OF FACT

4.1 PROPERTY OWNERSHIP

The study area includes mostly parcels owned by the FCDMC along with some private landowners and Arizona State Trust Land parcels. Refer to Figure 1 – Property Ownership to see property ownership in the vicinity of McMicken Dam Outlet Wash.

4.2 Existing Floodplain

Effective floodplain and floodway exist for the McMicken Dam Outlet Wash. The McMicken Dam Outlet Wash is located within the effective FEMA Flood Insurance Rate Map (FIRM) panels 04013C1155H and 04013C1165J, which classify the study area as Zone AE and Floodway Areas in Zone AE. Both panels are effective September 30, 2005. Refer to Figure 2 – Existing FEMA Floodplain.

Zone AE is defined as "Base Flood Elevations determined".

Floodway Areas in Zone AE is defined as "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."

4.3 Proposed Floodplain

There are no proposed floodplains located within the study area except for the re-delineation of McMicken Dam Outlet Wash. The re-delineation is necessary due to updated hydrology using NOAA Atlas 14 rainfall, new topographic mapping, and incorporating the four culverts constructed since the effective study was completed.

4.4 Reported Flooding

MCDOT, Maricopa County Planning and Development, and ASLD were contacted to determine if any reported flooding has occurred in the study area. These agencies provided no information of reported flooding for this area.

4.5 GIS Database, Topography, and Aerial Photography

The FCDMC provided their most recent GIS database, topography, and aerial photography for the study area. This information has been very useful for a variety of applications relative to aerial surveys, assessing development, and evaluating potential changes to the hydrologic modeling.

4.6 Reports and Models

RBF received the Wittmann Area Drainage Master Study Update (WADMSU) McMicken Dam Hydrology Report (Contract FCD 2002C029) prepared by Entellus dated May 2004. This report presents the hydrology specifically developed to analyze the effect of the 100-year and larger storms on the McMicken Dam and the McMicken Dam Outlet Channel. The hydrology model for the McMicken Dam Analysis focused on flows entering the dam at key inflow points, so the upstream watershed sub-basins were not delineated using a level of detail to address localized flooding issues. Portions of the watershed contain numerous split flow locations characteristic of distributary flow. Most split flows were not modeled because the flow ultimately reaches the dam. In addition, several structures are located within the watershed such as the State Route 74 (SR-74), US Highway 60 (US-60), Central Arizona Project (CAP) Canal, Beardsley Canal, Bonita Dam, Burlington Northern Santa Fe (BNSF) railroad, and Sun Valley Parkway. The only structure modeled was the CAP Canal embankment. The total watershed area modeled is approximately 300 square miles. These hydrology models do not include the attenuation due to the McMicken Dam storage. Refer to Figure 3 McMicken Dam Hydrology for the sub-basin delineation and area associated with this study area model.

The McMicken Dam Hydrology model forms the framework for the McMicken Dam Outlet Wash hydrologic model so the model methodology and parameter estimation will be briefly discussed. The sub-basins were delineated using a base map created from four different sources including: USGS 7.5 minute quadrangle topographic mapping (Yavapai County), 10-foot contour mapping, 4-foot con-

tour mapping, and 2-foot contour mapping. Soils surveys were obtained from the Natural Resources Conservation Services (NRCS). These include *Soil Survey of Maricopa County, Arizona-Central Part*, *Soil Survey Survey of Aguila-Carefree Area*, and *Soil Survey of Yavapai County, Arizona, Western Part.* The hydrologic modeling was performed using Watershed Modeling System (WMS) 7.0 software. The precipitation used was obtained from NOAA Atlas 2. The 24-hour storm duration was used due to the size of the watershed. Rainfall losses were modeled using Green and Ampt loss methodology. Rainfall excess was routed to concentration points using S-Graph methodology.

The FCDMC updated the McMicken Dam Hydrology model by modifying the rainfall depths from NOAA Atlas 2 to NOAA Atlas 14. A hydrograph for the McMicken Dam Principal Spillway was developed since the McMicken Dam Hydrology did not account for attenuation due to the McMicken Dam storage. The McMicken Dam Principal Spillway hydrograph was obtained using the NOAA14 updated peak inflow in the unsteady HEC-RAS model developed as part of the McMicken Dam Alternative Analysis.

RBF received the existing hydrologic studies prepared by Entellus for the Wittmann ADMSU Addendum (Contract FCD 2002C029) in July 2005. This report presents the hydrology developed to determine the 100-year flows to be used for floodplain delineation. The methodology and parameter determination were generally similar between the McMicken Dam Hydrology and Wittmann ADMSU Hydrology with a few noted differences. The Wittmann ADMSU sub-basin delineation is more detailed than the McMicken Dam Hydrology analysis and structures and flow splits were considered more due to the different purposes of each model. The Wittmann ADMSU used Clark Unit Hydrograph to route excess runoff to concentration points instead of S-Graphs. Another difference is the Wittmann ADMSU included additional area generally located east and south of the McMicken Dam Outlet Channel. This area is the Agua Fria River sub-watershed and sub-basins begin with the prefix AF. Refer to Figure 4 WADMSU Hydrology for the sub-basin delineation and area associated with this study area model.

RBF received the Final Hydrology Report Loop 303 / White Tanks ADMPU Area Hydrologic Analysis (Contract FCD 2007C031) prepared by HDR Engineering, Inc. in September 2009. The purpose of this study was to develop new hydrologic analysis to account for new development since the original update, include additional areas not covered in the previous work, use updated mapping and NOAA Atlas 14 rainfall, and reanalyze flow splits. The area impacting the McMicken Dam Outlet Wash is located with the Northeast Region (N). Refer to Figure 5 Loop 303 / White Tanks ADMPU Area Hydrologic Analysis for the sub-basin delineation within the vicinity of the McMicken Dam Outlet Wash. Rainfall losses were modeled using Green and Ampt loss methodology. Rainfall excess was routed to concentration points using S-Graph methodology.

RBF received the State Route 303L Initial Drainage Report Volume 1 of 2 (Off-Site) Stage II Design (30%) SR303L, US60 to Happy Valley Parkway prepared by Parsons Brinckerhoff in April 2012. The purpose of this study is to provide the offsite drainage design for the interim and ultimate SR303L from US60 to Happy Valley Parkway. PB developed 50-year 6-hour and 100-year 6-hour HEC-1 models using NOAA Atlas 14 rainfall, Green and Ampt infiltration, Clark Unit Hydrograph, and Normal Depth Channel Routing. The hydrologic analysis for McMicken Dam Outlet Wash was not performed as part of this study.

4.7 GAGES

There is a stream gage (FCDMC No. 5483) and precipitation gage (FCDMC No. 5480) located on the McMicken Dam Outlet Wash. The name of this gage is El Mirage Drain and it is located in Section 14 of Township 4 North Range 1 West (latitude: 33°41'26.6"N; longitude: 112°19'41.0"W). The

gage was installed February 16, 2006. The peak flow recorded since installation is 475 cfs. There are many precipitation gages and a few stream gages within and near the McMicken Dam Outlet Wash watershed. Refer to Figure 6 which shows the gage name and location in relationship to the watershed.

4.8 STRUCTURES

There are four culvert crossings located along the McMicken Dam Outlet Wash. They are located at SR303L, Williams Drive, and two crossings of El Mirage Road. The SR303L culvert crossing is currently an 11-10'x6' reinforced concrete box culvert. The SR303L, US60 to Happy Valley Parkway Stage II Design (30%) proposes adding two additional barrels at this crossing. The design was based on conveying the 100-year flow without overtopping SR303L. The 100-year peak flow used for the culvert design was 6,023 cfs obtained from the Flood Insurance Study. ADOT has advertised for the design of the SR303L/El Mirage Road Traffic Interchange Final Design. The Williams Drive crossing is an 11-10'x6' reinforced concrete box culvert. The two El Mirage Road crossings are 7 barrel reinforced concrete box culverts. As-built and design flow information has been requested from MCDOT.

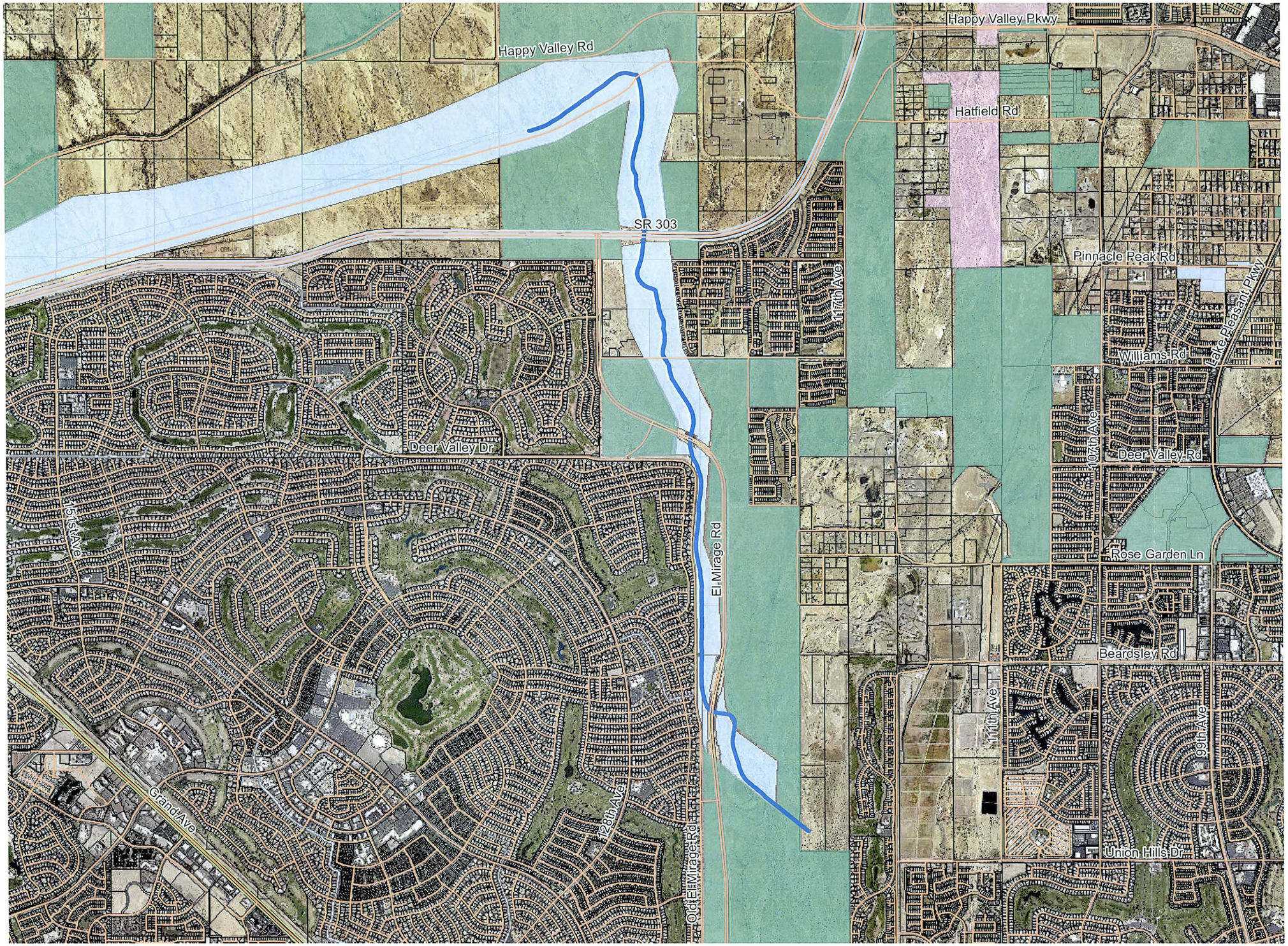
4.9 SITE VISIT

On December 20, 2012, RBF Staff conducted an initial site visit of the project study area. The field reconnaissance included a number of photographs and notations to obtain a preliminary understanding of the wash characteristics and other variables influencing the study area. Many characteristics within the study area were observed, many of the notable areas include:

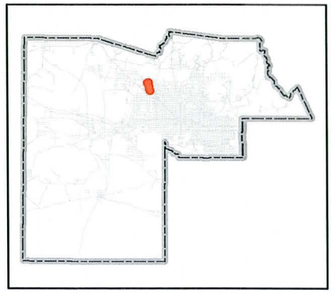
- Four culverts were observed during the site visit – SR303L, Williams Drive, and (2) El Mirage Road.
- McMicken Dam Outlet Wash has been channelized south of Deer Valley Drive adjacent to Sun City West.
- There is a concrete drop structure located within the McMicken Dam Outlet Wash.
- Flow from Sun City West enters the McMicken Dam Outlet Wash.
- Most of the overbanks are covered in moderate to heavy vegetation.

Please refer to the photographs illustrating the channel character and areas of interest.

Figure 1 – Property Ownership



Flood Control District of Maricopa County



McMicken Dam Outlet Wash Floodplain Delineation Study

Legend

- Streets
- Flowline
- Assessor Parcels

Land Ownership

- Bureau of Land Mgmt.
- Private Land
- State Trust Land
- FCDMC

0 625 1,250 2,500 Feet

1 inch = 2,500 feet

Property Ownership

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DLP	NEF

PROJECT NUMBER 133347

DATE 1.11.13

FIGURE 1

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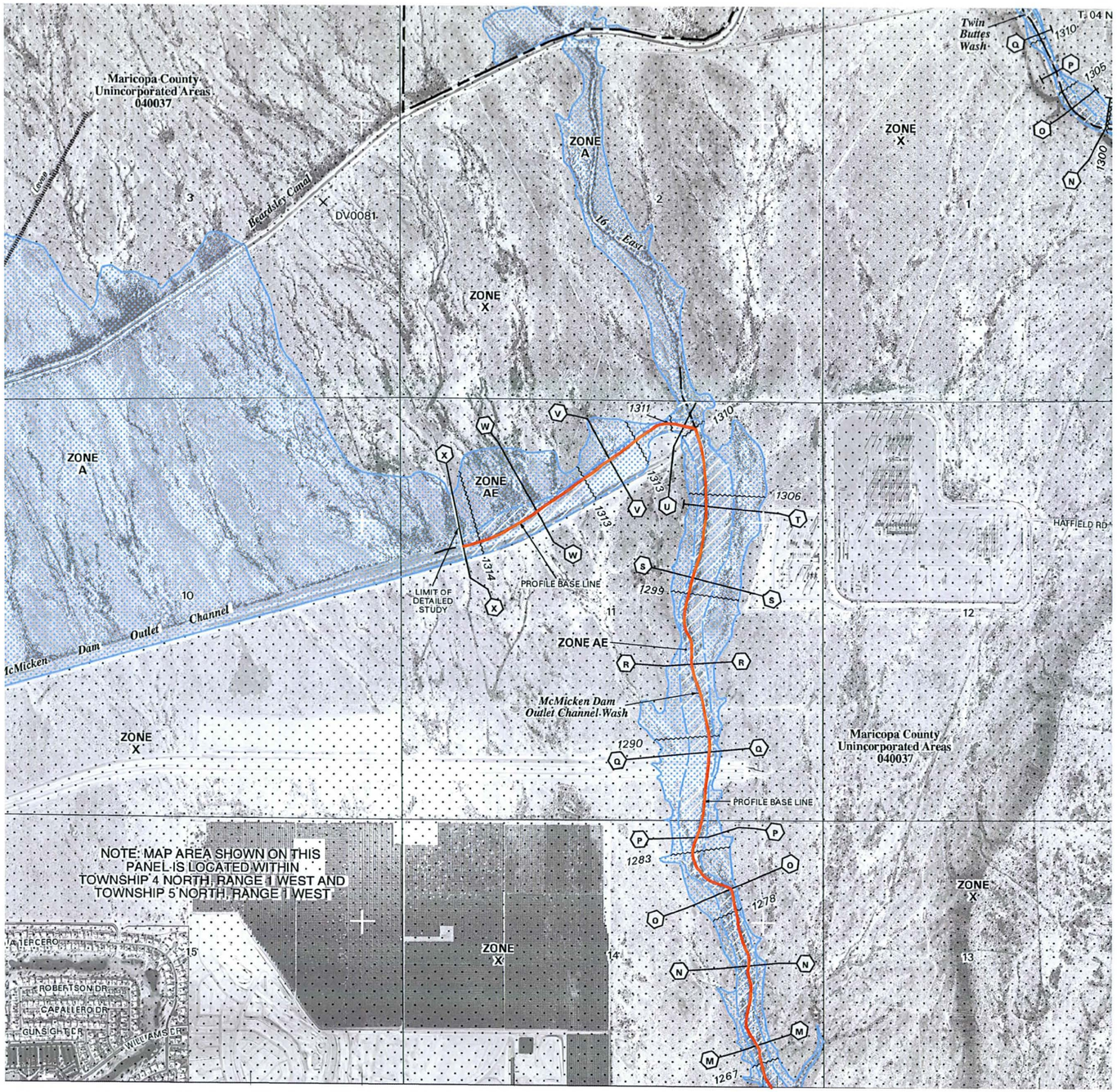
Figure 2 – Existing FEMA Floodplain



1500 750 0 1500 3000 4500

SCALE: 1"=1500'

SCALE: 1"=1500'

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1155H

FIRM

FLOOD INSURANCE RATE MAP

MARICOPA COUNTY, ARIZONA

AND INCORPORATED AREAS

PANEL 1155 OF 4350

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
MARICOPA COUNTY	040037	1155	H
PEORIA, CITY OF	040050	1155	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

04013C1155H

MAP REVISED

SEPTEMBER 30, 2005

Federal Emergency Management Agency

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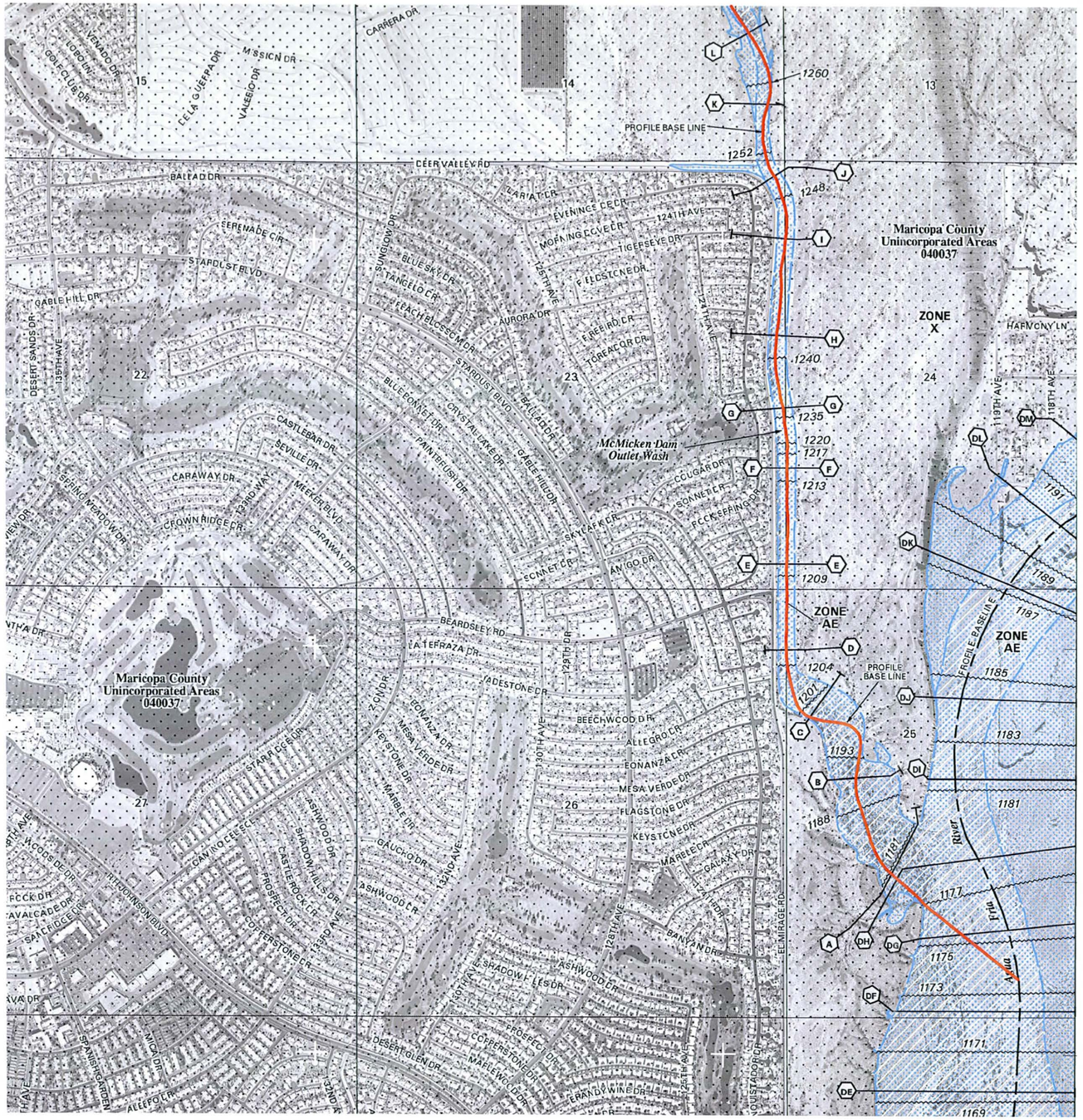

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NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1165J

FIRM

FLOOD INSURANCE RATE MAP

MARICOPA COUNTY, ARIZONA

AND INCORPORATED AREAS

PANEL 1165 OF 4350

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
EL MIRAGE, CITY OF	040041	1165	J
MARICOPA COUNTY	040037	1165	J
SURPRISE, CITY OF	040053	1165	J

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.

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MAP REVISED

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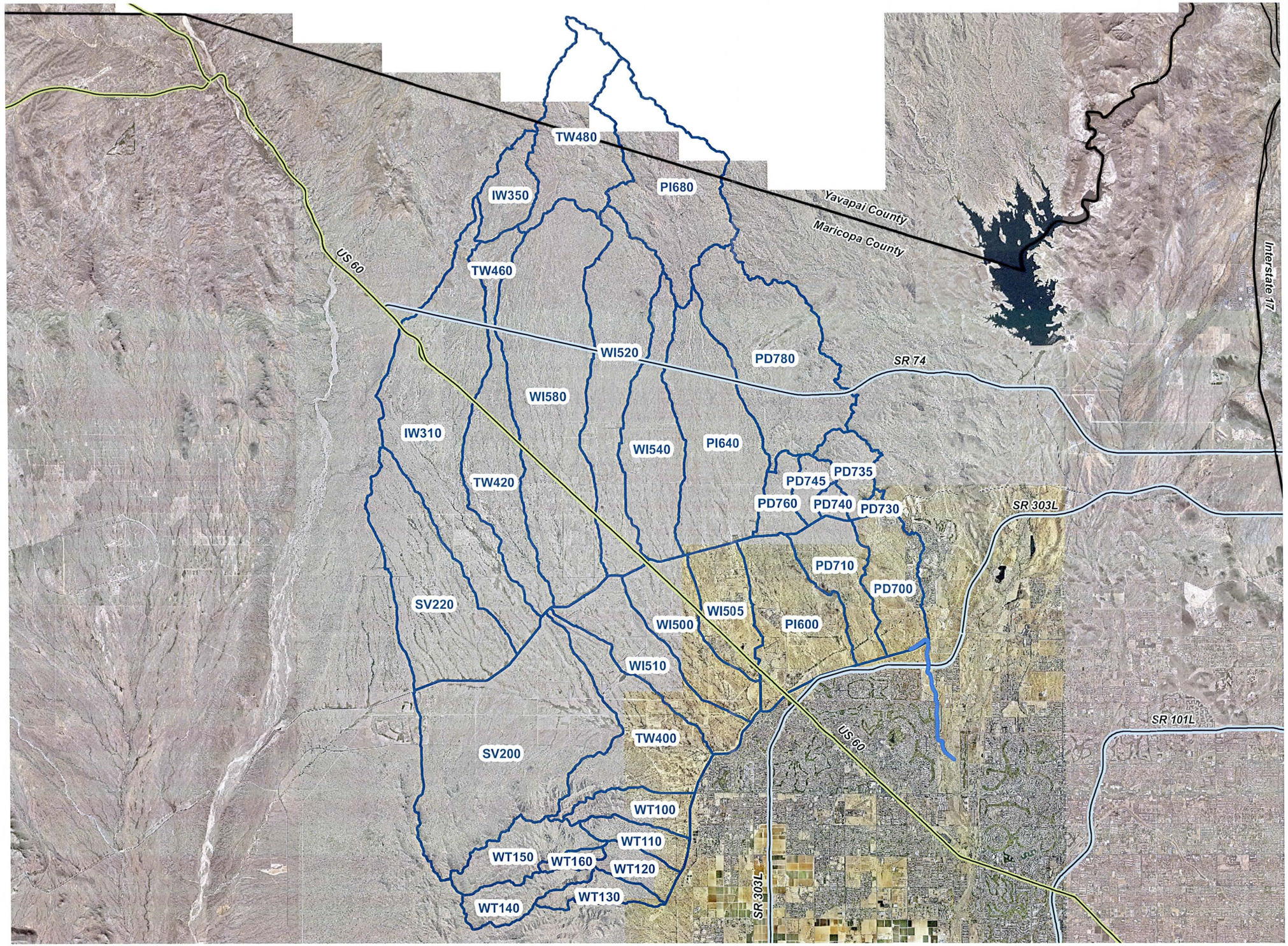
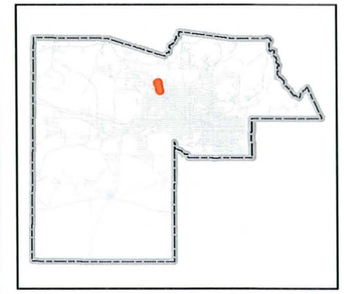
Figure 3 – McMicken Dam Hydrology



Flood Control District of Maricopa County



McMicken Dam Outlet Wash
Floodplain Delineation Study

Legend

- Flowline
- County Boundary
- Sub-Basins

0 0.5 1 2 Miles

1 inch = 3 miles

McMicken Dam Hydrology

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FIGURE 3

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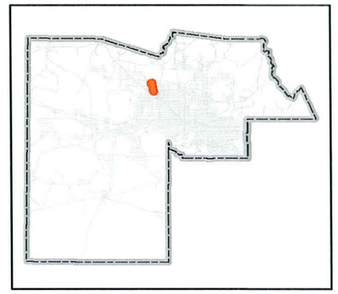
Figure 4 – WADMSU Hydrology

Flood Control District of Maricopa County



McMicken Dam Outlet Wash Floodplain Delineation Study

Legend

- Flowline
- WADMSU Sub-Basins
- Padelford Wash Sub-Basins
- County Boundary

0 0.5 1 2 Miles

1 inch = 3 miles

WADMSU Hydrology

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DATE 1.11.13

FIGURE 4

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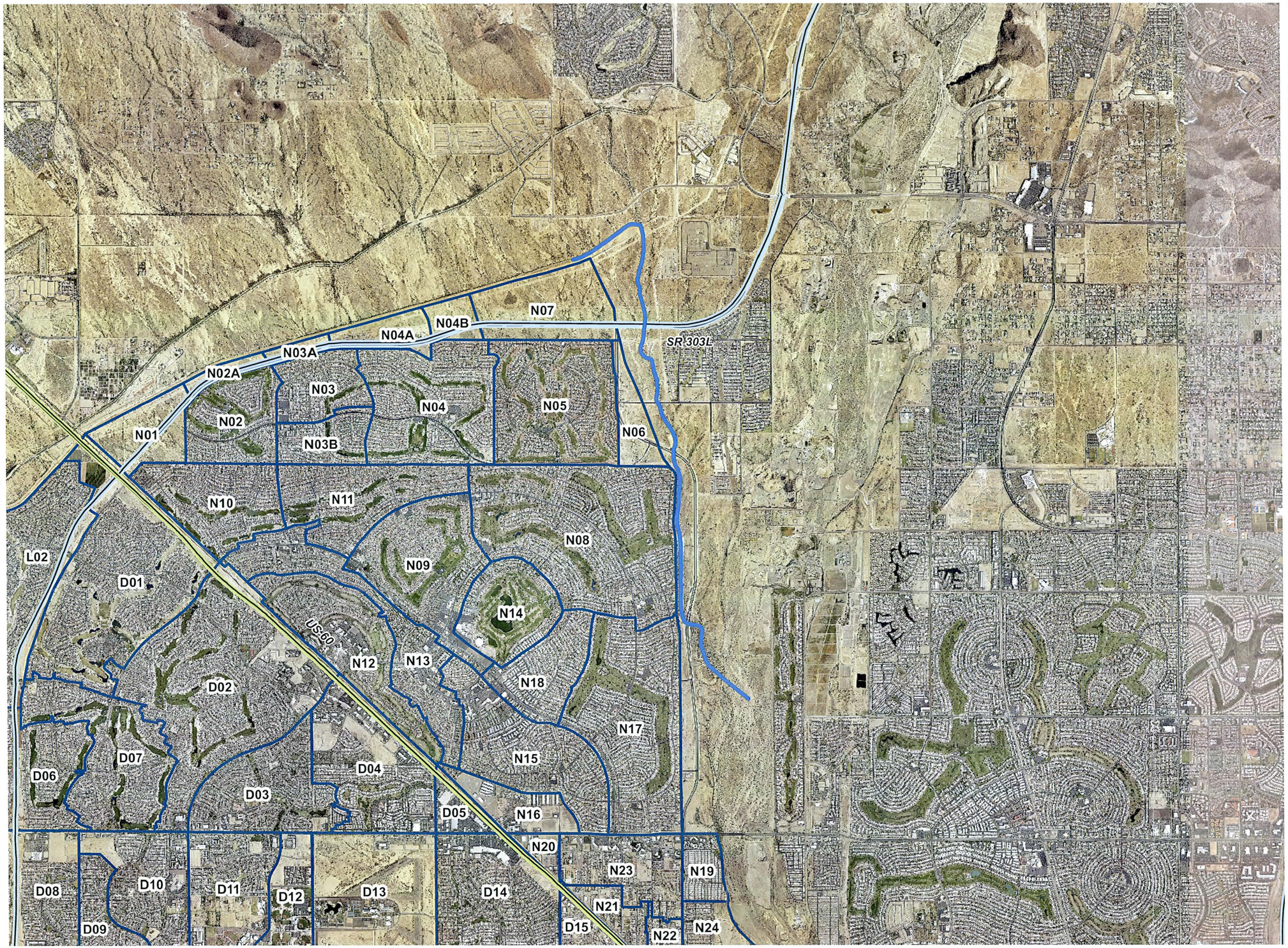
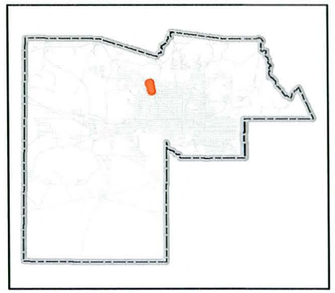
Figure 5 – Loop 303 / White Tanks ADMPU Area Hydrology Analysis



Flood Control District of Maricopa County



McMicken Dam Outlet Wash Floodplain Delineation Study

Legend

- Flowline
- Loop 303 / WT ADMPU Sub-Basins
- County Boundary

0 1,000 2,000 4,000 Feet

1 inch = 4,000 feet

Loop 303 / White Tanks ADMPU Area Hydrologic Analysis

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DATE *1.11.13*

FIGURE *5*

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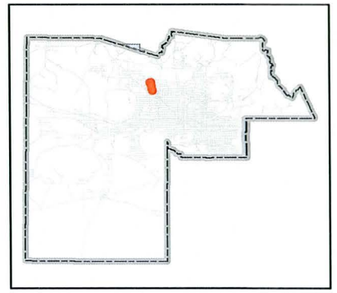
Figure 6 – Gage Locations

Sols Wash nr Matthie
Powder House Wash
Wickenburg Airport
Constellation Road
Hartman Wash
Casandro Dam
Hassy R. @ US 60
Sunset FRS
Casandro Wash
Flying E Wash
Sunny Cove FRS
Vulture Mine Road
Flying E Tank
Twin Peaks
Hassy nr Morristown
Box Wash
Morristown
SR-74
Picacho Wash
Circle City
US-60
Chrysler P. Ground
Wittmann
Daggs Wash
CAP @ 163rd Ave.
Patton Rd.
Garfias Mountain
Upper Trilby Wash
Castle Hot Springs
Yavapai County
Maricopa County
Sunup Ranch
New River Landfill
Lake Pleasant
I-17
New River Dam
McMicken Floodway
El Mirage Drain
NW Regional Landfill
McMicken Dam
Sun City West
Adobe Dam
SR-101
Scatter Wash
SR-303
Dysart @ Bell Rd.
New River @ Bell Rd.
Greenway @ 32nd Ave.
Agua Fria @ Grand Ave.
ACDC @ 67th Ave.
Ford Canyon Wash
Grand @ Peoria Ave.
McMicken Dam South
ACDC @ 43rd Ave.

Flood Control District of Maricopa County



McMicken Dam Outlet Wash
Floodplain Delineation Study

Legend

Gage Type

- Rain
- Rain/Stream
- Stream

Flowline

Streets

Watershed

County Boundary

0 4,0008,000 16,000 Feet

1 inch = 16,007 feet

Gage Locations

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FIGURE 6

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Site Visit Photos

Looking West at McMicken Dam Outlet Channel near Confluence with McMicken Dam Outlet Wash

Looking Upstream at Wash 16 East near Confluence with McMicken Dam Outlet Wash

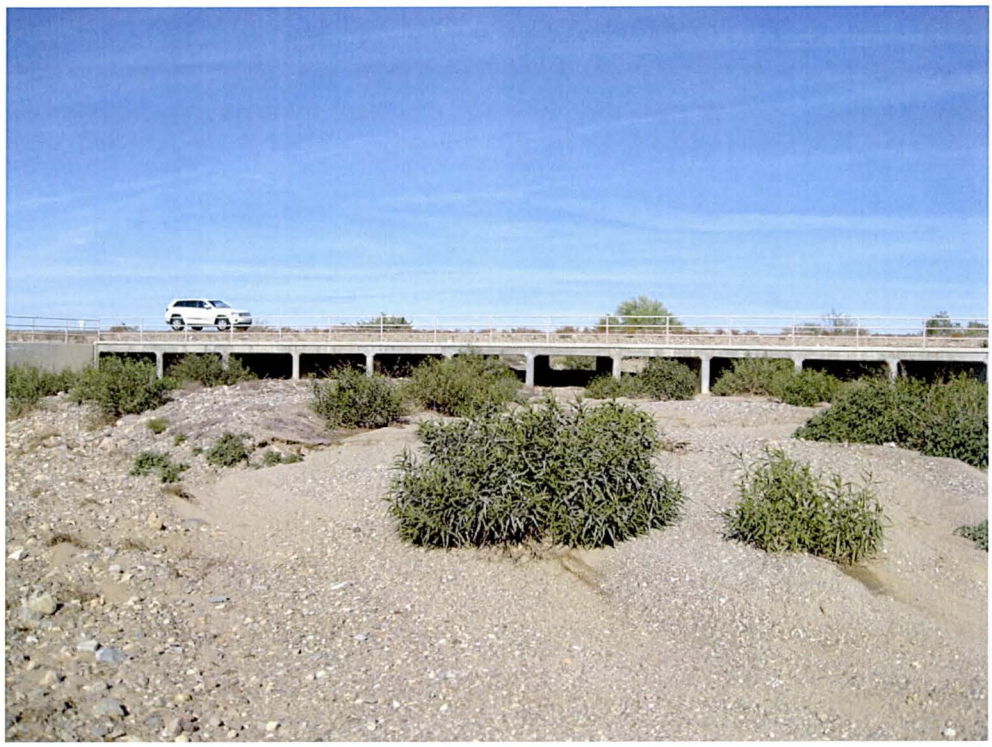
Looking Downstream at McMicken Dam Outlet Wash near McMicken Dam Outlet Channel

Looking Upstream at McMicken Dam Outlet Wash from SR303L

Looking Downstream at McMicken Dam Outlet Wash SR303L Culvert Entrance

Looking Upstream at McMicken Dam Outlet Wash SR303L Culvert Exit

Looking Downstream at McMicken Dam Outlet Wash Williams Drive Culvert Entrance



Looking Upstream at McMicken Dam Outlet Wash Williams Drive Culvert Exit

Looking Upstream at McMicken Dam Outlet Wash from Williams Drive Culvert

Looking Downstream at McMicken Dam Outlet Wash from Williams Drive Culvert

Looking Downstream at McMicken Dam Outlet Wash El Mirage Road Northern Culvert Entrance

Looking Upstream at McMicken Dam Outlet Wash El Mirage Road Northern Culvert Exit

Looking Upstream at McMicken Dam Outlet Wash from El Mirage Road Northern Culvert

Looking Downstream at McMicken Dam Outlet Wash from El Mirage Road Northern Culvert

Looking West at Deer Valley Drive Channel from McMicken Dam Outlet Wash

Looking Downstream at Concrete Drop Structure in McMicken Dam Outlet Wash

Looking Upstream at McMicken Dam Outlet Wash near Concrete Drop Structure

Looking Downstream at McMicken Dam Outlet Wash Upstream of Concrete Drop Structure

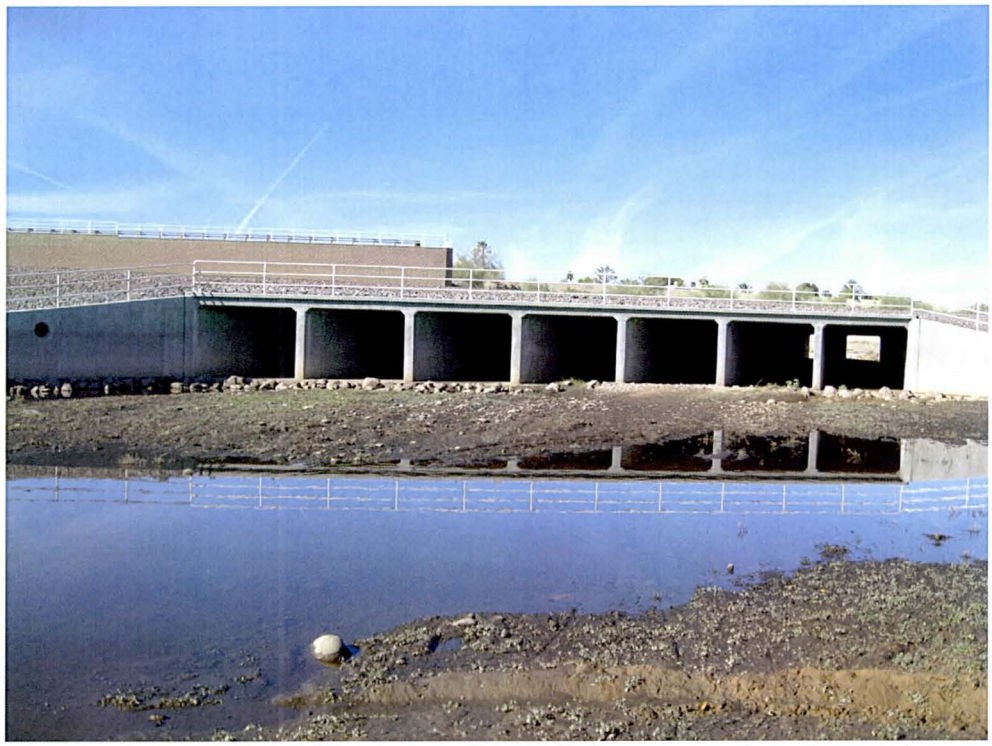
Looking Downstream at Sun City West Channel Entering McMicken Dam Outlet Wash

Looking Upstream at Sun City West Channel

Looking Upstream at McMicken Dam Outlet Wash near Sun City West Channel

Looking Downstream at McMicken Dam Outlet Wash near Sun City West Channel

Looking Downstream at McMicken Dam Outlet Wash El Mirage Road Southern Culvert Entrance



Looking Upstream at McMicken Dam Outlet Wash El Mirage Road Southern Culvert Exit

Looking Downstream at McMicken Dam Outlet Wash - South of El Mirage Road Southern Culvert

Table 1 – List of Project Contacts

Table 1 List of Project Contacts

Name	Organization	email	Phone	Address	City	State	Zip
Ken Rakestraw	FCDMC	kennethrakestraw@mail.maricopa.gov	602-506-2201	2801 W Durango St	Phoenix	AZ	85009
John Holmes	FCDMC	jwh@mail.maricopa.gov	602-506-3320	2801 W Durango St	Phoenix	AZ	85009
Eric Feldman	FCDMC	emf@mail.maricopa.gov	602-506-8736	2801 W Durango St	Phoenix	AZ	85009
Denise Lacey	MCDOT	deniselacey@mail.maricopa.gov	602-506-6172	2901 W Durango St	Phoenix	AZ	85009
Bill Hahn	MCDOT	billhahn@mail.maricopa.gov	602-506-4611	2901 W Durango St	Phoenix	AZ	85009
Sami Ayoub	MCDOT	samiayoub@mail.maricopa.gov	602-506-4662	2901 W Durango St	Phoenix	AZ	85009
Michael Norris	Maricopa County P&D	michaelnorris@mail.maricopa.gov	602-372-4114	501 N 44th Street, Ste 200	Phoenix	AZ	85008
Steve Beasley	ADOT	sbeasley@azdot.gov	602-712-7645	205 S 17th Ave	Phoenix	AZ	85007
Manny Patel	ASLD	mpatel@azland.gov	602-542-3671	1616 W Adams St	Phoenix	AZ	85007
Alex Kuchansky	ASLD	akuchansky@azland.gov	602-542-2680	1616 W Adams St	Phoenix	AZ	85007

Table 2 – List of Collected Reports and Electronic Files

Table 2 List of Collected Reports and Electronic Files

Document	Data Description	Media Type	Prepared By
Wittmann ADMSU Hydrology Report Final Addendum July 2005	Updated Hydrology for the Wittmann ADMSU	PDF	Entellus
Wittmann ADMSU McMicken Dam Hydrology Report May 2004	Hydrology for McMicken Dam	PDF	Entellus
Wittmann Area Drainage Master Plan McMicken Dam Project Alternative Analysis August 2008	McMicken Dam Alternative Analysis	PDF	Entellus
Final Drainage Report Loop 303 / White Tanks ADMPU Hydrologic Analysis Version 1.2 September 2009	Updated Hydrology for the Loop 303 / White Tanks ADMPU	PDF	HDR Engineering, Inc.
SR303L Final Design Memorandum Stage II Design (30%) SR303L, US60 to Happy Valley Parkway August 2012	30% Design	PDF	Parsons Brinckerhoff
State Route 303L Initial Drainage Report Volume 1 of 2 (Off-Site) Stage II Design (30%) SR303L, US60 to Happy Valley Parkway April 2012	30% Design Drainage Report	PDF	Parsons Brinckerhoff
State Route 303L Initial Drainage Report Volume 2 of 2 (On-Site) Stage II Design (30%) SR303L, US60 to Happy Valley Parkway April 2012	30% Design Drainage Report	PDF	J2 Engineering & Environmental Design, LLC
Vistancia Master Drainage Report Phase I-III	Sub-Basin Maps from Master Drainage Report	PDF	Wood Patel

Appendix B General Documentation and Correspondence

B.1 General Project Documentation and Correspondence

FCD 2011C003
McMicken Dam Outlet Wash Floodplain Delineation Study
Monthly Project Meeting

January 30, 2013

Agenda and Minutes

1. Data Collection Report

Ken to provide comments tomorrow (1/31/13).

2. Hydrology Discussion

Ken requested shapefiles used to determine rainfall in DDMSW and the DDMSW files for the four sub-basins that were modified. The draft peak flow in the McMicken Dam Outlet Wash is higher than the previous FIS peak flows. District wants to ensure the increase is warranted. Ken to investigate the velocities from the previous HEC-RAS models to determine if the n-steps are reasonable or if changes need to be made to the routing.

3. Topographic Data

Ken to check on the availability of the topo. Ken to talk to Jim Orr about the laser scan information of the culverts.

4. Field Visit

Ken to check with Mike Greenslade on the date of a field visit.

5. Project Schedule – Revision

No revisions were made.

6. Miscellaneous

RBF to email December invoice. RBF provided a copy of the as-builts for the El Mirage North and El Mirage South culverts obtained from McDOT.

FCD 2011C003
McMicken Dam Outlet Wash Floodplain Delineation Study
Monthly Project Meeting

January 30, 2013

Sign In Sheet

	Name	Organization	Phone Number	E-Mail
1.	Nathan Ford	RBF	602-798-7563	nford@rbf.com
2.	Ken Rakestraw	FCDMC	602-506-2201	kennethrakestraw@mail.maricopa.gov

B.2 Contract Documents

EXHIBIT A

SCOPE OF WORK

CONTRACT FCD 2011C003
Work Assignment No. 4
Floodplain Delineation Study of McMicken Dam Outlet Wash
EXHIBIT A

SCOPE OF WORK

CONTRACT FCD 2011C003
Work Assignment No. 4
Floodplain Delineation Study of McMicken Dam Outlet Wash

GENERAL

This study will delineate detailed Zone AE 100-year floodplains with floodway for McMicken Dam Outlet Wash using one-foot contour interval mapping recently acquired and provided by the Flood Control DISTRICT of Maricopa County. Four point fifty-five (4.55) linear miles of detailed 100-year floodplain with floodway will be delineated.

The CONSULTANT will use existing hydrology models and update precipitation to NOAA 14 values. The hydrology modeling will include merging the extreme eastern portion of the McMicken Dam Outlet Wash drainage from the Wittmann ADMSU hydrology to the McMicken Dam Hydrology model which includes McMicken Dam Outlet Channel. The unit hydrograph parameters for the eastern portion of the drainage will be converted from Clark to S-graph, consistent with the remainder of the McMicken Dam hydrology. The Consultant will develop new HEC-RAS modeling to determine the 100-yr floodplain boundaries for the Outlet Wash. In addition, the Consultant will determine the floodplain delineation for the current discharge of 14,000 cfs.

All work must meet the requirements of the DISTRICT's CONSULTANT Guidelines, Third Edition – December 1, 2003 - Revision 1. All work must also meet Arizona Department of Water Resources (ADWR) and Federal Emergency Management Agency (FEMA) requirements for detailed Zone AE floodplain delineation studies. Prior to the finalization of this contract, the DISTRICT must review and accept the results of this study, and all items called for in this Scope of Work must be delivered to the DISTRICT.

All work must be completed within five hundred (500) days or less from the Notice to Proceed (NTP) which includes at least seventy-five (75) days for DISTRICT reviews and a FEMA review period. All project activities including study data submittals and Milestones shall occur as defined in the attached Work Schedule. The Work Schedule may be updated during the course of the project given prior approval by the DISTRICT'S Project Manager.

TASK 1 - COORDINATION

1.1 Within seven (7) days of the NTP the CONSULTANT will submit a project schedule to the DISTRICT's Project Manager showing coordination meetings and completion dates for each task identified in the Scope of Work (SOW). The schedule shall also show product submittal dates and DISTRICT product review periods. The CONSULTANT will update the project schedule as necessary and when otherwise directed by the DISTRICT.

1.2 The CONSULTANT will participate in regular coordination meetings (at least on a monthly basis) with the DISTRICT's Project Manager and in milestone coordination meetings in the development of the hydraulic analyses. The CONSULTANT is responsible for the minutes of any meetings. Draft meeting minutes must be delivered to the DISTRICT within seven (7) working days of any monthly meeting. Coordination and milestone meetings should be combined whenever possible.

1.3 The CONSULTANT will submit an estimate of the total monthly billing projections within seven (7) days of the NTP. Thereafter, this estimate will be updated and submitted to the DISTRICT's Project Manager at least ten (10) days before the end of each quarter.

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

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

1.5 The DISTRICT has prepared a separate set of guidelines for the CONSULTANT on conducting public involvement and public information activities for the DISTRICT. A copy of these guidelines will be provided to the CONSULTANT by the Public Information Office and shall be used by the CONSULTANT if or when preparing public information related materials.

1.6 The DISTRICT will provide any public notice beyond that described in task 1.5.

1.7 **(Optional)** The CONSULTANT will participate in a public information open house meeting prior to sending the study Technical Data Notebook (TDN) to FEMA. The CONSULTANT will create the map and/or graphic portion of all exhibit displays for the meeting per DISTRICT specifications. The DISTRICT will create, print, and mount the final exhibit displays using the CONSULTANT'S maps and/or graphics. The DISTRICT will reserve the meeting venue, secure a certificate of insurance, and pay any facility rental fee. The CONSULTANT will provide refreshments for the open house meeting.

1.8 CONSULTANT/DISTRICT Performance Evaluations will be performed. A formal evaluation will be performed at the completion of the project upon receipt of all deliverables.

TASK 2 - DATA COLLECTION

2.1 The CONSULTANT will collect and review pertinent data from the DISTRICT and other outside sources. Data to be collected will include previous flood hazard reports and hydrology for the study area; existing readily available topographic mapping; proposed development plans, historical flooding information; as-built plans for existing structures; FEMA Flood Hazard Boundary Maps and any Letters of Map Amendment and/or Revisions, and other pertinent information.

2.2 The CONSULTANT will consult with officials from the DISTRICT and the County and State transportation departments, in order to identify local flooding problems and to obtain information on current and planned public works projects, channel modifications, storm drain systems, development, and corporate limits.

2.3 A written summary of the data collected will be included as a section in the Technical Data Notebook (TDN). A preliminary draft of this section is due within twenty-one (21) days of Notice to Proceed. The section will be updated to include information developed through continued research that may be necessary as the project proceeds.

TASK 3 - TOPOGRAPHIC MAPPING

3.1 Topographic mapping with 1-foot contour intervals (including digital terrain model data) will be provided for the study area by the DISTRICT. This topographic mapping will be referenced to the Arizona Central State Plane Coordinate System, which is tied to the North American Datum 1983 High-Accuracy Reference Network (NAD 83 HARN), horizontally; and the North American Vertical Datum 1988 (NAVD 88), vertically. The DISTRICT will provide the CONSULTANT with aerial photographic imagery that is recent enough to be appropriate to the level of study and contiguous within the study area.

TASK 4 - FIELD SURVEY

4.1 As needed, field surveys and measurements of bridges, culverts, and hydraulic structures are to be obtained by either the CONSULTANT or the DISTRICT when as-built plans are not available, or when conditions have changed that may impact the delineation. Geodetic Densification and Cadastral Survey (GDACS) control will be the basis of field survey. This information should be reduced and compiled into an 11" x 17" (maximum size) drawing format approved by the DISTRICT, for inclusion in the TDN. The information presented in the drawing should be in a format appropriate for use in future HEC-RAS models. It may be necessary to field survey some structures since the as-built plans may not be on the same vertical datum as the study.

4.2 Copies of the survey field books and office calculations must be supplied by the CONSULTANT to the DISTRICT for inclusion in the TDN. An Arizona Registered Land Surveyor (RLS) must seal and sign the survey notes. This information can be submitted separately if approval is obtained from the DISTRICT's Project Manager.

TASK 5 - HYDROLOGY

5.1 Hydrologic Modeling and Hydrologic Summary

The hydrology from previous studies for this area (Wittmann Area Drainage Master Study Update (ADMSU) contract FCD 2002-29) and (Wittmann Area Drainage Master Plan (ADMP) contract FCD 2004C060) will be used for this study. The Consultant will utilize existing hydrology models (HEC-1) and update precipitation to NOAA 14 values for the 10, 50, and 100-yr, 24 hour storms. The hydrology modeling will include merging the eastern portion of the McMicken Dam Outlet Wash drainage from the Wittman ADMSU hydrology to the McMicken Dam Hydrology model which includes McMicken Dam Outlet Channel. The District will provide a hydrograph for the Principal Outlet of McMicken Dam to represent the Dam outflow for the 10, 50, and 100-yr flood. The unit hydrograph parameters for the eastern portion of the drainage will be converted from Clark to S-graph, consistent with the remainder of the McMicken Dam hydrology. Flow routing parameters in the existing model will be reviewed for reasonableness. The previous study models should be included in the submittal of the hydrologic analysis documentation in order to provide a comprehensive package. A Hydrologic Summary of the documentation will be prepared by the CONSULTANT as a draft section in the TDN and it will be submitted for review and approval by the DISTRICT prior to commencing with floodplain modeling.

5.2 Meetings and Field Visits

One (1) meeting associated with the development of the hydrologic data shall be held with DISTRICT staff at the following milestone:

A. Meeting number 1: This meeting will occur after the preliminary peak discharges have been estimated. At this time, the CONSULTANT will have an opportunity to discuss any preliminary comments by the DISTRICT.

5.3 Review and Approval

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

a. Preliminary discharge results (Meeting 1)
b. Cross section locations with respect to changes in discharge

5.4 The Hydrologic Study and Report

5.4.1 The findings of the Hydrologic Summary will be finalized into a Hydrologic Report that will be presented as Section 4 of the Technical Data Notebook and will be prepared in accordance with ADWR State Standards Attachment 1-97 (SSA 1-97) or most recent version. The report will be organized as specified by the DISTRICT, following SS 1-97 format. The report will include backup documentation from the existing hydrology as well as comprehensive drainage displays to show all sub-basins and concentration points with discharge tables. A comparative analysis against regression equations will be included in the report. Specific deviations from this hydrologic scope shall not be undertaken without the specific written authorization from the DISTRICT's Project Manager.

5.5 Tables and Figures

5.5.1 Drainage Maps(s) showing the sub-basins, major man-made structures such as highways, levees, railroads, or culverts, and location references (i.e., street names, Township, Range, Section, etc.) at a scale to be agreed upon with DISTRICT Staff shall be included in the TDN as support for the related hydraulic analysis. The level of detail of this map is to be developed during the study period. A table will be prepared to show the results of the study (i.e. 6-hour and 24-hour peak flows, etc.) at major concentration points.

5.6 Digital Hydrologic Data Deliverables

Digital data in a GIS shape file format for any newly developed hydrologic information will be prepared in conformance with the DISTRICT's Hydrologic Information System Data Delivery Specifications, Revision 3.1, or Shape File Data Delivery Specifications V1.2, date May 1st, 2007. The following themes are the ones generally used for Hydrologic data. However, for this study there may not be data for every theme identified, or the CONSULTANT might develop data for themes not listed. Therefore, only those themes, for which there are data, need to be completed. If the CONSULTANT has data that doesn't fit one of the themes listed here, the DISTRICT's Project Manager shall be contacted to determine the appropriate theme for that data.

a. drnbsn (Drainage Basins)

b. drnpthln (Drainage Flowpaths and Routes)

c. drnpthpt (Concentration Points)

TASK 6 - FLOODPLAIN DELINEATION

6.1 Detailed Zone AE Floodplain delineations with floodway will be performed for four point fifty-five (4.55) linear miles of wash. Water surface profiles will also be computed for the 10- and 50- year frequency storms. Hydraulic information upon which the delineations will be based will be obtained by modeling using the U.S. Army Corps of Engineers latest release of HEC-RAS (version 4.1.0 or later) and methodology acceptable to FEMA as defined in their Guidelines and Specification for Flood Hazard Mapping Partners, April 2003 and FIA Document 12, Appeals, Revisions, and Amendments to Flood Insurance Maps, December 1993. The completed delineation work will meet the requirements for floodplain delineations as prescribed by FEMA and the ADWR, including the Arizona State Standard for Hydraulic Modeling (SS9-02).

6.2 The floodplain delineation maps shall have a scale of 1 inch = 200 feet. The hydraulic modeling and delineation work maps shall be referenced to the North American Vertical Datum of 1988 (NAVD 88). This work shall include inserting the cross sections, BFE boundary line work, and river mile ticks.

The CONSULTANT shall provide annotated FIRM panels to illustrate the proposed floodplain boundaries in comparison with the effective information. The annotated FIRM panels will be part of a draft addition to the FIS, which shall also include water surface profile plots and discharge data tables. These materials are normally included in Section 7 of the TDN. Excerpts from the effective FIS, as they relate to the study, shall be included within the TDN appendices as backup documentation.

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

a. Estimation of Manning's "n" values.
b. Cross-section location and orientation (with respect to channel geometric and bed slope changes, and mass-flow paths)
c. Hydraulic model feature names in context with CAD/GIS standards
d. Hydraulic model documentation
e. Draft and final floodplain (natural) delineation.
f. Draft and final floodway delineation
g. Draft Hydraulics TDN section documentation (Section 5 of the TDN).
h. Draft FIS TDN Section documentation (Section 7 of the TDN).

6.3 Field Reconnaissance

6.3.1 The CONSULTANT will conduct a field reconnaissance of the study area. This will include observation of channel and floodplain conditions for estimating Manning's "n" values; photographic documentation of floodplain characteristics; determination of channel bank characteristics; determination of channel bed particle size; observation of possible overflow area; observation and classification of levees or other flood control structures and nominal measurement of bridge and culvert dimensions not included in the survey task. Such measurements will be made to classify smaller cross-drainage structures as non-effective.

6.3.2 Manning's "n" values are to be determined using the methodology in the USGS report, *Selection of Manning's Roughness Coefficient for Natural and Constructed Vegetated and Non-Vegetated Channel, and Vegetation Maintenance Plan Guidelines for Vegetated Channels in Central Arizona, 2006.* If approved by the DISTRICT, another report entitled, *Estimated Manning's Roughness Coefficients for Stream Channels and Floodplains in Maricopa County, 1991*, may be substituted. Copies of these reports are available through the DISTRICT.

Manning's "n" values can be presented for typical reach types observed in the project area, rather than specific reaches of specifically named watercourses. It is anticipated that several different reach types will be identified during the field reconnaissance. Supplemental field photos will be used to substantiate slight roughness value variations from otherwise typical reach types, for locations where slight roughness value variations can be applied without providing complete calculations. These variations will be fully documented in Section 5 of the TDN and in the hydraulic model's General Description.

6.3.3 Representative Manning's "n" values will be selected and documented in a reconnaissance, "n value" report. The report will present the calculated determination of channel and overbank "n" values using captioned color photographs for each type in the project area, and the extents of each type will be displayed on an exhibit. The "n value" report will also discuss floodplain conditions affecting the delineation, describe all structures and obstructions, and provide color photos or photocopies of major hydraulic structures. Photo location for channels, structures, and "n" value determinations will then be displayed on reduced scale mapping and included in the draft TDN Hydraulic documentation appendix and in all subsequent TDN versions.

6.4 Cross Sections

6.4.1 The location and alignment of cross sections and channel centerlines will be submitted for the DISTRICT's review and approval. Cross sections shall be located at the same location as effective model cross sections where practicable. Cross sections will be spaced approximately every five hundred feet, unless geographic or structural constraints dictate otherwise, and will extend the full width of the area inundated by the SPF discharge of 14,000 cfs. Cross section placement locations shall be selected with respect to grade-breaks in the channel profile, channel geometric variations, and existing structures such as roads, railways, drainage features and confluences, as well as at future roadway alignments and cadastral section lines. Cross section spacing should be done in such a way as to minimize computational head loss and where natural channel bed grade breaks evidently occur in thalweg profile plots. Cross section stationing will be from left to right looking downstream with the hydraulic baseline at station 10,000. Identification of cross section will be in river miles, increasing upstream. The cross sections may need to be reoriented or altered after running the HEC-RAS model to ensure that they are perpendicular to the center of mass of flow per FEMA criteria. Cross sections developed by the HEC-RAS interpolation feature are not to be used. The CONSULTANT must coordinate and then document the methodology for generating the cross section geometric data. Acceptable methods might include collecting the data directly off paper copies of the DISTRICT's contour mapping, use of a computer program to develop the data from digital information, or from field surveys.

6.4.2 The HEC-RAS output in the TDN, in addition to summary tables and a full output report, shall include fully labeled profile and cross section plots.

6.4.3 Check-RAS reports and RAS-PLOT profiles of the 100-year event will be created for inclusion into the TDN. Digital export file (dxf) format of the profiles will also be provided.

6.5 Bridges and culverts must be modeled according to HEC-RAS modeling requirements for the selected routine. Where multiple bridges occur, each bridge will be modeled separately. The HEC-RAS modeling results for bridges, culverts, and other hydraulic structures must be checked by

using independent methods approved by the DISTRICT to analyze these structures. The hydraulic effects of bridges and culverts shall be incorporated into assessing the floodplain around such structures, especially in areas where ponding will occur. Minor conveyance structures such as small culverts (i.e. less than 30" in diameter), or, structures considered likely to become clogged during the 100-year peak discharge, shall not be included in the hydraulic analyses.

6.6 It is possible that during the course of the hydraulic modeling, it will be discovered that the 100-year event flows break out of one or more of the reaches being studied. If the modeling suggests that any flow breakouts occur, the CONSULTANT will promptly contact the DISTRICT to coordinate an appropriate course of action, which may include modification of the SOW, schedule, and fee for the project.

6.7 Flood Zones will be determined according to FEMA criteria and will be clearly labeled on the final drawings. The drawing cover sheets shall show the study title and DISTRICT contract number, and should show both location and vicinity maps and a sheet index in a cadastral section background. A list of survey control monuments (or ERM's) with elevations and coordinates shall be shown along with topographic mapping contour interval, vertical and horizontal datum's, coordinates, and the conversion factor between NAVD88 and NGVD29 vertical datum's. A field survey certification note (if necessary) will be provided and will include the signature and seal of the RLS responsible for all ground survey. The names of the companies and dates for both the topographic flights and the aerial photography flights shall be listed.

6.8 The main project Description box of the HEC-RAS models should include the following:

a. Project Name, FCD Contract Number, work assignment number, and project control number
b. CONSULTANT Name, phone number, address, website address, and company Job Number
c. Study Purpose
d. File Name and latest run date/final date if completed
e. Vertical Datum of the model, base map date, and base map contractor information
f. Any notable features that are considered unique or unusual to the hydraulic modeling
g. HEC-RAS program version
h. Source of Hydrology and discharges used
i. Wash names including River and Reach Names used in the HEC-RAS modeling
j. Subsequent update information, if any

In addition, minor descriptions should be added to the model for hydraulic cross sections located above or below drainage structures, at section lines, at highways and railway crossings, at canals, and at confluences. Model descriptions should be added to culverts and lateral structures, and at any other features considered pertinent to the modeling.

6.9 The CONSULTANT will provide work maps using the DISTRICT's most recent contour mapping. The work map drawings will be 24" X 36" in size. The work map scale will be 1" = 200'. The cover sheet of the work map drawings shall be prepared in a manner to be approved by the DISTRICT. Each study sheet work map drawings shall include the project title, contract number, source of topographic mapping, and a location map showing the geographic range covered by each specific mapping sheet. Each study sheet will include watercourse names and existing floodplain boundaries, proposed floodplain boundaries, a north arrow, map scale section lines and section

corners, current streets and highway names, subdivision boundary names, Horizontal and Vertical Datum references (State Plane Coordinate System, NAD 83, and NAVD 88) any of MCDOT's GDACS monuments and NGVD monuments located within individual sheet boundaries, major drainage features, corporate boundaries, hydraulic cross section lines, sheet index map, peak discharges, and relative Township and Range labels. A conversion factor from NAVD 88 to NGVD 29 should also be shown. Only the delineation for the 100-yr event will be included in the TDN for submittal to FEMA.

A separate set of work maps showing the SPF (Q=14,000 cfs) floodplain will be prepared.

6.10 Technical Data Notebook (TDN)

6.10.1 The findings of the floodplain delineation study will be presented in Section 5 of the TDN and will be prepared in accordance with ADWR State Standards Attachment 1-97 (SS1-97) or most recent version. The report will be organized as specified by the DISTRICT standards, following SS1-97 format.

6.10.2 The hydraulic analysis/HEC-RAS output in the TDN, in addition to summary tables and full output report, should include fully labeled cross section plots. Section plots should be grouped per study reach, and reach groups should be separated and then indexed within the main report to expedite data recovery.

6.11 The CONSULTANT shall review the output of the HEC-RAS computer model to ensure the flow depths and velocities are reasonable and realistic with respect to those expected in this watershed. This will include a comparison of flow velocities in the hydraulic analysis with those related to hydrologic routing. Adjustments to the model input should be completed as necessary to obtain the most realistic results. The CONSULTANT shall provide proper QA/QC of the models and TDN before delivering to the DISTRICT.

6.12 The CONSULTANT shall fill out all the forms required by FEMA (MT-2 forms) for the submittal of a Floodplain Delineation Study as a Letter of Map Revision (LOMR) request.

TASK 7 – DIGITAL DATA

Digital data shall be delivered in conformance with the DISTRICT's Hydrologic Information System Data Delivery Specifications, Revision 3.1, or Shape File Data Delivery Specifications V1.2., date May 1st, 2007 and will be prepared in conformance with the above standards. The following themes are generally used for the data developed for Floodplain Delineation Studies. However, for this study there may not be data for every theme identified here, or the CONSULTANT might develop data for themes not listed here. Therefore, only those themes for which there are data need to be completed. If the CONSULTANT has data that does not fit one of the themes listed here, the DISTRICT's Project Manager shall be contacted to determine the appropriate theme for that data.

a. PRJ (Project Boundaries)
b. DQ (Data Quality)
c. FPSRFFCD (Floodplain FCD Water Surface Elevation)
d. FPXFCD (Floodplain FCD Cross Section)
e. FPZNFCD (Floodplain FCD Zone)

f. FPBLN (Floodplain Baseline Route System)

g. PRJDAT (Project Identification)

The DISTRICT will provide the CONSULTANT with the project ID (prj-rid), necessary to complete the Digital Data delivery pending floodplain files prior to the finalization of remaining Data files.

TASK 8 – DELIVERABLES

8.1 The CONSULTANT will provide both paper and electronic deliverables at the completion of each task unless otherwise approved in advance by the DISTRICT.

8.2 Prior to FEMA Submittal: The CONSULTANT will deliver the following items to the DISTRICT.

8.2.1 Two (2) copies of the Draft TDN including draft work maps according to ADWR State Standards Attachment 1-97 (SS 1-97) or most recent version. The report shall be organized as specified by the DISTRICT standards, following SS 1-97 format. All products will be labeled "Draft" or "Preliminary" prior to approval from FEMA.

8.2.2 Preliminary Digital Data Delivery including all digital files listed under Task 7 applicable to the final deliverable.

8.3 FEMA Submittal: The CONSULTANT will submit the following items to the DISTRICT for review by FEMA and any other appropriate governmental agency. All of the following products are considered deliverables for the FEMA submittal:

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

8.3.2 Two (2) complete copies of the Technical Data Notebook, including completed FEMA forms, annotated Flood Insurance Rate Maps showing the proposed delineation and HEC-RAS input/output files on compact disc. The Technical Data Notebook will be prepared in accordance with ADWR State Standards Attachment 1-97 (SS 1-97) or most recent version. The notebook will be organized as specified by the DISTRICT, following SS 1-97 format.

8.4 Final Submittal: The following products are considered deliverables for the final submittal to the DISTRICT after FEMA approval is issued.

8.4.1 One (1) complete set of Mylars and two (2) complete sets of sealed blackline paper flood study work topographic map sets with the aerial photo background and the floodplain delineations shown or sealed PDF copies. All drawings will be signed and sealed by persons of appropriate professional registration(s). Each registrant will provide a specific statement as to what service they performed.

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

8.4.3 Two (2) complete copies of the Technical Data Notebook including HEC-RAS input/output files on compact disc (based upon the level of changes during the FEMA review process, this may require only change-outs of modified pages and/or disks). The Technical Data Notebook will be prepared in

accordance with ADWR State Standards Attachment 1-97 (SS 1-97) or most recent version. The notebook will be organized as specified by the DISTRICT, following SS 1-97 format. This submittal of the Technical Data Notebook shall include any correspondence and/or meeting minutes with the reviewing agencies and shall reflect any revisions required by those reviewing agencies. Revisions may include, but are not limited to, addressing FEMA's comments, modifications to the delineation maps, the HEC-RAS model, and/or the Final Report. The report shall also be prepared in PDF format.

Flood Control District
of Maricopa County

Board of Directors
Denny Barney, District 1
Steve Chucri, District 2
Andrew Kunasek, District 3
Clint L. Hickman, District 4
Mary Rose Wilcox, District 5

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2801 West Durango Street
Phoenix, Arizona 85009
Phone: 602-506-1501
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January 3, 2014

Dos Rios Homeowners Association
Alpha Community Management
P.O. Box 12169
Glendale, AZ 85318

RE: Notification of 1% (100-year) Annual Chance Water-Surface Increases or Decreases and Widening or Narrowing of the 1% Annual Chance Floodplain and Intent of Flood Control District of Maricopa County to Revise the Floodway for McMicken Dam Outlet Wash

Dear Dos Rios Homeowners Association:

The Flood Control District of Maricopa County (District) has recently completed a study to re-analyze floodplain delineations in the McMicken Dam Outlet Wash near your property and has determined that the floodplain needs to be revised. The District regularly conducts studies to identify or re-analyze floodplains throughout the county.

The District has submitted the results of the study to Federal Emergency Management Agency (FEMA) so they can update the floodplain and flood zones on the Flood Insurance Rate Maps (FIRM). A 100-year flood has a 1% chance of occurring or being exceeded in any given year. The FIRM is used to determine flood insurance rates and to help the community with floodplain management.

The Letter of Map Revision will result in:

Increases and decreases in the 1% annual chance water-surface elevations with a maximum increase of 5.7 feet at a point approximately 11,600 feet upstream of the confluence with the Agua Fria River and 60 feet upstream of El Mirage Road (northern culvert) and a maximum decrease in the 1% annual chance water-surface elevation of 0.6 feet at a point approximately

3,925 feet upstream of the confluence with the Agua Fria River and 70 feet downstream of El Mirage Road (southern culvert).

Widening and narrowing of the 1% annual chance floodplain with the maximum widening of approximately 1,300 feet located north of the Sundero subdivision in the Cross River Homeowner Association channel west of Pinnacle Peak Road at a point 16,975 feet upstream of the confluence with the Agua Fria River and the maximum narrowing of approximately 350 feet at a point approximately 3,700 feet upstream of the confluence with the Agua Fria River.

This letter hereby gives notice of the District's intent to revise the floodway for the McMicken Dam Outlet Wash from its confluence with the Agua Fria River to the lower portion of the McMicken Dam Outlet Channel, approximately 1.46 miles upstream of Loop 303.

As a result of the floodway revision, the floodway shall widen with a maximum of approximately 325 feet at a point approximately 16,250 feet upstream of the confluence with the Agua Fria River and a maximum narrowing of approximately 350 feet at a point approximately 3,700 feet upstream of the confluence with the Agua Fria River.

If you have any questions or concerns about the proposed changes to the FIRM or its effect on your property, you may contact me at (602) 506-2201.

Sincerely,

Kenneth Rakestraw

Kenneth Rakestraw
Hydrologist

MR. JOHN HAUSKINS
MCDOT
2901 W DURANGO ST
PHOENIX AZ 85009

KEN AKOH ARREY
ADOT
205 S. 17TH AVE, MD 634E
PHOENIX AZ 85007

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ASLD
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PHOENIX AZ 85007

KEVIN BERNER
AAM, LLC
1600 W. BROADWAY RD, STE 200
TEMPE AZ 85282-1112

ALPHA COMMUNITY MANAGEMENT
RE: DOS RIOS HOA
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or PC
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ADOT
205 S 17TH AVE MD 634E
PHOENIX AZ 85007

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ALPHA COMMUNITY MANAGEMENT
RE DOS RIOS HOA
PO BOX 12169
GLENDALE AZ 85318

PS Form 3800, August 2006 See Reverse for Instructions

MR. JOHN HAUSKINS
MCDOT
2[redacted]W DURANGO ST
PHOENIX AZ 85009

KEN AKOH ARREY
ADOT
205 S. 17TH AVE, MD 634E
PHOENIX AZ 85007

TRICIA BROWN
MCDOT
2901 W DURANGO
PHOENIX AZ 85009

MARK EDELMAN, AICP
ASLD
1616 W ADAMS ST
PHOENIX AZ 85007

KEVIN BERNER
AAM, LLC
1600 W. BROADWAY RD, STE 200
TEMPE AZ 85282-1112

ALPHA COMMUNITY MANAGEMENT
RE: DOS RIOS HOA
P.O. BOX 12169
GLENDALE AZ85318

Flood Control District
of Maricopa County

Board of Directors
Denny Barney, District 1
Steve Chucri, District 2
Andrew Kunasek, District 3
Clint L. Hickman, District 4
Mary Rose Wilcox, District 5

www.fcd.maricopa.gov

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

September 9, 2013

Mr. John Hauskins
MCDOT
2901 W Durango St
Phoenix, AZ 85009

Re: Notification of 1% (100-year) annual chance water-surface elevation increases or decreases {and widening or narrowing of the 1% annual chance floodplain}

Dear Mr. Hauskins:

The Flood Control District of Maricopa County (District) has recently completed a study to re-analyze floodplain delineations in the McMicken Dam Outlet Wash near your property and has determined that the floodplain needs to be revised. The District regularly conducts studies to identify or re-analyze floodplains throughout the county.

The District has submitted the results of the study to Federal Emergency Management Agency (FEMA) so they can update the floodplain and flood zones on the Flood Insurance Rate Maps (FIRM). The FIRM for a community depicts land which has been determined to be subject to a 100-year flood. A 100-year flood has a 1% chance of occurring or being exceeded in any given year. The FIRM is used to determine flood insurance rates and to help the community with floodplain management. To help you better understand your Zone designation, enclosed you will find a Zone AE fact sheet and a map of the area in which your property is located.

This letter is to inform you that the revision of the 100-year water-surface elevation and floodplain impacts your property.

The updated analysis results in changes in floodplain widths (both increases and decreases) and changes in Base Flood Elevations associated with the watercourses that were studied.

The watercourses impacted by this study are:

McMicken Dam Outlet Wash from near Terminus of McMicken Dam Outlet Channel to Agua Fria River, Zone AE

The District anticipates that FEMA will adopt the study within the next eight months. In the interim period, the District and other jurisdictions will use the data as the "best available information" for area floodplain management.

If you have any questions or concerns about the proposed changes to the FIRM or its effect on your property, you may contact me at 602-506-2201

Sincerely,

Kenneth Rakestraw

Kenneth Rakestraw

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KEN AKOH ARREY
ADOT
205 S 17TH AVE MD634E
PHOENIX AZ 85007

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MR JOHN HAUSKINS
MCDOT
2901 W DURANGO STREET
PHOENIX AZ 85009

7010 1670 0000 1106 1539

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ALPHA COMMUNITY MANAGEMENT
RE:DOS RIOS HOA
PO BOX 12169
GLENDALE AZ 85318

7010 1670 0000 1106 1492

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MARK EDELMAN AICP
ASLD
1616 W ADAMS
PHOENIX AZ 85007

7010 1670 0000 1106 1508

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Sent To
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or PO Box
City, State,

TRICIA BROWN
MCDOT
2901 W DURANGO STREET
PHOENIX AZ 85009

7010 1670 0000 1106 1515

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Restricted Delivery Fee (Endorsement Required)
Postmark Here

Tc

Sen
Stre
or P
City,

KEVIN BERNER
AAM LLC
1600 W BROADWAY RD STE 200
TEMPE AZ 85282-1112

7010 1670 0000 1106 1485

PS Form 3800, August 2006 See Reverse for Instructions

B.4 FEMA Correspondence

NATIONAL FLOOD INSURANCE PROGRAM

FEMA PRODUCTION AND TECHNICAL SERVICES CONTRACTOR

August 19, 2013

Mr. Kenneth Rakestraw
Hydrologist
Flood Control District of Maricopa County
2801 West Durango Street
Phoenix, AZ 85009

IN REPLY REFER TO:
Case No.: 13-09-2729P
Community: Maricopa County, AZ
Community No.: 040037

316-AD

Dear Mr. Rakestraw:

This responds to your request dated June 27, 2013 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:	Mcmicken Dam Outlet Wash Floodplain Delineation Study
Flooding Source:	Mcmicken Dam Outlet Wash
FIRM Panels Affected:	04013C0155G and 04013C0165G

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

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

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

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, Salman Babar, by e-mail at salman.babar@stantec.com or by telephone at (301) 513-8890, or the Revisions Coordinator for your request, Ms. Sonal Kulkarni., at Sonal.kulkarni@starr-team.com or at (240) 542-3102.

Sincerely,

Alex Haptemariam, P.E., CFM
MT-2 Process Manager
STARR

cc: Mr. Nathan Ford, P.E.
RBF Consulting, a Baker Company
2929 North Central Ave, Suite 800
Phoenix, AZ 85012
Email: nford@rbf.com

Mr. Brian Cosson, CFM
State NFIP Coordinator
Arizona Dept. of Water Resources
Phoenix, AZ 85012-2105
Email: btcosson@azwater.gov

Mr. Timothy S. Philips, P.E.
2801 West Durango Street
Phoenix, AZ 85009
Email: tsp@mail.maricopa.gov

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.: 13-09-2729P Requester: Mr. Kenneth Rakestraw

Community: Maricopa County, AZ Community No: 040037

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

1. The submitted application did not include a duplicate effective hydraulic model. The effective model used to produce the Flood Insurance Rate Map (FIRM) must be obtained, reproduced on your equipment, and submitted as the duplicate effective model. As stated in the instructions for Application/Certification Form 2, Section B, Hydraulics, if the effective model is not available, a model must be developed that matches within 0.5 foot the base (1-percent-annual-chance) flood profile published in the Flood Insurance Study (FIS) report. This model should then be submitted as the duplicate effective model. Please submit a duplicate effective hydraulic model for Mcmicken Dam Outlet Wash. Please provide digital copies of the input and output files for this model.

2. The submitted application did not include a corrected effective hydraulic model. The corrected effective model corrects any errors that occur in the duplicate effective model, adds any additional cross sections, and/or incorporates more topographic information than that used in the effective model. It must not reflect any manmade physical changes since the date of the effective model. If additional cross sections/more detailed topography is available, these sections should be added to the corrected effective model. The updated topography should reflect the physical conditions of the area at the time of the effective modeling. Please submit a corrected effective hydraulic model for Mcmicken Dam Outlet Wash. Please provide digital copies of the input and output files for this model.

3. The submitted application did not include an existing/pre-project conditions hydraulic model. The existing/pre-project conditions model should reflect any modifications that have occurred within the floodplain since the date of the effective model but prior to construction of the project for which the revision is being requested. If no modification has occurred since the date of the effective model, then this model would be identical to the corrected effective model or duplicate effective model. Please submit an existing/pre-project conditions hydraulic model for Mcmicken Dam Outlet Wash. Please provide digital copies of the input and output files for this model.

4. Our review revealed surcharges greater than 1.0 foot between the natural (unencroached) and encroached profiles of the revised conditions HEC-RAS hydraulic model. Please revise the floodway analysis to produce maximum surcharges of no more than 1.00 foot throughout the revised reach of Mcmicken Dam Outlet Wash.

5. Please ensure that the floodway top width at each cross section on the workmap agrees with the top width calculated in the hydraulic model at the corresponding cross section. Please provide paper and digital copies of the topographic workmap.

6. The normal depth of 0.0025 is being used as boundary condition whereas the profile is showing the average energy slope of 0.008. Additionally, William Drive culvert inverts do not match the as built plans. Please revise the hydraulic model and submit digital copies.

7. Cross section 4.199 shown in workmap entitled "Mcmicken Dam Outlet Wash" prepared by RBF Consulting dated June 24, 2013; does not match the cross section shown in GIS shape file. Please correct the cross section and submit a digital copy.

8. The HEC-RAS hydraulic computer model submitted show velocities as high as 12 feet per second. Because of the high erosive velocities and the lack of submitted documentation to show that the riprap along the El-Mirage Road (As-built sheet D65A) is adequate to withstand these erosive velocities, erosion and sediment transport calculations must be submitted to show the effects that erosion and sediment will have on the 1-percent-annual-chance Flood Elevations.

9. Please submit documentation of the individual legal notices that were sent to property owners who are affected by any increases in width and/or shifting of the floodplain of the flood having a 1-percent chance of being equaled or exceeded in any given year (base flood) and/or increase in Base Flood Elevations. Legal notice may take the form of certified mailing receipts or certification that all property owners have been notified, with an accompanying mailing list and a copy of letter sent. Examples of individual notices can be found on pages 12 through 17 of the instructions for the MT-2 application/certification forms, which may be accessed at http://www.fema.gov/library/viewRecord.do?id=1493.

10. Please submit a copy of the public notice distributed by City of Troy, MI stating their intent to revise the regulatory floodway, or provide a statement that city officials have notified all affected property owners, in compliance with Paragraph 65.7 (b)(1) of the National Flood Insurance Program regulations. These notices must include the extent of revision, the changes to the regulatory floodway, and contact information for any interested parties. An example of public notice can be found in Figure 3 of the MT-2 instructions, which may be accessed at http://www.fema.gov/library/viewRecord.do?id=1493.

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

Flood Control District
of Maricopa County

Board of Directors
Denny Barney, District 1
Steve Chucri, District 2
Andrew Kunasek, District 3
Clint L. Hickman, District 4
Mary Rose Wilcox, District 5

www.fcd.maricopa.gov

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

September 4, 2013

LOMC Clearinghouse
Attention: Salman Babar
847 South Pickett Street
Alexandria, VA 22304-4605

Re. Case Number 13-09-2729P, McMicken Dam Outlet Wash Floodplain Redelineation Study

Dear Mr. Babar:

In response to the request for additional data by letter of August 19, 2013 and following our phone conversation of April 22, 2013 including the District's consultant, Nathan Ford, RBF, Inc., please see below our responses shown in italics below each item.

1. The submitted application did not include a duplicate effective hydraulic model. The effective model used to produce the Flood Insurance Rate Map (FIRM) must be obtained, reproduced on your equipment, and submitted as the duplicate effective model. As stated in the instructions for Application/Certification Form 2, Section B, Hydraulics, if the effective model is not available, a model must be developed that matches within 0.5 foot the base (1-percent-annual-chance) flood profile published in the Flood Insurance Study (FIS) report. This model should then be submitted as the duplicate effective model. Please submit a duplicate effective hydraulic model for Mcmicken Dam Outlet Wash. Please provide digital copies of the input and output files for this model.

   Response: *This study is a complete restudy of the entire length of McMicken Dam Outlet Wash and provides an updated continuous FIS model for the whole reach. The impetus of the study was to account for new hydrology, new topographic data, and improvements already constructed that are not reflected in the effective model. The existing conditions model submitted represents the current conditions as encountered in the field. This model is more accurate than producing a duplicate effective hydraulic model and updating it to generate the corrected effective model because everything is different from the effective model including the model software, hydrology, vertical datum, topographic data, and additional modifications. For example, the effective model was generated in HEC-2 using 2-foot contour data on NGVD 1929 datum. The restudy model was generated in HEC-RAS using 1-foot contour data on NAVD 1988 datum with updated hydrology.*

2. The submitted application did not include a corrected effective hydraulic model. The corrected effective model corrects any errors that occur in the duplicate effective model, adds any additional cross sections, and/or incorporates more topographic information than that used in

the effective model. It must not reflect any manmade physical changes since the date of the effective model. If additional cross sections/more detailed topography is available, these sections should be added to the corrected effective model. The updated topography should reflect the physical conditions of the area at the time of the effective modeling. Please submit a corrected effective hydraulic model for Mcmicken Dam Outlet Wash. Please provide digital copies of the input and output files for this model.

Response: *Refer to the response to Comment 1.*

3. The submitted application did not include an existing/pre-project conditions hydraulic model. The existing/pre-project conditions model should reflect any modifications that have occurred within the floodplain since the date of the effective model but prior to construction of the project for which the revision is being requested. If no modification has occurred since the date of the effective model, then this model would be identical to the corrected effective model or duplicate effective model. Please submit an existing/pre-project conditions hydraulic model for Mcmicken Dam Outlet Wash. Please provide digital copies of the input and output files for this model.

Response: *There is no project associated with this study since it is a redelineation study. However, since the effective model date four culverts have been constructed which are included in the existing condition/restudy model. Per our phone conversation on August 22, 2013, it was stated that this model is necessary to make a comparison to see the impact of the culverts for possible violations. We understand this is necessary for CLOMRs but the culverts are already in place and any impact is isolated to property owned by the Flood Control District of Maricopa County, Maricopa County Department of Transportation, and Arizona Department of Transportation.*

4. Our review revealed surcharges greater than 1.0 foot between the natural (unencroached) and encroached profiles of the revised conditions HEC-RAS hydraulic model. Please revise the floodway analysis to produce maximum surcharges of no more than 1.00 foot throughout the revised reach of Mcmicken Dam Outlet Wash.

Response: *There are no surcharges greater than 1.0 foot. Please refer to the attached PDF which shows the surcharge elevations for each cross section. Per our phone conversation on August 22, 2013, the Encroachment Table 3 was used to verify the change in water surface elevation. This table uses the first profile as the base water surface elevation. So the results reported in this table are compared to the 10-year water surface elevation instead of the 100-year floodplain (profile 3) versus the 100- year floodway (profile 4).*

5. Please ensure that the floodway top width at each cross section on the workmap agrees with the top width calculated in the hydraulic model at the corresponding cross section. Please provide paper and digital copies of the topographic workmap.

Response: *All floodway top widths agree with the calculated top widths in the hydraulic model. Topographic workmaps were provided in 11 x 17 and 24 x 36 format as well as pdfs*

on the CD previously. Per our phone conversation, the floodplain top widths were also mentioned. Many of the cross sections have divided flow or areas where there are small, localized high spots included within the floodplain delineation Please note that the top width from the HEC-RAS output table may not be accurate for these cross sections and the difference between the Station Water Surface Right and Station Water Surface Left will match the workmap top widths.

6. The normal depth of 0.0025 is being used as boundary condition whereas the profile is showing the average energy slope of 0.008. Additionally, William Drive culvert inverts do not match the as built plans. Please revise the hydraulic model and submit digital copies.

Response: *The normal depth of 0.0025 is the slope of the channel downstream of Cross Section 0.324 to the confluence of the Agua Fria River. The profile average energy slope of 0.008 was computed between Cross Section 0.324 and 0.414.*

The Williams Drive culvert as-built plans are on NGVD 1929 and the model is on NAVD 1988. Refer to Section 3.2 for additional discussion of the datums.

7. Cross section 4.199 shown in workmap entitled "Mcmicken Dam Outlet Wash" prepared by RBF Consulting dated June 24, 2013; does not match the cross section shown in GIS shape file. Please correct the cross section and submit a digital copy.

Response: *Per our phone conversation on August 22, 2013, there are two Cross Sections 4.199 included in the GIS shapefile. Cross Section 4.199 was extended for the Standard Project Flood Analysis requested for local information only. Please disregard or delete the longer cross section as it is not associated with the FEMA submittal.*

8. The HEC-RAS hydraulic computer model submitted show velocities as high as 12 feet per second. Because of the high erosive velocities and the lack of submitted documentation to show that the riprap along the El-Mirage Road (As-built sheet D65A) is adequate to withstand these erosive velocities, erosion and sediment transport calculations must be submitted to show the effects that erosion and sediment will have on the 1-percent-annual-chance Flood Elevations.

Response: *For the culvert scour analysis, please refer to Section 5.0 of the El Mirage Road – Phase B Bell Road to Deer Valley Drive Final Drainage Report for Beardsley Road to Deer Valley Drive Maricopa County, Arizona MCDOT Project No. (TT103/TT104) July 2009. The entire report is provided on a CD (enclosed).*

9. Please submit documentation of the individual legal notices that were sent to property owners who are affected by any increases in width and/or shifting of the floodplain of the flood having a 1-percent chance of being equaled or exceeded in any given year (base flood) and/or increase in Base Flood Elevations. Legal notice may take the form of certified mailing

receipts or certification that all property owners have been notified, with an accompanying mailing list and a copy of letter sent. Examples of individual notices can be found on pages 12 through 17 of the instructions for the MT-2 application/certification forms, which may be accessed at http://www.fema.gov/library/viewRecord.do?id=1493.

Response: *The Flood Control District of Maricopa County owns the majority of the property affected by any changes to the floodplain. Documentation will be provided to the affected property owners.*

10. Please submit a copy of the public notice distributed by City of Troy, MI stating their intent to revise the regulatory floodway, or provide a statement that city officials have notified all affected property owners, in compliance with Paragraph 65.7 (b)(1) of the National Flood Insurance Program regulations. These notices must include the extent of revision, the changes to the regulatory floodway, and contact information for any interested parties. An example of public notice can be found in Figure 3 of the MT-2 instructions, which may be accessed at http://www.fema.gov/library/viewRecord.do?id=1493.

Response: *The Flood Control District of Maricopa County owns the majority of the property affected by any changes to the floodway. Documentation will be provided to the affected property owners.*

We appreciate your review of the additional data provided and look forward to advancing toward acceptance of the McMicken Dam Outlet Wash Redelineation Study.

Sincerely,

Kenneth Rakestraw

Kenneth Rakestraw
Project Manager
Flood Control District of Maricopa County

Enclosures: As stated

cc: Nathan Ford (without enclosures)
Project Manager
RBF Consulting
2929 N. Central Avenue, Suite 800
Phoenix, AZ 85012

NATIONAL FLOOD INSURANCE PROGRAM

FEMA PRODUCTION AND TECHNICAL SERVICES CONTRACTOR

November 22, 2013

Mr. Kenneth Rakestraw
Hydrologist
Flood Control District of Maricopa County
2801 West Durango Street
Phoenix, AZ 85009

IN REPLY REFER TO:
Case No.: 13-09-2729P
Community: Maricopa County, AZ
Community No.: 040037

316-AD

Dear Mr. Rakestraw:

This responds to your request dated June 27, 2013 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:	Mcmicken Dam Outlet Wash Floodplain Delineation Study
Flooding Source:	Mcmicken Dam Outlet Wash
FIRM Panels Affected:	04013C0155G and 04013C0165G

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

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

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

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, Salman Babar, by e-mail at salman.babar@stantec.com or by telephone at (301) 513-8890, or the Revisions Coordinator for your request, Ms. Sonal Kulkarni., at Sonal.kulkarni@starr-team.com or at (240) 542-3102.

Sincerely,

Alex Haptemariam, P.E., CFM
MT-2 Process Manager
STARR

cc: Mr. Nathan Ford, P.E.
RBF Consulting, a Baker Company
2929 North Central Ave, Suite 800
Phoenix, AZ 85012
Email: nford@rbf.com

Mr. Brian Cosson, CFM
State NFIP Coordinator
Arizona Dept. of Water Resources
Phoenix, AZ 85012-2105
Email: btcosson@azwater.gov

Mr. Timothy S. Philips, P.E.
2801 West Durango Street
Phoenix, AZ 85009
Email: tsp@mail.maricopa.gov

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.: 13-09-2729P Requester: Mr. Kenneth Rakestraw

Community: Maricopa County, AZ Community No: 040037

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

1. Please submit documentation of the individual legal notices that were sent to property owners who are affected by any increases in width and/or shifting of the floodplain of the flood having a 1-percent chance of being equaled or exceeded in any given year (base flood) and/or increase in Base Flood Elevations (BFEs). These BFE increases occur when the existing condition BFEs are compared with the corrected effective BFEs. Legal notice may take the form of certified mailing receipts or certification that all property owners have been notified, with an accompanying mailing list and a copy of letter sent. Examples of individual notices can be found on pages 12 through 17 of the instructions for the MT-2 application/certification forms, which may be accessed at http://www.fema.gov/library/viewRecord.do?id=1493.

2. Please submit a copy of the public notice distributed by Marion County, AZ stating their intent to revise the regulatory floodway, or provide a statement that city officials have notified all affected property owners, in compliance with Paragraph 65.7 (b)(1) of the National Flood Insurance Program regulations. These notices must include the extent of revision, the changes to the regulatory floodway, and contact information for any interested parties. An example of public notice can be found in Figure 3 of the MT-2 instructions, which may be accessed at http://www.fema.gov/library/viewRecord.do?id=1493.

3. Please provide certification that no structures are impacted by the increases in BFEs.

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

Flood Control District
of Maricopa County

Board of Directors
Denny Barney, District 1
Steve Chucri, District 2
Andrew Kunasek, District 3
Clint L. Hickman, District 4
Mary Rose Wilcox, District 5

www.fcd.maricopa.gov

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

December 17, 2013

LOMC Clearinghouse
Attention: Salman Babar
847 South Pickett Street
Alexandria, VA 22304-4605

Re. Case Number 13-09-2729P, McMicken Dam Outlet Wash LOMR

Dear Mr. Babar:

In response to Item 3 in the Request for Additional Data transmitted by letter of November 22, 2013 the following is provided:

No structures (habitations/dwellings/buildings) are impacted by the increases in BFE's resulting from this re-delineation study.

Sincerely,

Amir Motamedi, P.E.

Manager, Hydrology and Hydraulics Branch

Appendix C Survey Field Notes

SURVEY REPORT

MCMICKEN OUTFALL CHANNEL AERIAL MAPPING

FLOOD CONTROL DISTRICT CONTRACT 2011C033
ASSIGNMENT NUMBER 1
WOOLPERT PROJECT 72786

Background

This project involves the production of a Digital Terrain Model (DTM), planimetric mapping and ground surface contour mapping of about 4.5 square miles in Surprise, Arizona, as outlined in red on the attached Exhibit A. The DTM and mapping are compiled from aerial imagery and meet American Society of Photogrammetry and Remote Sensing (ASPRS) standards for mapping at a one-foot contour interval. A field survey was performed to establish and position the ground control required to develop the photogrammetric products. The survey was made under the direct supervision of Gary C. Bilow, RLS.

Datum

The survey is based on the North American Datum of 1983, 2011 adjustment (NAD83(2011)), epoch 2010.0 as defined by Continuously Operating Reference Station (CORS) AZPA in Peoria, AZ, CORS AZWA in Wickenburg, AZ and National Spatial Reference System (NSRS) A-order station Q 366.

The vertical datum is North American Vertical Datum of 1988 (NAVD88) established by ties to NSRS bench mark Q 366 and NSRS Height Modernization station 4GA2 which is also a City of Surprise/Maricopa County bench mark. The current geoid model, GEOID12A was used in the data processing.

Coordinate System

Woolpert created a coordinate system specific to the McMicken Dam and Outfall area. The system is designed to minimize the grid and elevation scale factors that must be applied when converting geographic coordinates (latitude and longitude) on an ellipsoidal earth to Cartesian coordinates (Northing and Easting) required by MircoStation and other computer assisted drafting and design software. The goal is to create a grid system where distances measured between points on the ground are the same as distances measured those same points on the grid, within the tolerances associated with the measuring instruments and techniques.

The McMicken Ground Coordinate System was produced by determining the Arizona Central Zone State Plane Coordinates for the photo control points required for the McMicken Outfall and McMicken Dam Aerial Mapping projects. Grid and elevation scale factors are multiplied to produce a combined scale factor for each point. The median values of the combined scale factors was determined and rounded to six places after the decimal. This value is 0.999869. Arizona Central Zone coordinates are multiplied by the reciprocal of the rounded, median,

combined scale factor to produce McMicken Ground Coordinates.

AZ Central Zone Coordinate x 1.000131 = McMicken Ground Coordinate
McMicken Ground Coordinate x 0.999869 = AZ Central Zone Coordinate

Aerial Photo Targets

Sixty-four target locations were selected by Woolpert photogrammetrists. Photo-identifiable (PID) features were available for seventeen targets. Field surveyors created targets consisting of painted or plastic chevrons with legs one foot wide by four feet long at forty seven locations. Each target was surveyed immediately after it was constructed. Targeting was completed on October 4, 2012 and the aerial photography acquired on October 8, 2012.

Methods

Target positions and elevations were determined using Global Positioning System (GPS) techniques. GPS receivers from Trimble Navigation Limited were used. GPS data were processed and adjusted using Trimble Business Center software.

Initial observations were obtained to verify the control monuments in and around the project area. The project is partially in the West Valley Land Subsidence Feature and NSRS bench mark elevations were determined over 40 years ago. CORS AZPA and AZWA were used with bedrock bench mark Q 366 occupied for four hours. Thirty-minute static GPS sessions were observed at NSRS bench marks Y 23 and N366 and height modernization station 4GA2.

The position and ellipsoid height of Q 366 was held fixed in a minimally constrained least squares adjustment and produced the following comparison with published NAD83(2011) values (in units of International Feet):

Point	PID	Δ North	Δ East	Δ Ell Hgt
Q 366	DV0080	0	0	0
AZPA	DN2121	0.004	0.008	-0.046
AZWA	DL6308	0.005	-0.031	-0.061
4GA2	AJ3856	0.007	0.007	-0.006
N 366	DV0086	n/a	n/a	n/a
Y 23	DV0259	-0.046	-0.149	n/a

Published - surveyed

These results show good agreement between published values and the current positions of the survey marks, with the exception of Y23 which is published as NAD83(1992).

The position and elevation of Q 366 was then held fixed in a minimally constrained adjustment using Geoid12A as the source for geoid heights. Note that use of the current geoid model may introduce some uncertainty when comparing our results with published elevations of stations with orthometric heights determined using earlier models. An exact comparison would require re-processing of historic project measurements used to derive the published data. Our survey produced the following comparison with published elevations:

Point	PID	Δ Elevation
Q 366	DV0080	0
AZPA	DN2121	n/a
AZWA	DL6308	n/a
4GA2	AJ3856	-0.125
N 366	DV0086	0.129
Y 23	DV0259	0.278

Published - surveyed

These results suggest that Y 23 may have subsided. While the checks on N 366 and 4GA2 are slightly poorer than we would like to see, they are equally split above and below published elevations. The published elevation of Q 366 is accepted as accurately defining NAVD88 for this project.

Aerial photo control points were surveyed over seven days using a combination of RTK and static GPS techniques. CORS AZPA and AZWA were used as RTK base stations accessed via the AZCORS network. CORS AZTP was substituted for AZWA for five points when the connection to AZWA became unreliable. Station Q 366 was also occupied each day to provide a direct tie to NAVD88 for each target and PID. Two five-minute RTK GPS sessions were conducted, one using CORS AZPA and the second using CORS AZWA or AZTP. RTK results were compared in the field and the point re-observed if tolerance exceeded 0.25 foot. The results were saved and the setup was checked for level. Photo control points were then occupied for ten minutes in a static GPS session.

All RTK and Static vectors were combined into a least squares adjustment. Measurement data were analyzed and vectors with poor fits were removed from the adjustment. A minimum of two vectors were retained for each photo control point. Seven days of observations at Q 366 were used to establish an adjusted NAVD88 orthometric height for each CORS. These derived elevations were held fixed with the CORS positions, the position and elevation of Q 366 and the elevation of 4GA2 to produce the final adjusted coordinates of the aerial photo control points.

A network diagram is included as Exhibit B. A listing of the aerial photo control point coordinates in the McMicken Ground Coordinate System is Exhibit C.

Submitted by: Gary C. Bilow

Gary C. Bilow, RLS # 18539

Exhibit A

McMicken Outfall Channel Aerial Mapping Project
1"=240' scale flight and ground control layout.

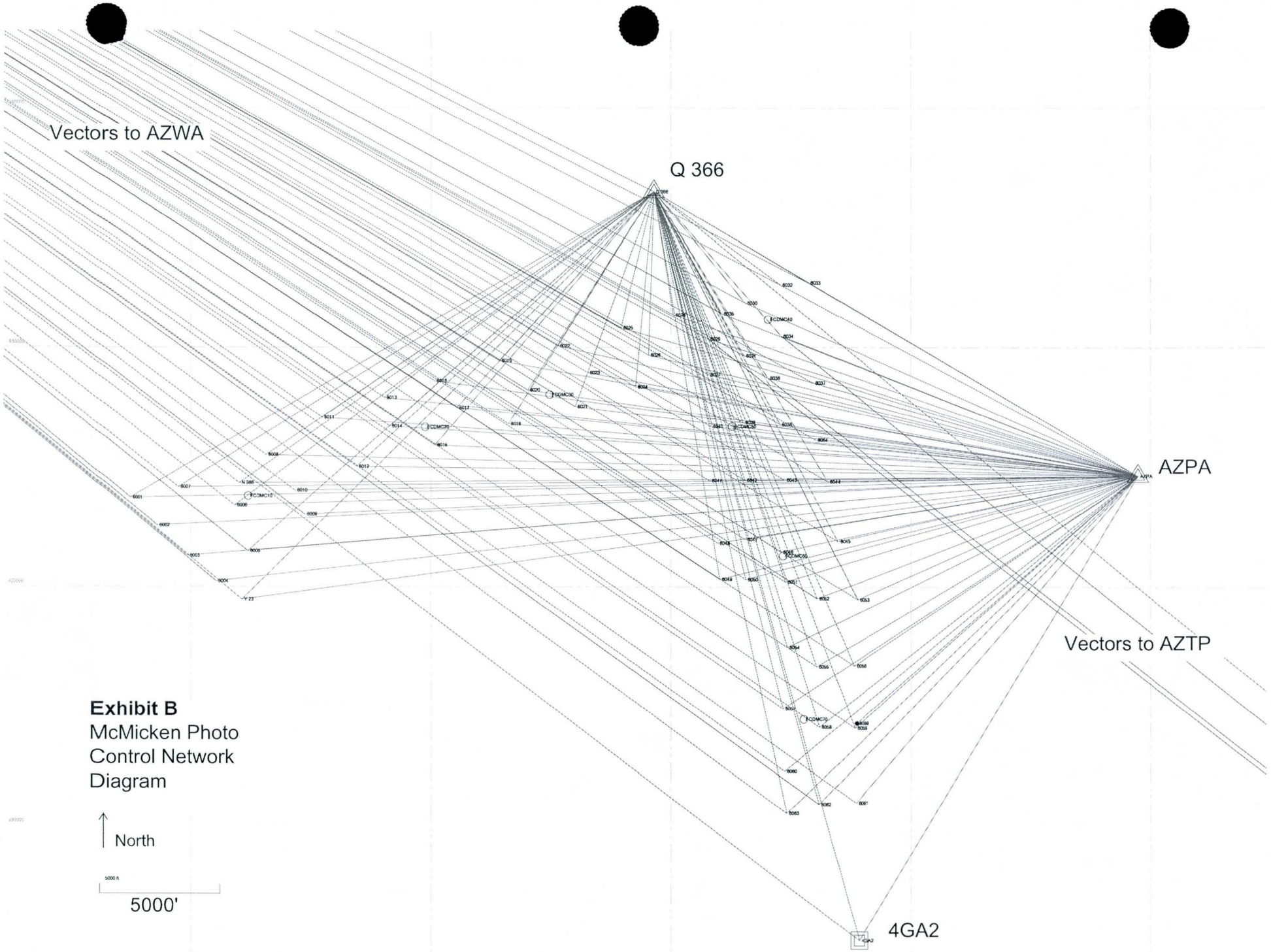

Exhibit B
McMicken Photo
Control Network
Diagram

Exhibit C

McMicken Outfall Aerial Mapping
Photo Control Point Coordinates

NAD83(2011) 2010.0 McMicken Ground Coordinates
Divide Northing and Easting by 1.000131 to convert to Arizona Central Zone State Plane Coordinates
NAVD88 Int'l Feet Geoid12A

Point ID	Northing	Easting	Elevation	Feature Code
6001	979182.31	548150.48	1354.50	PP
6002	978010.85	549269.76	1347.67	PID
6003	976740.52	550532.10	1334.94	PID
6004	975675.54	551715.47	1326.22	PP
6005	976925.32	553051.38	1332.38	PP
6006	978841.75	552510.12	1335.20	PP
6007	979612.06	550157.31	1350.35	PP
6008	980947.13	553820.79	1338.26	PP
6009	978437.62	555420.53	1321.40	PID
6010	979452.28	555013.95	1326.36	PP
6011	982498.35	556156.93	1339.68	PP
6012	980436.29	557589.57	1323.99	PP
6013	983314.70	558758.36	1332.51	PP
6014	982125.71	558976.93	1326.61	PP
6015	981326.21	560866.70	1317.14	PP
6016	984011.78	560858.79	1333.81	PP
6017	982886.60	561788.86	1325.07	PP
6018	982198.07	563934.82	1315.85	PP
6019	984844.08	563566.60	1332.47	PP
6020	983608.29	564745.35	1321.67	PP
6021	982914.27	566723.27	1312.89	PP
6022	985449.35	566010.36	1331.34	PP
6023	984325.02	567250.89	1321.62	PP
6024	983721.54	569240.18	1311.59	PP
6025	986193.74	568654.38	1329.53	PP
6026	985049.98	569793.89	1317.40	PP
6027	984220.37	572290.29	1306.19	PP
6028	986722.43	570839.29	1324.90	PP
6029	985713.65	572291.15	1313.88	PP
6030	987206.76	573834.13	1324.58	PP
6031	985001.53	573779.11	1310.35	PP
6032	987952.63	575305.74	1322.05	PP
6033	988035.08	576467.42	1326.65	PID
6034	985815.31	575338.73	1314.46	PP
6035	986770.81	572856.15	1323.91	PP
6036	984064.75	574768.67	1300.54	PP
6037	983853.79	576658.53	1304.97	PP
6038	982125.74	575258.23	1295.43	PP
6039	982217.21	573728.83	1292.12	PP
6040	982059.62	572374.83	1301.49	PP
6041	979785.87	572318.93	1285.65	PID
6042	979797.09	573784.84	1282.70	PP
6043	979795.42	575441.93	1277.63	PID
6044	979716.40	577249.83	1284.04	PID
6045	977214.52	577652.14	1271.99	PID
6046	976788.93	575287.27	1262.20	PP
6047	977311.71	573790.13	1265.98	PP
6048	977165.65	572639.36	1264.73	PID
6049	975666.17	572724.90	1261.16	PID
6050	975650.74	573807.81	1255.73	PID
6051	975541.20	575466.72	1252.07	PID
6052	974843.49	576780.84	1264.64	PP
6053	974784.99	578451.21	1219.24	PP
6054	972789.91	575523.12	1237.76	PID
6055	971971.09	576739.76	1245.58	PP
6056	972006.58	578299.42	1192.64	PP
6057	970220.54	575334.92	1227.73	PID
6058	969447.61	576846.75	1218.18	PP
6059	969398.59	578315.81	1182.56	PP
6060	967612.09	575387.92	1218.27	PID
6061	966283.48	578349.85	1173.00	PP
6062	966231.12	576810.04	1203.28	PP
6063	965866.77	575466.39	1205.95	PID
6064	981471.16	576747.32	1291.61	PID

Appendix D Hydrologic Analysis Supporting Documentation

D.1 Precipitation Data

ID	Method	Duration	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
DEFAULT	NOAA14	5 MIN	0.246	0.334	0.402	0.494	0.564	0.637
	NOAA14	10 MIN	0.375	0.509	0.612	0.751	0.859	0.970
	NOAA14	15 MIN	0.465	0.631	0.759	0.931	1.064	1.203
	NOAA14	30 MIN	0.625	0.850	1.022	1.254	1.433	1.619
	NOAA14	1 HOUR	0.774	1.052	1.264	1.552	1.774	2.004
	NOAA14	2 HOUR	0.888	1.188	1.418	1.732	1.972	2.223
	NOAA14	3 HOUR	0.930	1.227	1.462	1.783	2.040	2.313
	NOAA14	6 HOUR	1.072	1.377	1.619	1.954	2.215	2.487
	NOAA14	12 HOUR	1.202	1.523	1.777	2.118	2.378	2.649
	NOAA14	24 HOUR	1.479	1.910	2.248	2.716	3.086	3.472

D.2 Physical Parameter Calculations

(Modified basins are shown first, refer to the July 2005 WADMSU Hydrology Report prepared by Entellus or the September 2009 Loop 303/White Tanks ADMPU Area Hydrologic Analysis prepared by HDR for additional information)

Area ID	Sub Basin Parameters						Rainfall Losses						Return Period Parameters					
	Area (sq mi)	Length (mi)	Slope (ft/mi)	Adj Slope	Time-Area	Kb	IA (in)	DTHETA	PSIF (in)	XKSAT (in/hr)	RTIMP (%)		2 Yr	5 Yr	10 Yr	25 Yr	50 Yr	100 Yr
Major Basin ID: 01																		
AF802	0.862	2.12	31.2	31.2	NATURAL	0.050	0.27	0.31	4.80	0.31	5	**Tc (Hrs)**	1.500*	1.500*	1.381*	1.249*	1.157*	1.085*
												Vel (f/s)	2.07	2.07	2.25	2.49	2.69	2.87
												R (Hrs)	1.152	1.152	1.051	0.941	0.864	0.804
AF810	1.429	3.03	31.1	31.1	URBAN	0.039	0.24	0.29	4.40	0.43	21	**Tc (Hrs)**	1.500*	1.500*	1.402*	1.282*	1.203*	1.130*
												Vel (f/s)	2.96	2.96	3.17	3.47	3.69	3.93
												R (Hrs)	1.149	1.149	1.066	0.966	0.900	0.839
AF820	0.699	2.36	42.4	42.4	NATURAL	0.024	0.30	0.25	4.20	0.45	7	**Tc (Hrs)**	1.133*	1.018*	0.921*	0.835	0.777	0.725
												Vel (f/s)	3.06	3.40	3.76	4.15	4.45	4.77
												R (Hrs)	1.036	0.920	0.823	0.738	0.681	0.631

APPENDIX D.2.1: Soil Type Summary

Entellus

SHEET _____ OF _____

BY _____ DATE 4/19/2004

CLIENT: FCDMC CHECK _____ DATE _____

JOB: Wittmann Area Drainage Master Study Update JOB NO. 310.032

Areas and percentage area reported to 4 significant digits by WMS. Actual precision of the data is only 2-3 significant digits

Basin ID	Total Basin Area (sq-miles)	Soil Type (WMS)	Soil Type (DDMSW)	Soil Type Area (%)	Soil Type Area (sq-miles)	XKSAT (in/hr)	RTIMP
AF800	0.7163	645110	110	49.04%	0.3513	0.13	0
AF800	0.7163	645112	112	3.18%	0.0228	0.39	0
AF800	0.7163	64553	53	14.01%	0.1004	0.02	0
AF800	0.7163	64568	68	2.23%	0.0160	0.63	0
AF800	0.7163	64577	77	2.23%	0.0160	0.05	0
AF800	0.7163	64598	98	16.24%	0.1163	0.37	0
AF800	0.7163	651285026	EPD	7.96%	0.0570	0.12	0
AF800	0.7163	651326426	GWD	0.96%	0.0069	0.35	0
AF800	0.7163	6514462	MV	0.96%	0.0069	0.15	0
AF800	0.7163	6516229	Ve	3.18%	0.0228	0.25	0
AF802	0.3902	651285026	EPD	4.14%	0.0162	0.12	0
AF802	0.3902	651326426	GWD	18.93%	0.0739	0.35	0
AF802	0.3902	6514462	MV	33.73%	0.1316	0.15	0
AF802	0.3902	651505422	PRB	8.88%	0.0346	0.28	0
AF802	0.3902	6515058	PT	4.14%	0.0162	0.40	0
AF802	0.3902	651585624	TSC	13.02%	0.0508	0.14	0
AF802	0.3902	6516229	Ve	17.16%	0.0670	0.25	0
AF803	2.8368	6512021	Aa	0.08%	0.0023	0.26	0
AF803	2.8368	651202320	AbA	0.49%	0.0139	0.38	0
AF803	2.8368	651202322	AbB	0.08%	0.0023	0.39	0
AF803	2.8368	651202720	AdA	1.87%	0.0530	0.40	0
AF803	2.8368	651202722	AdB	1.79%	0.0508	0.40	0
AF803	2.8368	651203222	AGB	4.63%	0.1313	0.40	0
AF803	2.8368	651203424	AHC	0.24%	0.0068	0.38	0
AF803	2.8368	6512857	Es	5.76%	0.1634	0.25	0
AF803	2.8368	651323320	GgA	8.60%	0.2440	0.25	0
AF803	2.8368	6513244	GM	32.79%	0.9302	0.29	0
AF803	2.8368	651326426	GWD	1.46%	0.0414	0.35	0
AF803	2.8368	651326826	GYD	1.87%	0.0530	0.26	0
AF803	2.8368	651422520	LcA	1.87%	0.0530	0.25	0
AF803	2.8368	6514451	Mp	5.36%	0.1521	0.25	0
AF803	2.8368	651445822	MTB	13.64%	0.3869	0.15	0
AF803	2.8368	6514462	MV	6.09%	0.1728	0.15	0
AF803	2.8368	6515833	Tg	0.08%	0.0023	0.04	0
AF803	2.8368	6515835	Th	2.76%	0.0783	0.04	0
AF803	2.8368	651585022	TPB	6.01%	0.1705	0.12	0
AF803	2.8368	651585520	TrA	0.24%	0.0068	0.11	0
AF803	2.8368	651585522	TrB	1.38%	0.0391	0.13	0
AF803	2.8368	651585624	TSC	1.46%	0.0414	0.14	0
AF803	2.8368	6516221	Va	0.57%	0.0162	0.39	0
AF803	2.8368	6516225	Vc	0.89%	0.0252	0.39	0
AF805	0.6276	651203424	AHC	13.53%	0.0849	0.38	0
AF805	0.6276	6513244	GM	13.16%	0.0826	0.29	0
AF805	0.6276	651422520	LcA	0.75%	0.0047	0.25	0
AF805	0.6276	651445822	MTB	24.81%	0.1557	0.15	0
AF805	0.6276	6514462	MV	47.74%	0.2996	0.15	0
AF807	1.0224	6512021	Aa	4.62%	0.0472	0.26	0
AF807	1.0224	6512451	Cp	0.24%	0.0025	0.40	0

APPENDIX D.2.1: Soil Type Summary

Entellus

SHEET _____ OF _____

BY _____ DATE 4/19/2004

CLIENT: FCDMC CHECK _____ DATE _____

JOB: Wittmann Area Drainage Master Study Update JOB NO. 310.032

Areas and percentage area reported to 4 significant digits by WMS. Actual precision of the data is only 2-3 significant digits

Basin ID	Total Basin Area (sq-miles)	Soil Type (WMS)	Soil Type (DDMSW)	Soil Type Area (%)	Soil Type Area (sq-miles)	XKSAT (in/hr)	RTIMP
AF807	1.0224	651323320	GgA	0.73%	0.0075	0.25	0
AF807	1.0224	6513244	GM	1.95%	0.0199	0.29	0
AF807	1.0224	6514223	Lb	4.38%	0.0448	0.40	0
AF807	1.0224	651422520	LcA	16.55%	0.1692	0.25	0
AF807	1.0224	6514229	Le	7.54%	0.0771	0.04	0
AF807	1.0224	6514451	Mp	12.41%	0.1269	0.25	0
AF807	1.0224	6514455	Mr	35.77%	0.3657	0.05	0
AF807	1.0224	651445822	MTB	0.73%	0.0075	0.15	0
AF807	1.0224	6514462	MV	0.24%	0.0025	0.15	0
AF807	1.0224	651502920	PeA	2.68%	0.0274	0.37	0
AF807	1.0224	651583120	TfA	0.24%	0.0025	0.37	0
AF807	1.0224	651583122	TfB	4.38%	0.0448	0.36	0
AF807	1.0224	6515833	Tg	0.49%	0.0050	0.04	0
AF807	1.0224	6515835	Th	6.08%	0.0622	0.04	0
AF807	1.0224	65164	W	0.97%	0.0099	0.00	0
AF810	2.1166	6512021	Aa	0.75%	0.0159	0.26	0
AF810	2.1166	651203222	AGB	0.64%	0.0135	0.40	0
AF810	2.1166	6512228	BE	9.16%	0.1939	0.24	0
AF810	2.1166	6513244	GM	5.11%	0.1082	0.29	0
AF810	2.1166	651326426	GWD	25.35%	0.5366	0.35	0
AF810	2.1166	651326826	GYD	0.32%	0.0068	0.26	0
AF810	2.1166	651422520	LcA	2.45%	0.0519	0.25	0
AF810	2.1166	6514451	Mp	2.24%	0.0474	0.25	0
AF810	2.1166	651445822	MTB	1.06%	0.0224	0.15	0
AF810	2.1166	6514462	MV	4.79%	0.1014	0.15	0
AF810	2.1166	651505422	PRB	6.92%	0.1465	0.28	0
AF810	2.1166	6515058	PT	9.27%	0.1962	0.40	0
AF810	2.1166	651506422	PWB	29.71%	0.6288	0.38	0
AF810	2.1166	651585624	TSC	0.64%	0.0135	0.14	0
AF810	2.1166	6516229	Ve	1.60%	0.0339	0.25	0
AF820	0.6957	651203222	AGB	12.94%	0.0900	0.40	0
AF820	0.6957	65124202	CA2	0.97%	0.0067	0.38	0
AF820	0.6957	6512423	Cb	1.94%	0.0135	0.40	0
AF820	0.6957	651445822	MTB	3.56%	0.0248	0.15	0
AF820	0.6957	651505422	PRB	1.94%	0.0135	0.28	0
AF820	0.6957	651506422	PWB	69.26%	0.4818	0.38	0
AF820	0.6957	651506826	PYD	0.32%	0.0022	0.20	0
AF820	0.6957	651545128	RpE	1.29%	0.0090	0.29	0
AF820	0.6957	6515826	TD	1.94%	0.0135	1.20	0
AF820	0.6957	651583120	TfA	1.29%	0.0090	0.37	0
AF820	0.6957	651585522	TrB	4.53%	0.0315	0.13	0
AF830	0.2663	65124202	CA2	1.96%	0.0052	0.38	0
AF830	0.2663	651422520	LcA	5.88%	0.0157	0.25	0
AF830	0.2663	651506422	PWB	11.76%	0.0313	0.38	0
AF830	0.2663	651545128	RpE	4.90%	0.0130	0.29	0
AF830	0.2663	6515829	Te	6.86%	0.0183	0.25	0
AF830	0.2663	651583120	TfA	4.90%	0.0130	0.37	0
AF830	0.2663	6515835	Th	14.71%	0.0392	0.04	0

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AF830	0.2663	651585522	TrB	35.29%	0.0940	0.13	0
AF830	0.2663	6516231	Vf	13.73%	0.0366	0.01	0
AF850	0.2178	6512021	Aa	5.00%	0.0109	0.26	0
AF850	0.2178	6512423	Cb	3.00%	0.0065	0.40	0
AF850	0.2178	651323320	GgA	1.00%	0.0022	0.25	0
AF850	0.2178	6514451	Mp	1.00%	0.0022	0.25	0
AF850	0.2178	6515826	TD	3.00%	0.0065	1.20	0
AF850	0.2178	6515835	Th	28.00%	0.0610	0.04	0
AF850	0.2178	651585522	TrB	37.00%	0.0806	0.13	0
AF850	0.2178	6516231	Vf	22.00%	0.0479	0.01	0
AF852	0.1678	6512021	Aa	1.96%	0.0033	0.26	0
AF852	0.1678	6514451	Mp	11.76%	0.0197	0.25	0
AF852	0.1678	6515826	TD	7.84%	0.0132	1.20	0
AF852	0.1678	651583122	TfB	7.84%	0.0132	0.36	0
AF852	0.1678	6515835	Th	13.73%	0.0230	0.04	0
AF852	0.1678	651585522	TrB	45.10%	0.0757	0.13	0
AF852	0.1678	6516231	Vf	11.76%	0.0197	0.01	0
AF854	0.3382	6512857	Es	3.33%	0.0113	0.25	0
AF854	0.3382	651325036	GPl	2.50%	0.0085	0.00	0
AF854	0.3382	651326722	GxB	4.17%	0.0141	0.24	0
AF854	0.3382	651422520	LcA	20.83%	0.0704	0.25	0
AF854	0.3382	6514421	Ma	15.00%	0.0507	0.40	0
AF854	0.3382	6514451	Mp	8.33%	0.0282	0.25	0
AF854	0.3382	6514455	Mr	10.00%	0.0338	0.05	0
AF854	0.3382	6515826	TD	5.83%	0.0197	1.20	0
AF854	0.3382	6515829	Te	12.50%	0.0423	0.25	0
AF854	0.3382	651585522	TrB	17.50%	0.0592	0.13	0
AF860	0.3627	6512255	Br	1.32%	0.0048	1.05	0
AF860	0.3627	6512857	Es	16.45%	0.0597	0.25	0
AF860	0.3627	651323320	GgA	14.47%	0.0525	0.25	0
AF860	0.3627	651326720	GWD	0.66%	0.0024	0.35	0
AF860	0.3627	651422520	LcA	0.66%	0.0024	0.25	0
AF860	0.3627	6514421	Ma	9.87%	0.0358	0.40	0
AF860	0.3627	6514451	Mp	3.95%	0.0143	0.25	0
AF860	0.3627	651542320	RbA	2.63%	0.0095	0.26	0
AF860	0.3627	6515826	TD	11.18%	0.0405	1.20	0
AF860	0.3627	651585522	TrB	4.61%	0.0167	0.13	0
AF860	0.3627	6516233	Vg	21.71%	0.0787	0.91	0
AF860	0.3627	6516235	Vh	12.50%	0.0453	0.27	0
AF862	0.1772	6512255	Br	1.43%	0.0025	1.05	0
AF862	0.1772	6512857	Es	4.29%	0.0076	0.25	0
AF862	0.1772	651323320	GgA	22.86%	0.0405	0.25	0
AF862	0.1772	6514421	Ma	4.29%	0.0076	0.40	0
AF862	0.1772	6514451	Mp	1.43%	0.0025	0.25	0
AF862	0.1772	6516233	Vg	28.57%	0.0506	0.91	0
AF862	0.1772	6516235	Vh	37.14%	0.0658	0.27	0
AF864	0.0868	651323320	GgA	12.50%	0.0109	0.25	0
AF864	0.0868	6514451	Mp	37.50%	0.0326	0.25	0

APPENDIX D.2.1: Soil Type Summary

Entellus

SHEET _____ OF _____

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JOB: Wittmann Area Drainage Master Study Update JOB NO. 310.032

Areas and percentage area reported to 4 significant digits by WMS. Actual precision of the data is only 2-3 significant digits

Basin ID	Total Basin Area (sq-miles)	Soil Type (WMS)	Soil Type (DDMSW)	Soil Type Area (%)	Soil Type Area (sq-miles)	XKSAT (in/hr)	RTIMP
AF864	0.0868	651585522	TrB	50.00%	0.0434	0.13	0
AF866	0.4549	6512857	Es	2.60%	0.0118	0.25	0
AF866	0.4549	651326720	GWD	1.56%	0.0071	0.35	0
AF866	0.4549	651326722	GxB	0.52%	0.0024	0.24	0
AF866	0.4549	651422520	LcA	5.73%	0.0261	0.25	0
AF866	0.4549	6514451	Mp	27.08%	0.1232	0.25	0
AF866	0.4549	6514455	Mr	34.90%	0.1588	0.05	0
AF866	0.4549	651542320	RbA	7.29%	0.0332	0.26	0
AF866	0.4549	651583120	TfA	2.60%	0.0118	0.37	0
AF866	0.4549	651585522	TrB	17.71%	0.0806	0.13	0
IW300	1.4800	6451	1	1.23%	0.0182	0.41	0
IW300	1.4800	645112	112	33.38%	0.4940	0.39	0
IW300	1.4800	64522	22	16.08%	0.2380	0.04	0
IW300	1.4800	6453	3	12.40%	0.1835	0.58	0
IW300	1.4800	64553	53	11.64%	0.1723	0.02	0
IW300	1.4800	64555	55	12.25%	0.1813	0.27	0
IW300	1.4800	64576	76	13.02%	0.1927	0.23	0
IW302	1.3264	645112	112	41.71%	0.5532	0.39	0
IW302	1.3264	645113	113	14.87%	0.1972	0.39	0
IW302	1.3264	64522	22	7.69%	0.1020	0.04	0
IW302	1.3264	6453	3	11.11%	0.1474	0.58	0
IW302	1.3264	64553	53	11.79%	0.1564	0.02	0
IW302	1.3264	64555	55	1.54%	0.0204	0.27	0
IW302	1.3264	64598	98	11.28%	0.1496	0.37	0
IW310	1.1672	645112	112	4.22%	0.0493	0.39	0
IW310	1.1672	64522	22	40.12%	0.4683	0.04	0
IW310	1.1672	64553	53	23.03%	0.2688	0.02	0
IW310	1.1672	64576	76	32.63%	0.3808	0.23	0
IW312	0.5682	64546	46	86.00%	0.4887	0.03	0
IW312	0.5682	64574	74	14.00%	0.0795	0.08	0
IW314	2.1754	645112	112	32.82%	0.7140	0.39	0
IW314	2.1754	6452	2	1.86%	0.0405	0.41	0
IW314	2.1754	64522	22	16.67%	0.3626	0.04	0
IW314	2.1754	64553	53	14.70%	0.3198	0.02	0
IW314	2.1754	64555	55	8.07%	0.1756	0.27	0
IW314	2.1754	64560	60	0.72%	0.0157	0.26	0
IW314	2.1754	64570	70	16.15%	0.3513	0.36	0
IW314	2.1754	64576	76	4.87%	0.1059	0.23	0
IW314	2.1754	64578	78	4.14%	0.0901	0.05	0
IW318	0.5832	645112	112	24.51%	0.1429	0.39	0
IW318	0.5832	64522	22	41.11%	0.2397	0.04	0
IW318	0.5832	64553	53	34.39%	0.2005	0.02	0
IW322	1.8923	645112	112	3.60%	0.0681	0.39	0
IW322	1.8923	64522	22	50.30%	0.9518	0.04	0
IW322	1.8923	64553	53	20.65%	0.3907	0.02	0
IW322	1.8923	64558	58	0.84%	0.0159	0.34	0
IW322	1.8923	64560	60	2.28%	0.0431	0.26	0
IW322	1.8923	64570	70	8.76%	0.1658	0.36	0

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JOB NO. 310.032

Areas and percentage area reported to 4 significant digits by WMS. Actual precision of the data is only 2-3 significant digits

Basin ID	Total Basin Area (sq-miles)	Soil Type (WMS)	Soil Type (DDMSW)	Soil Type Area (%)	Soil Type Area (sq-miles)	XKSAT (in/hr)	RTIMP
IW322	1.8923	64576	76	5.64%	0.1067	0.23	0
IW322	1.8923	64577	77	5.16%	0.0976	0.05	0
IW322	1.8923	64578	78	2.76%	0.0522	0.05	0
IW326	0.3331	645112	112	14.69%	0.0489	0.39	0
IW326	0.3331	64558	58	13.99%	0.0466	0.34	0
IW326	0.3331	64576	76	51.05%	0.1700	0.23	0
IW326	0.3331	64578	78	20.28%	0.0675	0.05	0
IW330	1.0372	64529	29	12.36%	0.1282	0.34	0
IW330	1.0372	64553	53	12.80%	0.1328	0.02	0
IW330	1.0372	64555	55	16.05%	0.1665	0.27	0
IW330	1.0372	64558	58	36.44%	0.3779	0.34	0
IW330	1.0372	64570	70	6.29%	0.0652	0.36	0
IW330	1.0372	64576	76	0.65%	0.0067	0.23	0
IW330	1.0372	64578	78	15.40%	0.1597	0.05	0
IW334	1.2571	645112	112	21.30%	0.2678	0.39	0
IW334	1.2571	64522	22	8.48%	0.1066	0.04	0
IW334	1.2571	64553	53	7.22%	0.0908	0.02	0
IW334	1.2571	64576	76	3.61%	0.0454	0.23	0
IW334	1.2571	64578	78	21.30%	0.2678	0.05	0
IW334	1.2571	64598	98	38.09%	0.4788	0.37	0
IW338	0.3390	645112	112	20.98%	0.0711	0.39	0
IW338	0.3390	64522	22	5.59%	0.0190	0.04	0
IW338	0.3390	64576	76	3.50%	0.0119	0.23	0
IW338	0.3390	64580	80	45.45%	0.1541	0.08	0
IW338	0.3390	64598	98	24.48%	0.0830	0.37	0
IW342	0.3535	645112	112	17.11%	0.0605	0.39	0
IW342	0.3535	64558	58	30.92%	0.1093	0.34	0
IW342	0.3535	64580	80	16.45%	0.0582	0.08	0
IW342	0.3535	64598	98	35.53%	0.1256	0.37	0
IW346	3.4432	645112	112	3.25%	0.1119	0.39	0
IW346	3.4432	64522	22	9.88%	0.3402	0.04	0
IW346	3.4432	64523	23	2.93%	0.1009	0.01	0
IW346	3.4432	64529	29	6.63%	0.2283	0.34	0
IW346	3.4432	64555	55	15.41%	0.5306	0.27	0
IW346	3.4432	64558	58	54.16%	1.8648	0.34	0
IW346	3.4432	64570	70	5.01%	0.1725	0.36	0
IW346	3.4432	64576	76	0.07%	0.0024	0.23	0
IW346	3.4432	64578	78	2.60%	0.0895	0.05	0
IW346	3.4432	64598	98	0.07%	0.0024	0.37	0
IW349	0.2498	645113	113	76.15%	0.1902	0.39	0
IW349	0.2498	64548	48	23.85%	0.0596	0.06	0
IW350	2.1751	645110	110	27.21%	0.5918	0.13	0
IW350	2.1751	645119	119	2.80%	0.0609	0.14	0
IW350	2.1751	64522	22	36.14%	0.7861	0.04	0
IW350	2.1751	64529	29	7.17%	0.1560	0.34	0
IW350	2.1751	64553	53	0.42%	0.0091	0.02	0
IW350	2.1751	64555	55	2.49%	0.0542	0.27	0
IW350	2.1751	64570	70	10.49%	0.2282	0.36	0

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Entellus

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Areas and percentage area reported to 4 significant digits by WMS. Actual precision of the data is only 2-3 significant digits

Basin ID	Total Basin Area (sq-miles)	Soil Type (WMS)	Soil Type (DDMSW)	Soil Type Area (%)	Soil Type Area (sq-miles)	XKSAT (in/hr)	RTIMP
IW350	2.1751	64575	75	13.29%	0.2891	0.23	0
IW351	0.3164	645113	113	2.17%	0.0069	0.39	0
IW351	0.3164	64546	46	5.80%	0.0183	0.03	0
IW351	0.3164	64558	58	20.29%	0.0642	0.34	0
IW351	0.3164	64598	98	71.74%	0.2270	0.37	0
IW352	0.0961	645113	113	48.84%	0.0469	0.39	0
IW352	0.0961	64548	48	11.63%	0.0112	0.06	0
IW352	0.0961	64558	58	37.21%	0.0357	0.34	0
IW352	0.0961	64598	98	2.33%	0.0022	0.37	0
IW353	2.8031	64521	21	1.12%	0.0314	0.38	0
IW353	2.8031	64522	22	50.20%	1.4072	0.04	0
IW353	2.8031	64529	29	23.38%	0.6554	0.34	0
IW353	2.8031	64544	44	4.32%	0.1211	0.03	0
IW353	2.8031	64546	46	10.41%	0.2918	0.03	0
IW353	2.8031	64553	53	0.16%	0.0045	0.02	0
IW353	2.8031	64555	55	0.16%	0.0045	0.27	0
IW353	2.8031	64558	58	6.89%	0.1931	0.34	0
IW353	2.8031	64575	75	2.64%	0.0740	0.23	0
IW353	2.8031	64598	98	0.72%	0.0202	0.37	0
IW354	0.3605	64548	48	92.90%	0.3349	0.06	0
IW354	0.3605	64558	58	7.10%	0.0256	0.34	0
IW356	0.2861	645113	113	24.03%	0.0688	0.39	0
IW356	0.2861	64548	48	75.97%	0.2174	0.06	0
IW357	0.7457	64522	22	0.30%	0.0022	0.04	0
IW357	0.7457	64529	29	3.03%	0.0226	0.34	0
IW357	0.7457	6453	3	4.24%	0.0316	0.58	0
IW357	0.7457	64546	46	63.64%	0.4746	0.03	0
IW357	0.7457	64574	74	6.36%	0.0474	0.08	0
IW357	0.7457	64598	98	22.42%	0.1672	0.37	0
IW358	0.1641	64522	22	7.58%	0.0124	0.04	0
IW358	0.1641	64529	29	12.12%	0.0199	0.34	0
IW358	0.1641	64555	55	25.76%	0.0423	0.27	0
IW358	0.1641	64558	58	54.55%	0.0895	0.34	0
IW359	2.9120	645110	110	2.01%	0.0585	0.13	0
IW359	2.9120	64521	21	1.47%	0.0428	0.38	0
IW359	2.9120	64522	22	0.93%	0.0271	0.04	0
IW359	2.9120	64529	29	45.91%	1.3369	0.34	0
IW359	2.9120	64544	44	6.48%	0.1887	0.03	0
IW359	2.9120	64553	53	19.52%	0.5684	0.02	0
IW359	2.9120	64555	55	15.20%	0.4426	0.27	0
IW359	2.9120	64575	75	4.71%	0.1372	0.23	0
IW359	2.9120	64598	98	3.78%	0.1101	0.37	0
IW360	0.8306	645113	113	29.05%	0.2413	0.39	0
IW360	0.8306	64558	58	3.63%	0.0302	0.34	0
IW360	0.8306	64598	98	67.32%	0.5592	0.37	0
IW361	0.3547	64522	22	2.58%	0.0092	0.04	0
IW361	0.3547	64529	29	7.10%	0.0252	0.34	0
IW361	0.3547	64544	44	17.42%	0.0618	0.03	0

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Basin ID	Total Basin Area (sq-miles)	Soil Type (WMS)	Soil Type (DDMSW)	Soil Type Area (%)	Soil Type Area (sq-miles)	XKSAT (in/hr)	RTIMP
IW361	0.3547	64546	46	12.90%	0.0458	0.03	0
IW361	0.3547	64555	55	20.65%	0.0733	0.27	0
IW361	0.3547	64558	58	39.35%	0.1396	0.34	0
IW362	0.1794	64548	48	75.00%	0.1345	0.06	0
IW362	0.1794	64558	58	25.00%	0.0448	0.34	0
IW363	0.6278	645113	113	0.36%	0.0023	0.39	0
IW363	0.6278	64546	46	78.55%	0.4931	0.03	0
IW363	0.6278	64574	74	10.18%	0.0639	0.08	0
IW363	0.6278	64598	98	10.91%	0.0685	0.37	0
IW364	1.1451	645113	113	1.38%	0.0158	0.39	0
IW364	1.1451	64544	44	82.45%	0.9441	0.03	0
IW364	1.1451	64548	48	14.40%	0.1649	0.06	0
IW364	1.1451	64580	80	1.58%	0.0181	0.08	0
IW364	1.1451	64598	98	0.20%	0.0023	0.37	0
IW365	0.4729	64546	46	100.00%	0.4729	0.03	0
IW366	1.0558	64529	29	23.01%	0.2429	0.34	0
IW366	1.0558	64544	44	4.95%	0.0523	0.03	0
IW366	1.0558	64547	47	0.22%	0.0023	0.11	0
IW366	1.0558	64553	53	17.63%	0.1861	0.02	0
IW366	1.0558	64575	75	1.29%	0.0136	0.23	0
IW366	1.0558	64577	77	7.10%	0.0750	0.05	0
IW366	1.0558	64598	98	45.81%	0.4837	0.37	0
IW367	0.0512	64546	46	100.00%	0.0512	0.03	0
IW368	0.2907	645113	113	100.00%	0.2907	0.39	0
IW369	0.7949	645113	113	6.86%	0.0545	0.39	0
IW369	0.7949	64546	46	93.14%	0.7404	0.03	0
IW370	0.8795	645113	113	57.11%	0.5023	0.39	0
IW370	0.8795	6453	3	25.58%	0.2250	0.58	0
IW370	0.8795	64546	46	17.31%	0.1522	0.03	0
IW371	0.0529	64598	98	100.00%	0.0529	0.37	0
IW372	0.3175	645113	113	78.57%	0.2495	0.39	0
IW372	0.3175	6453	3	0.71%	0.0023	0.58	0
IW372	0.3175	64544	44	20.71%	0.0658	0.03	0
IW374	0.3875	64544	44	68.42%	0.2651	0.03	0
IW374	0.3875	64598	98	31.58%	0.1224	0.37	0
IW375	0.6582	645113	113	46.48%	0.3059	0.39	0
IW375	0.6582	64544	44	53.52%	0.3523	0.03	0
IW377	0.1126	645110	110	38.10%	0.0429	0.13	0
IW377	0.1126	64544	44	19.05%	0.0214	0.03	0
IW377	0.1126	64598	98	42.86%	0.0482	0.37	0
IW380	0.4998	6453	3	12.56%	0.0628	0.58	0
IW380	0.4998	64535	35	15.35%	0.0767	0.23	0
IW380	0.4998	64539	39	4.65%	0.0232	0.29	0
IW380	0.4998	64544	44	43.26%	0.2162	0.03	0
IW380	0.4998	64546	46	11.63%	0.0581	0.03	0
IW380	0.4998	64548	48	0.93%	0.0046	0.06	0
IW380	0.4998	6457	7	11.63%	0.0581	0.62	0
IW381	0.3841	64529	29	14.12%	0.0542	0.34	0

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CLIENT: FCDMC CHECK _____ DATE _____

JOB: Wittmann Area Drainage Master Study Update JOB NO. 310.032

Areas and percentage area reported to 4 significant digits by WMS. Actual precision of the data is only 2-3 significant digits

Basin ID	Total Basin Area (sq-miles)	Soil Type (WMS)	Soil Type (DDMSW)	Soil Type Area (%)	Soil Type Area (sq-miles)	XKSAT (in/hr)	RTIMP
IW381	0.3841	64544	44	77.06%	0.2960	0.03	0
IW381	0.3841	64574	74	8.82%	0.0339	0.08	0
IW382	0.6196	64513	13	1.82%	0.0113	0.01	0
IW382	0.6196	64529	29	54.74%	0.3392	0.34	0
IW382	0.6196	64544	44	33.94%	0.2103	0.03	0
IW382	0.6196	64574	74	3.28%	0.0203	0.08	0
IW382	0.6196	64598	98	6.20%	0.0384	0.37	0
IW384	0.0826	64529	29	23.53%	0.0194	0.34	0
IW384	0.0826	64544	44	76.47%	0.0631	0.03	0
IW386	0.3732	645110	110	7.41%	0.0277	0.13	0
IW386	0.3732	64513	13	3.09%	0.0115	0.01	0
IW386	0.3732	64544	44	33.95%	0.1267	0.03	0
IW386	0.3732	64548	48	28.40%	0.1060	0.06	0
IW386	0.3732	64549	49	14.20%	0.0530	0.06	0
IW386	0.3732	64574	74	1.23%	0.0046	0.08	0
IW386	0.3732	64598	98	11.73%	0.0438	0.37	0
IW387	1.3509	64536	36	32.72%	0.4420	0.07	0
IW387	1.3509	64539	39	43.85%	0.5924	0.29	0
IW387	1.3509	64564	64	9.80%	0.1324	0.14	25
IW387	1.3509	6457	7	1.66%	0.0224	0.62	0
IW387	1.3509	64594	94	11.96%	0.1616	0.33	0
IW388	1.2257	64513	13	3.49%	0.0428	0.01	0
IW388	1.2257	64529	29	8.26%	0.1012	0.34	0
IW388	1.2257	6453	3	9.54%	0.1169	0.58	0
IW388	1.2257	64544	44	13.39%	0.1641	0.03	0
IW388	1.2257	64546	46	62.20%	0.7624	0.03	0
IW388	1.2257	64598	98	3.12%	0.0382	0.37	0
IW389	0.1312	64546	46	100.00%	0.1312	0.03	0
IW390	0.3110	645110	110	14.60%	0.0454	0.13	0
IW390	0.3110	6453	3	29.20%	0.0908	0.58	0
IW390	0.3110	64544	44	0.73%	0.0023	0.03	0
IW390	0.3110	64548	48	12.41%	0.0386	0.06	0
IW390	0.3110	64549	49	8.76%	0.0272	0.06	0
IW390	0.3110	64574	74	5.84%	0.0182	0.08	0
IW390	0.3110	64598	98	28.47%	0.0885	0.37	0
IW390A	0.9003	64513	13	1.52%	0.0137	0.01	0
IW390A	0.9003	64528	28	5.56%	0.0501	0.02	0
IW390A	0.9003	6453	3	5.81%	0.0523	0.58	0
IW390A	0.9003	64542	42	5.05%	0.0455	0.17	0
IW390A	0.9003	64548	48	2.78%	0.0250	0.06	0
IW390A	0.9003	64564	64	16.16%	0.1455	0.14	25
IW390A	0.9003	64566	66	3.28%	0.0295	0.23	0
IW390A	0.9003	64568	68	3.03%	0.0273	0.63	0
IW390A	0.9003	64573	73	28.03%	0.2524	0.09	30
IW390A	0.9003	64574	74	5.81%	0.0523	0.08	0
IW390A	0.9003	64594	94	22.98%	0.2069	0.33	0
IW392	1.1135	6453	3	2.65%	0.0295	0.58	0
IW392	1.1135	64546	46	28.98%	0.3227	0.03	0

APPENDIX D.2.1: Soil Type Summary

Entellus

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Areas and percentage area reported to 4 significant digits by WMS. Actual precision of the data is only 2-3 significant digits

Basin ID	Total Basin Area (sq-miles)	Soil Type (WMS)	Soil Type (DDMSW)	Soil Type Area (%)	Soil Type Area (sq-miles)	XKSAT (in/hr)	RTIMP
IW392	1.1135	64548	48	31.84%	0.3546	0.06	0
IW392	1.1135	64564	64	13.27%	0.1478	0.14	25
IW392	1.1135	64574	74	3.27%	0.0364	0.08	0
IW392	1.1135	64598	98	20.00%	0.2227	0.37	0
IW394	4.1731	645121	121	4.74%	0.1978	0.12	0
IW394	4.1731	64531	31	5.11%	0.2132	0.33	35
IW394	4.1731	64533	33	9.20%	0.3839	0.23	0
IW394	4.1731	64536	36	15.45%	0.6448	0.07	0
IW394	4.1731	64539	39	2.91%	0.1214	0.29	0
IW394	4.1731	64542	42	7.00%	0.2921	0.17	0
IW394	4.1731	64563	63	37.30%	1.5566	0.14	25
IW394	4.1731	64566	66	3.34%	0.1394	0.23	0
IW394	4.1731	6457	7	1.18%	0.0492	0.62	0
IW394	4.1731	64573	73	11.52%	0.4807	0.09	30
IW394	4.1731	64594	94	2.26%	0.0943	0.33	0
IW395	7.8618	637244526	CmD	3.37%	0.2649	0.00	0
IW395	7.8618	6374229	Le	5.23%	0.4112	0.00	0
IW395	7.8618	6374235	Lh	1.14%	0.0896	0.00	0
IW395	7.8618	6375455	Rr	3.26%	0.2563	0.00	0
IW395	7.8618	645104	104	1.23%	0.0967	0.14	60
IW395	7.8618	64516	16	0.23%	0.0181	0.44	15
IW395	7.8618	64531	31	3.49%	0.2744	0.33	35
IW395	7.8618	64534	34	5.12%	0.4025	0.23	0
IW395	7.8618	64536	36	1.40%	0.1101	0.07	0
IW395	7.8618	64543	43	1.06%	0.0833	0.17	0
IW395	7.8618	64562	62	0.17%	0.0134	0.15	0
IW395	7.8618	64563	63	65.28%	5.1322	0.14	25
IW395	7.8618	6457	7	1.20%	0.0943	0.62	0
IW395	7.8618	64572	72	7.01%	0.5511	0.09	30
IW395	7.8618	64597	97	0.80%	0.0629	0.07	0
IW396	0.5863	64535	35	26.54%	0.1556	0.23	0
IW396	0.5863	64536	36	12.69%	0.0744	0.07	0
IW396	0.5863	64539	39	13.85%	0.0812	0.29	0
IW396	0.5863	64543	43	5.38%	0.0315	0.17	0
IW396	0.5863	64544	44	0.38%	0.0022	0.03	0
IW396	0.5863	64564	64	0.77%	0.0045	0.14	25
IW396	0.5863	6457	7	40.38%	0.2367	0.62	0
IW397	4.8148	637244526	CmD	44.82%	2.1580	0.00	0
IW397	4.8148	637244730	CnF	0.28%	0.0135	0.00	0
IW397	4.8148	6374229	Le	16.65%	0.8017	0.00	0
IW397	4.8148	6374235	Lh	16.60%	0.7993	0.00	0
IW397	4.8148	6375455	Rr	21.64%	1.0419	0.00	0
PD700	1.3998	651203222	AGB	1.63%	0.0228	0.40	0
PD700	1.3998	651203424	AHC	10.60%	0.1484	0.38	0
PD700	1.3998	6513244	GM	18.27%	0.2557	0.29	0
PD700	1.3998	651326426	GWD	2.77%	0.0388	0.35	0
PD700	1.3998	651326826	GYD	12.72%	0.1780	0.26	0
PD700	1.3998	651445822	MTB	26.59%	0.3722	0.15	0

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Basin ID	Total Basin Area (sq-miles)	Soil Type (WMS)	Soil Type (DDMSW)	Soil Type Area (%)	Soil Type Area (sq-miles)	XKSAT (in/hr)	RTIMP
PD700	1.3998	6514462	MV	16.97%	0.2375	0.15	0
PD700	1.3998	651505422	PRB	0.33%	0.0046	0.28	0
PD700	1.3998	651585022	TPB	4.89%	0.0684	0.12	0
PD700	1.3998	651585624	TSC	5.22%	0.0731	0.14	0
PD704	0.3620	645110	110	17.20%	0.0623	0.13	0
PD704	0.3620	64568	68	7.64%	0.0277	0.63	0
PD704	0.3620	64570	70	11.46%	0.0415	0.36	0
PD704	0.3620	64598	98	38.85%	0.1406	0.37	0
PD704	0.3620	651326426	GWD	15.29%	0.0553	0.35	0
PD704	0.3620	651326826	GYD	2.55%	0.0092	0.26	0
PD704	0.3620	651505422	PRB	6.37%	0.0231	0.28	0
PD704	0.3620	651585624	TSC	0.64%	0.0023	0.14	0
PD708	2.4019	64510	10	4.57%	0.1098	0.94	0
PD708	2.4019	645100	100	22.29%	0.5354	0.40	20
PD708	2.4019	645108	108	0.65%	0.0156	0.31	30
PD708	2.4019	645110	110	42.63%	1.0239	0.13	0
PD708	2.4019	645113	113	2.05%	0.0492	0.39	0
PD708	2.4019	64518	18	3.64%	0.0874	0.33	15
PD708	2.4019	64547	47	6.34%	0.1523	0.11	0
PD708	2.4019	64552	52	0.19%	0.0046	0.16	20
PD708	2.4019	64568	68	0.19%	0.0046	0.63	0
PD708	2.4019	64598	98	13.53%	0.3250	0.37	0
PD708	2.4019	651326426	GWD	3.92%	0.0942	0.35	0
PD712	0.8916	645110	110	7.09%	0.0632	0.13	0
PD712	0.8916	64552	52	68.61%	0.6117	0.16	20
PD712	0.8916	64598	98	17.72%	0.1580	0.37	0
PD712	0.8916	651326426	GWD	6.58%	0.0587	0.35	0
PD712A	0.7664	64510	10	0.88%	0.0067	0.94	0
PD712A	0.7664	645100	100	3.24%	0.0248	0.40	20
PD712A	0.7664	645110	110	12.06%	0.0924	0.13	0
PD712A	0.7664	645113	113	7.06%	0.0541	0.39	0
PD712A	0.7664	64521	21	2.35%	0.0180	0.38	0
PD712A	0.7664	64552	52	46.76%	0.3584	0.16	20
PD712A	0.7664	64568	68	9.12%	0.0699	0.63	0
PD712A	0.7664	64598	98	15.59%	0.1195	0.37	0
PD712A	0.7664	651326426	GWD	2.94%	0.0225	0.35	0
PD716	1.7546	645103	103	1.80%	0.0316	0.10	65
PD716	1.7546	645118	118	0.64%	0.0112	0.42	0
PD716	1.7546	64548	48	1.29%	0.0226	0.06	0
PD716	1.7546	64552	52	16.62%	0.2916	0.16	20
PD716	1.7546	64598	98	0.77%	0.0135	0.37	0
PD716	1.7546	651203424	AHC	13.14%	0.2305	0.38	0
PD716	1.7546	651285026	EPD	1.03%	0.0181	0.12	0
PD716	1.7546	6513244	GM	4.90%	0.0860	0.29	0
PD716	1.7546	651326426	GWD	1.42%	0.0249	0.35	0
PD716	1.7546	651445822	MTB	28.74%	0.5043	0.15	0
PD716	1.7546	6514462	MV	4.64%	0.0814	0.15	0
PD716	1.7546	651505422	PRB	0.39%	0.0068	0.28	0

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Basin ID	Total Basin Area (sq-miles)	Soil Type (WMS)	Soil Type (DDMSW)	Soil Type Area (%)	Soil Type Area (sq-miles)	XKSAT (in/hr)	RTIMP
PD716	1.7546	651506422	PWB	1.29%	0.0226	0.38	0
PD716	1.7546	651585022	TPB	21.52%	0.3776	0.12	0
PD716	1.7546	651585624	TSC	1.80%	0.0316	0.14	0
PD720	0.5945	6513244	GM	58.85%	0.3498	0.29	0
PD720	0.5945	651326426	GWD	3.46%	0.0206	0.35	0
PD720	0.5945	651445822	MTB	25.38%	0.1509	0.15	0
PD720	0.5945	6514462	MV	9.23%	0.0549	0.15	0
PD720	0.5945	651585022	TPB	3.08%	0.0183	0.12	0
PD726	0.4126	64555	55	9.14%	0.0377	0.27	0
PD726	0.4126	64558	58	3.23%	0.0133	0.34	0
PD726	0.4126	64598	98	23.12%	0.0954	0.37	0
PD726	0.4126	6512042	AL	8.60%	0.0355	0.40	0
PD726	0.4126	6513244	GM	46.24%	0.1908	0.29	0
PD726	0.4126	651445822	MTB	5.91%	0.0244	0.15	0
PD726	0.4126	6514462	MV	1.08%	0.0045	0.15	0
PD726	0.4126	651585022	TPB	2.69%	0.0111	0.12	0
PD726A	1.1030	645113	113	41.31%	0.4556	0.39	0
PD726A	1.1030	64521	21	4.29%	0.0473	0.38	0
PD726A	1.1030	64552	52	19.84%	0.2188	0.16	20
PD726A	1.1030	64555	55	13.09%	0.1444	0.27	0
PD726A	1.1030	64598	98	18.61%	0.2053	0.37	0
PD726A	1.1030	651445822	MTB	2.86%	0.0315	0.15	0
PD726B	0.9345	64552	52	9.00%	0.0841	0.16	20
PD726B	0.9345	64555	55	0.24%	0.0022	0.27	0
PD726B	0.9345	64558	58	15.40%	0.1439	0.34	0
PD726B	0.9345	64580	80	2.37%	0.0221	0.08	0
PD726B	0.9345	64598	98	72.99%	0.6821	0.37	0
PD732	0.4793	645110	110	42.18%	0.2022	0.13	0
PD732	0.4793	645113	113	19.43%	0.0931	0.39	0
PD732	0.4793	64555	55	4.27%	0.0205	0.27	0
PD732	0.4793	64598	98	34.12%	0.1635	0.37	0
PD736	0.7789	64552	52	1.46%	0.0114	0.16	20
PD736	0.7789	64555	55	5.54%	0.0432	0.27	0
PD736	0.7789	64580	80	17.78%	0.1385	0.08	0
PD736	0.7789	64598	98	75.22%	0.5859	0.37	0
PD740	1.2839	6452	2	5.73%	0.0736	0.41	0
PD740	1.2839	64552	52	4.30%	0.0552	0.16	20
PD740	1.2839	64558	58	6.09%	0.0782	0.34	0
PD740	1.2839	64570	70	27.24%	0.3497	0.36	0
PD740	1.2839	64598	98	56.63%	0.7271	0.37	0
PD744	0.7975	645115	115	0.28%	0.0022	0.39	0
PD744	0.7975	64552	52	1.98%	0.0158	0.16	20
PD744	0.7975	64558	58	6.78%	0.0541	0.34	0
PD744	0.7975	651203222	AGB	12.43%	0.0991	0.40	0
PD744	0.7975	651203424	AHC	8.47%	0.0676	0.38	0
PD744	0.7975	6512042	AL	25.99%	0.2073	0.40	0
PD744	0.7975	6513244	GM	34.18%	0.2726	0.29	0
PD744	0.7975	651445822	MTB	9.89%	0.0789	0.15	0

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Basin ID	Total Basin Area (sq-miles)	Soil Type (WMS)	Soil Type (DDMSW)	Soil Type Area (%)	Soil Type Area (sq-miles)	XKSAT (in/hr)	RTIMP
PD748	0.2838	645100	100	5.65%	0.0160	0.40	20
PD748	0.2838	645109	109	76.61%	0.2174	0.35	35
PD748	0.2838	645110	110	15.32%	0.0435	0.13	0
PD748	0.2838	64547	47	2.42%	0.0069	0.11	0
PD752	0.1897	645100	100	44.05%	0.0836	0.40	20
PD752	0.1897	645108	108	7.14%	0.0135	0.31	30
PD752	0.1897	645109	109	48.81%	0.0926	0.35	35
PD756	3.2304	64510	10	2.65%	0.0856	0.94	0
PD756	3.2304	645108	108	13.16%	0.4251	0.31	30
PD756	3.2304	645109	109	66.64%	2.1528	0.35	35
PD756	3.2304	645110	110	1.53%	0.0494	0.13	0
PD756	3.2304	645113	113	0.63%	0.0204	0.39	0
PD756	3.2304	64521	21	1.53%	0.0494	0.38	0
PD756	3.2304	64547	47	0.42%	0.0136	0.11	0
PD756	3.2304	64549	49	1.04%	0.0336	0.06	0
PD756	3.2304	64552	52	0.49%	0.0158	0.16	20
PD756	3.2304	64555	55	0.28%	0.0090	0.27	0
PD756	3.2304	64598	98	11.63%	0.3757	0.37	0
PD760	0.8671	645109	109	17.49%	0.1516	0.35	35
PD760	0.8671	645110	110	47.52%	0.4120	0.13	0
PD760	0.8671	645113	113	26.89%	0.2332	0.39	0
PD760	0.8671	64598	98	8.09%	0.0701	0.37	0
PI600	0.6050	651203222	AGB	12.08%	0.0731	0.40	0
PI600	0.6050	6513244	GM	43.77%	0.2648	0.29	0
PI600	0.6050	651445822	MTB	36.60%	0.2214	0.15	0
PI600	0.6050	6514462	MV	7.55%	0.0457	0.15	0
PI600A	0.5203	651203222	AGB	13.74%	0.0715	0.40	0
PI600A	0.5203	6513244	GM	31.75%	0.1652	0.29	0
PI600A	0.5203	651445822	MTB	42.65%	0.2219	0.15	0
PI600A	0.5203	6514462	MV	11.85%	0.0617	0.15	0
PI603	0.5190	645115	115	2.17%	0.0113	0.39	0
PI603	0.5190	64558	58	7.39%	0.0384	0.34	0
PI603	0.5190	651203222	AGB	17.83%	0.0925	0.40	0
PI603	0.5190	651203424	AHC	18.26%	0.0948	0.38	0
PI603	0.5190	6513244	GM	24.78%	0.1286	0.29	0
PI603	0.5190	651445822	MTB	6.96%	0.0361	0.15	0
PI603	0.5190	6515456	RS	3.48%	0.0181	0.40	65
PI603	0.5190	651585022	TPB	19.13%	0.0993	0.12	0
PI604	0.3628	64518	18	3.80%	0.0138	0.33	15
PI604	0.3628	64552	52	51.27%	0.1860	0.16	20
PI604	0.3628	64558	58	27.22%	0.0988	0.34	0
PI604	0.3628	64598	98	11.39%	0.0413	0.37	0
PI604	0.3628	6512448	CO	1.90%	0.0069	0.29	20
PI604	0.3628	6513244	GM	1.27%	0.0046	0.29	0
PI604	0.3628	6515456	RS	3.16%	0.0115	0.40	65
PI606	1.0766	645115	115	2.52%	0.0271	0.39	0
PI606	1.0766	64518	18	1.05%	0.0113	0.33	15
PI606	1.0766	64552	52	0.21%	0.0023	0.16	20

APPENDIX D.2.1: Soil Type Summary

Entellus

SHEET _____ OF _____

BY _____ DATE 4/19/2004

CLIENT: FCDMC CHECK _____ DATE _____

JOB: Wittmann Area Drainage Master Study Update JOB NO. 310.032

Areas and percentage area reported to 4 significant digits by WMS. Actual precision of the data is only 2-3 significant digits

Basin ID	Total Basin Area (sq-miles)	Soil Type (WMS)	Soil Type (DDMSW)	Soil Type Area (%)	Soil Type Area (sq-miles)	XKSAT (in/hr)	RTIMP
PI606	1.0766	64558	58	10.29%	0.1108	0.34	0
PI606	1.0766	64570	70	1.47%	0.0158	0.36	0
PI606	1.0766	64598	98	23.74%	0.2556	0.37	0
PI606	1.0766	651203222	AGB	0.84%	0.0090	0.40	0
PI606	1.0766	651203424	AHC	18.70%	0.2013	0.38	0
PI606	1.0766	6512448	CO	3.15%	0.0339	0.29	20
PI606	1.0766	6513244	GM	32.35%	0.3483	0.29	0
PI606	1.0766	651445822	MTB	2.73%	0.0294	0.15	0
PI606	1.0766	6514462	MV	2.10%	0.0226	0.15	0
PI606	1.0766	6515456	RS	0.84%	0.0090	0.40	65
PI606A	0.4572	64552	52	8.54%	0.0390	0.16	20
PI606A	0.4572	64570	70	17.59%	0.0804	0.36	0
PI606A	0.4572	64580	80	6.53%	0.0299	0.08	0
PI606A	0.4572	64598	98	67.34%	0.3079	0.37	0
PI609	1.9354	645112	112	1.64%	0.0317	0.39	0
PI609	1.9354	645115	115	6.20%	0.1200	0.39	0
PI609	1.9354	64552	52	1.29%	0.0250	0.16	20
PI609	1.9354	64555	55	1.17%	0.0226	0.27	0
PI609	1.9354	64558	58	6.90%	0.1335	0.34	0
PI609	1.9354	64570	70	28.65%	0.5545	0.36	0
PI609	1.9354	64578	78	1.75%	0.0339	0.05	0
PI609	1.9354	64580	80	6.78%	0.1312	0.08	0
PI609	1.9354	64598	98	12.87%	0.2491	0.37	0
PI609	1.9354	651203222	AGB	1.05%	0.0203	0.40	0
PI609	1.9354	651203424	AHC	8.07%	0.1562	0.38	0
PI609	1.9354	6513244	GM	21.87%	0.4233	0.29	0
PI609	1.9354	651445822	MTB	1.64%	0.0317	0.15	0
PI609	1.9354	6514462	MV	0.12%	0.0023	0.15	0
PI612	0.7378	645115	115	1.53%	0.0113	0.39	0
PI612	0.7378	64555	55	31.80%	0.2346	0.27	0
PI612	0.7378	64558	58	7.03%	0.0519	0.34	0
PI612	0.7378	64570	70	20.49%	0.1512	0.36	0
PI612	0.7378	64598	98	33.03%	0.2437	0.37	0
PI612	0.7378	651203424	AHC	0.92%	0.0068	0.38	0
PI612	0.7378	6513244	GM	5.20%	0.0384	0.29	0
PI615	0.8419	64555	55	29.81%	0.2510	0.27	0
PI615	0.8419	64570	70	5.69%	0.0479	0.36	0
PI615	0.8419	64598	98	64.50%	0.5431	0.37	0
PI618	0.2886	6453	3	1.60%	0.0046	0.58	0
PI618	0.2886	64555	55	96.00%	0.2771	0.27	0
PI618	0.2886	64598	98	2.40%	0.0069	0.37	0
PI621	0.9051	6512857	Es	12.84%	0.1162	0.25	0
PI621	0.9051	6513244	GM	82.47%	0.7464	0.29	0
PI621	0.9051	651445822	MTB	1.73%	0.0157	0.15	0
PI621	0.9051	6514462	MV	2.96%	0.0268	0.15	0
PI624	1.2251	651202720	AdA	0.56%	0.0069	0.40	0
PI624	1.2251	651202722	AdB	0.75%	0.0092	0.40	0
PI624	1.2251	6512857	Es	0.19%	0.0023	0.25	0

APPENDIX D.2.1: Soil Type Summary

Entellus

SHEET _____ OF _____

BY _____ DATE 4/19/2004

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JOB: Wittmann Area Drainage Master Study Update JOB NO. 310.032

Areas and percentage area reported to 4 significant digits by WMS. Actual precision of the data is only 2-3 significant digits

Basin ID	Total Basin Area (sq-miles)	Soil Type (WMS)	Soil Type (DDMSW)	Soil Type Area (%)	Soil Type Area (sq-miles)	XKSAT (in/hr)	RTIMP
PI624	1.2251	6513244	GM	70.06%	0.8583	0.29	0
PI624	1.2251	651445822	MTB	19.96%	0.2445	0.15	0
PI624	1.2251	6514462	MV	8.47%	0.1038	0.15	0
PI624A	2.8067	64555	55	7.88%	0.2212	0.27	0
PI624A	2.8067	64558	58	46.50%	1.3051	0.34	0
PI624A	2.8067	645999	999	1.69%	0.0474	0.00	0
PI624A	2.8067	6513244	GM	41.83%	1.1740	0.29	0
PI624A	2.8067	651445822	MTB	2.09%	0.0587	0.15	0
PI628	0.5695	64529	29	2.85%	0.0162	0.34	0
PI628	0.5695	64555	55	71.95%	0.4098	0.27	0
PI628	0.5695	64558	58	25.20%	0.1435	0.34	0
PI633	0.3359	651202320	AbA	0.68%	0.0023	0.38	0
PI633	0.3359	651202720	AdA	2.70%	0.0091	0.40	0
PI633	0.3359	651202722	AdB	1.35%	0.0045	0.40	0
PI633	0.3359	6512857	Es	1.35%	0.0045	0.25	0
PI633	0.3359	651323320	GgA	2.03%	0.0068	0.25	0
PI633	0.3359	6513244	GM	39.19%	0.1316	0.29	0
PI633	0.3359	651445822	MTB	12.16%	0.0408	0.15	0
PI633	0.3359	6514462	MV	40.54%	0.1362	0.15	0
PI635	0.6106	651202720	AdA	1.48%	0.0090	0.40	0
PI635	0.6106	651202722	AdB	11.44%	0.0699	0.40	0
PI635	0.6106	6512457	Cs	3.32%	0.0203	0.19	0
PI635	0.6106	6512857	Es	13.65%	0.0834	0.25	0
PI635	0.6106	651323320	GgA	1.48%	0.0090	0.25	0
PI635	0.6106	6514223	Lb	0.74%	0.0045	0.40	0
PI635	0.6106	6514451	Mp	36.53%	0.2231	0.25	0
PI635	0.6106	6514455	Mr	15.87%	0.0969	0.05	0
PI635	0.6106	651502922	PeB	0.37%	0.0023	0.38	0
PI635	0.6106	651585520	TrA	7.75%	0.0473	0.11	0
PI635	0.6106	651585522	TrB	1.85%	0.0113	0.13	0
PI635	0.6106	6516221	Va	1.11%	0.0068	0.39	0
PI635	0.6106	6516229	Ve	4.43%	0.0271	0.25	0
PI636	0.4286	651202720	AdA	6.01%	0.0258	0.40	0
PI636	0.4286	651202722	AdB	4.37%	0.0187	0.40	0
PI636	0.4286	651203424	AHC	15.85%	0.0679	0.38	0
PI636	0.4286	6512857	Es	5.46%	0.0234	0.25	0
PI636	0.4286	6513244	GM	59.02%	0.2530	0.29	0
PI636	0.4286	6514455	Mr	7.10%	0.0304	0.05	0
PI636	0.4286	651445822	MTB	2.19%	0.0094	0.15	0
PI639	0.3431	651202722	AdB	0.68%	0.0023	0.40	0
PI639	0.3431	651203222	AGB	2.70%	0.0093	0.40	0
PI639	0.3431	6513244	GM	89.86%	0.3083	0.29	0
PI639	0.3431	651445822	MTB	6.76%	0.0232	0.15	0
PI642	0.2367	645112	112	50.50%	0.1195	0.39	0
PI642	0.2367	64570	70	4.95%	0.0117	0.36	0
PI642	0.2367	64598	98	44.55%	0.1054	0.37	0
PI645	1.5619	645112	112	19.34%	0.3021	0.39	0
PI645	1.5619	645113	113	33.24%	0.5192	0.39	0

APPENDIX D.2.1: Soil Type Summary

Entellus

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JOB: Wittmann Area Drainage Master Study Update JOB NO. 310.032

Areas and percentage area reported to 4 significant digits by WMS. Actual precision of the data is only 2-3 significant digits

Basin ID	Total Basin Area (sq-miles)	Soil Type (WMS)	Soil Type (DDMSW)	Soil Type Area (%)	Soil Type Area (sq-miles)	XKSAT (in/hr)	RTIMP
PI645	1.5619	645114	114	0.86%	0.0134	0.39	0
PI645	1.5619	6452	2	2.29%	0.0358	0.41	0
PI645	1.5619	6453	3	4.01%	0.0626	0.58	0
PI645	1.5619	64555	55	18.19%	0.2841	0.27	0
PI645	1.5619	64598	98	22.06%	0.3446	0.37	0
PI645A	1.6307	64510	10	0.70%	0.0114	0.94	0
PI645A	1.6307	645110	110	0.84%	0.0137	0.13	0
PI645A	1.6307	645113	113	10.08%	0.1644	0.39	0
PI645A	1.6307	64529	29	4.48%	0.0731	0.34	0
PI645A	1.6307	64544	44	27.31%	0.4453	0.03	0
PI645A	1.6307	64545	45	36.97%	0.6029	0.03	0
PI645A	1.6307	64555	55	19.61%	0.3198	0.27	0
PI648	1.7278	645108	108	0.52%	0.0090	0.31	30
PI648	1.7278	645112	112	4.03%	0.0696	0.39	0
PI648	1.7278	645113	113	4.03%	0.0696	0.39	0
PI648	1.7278	64544	44	27.31%	0.4719	0.03	0
PI648	1.7278	64545	45	25.10%	0.4337	0.03	0
PI648	1.7278	64548	48	29.39%	0.5078	0.06	0
PI648	1.7278	64549	49	5.59%	0.0966	0.06	0
PI648	1.7278	64598	98	4.03%	0.0696	0.37	0
PI651	0.4594	645113	113	34.22%	0.1572	0.39	0
PI651	0.4594	645114	114	15.51%	0.0713	0.39	0
PI651	0.4594	64544	44	43.85%	0.2015	0.03	0
PI651	0.4594	64545	45	1.07%	0.0049	0.03	0
PI651	0.4594	64549	49	5.35%	0.0246	0.06	0
PI654	4.0277	645108	108	0.06%	0.0024	0.31	30
PI654	4.0277	645112	112	0.06%	0.0024	0.39	0
PI654	4.0277	645113	113	1.51%	0.0608	0.39	0
PI654	4.0277	645114	114	0.84%	0.0338	0.39	0
PI654	4.0277	64544	44	23.59%	0.9501	0.03	0
PI654	4.0277	64545	45	46.28%	1.8640	0.03	0
PI654	4.0277	64549	49	0.17%	0.0068	0.06	0
PI654	4.0277	64574	74	27.50%	1.1076	0.08	0
PI657	0.8697	64544	44	32.81%	0.2854	0.03	0
PI657	0.8697	64545	45	51.71%	0.4497	0.03	0
PI657	0.8697	64548	48	3.94%	0.0343	0.06	0
PI657	0.8697	64549	49	1.31%	0.0114	0.06	0
PI657	0.8697	64574	74	10.24%	0.0891	0.08	0
PI660	0.8393	645114	114	0.27%	0.0023	0.39	0
PI660	0.8393	64544	44	37.00%	0.3105	0.03	0
PI660	0.8393	64545	45	28.69%	0.2408	0.03	0
PI660	0.8393	64574	74	16.89%	0.1418	0.08	0
PI660	0.8393	64580	80	17.16%	0.1440	0.08	0
PI663	0.6041	64533	33	3.04%	0.0184	0.23	0
PI663	0.6041	64544	44	61.98%	0.3744	0.03	0
PI663	0.6041	64545	45	6.46%	0.0390	0.03	0
PI663	0.6041	64563	63	6.08%	0.0367	0.14	25
PI663	0.6041	64580	80	22.43%	0.1355	0.08	0

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Areas and percentage area reported to 4 significant digits by WMS. Actual precision of the data is only 2-3 significant digits

Basin ID	Total Basin Area (sq-miles)	Soil Type (WMS)	Soil Type (DDMSW)	Soil Type Area (%)	Soil Type Area (sq-miles)	XKSAT (in/hr)	RTIMP
PI669	0.2856	64555	55	100.00%	0.2856	0.27	0
PI672	1.5104	64529	29	46.58%	0.7035	0.34	0
PI672	1.5104	64544	44	0.30%	0.0045	0.03	0
PI672	1.5104	64555	55	23.81%	0.3596	0.27	0
PI672	1.5104	64558	58	29.32%	0.4428	0.34	0
PI675	0.0628	64555	55	80.00%	0.0502	0.27	0
PI675	0.0628	64558	58	20.00%	0.0126	0.34	0
PI678	0.8324	64510	10	1.68%	0.0140	0.94	0
PI678	0.8324	645110	110	0.28%	0.0023	0.13	0
PI678	0.8324	64529	29	68.91%	0.5736	0.34	0
PI678	0.8324	64555	55	17.09%	0.1423	0.27	0
PI678	0.8324	64558	58	12.04%	0.1002	0.34	0
PI681	0.9914	64510	10	18.01%	0.1786	0.94	0
PI681	0.9914	645110	110	4.85%	0.0481	0.13	0
PI681	0.9914	64544	44	32.10%	0.3182	0.03	0
PI681	0.9914	64545	45	45.03%	0.4464	0.03	0
PI684	0.7361	64510	10	16.46%	0.1212	0.94	0
PI684	0.7361	645108	108	4.35%	0.0320	0.31	30
PI684	0.7361	64544	44	42.55%	0.3132	0.03	0
PI684	0.7361	64545	45	10.25%	0.0755	0.03	0
PI684	0.7361	64549	49	10.87%	0.0800	0.06	0
PI684	0.7361	64574	74	15.53%	0.1143	0.08	0
PI687	7.0093	64510	10	0.19%	0.0133	0.94	0
PI687	7.0093	64531	31	34.70%	2.4322	0.33	35
PI687	7.0093	64533	33	1.32%	0.0925	0.23	0
PI687	7.0093	64534	34	3.72%	0.2607	0.23	0
PI687	7.0093	64544	44	0.45%	0.0315	0.03	0
PI687	7.0093	64545	45	0.10%	0.0070	0.03	0
PI687	7.0093	64563	63	41.70%	2.9229	0.14	25
PI687	7.0093	64572	72	13.19%	0.9245	0.09	30
PI687	7.0093	64574	74	1.57%	0.1100	0.08	0
PI687	7.0093	6458	8	3.05%	0.2138	0.96	0
PI688	3.1968	637244526	CmD	24.31%	0.7771	0.00	0
PI688	3.1968	6374229	Le	11.60%	0.3708	0.00	0
PI688	3.1968	6374235	Lh	10.89%	0.3481	0.00	0
PI688	3.1968	64516	16	2.25%	0.0719	0.44	15
PI688	3.1968	64531	31	25.09%	0.8021	0.33	35
PI688	3.1968	64563	63	9.42%	0.3011	0.14	25
PI688	3.1968	64572	72	14.62%	0.4674	0.09	30
PI688	3.1968	6458	8	1.83%	0.0585	0.96	0
PI689	6.7846	637244526	CmD	34.12%	2.3149	0.00	0
PI689	6.7846	6374229	Le	14.76%	1.0014	0.00	0
PI689	6.7846	6374235	Lh	13.77%	0.9342	0.00	0
PI689	6.7846	6375455	Rr	5.63%	0.3820	0.00	0
PI689	6.7846	645104	104	0.33%	0.0224	0.14	60
PI689	6.7846	64516	16	3.34%	0.2266	0.44	15
PI689	6.7846	64563	63	4.67%	0.3168	0.14	25
PI689	6.7846	64572	72	22.27%	1.5109	0.09	30

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Areas and percentage area reported to 4 significant digits by WMS. Actual precision of the data is only 2-3 significant digits

Basin ID	Total Basin Area (sq-miles)	Soil Type (WMS)	Soil Type (DDMSW)	Soil Type Area (%)	Soil Type Area (sq-miles)	XKSAT (in/hr)	RTIMP
PI689	6.7846	6458	8	1.13%	0.0767	0.96	0
PI690	0.6289	64529	29	61.17%	0.3847	0.34	0
PI690	0.6289	64555	55	10.99%	0.0691	0.27	0
PI690	0.6289	64558	58	27.11%	0.1705	0.34	0
PI690	0.6289	64575	75	0.73%	0.0046	0.23	0
PI693	0.8361	64529	29	2.17%	0.0181	0.34	0
PI693	0.8361	64555	55	8.70%	0.0727	0.27	0
PI693	0.8361	64558	58	53.53%	0.4476	0.34	0
PI693	0.8361	64575	75	35.60%	0.2977	0.23	0
SV200	2.2918	6451	1	1.08%	0.0248	0.41	0
SV200	2.2918	645112	112	31.08%	0.7123	0.39	0
SV200	2.2918	64529	29	0.20%	0.0046	0.34	0
SV200	2.2918	6453	3	1.57%	0.0360	0.58	0
SV200	2.2918	64553	53	2.84%	0.0651	0.02	0
SV200	2.2918	64555	55	13.14%	0.3011	0.27	0
SV200	2.2918	64575	75	15.10%	0.3461	0.23	0
SV200	2.2918	64576	76	1.47%	0.0337	0.23	0
SV200	2.2918	651203222	AGB	1.18%	0.0270	0.40	0
SV200	2.2918	6512042	AL	5.69%	0.1304	0.40	0
SV200	2.2918	6513244	GM	14.80%	0.3392	0.29	0
SV200	2.2918	651445822	MTB	9.22%	0.2113	0.15	0
SV200	2.2918	651585624	TSC	2.65%	0.0607	0.14	0
SV202	1.4365	645112	112	25.97%	0.3731	0.39	0
SV202	1.4365	64522	22	19.60%	0.2816	0.04	0
SV202	1.4365	64553	53	22.55%	0.3239	0.02	0
SV202	1.4365	64555	55	2.02%	0.0290	0.27	0
SV202	1.4365	64564	64	0.78%	0.0112	0.14	25
SV202	1.4365	64576	76	25.97%	0.3731	0.23	0
SV202	1.4365	64578	78	3.11%	0.0447	0.05	0
SV203	0.0760	645112	112	92.86%	0.0705	0.39	0
SV203	0.0760	64575	75	7.14%	0.0054	0.23	0
SV205	0.5022	645100	100	33.94%	0.1704	0.40	20
SV205	0.5022	645112	112	9.17%	0.0460	0.39	0
SV205	0.5022	64548	48	56.88%	0.2856	0.06	0
SV208	1.0674	645100	100	75.80%	0.8091	0.40	20
SV208	1.0674	645112	112	6.42%	0.0685	0.39	0
SV208	1.0674	6453	3	1.93%	0.0206	0.58	0
SV208	1.0674	64548	48	15.85%	0.1692	0.06	0
SV210	0.7184	645100	100	20.19%	0.1451	0.40	20
SV210	0.7184	645112	112	14.42%	0.1036	0.39	0
SV210	0.7184	6453	3	12.50%	0.0898	0.58	0
SV210	0.7184	64548	48	52.56%	0.3776	0.06	0
SV210	0.7184	64570	70	0.32%	0.0023	0.36	0
SV212	4.1391	645112	112	11.79%	0.4880	0.39	0
SV212	4.1391	645113	113	7.91%	0.3274	0.39	0
SV212	4.1391	645124	124	12.06%	0.4992	0.39	0
SV212	4.1391	64522	22	5.40%	0.2235	0.04	0
SV212	4.1391	64529	29	15.94%	0.6598	0.34	0

APPENDIX D.2.1: Soil Type Summary

Entellus

SHEET _____ OF _____

BY _____ DATE 4/19/2004

CLIENT: FCDMC CHECK _____ DATE _____

JOB: Wittmann Area Drainage Master Study Update JOB NO. 310.032

Areas and percentage area reported to 4 significant digits by WMS. Actual precision of the data is only 2-3 significant digits

Basin ID	Total Basin Area (sq-miles)	Soil Type (WMS)	Soil Type (DDMSW)	Soil Type Area (%)	Soil Type Area (sq-miles)	XKSAT (in/hr)	RTIMP
SV212	4.1391	64553	53	2.24%	0.0927	0.02	0
SV212	4.1391	64555	55	33.46%	1.3849	0.27	0
SV212	4.1391	64570	70	0.98%	0.0406	0.36	0
SV212	4.1391	64576	76	5.08%	0.2103	0.23	0
SV212	4.1391	64577	77	5.13%	0.2123	0.05	0
SV214	1.8700	645112	112	4.62%	0.0864	0.39	0
SV214	1.8700	645113	113	12.03%	0.2250	0.39	0
SV214	1.8700	645124	124	5.83%	0.1090	0.39	0
SV214	1.8700	64522	22	0.73%	0.0137	0.04	0
SV214	1.8700	64529	29	7.17%	0.1341	0.34	0
SV214	1.8700	64550	50	2.07%	0.0387	0.26	0
SV214	1.8700	64553	53	0.85%	0.0159	0.02	0
SV214	1.8700	64555	55	4.25%	0.0795	0.27	0
SV214	1.8700	64570	70	5.59%	0.1045	0.36	0
SV214	1.8700	64575	75	36.57%	0.6838	0.23	0
SV214	1.8700	64576	76	0.73%	0.0137	0.23	0
SV214	1.8700	64577	77	19.56%	0.3658	0.05	0
SV216	1.6268	645112	112	0.29%	0.0047	0.39	0
SV216	1.6268	645113	113	17.12%	0.2785	0.39	0
SV216	1.6268	64529	29	4.85%	0.0789	0.34	0
SV216	1.6268	6453	3	3.00%	0.0488	0.58	0
SV216	1.6268	64548	48	6.56%	0.1067	0.06	0
SV216	1.6268	64550	50	11.98%	0.1949	0.26	0
SV216	1.6268	64553	53	5.56%	0.0905	0.02	0
SV216	1.6268	64564	64	0.14%	0.0023	0.14	25
SV216	1.6268	64575	75	30.24%	0.4920	0.23	0
SV216	1.6268	64576	76	9.70%	0.1578	0.23	0
SV216	1.6268	64577	77	10.56%	0.1718	0.05	0
SV218	1.2862	645113	113	15.23%	0.1959	0.39	0
SV218	1.2862	645124	124	2.57%	0.0331	0.39	0
SV218	1.2862	6452	2	2.02%	0.0260	0.41	0
SV218	1.2862	64522	22	3.67%	0.0472	0.04	0
SV218	1.2862	64550	50	35.05%	0.4508	0.26	0
SV218	1.2862	64553	53	6.61%	0.0850	0.02	0
SV218	1.2862	64575	75	8.44%	0.1086	0.23	0
SV218	1.2862	64576	76	15.41%	0.1982	0.23	0
SV218	1.2862	64577	77	11.01%	0.1416	0.05	0
SV219	0.8972	645113	113	0.25%	0.0022	0.39	0
SV219	0.8972	645124	124	30.73%	0.2757	0.39	0
SV219	0.8972	64522	22	26.20%	0.2351	0.04	0
SV219	0.8972	6453	3	2.27%	0.0204	0.58	0
SV219	0.8972	64553	53	6.55%	0.0588	0.02	0
SV219	0.8972	64575	75	15.37%	0.1379	0.23	0
SV219	0.8972	64576	76	6.30%	0.0565	0.23	0
SV219	0.8972	64577	77	12.34%	0.1107	0.05	0
SV220	0.6004	64522	22	9.09%	0.0546	0.04	0
SV220	0.6004	64553	53	20.08%	0.1206	0.02	0
SV220	0.6004	64555	55	1.89%	0.0113	0.27	0

APPENDIX D.2.1: Soil Type Summary

Entellus

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Areas and percentage area reported to 4 significant digits by WMS. Actual precision of the data is only 2-3 significant digits

Basin ID	Total Basin Area (sq-miles)	Soil Type (WMS)	Soil Type (DDMSW)	Soil Type Area (%)	Soil Type Area (sq-miles)	XKSAT (in/hr)	RTIMP
SV220	0.6004	64570	70	20.08%	0.1206	0.36	0
SV220	0.6004	64576	76	48.86%	0.2933	0.23	0
SV230	0.8513	645100	100	32.28%	0.2748	0.40	20
SV230	0.8513	645112	112	1.84%	0.0157	0.39	0
SV230	0.8513	64548	48	48.56%	0.4134	0.06	0
SV230	0.8513	64549	49	5.51%	0.0469	0.06	0
SV230	0.8513	64570	70	11.81%	0.1005	0.36	0
SV232	3.0569	645100	100	34.98%	1.0693	0.40	20
SV232	3.0569	645112	112	6.37%	0.1947	0.39	0
SV232	3.0569	645124	124	0.37%	0.0113	0.39	0
SV232	3.0569	64529	29	7.19%	0.2198	0.34	0
SV232	3.0569	64548	48	46.74%	1.4288	0.06	0
SV232	3.0569	64549	49	3.37%	0.1030	0.06	0
SV232	3.0569	64570	70	0.97%	0.0297	0.36	0
SV236	0.5856	645112	112	3.11%	0.0182	0.39	0
SV236	0.5856	645113	113	32.68%	0.1914	0.39	0
SV236	0.5856	645124	124	15.56%	0.0911	0.39	0
SV236	0.5856	64529	29	48.64%	0.2848	0.34	0
SV240	3.6651	645100	100	46.15%	1.6914	0.40	20
SV240	3.6651	645124	124	0.18%	0.0066	0.39	0
SV240	3.6651	64529	29	21.57%	0.7906	0.34	0
SV240	3.6651	64548	48	32.10%	1.1765	0.06	0
SV242	0.0939	64529	29	100.00%	0.0939	0.34	0
SV244	0.9461	645100	100	8.53%	0.0807	0.40	20
SV244	0.9461	645115	115	5.69%	0.0538	0.39	0
SV244	0.9461	64529	29	21.33%	0.2018	0.34	0
SV244	0.9461	64548	48	59.72%	0.5650	0.06	0
SV244	0.9461	64549	49	4.74%	0.0448	0.06	0
SV246	0.1567	645113	113	15.00%	0.0235	0.39	0
SV246	0.1567	6453	3	1.67%	0.0026	0.58	0
SV246	0.1567	64548	48	83.33%	0.1306	0.06	0
SV248	1.2718	645100	100	50.89%	0.6472	0.40	20
SV248	1.2718	645113	113	1.43%	0.0182	0.39	0
SV248	1.2718	645115	115	4.11%	0.0523	0.39	0
SV248	1.2718	6453	3	6.43%	0.0818	0.58	0
SV248	1.2718	64548	48	17.50%	0.2226	0.06	0
SV248	1.2718	64549	49	19.64%	0.2498	0.06	0
SV250	0.1213	645113	113	81.13%	0.0984	0.39	0
SV250	0.1213	6453	3	1.89%	0.0023	0.58	0
SV250	0.1213	64548	48	16.98%	0.0206	0.06	0
SV251	0.2675	645113	113	87.27%	0.2334	0.39	0
SV251	0.2675	6453	3	12.73%	0.0341	0.58	0
SV252	0.1473	645113	113	62.50%	0.0921	0.39	0
SV252	0.1473	645124	124	15.62%	0.0230	0.39	0
SV252	0.1473	6453	3	21.88%	0.0322	0.58	0
SV254	0.0971	645113	113	45.95%	0.0446	0.39	0
SV254	0.0971	645124	124	40.54%	0.0394	0.39	0
SV254	0.0971	6453	3	13.51%	0.0131	0.58	0

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Areas and percentage area reported to 4 significant digits by WMS. Actual precision of the data is only 2-3 significant digits

Basin ID	Total Basin Area (sq-miles)	Soil Type (WMS)	Soil Type (DDMSW)	Soil Type Area (%)	Soil Type Area (sq-miles)	XKSAT (in/hr)	RTIMP
SV256	0.0604	645113	113	4.76%	0.0029	0.39	0
SV256	0.0604	6453	3	95.24%	0.0576	0.58	0
SV258	0.7359	645100	100	31.82%	0.2342	0.40	20
SV258	0.7359	6453	3	8.79%	0.0647	0.58	0
SV258	0.7359	64548	48	48.18%	0.3546	0.06	0
SV258	0.7359	64549	49	11.21%	0.0825	0.06	0
SV260	1.2629	645112	112	14.57%	0.1840	0.39	0
SV260	1.2629	64522	22	10.07%	0.1272	0.04	0
SV260	1.2629	64553	53	19.24%	0.2430	0.02	0
SV260	1.2629	64570	70	19.60%	0.2475	0.36	0
SV260	1.2629	64576	76	36.51%	0.4611	0.23	0
SV264	1.9190	645112	112	18.60%	0.3569	0.39	0
SV264	1.9190	64522	22	20.14%	0.3865	0.04	0
SV264	1.9190	64553	53	31.64%	0.6072	0.02	0
SV264	1.9190	64576	76	29.62%	0.5684	0.23	0
SV264A	2.8970	645112	112	33.67%	0.9754	0.39	0
SV264A	2.8970	64522	22	11.17%	0.3236	0.04	0
SV264A	2.8970	64553	53	37.73%	1.0930	0.02	0
SV264A	2.8970	64576	76	17.42%	0.5047	0.23	0
SV268	1.3755	64522	22	45.17%	0.6213	0.04	0
SV268	1.3755	64553	53	30.44%	0.4187	0.02	0
SV268	1.3755	64576	76	24.39%	0.3355	0.23	0
SV272	1.2010	645112	112	44.94%	0.5397	0.39	0
SV272	1.2010	64522	22	21.91%	0.2631	0.04	0
SV272	1.2010	64553	53	21.35%	0.2564	0.02	0
SV272	1.2010	64570	70	9.18%	0.1102	0.36	0
SV272	1.2010	64576	76	2.62%	0.0315	0.23	0
SV276	0.9233	645112	112	19.46%	0.1797	0.39	0
SV276	0.9233	645113	113	2.43%	0.0224	0.39	0
SV276	0.9233	64522	22	39.90%	0.3684	0.04	0
SV276	0.9233	64553	53	18.73%	0.1729	0.02	0
SV276	0.9233	64570	70	19.46%	0.1797	0.36	0
SV280	1.0563	645112	112	0.42%	0.0044	0.39	0
SV280	1.0563	645113	113	10.40%	0.1099	0.39	0
SV280	1.0563	64522	22	47.77%	0.5046	0.04	0
SV280	1.0563	64553	53	25.05%	0.2646	0.02	0
SV280	1.0563	64570	70	10.83%	0.1144	0.36	0
SV280	1.0563	64576	76	5.52%	0.0583	0.23	0
SV284	0.2834	645112	112	38.02%	0.1077	0.39	0
SV284	0.2834	64522	22	29.75%	0.0843	0.04	0
SV284	0.2834	64553	53	32.23%	0.0913	0.02	0
SV286	1.5380	645112	112	40.71%	0.6261	0.39	0
SV286	1.5380	64522	22	0.88%	0.0135	0.04	0
SV286	1.5380	64553	53	40.56%	0.6238	0.02	0
SV286	1.5380	64576	76	16.08%	0.2473	0.23	0
SV286	1.5380	64580	80	1.77%	0.0272	0.08	0
SV290	0.8137	645112	112	63.81%	0.5192	0.39	0
SV290	0.8137	64522	22	6.91%	0.0562	0.04	0

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Basin ID	Total Basin Area (sq-miles)	Soil Type (WMS)	Soil Type (DDMSW)	Soil Type Area (%)	Soil Type Area (sq-miles)	XKSAT (in/hr)	RTIMP
SV290	0.8137	64553	53	29.28%	0.2383	0.02	0
SV294	2.6465	645110	110	6.04%	0.1598	0.13	0
SV294	2.6465	645112	112	16.75%	0.4433	0.39	0
SV294	2.6465	64522	22	26.36%	0.6976	0.04	0
SV294	2.6465	64546	46	6.29%	0.1665	0.03	0
SV294	2.6465	64553	53	33.50%	0.8866	0.02	0
SV294	2.6465	64570	70	0.09%	0.0024	0.36	0
SV294	2.6465	64576	76	6.72%	0.1778	0.23	0
SV294	2.6465	64578	78	4.25%	0.1125	0.05	0
SV298	1.0753	645112	112	24.46%	0.2630	0.39	0
SV298	1.0753	645113	113	0.86%	0.0092	0.39	0
SV298	1.0753	64522	22	40.56%	0.4361	0.04	0
SV298	1.0753	64553	53	28.76%	0.3093	0.02	0
SV298	1.0753	64576	76	5.36%	0.0576	0.23	0
TW400	4.2709	651323320	GgA	3.27%	0.1397	0.25	0
TW400	4.2709	6513244	GM	39.98%	1.7075	0.29	0
TW400	4.2709	651445822	MTB	54.48%	2.3268	0.15	0
TW400	4.2709	651585522	TrB	1.27%	0.0542	0.13	0
TW400	4.2709	651585624	TSC	1.00%	0.0427	0.14	0
TW402	4.9144	651203222	AGB	9.03%	0.4438	0.40	0
TW402	4.9144	6512042	AL	12.01%	0.5902	0.40	0
TW402	4.9144	651285026	EPD	1.88%	0.0924	0.12	0
TW402	4.9144	651323320	GgA	2.71%	0.1332	0.25	0
TW402	4.9144	6513244	GM	17.15%	0.8428	0.29	0
TW402	4.9144	651326722	GxB	0.05%	0.0025	0.24	0
TW402	4.9144	651422520	LcA	0.18%	0.0088	0.25	0
TW402	4.9144	6514455	Mr	0.46%	0.0226	0.05	0
TW402	4.9144	651445822	MTB	34.07%	1.6743	0.15	0
TW402	4.9144	651505422	PRB	4.59%	0.2256	0.28	0
TW402	4.9144	651585522	TrB	5.23%	0.2570	0.13	0
TW402	4.9144	651585624	TSC	11.00%	0.5406	0.14	0
TW402	4.9144	6516229	Ve	0.50%	0.0246	0.25	0
TW402	4.9144	6516255	Vr	1.15%	0.0565	0.63	0
TW404	2.0927	651202720	AdA	0.98%	0.0205	0.40	0
TW404	2.0927	6512029	Ae	1.53%	0.0320	0.39	0
TW404	2.0927	651203222	AGB	12.01%	0.2513	0.40	0
TW404	2.0927	6512042	AL	40.72%	0.8522	0.40	0
TW404	2.0927	6512257	Bs	0.22%	0.0046	0.39	0
TW404	2.0927	6512448	CO	0.98%	0.0205	0.29	20
TW404	2.0927	6512451	Cp	0.98%	0.0205	0.40	0
TW404	2.0927	6512457	Cs	1.09%	0.0228	0.19	0
TW404	2.0927	651285026	EPD	2.51%	0.0525	0.12	0
TW404	2.0927	651323320	GgA	8.62%	0.1804	0.25	0
TW404	2.0927	6514451	Mp	2.95%	0.0617	0.25	0
TW404	2.0927	6514455	Mr	3.82%	0.0799	0.05	0
TW404	2.0927	651445822	MTB	6.99%	0.1463	0.15	0
TW404	2.0927	6515833	Tg	1.86%	0.0389	0.04	0
TW404	2.0927	651585520	TrA	0.76%	0.0159	0.11	0

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Basin ID	Total Basin Area (sq-miles)	Soil Type (WMS)	Soil Type (DDMSW)	Soil Type Area (%)	Soil Type Area (sq-miles)	XKSAT (in/hr)	RTIMP
TW404	2.0927	651585522	TrB	0.66%	0.0138	0.13	0
TW404	2.0927	6516229	Ve	8.52%	0.1783	0.25	0
TW404	2.0927	6516231	Vf	4.80%	0.1005	0.01	0
TW406	0.1633	651203222	AGB	2.90%	0.0047	0.40	0
TW406	0.1633	6512448	CO	36.23%	0.0591	0.29	20
TW406	0.1633	651285026	EPD	60.87%	0.0994	0.12	0
TW408	0.9101	645100	100	73.72%	0.6709	0.40	20
TW408	0.9101	6512448	CO	9.69%	0.0882	0.29	20
TW408	0.9101	651285026	EPD	11.73%	0.1068	0.12	0
TW408	0.9101	6515456	RS	4.85%	0.0441	0.40	65
TW410	0.3080	651203222	AGB	9.85%	0.0303	0.40	0
TW410	0.3080	6512042	AL	28.79%	0.0887	0.40	0
TW410	0.3080	6513244	GM	61.36%	0.1890	0.29	0
TW412	2.0637	645112	112	8.35%	0.1723	0.39	0
TW412	2.0637	64522	22	0.22%	0.0045	0.04	0
TW412	2.0637	64553	53	3.47%	0.0716	0.02	0
TW412	2.0637	6513244	GM	14.53%	0.2999	0.29	0
TW412	2.0637	651445822	MTB	30.04%	0.6199	0.15	0
TW412	2.0637	651585624	TSC	43.38%	0.8952	0.14	0
TW414	1.1684	6451	1	1.55%	0.0181	0.41	0
TW414	1.1684	645100	100	24.85%	0.2904	0.40	20
TW414	1.1684	645112	112	4.27%	0.0499	0.39	0
TW414	1.1684	645115	115	8.74%	0.1021	0.39	0
TW414	1.1684	6453	3	3.88%	0.0453	0.58	0
TW414	1.1684	64548	48	35.34%	0.4129	0.06	0
TW414	1.1684	651203222	AGB	13.20%	0.1542	0.40	0
TW414	1.1684	6512042	AL	1.17%	0.0137	0.40	0
TW414	1.1684	651285026	EPD	5.83%	0.0681	0.12	0
TW414	1.1684	6515456	RS	1.17%	0.0137	0.40	65
TW416	0.5883	645112	112	53.52%	0.3149	0.39	0
TW416	0.5883	645113	113	2.34%	0.0138	0.39	0
TW416	0.5883	64522	22	1.17%	0.0069	0.04	0
TW416	0.5883	64553	53	22.27%	0.1310	0.02	0
TW416	0.5883	64598	98	1.56%	0.0092	0.37	0
TW416	0.5883	6513244	GM	0.78%	0.0046	0.29	0
TW416	0.5883	651445822	MTB	18.36%	0.1080	0.15	0
TW418	1.3681	645112	112	19.21%	0.2628	0.39	0
TW418	1.3681	645113	113	4.43%	0.0606	0.39	0
TW418	1.3681	6452	2	0.16%	0.0022	0.41	0
TW418	1.3681	64522	22	8.70%	0.1190	0.04	0
TW418	1.3681	64553	53	8.21%	0.1123	0.02	0
TW418	1.3681	64557	57	7.06%	0.0966	0.06	0
TW418	1.3681	64580	80	36.45%	0.4987	0.08	0
TW418	1.3681	6513244	GM	12.81%	0.1753	0.29	0
TW418	1.3681	651445822	MTB	2.96%	0.0405	0.15	0
TW420	0.8077	645112	112	53.80%	0.4346	0.39	0
TW420	0.8077	64522	22	3.94%	0.0318	0.04	0
TW420	0.8077	64553	53	18.03%	0.1456	0.02	0

APPENDIX D.2.1: Soil Type Summary

Entellus

CLIENT: FCDMC

JOB: Wittmann Area Drainage Master Study Update

SHEET _____ OF _____

BY _____ DATE 4/19/2004

CHECK _____ DATE _____

JOB NO. 310.032

Areas and percentage area reported to 4 significant digits by WMS. Actual precision of the data is only 2-3 significant digits

Basin ID	Total Basin Area (sq-miles)	Soil Type (WMS)	Soil Type (DDMSW)	Soil Type Area (%)	Soil Type Area (sq-miles)	XKSAT (in/hr)	RTIMP
TW420	0.8077	6513244	GM	7.61%	0.0615	0.29	0
TW420	0.8077	651445822	MTB	14.65%	0.1183	0.15	0
TW420	0.8077	651585624	TSC	1.97%	0.0159	0.14	0
TW422	0.7032	64580	80	0.33%	0.0023	0.08	0
TW422	0.7032	6513244	GM	30.62%	0.2153	0.29	0
TW422	0.7032	651445822	MTB	69.06%	0.4856	0.15	0
TW424	1.4967	64555	55	9.50%	0.1422	0.27	0
TW424	1.4967	64558	58	2.02%	0.0302	0.34	0
TW424	1.4967	64564	64	0.31%	0.0046	0.14	25
TW424	1.4967	64575	75	2.34%	0.0350	0.23	0
TW424	1.4967	64577	77	23.52%	0.3520	0.05	0
TW424	1.4967	64580	80	29.75%	0.4453	0.08	0
TW424	1.4967	6513244	GM	4.52%	0.0676	0.29	0
TW424	1.4967	651445822	MTB	28.04%	0.4197	0.15	0
TW429	0.5553	645112	112	9.05%	0.0503	0.39	0
TW429	0.5553	645113	113	7.00%	0.0389	0.39	0
TW429	0.5553	64522	22	41.98%	0.2331	0.04	0
TW429	0.5553	64553	53	10.70%	0.0594	0.02	0
TW429	0.5553	64578	78	9.47%	0.0526	0.05	0
TW429	0.5553	64580	80	21.81%	0.1211	0.08	0
TW430	2.4917	645112	112	26.76%	0.6668	0.39	0
TW430	2.4917	645113	113	1.99%	0.0496	0.39	0
TW430	2.4917	6452	2	2.98%	0.0743	0.41	0
TW430	2.4917	64553	53	2.89%	0.0720	0.02	0
TW430	2.4917	64555	55	8.23%	0.2051	0.27	0
TW430	2.4917	64557	57	2.53%	0.0630	0.06	0
TW430	2.4917	64577	77	23.15%	0.5768	0.05	0
TW430	2.4917	64578	78	2.08%	0.0518	0.05	0
TW430	2.4917	64580	80	29.39%	0.7323	0.08	0
TW431	0.8733	645112	112	11.17%	0.0975	0.39	0
TW431	0.8733	645113	113	2.34%	0.0204	0.39	0
TW431	0.8733	64553	53	0.52%	0.0045	0.02	0
TW431	0.8733	64577	77	38.18%	0.3334	0.05	0
TW431	0.8733	64580	80	47.79%	0.4173	0.08	0
TW432	0.8620	645113	113	16.71%	0.1440	0.39	0
TW432	0.8620	64544	44	12.01%	0.1035	0.03	0
TW432	0.8620	64577	77	4.44%	0.0383	0.05	0
TW432	0.8620	64580	80	8.09%	0.0697	0.08	0
TW432	0.8620	64598	98	58.75%	0.5064	0.37	0
TW434	0.5691	645112	112	22.97%	0.1307	0.39	0
TW434	0.5691	645113	113	35.59%	0.2025	0.39	0
TW434	0.5691	64522	22	23.42%	0.1333	0.04	0
TW434	0.5691	64555	55	2.70%	0.0154	0.27	0
TW434	0.5691	64577	77	15.32%	0.0872	0.05	0
TW436	0.6744	645112	112	19.59%	0.1321	0.39	0
TW436	0.6744	645113	113	10.31%	0.0695	0.39	0
TW436	0.6744	64555	55	3.78%	0.0255	0.27	0
TW436	0.6744	64577	77	65.98%	0.4450	0.05	0

APPENDIX D.2.1: Soil Type Summary

Entellus

SHEET _____ OF _____

BY _____ DATE 4/19/2004

CLIENT: FCDMC CHECK _____ DATE _____

JOB: Wittmann Area Drainage Master Study Update JOB NO. 310.032

Areas and percentage area reported to 4 significant digits by WMS. Actual precision of the data is only 2-3 significant digits

Basin ID	Total Basin Area (sq-miles)	Soil Type (WMS)	Soil Type (DDMSW)	Soil Type Area (%)	Soil Type Area (sq-miles)	XKSAT (in/hr)	RTIMP
TW436	0.6744	64580	80	0.34%	0.0023	0.08	0
TW440	0.1083	645113	113	60.00%	0.0650	0.39	0
TW440	0.1083	64522	22	37.78%	0.0409	0.04	0
TW440	0.1083	64544	44	2.22%	0.0024	0.03	0
TW442	0.3766	645113	113	1.94%	0.0073	0.39	0
TW442	0.3766	64522	22	46.45%	0.1749	0.04	0
TW442	0.3766	64544	44	9.68%	0.0365	0.03	0
TW442	0.3766	64577	77	1.29%	0.0049	0.05	0
TW442	0.3766	64598	98	40.65%	0.1531	0.37	0
TW444	0.3468	645113	113	8.03%	0.0278	0.39	0
TW444	0.3468	64544	44	41.61%	0.1443	0.03	0
TW444	0.3468	64598	98	50.36%	0.1746	0.37	0
TW446	0.3542	645113	113	1.39%	0.0049	0.39	0
TW446	0.3542	64544	44	95.83%	0.3394	0.03	0
TW446	0.3542	64598	98	2.78%	0.0098	0.37	0
TW446A	0.3372	64544	44	61.74%	0.2082	0.03	0
TW446A	0.3372	64573	73	38.26%	0.1290	0.09	30
TW448	0.3469	64544	44	95.27%	0.3305	0.03	0
TW448	0.3469	64573	73	4.73%	0.0164	0.09	30
TW450	1.2535	6453	3	2.74%	0.0343	0.58	0
TW450	1.2535	64544	44	62.71%	0.7861	0.03	0
TW450	1.2535	64545	45	21.57%	0.2704	0.03	0
TW450	1.2535	64573	73	6.40%	0.0802	0.09	30
TW450	1.2535	64598	98	6.58%	0.0825	0.37	0
TW450A	0.8811	645110	110	1.81%	0.0159	0.13	0
TW450A	0.8811	64538	38	17.05%	0.1502	0.13	0
TW450A	0.8811	64539	39	19.38%	0.1708	0.29	0
TW450A	0.8811	64545	45	53.49%	0.4713	0.03	0
TW450A	0.8811	64548	48	6.46%	0.0569	0.06	0
TW450A	0.8811	64568	68	1.81%	0.0159	0.63	0
TW450B	0.4043	645110	110	0.56%	0.0023	0.13	0
TW450B	0.4043	645113	113	9.50%	0.0384	0.39	0
TW450B	0.4043	6453	3	8.38%	0.0339	0.58	0
TW450B	0.4043	64544	44	23.46%	0.0948	0.03	0
TW450B	0.4043	64545	45	54.19%	0.2191	0.03	0
TW450B	0.4043	64548	48	3.91%	0.0158	0.06	0
TW452	0.4617	645113	113	6.40%	0.0295	0.39	0
TW452	0.4617	64544	44	92.61%	0.4276	0.03	0
TW452	0.4617	64598	98	0.99%	0.0046	0.37	0
TW452A	1.0764	645110	110	2.97%	0.0320	0.13	0
TW452A	1.0764	64538	38	43.22%	0.4652	0.13	0
TW452A	1.0764	64543	43	2.12%	0.0228	0.17	0
TW452A	1.0764	64545	45	45.97%	0.4948	0.03	0
TW452A	1.0764	64568	68	5.72%	0.0616	0.63	0
TW452B	1.0314	645110	110	6.74%	0.0695	0.13	0
TW452B	1.0314	64544	44	13.91%	0.1435	0.03	0
TW452B	1.0314	64545	45	46.09%	0.4754	0.03	0
TW452B	1.0314	64598	98	33.26%	0.3430	0.37	0

APPENDIX D.2.1: Soil Type Summary

Entellus

SHEET _____ OF _____

BY _____ DATE 4/19/2004

CLIENT: FCDMC CHECK _____ DATE _____

JOB: Wittmann Area Drainage Master Study Update JOB NO. 310.032

Areas and percentage area reported to 4 significant digits by WMS. Actual precision of the data is only 2-3 significant digits

Basin ID	Total Basin Area (sq-miles)	Soil Type (WMS)	Soil Type (DDMSW)	Soil Type Area (%)	Soil Type Area (sq-miles)	XKSAT (in/hr)	RTIMP
TW454	0.3557	645110	110	15.17%	0.0540	0.13	0
TW454	0.3557	64544	44	4.14%	0.0147	0.03	0
TW454	0.3557	64545	45	13.10%	0.0466	0.03	0
TW454	0.3557	64598	98	67.59%	0.2404	0.37	0
TW456	0.1764	64574	74	59.15%	0.1043	0.08	0
TW456	0.1764	64598	98	40.85%	0.0720	0.37	0
TW458	0.6697	645110	110	0.34%	0.0023	0.13	0
TW458	0.6697	64545	45	73.06%	0.4893	0.03	0
TW458	0.6697	64574	74	13.13%	0.0879	0.08	0
TW458	0.6697	64598	98	13.47%	0.0902	0.37	0
TW459	1.0450	64538	38	14.29%	0.1493	0.13	0
TW459	1.0450	64539	39	35.06%	0.3664	0.29	0
TW459	1.0450	64543	43	24.68%	0.2579	0.17	0
TW459	1.0450	64544	44	9.31%	0.0973	0.03	0
TW459	1.0450	64545	45	10.82%	0.1131	0.03	0
TW459	1.0450	64548	48	0.22%	0.0023	0.06	0
TW459	1.0450	64568	68	5.63%	0.0588	0.63	0
TW460	2.3156	645121	121	3.87%	0.0896	0.12	0
TW460	2.3156	64538	38	16.92%	0.3918	0.13	0
TW460	2.3156	64542	42	15.47%	0.3582	0.17	0
TW460	2.3156	64543	43	18.67%	0.4323	0.17	0
TW460	2.3156	64545	45	1.64%	0.0380	0.03	0
TW460	2.3156	64562	62	18.86%	0.4367	0.15	0
TW460	2.3156	64563	63	15.47%	0.3582	0.14	25
TW460	2.3156	64568	68	0.19%	0.0044	0.63	0
TW460	2.3156	64574	74	1.55%	0.0359	0.08	0
TW460	2.3156	64594	94	5.03%	0.1165	0.33	0
TW460	2.3156	64598	98	2.32%	0.0537	0.37	0
TW462	0.0799	6453	3	8.00%	0.0064	0.58	0
TW462	0.0799	64544	44	92.00%	0.0735	0.03	0
TW478	0.2625	645112	112	15.04%	0.0395	0.39	0
TW478	0.2625	64575	75	38.94%	0.1022	0.23	0
TW478	0.2625	64577	77	44.25%	0.1162	0.05	0
TW478	0.2625	64580	80	1.77%	0.0046	0.08	0
TW480	0.7539	645112	112	9.79%	0.0738	0.39	0
TW480	0.7539	645113	113	0.92%	0.0069	0.39	0
TW480	0.7539	64575	75	24.46%	0.1844	0.23	0
TW480	0.7539	64577	77	63.91%	0.4818	0.05	0
TW480	0.7539	64580	80	0.92%	0.0069	0.08	0
TW482	0.7565	645113	113	7.58%	0.0573	0.39	0
TW482	0.7565	64575	75	84.24%	0.6373	0.23	0
TW482	0.7565	64577	77	8.18%	0.0619	0.05	0
TW484	0.3477	645113	113	60.69%	0.2110	0.39	0
TW484	0.3477	64544	44	29.66%	0.1031	0.03	0
TW484	0.3477	64577	77	9.66%	0.0336	0.05	0
TW485	2.3729	645113	113	56.19%	1.3333	0.39	0
TW485	2.3729	64544	44	22.00%	0.5220	0.03	0
TW485	2.3729	64574	74	16.81%	0.3989	0.08	0

APPENDIX D.2.1: Soil Type Summary

Entellus

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BY _____ DATE 4/19/2004

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JOB: Wittmann Area Drainage Master Study Update JOB NO. 310.032

Areas and percentage area reported to 4 significant digits by WMS. Actual precision of the data is only 2-3 significant digits

Basin ID	Total Basin Area (sq-miles)	Soil Type (WMS)	Soil Type (DDMSW)	Soil Type Area (%)	Soil Type Area (sq-miles)	XKSAT (in/hr)	RTIMP
TW485	2.3729	64575	75	1.98%	0.0470	0.23	0
TW485	2.3729	64577	77	1.98%	0.0470	0.05	0
TW485	2.3729	64598	98	1.04%	0.0247	0.37	0
WI510	1.2274	6513244	GM	18.76%	0.2303	0.29	0
WI510	1.2274	651445822	MTB	55.74%	0.6842	0.15	0
WI510	1.2274	651585624	TSC	25.50%	0.3130	0.14	0
WI510A	1.1294	645115	115	8.43%	0.0952	0.39	0
WI510A	1.1294	64522	22	0.20%	0.0023	0.04	0
WI510A	1.1294	64555	55	6.22%	0.0702	0.27	0
WI510A	1.1294	64558	58	40.36%	0.4558	0.34	0
WI510A	1.1294	64560	60	6.02%	0.0680	0.26	0
WI510A	1.1294	64580	80	2.81%	0.0317	0.08	0
WI510A	1.1294	6513244	GM	22.49%	0.2540	0.29	0
WI510A	1.1294	651445822	MTB	13.45%	0.1519	0.15	0
WI538	1.4302	64529	29	0.47%	0.0067	0.34	0
WI538	1.4302	6453	3	3.15%	0.0451	0.58	0
WI538	1.4302	64544	44	35.96%	0.5143	0.03	0
WI538	1.4302	64545	45	32.02%	0.4580	0.03	0
WI538	1.4302	64558	58	3.63%	0.0519	0.34	0
WI538	1.4302	64574	74	0.16%	0.0023	0.08	0
WI538	1.4302	64598	98	24.61%	0.3520	0.37	0
WI538A	0.7764	645108	108	5.57%	0.0432	0.31	30
WI538A	0.7764	64544	44	9.09%	0.0706	0.03	0
WI538A	0.7764	64545	45	9.68%	0.0752	0.03	0
WI538A	0.7764	64563	63	7.04%	0.0547	0.14	25
WI538A	0.7764	64574	74	68.33%	0.5305	0.08	0
WI538A	0.7764	64598	98	0.29%	0.0023	0.37	0
WI560	3.5624	645110	110	15.77%	0.5618	0.13	0
WI560	3.5624	645113	113	13.66%	0.4866	0.39	0
WI560	3.5624	645115	115	3.60%	0.1282	0.39	0
WI560	3.5624	64548	48	15.27%	0.5440	0.06	0
WI560	3.5624	64555	55	1.74%	0.0620	0.27	0
WI560	3.5624	64558	58	3.17%	0.1129	0.34	0
WI560	3.5624	64575	75	11.67%	0.4157	0.23	0
WI560	3.5624	64577	77	1.30%	0.0463	0.05	0
WI560	3.5624	64598	98	33.83%	1.2052	0.37	0
WI560A	2.0440	645110	110	0.11%	0.0022	0.13	0
WI560A	2.0440	645113	113	15.41%	0.3150	0.39	0
WI560A	2.0440	645115	115	1.64%	0.0335	0.39	0
WI560A	2.0440	645121	121	4.92%	0.1006	0.12	0
WI560A	2.0440	64533	33	12.68%	0.2592	0.23	0
WI560A	2.0440	64547	47	2.84%	0.0580	0.11	0
WI560A	2.0440	64548	48	10.16%	0.2077	0.06	0
WI560A	2.0440	64562	62	9.07%	0.1854	0.15	0
WI560A	2.0440	64563	63	5.14%	0.1051	0.14	25
WI560A	2.0440	64564	64	21.97%	0.4491	0.14	25
WI560A	2.0440	64574	74	5.36%	0.1096	0.08	0
WI560A	2.0440	64575	75	6.12%	0.1251	0.23	0

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Areas and percentage area reported to 4 significant digits by WMS. Actual precision of the data is only 2-3 significant digits

Basin ID	Total Basin Area (sq-miles)	Soil Type (WMS)	Soil Type (DDMSW)	Soil Type Area (%)	Soil Type Area (sq-miles)	XKSAT (in/hr)	RTIMP
WI560A	2.0440	64597	97	4.59%	0.0938	0.07	0
WI576	1.1801	645113	113	5.90%	0.0696	0.39	0
WI576	1.1801	64574	74	0.76%	0.0090	0.08	0
WI576	1.1801	64575	75	59.05%	0.6968	0.23	0
WI576	1.1801	64598	98	34.29%	0.4047	0.37	0
WI576A	1.2238	645112	112	2.04%	0.0250	0.39	0
WI576A	1.2238	645115	115	2.23%	0.0273	0.39	0
WI576A	1.2238	645121	121	7.06%	0.0864	0.12	0
WI576A	1.2238	64538	38	13.94%	0.1706	0.13	0
WI576A	1.2238	64542	42	30.86%	0.3777	0.17	0
WI576A	1.2238	64562	62	12.83%	0.1570	0.15	0
WI576A	1.2238	64563	63	6.32%	0.0773	0.14	25
WI576A	1.2238	64564	64	0.74%	0.0091	0.14	25
WI576A	1.2238	64574	74	15.80%	0.1934	0.08	0
WI576A	1.2238	64594	94	3.16%	0.0387	0.33	0
WI576A	1.2238	64598	98	5.02%	0.0614	0.37	0
WI576B	0.4631	645115	115	31.00%	0.1436	0.39	0
WI576B	0.4631	64574	74	50.50%	0.2339	0.08	0
WI576B	0.4631	64598	98	18.50%	0.0857	0.37	0
WI578	0.4841	645121	121	17.65%	0.0854	0.12	0
WI578	0.4841	64548	48	21.08%	0.1020	0.06	0
WI578	0.4841	64574	74	30.88%	0.1495	0.08	0
WI578	0.4841	64598	98	30.39%	0.1471	0.37	0
WI580	1.3195	645110	110	8.38%	0.1106	0.13	0
WI580	1.3195	645113	113	1.20%	0.0158	0.39	0
WI580	1.3195	64574	74	22.05%	0.2909	0.08	0
WI580	1.3195	64575	75	17.78%	0.2346	0.23	0
WI580	1.3195	64598	98	50.60%	0.6677	0.37	0
WI580A	2.7850	645110	110	1.05%	0.0292	0.13	0
WI580A	2.7850	645112	112	5.03%	0.1401	0.39	0
WI580A	2.7850	645121	121	19.79%	0.5512	0.12	0
WI580A	2.7850	64533	33	1.54%	0.0429	0.23	0
WI580A	2.7850	64538	38	0.97%	0.0270	0.13	0
WI580A	2.7850	64542	42	2.51%	0.0699	0.17	0
WI580A	2.7850	64545	45	2.19%	0.0610	0.03	0
WI580A	2.7850	64562	62	15.09%	0.4203	0.15	0
WI580A	2.7850	64563	63	17.84%	0.4968	0.14	25
WI580A	2.7850	64564	64	0.32%	0.0089	0.14	25
WI580A	2.7850	64574	74	16.46%	0.4584	0.08	0
WI580A	2.7850	64594	94	1.62%	0.0451	0.33	0
WI580A	2.7850	64597	97	8.43%	0.2348	0.07	0
WI580A	2.7850	64598	98	7.14%	0.1988	0.37	0
WI580B	0.6285	645121	121	20.66%	0.1298	0.12	0
WI580B	0.6285	64533	33	31.73%	0.1994	0.23	0
WI580B	0.6285	64562	62	9.59%	0.0603	0.15	0
WI580B	0.6285	64563	63	28.41%	0.1786	0.14	25
WI580B	0.6285	64564	64	7.75%	0.0487	0.14	25
WI580B	0.6285	64574	74	1.85%	0.0116	0.08	0

APPENDIX D.2.1: Soil Type Summary

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SHEET _____ OF _____

BY _____ DATE 4/19/2004

CLIENT: FCDMC CHECK _____ DATE _____

JOB: Wittmann Area Drainage Master Study Update JOB NO. 310.032

Areas and percentage area reported to 4 significant digits by WMS. Actual precision of the data is only 2-3 significant digits

Basin ID	Total Basin Area (sq-miles)	Soil Type (WMS)	Soil Type (DDMSW)	Soil Type Area (%)	Soil Type Area (sq-miles)	XKSAT (in/hr)	RTIMP
WT150	1.0865	64510	10	2.93%	0.0318	0.94	0
WT150	1.0865	645100	100	78.45%	0.8524	0.40	20
WT150	1.0865	64548	48	14.85%	0.1613	0.06	0
WT150	1.0865	651285026	EPD	1.26%	0.0137	0.12	0
WT150	1.0865	6515822	TB	2.51%	0.0273	0.40	0
WT150A	4.7510	645100	100	100.00%	4.7510	0.40	20

Appendix D.2.2

Entellus

SHEET _____ OF _____

BY _____ DATE _____

CLIENT: FCDMC CHECK _____ DATE _____

JOB: Wittmann Area Drainage Master Study Update JOB NO. 310.032

Existing Land Use Summary by Basin

Basin ID	Area (sqmiles)	WMS Land Use Code	Mag Land Use Code	IA (in) Initial Abstractions	RTIMP	% Vegetation	Land Use Definition
AF800	0.51	570	IND-4	0.15	80	25	Other Employment - low (Proving grounds and land fills)
AF800	0.19	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
AF800	0.00	740	WTR	0.00	0	0	Water
AF802	0.37	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
AF802	0.01	740	WTR	0.00	0	0	Water
AF803	1.94	150	SLR	0.25	35	50	Small Lot Residential - Single Family (4-6 du per acre)
AF803	0.09	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
AF803	0.74	760	OPEN-5	0.25	0	0	Graded Land
AF805	0.45	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
AF805	0.15	760	OPEN-5	0.25	0	0	Graded Land
AF807	0.00	150	SLR	0.25	35	50	Small Lot Residential - Single Family (4-6 du per acre)
AF807	0.40	750	AGR	0.50	0	85	Agriculture
AF807	0.52	760	OPEN-5	0.25	0	0	Graded Land
AF810	0.25	320	IND-3	0.15	55	60	Industrial
AF810	1.84	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
AF810	0.02	760	OPEN-5	0.25	0	0	Graded Land
AF820	0.69	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
AF830	0.23	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
AF850	0.01	150	SLR	0.25	35	50	Small Lot Residential - Single Family (4-6 du per acre)
AF850	0.01	160	VSLR	0.25	40	50	Very Small Lot Residential - Single Family (>6 du per acre-includes mobile home
AF850	0.00	190	VHDR	0.25	85	50	Very High Density Residential - Multi Family (> 15 du per acre)
AF850	0.03	300	IND-1	0.15	55	60	General Industrial (Industrial where no detail available)
AF850	0.01	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
AF852	0.07	150	SLR	0.25	35	50	Small Lot Residential - Single Family (4-6 du per acre)
AF852	0.04	300	IND-1	0.15	55	60	General Industrial (Industrial where no detail available)
AF854	0.16	150	SLR	0.25	35	50	Small Lot Residential - Single Family (4-6 du per acre)
AF854	0.11	300	IND-1	0.15	55	60	General Industrial (Industrial where no detail available)
AF860	0.08	300	IND-1	0.15	55	60	General Industrial (Industrial where no detail available)
AF860	0.05	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
AF862	0.06	300	IND-1	0.15	55	60	General Industrial (Industrial where no detail available)
AF862	0.10	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
AF864	0.05	300	IND-1	0.15	55	60	General Industrial (Industrial where no detail available)
AF866	0.23	150	SLR	0.25	35	50	Small Lot Residential - Single Family (4-6 du per acre)
AF866	0.20	300	IND-1	0.15	55	60	General Industrial (Industrial where no detail available)
IW300	0.20	120	LDR-1	0.30	10	30	Estate Residential (1/5 du per acre to 1 du per acre)
IW300	1.22	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW300	0.04	740	WTR	0.00	0	0	Water
IW302	0.20	620	INS-5	0.15	55	60	Airports (Includes public use airports)

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SHEET _____ OF _____

BY _____ DATE _____

CLIENT: FCDMC CHECK _____ DATE _____

JOB: Wittmann Area Drainage Master Study Update JOB NO. 310.032

Existing Land Use Summary by Basin

Basin ID	Area (sqmiles)	WMS Land Use Code	Mag Land Use Code	IA (in) Initial Abstractions	RTIMP	% Vegetation	Land Use Definition
IW302	1.09	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW302	0.02	740	WTR	0.00	0	0	Water
IW310	0.33	120	LDR-1	0.30	10	30	Estate Residential (1/5 du per acre to 1 du per acre)
IW310	0.00	130	LDR-2	0.30	15	50	Large Lot Residential - Single Family (1 du per acre to 2 du per acre)
IW310	0.82	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW310	0.02	740	WTR	0.00	0	0	Water
IW312	0.02	600	FWY-1	0.30	20	30	General Transportation (Transportation where no detail available)
IW312	0.01	610	FWY-2	0.10	80	30	Transportation (Includes railroads, railyards, transit centers and freeways)
IW312	0.53	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW314	0.09	120	LDR-1	0.30	10	30	Estate Residential (1/5 du per acre to 1 du per acre)
IW314	0.01	130	LDR-2	0.30	15	50	Large Lot Residential - Single Family (1 du per acre to 2 du per acre)
IW314	2.05	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW314	0.01	740	WTR	0.00	0	0	Water
IW318	0.13	130	LDR-2	0.30	15	50	Large Lot Residential - Single Family (1 du per acre to 2 du per acre)
IW318	0.43	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW322	1.87	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW326	0.32	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW330	1.03	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW334	0.10	120	LDR-1	0.30	10	30	Estate Residential (1/5 du per acre to 1 du per acre)
IW334	1.13	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW334	0.02	740	WTR	0.00	0	0	Water
IW338	0.09	120	LDR-1	0.30	10	30	Estate Residential (1/5 du per acre to 1 du per acre)
IW338	0.23	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW342	0.06	110	VLDR	0.30	5	30	Rural Residential (<= 1/5 du per acre)
IW342	0.28	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW346	0.10	110	VLDR	0.30	5	30	Rural Residential (<= 1/5 du per acre)
IW346	3.35	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW349	0.02	130	LDR-2	0.30	15	50	Large Lot Residential - Single Family (1 du per acre to 2 du per acre)
IW349	0.05	140	MDR-1	0.25	30	50	Medium Lot Residential - Single Family (2-4 du per acre)
IW349	0.01	610	FWY-2	0.10	80	30	Transportation (Includes railroads, railyards, transit centers and freeways)
IW349	0.16	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW350	2.16	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW351	0.04	140	MDR-1	0.25	30	50	Medium Lot Residential - Single Family (2-4 du per acre)
IW351	0.27	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW352	0.10	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW353	0.01	120	LDR-1	0.30	10	30	Estate Residential (1/5 du per acre to 1 du per acre)
IW353	0.00	610	FWY-2	0.10	80	30	Transportation (Includes railroads, railyards, transit centers and freeways)
IW353	2.78	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)

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SHEET _____ OF _____

BY _____ DATE _____

CLIENT: FCDMC CHECK _____ DATE _____

JOB: Wittmann Area Drainage Master Study Update JOB NO. 310.032

Existing Land Use Summary by Basin

Basin ID	Area (sqmiles)	WMS Land Use Code	Mag Land Use Code	IA (in) Initial Abstractions	RTIMP	% Vegetation	Land Use Definition
IW354	0.35	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW356	0.29	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW357	0.03	120	LDR-1	0.30	10	30	Estate Residential (1/5 du per acre to 1 du per acre)
IW357	0.03	570	IND-4	0.15	80	25	Other Employment - low (Proving grounds and land fills)
IW357	0.03	610	FWY-2	0.10	80	30	Transportation (Includes railroads, railyards, transit centers and freeways)
IW357	0.65	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW358	0.15	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW359	0.08	120	LDR-1	0.30	10	30	Estate Residential (1/5 du per acre to 1 du per acre)
IW359	0.04	610	FWY-2	0.10	80	30	Transportation (Includes railroads, railyards, transit centers and freeways)
IW359	2.78	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW360	0.22	140	MDR-1	0.25	30	50	Medium Lot Residential - Single Family (2-4 du per acre)
IW360	0.01	610	FWY-2	0.10	80	30	Transportation (Includes railroads, railyards, transit centers and freeways)
IW360	0.57	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW361	0.35	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW362	0.17	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW363	0.02	120	LDR-1	0.30	10	30	Estate Residential (1/5 du per acre to 1 du per acre)
IW363	0.01	140	MDR-1	0.25	30	50	Medium Lot Residential - Single Family (2-4 du per acre)
IW363	0.04	160	VSLR	0.25	40	50	Very Small Lot Residential - Single Family (>6 du per acre-includes mobile home
IW363	0.03	610	FWY-2	0.10	80	30	Transportation (Includes railroads, railyards, transit centers and freeways)
IW363	0.51	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW364	0.04	610	FWY-2	0.10	80	30	Transportation (Includes railroads, railyards, transit centers and freeways)
IW364	1.10	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW365	0.03	600	FWY-1	0.30	20	30	General Transportation (Transportation where no detail available)
IW365	0.00	610	FWY-2	0.10	80	30	Transportation (Includes railroads, railyards, transit centers and freeways)
IW365	0.44	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW366	0.02	130	LDR-2	0.30	15	50	Large Lot Residential - Single Family (1 du per acre to 2 du per acre)
IW366	0.01	520	INS-1	0.25	45	80	Educational (Public schools, private schools and universities)
IW366	0.02	610	FWY-2	0.10	80	30	Transportation (Includes railroads, railyards, transit centers and freeways)
IW366	0.98	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW367	0.00	610	FWY-2	0.10	80	30	Transportation (Includes railroads, railyards, transit centers and freeways)
IW367	0.04	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW368	0.01	610	FWY-2	0.10	80	30	Transportation (Includes railroads, railyards, transit centers and freeways)
IW368	0.26	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW369	0.02	600	FWY-1	0.30	20	30	General Transportation (Transportation where no detail available)
IW369	0.00	610	FWY-2	0.10	80	30	Transportation (Includes railroads, railyards, transit centers and freeways)
IW369	0.77	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW370	0.16	130	LDR-2	0.30	15	50	Large Lot Residential - Single Family (1 du per acre to 2 du per acre)
IW370	0.03	600	FWY-1	0.30	20	30	General Transportation (Transportation where no detail available)

Existing Land Use Summary by Basin

Basin ID	Area (sqmiles)	WMS Land Use Code	Mag Land Use Code	IA (in) Initial Abstractions	RTIMP	% Vegetation	Land Use Definition
IW370	0.01	610	FWY-2	0.10	80	30	Transportation (Includes railroads, railyards, transit centers and freeways)
IW370	0.67	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW371	0.01	130	LDR-2	0.30	15	50	Large Lot Residential - Single Family (1 du per acre to 2 du per acre)
IW371	0.01	610	FWY-2	0.10	80	30	Transportation (Includes railroads, railyards, transit centers and freeways)
IW371	0.02	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW372	0.00	130	LDR-2	0.30	15	50	Large Lot Residential - Single Family (1 du per acre to 2 du per acre)
IW372	0.02	610	FWY-2	0.10	80	30	Transportation (Includes railroads, railyards, transit centers and freeways)
IW372	0.29	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW374	0.03	110	VLDR	0.30	5	30	Rural Residential (<= 1/5 du per acre)
IW374	0.14	130	LDR-2	0.30	15	50	Large Lot Residential - Single Family (1 du per acre to 2 du per acre)
IW374	0.04	600	FWY-1	0.30	20	30	General Transportation (Transportation where no detail available)
IW374	0.01	610	FWY-2	0.10	80	30	Transportation (Includes railroads, railyards, transit centers and freeways)
IW374	0.17	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW375	0.00	610	FWY-2	0.10	80	30	Transportation (Includes railroads, railyards, transit centers and freeways)
IW375	0.63	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW377	0.09	110	VLDR	0.30	5	30	Rural Residential (<= 1/5 du per acre)
IW377	0.00	600	FWY-1	0.30	20	30	General Transportation (Transportation where no detail available)
IW377	0.01	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW380	0.00	600	FWY-1	0.30	20	30	General Transportation (Transportation where no detail available)
IW380	0.48	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW381	0.14	110	VLDR	0.30	5	30	Rural Residential (<= 1/5 du per acre)
IW381	0.03	600	FWY-1	0.30	20	30	General Transportation (Transportation where no detail available)
IW381	0.06	610	FWY-2	0.10	80	30	Transportation (Includes railroads, railyards, transit centers and freeways)
IW381	0.15	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW382	0.21	110	VLDR	0.30	5	30	Rural Residential (<= 1/5 du per acre)
IW382	0.02	600	FWY-1	0.30	20	30	General Transportation (Transportation where no detail available)
IW382	0.02	610	FWY-2	0.10	80	30	Transportation (Includes railroads, railyards, transit centers and freeways)
IW382	0.36	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW384	0.00	610	FWY-2	0.10	80	30	Transportation (Includes railroads, railyards, transit centers and freeways)
IW384	0.07	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW386	0.11	110	VLDR	0.30	5	30	Rural Residential (<= 1/5 du per acre)
IW386	0.01	600	FWY-1	0.30	20	30	General Transportation (Transportation where no detail available)
IW386	0.25	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW387	1.35	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW388	0.01	110	VLDR	0.30	5	30	Rural Residential (<= 1/5 du per acre)
IW388	0.05	570	IND-4	0.15	80	25	Other Employment - low (Proving grounds and land fills)
IW388	0.09	600	FWY-1	0.30	20	30	General Transportation (Transportation where no detail available)
IW388	1.07	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)

Entellus

SHEET _____ OF _____

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CLIENT: FCDMC CHECK _____ DATE _____

JOB: Wittmann Area Drainage Master Study Update JOB NO. 310.032

Existing Land Use Summary by Basin

Basin ID	Area (sqmiles)	WMS Land Use Code	Mag Land Use Code	IA (in) Initial Abstractions	RTIMP	% Vegetation	Land Use Definition
IW389	0.00	600	FWY-1	0.30	20	30	General Transportation (Transportation where no detail available)
IW389	0.12	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW390	0.00	600	FWY-1	0.30	20	30	General Transportation (Transportation where no detail available)
IW390	0.30	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW390A	0.81	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW390A	0.07	730	OPEN-4	0.35	0	30	Passive Open Space (Includes mountain preserves and washes)
IW392	0.00	600	FWY-1	0.30	20	30	General Transportation (Transportation where no detail available)
IW392	1.10	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW394	1.71	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW394	2.45	730	OPEN-4	0.35	0	30	Passive Open Space (Includes mountain preserves and washes)
IW395	0.97	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW395	6.87	730	OPEN-4	0.35	0	30	Passive Open Space (Includes mountain preserves and washes)
IW396	0.58	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
IW397	4.79	730	OPEN-4	0.35	0	30	Passive Open Space (Includes mountain preserves and washes)
PD700	1.35	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
PD700	0.02	740	WTR	0.00	0	0	Water
PD704	0.17	570	IND-4	0.15	80	25	Other Employment - low (Proving grounds and land fills)
PD704	0.18	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
PD704	0.00	740	WTR	0.00	0	0	Water
PD708	0.01	570	IND-4	0.15	80	25	Other Employment - low (Proving grounds and land fills)
PD708	2.35	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
PD708	0.05	740	WTR	0.00	0	0	Water
PD712	0.17	300	IND-1	0.15	55	60	General Industrial (Industrial where no detail available)
PD712	0.71	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
PD712A	0.76	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
PD716	1.73	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
PD716	0.01	740	WTR	0.00	0	0	Water
PD720	0.57	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
PD720	0.02	740	WTR	0.00	0	0	Water
PD726	0.13	120	LDR-1	0.30	10	30	Estate Residential (1/5 du per acre to 1 du per acre)
PD726	0.29	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
PD726A	0.00	120	LDR-1	0.30	10	30	Estate Residential (1/5 du per acre to 1 du per acre)
PD726A	1.08	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
PD726A	0.01	740	WTR	0.00	0	0	Water
PD726B	0.56	120	LDR-1	0.30	10	30	Estate Residential (1/5 du per acre to 1 du per acre)
PD726B	0.39	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
PD732	0.44	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
PD732	0.03	740	WTR	0.00	0	0	Water

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JOB: Wittmann Area Drainage Master Study Update JOB NO. 310.032

Existing Land Use Summary by Basin

Basin ID	Area (sqmiles)	WMS Land Use Code	Mag Land Use Code	IA (in) Initial Abstractions	RTIMP	% Vegetation	Land Use Definition
PD736	0.76	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
PD736	0.01	740	WTR	0.00	0	0	Water
PD740	0.62	120	LDR-1	0.30	10	30	Estate Residential (1/5 du per acre to 1 du per acre)
PD740	0.59	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
PD740	0.04	740	WTR	0.00	0	0	Water
PD744	0.10	120	LDR-1	0.30	10	30	Estate Residential (1/5 du per acre to 1 du per acre)
PD744	0.69	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
PD744	0.00	740	WTR	0.00	0	0	Water
PD748	0.19	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
PD748	0.09	730	OPEN-4	0.35	0	30	Passive Open Space (Includes mountain preserves and washes)
PD752	0.09	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
PD752	0.09	730	OPEN-4	0.35	0	30	Passive Open Space (Includes mountain preserves and washes)
PD752	0.01	740	WTR	0.00	0	0	Water
PD756	0.10	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
PD756	3.11	730	OPEN-4	0.35	0	30	Passive Open Space (Includes mountain preserves and washes)
PD756	0.01	740	WTR	0.00	0	0	Water
PD760	0.14	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
PD760	0.71	730	OPEN-4	0.35	0	30	Passive Open Space (Includes mountain preserves and washes)
PD760	0.02	740	WTR	0.00	0	0	Water
PI600	0.58	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
PI600	0.01	740	WTR	0.00	0	0	Water
PI600A	0.47	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
PI600A	0.01	740	WTR	0.00	0	0	Water
PI603	0.05	120	LDR-1	0.30	10	30	Estate Residential (1/5 du per acre to 1 du per acre)
PI603	0.01	130	LDR-2	0.30	15	50	Large Lot Residential - Single Family (1 du per acre to 2 du per acre)
PI603	0.46	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
PI604	0.28	120	LDR-1	0.30	10	30	Estate Residential (1/5 du per acre to 1 du per acre)
PI604	0.02	130	LDR-2	0.30	15	50	Large Lot Residential - Single Family (1 du per acre to 2 du per acre)
PI604	0.05	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
PI606	0.16	120	LDR-1	0.30	10	30	Estate Residential (1/5 du per acre to 1 du per acre)
PI606	0.38	130	LDR-2	0.30	15	50	Large Lot Residential - Single Family (1 du per acre to 2 du per acre)
PI606	0.52	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
PI606A	0.32	120	LDR-1	0.30	10	30	Estate Residential (1/5 du per acre to 1 du per acre)
PI606A	0.12	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
PI606A	0.01	740	WTR	0.00	0	0	Water
PI609	0.65	120	LDR-1	0.30	10	30	Estate Residential (1/5 du per acre to 1 du per acre)
PI609	0.28	130	LDR-2	0.30	15	50	Large Lot Residential - Single Family (1 du per acre to 2 du per acre)
PI609	0.96	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)

Appendix D.2.2

Entellus

SHEET _____ OF _____

BY _____ DATE _____

CLIENT: FCDMC CHECK _____ DATE _____

JOB: Wittmann Area Drainage Master Study Update JOB NO. 310.032

Existing Land Use Summary by Basin

Basin ID	Area (sqmiles)	WMS Land Use Code	Mag Land Use Code	IA (in) Initial Abstractions	RTIMP	% Vegetation	Land Use Definition
PI609	0.02	740	WTR	0.00	0	0	Water
PI612	0.19	120	LDR-1	0.30	10	30	Estate Residential (1/5 du per acre to 1 du per acre)
PI612	0.54	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
PI615	0.68	120	LDR-1	0.30	10	30	Estate Residential (1/5 du per acre to 1 du per acre)
PI615	0.12	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
PI615	0.02	740	WTR	0.00	0	0	Water
PI618	0.00	110	VLDR	0.30	5	30	Rural Residential (<= 1/5 du per acre)
PI618	0.26	120	LDR-1	0.30	10	30	Estate Residential (1/5 du per acre to 1 du per acre)
PI618	0.02	740	WTR	0.00	0	0	Water
PI621	0.03	130	LDR-2	0.30	15	50	Large Lot Residential - Single Family (1 du per acre to 2 du per acre)
PI621	0.87	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
PI621	0.00	740	WTR	0.00	0	0	Water
PI624	0.11	130	LDR-2	0.30	15	50	Large Lot Residential - Single Family (1 du per acre to 2 du per acre)
PI624	0.09	210	COM-2	0.10	80	65	Specialty Commercial (<=50,000 sq. ft.)
PI624	0.00	610	FWY-2	0.10	80	30	Transportation (Includes railroads, railyards, transit centers and freeways)
PI624	0.53	620	INS-5	0.15	55	60	Airports (Includes public use airports)
PI624	0.45	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
PI624	0.01	740	WTR	0.00	0	0	Water
PI624A	0.22	110	VLDR	0.30	5	30	Rural Residential (<= 1/5 du per acre)
PI624A	0.17	120	LDR-1	0.30	10	30	Estate Residential (1/5 du per acre to 1 du per acre)
PI624A	1.51	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
PI624A	0.90	750	AGR	0.50	0	85	Agriculture
PI628	0.07	110	VLDR	0.30	5	30	Rural Residential (<= 1/5 du per acre)
PI628	0.46	120	LDR-1	0.30	10	30	Estate Residential (1/5 du per acre to 1 du per acre)
PI628	0.03	740	WTR	0.00	0	0	Water
PI633	0.31	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
PI633	0.02	740	WTR	0.00	0	0	Water
PI635	0.11	300	IND-1	0.15	55	60	General Industrial (Industrial where no detail available)
PI635	0.03	610	FWY-2	0.10	80	30	Transportation (Includes railroads, railyards, transit centers and freeways)
PI635	0.31	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
PI635	0.14	730	OPEN-4	0.35	0	30	Passive Open Space (Includes mountain preserves and washes)
PI635	0.02	740	WTR	0.00	0	0	Water
PI636	0.06	610	FWY-2	0.10	80	30	Transportation (Includes railroads, railyards, transit centers and freeways)
PI636	0.03	620	INS-5	0.15	55	60	Airports (Includes public use airports)
PI636	0.32	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
PI639	0.02	610	FWY-2	0.10	80	30	Transportation (Includes railroads, railyards, transit centers and freeways)
PI639	0.31	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
PI642	0.19	110	VLDR	0.30	5	30	Rural Residential (<= 1/5 du per acre)

Entellus

SHEET _____ OF _____

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JOB: Wittmann Area Drainage Master Study Update JOB NO. 310.032

Existing Land Use Summary by Basin

Basin ID	Area (sqmiles)	WMS Land Use Code	Mag Land Use Code	IA (in) Initial Abstractions	RTIMP	% Vegetation	Land Use Definition
PI642	0.04	750	AGR	0.50	0	85	Agriculture
PI645	0.44	110	VLDR	0.30	5	30	Rural Residential (<= 1/5 du per acre)
PI645	1.06	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
PI645	0.01	740	WTR	0.00	0	0	Water
PI645	0.06	750	AGR	0.50	0	85	Agriculture
PI645A	0.22	300	IND-1	0.15	55	60	General Industrial (Industrial where no detail available)
PI645A	0.05	570	IND-4	0.15	80	25	Other Employment - low (Proving grounds and land fills)
PI645A	0.02	600	FWY-1	0.30	20	30	General Transportation (Transportation where no detail available)
PI645A	1.31	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
PI648	0.14	110	VLDR	0.30	5	30	Rural Residential (<= 1/5 du per acre)
PI648	1.59	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
PI651	0.42	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
PI654	0.17	600	FWY-1	0.30	20	30	General Transportation (Transportation where no detail available)
PI654	3.84	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
PI657	0.04	600	FWY-1	0.30	20	30	General Transportation (Transportation where no detail available)
PI657	0.82	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
PI660	0.06	600	FWY-1	0.30	20	30	General Transportation (Transportation where no detail available)
PI660	0.78	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
PI663	0.00	600	FWY-1	0.30	20	30	General Transportation (Transportation where no detail available)
PI663	0.59	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
PI669	0.22	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
PI669	0.00	740	WTR	0.00	0	0	Water
PI669	0.06	750	AGR	0.50	0	85	Agriculture
PI672	1.48	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
PI672	0.01	740	WTR	0.00	0	0	Water
PI672	0.01	750	AGR	0.50	0	85	Agriculture
PI675	0.06	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
PI678	0.09	300	IND-1	0.15	55	60	General Industrial (Industrial where no detail available)
PI678	0.01	570	IND-4	0.15	80	25	Other Employment - low (Proving grounds and land fills)
PI678	0.69	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
PI681	0.04	570	IND-4	0.15	80	25	Other Employment - low (Proving grounds and land fills)
PI681	0.07	600	FWY-1	0.30	20	30	General Transportation (Transportation where no detail available)
PI681	0.86	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
PI684	0.01	600	FWY-1	0.30	20	30	General Transportation (Transportation where no detail available)
PI684	0.72	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
PI687	1.03	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
PI687	5.96	730	OPEN-4	0.35	0	30	Passive Open Space (Includes mountain preserves and washes)
PI688	0.02	110	VLDR	0.30	5	30	Rural Residential (<= 1/5 du per acre)

Entellus

SHEET _____ OF _____

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JOB: Wittmann Area Drainage Master Study Update JOB NO. 310.032

Existing Land Use Summary by Basin

Basin ID	Area (sqmiles)	WMS Land Use Code	Mag Land Use Code	IA (in) Initial Abstractions	RTIMP	% Vegetation	Land Use Definition
PI688	3.17	730	OPEN-4	0.35	0	30	Passive Open Space (Includes mountain preserves and washes)
PI689	0.01	110	VLDR	0.30	5	30	Rural Residential (<= 1/5 du per acre)
PI689	6.76	730	OPEN-4	0.35	0	30	Passive Open Space (Includes mountain preserves and washes)
PI690	0.61	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
PI693	0.81	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
PI693	0.01	740	WTR	0.00	0	0	Water
SV200	0.01	610	FWY-2	0.10	80	30	Transportation (Includes railroads, railyards, transit centers and freeways)
SV200	2.28	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
SV202	0.37	120	LDR-1	0.30	10	30	Estate Residential (1/5 du per acre to 1 du per acre)
SV202	1.05	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
SV202	0.03	740	WTR	0.00	0	0	Water
SV203	0.00	610	FWY-2	0.10	80	30	Transportation (Includes railroads, railyards, transit centers and freeways)
SV203	0.06	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
SV205	0.32	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
SV205	0.17	730	OPEN-4	0.35	0	30	Passive Open Space (Includes mountain preserves and washes)
SV208	0.33	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
SV208	0.72	730	OPEN-4	0.35	0	30	Passive Open Space (Includes mountain preserves and washes)
SV210	0.70	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
SV212	0.02	120	LDR-1	0.30	10	30	Estate Residential (1/5 du per acre to 1 du per acre)
SV212	0.03	610	FWY-2	0.10	80	30	Transportation (Includes railroads, railyards, transit centers and freeways)
SV212	3.71	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
SV212	0.35	730	OPEN-4	0.35	0	30	Passive Open Space (Includes mountain preserves and washes)
SV214	1.84	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
SV214	0.01	740	WTR	0.00	0	0	Water
SV216	0.01	610	FWY-2	0.10	80	30	Transportation (Includes railroads, railyards, transit centers and freeways)
SV216	1.56	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
SV218	1.20	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
SV218	0.02	740	WTR	0.00	0	0	Water
SV219	0.83	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
SV219	0.05	740	WTR	0.00	0	0	Water
SV220	0.54	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
SV220	0.05	740	WTR	0.00	0	0	Water
SV230	0.69	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
SV230	0.17	730	OPEN-4	0.35	0	30	Passive Open Space (Includes mountain preserves and washes)
SV232	0.97	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
SV232	2.03	730	OPEN-4	0.35	0	30	Passive Open Space (Includes mountain preserves and washes)
SV236	0.01	610	FWY-2	0.10	80	30	Transportation (Includes railroads, railyards, transit centers and freeways)
SV236	0.33	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)

Appendix D.2.2

Entellus

SHEET _____ OF _____

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JOB: Wittmann Area Drainage Master Study Update JOB NO. 310.032

Existing Land Use Summary by Basin

Basin ID	Area (sqmiles)	WMS Land Use Code	Mag Land Use Code	IA (in) Initial Abstractions	RTIMP	% Vegetation	Land Use Definition
SV236	0.24	730	OPEN-4	0.35	0	30	Passive Open Space (Includes mountain preserves and washes)
SV240	0.14	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
SV240	3.50	730	OPEN-4	0.35	0	30	Passive Open Space (Includes mountain preserves and washes)
SV242	0.04	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
SV242	0.05	730	OPEN-4	0.35	0	30	Passive Open Space (Includes mountain preserves and washes)
SV244	0.27	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
SV244	0.68	730	OPEN-4	0.35	0	30	Passive Open Space (Includes mountain preserves and washes)
SV246	0.13	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
SV246	0.01	730	OPEN-4	0.35	0	30	Passive Open Space (Includes mountain preserves and washes)
SV248	0.13	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
SV248	1.12	730	OPEN-4	0.35	0	30	Passive Open Space (Includes mountain preserves and washes)
SV250	0.12	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
SV251	0.25	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
SV252	0.01	610	FWY-2	0.10	80	30	Transportation (Includes railroads, railyards, transit centers and freeways)
SV252	0.14	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
SV254	0.08	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
SV256	0.05	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
SV258	0.17	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
SV258	0.55	730	OPEN-4	0.35	0	30	Passive Open Space (Includes mountain preserves and washes)
SV260	1.22	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
SV260	0.03	740	WTR	0.00	0	0	Water
SV264	0.00	130	LDR-2	0.30	15	50	Large Lot Residential - Single Family (1 du per acre to 2 du per acre)
SV264	1.89	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
SV264A	0.07	620	INS-5	0.15	55	60	Airports (Includes public use airports)
SV264A	2.78	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
SV264A	0.01	740	WTR	0.00	0	0	Water
SV268	0.11	120	LDR-1	0.30	10	30	Estate Residential (1/5 du per acre to 1 du per acre)
SV268	1.22	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
SV268	0.04	740	WTR	0.00	0	0	Water
SV272	0.04	110	VLDR	0.30	5	30	Rural Residential (<= 1/5 du per acre)
SV272	0.08	130	LDR-2	0.30	15	50	Large Lot Residential - Single Family (1 du per acre to 2 du per acre)
SV272	1.07	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
SV276	0.00	120	LDR-1	0.30	10	30	Estate Residential (1/5 du per acre to 1 du per acre)
SV276	0.04	130	LDR-2	0.30	15	50	Large Lot Residential - Single Family (1 du per acre to 2 du per acre)
SV276	0.87	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
SV280	0.15	120	LDR-1	0.30	10	30	Estate Residential (1/5 du per acre to 1 du per acre)
SV280	0.13	130	LDR-2	0.30	15	50	Large Lot Residential - Single Family (1 du per acre to 2 du per acre)
SV280	0.77	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)

Entellus

SHEET _____ OF _____

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Existing Land Use Summary by Basin

Basin ID	Area (sqmiles)	WMS Land Use Code	Mag Land Use Code	IA (in) Initial Abstractions	RTIMP	% Vegetation	Land Use Definition
SV284	0.08	130	LDR-2	0.30	15	50	Large Lot Residential - Single Family (1 du per acre to 2 du per acre)
SV284	0.19	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
SV286	1.52	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
SV290	0.02	130	LDR-2	0.30	15	50	Large Lot Residential - Single Family (1 du per acre to 2 du per acre)
SV290	0.79	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
SV294	0.07	130	LDR-2	0.30	15	50	Large Lot Residential - Single Family (1 du per acre to 2 du per acre)
SV294	2.57	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
SV298	0.17	130	LDR-2	0.30	15	50	Large Lot Residential - Single Family (1 du per acre to 2 du per acre)
SV298	0.87	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
TW400	0.06	110	VLDR	0.30	5	30	Rural Residential (<= 1/5 du per acre)
TW400	0.34	120	LDR-1	0.30	10	30	Estate Residential (1/5 du per acre to 1 du per acre)
TW400	0.15	310	IND-2	0.15	80	75	Warehouse/Distribution Centers
TW400	0.52	570	IND-4	0.15	80	25	Other Employment - low (Proving grounds and land fills)
TW400	3.17	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
TW402	0.33	570	IND-4	0.15	80	25	Other Employment - low (Proving grounds and land fills)
TW402	0.02	610	FWY-2	0.10	80	30	Transportation (Includes railroads, railyards, transit centers and freeways)
TW402	4.54	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
TW404	0.03	610	FWY-2	0.10	80	30	Transportation (Includes railroads, railyards, transit centers and freeways)
TW404	2.03	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
TW406	0.00	610	FWY-2	0.10	80	30	Transportation (Includes railroads, railyards, transit centers and freeways)
TW406	0.15	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
TW408	0.00	610	FWY-2	0.10	80	30	Transportation (Includes railroads, railyards, transit centers and freeways)
TW408	0.22	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
TW408	0.65	730	OPEN-4	0.35	0	30	Passive Open Space (Includes mountain preserves and washes)
TW410	0.00	610	FWY-2	0.10	80	30	Transportation (Includes railroads, railyards, transit centers and freeways)
TW410	0.29	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
TW412	0.13	570	IND-4	0.15	80	25	Other Employment - low (Proving grounds and land fills)
TW412	0.05	620	INS-5	0.15	55	60	Airports (Includes public use airports)
TW412	1.88	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
TW414	0.02	610	FWY-2	0.10	80	30	Transportation (Includes railroads, railyards, transit centers and freeways)
TW414	0.33	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
TW414	0.81	730	OPEN-4	0.35	0	30	Passive Open Space (Includes mountain preserves and washes)
TW416	0.03	570	IND-4	0.15	80	25	Other Employment - low (Proving grounds and land fills)
TW416	0.53	620	INS-5	0.15	55	60	Airports (Includes public use airports)
TW416	0.01	740	WTR	0.00	0	0	Water
TW418	0.02	130	LDR-2	0.30	15	50	Large Lot Residential - Single Family (1 du per acre to 2 du per acre)
TW418	0.04	570	IND-4	0.15	80	25	Other Employment - low (Proving grounds and land fills)
TW418	0.73	620	INS-5	0.15	55	60	Airports (Includes public use airports)

Entellus

SHEET _____ OF _____

BY _____ DATE _____

CLIENT: FCDMC CHECK _____ DATE _____

JOB: Wittmann Area Drainage Master Study Update JOB NO. 310.032

Existing Land Use Summary by Basin

Basin ID	Area (sqmiles)	WMS Land Use Code	Mag Land Use Code	IA (in) Initial Abstractions	RTIMP	% Vegetation	Land Use Definition
TW418	0.50	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
TW418	0.07	740	WTR	0.00	0	0	Water
TW420	0.00	570	IND-4	0.15	80	25	Other Employment - low (Proving grounds and land fills)
TW420	0.04	620	INS-5	0.15	55	60	Airports (Includes public use airports)
TW420	0.76	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
TW422	0.20	570	IND-4	0.15	80	25	Other Employment - low (Proving grounds and land fills)
TW422	0.49	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
TW424	0.86	130	LDR-2	0.30	15	50	Large Lot Residential - Single Family (1 du per acre to 2 du per acre)
TW424	0.55	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
TW424	0.03	740	WTR	0.00	0	0	Water
TW429	0.30	120	LDR-1	0.30	10	30	Estate Residential (1/5 du per acre to 1 du per acre)
TW429	0.25	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
TW429	0.00	740	WTR	0.00	0	0	Water
TW430	0.21	110	VLDR	0.30	5	30	Rural Residential (<= 1/5 du per acre)
TW430	0.24	120	LDR-1	0.30	10	30	Estate Residential (1/5 du per acre to 1 du per acre)
TW430	1.98	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
TW430	0.05	740	WTR	0.00	0	0	Water
TW431	0.11	110	VLDR	0.30	5	30	Rural Residential (<= 1/5 du per acre)
TW431	0.09	120	LDR-1	0.30	10	30	Estate Residential (1/5 du per acre to 1 du per acre)
TW431	0.62	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
TW431	0.04	750	AGR	0.50	0	85	Agriculture
TW432	0.25	110	VLDR	0.30	5	30	Rural Residential (<= 1/5 du per acre)
TW432	0.59	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
TW432	0.02	750	AGR	0.50	0	85	Agriculture
TW434	0.04	110	VLDR	0.30	5	30	Rural Residential (<= 1/5 du per acre)
TW434	0.04	120	LDR-1	0.30	10	30	Estate Residential (1/5 du per acre to 1 du per acre)
TW434	0.39	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
TW434	0.03	750	AGR	0.50	0	85	Agriculture
TW436	0.07	110	VLDR	0.30	5	30	Rural Residential (<= 1/5 du per acre)
TW436	0.17	150	SLR	0.25	35	50	Small Lot Residential - Single Family (4-6 du per acre)
TW436	0.02	610	FWY-2	0.10	80	30	Transportation (Includes railroads, railyards, transit centers and freeways)
TW436	0.40	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
TW440	0.05	110	VLDR	0.30	5	30	Rural Residential (<= 1/5 du per acre)
TW440	0.05	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
TW442	0.13	110	VLDR	0.30	5	30	Rural Residential (<= 1/5 du per acre)
TW442	0.02	610	FWY-2	0.10	80	30	Transportation (Includes railroads, railyards, transit centers and freeways)
TW442	0.20	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
TW444	0.03	110	VLDR	0.30	5	30	Rural Residential (<= 1/5 du per acre)

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SHEET _____ OF _____

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JOB: Wittmann Area Drainage Master Study Update JOB NO. 310.032

Existing Land Use Summary by Basin

Basin ID	Area (sqmiles)	WMS Land Use Code	Mag Land Use Code	IA (in) Initial Abstractions	RTIMP	% Vegetation	Land Use Definition
TW444	0.13	150	SLR	0.25	35	50	Small Lot Residential - Single Family (4-6 du per acre)
TW444	0.02	610	FWY-2	0.10	80	30	Transportation (Includes railroads, railyards, transit centers and freeways)
TW444	0.13	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
TW446	0.02	110	VLDR	0.30	5	30	Rural Residential (<= 1/5 du per acre)
TW446	0.03	610	FWY-2	0.10	80	30	Transportation (Includes railroads, railyards, transit centers and freeways)
TW446	0.28	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
TW446A	0.01	610	FWY-2	0.10	80	30	Transportation (Includes railroads, railyards, transit centers and freeways)
TW446A	0.32	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
TW448	0.33	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
TW450	0.01	610	FWY-2	0.10	80	30	Transportation (Includes railroads, railyards, transit centers and freeways)
TW450	1.22	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
TW450A	0.03	600	FWY-1	0.30	20	30	General Transportation (Transportation where no detail available)
TW450A	0.84	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
TW450B	0.06	600	FWY-1	0.30	20	30	General Transportation (Transportation where no detail available)
TW450B	0.35	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
TW452	0.02	610	FWY-2	0.10	80	30	Transportation (Includes railroads, railyards, transit centers and freeways)
TW452	0.44	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
TW452A	0.02	600	FWY-1	0.30	20	30	General Transportation (Transportation where no detail available)
TW452A	1.04	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
TW452B	0.02	600	FWY-1	0.30	20	30	General Transportation (Transportation where no detail available)
TW452B	1.01	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
TW454	0.00	600	FWY-1	0.30	20	30	General Transportation (Transportation where no detail available)
TW454	0.32	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
TW456	0.16	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
TW458	0.08	600	FWY-1	0.30	20	30	General Transportation (Transportation where no detail available)
TW458	0.59	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
TW459	0.00	600	FWY-1	0.30	20	30	General Transportation (Transportation where no detail available)
TW459	1.03	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
TW460	0.00	600	FWY-1	0.30	20	30	General Transportation (Transportation where no detail available)
TW460	2.31	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
TW462	0.01	600	FWY-1	0.30	20	30	General Transportation (Transportation where no detail available)
TW462	0.05	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
TW478	0.00	110	VLDR	0.30	5	30	Rural Residential (<= 1/5 du per acre)
TW478	0.04	120	LDR-1	0.30	10	30	Estate Residential (1/5 du per acre to 1 du per acre)
TW478	0.20	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
TW478	0.01	740	WTR	0.00	0	0	Water
TW480	0.06	110	VLDR	0.30	5	30	Rural Residential (<= 1/5 du per acre)
TW480	0.16	120	LDR-1	0.30	10	30	Estate Residential (1/5 du per acre to 1 du per acre)

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SHEET _____ OF _____

BY _____ DATE _____

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JOB: Wittmann Area Drainage Master Study Update JOB NO. 310.032

Existing Land Use Summary by Basin

Basin ID	Area (sqmiles)	WMS Land Use Code	Mag Land Use Code	IA (in) Initial Abstractions	RTIMP	% Vegetation	Land Use Definition
TW480	0.03	150	SLR	0.25	35	50	Small Lot Residential - Single Family (4-6 du per acre)
TW480	0.04	610	FWY-2	0.10	80	30	Transportation (Includes railroads, railyards, transit centers and freeways)
TW480	0.44	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
TW482	0.02	110	VLDR	0.30	5	30	Rural Residential (<= 1/5 du per acre)
TW482	0.06	130	LDR-2	0.30	15	50	Large Lot Residential - Single Family (1 du per acre to 2 du per acre)
TW482	0.03	610	FWY-2	0.10	80	30	Transportation (Includes railroads, railyards, transit centers and freeways)
TW482	0.63	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
TW484	0.08	130	LDR-2	0.30	15	50	Large Lot Residential - Single Family (1 du per acre to 2 du per acre)
TW484	0.05	610	FWY-2	0.10	80	30	Transportation (Includes railroads, railyards, transit centers and freeways)
TW484	0.20	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
TW485	0.02	110	VLDR	0.30	5	30	Rural Residential (<= 1/5 du per acre)
TW485	0.08	130	LDR-2	0.30	15	50	Large Lot Residential - Single Family (1 du per acre to 2 du per acre)
TW485	2.27	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
WI500	0.02	120	LDR-1	0.30	10	30	Estate Residential (1/5 du per acre to 1 du per acre)
WI500	0.97	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
WI502	0.01	110	VLDR	0.30	5	30	Rural Residential (<= 1/5 du per acre)
WI502	0.06	120	LDR-1	0.30	10	30	Estate Residential (1/5 du per acre to 1 du per acre)
WI502	0.02	310	IND-2	0.15	80	75	Warehouse/Distribution Centers
WI502	1.10	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
WI504	0.09	310	IND-2	0.15	80	75	Warehouse/Distribution Centers
WI504	1.24	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
WI506	0.50	130	LDR-2	0.30	15	50	Large Lot Residential - Single Family (1 du per acre to 2 du per acre)
WI506	0.05	610	FWY-2	0.10	80	30	Transportation (Includes railroads, railyards, transit centers and freeways)
WI506	1.01	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
WI508	0.02	110	VLDR	0.30	5	30	Rural Residential (<= 1/5 du per acre)
WI508	0.11	120	LDR-1	0.30	10	30	Estate Residential (1/5 du per acre to 1 du per acre)
WI508	0.07	130	LDR-2	0.30	15	50	Large Lot Residential - Single Family (1 du per acre to 2 du per acre)
WI508	0.51	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
WI510	0.22	110	VLDR	0.30	5	30	Rural Residential (<= 1/5 du per acre)
WI510	0.04	120	LDR-1	0.30	10	30	Estate Residential (1/5 du per acre to 1 du per acre)
WI510	0.00	620	INS-5	0.15	55	60	Airports (Includes public use airports)
WI510	0.97	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
WI510A	0.15	110	VLDR	0.30	5	30	Rural Residential (<= 1/5 du per acre)
WI510A	0.03	130	LDR-2	0.30	15	50	Large Lot Residential - Single Family (1 du per acre to 2 du per acre)
WI510A	0.92	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
WI510A	0.02	740	WTR	0.00	0	0	Water
WI512	0.22	110	VLDR	0.30	5	30	Rural Residential (<= 1/5 du per acre)
WI512	0.01	610	FWY-2	0.10	80	30	Transportation (Includes railroads, railyards, transit centers and freeways)

Appendix D.2.2

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SHEET _____ OF _____

BY _____ DATE _____

CLIENT: FCDMC CHECK _____ DATE _____

JOB: Wittmann Area Drainage Master Study Update JOB NO. 310.032

Existing Land Use Summary by Basin

Basin ID	Area (sqmiles)	WMS Land Use Code	Mag Land Use Code	IA (in) Initial Abstractions	RTIMP	% Vegetation	Land Use Definition
WI512	0.21	620	INS-5	0.15	55	60	Airports (Includes public use airports)
WI512	0.90	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
WI514	0.01	110	VLDR	0.30	5	30	Rural Residential (<= 1/5 du per acre)
WI514	0.01	610	FWY-2	0.10	80	30	Transportation (Includes railroads, railyards, transit centers and freeways)
WI514	0.32	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
WI514	0.02	740	WTR	0.00	0	0	Water
WI516	0.10	110	VLDR	0.30	5	30	Rural Residential (<= 1/5 du per acre)
WI516	0.01	610	FWY-2	0.10	80	30	Transportation (Includes railroads, railyards, transit centers and freeways)
WI516	0.03	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
WI518	0.01	110	VLDR	0.30	5	30	Rural Residential (<= 1/5 du per acre)
WI518	0.02	610	FWY-2	0.10	80	30	Transportation (Includes railroads, railyards, transit centers and freeways)
WI518	0.48	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
WI524	0.07	610	FWY-2	0.10	80	30	Transportation (Includes railroads, railyards, transit centers and freeways)
WI524	0.76	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
WI524	0.10	750	AGR	0.50	0	85	Agriculture
WI525	0.01	110	VLDR	0.30	5	30	Rural Residential (<= 1/5 du per acre)
WI525	0.25	120	LDR-1	0.30	10	30	Estate Residential (1/5 du per acre to 1 du per acre)
WI525	0.09	610	FWY-2	0.10	80	30	Transportation (Includes railroads, railyards, transit centers and freeways)
WI525	1.47	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
WI525	0.04	740	WTR	0.00	0	0	Water
WI525	0.08	750	AGR	0.50	0	85	Agriculture
WI526	0.03	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
WI527	0.03	610	FWY-2	0.10	80	30	Transportation (Includes railroads, railyards, transit centers and freeways)
WI527	0.65	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
WI527	0.02	740	WTR	0.00	0	0	Water
WI528	0.04	610	FWY-2	0.10	80	30	Transportation (Includes railroads, railyards, transit centers and freeways)
WI528	0.29	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
WI528	0.02	740	WTR	0.00	0	0	Water
WI529	0.04	610	FWY-2	0.10	80	30	Transportation (Includes railroads, railyards, transit centers and freeways)
WI529	0.09	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
WI529	0.02	740	WTR	0.00	0	0	Water
WI530	2.34	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
WI530	0.01	740	WTR	0.00	0	0	Water
WI532	0.30	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
WI534	0.07	570	IND-4	0.15	80	25	Other Employment - low (Proving grounds and land fills)
WI534	0.37	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
WI536	0.14	570	IND-4	0.15	80	25	Other Employment - low (Proving grounds and land fills)
WI536	0.01	600	FWY-1	0.30	20	30	General Transportation (Transportation where no detail available)

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SHEET _____ OF _____

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JOB: Wittmann Area Drainage Master Study Update JOB NO. 310.032

Existing Land Use Summary by Basin

Basin ID	Area (sqmiles)	WMS Land Use Code	Mag Land Use Code	IA (in) Initial Abstractions	RTIMP	% Vegetation	Land Use Definition
WI536	1.19	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
WI538	0.10	570	IND-4	0.15	80	25	Other Employment - low (Proving grounds and land fills)
WI538	1.32	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
WI538A	0.08	600	FWY-1	0.30	20	30	General Transportation (Transportation where no detail available)
WI538A	0.69	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
WI540	0.00	600	FWY-1	0.30	20	30	General Transportation (Transportation where no detail available)
WI540	1.22	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
WI542	0.03	570	IND-4	0.15	80	25	Other Employment - low (Proving grounds and land fills)
WI542	1.14	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
WI542	0.00	740	WTR	0.00	0	0	Water
WI544	0.80	570	IND-4	0.15	80	25	Other Employment - low (Proving grounds and land fills)
WI544	1.00	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
WI546	0.36	570	IND-4	0.15	80	25	Other Employment - low (Proving grounds and land fills)
WI546	0.25	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
WI548	0.30	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
WI550	0.03	610	FWY-2	0.10	80	30	Transportation (Includes railroads, railyards, transit centers and freeways)
WI550	0.10	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
WI550	0.01	740	WTR	0.00	0	0	Water
WI552	0.04	610	FWY-2	0.10	80	30	Transportation (Includes railroads, railyards, transit centers and freeways)
WI552	0.38	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
WI554	0.03	570	IND-4	0.15	80	25	Other Employment - low (Proving grounds and land fills)
WI554	0.05	610	FWY-2	0.10	80	30	Transportation (Includes railroads, railyards, transit centers and freeways)
WI554	0.90	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
WI556	0.01	570	IND-4	0.15	80	25	Other Employment - low (Proving grounds and land fills)
WI556	0.05	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
WI560	0.25	110	VLDR	0.30	5	30	Rural Residential (<= 1/5 du per acre)
WI560	0.86	570	IND-4	0.15	80	25	Other Employment - low (Proving grounds and land fills)
WI560	0.04	600	FWY-1	0.30	20	30	General Transportation (Transportation where no detail available)
WI560	2.45	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
WI560A	0.03	600	FWY-1	0.30	20	30	General Transportation (Transportation where no detail available)
WI560A	2.02	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
WI562	0.11	600	FWY-1	0.30	20	30	General Transportation (Transportation where no detail available)
WI562	0.75	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
WI564	0.01	600	FWY-1	0.30	20	30	General Transportation (Transportation where no detail available)
WI564	1.79	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
WI566	0.00	600	FWY-1	0.30	20	30	General Transportation (Transportation where no detail available)
WI566	0.09	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
WI570	0.00	600	FWY-1	0.30	20	30	General Transportation (Transportation where no detail available)

Appendix D.2.2

Entellus

SHEET _____ OF _____

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JOB: Wittmann Area Drainage Master Study Update JOB NO. 310.032

Existing Land Use Summary by Basin

Basin ID	Area (sqmiles)	WMS Land Use Code	Mag Land Use Code	IA (in) Initial Abstractions	RTIMP	% Vegetation	Land Use Definition
WI570	2.20	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
WI570	0.02	730	OPEN-4	0.35	0	30	Passive Open Space (Includes mountain preserves and washes)
WI572	0.02	600	FWY-1	0.30	20	30	General Transportation (Transportation where no detail available)
WI572	1.56	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
WI572	0.46	730	OPEN-4	0.35	0	30	Passive Open Space (Includes mountain preserves and washes)
WI574	0.19	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
WI576	0.29	110	VLDR	0.30	5	30	Rural Residential (<= 1/5 du per acre)
WI576	0.89	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
WI576A	0.02	600	FWY-1	0.30	20	30	General Transportation (Transportation where no detail available)
WI576A	1.18	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
WI576B	0.04	600	FWY-1	0.30	20	30	General Transportation (Transportation where no detail available)
WI576B	0.41	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
WI578	0.02	600	FWY-1	0.30	20	30	General Transportation (Transportation where no detail available)
WI578	0.44	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
WI580	0.06	600	FWY-1	0.30	20	30	General Transportation (Transportation where no detail available)
WI580	1.25	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
WI580A	0.04	600	FWY-1	0.30	20	30	General Transportation (Transportation where no detail available)
WI580A	2.70	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
WI580A	0.03	730	OPEN-4	0.35	0	30	Passive Open Space (Includes mountain preserves and washes)
WI580B	0.61	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
WI580B	0.00	730	OPEN-4	0.35	0	30	Passive Open Space (Includes mountain preserves and washes)
WI582	0.01	610	FWY-2	0.10	80	30	Transportation (Includes railroads, railyards, transit centers and freeways)
WI582	0.32	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
WI584	0.14	110	VLDR	0.30	5	30	Rural Residential (<= 1/5 du per acre)
WI584	0.22	120	LDR-1	0.30	10	30	Estate Residential (1/5 du per acre to 1 du per acre)
WI584	0.06	610	FWY-2	0.10	80	30	Transportation (Includes railroads, railyards, transit centers and freeways)
WI584	0.82	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
WI584	0.00	740	WTR	0.00	0	0	Water
WT100	0.05	610	FWY-2	0.10	80	30	Transportation (Includes railroads, railyards, transit centers and freeways)
WT100	2.37	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
WT100	1.41	730	OPEN-4	0.35	0	30	Passive Open Space (Includes mountain preserves and washes)
WT110	1.80	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
WT110	1.08	730	OPEN-4	0.35	0	30	Passive Open Space (Includes mountain preserves and washes)
WT120	1.59	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
WT120	1.19	730	OPEN-4	0.35	0	30	Passive Open Space (Includes mountain preserves and washes)
WT130	0.48	700	OPEN-1	0.35	5	30	General Open Space (Open space where no detail available)
WT130	2.08	730	OPEN-4	0.35	0	30	Passive Open Space (Includes mountain preserves and washes)
WT140	3.77	730	OPEN-4	0.35	0	30	Passive Open Space (Includes mountain preserves and washes)

Entellus

SHEET _____ OF _____

BY _____ DATE _____

CLIENT: FCDMC CHECK _____ DATE _____

JOB: Wittmann Area Drainage Master Study Update JOB NO. 310.032

Existing Land Use Summary by Basin

Basin ID	Area (sqmiles)	WMS Land Use Code	Mag Land Use Code	IA (in) Initial Abstractions	RTIMP	% Vegetation	Land Use Definition
WT150	1.07	730	OPEN-4	0.35	0	30	Passive Open Space (Includes mountain preserves and washes)
WT150A	4.73	730	OPEN-4	0.35	0	30	Passive Open Space (Includes mountain preserves and washes)
WT160	0.80	730	OPEN-4	0.35	0	30	Passive Open Space (Includes mountain preserves and washes)

APPENDIX D.2.3

EXISTING CONDITIONS
BASIN LG CARD SUMMARY

Basin	IA	DTHETA	PSIF	XKSAT	RTIMP*
AF800	0.276	0.328	6.447	0.135	1.369
AF802	0.342	0.244	5.222	0.251	4.882
AF803	0.253	0.279	5.068	0.289	24.728
AF805	0.325	0.283	5.475	0.217	3.741
AF807	0.358	0.282	6.738	0.150	0.170
AF810	0.325	0.251	4.419	0.389	10.927
AF820	0.350	0.250	4.217	0.423	5.000
AF830	0.350	0.162	6.880	0.130	5.000
AF850	0.213	0.250	5.050	0.307	44.259
AF852	0.211	0.181	6.691	0.168	42.843
AF854	0.208	0.250	5.078	0.304	43.333
AF860	0.229	0.250	4.023	0.518	35.172
AF862	0.273	0.250	4.025	0.487	24.286
AF864	0.150	0.250	5.594	0.280	55.000
AF866	0.204	0.207	6.431	0.192	44.271
IW300	0.333	0.243	5.605	0.213	5.544
IW302	0.314	0.246	4.918	0.296	12.350
IW310	0.331	0.148	8.143	0.081	6.392
IW312	0.344	0.139	9.923	0.042	6.860
IW314	0.346	0.244	6.048	0.180	5.233
IW318	0.338	0.150	8.597	0.070	7.372
IW322	0.350	0.150	8.622	0.067	5.000
IW326	0.350	0.250	5.374	0.235	5.000
IW330	0.350	0.250	5.701	0.208	5.000
IW334	0.341	0.246	5.789	0.196	5.325
IW338	0.336	0.250	5.780	0.198	6.399
IW342	0.341	0.268	4.586	0.346	5.000
IW346	0.349	0.253	5.005	0.281	5.000
IW349	0.315	0.250	4.804	0.321	13.991
IW350	0.350	0.171	6.789	0.135	5.000
IW351	0.338	0.250	4.426	0.393	7.899
IW352	0.350	0.250	4.511	0.364	5.000
IW353	0.350	0.150	7.596	0.098	5.084
IW354	0.350	0.150	8.086	0.083	5.000
IW356	0.350	0.150	7.178	0.115	5.000
IW357	0.330	0.156	8.059	0.083	11.106
IW358	0.350	0.250	4.638	0.333	5.000
IW359	0.345	0.250	5.939	0.187	6.181
IW360	0.319	0.250	4.127	0.480	13.031
IW361	0.350	0.244	6.061	0.180	5.000
IW362	0.350	0.150	7.223	0.113	5.000
IW363	0.328	0.150	9.339	0.055	11.655
IW364	0.342	0.140	9.898	0.043	7.515
IW365	0.345	0.130	10.100	0.037	6.579
IW366	0.343	0.250	5.762	0.202	7.207
IW367	0.324	0.130	10.100	0.037	12.895

*Ggreen and Ampt parameters are reported to 3 decimal places by WMS, but the actual precision of the data is only 2-3 significant figures.

APPENDIX D.2.3

EXISTING CONDITIONS
BASIN LG CARD SUMMARY

Basin	IA	DTHETA	PSIF	XKSAT	RTIMP*
IW368	0.344	0.250	4.000	0.477	6.907
IW369	0.348	0.142	9.869	0.044	5.514
IW370	0.337	0.250	4.616	0.331	7.933
IW371	0.275	0.250	4.150	0.473	26.250
IW372	0.335	0.250	5.001	0.281	9.357
IW374	0.315	0.161	8.147	0.086	12.602
IW375	0.348	0.150	7.035	0.121	5.528
IW377	0.304	0.382	5.921	0.188	5.357
IW380	0.350	0.150	7.161	0.111	5.140
IW381	0.309	0.190	9.152	0.056	11.882
IW382	0.322	0.275	6.319	0.164	8.175
IW384	0.343	0.150	8.675	0.065	7.206
IW386	0.334	0.192	8.439	0.072	5.278
IW387	0.350	0.250	5.656	0.213	7.450
IW388	0.337	0.156	8.775	0.061	9.239
IW389	0.348	0.130	10.100	0.037	5.526
IW390	0.349	0.250	5.071	0.258	5.221
IW390A	0.350	0.250	6.134	0.172	17.033
IW392	0.350	0.150	7.459	0.103	8.347
IW394	0.350	0.327	6.166	0.173	16.632
IW395	0.350	0.374	6.125	0.175	27.313
IW396	0.350	0.250	4.518	0.336	5.192
IW397	0.350	0.381	6.390	0.159	39.233
PD700	0.344	0.246	5.243	0.250	4.918
PD704	0.299	0.297	4.461	0.342	2.516
PD708	0.342	0.245	4.987	0.268	10.121
PD712	0.311	0.250	5.374	0.248	28.595
PD712A	0.350	0.250	4.955	0.280	15.000
PD716	0.348	0.249	5.684	0.209	9.472
PD720	0.341	0.243	5.039	0.275	4.865
PD726	0.335	0.250	4.531	0.353	6.505
PD726A	0.346	0.247	4.501	0.366	8.937
PD726B	0.320	0.250	4.368	0.399	9.751
PD732	0.325	0.232	4.928	0.286	4.645
PD736	0.347	0.248	4.632	0.334	5.248
PD740	0.315	0.242	4.227	0.427	8.181
PD744	0.342	0.249	4.427	0.357	5.989
PD748	0.350	0.283	4.527	0.356	31.290
PD752	0.325	0.277	4.160	0.413	30.417
PD756	0.349	0.346	4.292	0.415	27.514
PD760	0.344	0.336	5.039	0.275	6.919
PI600	0.342	0.244	5.047	0.268	4.887
PI600A	0.345	0.246	5.184	0.252	4.929
PI603	0.344	0.250	4.660	0.316	7.957
PI604	0.307	0.250	4.970	0.285	22.848
PI606	0.324	0.250	4.383	0.419	10.725

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APPENDIX D.2.3

EXISTING CONDITIONS
BASIN LG CARD SUMMARY

Basin	IA	DTHETA	PSIF	XKSAT	RTIMP*
PI606A	0.308	0.245	4.449	0.378	10.151
PI609	0.321	0.247	4.529	0.368	8.386
PI612	0.337	0.250	4.365	0.400	6.284
PI615	0.299	0.243	4.318	0.409	8.997
PI618	0.281	0.235	4.623	0.332	9.320
PI621	0.347	0.249	4.621	0.339	5.296
PI624	0.234	0.249	4.886	0.341	34.218
PI624A	0.391	0.258	4.467	0.431	3.693
PI628	0.285	0.250	4.560	0.349	8.902
PI633	0.329	0.235	5.231	0.248	4.696
PI635	0.290	0.270	5.391	0.237	15.959
PI636	0.297	0.250	4.650	0.331	20.164
PI639	0.335	0.250	4.598	0.341	9.561
PI642	0.332	0.334	4.103	0.501	4.208
PI645	0.340	0.277	4.166	0.451	4.792
PI645A	0.316	0.154	8.035	0.087	14.307
PI648	0.346	0.160	8.694	0.064	5.156
PI651	0.350	0.173	6.770	0.136	5.000
PI654	0.348	0.150	9.530	0.051	5.671
PI657	0.348	0.139	9.924	0.042	5.669
PI660	0.346	0.150	9.503	0.052	6.086
PI663	0.350	0.150	9.369	0.053	6.578
PI669	0.378	0.248	4.650	0.364	3.929
PI672	0.348	0.248	4.402	0.391	4.918
PI675	0.350	0.250	4.586	0.346	5.000
PI678	0.324	0.252	4.342	0.417	12.003
PI681	0.338	0.156	8.404	0.071	9.157
PI684	0.350	0.150	7.860	0.087	6.444
PI687	0.350	0.360	5.392	0.232	27.265
PI688	0.350	0.390	5.752	0.200	32.193
PI689	0.350	0.377	6.465	0.154	33.445
PI690	0.350	0.250	4.347	0.404	5.000
PI693	0.345	0.247	4.550	0.354	4.932
SV200	0.349	0.250	4.654	0.323	5.221
SV202	0.331	0.153	6.942	0.125	6.369
SV203	0.341	0.250	4.122	0.459	7.679
SV205	0.350	0.277	6.287	0.156	10.092
SV208	0.350	0.319	4.511	0.313	16.724
SV210	0.350	0.250	5.921	0.177	9.038
SV212	0.348	0.259	4.856	0.299	5.172
SV214	0.349	0.249	5.322	0.242	4.982
SV216	0.348	0.250	5.555	0.222	5.678
SV218	0.345	0.246	5.599	0.219	4.927
SV219	0.330	0.185	6.542	0.148	4.721
SV220	0.320	0.195	6.363	0.159	4.564
SV230	0.350	0.264	6.169	0.163	10.472

*Ggreen and Ampt parameters are reported to 3 decimal places by WMS, but the actual precision of the data is only 2-3 significant figures.

APPENDIX D.2.3

EXISTING CONDITIONS
BASIN LG CARD SUMMARY

Basin	IA	DTHETA	PSIF	XKSAT	RTIMP*
SV232	0.350	0.350	5.952	0.174	8.610
SV236	0.344	0.291	4.176	0.446	4.689
SV240	0.350	0.365	5.199	0.235	9.424
SV242	0.350	0.304	4.300	0.416	2.308
SV244	0.350	0.311	6.728	0.137	3.116
SV246	0.350	0.159	7.525	0.101	4.750
SV248	0.350	0.357	5.288	0.220	10.629
SV250	0.350	0.250	4.570	0.348	5.000
SV251	0.350	0.250	3.914	0.490	5.000
SV252	0.338	0.250	3.861	0.499	8.516
SV254	0.350	0.250	3.910	0.491	5.000
SV256	0.350	0.269	3.427	0.575	5.000
SV258	0.350	0.343	6.344	0.150	7.423
SV260	0.342	0.229	6.158	0.173	4.892
SV264	0.350	0.150	7.529	0.101	5.012
SV264A	0.343	0.149	7.303	0.111	6.272
SV268	0.336	0.146	8.834	0.060	5.262
SV272	0.345	0.202	6.541	0.152	5.693
SV276	0.347	0.150	7.339	0.109	5.499
SV280	0.336	0.150	8.395	0.075	6.985
SV284	0.335	0.150	7.759	0.098	8.058
SV286	0.350	0.155	6.951	0.125	5.000
SV290	0.349	0.229	6.207	0.172	5.276
SV294	0.349	0.150	8.572	0.068	5.247
SV298	0.342	0.150	8.237	0.081	6.631
TW400	0.313	0.267	5.320	0.244	17.350
TW402	0.335	0.258	5.155	0.251	10.365
TW404	0.347	0.250	4.926	0.261	6.179
TW406	0.343	0.250	5.689	0.208	14.420
TW408	0.349	0.324	4.317	0.353	21.505
TW410	0.348	0.250	4.358	0.373	5.568
TW412	0.332	0.259	5.787	0.198	11.128
TW414	0.347	0.339	5.371	0.216	8.252
TW416	0.148	0.254	5.761	0.250	55.508
TW418	0.219	0.178	6.692	0.161	34.138
TW420	0.340	0.250	5.662	0.215	7.606
TW422	0.293	0.287	5.537	0.221	26.254
TW424	0.313	0.161	6.851	0.145	10.935
TW429	0.321	0.149	8.256	0.078	7.695
TW430	0.334	0.209	6.520	0.150	5.389
TW431	0.344	0.172	7.534	0.103	5.325
TW432	0.338	0.282	5.069	0.275	4.909
TW434	0.352	0.261	5.746	0.208	5.068
TW436	0.312	0.171	7.041	0.126	14.794
TW440	0.327	0.317	5.883	0.190	5.000
TW442	0.320	0.227	6.986	0.123	8.387

*Ggreen and Ampt parameters are reported to 3 decimal places by WMS, but the actual precision of the data is only 2-3 significant figures.

APPENDIX D.2.3

EXISTING CONDITIONS
BASIN LG CARD SUMMARY

Basin	IA	DTHETA	PSIF	XKSAT	RTIMP*
TW444	0.285	0.226	6.387	0.172	23.066
TW446	0.326	0.142	9.967	0.041	11.250
TW446A	0.340	0.150	9.190	0.056	19.497
TW448	0.350	0.133	10.036	0.039	6.419
TW450	0.349	0.150	9.593	0.050	7.331
TW450A	0.348	0.150	8.086	0.083	5.465
TW450B	0.343	0.150	8.767	0.061	7.095
TW452	0.341	0.142	9.850	0.044	7.586
TW452A	0.349	0.150	7.883	0.088	5.286
TW452B	0.349	0.150	7.745	0.093	5.326
TW454	0.350	0.250	5.253	0.250	5.103
TW456	0.350	0.249	6.009	0.183	5.000
TW458	0.344	0.150	8.971	0.059	6.768
TW459	0.350	0.249	6.011	0.181	5.065
TW460	0.350	0.250	5.920	0.188	8.897
TW462	0.342	0.146	9.779	0.046	7.400
TW478	0.329	0.193	6.512	0.151	5.664
TW480	0.316	0.166	7.274	0.112	11.804
TW482	0.334	0.254	5.187	0.262	8.939
TW484	0.301	0.249	6.010	0.191	18.414
TW485	0.348	0.251	5.786	0.199	5.349
WI500	0.349	0.250	5.521	0.224	5.124
WI502	0.344	0.251	5.448	0.229	6.516
WI504	0.336	0.250	5.982	0.190	10.285
WI506	0.326	0.250	5.331	0.254	10.467
WI508	0.336	0.252	5.116	0.271	6.720
WI510	0.339	0.274	5.732	0.204	5.364
WI510A	0.337	0.260	4.622	0.338	5.191
WI512	0.308	0.273	5.800	0.204	13.487
WI514	0.322	0.237	5.113	0.264	6.094
WI516	0.297	0.324	4.300	0.416	9.918
WI518	0.338	0.253	5.205	0.256	8.261
WI524	0.347	0.250	4.659	0.322	10.203
WI525	0.330	0.245	4.547	0.361	8.635
WI526	0.350	0.250	4.350	0.403	5.000
WI527	0.328	0.241	4.863	0.296	7.911
WI528	0.296	0.233	4.353	0.398	13.563
WI529	0.246	0.224	4.300	0.408	24.627
WI530	0.348	0.249	4.293	0.415	4.976
WI532	0.350	0.250	5.053	0.275	5.000
WI534	0.320	0.165	9.599	0.050	16.269
WI536	0.328	0.161	9.678	0.049	13.114
WI538	0.336	0.160	8.095	0.082	10.205
WI538A	0.345	0.150	7.801	0.092	9.971
WI540	0.350	0.200	6.497	0.153	24.434
WI542	0.345	0.252	4.299	0.415	6.718

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APPENDIX D.2.3

EXISTING CONDITIONS
BASIN LG CARD SUMMARY

Basin	IA	DTHETA	PSIF	XKSAT	RTIMP*
WI544	0.261	0.295	4.302	0.407	38.479
WI546	0.232	0.309	4.480	0.362	49.331
WI548	0.350	0.162	6.881	0.129	5.000
WI550	0.271	0.230	4.300	0.410	20.079
WI552	0.327	0.250	4.373	0.398	11.892
WI554	0.332	0.253	4.497	0.367	10.849
WI556	0.320	0.265	4.399	0.389	16.111
WI560	0.298	0.284	5.108	0.265	23.110
WI560A	0.349	0.250	5.869	0.191	11.973
WI562	0.344	0.155	6.954	0.125	7.052
WI564	0.350	0.250	5.988	0.181	17.920
WI566	0.348	0.210	6.400	0.159	5.682
WI570	0.350	0.164	6.881	0.129	22.117
WI572	0.349	0.228	6.630	0.145	17.629
WI574	0.350	0.250	4.987	0.283	5.000
WI576	0.338	0.274	4.615	0.339	5.000
WI576A	0.349	0.250	5.970	0.185	7.045
WI576B	0.346	0.250	5.665	0.212	6.275
WI578	0.348	0.208	6.424	0.157	5.662
WI580	0.348	0.250	5.076	0.272	5.692
WI580A	0.349	0.216	6.359	0.161	9.712
WI580B	0.350	0.251	5.837	0.193	14.022
WI582	0.343	0.250	5.000	0.281	7.041
WI584	0.323	0.261	5.089	0.270	9.277
WT100	0.346	0.287	4.578	0.316	16.889
WT110	0.350	0.287	4.795	0.285	7.191
WT120	0.350	0.301	5.261	0.243	3.944
WT130	0.350	0.331	4.724	0.282	10.801
WT140	0.350	0.350	4.071	0.385	19.488
WT150	0.350	0.350	4.476	0.316	15.690
WT150A	0.350	0.350	3.950	0.400	20.000
WT160	0.350	0.350	4.390	0.335	17.815

*Ggreen and Ampt parameters are reported to 3 decimal places by WMS, but the actual precision of the data is only 2-3 significant figures.

Table HY-D.2.3 Time of Concentration

Entellus

CLIENT: FCDMC **JOB NO.** 310.032

JOB: Wittmann Area Drainage Master Study Update

	Basin	TOC Length	TOC Length	US Elev	DS Elev	Slope	Area	Adjusted Length	TOC adjusted slope	basin adjusted slope	Adjusted Slope	Resistance Coefficient Class K_b [e]	24-hr Tc	24-hr R	6-hr Tc	6-hr R	Existing Time-Area Relation	Future Time-Area Relation
		[ft]	[mi]	[ft]	[ft]	[ft/mi]	[mi^2]	[mi]	[ft/mi]	[ft/mi]	[ft/mi]	[A, B, C, D]	[hr]	[hr]	[hr]	[hr]		
	AF800	10443	1.978	1434	1342	46.5	0.7163		46.5		46.5	B	0.654	0.482	0.654	0.482	Natural	Urban
	AF802	6070	1.150	1346	1311	30.4	0.3902		30.4		30.4	B	0.613	0.411	0.563	0.374	Natural	Urban
	AF803	22740	4.307	1340	1270	16.3	2.8368		16.3		16.3	A	1.129	0.752	1.117	0.742	Urban	Urban
	AF805	7505	1.421	1320	1290	21.1	0.6276		21.1		21.1	B	0.817	0.510	0.754	0.467	Natural	Natural
	AF807	8909	1.687	1300	1250	29.6	1.0224		29.6		29.6	A	0.463	0.236	0.467	0.238	Natural	Urban
	AF810	15994	3.029	1344	1250	31.0	2.1166		31.0		31.0	B	1.125	0.667	1.121	0.665	Natural	Natural
	AF820	12472	2.362	1285	1180	44.5	0.6957		44.5		44.5	B	0.904	0.809	0.838	0.743	Natural	Urban
	AF830	7549	1.430	1220	1170	35.0	0.2663		35.0		35.0	B	0.663	0.663	0.608	0.603	Natural	Urban
	AF850	4057	0.768	1176	1152	31.2	0.2178		31.2		31.2	A	0.296	0.185	0.271	0.168	Urban	Urban
	AF852	3605	0.683	1178	1152	38.1	0.1678		38.1		38.1	A	0.263	0.171	0.238	0.153	Urban	Urban
	AF854	5135	0.973	1194	1164	30.8	0.3382		30.8		30.8	A	0.346	0.207	0.313	0.185	Urban	Urban
	AF860	9763	1.849	1198	1148	27.0	0.3627		27.0		27.0	A	0.563	0.569	0.525	0.527	Urban	Urban
	AF862	2390	0.453	1160	1143	37.6	0.1772		37.6		37.6	A	0.221	0.098	0.200	0.088	Urban	Urban
	AF864	5480	1.038	1146	1130	15.4	0.0868		15.4		15.4	A	0.508	0.724	0.467	0.659	Urban	Urban
	AF866	7821	1.481	1150	1116	23.0	0.4549		23.0		23.0	A	0.483	0.354	0.446	0.324	Urban	Urban
	IW300	18303	3.467	1536	1446	26.0	1.4800		26.0		26.0	B	1.438	1.251	1.288	1.059	Natural	Natural
	IW302	19377	3.670	1546	1448	26.7	1.3264		26.7		26.7	B	1.467	1.431	1.367	1.261	Natural	Natural
[a]	IW310	19517	3.696	1654	1548	28.7	1.1672	3.400	31.2		31.2	B	1.188	1.167	1.117	1.090	Natural	Natural
	IW312	14836	2.810	2130	1910	78.3	0.5682		78.3		78.3	C	1.104	1.303	1.004	1.172	Natural	Natural
	IW314	24196	4.583	1702	1548	33.6	2.1754		33.6		33.6	B	1.383	1.151	1.342	1.113	Natural	Urban
	IW318	13854	2.624	1726	1636	34.3	0.5832		34.3		34.3	B	0.942	1.018	0.863	0.924	Natural	Natural
	IW322	29694	5.624	1812	1614	35.2	1.8923		35.2		35.2	B	1.442	1.537	1.371	1.453	Natural	Natural

[a] Adjusted length used for Tc calculation

[b] Adjusted slope used

[c] S-Graphs used (***** used to identify S-Graph basins)

[d] Adjusted length and slope used

[e] Roughness classes determined based on Hydrology Manual definitions

Table HY-D.2.3 Time of Concentration

Entellus

CLIENT: FCDMC **JOB NO.** 310.032

JOB: Wittmann Area Drainage Master Study Update

Basin	TOC Length	TOC Length	US Elev	DS Elev	Slope	Area	Adjusted Length	TOC adjusted slope	basin adjusted slope	Adjusted Slope	Resistance Coefficient Class K_b[e]	24-hr Tc	24-hr R	6-hr Tc	6-hr R	Existing Time-Area Relation	Future Time-Area Relation
	[ft]	[mi]	[ft]	[ft]	[ft/mi]	[mi^2]	[mi]	[ft/mi]	[ft/mi]	[ft/mi]	[A, B, C, D]	[hr]	[hr]	[hr]	[hr]		
IW326	7473	1.415	1660	1592	48.0	0.3331		48.0		48.0	B	0.588	0.506	0.538	0.459	Natural	Natural
IW330	16152	3.059	1744	1630	37.3	1.0372		37.3		37.3	B	1.058	0.944	1.008	0.895	Natural	Natural
IW334	12266	2.323	1632	1548	36.2	1.2571		36.2		36.2	B	0.838	0.523	0.808	0.503	Natural	Natural
IW338	7098	1.344	1644	1584	44.6	0.3390		44.6		44.6	B	0.575	0.470	0.529	0.428	Natural	Natural
IW342	11257	2.132	1698	1606	43.2	0.3535		43.2		43.2	B	0.888	1.074	0.800	0.957	Natural	Natural
IW346	26458	5.011	1842	1608	46.7	3.4432		46.7		46.7	B	1.254	0.854	1.271	0.866	Natural	Natural
IW349	9959	1.886	1906	1780	66.8	0.2498		66.8		66.8	B	0.650	0.840	0.596	0.763	Natural	Natural
IW350	26115	4.946	1852	1680	34.8	2.1751		34.8		34.8	B	1.363	1.203	1.308	1.150	Natural	Natural
IW351	8979	1.701	1888	1790	57.6	0.3164		57.6		57.6	B	0.642	0.658	0.596	0.615	Natural	Natural
IW352	4164	0.789	1780	1736	55.8	0.0961		55.8		55.8	B	0.421	0.445	0.383	0.401	Natural	Natural
IW353	25008	4.736	1976	1716	54.9	2.8031		54.9		54.9	B	1.004	0.717	0.996	0.710	Natural	Natural
IW354	8758	1.659	1812	1712	60.3	0.3605		60.3		60.3	B	0.550	0.511	0.508	0.468	Natural	Natural
IW356	9366	1.774	1850	1736	64.3	0.2861		64.3		64.3	B	0.579	0.651	0.533	0.594	Natural	Natural
IW357	15742	2.981	2050	1848	67.8	0.7457		67.8		67.8	B	0.742	0.752	0.700	0.705	Natural	Natural
IW358	8063	1.527	1790	1716	48.5	0.1641		48.5		48.5	B	0.683	0.953	0.625	0.863	Natural	Natural
IW359	20045	3.796	1968	1792	46.4	2.9120		46.4		46.4	B	0.979	0.571	0.983	0.574	Natural	Natural
IW360	11142	2.110	1888	1756	62.6	0.8306		62.6		62.6	B	0.683	0.490	0.654	0.467	Urban	Urban
IW361	11395	2.158	1838	1740	45.4	0.3547		45.4		45.4	B	0.804	0.970	0.733	0.876	Urban	Natural
IW362	6905	1.308	1750	1680	53.5	0.1794		53.5		53.5	B	0.525	0.597	0.488	0.550	Natural	Natural
IW363	9983	1.891	1940	1824	61.4	0.6278		61.4		61.4	B	0.563	0.424	0.529	0.396	Natural	Natural
IW364	13961	2.644	1836	1680	59.0	1.1451		59.0		59.0	B	0.683	0.489	0.667	0.475	Natural	Natural
IW365	14686	2.781	2110	1892	78.4	0.4729		78.4		78.4	C	1.113	1.447	1.000	1.285	Natural	Natural

[a] Adjusted length used for Tc calculation

[b] Adjusted slope used

[c] S-Graphs used (***** used to identify S-Graph basins)

[d] Adjusted length and slope used

[e] Roughness classes determined based on Hydrology Manual definitions

Table HY-D.2.3 Time of Concentration

Entellus

CLIENT: FCDMC JOB NO. 310.032

JOB: Wittmann Area Drainage Master Study Update

	Basin	TOC Length	TOC Length	US Elev	DS Elev	Slope	Area	Adjusted Length	TOC adjusted slope	basin adjusted slope	Adjusted Slope	Resistance Coefficient Class K_b [e]	24-hr Tc	24-hr R	6-hr Tc	6-hr R	Existing Time-Area Relation	Future Time-Area Relation
		[ft]	[mi]	[ft]	[ft]	[ft/mi]	[mi^2]	[mi]	[ft/mi]	[ft/mi]	[ft/mi]	[A, B, C, D]	[hr]	[hr]	[hr]	[hr]		
	IW366	14409	2.729	2012	1864	54.2	1.0558		54.2		54.2	B	0.796	0.622	0.763	0.593	Natural	Natural
	IW367	2549	0.483	1924	1880	91.2	0.0512		91.2		91.2	C	0.371	0.374	0.338	0.337	Natural	Natural
	IW368	7212	1.366	1980	1872	79.1	0.2907		79.1		79.1	C	0.833	0.784	0.754	0.702	Natural	Natural
	IW369	17914	3.393	2130	1882	73.1	0.7949		73.1		73.1	C	1.271	1.462	1.175	1.340	Natural	Natural
	IW370	20797	3.939	2150	1852	75.7	0.8795		75.7		75.7	B	0.967	1.148	0.917	1.082	Natural	Natural
	IW371	2857	0.541	2002	1964	70.2	0.0529		70.2		70.2	B	0.308	0.327	0.275	0.288	Urban	Urban
	IW372	7532	1.427	1930	1818	78.5	0.3175		78.5		78.5	B	0.479	0.418	0.442	0.382	Natural	Natural
	IW374	7657	1.450	2056	1958	67.6	0.3875		67.6		67.6	B	0.475	0.374	0.442	0.345	Natural	Natural
	IW375	18208	3.448	2052	1806	71.3	0.6582		71.3		71.3	C	1.392	1.824	1.296	1.685	Natural	Natural
	IW377	5891	1.116	2110	2022	78.9	0.1126		78.9		78.9	B	0.442	0.566	0.408	0.519	Natural	Natural
	IW380	13534	2.563	2340	2072	104.6	0.4998		104.6		104.6	B	0.575	0.631	0.533	0.581	Natural	Natural
	IW381	12702	2.406	2086	1940	60.7	0.3841		60.7		60.7	B	0.704	0.873	0.650	0.799	Natural	Natural
	IW382	11526	2.183	2060	1936	56.8	0.6196		56.8		56.8	B	0.688	0.599	0.642	0.555	Urban	Urban
	IW384	3456	0.654	1976	1936	61.1	0.0826		61.1		61.1	B	0.338	0.327	0.308	0.296	Natural	Natural
	IW386	9528	1.805	2160	2040	66.5	0.3732		66.5		66.5	C	0.917	0.945	0.838	0.855	Natural	Natural
	IW387	13341	2.527	2440	2180	102.9	1.3509		102.9		102.9	C	0.921	0.597	0.892	0.576	Natural	Natural
	IW388	15575	2.950	2100	1920	61.0	1.2257		61.0		61.0	C	1.200	0.958	1.133	0.900	Natural	Natural
	IW389	6318	1.197	2160	2054	88.6	0.1312		88.6		88.6	C	0.638	0.825	0.588	0.753	Natural	Natural
	IW390	10762	2.038	2210	2040	83.4	0.3110		83.4		83.4	C	1.021	1.302	0.929	1.173	Natural	Natural
	IW390A	15477	2.931	2460	2155	104.1	0.9003		104.1		104.1	C	1.033	0.963	0.971	0.899	Natural	Natural
[b]	IW392	10410	1.972	2520	2038	244.5	1.1135		244.5	233.0	233.0	C	0.500	0.278	0.504	0.280	Natural	Natural
[b]	IW394	27057	5.124	3380	2260	218.6	4.1731		218.6	212.0	212.0	D	1.367	0.857	1.367	0.857	Natural	Natural

[a] Adjusted length used for Tc calculation

[b] Adjusted slope used

[c] S-Graphs used (***** used to identify S-Graph basins)

[d] Adjusted length and slope used

[e] Roughness classes determined based on Hydrology Manual definitions

Table HY-D.2.3 Time of Concentration

Entellus

CLIENT: FCDMC JOB NO. 310.032

JOB: Wittmann Area Drainage Master Study Update

	Basin	TOC Length	TOC Length	US Elev	DS Elev	Slope	Area	Adjusted Length	TOC adjusted slope	basin adjusted slope	Adjusted Slope	Resistance Coefficient Class K_b[e]	24-hr Tc	24-hr R	6-hr Tc	6-hr R	Existing Time-Area Relation	Future Time-Area Relation
		[ft]	[mi]	[ft]	[ft]	[ft/mi]	[mi^2]	[mi]	[ft/mi]	[ft/mi]	[ft/mi]	[A, B, C, D]	[hr]	[hr]	[hr]	[hr]		
[b]	IW395	28919	5.477	3840	2390	264.7	7.8618		264.7	240.0	240.0	D	1.267	0.579	1.296	0.594	Natural	Natural
	IW396	14427	2.732	2460	2170	106.1	0.5863		106.1		106.1	C	1.113	1.262	1.017	1.142	Natural	Natural
[b]	IW397	27120	5.136	4160	2840	257.0	4.8148		257.0	240.0	240.0	D	1.217	0.695	1.213	0.693	Natural	Natural
[a]	PD700	11408	2.161	1340	1302	17.6	1.3998	0.815	46.6		46.6	B	0.708	0.386	0.700	0.381	Natural	Natural
	PD704	7321	1.386	1396	1334	44.7	0.3620		44.7		44.7	B	0.583	0.471	0.571	0.460	Natural	Urban
	PD708	20407	3.865	1524	1348	45.5	2.4019		45.5		45.5	B	1.058	0.705	1.046	0.696	Natural	Natural
	PD712	10292	1.949	1590	1348	124.2	0.8916		124.2		124.2	D	0.942	0.630	0.879	0.584	Natural	Natural
	PD712A	12355	2.340	1528	1394	57.3	0.7664		57.3		57.3	C	1.238	1.077	1.150	0.993	Natural	Natural
	PD716	12081	2.288	1626	1340	125.0	1.7546		125.0		125.0	B	0.454	0.217	0.488	0.235	Natural	Natural
[a]	PD720	7505	1.421	1338	1314	16.9	0.5945	0.566	42.4		42.4	B	0.596	0.371	0.558	0.345	Natural	Natural
	PD726	9836	1.863	1412	1342	37.6	0.4126		37.6		37.6	B	0.833	0.823	0.758	0.742	Natural	Natural
	PD726A	14289	2.706	1524	1396	47.3	1.1030		47.3		47.3	C	1.500	1.258	1.471	1.191	Natural	Natural
[c]	PD726B	11400	2.159	1508	1402	49.1	0.9345		49.1		49.1	*****[c]	*****[c]	*****[c]	*****[c]	*****[c]	*****[c]	*****[c]
	PD732	6439	1.220	1544	1464	65.6	0.4793		65.6		65.6	C	0.738	0.470	0.675	0.426	Natural	Natural
	PD736	15044	2.849	1552	1406	51.2	0.7789		51.2		51.2	C	1.500	1.637	1.500	1.546	Natural	Natural
[c]	PD740	11243	2.129	1538	1436	47.9	1.2839		47.9		47.9	*****[c]	*****[c]	*****[c]	*****[c]	*****[c]	*****[c]	*****[c]
[a]	PD744	11909	2.255	1414	1344	31.0	0.7975	1.875	37.3		37.3	B	0.908	0.725	0.850	0.674	Natural	Natural
[b]	PD748	5366	1.016	1908	1516	385.7	0.2838		385.7	282.0	282.0	D	0.450	0.317	0.417	0.291	Natural	Natural
[b]	PD752	4956	0.939	2044	1536	541.2	0.1897		541.2	310.0	310.0	D	0.429	0.355	0.388	0.317	Natural	Natural
	PD756	25028	4.740	2224	1516	149.4	3.2304		149.4		149.4	D	1.500	1.093	1.500	1.093	Natural	Natural
[b]	PD760	6784	1.285	1844	1532	242.8	0.8671		242.8	235.0	235.0	D	0.542	0.248	0.533	0.244	Natural	Natural
[a]	PI600	7813	1.480	1342	1320	14.9	0.6050	0.403	54.5		54.5	B	0.542	0.341	0.513	0.321	Natural	Urban

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[c] S-Graphs used (***** used to identify S-Graph basins)

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[e] Roughness classes determined based on Hydrology Manual definitions

Table HY-D.2.3 Time of Concentration

Entellus

CLIENT: FCDMC **JOB NO.** 310.032

JOB: Wittmann Area Drainage Master Study Update

													24-hr		6-hr			
	Basin	TOC Length	TOC Length	US Elev	DS Elev	Slope	Area	Adjusted Length	TOC adjusted slope	basin adjusted slope	Adjusted Slope	Resistance Coefficient Class K_b [e]	Tc	R	Tc	R	Existing Time-Area Relation	Future Time-Area Relation
		[ft]	[mi]	[ft]	[ft]	[ft/mi]	[mi^2]	[mi]	[ft/mi]	[ft/mi]	[ft/mi]	[A, B, C, D]	[hr]	[hr]	[hr]	[hr]		
	PI600A	4796	0.908	1376	1340	39.6	0.5203		39.6		39.6	B	0.450	0.205	0.417	0.188	Natural	Urban
[b]	PI603	9536	1.806	1412	1336	42.1	0.5190		42.1		42.1	B	0.738	0.615	0.675	0.558	Natural	Urban
	PI604	7549	1.430	1644	1390	177.6	0.3628		177.6		177.6	D	0.688	0.579	0.629	0.525	Urban	Urban
	PI606	13056	2.473	1462	1352	44.5	1.0766		44.5		44.5	B	0.879	0.635	0.842	0.605	Urban	Urban
	PI606A	9420	1.784	1548	1452	53.8	0.4572		53.8		53.8	B	0.667	0.586	0.608	0.529	Natural	Natural
	PI609	21691	4.108	1566	1362	49.7	1.9354		49.7		49.7	B	1.146	0.915	1.133	0.904	Urban	Urban
	PI612	12622	2.391	1520	1410	46.0	0.7378		46.0		46.0	B	0.883	0.770	0.821	0.710	Natural	Natural
	PI615	11492	2.177	1558	1450	49.6	0.8419		49.6		49.6	B	0.771	0.570	0.725	0.532	Urban	Urban
	PI618	6425	1.217	1558	1490	55.9	0.2886		55.9		55.9	B	0.500	0.407	0.463	0.374	Natural	Natural
	PI621	11523	2.182	1418	1342	34.8	0.9051		34.8		34.8	B	0.900	0.650	0.850	0.610	Natural	Urban
[a]	PI624	13858	2.625	1400	1342	22.1	1.2251	2.008	28.9		28.9	B	1.021	0.730	0.963	0.684	Urban	Urban
	PI624A	19404	3.675	1540	1392	40.3	2.8067		40.3		40.3	B	1.171	0.693	1.229	0.732	Natural	Urban
	PI628	6878	1.303	1548	1486	47.6	0.5695		47.6		47.6	B	0.538	0.316	0.500	0.292	Natural	Natural
[a]	PI633	8600	1.629	1342	1322	12.3	0.3359	0.529	37.8		37.8	B	0.708	0.635	0.667	0.649	Natural	Urban
[a]	PI635	8372	1.586	1368	1326	26.5	0.6106	1.185	35.4		35.4	B	0.683	0.465	0.638	0.430	Natural	Natural
	PI636	7883	1.493	1392	1342	33.5	0.4286		33.5		33.5	B	0.708	0.564	0.646	0.509	Natural	Urban
	PI639	11255	2.132	1452	1374	36.6	0.3431		36.6		36.6	B	0.946	1.173	0.854	1.047	Natural	Urban
	PI642	7008	1.327	1624	1544	60.3	0.2367		60.3		60.3	B	0.583	0.580	0.538	0.530	Urban	Urban
	PI645	14012	2.654	1688	1552	51.2	1.5619		51.2		51.2	B	0.863	0.532	0.858	0.529	Natural	Natural
	PI645A	22945	4.346	2016	1654	83.3	1.6307		83.3		83.3	C	1.367	1.283	1.288	1.201	Natural	Natural
	PI648	20686	3.918	1848	1588	66.4	1.7278		66.4		66.4	C	1.388	1.162	1.317	1.096	Natural	Natural
	PI651	10151	1.922	1712	1588	64.5	0.4594		64.5		64.5	C	0.983	0.954	0.892	0.856	Natural	Natural

[a] Adjusted length used for Tc calculation

[b] Adjusted slope used

[c] S-Graphs used (***** used to identify S-Graph basins)

[d] Adjusted length and slope used

[e] Roughness classes determined based on Hydrology Manual definitions

Table HY-D.2.3 Time of Concentration

Entellus

CLIENT: FCDMC **JOB NO.** 310.032

JOB: Wittmann Area Drainage Master Study Update

	Basin	TOC Length	TOC Length	US Elev	DS Elev	Slope	Area	Adjusted Length	TOC adjusted slope	basin adjusted slope	Adjusted Slope	Resistance Coefficient Class K_b[e]	24-hr Tc	24-hr R	6-hr Tc	6-hr R	Existing Time-Area Relation	Future Time-Area Relation
		[ft]	[mi]	[ft]	[ft]	[ft/mi]	[mi^2]	[mi]	[ft/mi]	[ft/mi]	[ft/mi]	[A, B, C, D]	[hr]	[hr]	[hr]	[hr]		
	PI654	33247	6.297	2210	1660	87.3	4.0277		87.3		87.3	C	1.500	1.196	1.500	1.150	Natural	Natural
	PI657	20498	3.882	2070	1732	87.1	0.8697		87.1		87.1	C	1.279	1.558	1.200	1.452	Natural	Natural
	PI660	24728	4.683	2160	1732	91.4	0.8393		91.4		91.4	C	1.450	2.124	1.358	1.975	Natural	Natural
	PI663	17993	3.408	2310	1944	107.4	0.6041		107.4		107.4	C	1.108	1.474	1.008	1.327	Natural	Natural
	PI669	11427	2.164	1672	1546	58.2	0.2856		58.2		58.2	B	0.800	1.094	0.725	0.981	Natural	Natural
	PI672	14991	2.839	1706	1544	57.1	1.5104		57.1		57.1	B	0.838	0.554	0.825	0.544	Natural	Natural
	PI675	3073	0.582	1574	1546	48.1	0.0628		48.1		48.1	B	0.375	0.391	0.342	0.353	Natural	Natural
	PI678	18767	3.554	1798	1568	64.7	0.8324		64.7		64.7	B	0.983	1.112	0.933	1.049	Natural	Urban
	PI681	18480	3.500	2100	1786	89.7	0.9914		89.7		89.7	C	1.175	1.212	1.100	1.126	Natural	Natural
	PI684	12619	2.390	2240	1980	108.8	0.7361		108.8		108.8	C	0.842	0.731	0.788	0.679	Natural	Natural
	PI687	32563	6.167	3270	2160	180.0	7.0093		180.0		180.0	D	1.500	0.868	1.500	0.868	Natural	Natural
[b]	PI688	20383	3.860	3320	2490	215.0	3.1968		215.0	208.0	208.0	D	1.121	0.638	1.117	0.635	Natural	Natural
[b]	PI689	33171	6.282	4160	2490	265.8	6.7846		265.8	242.0	242.0	D	1.383	0.775	1.392	0.780	Natural	Natural
	PI690	15727	2.979	1744	1566	59.8	0.6289		59.8		59.8	B	0.913	1.043	0.871	0.990	Natural	Natural
	PI693	10564	2.001	1650	1542	54.0	0.8361		54.0		54.0	B	0.688	0.471	0.654	0.446	Natural	Natural
	SV200	14175	2.685	1504	1412	34.3	2.2918		34.3		34.3	B	0.950	0.480	0.954	0.482	Natural	Natural
	SV202	16874	3.196	1546	1446	31.3	1.4365		31.3		31.3	B	1.054	0.803	1.017	0.777	Natural	Natural
	SV203	2366	0.448	1516	1480	80.3	0.0760		80.3		80.3	B	0.258	0.188	0.233	0.168	Natural	Natural
[b]	SV205	10839	2.053	2540	1484	514.4	0.5022		514.4	302.0	302.0	B	0.333	0.288	0.300	0.256	Natural	Natural
[b]	SV208	17407	3.297	3140	1488	501.1	1.0674		501.1	301.0	301.0	D	0.971	0.896	0.925	0.849	Natural	Natural
[b]	SV210	10699	2.026	2280	1500	384.9	0.7184		384.9	283.0	283.0	B	0.329	0.229	0.313	0.216	Natural	Natural
	SV212	24690	4.676	1800	1462	72.3	4.1391		72.3		72.3	B	0.942	0.529	0.979	0.552	Natural	Natural

[a] Adjusted length used for Tc calculation

[b] Adjusted slope used

[c] S-Graphs used (***** used to identify S-Graph basins)

[d] Adjusted length and slope used

[e] Roughness classes determined based on Hydrology Manual definitions

Table HY-D.2.3 Time of Concentration

Entellus

CLIENT: FCDMC **JOB NO.** 310.032

JOB: Wittmann Area Drainage Master Study Update

													24-hr		6-hr			
	Basin	TOC Length	TOC Length	US Elev	DS Elev	Slope	Area	Adjusted Length	TOC adjusted slope	basin adjusted slope	Adjusted Slope	Resistance Coefficient Class K_b [e]	Tc	R	Tc	R	Existing Time-Area Relation	Future Time-Area Relation
		[ft]	[mi]	[ft]	[ft]	[ft/mi]	[mi^2]	[mi]	[ft/mi]	[ft/mi]	[ft/mi]	[A, B, C, D]	[hr]	[hr]	[hr]	[hr]		
	SV214	14096	2.670	1640	1498	53.2	1.8700		53.2		53.2	B	0.754	0.415	0.754	0.415	Natural	Urban
	SV216	14362	2.720	1684	1530	56.6	1.6268		56.6		56.6	B	0.750	0.454	0.742	0.448	Natural	Natural
	SV218	14735	2.791	1676	1546	46.6	1.2862		46.6		46.6	B	0.863	0.618	0.838	0.598	Natural	Natural
	SV219	11995	2.272	1676	1564	49.3	0.8972		49.3		49.3	B	0.596	0.379	0.683	0.497	Natural	Natural
	SV220	6896	1.306	1546	1498	36.8	0.6004		36.8		36.8	B	0.567	0.326	0.533	0.305	Natural	Urban
[b]	SV230	12951	2.453	2620	1524	446.8	0.8513		446.8	291.0	291.0	B	0.363	0.270	0.354	0.263	Natural	Natural
[b]	SV232	22945	4.346	3060	1532	351.6	3.0569		351.6	275.0	275.0	C	0.779	0.471	0.821	0.509	Natural	Natural
	SV236	10295	1.950	1770	1588	93.3	0.5856		93.3		93.3	B	0.558	0.448	0.525	0.419	Natural	Natural
[b]	SV240	26273	4.976	3090	1628	293.8	3.6651		293.8	260.0	260.0	C	0.925	0.584	0.954	0.605	Natural	Natural
	SV242	6324	1.198	1730	1636	78.5	0.0939		78.5		78.5	B	0.496	0.756	0.458	0.692	Natural	Natural
	SV244	21079	3.992	2170	1632	134.8	0.9461		134.8		134.8	C	1.179	1.388	1.125	1.317	Natural	Natural
	SV246	6139	1.163	1762	1660	87.7	0.1567		87.7		87.7	B	0.404	0.439	0.371	0.399	Natural	Natural
[b]	SV248	22862	4.330	3250	1738	349.2	1.2718		349.2	275.0	275.0	C	0.896	0.922	0.871	0.894	Natural	Natural
	SV250	6151	1.165	1768	1672	82.4	0.1213		82.4		82.4	B	0.454	0.579	0.417	0.527	Natural	Natural
	SV251	8684	1.645	1815	1672	86.9	0.2675		86.9		86.9	B	0.546	0.597	0.504	0.546	Natural	Natural
	SV252	7589	1.437	1786	1660	87.7	0.1473		87.7		87.7	B	0.517	0.708	0.475	0.645	Natural	Natural
	SV254	4596	0.870	1753	1672	93.1	0.0971		93.1		93.1	B	0.375	0.421	0.333	0.369	Natural	Natural
	SV256	3345	0.633	1769	1706	99.5	0.0604		99.5		99.5	B	0.308	0.344	0.271	0.298	Natural	Urban
[b]	SV258	13957	2.643	2550	1746	304.2	0.7359		304.2	265.0	265.0	C	0.638	0.582	0.613	0.557	Natural	Natural
	SV260	11890	2.252	1606	1538	30.2	1.2629		30.2		30.2	B	0.875	0.535	0.846	0.515	Natural	Natural
	SV264	20621	3.905	1678	1552	32.3	1.9190		32.3		32.3	B	1.167	0.900	1.121	0.861	Natural	Natural
	SV264A	27055	5.124	1716	1562	30.1	2.8970		30.1		30.1	B	1.413	1.094	1.358	1.048	Natural	Natural

[a] Adjusted length used for Tc calculation

[b] Adjusted slope used

[c] S-Graphs used (***** used to identify S-Graph basins)

[d] Adjusted length and slope used

[e] Roughness classes determined based on Hydrology Manual definitions

Table HY-D.2.3 Time of Concentration

Entellus

CLIENT: FCDMC JOB NO. 310.032

JOB: Wittmann Area Drainage Master Study Update

	Basin	TOC Length	TOC Length	US Elev	DS Elev	Slope	Area	Adjusted Length	TOC adjusted slope	basin adjusted slope	Adjusted Slope	Resistance Coefficient Class K_b [e]	24-hr Tc	24-hr R	6-hr Tc	6-hr R	Existing Time-Area Relation	Future Time-Area Relation
		[ft]	[mi]	[ft]	[ft]	[ft/mi]	[mi^2]	[mi]	[ft/mi]	[ft/mi]	[ft/mi]	[A, B, C, D]	[hr]	[hr]	[hr]	[hr]		
	SV268	13780	2.610	1618	1540	29.9	1.3755		29.9		29.9	B	0.908	0.597	0.871	0.570	Natural	Natural
	SV272	14449	2.736	1668	1568	36.5	1.2010		36.5		36.5	B	0.921	0.680	0.883	0.650	Natural	Natural
	SV276	15413	2.919	1666	1558	37.0	0.9233		37.0		37.0	B	0.958	0.870	0.900	0.812	Natural	Natural
	SV280	17827	3.376	1666	1554	33.2	1.0563		33.2		33.2	B	1.088	1.042	1.021	0.971	Natural	Natural
	SV284	6288	1.191	1690	1648	35.3	0.2834		35.3		35.3	B	0.567	0.465	0.521	0.423	Natural	Natural
	SV286	17472	3.309	1784	1668	35.1	1.5380		35.1		35.1	B	1.029	0.779	0.992	0.747	Natural	Urban
	SV290	12131	2.298	1740	1656	36.6	0.8137		36.6		36.6	B	0.854	0.680	0.800	0.632	Natural	Natural
	SV294	26156	4.954	1832	1650	36.7	2.6465		36.7		36.7	B	1.242	0.972	1.192	0.928	Natural	Natural
	SV298	24265	4.596	1812	1648	35.7	1.0753		35.7		35.7	B	1.325	1.644	1.242	1.529	Natural	Natural
	TW400	27511	5.210	1488	1334	29.6	4.2709	5.082	30.3		30.3	B	1.463	0.924	1.483	0.938	Urban	Urban
	TW402	25408	4.812	1496	1338	32.8	4.9144		32.8		32.8	B	1.342	0.727	1.367	0.742	Natural	Urban
[a]	TW404	13907	2.634	1480	1332	56.2	2.0927	2.050	72.2		72.2	B	0.638	0.320	0.667	0.336	Natural	Urban
[b]	TW406	3030	0.574	1720	1452	467.0	0.1633		467.0	300.0	300.0	B	0.179	0.099	0.163	0.089	Natural	Natural
[b]	TW408	20229	3.831	3160	1456	444.8	0.9101		444.8	289.0	289.0	D	1.129	1.308	1.058	1.218	Natural	Natural
	TW410	9964	1.887	1464	1390	39.2	0.3080		39.2		39.2	B	0.813	0.925	0.775	0.907	Natural	Urban
	TW412	20690	3.919	1518	1388	33.2	2.0637		33.2		33.2	B	1.238	0.925	1.200	0.894	Natural	Urban
[b]	TW414	11243	2.129	2360	1464	420.8	1.1684		420.8	288.0	288.0	B	0.329	0.181	0.338	0.186	Natural	Urban
	TW416	12097	2.291	1556	1488	29.7	0.5883		29.7		29.7	B	0.929	0.896	0.838	0.798	Urban	Urban
	TW418	12099	2.292	1558	1488	30.5	1.3681		30.5		30.5	B	0.833	0.491	0.800	0.469	Natural	Urban
	TW420	12533	2.374	1534	1452	34.5	0.8077		34.5		34.5	B	0.925	0.765	0.863	0.708	Natural	Urban
	TW422	12249	2.320	1524	1444	34.5	0.7032		34.5		34.5	B	0.908	0.802	0.829	0.720	Natural	Urban
	TW424	9604	1.819	1546	1472	40.7	1.4967		40.7		40.7	B	0.617	0.277	0.625	0.282	Urban	Urban

[a] Adjusted length used for Tc calculation

[b] Adjusted slope used

[c] S-Graphs used (***** used to identify S-Graph basins)

[d] Adjusted length and slope used

[e] Roughness classes determined based on Hydrology Manual definitions

Table HY-D.2.3 Time of Concentration

Entellus

CLIENT: FCDMC **JOB NO.** 310.032

JOB: Wittmann Area Drainage Master Study Update

													24-hr		6-hr			
	Basin	TOC Length	TOC Length	US Elev	DS Elev	Slope	Area	Adjusted Length	TOC adjusted slope	basin adjusted slope	Adjusted Slope	Resistance Coefficient Class K_b[e]	Tc	R	Tc	R	Existing Time-Area Relation	Future Time-Area Relation
		[ft]	[mi]	[ft]	[ft]	[ft/mi]	[mi^2]	[mi]	[ft/mi]	[ft/mi]	[ft/mi]	[A, B, C, D]	[hr]	[hr]	[hr]	[hr]		
	TW429	10305	1.952	1624	1554	35.9	0.5553		35.9		35.9	B	0.746	0.638	0.692	0.587	Urban	Urban
[a]	TW430	14765	2.796	1646	1546	35.8	2.4917	2.307	43.3		43.3	B	0.792	0.386	0.800	0.391	Natural	Natural
	TW431	14230	2.695	1688	1580	40.1	0.8733		40.1		40.1	B	0.875	0.762	0.825	0.714	Natural	Natural
	TW432	14188	2.687	1782	1640	52.8	0.8620		52.8		52.8	B	0.854	0.745	0.808	0.701	Natural	Natural
	TW434	10971	2.078	1674	1578	46.2	0.5691		46.2		46.2	B	0.750	0.666	0.696	0.612	Natural	Natural
	TW436	10224	1.936	1714	1616	50.6	0.6744		50.6		50.6	B	0.633	0.473	0.600	0.446	Urban	Urban
	TW440	3973	0.753	1684	1646	50.5	0.1083		50.5		50.5	B	0.408	0.387	0.375	0.353	Natural	Natural
	TW442	8697	1.647	1732	1646	52.2	0.3766		52.2		52.2	B	0.596	0.542	0.550	0.496	Urban	Urban
	TW444	8664	1.641	1772	1670	62.2	0.3468		62.2		62.2	B	0.554	0.522	0.508	0.475	Urban	Urban
	TW446	10098	1.913	1808	1700	56.5	0.3542		56.5		56.5	B	0.621	0.662	0.571	0.603	Natural	Natural
	TW446A	10973	2.078	1904	1756	71.2	0.3372		71.2		71.2	C	0.975	1.200	0.879	1.070	Natural	Natural
	TW448	12508	2.369	1948	1776	72.6	0.3469		72.6		72.6	C	1.054	1.430	0.950	1.274	Natural	Natural
	TW450	21348	4.043	2020	1740	69.3	1.2535		69.3		69.3	C	1.421	1.469	1.333	1.369	Natural	Natural
	TW450A	14391	2.726	2350	2056	107.9	0.8811		107.9		107.9	C	0.917	0.805	0.858	0.749	Natural	Natural
	TW450B	7413	1.404	2084	1968	82.6	0.4043		82.6		82.6	C	0.675	0.526	0.625	0.483	Natural	Natural
	TW452	11311	2.142	1856	1722	62.6	0.4617		62.6		62.6	C	1.025	1.087	0.925	0.970	Natural	Natural
	TW452A	16407	3.107	2405	2048	114.9	1.0764		114.9		114.9	C	0.963	0.842	0.913	0.794	Natural	Natural
	TW452B	17219	3.261	2068	1818	76.7	1.0314		76.7		76.7	C	1.213	1.159	1.142	1.084	Natural	Natural
	TW454	13215	2.503	2052	1864	75.1	0.3557		75.1		75.1	C	1.250	1.780	1.133	1.596	Natural	Natural
	TW456	7348	1.392	2044	1920	89.1	0.1764		89.1		89.1	C	0.746	0.936	0.683	0.849	Natural	Natural
	TW458	9903	1.876	2150	1964	99.2	0.6697		99.2		99.2	C	0.733	0.545	0.688	0.507	Natural	Natural
	TW459	22494	4.260	2500	2060	103.3	1.0450		103.3		103.3	C	1.413	1.688	1.346	1.600	Natural	Natural

[a] Adjusted length used for Tc calculation

[b] Adjusted slope used

[c] S-Graphs used (***** used to identify S-Graph basins)

[d] Adjusted length and slope used

[e] Roughness classes determined based on Hydrology Manual definitions

Table HY-D.2.3 Time of Concentration

Entellus

CLIENT: FCDMC **JOB NO.** 310.032

JOB: Wittmann Area Drainage Master Study Update

	Basin	TOC Length	TOC Length	US Elev	DS Elev	Slope	Area	Adjusted Length	TOC adjusted slope	basin adjusted slope	Adjusted Slope	Resistance Coefficient Class K_b [e]	24-hr Tc	24-hr R	6-hr Tc	6-hr R	Existing Time-Area Relation	Future Time-Area Relation
		[ft]	[mi]	[ft]	[ft]	[ft/mi]	[mi^2]	[mi]	[ft/mi]	[ft/mi]	[ft/mi]	[A, B, C, D]	[hr]	[hr]	[hr]	[hr]		
	TW460	28510	5.400	2910	2044	160.4	2.3156		160.4		160.4	C	1.250	1.132	1.221	1.103	Natural	Natural
	TW462	3969	0.752	2140	2060	106.4	0.0799		106.4		106.4	B	0.296	0.322	0.267	0.287	Natural	Natural
	TW478	5622	1.065	1598	1552	43.2	0.2625		43.2		43.2	B	0.458	0.333	0.458	0.351	Urban	Urban
	TW480	11437	2.166	1692	1590	47.1	0.7539		47.1		47.1	B	0.700	0.543	0.663	0.511	Urban	Urban
	TW482	11502	2.178	1766	1646	55.1	0.7565		55.1		55.1	B	0.704	0.548	0.667	0.516	Natural	Urban
	TW484	10510	1.990	1768	1674	47.2	0.3477		47.2		47.2	B	0.733	0.830	0.671	0.752	Urban	Urban
	TW485	25285	4.789	2012	1686	68.1	2.3729		68.1		68.1	B	1.013	0.803	1.004	0.795	Natural	Natural
[a]	**WI500**	12378	2.344	1402	1340	26.4	1.0488	2.154	28.8		28.8	B	0.979	0.695	0.933	0.659	Natural	Natural
[a]	**WI502**	16737	3.170	1428	1336	29.0	1.2082	2.967	31.0		31.0	B	1.179	1.004	1.133	0.961	Natural	Natural
[a]	**WI504**	10910	2.066	1390	1336	26.1	1.3495	1.685	32.1		32.1	B	0.796	0.433	0.771	0.417	Natural	Urban
	WI506	16618	3.147	1458	1350	34.3	1.5757		34.3		34.3	B	1.083	0.781	1.054	0.758	Urban	Urban
	WI508	12621	2.390	1438	1364	31.0	0.6991		31.0		31.0	B	1.021	0.932	0.946	0.856	Natural	Natural
	WI510	19908	3.770	1488	1364	32.9	1.2274		32.9		32.9	B	1.313	1.287	1.258	1.228	Natural	Natural
	WI510A	11774	2.230	1550	1456	42.2	1.1294		42.2		42.2	B	0.813	0.521	0.783	0.500	Natural	Urban
	WI512	14556	2.757	1534	1428	38.5	1.3551		38.5		38.5	B	0.917	0.636	0.888	0.613	Urban	Urban
	WI514	6102	1.156	1548	1488	51.9	0.3525		51.9		51.9	B	0.488	0.339	0.450	0.310	Natural	Urban
	WI516	4853	0.919	1534	1490	47.9	0.1435		47.9		47.9	B	0.488	0.471	0.450	0.431	Natural	Urban
	WI518	8788	1.664	1500	1434	39.7	0.5318		39.7		39.7	B	0.721	0.572	0.638	0.484	Natural	Urban
	WI524	12352	2.339	1474	1382	39.3	0.9501		39.3		39.3	B	0.871	0.645	0.825	0.607	Natural	Urban
	WI525	15452	2.927	1560	1424	46.5	1.9406		46.5		46.5	B	0.900	0.533	0.896	0.530	Natural	Urban
	WI526	4413	0.836	1546	1508	45.5	0.0486		45.5		45.5	B	0.500	0.833	0.463	0.764	Natural	Urban
[a]	**WI527**	9630	1.824	1542	1474	37.3	0.7094	1.726	39.4		39.4	B	0.733	0.516	0.688	0.480	Natural	Urban

[a] Adjusted length used for Tc calculation

[b] Adjusted slope used

[c] S-Graphs used (***** used to identify S-Graph basins)

[d] Adjusted length and slope used

[e] Roughness classes determined based on Hydrology Manual definitions

Table HY-D.2.3 Time of Concentration

Entellus

CLIENT: FCDMC JOB NO. 310.032

JOB: Wittmann Area Drainage Master Study Update

Basin	TOC Length	TOC Length	US Elev	DS Elev	Slope	Area	Adjusted Length	TOC adjusted slope	basin adjusted slope	Adjusted Slope	Resistance Coefficient Class K_b[e]	24-hr Tc	24-hr R	6-hr Tc	6-hr R	Existing Time-Area Relation	Future Time-Area Relation
	[ft]	[mi]	[ft]	[ft]	[ft/mi]	[mi^2]	[mi]	[ft/mi]	[ft/mi]	[ft/mi]	[A, B, C, D]	[hr]	[hr]	[hr]	[hr]		
WI528	7347	1.391	1544	1494	35.9	0.3585		35.9		35.9	B	0.679	0.563	0.617	0.506	Natural	Urban
WI529	3873	0.734	1548	1526	30.0	0.1664		30.0		30.0	B	0.479	0.355	0.442	0.324	Natural	Urban
WI530	19476	3.689	1750	1542	56.4	2.3758		56.4		56.4	B	0.971	0.621	1.013	0.651	Natural	Natural
WI532	7839	1.485	1782	1676	71.4	0.3228		71.4		71.4	B	0.475	0.423	0.475	0.423	Natural	Urban
WI534	9108	1.725	1852	1712	81.2	0.4340		81.2		81.2	C	0.767	0.686	0.717	0.636	Natural	Urban
WI536	24561	4.652	2028	1672	76.5	1.3700		76.5		76.5	C	1.467	1.618	1.396	1.532	Natural	Natural
WI538	22852	4.328	1984	1668	73.0	1.4302		73.0		73.0	C	1.438	1.457	1.388	1.401	Natural	Natural
WI538A	14839	2.810	2190	1908	100.3	0.7764		100.3		100.3	C	0.979	0.954	0.913	0.882	Natural	Natural
WI540	18692	3.540	2390	1976	116.9	1.2455		116.9		116.9	C	1.063	0.960	1.008	0.906	Natural	Natural
WI542	18000	3.409	1706	1546	46.9	1.1740	2.977	53.7		53.7	B	1.033	0.934	0.996	0.897	Natural	Urban
WI544	20705	3.921	1896	1628	68.3	1.7938		68.3		68.3	B	0.863	0.671	0.875	0.682	Urban	Urban
WI546	14356	2.719	1860	1678	66.9	0.6051		66.9		66.9	B	0.725	0.767	0.688	0.724	Urban	Urban
WI548	9126	1.728	1976	1832	83.3	0.3084		83.3		83.3	B	0.504	0.524	0.471	0.486	Natural	Natural
WI550	3526	0.668	1584	1542	62.9	0.1426		62.9		62.9	B	0.346	0.250	0.308	0.220	Natural	Urban
WI552	9106	1.725	1644	1560	48.7	0.4131		48.7		48.7	B	0.692	0.629	0.629	0.566	Natural	Urban
WI554	12861	2.436	1718	1594	50.9	1.0438		50.9		50.9	B	0.792	0.568	0.763	0.545	Natural	Urban
WI556	2069	0.392	1728	1694	86.8	0.0781		86.8		86.8	B	0.221	0.140	0.213	0.134	Natural	Urban
WI560	26588	5.036	2044	1688	70.7	3.5624		70.7		70.7	B	0.979	0.639	0.992	0.648	Natural	Natural
WI560A	32924	6.236	3030	1876	185.1	2.0440		185.1		185.1	C	1.317	1.432	1.275	1.394	Natural	Natural
WI562	16143	3.057	2170	1852	104.0	0.8720		104.0		104.0	C	1.029	1.010	0.967	0.942	Natural	Natural
WI564	23492	4.449	2580	1960	139.3	1.8057		139.3		139.3	D	1.500	1.448	1.500	1.385	Natural	Natural
WI566	4387	0.831	2060	1980	96.3	0.1110		96.3		96.3	C	0.500	0.518	0.467	0.479	Natural	Natural

[a] Adjusted length used for Tc calculation

[b] Adjusted slope used

[c] S-Graphs used (***** used to identify S-Graph basins)

[d] Adjusted length and slope used

[e] Roughness classes determined based on Hydrology Manual definitions

Table HY-D.2.3 Time of Concentration

Entellus

CLIENT: FCDMC JOB NO. 310.032

JOB: Wittmann Area Drainage Master Study Update

	Basin	TOC Length	TOC Length	US Elev	DS Elev	Slope	Area	Adjusted Length	TOC adjusted slope	basin adjusted slope	Adjusted Slope	Resistance Coefficient Class K_b [e]	24-hr Tc	24-hr R	6-hr Tc	6-hr R	Existing Time-Area Relation	Future Time-Area Relation
		[ft]	[mi]	[ft]	[ft]	[ft/mi]	[mi^2]	[mi]	[ft/mi]	[ft/mi]	[ft/mi]	[A, B, C, D]	[hr]	[hr]	[hr]	[hr]		
[b]	**WI570**	23861	4.519	3336	1988	298.3	2.2377		298.3	264.0	264.0	D	1.096	0.865	1.063	0.836	Natural	Natural
[b]	**WI572**	29934	5.669	3150	1976	207.1	2.0606		207.1	205.0	205.0	B	0.663	0.622	0.679	0.639	Natural	Natural
	WI574	6919	1.310	1928	1836	70.2	0.2190		70.2		70.2	B	0.492	0.496	0.454	0.454	Natural	Natural
	WI576	17965	3.402	1968	1734	68.8	1.1801		68.8		68.8	B	0.896	0.794	0.863	0.761	Natural	Natural
	WI576A	23736	4.495	2870	2040	184.6	1.2238		184.6		184.6	C	1.083	1.199	1.042	1.148	Natural	Natural
	WI576B	9138	1.731	2048	1896	87.8	0.4631		87.8		87.8	C	0.817	0.711	0.750	0.647	Natural	Natural
	WI578	11252	2.131	2225	1994	108.4	0.4841		108.4		108.4	C	0.838	0.842	0.767	0.763	Natural	Natural
	WI580	13296	2.518	2020	1832	74.7	1.3195		74.7		74.7	B	0.642	0.404	0.646	0.407	Natural	Natural
	WI580A	26073	4.938	2940	2024	185.5	2.7850		185.5		185.5	C	1.033	0.768	1.029	0.764	Natural	Natural
[b]	**WI580B**	15228	2.884	3270	2183	376.9	0.6285		376.9	281.0	281.0	C	0.671	0.722	0.625	0.668	Natural	Natural
	WI582	8237	1.560	1716	1628	56.4	0.3753		56.4		56.4	B	0.579	0.504	0.538	0.464	Natural	Urban
[a]	**WI584**	14905	2.823	1646	1550	34.0	1.2569	2.420	39.7		39.7	B	0.963	0.714	0.925	0.683	Urban	Urban
[d]	**WT100**	28360	5.371	2980	1336	306.1	3.8475	4.563	360.3	266.0	266.0	C	0.958	0.628	0.983	0.647	Natural	Natural
[d]	**WT110**	22505	4.262	2560	1340	286.2	2.8958	4.201	290.4	258.0	258.0	C	0.846	0.535	0.867	0.549	Natural	Natural
[d]	**WT120**	26273	4.976	2470	1340	227.1	2.8035	4.024	280.8	222.0	222.0	C	1.029	0.766	1.038	0.773	Natural	Natural
[d]	**WT130**	25083	4.751	2970	1350	341.0	2.5672	4.663	347.4	275.0	275.0	C	0.908	0.676	0.921	0.686	Natural	Natural
[b]	**WT140**	29200	5.530	3510	1610	343.6	3.7893		343.6	278.0	278.0	D	1.375	0.969	1.417	1.001	Natural	Natural
[b]	**WT150**	13181	2.496	3040	1530	604.9	1.0865		604.9	313.0	313.0	D	0.771	0.550	0.746	0.530	Natural	Natural
[b]	**WT150A**	27551	5.218	3330	1740	304.7	4.7510		304.7	270.0	270.0	D	1.308	0.769	1.371	0.810	Natural	Natural
[b]	**WT160**	13800	2.614	2920	1540	528.0	0.8127		528.0	308.0	308.0	D	0.829	0.730	0.779	0.681	Natural	Natural

[a] Adjusted length used for Tc calculation

[b] Adjusted slope used

[c] S-Graphs used (***** used to identify S-Graph basins)

[d] Adjusted length and slope used

[e] Roughness classes determined based on Hydrology Manual definitions

D.3 Hydrograph Routing Data

(Modifications made to the length for R810 and RAF810, refer to the July 2005 WADMSU Hydrology Report prepared by Entellus or the September 2009 Loop 303/White Tanks ADMPU Area Hydrologic Analysis prepared by HDR for additional information)

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CLIENT: FCDMC

JOB NO. 310.032

JOB: Wittmann Area Drainage Master Study Update

Route ID	Mannings' n-values		length [ft]	length [miles]	US elev [ft]	DS elev [ft]	slope [ft/ft]	Typical Cross Section ID
	Overbank	Channel						
R150A	0.060	0.035	9557.0	1.81	1730.0	1530.0	0.0209	WTTS20_2
R205*	0.040	0.04	9517.3	1.80	1492	1412.0	0.0084	SVTS40
R230*	0.040	0.04	8744.1	1.66	1540	1462.0	0.0089	SVTS30
R242*	0.040	0.04	13351.2	2.53	1629.9	1497.7	0.0099	SVTS10
R264A	0.040	0.04	4041.9	0.77	1568	1556.0	0.0030	TSR264A
R350*	0.040	0.04	8309.6	1.57	1680	1630.0	0.0060	IWTS40_1
R359*	0.040	0.04	9280.3	1.76	1888	1792.0	0.0103	IWTS30_2
R390A	0.043	0.035	8577.0	1.62	2155	2040.0	0.0134	IWTS10_1
R442*	0.040	0.04	9087.7	1.72	1645.9	1581.3	0.0071	WITS20
R446A	0.043	0.035	6777.0	1.28	1758.0	1700.0	0.0086	WITS130
R450A	0.043	0.035	5936.0	1.12	2056.0	1968.0	0.0148	WITS10
R450B	0.043	0.035	18811.0	3.56	1968.0	1738.0	0.0122	WITS10
R452A	0.043	0.035	16523.0	3.13	2048.0	1816.0	0.0140	WITS10
R452B	0.043	0.035	9296.0	1.76	1816.0	1738.0	0.0084	WITS10
R508*	0.043	0.035	12365.6	2.34	1433.5	1367.6	0.0053	WITS130
R510A	0.040	0.04	17256.7	3.27	1460	1372.0	0.0051	WITS70
R530*	0.043	0.035	14750.6	2.79	1677.1	1556.3	0.0082	WITS90_3
R538A	0.043	0.035	18226.3	3.45	1912	1668.0	0.0134	WITS90_2
R562*	0.043	0.035	14580.6	2.76	1852	1688.0	0.0112	WITS40
R576A	0.043	0.035	8797.0	1.67	2044	1896.0	0.0168	WITS10
R576B	0.043	0.035	18394.4	3.48	1896	1686.0	0.0114	WITS10
R580A	0.043	0.035	21212.8	4.02	2024	1832.0	0.0091	WITS10
R580B	0.043	0.035	8181.3	1.55	2182	2016.0	0.0203	WITS10
R606A	0.043	0.035	12583.4	2.38	1454	1352.0	0.0081	PDTS30
R624A	0.043	0.035	11809.0	2.24	1392	1342.0	0.0042	PDTS40_1
R645A	0.043	0.035	8663.6	1.64	1656	1552.0	0.0120	PITS10_2
R700*	0.045	0.035	5757.0	1.09	1314	1308.0	0.0010	Channel
R708*	0.043	0.035	10483.6	1.99	1430	1348.0	0.0078	PDTS40_2
R712A	0.043	0.035	6448.0	1.22	1394	1334.9	0.0092	PDTS40_2
R726*	0.043	0.035	4179.0	0.79	1366	1342.0	0.0057	PDTS30
R726A	0.043	0.035	3986.0	0.75	1394	1366.0	0.0070	PDTS30
R726B	0.043	0.035	4094.0	0.78	1400	1366.0	0.0083	PDTS30
R810*	0.043	0.035	10685.0	2.02	1312	1250.0	0.0058	PDTS40_1
RAF803	0.045	0.035	5287.0	1.00	1270	1260.0	0.0019	TSAF10
RAF805	0.043	0.035	6821.0	1.29	1290	1250.0	0.0059	PDTS40_1
RAF807	0.045	0.035	2485.0	0.47	1260	1250.0	0.0040	TSAF10
RAF810	0.043	0.035	8372.0	1.59	1250	1180.0	0.0084	PDTS40_1

Entellus

BY _____ DATE _____

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JOB NO. 310.032

JOB: Wittmann Area Drainage Master Study Update

Route ID	Mannings' n-values Overbank	Channel	length [ft]	length [miles]	US elev [ft]	DS elev [ft]	slope [ft/ft]	Typical Cross Section ID
RAF852	0.045	0.035	1378.0	0.26	1154	1148.0	0.0044	TSAF10
RAF854	0.045	0.035	2113.0	0.40	1164	1154.0	0.0047	TSAF10
RAF862	0.045	0.035	2136.0	0.40	1128	1118.0	0.0047	TSAF20
RAF864	0.045	0.035	4666.0	0.88	1142	1128.0	0.0030	TSAF20
RAF866	0.045	0.035	6743.0	1.28	1148	1118.0	0.0044	TSAF20
RD248	0.040	0.04	4587.8	0.87	1740.5	1665.1	0.0164	SVTS10
RD312	0.043	0.035	1034.0	0.20	1908	1900.0	0.0077	WITS130
RD349	0.043	0.035	4244.0	0.80	1782.7	1735.5	0.0111	TWTS20
RD351	0.040	0.04	6586.0	1.25	1790	1740.0	0.0076	IWTS30_1
RD357	0.040	0.04	2791.0	0.53	1848	1826.0	0.0079	IWTS30_1
RD363	0.040	0.04	3820.0	0.72	1826	1790.0	0.0094	IWTS30_1
RD365	0.043	0.035	1700.0	0.32	1900	1882.0	0.0106	WITS130
RD369	0.043	0.035	1927.0	0.36	1884	1874.0	0.0052	WITS130
RD371	0.043	0.035	1409.0	0.27	1964	1962.0	0.0014	WITS130
RD372	0.043	0.035	1828.0	0.35	1824	1818.0	0.0033	WITS130
RD380	0.043	0.035	1142.0	0.22	2072	2068.0	0.0035	TWTS20
RD382A	0.043	0.035	1172.0	0.22	1952	1944.0	0.0068	WITS130
RD446A	0.043	0.035	2942.0	0.56	1764	1738.0	0.0088	WITS130
RD448	0.043	0.035	1591.0	0.30	1780	1760.0	0.0126	WITS130
RD450	0.043	0.035	2017.0	0.38	1738	1726.0	0.0059	WITS130
RD454	0.043	0.035	3342.0	0.63	1861.3	1816.0	0.0136	WITS90_2
RD480	0.040	0.04	5985.0	1.13	1591	1552.0	0.0065	TSR482
RD482	0.043	0.035	2439.0	0.46	1650	1627.0	0.0094	WITS130
RD508	0.040	0.04	5200.0	0.98	1366	1332.2	0.0065	WITS70
RD524	0.043	0.035	2235.0	0.42	1382	1376.0	0.0027	WITS130
RD525	0.043	0.035	6496.0	1.23	1424	1382.0	0.0065	WITS130
RD527	0.043	0.035	7666.0	1.45	1474	1424.0	0.0065	WITS130
RD529	0.043	0.035	4871.0	0.92	1526	1488.0	0.0078	WITS130
RD544	0.043	0.035	9401.1	1.78	1628.8	1552.0	0.0082	WITS40
RD576	0.043	0.035	4830.3	0.91	1734	1688.0	0.0095	WITS10
RD576B	0.043	0.035	13551.5	2.57	1896	1736.0	0.0118	WITS10
RD580B	0.043	0.035	9429.7	1.79	2182	1994.0	0.0199	WITS90_1
RD600A	0.043	0.035	4775.0	0.90	1342	1336.0	0.0013	TSBEAR
RD606A	0.043	0.035	7506.5	1.42	1454	1389.0	0.0087	PITS30
RD612	0.043	0.035	11125.0	2.11	1412.2	1340.0	0.0065	PITS20
RD618	0.043	0.035	9630.0	1.82	1534	1446.0	0.0091	PITS20
RD654	0.043	0.035	11214.8	2.12	1658	1548.4	0.0098	PITS10_2

Entellus

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CHECK _____ DATE _____

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JOB NO. 310.032

JOB: Wittmann Area Drainage Master Study Update

Route ID	Mannings' n-values Overbank	Channel	length [ft]	length [miles]	US elev [ft]	DS elev [ft]	slope [ft/ft]	Typical Cross Section ID
RD678	0.043	0.035	6108.0	1.16	1574	1550.0	0.0039	WITS110_2
RD744	0.043	0.035	3177.0	0.60	1338	1320.0	0.0057	TSR606
RD800	0.043	0.035	5888.0	1.12	1346	1311.0	0.0059	PDTS40_1
RDCP07	0.043	0.035	6956.4	1.32	1552	1494.0	0.0083	WITS120
RDCP08	0.043	0.035	4229.1	0.80	1556	1508.0	0.0114	WITS120
RDCP09	0.043	0.035	14617.9	2.77	1558	1426.0	0.0090	WITS120
RDCP10	0.043	0.035	6701.3	1.27	1550	1496.0	0.0081	WITS120
RDCP11	0.043	0.035	6376.9	1.21	1550	1490.0	0.0094	PITS10_2
RDCP12	0.043	0.035	6159.0	1.17	1548.4	1490.7	0.0094	PITS30
RDCP13	0.043	0.035	11034.4	2.09	1544	1446.0	0.0089	PITS30
RDCP14	0.043	0.035	20385.8	3.86	1556	1380.0	0.0086	PITS30
RDCP15	0.043	0.035	9601.8	1.82	1556	1454.0	0.0106	PITS30
RDCP16	0.043	0.035	10753.8	2.04	1556	1436.0	0.0112	PDTS30
RDCP17	0.043	0.035	10399.9	1.97	1556	1436.0	0.0115	PDTS30
RDCP18	0.043	0.035	14927.0	2.83	1556	1406.0	0.0100	PDTS30
RDCP19	0.043	0.035	5902.3	1.12	1552	1464.0	0.0149	PDTS30
RDCPOT	0.040	0.04	8638.0	1.64	1538	1474.0	0.0074	WITS70
RIW300	0.040	0.04	6125.0	1.16	1445.1	1418.8	0.0043	TWTS50
RIW302	0.040	0.04	5720.1	1.08	1443.9	1418.8	0.0044	TWTS50
RIW310	0.040	0.04	860.0	0.16	1548.7	1547.0	0.0020	IWTS50
RIW312	0.040	0.04	8292.4	1.57	1908.3	1828.3	0.0096	TSR375
RIW314	0.040	0.04	20067.8	3.80	1547	1445.1	0.0051	IWTS50
RIW318	0.040	0.04	17570.2	3.33	1634.9	1548.7	0.0049	TSR294
RIW322	0.040	0.04	12886.2	2.44	1616.3	1547.0	0.0054	IWTS40_2
RIW326	0.040	0.04	8065.9	1.53	1594.9	1548.7	0.0057	TWTS30
RIW330	0.040	0.04	2770.8	0.52	1630.4	1616.3	0.0051	IWTS40_2
RIW334	0.040	0.04	21501.4	4.07	1588.6	1443.9	0.0067	TWTS40
RIW338	0.040	0.04	7227.0	1.37	1588.6	1548.7	0.0055	TWTS30
RIW346	0.040	0.04	3705.8	0.70	1605.5	1588.6	0.0046	TWTS30
RIW349	0.043	0.035	4331.4	0.82	1782.7	1712.9	0.0161	TWTS20
RIW351	0.040	0.04	24311.3	4.60	1791.5	1606.6	0.0076	IWTS30_2
RIW353	0.040	0.04	7495.9	1.42	1720	1680.0	0.0053	IWTS40_1
RIW354	0.040	0.04	4522.5	0.86	1712.9	1680.3	0.0072	TSR371
RIW356	0.040	0.04	2643.0	0.50	1735.5	1712.9	0.0086	TSR371
RIW357	0.040	0.04	16692.7	3.16	1848	1716.8	0.0079	IWTS30_1
RIW359	0.040	0.04	13031.3	2.47	1793.4	1716.8	0.0059	IWTS30_2
RIW360	0.043	0.035	2593.3	0.49	1756	1735.5	0.0079	TWTS20

Entellus

BY _____ DATE _____

CHECK _____ DATE _____

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JOB NO. 310.032

JOB: Wittmann Area Drainage Master Study Update

Route ID	Mannings' n-values Overbank	Channel	length [ft]	length [miles]	US elev [ft]	DS elev [ft]	slope [ft/ft]	Typical Cross Section ID
RIW361	0.040	0.04	17152.4	3.25	1740	1630.0	0.0064	IWTS30_1
RIW363	0.040	0.04	11126.8	2.11	1826	1740.0	0.0077	IWTS30_1
RIW364	0.040	0.04	10401.5	1.97	1682.4	1605.5	0.0074	TSR371
RIW365	0.040	0.04	7350.8	1.39	1893.6	1828.3	0.0089	IWTS30_1
RIW366	0.040	0.04	9656.7	1.83	1864	1796.0	0.0070	IWTS30_2
RIW368	0.040	0.04	11647.7	2.21	1875.5	1756.0	0.0103	TSR375
RIW369	0.040	0.04	6796.8	1.29	1887.1	1828.3	0.0087	TSR375
RIW370	0.043	0.035	7247.6	1.37	1851.8	1782.7	0.0095	TWTS20
RIW371	0.040	0.04	11583.3	2.19	1965.7	1864.0	0.0088	TSR371
RIW372	0.040	0.04	15366.7	2.91	1828	1680.0	0.0096	TSR375
RIW374	0.040	0.04	20436.7	3.87	1962	1796.0	0.0081	TSR371
RIW375	0.040	0.04	13330.0	2.52	1814	1681.5	0.0099	TSR375
RIW377	0.040	0.04	6588.4	1.25	2025.8	1962.6	0.0096	TSR371
RIW380	0.043	0.035	16914.1	3.20	2072.5	1851.8	0.0130	TWTS20
RIW381	0.040	0.04	4964.3	0.94	1939.5	1892.0	0.0096	TSR371
RIW382	0.040	0.04	4964.3	0.94	1947.8	1888.0	0.0120	TSR371
RIW384	0.040	0.04	4694.3	0.89	1940	1882.0	0.0124	TSR371
RIW386	0.043	0.035	10311.1	1.95	2027.8	1947.8	0.0078	IWTS20_1
RIW387	0.043	0.035	1005.1	0.19	2179.3	2165.2	0.0140	TWTS20
RIW388	0.040	0.04	7725.8	1.46	1920.8	1848.0	0.0094	IWTS20_2
RIW389	0.040	0.04	11459.2	2.17	2063.1	1920.8	0.0124	TSR371
RIW390	0.043	0.035	11625.6	2.20	2038.3	1920.8	0.0101	IWTS20_1
RIW394	0.043	0.035	7697.0	1.46	2257	2155.0	0.0133	IWTS10_1
RIW395	0.043	0.035	13324.0	2.52	2389.6	2165.2	0.0168	TWTS10
RIW396	0.043	0.035	6512.2	1.23	2165.2	2072.5	0.0142	TWTS10
RIW397	0.043	0.035	21294.0	4.03	2830	2390.0	0.0207	TWTS10
RPD704	0.043	0.035	5924.4	1.12	1334.9	1302.6	0.0055	PDTS40_1
RPD708	0.043	0.035	2780.0	0.53	1351	1334.9	0.0058	PDTS40_1
RD716	0.043	0.035	4300.0	0.81	1341.9	1302.6	0.0091	PDTS40_1
RPD720	0.045	0.035	1840.0	0.35	1320.9	1302.6	0.0099	Channel
RPD726	0.043	0.035	4959.0	0.94	1342	1320.0	0.0044	PDTS40_1
RPD732	0.043	0.035	10623.0	2.01	1464	1396.0	0.0064	PDTS30
RPD736	0.043	0.035	1894.0	0.36	1406	1396.0	0.0053	PDTS30
RPD740	0.043	0.035	5434.0	1.03	1436	1402.0	0.0063	PDTS30
RPD748	0.043	0.035	6476.1	1.23	1524	1430.0	0.0145	PDTS40_2
RPD756	0.043	0.035	8775.3	1.66	1540	1430.0	0.0125	PDTS40_2
RPD760	0.043	0.035	5148.6	0.98	1516	1464.0	0.0101	PDTS30

Entellus

BY _____ DATE _____

CHECK _____ DATE _____

CLIENT: FCDMC

JOB NO. 310.032

JOB: Wittmann Area Drainage Master Study Update

Route ID	Mannings' n-values		length [ft]	length [miles]	US elev [ft]	DS elev [ft]	slope [ft/ft]	Typical Cross Section ID
	Overbank	Channel						
RPI600	0.045	0.035	4937.0	0.94	1318	1320.9	0.0010	Channel
RPI603	0.043	0.035	3427.5	0.65	1337.5	1322.4	0.0044	PDTS40_1
RPI604	0.043	0.035	7441.8	1.41	1390	1338.0	0.0070	PDTS30
RPI606	0.043	0.035	2654.4	0.50	1352.2	1337.5	0.0055	TSR606
RPI609	0.043	0.035	4513.0	0.85	1372	1344.0	0.0062	PITS40
RPI612	0.043	0.035	5753.6	1.09	1412.2	1377.5	0.0060	PITS20
RPI615	0.043	0.035	5108.7	0.97	1452.4	1412.2	0.0079	PITS20
RPI618	0.043	0.035	10443.1	1.98	1490.7	1412.2	0.0075	PITS20
RPI621	0.043	0.035	2775.0	0.53	1342	1320.0	0.0079	TSR621
RPI624	0.043	0.035	5060.0	0.96	1342	1320.0	0.0043	TSR621
RPI628	0.043	0.035	14427.0	2.73	1488	1392.0	0.0067	PITS20
RPI633	0.045	0.035	5834.0	1.10	1322	1318.0	0.0010	Channel
RPI635	0.045	0.035	7557.0	1.43	1326	1322	0.0010	Channel
RPI636	0.043	0.035	728.0	0.14	1350	1340.0	0.0137	WITS130
RPI639	0.043	0.035	2635.0	0.50	1370	1354.0	0.0061	WITS130
RPI651	0.043	0.035	5658.2	1.07	1587	1548.4	0.0068	PITS10_2
RPI654	0.043	0.035	6846.6	1.30	1658	1587.0	0.0104	PITS10_2
RPI660	0.043	0.035	5729.3	1.09	1731	1658.0	0.0127	PITS10_1
RPI663	0.043	0.035	14315.6	2.71	1945	1731.0	0.0149	PITS10_1
RPI681	0.043	0.035	19831.2	3.76	1786	1568.0	0.0110	WITS110_2
RPI684	0.043	0.035	14047.0	2.66	1980	1784.5	0.0139	WITS110_1
RPI687	0.043	0.035	10777.1	2.04	2160	1980.0	0.0167	WITS100
RPI689	0.043	0.035	18798.3	3.56	2485	2160.0	0.0173	WITS100
RPI690	0.043	0.035	2826.0	0.54	1568	1560.0	0.0028	WITS110_2
RSV200	0.040	0.04	5688.5	1.08	1418.8	1392.1	0.0047	TWTS50
RSV202	0.040	0.04	6617.4	1.25	1447.9	1418.8	0.0044	TWTS50
RSV203	0.040	0.04	7460.7	1.41	1481.9	1418.8	0.0085	SVTS40
RSV210	0.040	0.04	12155.7	2.30	1504.5	1418.8	0.0071	SVTS40
RSV212	0.040	0.04	9921.7	1.88	1462	1412.0	0.0050	TSR408
RSV216	0.040	0.04	7196.1	1.36	1528.3	1497.7	0.0043	SVTS10
RSV218	0.040	0.04	4697.9	0.89	1546.5	1528.3	0.0039	SVTS10
RSV219	0.040	0.04	5058.3	0.96	1567.8	1546.5	0.0042	SVTS10
RSV220	0.040	0.04	10623.1	2.01	1502	1462.0	0.0038	SVTS50_2
RSV236	0.040	0.04	9733.5	1.84	1528.2	1497.7	0.0031	SVTS20_1
RSV244	0.040	0.04	11106.1	2.10	1633.7	1528.3	0.0095	SVTS10
RSV248	0.060	0.035	7772.3	1.47	1740.5	1633.7	0.0137	TSR248
RSV250	0.040	0.04	11764.9	2.23	1674	1546.5	0.0108	SVTS10

Entellus

BY _____ DATE _____

CHECK _____ DATE _____

CLIENT: FCDMC

JOB NO. 310.032

JOB: Wittmann Area Drainage Master Study Update

Route ID	Mannings' n-values Overbank	Channel	length [ft]	length [miles]	US elev [ft]	DS elev [ft]	slope [ft/ft]	Typical Cross Section ID
RSV251	0.040	0.04	12592.4	2.38	1674.9	1546.5	0.0102	SVTS10
RSV252	0.040	0.04	9743.8	1.85	1659.5	1567.8	0.0094	SVTS10
RSV254	0.040	0.04	10928.0	2.07	1677.3	1567.8	0.0100	SVTS10
RSV258	0.060	0.035	2154.8	0.41	1744.2	1705.3	0.0181	TSR248
RSV260	0.040	0.04	6945.8	1.32	1536.5	1502.2	0.0049	SVTS50_1
RSV264	0.040	0.04	4870.0	0.92	1552	1538.0	0.0029	TSR264A
RSV268	0.040	0.04	2945.7	0.56	1540.7	1536.5	0.0014	SVTS50_1
RSV272	0.040	0.04	1627.9	0.31	1570.4	1560.7	0.0060	SVTS50_1
RSV276	0.040	0.04	1015.5	0.19	1560.7	1556.4	0.0042	SVTS50_1
RSV280	0.040	0.04	6287.6	1.19	1556.4	1536.5	0.0032	SVTS50_1
RSV284	0.040	0.04	12013.1	2.28	1646.8	1570.4	0.0064	TSR294
RSV286	0.040	0.04	3543.8	0.67	1668.2	1646.8	0.0060	TSR294
RSV290	0.040	0.04	13499.8	2.56	1654.9	1570.4	0.0063	TSR294
RSV294	0.040	0.04	14316.0	2.71	1650.4	1560.7	0.0063	TSR294
RSV298	0.040	0.04	15128.8	2.87	1647.5	1556.4	0.0060	TSR294
RTW400	0.045	0.035	6826.5	1.29	1359.4	1334.4	0.0037	Channel
RTW402	0.045	0.035	2374.6	0.45	1337.4	1359.4	0.0010	Channel
RTW404	0.045	0.035	2936.4	0.56	1334.3	1337.4	0.0010	Channel
RTW406	0.040	0.04	14969.5	2.84	1451.2	1334.3	0.0078	TSR408
RTW408	0.040	0.04	16567.5	3.14	1453.3	1334.3	0.0072	TSR408
RTW410	0.040	0.04	11702.6	2.22	1392.1	1337.4	0.0047	TWTS50
RTW414	0.040	0.04	10139.1	1.92	1467.2	1392.1	0.0074	TSR408
RTW416	0.040	0.04	18065.4	3.42	1483.7	1390.6	0.0052	WITS30
RTW418	0.040	0.04	7044.4	1.33	1484.7	1444.3	0.0057	WITS30
RTW420	0.040	0.04	12733.0	2.41	1450.8	1390.6	0.0047	WITS30
RTW422	0.040	0.04	22820.9	4.32	1444.3	1359.4	0.0037	WITS30
RTW424	0.040	0.04	5625.3	1.07	1473.7	1444.3	0.0052	WITS30
RTW429	0.040	0.04	3702.9	0.70	1552	1550.0	0.0010	TSR429
RTW430	0.040	0.04	10140.7	1.92	1546	1488.0	0.0057	WITS30
RTW432	0.040	0.04	8990.1	1.70	1640.0	1584.0	0.0062	TWTS30
RTW434	0.040	0.04	7363.4	1.39	1581.3	1547.6	0.0046	TWTS30
RTW436	0.040	0.04	13449.0	2.55	1615.6	1547.6	0.0051	TWTS30
RTW444	0.040	0.04	2739.1	0.52	1671.6	1646.4	0.0092	WITS20
RTW446	0.040	0.04	6940.6	1.31	1700.0	1640.0	0.0086	WITS20
RTW448	0.043	0.035	8794.0	1.67	1782.0	1698.3	0.0095	WITS10
RTW450	0.043	0.035	7274.1	1.38	1737.3	1671.6	0.0090	WITS10
RTW452	0.040	0.04	8151.0	1.54	1726.4	1645.9	0.0099	WITS20

Entellus

BY _____ DATE _____

CHECK _____ DATE _____

CLIENT: FCDMC

JOB NO. 310.032

JOB: Wittmann Area Drainage Master Study Update

Route ID	Mannings' n-values Overbank	Channel	length [ft]	length [miles]	US elev [ft]	DS elev [ft]	slope [ft/ft]	Typical Cross Section ID
RTW454	0.043	0.035	13092.9	2.48	1861.3	1726.4	0.0103	WITS10
RTW456	0.043	0.035	4821.2	0.91	1919.3	1861.3	0.0120	WITS10
RTW458	0.043	0.035	3227.4	0.61	1962.8	1919.3	0.0135	WITS10
RTW459	0.043	0.035	6625.0	1.25	2056.0	1968.0	0.0133	TWTS20
RTW460	0.043	0.035	4935.1	0.93	2044.9	1962.8	0.0166	WITS10
RTW462	0.043	0.035	6520.0	1.23	2056.0	1968.0	0.0135	TWTS20
RTW478	0.040	0.04	5968.5	1.13	1554	1546.0	0.0013	TSR478
RTW480	0.040	0.04	4817.3	0.91	1591.9	1552.0	0.0083	TSR482
RTW482	0.040	0.04	7471.3	1.42	1650.2	1591.9	0.0078	TSR482
RTW484	0.040	0.04	10402.1	1.97	1680	1591.9	0.0085	TSR482
RTW485	0.040	0.04	1831.1	0.35	1686	1674.0	0.0066	TSR482
RWI500	0.045	0.035	5659.1	1.07	1332.2	1338.7	0.0010	Channel
RWI502	0.045	0.035	1679.3	0.32	1336.5	1332.2	0.0026	Channel
RWI504	0.045	0.035	1494.1	0.28	1334.4	1336.5	0.0010	Channel
RWI506	0.040	0.04	5234.7	0.99	1358.000	1336.0	0.0042	WITS70
RWI510	0.040	0.04	6491.7	1.23	1367.6	1336.5	0.0048	WITS70
RWI516	0.040	0.04	11711.2	2.22	1488.3	1428.2	0.0051	WITS70
RWI524	0.043	0.035	4525.7	0.86	1384	1356.0	0.0062	WITS130
RWI525	0.043	0.035	11015.0	2.09	1426	1356.0	0.0064	WITS130
RWI526	0.043	0.035	11922.1	2.26	1508.6	1426.8	0.0069	WITS120
RWI527	0.040	0.04	5909.0	1.12	1474	1434.0	0.0068	WITS70
RWI528	0.040	0.04	8239.6	1.56	1494	1434.0	0.0073	WITS70
RWI529	0.040	0.04	3669.9	0.70	1526	1490.0	0.0098	WITS70
RWI534	0.043	0.035	3888.5	0.74	1720.5	1677.1	0.0112	WITS90_3
RWI538	0.043	0.035	15096.4	2.86	1669.3	1556.3	0.0075	WITS90_3
RWI540	0.043	0.035	4350.4	0.82	1981.5	1908.0	0.0169	WITS90_1
RWI542	0.043	0.035	2705.6	0.51	1546	1526.0	0.0074	WITS90_3
RWI544	0.043	0.035	9910.1	1.88	1628.8	1546.5	0.0083	WITS40
RWI546	0.043	0.035	5296.4	1.00	1677.2	1628.8	0.0091	WITS90_3
RWI548	0.043	0.035	13443.6	2.55	1834.6	1677.2	0.0117	WITS90_2
RWI550	0.040	0.04	6201.4	1.17	1542	1490.0	0.0084	WITS70
RWI552	0.040	0.04	1732.0	0.33	1564.6	1543.4	0.0122	WITS70
RWI554	0.043	0.035	4537.9	0.86	1607	1543.4	0.0140	WITS50
RWI556	0.043	0.035	11635.1	2.20	1692	1606.0	0.0074	WITS40
RWI560	0.043	0.035	11698.6	2.22	1688	1606.0	0.0070	WITS40
R560A	0.043	0.035	16408.0	3.11	1876	1688.0	0.0115	WITS10
RWI564	0.043	0.035	9364.4	1.77	1964	1852.0	0.0120	WITS90_1

Entellus

BY _____ DATE _____

CHECK _____ DATE _____

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JOB NO. 310.032

JOB: Wittmann Area Drainage Master Study Update

Route ID	Mannings' n-values Overbank	Channel	length [ft]	length [miles]	US elev [ft]	DS elev [ft]	slope [ft/ft]	Typical Cross Section ID
RWI566	0.043	0.035	10390.3	1.97	1980	1852.0	0.0123	WITS90_1
RWI570	0.043	0.035	12212.1	2.31	1992	1822.0	0.0139	WITS90_1
RWI572	0.043	0.035	23542.7	4.46	1976	1688.0	0.0122	WITS90_1
RWI574	0.043	0.035	14010.4	2.65	1836	1688.0	0.0106	WITS10
RWI576	0.043	0.035	8726.4	1.65	1736	1650.2	0.0098	WITS10
RWI578	0.043	0.035	12423.9	2.35	1996	1832.0	0.0132	WITS90_1
RWI580	0.043	0.035	8541.2	1.62	1832	1736.0	0.0112	WITS10
RWI582	0.043	0.035	5153.1	0.98	1633.8	1607.0	0.0052	WITS10
RWI584	0.040	0.04	3933.0	0.74	1552	1552.0	0.0010	WITS70
RWT100	0.045	0.035	4778.0	0.90	1337	1335.2	0.0010	Channel
RWT110	0.045	0.035	7640.0	1.45	1339.8	1337.0	0.0010	Channel
RWT120	0.045	0.035	6167.9	1.17	1339.1	1339.8	0.0010	Channel
RWT130	0.045	0.035	5750.0	1.09	1341.7	1339.1	0.0010	Channel
RWT140	0.060	0.035	13052.8	2.47	1600	1350.0	0.0192	WTTS20_1
RWT150	0.060	0.035	16082.2	3.05	1553.5	1339.1	0.0133	WTTS20_1
RWT160	0.060	0.035	18961.0	3.59	1558.2	1339.1	0.0116	WTTS10_1

Appendix D.3

Entellus

BY _____ DATE _____

CHECK _____ DATE _____

CLIENT: FCDMC **JOB NO.** 310.032

JOB: Wittmann Area Drainage Master Study Update

Storm: 100-yr, 24-hr Existing Conditions **Route N-Step vs Velocity**

Route (Model Order)	Previous Time to Peak [hr]	Route Time to Peak [hr]	Difference in Time to peak [hr]	Route Length [ft]	HEC-1 Velocity [fps]	Normal Depth Velocity [fps]	HEC-1 Flow [cfs]	Normal Depth Flow [cfs]	Typical Cross Section	Route Slope [ft/ft]	Manning's "n" Value	HEC-1 N-step
RWT140	13.00	13.33	0.33	13053	10.99	6.41	1804	1811	WTTS20_1	0.019	0.035	4
RWT130	13.25	13.75	0.50	5750	3.19	4.16	2441	2450	Channel	0.001	0.035	5
RWT160	12.58	14.25	1.67	18961	3.15	2.35	376	384	WTTS10_1	0.012	0.035	12
R150A	12.92	13.17	0.25	9557	10.62	9.31	2601	2609	WTTS20_2	0.021	0.035	2
RWT150	13.08	13.50	0.42	16082	10.64	6.29	2875	2881	WTTS20_1	0.013	0.035	7
RWT120	13.50	14.08	0.58	6168	2.95	5.27	5726	5735	Channel	0.001	0.035	7
RWT110	14.08	14.75	0.67	7640	3.17	5.21	5507	5516	Channel	0.001	0.035	5
RWT100	14.75	15.08	0.33	4778	4.02	5.15	5251	5260	Channel	0.001	0.035	1
RTW406	12.08	16.67	4.59	16567	1.00	0.48	30	21	TSR408	0.007	0.04	6
RTW408 **	12.83	16.00	3.17	11703	1.03	1.35	213	222	TWTS50	0.005	0.04	10
RTW404	15.17	15.42	0.25	14969	16.63	3.63	5210	5210	TSR408	0.008	0.035	2
RIW371	12.08	14.58	2.50	20437	2.27	0.33	13	3	TSR371	0.008	0.04	15
RIW366	12.58	13.00	0.42	6797	4.50	4.56	771	780	TSR375	0.009	0.04	6
RIW377 **	12.42	13.25	0.83	4964	1.66	0.93	67	58	TSR371	0.010	0.04	6
RD371	12.08	12.33	0.25	1828	2.03	0.78	26	16	WITS130	0.003	0.035	1
RIW374	12.33	14.17	1.84	6588	0.99	1.48	279	286	TSR371	0.010	0.04	15
RIW386 **	12.67	13.75	1.08	7726	1.99	2.78	208	217	IWTS20_2	0.009	0.035	6
RIW382	12.33	12.83	0.50	10311	5.73	2.18	212	221	IWTS20_1	0.008	0.04	3
RD382A	12.33	12.42	0.09	2942	9.08	1.57	60	50	WITS130	0.009	0.035	1
RIW384	12.33	12.75	0.42	1005	0.66	1.90	120	129	TWTS20	0.014	0.04	3
RIW381	12.50	12.92	0.42	4694	3.10	1.86	460	467	TSR371	0.012	0.04	3
R359*	12.83	13.25	0.42	9280	6.14	4.96	719	728	IWTS30_2	0.010	0.04	4
RIW359	12.92	13.25	0.33	17152	14.44	5.79	2943	2951	IWTS30_1	0.006	0.04	5
RIW389	12.50	13.92	1.42	7697	1.51	2.81	76	66	IWTS10_1	0.013	0.04	6
RIW394	13.00	13.17	0.17	6512	10.64	5.89	2473	2478	TWTS10	0.014	0.035	3
R390A	13.17	13.42	0.25	8577	9.53	7.97	2827	2834	IWTS10_1	0.013	0.035	4

+ Time lapse less than time step of 5 minutes, so 1 time step was assumed for HEC-1 Velocity Calculation

** Modified Typical X-Section

x Modified Time To Peak Used

Entellus

Appendix D.3

BY _____ DATE _____

CHECK _____ DATE _____

CLIENT: FCDMC **JOB NO.** 310.032

JOB: Wittmann Area Drainage Master Study Update

Storm: 100-yr, 24-hr Existing Conditions **Route N-Step vs Velocity**

Route (Model Order)	Previous Time to Peak [hr]	Route Time to Peak [hr]	Difference in Time to peak [hr]	Route Length [ft]	HEC-1 Velocity [fps]	Normal Depth Velocity [fps]	HEC-1 Flow [cfs]	Normal Depth Flow [cfs]	Typical Cross Section	Route Slope [ft/ft]	Manning's "n" Value	HEC-1 N-step
RIW390	13.42	13.75	0.33	13324	11.22	6.56	2891	2896	TWTS10	0.017	0.035	5
RIW388	13.75	14.00	0.25	11626	12.92	6.01	3364	3371	IWTS20_1	0.010	0.04	4
RIW357 **	14.00	14.50	0.50	2593	1.44	3.32	2494	2499	TWTS20	0.008	0.04	9
RIW353	13.33	13.75	0.42	2643	1.75	2.99	4898	4900	TSR371	0.009	0.04	2
RIW312 **	12.92	13.75	0.83	17570	5.88	2.04	228	237	TSR294	0.005	0.04	1
RD312	12.92	13.00	0.08	4244	14.74	1.67	86	76	TWTS20	0.011	0.035	1
RIW365	13.00	13.50	0.50	11648	6.47	3.51	282	291	TSR375	0.010	0.04	5
RD365	13.00	13.17	0.17	1927	3.15	1.29	58	48	WITS130	0.005	0.035	2
RIW369 **	13.08	13.42	0.34	11583	9.46	1.42	266	274	TSR371	0.009	0.04	4
RD357	14.00	14.08	0.08	3820	13.26	5.02	926	935	IWTS30_1	0.009	0.04	2
RIW363	14.00	14.33	0.33	7351	6.19	5.13	1098	1107	IWTS30_1	0.009	0.04	4
RD369	13.00	13.25	0.25	1409	1.57	1.23	205	214	WITS130	0.001	0.035	1
RIW368	13.17	13.75	0.58	7248	3.47	2.03	270	279	TWTS20	0.010	0.04	6
RIW360	12.25	12.42	0.17	11127	18.18	4.69	635	644	IWTS30_1	0.008	0.035	1
RIW397	12.83	13.42	0.59	2780	1.31	3.92	3396	3401	PDTS40_1	0.006	0.035	8
RIW395	13.17	13.42	0.25	21294	23.66	9.43	7399	7400	TWTS10	0.021	0.035	4
RIW387 +	12.67	12.67	0.08	11459	38.20	2.58	1106	1112	TSR371	0.012	0.035	1
RIW396	13.33	13.50	0.17	5924	9.68	4.74	7858	7860	PDTS40_1	0.006	0.035	2
RIW380	13.50	14.58	1.08	4964	1.28	3.86	5542	5542	TSR371	0.012	0.035	11
RIW370	14.58	15.08	0.50	15367	8.54	9.11	5390	5397	TSR375	0.010	0.035	3
RIW349	15.08	15.17	0.09	7496	23.14	3.37	2047	2053	IWTS40_1	0.005	0.035	2
RD349	15.08	15.42	0.34	6586	5.38	6.97	3194	3202	IWTS30_1	0.008	0.035	1
RIW356 **	15.25	15.42	0.17	13031	21.29	8.49	5244	5252	IWTS30_2	0.006	0.04	1
RIW354	15.42	15.75	0.33	16693	14.05	7.21	5141	5149	IWTS30_1	0.008	0.04	2
RIW372	12.33	13.50	1.17	13330	3.16	2.68	129	139	TSR375	0.010	0.04	9
RD372	12.33	12.50	0.17	1142	1.87	1.21	101	110	TWTS20	0.004	0.035	1

+ Time lapse less than time step of 5 minutes, so 1 time step was assumed for HEC-1 Velocity Calculation

** Modified Typical X-Section

x Modified Time To Peak Used

Appendix D.3

Entellus

BY _____ DATE _____

CHECK _____ DATE _____

CLIENT: FCDMC **JOB NO.** 310.032

JOB: Wittmann Area Drainage Master Study Update

Storm: 100-yr, 24-hr Existing Conditions **Route N-Step vs Velocity**

Route (Model Order)	Previous Time to Peak [hr]	Route Time to Peak [hr]	Difference in Time to peak [hr]	Route Length [ft]	HEC-1 Velocity [fps]	Normal Depth Velocity [fps]	HEC-1 Flow [cfs]	Normal Depth Flow [cfs]	Typical Cross Section	Route Slope [ft/ft]	Manning's "n" Value	HEC-1 N-step
RIW375	13.00	13.75	0.75	16914	6.26	2.30	280	289	TWTS20	0.013	0.04	8
RIW364	15.75	16.42	0.67	9657	4.00	8.92	5152	5159	IWTS30_2	0.007	0.04	7
RD363	14.00	14.08	0.08	1700	5.90	2.98	514	522	WITS130	0.011	0.04	1
RIW351	13.42	16.50	3.08	4523	0.41	0.85	68	59	TSR371	0.007	0.04	10
RIW346	16.42	16.58	0.16	24311	42.21	9.21	5213	5220	IWTS30_2	0.008	0.04	2
RIW338	16.58	17.00	0.42	4331	2.86	5.20	5156	5159	TWTS20	0.016	0.04	5
RIW326	12.42	13.00	0.58	21501	10.30	2.13	235	244	TWTS40	0.007	0.04	5
RIW334	17.08	17.92	0.84	3706	1.23	4.28	5060	5067	TWTS30	0.005	0.04	12
RD351	13.42	13.83	0.41	2791	1.89	3.99	475	485	IWTS30_1	0.008	0.04	3
RIW361	14.17	14.83	0.66	10402	4.38	2.13	1591	1596	TSR371	0.007	0.04	12
R350*	13.83	14.08	0.25	8310	9.23	4.57	6462	6467	IWTS40_1	0.006	0.04	3
RIW330	14.08	14.25	0.17	7227	11.81	4.88	6525	6530	TWTS30	0.006	0.04	1
RIW322	14.25	14.92	0.67	2771	1.15	3.86	6912	6917	IWTS40_2	0.005	0.04	12
RIW318	12.75	14.58	1.83	8066	1.22	2.11	295	304	TWTS30	0.006	0.04	15
RIW310	12.92	13.00	0.08	20068	69.68	2.23	703	712	IWTS50	0.005	0.04	1
RIW314	15.17	16.42	1.25	12886	2.86	3.94	6916	6918	IWTS40_2	0.005	0.04	15
RIW300	16.42	16.83	0.41	860	0.58	2.79	6759	6762	IWTS50	0.002	0.04	3
RIW302	17.25	17.58	0.33	8292	6.98	9.92	10637	10642	TSR375	0.010	0.04	3
R264A	13.08	13.50	0.42	4042	2.67	2.12	1353	1360	TSR264A	0.003	0.04	1
RSV264	13.33	13.75	0.42	2946	1.95	2.41	1931	1940	SVTS50_1	0.001	0.04	1
RSV298	13.08	14.42	1.34	6826	1.42	3.52	450	460	Channel	0.004	0.04	14
RSV286	12.75	13.00	0.25	13500	15.00	3.27	1023	1031	TSR294	0.006	0.04	1
RSV284	12.92	13.75	0.83	3544	1.19	3.14	931	939	TSR294	0.006	0.04	4
RSV290	12.58	13.75	1.17	14316	3.40	2.56	385	394	TSR294	0.006	0.04	5
RSV272	13.67	13.75	0.08	1016	3.53	3.45	1550	1558	SVTS50_1	0.004	0.04	1
RSV294	12.92	13.83	0.91	15129	4.62	3.52	1466	1474	TSR294	0.006	0.04	5

+ Time lapse less than time step of 5 minutes, so 1 time step was assumed for HEC-1 Velocity Calculation

** Modified Typical X-Section

x Modified Time To Peak Used

Entellus

Appendix D.3

BY _____ DATE _____

CHECK _____ DATE _____

CLIENT: FCDMC **JOB NO.** 310.032

JOB: Wittmann Area Drainage Master Study Update

Storm: 100-yr, 24-hr Existing Conditions **Route N-Step vs Velocity**

Route (Model Order)	Previous Time to Peak [hr]	Route Time to Peak [hr]	Difference in Time to peak [hr]	Route Length [ft]	HEC-1 Velocity [fps]	Normal Depth Velocity [fps]	HEC-1 Flow [cfs]	Normal Depth Flow [cfs]	Typical Cross Section	Route Slope [ft/ft]	Manning's "n" Value	HEC-1 N-step
RSV276	13.75	13.83	0.08	6288	21.83	3.74	3233	3241	SVTS50_1	0.003	0.04	1
RSV280	13.92	14.25	0.33	12013	10.11	4.53	3625	3631	TSR294	0.006	0.04	3
RSV268	12.67	12.92	0.25	1628	1.81	3.60	1081	1090	SVTS50_1	0.006	0.04	1
RSV260	14.92	15.17	0.25	4870	5.41	2.87	4052	4057	TSR264A	0.003	0.04	5
RSV252	12.33	13.42	1.09	10928	2.78	1.46	62	52	SVTS10	0.010	0.04	5
RSV254	12.25	13.42	1.17	2155	0.51	1.39	45	36	TSR248	0.018	0.04	6
RSV219	12.42	12.83	0.41	10623	7.20	2.89	786	795	SVTS50_2	0.004	0.04	3
RSV251	12.42	13.42	1.00	9744	2.71	1.87	126	135	SVTS10	0.009	0.04	8
RSV250	12.33	13.50	1.17	12592	2.99	1.46	61	51	SVTS10	0.010	0.04	8
RSV218	12.75	13.17	0.42	5058	3.35	2.57	1409	1417	SVTS10	0.004	0.04	2
RSV248	12.67	13.25	0.58	11765	5.63	2.76	324	333	SVTS10	0.011	0.035	3
RD248	12.67	12.92	0.25	1034	1.15	2.35	324	333	WITS130	0.008	0.04	2
RSV244	13.00	13.75	0.75	7772	2.88	3.71	977	984	TSR248	0.014	0.04	8
RSV216	13.33	13.75	0.42	4698	3.11	2.83	2308	2315	SVTS10	0.004	0.04	5
RSV236	12.42	13.75	1.33	11106	2.32	2.25	258	267	SVTS10	0.010	0.04	8
R242*	12.67	13.42	0.75	13351	4.94	4.01	2310	2317	SVTS10	0.010	0.04	9
RSV220	13.67	14.17	0.50	9734	5.41	4.24	6674	6680	SVTS20_1	0.003	0.04	6
R230*	12.50	12.83	0.33	8744	7.36	4.26	3214	3220	SVTS30	0.009	0.04	6
RSV212 **	14.00	14.67	0.67	7196	2.98	3.90	7179	7185	SVTS10	0.004	0.04	6
RSV202	12.75	13.25	0.50	7461	4.15	3.41	977	985	SVTS40	0.009	0.04	5
RSV210	12.17	13.17	1.00	9922	2.76	1.50	642	649	TSR408	0.005	0.04	11
R205*	12.25	13.00	0.75	9517	3.52	2.98	585	594	SVTS40	0.008	0.04	1
RSV203	12.17	12.67	0.50	12156	6.75	1.56	73	63	SVTS40	0.007	0.04	7
RSV200	17.33	17.58	0.25	6617	7.35	4.08	14045	14040	TWTS50	0.004	0.04	5
RTW416	12.50	13.75	1.25	7044	1.57	2.26	359	368	WITS30	0.006	0.04	15
RTW420	12.67	13.58	0.91	22821	6.97	2.04	460	469	WITS30	0.004	0.04	10

+ Time lapse less than time step of 5 minutes, so 1 time step was assumed for HEC-1 Velocity Calculation

** Modified Typical X-Section

x Modified Time To Peak Used

Appendix D.3

Entellus

BY _____ DATE _____

CHECK _____ DATE _____

CLIENT: FCDMC **JOB NO.** 310.032

JOB: Wittmann Area Drainage Master Study Update

Storm: 100-yr, 24-hr Existing Conditions **Route N-Step vs Velocity**

Route (Model Order)	Previous Time to Peak [hr]	Route Time to Peak [hr]	Difference in Time to peak [hr]	Route Length [ft]	HEC-1 Velocity [fps]	Normal Depth Velocity [fps]	HEC-1 Flow [cfs]	Normal Depth Flow [cfs]	Typical Cross Section	Route Slope [ft/ft]	Manning's "n" Value	HEC-1 N-step
RTW414	12.17	13.25	1.08	18065	4.65	2.62	760	769	WITS30	0.005	0.04	8
RTW410	17.58	18.25	0.67	10139	4.20	4.25	13989	13992	TSR408	0.007	0.04	8
RTW402	15.58	15.75	0.17	2936	4.80	6.92	16000	16007	Channel	0.001	0.035	1
RTW448	12.83	13.83	1.00	7274	2.02	1.92	152	161	WITS10	0.009	0.035	5
RD448	12.83	13.00	0.17	2017	3.30	1.17	40	30	WITS130	0.006	0.035	1
R446A	12.92	13.58	0.66	6777	2.85	2.40	211	220	WITS130	0.009	0.035	4
RTW446	13.50	13.92	0.42	8794	5.82	2.36	455	464	WITS10	0.010	0.04	4
RTW432	12.75	13.33	0.58	7363	3.53	2.54	734	742	TWTS30	0.005	0.04	7
RTW459	13.08	13.42	0.34	4935	4.03	3.06	384	392	WITS10	0.017	0.035	2
RD380 **	13.50	13.67	0.17	1172	1.92	3.94	1954	1961	WITS130	0.007	0.035	1
RTW462	13.67	13.83	0.16	5969	10.36	2.15	2018	2025	TSR478	0.001	0.035	2
R450A	12.83	13.25	0.42	5936	3.93	3.20	538	546	WITS10	0.015	0.035	1
R450B	13.83	14.50	0.67	18811	7.80	4.42	2499	2504	WITS10	0.012	0.035	8
RD446A +	0.00	0.00	0.08	1591	5.30	0.22	0	0	WITS130	0.013	0.035	1
RTW450	14.42	14.75	0.33	8151	6.86	4.39	2604	2609	WITS20	0.010	0.035	4
RTW444	14.75	14.92	0.17	6941	11.34	3.75	2556	2561	WITS20	0.009	0.04	1
RTW460	13.00	13.17	0.17	6520	10.65	3.69	1152	1160	TWTS20	0.014	0.035	2
RTW458	13.08	13.25	0.17	6625	10.83	3.89	1457	1463	TWTS20	0.013	0.035	2
RTW456	13.25	13.42	0.17	3227	5.27	4.00	1461	1466	WITS10	0.014	0.035	2
RTW454	13.42	14.33	0.91	4821	1.47	2.92	509	517	WITS10	0.012	0.035	10
R452A	12.75	13.75	1.00	16523	4.59	3.33	675	682	WITS10	0.014	0.035	11
R452B	13.75	14.42	0.67	9296	3.85	3.23	1257	1264	WITS10	0.008	0.035	4
RD450	14.42	14.67	0.25	3342	3.71	2.95	120	130	WITS90_2	0.014	0.035	1
RTW452	14.50	15.00	0.50	13093	7.27	3.25	1415	1422	WITS10	0.010	0.04	6
R442*	14.92	15.50	0.58	9088	4.35	3.81	3623	3629	WITS20	0.007	0.04	6
RTW434	15.50	16.00	0.50	13449	7.47	4.12	3790	3798	TWTS30	0.005	0.04	5

+ Time lapse less than time step of 5 minutes, so 1 time step was assumed for HEC-1 Velocity Calculation

** Modified Typical X-Section

x Modified Time To Peak Used

Entellus

Appendix D.3

BY _____ DATE _____

CHECK _____ DATE _____

CLIENT: FCDMC **JOB NO.** 310.032

JOB: Wittmann Area Drainage Master Study Update

Storm: 100-yr, 24-hr Existing Conditions **Route N-Step vs Velocity**

Route (Model Order)	Previous Time to Peak [hr]	Route Time to Peak [hr]	Difference in Time to peak [hr]	Route Length [ft]	HEC-1 Velocity [fps]	Normal Depth Velocity [fps]	HEC-1 Flow [cfs]	Normal Depth Flow [cfs]	Typical Cross Section	Route Slope [ft/ft]	Manning's "n" Value	HEC-1 N-step
RTW436	12.25	13.17	0.92	2739	0.83	2.64	563	572	WITS20	0.009	0.04	10
RTW429	12.33	13.17	0.84	10141	3.35	2.20	320	329	WITS30	0.006	0.04	2
RD454	13.42	13.58	0.16	5985	10.39	2.64	978	986	TSR482	0.007	0.035	1
R576A	12.83	13.42	0.59	18394	8.66	2.93	558	565	WITS10	0.011	0.035	6
R576B	13.33	15.25	1.92	21213	3.07	2.39	347	355	WITS10	0.009	0.035	16
RTW485	12.92	13.00	0.08	5659	19.65	3.52	1903	1912	Channel	0.001	0.04	1
RTW484	13.00	13.67	0.67	1831	0.76	2.89	1959	1966	TSR482	0.007	0.04	7
R580B	12.50	12.92	0.42	12583	8.32	2.73	237	247	PDTS30	0.008	0.035	5
R580A	12.75	13.83	1.08	8181	2.10	4.92	1804	1808	WITS10	0.020	0.035	14
RD580B	12.50	13.00	0.50	4775	2.65	1.20	200	209	TSBEAR	0.001	0.035	6
RWI578	13.08	13.67	0.59	12424	5.85	3.69	411	420	WITS90_1	0.013	0.035	8
RWI580	13.83	14.25	0.42	8541	5.65	4.11	2114	2121	WITS10	0.011	0.035	5
RD576B	13.33	14.25	0.92	9430	2.85	3.80	248	256	WITS90_1	0.020	0.035	9
RWI576	14.25	14.67	0.42	8726	5.77	3.24	1019	1027	WITS10	0.010	0.035	5
RTW482	14.67	15.17	0.50	10402	5.78	2.66	1001	1009	TSR482	0.009	0.04	6
RTW480	13.67	14.42	0.75	7471	2.77	1.45	124	133	TSR482	0.008	0.04	2
RTW478	12.17	13.50	1.33	4817	1.01	1.47	120	129	TSR482	0.008	0.04	3
RTW430	16.83	17.33	0.50	8990	4.99	4.07	2755	2762	TWTS30	0.006	0.04	1
RTW418	17.25	17.58	0.33	12733	10.72	3.47	2737	2743	WITS30	0.005	0.04	1
RTW424	12.25	12.50	0.25	3703	4.11	1.90	1773	1782	TSR429	0.001	0.04	3
RTW422	12.58	20.67	8.09	5625	0.19	3.52	2486	2493	WITS30	0.005	0.04	17
RTW400	15.83	16.08	0.25	2375	2.64	7.05	17199	17206	Channel	0.001	0.035	2
RWI504	16.08	16.17	0.09	5235	16.16	5.24	17161	17163	WITS70	0.004	0.035	1
RD576	14.25	14.50	0.25	13552	15.06	3.72	1331	1338	WITS10	0.012	0.035	3
RWI574	12.33	13.50	1.17	14010	3.33	1.90	118	127	WITS10	0.011	0.035	7
RWI572	12.50	13.25	0.75	23543	8.72	4.98	1567	1574	WITS90_1	0.012	0.035	12

+ Time lapse less than time step of 5 minutes, so 1 time step was assumed for HEC-1 Velocity Calculation

** Modified Typical X-Section

x Modified Time To Peak Used

Appendix D.3

Entellus

BY _____ DATE _____

CHECK _____ DATE _____

CLIENT: FCDMC **JOB NO.** 310.032

JOB: Wittmann Area Drainage Master Study Update

Storm: 100-yr, 24-hr Existing Conditions **Route N-Step vs Velocity**

Route (Model Order)	Previous Time to Peak [hr]	Route Time to Peak [hr]	Difference in Time to peak [hr]	Route Length [ft]	HEC-1 Velocity [fps]	Normal Depth Velocity [fps]	HEC-1 Flow [cfs]	Normal Depth Flow [cfs]	Typical Cross Section	Route Slope [ft/ft]	Manning's "n" Value	HEC-1 N-step
RWI570	12.83	13.25	0.42	12212	8.08	4.86	1160	1168	WITS90_1	0.014	0.035	4
RWI566	12.83	13.33	0.50	10390	5.77	3.52	379	388	WITS90_1	0.012	0.035	8
RWI564	13.17	13.67	0.50	9364	5.20	4.13	748	757	WITS90_1	0.012	0.035	3
R562*	13.33	14.00	0.67	8797	3.65	4.90	2344	2348	WITS10	0.017	0.035	8
R560A	13.00	14.00	1.00	14581	4.05	3.22	780	788	WITS40	0.011	0.035	9
RWI560	14.08	14.67	0.59	16408	7.73	5.18	5105	5108	WITS10	0.012	0.035	8
RD482 +	0.00	0.00	0.08	5200	17.33	0.16	0	0	WITS70	0.007	0.035	1
RWI582	12.42	13.00	0.58	5153	2.47	1.72	216	225	WITS10	0.005	0.035	2
RWI556	12.08	13.75	1.67	11699	1.95	0.92	25	15	WITS40	0.007	0.035	4
RWI554	14.67	14.75	0.08	11635	40.40	4.44	5155	5161	WITS40	0.007	0.035	2
RWI552 +	14.75	14.75	0.08	4538	15.13	8.40	5158	5164	WITS50	0.014	0.04	1
RD480	13.67	14.25	0.58	2439	1.17	4.26	2450	2457	WITS130	0.009	0.04	2
RWI584	14.17	14.75	0.58	3933	1.88	1.69	2435	2443	WITS70	0.001	0.04	2
RWI550	15.00	15.25	0.25	1732	1.92	5.60	7070	7075	WITS70	0.012	0.04	2
RWI548	12.33	13.25	0.92	6201	1.87	2.00	224	233	WITS70	0.008	0.035	7
RWI546	12.33	13.33	1.00	13444	3.73	3.81	440	449	WITS90_2	0.012	0.035	3
RWI544	12.50	13.33	0.83	5296	1.77	3.03	446	454	WITS90_3	0.009	0.035	5
RWI540	12.83	13.00	0.17	2706	4.42	3.38	781	789	WITS90_3	0.007	0.035	1
R538A	12.92	13.67	0.75	18226	6.75	5.06	1139	1148	WITS90_2	0.013	0.035	8
RWI538	13.58	14.25	0.67	4350	1.80	5.70	1643	1651	WITS90_1	0.017	0.035	9
RWI534	12.58	12.75	0.17	15096	24.67	2.70	379	388	WITS90_3	0.008	0.035	2
R530*	13.00	13.75	0.75	14751	5.46	3.78	1003	1010	WITS90_3	0.008	0.035	9
RD544	12.50	13.08	0.58	4830	2.31	3.18	993	1001	WITS10	0.010	0.035	6
RPI663	12.92	13.75	0.83	19831	6.64	2.87	304	313	WITS110_2	0.011	0.035	10
RPI660	13.50	13.75	0.25	14316	15.91	5.84	955	963	PITS10_1	0.015	0.035	1
RPI654	13.33	13.58	0.25	5729	6.37	6.97	2448	2456	PITS10_1	0.013	0.035	4

+ Time lapse less than time step of 5 minutes, so 1 time step was assumed for HEC-1 Velocity Calculation

** Modified Typical X-Section

x Modified Time To Peak Used

Entellus

Appendix D.3

BY _____ DATE _____

CHECK _____ DATE _____

CLIENT: FCDMC **JOB NO.** 310.032

JOB: Wittmann Area Drainage Master Study Update

Storm: 100-yr, 24-hr Existing Conditions **Route N-Step vs Velocity**

Route (Model Order)	Previous Time to Peak [hr]	Route Time to Peak [hr]	Difference in Time to peak [hr]	Route Length [ft]	HEC-1 Velocity [fps]	Normal Depth Velocity [fps]	HEC-1 Flow [cfs]	Normal Depth Flow [cfs]	Typical Cross Section	Route Slope [ft/ft]	Manning's "n" Value	HEC-1 N-step
RPI651 **	13.42	13.75	0.33	6847	5.76	6.45	3384	3392	PITS10_2	0.010	0.035	3
R645A	13.08	13.42	0.34	5757	4.70	3.07	876	885	Channel	0.001	0.035	5
RD654	13.33	13.83	0.50	6108	3.39	2.47	597	606	WITS110_2	0.004	0.035	6
RPI689 **	12.92	13.33	0.41	2826	1.91	4.20	6389	6395	WITS110_2	0.003	0.035	4
RPI687	13.25	13.42	0.17	18798	30.72	11.95	9861	9865	WITS100	0.017	0.035	3
RPI684	13.58	13.92	0.34	10777	8.80	11.63	9368	9373	WITS100	0.017	0.035	4
RPI681	13.83	14.50	0.67	14047	5.82	9.81	9000	9006	WITS110_1	0.014	0.035	7
RPI690 **	14.50	14.67	0.17	5688	9.29	3.79	6454	6455	TWTS50	0.005	0.035	1
RD678	14.50	14.92	0.42	3177	2.10	3.33	2162	2168	TSR606	0.006	0.035	1
RWI542	16.08	16.25	0.17	9910	16.19	2.43	397	405	WITS40	0.008	0.035	1
RWI529	16.00	16.25	0.25	3889	4.32	2.89	407	416	WITS90_3	0.011	0.04	1
RWI516	15.25	15.75	0.50	4526	2.51	4.79	7199	7204	WITS130	0.006	0.04	6
RDCP07	16.08	16.58	0.50	14618	8.12	2.97	407	416	WITS120	0.009	0.035	2
RD529 +	0.00	0.00	0.08	9401	31.34	0.18	0	0	WITS40	0.008	0.035	2
RWI528	16.33	16.92	0.59	3670	1.73	2.34	417	425	WITS70	0.010	0.04	1
RDCPOT +	0.00	0.00	0.08	5720	19.07	0.11	0	0	TWTS50	0.004	0.04	2
RWI527	12.50	12.92	0.42	8240	5.45	2.23	501	510	WITS70	0.007	0.04	3
R508*	15.83	16.33	0.50	12366	6.87	5.03	7402	7405	WITS130	0.005	0.035	7
R510A	12.58	13.75	1.17	17257	4.10	2.02	553	561	WITS70	0.005	0.04	8
RWI510	16.25	16.67	0.42	11711	7.75	3.90	6035	6038	WITS70	0.005	0.04	2
RWI502	16.58	16.67	0.09	1494	4.61	7.46	21344	21351	Channel	0.001	0.035	1
RDCP08	16.08	16.33	0.25	6701	7.45	2.85	408	417	WITS120	0.008	0.035	1
RWI526	16.08	16.92	0.84	5909	1.95	2.26	417	425	WITS70	0.007	0.035	6
RDCP09	16.08	17.00	0.92	6377	1.93	3.68	410	419	PITS10_2	0.009	0.035	8
RD527	12.50	13.33	0.83	4871	1.63	0.17	4	0	WITS130	0.008	0.035	2
RWI525	12.58	13.33	0.75	11922	4.42	3.49	1184	1193	WITS120	0.007	0.035	6

+ Time lapse less than time step of 5 minutes, so 1 time step was assumed for HEC-1 Velocity Calculation

** Modified Typical X-Section

x Modified Time To Peak Used

Appendix D.3

Entellus

BY _____ DATE _____

CHECK _____ DATE _____

CLIENT: FCDMC **JOB NO.** 310.032

JOB: Wittmann Area Drainage Master Study Update

Storm: 100-yr, 24-hr Existing Conditions **Route N-Step vs Velocity**

Route (Model Order)	Previous Time to Peak [hr]	Route Time to Peak [hr]	Difference in Time to peak [hr]	Route Length [ft]	HEC-1 Velocity [fps]	Normal Depth Velocity [fps]	HEC-1 Flow [cfs]	Normal Depth Flow [cfs]	Typical Cross Section	Route Slope [ft/ft]	Manning's "n" Value	HEC-1 N-step
RD525	12.58	13.58	1.00	7666	2.13	1.44	63	53	WITS130	0.007	0.035	6
RWI524	12.58	13.00	0.42	11015	7.29	2.81	577	586	WITS130	0.006	0.035	2
RD524	12.58	12.83	0.25	6496	7.22	0.16	3	0	WITS130	0.007	0.035	3
RPI639 **	12.75	13.08	0.33	5658	4.76	2.48	149	139	PITS10_2	0.007	0.035	2
RWI506	13.17	13.42	0.25	6492	7.21	2.94	2263	2269	WITS70	0.005	0.04	3
RD508	16.33	16.58	0.25	2235	2.48	2.32	1389	1397	WITS130	0.003	0.04	6
RWI500	26.83	27.33	0.50	1679	0.93	6.14	2908	2917	Channel	0.003	0.035	5
RPI635	27.33	28.08	0.75	728	0.27	5.66	2907	2911	WITS130	0.014	0.035	2
RDCP11	16.08	16.33	0.25	11034	12.26	3.11	424	433	PITS30	0.009	0.035	5
RDCP12	16.08	16.33	0.25	20386	22.65	2.52	193	202	PITS30	0.009	0.035	6
RPI618	16.17	16.75	0.58	2775	1.33	3.19	628	637	TSR621	0.008	0.035	2
RDCP13	16.08	16.67	0.59	9602	4.52	3.31	420	429	PITS30	0.011	0.035	2
RD618	16.08	16.42	0.34	11215	9.16	3.21	217	226	PITS10_2	0.010	0.035	5
RPI615	12.33	16.75	4.42	10443	0.66	3.50	653	662	PITS20	0.008	0.035	12
RPI612	12.67	12.92	0.25	5109	5.68	3.02	335	344	PITS20	0.008	0.035	2
RDCP14	16.08	17.25	1.17	10754	2.55	3.43	362	371	PDTS30	0.011	0.035	8
RPI609	12.75	12.92	0.17	5754	9.40	3.74	1181	1190	PITS20	0.006	0.035	1
RD612	12.67	17.33	4.66	9630	0.57	4.15	960	968	PITS20	0.009	0.035	4
RPI621 **	13.33	13.42	0.09	5060	15.62	2.99	1177	1186	TSR621	0.004	0.035	6
RDCP10	16.08	16.50	0.42	6159	4.07	3.16	420	429	PITS30	0.009	0.035	6
RPI628	12.33	13.08	0.75	5834	2.16	2.59	507	517	Channel	0.001	0.035	1
R624A	12.83	13.83	1.00	8664	2.41	5.58	1528	1536	PITS10_2	0.012	0.035	2
RPI636 +	12.50	12.50	0.08	2635	8.78	2.47	377	386	WITS130	0.006	0.035	1
RPI624	13.83	14.17	0.34	14427	11.79	4.30	1743	1751	PITS20	0.007	0.035	3
RPI633	24.50	25.08	0.58	7557	3.62	4.74	3903	3912	Channel	0.001	0.035	4
RDCP15	14.00	14.42	0.42	10400	6.88	3.14	248	257	PDTS30	0.012	0.035	6

+ Time lapse less than time step of 5 minutes, so 1 time step was assumed for HEC-1 Velocity Calculation

** Modified Typical X-Section

x Modified Time To Peak Used

Entellus

Appendix D.3

BY _____ DATE _____

CHECK _____ DATE _____

CLIENT: FCDMC **JOB NO.** 310.032

JOB: Wittmann Area Drainage Master Study Update

Storm: 100-yr, 24-hr Existing Conditions **Route N-Step vs Velocity**

Route (Model Order)	Previous Time to Peak [hr]	Route Time to Peak [hr]	Difference in Time to peak [hr]	Route Length [ft]	HEC-1 Velocity [fps]	Normal Depth Velocity [fps]	HEC-1 Flow [cfs]	Normal Depth Flow [cfs]	Typical Cross Section	Route Slope [ft/ft]	Manning's "n" Value	HEC-1 N-step
R606A	12.50	17.92	5.42	11809	0.61	1.63	166	175	PDTS40_1	0.004	0.035	7
RPI606	12.42	12.67	0.25	4513	5.01	4.94	578	587	PITS40	0.006	0.035	1
RD606A	12.50	12.83	0.33	11125	9.36	2.22	131	140	PITS20	0.007	0.035	6
RPI604	12.67	12.92	0.25	2654	2.95	1.96	312	321	TSR606	0.006	0.035	4
RD600A	12.58	13.33	0.75	7507	2.78	3.93	1120	1128	PITS30	0.009	0.035	2
RPI603	13.17	13.42	0.25	7442	8.27	4.58	2239	2247	PDTS30	0.007	0.035	1
RPI600	24.33	24.83	0.50	3427	1.90	3.78	4429	4434	PDTS40_1	0.004	0.035	2
RDCP16	14.00	14.50	0.50	14927	8.29	4.16	907	916	PDTS30	0.010	0.035	8
RDCP17	14.00	14.42	0.42	5902	3.90	3.64	303	312	PDTS30	0.015	0.035	5
RPD740	14.33	14.67	0.34	6476	5.29	6.01	1269	1277	PDTS40_2	0.015	0.035	5
R726B	13.25	14.75	1.50	10685	1.98	3.07	1292	1300	PDTS40_1	0.006	0.035	2
RDCP18	14.00	14.58	0.58	8638	4.14	2.13	311	320	WITS70	0.007	0.035	8
RPD736	14.17	14.33	0.16	5434	9.43	2.93	449	458	PDTS30	0.006	0.035	1
RDCP19	14.00	14.25	0.25	6125	6.81	2.21	955	963	TWTS50	0.004	0.035	4
RPD760	12.75	12.92	0.17	4937	8.07	2.32	364	374	Channel	0.001	0.035	2
RPD732	13.83	14.42	0.59	1894	0.89	3.51	1179	1188	PDTS30	0.005	0.035	6
R726A	14.25	14.42	0.17	4094	6.69	4.62	1805	1812	PDTS30	0.008	0.035	2
R726*	14.50	15.17	0.67	3986	1.65	4.91	2943	2951	PDTS30	0.007	0.035	2
RPD726	15.08	15.42	0.34	10623	8.68	4.51	2405	2412	PDTS30	0.006	0.035	2
RD744 +	0.00	0.00	0.08	6956	23.19	0.11	0	0	WITS120	0.008	0.035	1
RPD720	15.00	15.08	0.08	4959	17.22	4.05	5841	5844	PDTS40_1	0.004	0.035	1
RD716	15.08	15.25	0.17	5888	9.62	2.53	584	592	PDTS40_1	0.006	0.035	2
R700*	15.25	15.92	0.67	10484	4.35	7.12	6167	6174	PDTS40_2	0.008	0.035	2
RPD748	12.42	12.75	0.33	8775	7.39	4.32	440	449	PDTS40_2	0.013	0.035	3
RPD756	13.17	13.50	0.33	5149	4.33	4.71	1459	1467	PDTS30	0.010	0.035	4
R708*	13.50	13.92	0.42	6448	4.26	5.30	1504	1512	PDTS40_2	0.009	0.035	6

+ Time lapse less than time step of 5 minutes, so 1 time step was assumed for HEC-1 Velocity Calculation

** Modified Typical X-Section

x Modified Time To Peak Used

Appendix D.3

Entellus

BY _____ DATE _____

CHECK _____ DATE _____

CLIENT: FCDMC **JOB NO.** 310.032

JOB: Wittmann Area Drainage Master Study Update

Storm: 100-yr, 24-hr Existing Conditions **Route N-Step vs Velocity**

Route (Model Order)	Previous Time to Peak [hr]	Route Time to Peak [hr]	Difference in Time to peak [hr]	Route Length [ft]	HEC-1 Velocity [fps]	Normal Depth Velocity [fps]	HEC-1 Flow [cfs]	Normal Depth Flow [cfs]	Typical Cross Section	Route Slope [ft/ft]	Manning's "n" Value	HEC-1 N-step
R712A	12.92	13.25	0.33	4179	3.52	2.72	389	398	PDTS30	0.006	0.035	6
RPD708	12.92	13.08	0.16	1840	3.19	9.54	2672	2680	Channel	0.010	0.035	1
RPD704	13.17	13.42	0.25	4300	4.78	4.47	2930	2937	PDTS40_1	0.009	0.035	4
RD800 +	0.00	0.00	0.08	4229	14.10	0.13	0	0	WITS120	0.011	0.035	2
R810*	15.50	15.92	0.42	5287	3.50	6.31	7022	7030	TSAF10	0.002	0.035	8
RAF803	12.50	12.75	0.25	6821	7.58	3.34	1744	1751	PDTS40_1	0.006	0.035	3
RAF805	12.58	12.92	0.34	2485	2.03	3.94	506	515	TSAF10	0.004	0.035	6
RAF807	12.67	12.75	0.08	8372	29.07	4.17	2496	2503	PDTS40_1	0.008	0.035	1
RAF810	15.83	16.08	0.25	1378	1.53	8.64	7154	7162	TSAF10	0.004	0.035	5
RAF854	12.08	12.17	0.09	2136	6.59	4.20	527	537	TSAF20	0.005	0.035	1
RAF852 +	12.17	12.17	0.08	2113	7.04	4.75	783	792	TSAF10	0.005	0.035	1
RAF864	12.25	12.75	0.50	6743	3.75	1.79	50	40	TSAF20	0.004	0.035	1
RAF862	12.00	12.08	0.08	4666	16.20	3.03	294	304	TSAF20	0.003	0.035	1
RAF866	12.17	12.50	0.33	4588	3.86	3.41	406	415	SVTS10	0.016	0.035	1
RSV258	12.42	12.58	0.16	6946	12.06	2.72	313	322	SVTS50_1	0.005	0.035	0

+ Time lapse less than time step of 5 minutes, so 1 time step was assumed for HEC-1 Velocity Calculation
** Modified Typical X-Section
x Modified Time To Peak Used

D.4 Reservoir Routing Data

(Not modified refer to the July 2005 WADMSU Hydrology Report prepared by Entellus or the September 2009 Loop 303/White Tanks ADMPU Area Hydrologic Analysis prepared by HDR for additional information)

D.5 Flow Splits and Diversion Data

(RBF removed flow splits at Corte Bella because of Loop 303 channel, refer to the July 2005 WADMSU Hydrology Report prepared by Entellus or the September 2009 Loop 303/White Tanks ADMPU Area Hydrologic Analysis prepared by HDR for additional information)

D.6 Hydrologic Calculations

100-Year 24-Hour Storm HEC-1 Model

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1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*              JUN  1998                *
*           VERSION 4.1                 *
*                                       *
*  RUN DATE   02MAY13  TIME  15:20:47   *
*                                       *
*****************************************
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*****************************************
*                                       *
*    U.S. ARMY CORPS OF ENGINEERS       *
*    HYDROLOGIC ENGINEERING CENTER      *
*          609 SECOND STREET            *
*       DAVIS, CALIFORNIA 95616         *
*           (916) 756-1104              *
*                                       *
*****************************************
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```
X     X  XXXXXXX   XXXXX           X
X     X  X        X     X         XX
X     X  X        X               X
XXXXXXX  XXXX     X        XXXXX  X
X     X  X        X               X
X     X  X        X     X         X
X     X  XXXXXXX   XXXXX          XXX
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1 HEC-1 INPUT PAGE 1

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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

   1          ID        McMicken Dam Outlet Wash Floodplain Delineation Study
   2          ID        FCDMC Contract 2011C003 Assignment 4
   3          ID        RBF Consulting combined the Loop 303 / White Tanks ADMPU AHA
   4          ID        and Wittmann ADMSU Hydrology
   5          ID        100-Year 24-Hour
   6          ID        Revised 5/1/13
   7          ID
   8          ID        Sub-Basins N01, N02, N02A, N03, N03A, N03B, N04, N04A, N04B, N05, N06,
   9          ID        N07, and N08 were obtained from the following model:
  10          ID        Flood Control District of Maricopa County
  11          ID        L303_EX_MB01 - Loop 303/ White Tanks ADMPU AHA
  12          ID        100 YEAR
  13          ID        24 Hour Storm
  14          ID        Unit Hydrograph: S-Graph
  15          ID        08/19/2009
  16          ID        FCDMC CONTRACT 2007C031
  17          ID        BY HDR ENGINEERING (#79902)
  18          ID        EXISTING CONDITIONS-AUGUST 2009
  19          ID        MAJOR BASIN 01
  20          ID        FILE NAME: EX-MB01.DAT
  21          IT       5       0       0    2000
  22          IN      15
  23          IO       5
              *DIAGRAM
              *
  24          JD   3.480  0.0001
  25          PC   0.000   0.002   0.005   0.008   0.011   0.014   0.017   0.020   0.023   0.026
  26          PC   0.029   0.032   0.035   0.038   0.041   0.044   0.048   0.052   0.056   0.060
  27          PC   0.064   0.068   0.072   0.076   0.080   0.085   0.090   0.095   0.100   0.105
  28          PC   0.110   0.115   0.120   0.126   0.133   0.140   0.147   0.155   0.163   0.172
  29          PC   0.181   0.191   0.203   0.218   0.236   0.257   0.283   0.387   0.663   0.707
  30          PC   0.735   0.758   0.776   0.791   0.804   0.815   0.825   0.834   0.842   0.849
  31          PC   0.856   0.863   0.869   0.875   0.881   0.887   0.893   0.898   0.903   0.908
  32          PC   0.913   0.918   0.922   0.926   0.930   0.934   0.938   0.942   0.946   0.950
  33          PC   0.953   0.956   0.959   0.962   0.965   0.968   0.971   0.974   0.977   0.980
  34          PC   0.983   0.986   0.989   0.992   0.995   0.998   1.000
  35          JD   3.393     5.0
  36          JD   3.306    10.0
  37          JD   3.195    20.0
  38          JD   3.028    60.0
  39          JD   2.951   100.0
  40          JD   2.854   200.0
  41          JD   2.805   300.0
  42          JD   2.770   400.0
              *  RBF Modified Basin Boundary

  43          KK   AF802
  44          KM        WADMSU Sub-Basin AF802 and portion of WADMSU AF810
  45          BA   0.862
  46          LG    0.27    0.31    4.80    0.31       5
  47          UC   1.085   0.804
              * Natural Time-Area Relation
  48          UA       0       3       5       8      12      20      43      75      90      96
  49          UA     100
              *
              *
              *  WADMSU Hydrology Model Concentration Point CPD700
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1 HEC-1 INPUT PAGE 2

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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  50          IN       5       0       0

  51          KK    MDOC
  52          BA   99.65
  53          QI       0       0       0       0       0       0       0       0       1       1
  54          QI       1       1       1       2       2       2       3       3       3       3
  55          QI       4       4       5       6       7       8      10      11      12      14
```

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 56          QI      15      16      17      18      19      20      21      22      23      24
 57          QI      25      26      27      28      30      31      33      34      35      37
 58          QI      38      39      41      42      44      45      47      48      50      51
 59          QI      53      54      56      57      59      60      62      63      65      66
 60          QI      67      69      70      71      73      74      75      76      77      78
 61          QI      79      81      82      83      84      85      86      87      89      90
 62          QI      91      93      94      96      97      98      99     101     102     103
 63          QI     104     105     107     108     109     111     113     114     116     117
 64          QI     119     121     122     124     126     128     130     132     134     136
 65          QI     138     141     143     145     148     150     153     156     159     162
 66          QI     165     168     172     176     180     184     189     194     199     208
 67          QI     221     240     275     345     470     659     938    1358    1858    2301
 68          QI    2561    2721    2952    3289    3633    3984    4336    4705    5007    5237
 69          QI    5425    5571    5688    5786    5878    5973    6077    6192    6320    6455
 70          QI    6591    6730    6858    6971    7076    7171    7243    7299    7347    7390
 71          QI    7426    7452    7466    7471    7469    7451    7415    7363    7298    7222
 72          QI    7138    7051    6962    6874    6788    6696    6598    6496    6391    6284
 73          QI    6174    6058    5931    5761    5640    5549    5472    5400    5333    5271
 74          QI    5213    5160    5112    5069    5029    4994    4962    4934    4908    4884
 75          QI    4862    4841    4822    4804    4787    4771    4755    4740    4724    4709
 76          QI    4694    4678    4663    4647    4631    4615    4598    4582    4565    4547
 77          QI    4528    4508    4487    4466    4443    4420    4396    4370    4343    4315
 78          QI    4286    4255    4223    4190    4156    4119    4081    4041    3999    3955
 79          QI    3909    3862    3813    3763    3712    3659    3605    3551    3497    3443
 80          QI    3389    3336    3285    3235    3186    3138    3091    3046    3002    2959
 81          QI    2917    2878    2840    2804    2770    2737    2707    2678    2650    2623
 82          QI    2598    2574    2550    2527    2504    2480    2457    2433    2409    2384
 83          QI    2358    2331    2304    2276    2249    2222    2196    2170    2146    2121
 84          QI    2098    2075    2052    2030    2007    1985    1964    1942    1920    1898
 85          QI    1877    1856    1835    1814    1793    1773    1752    1732    1713    1693
 86          QI    1673    1654    1635    1615    1596    1577    1558    1540    1522    1504
 87          QI    1486    1468    1451    1433    1415    1396    1377    1358    1339    1321
 88          QI    1303    1285    1268    1250    1233    1215    1198    1181    1164    1146
 89          QI    1129    1112    1095    1078    1061    1045    1028    1011     995     978
 90          QI     962     945     928     911     894     877     859     841     823     805
 91          QI     786     767     748     727     706     688     670     654     638     623
 92          QI     610     596     584     572     561     551     541     531     522     514
 93          QI     505     496     486     477     467     456     445     434     424     413
 94          QI     403     393     383     375     367     360     354     348     342     335
 95          QI     328     321     315     308     301     294     287     281     274     268
 96          QI     261     255     249     244     238     233     227     222     217     213
 97          QI     208     204     199     195     191     188     184     181     177     174
 98          QI     171     169     166     164     161     159     157     155     154     152
 99          QI     151     149     148     146     145     143     142     140     139     137
100          QI     136     134     133     131     129     128     126     124     122     121
101          QI     119     118     116     115     113     112     111     110     109     108
102          QI     107     106     105     104     103     102     100      99      97      96
103          QI      94      93      91      89      88      86      85      83      81      80
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LINE         ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

104          QI      78      76      75      73      71      70      68      67      65      64
105          QI      62      61      59      58      56      55      53      52      51      49
106          QI      48      47      45      44      43      42      41      39      38      37
107          QI      36      35      34      33      32      31      30      30      29      28
108          QI      27      26      26      25      24      24      23      23      22      21
109          QI      21      20      20      19      19      19      18      18      17      17
110          QI      17      16      16      15      15      15      14      14      14      13
111          QI      13      13      13      12      12      12      11      11      11      11
112          QI      10      10      10      10      10       9       9       9       9       8
113          QI       8       8       8       8       8       7       7       7       7       7
114          QI       7       6       6       6       6       6       6       6       5       5
115          QI       5       5       5       5       5       4       4       4       4       4
116          QI       4       4       4       4       3       3       3       3       3       3
117          QI       3       3       3       3       3       3       2       2       2       2
118          QI       2       2       2       2       2       2       2       2       2       2
119          QI       2       2       1       1       1       1       1       1       1       1
120          QI       1       1       1       1       1       1       1       1       1       1
121          QI       1       1       1       1       1       1       1       1       1       1
122          QI       1       1       1       1       1       0       0       0       0       0
             * RBF Modified WADMSU R810* Length (Name changed to R810A)
             * Route updated 04-15-2004

123          KK   R810A
124          RS       3    FLOW     0.0     0.0
125          RC   0.043   0.035   0.043    4932  0.0058
             * PDTS40_1
126          RX       0      86     158     492     543     560     776    1208
127          RY    1330  1326.5    1326    1324    1320    1326    1328    1330
             *
             *  RBF removed flow splits at Corte Bella because of Loop 303 Channel

128          KK     N07BASIN
129          KM        BASIN BOUNDARY FROM CORTE BELLA AND MCMICKEN DAM
130          BA   0.570
131          LG    0.35    0.38    5.40    0.23       0
132          UI       0      84     319     594     769     794     595     407     278     187
133          UI     132      86      57      36      21      20      21       0       0       0
134          UI       0       0       0       0       0       0       0       0       0       0
135          UI       0       0       0       0       0       0       0       0       0       0
136          UI       0       0       0       0       0       0       0       0       0       0
             *

137          KK   CP802
138          HC       3
             * RBF Modified WADMSU R810* Length (Name changed to R810B)
             * Route updated 04-15-2004

139          KK   R810B
140          RS       2    FLOW     0.0     0.0
141          RC   0.043   0.035   0.043    5755  0.0058
             * PDTS40_1
142          RX       0      86     158     492     543     560     776    1208
143          RY    1330  1326.5    1326    1324    1320    1326    1328    1330
             *
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LINE          ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

  144         KK     N01BASIN
  145         KM        BASIN BOUNDARY FROM SUN CITY WEST EXPANSION BOUNDARY
  146         KM        GRAND AVE AND MCMICKEN DAM
  147         BA   0.345
  148         LG   0.33    0.33    4.60    0.34       1
  149         UI      0     145     559     766     560     302     161      85      46      20
  150         UI     20       0       0       0       0       0       0       0       0       0
  151         UI      0       0       0       0       0       0       0       0       0       0
  152         UI      0       0       0       0       0       0       0       0       0       0
  153         UI      0       0       0       0       0       0       0       0       0       0
              *

  154         KK    N02ABASIN
  155         KM        BASIN BOUNDARY FROM SUN CITY WEST EXPANSION AREA MASTER
  156         KM        DRAINAGE PLAN, JAN 1992, MODIFIED SLIGHTLY TO REFLECT
  157         KM        AS-BUILT CONDITIONS AND MC MICKEN DAM
  158         BA   0.083
  159         LG   0.34    0.35    5.00    0.27       0
  160         UI      0      10      27      55      79      94      93      76      57      41
  161         UI     31      21      17      11       9       7       4       2       3       2
  162         UI      3       0       0       0       0       0       0       0       0       0
  163         UI      0       0       0       0       0       0       0       0       0       0
  164         UI      0       0       0       0       0       0       0       0       0       0
              *

  165         KK  N2AN01ROUTE
  166         KM        Cross-section: cross-section from aerial
  167         KM        Manning's N Value: Natural desert wash with vegetation
  168         RS       5    FLOW
  169         RC  0.035   0.035   0.035    2386  0.0010    0.00
  170         RX 100.00  120.00  140.00  149.00  150.00  160.00  180.00  200.00
  171         RY 1000.0  999.50  999.00  997.00  997.10  999.00  999.50 1000.00
              *

  172         KK   CPN01COMBINE
  173         HC       2   0.428
              *

  174         KK  N01N02ROUTE
  175         KM        Cross-section:  / Manning's N Value: Concrete channel
  176         KM        10-ft bottom, with 2:1 side slopes, left and right
  177         KM        Mannings N Value: clean earth, straight
  178         RS       1    FLOW
  179         RC  0.022   0.016   0.022    3902  0.0051    0.00
  180         RX 100.00  100.10  112.00  122.00  132.00  142.00  153.90  154.00
  181         RY 1300.0 1295.25 1295.00 1290.00 1290.10 1295.00 1295.25 1300.00
              *

  182         KK     N02BASIN
  183         KM        BASIN BOUNDARY FROM SUN CITY WEST EXPANSION AREA MASTER DRAINAGE
  184         KM        PLAN, JAN 1992, MODIFIED SLIGHTLY TO REFLECT AS-BUILT CONDITIONS
  185         BA   0.510
  186         LG   0.20    0.25    5.20    0.33      21
  187         UI      0     150     511     824    1102     698     371     157      71      31
1                                    HEC-1 INPUT                                          PAGE 5
LINE          ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

  188         UI     31       0       0       0       0       0       0       0       0       0
  189         UI      0       0       0       0       0       0       0       0       0       0
  190         UI      0       0       0       0       0       0       0       0       0       0
  191         UI      0       0       0       0       0       0       0       0       0       0
              *

  192         KK  DN02REDIVERT
  193         KM        Sun City West Expansion Area 2
  194         DT    RN02    38.4     0.0
  195         DI     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
  196         DQ     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
              *

  197         KK    N03ABASIN
  198         KM        BASIN BOUNDARY FROM SUN CITY WEST EXPANSION AREA MASTER DRAINAGE
  199         KM        PLAN, JAN 1992, MODIFIED SLIGHTLY TO REFLECT AS-BUILT CONDITIONS AND MC
  200         KM        MICKEN DAM
  201         BA   0.065
  202         LG   0.33    0.33    4.90    0.29       2
  203         UI      0      11      45      81      99      90      62      40      26      18
  204         UI     11       7       5       2       3       2       0       0       0       0
  205         UI      0       0       0       0       0       0       0       0       0       0
  206         UI      0       0       0       0       0       0       0       0       0       0
  207         UI      0       0       0       0       0       0       0       0       0       0
              *

  208         KK  N3AN02ROUTE
  209         KM        Cross-section:  / Manning's N Value: Golf course channel
  210         RS      10    FLOW
  211         RC  0.025   0.025   0.025    5514  0.0054    0.00
  212         RX 100.00  120.00  140.00  180.00  280.00  340.00  360.00  380.00
  213         RY 1000.0  998.50  997.40  995.00  995.00  997.70  998.70 1000.00
              *

  214         KK   CPN02COMBINE
  215         HC       3   1.003
              *

  216         KK  N02N3BROUTE
  217         KM        Cross-section:  / Manning's N Value: Golf course channel
  218         KM        Route is from CPN02 to CPN03B
  219         RS       3    FLOW
  220         RC  0.025   0.025   0.025    3992  0.0020    0.00
```

```
 221          RX  100.00  130.00  150.00  155.00  215.00  220.00  230.00  245.00
 222          RY  1288.5 1286.00 1283.00 1282.50 1282.60 1283.00 1285.00 1286.00
              *
 223          KK    N03BBASIN
 224          KM        BASIN BOUNDARY FROM SUN CITY WEST EXPANSION AREA MASTER DRAINAGE
 225          KM        PLAN, JAN 1992, MODIFIED SLIGHTLY TO REFLECT AS-BUILT CONDITIONS
 226          BA   0.285
 227          LG   0.23    0.25    4.80    0.36      30
 228          UI      0     109     342     619     573     335     131      58      19      20
 229          UI      0       0       0       0       0       0       0       0       0       0
 230          UI      0       0       0       0       0       0       0       0       0       0
1                                        HEC-1 INPUT                                        PAGE  6

 LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 231          UI      0       0       0       0       0       0       0       0       0       0
 232          UI      0       0       0       0       0       0       0       0       0       0
              *
 233          KK  DN3BREDIVERT
 234          KM        Master Drainage Plan for Del Webb's Sun City West - Expansion Area
 235          DT   RN03B     8.0     0.0
 236          DI    0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
 237          DQ    0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
              *
 238          KK  CPN03BCOMBINE
 239          HC       2   1.288
              *
 240          KK  N3BN04ROUTE
 241          KM        Cross-section:  / Manning's N Value: Golf course channel
 242          KM        Route is from CPN03B to CPN04
 243          RS       7    FLOW
 244          RC   0.025   0.025   0.025    5663  0.0020    0.00
 245          RX  100.00  110.00  120.00  150.00  300.00  330.00  340.00  350.00
 246          RY  1000.0  999.00  998.00  996.00  996.10  998.00  999.00 1000.00
              *
 247          KK     N04BASIN
 248          KM        BASIN BOUNDARY FROM SUN CITY WEST EXPANSION AREA MASTER DRAINAGE
 249          KM        PLAN, JAN 1992, MODIFIED SLIGHTLY TO REFLECT AS-BUILT CONDITIONS
 250          BA   0.992
 251          LG   0.21    0.25    5.40    0.29      26
 252          UI      0     109     275     516     663     871    1299    1124     873     660
 253          UI    493     272     185     123      79      33      34      34      34       0
 254          UI      0       0       0       0       0       0       0       0       0       0
 255          UI      0       0       0       0       0       0       0       0       0       0
 256          UI      0       0       0       0       0       0       0       0       0       0
              *
 257          KK     N03BASIN
 258          KM        BASIN BOUNDARY FROM SUN CITY WEST EXPANSION AREA MASTER DRAINAGE
 259          KM        PLAN, JAN 1992, MODIFIED SLIGHTLY TO REFLECT AS-BUILT CONDITIONS
 260          BA   0.358
 261          LG   0.24    0.26    4.65    0.39      27
 262          UI      0     105     359     578     774     490     261     110      50      21
 263          UI     22       0       0       0       0       0       0       0       0       0
 264          UI      0       0       0       0       0       0       0       0       0       0
 265          UI      0       0       0       0       0       0       0       0       0       0
 266          UI      0       0       0       0       0       0       0       0       0       0
              *
 267          KK  DN03REDIVERT
 268          KM        Master Drainage Plan for Del Webb's Sun City West - Expansion Area
 269          DT    RN03    10.0     0.0
 270          DI    0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
 271          DQ    0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
              *
1                                        HEC-1 INPUT                                        PAGE  7

 LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 272          KK  N03N04ROUTE
 273          KM        Cross-section:  / Manning's N Value: Golf course channel
 274          RS       7    FLOW
 275          RC   0.025   0.025   0.025    7853  0.0035    0.00
 276          RX  100.00  140.00  175.00  260.00  350.00  415.50  445.00  475.00
 277          RY  1000.0  999.00  998.00  995.00  995.00  998.00  999.00 1000.00
              *
 278          KK    N04ABASIN
 279          KM        BASIN BOUNDARY FROM SUN CITY WEST EXPANSION AREA MASTER DRAINAGE
 280          KM        PLAN, JAN 1992, MODIFIED SLIGHTLY TO REFLECT AS-BUILT CONDITIONS AND MC
 281          KM        MICKEN DAM
 282          BA   0.199
 283          LG   0.34    0.36    5.20    0.25       1
 284          UI      0      58     223     361     351     227     133      79      47      28
 285          UI     12      10       9       0       0       0       0       0       0       0
 286          UI      0       0       0       0       0       0       0       0       0       0
 287          UI      0       0       0       0       0       0       0       0       0       0
 288          UI      0       0       0       0       0       0       0       0       0       0
              *
 289          KK  N4AN04ROUTE
 290          KM        Cross-section:  / Manning's N Value: Golf course channel
 291          KM        Route is from N04A to CPN04
 292          RS      10    FLOW
 293          RC   0.025   0.025   0.025    7932  0.0044    0.00
 294          RX  100.00  110.00  120.00  150.00  300.00  330.00  340.00  350.00
 295          RY  1000.0  999.00  998.00  996.00  996.10  998.00  999.00 1000.00
              *
 296          KK    N04BBASIN
```

```
297          KM        BASIN BOUNDARY FROM CORTE BELLA AND MCMICKEN DAM
298          BA   0.131
299          LG    0.34    0.34    4.80    0.30       1
300          UI       0     203     487     217      73      22       0       0       0       0
301          UI       0       0       0       0       0       0       0       0       0       0
302          UI       0       0       0       0       0       0       0       0       0       0
303          UI       0       0       0       0       0       0       0       0       0       0
304          UI       0       0       0       0       0       0       0       0       0       0
             *

305          KK  N4BN04ROUTE
306          KM        Cross-section:  / Manning's N Value: Golf course channel
307          KM        Route is from N04B to CPN04
308          RS       8    FLOW
309          RC   0.025   0.025   0.025    6839  0.0050    0.00
310          RX  100.00  110.00  120.00  150.00  300.00  330.00  340.00  350.00
311          RY  1000.0  999.00  998.00  996.00  996.10  998.00  999.00 1000.00
             *
1                                        HEC-1 INPUT                                        PAGE  8

         LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

312          KK   CPN04COMBINE
313          HC       5   2.968
             *

314          KK  DN04REDIVERT
315          KM        Master Drainage Plan for Del Webb's Sun City West - Expansion Area
316          DT    RN04    96.0     0.0
317          DI     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
318          DQ     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
             *

319          KK  N04N05ROUTE
320          KM        Cross-section:  / Manning's N Value: Golf course channel
321          RS       6    FLOW
322          RC   0.025   0.025   0.025    5405  0.0019    0.00
323          RX  100.00  120.00  136.00  153.00  236.00  253.00  270.00  290.00
324          RY 1270.5 1268.50 1266.70 1265.00 1264.90 1266.70 1268.50 1270.50
             *

325          KK     N05BASIN
326          KM        BASIN BOUNDARY FROM CORTEBELLA MASTER DRAINAGE REPORT, DEI
327          BA   0.995
328          LG    0.21    0.19    6.60    0.18      27
329          UI       0      94     174     388     510     626     795    1151     988     786
330          UI     624     502     363     200     159     108      86      30      28      29
331          UI      29      29       0       0       0       0       0       0       0       0
332          UI       0       0       0       0       0       0       0       0       0       0
333          UI       0       0       0       0       0       0       0       0       0       0
             *

334          KK  DN05REDIVERT
335          KM        First flush volume estimated based on aerial and Preliminary Plat Final
336          KM        Report for Corte Bella Country Club Phase II
337          KM        Route through Corte Bella
338          DT    RN05    15.6     0.0
339          DI     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
340          DQ     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
             *

341          KK   CPN05COMBINE
342          HC       2
             *

343          KK  N05N06ROUTE
344          KM        Cross-section:  / Manning's N Value: clean earth, earth
345          KM        with sparse trees and shrubs, and pavement
346          RS       2    FLOW
347          RC   0.032   0.022   0.013    2139  0.0010    0.00
348          RX  100.00  250.00  306.00  326.00  338.00  360.00  414.00  415.00
349          RY 1001.0  999.50  999.00  996.00  996.10  999.00  999.50 1002.00
             *
1                                        HEC-1 INPUT                                        PAGE  9

         LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

350          KK     N06BASIN
351          KM        BASIN BOUNDARY FROM CORTE BELLA, SUN CITY WEST AND MCMICKEN DAM
352          BA   0.219
353          LG    0.34    0.34    4.40    0.39       2
354          UI       0      39     155     270     337     303     206     135      88      60
355          UI      37      24      14       9       8       9       0       0       0       0
356          UI       0       0       0       0       0       0       0       0       0       0
357          UI       0       0       0       0       0       0       0       0       0       0
358          UI       0       0       0       0       0       0       0       0       0       0
             *

359          KK   CPN06COMBINE
360          HC       2
             *
             *  RBF Modified Basin Boundary

361          KK   AF810
362          KM         Portion of WADMSU AF810
363          BA   1.429
364          LG    0.24    0.29    4.40    0.43      21
365          UC   1.130   0.839
             * Urban Time-Area Relation
366          UA       0       5      16      30      65      77      84      90      94      97
367          UA     100
             *
             *
```

```
368          KK   CP810
369          HC      3
             * RBF Modified WADMSU RAF810 Length (Name changed to AF810A)
             * ROUTE UPDATED 4/14/4

370          KK  AF810A
371          RS       3    FLOW     0.0     0.0
372          RC   0.043   0.035   0.043    6368  0.0084
             * PDTS40_1
373          RX       0      86     158     492     543     560     776    1208
374          RY    1330  1326.5    1326    1324    1320    1326    1328    1330
             *

375          KK     N08BASIN
376          KM          BASIN BOUNDARY FROM SUN CITY WEST
377          BA   1.723
378          LG    0.21    0.23    6.20    0.21      26
379          UI       0     137     157     482     653     788     924    1129    1601    1617
380          UI    1248    1089     868     725     591     341     238     226     137     129
381          UI      42      42      42      42      42      42       0       0       0       0
382          UI       0       0       0       0       0       0       0       0       0       0
383          UI       0       0       0       0       0       0       0       0       0       0
             *
1                                          HEC-1 INPUT                                          PAGE 10

          LINE       ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

384          KK   CPN08
385          HC       2
             * RBF Modified WADMSU RAF810 Length (Name changed to AF810B)
             * ROUTE UPDATED 4/14/4

386          KK  AF810B
387          RS       1    FLOW     0.0     0.0
388          RC   0.043   0.035   0.043    2005  0.0084
             * PDTS40_1
389          RX       0      86     158     492     543     560     776    1208
390          RY    1330  1326.5    1326    1324    1320    1326    1328    1330
             *

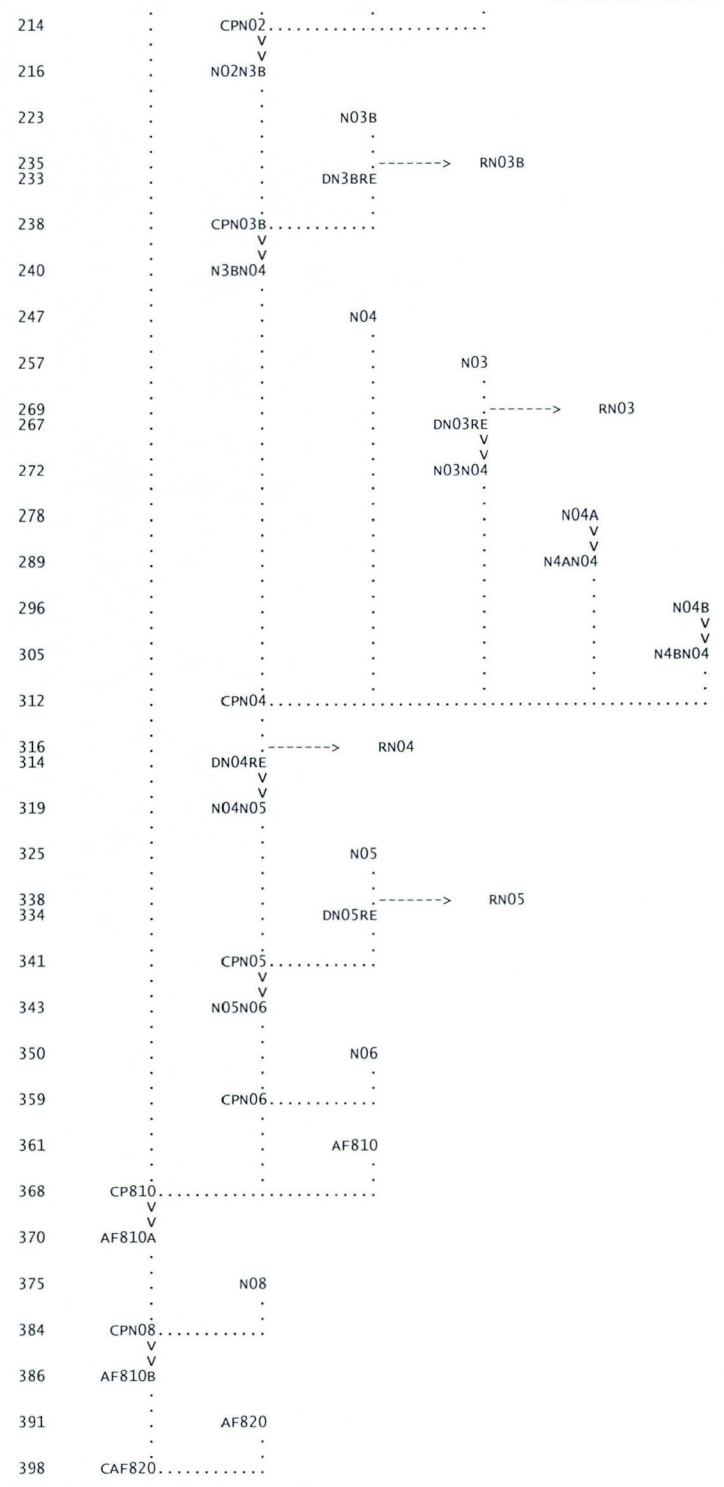
391          KK   AF820
392          KO       0       0     0.0       1      22
393          BA   0.699
394          LG    0.30    0.25     4.2    0.45       7
395          UC   0.725   0.631
             * Natural Time-Area Relation
396          UA       0       3       5       8      12      20      43      75      90      96
397          UA     100
             *

398          KK  CAF820
399          HC       2
400          ZZ
1
               SCHEMATIC DIAGRAM OF STREAM NETWORK

 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

    NO.     (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

     43      AF802
              .
              .
     51       .        MDOC
              .          V
              .          V
    123       .       R810A
              .          .
              .          .
    128       .          .         N07
              .          .          .
              .          .          .
    137      CP802.......................
              V
              V
    139      R810B
              .
              .
    144       .         N01
              .          .
              .          .
    154       .          .        N02A
              .          .          V
              .          .          V
    165       .          .      N2AN01
              .          .          .
              .          .          .
    172       .       CPN01..........
              .          V
              .          V
    174       .      N01N02
              .          .
              .          .
    182       .          .         N02
              .          .          .
              .          .          .
    194       .          .          .-------->    RN02
    192       .          .      DN02RE
              .          .          .
              .          .          .
    197       .          .          .        N03A
              .          .          .          V
              .          .          .          V
    208       .          .          .      N3AN02
              .          .          .          .
```



(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

1**********

```
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*             JUN   1998                *
*          VERSION 4.1                  *
*                                       *
*  RUN DATE   02MAY13  TIME  15:20:47   *
*                                       *
```

```
*****************************************
*                                       *
*    U.S. ARMY CORPS OF ENGINEERS       *
*    HYDROLOGIC ENGINEERING CENTER      *
*         609 SECOND STREET             *
*       DAVIS, CALIFORNIA 95616         *
*           (916) 756-1104              *
*                                       *
```

```
                              McMicken Dam Outlet Wash Floodplain Delineation Study
                              FCDMC Contract 2011C003 Assignment 4
                              RBF Consulting combined the Loop 303 / White Tanks ADMPU AHA
                              and Wittmann ADMSU Hydrology
                              100-Year 24-Hour
                              Revised 5/1/13

                              Sub-Basins N01, N02, N02A, N03, N03A, N03B, N04, N04A, N04B, N05, N06,
                              N07, and N08 were obtained from the following model:
                              Flood Control District of Maricopa County
                              L303_EX_MB01 - Loop 303/ White Tanks ADMPU AHA
                              100 YEAR
                              24 Hour Storm
                              Unit Hydrograph: S-Graph
                              08/19/2009
                              FCDMC CONTRACT 2007C031
                              BY HDR ENGINEERING (#79902)
                              EXISTING CONDITIONS-AUGUST 2009
                              MAJOR BASIN 01
                              FILE NAME: EX-MB01.DAT

 23 IO           OUTPUT CONTROL VARIABLES
                       IPRNT          5  PRINT CONTROL
                       IPLOT          0  PLOT CONTROL
                       QSCAL         0.  HYDROGRAPH PLOT SCALE

    IT           HYDROGRAPH TIME DATA
                        NMIN          5  MINUTES IN COMPUTATION INTERVAL
                       IDATE     1    0  STARTING DATE
                       ITIME       0000  STARTING TIME
                          NQ       2000  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE     7    0  ENDING DATE
                      NDTIME       2235  ENDING TIME
                       ICENT         19  CENTURY MARK

                   COMPUTATION INTERVAL     0.08 HOURS
                        TOTAL TIME BASE   166.58 HOURS

        ENGLISH UNITS
             DRAINAGE AREA          SQUARE MILES
             PRECIPITATION DEPTH    INCHES
             LENGTH, ELEVATION      FEET
             FLOW                   CUBIC FEET PER SECOND
             STORAGE VOLUME         ACRE-FEET
             SURFACE AREA           ACRES
             TEMPERATURE            DEGREES FAHRENHEIT

 24 JD            INDEX STORM NO. 1
                        STRM       3.48  PRECIPITATION DEPTH
                        TRDA       0.00  TRANSPOSITION DRAINAGE AREA

 25 PI              PRECIPITATION PATTERN
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.01      0.00      0.01
                   0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.03      0.03
                   0.03      0.09      0.09      0.09      0.01      0.01      0.01      0.01      0.01      0.01
                   0.01      0.01      0.01      0.01      0.01      0.01      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
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                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00

 35 JD            INDEX STORM NO. 2
                        STRM       3.39  PRECIPITATION DEPTH
                        TRDA       5.00  TRANSPOSITION DRAINAGE AREA

  0 PI              PRECIPITATION PATTERN
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.01      0.00      0.01
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36 JD INDEX STORM NO. 3
STRM 3.31 PRECIPITATION DEPTH
TRDA 10.00 TRANSPOSITION DRAINAGE AREA

0 PI PRECIPITATION PATTERN
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
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37 JD INDEX STORM NO. 4
STRM 3.19 PRECIPITATION DEPTH
TRDA 20.00 TRANSPOSITION DRAINAGE AREA

0 PI PRECIPITATION PATTERN
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
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38 JD INDEX STORM NO. 5
STRM 3.03 PRECIPITATION DEPTH
TRDA 60.00 TRANSPOSITION DRAINAGE AREA

0 PI PRECIPITATION PATTERN
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
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0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.03 0.03

0.03	0.09	0.09	0.09	0.01	0.01	0.01	0.01	0.01	0.01
0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
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0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		

39 JD INDEX STORM NO. 6
STRM 2.95 PRECIPITATION DEPTH
TRDA 100.00 TRANSPOSITION DRAINAGE AREA

0 PI PRECIPITATION PATTERN

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01
0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.03	0.03
0.03	0.09	0.09	0.09	0.01	0.01	0.01	0.01	0.01	0.01
0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
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0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
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0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		

40 JD INDEX STORM NO. 7
STRM 2.85 PRECIPITATION DEPTH
TRDA 200.00 TRANSPOSITION DRAINAGE AREA

0 PI PRECIPITATION PATTERN

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
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0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01
0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.03	0.03
0.03	0.09	0.09	0.09	0.01	0.01	0.01	0.01	0.01	0.01
0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		

41 JD INDEX STORM NO. 8
STRM 2.81 PRECIPITATION DEPTH
TRDA 300.00 TRANSPOSITION DRAINAGE AREA

0 PI PRECIPITATION PATTERN

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01
0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.03	0.03
0.03	0.09	0.09	0.09	0.01	0.01	0.01	0.01	0.01	0.01

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                  0.01      0.01      0.01      0.01      0.01      0.01      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
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                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
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                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00

 42 JD          INDEX STORM NO. 9
                       STRM      2.77  PRECIPITATION DEPTH
                       TRDA    400.00  TRANSPOSITION DRAINAGE AREA

  0 PI            PRECIPITATION PATTERN
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.01      0.00      0.01
                  0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.03      0.03
                  0.03      0.09      0.09      0.09      0.01      0.01      0.01      0.01      0.01      0.01
                  0.01      0.01      0.01      0.01      0.01      0.01      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
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                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

            **************
            *            *
391 KK      *   AF820    *
            *            *
            **************

392 KO          OUTPUT CONTROL VARIABLES
                      IPRNT          5  PRINT CONTROL
                      IPLOT          0  PLOT CONTROL
                      QSCAL         0.  HYDROGRAPH PLOT SCALE
                      IPNCH          1  PUNCH COMPUTED HYDROGRAPH
                       IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                      ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                      ISAV2       2000  LAST ORDINATE PUNCHED OR SAVED
                     TIMINT      0.083  TIME INTERVAL IN HOURS

1
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RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

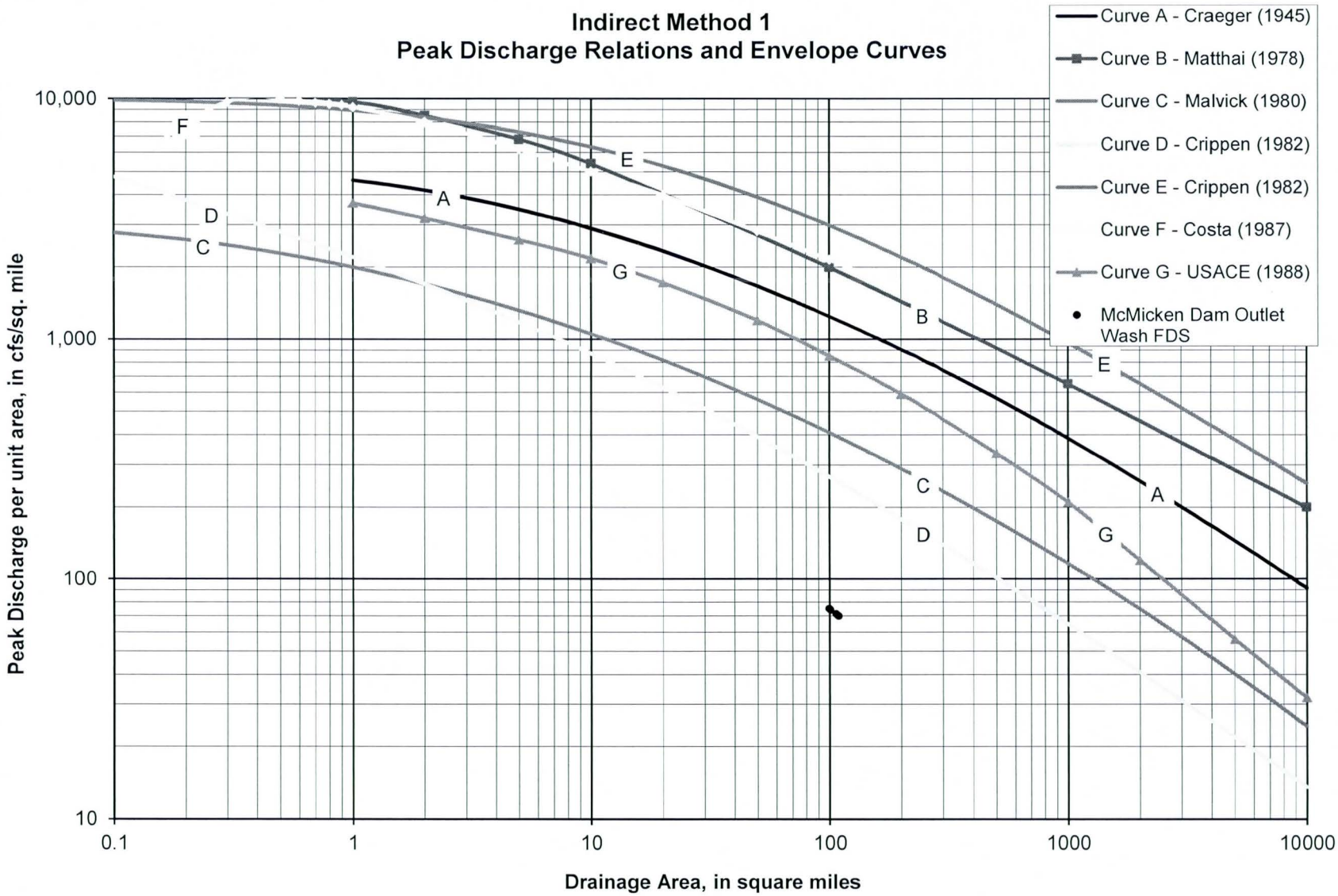
	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+	HYDROGRAPH AT	AF802	398.	12.75	88.	23.	8.	0.86		
+	HYDROGRAPH AT	MDOC	7471.	15.25	6059.	3024.	1037.	99.65		
+	ROUTED TO	R810A	7464.	15.42	6054.	3024.	1037.	99.65		
+	HYDROGRAPH AT	N07	602.	12.25	54.	14.	5.	0.57		
+	3 COMBINED AT	CP802	7481.	15.42	6084.	3051.	1047.	101.08		
+	ROUTED TO	R810B	7463.	15.58	6075.	3051.	1047.	101.08		
+	HYDROGRAPH AT	N01	479.	12.17	31.	8.	3.	0.34		
+	HYDROGRAPH AT	N02A	74.	12.33	8.	2.	1.	0.08		
+	ROUTED TO	N2AN01	57.	12.75	8.	2.	1.	0.08		

+	2 COMBINED AT	CPN01	479.	12.17	39.	10.	3.	0.43
+	ROUTED TO	N01N02	421.	12.25	39.	10.	3.	0.43
+	HYDROGRAPH AT	N02	743.	12.25	67.	20.	7.	0.51
+	DIVERSION TO	RN02	743.	12.25	67.	19.	6.	0.51
+	HYDROGRAPH AT	DN02RE	3.	23.25	1.	0.	0.	0.51
+	HYDROGRAPH AT	N03A	74.	12.25	6.	2.	1.	0.06
+	ROUTED TO	N3AN02	42.	13.08	6.	2.	1.	0.06
+	3 COMBINED AT	CPN02	421.	12.25	45.	12.	4.	1.00
+	ROUTED TO	N02N3B	305.	12.50	45.	12.	4.	1.00
+	HYDROGRAPH AT	N03B	451.	12.17	41.	13.	4.	0.28
+	DIVERSION TO	RN03B	227.	12.00	14.	4.	1.	0.28
+	HYDROGRAPH AT	DN3BRE	451.	12.17	32.	9.	3.	0.28
+	2 COMBINED AT	CPN03B	482.	12.25	77.	20.	7.	1.29
+	ROUTED TO	N3BN04	373.	12.83	75.	20.	7.	1.29
+	HYDROGRAPH AT	N04	1067.	12.42	141.	42.	14.	0.99
+	HYDROGRAPH AT	N03	518.	12.25	49.	15.	5.	0.36
+	DIVERSION TO	RN03	274.	12.08	17.	5.	2.	0.36
+	HYDROGRAPH AT	DN03RE	518.	12.25	36.	10.	3.	0.36
+	ROUTED TO	N03N04	225.	12.83	35.	10.	3.	0.36
+	HYDROGRAPH AT	N04A	257.	12.17	19.	5.	2.	0.20
+	ROUTED TO	N4AN04	128.	13.00	19.	5.	2.	0.20
+	HYDROGRAPH AT	N04B	229.	12.08	12.	3.	1.	0.13
+	ROUTED TO	N4BN04	88.	12.75	12.	3.	1.	0.13
+	5 COMBINED AT	CPN04	1122.	12.75	276.	79.	27.	2.97
+	DIVERSION TO	RN04	1122.	12.75	185.	48.	16.	2.97
+	HYDROGRAPH AT	DN04RE	648.	13.17	110.	31.	10.	2.97
+	ROUTED TO	N04N05	445.	13.67	106.	31.	10.	2.97
+	HYDROGRAPH AT	N05	1065.	12.50	157.	46.	16.	1.00
+	DIVERSION TO	RN05	226.	12.00	25.	8.	3.	1.00
+	HYDROGRAPH AT	DN05RE	1065.	12.50	145.	39.	13.	1.00
+	2 COMBINED AT	CPN05	1061.	12.50	245.	70.	23.	3.96
+	ROUTED TO	N05N06	981.	12.67	243.	70.	23.	3.96
+	HYDROGRAPH AT	N06	227.	12.25	19.	5.	2.	0.22
+	2 COMBINED AT	CPN06	1027.	12.67	260.	74.	25.	4.18
+	HYDROGRAPH AT	AF810	610.	12.50	172.	51.	17.	1.43

+	3 COMBINED AT	CP810	7605.	15.58	6184.	3135.	1077.	106.69
+	ROUTED TO	AF810A	7597.	15.75	6179.	3135.	1077.	106.69
+	HYDROGRAPH AT	N08	1557.	12.67	259.	77.	26.	1.72
+	2 COMBINED AT	CPN08	7620.	15.75	6207.	3188.	1098.	108.42
+	ROUTED TO	AF810B	7616.	15.83	6206.	3188.	1098.	108.42
+	HYDROGRAPH AT	AF820	391.	12.50	69.	18.	6.	0.70
+	2 COMBINED AT	CAF820	7619.	15.83	6214.	3201.	1102.	109.11

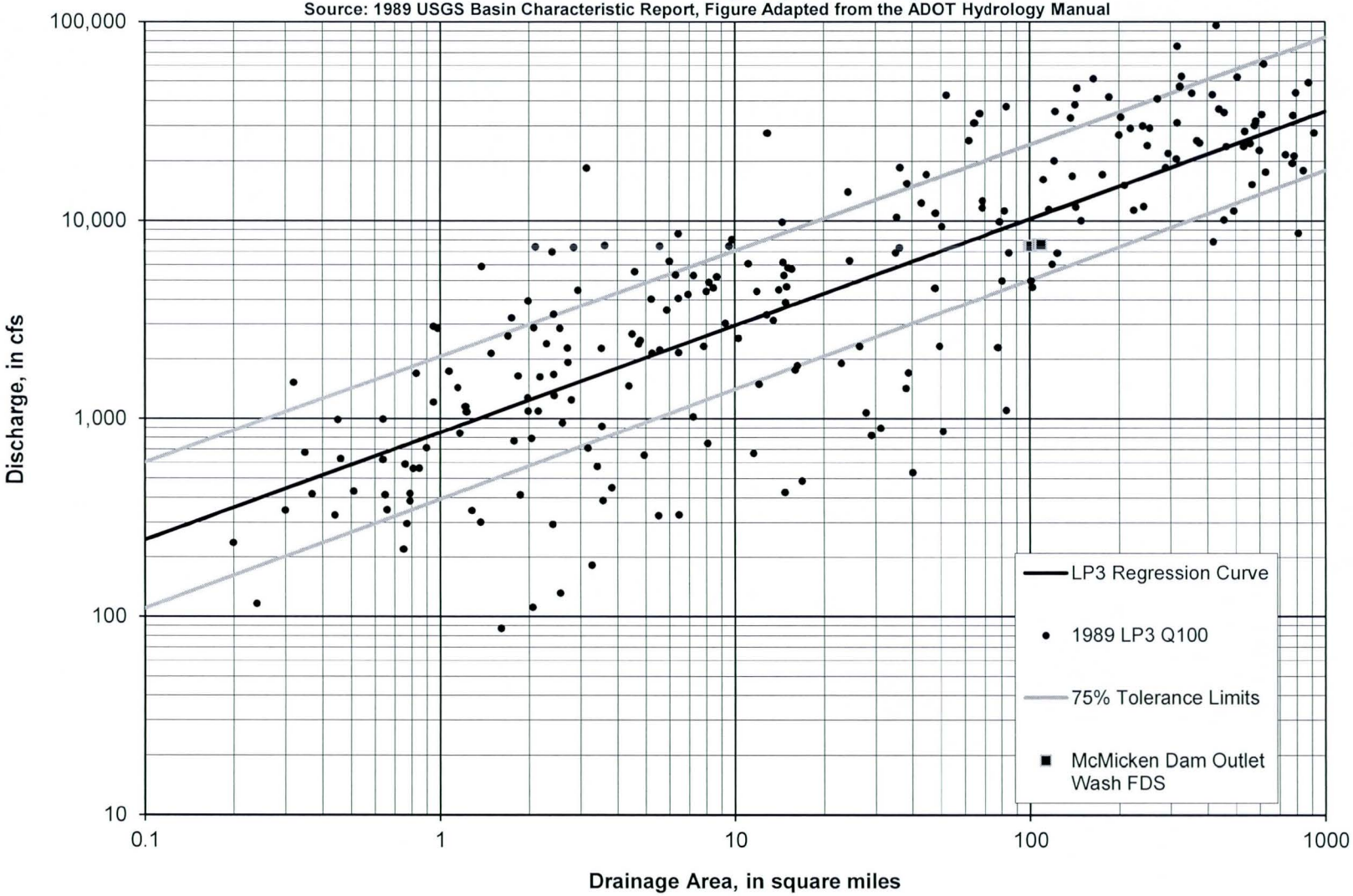
*** NORMAL END OF HEC-1 ***

Indirect Method Comparison Graphs


Indirect Method 1
Peak Discharge Relations and Envelope Curves
Curve A - Craeger (1945)
Curve B - Matthai (1978)
Curve C - Malvick (1980)
Curve D - Crippen (1982)
Curve E - Crippen (1982)
Curve F - Costa (1987)
Curve G - USACE (1988)
McMicken Dam Outlet Wash FDS
Peak Discharge per unit area, in cfs/sq. mile
10,000
1,000
100
10
0.1
1
10
100
1000
10000
Drainage Area, in square miles
A
B
C
D
E
F
G

Indirect Method 2
100-Year Peak Discharge by LP3 Analysis

Source: 1989 USGS Basin Characteristic Report, Figure Adapted from the ADOT Hydrology Manual



Appendix E Hydraulic Analysis Supporting Documentation

E.1 Roughness Coefficient Estimation

MANNING'S n VALUE DETERMINATIONS

I. INTRODUCTION

The Manning's *n* values chosen for the channel and overbanks of McMicken Dam Outlet Wash were based on the methodology outlined in the *Selection of Manning's Roughness Coefficient for Natural and Constructed Vegetated and Non-Vegetated Channels, and Vegetation Maintenance Plan Guidelines for Vegetated Channels in Central Arizona* (the *Manning's Manual*) prepared by the United States Geological Survey (USGS) for the Flood Control District of Maricopa County (FCDMC) dated 2006.

RBF conducted a field visit on December 20, 2012 to determine the Manning's n values to be used for the McMicken Dam Outlet Wash. Contained within this section is a sampling of some of the photos that were used to establish the Manning's *n* values.

II. METHODOLOGY

The Manning's *n* values were based on inspection of the field conditions, aerial imagery, and field photographs. Six hydraulically differentiable reaches (referred to as Reaches 1 through 6) were identified within the study area. These reaches were generally delineated by the prominent manmade features with the McMicken Dam Outlet Wash. Overall, the characteristics of each of the reach segments vary by the extent of channelization and the amount of vegetation.

Reach 1 of the McMicken Dam Outlet Wash begins at the Agua Fria River and terminates at the El Mirage Road South culvert. This reach is characterized as a natural highly vegetated wash with cobble and some boulders. Reach 2 runs from the El Mirage Road South culvert to the drop structure. This reach has been channelized. The main channel is a wide earthen channel with cobbles that is relatively free of vegetation. The channel side slopes or overbank areas are more vegetated and include large bushy trees. Reach 3 is the concrete drop structure. This short reach was isolated so the concrete channel lining could be represented. Reach 4

runs from the drop structure to Deer Valley Drive. This reach is very similar to Reach 2 and is also channelized. Reach 5 is from Deer Valley Drive to the confluence of the McMicken Dam Outlet Channel. This reach is typical of a large natural desert wash. Reach 6 is the portion of the McMicken Dam Outlet Channel that is included as part of the floodplain delineation study. This reach is also channelized. The extents of the study limit are depicted on Figure 1, along with the locations of the selected photographs that represent typical cross-sections of each of the reaches.

As specified in the *Manning's Manual*, the Manning's coefficient is comprised of coefficients that describe the bed material (n_0), irregularity of the channel (n_1), the variation in channel cross-section (n_2), the effect of obstructions (n_3), the amount of vegetation (n_4), and the degree of meandering (m). The degree of meandering ranges from 1 to 1.3 and is multiplied by the sum of the rest of the coefficients to compute the final n-value for the reach. This determination is made once for the channel and once for the overbanks. The equation for the composite n value is: $n = (n_0 + n_1 + n_2 + n_3 + n_4)\, m$.

Table 2 of the *Manning's Manual* was used to select base n-value (n_0) coefficients as a function of bed material for stable channels. Overall, the grain sizes range from course sand to cobble with a limited number of rocks greater than 1-foot in diameter, therefore this value remained fairly consistent throughout the reaches. Overall, n_0 values ranged between 0.020 and 0.040.

The selection of the adjustment factors for channel n_1 through n_4 and m values were extrapolated from Table 3 from the *Manning's Manual*. For the channels, smooth channel conditions were met for all the reaches; n_1 was set to 0.000. Where channels were natural, the variation in the cross-section shapes (n_2) within the reaches was set between 0.001-0.002. For the channelized reaches n_2 was set to 0.000. The obstruction value, n_3, varies between 0.000 and 0.002, depending on whether obstructions were encountered in the field and how large the obstruction. Vegetation within the wash bottoms was negligible except for Reach 1 but along the channel banks some trees and tall brush were present. To account for this variation, the n_4 value was determined at the bottom and along the banks separately and then weighted linearly to determine a total value. The n_4 value within the channels was set between 0.000 and 0.018.

The degree of meandering was fairly minor among all of the reaches, varying between 1.00 and 1.10.

Overbank n_0 values were determined from Table 2 of the *Manning's Manual*. This value was between 0.020 and 0.040. Irregularity in the overbanks was minimal; therefore n_1 was set to 0.000 for channelized sections or 0.001 for natural sections. Per the *Manning's Manual* n_2 was not used as it represents variation in channel cross-section. For n_3, because occasional obstructions such as logs and exposed tree roots were located within the overbanks, values between 0.000-0.002 were used for all reaches. Table 4 of the *Manning's Manual* was used to determine the n_4-value in the overbanks. The n_4-value of vegetation ranged between 0.000 and 0.018. The lowest value was applied to the right overbank of Reach 6 since vegetation appeared to be removed as part of the maintenance of the McMicken Dam Outlet Channel. The degree of meandering for the overbanks was minor and the *m* factor was kept to 1.0 for the overbanks, except for Reach 5. The Manning's *n* values calculated for each reach are listed in Table 1.

Table 1: Channel and Overbank Manning's *n* Values

Reach	Wash Name	Limits	Channel *n*	Overbank *n*
1	McMicken Dam Outlet Wash	Agua Fria River to El Mirage Road South Culvert	0.060	0.060
2	McMicken Dam Outlet Wash	El Mirage Road South Culvert to Drop Structure	0.035	0.050
3	McMicken Dam Outlet Wash	Drop Structure	0.020	0.025
4	McMicken Dam Outlet Wash	Drop Structure to Deer Valley Dr.	0.035	0.050
5	McMicken Dam Outlet Wash	Deer Valley Dr. to McMicken Dam Outlet Channel	0.040	0.056
6	McMicken Dam Outlet Wash	McMicken Dam Outlet Channel	0.030	0.030-0.050

Table 2: Comparison of WLB's Manning's *n* Values compares the *n*-values used in the previous study that were part of the 1989 Zone AE floodplain delineations prepared by WLB

with the proposed *n*-values for this study. Overall, the Manning's *n*-values reflected for this analysis are lower within the channel and the overbanks.

Table 2: Comparison of WLB's Manning's *n* Values

Reach	Wash Name	Portion of Cross-Section	*n*-Value used in WLB Model	Selected *n*-Value*
1	McMicken Dam Outlet Wash	Channel	0.040	0.060
		Overbank	0.060	0.060
2	McMicken Dam Outlet Wash	Channel	0.040	0.035
		Overbank	0.060	0.050
3	McMicken Dam Outlet Wash	Channel	0.020	0.020
		Overbank	0.050	0.025
4	McMicken Dam Outlet Wash	Channel	0.040	0.035
		Overbank	0.060	0.050
5	McMicken Dam Outlet Wash	Channel	0.050	0.040
		Overbank	0.070	0.056
6	McMicken Dam Outlet Wash	Channel	0.035	0.030
		Left Overbank	0.080	0.050
		Right Overbank	0.035	0.030

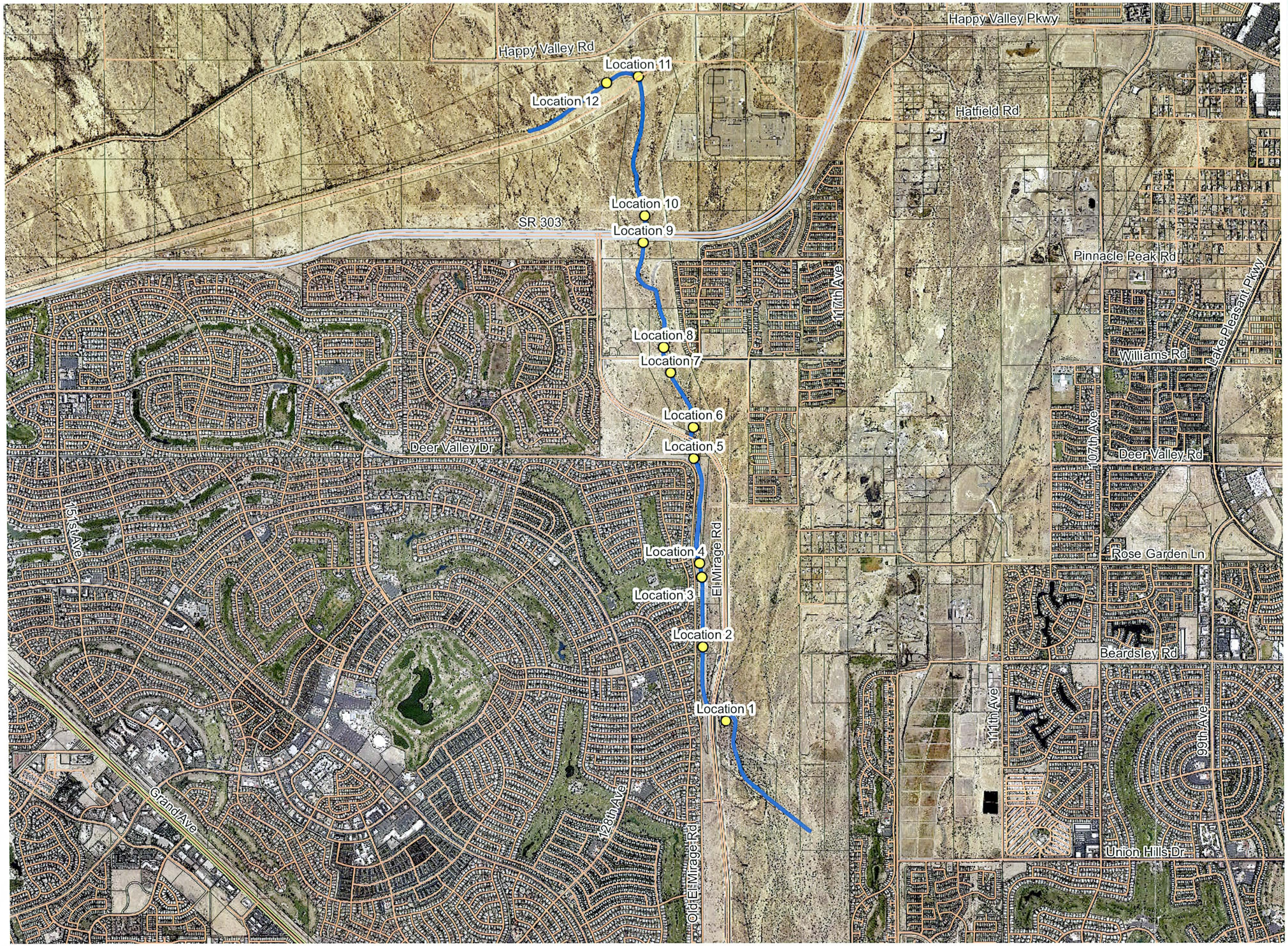
Value taken from Table 1*

III. PHOTOGRAPHS AND N VALUE ASSIGNMENTS

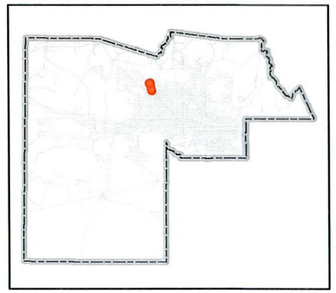
The remainder of this document includes Table 3 which shows the components of the Manning's *n* values used to determine the composite *n* values along with representative photographs of the channels and the overbanks. For reference, the grid depicted in many of the photographs is composed of 1-inch squares and is 1-square foot in area. The Manning's *n* values that were determined in this section will be applied to the HEC-RAS modeling for the floodplain delineation of McMicken Dam Outlet Wash.

Table 3: Channel and Overbank Assignments

	$n_{0\text{ – channel}}$	$n_{1\text{- irregularity}}$	$n_{2\text{- variation}}$	$n_{3\text{- obstructions}}$	$n_{4\text{- vegetation}}$	m	Composite n-Value
Reach 1							
Channel	0.040	0.000	0.001	0.001	0.018	1.00	**0.060**
Overbanks	0.040	0.001	0.000	0.001	0.018	1.00	**0.060**
Reach 2							
Channel	0.032	0.000	0.000	0.000	0.003	1.00	**0.035**
Overbanks	0.032	0.000	0.000	0.000	0.018	1.00	**0.050**
Reach 3							
Channel	0.020	0.000	0.000	0.000	0.000	1.00	**0.020**
Overbanks	0.020	0.000	0.000	0.000	0.005	1.00	**0.025**
Reach 4							
Channel	0.032	0.000	0.000	0.000	0.003	1.00	**0.035**
Overbanks	0.032	0.000	0.000	0.000	0.018	1.00	**0.050**
Reach 5							
Channel	0.030	0.000	0.002	0.002	0.002	1.10	**0.040**
Overbanks	0.030	0.001	0.000	0.002	0.018	1.10	**0.056**
Reach 6							
Channel	0.030	0.000	0.000	0.00	0.000	1.00	**0.030**
Left Overbank	0.030	0.001	0.000	0.001	0.018	1.00	**0.050**
Right Overbank	0.030	0.000	0.000	0.000	0.000	1.00	**0.030**



Flood Control District of Maricopa County



McMicken Dam Outlet Wash Floodplain Delineation Study

Legend

- Photo Locations
- Streets
- Flowline
- Assessor Parcels

0 625 1,250 2,500 Feet

1 inch = 2,500 feet

Photo Locations n Value Determination

RBF CONSULTING
PLANNING ■ DESIGN ■ CONSTRUCTION
2929 NORTH CENTRAL AVENUE, SUITE 800
PHOENIX, ARIZONA 85012
602-279-1234 FAX 602-279-1411 www.RBF.com

DRAFTED	CHECKED
DLP	NEF

PROJECT NUMBER 133347

DATE 2.1.13

FIGURE 1

File: H:\PDATA\133347\GIS\MXD\n-value.mxd

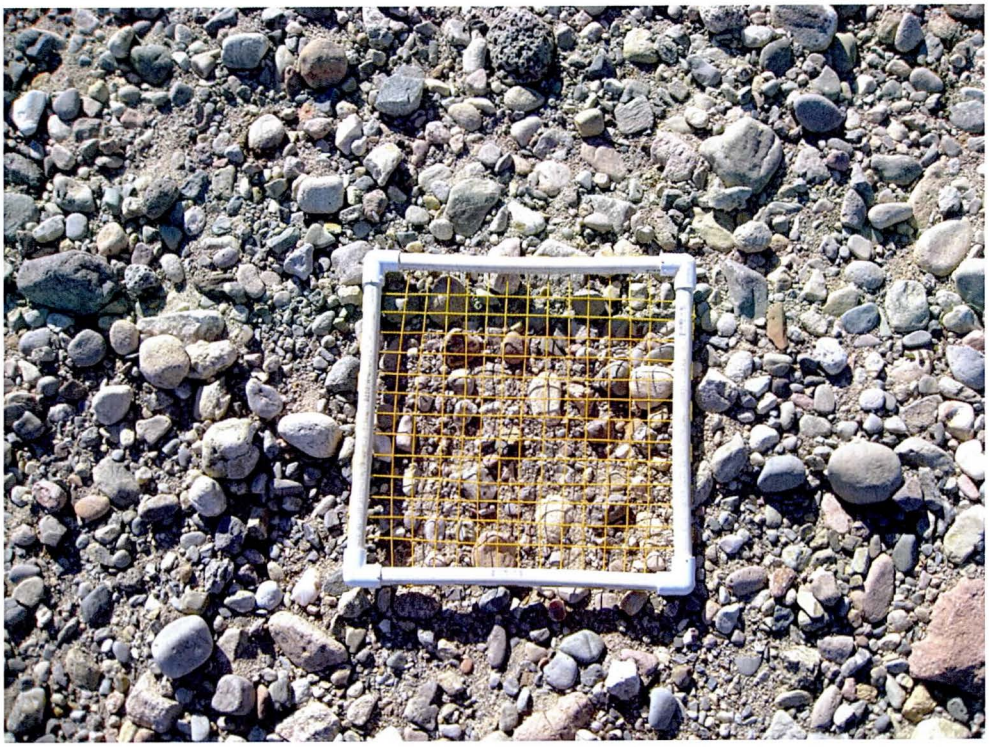
McMicken Dam Outlet Wash Looking Upstream
East of El Mirage Road South Culvert (Location 1)

McMicken Dam Outlet Wash Channel
East of El Mirage Road South Culvert (Location 1)

McMicken Dam Outlet Wash Looking Upstream at Left Bank
East of El Mirage Road South Culvert (Location 1)

McMicken Dam Outlet Wash Looking Upstream at Right Bank
East of El Mirage Road South Culvert (Location 1)

McMicken Dam Outlet Wash Looking Upstream
North of Beardsley Road Alignment (Location 2)



McMicken Dam Outlet Wash Channel
North of Beardsley Road Alignment (Location 2)

McMicken Dam Outlet Wash Looking Upstream at Left Bank
North of Beardsley Road Alignment (Location 2)

McMicken Dam Outlet Wash Looking Upstream at Right Bank
North of Beardsley Road Alignment (Location 2)

McMicken Dam Outlet Wash Drop Structure Looking Downstream
Drop Structure (Location 3)

McMicken Dam Outlet Wash Drop Structure Looking Downstream
Drop Structure (Location 3)

McMicken Dam Outlet Wash Looking Upstream
Upstream of Drop Structure (Location 4)

McMicken Dam Outlet Wash Channel
Upstream of Drop Structure (Location 4)

McMicken Dam Outlet Wash Looking Upstream at Left Bank
Upstream of Drop Structure (Location 4)

McMicken Dam Outlet Wash Looking Upstream at Right Bank
Upstream of Drop Structure (Location 4)

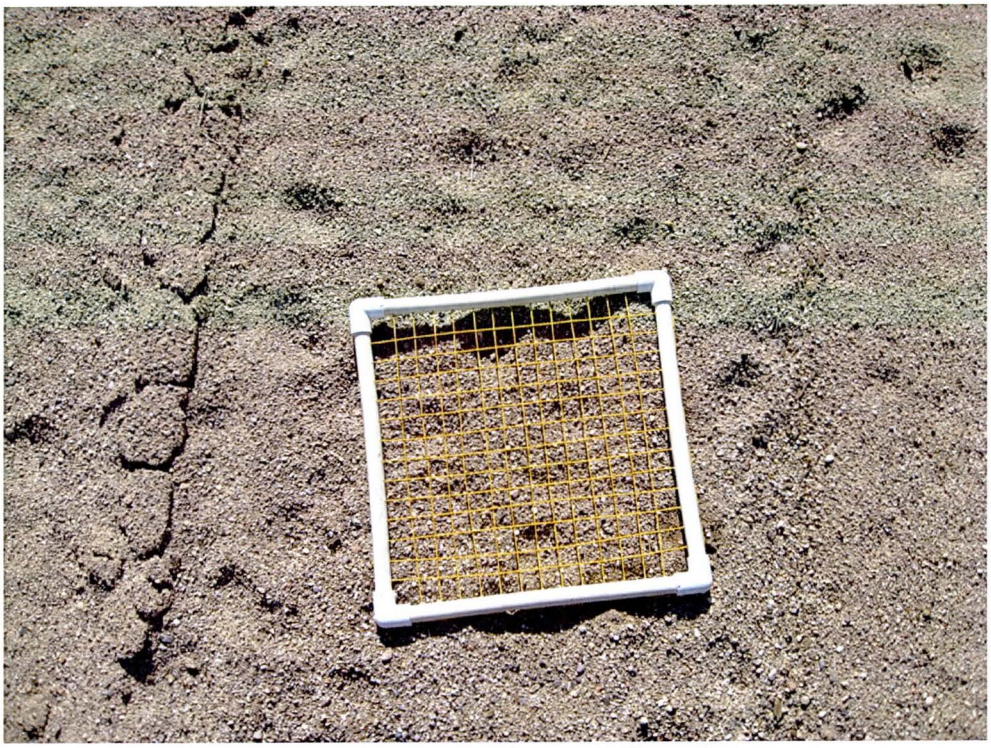
McMicken Dam Outlet Wash Looking Downstream
Near Deer Valley Drive (Location 5)

McMicken Dam Outlet Wash Looking Upstream
El Mirage Road North Culvert (Location 6)

McMicken Dam Outlet Wash Looking Downstream
South of Williams Drive Culvert (Location 7)

McMicken Dam Outlet Wash Looking Upstream
North of Williams Drive Culvert (Location 8)

McMicken Dam Outlet Wash Looking Upstream
South of SR303L (Location 9)



McMicken Dam Outlet Wash Channel
South of SR303L (Location 9)

McMicken Dam Outlet Wash Looking Upstream at Left Bank
South of SR303L (Location 9)

McMicken Dam Outlet Wash Looking Upstream at Right Bank
South of SR303L (Location 9)

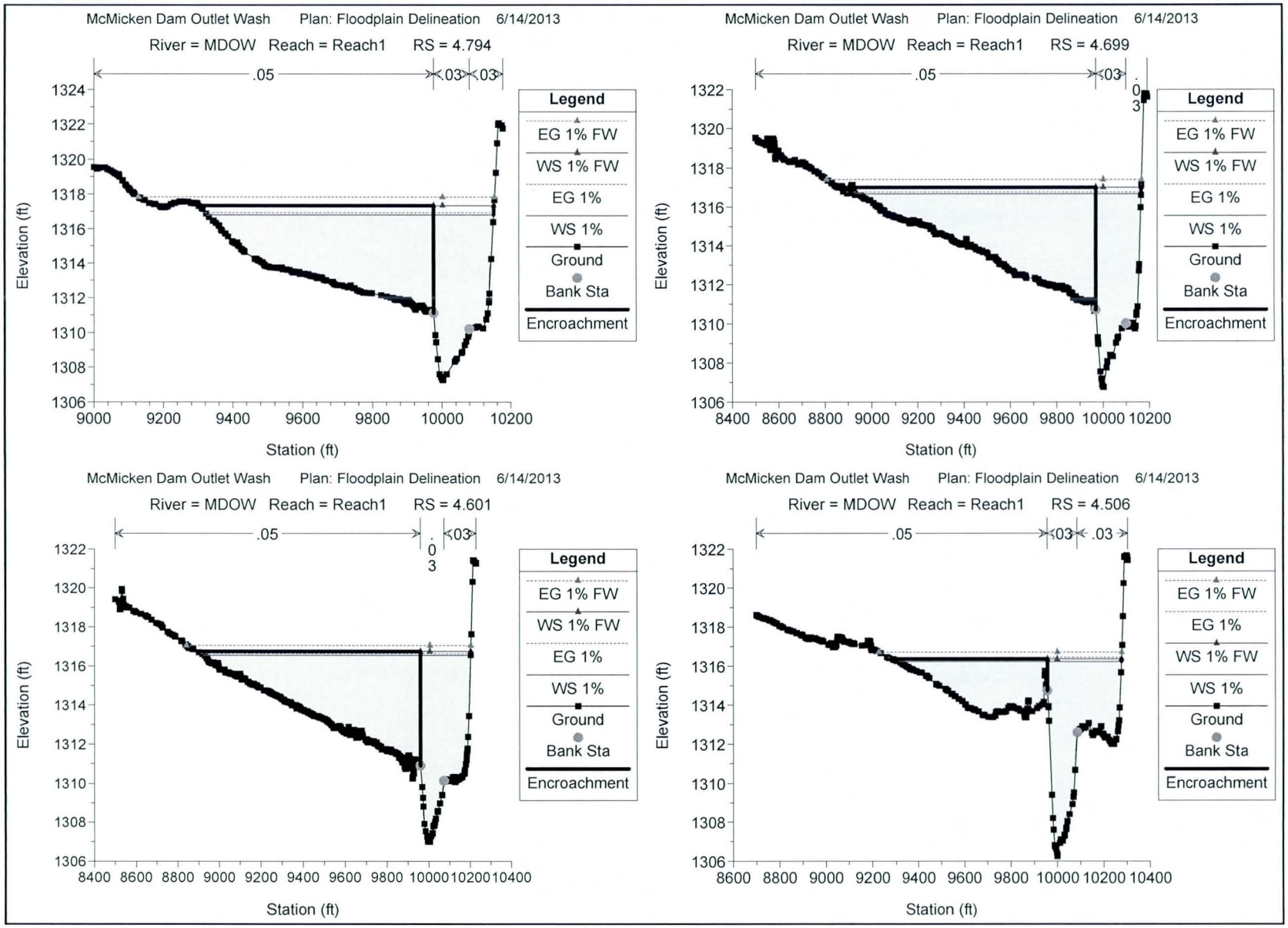
McMicken Dam Outlet Wash Looking Upstream
North of SR303L (Location 10)

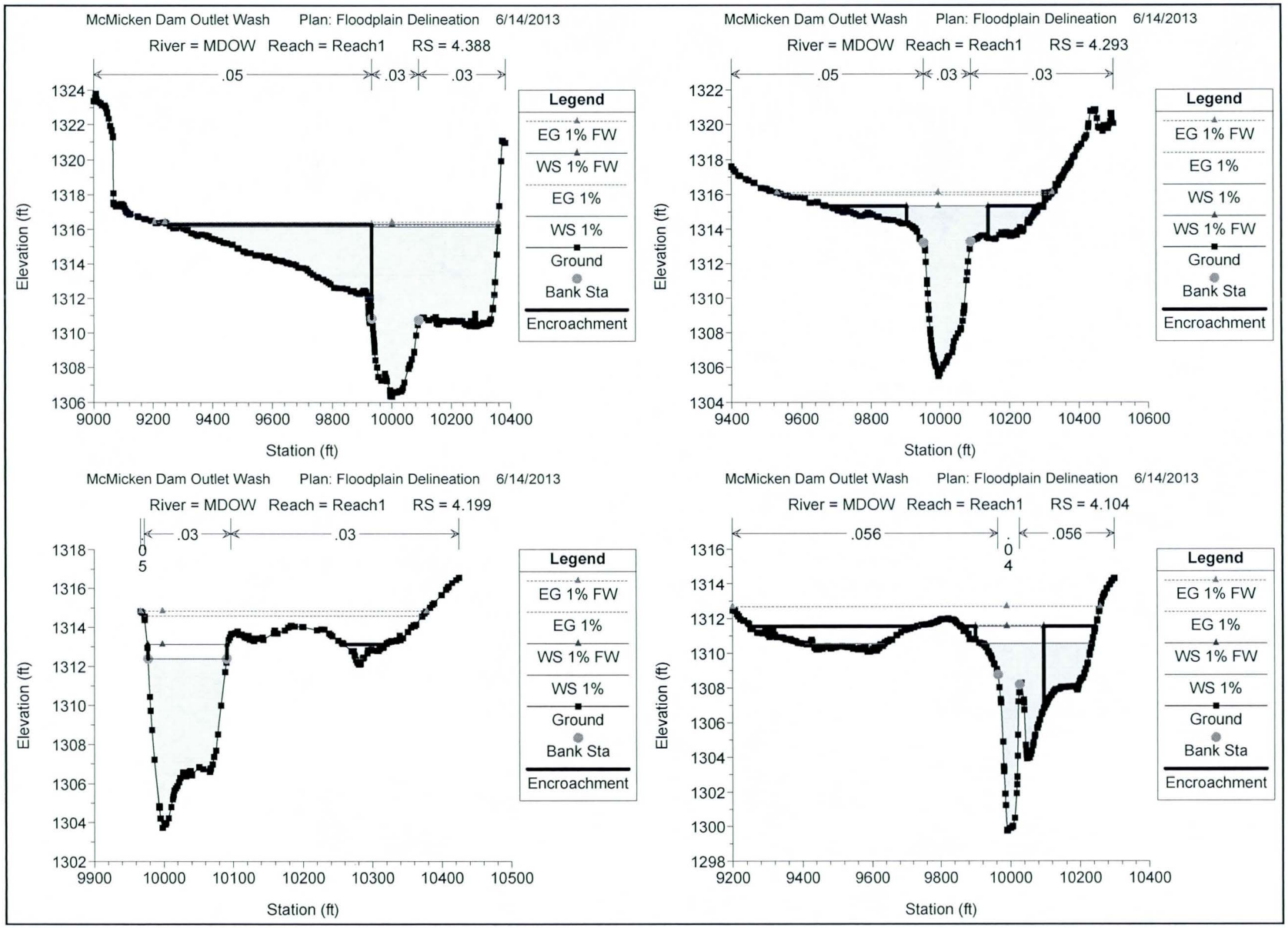
McMicken Dam Outlet Wash Looking Downstream
Confluence with McMicken Dam Outlet Channel (Location 11)

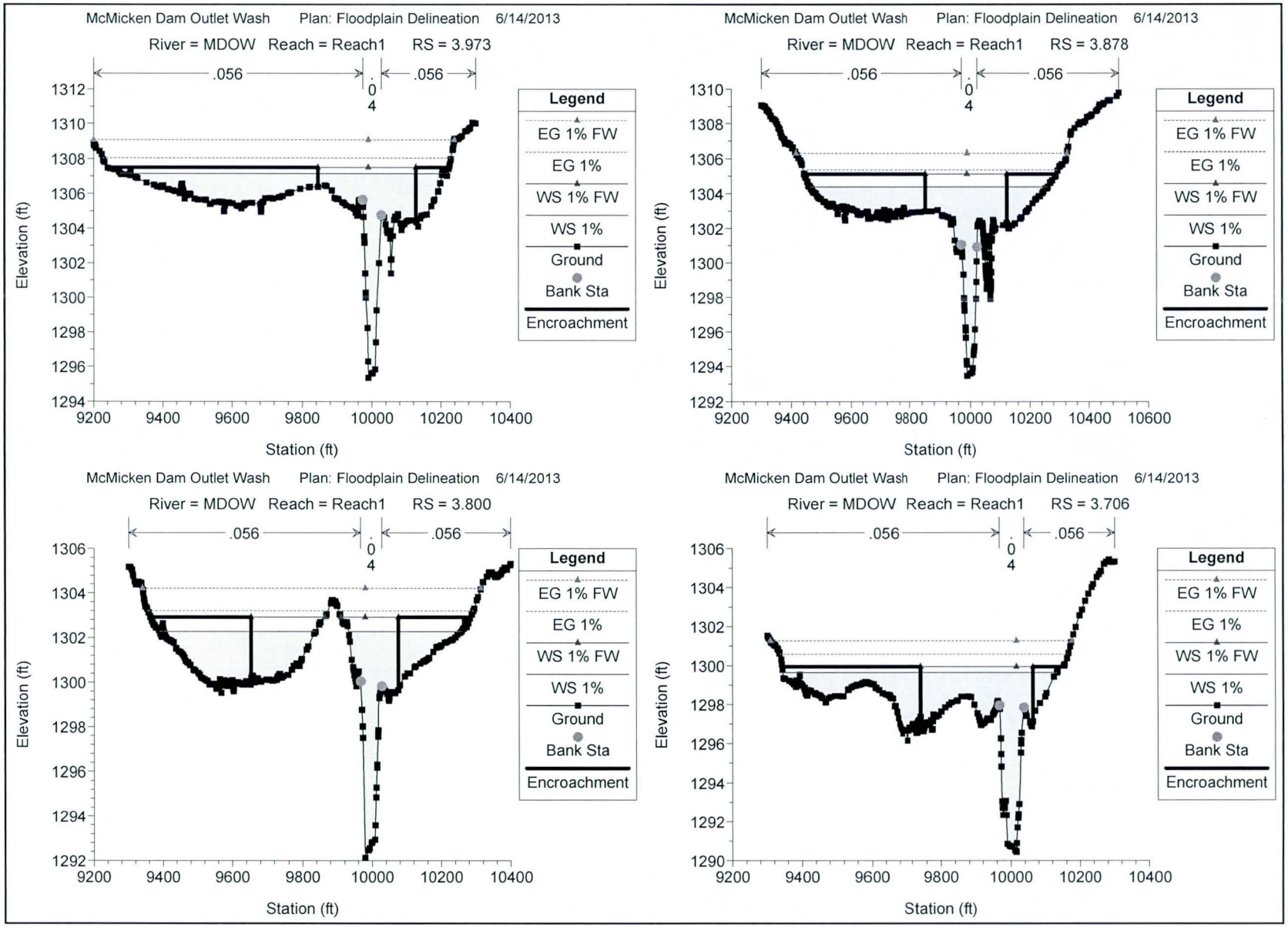
McMicken Dam Outlet Channel Looking Upstream
Confluence with McMicken Dam Outlet Wash (Location 11)

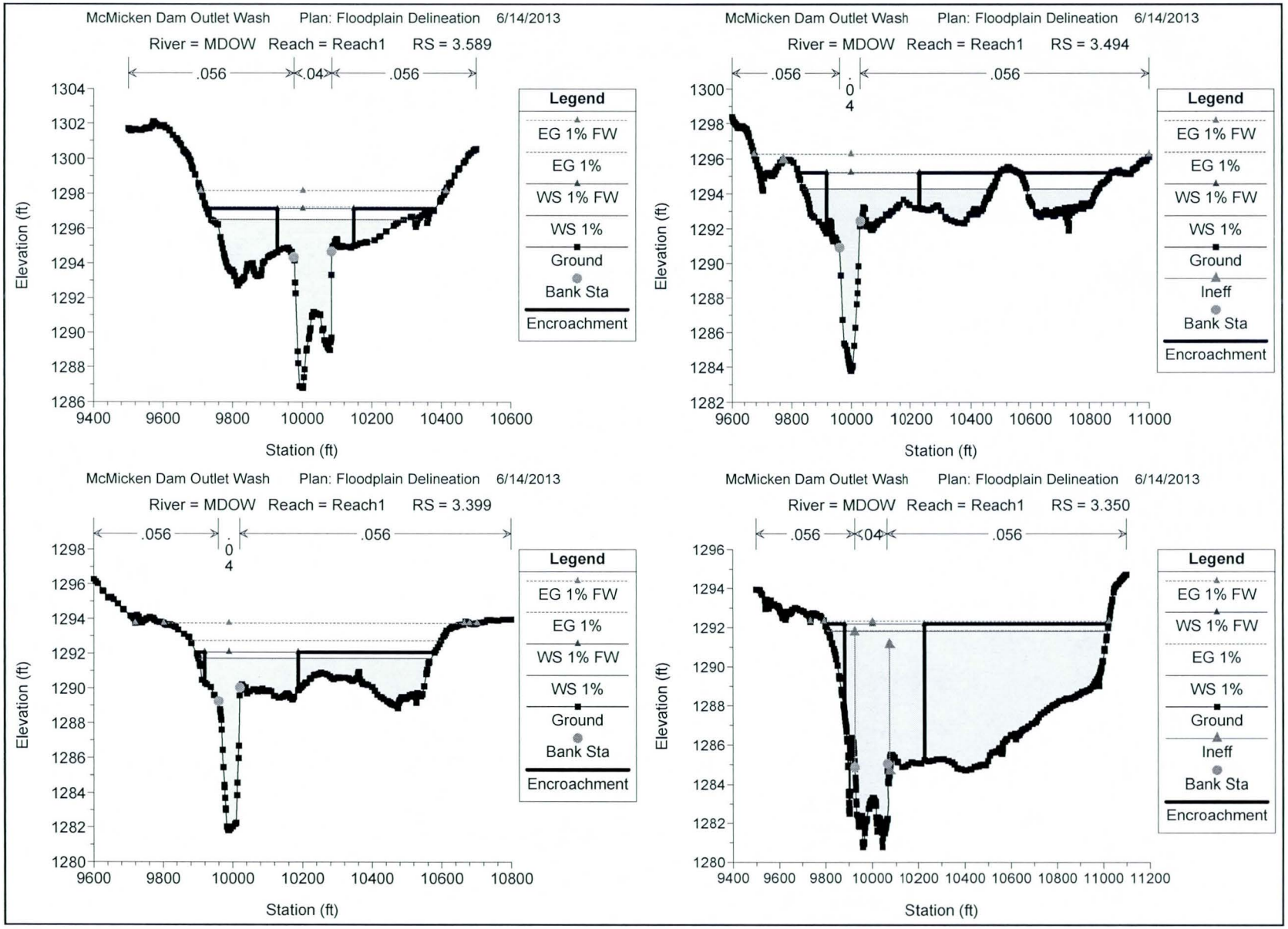
McMicken Dam Outlet Channel Looking Upstream
West of Confluence with McMicken Dam Outlet Wash (Location 12)

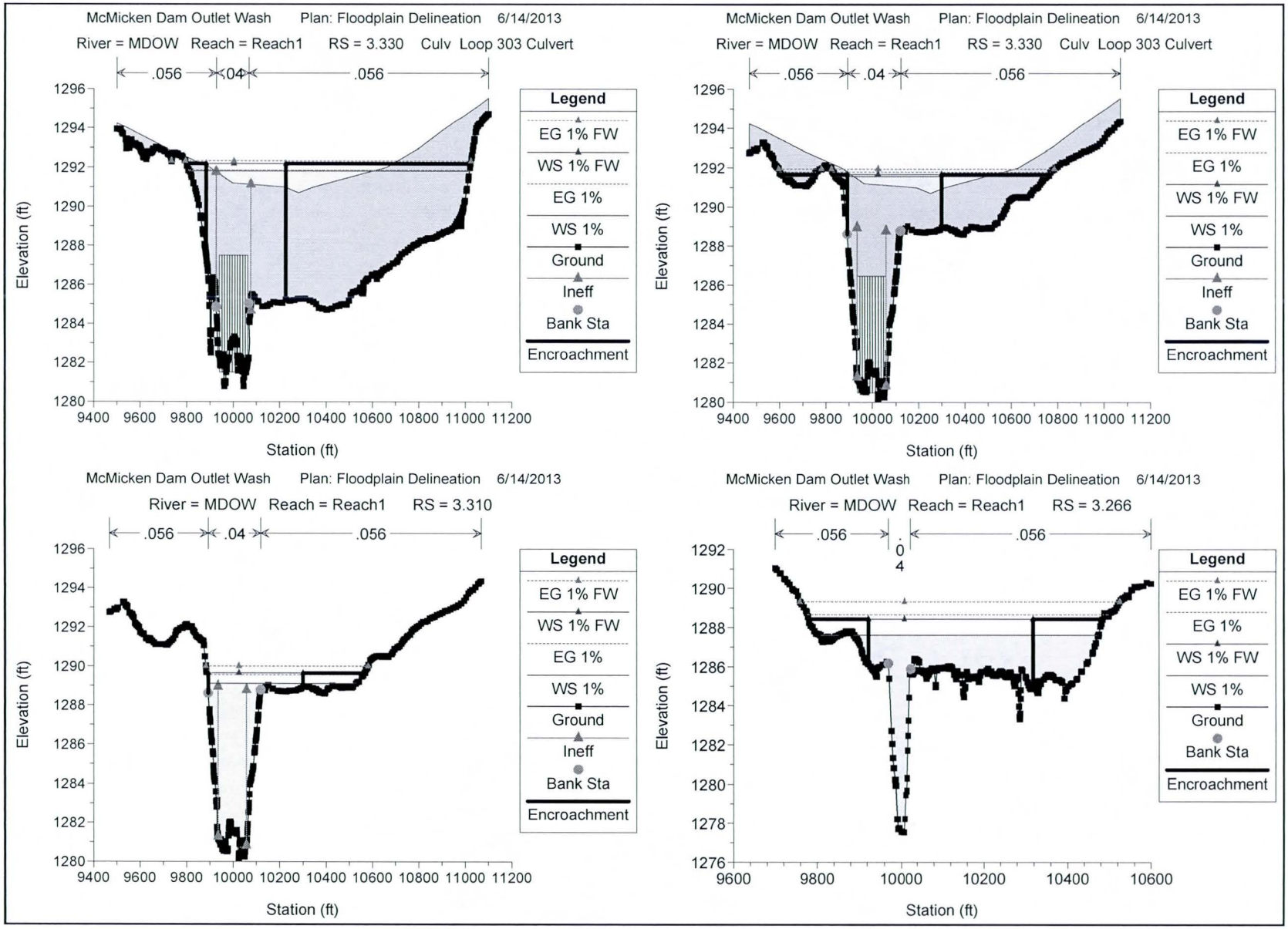
E.2 Cross Section Plots

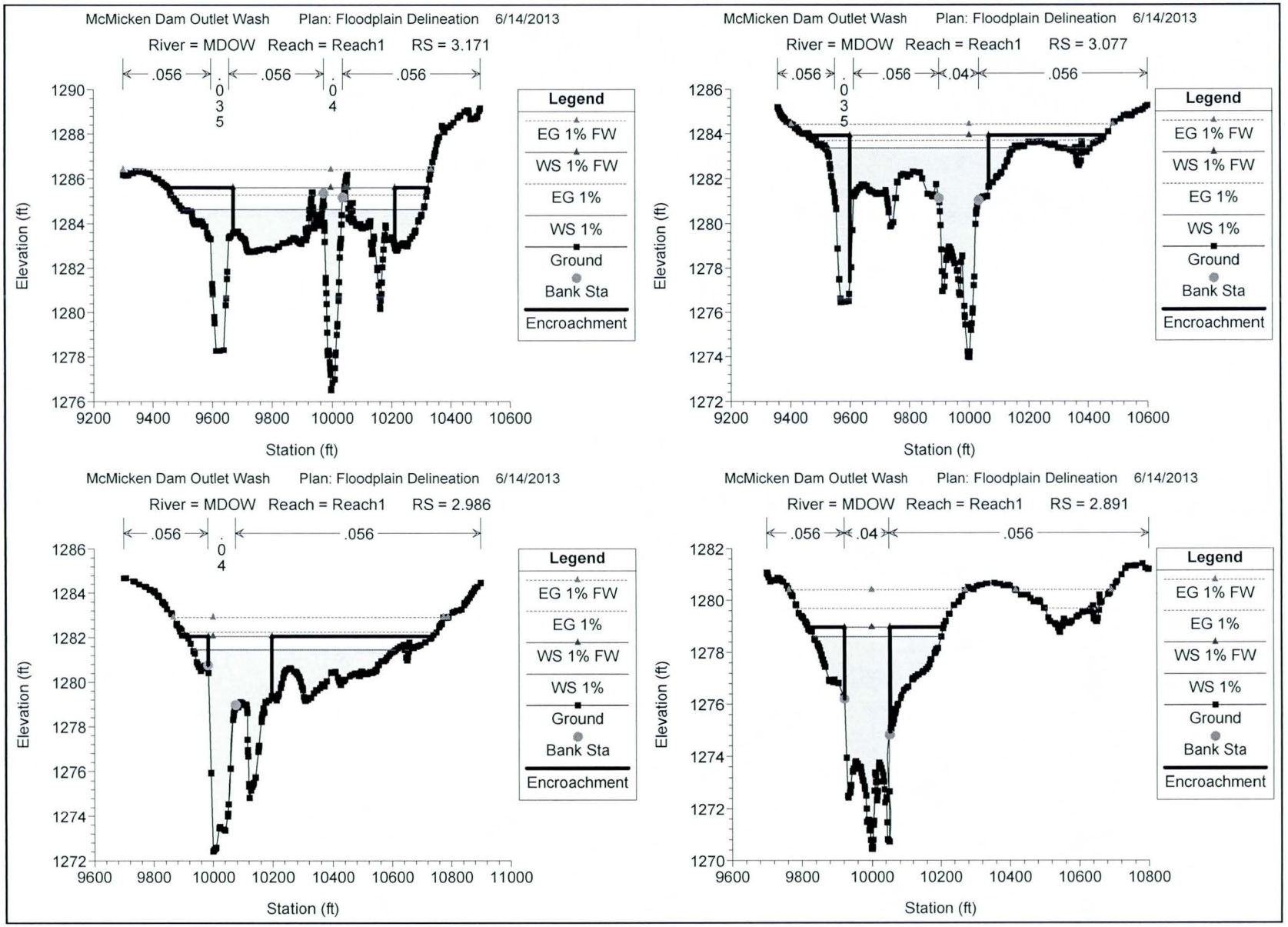

McMicken Dam Outlet Wash Plan: Floodplain Delineation 6/14/2013
River = MDOW Reach = Reach1 RS = 4.794
.05
.03
.03
Elevation (ft)
Station (ft)
Legend
EG 1% FW
WS 1% FW
EG 1%
WS 1%
Ground
Bank Sta
Encroachment
McMicken Dam Outlet Wash Plan: Floodplain Delineation 6/14/2013
River = MDOW Reach = Reach1 RS = 4.699
.05
.03
.03
Elevation (ft)
Station (ft)
Legend
EG 1% FW
WS 1% FW
EG 1%
WS 1%
Ground
Bank Sta
Encroachment
McMicken Dam Outlet Wash Plan: Floodplain Delineation 6/14/2013
River = MDOW Reach = Reach1 RS = 4.601
.05
.03
.03
Elevation (ft)
Station (ft)
Legend
EG 1% FW
WS 1% FW
EG 1%
WS 1%
Ground
Bank Sta
Encroachment
McMicken Dam Outlet Wash Plan: Floodplain Delineation 6/14/2013
River = MDOW Reach = Reach1 RS = 4.506
.05
.03
.03
Elevation (ft)
Station (ft)
Legend
EG 1% FW
EG 1%
WS 1% FW
WS 1%
Ground
Bank Sta
Encroachment

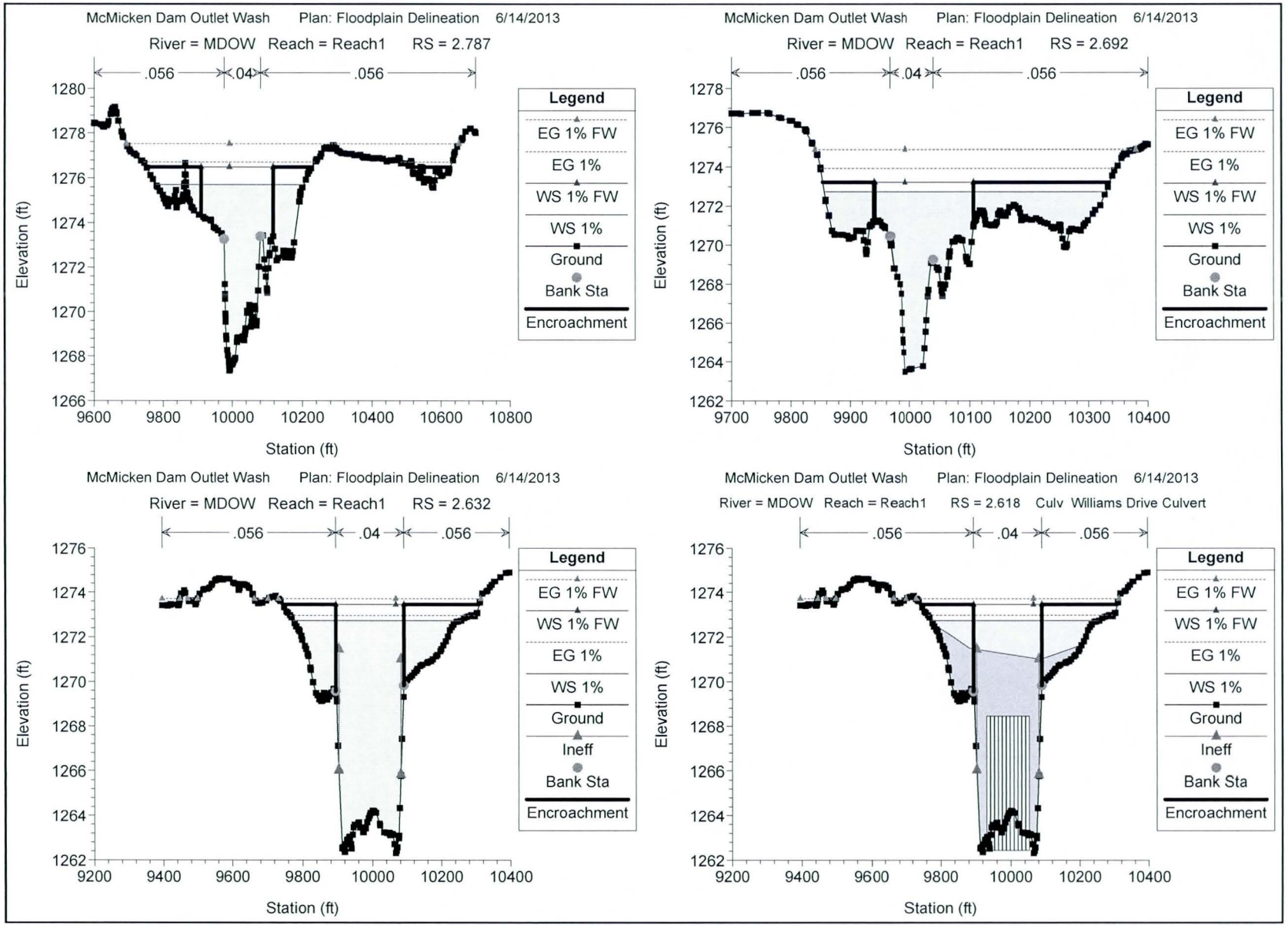

McMicken Dam Outlet Wash Plan: Floodplain Delineation 6/14/2013
River = MDOW Reach = Reach1 RS = 4.388
.05
.03
.03
Elevation (ft)
Station (ft)
Legend
EG 1% FW
WS 1% FW
EG 1%
WS 1%
Ground
Bank Sta
Encroachment
McMicken Dam Outlet Wash Plan: Floodplain Delineation 6/14/2013
River = MDOW Reach = Reach1 RS = 4.293
.05
.03
.03
Elevation (ft)
Station (ft)
Legend
EG 1% FW
EG 1%
WS 1%
WS 1% FW
Ground
Bank Sta
Encroachment
McMicken Dam Outlet Wash Plan: Floodplain Delineation 6/14/2013
River = MDOW Reach = Reach1 RS = 4.199
.03
.03
Elevation (ft)
Station (ft)
Legend
EG 1% FW
EG 1%
WS 1% FW
WS 1%
Ground
Bank Sta
Encroachment
McMicken Dam Outlet Wash Plan: Floodplain Delineation 6/14/2013
River = MDOW Reach = Reach1 RS = 4.104
.056
.056
Elevation (ft)
Station (ft)
Legend
EG 1% FW
EG 1%
WS 1% FW
WS 1%
Ground
Bank Sta
Encroachment

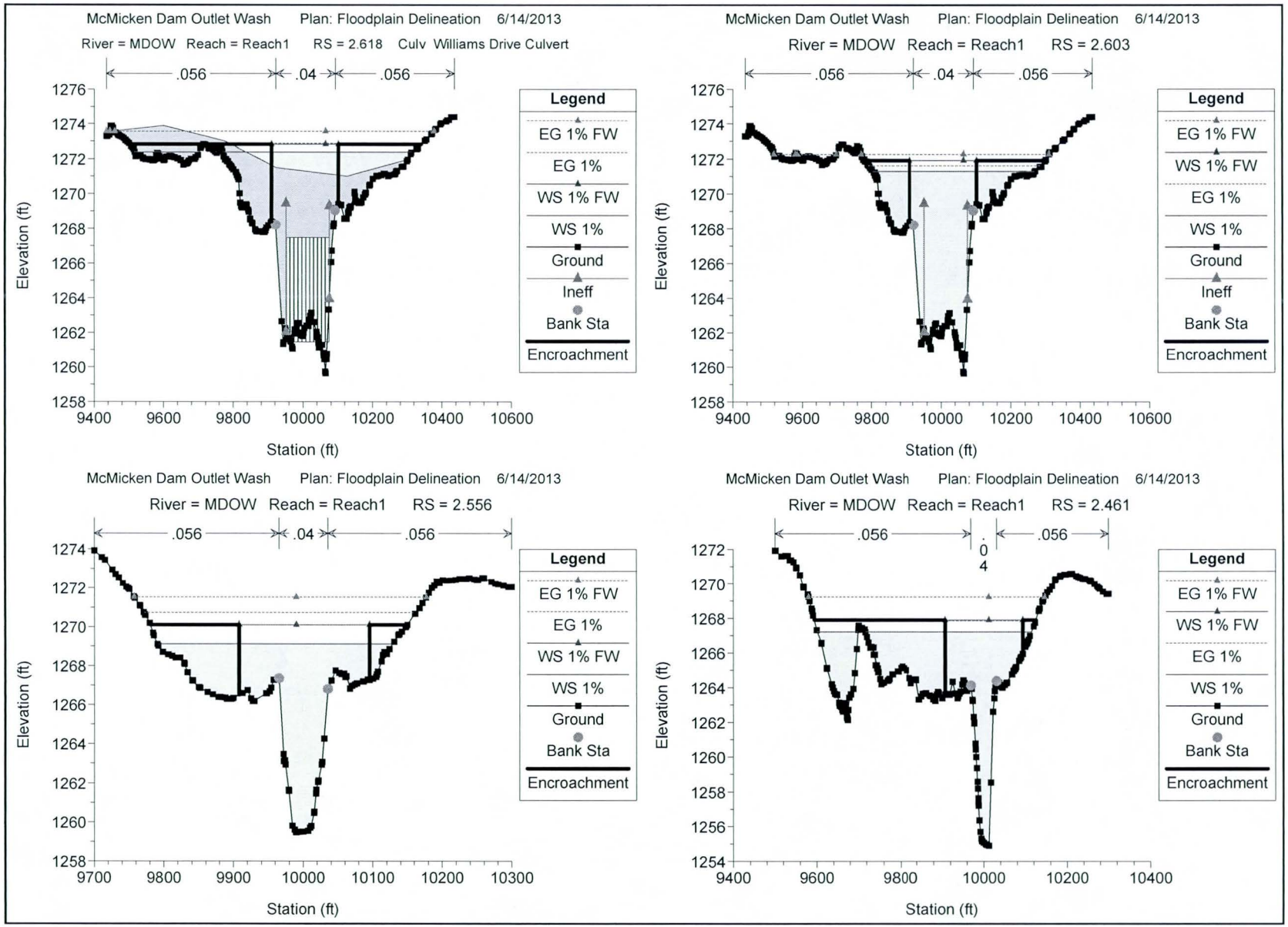

McMicken Dam Outlet Wash Plan: Floodplain Delineation 6/14/2013
River = MDOW Reach = Reach1 RS = 3.973
.056
.056
0.04
Legend
EG 1% FW
EG 1%
WS 1% FW
WS 1%
Ground
Bank Sta
Encroachment
Elevation (ft)
Station (ft)
McMicken Dam Outlet Wash Plan: Floodplain Delineation 6/14/2013
River = MDOW Reach = Reach1 RS = 3.878
.056
.056
0.04
Legend
EG 1% FW
EG 1%
WS 1% FW
WS 1%
Ground
Bank Sta
Encroachment
Elevation (ft)
Station (ft)
McMicken Dam Outlet Wash Plan: Floodplain Delineation 6/14/2013
River = MDOW Reach = Reach1 RS = 3.800
.056
.056
0.04
Legend
EG 1% FW
EG 1%
WS 1% FW
WS 1%
Ground
Bank Sta
Encroachment
Elevation (ft)
Station (ft)
McMicken Dam Outlet Wash Plan: Floodplain Delineation 6/14/2013
River = MDOW Reach = Reach1 RS = 3.706
.056
.056
0.04
Legend
EG 1% FW
EG 1%
WS 1% FW
WS 1%
Ground
Bank Sta
Encroachment
Elevation (ft)
Station (ft)

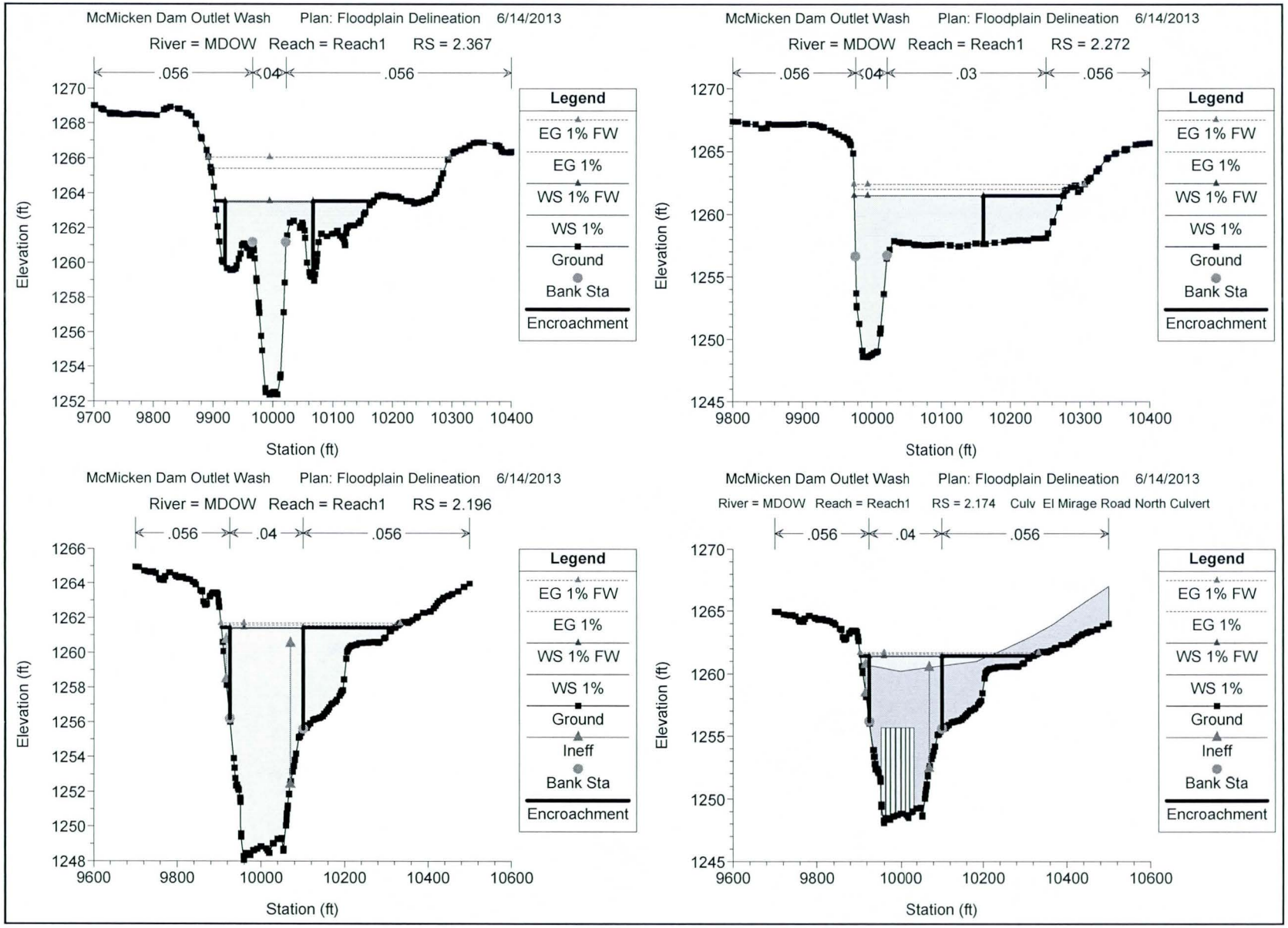

McMicken Dam Outlet Wash Plan: Floodplain Delineation 6/14/2013
River = MDOW Reach = Reach1 RS = 3.589
.056
.04
.056
Elevation (ft)
Station (ft)
Legend
EG 1% FW
EG 1%
WS 1% FW
WS 1%
Ground
Bank Sta
Encroachment
McMicken Dam Outlet Wash Plan: Floodplain Delineation 6/14/2013
River = MDOW Reach = Reach1 RS = 3.494
.056
.04
.056
Elevation (ft)
Station (ft)
Legend
EG 1% FW
EG 1%
WS 1% FW
WS 1%
Ground
Ineff
Bank Sta
Encroachment
McMicken Dam Outlet Wash Plan: Floodplain Delineation 6/14/2013
River = MDOW Reach = Reach1 RS = 3.399
.056
.04
.056
Elevation (ft)
Station (ft)
Legend
EG 1% FW
EG 1%
WS 1% FW
WS 1%
Ground
Bank Sta
Encroachment
McMicken Dam Outlet Wash Plan: Floodplain Delineation 6/14/2013
River = MDOW Reach = Reach1 RS = 3.350
.056
.04
.056
Elevation (ft)
Station (ft)
Legend
EG 1% FW
WS 1% FW
EG 1%
WS 1%
Ground
Ineff
Bank Sta
Encroachment

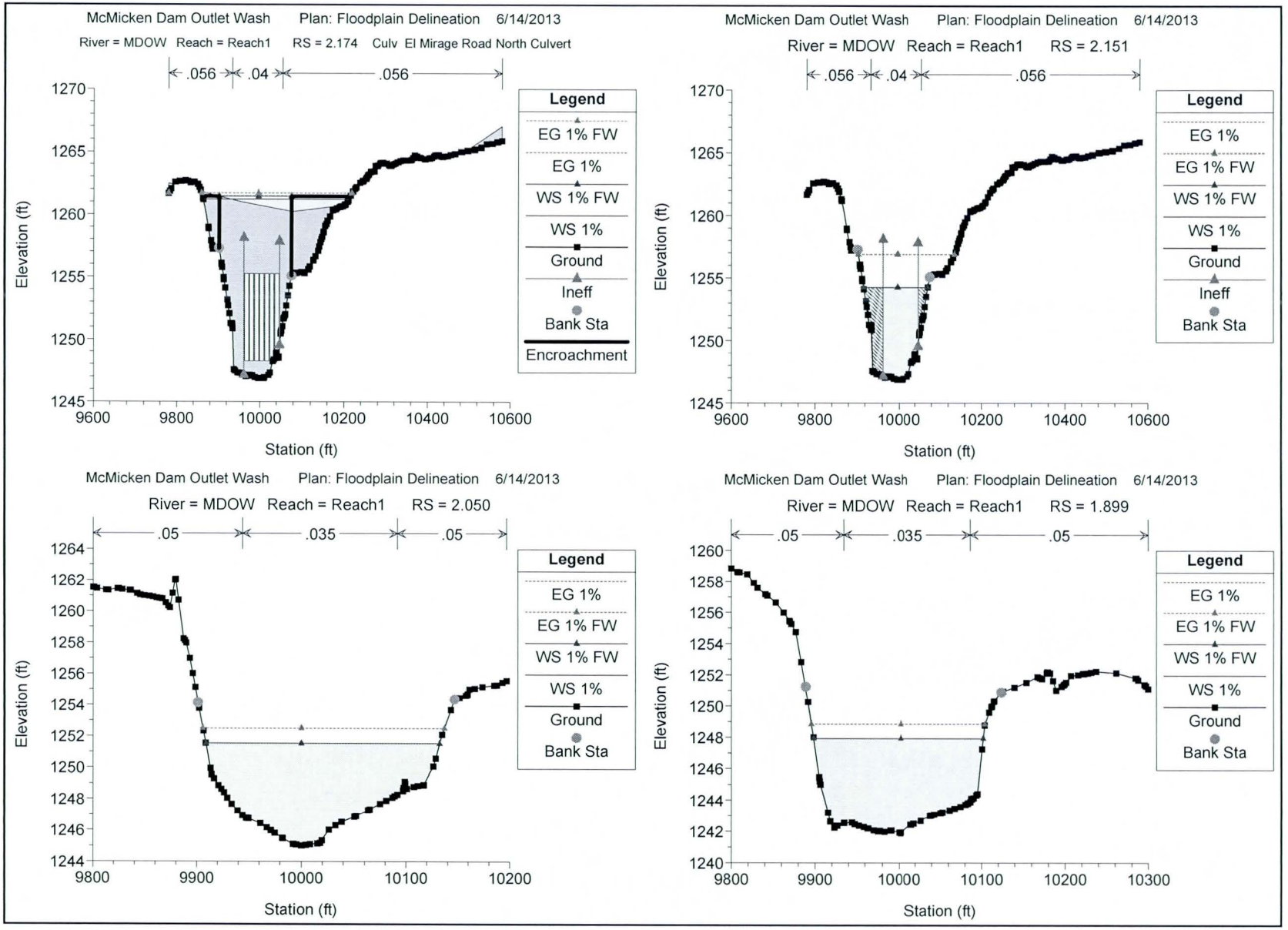

McMicken Dam Outlet Wash Plan: Floodplain Delineation 6/14/2013
River = MDOW Reach = Reach1 RS = 3.330 Culv Loop 303 Culvert
.056
.04
.056
Elevation (ft)
Station (ft)
Legend
EG 1% FW
WS 1% FW
EG 1%
WS 1%
Ground
Ineff
Bank Sta
Encroachment
McMicken Dam Outlet Wash Plan: Floodplain Delineation 6/14/2013
River = MDOW Reach = Reach1 RS = 3.330 Culv Loop 303 Culvert
.056
.04
.056
Elevation (ft)
Station (ft)
Legend
EG 1% FW
EG 1%
WS 1% FW
WS 1%
Ground
Ineff
Bank Sta
Encroachment
McMicken Dam Outlet Wash Plan: Floodplain Delineation 6/14/2013
River = MDOW Reach = Reach1 RS = 3.310
.056
.04
.056
Elevation (ft)
Station (ft)
Legend
EG 1% FW
WS 1% FW
EG 1%
WS 1%
Ground
Ineff
Bank Sta
Encroachment
McMicken Dam Outlet Wash Plan: Floodplain Delineation 6/14/2013
River = MDOW Reach = Reach1 RS = 3.266
.056
.04
.056
Elevation (ft)
Station (ft)
Legend
EG 1% FW
EG 1%
WS 1% FW
WS 1%
Ground
Bank Sta
Encroachment

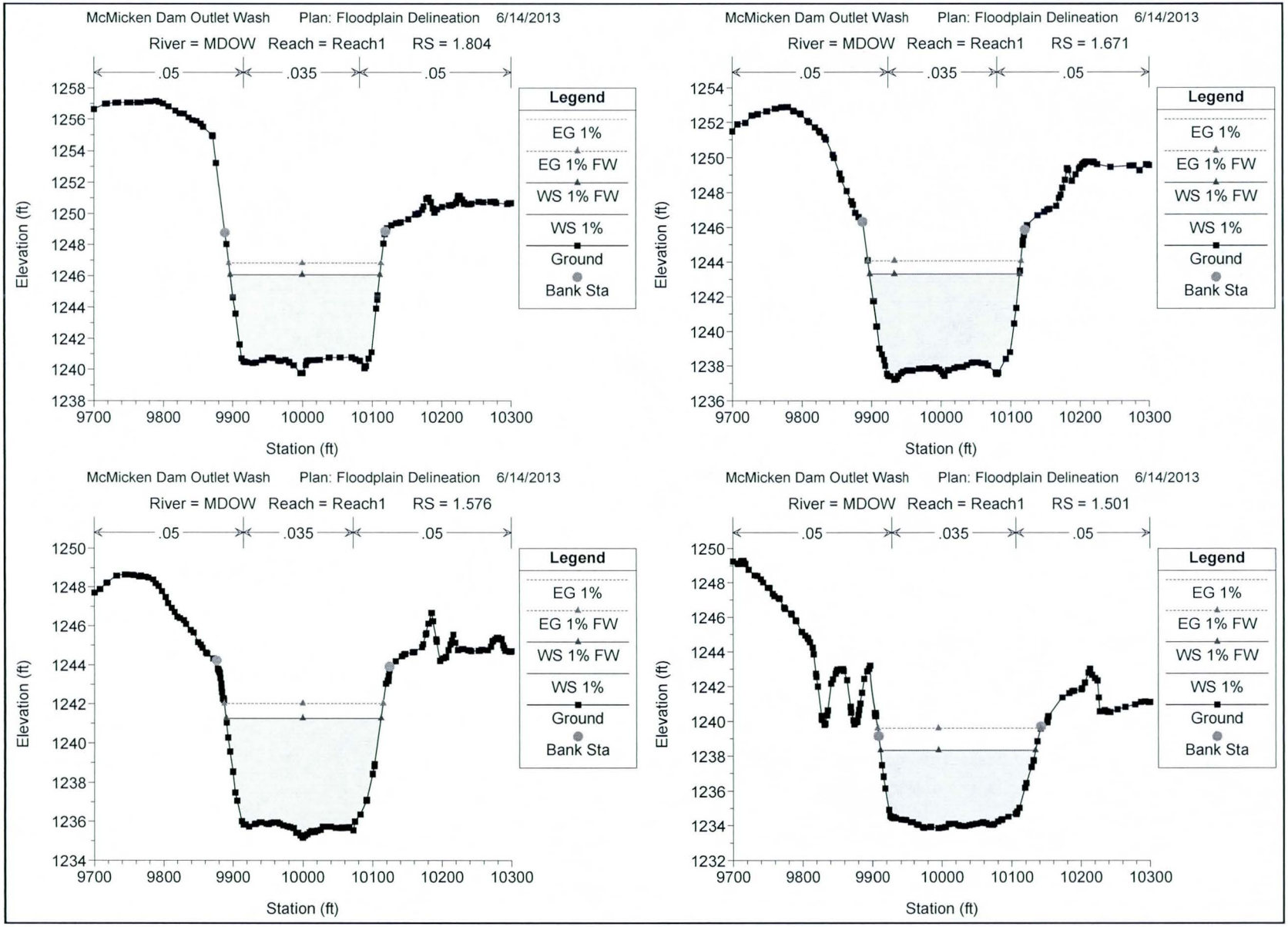

McMicken Dam Outlet Wash Plan: Floodplain Delineation 6/14/2013
River = MDOW Reach = Reach1 RS = 3.171
.056
.035
.056
.04
.056
Elevation (ft)
Station (ft)
Legend
EG 1% FW
WS 1% FW
EG 1%
WS 1%
Ground
Bank Sta
Encroachment
McMicken Dam Outlet Wash Plan: Floodplain Delineation 6/14/2013
River = MDOW Reach = Reach1 RS = 3.077
.056
.035
.056
.04
.056
Elevation (ft)
Station (ft)
Legend
EG 1% FW
WS 1% FW
EG 1%
WS 1%
Ground
Bank Sta
Encroachment
McMicken Dam Outlet Wash Plan: Floodplain Delineation 6/14/2013
River = MDOW Reach = Reach1 RS = 2.986
.056
.04
.056
Elevation (ft)
Station (ft)
Legend
EG 1% FW
EG 1%
WS 1% FW
WS 1%
Ground
Bank Sta
Encroachment
McMicken Dam Outlet Wash Plan: Floodplain Delineation 6/14/2013
River = MDOW Reach = Reach1 RS = 2.891
.056
.04
.056
Elevation (ft)
Station (ft)
Legend
EG 1% FW
EG 1%
WS 1% FW
WS 1%
Ground
Bank Sta
Encroachment

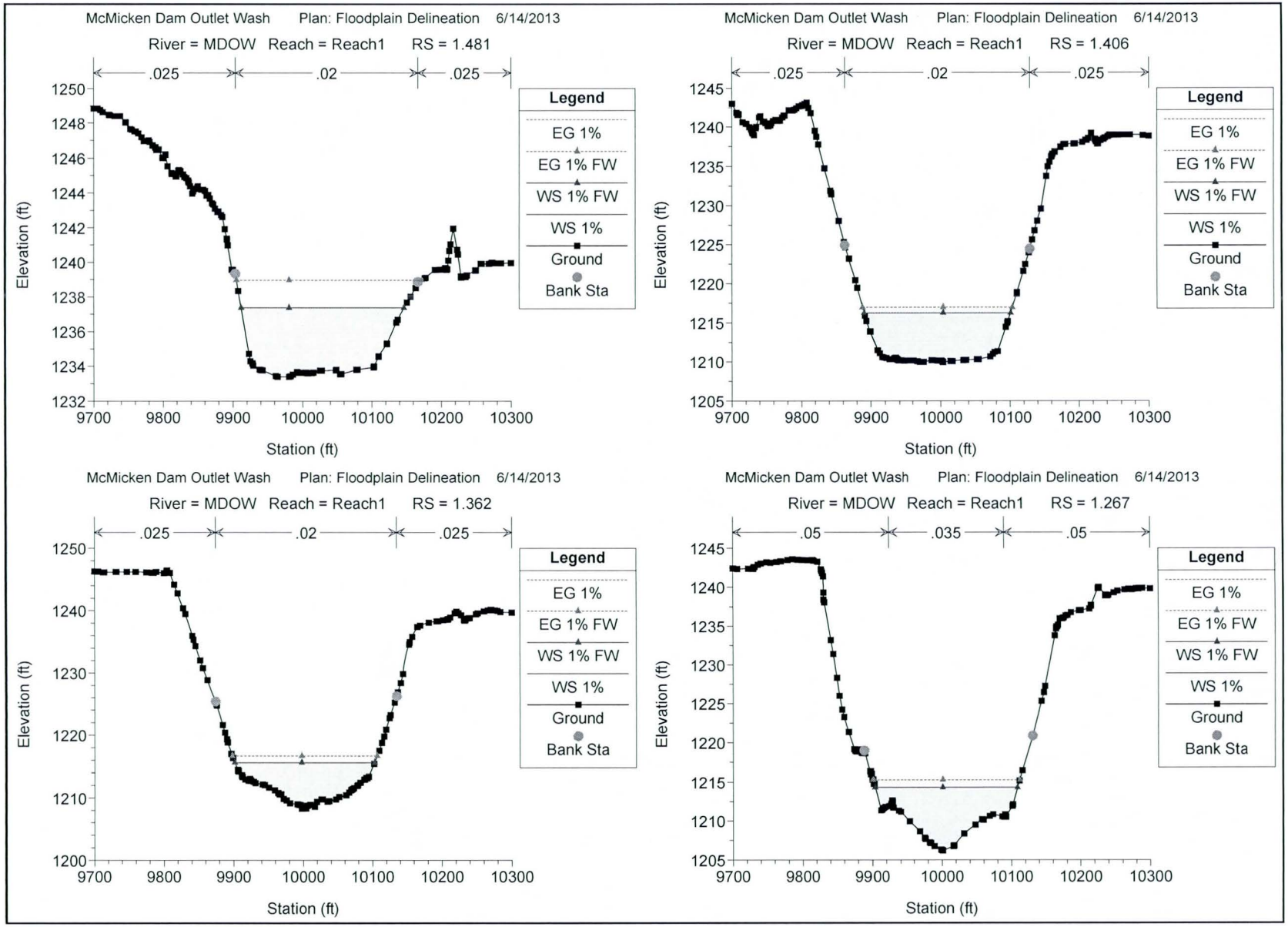

McMicken Dam Outlet Wash Plan: Floodplain Delineation 6/14/2013
River = MDOW Reach = Reach1 RS = 2.787
.056
.04
.056
Elevation (ft)
Station (ft)
Legend
EG 1% FW
EG 1%
WS 1% FW
WS 1%
Ground
Bank Sta
Encroachment
McMicken Dam Outlet Wash Plan: Floodplain Delineation 6/14/2013
River = MDOW Reach = Reach1 RS = 2.692
.056
.04
.056
Elevation (ft)
Station (ft)
Legend
EG 1% FW
EG 1%
WS 1% FW
WS 1%
Ground
Bank Sta
Encroachment
McMicken Dam Outlet Wash Plan: Floodplain Delineation 6/14/2013
River = MDOW Reach = Reach1 RS = 2.632
.056
.04
.056
Elevation (ft)
Station (ft)
Legend
EG 1% FW
WS 1% FW
EG 1%
WS 1%
Ground
Ineff
Bank Sta
Encroachment
McMicken Dam Outlet Wash Plan: Floodplain Delineation 6/14/2013
River = MDOW Reach = Reach1 RS = 2.618 Culv Williams Drive Culvert
.056
.04
.056
Elevation (ft)
Station (ft)
Legend
EG 1% FW
WS 1% FW
EG 1%
WS 1%
Ground
Ineff
Bank Sta
Encroachment

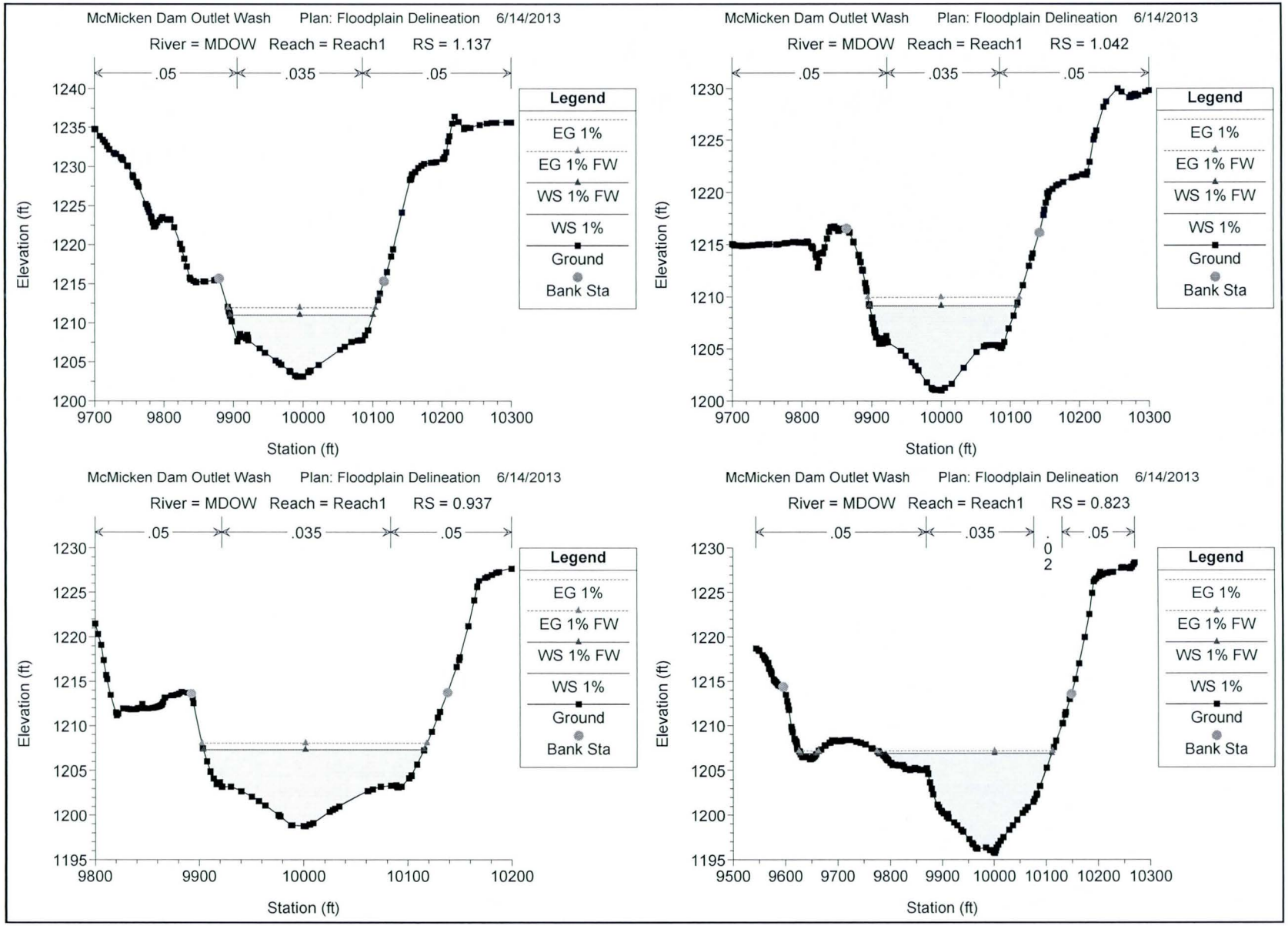

McMicken Dam Outlet Wash Plan: Floodplain Delineation 6/14/2013
River = MDOW Reach = Reach1 RS = 2.618 Culv Williams Drive Culvert
.056
.04
.056
Elevation (ft)
Station (ft)
Legend
EG 1% FW
EG 1%
WS 1% FW
WS 1%
Ground
Ineff
Bank Sta
Encroachment
McMicken Dam Outlet Wash Plan: Floodplain Delineation 6/14/2013
River = MDOW Reach = Reach1 RS = 2.603
McMicken Dam Outlet Wash Plan: Floodplain Delineation 6/14/2013
River = MDOW Reach = Reach1 RS = 2.556
McMicken Dam Outlet Wash Plan: Floodplain Delineation 6/14/2013
River = MDOW Reach = Reach1 RS = 2.461

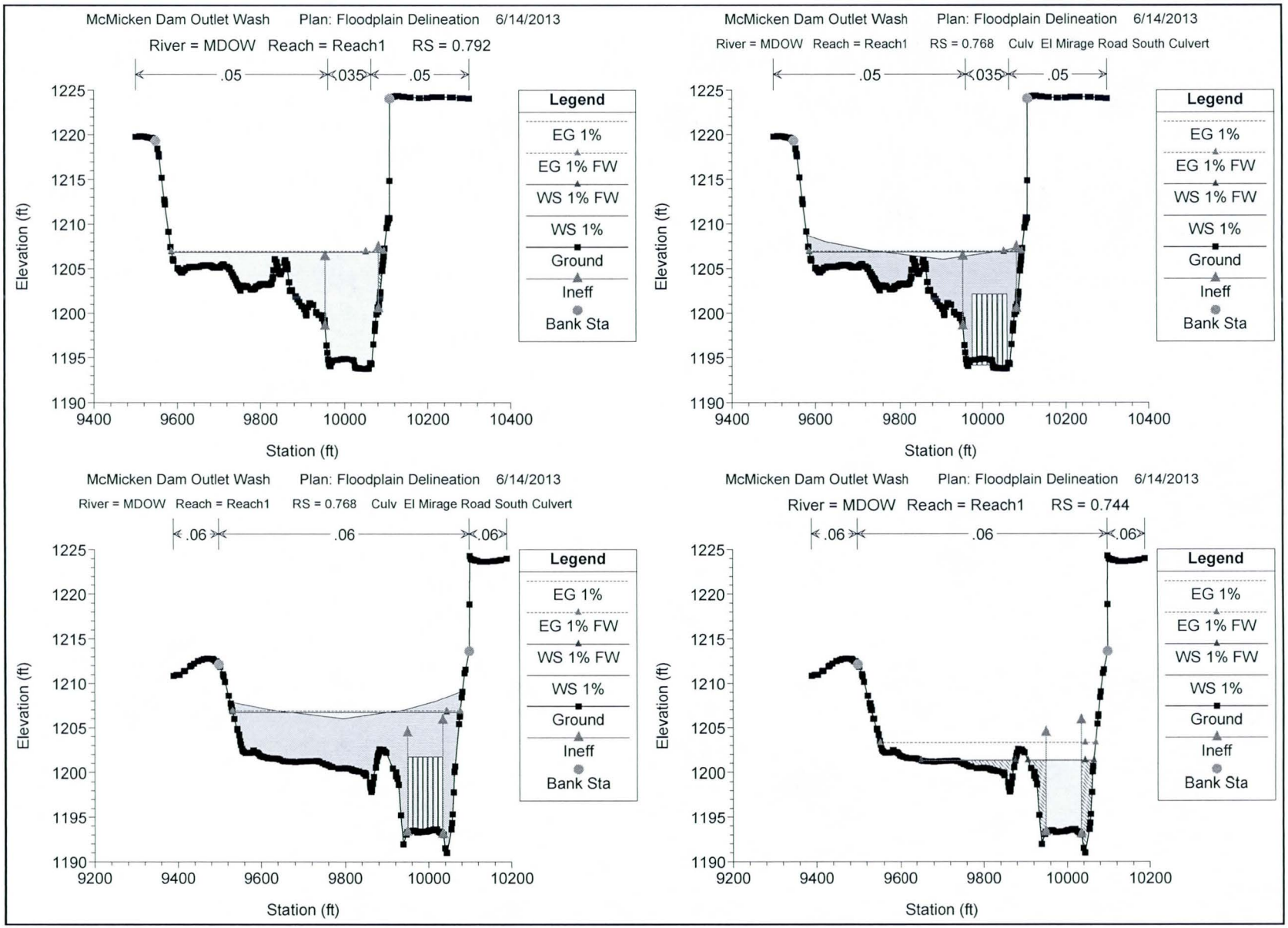

McMicken Dam Outlet Wash Plan: Floodplain Delineation 6/14/2013
River = MDOW Reach = Reach1 RS = 2.367
.056
.04
.056
Elevation (ft)
Station (ft)
Legend
EG 1% FW
EG 1%
WS 1% FW
WS 1%
Ground
Bank Sta
Encroachment
McMicken Dam Outlet Wash Plan: Floodplain Delineation 6/14/2013
River = MDOW Reach = Reach1 RS = 2.272
.056
.04
.03
.056
Elevation (ft)
Station (ft)
Legend
EG 1% FW
EG 1%
WS 1% FW
WS 1%
Ground
Bank Sta
Encroachment
McMicken Dam Outlet Wash Plan: Floodplain Delineation 6/14/2013
River = MDOW Reach = Reach1 RS = 2.196
.056
.04
.056
Elevation (ft)
Station (ft)
Legend
EG 1% FW
EG 1%
WS 1% FW
WS 1%
Ground
Ineff
Bank Sta
Encroachment
McMicken Dam Outlet Wash Plan: Floodplain Delineation 6/14/2013
River = MDOW Reach = Reach1 RS = 2.174 Culv El Mirage Road North Culvert
.056
.04
.056
Elevation (ft)
Station (ft)
Legend
EG 1% FW
EG 1%
WS 1% FW
WS 1%
Ground
Ineff
Bank Sta
Encroachment

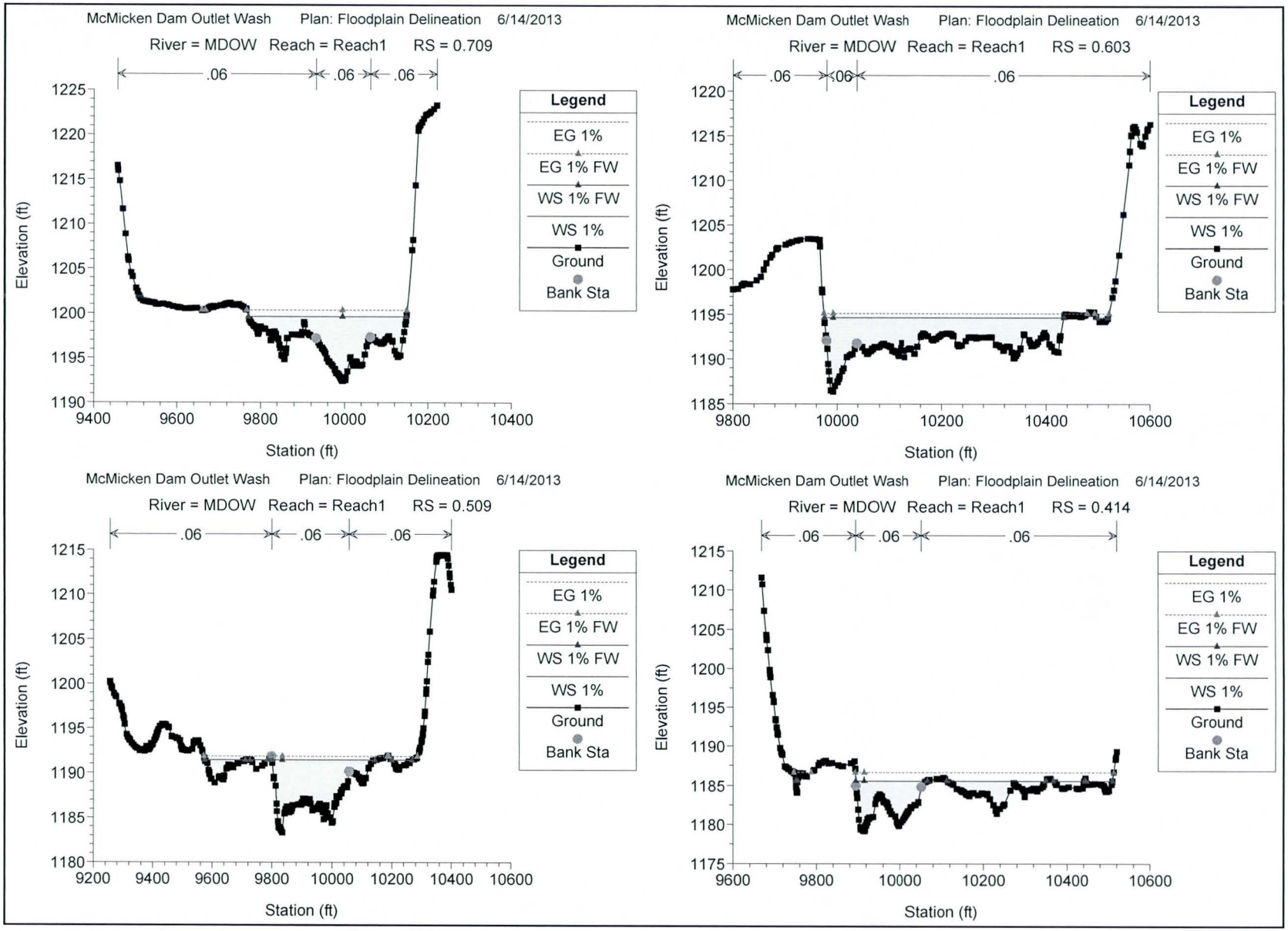

McMicken Dam Outlet Wash Plan: Floodplain Delineation 6/14/2013
River = MDOW Reach = Reach1 RS = 2.174 Culv El Mirage Road North Culvert
.056
.04
.056
Elevation (ft)
Station (ft)
Legend
EG 1% FW
EG 1%
WS 1% FW
WS 1%
Ground
Ineff
Bank Sta
Encroachment
McMicken Dam Outlet Wash Plan: Floodplain Delineation 6/14/2013
River = MDOW Reach = Reach1 RS = 2.151
.056
.04
.056
Elevation (ft)
Station (ft)
Legend
EG 1%
EG 1% FW
WS 1% FW
WS 1%
Ground
Ineff
Bank Sta
McMicken Dam Outlet Wash Plan: Floodplain Delineation 6/14/2013
River = MDOW Reach = Reach1 RS = 2.050
.05
.035
.05
Elevation (ft)
Station (ft)
Legend
EG 1%
EG 1% FW
WS 1% FW
WS 1%
Ground
Bank Sta
McMicken Dam Outlet Wash Plan: Floodplain Delineation 6/14/2013
River = MDOW Reach = Reach1 RS = 1.899
.05
.035
.05
Elevation (ft)
Station (ft)
Legend
EG 1%
EG 1% FW
WS 1% FW
WS 1%
Ground
Bank Sta

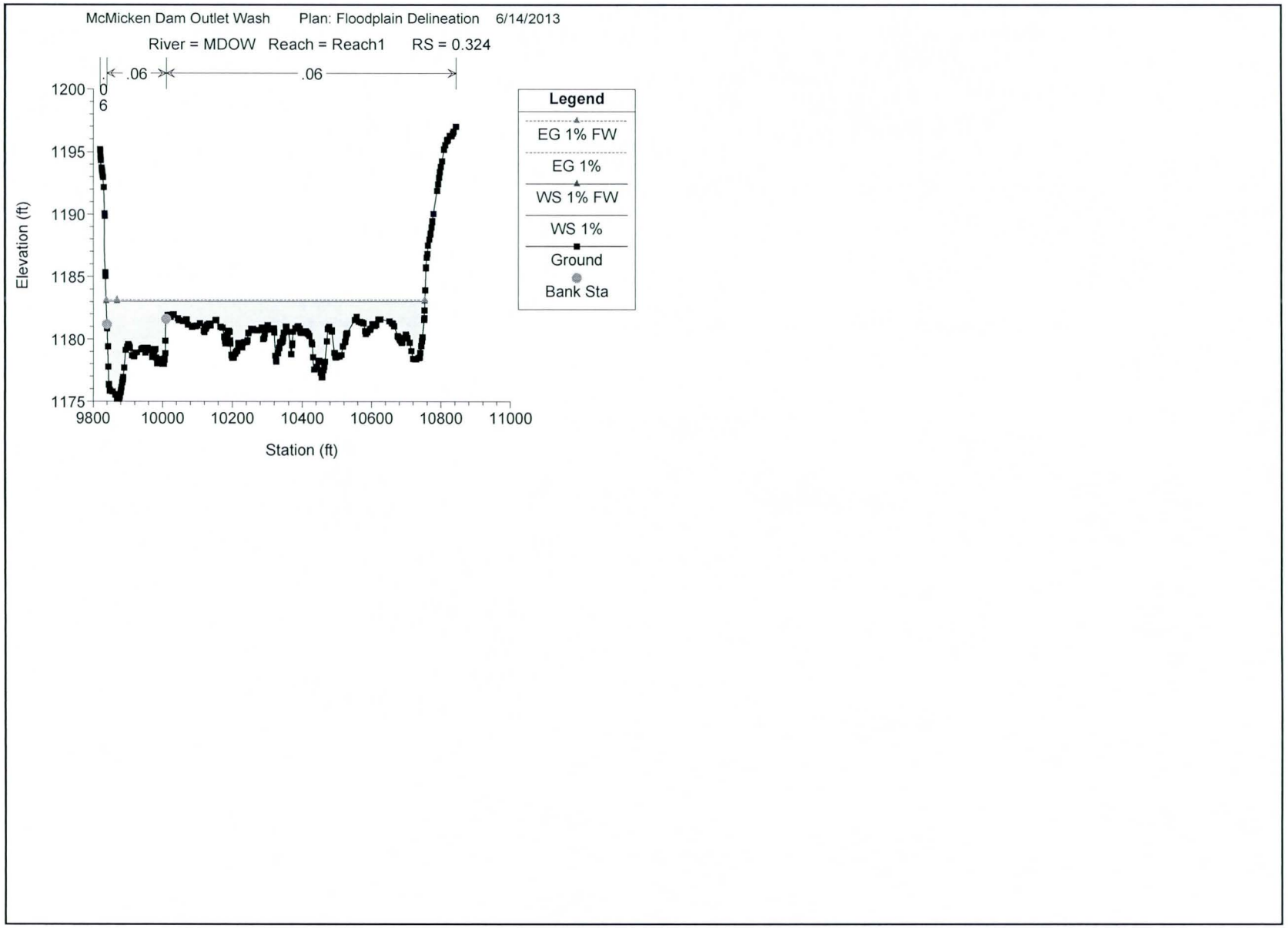

McMicken Dam Outlet Wash Plan: Floodplain Delineation 6/14/2013
River = MDOW Reach = Reach1 RS = 1.804
.05
.035
.05
Elevation (ft)
Station (ft)
Legend
EG 1%
EG 1% FW
WS 1% FW
WS 1%
Ground
Bank Sta
McMicken Dam Outlet Wash Plan: Floodplain Delineation 6/14/2013
River = MDOW Reach = Reach1 RS = 1.671
.05
.035
.05
Elevation (ft)
Station (ft)
Legend
EG 1%
EG 1% FW
WS 1% FW
WS 1%
Ground
Bank Sta
McMicken Dam Outlet Wash Plan: Floodplain Delineation 6/14/2013
River = MDOW Reach = Reach1 RS = 1.576
.05
.035
.05
Elevation (ft)
Station (ft)
Legend
EG 1%
EG 1% FW
WS 1% FW
WS 1%
Ground
Bank Sta
McMicken Dam Outlet Wash Plan: Floodplain Delineation 6/14/2013
River = MDOW Reach = Reach1 RS = 1.501
.05
.035
.05
Elevation (ft)
Station (ft)
Legend
EG 1%
EG 1% FW
WS 1% FW
WS 1%
Ground
Bank Sta


McMicken Dam Outlet Wash Plan: Floodplain Delineation 6/14/2013
River = MDOW Reach = Reach1 RS = 1.481
.025
.02
.025
Elevation (ft)
Station (ft)
Legend
EG 1%
EG 1% FW
WS 1% FW
WS 1%
Ground
Bank Sta
McMicken Dam Outlet Wash Plan: Floodplain Delineation 6/14/2013
River = MDOW Reach = Reach1 RS = 1.406
.025
.02
.025
Elevation (ft)
Station (ft)
Legend
EG 1%
EG 1% FW
WS 1% FW
WS 1%
Ground
Bank Sta
McMicken Dam Outlet Wash Plan: Floodplain Delineation 6/14/2013
River = MDOW Reach = Reach1 RS = 1.362
.025
.02
.025
Elevation (ft)
Station (ft)
Legend
EG 1%
EG 1% FW
WS 1% FW
WS 1%
Ground
Bank Sta
McMicken Dam Outlet Wash Plan: Floodplain Delineation 6/14/2013
River = MDOW Reach = Reach1 RS = 1.267
.05
.035
.05
Elevation (ft)
Station (ft)
Legend
EG 1%
EG 1% FW
WS 1% FW
WS 1%
Ground
Bank Sta


McMicken Dam Outlet Wash Plan: Floodplain Delineation 6/14/2013
River = MDOW Reach = Reach1 RS = 1.137
.05
.035
.05
Legend
EG 1%
EG 1% FW
WS 1% FW
WS 1%
Ground
Bank Sta
Elevation (ft)
Station (ft)
McMicken Dam Outlet Wash Plan: Floodplain Delineation 6/14/2013
River = MDOW Reach = Reach1 RS = 1.042
.05
.035
.05
Legend
EG 1%
EG 1% FW
WS 1% FW
WS 1%
Ground
Bank Sta
Elevation (ft)
Station (ft)
McMicken Dam Outlet Wash Plan: Floodplain Delineation 6/14/2013
River = MDOW Reach = Reach1 RS = 0.937
.05
.035
.05
Legend
EG 1%
EG 1% FW
WS 1% FW
WS 1%
Ground
Bank Sta
Elevation (ft)
Station (ft)
McMicken Dam Outlet Wash Plan: Floodplain Delineation 6/14/2013
River = MDOW Reach = Reach1 RS = 0.823
.05
.035
.02
.05
Legend
EG 1%
EG 1% FW
WS 1% FW
WS 1%
Ground
Bank Sta
Elevation (ft)
Station (ft)


McMicken Dam Outlet Wash Plan: Floodplain Delineation 6/14/2013
River = MDOW Reach = Reach1 RS = 0.792
.05
.035
.05
Elevation (ft)
Station (ft)
Legend
EG 1%
EG 1% FW
WS 1% FW
WS 1%
Ground
Ineff
Bank Sta
McMicken Dam Outlet Wash Plan: Floodplain Delineation 6/14/2013
River = MDOW Reach = Reach1 RS = 0.768 Culv El Mirage Road South Culvert
.05
.035
.05
Elevation (ft)
Station (ft)
Legend
EG 1%
EG 1% FW
WS 1% FW
WS 1%
Ground
Ineff
Bank Sta
McMicken Dam Outlet Wash Plan: Floodplain Delineation 6/14/2013
River = MDOW Reach = Reach1 RS = 0.768 Culv El Mirage Road South Culvert
.06
.06
.06
Elevation (ft)
Station (ft)
Legend
EG 1%
EG 1% FW
WS 1% FW
WS 1%
Ground
Ineff
Bank Sta
McMicken Dam Outlet Wash Plan: Floodplain Delineation 6/14/2013
River = MDOW Reach = Reach1 RS = 0.744
.06
.06
.06
Elevation (ft)
Station (ft)
Legend
EG 1%
EG 1% FW
WS 1% FW
WS 1%
Ground
Ineff
Bank Sta


McMicken Dam Outlet Wash Plan: Floodplain Delineation 6/14/2013
River = MDOW Reach = Reach1 RS = 0.709
.06 .06 .06
Elevation (ft)
Station (ft)
Legend
EG 1%
EG 1% FW
WS 1% FW
WS 1%
Ground
Bank Sta
McMicken Dam Outlet Wash Plan: Floodplain Delineation 6/14/2013
River = MDOW Reach = Reach1 RS = 0.603
.06 .06 .06
Elevation (ft)
Station (ft)
Legend
EG 1%
EG 1% FW
WS 1% FW
WS 1%
Ground
Bank Sta
McMicken Dam Outlet Wash Plan: Floodplain Delineation 6/14/2013
River = MDOW Reach = Reach1 RS = 0.509
.06 .06 .06
Elevation (ft)
Station (ft)
Legend
EG 1%
EG 1% FW
WS 1% FW
WS 1%
Ground
Bank Sta
McMicken Dam Outlet Wash Plan: Floodplain Delineation 6/14/2013
River = MDOW Reach = Reach1 RS = 0.414
.06 .06 .06
Elevation (ft)
Station (ft)
Legend
EG 1%
EG 1% FW
WS 1% FW
WS 1%
Ground
Bank Sta


McMicken Dam Outlet Wash Plan: Floodplain Delineation 6/14/2013
River = MDOW Reach = Reach1 RS = 0.324
.06
.06
1200
1195
1190
1185
1180
1175
Elevation (ft)
9800
10000
10200
10400
10600
10800
11000
Station (ft)
Legend
EG 1% FW
EG 1%
WS 1% FW
WS 1%
Ground
Bank Sta

E.3 Expansion and Contraction Coefficients

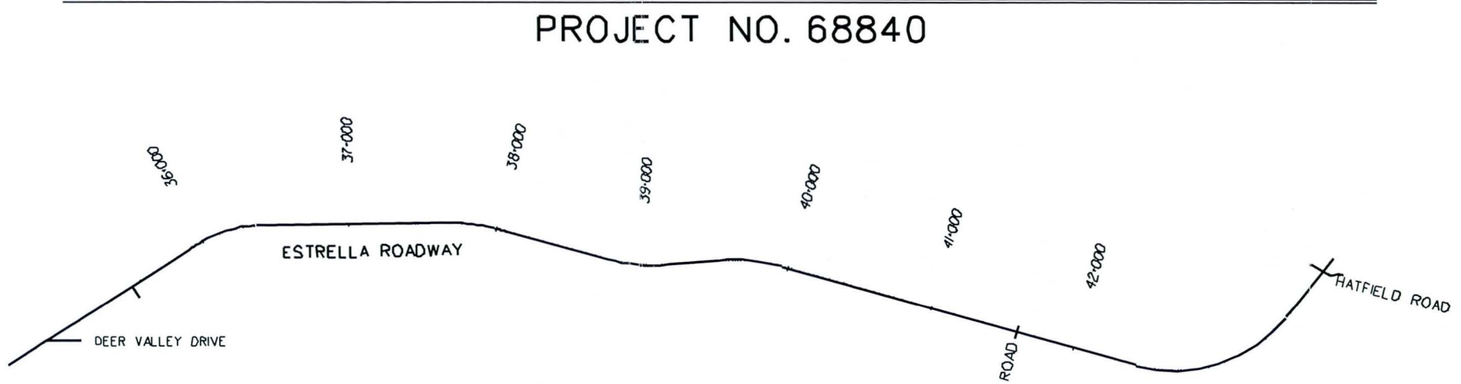
E.4 Analysis of Structures

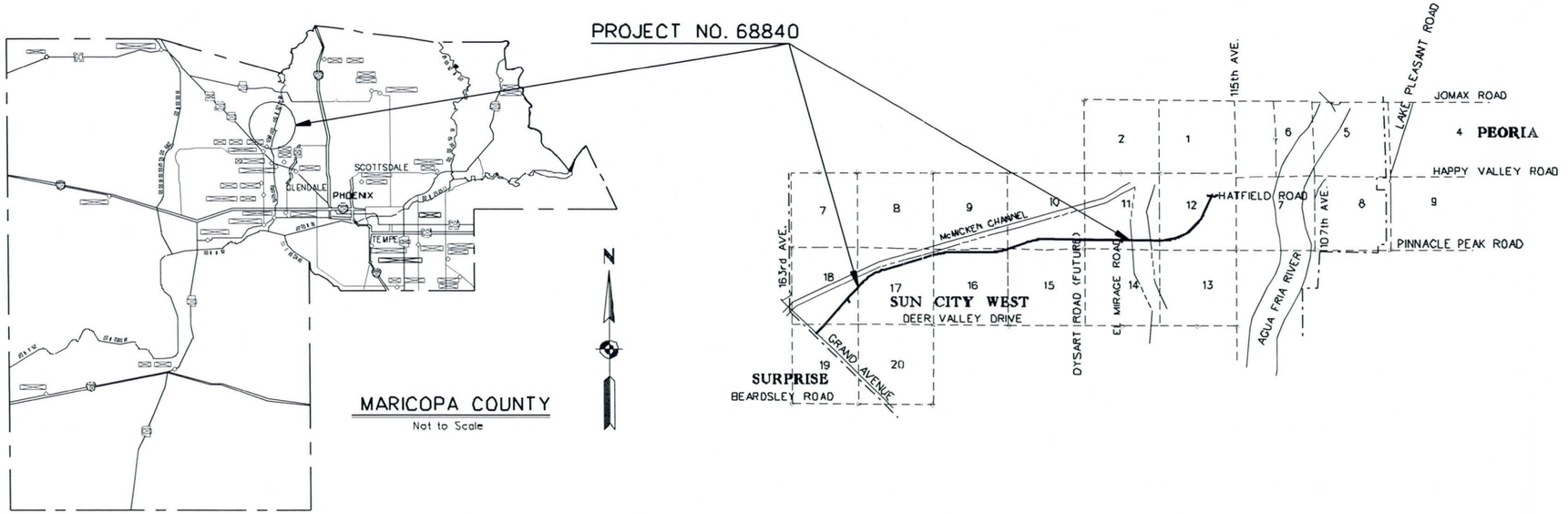
MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION

PLANS FOR THE CONSTRUCTION OF:

ESTRELLA ROADWAY, PHASE 2A - REEMS ROAD TO EL MIRAGE ROAD

PROJECT NO. 68840





KEY MAP

NOT TO SCALE

▢ PLAN & PROFILE SHEETS

MARICOPA COUNTY DEPARTMENT OF TRANSPORTATION

ISSUED FOR PUBLIC BIDDING BY:

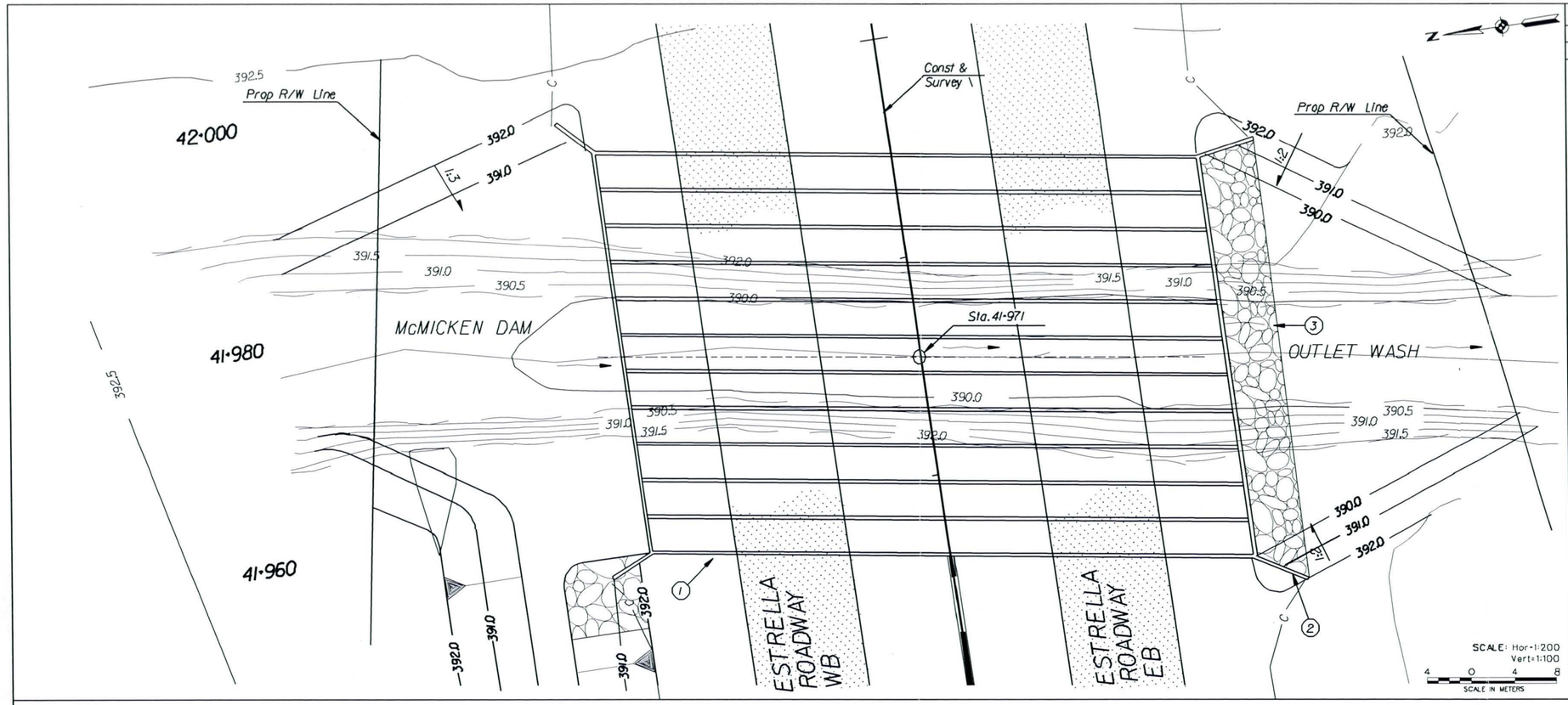
PROJECT MANAGER _____ DATE _____

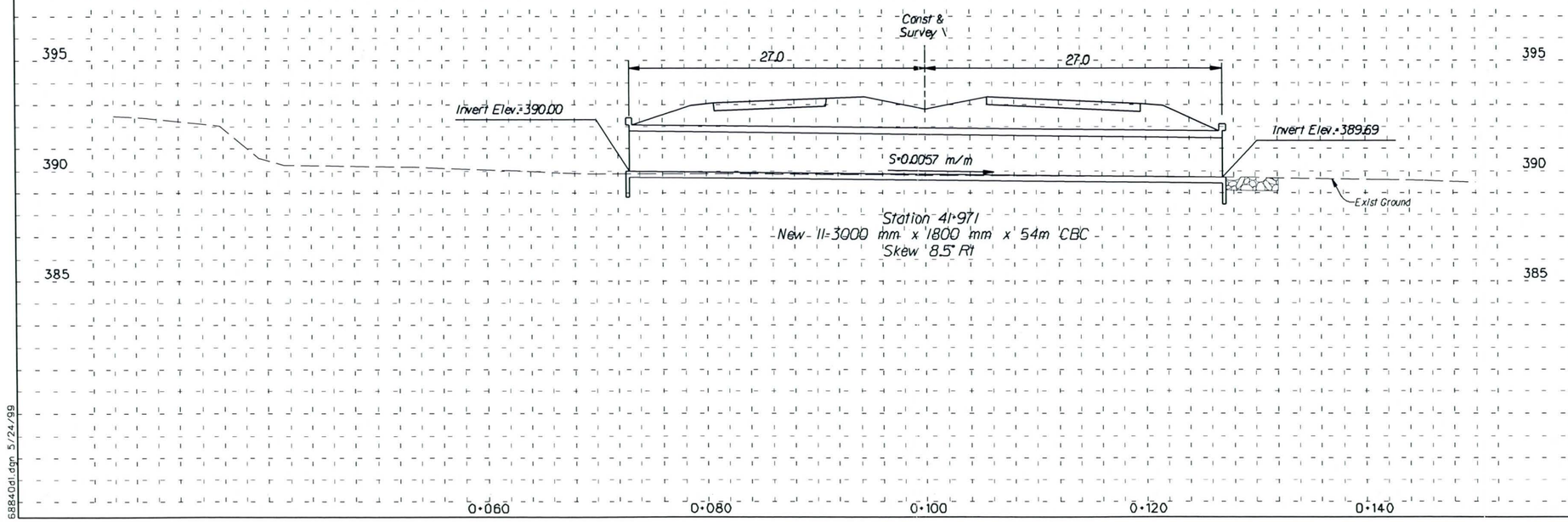
COUNTY BOARD OF SUPERVISORS

DON STAPLEY - CHAIRPERSON

DISTRICT 1	R. FULTON BROCK
DISTRICT 2	DON STAPLEY
DISTRICT 3	ANDREW W. KUNASEK
DISTRICT 4	MAX W. WILSON
DISTRICT 5	MARY ROSE WILCOX

FILE: C:\WINDM\ESTRELLA, PART A\68840F.DGN
DATE: 05-MAR-02 10:07





FHWA REGION	STATE	PROJECT NO	SHEET NO	TOTAL SHEETS	RECORD DRAWING
9	AZ	68840	45	59	

☐ REMOVAL/RELOCATE ☐

◯ CONSTRUCTION ◯

(1) Construct Box Culvert Per ADOT Std. No. B-01-10, B-02.60, B-04.10 And B-04.30. Additional Barrels to be Constructed Per Std. No. B-02.60. Concrete Shall be Class A. See Detail D1, Sht No 46.

(2) Wing Dimensions to be Based on 1:4 Slope, 10° Skew as Given In ADOT Std. No. B-04.10 And B-04.30.

(3) Install Grouted RipRap to limits shown. Gradation per Detail D8, Sht No 48. Thickness - 610mm

602-263-1100
1-800-STAKE-IT

NO.	REVISION	BY	DATE
3			
2			
1			

MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION
ENGINEERING DIVISION

ESTRELLA ROADWAY, PHASE 2A
REEMS ROAD TO EL MIRAGE ROAD
PROJECT NO. 68840

	BY	DATE
DESIGNED	E. LOVSTAD	02/99
DRAWN	D. WESTMORELAND	02/99
CHECKED	L. MILLER	03/99

Registered Professional Engineer 15268 DAVID W. BURAS ARIZONA U.S.A.

HDR ENGINEERING, INC.

CULVERT PROFILE SHEET
CULVERT Sta 41+971

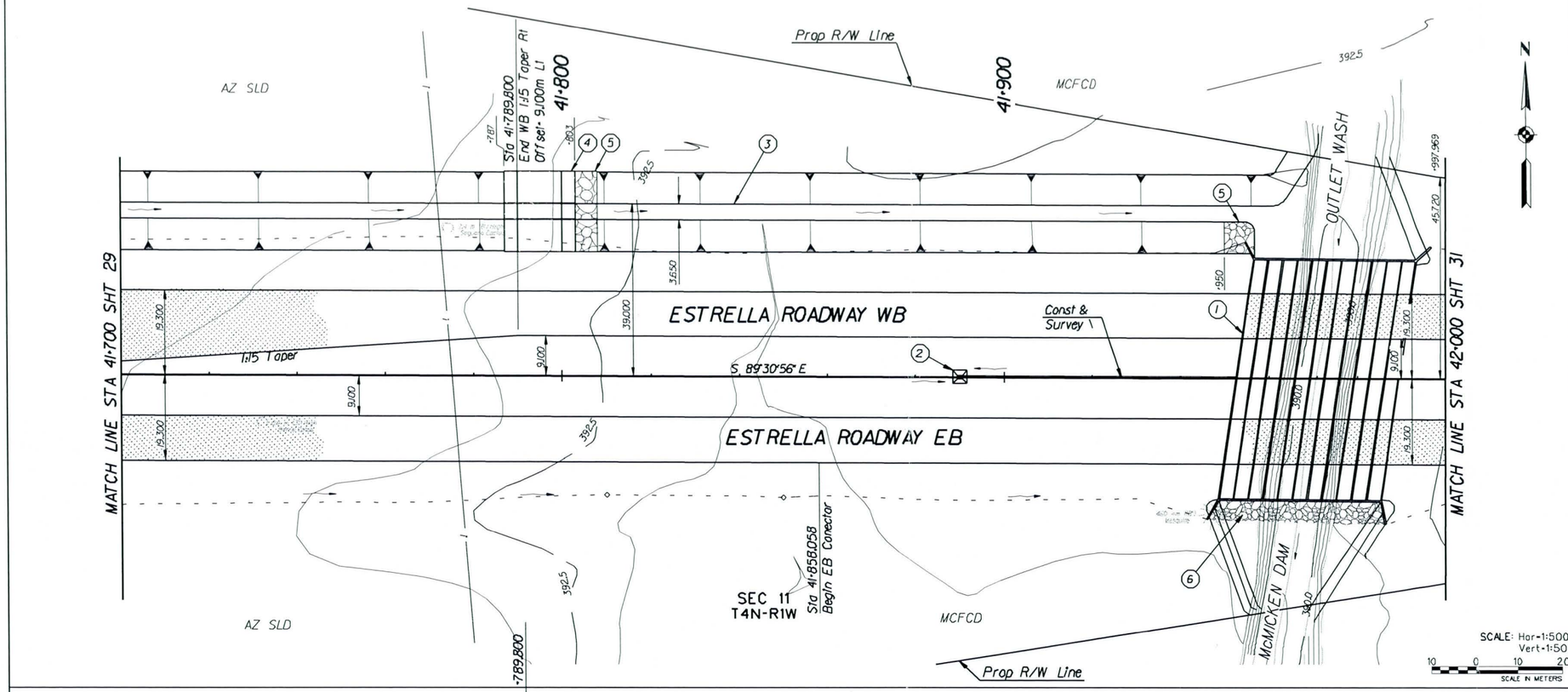
SHEET OF 13 13

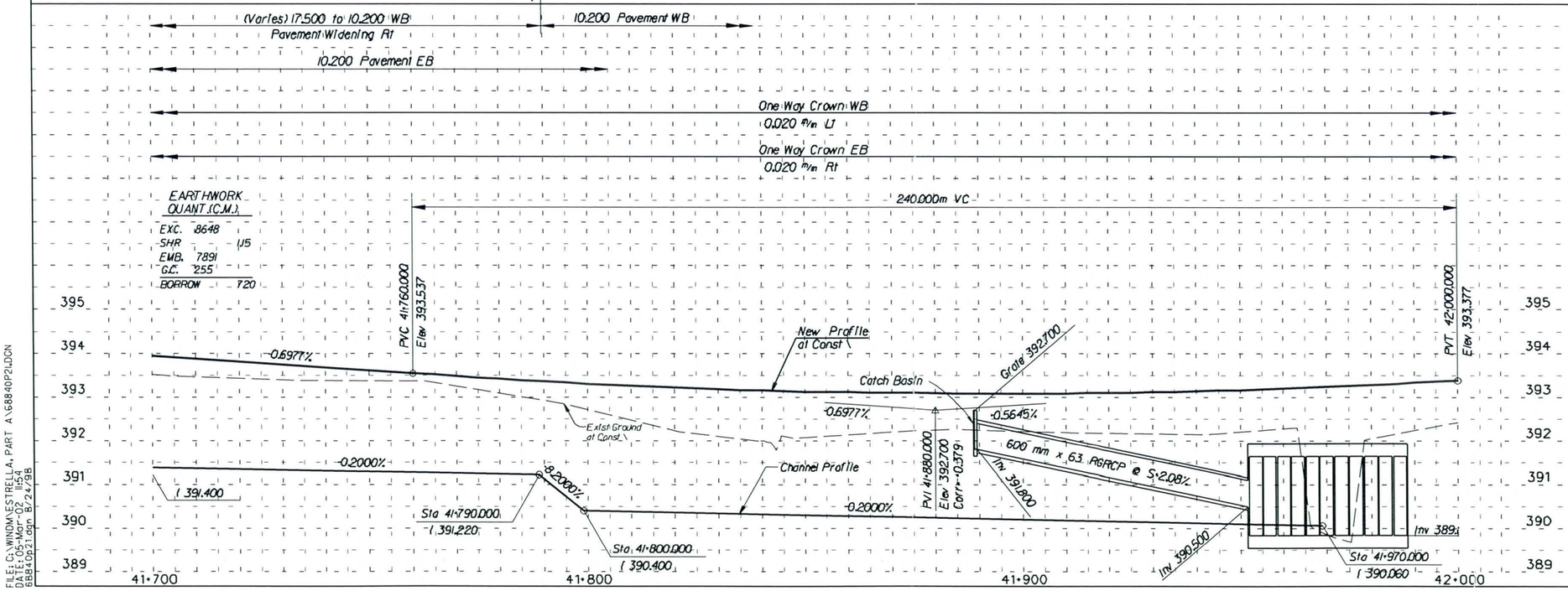
TRACS NO.

68840d1.dgn 5/24/99

FHWA REGION	STATE	PROJECT NO	SHEET NO	TOTAL SHEETS	RECORD DRAWING
9	AZ	68840	30	59	

☐ REMOVAL/RELOCATE ☐





CONSTRUCTION

(1) Sta 41+971.000 8½° Skew Rt
New 11-3000mm x 1800mm x 54.000m CBC
ADOT Std B-01.10, B-02.60, B-04.30
(See Culvert Profile, Sht No 45)
(See Detail D1, Sht No 46)

(2) Sta 41+890.000
New Catch Basin and Apron
ADOT Std Det C-15.80, H=900mm
Connect to CBC at Sta 41+953.000
with 600mm x 63.0m RGRCP, Class III
(See Detail D7, Sht No 48 for Connection to CBC)

(3) Construct Earthen Channel to Line and Grade Shown.
(See Detail D8, Sht No 48). Grading quantities included in Roadway Excavation for Payment.

(4) Construct Concrete Spillway 33.3m²
(See Detail D8, Sht No 48)

(5) Install Plain RipRap Slope Protection 71m³
610mm Thickness, Gradation per Detail D8, Sht No 48.

(6) Install Grouted RipRap. 111m³
See sheet 45 for details.

602-263-1100
1-800-STAKE-IT

NO.	REVISION	BY	DATE
3			
2			
1			

MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION
ENGINEERING DIVISION

ESTRELLA ROADWAY, PHASE 2A
REEMS ROAD TO EL MIRAGE ROAD
PROJECT NO. 68840

	BY	DATE
DESIGNED	E. SHAPLEY	8/20/98
DRAWN	D. WESTMORELAND	8/24/98
CHECKED	SCR	9/9/99

25116 EDMOND R. SHAPLEY

HDR ENGINEERING, INC.

PLAN AND PROFILE
Sta 41+700 to Sta 42+000

SHEET OF 21 22

TRACS NO.

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DATE: 05-Mar-02 11:54
68840p21.dgn 8/24/98

DEVELOPER
WOODSIDE HOMES
OF ARIZONA, INC.
ONE AGAVE CENTER
8950 S. 52ND ST. SUITE 115
TEMPE, AZ 85284
(480) 755-0801
(480) 755-0802 (FAX)

ENGINEER
COE & VAN LOO
4550 N. 12TH STREET
PHOENIX, AZ. 85014
(602) 264-6831
(602) 264-0928 (FAX)

BENCHMARK
MARICOPA COUNTY DEPARTMENT OF TRANSPORTATION - BRASS CAP FLUSH
@ 135TH AVENUE & DEER VALLEY ROAD
ELEVATION 1275.80
MARICOPA COUNTY 1929 NGVD DATUM
(N10350.231-E3781.965)

LEGEND

TC	TOP OF CURB
G	GUTTER
P	PAVEMENT
E.P.	EDGE OF PAVEMENT
B.V.C.	BEGIN VERTICAL CURVE
P.I.	POINT OF INTERSECTION
E.V.C.	END VERTICAL CURVE
SW	SIDEWALK
C	CONCRETE
NG	NATURAL GROUND
B/C	BACK OF CURB
R/W	RIGHT OF WAY
S/W ESM'T	SIDEWALK EASEMENT
LE ESM'T	LANDSCAPE ESM'T
P.U.E.	PUBLIC UTILITY EASEMENT
R.W.	RETAINING WALL
L.F.	LINEAL FOOT
G.B.	GRADE BREAK
T.N.	TOP OF WATER VALVE
INV.	ELEVATION AT PIPE
M.H.	MANHOLE
M	MONUMENT LINE
P.C.	POINT OF CURVE
P.T.	POINT OF TANGENCY
P.R.C.	POINT OF REVERSE CURVE

GRADE BREAK
PROP. STOP SIGN
SURVEY MONUMENT
PROP. STREET LIGHT
PROP. FIRE HYDRANT
PROP WATERLINE & VALVE
EXIST. FIRE HYDRANT
EXIST. WATERLINE & VALVE
PROP. SEWERLINE & MANHOLE
EXIST. SEWERLINE & MANHOLE
PROP. CATCH BASIN
PROP. STORM DRAIN & MANHOLE
EXIST. CATCH BASIN
EXIST. STORM DRAIN & MANHOLE
(3) PLAN SHEET NOS.

INSTALLATIONS WITHIN DISTRICT'S RIGHT-OF-WAY TO BE MAINTAINED BY M.C.D.O.T.

THE QUANTITIES SHOWN ARE AN ESTIMATE ONLY THE CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING ALL QUANTITIES BEFORE BIDDING.

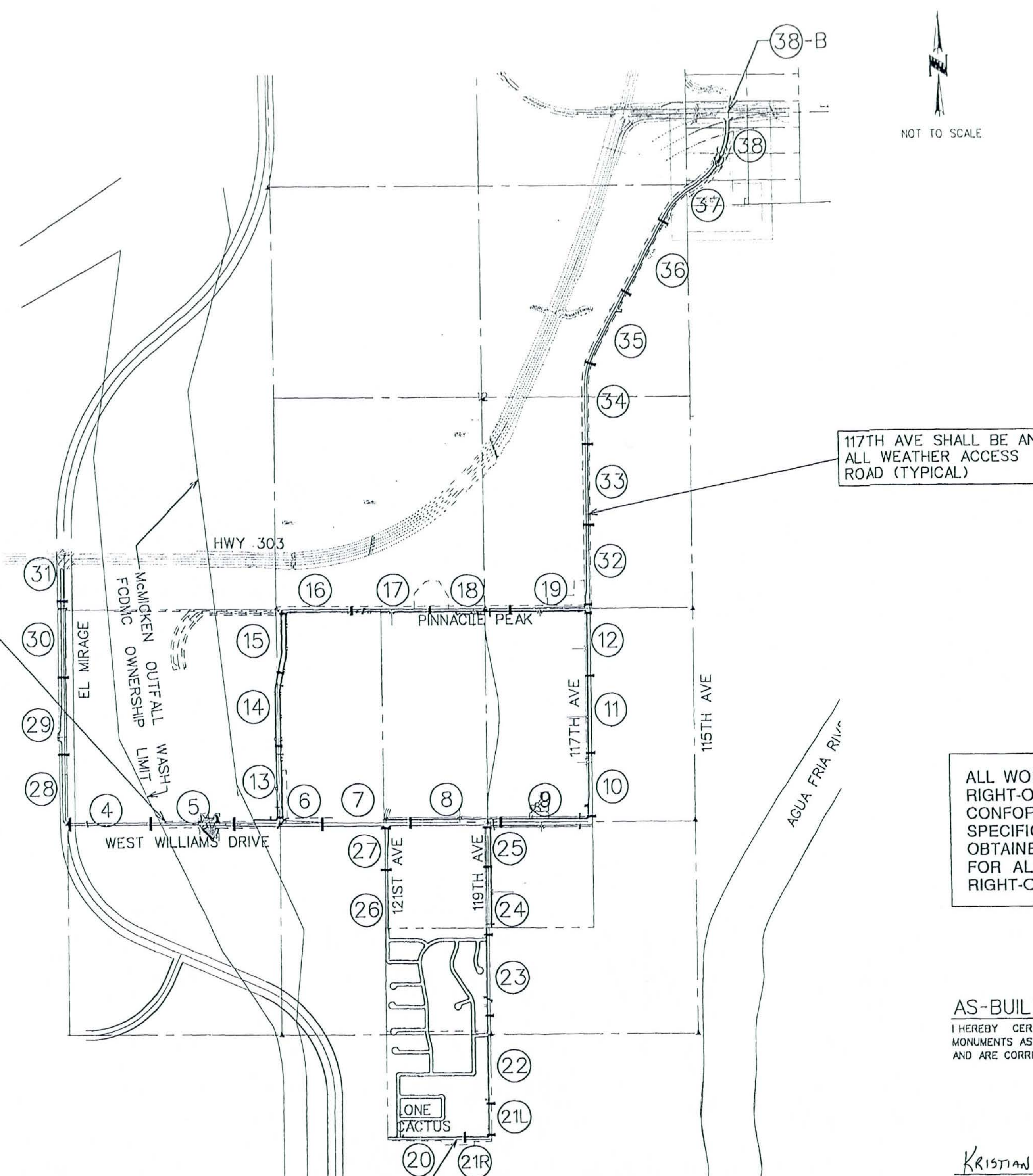
ESTIMATED PAVING QUANTITIES

DESCRIPTION	UNITS	QUANTITY
PAVEMENT-4" AC/10" ABC (RESIDENTIAL STREETS)	SY	136,497
BRASS CAP-M.A.G. STD.DET 120-2 (TYPE "D")	EA	32
BRASS CAP-M.A.G. STD.DET 120-2 (TYPE "E")	EA	6
CONC. VALLEY GUTTER & APRON	SY	1,454
CONC. SIDEWALK-M.A.G. STD. DET. 230	SF	102,372
6" VERT. CURB & GUTTER-M.A.G. STD. DET. 220 (TYPE A)	LF	22,109
SIDEWALK RAMP-M.A.G. STD. DET. 2031-A	EA	-
SIDEWALK RAMP-M.A.G. STD. DET. 2031-B	EA	54
SIDEWALK RAMP-M.A.G. STD. DET. 2032-A	EA	-
MANHOLE FRAME & COVER ADJUSTMENT-M.A.G. STD. DET. 422	EA	43
WATER VLAVE/CLEANOUT ADJUSTMENT-M.A.G. STD. DET. 270	EA	108
THICKEND EDGE-M.A.G. STD. DET. 201, TYPE "B"	LF	40,249
DRIVEWAY ENTRANCE PER M.C.D.O.T. STD. DET. 2036	EA	2
STREET SIGN BASE-M.C.D.O.T. STD. DET. 2054	EA	12
SCUPPER-M.A.G. STD. DET. 206.1 & 206.2 W/HANDRAL-C.O.P. STD DET P-1173	EA	10
BARRICADE-M.A.G STD. DET. 130, TYPE "A"	LF	465
GROUTED RIP-RAP PER MCFCD SPECIFICATIONS	CY	862

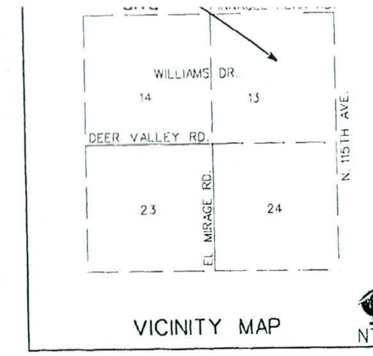
THE QUANTITIES SHOWN ARE AN ESTIMATE ONLY THE CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING ALL QUANTITIES BEFORE BIDDING.

ESTIMATED STORMDRAIN QUANTITIES

DESCRIPTION	UNITS	QUANTITY
10 X 6 BOX CULVERT-A.D.O.T. B-02.60	LF	957
8 X 4 BOX CULVERT-A.D.O.T. B-02.20 & B-02.30	LF	142
8 X 4 BOX CULVERT-A.D.O.T. B-02.10	LF	69
10 X 4 BOX CULVERT-A.D.O.T. B-02.10	LF	548
CONC. INLET WING WALLS-A.D.O.T. DET B-04.30	EA	1
CONC. OUTLET WING WALLS-A.D.O.T. DET B-04.10	EA	4
CONC. INLET WING WALLS-A.D.O.T. DET B-08.10 TYPE "B"	EA	3
CONC. OUTLET WING WALLS-A.D.O.T. DET B-08.10 TYPE "A"	EA	1
CONC. INLET WING WALLS-A.D.O.T. DET B-08.10 TYPE "A"	EA	1
CONC. OUTLET WING WALLS-A.D.O.T. DET B-04.50	EA	1
CONC. HEADWALL-M.A.G. STD. DET 501-1	EA	7
CONC. INLET HEADWALL-A.D.O.T. DET B-11.12 & B-11.14	EA	2
CATCH BASIN-M.A.G. STD. DET 533-1(SINGLE)	EA	12
18" RGRCP	LF	329
24" RGRCP	LF	393
32" X 52" RCPA CULVERT	LF	172



KEY MAP
NOT TO SCALE



VICINITY MAP

LEGAL DESCRIPTION

LOCATED AT THE SOUTHWEST CORNER OF PINNACLE PEAK ROAD AND N. 117TH AVENUE. LEGALLY DESCRIBED AS:

THE NORTHWEST QUARTER OF THE SOUTHEAST QUARTER, ALSO THE WEST HALF OF THE NORTHEAST QUARTER, ALSO THE EAST HALF OF THE NORTHWEST QUARTER OF SECTION 13, TOWNSHIP 4 NORTH, RANGE 1 WEST OF THE GILA AND SALT RIVER BASE AND MERIDIAN, MARICOPA COUNTY, ARIZONA

UTILITIES:

WATER:	CITIZENS UTILITIES
SEWER:	CITIZENS UTILITIES
FIRE:	RURAL METRO F.D.
ELECTRIC:	A.P.S.
TELEPHONE:	QWEST
CABLE TV:	COX
POLICE:	MARICOPA COUNTY

ZONING:
PAD RESIDENTIAL

ALL WORK WITHIN FCDMC RIGHT-OF-WAY SHALL CONFORM TO THE DISTRICT'S SPECIFICATIONS AND A PERMIT OBTAINED FROM THE DISTRICT FOR ALL WORK WITHIN THE RIGHT-OF-WAY

AS-BUILT CERTIFICATION

I HEREBY CERTIFY THAT THE "RECORD DRAWING" MEASUREMENTS AND SURVEY MONUMENTS AS SHOWN HEREON WERE MADE UNDER MY SUPERVISION OR AS NOTED AND ARE CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF.

Kristian P. McRae — 3-8-07
REGISTERED LAND SURVEYOR — DATE
34558
REGISTRATION NUMBER — CVL PHONE: (602) 264-6831

MCDOT APPROVAL

BY LETTER — AUG. 11, 2004
MARICOPA COUNTY DEPT. OF TRANSPORTATION — DATE

SHEET INDEX

1........................COVER SHEET
2-3......................NOTES & SECTION DETAILS
4-38.....................PLAN & PROFILES
38-A.....................DETAILS
38-B.....................PAVING AND STRIPING

CROSSRIVER INFRASTRUCTURE

COE & VAN LOO
PLANNING • ENGINEERING • LANDSCAPE ARCHITECTURE
4550 NORTH 12TH STREET
PHOENIX, ARIZONA
TELEPHONE (602) 264

DESIGNED	KG
DRAWN	SM/GM
CHECKED	KG
DATE	7-2004

REVISIONS	DATE	BY
1 SCOUR PROTECTION ON SHT.5	2-14-06	PZS
2 ADDED GUARDRAIL ON SHT.38	4-5-06	TVC
3 ADDED GUARDRAIL ON SHT.S 7 & 8	4-5-06	TVC
4 SCOUR PROTECTION ON SHT.38	4-5-06	TVC
5 REMOVED GUARDRAIL ON WILLIAMS DRIVE		

PAVING AND STORM DRAIN PLANS

CVL

SHEET 1 OF 38

CVL PROJECT NO.: 990050-08

602-263-1100
1-800-STAKE-IT

2507 P07

504-P062

tomc

PAVING NOTES:

1. INSTALL A.C. PAVEMENT & BASE COURSE PER TYPICAL SECTIONS ON SHT. 2
2. INSTALL BRASS CAP-M.A.G. STD. DET. 120-2 (TYPE E)
3. INSTALL BRASS CAP-M.A.G. STD. DET. 120-2 (TYPE D)
4. INSTALL 4' VALLEY GUTTER & APRONS-M.A.G. STD. DET. 240
5. INSTALL SIDEWALK-M.A.G. STD. DET. 230. (WIDTH PER TYP SECTIONS)
6. INSTALL 6" VERTICAL CURB-M.A.G. STD. DET. 220 (TYPE A)
7. INSTALL SIDEWALK RAMP-M.C.D.O.T. STD DET 2031-A
8. INSTALL SIDEWALK RAMP-M.C.D.O.T. STD. DET. 2031-A
9. INSTALL SIDEWALK RAMP-M.C.D.O.T. STD. DET. 2032-A
10. MANHOLE FRAME & COVER ADJUSTMENT-M.A.G. STD. DET. 422
11. WATER VALVE/CLEANOUT ADJUSTMENT-M.A.G. STD. DET. 270
12. CONSTRUCT THICKENED EDGE PER M.A.G. STD DET 201 TYPE "B"
13. INSTALL DRIVEWAY ENTRANCE PER MCDOT, STD. DET. 2036.
14. INSTALL STREET SIGN BASE-M.C.D.O.T. STD. DET. 2054
15. INSTALL SCUPPER PER M.A.G. STD DET 206.1 & 206.2 W/HANDRAIL PER C.O.P. STD DET P-1175
16. INSTALL LOOSE RIP-RAP, MIN. THICKNESS = 12", D50=6" (UNLESS OTHERWISE NOTED)
17. 2-WAY REFLECTIVE BLUE PVMT MARKER FOR FIRE HYDRANT
18. BARRICADE PER M.A.G. STD. DET. 130, TYPE 'A' UNLESS OTHERWISE NOTED
19. REMOVE BARRICADE (L.F. GIVEN)
20. SAWCUT AND MATCH EXISTING PAVEMENT (2' MIN.)

ALL WORK WITHIN FCDMC RIGHT-OF-WAY SHALL CONFORM TO THE DISTRICT'S SPECIFICATIONS AND A PERMIT OBTAINED FROM THE DISTRICT FOR ALL WORK WITHIN THE RIGHT-OF-WAY

PROPOSED 16" WATER TRANSMISSION LINE PER C.V.L. PLAN NO. 990050-11 "CROSSRIVER WATER SYSTEM WELL WATER DELIVERY"

INSTALL RIP-RAP SCOUR PROTECTION PER DETAILS ON SHT. 38A

ALL WEATHER ACCESS ROAD PER MARICOPA COUNTY FLOOD CONTROL DISTRICT. SEE X-SEC LEFT. W/ACCESS GATE PER FCDMC GATE DET.

WEST WILLIAMS DRIVE
LOOKING EAST
HALF STREET/NO SIDEWALK
STA 0+00.00 TO STA 23+51.71
STA 27+21.84 TO STA 40+02.96

MATCH SHT 4 STA 10+50

MATCH SHT 6 STA 20+88.91

CONSTRUCTION NOTES
BOX CULVERT STRUCTURE

1. CONSTRUCT 6-10'X 8' & 5-10'X 6' BOX CULVERT STRUCTURES! INV 1260.79 N & 1259.40 S. PER A.D.O.T. DET. B-02.60, S=0.0153, W/HANDRAIL PER C.O.P. STD. DET. P-1171(SEE SHT. 27)
2. CONSTRUCT CONC. INLET WING WALLS PER A.D.O.T. DET B-04.30
3. CONSTRUCT CONC. OUTLET WING WALLS PER A.D.O.T. DET B-04.10

FLOOD CONTROL DISTRICT
SERVICE ROAD
N.T.S.

* ALT- 3" MIN. COMPACTED ALL WEATHER PLATING

WEST WILLIAMS DRIVE

NOTE:
REMOVE NATIVE MATERIAL TO 1259.7 & COMPACT TO 95% COMPACTION FOR BASE OF BOX CULVERT. PLACE ALL BACK FILL TO ADOT SPECIFICATIONS SEC. 203-5.03(B)(1)

SCALE: 1" = 40' HORIZ.
SCALE: 1" = 4' VERT.

CROSSRIVER INFRASTRUCTURE

COE & VAN LOO
PLANNING • ENGINEERING • LANDSCAPE ARCHITECTURE
4550 NORTH 12TH STREET
PHOENIX, ARIZONA 85014
TELEPHONE (602) 264-6831

REVISIONS	DATE	BY
ADDED SCOUR PROTECTION	2-14-06	PJS

DESIGNED KG
DRAWN SM/GM
CHECKED KG
DATE 7-2004

PAVING AND STORM DRAIN PLANS

10516 PAUL E. SIDERS

CVL

SHEET 5 OF 38

CVL PROJECT NO.: 990050-08

AS BUILT

PAVING NOTES:

1. INSTALL A.C. PAVEMENT & BASE COURSE PER TYPICAL SECTIONS ON SHT. 2
2. INSTALL BRASS CAP-M.A.G. STD. DET. 120-2 (TYPE E)
3. INSTALL BRASS CAP-M.A.G. STD. DET. 120-2 (TYPE D)
4. INSTALL 4' VALLEY GUTTER & APRONS-M.A.G. STD. DET. 240
5. INSTALL SIDEWALK-M.A.G. STD. DET. 230. (WIDTH PER TYP SECTIONS)
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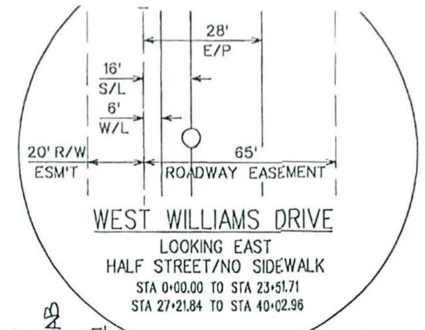
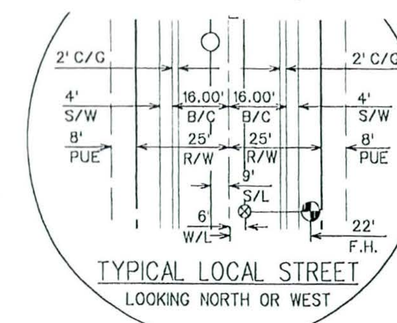
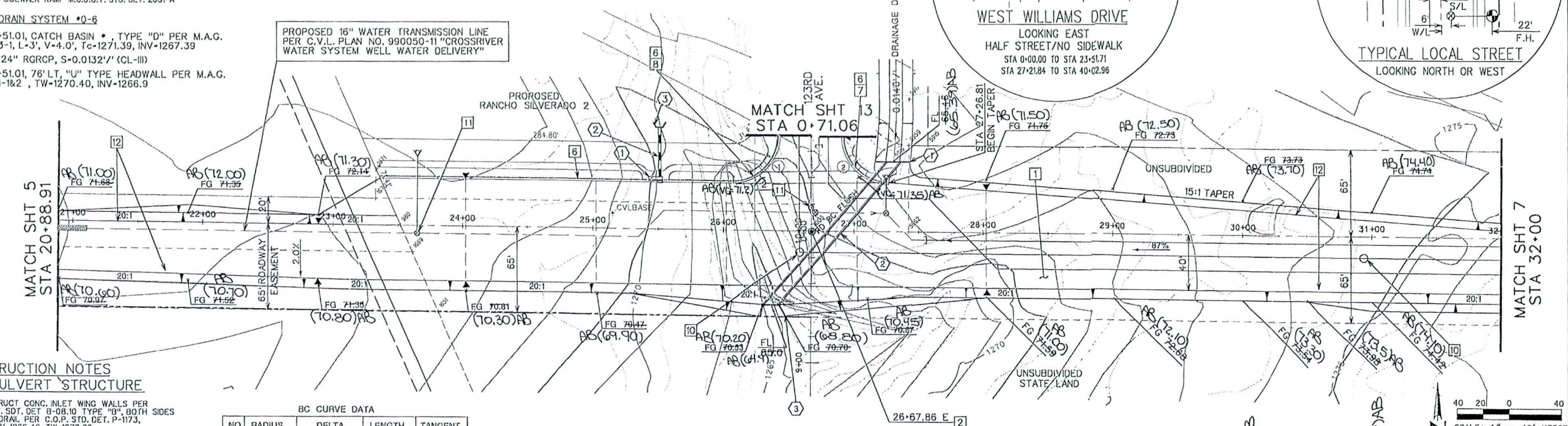
13. INSTALL DRIVEWAY ENTRANCE PER MCDOT. STD. DET. 2036.
14. INSTALL STREET SIGN BASE-M.C.D.O.T. STD. DET. 2054
15. INSTALL SCUPPER PER M.A.G. STD DET 206.1 & 206.2 W/HANDRAIL PER C.O.P. STD DET P-1173
16. INSTALL LOOSE RIP-RAP, MIN. THICKNESS - [illegible] (UNLESS OTHERWISE NOTED)
17. 2-WAY REFLECTIVE BLUE PVMT MARKER FOR FIRE HYDRANT
18. BARRICADE PER M.A.G. STD. DET. 130, TYPE 'A' UNLESS OTHERWISE NOTED
19. REMOVE BARRICADE (L.F. GIVEN)
20. SAWCUT AND MATCH EXISTING PAVEMENT (2' MIN.)

STORM DRAIN SYSTEM *0-6

(1) STA 25+51.01, CATCH BASIN * , TYPE "D" PER M.A.G. DET. 533-1, L-3', V-4.0', Tc-1271.39, INV-1267.39
(2) 37 L.F. 24" RGRCP, S-0.0132'/' (CL-III)
(3) STA 25+51.01, 76' LT, "U" TYPE HEADWALL PER M.A.G. DET. 501-1&2 , TW-1270.40, INV-1266.9





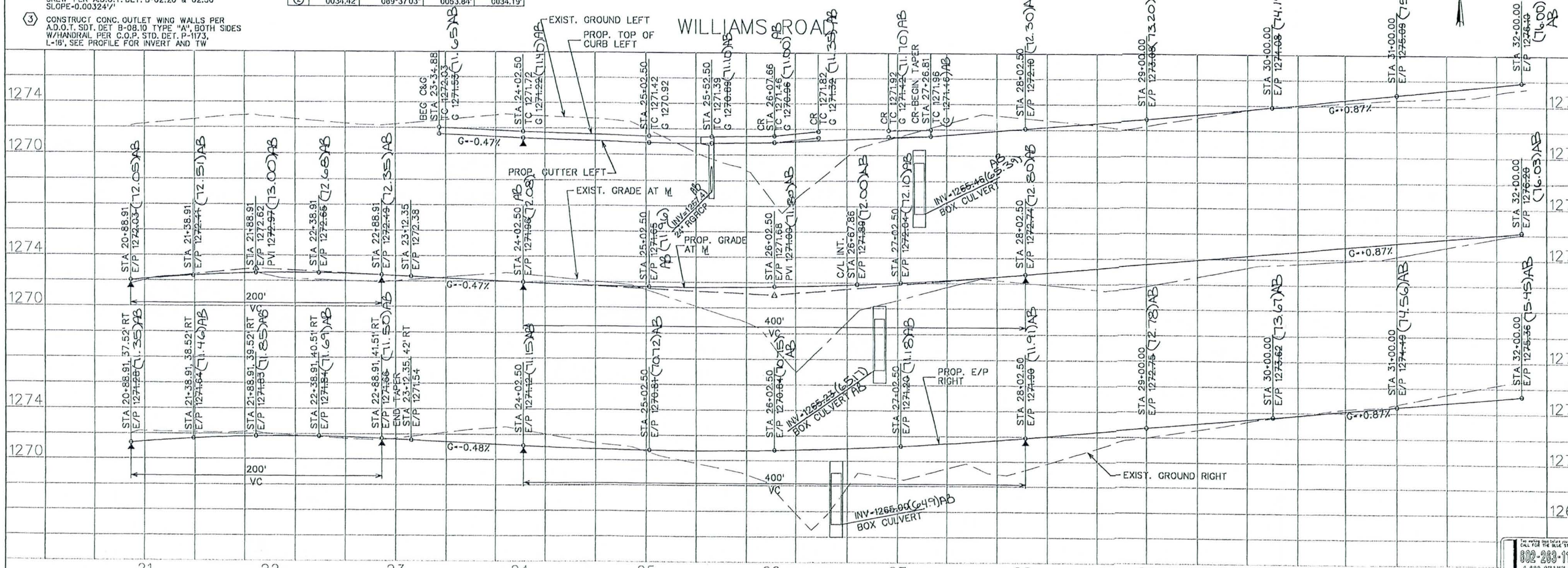


CONSTRUCTION NOTES
BOX CULVERT STRUCTURE

(1) CONSTRUCT CONC. INLET WING WALLS PER A.D.O.T. SDT. DET B-08.10 TYPE "B", BOTH SIDES W/HANDRAIL PER C.O.P. STD. DET. P-1173, L-16' INV-1265.46, TW-1270.96
(2) CONSTRUCT BOX CULVERT 1-8' X 4' X 142' @ 45° SKEW PER A.D.O.T. DET. B-02.20 & 02.30 SLOPE-0.00324'/'
(3) CONSTRUCT CONC. OUTLET WING WALLS PER A.D.O.T. SDT. DET B-08.10 TYPE "A", BOTH SIDES W/HANDRAIL PER C.O.P. STD. DET. P-1173, L-16', SEE PROFILE FOR INVERT AND TW

BC CURVE DATA

NO.	RADIUS	DELTA	LENGTH	TANGENT
1	0034.42'	090°37'31"	0054.44'	0034.80'
2	0034.42'	089°37'03"	0053.84'	0034.19'



CROSSRIVER INFRASTRUCTURE

COE & VAN LOO
PLANNING • ENGINEERING • LANDSCAPE ARCHITECTURE

4550 NORTH 12TH S[illegible]
PHOENIX, ARIZONA [illegible]
TELEPHONE (602) 26[illegible]

PAVING AND STORM DRAIN PLANS

DESIGNED	KG
DRAWN	SM/GM
CHECKED	KG
DATE	7-2004

REVISIONS | DATE | BY

Registered Professional Engineer — 10516 PAUL E. SIDERS

CVL

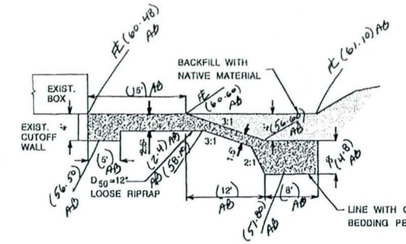
SHEET 6 OF 38

CVL PROJECT NO.: 990050-08

602-263-1100
1-800-STAKE-IT

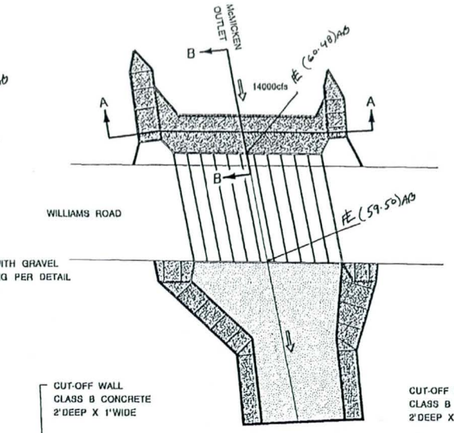
AS BUILT

DATE: Jan. 15, 2004



CROSS SECTION B-B

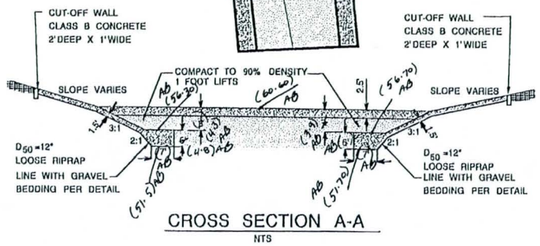
NTS



LINING DETAIL

NTS

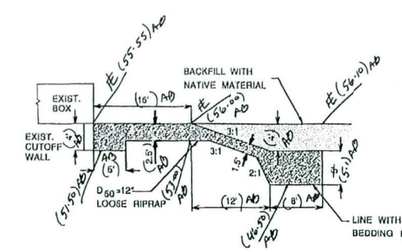
* TYPE II BEDDING MATERIAL PER DRAINAGE DESIGN MANUAL FOR MARICOPA COUNTY, VOLUME II, HYDRAULICS



CROSS SECTION A-A

NTS

WILLIAMS ROAD - INLET



CROSS SECTION B-B

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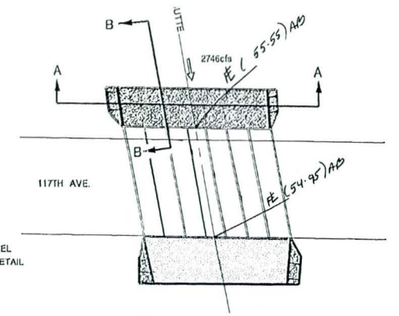

LINING DETAIL

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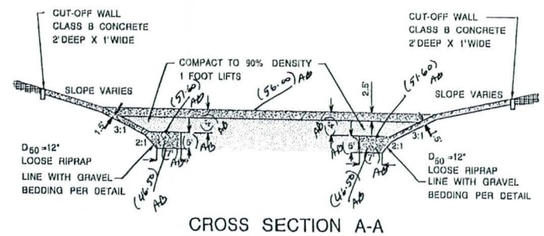
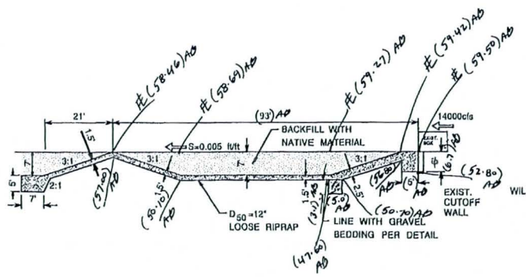


CROSS SECTION A-A

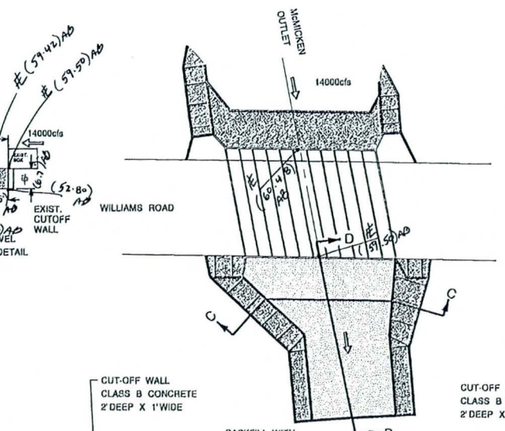
NTS

117TH AVENUE - INLET



CROSS SECTION D-D

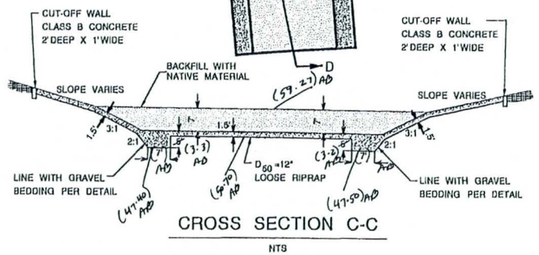
NTS



LINING DETAIL

NTS

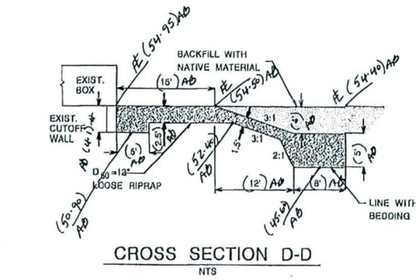
* TYPE II BEDDING MATERIAL PER DRAINAGE DESIGN MANUAL FOR MARICOPA COUNTY, VOLUME II, HYDRAULICS



CROSS SECTION C-C

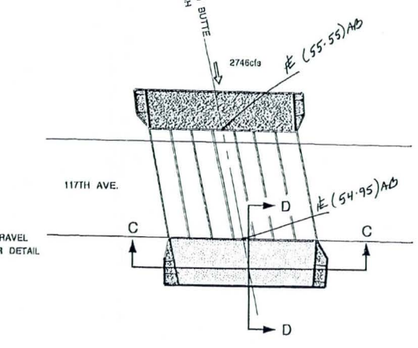
NTS

WILLIAMS ROAD - OUTLET



CROSS SECTION D-D

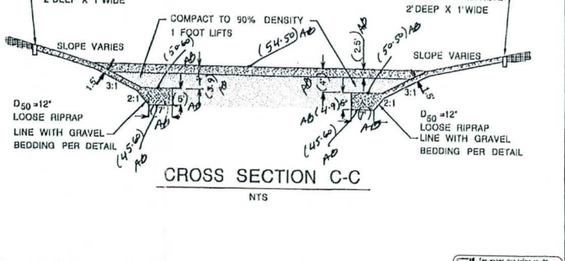
NTS



LINING DETAIL

NTS

* TYPE II BEDDING MATERIAL PER DRAINAGE DESIGN MANUAL FOR MARICOPA COUNTY, VOLUME II, HYDRAULICS



CROSS SECTION C-C

NTS

117TH AVENUE - OUTLET

CROSSRIVER INFRASTRUCTURE

COE & VAN LOO
PLANNING • ENGINEERING • LANDSCAPE ARCHITECTURE
4550 NORTH 12TH STREET
PHOENIX, ARIZONA
TELEPHONE (602) 264-6831

	BY	DATE	REVISIONS
DESIGNED	KG		
DRAWN	SM/GM		
CHECKED	KG		
DATE	7-2004		

PAVING AND STORM DRAIN PLANS

Registered Professional Engineer
CERTIFICATE NO. 10518
PAUL E. SIDERS
Date Signed 04-22-05
ARIZONA U.S.A.

CVL

SHEET 38A OF 38

CVL PROJECT NO.: 990050-08

AS BUILT 476P08R

Arizona Blue Stake, Inc. 602-263-1100 1-800-STAKE-IT (OUTSIDE MARICOPA COUNTY)

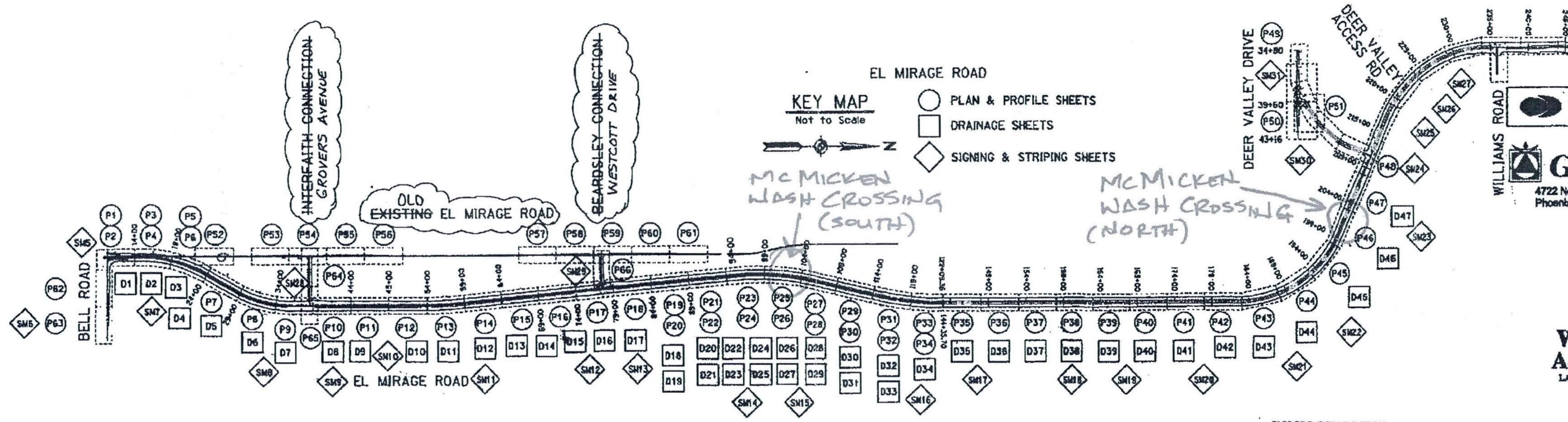
Tomc
05 APR 2006
10:50:20
n:\990050\land\pa01s38a.dgn

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	AZ	TT103/TT104	1	266	

MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION

PLANS FOR THE CONSTRUCTION OF
EL MIRAGE ROAD PHASE B - BELL ROAD TO DEER VALLEY DRIVE

PROJECT NO. TT103/TT104



Prestige

Gannett Fleming
4722 North 24th Street, Ste 120 TEL 602.553.8817
Phoenix, AZ 85016 FAX 602.553.7236
www.gannettfleming.com

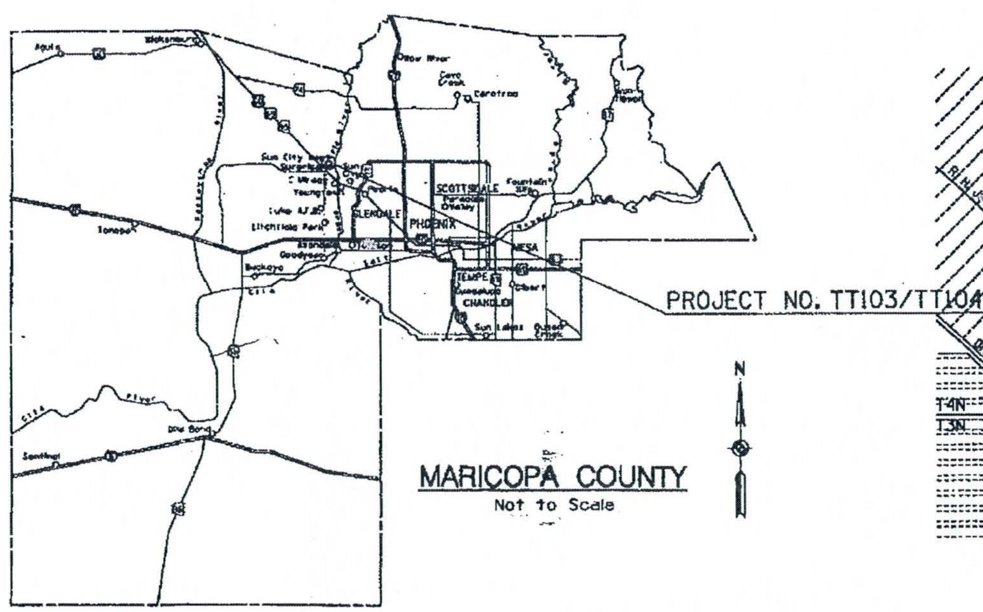
JACOBS
101 North First Avenue Suite 3100
Phoenix, Arizona 85003
(602) 253-1200 Fax (602) 253-1202

WOOD, PATEL & ASSOCIATES, INC.
LAND DEVELOPMENT • WATER RESOURCES
TRANSPORTATION / TRAFFIC
WATER / WASTEWATER • SURVEYING
CONSTRUCTION MANAGEMENT
(602) 335-8500
PHOENIX • MESA • TUCSON

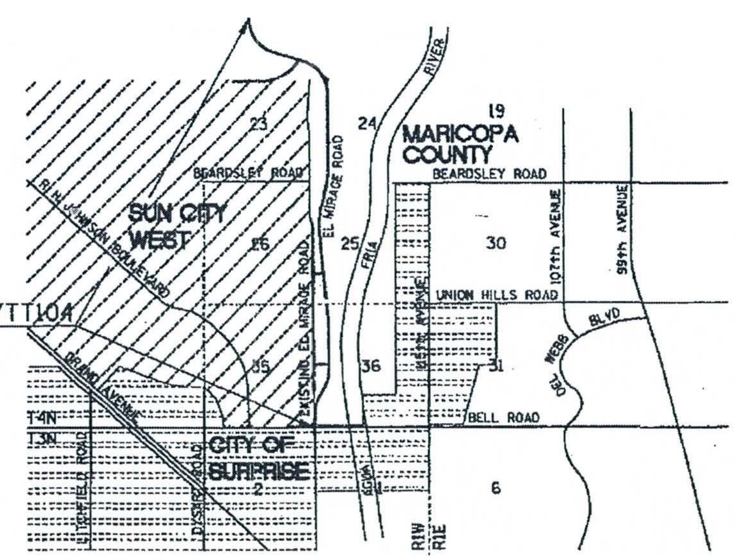
OLSSON ASSOCIATES
7250 North 16th Street, Suite 210 TEL 602.748.1000
Phoenix, AZ 85020-5282 FAX 602.748.1001
www.oaconsulting.com

PLSS PROJECT LOCATION

TOWNSHIP	RANGE	SECTION	QUARTER
4N	1W	35	SE
4N	1W	36	SW, NW
4N	1W	25	SW, NW
4N	1W	24	SW, NW
4N	1W	13	SW
4N	1W	14	SE



MARICOPA COUNTY
Not to Scale



VICINITY MAP
Not to Scale

TWO WORKING DAYS BEFORE YOU DIG, CALL 602-263-1100 BLUE STAKE

Expires 12/31/2013

Drawing As-Built Changes
Certification of these As-built drawings has been prepared based upon field observations and information received from the project owner, registered land surveyor, project contractors and public agencies and shown changes during Construction only.

MARICOPA COUNTY DEPARTMENT OF TRANSPORTATION

RECOMMENDED FOR CONSTRUCTION:
SAMI AYOUB, PROJECT MANAGER — 9/21/2009 DATE

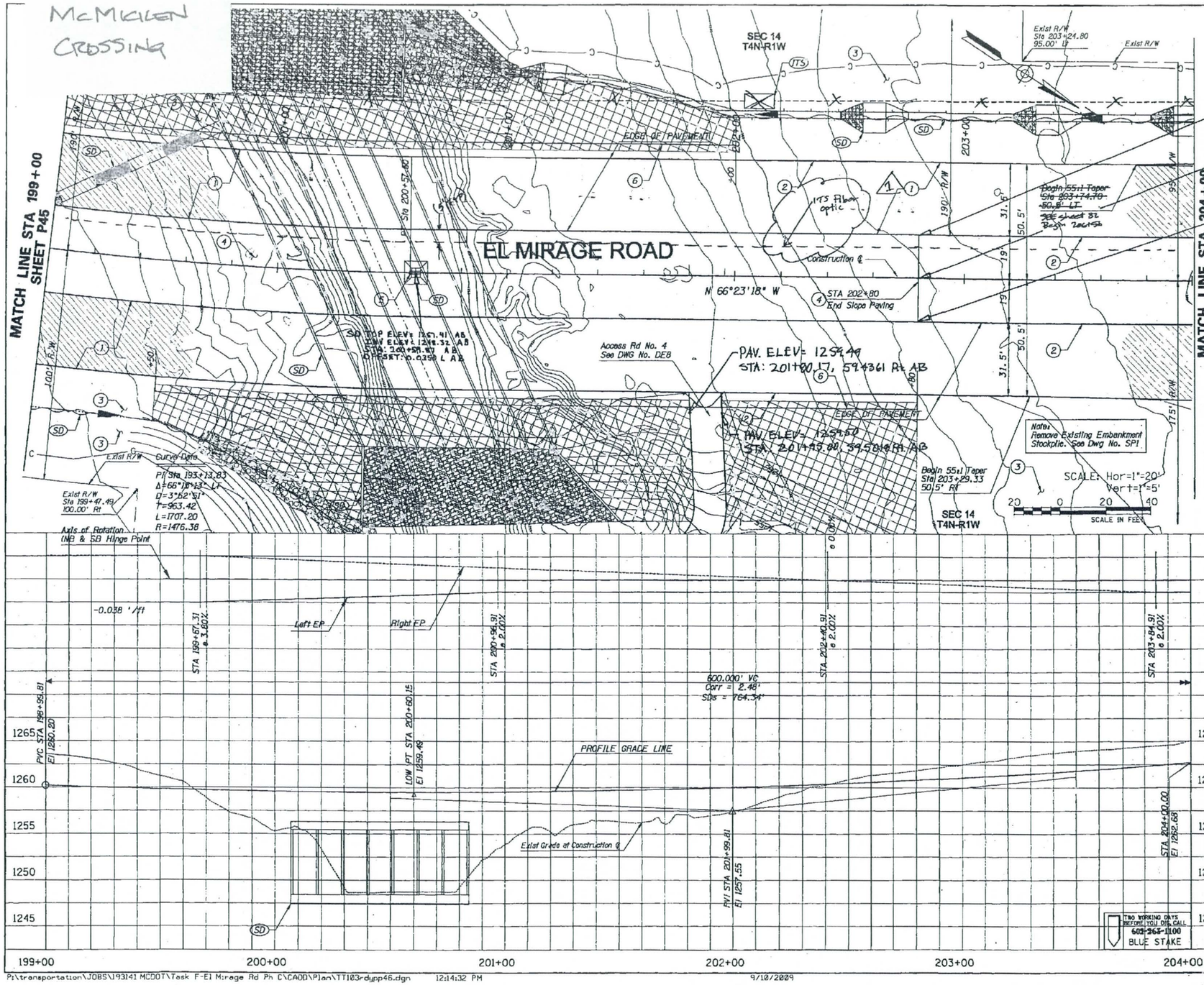
ISSUED FOR CONSTRUCTION:
JOHN B. HAUSKINS, P.E., TRANSPORTATION DIRECTOR — 9-22-09 DATE

COUNTY BOARD OF SUPERVISORS
ANDREW KUNASEK - CHAIRMAN

DISTRICT 1	FULTON BROCK
DISTRICT 2	DON STAPLEY
DISTRICT 3	ANDREW W. KUNASEK
DISTRICT 4	MAX WILSON
DISTRICT 5	MARY ROSE WILCOX

TRACS NO.

NORTH
McMICKEN
CROSSING



F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	AZ	TT103/TT104	81	266	

☐ REMOVAL /RELOCATE ☐

CONC EDGE END
ELEV= 1260.71 AB
STA: 202+82.21 AB
OFFSET: 19.283 L AB

CONC FLOWLINE END
ELEV= 1258.81 AB
STA: 202+79.98 AB
OFFSET: 0.3184 L AB

CONC EDGE END
ELEV= 1260.76 AB
STA: 202+79.85 AB
OFFSET: 18.7569 R AB

CONSTRUCTION

(1)	New Pavement Structural Section No. 1. Sta 199+00 to 204+00	3472 SY
(2)	Construct Thickened Edge, MAG Std Det 201, Type "A" Sta 199+00.00 to 204+00.00	
(3)	Place Decomposed Granite per MAG 430.4 on All Permanently Disturbed Earthen Areas	2380 SY
(4)	Concrete Median Paving, 4" Thick Sta 199+00.00 to Sta 202+80.00	14440 SF
(5)	Install Survey Monument MAG Std Det 120-2, Type D, Sta 200+57.60 PT	1 EA
(6)	Construct 3" AC Shoulder Pvmt on Prepared Subgrade, Structural Section No. 5 Lt Sta 199+00 to Sta 202+00 Rt Sta 199+50 to Sta 202+80	453 SY

NOTES

(SD) REFER TO DRAINAGE PLAN D46 FOR CULVERTS, STORM DRAIN PIPES, CATCH BASINS, MANHOLES, HEADWALLS AND RIP RAP CONSTRUCTION

(ITS) REFER TO ITS PLAN SHEETS

NOTE:
SEE DRAWING NO. GP1 AND GP2 FOR R/W DELINEATION

NO.	REVISION	BY	DATE
1	HDR, JACOBS-MOVE ITS LINE	RW/TC	March '10

MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION
ENGINEERING DIVISION

EL MIRAGE ROAD - PHASE B
BELL ROAD TO DEER VALLEY DRIVE
PROJECT NO. TT103 & NO. TT104

	BY	DATE
DESIGNED	A. FRICK	9/09
DRAWN	G. PEREZ	9/09
CHECKED	A. CABRERA	9/09

CERTIFICATE NO. 40208
ANTHONY M. CABRERA
Date Signed
Exp. 6/30/09

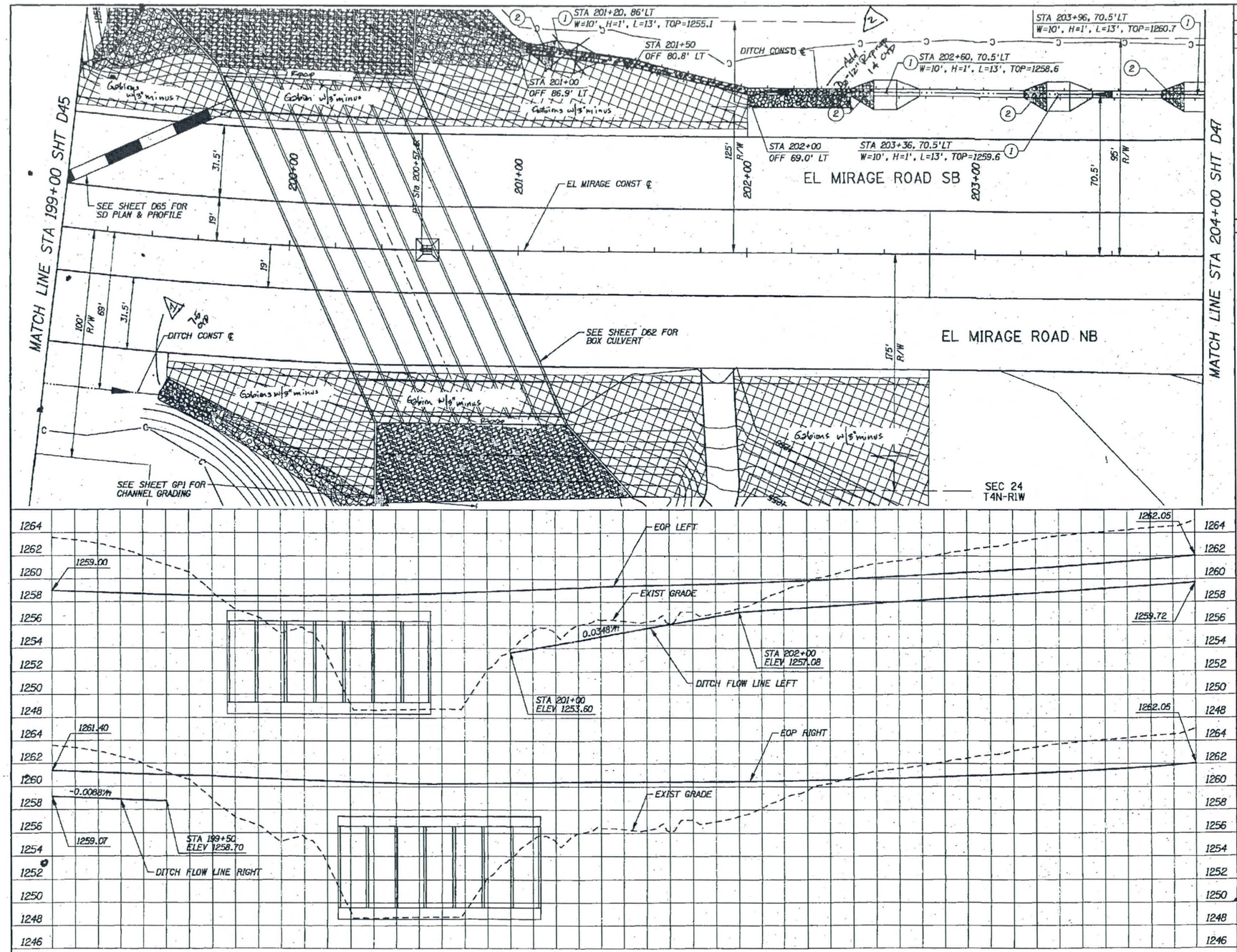
JACOBS

PAVING PLAN AND PROFILE
STA 199+00.00 TO STA 204+00.00

SHEET P46

TRACS NO.

P:\transportation\JOBS\193141 MCDOT\Task F-El Mirage Rd Ph C\CADD\Plan\TT103rdypp46.dgn 12:14:32 PM 9/10/2009



F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	AZ	TT103 & TT104	147	266	

☐ REMOVAL /RELOCATE ☐

○ CONSTRUCTION ○

(1)	CONSTRUCT DIKE PER ADOT C-03.10 TYPE B TRANSVERSE MEDIAN DIKE	4 EA
(2)	INSTALL LOOSE RIPRAP W/FILTER FABRIC D_{50}=6", DEPTH=12"	12 CY

AS-BUILTS - SEE SHT D62 FOR BOX CULVERT AS-BUILTS

20 0 20 40
SCALE IN FEET

TWO WORKING DAYS BEFORE YOU DIG, CALL 602-263-1100 BLUE STAKE

NO.	REVISION	BY	DATE
1	Add/extend Riprap ditch	Final 8/19	
2	Extend Riprap Ditch	Final 8/19	

MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION
ENGINEERING DIVISION

EL MIRAGE ROAD - PHASE B
BELL ROAD TO DEER VALLEY DRIVE
PROJECTS NO. TT103 & TT104

	BY	DATE
DESIGNED	J.TAILLON	09/09
DRAWN	D.BURMEISTER	09/09
CHECKED	J.WINCH	09/09

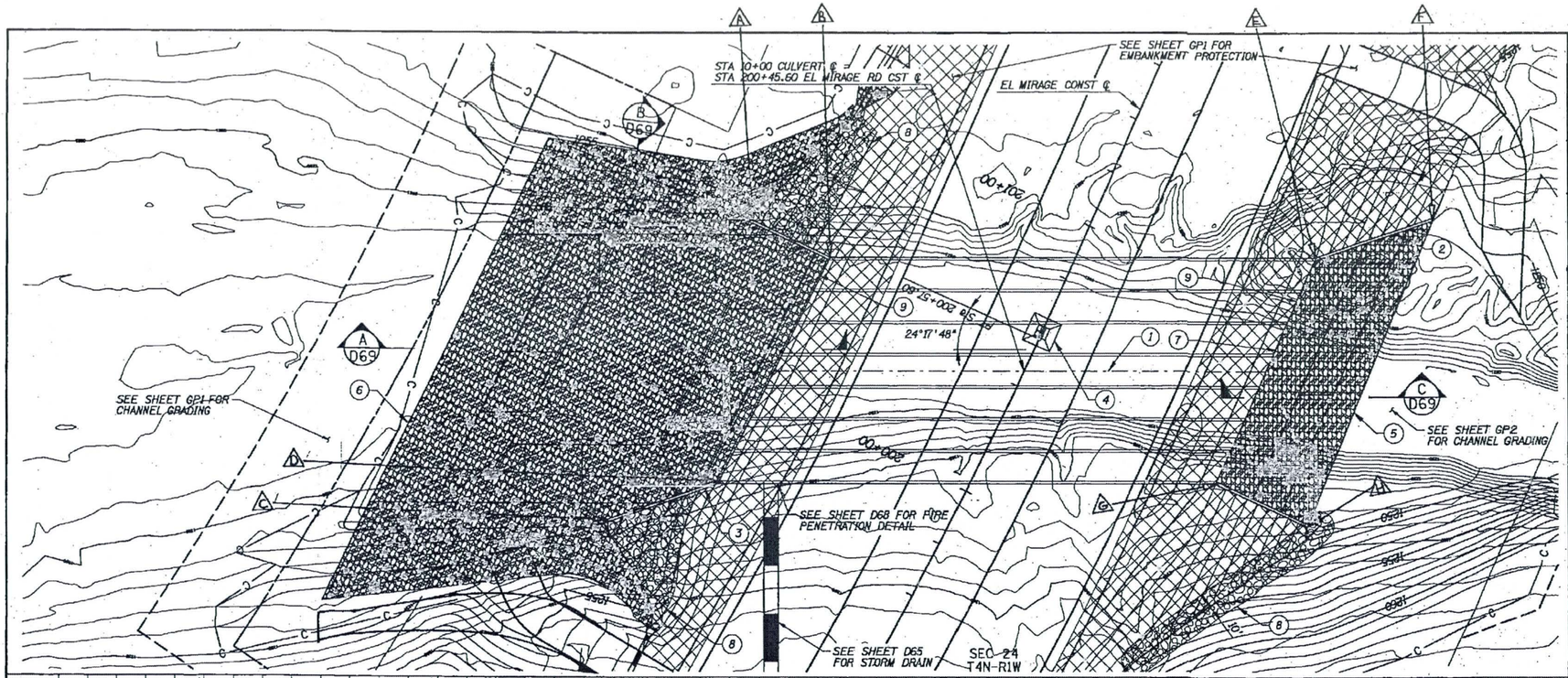
Registered Professional Engineer — Jeffrey R. Winch — Arizona, U.S.A. — Expires 09-30-09

WOOD, PATEL & ASSOCIATES, INC.
PHOENIX • MESA
GOODYEAR • TUCSON
2051 W. Northern Ave.
Phoenix, AZ 85021
(602) 336-8500

PLAN AND PROFILE
STA 199+00.00 TO STA 204+00.00

SHEET D46

TRACS NO.



F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	AZ	TT103 & TT104	163	266	

AS BUILTS

- (A) WING WALL TOP ELEV= 1251.28 STA: 200+54.99 OFFSET: 106.8913 Lt
- (B) BOX COR TOP ELEV= 1256.68 INV ELEV=1248.23 STA: 200+53.91 OFFSET: 75.5240 Lt
- (C) WING WALL TOP ELEV= 1251.28 STA: 199+31.26 OFFSET: 102.0721 Lt
- (D) BOX COR TOP ELEV= 1256.66 STA: 199+62.64 OFFSET: 76.0008 Lt
- (E) BOX COR TOP ELEV=1259.57 INV=1248.68 STA: 201+21.35 OFFSET: 75.2238 Rt
- (F) WING WALL TOP ELEV= 1251.66 STA: 201+51.08 OFFSET: 104.9402 Rt
- (G) BOX COR TOP ELEV= 1259.37 STA: 200+38.63 OFFSET: 77.6202 Rt
- (H) WING WALL TOP ELEV= 1251.53 STA: 200+38.90 OFFSET 111.9096 Rt

CONSTRUCTION

1. CONSTRUCT 7-10' x 7' CONCRETE BOX CULVERT PER MODIFIED ADOT STD DET B-02.60, 25° SKEW. SEE DETAIL ON SHEET CS16. Str. Ex = 1292 CY, Str Backfill = 486 CY — 168.3 LF
2. CONSTRUCT INLET WINGWALL PER ADOT B-04.80, MODIFIED, 4:1 SLOPE, 25° SKEW, H=10', E=35', G=42', L=3', W=3' — 1 EA
3. CONSTRUCT OUTLET WINGWALL PER ADOT B-04.50, MODIFIED, 4:1 SLOPE, 25° SKEW, E=30', G=40', L=3', W=3' — 1 EA
4. CONSTRUCT CATCH BASIN PER ADOT C-15.80 STA 200+60, 0.0' RT. SEE SHEET D68 FOR INLET DETAIL — 1 EA
5. CONSTRUCT LOOSE RIPRAP PROTECTION PER SECTION C, SHEET D69 — D_{50}=12" 384 CY
6. CONSTRUCT LOOSE RIPRAP PROTECTION PER SECTIONS A & B, SHEET D69 — D_{50}=12" 1548 CY
7. CONSTRUCT BOX CULVERT HEADWALL PER DETAIL ON SHEET D68 — 1 EA
8. CONSTRUCT LOOSE RIPRAP PROTECTION W/FILTER FABRIC, D_{50}=6", DEPTH=1.0', SEE DETAIL 4 ON SHEET D70 — 101 CY
9. CONSTRUCT SAFETY RAIL PER MAG STD DET 145 — 304 LF

SEE SHT D46 FOR AS-BUILT RIPRAP, GABION MATTRESS & ROCK MULCH

N

20 0 20 40
SCALE IN FEET

TWO WORKING DAYS BEFORE YOU DIG, CALL 602-263-1100 BLUE STAKE

NO.	REVISION	BY	DATE

MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION
ENGINEERING DIVISION

EL MIRAGE ROAD - PHASE B
BELL ROAD TO DEER VALLEY DRIVE
PROJECTS NO. TT103 & TT104

	BY	DATE
DESIGNED	J.TAILLON	09/09
DRAWN	D.BURMEISTER	09/09
CHECKED	J.MINCH	09/09

Registered Professional Engineer — Jeffrey R. Minch — Arizona, U.S.A. — Expires 09-30-09

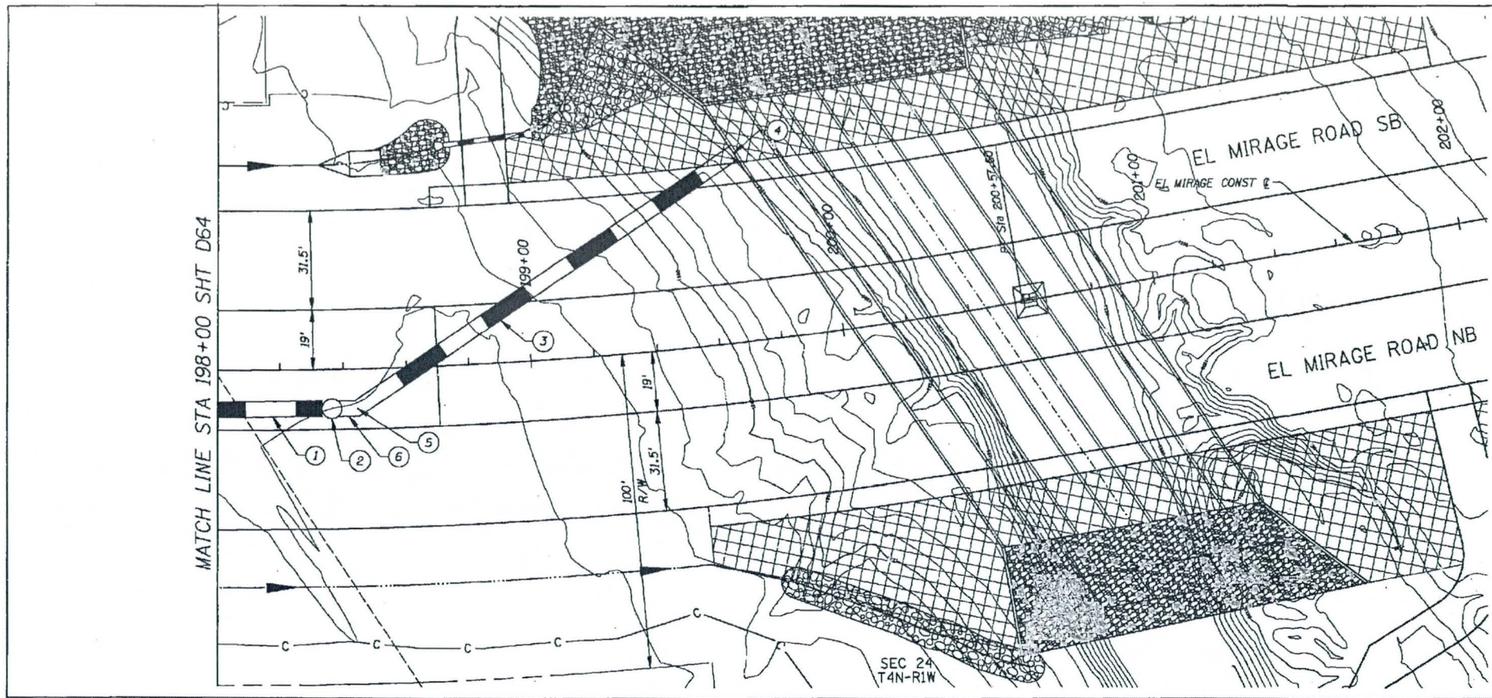
WOOD, PATEL & ASSOCIATES, INC.
PHOENIX • MESA
GOODYEAR • TUCSON
2051 W. Northern Ave.
Phoenix, AZ 85021
(602) 336-8500

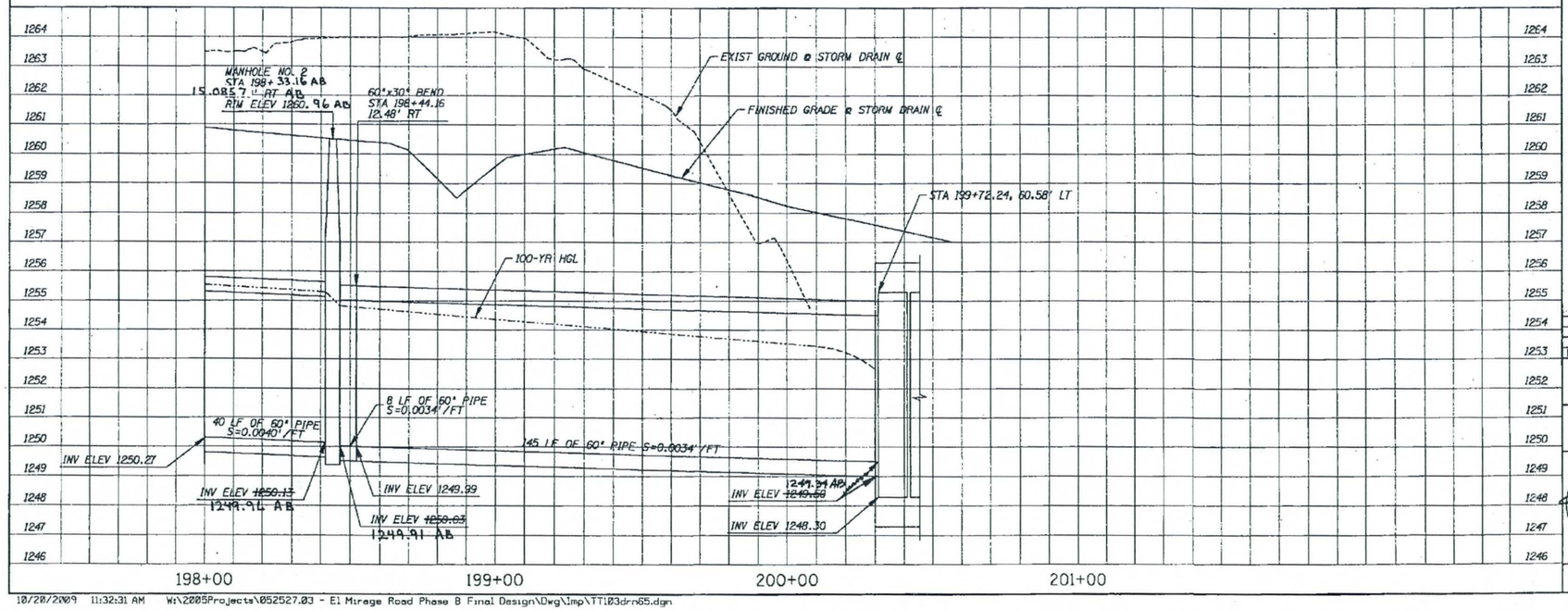
PLAN AND PROFILE
BOX CULVERT

SHEET D62

TRACS NO.

TO ACCOMPANY ADDENDUM NO. 1





F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	AZ	TT103 & TT104	166	266	

☐ REMOVAL /RELOCATE ☐

TO ACCOMPANY ADDENDUM NO. 1

○ CONSTRUCTION ○

(1)	INSTALL 60" RGRCP CLASS III	40 LF
(2)	CONSTRUCT STORM DRAIN MANHOLE PER MAG STD DET 521 & 522	1 EA
(3)	INSTALL 60" RGRCP CLASS III	145 LF
(4)	CONSTRUCT PIPE OPENING IN BOX CULVERT PER PIPE PENETRATION DETAIL SEE SHEET D68	1 EA
(5)	INSTALL 60"x30" PREFABRICATED BEND	1 EA
(6)	INSTALL 60" RGRCP CLASS III	8 LF

20 0 20 40
SCALE IN FEET

TWO WORKING DAYS BEFORE YOU DIG, CALL 602-263-1100 BLUE STAKE

NO.	REVISION	BY	DATE
1			
2			
3			

MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION
ENGINEERING DIVISION

EL MIRAGE ROAD - PHASE B
BELL ROAD TO DEER VALLEY DRIVE
PROJECTS NO. TT103 & TT104

	BY	DATE
DESIGNED	J.TAILLON	10/09
DRAWN	D.BURMEISTER	10/09
CHECKED	J.MINCH	10/09

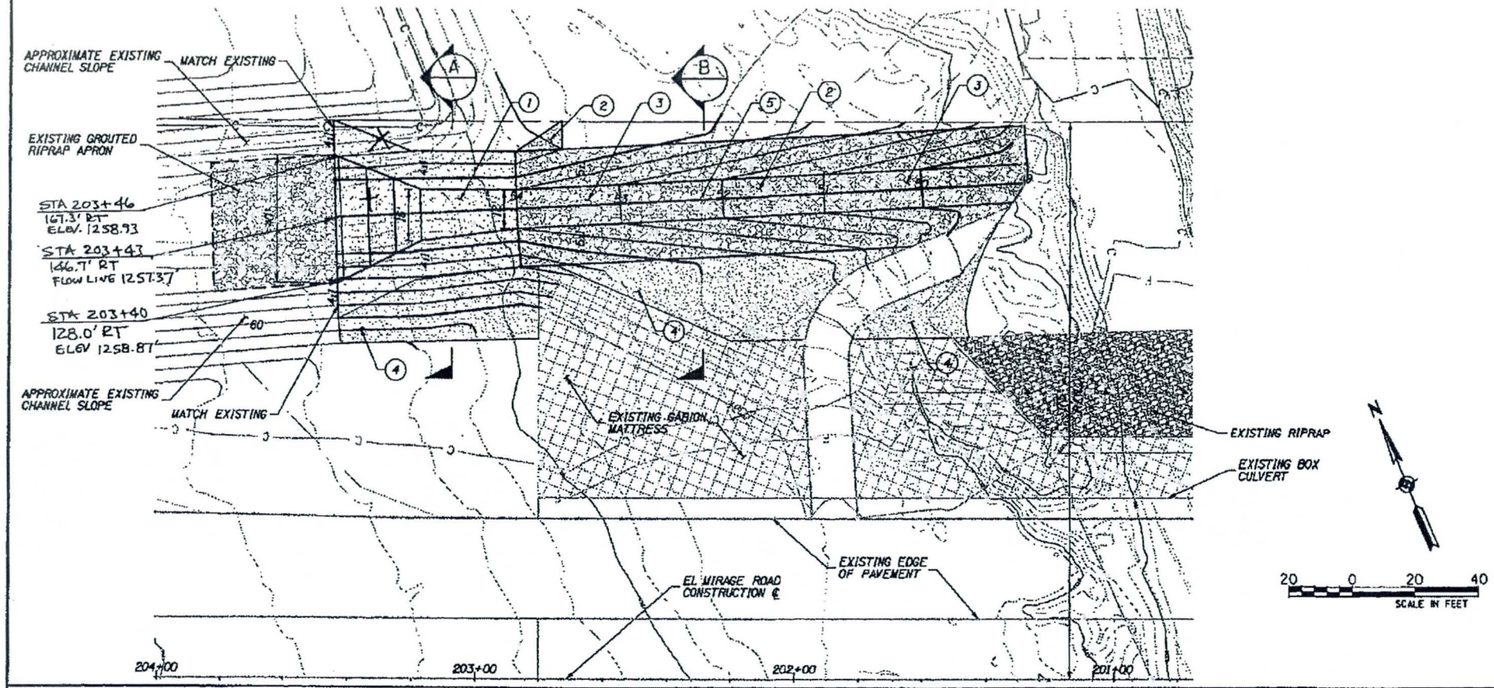
EXPIRES 09-30-12

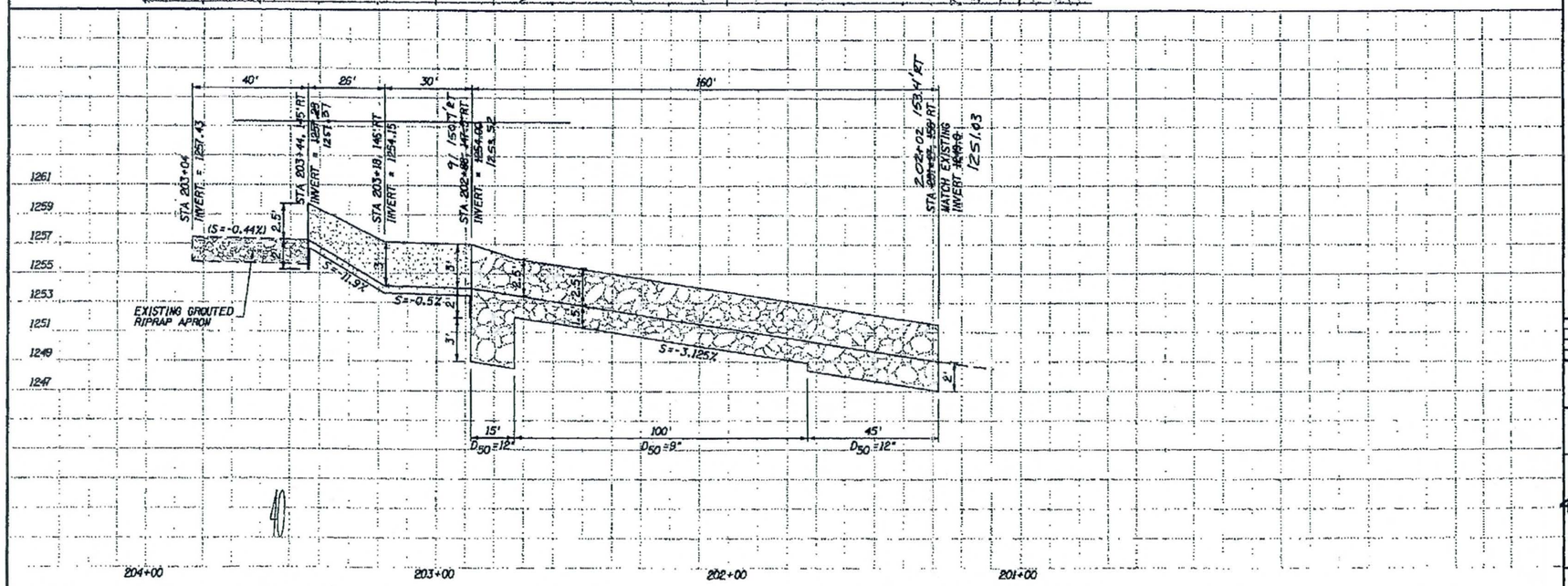
WOOD, PATEL & ASSOCIATES, INC.
PHOENIX • MESA 2051 W. Northern Ave.
GOODYEAR • TUCSON Phoenix, AZ 85021
(602) 335-8500

PLAN AND PROFILE
STORM DRAIN

SHEET D65

TRACS NO.





F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	AZ	TT103 & TT104	166A	266	

☐ REMOVAL /RELOCATE ☐

○ CONSTRUCTION ○

①	INTALL PNEUMATICALLY PLACED MORTAR (SHOTCRETE) 6" THICK W/ 4X4 - W7.5XW7.5 WELDED WIRE FABRIC 2 LAYERS OF 4"XG" MESH	222 882 SY
②	INSTALL ANGULAR LOOSE RIPRAP W/FILTER FABRIC D_{50}=9", DEPTH=1.5'	210 CY
③	INSTALL ANGULAR LOOSE RIPRAP W/FILTER FABRIC D_{50}=12", DEPTH=2'	230 CY
④	INSTALL 3" MINUS GRAVEL MULCH	267 SY
⑤	CHANNEL EXCAVATION	1,000 CY

TWO WORKING DAYS BEFORE YOU DIG CALL 602-263-1100 BLUE STAKE

NO.	REVISION	BY	DATE
1			
2			
3			

MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION
ENGINEERING DIVISION

EL MIRAGE ROAD - PHASE B
BELL ROAD TO DEER VALLEY DRIVE
PROJECTS NO. TT103 & TT104

	BY	DATE
DESIGNED	J.TAILLON	09/10
DRAWN	D.BURMEISTER	09/10
CHECKED	J.MINCH	09/10

EXPIRES 09-30-12

WOOD, PATEL & ASSOCIATES, INC.
PHOENIX • MESA
GOODYEAR • TUCSON
2051 W. Northern Ave.
Phoenix, AZ 85021
(602) 335-8300

PLAN AND PROFILE
ROADWAY CHANNEL AT MCMICKEN WASH

SHEET D65A

TRACS NO.

9/10/2010 3:58:23 PM W:\2005Projects\052527.23 - El Mirage Road Phase B Final Design\Dwg\Imp\TT103outfall.dgn

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	AZ	TT103 & TT104	173	266	

TO ACCOMPANY ADDENDUM NO. 1

STA 202+80
EL MIRAGE CONST ℄
57'54' RT
END GABION
MATTRESS

STA 202+00
EL MIRAGE CONST ℄
57'54' LT
END GABION
MATTRESS

STA 200+78.74
EL MIRAGE CONST ℄
220' LT

STA 200+78.74
EL MIRAGE CONST ℄
190' LT

STA 200+78.74
EL MIRAGE CONST ℄
145' LT

STA 200+57.60
EL MIRAGE CONST ℄
220' LT

SEE SHEET D62 FOR
BOX CULVERT, WINGWALLS,
AND OUTLET PROTECTION

SEE SHEET D62 FOR
BOX CULVERT, WINGWALLS,
AND OUTLET PROTECTION

SEE SHEET GP1
FOR QUANTITY
SEE SHT D65A
FOR CHANNEL

MATCH LINE SHEET GP2

EASEMENT

McMICKEN WASH

STA 200+28
EL MIRAGE CONST ℄
175' RT

STA 199+05.5
EL MIRAGE CONST ℄
LT 72.1249 AB
INV 1255.65 AB

STA 199+50
EL MIRAGE CONST ℄
57'54' RT
BEGIN GABION
MATTRESS

STA 198+00.00
EL MIRAGE CONST ℄
220' LT

STA 198+16.27
EL MIRAGE CONST ℄
190' LT

STA 198+67.54 AB
EL MIRAGE CONST ℄
OFFSET 69.5646 LT AB
INV 1255.89 AB

STA 198+16.27
EL MIRAGE CONST ℄
145' LT

STA 198+64
EL MIRAGE CONST ℄
65' LT
ELEV 1257.0

STA 198+96.3
EL MIRAGE CONST ℄
57'54' LT
BEGIN GABION MATTRESS

STA 198+00.00
EL MIRAGE CONST ℄
85' LT

STA 10+00 CULVERT ℄ =
STA 200+45.60 EL MIRAGE CONST ℄

SEE SHEET D65 FOR STORM
DRAIN PLAN & PROFILE

EL MIRAGE CONST ℄

EASEMENT

CONSTRUCTION NOTES

(1)	CHANNEL EXCAVATION	1285 CY
(2)	HYDROSEED DISTURBED AREA	0.1 AC
(3)	CONSTRUCT GABION MATTRESS PER DETAIL 4 ON SHEET D70	~~830~~ 990 CY
(4)	INSTALL LOOSE RIPRAP W/FILTER FABRIC, D_{50}=6", DEPTH=12"	9 CY
(5)	INSTALL REINFORCED CONCRETE END SECTION PER MAG STD DET 545 T=2-1/2", A=7', B=33", C=39' E=72", F=36", SLOPE=3	2 EA
(6)	INSTALL 18" STORM DRAIN PIPE	26 LF

SEE SHT 147 FOR AS-BUILT CONDITION

N

20 0 20 40
SCALE IN FEET

TWO WORKING DAYS BEFORE YOU DIG, CALL 602-263-1100 BLUE STAKE

NO.	REVISION	BY	DATE

MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION
ENGINEERING DIVISION

EL MIRAGE ROAD - PHASE B
BELL ROAD TO DEER VALLEY DRIVE
PROJECTS NO. TT103 & TT104

	BY	DATE
DESIGNED	J.TAILLON	09/09
DRAWN	D.BURMEISTER	09/09
CHECKED	J.MINCH	09/09

JEFFREY R. MINCH — EXPIRES 09-30-09

WOOD, PATEL & ASSOCIATES, INC.
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Phoenix, AZ 85021
(602) 336-8500

McMICKEN WASH GRADING PLAN — SHEET GP1

TRACS NO.

9/11/2009 9:26:15 AM W:\2005Projects\052527.03 - El Mirage Road Phase B Final Design\Dwg\Imp\TT103drngpl.dgn

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	AZ	TT103 & TT104	174	266	

CONSTRUCTION NOTES

(1) CHANNEL EXCAVATION 9513 CY

(2) HYDROSEED DISTURBED AREA 3.0 AC

SEE SHT D6STA FOR CHANNEL MATCH LINE SHEET GP1

STA 205+53
EL MIRAGE CONST ℄
452' RT

STA 205+69
EL MIRAGE CONST ℄
500' RT

STA 205+40
EL MIRAGE CONST ℄
593' RT

STA 204+67
EL MIRAGE CONST ℄
629' RT
ELEV 1261

STA 204+11
EL MIRAGE CONST ℄
662' RT
ELEV 1261

STA 203+99
EL MIRAGE CONST ℄
697' RT

STA 203+85
EL MIRAGE CONST ℄
307' RT

STA 203+80
EL MIRAGE CONST ℄
304' RT
ELEV 1261

STA 203+46
EL MIRAGE CONST ℄
251' RT

STA 203+17
EL MIRAGE CONST ℄
175' RT

EASEMENT

R=10'
STA 205+53
EL MIRAGE CONST ℄
453' RT
ELEV 1259

STA 205+04.36
446.2' RT
ELEV. 1259.12

R=12'
STA 204+27
EL MIRAGE CONST ℄
391' RT
ELEV 1258

R=10'
STA 203+98.01
EL MIRAGE CONST ℄
233.233' RT
ELEV 1256.25

R=12'
STA 203+56
EL MIRAGE CONST ℄
317' RT
ELEV 1257

STA 203+72.89
349.49' RT
ELEV 1257.81

EXISTING R/W

STA 202+41.60
259' RT
ELEV. 1256.03

STA 203+06.84
392.36' RT
ELEV 1251.40

STA 203+44
EL MIRAGE CONST ℄
632' RT
ELEV 1260

STA 201+27.26
EL MIRAGE CONST ℄
195' RT

STA 201+33
EL MIRAGE CONST ℄
227' RT

STA 201+97.48
458.834' RT
ELEV 1256.71

STA 201+41.44
EL MIRAGE CONST ℄
335' RT
ELEV 1255.59

McMICKEN WASH

STA 201+82
EL MIRAGE CONST ℄
437' RT

STA 202+32
EL MIRAGE CONST ℄
537' RT

EASEMENT

STA 200+46.03
EL MIRAGE CONST ℄
195' RT

20 0 20 40
SCALE IN FEET

ITEM WORKING DAYS BEFORE YOU DIG, CALL 602-263-1100 BLUE STAKE

NO.	REVISION	BY	DATE

MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION
ENGINEERING DIVISION

EL MIRAGE ROAD - PHASE B
BELL ROAD TO DEER VALLEY DRIVE
PROJECTS NO. TT103 & TT104

	BY	DATE
DESIGNED	J.TAILLON	09/09
DRAWN	D.BURMEISTER	09/09
CHECKED	J.MINCH	09/09

JEFFREY R. MINCH 22288 REGISTERED PROFESSIONAL ENGINEER ARIZONA, U.S.A. EXPIRES 09-30-09

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Phoenix, AZ 85021
(602) 335-8500

McMICKEN WASH GRADING PLAN

SHEET GP2

TRACS NO.

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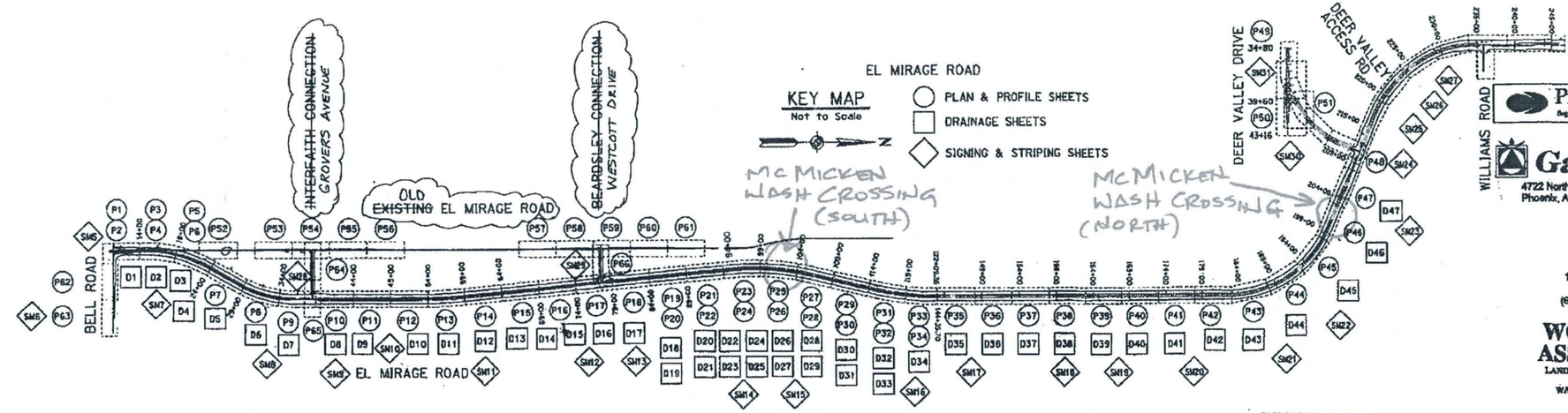
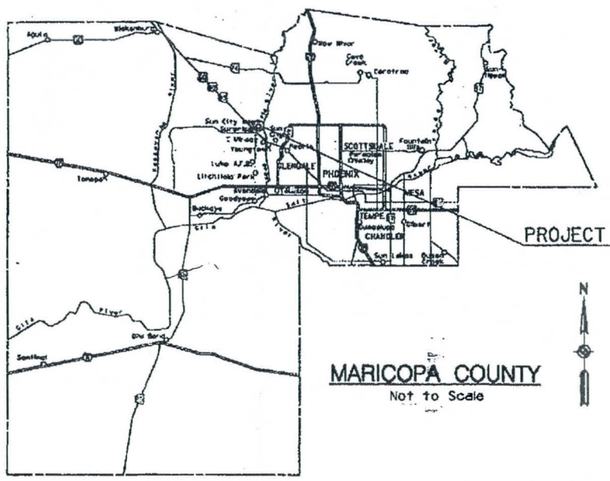
F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	AZ	TT103/TT104	1	266	

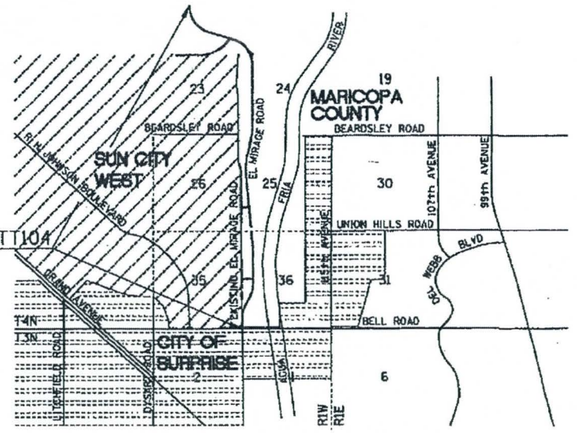
MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION

PLANS FOR THE CONSTRUCTION OF
EL MIRAGE ROAD PHASE B - BELL ROAD TO DEER VALLEY DRIVE

PROJECT NO. TT103/TT104







THO WORKING DAYS BEFORE YOU DIG, CALL 602-263-1100 BLUE STAKE

PLSS PROJECT LOCATION

TOWNSHIP	RANGE	SECTION	QUARTER
4N	1W	35	SE
4N	1W	36	SW, NW
4N	1W	25	SW, NW
4N	1W	24	SW, NW
4N	1W	13	SW
4N	1W	14	SE

Prestige Engineering Consultants
3200 N Central Ave, Suite 1200 Phoenix, AZ 85012
TEL 602-978-3300 FAX 602-978-4450

Gannett Fleming
4722 North 24th Street, Ste 120 TEL 602.553.8817
Phoenix, AZ 85016 FAX 602.553.7295
www.gannettfleming.com

JACOBS
101 North First Avenue Suite 3100
Phoenix, Arizona 85003
(602) 253-1200 Fax (602) 253-1202

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CONSTRUCTION MANAGEMENT
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OLSSON ASSOCIATES
7250 North 16th Street, Suite 210 TEL 602.748.1000
Phoenix, AZ 85020-5282 FAX 602.748.1001
www.oaconsulting.com

MARICOPA COUNTY DEPARTMENT OF TRANSPORTATION

RECOMMENDED FOR CONSTRUCTION:
SAMI AYOUB, PROJECT MANAGER — 9/21/2009 DATE

ISSUED FOR CONSTRUCTION:
JOHN B. HAUSKINS, P.E., TRANSPORTATION DIRECTOR — 9-22-09 DATE

COUNTY BOARD OF SUPERVISORS

ANDREW KUNASEK - CHAIRMAN

DISTRICT 1	FULTON BROCK
DISTRICT 2	DON STAPLEY
DISTRICT 3	ANDREW W. KUNASEK
DISTRICT 4	MAX WILSON
DISTRICT 5	MARY ROSE WILCOX

Expires 12/31/2013

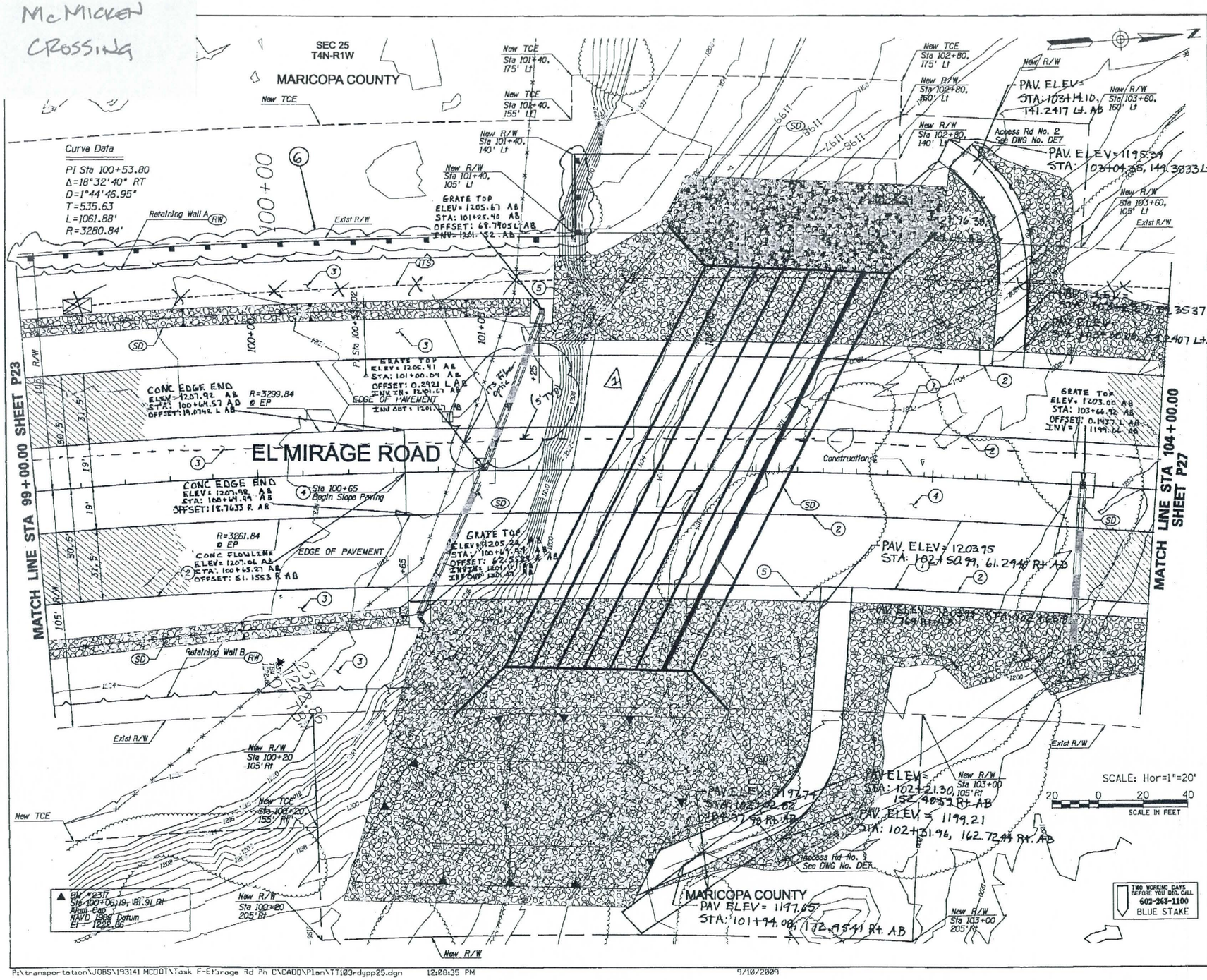
Drawing As-Built Changes

Certification of these As-built drawings has been prepared based upon field observations and information received from the project owner, registered land surveyor, project contractors and public agencies and shown changes during Construction only.

TRACS NO.

PLOTTING DATE: 9/18/2009
FILE NAME: AF1L1.S

SOUTH
McMICKEN
CROSSING



F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	AZ	TT103/TT104	60	266	

☐ REMOVAL /RELOCATE ☐

1 Remove Exist Fence — 263 LF
Sta 99+81.12, 105' Rt
to Sta 101+17.29, 105' Lt

AS - BUILTS

6 INSTALL W BEAM GUARDRAIL STA 99+00 - 101+39.50, 105' LT 90 DEGREE RETURN AT STA 101+39.5 INSTALL W BEAM GUARDRAIL FOR 105' LT TO ROW CORNER 140' LT. TYPE B PER MCDOT DETAILS 1001, 1003 G4(W2) SYSTEM.

○ CONSTRUCTION ○

1. Construct New Pavement Structural Section No. 1 — 3500 SY
Sta 99+00.00 to Sta 104+00
2. Construct Thickened Edge, MAG. Std. Det. 201, Type "A"
Sta 99+00.00 to Sta 104+00.00
3. Place Decomposed Granite per MAG 430.4 on All Permanently Disturbed Earthen Areas — 1610 SY
4. Concrete Median Paving, 4" Thick
Sta 100+65 to Sta 104+00.00 — 12713 SF
5. Construct 3" AC Shoulder Pvmt on Prepared Subgrade, Structural Section No. 5
Lt Sta 101+25 to Sta 104+00
Rt Sta 100+65 to Sta 104+00 — 440 SY

○ NOTES ○

(SD) REFER TO DRAINAGE PLANS D24-D26 FOR CULVERTS, STORM DRAIN PIPES, CATCH BASINS, MANHOLES, HEADWALLS AND RIP RAP CONSTRUCTION

(ITS) REFER TO ITS PLAN SHEETS

(RW) REFER TO RETAINIG WALL PLAN SHEET CS13 FOR RETAINING WALL CONSTRUCTION

NO.	REVISION	BY	DATE
1	ADD, JACOBS MOVE ITS LINE	WHITE Mendoza	
2			
3			

MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION
ENGINEERING DIVISION

EL MIRAGE ROAD - PHASE B
BELL ROAD TO DEER VALLEY DRIVE
PROJECT NO. TT103 & NO. TT104

	BY	DATE
DESIGNED	A. Frick	9/09
DRAWN	G. Perez	9/09
CHECKED	A. Cabrera	9/09

CERTIFICATE NO. 40208 — ANTHONY M. CABRERA — REGISTERED PROFESSIONAL ENGINEER — STATE OF ARIZONA, U.S.A. — Exp. 12/31/09

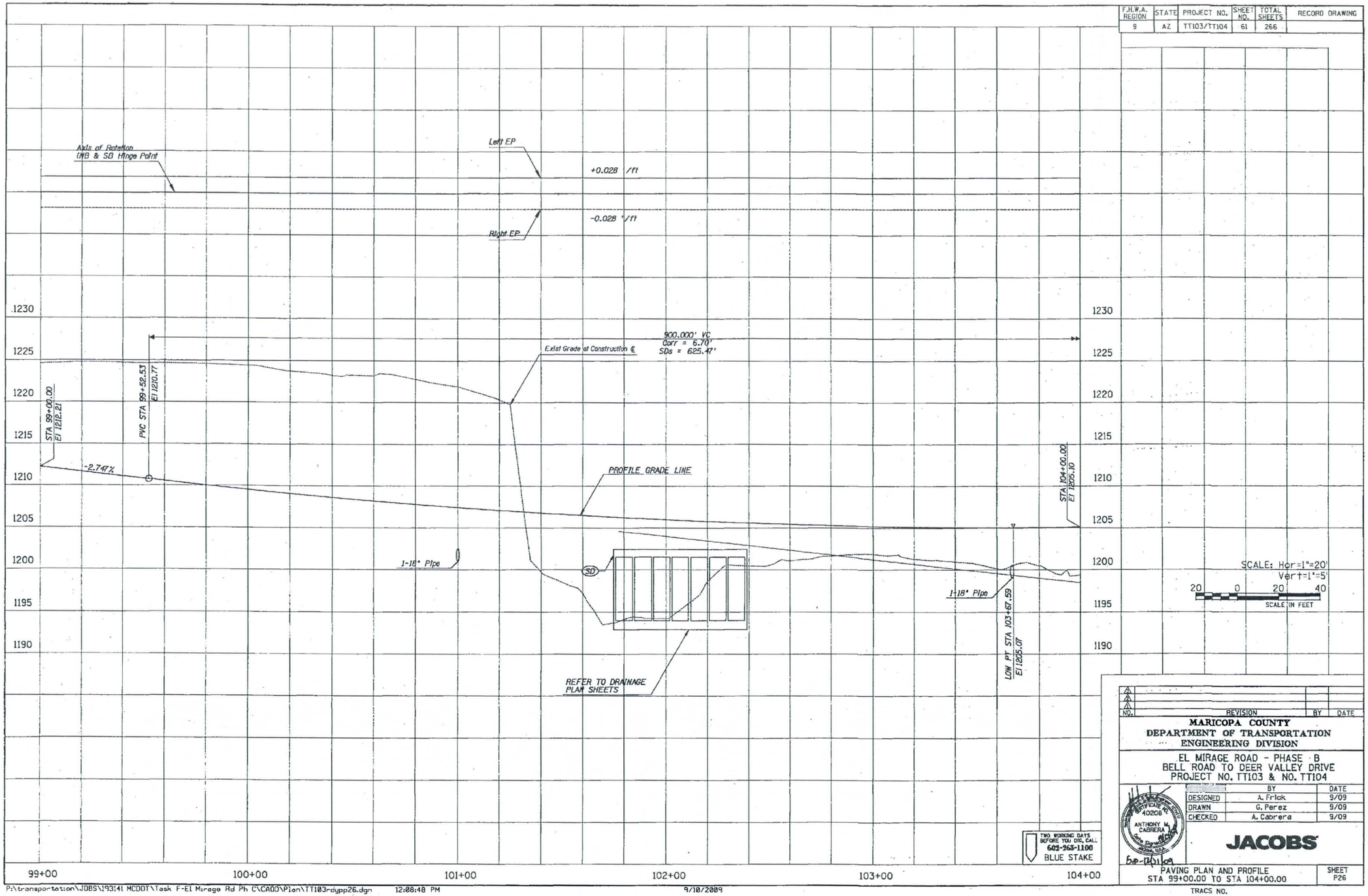
JACOBS

PAVING PLAN AND PROFILE
STA 99+00 TO STA 104+00 — SHEET P25

TRACS NO.

P:\transportation\JOBS\193141 MCDOT\Task F-ElMirage Rd Ph C\CADD\Plan\TT103rdypp25.dgn 12:08:35 PM 9/10/2009

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	AZ	TT103/TT104	61	266	



SCALE: Hor=1"=20'
Vert=1"=5'
20 0 20 40
SCALE IN FEET

TWO WORKING DAYS BEFORE YOU DIG, CALL 602-263-1100 BLUE STAKE

NO.	REVISION	BY	DATE

MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION
ENGINEERING DIVISION

EL MIRAGE ROAD - PHASE B
BELL ROAD TO DEER VALLEY DRIVE
PROJECT NO. TT103 & NO. TT104

	BY	DATE
DESIGNED	A. Frick	9/09
DRAWN	G. Perez	9/09
CHECKED	A. Cabrera	9/09

CERTIFICATE NO. 40208 ANTHONY M. CABRERA Date Signed 9/10/09

JACOBS

PAVING PLAN AND PROFILE
STA 99+00.00 TO STA 104+00.00

SHEET P26

TRACS NO.

P:\transportation\JOBS\193141 MCDOT\Task F-El Mirage Rd Ph C\CADD\Plan\TT103rdypp26.dgn 12:08:48 PM 9/10/2009

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	AZ	TT103 & TT104	127	266	

☐ REMOVAL /RELOCATE ☐

RIP RAP TOP
ELEV= 1202.70
STA: 104+71.39, 92.2951 Lt. AB

RIP RAP FLOWLINE
ELEV= 1200.97
STA: 104+71.13, 87.8957 Lt. AB

RIP RAP TOP
ELEV= 1201.86
STA: 104+71.28, 84.6506 Lt. AB

PAV. EDGE
ELEV= 1206.18
STA: 104+78.51, 58.8707 Lt. AB

○ CONSTRUCTION ○

(1) Install 12" Thick Gabion Mattress W/ Filter Fabric, D_{50}=6", Depth=12". See Sheet D70	1304 CY
(2) Install Median Catchbasin Per ADOT Std Det. C-15.80 Sta 102+64.92, 0.4937 Lt GRATE EL= 1203.00 AB Sta 101+25.40, 68.7905 Lt GRATE EL= 1205.67 AB Sta 101+80.01 0.2921 Lt GRATE EL= 1205.41 AB Sta 100+69.97 62.5589 Rt GRATE EL= 1205.22 AB See Sheet D59 & D60 For Profile	4 EA
(3) Install 18" Class III RGRCP PIPE	278 LF
(4) Install End Section Per MAG Std Det. 545	1 EA
(5) Connect 18" Pipe @ Knockout In Outlet Headwall Per Detail Sheet D61 Sta 100+95. 100' Rt	1 EA
(6) Install Loose Riprap W/Filter Fabric, D_{50}=6", Depth=12"	174 CY
(7) ~~Install Gravel Berm Gabion Berm Per Detail on Sheet D61~~	~~3 CY~~

PAV. EDGE
ELEV= 1204.86
STA: 105+21.50, 58.2490 Rt. AB
RIP RAP TOP
STA: 105+21.06, 86.2729 Rt. AB
ELEV= 1200.56

NO.	REVISION	BY	DATE
A	Add Guardrail	TC	6/10
A	Move Access Rd East	TC	6/10
A	Added Gabions w/ Rock & Wire	TC/CS	7/10
A	Added Gabions with 'B' Bundle protection	TC/CS	8/10

TWO WORKING DAYS BEFORE YOU DIG, CALL 602-263-1100 BLUE STAKE

- SEE PROPOSED PAVING PLANS FOR FINISHED GRADE ELEVATIONS

MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION
ENGINEERING DIVISION

EL MIRAGE ROAD - PHASE B
BELL ROAD TO DEER VALLEY DRIVE
PROJECT NO. TT103 & TT104

	BY	DATE
DESIGNED	R. Shah	9/10/2009
DRAWN	R. Ruiz	9/10/2009
CHECKED	K. Avumah	9/10/2009

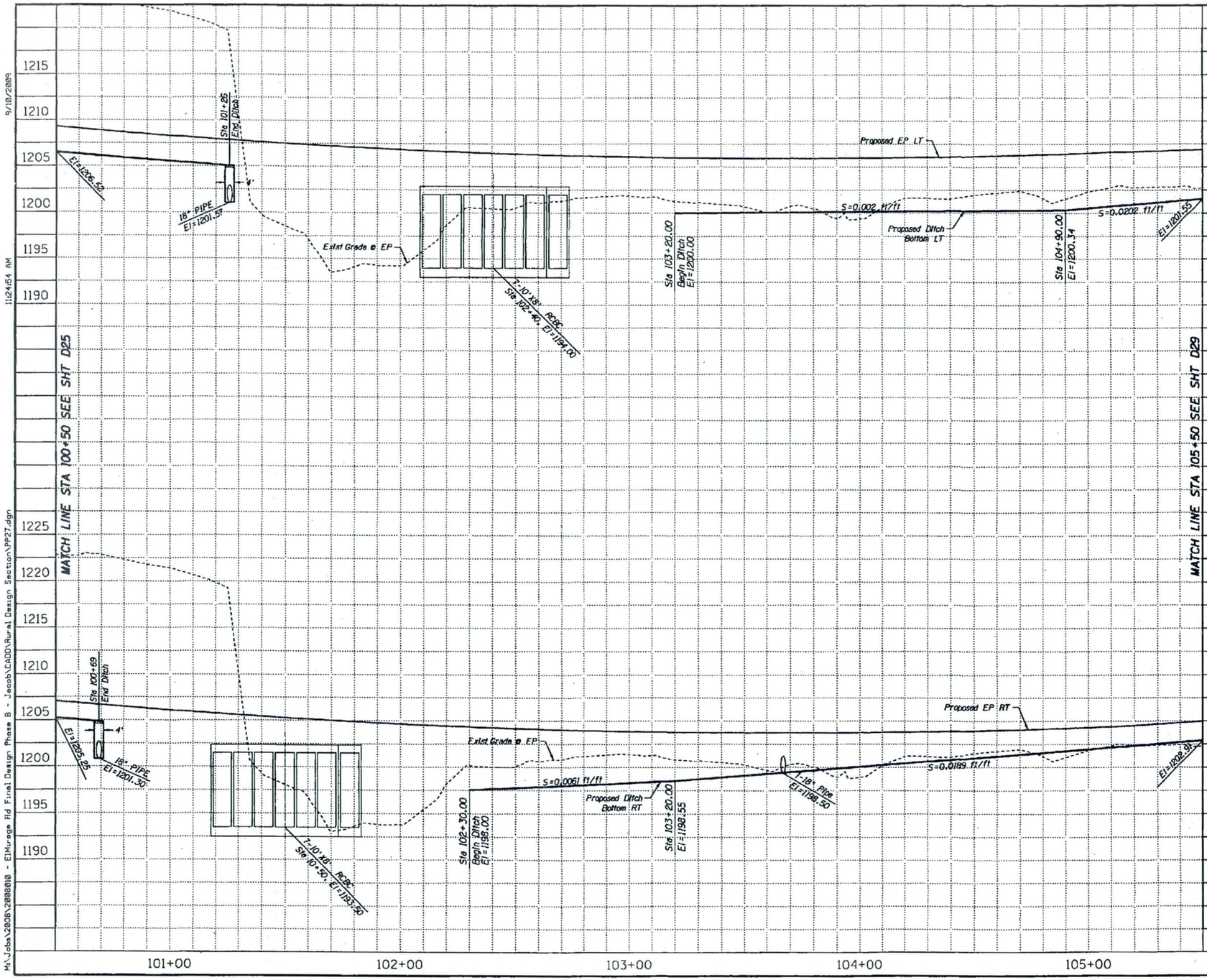
Prestige Engineering Consultants, Inc. 3404 W Cheryl Dr., Suite A130, Phoenix, AZ 85051, TEL: 602-296-3355, FAX: 602-375-4400

DITCH PLAN
STA 101+50 TO STA 105+50

SHEET OF D26

TO ACCOMPANY ADDENDUM NO. 1

9/10/2009 11:21:50 AM M:\Jobs\2008\2008010 - ElMirage Phase B Design\Design Phase B - Jacobs\CADD\Rural Design Section\PP26.dgn English



F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	AZ	TT103 & TT104	128	266	

☐ REMOVAL /RELOCATE ☐

○ CONSTRUCTION ○

TWO WORKING DAYS BEFORE YOU DIG, CALL 602-263-1100 BLUE STAKE

SCALE 1" = 20' HORIZONTAL
5' VERTICAL

SEE PROPOSED PAVING PLANS FOR FINISHED GRADE ELEVATIONS

NO.	REVISION	BY	DATE

MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION
ENGINEERING DIVISION

EL MIRAGE ROAD - PHASE B
BELL ROAD TO DEER VALLEY DRIVE
PROJECT NO. TT103 & TT104

	BY	DATE
DESIGNED	R. Shah	9/10/2009
DRAWN	R. Ruiz	9/10/2009
CHECKED	K. Awuman	9/10/2009

Prestige Engineering Consultants

DITCH PROFILE
STA 100+50 TO STA 105+50

SHEET OF 027

9/10/2009 11:24:54 AM

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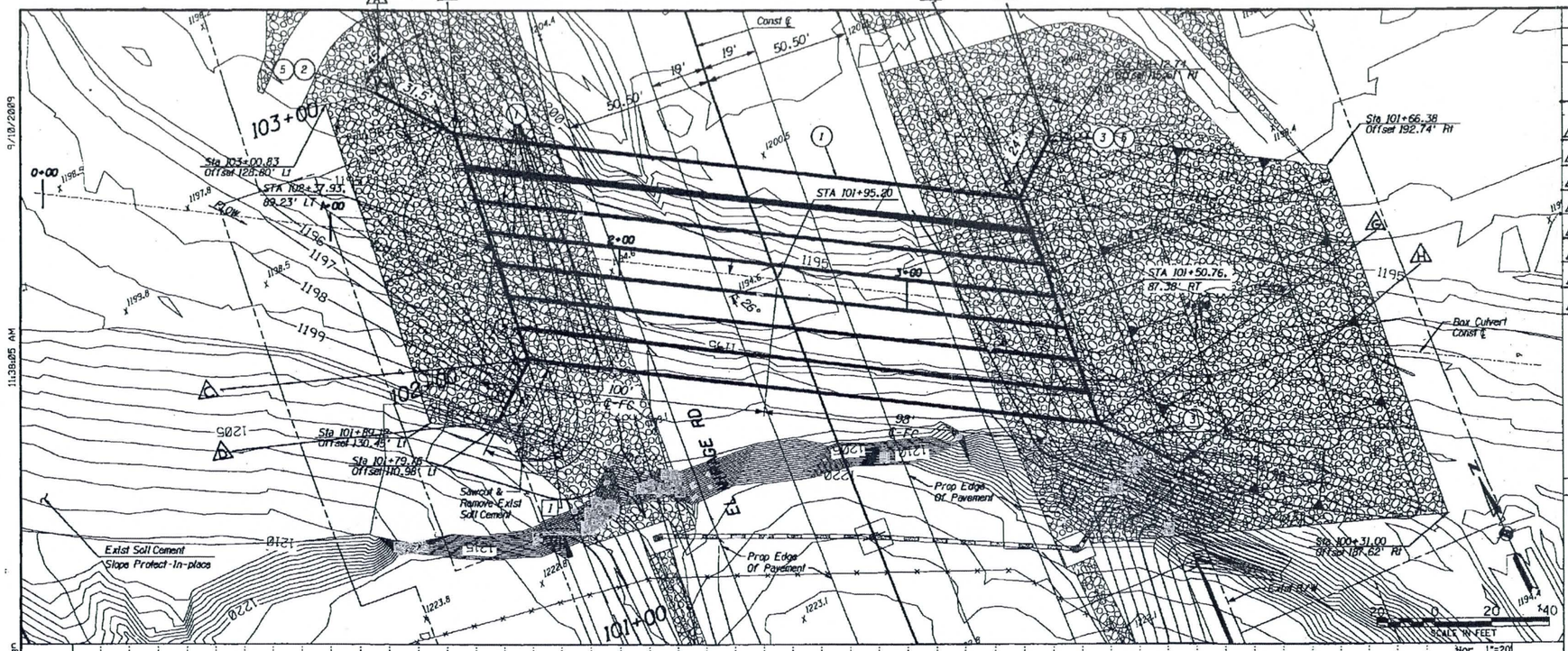
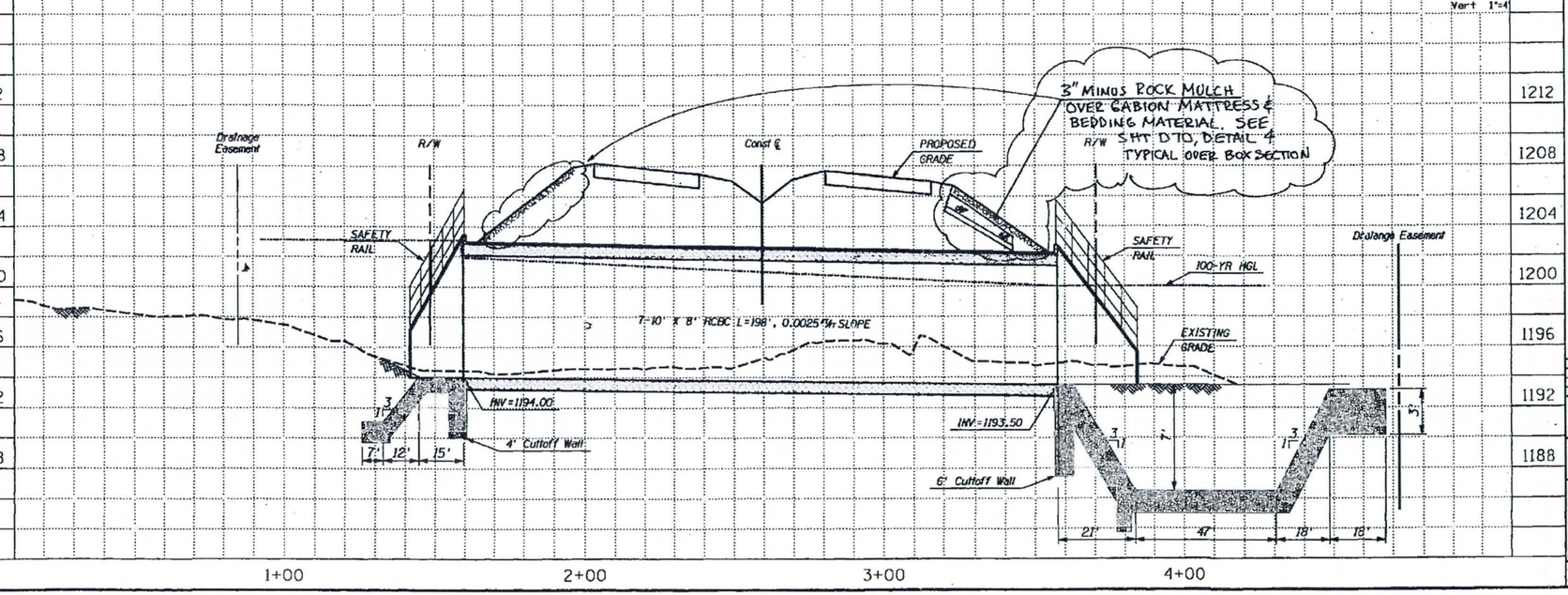
English





F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	AZ	TT103 & TT104	158	266	

☐ **REMOVAL /RELOCATE** ☐

J	SAWCUT AND REMOVE EXISTING SOIL CEMENT	330 SF

AS BUILTS

- ⚠ WING WALL TOP ELEV= 1199.45 STA: 103+00.57 OFFSET: 112.3647 Lt
- ⚠ BOX COR TOP ELEV= 1203.53 INV ELEV= 1194.11 STA: 102+79.33 OFFSET: 89.1263
- ⚠ BOX COR TOP ELEV= 1203.47 STA: 101+95.92 OFFSET: 88.9649 Lt
- ⚠ WING WALL TOP ELEV= 1199.08 STA: 101+79.70 OFFSET 106.2580 Lt
- ⚠ BOX COR TOP ELEV= 1203.12 INV= 1193.70 STA: 101+95.16 OFFSET: 87.3299 Rt
- ⚠ WING WALL TOP ELEV= 1198.70 STA: 102+12.39 OFFSET: 104.8024 Rt
- ⚠ BOX COR TOP ELEV= 1202.96 STA: 101+01.02 OFFSET: 85.9347 Rt
- ⚠ WING WALL TOP ELEV= 1198.91 STA: 100+83.04 OFFSET: 107.7386 Rt

○ **CONSTRUCTION** ○

1	7-10' x 8' BOX CULVERT Per Mod. ADOT Std. Det. B-02.60 Skew=26°, Sheet CS15, Str Ex=1,616 CY, Str Backfill=724 CY	198' LF
2	INLET HEADWALL PER ADOT Std Det. B-04.80 SS=6:1, E=24', G=31'6"	1 EA
3	OUTLET HEADWALL PER ADOT Std Det. B-04.60 SS=6:1, E=24', G=31'6"	1 EA
4	INSTALL RIPRAP W/ FILTER FABRIC SEE DETAIL SHT D58 D_{50}=12", T=18"	1665 CY
5	SAFETY RAIL PER MAG STD DET. 145 & DETAIL SHEET D61	272 CY

TWO WORKING DAYS BEFORE YOU DIG, CALL 602-263-1100 BLUE STAKE

SEE PROPOSED PAVING PLANS FOR FINISHED GRADE ELEVATIONS

NO.	REVISION	BY	DATE

MARICOPA COUNTY DEPARTMENT OF TRANSPORTATION
ENGINEERING DIVISION

EL MIRAGE ROAD - PHASE B
BELL ROAD TO DEER VALLEY DRIVE
PROJECT NO. TT103 & TT104

	BY	DATE
DESIGNED	R. Shah	9/10/2009
DRAWN	R. Ruiz	9/10/2009
CHECKED	K. Anumeth	9/10/2009

Prestige Engineering Consultants

CULVERT PLAN & PROFILE STA 102+06.93

SHEET OF D57

TO ACCOMPANY ADDENDUM NO. 1

9/10/2009 11:38:05 AM M:\Jobs\2008\2008010 - ElMirage Rd Final Design Phase B - Jacob\CADD\Rural Design Section\PP44.dgn

E.5 Hydraulic Calculations

HEC-RAS Plan: FDS River: MDOW Reach: Reach1

Reach	River Sta	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)	
Reach1	4.794	7481.00	1307.26	1316.80		1316.93	0.000362	3.85	3548.18	823.95	0.24
Reach1	4.794	7481.00	1307.26	1317.34		1317.83	0.000845	5.91	1350.34	174.03	0.35
Reach1	4.699	7481.00	1306.76	1316.67		1316.77	0.000273	3.28	4468.74	1235.97	0.20
Reach1	4.699	7481.00	1306.76	1317.01		1317.41	0.000708	5.26	1492.23	195.65	0.32
Reach1	4.601	7481.00	1306.99	1316.56		1316.64	0.000226	3.03	4772.02	1278.87	0.19
Reach1	4.601	7481.00	1306.99	1316.76		1317.05	0.000561	4.69	1733.40	243.01	0.28
Reach1	4.506	7481.00	1306.25	1316.23		1316.45	0.000575	4.53	2805.01	966.65	0.29
Reach1	4.506	7481.00	1306.25	1316.37		1316.72	0.000764	5.24	1692.92	319.98	0.33
Reach1	4.388	7481.00	1306.34	1316.14		1316.23	0.000187	2.79	4056.25	1083.59	0.17
Reach1	4.388	7481.00	1306.34	1316.30		1316.42	0.000225	3.04	2817.88	425.74	0.18
Reach1	4.293	7481.00	1305.49	1315.33		1315.97	0.001364	6.77	1467.33	622.97	0.44
Reach1	4.293	7481.00	1305.49	1315.33		1316.11	0.001575	7.27	1140.87	235.00	0.48
Reach1	4.199	7481.00	1303.72	1312.39	1311.91	1314.57	0.006040	11.85	632.76	123.75	0.89
Reach1	4.199	7481.00	1303.72	1313.12		1314.83	0.004064	10.47	714.20	113.84	0.74
Reach1	4.104	7481.00	1299.73	1310.55	1309.83	1311.61	0.005343	9.97	1205.59	531.61	0.64
Reach1	4.104	7481.00	1299.73	1311.55		1312.68	0.004303	9.72	1024.25	195.81	0.59
Reach1	3.973	7481.00	1295.35	1307.14	1307.14	1308.03	0.004801	9.75	1705.79	932.97	0.60
Reach1	3.973	7481.00	1295.35	1307.50	1307.39	1309.05	0.006397	11.58	1013.70	282.39	0.70
Reach1	3.878	7481.00	1293.46	1304.39	1304.39	1305.36	0.004640	10.05	1651.31	797.63	0.61
Reach1	3.878	7481.00	1293.46	1305.12		1306.30	0.004397	10.34	1164.10	272.12	0.60
Reach1	3.800	7481.00	1292.12	1302.28	1302.21	1303.20	0.005460	9.84	1591.16	770.22	0.64
Reach1	3.800	7481.00	1292.12	1302.91	1302.52	1304.21	0.005821	10.74	1157.80	375.51	0.67
Reach1	3.706	7481.00	1290.44	1299.65	1299.65	1300.59	0.005543	9.66	1568.65	787.82	0.65
Reach1	3.706	7481.00	1290.44	1299.94	1299.79	1301.27	0.006396	10.67	1082.91	321.16	0.70

HEC-RAS Plan: FDS River: MDOW Reach: Reach1 (Continued)

Reach	River Sta	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)	
Reach1	3.589	7481.00	1286.79	1296.52		1297.23	0.003576	7.66	1502.66	572.16	0.52
Reach1	3.589	7481.00	1286.79	1297.13		1298.16	0.003902	8.47	1049.91	218.70	0.55
Reach1	3.494	7481.00	1283.78	1294.29	1294.29	1295.24	0.004256	9.36	1641.47	873.21	0.59
Reach1	3.494	7481.00	1283.78	1295.21	1294.39	1296.26	0.003612	9.29	1225.08	311.97	0.55
Reach1	3.399	7481.00	1281.80	1291.72	1291.72	1292.73	0.005442	10.04	1487.65	668.04	0.65
Reach1	3.399	7481.00	1281.80	1292.07	1292.07	1293.75	0.006981	11.73	958.92	268.10	0.74
Reach1	3.350	7481.00	1280.78	1291.82	1286.71	1291.84	0.000131	1.88	6804.87	1208.55	0.11
Reach1	3.350	7481.00	1280.78	1292.18	1286.71	1292.32	0.000418	3.45	2811.63	342.93	0.19
Reach1	3.330	Culvert									
Reach1	3.310	7481.00	1280.17	1289.12	1285.91	1289.55	0.001816	5.29	1517.77	641.28	0.37
Reach1	3.310	7481.00	1280.17	1289.64	1285.91	1290.00	0.001367	4.83	1673.14	406.99	0.33
Reach1	3.266	7481.00	1277.53	1287.61	1287.61	1288.65	0.006543	10.58	1408.00	631.64	0.70
Reach1	3.266	7481.00	1277.53	1288.43	1287.95	1289.31	0.004655	9.59	1376.48	394.54	0.60
Reach1	3.171	7620.00	1276.50	1284.63		1285.28	0.006336	8.52	1405.13	771.39	0.66
Reach1	3.171	7620.00	1276.50	1285.61		1286.42	0.006908	9.66	1430.41	532.75	0.70
Reach1	3.077	7620.00	1273.96	1283.35		1283.69	0.002243	5.51	1820.86	710.08	0.41
Reach1	3.077	7620.00	1273.96	1283.92		1284.42	0.002737	6.49	1662.18	466.01	0.46
Reach1	2.986	7620.00	1272.42	1281.46		1282.24	0.004419	8.48	1588.48	696.02	0.58
Reach1	2.986	7620.00	1272.42	1282.06		1282.91	0.003844	8.31	1169.13	214.07	0.55
Reach1	2.891	7620.00	1270.44	1278.59	1277.90	1279.68	0.005871	8.93	1108.71	368.55	0.65
Reach1	2.891	7620.00	1270.44	1278.96		1280.39	0.006453	9.62	798.09	129.90	0.68
Reach1	2.787	7620.00	1267.34	1275.71		1276.71	0.004954	8.90	1212.84	425.43	0.62
Reach1	2.787	7620.00	1267.34	1276.49		1277.51	0.004008	8.64	1071.84	207.67	0.57
Reach1	2.692	7620.00	1263.48	1272.74	1272.70	1273.92	0.006290	10.37	1258.08	473.00	0.70

HEC-RAS Plan: FDS River: MDOW Reach: Reach1 (Continued)

Reach	River Sta	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)	
Reach1	2.692	7620.00	1263.48	1273.22		1274.88	0.006853	11.32	852.60	167.12	0.74
Reach1	2.632	7620.00	1262.31	1272.73	1267.27	1272.97	0.000660	4.06	2269.15	482.89	0.24
Reach1	2.632	7620.00	1262.31	1273.45	1267.28	1273.71	0.000621	4.04	1883.87	195.62	0.23
Reach1	2.618	Culvert									
Reach1	2.603	7620.00	1259.63	1271.29	1266.80	1271.62	0.000975	4.79	1961.63	464.16	0.29
Reach1	2.603	7620.00	1259.63	1271.92	1266.80	1272.27	0.000900	4.82	1628.04	191.44	0.28
Reach1	2.556	7620.00	1259.47	1269.12	1269.12	1270.73	0.006678	11.36	1022.10	338.03	0.73
Reach1	2.556	7620.00	1259.47	1270.10		1271.52	0.004778	10.43	964.74	187.50	0.63
Reach1	2.461	7620.00	1254.90	1267.21	1266.12	1267.85	0.003074	8.16	1692.17	495.16	0.49
Reach1	2.461	7620.00	1254.90	1267.89	1266.76	1269.22	0.004441	10.33	1008.82	185.42	0.60
Reach1	2.367	7620.00	1252.37	1263.48	1263.48	1265.42	0.007397	12.54	915.05	275.22	0.76
Reach1	2.367	7620.00	1252.37	1263.55	1263.55	1266.06	0.008703	13.67	720.92	146.62	0.83
Reach1	2.272	7620.00	1248.56	1261.49		1262.00	0.001604	6.78	1412.71	301.87	0.36
Reach1	2.272	7620.00	1248.56	1261.50		1262.40	0.002581	8.61	1046.60	187.01	0.46
Reach1	2.196	7620.00	1248.07	1261.37	1254.09	1261.56	0.000427	3.71	2499.35	412.49	0.20
Reach1	2.196	7620.00	1248.07	1261.43	1254.08	1261.68	0.000539	4.02	1895.58	174.88	0.22
Reach1	2.174	Culvert									
Reach1	2.151	7620.00	1246.86	1254.26	1253.67	1256.88	0.009391	12.99	586.57	154.59	0.87
Reach1	2.151	7620.00	1246.86	1254.26	1253.68	1256.88	0.009391	12.99	586.57	154.59	0.87
Reach1	2.050	7620.00	1245.01	1251.52		1252.49	0.004951	7.90	964.25	223.66	0.67
Reach1	2.050	7620.00	1245.01	1251.52		1252.49	0.004951	7.90	964.25	223.66	0.67
Reach1	1.899	7620.00	1241.89	1247.93		1248.84	0.004229	7.64	997.33	203.80	0.61
Reach1	1.899	7620.00	1241.89	1247.93		1248.84	0.004229	7.64	997.33	203.80	0.61

HEC-RAS Plan: FDS River: MDOW Reach: Reach1 (Continued)

Reach	River Sta	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)	
Reach1	1.804	7620.00	1239.75	1246.07		1246.81	0.003715	6.92	1101.88	214.59	0.54
Reach1	1.804	7620.00	1239.75	1246.07		1246.81	0.003715	6.92	1101.88	214.59	0.54
Reach1	1.671	7620.00	1237.20	1243.30		1244.07	0.004101	7.04	1082.39	215.64	0.55
Reach1	1.671	7620.00	1237.20	1243.30		1244.07	0.004101	7.04	1082.39	215.64	0.55
Reach1	1.576	7620.00	1235.15	1241.26		1242.01	0.004097	6.93	1100.02	222.17	0.55
Reach1	1.576	7620.00	1235.15	1241.26		1242.01	0.004097	6.93	1100.02	222.17	0.55
Reach1	1.501	7620.00	1233.84	1238.33	1237.82	1239.59	0.009272	9.04	843.12	223.49	0.82
Reach1	1.501	7620.00	1233.84	1238.33	1237.82	1239.59	0.009272	9.04	843.12	223.49	0.82
Reach1	1.481	7620.00	1233.39	1237.37	1237.37	1238.97	0.003971	10.15	750.92	234.80	1.00
Reach1	1.481	7620.00	1233.39	1237.37	1237.37	1238.97	0.003971	10.15	750.92	234.80	1.00
Reach1	1.406	7620.00	1209.94	1216.27		1216.98	0.000886	6.75	1129.25	210.54	0.51
Reach1	1.406	7620.00	1209.94	1216.27		1216.98	0.000886	6.75	1129.25	210.54	0.51
Reach1	1.362	7620.00	1208.28	1215.60		1216.67	0.001648	8.28	920.65	201.19	0.68
Reach1	1.362	7620.00	1208.28	1215.60		1216.67	0.001648	8.28	920.65	201.19	0.68
Reach1	1.267	7620.00	1206.19	1214.32		1215.28	0.005259	7.88	967.51	205.63	0.64
Reach1	1.267	7620.00	1206.19	1214.32		1215.28	0.005259	7.88	967.51	205.63	0.64
Reach1	1.137	7620.00	1203.07	1211.01		1211.93	0.004517	7.67	993.96	205.44	0.61
Reach1	1.137	7620.00	1203.07	1211.01		1211.93	0.004517	7.67	993.96	205.44	0.61
Reach1	1.042	7620.00	1200.99	1209.13		1209.95	0.003391	7.29	1045.63	212.56	0.58
Reach1	1.042	7620.00	1200.99	1209.13		1209.95	0.003391	7.29	1045.63	212.56	0.58
Reach1	0.937	7620.00	1198.74	1207.31		1208.02	0.003447	6.79	1122.50	212.06	0.52
Reach1	0.937	7620.00	1198.74	1207.31		1208.02	0.003447	6.79	1122.50	212.06	0.52
Reach1	0.823	7620.00	1195.73	1206.89		1207.14	0.000633	4.00	1902.99	364.17	0.31
Reach1	0.823	7620.00	1195.73	1206.89		1207.14	0.000633	4.00	1902.99	364.17	0.31

HEC-RAS Plan: FDS River: MDOW Reach: Reach1 (Continued)

Reach	River Sta	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)	
Reach1	0.792	7620.00	1193.72	1206.83	1199.67	1206.95	0.000854	2.83	2694.82	508.83	0.21
Reach1	0.792	7620.00	1193.72	1206.83	1199.67	1206.95	0.000854	2.83	2694.82	508.83	0.21
Reach1	0.768	Culvert									
Reach1	0.744	7620.00	1190.98	1201.30	1199.67	1203.28	0.013223	11.30	674.55	384.57	0.71
Reach1	0.744	7620.00	1190.98	1201.30	1199.67	1203.28	0.013223	11.30	674.55	384.57	0.71
Reach1	0.709	7620.00	1192.39	1199.63		1200.34	0.011196	7.64	1222.96	377.68	0.60
Reach1	0.709	7620.00	1192.39	1199.63		1200.34	0.011196	7.64	1222.96	377.68	0.60
Reach1	0.603	7620.00	1186.36	1194.65		1195.12	0.008724	7.15	1472.97	480.73	0.53
Reach1	0.603	7620.00	1186.36	1194.65		1195.12	0.008724	7.15	1472.97	480.73	0.53
Reach1	0.509	7620.00	1183.33	1191.41	1189.47	1191.83	0.005831	5.46	1614.20	608.09	0.43
Reach1	0.509	7620.00	1183.33	1191.41	1189.47	1191.83	0.005831	5.46	1614.20	608.09	0.43
Reach1	0.414	7620.00	1179.16	1185.60	1185.60	1186.61	0.022161	9.06	1079.77	552.60	0.81
Reach1	0.414	7620.00	1179.16	1185.60	1185.60	1186.61	0.022161	9.06	1079.77	552.60	0.81
Reach1	0.324	7620.00	1175.19	1183.03	1181.17	1183.16	0.002501	3.53	2811.48	915.60	0.28
Reach1	0.324	7620.00	1175.19	1183.03	1181.13	1183.16	0.002501	3.53	2811.70	915.60	0.28

HEC-RAS Version 4.1.0 Jan 2010
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```
X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X       X   X     X  X     X
X     X  X             X      X   X    X    X    X
XXXXXXX  XXXX        X       XXX  XXXX  XXXXXX    XXXX
X     X  X           X            X  X  X    X        X
X     X  X        X    X          X   X  X    X       X
X     X  XXXXXX    XXXX           X    X  X    X   XXXXX
```

****

PROJECT DATA
Project Title: McMicken Dam Outlet Wash
Project File : MDOWFP.prj
Run Date and Time: 6/14/2013 8:58:47 AM

Project in English units

Project Description:
McMicken Dam Outlet Wash Floodplain Delineation Study
Contract FCD 2011C003
Assignment 4

Consultant: RBF Consulting
2929 North Central Avenue
#800
Phoenix, AZ 85012

Model Geometry based upon 1' contour interval
mapping

Vertical Datum in NAVD88

Aerial mapping provided by the Flood
Control District of Maricopa County for McMicken Outfall Channel Mapping,
Contract FCD 2012C033, Flight Date October 8, 2012.

HEC-RAS Version
4.1.0
McMicken Dam Outlet Wash is tributary to the Agua Fria River

Last Run
Date June 14, 2013

****

PLAN DATA

Plan Title: Floodplain Delineation
Plan File : h:\PDATA\133347\Calcs\Strmwater\Hydraulics\MDOWFP.p01

Geometry Title: Existing Conditions
Geometry File : h:\PDATA\133347\Calcs\Strmwater\Hydraulics\MDOWFP.g01

Flow Title   : Existing Conditions
Flow File   : h:\PDATA\133347\Calcs\Strmwater\Hydraulics\MDOWFP.f01

Plan Summary Information:
Number of: Cross Sections = 53   Multiple Openings = 0
            Culverts   =   4   Inline Structures = 0
            Bridges   =   0   Lateral Structures = 0

Computational Information
    Water surface calculation tolerance = 0.01
    Critical depth calculation tolerance = 0.01
    Maximum number of iterations   = 20
    Maximum difference tolerance   = 0.3
    Flow tolerance factor   = 0.001

Computation Options
    Critical depth computed only where necessary
    Conveyance Calculation Method: At breaks in n values only
    Friction Slope Method: Average Conveyance
    Computational Flow Regime: Subcritical Flow

Encroachment Data
   Equal Conveyance = True
   Left Offset   =   0
   Right Offset   =   0

River = MDOW   Reach = Reach1

RS	Profile	Method	Value1	Value2
4.794	2%	0	0	0
4.699	2%	0	0	0
4.601	2%	0	0	0
4.506	2%	0	0	0
4.388	2%	0	0	0
4.293	2%	0	0	0
4.199	2%	0	0	0
4.104	2%	0	0	0
3.973	2%	0	0	0
3.878	2%	0	0	0
3.800	2%	0	0	0
3.706	2%	0	0	0
3.589	2%	0	0	0
3.494	2%	0	0	0
3.399	2%	0	0	0
3.350	2%	0	0	0
3.310	2%	0	0	0
3.266	2%	0	0	0
3.171	2%	0	0	0
3.077	2%	0	0	0
2.986	2%	0	0	0
2.891	2%	0	0	0
2.787	2%	0	0	0
2.692	2%	0	0	0
2.632	2%	0	0	0
2.603	2%	0	0	0
2.556	2%	0	0	0
2.461	2%	0	0	0
2.367	2%	0	0	0
2.272	2%	0	0	0
2.196	2%	0	0	0
2.151	2%	0	0	0
2.050	2%	0	0	0
1.899	2%	0	0	0
1.804	2%	0	0	0
1.671	2%	0	0	0
1.576	2%	0	0	0

1.501	2%	0	0	0
1.481	2%	0	0	0
1.406	2%	0	0	0
1.362	2%	0	0	0
1.267	2%	0	0	0
1.137	2%	0	0	0
1.042	2%	0	0	0
0.937	2%	0	0	0
0.823	2%	0	0	0
0.792	2%	0	0	0
0.744	2%	0	0	0
0.709	2%	0	0	0
0.603	2%	0	0	0
0.509	2%	0	0	0
0.414	2%	0	0	0
0.324	2%	0	0	0

River = MDOW Reach = Reach1

RS	Profile	Method	Value1	Value2
4.794	1%	0	0	0
4.699	1%	0	0	0
4.601	1%	0	0	0
4.506	1%	0	0	0
4.388	1%	0	0	0
4.293	1%	0	0	0
4.199	1%	0	0	0
4.104	1%	0	0	0
3.973	1%	0	0	0
3.878	1%	0	0	0
3.800	1%	0	0	0
3.706	1%	0	0	0
3.589	1%	0	0	0
3.494	1%	0	0	0
3.399	1%	0	0	0
3.350	1%	0	0	0
3.310	1%	0	0	0
3.266	1%	0	0	0
3.171	1%	0	0	0
3.077	1%	0	0	0
2.986	1%	0	0	0
2.891	1%	0	0	0
2.787	1%	0	0	0
2.692	1%	0	0	0
2.632	1%	0	0	0
2.603	1%	0	0	0
2.556	1%	0	0	0
2.461	1%	0	0	0
2.367	1%	0	0	0
2.272	1%	0	0	0
2.196	1%	0	0	0
2.151	1%	0	0	0
2.050	1%	0	0	0
1.899	1%	0	0	0
1.804	1%	0	0	0
1.671	1%	0	0	0
1.576	1%	0	0	0
1.501	1%	0	0	0
1.481	1%	0	0	0
1.406	1%	0	0	0
1.362	1%	0	0	0
1.267	1%	0	0	0
1.137	1%	0	0	0
1.042	1%	0	0	0
0.937	1%	0	0	0
0.823	1%	0	0	0
0.792	1%	0	0	0
0.744	1%	0	0	0
0.709	1%	0	0	0
0.603	1%	0	0	0
0.509	1%	0	0	0
0.414	1%	0	0	0
0.324	1%	0	0	0

River = MDOW Reach = Reach1

RS	Profile	Method	Value1	Value2
4.794	1% FW	1	9975.8410149.87	
4.699	1% FW	1	9969.8310165.48	
4.601	1% FW	1	9959.3710202.38	
4.506	1% FW	1	9956.2410276.22	
4.388	1% FW	1	9932.9410358.68	
4.293	1% FW	1	9905	10140
4.199	1% FW	1	9977.2110091.05	
4.104	1% FW	1	990010095.81	
3.973	1% FW	1	9844.6810127.07	
3.878	1% FW	1	9851.1410123.26	
3.800	1% FW	1	9653.1210075.15	
3.706	1% FW	1	9741.9610063.12	
3.589	1% FW	1	9929.0510147.75	
3.494	1% FW	1	9917.73 10229.7	
3.399	1% FW	1	9919.1410187.24	
3.350	1% FW	1	9883.1910226.12	
3.310	1% FW	1	9892.2710299.26	
3.266	1% FW	1	9923.3210317.86	
3.171	1% FW	1	9670.310212.05	
3.077	1% FW	1	960010066.01	
2.986	1% FW	1	9982.9910197.06	
2.891	1% FW	1	9923.0510052.95	
2.787	1% FW	1	9910.1110117.77	
2.692	1% FW	1	9939.1210106.24	
2.632	1% FW	1	9894.0610089.68	
2.603	1% FW	1	9910.110101.54	
2.556	1% FW	1	9907.9710095.47	
2.461	1% FW	1	9907.6710093.09	
2.367	1% FW	1	9920.2310066.85	
2.272	1% FW	1	9973.2310161.58	
2.196	1% FW	1	9925.7910100.67	
2.151	1% FW	1	9901.9710075.67	
2.050	1% FW	1	9801.13 10246.7	
1.899	1% FW	1	9788.8310223.82	
1.804	1% FW	1	9788.8710218.98	
1.671	1% FW	1	9787.3310220.36	
1.576	1% FW	1	9776.5610224.42	
1.501	1% FW	1	9808.3110242.12	
1.481	1% FW	1	9803.4710266.57	
1.406	1% FW	1	9762.6610228.82	
1.362	1% FW	1	9773.9910234.81	
1.267	1% FW	1	9789.0610231.06	
1.137	1% FW	1	9779.6910216.39	
1.042	1% FW	1	9764.7610243.09	
0.937	1% FW	1	9792.5810238.29	
0.823	1% FW	1	9495.8410248.88	
0.792	1% FW	1	9427.7510227.58	
0.744	1% FW	1	9388.8910188.89	
0.709	1% FW	1	9456.7510221.05	
0.603	1% FW	1	9800	10600
0.509	1% FW	1	9255.9110400.06	
0.414	1% FW	1	9668.3610519.95	
0.324	1% FW	1	9820.5310843.96	

```
*****************************************************************************

GEOMETRY DATA

Geometry Title: Existing Conditions
Geometry File : h:\PDATA\133347\Calcs\Strmwater\Hydraulics\MDOWFP.g01

CROSS SECTION


RIVER: MDOW
REACH: Reach1             RS: 4.794

INPUT
Description:
Station Elevation Data    num=     284
      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev
*****************************************************************************************
     9000 1319.55 9010.04 1319.45 9015.58  1319.5 9018.45 1319.53 9028.61 1319.52
   9030.6 1319.53 9032.49 1319.53 9038.98 1319.44 9039.93 1319.42  9046.8 1319.36
  9047.32 1319.35 9047.82 1319.35 9053.77 1319.29 9058.74 1319.22  9060.6 1319.19
   9065.2 1319.14 9069.05 1319.09 9071.38 1319.15 9073.15 1319.09 9073.78 1318.99
  9082.65 1318.79 9083.39 1318.77 9084.03 1318.76 9091.03 1318.56 9093.93 1318.48
  9099.39 1318.35 9102.38 1318.28 9104.83 1318.21 9111.84 1318.11 9114.24 1318.06
  9116.24 1317.98 9130.27  1317.8 9131.54 1317.77 9133.26 1317.75 9142.18 1317.67
  9146.59 1317.64 9158.13 1317.47 9159.41 1317.47 9173.02 1317.41 9175.67 1317.43
   9177.1 1317.41 9190.28 1317.31 9194.03 1317.23 9201.98 1317.22 9202.86 1317.24
  9207.55 1317.25  9209.9 1317.28  9210.4  1317.3 9212.89  1317.3 9222.19 1317.41
  9223.32 1317.42 9231.06 1317.48 9232.49 1317.49 9234.53 1317.51 9246.97 1317.57
  9247.96 1317.56 9248.46 1317.55 9254.02 1317.55  9255.4 1317.58  9264.8 1317.56
  9267.24 1317.56 9270.89 1317.56 9279.41 1317.48 9284.86  1317.5 9289.96 1317.44
  9294.19 1317.49 9298.11 1317.44 9301.44  1317.3 9310.39 1317.19 9312.96 1317.13
  9322.45 1316.87  9322.5 1316.87 9322.58 1316.87 9331.55 1316.67 9342.77 1316.47
  9344.47 1316.45 9345.11 1316.44 9351.59 1316.33 9359.41  1316.2 9361.48 1316.16
  9366.52 1315.95 9369.26 1315.88  9377.8 1315.72 9379.55 1315.69 9386.57 1315.54
  9397.79 1315.25 9400.51 1315.23 9403.72 1315.19 9408.55 1315.12 9411.16 1315.19
  9412.96 1315.19 9415.13 1315.03 9418.59 1314.97 9423.98 1314.81 9427.95 1314.76
  9431.78  1314.7    9434 1314.64 9463.95 1314.24 9464.52 1314.23 9464.99 1314.22
  9465.72 1314.25 9469.35 1314.23 9472.24 1314.16 9475.54 1314.14 9477.39 1314.13
   9482.3 1314.05 9485.33 1314.04 9486.58 1314.04 9489.51 1313.92 9492.01 1313.88
  9493.56 1313.83 9498.63 1313.81 9498.99 1313.81 9501.85 1313.79 9503.81 1313.79
  9508.06 1313.73 9513.52 1313.73 9517.54 1313.73 9518.92 1313.72 9526.74 1313.71
  9528.95 1313.71 9533.68  1313.7 9537.42 1313.74 9539.77 1313.73  9542.6 1313.63
   9552.1 1313.64 9555.91 1313.59 9559.09 1313.59    9562 1313.59 9567.92 1313.51
  9570.07  1313.5 9571.72 1313.48 9573.46 1313.45 9574.98 1313.45 9575.84 1313.45
  9576.73  1313.5 9587.39 1313.49 9589.16 1313.49 9592.44 1313.35 9593.23 1313.35
  9596.23 1313.35 9599.79 1313.38 9602.27 1313.38 9605.18 1313.38 9609.12 1313.35
  9611.35 1313.35 9613.61 1313.31 9616.14 1313.35  9620.1 1313.27 9622.55 1313.27
   9625.2 1313.23  9628.6 1313.26 9631.22 1313.26 9634.69 1313.21 9637.24 1313.21
  9639.06  1313.2 9641.14 1313.12 9646.57 1313.18  9649.4 1313.18 9651.62 1313.18
  9653.79 1313.14 9655.79 1313.14 9660.04 1313.02 9662.49 1313.02 9664.97 1313.02
  9667.23 1312.98 9683.67 1312.89  9686.1 1312.92 9688.77 1312.82 9691.51 1312.76
  9698.56 1312.72 9701.59 1312.72 9711.28 1312.71 9719.96 1312.65 9728.62  1312.6
  9737.18 1312.71 9745.56 1312.55 9749.11 1312.54  9756.7 1312.42 9757.32 1312.41
  9763.61 1312.35 9763.87 1312.35 9764.51 1312.36 9764.64 1312.37 9773.03  1312.3
  9776.98 1312.28 9788.91 1312.27 9797.42 1312.25 9824.74 1312.14 9841.18 1312.06
  9852.81    1312 9857.81    1312 9863.41  1311.9 9866.96 1311.87 9872.52 1311.87
  9872.65 1311.86 9876.33 1311.91  9877.9 1311.93 9878.06 1311.93 9883.65 1311.87
  9883.95 1311.86  9888.3 1311.81 9888.71  1311.8    9889  1311.8 9893.25 1311.68
  9893.61 1311.68 9897.55 1311.63 9897.83 1311.63 9902.35 1311.85 9902.61 1311.85
  9902.78 1311.87  9905.6 1311.77    9906 1311.79 9908.56 1311.69 9908.87 1311.68
  9910.62 1311.66 9911.27 1311.66 9914.12  1311.6 9916.56 1311.51 9920.53 1311.39
     9923 1311.31 9926.14 1311.43 9932.35 1311.54 9934.55 1311.49 9935.49 1311.49
   9938.54 1311.49  9939.6 1311.55 9941.19 1311.54 9942.07 1311.54 9945.37 1311.45
  9946.66 1311.42 9948.35 1311.33 9950.55 1311.31 9951.68 1311.24 9954.86 1311.19
   9956.7 1311.22 9958.73 1311.24 9960.75 1311.28 9962.34 1311.29 9964.86 1311.29
  9965.94  1311.3 9971.95 1311.23 9973.68 1311.21 9975.84  1311.1 9981.03 1309.86
   9982.6 1309.45 9988.01 1308.45 9992.67 1307.59 9996.84 1307.44   10000 1307.32
10001.79 1307.2610003.11  1307.310013.68 1307.5910036.66 1308.3210039.81 1308.41
 10042.9  1308.510056.85 1308.8110058.67  1308.9 10065.7 1309.2810070.08 1309.49
10075.73 1309.7710077.48 1309.9510078.79  1310.210096.11 1310.2810102.36 1310.35
10106.07 1310.3210118.98 1310.2410127.73 1310.7510132.79 1311.1110135.61 1311.73
10136.22 1311.8310137.38 1312.2310143.31 1314.2310148.81 1316.3910152.12 1317.66
10155.96 1319.24   10160 1320.9110162.54 1321.9610164.35 1322.07 10164.4 1322.07
10164.67 1322.0710173.81 1321.9410173.88 1321.9410176.63 1321.75

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*************************************************
    9000     .05 9975.84     .0310078.79     .03

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.    Expan.
       9975.8410078.79             433.5     500   518.6             .1       .3

CROSS SECTION


RIVER: MDOW
REACH: Reach1             RS: 4.699

INPUT
Description:
Station Elevation Data    num=     490
      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev
*****************************************************************************************
     8500 1319.52 8500.54 1319.51 8509.33  1319.4 8511.59 1319.33 8515.54 1319.32
  8521.03 1319.28 8524.98 1319.27  8529.1 1319.27 8532.03 1319.26 8536.11 1319.22
  8546.14 1319.16 8547.48 1319.16 8548.56 1319.15 8551.59 1319.46 8552.94 1319.42
   8555.6 1319.49 8557.51 1319.45  8559.8 1319.35 8560.21 1319.33 8561.32 1319.24
  8562.75 1319.12 8563.72 1319.07  8565.8 1318.97  8567.7 1318.92  8570.7 1319.48
  8571.17 1319.48 8575.02 1319.46 8575.85 1319.48 8576.88 1319.46 8580.25 1319.39
  8581.72 1319.29 8583.11 1319.22 8584.13    1319  8585.6 1318.56 8587.61 1318.45
  8590.36 1318.74  8591.2 1318.74 8591.98 1318.82 8593.33 1318.82 8594.43 1318.78
  8597.21 1318.87 8599.96 1318.84 8610.54 1318.66 8616.38 1318.54 8622.89 1318.46
  8623.84 1318.46 8625.22 1318.43 8626.96 1318.41 8643.86 1318.36 8644.58 1318.35
  8645.71 1318.34 8650.74  1318.3 8663.34 1318.33 8664.82 1318.32 8665.99 1318.31
  8667.14 1318.32 8671.46 1318.41 8685.82 1318.17 8686.17 1318.21 8686.64 1318.18
  8687.14 1318.21 8687.59 1318.17 8688.03 1318.19  8697.9 1318.19 8698.73 1318.23
  8700.46 1318.27 8702.29 1318.28  8703.6 1318.28 8706.27  1318.3 8716.33 1318.23
  8717.93 1318.11 8720.83  1318.1 8724.98 1318.08 8728.54 1318.07 8735.18 1318.03
  8735.83 1318.02 8743.32 1317.96 8755.86 1317.84 8757.74 1317.84 8761.93 1317.82
  8771.63 1317.75 8774.83 1317.71 8786.56 1317.58 8793.54 1317.53 8798.66  1317.5
  8812.88 1317.36 8814.44 1317.36 8827.75 1317.25 8831.23 1317.21 8841.61  1317.1
  8847.97 1317.05 8855.04 1317.03 8856.02 1317.03 8858.65 1316.99 8863.55 1317.04
  8865.12 1317.03  8866.3 1317.07 8868.03 1317.06 8872.66 1317.08 8875.08 1317.03
  8876.16 1316.96 8878.85 1316.81  8879.5 1316.79 8880.64 1316.83 8881.93 1316.86
  8882.64 1316.86 8886.99 1316.88 8888.13 1316.89 8896.06  1316.7 8896.61 1316.69
  8903.12 1316.72 8904.18 1316.75 8905.63 1316.75 8910.92 1316.88 8913.52    1317
   8914.1 1317.04 8916.43 1317.14 8918.65 1317.14 8918.77 1317.13 8922.01 1316.83
  8922.53 1316.81 8922.91 1316.81 8923.65  1316.8 8928.53 1316.69 8932.43 1316.62
  8934.23 1316.63 8935.45 1316.63 8956.35 1316.58 8957.39 1316.57 8958.14 1316.56
  8963.23 1316.54 8965.94 1316.47 8972.14 1316.43 8975.58 1316.41  8991.1 1316.35
  8996.25 1316.34  9008.4  1316.2 9018.75 1316.09 9025.64 1316.02 9026.46 1316.02
  9029.92 1316.01 9031.44 1316.06 9035.25 1315.97 9036.15  1315.9 9036.54 1315.88
  9039.04 1315.83 9041.55 1315.82 9042.89  1315.8 9046.37 1315.85 9051.99 1315.83
  9054.69  1315.8 9059.86 1315.66 9060.86 1315.66 9063.91 1315.65 9067.96 1315.65
```

```
 9072.71 1315.59 9077.23 1315.58 9079.62 1315.57 9084.52 1315.57 9087.87 1315.58
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 9238.76 1315.05 9239.14 1315.06 9240.07 1315.04 9244.63 1315.04 9246.59 1315.03
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 9653.33 1312.52 9656.12 1312.47 9664.51 1312.47  9666.3 1312.41 9667.72 1312.41
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  9757.4 1312.02 9758.53 1311.98 9759.81 1311.98 9763.12 1312.01 9764.71 1312.01
 9767.08 1311.99  9769.2 1311.94 9773.22 1311.94 9775.86 1311.93 9776.48 1311.93
 9778.61 1311.92 9781.03 1311.95 9782.39 1311.98 9784.21 1311.95 9786.53 1311.94
 9789.13 1311.93 9790.93 1311.93 9793.88 1311.92 9795.14 1311.94 9796.15 1311.93
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  9865.4 1311.58 9866.62 1311.55 9868.03 1311.55 9871.65 1311.32 9872.93 1311.34
 9876.76 1311.34 9878.41 1311.39 9882.61 1311.39 9883.89 1311.36 9886.22 1311.27
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 9903.49 1311.26 9905.38 1311.23 9908.27 1311.19 9910.39 1311.19 9913.11 1311.15
 9917.04 1311.15  9918.1 1311.13 9922.48 1311.13 9926.31 1311.08 9929.65 1311.18
 9930.13  1311.1 9931.53 1311.14  9933.3 1311.12 9934.21 1311.12 9935.94 1311.16
 9938.64 1311.15 9940.36 1311.16 9942.97 1311.19    9944 1311.15 9945.26 1311.14
 9947.27 1311.19 9949.73 1311.19 9951.95 1311.14    9953 1311.15 9956.52 1311.13
  9957.8 1311.12 9960.04 1310.82 9963.48 1310.65 9965.83 1310.65 9969.19 1310.67
 9969.83 1310.72 9976.98 1309.32 9978.04  1309.1 9978.83 1308.97 9987.46 1307.56
  9991.7 1307.19 9995.29 1306.88 9999.87 1306.78   10000 1306.7810002.15 1306.76
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10041.72 1308.3310056.76 1309.0410062.05 1309.2710065.15 1309.3410081.99 1309.77
 10098.2 1309.9810099.38 1310.0210100.33  1310 10112.7 1309.8510118.51 1309.96
10128.81 1310.0510134.42 1309.8610137.75 1309.7610140.72 1309.8910143.87 1310.45
10144.24 1310.5110144.77 1310.5610149.73 1310.8810155.88  1312.7 10157.1 1313.04
10163.92 1315.9910165.35 1316.6210166.65 1317.1510177.03 1321.4510177.54 1321.53
10178.98 1321.7610181.16 1321.8110188.54 1321.7910189.48 1321.7310191.77 1321.62

Manning's n Values        num=       3
     Sta   n Val      Sta   n Val      Sta   n Val
***********************************************
    8500     .05 9969.83     .0310099.38     .03

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.    Expan.
       9969.8310099.38             493.3  519.12   522.8             .1       .3

CROSS SECTION


RIVER: MDOW
REACH: Reach1             RS: 4.601

INPUT
Description:
Station Elevation Data    num=     490
      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev
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    8500 1319.41 8517.15 1319.31 8518.27 1319.31 8518.85  1319.3 8519.87 1319.29
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 8523.58    1319 8523.99 1318.98 8525.54 1318.91 8528.09 1319.33 8531.82 1319.94
 8533.05 1319.83  8538.3 1319.44 8541.89  1319.1 8543.33 1319.06 8544.56 1319.05
  8547.7 1319.04 8549.85 1319.06 8552.03 1319.03 8553.87 1319.01 8557.62 1318.99
 8561.02 1318.99 8562.95 1318.98 8566.45 1318.98 8587.56 1318.81  8592.1  1318.8
 8599.29 1318.74    8621 1318.66 8643.92 1318.59 8650.16 1318.53 8656.62  1318.5
  8673.8 1318.37 8695.17  1318.2 8705.97 1318.16 8717.64 1318.13 8721.46 1318.07
 8728.05 1317.96 8750.77 1317.75 8760.86 1317.66 8773.88 1317.59 8784.36 1317.54
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  8836.7  1317.1 8837.13  1317.1  8842.1 1317.04 8847.89 1316.99 8852.22 1316.94
 8854.77 1316.92 8857.22 1316.92 8863.56  1316.9 8867.76  1316.9 8869.81 1316.89
 8871.87 1316.89 8872.74 1316.85 8900.46  1316.7 8916.56 1316.61  8928.5 1316.52
 8936.42 1316.43 8937.63 1316.42 8940.11  1316.4 8941.44 1316.38 8945.53 1316.28
 8949.52  1316.2  8953.2 1316.19 8962.05 1316.15  8962.5 1316.15    8963 1316.14
 8966.94 1316.14 8968.62 1316.19    8970 1316.19 8970.92 1316.16 8972.07 1316.13
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 9000.59 1315.83 9001.25 1315.83 9005.68 1315.81 9016.19 1315.81 9017.65 1315.82
 9021.19 1315.82  9022.7 1315.83 9024.04 1315.83  9027.6 1315.68 9028.98 1315.67
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 9074.48 1315.54  9076.4 1315.55 9081.17  1315.5 9084.92 1315.49 9087.56 1315.47
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 9225.95 1314.76 9226.77 1314.76 9228.42 1314.75 9237.17 1314.71 9241.81 1314.68
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 9265.84 1314.52 9269.45  1314.5 9270.59  1314.5  9274.4 1314.48 9275.55 1314.46
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 9777.43 1311.72 9779.43 1311.73 9784.25 1311.73  9786.1 1311.74 9792.06 1311.74
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 9823.19 1311.62 9825.28 1311.59 9831.25 1311.59 9836.35  1311.6 9841.49 1311.54
 9842.35  1311.5 9844.13  1311.5 9849.36 1311.49 9849.89 1311.52 9854.55 1311.46
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  9875.3 1311.13 9876.34 1311.24 9878.06 1311.31 9879.69 1311.26 9881.31 1311.23
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 9887.54  1310.9  9888.9 1310.76 9889.08 1310.73 9890.22 1310.86 9890.66 1310.85
 9891.63 1310.75 9892.16 1310.77 9893.78 1310.78  9894.1  1310.8 9894.49 1310.85
 9896.17 1311.18 9898.05 1311.24  9902.4 1311.38 9903.39 1311.41  9903.8 1311.42
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 9916.36 1310.98 9917.47 1310.86 9918.76  1310.8 9921.16 1310.26 9922.41 1310.29
 9922.62  1310.3 9924.46 1310.57 9924.82 1310.62 9925.02 1310.66 9925.11 1310.65
 9926.75 1310.51 9927.21 1310.61 9930.95 1311.22  9931.7 1311.22 9932.97 1311.19
 9935.05 1311.17 9937.76 1311.17 9939.41 1311.12 9942.35 1311.11 9944.42 1311.05
 9945.59 1311.03  9948.9 1310.95 9951.67 1310.96 9952.89 1311.04 9953.35 1310.98
 9958.83  1310.9 9959.37 1310.89 9966.61 1309.82 9969.91 1309.26 9972.63 1308.81
  9977.7  1307.9 9983.87 1307.53 9990.99 1307.24 9994.66 1307.03 9995.31    1307
 9995.91    1307   10000    130710005.58 1306.9910011.09 1307.2810016.44  1307.4
10017.72 1307.4210017.81 1307.4310021.28 1307.7810023.62 1307.8210026.89 1307.84
10029.94    130810032.91 1308.1710041.68 1308.5210042.98 1308.5610043.54 1308.59
10052.95 1308.9710064.03  1309.4 10064.1  1309.410064.15  1309.410064.24 1309.41
10073.24 1310.1410078.12 1310.1810080.85 1310.22 10082.2 1310.2310083.23 1310.23
10090.89 1310.1410091.09 1310.1410091.13 1310.1410104.87 1310.1210105.87 1310.13
10115.45  1310.310118.17 1310.2810123.23 1310.3210124.66 1310.1910125.34 1310.07
10128.89  1310.110131.68 1310.18 10138.1 1310.19 10141.1 1310.1910147.27 1310.25
10152.93  1310.310156.47 1310.3110162.55 1310.3610171.57 1310.5210172.63 1310.54
10174.36 1310.6610178.64 1310.96 10181.6 1311.1910181.84 1311.2110181.98 1311.24
10183.32 1311.4810185.78 1311.6710186.87 1311.7710189.34 1312.38 10193.6 1313.45
10202.44 1316.5810205.51 1317.6410211.44 1320.3310213.91 1321.44   10214 1321.44
10216.32 1321.4410219.31 1321.3910225.32 1321.31 10227.6 1321.2810228.07 1321.27

Manning's n Values          num=       3
    Sta    n Val     Sta    n Val     Sta    n Val
**************************************************
    8500      .05 9959.37      .0310073.24      .03

Bank Sta: Left   Right     Lengths: Left Channel   Right     Coeff Contr.    Expan.
       9959.3710073.24              478.1     500   516.3             .1       .3

CROSS SECTION


RIVER: MDOW
REACH: Reach1             RS: 4.506

INPUT
Description:
Station Elevation Data    num=     313
      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev
*********************************************************************************************
     8700 1318.62     8703 1318.59 8708.41 1318.55 8715.01 1318.52 8726.95 1318.46
 8733.36 1318.44 8742.06 1318.41  8754.7 1318.36 8761.43 1318.32 8762.08 1318.32
  8762.8 1318.32 8773.15 1318.27 8780.57 1318.22 8788.14 1318.17 8798.95 1318.07
 8800.85 1318.07 8807.78 1318.02 8815.95 1317.97 8834.29 1317.87  8838.2 1317.84
 8840.22 1317.83 8846.98 1317.81 8859.23 1317.77 8873.89  1317.7 8874.07 1317.69
 8874.18 1317.69 8874.69 1317.69 8891.72 1317.62 8893.68  1317.6 8896.81 1317.59
 8898.71 1317.57  8900.2 1317.56 8912.38 1317.46 8919.22 1317.42 8923.89 1317.41
 8928.34 1317.38 8933.37 1317.47 8948.51 1317.41  8953.9 1317.43 8961.92 1317.37
 8971.76 1317.33 8978.11 1317.31 8982.61 1317.32 8984.55 1317.27 8986.22 1317.27
 8988.33 1317.26 9011.31 1317.11 9014.56 1317.11 9017.43 1317.08 9021.23 1317.14
 9022.49 1317.18    9025 1317.17 9026.53 1317.17 9028.52  1317.1 9029.73 1316.96
 9030.62 1316.96 9034.52 1316.96 9034.77 1316.97 9037.49 1316.98  9039.6 1317.01
 9041.15 1317.04 9044.69 1317.07 9044.84 1317.07 9044.99 1317.08 9048.97 1317.35
 9050.58 1317.49 9052.26 1317.51 9053.98 1317.49 9056.02 1317.48 9057.19 1317.47
 9058.64 1317.48 9059.34 1317.48 9062.02 1317.49 9064.11 1317.46 9064.43 1317.47
 9067.78 1317.44  9068.1 1317.44 9071.27  1317.4 9072.91 1317.33 9073.14 1317.33
 9075.89 1317.29 9078.85 1317.26 9081.56 1317.24 9084.34 1317.25    9088 1317.25
  9094.6 1317.26 9097.75 1317.23 9099.71 1317.25 9103.25  1317.2 9111.93 1317.15
 9114.41  1317.14 9114.97 1317.16 9116.08 1317.14 9117.45 1317.18 9119.07 1317.14
  9121.2 1317.13 9122.46 1317.13 9155.77 1317.06 9173.95 1317.07 9174.99 1317.07
 9175.08 1317.07 9175.69 1317.07 9180.54 1317.25 9182.03  1317.3 9182.66  1317.3
 9183.36 1317.29 9184.37 1317.29 9187.24 1317.27 9189.61 1317.28 9190.63 1317.27
 9192.69 1317.07 9193.67 1316.96  9194.9 1316.92  9196.9 1316.82  9198.7 1316.84
 9200.33 1316.84 9200.91 1316.84 9201.65 1316.84 9202.21 1316.85  9203.8 1316.83
 9209.51 1316.82 9217.71 1316.78  9233.4 1316.66  9261.2 1316.47 9269.47 1316.42
 9286.19 1316.36 9289.85 1316.33 9295.74 1316.31 9302.88 1316.27 9317.93 1316.19
  9326.6 1316.13 9331.17 1316.08 9340.39 1316.03 9348.33 1315.97 9354.61 1315.94
 9355.38 1315.94 9361.52 1315.87 9364.98 1315.84 9366.12 1315.84 9371.97 1315.85
 9377.55 1315.79 9392.07 1315.74 9405.72 1315.69 9414.84 1315.67 9433.45 1315.52
 9438.21 1315.48 9446.69 1315.39 9476.93 1315.09 9479.63 1315.06 9480.27 1315.06
 9490.53    1315 9518.02 1314.84 9522.54 1314.79  9529.5 1314.74 9544.15 1314.59
 9547.04 1314.57 9557.95 1314.47 9559.65 1314.45 9573.36 1314.33 9574.68 1314.32
 9574.95 1314.32 9588.12 1314.22 9589.74  1314.2 9601.08 1314.04 9604.11 1314.01
 9612.71 1313.86 9619.51 1313.83 9625.06 1313.85 9636.84 1313.78 9641.57 1313.77
 9645.67 1313.74 9660.92 1313.67 9677.98 1313.51 9681.29  1313.5 9681.88 1313.49
 9682.94 1313.49 9686.27 1313.47 9702.76  1313.4 9711.09 1313.39 9711.97  1313.4
 9712.12  1313.4  9720.6 1313.38 9723.73  1313.4  9732.5 1313.46 9736.68 1313.63
 9742.12 1313.68 9747.84 1313.65 9751.14 1313.63 9759.23 1313.64 9764.08 1313.63
 9769.03 1313.64 9772.28 1313.65 9778.92 1313.68 9788.12 1313.85 9788.47 1313.86
 9788.55 1313.86  9794.4 1313.95 9795.46 1313.94 9802.38 1313.94 9806.55 1313.91
 9809.29 1313.91 9810.91 1313.86 9824.72 1313.82  9832.2  1313.8 9839.41 1313.71
 9846.87  1313.7 9855.73 1313.61 9856.95 1313.44 9859.19 1313.37 9860.66 1313.51
 9863.91  1313.4 9865.01 1313.37 9866.25  1313.6 9866.87 1313.67 9868.91 1313.81
 9872.41 1314.17 9874.72 1314.25 9875.99 1314.22 9890.03 1313.69 9890.09 1313.69
 9911.07 1313.83 9919.53 1313.95 9933.64 1314.02 9933.71 1314.02 9933.72 1314.02
 9933.81 1314.02 9934.04 1314.02 9940.43 1314.17 9944.17 1315.52 9945.54 1315.76
 9949.77 1315.04 9950.58 1314.86 9955.05 1314.79 9956.24 1314.76 9960.19 1313.93
 9960.37 1313.88 9962.67 1313.19 9975.39  1309.4 9979.22 1308.19 9982.56 1307.59
 9986.89  1306.8    9989 1306.72 9993.65 1306.62 9996.15 1306.44 9998.73 1306.25
   10000 1306.3210010.39 1306.9110013.61 1307.0910016.42 1307.0510017.42 1307.06
10018.09 1307.0410021.67 1307.0210029.49 1307.2810030.18 1307.3110030.57 1307.32
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10037.05 1307.6110038.29 1307.7110042.36 1308.03 10050.8 1308.410063.49 1308.93
10067.78 1309.3110070.25 1309.5310075.26 1310.6710075.28 1310.6710075.32 1310.68
10085.23 1312.6110094.28 1312.7210098.12 1312.7810099.51 1312.7710106.37 1312.91
10110.82 1312.8610116.05 1312.8310121.57 1312.910133.72 1313.08 10148.1 1312.58
10151.22 1312.4510153.38 1312.5210163.58 1312.6810166.92 1312.6610179.36 1312.59
10187.39 1312.910187.79 1312.9110195.06 1312.5410197.14 1312.4910201.86 1312.39
10205.72 1312.3310210.16 1312.3410214.36 1312.3810215.46 1312.3510222.49 1312.21
10226.09 1312.1310231.02 1312.0510234.88 1311.9910237.32 131210243.16 1312
10251.72 1312.2210252.49 1312.2410253.07 1312.26 10260.3 1312.6510262.58 1312.95
10265.27 1313.2110267.82 1313.8710274.56 1315.6910278.81 1317.08 10282.9 1318.55
10286.39 1320.2510288.92 1321.6110290.61 1321.5910291.56 1321.5910295.97 1321.64
10300.17 1321.6710301.53 1321.5910303.83 1321.43

Manning's n Values num= 3
Sta n Val Sta n Val Sta n Val
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8700 .05 9956.24 .0310085.23 .03

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
9956.2410085.23 666.5 624.32 600.9 .1 .3

CROSS SECTION

RIVER: MDOW
REACH: Reach1 RS: 4.388

INPUT
Description:
Station Elevation Data num= 323
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
****
9000 1323.38 9001.9 1323.36 9003.02 1323.35 9004.97 1323.5 9005.52 1323.57
9006.94 1323.73 9007.68 1323.8 9008.2 1323.54 9008.33 1323.47 9008.55 1323.47
9010.56 1323.46 9016.91 1323.33 9023.28 1323.25 9028.73 1323.13 9036.61 1323.13
9038.4 1323.07 9041.84 1322.96 9045.3 1322.72 9045.4 1322.71 9046 1322.67
9050.85 1322.35 9055.75 1321.93 9055.87 1321.92 9060.68 1321.68 9061.13 1321.63
9064.72 1321.32 9065.28 1321.27 9066.12 1318.09 9066.24 1317.55 9067.17 1317.48
9068.68 1317.45 9071.79 1317.44 9072.36 1317.44 9075.04 1317.35 9076.17 1317.32
9076.71 1317.32 9081.24 1317.36 9084.19 1317.36 9085.06 1317.34 9086.67 1317.32
9088.84 1317.4 9090.23 1317.4 9093.64 1317.48 9094.26 1317.46 9095.73 1317.43
9099.32 1317.4 9101.2 1317.37 9102.53 1317.31 9105.09 1317.2 9107.84 1317.04
9107.98 1317.04 9108.42 1317.06 9108.82 1317.07 9111.99 1317 9113.39 1316.97
9114.81 1316.95 9120.52 1316.86 9121.35 1316.9 9121.81 1316.9 9123.33 1316.9
9148.16 1316.76 9151.18 1316.71 9170.57 1316.61 9174.52 1316.59 9192.35 1316.52
9193.06 1316.52 9193.62 1316.51 9195.98 1316.48 9209.03 1316.37 9213.51 1316.36
9232.06 1316.4 9239.31 1316.42 9244.2 1316.35 9255.54 1316.2 9259.02 1316.19
9267.18 1316.07 9269.4 1316.06 9275.43 1316.06 9277.28 1316.07 9278.46 1316.09
9287.11 1316.17 9290.26 1316.21 9301.57 1316.08 9303.6 1316.05 9311.17 1316
9316.36 1315.95 9329.19 1315.77 9330.04 1315.76 9337.88 1315.74 9344.13 1315.66
9350.31 1315.61 9363 1315.69 9363.23 1315.69 9363.7 1315.7 9374.28 1315.68
9379.22 1315.65 9384.84 1315.56 9387.98 1315.6 9397.52 1315.47 9408.48 1315.41
9422.87 1315.33 9424.43 1315.32 9425.19 1315.31 9438.41 1315.21 9449.2 1315.18
9449.25 1315.18 9466.08 1315.11 9467.91 1315.1 9484.38 1314.9 9486.79 1314.87
9503.4 1314.72 9508.22 1314.69 9516.16 1314.62 9527.11 1314.61 9543.8 1314.5
9544.97 1314.48 9556.29 1314.49 9564.38 1314.48 9574.06 1314.37 9584.43 1314.35
9590.48 1314.42 9604.87 1314.28 9611.27 1314.21 9613.56 1314.17 9628.85 1314.18
9629.85 1314.18 9630.34 1314.18 9635.65 1314.13 9647.51 1314.06 9650.13 1314.02
9653.8 1314.03 9662.88 1313.97 9669.73 1313.98 9678.34 1313.91 9685.76 1313.77
9696.29 1313.75 9701.42 1313.75 9712.08 1313.71 9718.38 1313.6 9726.26 1313.47
9735.35 1313.36 9748.79 1313.22 9752.23 1313.19 9754.17 1313.18 9769.81 1313.09
9779.68 1312.98 9787.96 1312.88 9794.37 1312.81 9805.62 1312.62 9806.34 1312.61
9812.53 1312.59 9823.88 1312.57 9825.17 1312.57 9834.26 1312.57 9848.58 1312.53
9850.79 1312.54 9861.98 1312.41 9863.01 1312.39 9863.5 1312.39 9864.12 1312.39
9872.61 1312.42 9880.09 1312.31 9886.32 1312.29 9890.32 1312.25 9892.36 1312.24
9894.84 1312.29 9899.18 1312.29 9902.55 1312.38 9906.78 1312.45 9908.42 1312.44
9909.11 1312.43 9913.36 1312.37 9913.37 1312.37 9913.38 1312.37 9913.4 1312.37
9918.89 1312.14 9918.95 1312.15 9919.39 1312.14 9919.79 1311.96 9920.82 1311.53
9921.24 1311.35 9921.33 1311.31 9921.82 1311.14 9923.83 1310.92 9924.54 1310.68
9924.62 1310.66 9925.67 1310.57 9925.81 1310.58 9926.98 1311.59 9927.41 1311.99
9927.73 1312.01 9928.42 1312.01 9929.71 1312.02 9930.22 1312.02 9930.87 1311.55
9932.94 1310.83 9933.94 1310.72 9934.07 1310.71 9934.14 1310.68 9935.84 1310.4
9935.95 1310.31 9936.16 1310.26 9937.88 1309.96 9938.29 1309.92 9939.58 1309.62
9940.76 1309.43 9941.12 1309.28 9941.41 1309.1 9941.91 1308.89 9945.12 1308.41
9950.09 1308 9954.98 1307.47 9965.03 1307.26 9965.12 1307.26 9965.18 1307.26
9965.19 1307.26 9965.21 1307.26 9976.87 1307.65 9978.68 1307.45 9980.12 1307.36
9981.14 1307.38 9983.95 1307.22 9993.54 1306.7 9994.9 1306.49 9995.64 1306.36
9996.4 1306.41 9998.36 1306.47 9999.01 1306.43 10000 1306.3710000.66 1306.34
10007.02 1306.5610009.77 1306.6210016.04 1306.5910017.09 1306.5710018.23 1306.62
10026 1306.6610028.72 1306.6310031.64 1306.6310034.88 1306.7310037.38 1306.85
10042.17 1307.1510056.75 1307.9410059.54 1308.1 10061.1 1308.17 10067.3 1308.46
10067.36 1308.4710075.25 1308.85 10075.8 1308.9210082.54 1309.8510088.01 1310.45
10091.03 1310.7310103.17 1310.8610104.32 1310.8610104.54 1310.8510105.88 1310.89
10108.07 1310.8610123.16 1310.7410126.08 1310.7310139.46 1310.8210148.25 1310.92
10149.98 1310.7510151.45 1310.53 10158.1 1310.4810161.01 1310.5110166.37 1310.67
10166.95 1310.710167.09 1310.710173.36 1310.71 10176.4 1310.6910180.47 1310.69
10189.04 1310.6710193.65 1310.6310198.21 1310.6410202.17 1310.6910206.62 1310.73
10215.75 1310.6910221.85 1310.6410229.34 1310.710237.69 1310.6810245.95 1310.52
10251.19 1310.4510257.19 1310.4610261.34 1310.3810263.55 1310.5110266.13 1310.69
10266.87 1310.6510268.19 1310.41 10271.9 1310.3910277.23 1310.3910277.96 1310.39
10278.21 1310.4610280.47 1311.1 10281 1310.910281.77 1310.6810282.52 1310.37
10288.18 1310.410293.22 1310.4410299.35 1310.4710301.89 1310.510307.54 1310.58
10309.01 1310.610310.31 1310.610316.84 1310.610319.63 1310.5410322.66 1310.52
10325.59 1310.5410327.73 1310.54 10331.1 1310.69 10334 1310.810340.05 1311.36
10340.27 1311.37 10340.7 1311.4410345.77 1312.210348.41 1312.9410353.84 1314.53
10357.97 1315.910362.27 1317.3510368.66 1319.9310371.52 1321.0710372.76 1321.05
10373.24 1321.0510374.84 1321.0310383.24 1320.95

Manning's n Values num= 3
Sta n Val Sta n Val Sta n Val
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9000 .05 9932.94 .0310091.03 .03

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
9932.9410091.03 494.1 500 500.7 .1 .3

CROSS SECTION

RIVER: MDOW
REACH: Reach1 RS: 4.293

INPUT
Description:
Station Elevation Data num= 307
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
****
9400 1317.61 9400.64 1317.58 9405.67 1317.45 9411 1317.31 9420.24 1317.11
9424.76 1317.06 9440.39 1316.89 9448.2 1316.8 9463.32 1316.68 9465.77 1316.66
9484.18 1316.38 9485.55 1316.37 9496.15 1316.35 9500.54 1316.32 9508.01 1316.23
9512.09 1316.2 9528.62 1316.12 9530.42 1316.11 9531.82 1316.11 9539.98 1316.05
9553.52 1315.96 9560.82 1315.93 9572.1 1315.85 9577.61 1315.85 9580.99 1315.84
9596.27 1315.82 9596.6 1315.82 9609.93 1315.78 9623.98 1315.53 9624.84 1315.52
9627.46 1315.52 9644.55 1315.58 9648.47 1315.54 9663.93 1315.38 9667.21 1315.38
9669.68 1315.34 9689.62 1315.24 9694.3 1315.19 9705.07 1315.11 9707.73 1315.07
9718.65 1314.99 9721.04 1314.96 9721.85 1314.96 9724.35 1315.01 9728.34 1315.08
9732.46 1315.06 9741.69 1314.99 9750.72 1314.91 9757.86 1314.86 9768.27 1314.76
9770.4 1314.75 9776.45 1314.77 9785.04 1314.81 9787.44 1314.86 9792.64 1314.95

```
  9798.3 1314.89 9804.39 1314.82 9817.83 1314.73 9820.72 1314.71 9821.85  1314.7
  9838.3 1314.56 9847.27 1314.54  9857.3 1314.52 9863.43 1314.52 9863.66 1314.52
 9863.91 1314.52 9879.13 1314.43 9884.55 1314.37 9889.74 1314.31 9903.34 1314.33
 9907.75 1314.33 9914.33 1314.23 9922.18 1314.16 9923.89 1314.08 9925.18 1314.08
 9929.85 1314.03 9931.53 1314.01 9934.78 1313.86 9935.42 1313.85 9942.45 1313.49
 9942.74 1313.48 9943.55 1313.41  9949.2 1313.27 9951.93 1313.23 9954.15 1313.19
 9954.89 1313.12 9956.52 1313.08 9957.96 1312.88 9958.39 1312.84 9958.63 1312.74
 9960.84 1312.08 9963.67 1311.01 9963.92 1310.88 9964.19 1310.81 9965.94 1310.25
 9967.63 1309.59  9968.5 1309.31 9970.47 1308.76 9972.51 1308.17 9973.28 1307.94
 9974.96 1307.56 9977.08 1307.24 9978.07 1307.06 9981.75 1306.69 9982.74 1306.55
 9985.57 1306.32 9986.45 1306.23  9988.2 1306.11 9989.26 1306.05 9993.48 1305.74
 9995.95  1305.6 9996.93 1305.49 9999.13 1305.63   10000 1305.6610006.59 1305.91
10009.64 1306.09   10011 1306.1610017.59 1306.2610019.73 1306.2810021.05  1306.4
10022.94 1306.5710026.88 1306.6510036.09 1306.8610038.78 1307.16 10041.4 1307.49
10046.69  1307.710053.22 1307.9410059.91 1308.1610060.84 1308.1910061.63 1308.26
10066.46 1308.6610068.54 1309.1110068.79 1309.1510070.77  1309.310071.08 1309.35
10071.83 1309.5310077.89 1311.0110079.96 1311.4710082.63 1312.1110086.98 1312.83
10089.92 1313.2610092.65 1313.2810099.57 1313.3710103.56 1313.4110107.73 1313.42
 10109.8 1313.4610115.09 1313.5510121.36 1313.6210125.12 1313.6410136.43 1313.51
10137.24  1313.5 10137.7 1313.4910141.69 1313.4410157.67 1313.4210160.02  1313.4
10163.19 1313.4710172.47 1313.65 10173.7 1313.6510178.55  1313.810184.46 1313.65
10186.05 1313.6410188.08 1313.6810190.91 1313.8110192.26 1313.82   10197 1313.72
10197.59 1313.7510198.19 1313.7810203.23  1313.610203.82 1313.5810204.19 1313.57
10204.61 1313.5910205.12 1313.5910207.05 1313.5910209.82 1313.6110209.94 1313.62
10210.99 1313.7910219.03  1313.710219.07  1313.710219.77 1313.6910220.89 1313.71
10221.53 1313.6410221.99 1313.7410222.71 1313.8510225.65  1313.910231.21  1314.1
10235.69 1313.9610237.32 1313.8510237.63 1313.9310238.26 1314.0310238.64 1313.93
10238.91 1313.8710241.69 1313.9610253.37 1314.3410254.73 1314.4410255.51 1314.53
10256.93 1314.3910257.55 1314.3610260.08 1314.4510264.37 1314.6510267.93 1314.75
10270.48 1314.83 10271.2  1314.910273.48 1315.1310274.12 1315.0810275.28 1314.94
10279.39 1314.9910281.05 1315.0810286.48 1315.2810287.77 1315.3310289.23 1315.32
10292.69 1315.3610294.94 1315.3210297.67 1315.2610298.05 1315.3710301.22 1316.09
10302.67 1315.7610303.01 1315.6710304.06 1315.6710311.92  1315.810313.61 1315.87
10314.79  1315.910316.24 1316.1110319.31 1316.0110319.94 1315.9910320.15 1315.99
10322.38 1316.0610325.04 1316.15 10331.1  1316.210331.18 1316.2110331.21  1316.2
10333.49 1316.5510333.78 1316.5810333.97 1316.5810335.55  1316.510339.17 1316.54
10340.35 1316.5610343.07 1316.7910344.47  1316.910346.52 1316.9310349.84 1316.93
10350.25    131710352.54 1317.0510354.44 1317.1210357.11 1317.2610359.26 1317.37
10361.13  1317.410361.78 1317.4210365.01 1317.4910366.45 1317.5210366.86 1317.53
10368.83  1317.610370.19 1317.6810370.77 1317.74 10371.3 1317.7310373.63 1317.66
10376.18 1317.79 10378.3  1317.910381.93 1318.1310383.15 1318.1810384.68 1318.18
10387.18 1318.1610388.67 1318.2510393.18 1318.5510397.64 1318.67   10401 1318.72
10407.62 1318.8510407.66 1318.8510407.69 1318.8610415.94 1319.1510419.26 1319.24
10422.51 1319.3610427.26 1319.8110428.22 1319.9210429.13 1320.0410434.16 1320.78
 10434.7 1320.77 10436.7 1320.7810444.42 1320.8510446.15 1320.7410446.34 1320.78
 10446.7  1320.810447.38 1320.8610448.75 1320.8410452.66 1320.3410456.35 1319.83
10460.12 1319.7710469.52  1319.610472.52 1319.8710473.08 1319.9310473.29 1319.94
10475.31 1319.9110478.57 1319.8810484.13 1319.7610484.72 1319.8210485.92 1319.97
 10491.5 1320.1710491.64 1320.1710492.65 1320.6310493.39 1320.62 10493.7 1320.64
10493.87 1320.6510493.94 1320.6510494.17 1320.6210494.74 1320.5910495.57 1320.21
10495.63 1320.21   10500 1320.05

Manning's n Values         num=       3
     Sta   n Val      Sta   n Val      Sta   n Val
**********************************************
    9400     .05 9954.15     .0310089.92     .03

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.    Expan.
       9954.1510089.92              543     500   409.9             .1       .3

CROSS SECTION


RIVER: MDOW
REACH: Reach1              RS: 4.199

INPUT
Description:
Station Elevation Data    num=     154
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
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 9966.83 1314.81 9969.15 1314.75 9971.89 1314.55 9972.25 1314.53  9972.7 1314.38
 9976.41 1312.95 9977.211312.391    9980 1310.44 9981.02 1309.72 9983.19 1308.74
 9986.51 1307.21 9993.41 1304.85 9993.62 1304.77 9995.27 1304.19  9997.9 1303.72
10001.72 1303.8810003.35 1303.9710006.81 1304.21 10010.5  1304.810012.81 1305.21
10013.59 1305.3310014.13 1305.4310015.53 1305.6610017.49 1305.7710019.74 1305.88
10021.97 1306.0910024.03  1306.310027.97 1306.5510028.68 1306.56  10029.8 1306.47
10032.17 1306.3910033.46 1306.4610034.11 1306.4410037.29  1306.610038.24 1306.64
10040.04 1306.44 10040.5 1306.4610050.75 1306.8210051.06 1306.8410056.67 1306.73
10066.31 1306.6110067.28 1306.7110067.84 1306.7810070.09 1306.9710072.48 1307.36
10075.35 1307.6810077.86 1308.5110082.68 1309.9910088.62 1311.71 10090.5  1312.2
10091.051312.392 10093.8 1313.35 10095.5 1313.49 10097.2 1313.6410098.35 1313.67
10103.26  1313.710104.53 1313.7110106.29 1313.79 10108.4  1313.610110.18 1313.63
10112.13 1313.6410115.32 1313.5710116.79 1313.4910117.92 1313.5110120.25 1313.44
10121.67 1313.5610122.21 1313.5410123.89 1313.3710128.29 1313.3510130.13 1313.29
10130.52 1313.3910130.83 1313.43 10134.4 1313.4110138.16 1313.43 10142.7 1313.49
10143.84 1313.3610158.44  1313.710159.47 1313.8410159.71 1313.8410160.51 1313.68
10163.14 1313.6910173.93 1313.8310178.61 1313.9910182.44 1314.0710183.09 1314.09
10183.48 1314.0510187.76 1314.0410198.58 1314.02 10200.5 1314.0110220.04 1313.85
10226.59 1313.8910230.61 1313.8810237.39 1313.6910239.79  1313.610242.08 1313.54
10250.72 1313.32   10256 1313.2110257.32 1313.1810257.82 1313.1610269.86 1312.78
   10270 1312.7910271.26 1312.7910272.84 1312.7810274.04 1312.5810274.85 1312.51
10276.32 1312.3410277.92 1312.2410278.61 1312.1910280.62 1312.0910281.47 1312.09
10283.13 1312.1310285.97 1312.4110287.27 1312.4710292.49 1312.6810293.25 1312.83
10298.12 1312.8510298.57 1312.8310301.31 1312.8110305.39 1312.8110307.14 1312.79
10308.46 1312.7910310.38 1312.8910313.44 1312.95 10315.3 1312.9510315.89    1313
10320.05 1313.1610320.59 1313.1910323.42 1313.2410326.52 1313.2710327.28  1313.3
10334.03 1313.29 10335.2 1313.3510338.97 1313.5710339.94 1313.4210340.25 1313.35
10344.03 1313.4410351.02 1313.7610355.68   131410359.12 1314.1110360.83 1314.06
10362.88 1314.1410371.57 1314.5610374.55 1314.7210377.33  1314.810382.89 1315.01
10386.39 1315.1610388.88 1315.2310399.55 1315.6510405.79 1315.9210408.35 1316.04
10409.79 1316.0910414.85 1316.28 10420.7 1316.43   10425 1316.55

Manning's n Values         num=       3
     Sta   n Val      Sta   n Val      Sta   n Val
**********************************************
 9966.83     .05 9971.89     .03 10097.2     .03

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.    Expan.
       9977.2110091.05              617.4     500   297.9             .1       .3

CROSS SECTION


RIVER: MDOW
REACH: Reach1              RS: 4.104

INPUT
Description:
Station Elevation Data    num=     416
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*********************************************************************************
    9200 1312.46 9204.75 1312.46 9206.88 1312.44 9212.38 1312.24 9216.17 1312.14
 9217.59 1312.13 9221.93 1311.95 9229.94 1311.86 9231.91 1311.88 9242.84 1311.74
 9246.57 1311.68 9251.18 1311.39 9252.51 1311.38 9255.76 1311.41 9256.93 1311.38
 9270.04 1311.19 9271.33 1311.18 9274.46 1311.17 9285.26 1311.15 9285.42 1311.15
 9287.27 1311.17 9291.22 1311.18 9292.01  1311.2 9294.41 1311.26 9294.89 1311.26
 9296.42 1311.16 9296.45 1311.15 9296.53 1311.15 9296.86 1311.14 9300.61 1311.11
```

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 9302.33 1311.08 9303.19 1311.04 9305.02 1310.93 9307.43 1311.13 9307.63 1311.15
 9307.83 1311.15    9308 1311.15 9308.48 1311.16 9310.63  1311.2 9312.05 1311.25
 9312.23 1311.25  9312.4 1311.26 9313.32 1311.29 9314.73 1311.27 9316.16 1311.22
 9319.88 1311.05 9320.68 1311.03 9320.84 1311.01 9321.08    1311 9321.56 1310.97
  9325.8 1310.92 9334.26 1310.92  9340.4 1310.92 9345.33  1310.9 9351.52 1310.82
 9354.56 1310.79 9361.92 1310.81 9363.97 1310.82 9367.76 1310.75 9373.57 1310.71
 9376.55 1310.71 9381.03 1310.68  9386.5  1310.6 9393.46 1310.58 9401.54 1310.56
 9404.05 1310.56 9412.69 1310.51 9414.18  1310.5 9419.54 1310.56 9423.43 1310.66
 9425.65 1310.78 9426.09 1310.76 9428.69 1310.65  9433.5 1310.35 9435.54  1310.3
 9440.19 1310.21 9444.38 1310.34 9445.68 1310.33 9446.57 1310.22 9454.73 1310.25
 9456.88 1310.25 9457.33 1310.26 9460.73 1310.33  9463.9 1310.38  9468.7 1310.39
 9472.48 1310.41 9474.15 1310.37 9474.89 1310.35 9475.83 1310.38  9479.8 1310.33
 9480.89  1310.3 9481.59 1310.27 9482.65  1310.3 9486.52 1310.32 9489.46 1310.32
 9492.15 1310.35 9495.28 1310.34 9498.54 1310.38 9503.62  1310.4  9507.2  1310.4
 9514.39 1310.41 9516.61  1310.4  9523.2 1310.38 9524.19 1310.37 9530.29 1310.33
 9530.77 1310.33 9537.56 1310.33 9537.72 1310.33 9540.14 1310.34 9543.36 1310.35
 9543.43 1310.35  9543.5 1310.34 9545.35 1310.25 9545.42 1310.25 9548.13 1310.27
 9548.29 1310.27 9551.84 1310.27 9552.42 1310.27 9557.54 1310.24 9560.68 1310.22
 9562.06 1310.23 9564.69 1310.28 9566.86 1310.31 9568.68 1310.22 9569.09 1310.21
 9570.84 1310.26  9572.8 1310.28 9575.43 1310.25 9577.76  1310.3 9579.16 1310.36
 9581.61 1310.32 9587.53  1310.1 9589.01 1310.08 9590.65 1310.09 9591.31 1310.08
 9591.84 1310.08 9592.25 1310.11 9592.81 1310.13 9601.48 1310.24 9602.98 1310.25
 9607.04 1310.32 9608.55 1310.24 9609.57 1310.18  9609.7 1310.17 9610.84 1310.14
 9612.49 1310.15 9613.94 1310.24 9617.44 1310.29 9619.55 1310.31 9620.54 1310.43
 9622.12 1310.44 9622.74 1310.51 9623.71 1310.45 9624.81 1310.42 9625.97 1310.41
 9628.87 1310.42 9629.75 1310.41 9630.67 1310.47 9634.51 1310.54 9635.81  1310.6
 9637.13 1310.63 9643.29 1310.66 9644.19 1310.69 9645.12  1310.7 9646.53 1310.72
 9652.64 1310.79 9653.49 1310.79 9654.41 1310.76 9655.23 1310.76 9655.86 1310.77
 9669.34 1311.02 9670.18 1311.03 9670.78 1311.04 9671.29 1311.04 9671.96 1311.04
 9682.96 1311.19 9683.46 1311.19 9683.96 1311.21 9695.19 1311.32 9695.49 1311.32
  9695.8 1311.32 9701.45 1311.35 9710.34  1311.4 9711.36 1311.41 9712.27 1311.41
 9721.65 1311.48 9723.26 1311.49 9731.62 1311.55 9734.44 1311.57 9744.67 1311.63
  9748.8 1311.63 9754.56 1311.64 9759.32 1311.66 9764.11 1311.66 9768.81 1311.67
 9773.15 1311.71 9778.63 1311.74 9781.78 1311.75 9787.85  1311.8 9789.93 1311.82
 9793.34 1311.85 9798.87 1311.93 9799.42 1311.94 9804.45 1311.97 9806.22 1311.97
 9809.91 1311.96 9810.28 1311.95 9815.14 1311.95 9815.69 1311.94 9820.85 1311.95
 9821.69 1311.97 9822.36 1311.99 9827.55 1311.94 9829.05 1311.94 9832.05 1311.91
 9833.94 1311.94 9835.92 1311.92 9838.15 1311.91 9841.89 1311.85  9844.1  1311.8
 9847.09 1311.71 9854.88 1311.62 9856.81 1311.57 9857.72 1311.55 9858.23 1311.53
 9859.23 1311.51 9866.15 1311.28 9867.56 1311.26 9871.69 1311.35 9872.37 1311.35
 9879.91  1311.1 9880.29 1311.09 9883.07 1310.79 9883.13 1310.79 9883.18 1310.79
 9885.43 1310.79 9886.85 1310.79  9886.9 1310.79 9889.45 1310.82 9898.28 1310.78
 9899.25 1310.78    9900 1310.79 9910.29 1310.61 9911.99 1310.59 9917.71 1310.57
  9918.5 1310.56 9919.29 1310.53 9923.56 1310.53 9924.71 1310.47 9926.13 1310.44
  9930.3 1310.33 9931.59 1310.32 9935.15 1310.11 9936.99 1310.08 9938.84    1310
 9943.58 1309.86 9945.58 1309.76 9947.35 1309.66 9952.65  1309.4 9954.65 1309.35
 9960.66 1309.08    9961 1309.05 9961.52 1309.04 9963.26 1308.88 9965.09 1308.76
 9968.53 1308.03 9972.61 1307.36 9973.11 1307.27 9973.15 1307.27 9973.29 1307.25
 9973.35 1307.23 9973.46 1307.18 9973.56 1307.14    9979 1304.89 9981.01 1303.46
 9981.42 1303.36 9981.94 1303.17  9982.5 1303.27 9985.18  1301.9 9986.71 1301.24
 9990.14 1299.79 9990.28 1299.73 9991.67 1299.76   10000 1299.8910004.33 1299.96
10005.51 1299.9810005.88 1300.0210011.95 1300.4910016.85 1301.9310018.52 1302.45
10018.71 1302.44 10019.1 1302.8710020.17 1304.0710021.16 1305.29 10022.6 1307.21
10025.02 1307.7310026.79 1308.1910028.96 1308.2210032.23 1308.2910037.98 1307.33
10039.15 1307.1310039.81 1306.7310043.92 1304.7110045.35 1304.36   10046 1304.15
 10046.4  1304.1 10047.2 1303.9110047.98 1303.9510048.05 1303.9610049.53 1304.05
10049.56 1304.0610049.59 1304.0610050.05 1304.0710052.16 1304.1310052.94 1304.08
10054.17 1303.9810054.32 1303.9710054.46 1303.9710054.54 1303.9710054.67 1303.98
10058.03 1304.1610060.81 1304.36 10064.3 1304.68 10065.8 1304.83 10069.7  1305.2
 10070.6 1305.2810076.48 1305.6810077.01 1305.7210079.78 1305.8810083.97 1306.15
10084.43 1306.1710089.18 1306.4810091.37 1306.5910095.81 1306.8110098.02 1306.88
10101.38 1307.0110102.92 1307.0810105.28 1307.1710107.89 1307.2910110.97  1307.4
 10112.5 1307.4610117.27 1307.5710118.34  1307.610122.78 1307.75 10123.1 1307.75
10126.07 1307.8310129.53 1307.9210130.07 1307.92  10135.6 1307.9210139.41 1307.95
10140.95 1307.9610144.59 1308.0410147.56 1308.0610150.32 1308.0610154.91 1308.03
10159.25 1308.0510162.47 1308.0810168.12 1308.0610169.09 1308.0910174.65 1308.08
10175.47 1308.0810178.08 1308.0910181.34  1308.110181.61  1308.110181.63  1308.1
10181.69  1308.110185.22  1308.110188.45 1308.0110190.87 1307.8910191.83  1307.9
10192.37 1307.9210193.71    130810194.32 1308.0910195.41 1308.1510196.08  1308.2
10198.31 1308.3910199.35  1308.410201.22 1308.52 10202.4 1308.4610204.97 1308.55
10206.49 1308.59 10208.2 1308.5910211.86 1308.79 10212.9 1308.8510216.14 1309.06
 10216.5 1309.0910221.41 1309.3710222.41 1309.4310222.59 1309.4510227.08  1309.9
10228.25 1310.0110231.97 1310.2910234.37 1310.5410237.77  1310.910241.41 1311.22
10243.79 1311.3910249.12 1311.8510250.08 1311.9310255.07 1312.3910255.94 1312.46
10256.31 1312.4910260.75 1312.8310262.32 1312.9710265.63 1313.2110268.24 1313.33
10270.54  1313.410271.93 1313.4510277.26 1313.6810278.25 1313.7210284.87 1313.92
10286.63 1313.9710286.91 1313.9710291.33 1314.1510292.88 1314.1910298.63  1314.3
   10300 1314.33

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
***********************************************
    9200    .056 9965.09     .0410026.79    .056

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.    Expan.
       9965.0910026.79             793.5     693   658.3             .1       .3

CROSS SECTION


RIVER: MDOW
REACH: Reach1             RS: 3.973

INPUT
Description:
Station Elevation Data    num=     259
     Sta     Elev     Sta     Elev     Sta     Elev     Sta     Elev     Sta     Elev
*********************************************************************************
    9200 1308.81 9200.22 1308.81 9200.42 1308.81 9201.55 1308.78 9202.93 1308.75
 9204.44 1308.71 9206.46  1308.6  9217.5 1308.43 9223.86 1308.25 9227.17 1307.96
 9227.77  1307.9 9228.89 1307.86 9231.47  1307.8 9240.91 1307.47 9247.74 1307.43
 9249.04 1307.43  9258.1  1307.4 9258.48  1307.4 9258.76  1307.4 9261.94 1307.38
 9273.15 1307.26 9274.11 1307.23 9278.61 1307.13  9281.6 1307.09 9298.44 1307.09
 9305.02 1307.06 9305.51 1307.16 9306.37 1307.27 9306.76 1307.11 9307.06 1307.04
 9320.72 1306.94 9322.86 1306.92 9326.17 1306.88 9352.54 1306.62  9373.8  1306.5
 9374.37 1306.49 9382.97  1306.4 9390.54 1306.41 9394.18 1306.35 9396.13 1306.37
 9397.78 1306.45 9401.02 1306.46 9414.29 1306.26 9415.98 1306.24 9417.37 1306.23
 9429.27 1306.19 9430.14 1306.18 9435.86 1306.12 9449.08 1306.01 9452.54 1306.38
 9453.67 1306.49 9454.17 1306.51 9454.67 1306.53 9456.56 1306.57 9458.01 1306.26
 9458.66 1306.15 9458.76 1306.15 9459.43 1306.09 9463.16 1305.71 9469.01 1305.89
 9469.13  1305.9 9469.19  1305.9  9469.2  1305.9 9469.35  1305.9 9473.18 1305.96
  9474.5 1305.99 9475.31 1305.98 9476.73 1305.99 9478.14 1305.97  9480.3 1305.93
  9491.5 1305.71 9501.52 1305.64 9520.85 1305.65 9522.52 1305.65 9525.23 1305.62
 9536.58 1305.39  9538.7  1305.4 9548.93  1305.5 9563.42 1305.54 9569.78 1305.48
 9572.67 1305.52 9576.56 1305.02  9577.2 1304.97 9578.62 1305.29 9578.86 1305.35
 9578.91 1305.36 9580.21 1305.37 9588.13 1305.46 9589.34 1305.47 9590.68 1305.49
 9601.79 1305.43 9613.04 1305.31 9614.92 1305.31 9618.99 1305.26 9627.46 1305.13
 9633.14 1305.31 9634.91 1305.36 9636.23 1305.39 9636.76 1305.41 9637.56 1305.45
 9656.41 1305.46 9657.25 1305.46 9657.38 1305.46 9657.66 1305.46 9680.99 1305.39
 9682.16 1305.09 9682.85 1304.93 9683.78 1305.09 9685.95 1305.47 9689.28 1305.54
 9695.32 1305.73 9710.03 1305.75 9717.29  1305.7 9733.12 1305.77  9737.8  1305.8
  9744.9 1305.86 9759.95 1306.02 9763.62 1306.04 9767.35 1306.07  9793.4 1306.27
 9818.72 1306.36 9819.64 1306.37 9821.74 1306.38 9844.68 1306.39 9864.38 1306.46
 9869.19 1306.42 9884.39 1306.18 9884.85 1306.17 9885.12 1306.16 9892.87 1305.75
 9898.83 1305.71 9900.35  1305.7 9902.94 1305.67 9913.75  1305.5 9918.85 1305.44
 9924.89 1305.32  9938.4 1305.24 9939.62 1305.24 9940.37 1305.23 9941.42 1305.21
 9946.54 1305.17 9949.41 1305.12 9949.82 1305.12 9953.27 1304.89 9958.19 1304.73
 9958.93 1304.72 9960.46 1304.95 9960.99 1304.98 9961.47 1305.23 9962.29 1305.57
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 9965.51 1305.65 9969.47 1305.65 9973.58 1305.65 9974.75 1305.23 9976.24 1304.66
 9978.09 1303.53 9978.62 1303.15 9980.68 1301.38    9982 1300.27 9982.65 1299.98
 9986.98 1298.23 9988.55 1296.28 9989.33 1295.35   10000 1295.5910002.13 1295.64
10009.41 1295.8310011.35 1297.4110013.57 1299.2510020.26 1301.9810027.07 1304.76
10032.55 1304.63 10035.5 1304.6210039.55 1304.2310043.34 1303.8710045.36 1303.72
 10045.9 1303.7510046.87 1303.7510048.77 1303.7310050.44 1303.7210051.45 1303.75
10052.11 1303.8810052.12 1303.8810052.14 1303.8810053.18  1303.410054.36 1302.18
10054.96 1301.3810056.22 1302.1910056.24  1302.210060.96 1303.5510064.05 1304.48
10067.39 1304.6210068.39 1304.6810069.67 1304.69    10075 1304.8210076.21 1304.73
10082.52 1304.2910085.88 1303.9110087.24 1304.1410087.71 1304.1910094.29 1304.25
10099.99 1304.3810104.62 1304.4410110.12 1304.4610123.48 1304.4610126.42 1304.45
10128.19 1304.3610133.62  1304.1 10140.3 1304.5710142.64 1304.7310149.85 1304.76
10158.59  1304.810171.96 1305.2710178.88 1305.57 10181.7 1305.6610192.06 1306.11
 10192.3 1306.1310192.49 1306.1410198.44 1306.5910203.51 1307.0810205.04 1307.24
10205.86 1307.2610208.57 1307.3410210.22 1307.1810212.07 1307.1210213.31 1307.07
10217.96 1307.0210222.48 1307.4110223.29 1307.4610224.67 1307.5810225.77 1307.69
10227.94 1307.93 10228.8 1307.9810234.12  1308.510234.63 1308.5510234.83 1308.56
10236.83 1308.8110238.42 1308.9810238.83 1309.0310239.46  1309.110241.04 1309.13
10242.34 1309.1310243.18 1309.1310243.63 1309.1310248.11  1309.110248.97  1309.1
10250.19 1309.1410251.09 1309.13 10255.7 1309.2110260.66 1309.2810269.81 1309.55
10274.64 1309.5910280.48 1309.6810283.96 1309.7610284.02 1309.7710291.27 1310.07
10291.46 1310.0710291.55 1310.0710298.46 1310.02   10300 1310.01

Manning's n Values         num=       3
    Sta   n Val     Sta   n Val     Sta   n Val
**************************************************
    9200    .056 9973.58     .0410027.07    .056

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
       9973.5810027.07               530     500     490            .1      .3

CROSS SECTION


RIVER: MDOW
REACH: Reach1              RS: 3.878

INPUT
Description:
Station Elevation Data     num=     437
    Sta     Elev     Sta     Elev     Sta     Elev     Sta     Elev     Sta     Elev
**************************************************************************************
    9300 1309.06 9304.03 1309.04 9307.93 1309.01 9309.96 1309.01 9312.42 1308.97
 9316.64 1308.83 9318.12 1308.79 9321.98 1308.74 9324.84 1308.67 9329.93 1308.49
 9330.84 1308.45 9335.99 1308.31 9336.52  1308.3 9337.09 1308.28 9343.44 1308.25
 9344.06 1308.23 9348.34 1308.13 9348.89 1308.11 9352.42 1307.98 9356.47 1307.78
 9356.57 1307.78 9357.91 1307.74 9360.65 1307.66 9363.38 1307.48 9363.74 1307.47
  9366.9 1307.29 9369.08  1307.2  9374.8 1307.11 9376.46 1307.07 9377.24 1307.05
 9377.85 1306.98 9379.03 1306.84 9379.06 1306.84 9379.08 1306.84 9380.96 1306.84
 9381.59 1306.92 9383.07  1306.9  9384.3 1306.88 9384.99 1306.86 9386.81 1306.88
 9387.33 1306.87 9390.25 1306.84 9390.71 1306.82 9392.57 1306.82 9392.86 1306.82
 9395.79 1306.78 9396.37 1306.77 9403.19 1306.63 9403.86 1306.63 9404.69  1306.6
 9412.84 1306.39 9417.42 1306.22 9418.15  1306.2 9423.98 1306.03 9430.43 1305.91
 9430.59  1305.9 9433.05 1305.79 9435.02 1305.67 9435.14 1305.67 9435.31 1305.66
  9442.4 1305.14 9443.02 1305.12 9443.64  1305.1 9447.27 1304.98 9448.67 1304.91
 9453.17 1304.68  9456.8 1304.48  9458.9 1304.41 9461.85 1304.43 9464.71 1304.31
 9466.76 1304.26 9469.98 1304.15 9472.98 1304.07 9477.07 1304.06 9481.69 1304.02
 9486.37 1303.84  9491.4 1303.74 9498.63 1303.69 9507.63 1303.55 9508.05 1303.55
 9510.85 1303.52 9513.22  1303.5 9519.05 1303.37 9521.84 1303.33 9522.98 1303.33
 9527.55 1303.25 9531.15 1303.29 9532.62 1303.35  9534.3  1303.4 9535.75 1303.42
  9537.7 1303.36  9539.7 1303.38 9550.17 1303.19 9550.24 1303.19    9555 1302.82
 9555.01 1302.82 9555.02 1302.82 9559.06 1303.22 9571.07 1303.26 9573.06 1303.27
 9573.43 1303.25 9576.34 1303.09 9578.52 1302.66 9580.22 1302.46 9582.39 1302.94
 9583.48 1303.23 9585.55 1303.21  9594.2 1303.15 9596.55 1303.08 9597.16 1303.08
 9601.08 1303.13 9601.23 1303.13 9602.97  1303.1 9604.83 1303.08 9604.98 1303.07
 9609.47 1303.04 9610.04 1303.04 9620.05 1302.99 9620.09 1302.99 9622.14 1302.82
 9624.97  1302.8 9627.16 1302.79 9629.85 1302.79 9631.22 1302.77  9631.8  1302.8
  9633.5 1302.87 9634.82 1302.86  9635.7 1302.87 9636.86 1302.87 9638.28 1302.88
  9653.3 1302.96 9656.63 1302.91 9658.13 1302.67 9658.82 1302.55    9663 1302.57
  9679.3 1302.63 9680.03 1302.65 9684.34 1302.76 9686.56 1302.87 9688.31 1302.93
 9693.68 1302.88 9694.85 1302.82 9697.15 1302.86 9698.35 1302.75  9700.5 1302.57
  9703.1 1302.72 9704.43 1302.78 9707.46 1302.89 9707.72 1302.91 9707.96 1302.93
 9709.89 1303.05 9710.96 1303.07 9712.87 1302.96 9713.46 1302.96 9713.92 1302.89
 9715.94 1302.91  9716.5 1302.89 9721.18 1302.56 9721.34 1302.56  9722.3 1302.48
 9725.03 1302.94 9725.33 1302.99  9727.3 1302.94 9731.83 1302.81 9733.01 1302.79
 9735.43 1302.77 9740.94 1302.75 9744.04 1302.66 9744.48 1302.68 9745.19  1302.7
 9749.11 1302.86 9752.11 1302.93 9752.69 1302.96 9752.96 1302.95 9755.62 1303.01
 9755.75 1303.01 9756.79 1302.96 9759.31  1302.9 9760.58 1302.85 9763.22 1302.85
 9768.11 1302.68 9770.66 1302.92    9773 1303.13 9775.38 1303.13 9776.28 1303.18
 9776.55  1303.2 9778.51 1303.19 9779.83 1303.12 9780.94 1303.07 9781.91 1302.97
 9785.14 1302.85 9786.73 1302.81 9796.18 1302.85 9807.41 1302.91 9810.82 1302.92
 9831.09 1302.93  9835.5 1302.94 9851.14 1302.98 9871.14 1302.98 9871.65 1302.98
 9871.98 1302.98 9892.49 1303.05 9906.97 1302.76 9910.22 1302.71 9916.21  1302.7
 9926.58 1302.64 9935.66 1302.29 9937.15 1302.22 9942.29 1302.49 9942.74 1302.54
 9944.36 1302.33 9949.03  1301.3 9953.81 1300.82 9955.84 1300.61 9956.73 1300.63
  9957.1 1300.65 9957.96 1300.69 9960.65 1300.77 9960.72 1300.78 9962.31 1300.95
 9963.14 1301.08 9963.52 1301.08 9963.98 1301.04 9964.52 1301.03 9965.89 1301.08
 9966.55  1301.1 9967.91 1301.02 9969.61 1301.03 9970.53 1301.06    9971 1301.04
 9972.44  1300.8 9972.97 1300.73  9973.7 1300.49 9974.22 1300.35 9977.59 1299.32
 9977.88 1299.32 9979.59 1297.95 9980.18 1297.55  9980.7 1297.21  9984.4 1296.26
 9984.77 1296.17 9985.07 1296.07 9985.67 1295.66 9987.85 1294.32 9988.37  1294.1
 9989.37 1293.46   10000 1293.5910000.05 1293.5910007.08 1293.6610008.58  1293.9
 10010.8 1294.6510011.84 1294.8810012.56 1294.9110012.84 1294.8810013.29    1295
10013.93 1295.1610015.97 1296.1410019.64 1297.9110020.69 1298.8810022.04 1300.08
10023.26 1300.91 10025.1 1302.1210025.69 1302.1710027.23 1302.2210027.77 1302.24
10029.82 1302.3510030.25 1302.3710032.58 1302.4410038.79 1302.18 10038.8 1302.18
10038.81 1302.1810038.84 1302.1810039.01  1302.210040.48 1302.3110040.63  1302.3
10041.34 1302.2310042.57 1302.1310043.03 1302.05 10044.2 1301.7310045.62 1301.38
10046.36 1301.2210048.03 1300.9210048.74 1300.7610049.62 1300.5210050.46 1300.35
10050.72 1300.3210051.99 1299.8210052.23 1299.7310052.44 1299.5210052.95 1299.34
10054.14 1299.1210055.43 1298.4810055.75  1298.610056.54 1298.7810056.98 1299.24
10059.13 1301.5610060.41 1301.3810061.56 1301.2610063.71 1300.9910063.93 1300.96
10064.31 1300.9310064.46 1300.9310064.78 1300.4910065.24 1299.8610065.42  1299.7
10066.04 1299.1210066.85 1298.4610067.55 1298.2510068.12  1297.910069.69 1298.43
10070.27 1298.5810070.27 1298.5910070.29  1298.610070.59 1298.88 10071.2 1299.45
10071.21 1299.4710072.14 1300.2510073.23 1301.26 10073.7 1301.4110075.01 1301.81
10075.41 1301.9110075.81 1302.0710076.77 1302.4810077.66 1302.4210079.02 1302.34
10080.01 1302.13 10081.5 1301.8910082.04 1301.9210083.97 1301.9910084.03 1301.99
10084.37 1301.9710084.51 1301.9710085.69    130210110.78 1302.1910122.43 1302.31
10122.68  1302.310124.13 1302.2110127.85 1302.04 10128.3 1302.0710129.82 1301.99
10130.61 1302.0510140.99 1302.1810149.63 1302.2710150.82 1302.2910168.32 1302.55
10172.31 1302.6410185.98 1302.9310189.81 1302.9910190.65    130310190.84 1303.01
10191.08 1303.0210191.58 1303.0310196.91 1303.1610209.11 1303.4410217.98 1303.65
 10222.3 1303.7110230.16 1303.8410234.37 1303.8610242.58 1304.0310245.88 1304.12
10252.83 1304.2810253.66  1304.310253.95  1304.310254.05  1304.310258.01  1304.3
10260.96  1304.410267.77 1304.6110267.93 1304.6110268.62 1304.6310269.45 1304.65
10275.31 1304.7710284.43 1304.9610287.58 1305.0210293.92 1305.3210299.33 1305.55
10299.71 1305.54   10300 1305.54 10301.1 1305.5810301.73 1305.5910307.14 1305.65
 10308.3 1305.6810309.49 1305.6710319.12 1305.8610319.23 1305.8710319.42 1305.87
10319.85 1305.8910321.64 1305.9710326.19 1306.4310328.83 1306.6610336.87 1307.36
10337.62 1307.4210339.11 1307.5310339.59 1307.5110339.79 1307.5310350.68 1307.73
10363.05 1307.9710363.48 1307.9610364.29 1307.9810364.89 1307.9710365.89 1307.95
10366.53 1307.9710370.06 1308.1110370.45 1308.1110370.71 1308.1110371.03 1308.11
10371.62  1308.110375.95 1308.0910377.49 1308.0910378.24  1308.110379.86  1308.1
 10380.6 1308.0810381.07 1308.06 10381.4 1308.0510386.94 1308.1510393.33 1308.38
10399.63 1308.4210404.35 1308.4610406.54 1308.4810409.99 1308.5410423.66 1308.73
10428.81  1308.810428.86 1308.8110434.39 1308.9810436.19 1309.0910438.53 1309.09
10438.61  1309.1 10446.5 1309.1110450.24  1309.210464.33 1309.3210466.56 1309.34
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10467.26 1309.3510468.01 1309.3610468.64 1309.3610469.44 1309.3510469.93 1309.36
10492.72 1309.59   10500 1309.78

Manning's n Values   num=   3
    Sta   n Val   Sta   n Val   Sta   n Val
****
    9300   .056   9971   .0410023.26   .056

Bank Sta: Left   Right   Lengths: Left Channel   Right   Coeff Contr.   Expan.
         997110023.26   433.4 410.73   399.9   .1   .3

CROSS SECTION

RIVER: MDOW
REACH: Reach1   RS: 3.800

INPUT
Description:
Station Elevation Data   num=   402
     Sta   Elev   Sta   Elev   Sta   Elev   Sta   Elev   Sta   Elev
****
    9300 1305.17 9301.11 1305.18 9303.19 1305.16 9305.55 1305.16 9307.81 1305.07
 9309.75 1305.03 9312.04 1304.84 9312.83 1304.77 9316.48 1304.53   9317 1304.5
 9319.95 1304.4 9320.11 1304.37 9322.99 1304.41 9323.01 1304.41 9323.2 1304.42
 9325.66 1304.48 9327.89 1304.51 9328.35 1304.52 9332.32 1304.48 9334.77 1304.46
 9336.13 1304.47 9336.36 1304.46 9337.54 1304.36 9340.66 1304.14 9341.57 1304.06
 9342.02 1303.99 9343.16 1303.76 9344.49 1303.68 9345.32 1303.68 9346.56 1303.55
 9346.58 1303.54 9347.92 1303.4 9348.22 1303.39 9351.8 1303.35 9353.33 1303.28
 9357.28 1303.14 9358.29 1303.12 9361.53 1302.96 9362.69 1302.92 9366.03 1302.8
 9367.67 1302.74 9370.52 1302.65 9372.29 1302.58 9375.07 1302.56 9378.1 1302.45
 9381.69 1302.45 9385.27 1302.42 9387.24 1302.37 9388.65 1302.34 9389.65 1302.32
  9391.1 1302.19 9394.06 1302.09 9395.64 1302.04 9396.13 1302.02 9397.71 1302.52
 9398.57 1302.64 9399.78 1302.42 9400.69 1302.32 9402.29 1302.23 9402.82 1302.17
 9404.72 1302.1 9405.12 1302.08 9407.62 1302.03 9409.91 1301.95 9410.36 1301.96
 9415.97 1301.9 9416.35 1301.91 9416.8 1301.91 9421.97 1301.87 9422.48 1301.85
 9423.71 1301.83 9429.76 1301.8 9431.05 1301.76 9436.74 1301.53 9438.94 1301.49
  9444.9 1301.39 9450.16 1301.35 9454.85 1301.28 9458.57 1301.2 9462.06 1301.1
  9465.2 1300.96 9469.57 1300.9 9471.05 1300.9 9472.83 1300.87 9477.3 1300.78
 9478.26 1300.77 9478.95 1300.76 9487.46 1300.59 9488.2 1300.56 9488.76 1300.54
  9493.2 1300.52 9501.84 1300.42 9505.43 1300.34 9509.23 1300.21 9513.55 1300.18
 9519.45 1300.13 9524.4 1300.08 9528.36 1300.06 9533.27 1299.93 9534.01 1299.91
 9535.97 1299.89 9538.05 1299.89 9538.18 1299.9 9538.49 1299.9 9538.86 1299.9
 9544.61 1299.94 9545.56 1299.91 9548.93 1299.93 9553.48 1299.75 9554.67 1299.7
 9555.73 1299.79 9563.65 1300.13 9565.41 1300.02 9565.46 1299.98 9566.16 1299.87
  9568.2 1299.53 9569.85 1299.85 9570.61 1299.94 9571.56 1299.98 9572.78 1299.99
 9576.65 1300.09 9577.02 1300.09 9578.87 1300.02 9579.01 1300.02 9580.43 1300.05
 9581.04 1300.01 9583.67 1299.87 9583.72 1299.87 9584.21 1299.86 9587.41 1299.84
 9587.68 1299.82   9592.8 1299.88 9593.62 1299.91 9593.72 1299.92 9593.99 1299.94
 9594.44 1299.97 9595.01   1300 9596.49 1300.05 9597.1 1300.06 9598.05 1300.08
  9598.8 1300.08 9599.95 1300.09 9600.23 1300.06 9600.61 1300.04 9602.54 1299.68
 9603.37 1299.59 9604.62 1299.75 9606.91 1299.97 9607.94 1299.97 9608.03 1299.97
 9609.98 1299.94 9610.22 1299.96 9610.8 1299.98 9613.03 1299.96 9613.22 1299.96
 9615.23   1300 9615.4   1300 9618.04 1299.96 9620.65 1299.96 9620.88 1299.94
 9626.62 1299.91 9630.66 1299.89 9634.82 1299.93 9639.32 1300.04 9639.55 1300.05
 9643.78 1299.97 9645.59 1299.94 9646.78 1299.9 9649.23 1299.92 9652.01 1299.89
 9652.09 1299.91 9652.16 1299.91 9653.91 1300.16 9654.12 1300.19 9656.03 1300.3
 9657.32 1300.28 9658.76 1300.26 9661.37   1300 9662.02   1300 9662.21 1299.99
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 9681.51 1300.02 9696.97 1300.11 9698.81 1300.12 9703.73 1300.12 9707.08 1300.1
 9714.64 1300.07 9716.38 1300.09 9719.2 1300.1 9723.46 1300.1   9726 1300.11
 9727.98 1300.12 9728.32 1300.19 9728.47 1300.19 9730.11 1300.26 9730.69 1300.25
 9731.86 1300.27 9732.33 1300.27 9734.15 1300.36 9735.09 1300.37 9736.32 1300.31
 9738.12 1300.21 9738.58 1300.2 9739.54 1300.2 9741.18 1300.23 9745.12 1300.27
 9758.44 1300.33 9768.83 1300.56 9774.13 1300.74 9781.36 1300.85 9786.87 1300.79
 9788.68 1300.73 9790.98 1300.74 9794.74 1300.97 9797.32 1301.05 9811.42 1301.46
 9815.33 1301.61   9833 1302.18 9836.47 1302.26 9846.89 1302.59 9849.85 1302.68
 9850.66 1302.7 9866.75 1302.99 9868.77 1303.05 9880.95 1303.53 9883.34 1303.63
 9883.36 1303.63 9884.15 1303.68 9885.78 1303.69 9886.58 1303.61 9892.05 1303.63
 9893.26 1303.59 9895.54 1303.5 9898.83 1303.42 9905.92 1303.05 9906.13 1303.04
 9906.39 1303.04 9913.19 1302.71 9914.45 1302.67 9916.71 1302.63 9918.77 1302.62
 9920.07 1302.6 9922.14 1302.64 9924.55 1302.7 9924.56 1302.7 9924.58 1302.7
  9924.6 1302.7 9924.62 1302.7 9925.38 1302.69 9926.21 1302.69 9926.76 1302.67
 9928.05 1302.52 9932.52 1302.11 9935.09 1301.82 9940.46 1301.01 9944.32 1300.68
 9945.87 1300.56 9948.56 1300.32 9951.09 1300.17 9952.27 1300.05 9954.53 1299.82
 9958.48 1300.25 9960.98 1300.48 9965.74 1300.07 9966.74 1300.05 9970.44 1298.76
 9971.89 1298.01 9971.99 1298.02 9972.73 1297.5 9979.5 1292.12 9989.41 1292.46
 9991.97 1292.55 9997.89 1292.79   10000 1292.8210008.09 1292.9310009.25 1293.58
10011.31 1294.8510012.08 1295.2810013.91 1296.1710014.18 1296.310016.87 1297.56
10017.17 1297.710017.22 1297.7210017.44 1297.8410020.17 1299.2910020.45 1299.33
 10020.8 1299.3610022.31 1299.4910023.66 1299.6210024.67 1299.6210025.19 1299.67
10026.12 1299.6510026.56 1299.710027.75 1299.8310029.23 1299.8310029.57 1299.83
10034.88 1299.6610035.73 1299.6510038.18 1299.5910043.46 1299.4910043.64 1299.48
10043.75 1299.4810046.73 1299.2510048.18 1299.1610049.14 1299.3110050.02 1299.54
10056.83 1299.56   10060 1299.5710063.78 1299.5410065.79 1299.5210075.15 1299.65
10079.97 1299.87 10080.1 1299.8710080.33 1299.8810094.23 1300.2610102.06 1300.41
10108.51 1300.4110122.15 1300.6810125.33 1300.7310138.56 1300.8510147.53 1300.92
10150.35 1300.9510152.27 1300.97 10157.5 1301.0110162.54 1301.0710164.33 1301.1
10176.58 1301.3710185.61 1301.5510186.84 1301.5810188.26 1301.5910193.74 1301.58
10196.17 1301.6210200.11 1301.6610209.62 1301.7710210.26 1301.7810210.54 1301.78
10211.48 1301.79 10216.7 1301.8210226.66 1301.8710230.14 1301.8910233.24 1301.93
10240.81 1302.0110246.96 1302.1410254.48 1302.2210258.93 1302.2910261.43 1302.39
10265.39 1302.4210265.62 1302.4410265.71 1302.4510265.75 1302.4510267.61 1302.69
10269.33 1302.6510269.72 1302.63 10270.8 1302.6110272.82 1302.4810273.48 1302.53
10277.65 1302.6510282.34 1302.8610287.37 1303.0410291.74 1303.1910294.99 1303.3
10301.94 1303.6810305.46 1303.8210313.41 1304.16 10319.5 1304.5110319.89 1304.5
10320.26 1304.4810331.27 1304.7410331.39 1304.7410331.83 1304.7410336.58 1304.9
10338.03 1304.9410340.92 1304.9510344.07 1304.94 10345.1 1304.95 10350.8 1304.86
10351.72 1304.8310352.74 1304.8210354.22 1304.7510357.28 1304.7210360.36 1304.74
10362.99 1304.7710366.55 1304.8510367.21 1304.8510367.78 1304.8510369.16 1304.83
10372.02 1304.9110372.27 1304.910375.83 1305.0110376.29 1305.0310376.61 1305.04
10381.82 1305.1510386.16 1305.0610386.29 1305.0610386.46 1305.0610388.74 1305.06
10398.04 1305.25   10400 1305.32

Manning's n Values   num=   3
    Sta   n Val   Sta   n Val   Sta   n Val
****
    9300   .056 9966.74   .0410027.75   .056

Bank Sta: Left   Right   Lengths: Left Channel   Right   Coeff Contr.   Expan.
       9966.7410027.75   414.5   500   522   .1   .3

CROSS SECTION

RIVER: MDOW
REACH: Reach1   RS: 3.706

INPUT
Description:
Station Elevation Data   num=   298
     Sta   Elev   Sta   Elev   Sta   Elev   Sta   Elev   Sta   Elev
****
    9300 1301.53 9302.88 1301.44 9303.94 1301.42 9304.91 1301.39 9307.87 1301.3
  9310.2 1301.21 9311.54 1301.18 9313.87 1301.16 9314.54 1301.15 9318.14 1301.1
 9320.49 1301.07 9320.8 1301.06 9321.04 1301.06 9322.76 1301.02 9328.57 1300.89
 9330.51 1300.81 9334.39 1300.68 9334.51 1300.68 9334.65 1300.67 9335.21 1300.63
 9339.95 1300.31 9341.23 1300.07 9343.61 1299.79 9346.67 1299.36 9350.71 1299.32

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 9363.41 1299.23 9370.93 1299.15 9374.85  1299.1 9376.76 1299.05 9381.78 1298.92
 9382.39 1298.92 9383.06 1299.23 9383.18 1299.24 9384.78 1299.22 9385.35 1299.23
 9385.97 1299.22 9388.93 1299.07 9389.12 1299.06 9389.16 1299.05 9389.76 1299.19
 9393.06 1299.54 9393.27 1299.47 9395.35 1299.09 9397.89 1299.01 9399.92 1298.98
 9406.26 1298.87 9406.49 1298.86 9408.13 1298.75 9409.94 1298.61 9411.62 1298.56
 9413.52 1298.46 9414.74 1298.53 9415.89 1298.62 9417.53 1298.76 9419.42 1298.71
 9419.77 1298.71 9419.81 1298.71  9420.5 1298.71  9423.9  1298.7 9424.96 1298.71
 9425.18 1298.71 9435.94 1298.61 9436.94 1298.57 9439.41 1298.54 9446.31  1298.5
 9451.32 1298.46 9454.78 1298.37 9456.92 1298.33 9466.32 1298.12 9467.29  1298.1
 9468.02 1298.13 9476.02 1298.33 9482.08 1298.39 9494.53 1298.44 9495.51 1298.44
 9495.72 1298.44 9507.43 1298.43 9513.28 1298.41 9517.73 1298.42 9531.29 1298.75
 9531.99 1298.77 9533.35 1298.79 9541.39 1298.89 9547.49 1298.95 9554.42 1298.98
  9558.3 1299.03 9564.22 1299.02 9564.98 1299.02  9570.5 1299.06 9573.88  1299.1
 9574.88 1299.12 9582.19 1299.17 9583.64 1299.15 9589.28 1299.12 9591.22 1299.09
 9596.64 1299.07 9600.67 1299.04 9603.64 1299.04 9609.02 1298.87  9610.6 1298.87
 9611.78 1298.84 9619.34 1298.76 9620.21 1298.76 9629.39 1298.59 9629.56 1298.58
 9629.58 1298.58 9629.59 1298.58 9629.61 1298.58 9639.79 1298.52 9640.35 1298.52
 9641.18 1298.53 9647.12  1298.5 9648.02 1298.46 9649.46 1298.46  9652.6 1298.34
 9656.59 1298.32 9663.25 1297.91 9663.99 1297.92 9665.24  1297.9 9669.87 1297.63
 9670.25 1297.62 9670.77 1297.58 9674.05 1297.31 9674.39 1297.29 9678.41 1297.02
 9679.29 1296.98 9681.82 1296.87 9683.31  1296.8 9685.73 1296.73 9688.59 1296.53
 9689.04 1296.51 9690.27  1296.7 9700.84 1296.68 9701.94 1296.69 9702.18 1296.66
 9705.45 1296.15 9709.45 1296.66 9711.12 1296.82 9720.64 1296.95 9722.89    1297
 9723.74 1296.95 9728.76 1296.71 9731.86 1296.54 9733.99 1296.85 9734.92 1297.04
 9736.48 1297.12 9738.28 1297.19 9741.96 1297.35 9742.03 1297.35 9742.08 1297.34
  9745.3 1297.05  9747.4 1296.87 9748.62 1296.75 9749.91 1296.62 9752.07 1296.78
 9754.09 1296.92 9754.73 1296.96 9755.62 1296.99 9759.81    1297    9762 1297.07
 9764.36 1297.07 9765.06  1297.1 9766.25 1297.09 9766.85 1297.05 9771.83 1297.19
 9771.85 1297.19 9771.86 1297.19 9771.87 1297.18 9773.47  1296.7 9774.77 1296.72
 9775.96 1296.74 9776.93 1297.14  9777.9 1297.48 9778.35 1297.47 9778.64 1297.48
 9779.98 1297.38 9784.56 1297.37 9786.86 1297.39 9792.87 1297.45 9800.57 1297.63
  9811.5 1297.85 9822.38 1297.99 9829.39 1298.11 9843.31 1298.18 9845.47  1298.2
 9847.22 1298.22 9857.82 1298.41 9869.19 1298.41 9871.11 1298.41 9877.13 1298.42
  9883.6  1298.4 9885.07 1298.37 9894.17 1297.98 9903.11 1297.55 9908.02 1297.35
 9909.95 1297.19 9912.52 1297.03 9913.27 1297.02 9914.41 1296.94 9916.71 1297.02
  9917.6 1297.03 9920.97 1297.07 9922.06 1297.05 9924.51 1297.11 9930.76 1297.19
 9932.27 1297.26 9933.44 1297.28  9935.3 1297.28 9937.65 1297.26 9940.17 1297.21
 9941.72  1297.2 9948.34 1297.47 9950.18 1297.55 9952.22 1297.62 9952.28 1297.63
 9955.63 1297.72 9957.97 1297.83  9960.3 1298.08 9962.56  1298.2 9964.63 1298.05
 9965.92 1297.97 9967.32 1297.95 9967.73 1297.91 9968.06 1297.77 9970.52 1296.26
  9971.7 1295.46 9972.37 1294.81 9974.69 1293.05 9975.93 1292.72 9977.54 1292.33
 9981.62 1292.74 9984.47 1293.08 9986.41 1292.34 9989.76 1290.85 9994.99 1290.77
 9997.73 1290.73    10000 1290.7210002.38  1290.7 10011.6 1290.5210015.21 1290.47
10015.28 1290.4710015.47 1290.44 10016.6 1290.8910018.66 1291.69 10020.3 1292.19
10021.48 1292.3810023.35 1292.9110028.07 1295.5310028.96 1295.9910029.12 1296.17
10030.52 1296.5510037.39 1297.84 10037.8 1297.8310038.84 1297.8610040.02 1297.83
10042.07 1297.6110044.33 1297.4110054.69 1297.0610058.31 1296.9310060.38 1296.88
10063.12 1297.1310069.61 1297.6710083.28 1298.0710098.16 1298.4110102.33 1298.61
10123.65 1299.4310132.38 1299.6510134.08 1299.69 10134.6 1299.71 10152.7    1300
10152.79    130010152.92    130010153.14    1300 10154.7 1300.0710161.69 1300.37
10165.96 1300.6510170.86 1300.98 10173.5  1301.210180.27 1301.59 10187.5 1301.98
10198.45 1302.5710205.34 1302.8610215.06 1303.3110223.83 1303.6710233.79 1304.01
10238.51 1304.18 10249.1 1304.5410255.27 1304.6910260.06 1304.8310260.38 1304.83
10260.58 1304.8410260.86 1304.8610270.44  1305.210276.28 1305.3210283.79 1305.44
10291.87  1305.310299.65 1305.32    10300 1305.32

Manning's n Values         num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
**************************************************
    9300    .056 9967.32     .0410037.39    .056

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.    Expan.
       9967.3210037.39             590.8   617.7   623.3             .1       .3

CROSS SECTION


RIVER: MDOW
REACH: Reach1             RS: 3.589

INPUT
Description:
Station Elevation Data    num=      318
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev
**********************************************************************************************
    9500  1301.7 9501.16 1301.69  9503.2 1301.64 9507.55 1301.57  9508.8 1301.58
 9518.55 1301.66 9519.42 1301.66 9520.53 1301.66 9526.15 1301.63 9533.17 1301.61
 9537.14  1301.6 9537.52 1301.61 9538.95 1301.62 9546.84 1301.66 9548.87 1301.69
 9551.97 1301.75 9552.45 1301.75 9555.05 1301.73 9556.25 1301.74 9556.75 1301.75
    9560  1301.7 9560.05  1301.7 9560.14 1301.69 9567.17 1301.81 9569.16 1301.87
 9570.79 1302.03 9572.21 1302.13  9572.8 1302.13 9573.17 1302.14 9574.72 1301.99
 9575.57    1302  9576.4    1302 9577.03    1302 9580.29 1301.95 9589.79 1301.82
 9591.17 1301.84 9594.36 1301.88 9596.07 1301.88 9598.91 1301.89 9600.56 1301.89
  9603.1 1301.89  9607.3 1301.74  9609.9 1301.74 9610.32 1301.74 9617.97 1301.62
 9618.02 1301.61 9618.09 1301.61 9619.53 1301.57 9627.74 1301.32 9628.72 1301.31
 9637.83 1301.14  9639.7 1301.11 9642.94 1301.02 9648.83 1300.85 9651.72 1300.76
 9658.16 1300.49 9658.88 1300.46 9660.54 1300.43 9662.67 1300.36 9664.68 1300.37
 9667.16  1300.3 9667.78 1300.28 9668.01 1300.28  9672.5 1300.19 9674.06 1300.11
 9677.24 1299.95 9679.88 1299.85 9682.54 1299.59 9684.13 1299.49 9685.19 1299.44
 9686.06  1299.4 9692.22 1299.09 9692.32 1299.08 9692.41 1299.08 9693.01 1299.06
 9702.03 1298.59 9703.28  1298.5  9705.1 1298.37 9707.66 1298.24 9709.43 1298.13
 9712.69 1297.87 9713.11 1297.84 9713.97 1297.79 9719.67 1297.44 9721.08 1297.34
 9725.13 1297.12 9729.11 1296.93 9730.35 1296.88 9731.36 1296.82 9732.05 1296.79
 9738.09  1296.5 9741.87 1296.45  9742.7 1296.45 9745.21 1296.41 9750.44 1296.33
 9756.05 1296.24 9756.95 1296.23 9758.15 1296.21 9765.24 1295.49 9768.81 1295.12
 9771.79 1294.83 9775.52 1294.53 9776.54 1294.42 9777.88 1294.29 9780.47 1294.12
 9781.29 1294.04 9781.98    1294 9785.51 1293.79 9787.49 1293.75 9790.71 1293.65
 9793.14 1293.55 9795.27  1293.59 9797.37 1293.51 9799.36 1293.61 9801.45  1293.5
 9803.47 1293.49 9805.16 1293.26 9806.34 1293.24 9807.08 1293.25 9811.45 1292.94
 9811.67 1292.94 9811.89 1292.94  9814.8  1292.7 9815.87 1292.69 9815.92 1292.69
 9818.57 1292.84 9819.36 1292.85 9820.03 1292.87 9823.86    1293 9825.16 1292.98
 9827.05 1293.01 9828.45 1293.06 9831.22 1293.08 9831.95 1293.12 9833.48  1293.2
 9835.22 1293.19 9839.79 1293.54 9841.99 1293.71 9843.16  1293.9 9843.65 1293.93
 9844.15  1293.9 9856.25 1293.98 9858.09 1293.99 9858.69 1293.91 9861.06 1293.66
  9861.8 1293.59 9862.05 1293.55 9862.44 1293.53  9865.8 1293.36 9867.39 1293.32
 9872.75 1293.22 9880.19 1293.28 9882.64 1293.32 9884.61 1293.59 9887.48 1293.98
 9888.92 1294.02 9892.72  1294.1 9903.37 1294.33 9906.27 1294.39  9909.7 1294.44
 9914.33 1294.46 9917.94 1294.52 9925.45  1294.6 9929.05 1294.61 9936.41 1294.77
 9947.68 1294.83 9948.31 1294.83 9948.49 1294.83 9948.74 1294.84 9958.17 1294.88
 9959.76 1294.89  9962.3 1294.77 9963.55 1294.77 9967.84 1294.65 9969.17 1294.64
 9970.16 1294.63 9972.59  1294.4 9975.88 1294.34 9975.97 1294.33  9977.8 1294.15
 9979.47 1292.87 9981.07 1292.25 9986.32  1288.9 9988.06  1288.2 9991.44 1286.88
 9999.32 1286.81    10000  1286.810001.49 1286.7910001.91 1286.8810004.46  1287.4
10006.44 1287.8510011.31 1288.9210011.62 1288.9410012.01    128910012.65 1289.07
10018.47 1289.6210019.45 1289.74 10021.8  1290.110022.92 1290.1710023.38 1290.25
10027.47 1290.8910027.72 1290.9210027.95 1290.9810031.94 1291.1510032.65 1291.18
10032.68 1291.1810033.49 1291.1810039.88  1291.1 10040.1  1291.110040.62 1291.09
10047.29 1291.0310050.71 1291.0510051.11 1291.0410051.45 1290.9910057.61 1290.11
10060.26 1290.21 10063.4 1289.5510067.54 1289.3410068.58 1289.3110072.16 1289.17
10073.17 1289.1410075.47 1289.0610078.06 1288.9510079.43 1288.9610081.16 1289.44
10082.67 1289.5710083.38  1289.710083.97 1293.3210084.22 1294.6610084.66 1294.72
10086.63 1294.9210090.41    129510090.71    129510093.66 1295.2110094.22 1295.24
10097.26 1295.34 10099.5  1295.410100.58 1295.3210105.33    129510105.59 1294.99
10108.84 1294.9110110.68 1294.9310113.14 1294.9810113.81 1294.9810121.58 1294.94
 10138.4 1294.9210139.01 1294.93 10139.9 1294.8910140.02 1294.8910140.41 1294.89
10147.75 1294.9810150.36 1294.99 10157.8 1295.0410166.44 1295.1410179.38 1295.17
10183.32 1295.1910183.78 1295.2110186.44 1295.1910208.11 1295.3110221.17 1295.52
10223.66 1295.5610224.56 1295.5710240.78 1295.8410241.86 1295.8410262.95 1296.16
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10269.18 1296.2710274.04 1296.3410291.14  1296.510311.08 1296.6610313.82 1296.68
10316.07 1296.6910324.91 1296.2910327.04  1296.110329.66 1296.3110331.42  1296.5
 10335.7 1296.6110339.04 1296.6510344.74 1296.7610351.23 1296.8210352.02 1296.84
 10354.5 1296.8410358.56 1296.3310361.53 1296.5910361.68  1296.610364.71 1296.86
10376.94 1297.0110377.93 1297.02 10378.3 1297.0310395.77 1297.5510396.62 1297.59
10397.93 1297.65 10400.4 1297.7410407.05 1297.93   10408 1298.0310408.19 1298.06
10408.63  1298.110412.37 1298.1310412.69 1298.1410414.16 1298.1810415.36 1298.31
10416.04 1298.3310422.15  1298.610423.96 1298.5410424.72 1298.5110428.75 1298.65
10438.16 1299.0310448.63 1299.38 10450.3 1299.4410450.76 1299.4510451.16 1299.46
10464.47 1299.7710469.42 1299.8910476.06 1300.1610479.16 1300.2510485.09 1300.34
10492.88 1300.45 10496.2 1300.51   10500 1300.53

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*****************************************************
    9500    .056 9975.97     .0410084.22    .056

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
       9975.9710084.22             481.7     500   555.7             .1       .3

CROSS SECTION


RIVER: MDOW
REACH: Reach1             RS: 3.494

INPUT
Description:
Station Elevation Data    num=     490
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev
*****************************************************************************************
    9600 1298.39 9602.39 1298.25 9604.08 1298.14 9605.47  1298.1 9606.45 1298.08
 9607.35 1298.08 9609.54 1298.01 9610.41    1298  9612.8 1297.95 9612.97 1297.95
 9616.06 1297.86 9616.53 1297.86 9619.09 1297.75 9619.42 1297.75 9624.17  1297.8
 9624.79 1297.76 9625.27 1297.74 9626.36 1297.74 9629.27  1297.8 9631.02 1297.85
 9633.96 1297.85 9637.78 1297.78 9641.23 1297.74 9643.22 1297.71 9645.45 1297.67
 9647.77 1297.68 9648.73 1297.64 9649.44 1297.56  9651.5 1297.46 9653.04 1297.44
 9654.23 1297.35 9655.74 1297.25 9662.08 1296.95 9665.87  1296.7 9670.37 1296.45
 9674.24 1296.18 9678.03 1295.96 9680.25 1295.93 9680.98 1295.94 9684.32 1295.57
 9685.07 1295.61 9690.85 1295.42 9692.09 1295.34 9693.46 1295.07    9696 1294.81
 9696.51 1294.78 9699.56 1294.47 9700.97 1294.32 9702.24 1294.23 9702.89 1294.21
 9703.09 1294.19 9703.65 1294.22 9706.58 1294.88 9707.43 1295.05 9710.03 1295.11
 9712.22 1295.14 9715.03 1295.09 9717.32 1295.12 9718.59 1295.18 9719.62  1295.2
 9724.97 1295.16  9726.4 1295.18 9727.93 1295.18 9732.15 1295.04  9734.2 1295.02
 9734.67 1295.02 9740.54 1295.12 9741.58 1295.12 9744.38 1295.29 9747.33 1295.36
 9747.92 1295.39  9752.9 1295.52 9754.04 1295.56  9761.3 1295.79 9761.59 1295.79
 9764.03 1295.74 9766.54  1295.8 9767.08 1295.82 9771.22 1295.92 9772.13 1295.95
 9777.18 1295.93 9780.76 1295.96 9789.32 1295.96 9790.68 1295.93 9791.27 1295.93
  9792.3 1295.94  9796.8  1295.9 9805.97 1295.79  9817.8 1295.45 9818.41 1295.44
    9819 1295.41 9823.03  1295.1  9824.1 1295.06 9828.35 1294.83 9828.98  1294.8
 9837.28 1294.39 9838.36 1294.33 9842.37 1294.21 9846.24 1294.11 9847.33 1294.05
 9851.59 1293.87 9854.83 1293.68 9858.41 1293.42 9860.64  1293.2 9863.73 1292.87
 9870.05 1292.75 9875.36 1292.66 9891.23 1292.42  9891.6 1292.41    9903 1292.23
 9905.99 1292.13 9906.33 1292.11 9908.31 1292.06 9912.32 1291.93 9912.97  1291.9
 9917.73 1291.73 9922.09 1291.74 9924.35 1291.73 9926.88  1292.3 9927.67 1292.45
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 9937.03 1291.48 9938.31 1291.42 9939.48 1291.36 9939.82 1291.33 9940.09 1291.27
 9941.05 1291.29 9943.08 1291.46 9943.94  1291.5 9946.01 1291.51 9947.41 1291.47
 9949.53  1291.4 9950.21 1291.37 9953.88 1291.16 9956.27 1291.08  9957.9 1290.94
 9958.18 1290.91 9958.34 1290.92 9961.27  1290.9 9965.11  1289.3 9971.15 1286.74
 9975.95 1285.38 9976.28 1285.38  9980.4 1285.25 9985.93    1285 9987.25 1284.67
 9989.74 1284.52 9990.25 1284.44 9990.55 1284.44 9991.62 1284.31 9992.08 1284.24
 9993.85 1284.12 9996.31 1283.91 9998.82 1283.78   10000 1283.8410003.18 1283.99
 10004.6 1284.0810009.46 1285.2410013.89 1286.2810018.84 1287.6510021.18 1288.28
10022.64 1288.9610024.41 1289.8410029.86 1292.1610030.49 1292.44 10033.2 1292.53
10038.98 1292.7310039.78 1292.7510040.45  1292.910041.67 1293.23 10044.7 1293.17
10046.88 1293.1510050.45  1292.510052.05 1292.1910052.59 1292.1810053.62 1292.14
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 10070.1 1291.9710071.63 1292.0410074.85 1292.07 10082.2 1292.23 10085.3 1292.32
 10088.7 1292.4110090.17 1292.4410101.01 1292.5110105.06 1292.5310105.26 1292.54
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10172.35 1293.6810173.32 1293.6710186.74  1293.510195.34 1293.3910196.54 1293.38
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10239.26 1293.12  10245.8 1293.1110257.86 1293.0710261.67  1293.110267.88 1293.11
10275.43 1293.2210285.21 1293.31 10289.1 1293.3510292.92 1293.2710301.27 1293.03
10301.35 1293.0410301.85 1293.03 10315.8 1292.6910320.59 1292.5710335.87 1292.48
10346.25 1292.4110356.79 1292.3410378.24 1292.3210379.65 1292.3410387.23 1292.54
10396.38 1292.8110400.67 1292.83 10401.2 1292.8310403.19 1292.8610404.05 1292.87
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10416.49 1293.1410417.53 1293.1210419.44 1292.9210420.38 1292.8310421.23 1292.85
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10496.29 1295.16 10502.2 1295.32 10502.7 1295.3310510.43 1295.4210515.02 1295.38
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10547.85 1295.3410553.03 1295.2810556.92 1295.2510557.65 1295.24 10565.4 1295.17
10566.47 1295.1910570.88 1295.1210571.91 1295.0810572.84 1295.0310575.42 1294.87
10577.36 1294.7810582.48 1294.6210584.57 1294.4710587.26 1294.32 10594.9 1293.81
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10708.83 1293.0210715.06 1293.0410715.44 1293.08 10717.4 1293.21 10717.8 1293.19
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10774.33 1293.39 10775.3 1293.4610777.46 1293.2810778.88 1293.1810779.65 1293.15
10780.11 1293.2210781.72 1293.3910783.04 1293.4310785.79 1293.4610787.98 1293.45
10791.55 1293.3610792.02 1293.35 10796.7 1293.3110802.24 1293.3410804.27  1293.4
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10815.89 1293.9310819.99 1294.0310822.42  1294.110824.91 1294.1810827.19 1294.25
10828.73  1294.310831.54 1294.3210833.67 1294.3410838.99 1294.5510842.84 1294.58
10845.42 1294.6110847.11 1294.66 10851.2 1294.6810858.22 1294.7810858.47 1294.79
10863.62 1294.8810866.42 1294.9310873.88  1295.210874.67 1295.2210877.92 1295.26
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10896.27 1295.2910898.39 1295.3510900.66 1295.2910902.22 1295.2210902.57 1295.19
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10979.23 1295.8710981.71  1295.910983.99 1295.89   10985 1295.95 10987.9 1295.93
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10989.23 1295.8610992.26 1295.9610992.32 1295.9610996.85 1296.11   11000 1296.11

Manning's n Values          num=         3
    Sta   n Val     Sta   n Val     Sta   n Val
*************************************************
    9600    .056 9961.27     .0410030.49    .056

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.    Expan.
      9961.2710030.49                485     500   514.4             .1       .3
Ineffective Flow     num=         1
   Sta L    Sta R    Elev  Permanent
    9600 9772.13 1295.95         F

CROSS SECTION


RIVER: MDOW
REACH: Reach1               RS: 3.399

INPUT
Description:
Station Elevation Data     num=     330
    Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*********************************************************************************
    9600 1296.27 9605.77 1296.15 9611.49 1296.02 9624.96  1295.6  9627.3 1295.56
 9640.57 1295.18 9640.94 1295.18 9645.03 1295.23 9650.36 1295.24 9657.87  1295.1
 9670.03 1294.86 9684.58 1294.55 9685.85 1294.53 9686.34 1294.51 9705.36 1294.16
 9707.47 1294.16  9708.6 1294.12 9710.62 1294.13 9711.42 1294.12 9712.73 1294.13
 9713.01 1294.12 9713.31  1294.1 9713.98 1294.06 9714.91    1294 9719.52 1293.74
 9721.36 1293.82 9721.85 1293.84 9724.34 1294.15 9724.91  1294.2 9729.22 1294.11
 9730.05 1294.05 9730.26 1294.05 9733.38 1293.81 9733.73 1293.81 9735.26 1293.78
 9736.83 1293.77 9738.07 1293.76 9739.58 1293.79 9740.74 1293.86  9743.7 1293.88
 9744.92  1293.9 9748.49 1293.93 9748.62 1293.93 9748.72 1293.93 9749.17 1293.93
 9752.21 1293.99 9755.48 1294.01 9756.09 1294.01 9761.33  1294.1  9769.8 1294.04
 9770.64 1294.04 9771.35 1294.02 9771.99    1294 9774.66  1293.9 9781.97 1293.83
 9790.37 1293.78 9793.86 1293.81  9796.3 1293.78 9800.77 1293.76    9804 1293.68
 9806.69 1293.65 9810.58 1293.62 9813.47 1293.65 9816.72 1293.67 9820.16 1293.66
 9823.82 1293.62 9827.83  1293.6 9831.87 1293.57 9834.44 1293.54 9836.21 1293.51
 9843.34 1293.35 9860.47 1293.12 9872.08 1292.96 9875.09 1292.93 9881.36  1292.6
 9881.43 1292.59 9881.48 1292.59 9881.55 1292.59 9881.85 1292.58 9897.38 1291.98
 9899.84 1291.86 9901.73  1291.7 9905.03 1291.39 9906.19 1291.26 9911.19 1290.47
 9920.93 1290.28 9925.82 1290.22 9937.28 1290.06  9946.1 1289.61 9946.52 1289.59
 9947.26 1289.58 9959.14 1289.24 9963.32 1288.75  9964.7 1288.62 9966.33 1288.33
 9967.42 1288.16 9968.61 1287.59 9970.96 1286.44 9973.06 1285.45 9976.13 1284.46
 9976.28  1284.4 9976.52 1284.31  9978.3  1283.7 9979.57  1283.1 9980.22    1283
 9982.66 1282.01  9983.9 1282.03 9984.25 1282.02 9986.23 1281.91 9987.09 1281.81
 9989.18  1281.8 9993.89 1281.91   10000 1282.03 10006.9 1282.1710009.97 1282.25
10012.79 1283.8510013.88 1284.5810016.64 1285.9710017.75 1286.68 10020.3 1289.57
10020.73 1290.0310025.76 1290.18   10027 1290.2110029.88  1290.110033.81 1289.92
10035.09 1289.95 10037.4 1290.05 10041.2 1289.7610041.83 1289.69 10049.2 1289.82
10059.99 1289.9110061.28 1289.9310061.88 1289.93 10072.6  1289.810074.25 1289.83
10078.37 1289.9210085.91 1289.9710090.01 1289.8510094.49 1289.8210095.38 1289.82
 10103.4 1289.8710108.73 1289.8110111.15 1289.8210119.11 1289.5510121.83 1289.53
10131.77 1289.4310134.86 1289.4310141.65 1289.4810143.14 1289.4810144.79 1289.52
10148.28 1289.5510151.13 1289.6210152.16 1289.6310154.96 1289.6810155.84  1289.7
10156.01 1289.6910157.32 1289.6810159.59 1289.6510161.69 1289.5810164.93 1289.44
   10171 1289.3210172.42  1289.410173.85 1289.4710175.11 1289.5110187.24 1289.88
10189.29 1289.92 10192.3 1290.0210196.42 1290.0610200.73 1290.1510206.82 1290.27
10209.23 1290.3210211.67 1290.3110220.61 1290.5310221.93 1290.55 10223.9 1290.58
10232.83 1290.7410234.47 1290.76 10237.2 1290.7810241.82 1290.78 10245.5 1290.81
10249.06 1290.83 10253.3 1290.8910261.73 1290.8310263.95 1290.8410270.52 1290.78
10278.37 1290.6910283.75 1290.59 10289.2 1290.5110302.89 1290.6210307.37 1290.59
10317.23 1290.6110320.11 1290.6110330.91 1290.5810333.79 1290.5410337.09 1290.48
10342.33 1290.4210345.95 1290.4610354.66 1290.5510356.59 1290.5710356.98 1290.57
10359.73 1290.7410360.46 1290.8410361.38 1290.8910362.47 1290.9410362.81 1290.91
10365.53 1290.5210370.31 1290.3710371.41 1290.3610372.69 1290.2610372.98 1290.25
10381.85 1290.2310387.49 1290.1910400.66 1290.0710407.52 1289.8610414.56 1289.63
10424.04 1289.4910428.37 1289.4610433.53 1289.3710443.28 1289.2510444.19 1289.27
10445.12 1289.2310449.98 1289.1810451.97 1289.1510452.31 1289.1410453.71  1289.1
 10455.4 1289.0910457.34 1289.0610462.85 1289.0510464.57 1289.0110468.89 1289.02
 10469.9 1289.0110471.43 1288.9710473.41 1288.9610474.44 1288.8510476.98 1289.15
10478.63 1289.2610480.26  1289.310480.71 1289.3210483.29 1289.4210484.79 1289.46
10485.97 1289.4910488.16 1289.4810489.12  1289.510491.34  1289.510491.84  1289.5
10492.26  1289.5 10493.9  1289.510494.25 1289.4910496.49 1289.3710497.68 1289.41
10499.09 1289.4110499.97 1289.4210502.13 1289.4910502.94 1289.5110505.33 1289.51
10506.01 1289.5110508.33 1289.6110509.03 1289.6110511.62 1289.6110515.93 1289.66
10517.62 1289.6610520.06 1289.5710520.96 1289.5710524.63  1289.610524.81  1289.6
10524.87  1289.610525.03  1289.6 10525.6 1289.48 10527.4 1289.1610527.67 1289.21
10530.11 1289.7310531.66 1289.69 10540.1 1289.5210543.85 1289.6510544.18 1289.66
10544.34 1289.6810549.52 1290.1210555.75 1290.8210556.27 1290.8810558.08 1291.07
10561.64 1291.4510563.88 1291.5210579.28 1292.0610582.98  1292.210588.34 1292.37
10594.32 1292.5610598.45 1292.7510605.01 1292.9710608.53 1293.0410612.34 1293.17
10614.33 1293.3110622.99 1293.4110627.12 1293.4710630.27 1293.5410634.37 1293.55
10636.26 1293.55 10639.2 1293.5310643.74 1293.5710649.26 1293.6310652.69 1293.66
 10660.3 1293.6710661.78 1293.6610668.83 1293.8410668.98 1293.8410675.35 1293.79
10676.02 1293.7910683.45 1293.7110692.55 1293.6810694.13 1293.6910697.89 1293.71
10699.88 1293.7410700.69 1293.7410711.37 1293.7810713.24 1293.7810722.77 1293.81
10723.69 1293.8110730.53 1293.9310735.31 1293.93 10738.3 1293.9410747.61  1293.9
10749.52  1293.910760.72 1293.8910761.79 1293.8910776.16 1293.9510777.06 1293.96
10777.13 1293.9610789.56 1293.9610789.57 1293.9610799.66 1293.95   10800 1293.95

Manning's n Values          num=         3
    Sta   n Val     Sta   n Val     Sta   n Val
*************************************************
    9600    .056 9959.14     .0410020.73    .056

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.    Expan.
      9959.1410020.73              225.4  260.73   266.7             .3       .5

CROSS SECTION


RIVER: MDOW
REACH: Reach1               RS: 3.350

INPUT
Description:
Station Elevation Data     num=     490
    Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*********************************************************************************
    9500 1293.94 9502.41 1293.93 9511.63 1293.93 9516.43  1293.9 9521.75 1293.75
  9526.1 1293.67  9537.9  1293.4 9538.98 1293.41 9539.52 1293.44 9540.08 1293.37
  9540.7 1293.14 9541.12 1292.94 9541.48 1293.06 9542.65 1293.44 9545.97  1293.4
  9547.7 1293.37 9549.84 1293.37 9550.93 1293.32 9551.29  1293.3 9552.99 1293.34
9553.86 1293.05 9554.08 1292.99 9554.26 1292.97 9554.55 1293.01 9555.28 1293.08
  9555.6 1293.12 9556.56 1293.26 9557.08 1293.32 9557.74 1293.35 9558.63 1293.38
9563.11 1293.38 9563.42 1293.37  9578.5 1293.19 9583.25 1293.12 9584.39 1293.11
9592.16  1293.1 9593.65 1293.08 9594.72 1293.08 9596.51 1293.04 9598.43 1293.03
9600.28 1292.99 9602.58  1292.9 9604.23 1292.82  9606.2 1292.81 9608.91 1292.75
9610.59 1292.72 9612.87 1292.58 9614.31  1292.5 9614.43  1292.5 9617.18 1292.47
9620.02 1292.59 9620.17 1292.59 9622.34 1292.54 9622.58 1292.55 9626.68  1292.4
9629.68 1292.57 9629.96 1292.58 9631.64  1292.7 9632.41 1292.74 9633.27 1292.77
9634.67  1292.8 9636.06 1292.81 9637.84 1292.72 9638.84 1292.72  9640.4 1292.75
9644.05 1292.69 9648.82 1292.74    9651 1292.78 9653.81 1292.82 9655.62 1292.88
9657.13 1292.92 9668.88    1293 9669.71 1293.01 9676.81 1292.97  9679.2 1292.95
9689.34 1292.88 9694.56 1292.88 9703.37 1292.83 9707.42  1292.8 9717.94 1292.71
9719.66  1292.7 9720.81 1292.66 9727.37 1292.63 9731.01 1292.58 9731.74 1292.58
9733.53 1292.49 9733.66 1292.49 9734.15 1292.44 9735.15 1292.29 9735.53 1292.32
```

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 9736.35 1292.43 9737.05 1292.56 9737.17 1292.57 9738.73  1292.6 9739.87 1292.62
 9741.09 1292.69 9744.17  1292.7 9746.41 1292.74 9748.91 1292.74 9753.27 1292.71
 9757.13  1292.7  9761.6 1292.68 9768.14  1292.6 9772.06  1292.6 9778.02 1292.59
 9780.42 1292.53 9782.02 1292.52 9791.71 1292.37 9792.76 1292.36  9800.6 1292.08
 9802.11 1292.06 9806.71 1291.88 9807.16 1291.87 9807.87 1291.83 9814.11 1291.77
 9814.33 1291.77 9817.91 1291.61  9820.2 1291.51  9820.5  1291.5 9827.82 1291.21
 9828.86 1291.17 9836.49 1290.91  9839.3 1290.77 9842.48 1290.62 9846.54 1290.39
 9852.18 1290.06 9859.22 1289.53 9860.51 1289.44 9860.77 1289.42 9860.88 1289.42
 9861.05  1289.4 9868.39 1288.83 9868.86 1288.78 9869.37 1288.76 9870.18  1288.7
 9870.75 1288.65 9871.53 1288.56 9876.76 1288.06 9877.92    1288 9878.91 1287.96
 9879.74 1287.87 9880.65 1287.74  9881.8 1287.62  9882.9 1287.55 9884.05 1287.43
 9885.82 1287.21 9887.78 1287.04 9889.73  1286.9 9890.15 1286.86 9890.94 1286.69
  9892.9 1286.31 9893.61 1286.17 9897.32 1284.94 9897.44 1284.88 9898.23 1285.47
 9898.68 1285.38 9900.04 1283.63 9900.85 1283.47 9901.33 1283.06 9901.81 1282.66
 9902.99 1282.48 9903.35 1282.52  9903.6 1282.74  9904.9 1283.44 9905.25 1283.65
  9906.1 1285.35 9906.47  1285.7 9907.27 1285.58 9908.76 1285.54 9909.12 1285.81
  9909.7 1286.07 9910.28 1286.05 9911.39 1286.02 9912.68 1286.06 9913.76 1286.23
 9914.46 1286.36 9915.97 1286.31 9916.38 1286.28 9918.78 1286.15 9921.32 1286.09
 9921.85 1286.06 9923.29 1285.77 9924.35 1285.58 9925.61 1285.18 9926.99 1284.85
  9927.2 1284.83 9927.21 1284.79 9927.27 1284.78 9928.71 1284.33 9929.56 1284.13
 9930.68 1283.87 9931.35 1283.74 9932.29 1283.14 9932.86 1282.97 9934.85 1282.46
 9938.87 1282.38 9941.39 1282.24 9941.95 1282.23 9942.28 1282.17 9943.04 1281.86
 9943.62 1281.87 9944.09 1281.91 9946.74 1281.82 9947.64 1281.86 9953.03 1281.87
 9957.52  1282.4 9957.55 1282.39  9960.1 1281.01 9960.27 1280.99 9961.79 1280.78
 9962.04 1280.84  9962.4 1280.97 9965.09 1281.04 9966.43 1280.98 9967.16 1280.94
 9967.32    1281 9968.95 1281.49 9971.12 1281.79 9973.24 1282.06 9974.73 1282.19
 9976.12 1282.11 9977.14 1282.13 9977.46 1282.15 9977.67 1282.17 9978.65 1282.23
 9986.55  1282.76 9990.52  1282.96 9991.33    1283  9995.1 1283.12 9996.16 1283.13
 9998.26 1283.17   10000 1283.1910000.37  1283.210001.83 1283.1910002.54 1283.21
10003.37 1283.22 10004.5 1283.33 10007.6 1283.2210007.84 1283.2210007.96 1283.21
10008.34 1283.16 10009.7 1282.9610010.51 1282.9810011.77   128310013.04 1283.11
10014.28 1282.9110016.59 1282.3210018.08    128210020.55 1281.5710020.81 1281.62
10021.67 1281.9710022.39 1282.3210023.34 1282.0810024.64 1282.0310025.47 1281.98
10026.94 1282.0710028.11 1282.2110029.11 1282.2710033.23 1282.2210034.26 1282.02
10036.33  1281.710038.93 1281.5910039.76 1281.5210041.61 1281.0910044.16 1280.78
10045.69 1281.2310047.53 1281.6110047.64 1281.6410048.38 1281.9610049.25 1282.07
10050.89 1281.8210051.79 1281.7110053.71 1281.5310054.45 1281.48 10055.6 1281.54
10057.94 1281.7210059.49  1281.810059.99 1281.8510060.66 1281.9310062.05 1282.02
10064.19 1282.1610065.06 1282.1910065.82 1282.24 10066.3 1284.6610066.37 1285.04
10066.58 1284.9910066.95 1284.8810067.25 1284.93   10068 1284.1510070.05 1284.08
10070.89  1284.410071.44 1284.4710071.94 1284.5110073.32 1284.4710075.57 1284.66
10077.06    128510077.39 1285.0610078.49 1285.3710079.78 1285.4110080.56 1285.51
10084.83 1285.4610092.38 1285.3710092.91 1285.3710106.99 1285.1510108.84 1285.12
10125.77 1284.8810128.81 1284.8810144.62 1284.8910146.83  1284.910147.91 1284.93
10158.22    128510159.71 1284.9910174.95 1285.1110175.81 1285.1110193.24 1285.07
10194.42 1285.0710210.94 1285.0610212.05 1285.0510226.12 1285.2310227.53 1285.23
10243.19 1285.1810244.62 1285.1710245.79 1285.1810262.21  1285.210263.07  1285.2
10279.72 1285.2710307.33 1285.2710307.91 1285.2810308.82 1285.2710328.52 1285.19
10329.55 1285.1910343.83 1285.1210345.08 1285.1110356.05 1285.0110367.43 1284.81
10369.66  1284.810382.81 1284.7610384.92 1284.7610401.48 1284.7210402.91  1284.7
10423.53 1284.7510425.45 1284.7610440.76 1284.8910442.86 1284.8810455.64 1284.92
 10457.4  1284.910465.76 1284.9810469.01 1284.9910478.15 1285.0110486.59 1284.97
10489.76 1284.9810498.78 1285.1810506.67 1285.4610507.75 1285.48 10516.1 1285.61
10523.78 1285.6210524.55 1285.6310532.89 1285.6610533.13 1285.66 10534.8 1285.67
10539.56 1285.6810545.26 1285.7310547.28  1285.810548.63 1285.8410549.51 1285.83
10550.55 1285.8310552.23 1285.8110554.06 1285.6910554.13 1285.68 10555.4 1285.61
10555.63 1285.6210557.55 1285.5910560.03 1285.54 10560.3 1285.5510562.26 1285.68
10562.59 1285.7910562.85 1286.0510563.25 1286.0810572.29 1286.1710576.28 1286.26
   10580 1286.2710581.98 1286.3110597.54 1286.4910598.02 1286.4510598.25 1286.45
10602.01 1286.5210609.44 1286.4910617.35 1286.5710617.43 1286.56 10618.9 1286.29
10619.49 1286.28 10621.9 1286.4710627.52 1286.47 10634.4 1286.5210639.52 1286.63
10645.22 1286.7210650.03 1286.7710657.78 1286.8210662.37 1286.8410672.33 1286.91
 10675.4 1286.9610688.82 1287.0910691.37 1287.0810704.18 1287.1510705.07 1287.16
10709.21 1287.2510716.83 1287.4110717.47 1287.4210726.66 1287.5710727.55 1287.57
 10740.2 1287.65 10742.4 1287.6710752.68 1287.7710755.45  1287.8 10764.9 1287.88
 10768.6  1287.910777.83    128810783.19 1288.0410791.71 1288.0610798.58 1288.14
 10807.3 1288.2410813.73 1288.2610822.97 1288.2610831.41 1288.3310838.88 1288.39
10848.14 1288.3510856.42 1288.3510865.02 1288.4110874.06 1288.4510880.09 1288.49
10887.96 1288.5910894.34 1288.5610901.65 1288.6410908.63 1288.7210915.04 1288.71
10923.64 1288.76 10929.8  1288.810937.88 1288.8210944.33 1288.8910953.41 1288.99
10960.31 1289.1210965.14 1289.2410973.37 1289.35 10975.8 1289.3810977.84 1289.41
10979.15 1289.4710979.45 1289.4810980.96  1289.210981.54 1289.0210982.57 1289.47
10982.76 1289.57    10983 1289.5810985.69 1289.7110987.49 1289.7810990.42  1289.9
10991.35 1289.9510995.85 1290.2310997.31 1290.3110004.26 1290.8111004.45 1290.82
11005.71 1290.9211012.11 1291.3611013.42 1291.4711014.04 1291.54   11020 1291.97
11022.57 1292.1911026.19 1292.4711028.36 1292.6211031.12 1292.87   11034 1293.09
11037.71 1293.3211039.17 1293.4411044.29 1293.7911046.97 1293.9811051.54 1294.09
11053.37 1294.1311057.72  1294.211063.28 1294.2211065.43 1294.2511070.91 1294.38
11072.76 1294.4211073.14 1294.4211073.86 1294.4311079.65 1294.4811082.43 1294.53
11086.91 1294.5811090.44 1294.65 11095.8 1294.6911096.96 1294.71   11100 1294.72

Manning's n Values         num=       3
    Sta    n Val     Sta    n Val     Sta    n Val
**************************************************
    9500     .056 9926.99     .0410066.37     .056

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.    Expan.
      9926.9910066.37           208.5   208.5   208.5             .3         .5
Ineffective Flow     num=       2
   Sta L    Sta R    Elev  Permanent
    9500  9926.7 1291.77        F
10075.64   11100 1291.13        F

CULVERT


RIVER: MDOW
REACH: Reach1             RS: 3.330

INPUT
Description: Loop 303 Culvert
Distance from Upstream XS =       38
Deck/Roadway Width        =      148
Weir Coefficient          =      2.6
Upstream  Deck/Roadway Coordinates
    num=       14
    Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
**************************************************************************
    9500 1294.23           9544.47    1294          9708.35    1293
    9800 1292.52           9898.3     1292          9996.88  1291.2
10223.67    1291          10281.26  1290.7         10344.77    1291
10661.78    1292          10802.4    1293          10914.78    1294
11039.12    1295            11100 1295.53

Upstream Bridge Cross Section Data
Station Elevation Data    num=      490
    Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev
**************************************************************************************
    9500 1293.94 9502.41 1293.93 9511.63 1293.93 9516.43  1293.9 9521.75 1293.75
  9526.1 1293.67  9537.9  1293.4 9538.98 1293.41 9539.52 1293.44 9540.08 1293.37
  9540.7 1293.14 9541.12 1292.94 9541.48 1293.06 9542.65 1293.44 9545.97  1293.4
  9547.7 1293.37 9549.84 1293.37 9550.93 1293.32 9551.29  1293.3 9552.99 1293.34
 9553.86 1293.05 9554.08 1292.99 9554.26 1292.97 9554.55 1293.01 9555.28 1293.08
  9555.6 1293.12 9556.56 1293.26 9557.08 1293.32 9557.74 1293.35 9558.63 1293.38
 9563.11 1293.38 9563.42 1293.37  9578.5 1293.19 9583.25 1293.12 9584.39 1293.11
 9592.16  1293.1 9593.65 1293.08 9594.72 1293.08 9596.51 1293.04 9598.43 1293.03
 9600.28 1292.99 9602.58  1292.9 9604.23 1292.82  9606.2 1292.81 9608.91 1292.75
 9610.59 1292.72 9612.87 1292.58 9614.31  1292.5 9614.43  1292.5 9617.18 1292.47
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 9620.02 1292.59 9620.17 1292.59 9622.34 1292.54 9622.58 1292.55 9626.68  1292.4
 9629.68 1292.57 9629.96 1292.58 9631.64  1292.7 9632.41 1292.74 9633.27 1292.77
 9634.67  1292.8 9636.06 1292.81 9637.84 1292.72 9638.84 1292.72  9640.4 1292.75
 9644.05 1292.69 9648.82 1292.74    9651 1292.78 9653.81 1292.82 9655.62 1292.88
 9657.13 1292.92 9668.88    1293 9669.71 1293.01 9676.81 1292.97  9679.2 1292.95
 9689.34 1292.88 9694.56 1292.88 9703.37 1292.83 9707.42  1292.8 9717.94 1292.71
 9719.66  1292.7 9720.81 1292.66 9727.37 1292.63 9731.01 1292.58 9731.74 1292.58
 9733.53 1292.49 9733.66 1292.49 9734.15 1292.44 9735.15 1292.29 9735.53 1292.32
 9736.35 1292.43 9737.05 1292.56 9737.17 1292.57 9738.73  1292.6 9739.87 1292.62
 9741.09 1292.69 9744.17  1292.7 9746.41 1292.74 9748.91 1292.74 9753.27 1292.71
 9757.13  1292.7  9761.6 1292.68 9768.14  1292.6 9772.06  1292.6 9778.02 1292.59
 9780.42 1292.53 9782.02 1292.52 9791.71 1292.37 9792.76 1292.36  9800.6 1292.08
 9802.11 1292.06 9806.71 1291.88 9807.16 1291.87 9807.87 1291.83 9814.11 1291.77
 9814.33 1291.77 9817.91 1291.61  9820.2 1291.51  9820.5  1291.5 9827.82 1291.21
 9828.86 1291.17 9836.49 1290.91  9839.3 1290.77 9842.48 1290.62 9846.54 1290.39
 9852.18 1290.06 9859.22 1289.53 9860.51 1289.44 9860.77 1289.42 9860.88 1289.42
 9861.05  1289.4 9868.39 1288.83 9868.86 1288.78 9869.37 1288.76 9870.18  1288.7
 9870.75 1288.65 9871.53 1288.56 9876.76 1288.06 9877.92    1288 9878.91 1287.96
 9879.74 1287.87 9880.65 1287.74  9881.8 1287.62  9882.9 1287.55 9884.05 1287.43
 9885.82 1287.21 9887.78 1287.04 9889.73  1286.9 9890.15 1286.86 9890.94 1286.69
  9892.9 1286.31 9893.61 1286.17 9897.32 1284.94 9897.44 1284.88 9898.23 1285.47
 9898.68 1285.38 9900.04 1283.63 9900.85 1283.47 9901.33 1283.06 9901.81 1282.66
 9902.99 1282.48 9903.35 1282.52  9903.6 1282.74  9904.9 1283.44 9905.25 1283.65
  9906.1 1285.35 9906.47  1285.7 9907.27 1285.58 9908.76 1285.54 9909.12 1285.81
  9909.7 1286.07 9910.28 1286.05 9911.39 1286.02 9912.68 1286.06 9913.76 1286.23
 9914.46 1286.36 9915.97 1286.31 9916.38 1286.28 9918.78 1286.15 9921.32 1286.09
 9921.85 1286.06 9923.29 1285.77 9924.35 1285.58 9925.61 1285.18 9926.99 1284.85
  9927.2 1284.83 9927.21 1284.79 9927.27 1284.78 9928.71 1284.33 9929.56 1284.13
 9930.68 1283.87 9931.35 1283.74 9932.29 1283.14 9932.86 1282.97 9934.85 1282.46
 9938.87 1282.38 9941.39 1282.24 9941.95 1282.23 9942.28 1282.17 9943.04 1281.86
 9943.62 1281.87 9944.09 1281.91 9946.74 1281.82 9947.64 1281.86 9953.03 1281.87
 9957.52  1282.4 9957.55 1282.39  9960.1 1281.01 9960.27 1280.99 9961.79 1280.78
 9962.04 1280.84  9962.4 1280.97 9965.09 1281.04 9966.43 1280.98 9967.16 1280.94
 9967.32    1281 9968.95 1281.49 9971.12 1281.79 9973.24 1282.06 9974.73 1282.19
 9976.12 1282.11 9977.14 1282.13 9977.46 1282.15 9977.67 1282.17 9978.65 1282.23
 9986.55 1282.76 9990.52 1282.96 9991.33    1283  9995.1 1283.12 9996.16 1283.13
 9998.26 1283.17   10000 1283.1910000.37  1283.210001.83 1283.1910002.54 1283.21
10003.37 1283.22 10004.5 1283.33 10007.6 1283.2210007.84 1283.2210007.96 1283.21
10008.34 1283.16 10009.7 1282.9610010.51 1282.9810011.77   128310013.04 1283.11
10014.28 1282.9110016.59 1282.3210018.08   12821020.55 1281.5710020.81 1281.62
10021.67 1281.9710022.39 1282.3210023.34 1282.0810024.64 1282.0310025.47 1281.98
10026.94 1282.0710028.11 1282.2110029.11 1282.2710033.23 1282.2210034.26 1282.02
10036.33  1281.710038.93 1281.5910039.76 1281.5210041.61 1281.0910044.16 1280.78
10045.69 1281.2310047.53 1281.6110047.64 1281.6410048.38 1281.9610049.25 1282.07
10050.89 1281.8210051.79 1281.7110053.71 1281.5310054.45 1281.48 10055.6 1281.54
10057.94 1281.7210059.49  1281.810059.99 1281.8510060.66 1281.9310062.05 1282.02
10064.19 1282.1610065.06 1282.1910065.82 1282.24 10066.3 1284.6610066.37 1285.04
10066.58 1284.9910066.95 1284.8810067.25 1284.93   10068 1284.1510070.05 1284.08
10070.89  1284.410071.44 1284.4710071.94 1284.5110073.32 1284.4710075.57 1284.66
10077.06    128510077.39 1285.0610078.49 1285.3710079.78 1285.4110080.56 1285.51
10084.83 1285.4610092.38 1285.3710092.91 1285.3710106.99 1285.1510108.84 1285.12
10125.77 1284.8810128.81 1284.8810144.62 1284.8910146.83  1284.910147.91 1284.93
10158.22    128510159.71 1284.9910174.95 1285.1110175.81 1285.1110193.24 1285.07
10194.42 1285.0710210.94 1285.0610212.05 1285.0510226.12 1285.2310227.53 1285.23
10243.19 1285.1810244.62 1285.1710245.79 1285.1810262.21  1285.210263.07  1285.2
10279.72 1285.2710307.33 1285.2710307.91 1285.2810308.82 1285.2710328.52 1285.19
10329.55 1285.1910343.83 1285.1210345.08 1285.1110356.05 1285.0110367.43 1284.81
10369.66  1284.810382.81 1284.7610384.92 1284.7610401.48 1284.7210402.91  1284.7
10423.53 1284.7510425.45 1284.7610440.76 1284.8910442.86 1284.8810455.64 1284.92
 10457.4  1284.910465.76 1284.9810469.01 1284.9910478.15 1285.0110486.59 1284.97
10489.76 1284.9810498.78 1285.1810506.67 1285.4610507.75 1285.48 10516.1 1285.61
10523.78 1285.6210524.55 1285.6310532.89 1285.6610533.13 1285.66 10534.8 1285.67
10539.56 1285.6810545.26 1285.7310547.28 1285.8105448.63 1285.8410549.51 1285.83
10550.55 1285.8310552.23 1285.8110554.06 1285.6910554.13 1285.68 10555.4 1285.61
10555.63 1285.6210557.55 1285.5910560.03 1285.54 10560.3 1285.5510562.26 1285.68
10562.59 1285.7910562.85 1286.0510563.25 1286.0810572.29 1286.1710576.28 1286.26
   10580 1286.2710581.98 1286.3110597.54 1286.4910598.02 1286.4510598.25 1286.45
10602.01 1286.5210609.44 1286.4910617.35 1286.5710617.43 1286.56 10618.9 1286.29
10619.49 1286.28 10621.9 1286.4710627.52 1286.47 10634.4 1286.5210639.52 1286.63
10645.22 1286.7210650.03 1286.7710657.78 1286.8210662.37 1286.8410672.33 1286.91
 10675.4 1286.9610688.82 1287.0910691.37 1287.0810704.18 1287.1510705.07 1287.16
10709.21 1287.2510716.83 1287.4110717.47 1287.4210726.66 1287.5710727.55 1287.57
 10740.2 1287.65 10742.4 1287.6710752.68 1287.7710755.45  1287.8 10764.9 1287.88
 10768.6  1287.910777.83    12881783.19 1288.0410791.71 1288.0610798.58 1288.14
 10807.3 1288.2410813.73 1288.2610822.97 1288.2610831.41 1288.3310838.88 1288.39
10848.14 1288.3510856.42 1288.3510865.02 1288.4110874.06 1288.4510880.09 1288.49
10887.96 1288.5910894.34 1288.5610901.65 1288.6410908.63 1288.7210915.04 1288.71
10923.64 1288.76 10929.8  1288.810937.88 1288.8210944.33 1288.8910953.41 1288.99
10960.31 1289.1210965.14 1289.2410973.37 1289.35 10975.8 1289.3810977.84 1289.41
10979.15 1289.4710979.45 1289.4810980.96  1289.210981.54 1289.0210982.57 1289.47
10982.76 1289.57   10983 1289.5810985.69 1289.7110987.49 1289.7810990.42  1289.9
10991.35 1289.9510995.85 1290.2310997.31  1290.311004.26 1290.8111004.45 1290.82
11005.71 1290.9211012.11 1291.3611013.42 1291.4711014.04 1291.54   11020 1291.97
11022.57 1292.1911026.19 1292.4711028.36 1292.6211031.12 1292.87   11034 1293.09
11037.71 1293.3211039.17 1293.4411044.29 1293.7911046.97 1293.9811051.54 1294.09
11053.37 1294.1311057.72  1294.211063.28 1294.2211065.43 1294.2511070.91 1294.38
11072.76 1294.4211073.14 1294.4211073.86 1294.4311079.65 1294.4811082.43 1294.53
11086.91 1294.5811090.44 1294.65 11095.8 1294.6911096.96 1294.71   11100 1294.72

Manning's n Values         num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*************************************************
    9500    .056 9926.99    .0410066.37    .056

Bank Sta: Left   Right    Coeff Contr.   Expan.
     9926.99110066.37             .3       .5
Ineffective Flow     num=       2
    Sta L   Sta R    Elev  Permanent
    9500  9926.7 1291.77        F
10075.64   11100 1291.13        F

Downstream  Deck/Roadway Coordinates
    num=      14
    Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
*************************************************************************
 9468.44 1294.23         9512.91    1294         9676.79    1293
 9768.44 1292.52         9866.74    1292         9965.32  1291.2
10192.11    1291        10249.7  1290.7        10313.21    1291
10630.22    1292        10770.84    1293        10883.22    1294
11007.56    1295        11068.44 1295.53

Downstream Bridge Cross Section Data
Station Elevation Data    num=     416
    Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*********************************************************************************
 9468.44 1292.74 9473.28 1292.78 9489.23  1292.9 9494.06 1292.88 9498.19 1292.87
 9503.07 1292.97 9504.44 1292.97 9526.54 1293.25  9527.8 1293.27 9529.21 1293.27
 9531.22 1293.27 9531.35 1293.27 9531.68 1293.26 9532.84 1293.22 9537.68 1293.08
 9540.13  1293.1 9543.02 1293.04 9545.75 1293.04 9546.01 1292.99 9546.13 1292.99
 9555.31 1292.71  9556.9 1292.72 9563.22 1292.65 9563.93 1292.64 9565.14 1292.64
 9567.09 1292.61 9567.52  1292.6 9568.07 1292.58 9568.44 1292.54    9573 1292.48
 9577.87 1292.18 9579.71 1292.17 9583.41 1292.11 9586.15 1292.08 9590.44 1292.02
 9595.67 1291.98 9600.82 1291.74 9601.34 1291.73 9601.68 1291.72 9607.58 1291.66
 9612.89 1291.66 9613.89 1291.66 9614.72 1291.63 9615.92 1291.61 9624.82 1291.43
 9626.87  1291.4 9628.03 1291.42 9630.81 1291.39 9632.51 1291.42 9636.03 1291.36
 9637.21 1291.32 9639.55 1291.29 9640.78 1291.41  9640.8 1291.41 9642.36  1291.4
 9643.48 1291.35 9644.79 1291.35 9650.87 1291.28 9658.66 1291.19 9666.39 1291.11
 9671.12  1291.1 9687.79 1291.11 9688.64 1291.11    9700  1291.1 9705.77 1291.11
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 9710.9 1291.08 9711.72 1291.08 9715.79 1291.07 9721.39 1291.14 9727.52 1291.22
 9736.3 1291.31 9742.45  1291.4  9751.6 1291.57 9754.75 1291.73 9758.63 1291.81
9764.39 1291.83 9772.91 1291.92 9781.08 1291.93 9783.58 1291.97 9793.22 1292.08
9796.81 1292.12 9800.27 1292.14 9807.12 1292.04 9812.24 1291.98 9816.56 1291.98
9821.38 1292.02 9822.46    1292 9826.81 1291.83 9828.17 1291.81 9830.75 1291.78
   9834 1291.72 9834.68 1291.71  9840.1 1291.56  9844.5 1291.49 9844.85 1291.49
9851.48 1291.45 9851.62 1291.45 9855.49 1291.41 9859.99 1291.35 9860.02 1291.35
9862.65 1291.31 9862.68 1291.31 9862.72 1291.31 9865.28 1291.31  9865.3 1291.31
9866.36 1291.31 9867.95 1291.29 9868.07 1291.29 9871.67 1291.27 9873.45 1291.06
9878.17 1290.49 9881.56 1290.02 9882.85 1289.84 9884.06 1289.68 9892.27 1288.62
 9897.7 1287.76 9898.76  1287.6 9900.32 1287.29    9901 1287.17 9901.25 1287.13
9904.05 1286.66 9904.31 1286.62 9905.94  1286.4 9907.61 1286.18 9908.72 1286.08
9912.64 1285.62 9913.08 1285.57 9913.73 1285.47 9915.33 1284.89  9916.2 1284.61
9916.38 1284.56 9917.43 1284.34 9919.22 1284.23 9921.64 1284.12 9922.04  1284.1
9926.07 1283.59 9927.15  1283.1 9927.32  1283.1 9928.82 1282.81 9928.96 1282.81
9930.76 1283.14 9930.95 1283.14 9930.98 1282.89 9931.51 1281.75 9932.51 1281.44
9932.98 1281.41 9933.58  1281.4 9933.81 1281.36 9935.69 1281.19 9937.93 1281.13
9941.38 1281.07 9942.29 1281.08 9943.83 1281.03 9945.28 1280.91 9946.09 1280.85
9947.44 1281.02 9948.29 1281.13 9950.34 1280.94 9953.04 1280.64 9954.21 1280.62
9959.18 1280.54 9961.42 1280.53 9964.32 1280.91 9965.37 1281.02 9965.55 1281.02
9967.83 1280.85 9968.45 1280.76 9970.92 1280.63 9973.37 1280.51  9974.2 1280.51
9977.23 1280.59 9977.29 1280.62 9977.44 1280.65 9979.68 1281.31  9980.2 1281.36
 9981.9  1281.7 9983.28 1281.96 9984.14 1281.96    9985 1282.02 9987.87 1282.03
9989.34 1281.96 9990.14 1281.95 9990.99 1281.91 9993.47 1281.54 9994.12 1281.45
9994.39 1281.45 9994.48 1281.45 9998.38 1281.51   10000 1281.4710000.33 1281.47
10001.08 1281.4610002.29 1281.48 10003.5 1281.5710006.08  1281.610007.26 1281.59
10009.14 1281.5910009.96 1281.5610010.21 1281.5510012.41  1281.610014.01  1281.6
10015.68 1281.41 10023.1 1280.1710023.82  1280.310024.36 1280.4110027.01  1280.9
10027.96 1280.9410027.97 1280.9410031.15 1281.0210031.84 1281.0810033.99 1281.04
10035.11 1281.0410035.49 1281.0610037.87 1280.5510038.74 1280.4410039.93 1280.28
10040.48 1280.27 10041.6 1280.2710043.15 1280.2510044.85 1280.2710045.89 1280.27
10046.99 1280.2610049.29 1280.2510050.62  1280.510051.52 1280.7510056.35 1280.81
10057.78 1280.8310059.26 1281.1110061.04 1281.4710061.76 1281.6310063.03 1281.91
10065.99 1282.5210066.38 1282.5210067.86 1282.7610068.17 1282.8610068.62 1283.02
10068.75 1283.0210070.68 1283.4510072.24 1283.96 10072.6 1283.9910074.26 1284.15
10074.36 1284.15 10075.1 1284.16 10076.4 1284.2210078.78 1284.2810081.92 1284.51
10085.11 1284.6910085.98 1284.7910086.51 1284.8410087.22 1284.8610092.18 1285.55
10093.6 1285.62 10095.1  1285.810097.12 1286.1610098.87  1286.310099.46 1286.36
10099.93 1286.36   10101 1286.5210102.92 1286.7110106.59  1287.210107.41 1287.34
 10108.4 1287.4910110.52 1287.9210111.07   128810111.84  1288.110112.79  1288.2
10113.08 1288.2310113.67 1288.2810114.43 1288.5410116.48 1288.6810119.26 1288.79
10122.05 1288.84 10124.7 1288.8710126.86 1288.8510127.62 1288.8610129.39 1288.84
 10133.6  1288.810133.81  1288.810134.06 1288.7910137.43 1288.7710139.74 1288.91
10139.85 1288.9210151.46 1289.0310151.58 1289.0310170.77 1288.8510171.08 1288.84
10193.19 1288.7410193.78 1288.7410205.98 1288.7310211.38 1288.71 10212.6 1288.71
 10218.2 1288.7110227.83  1288.710228.41  1288.7 10241.8 1288.7410246.15 1288.75
 10246.8 1288.7510264.65 1288.7510269.08 1288.7710279.71 1288.8110288.08 1288.84
10293.28 1288.8710300.27 1288.9510302.36 1288.9510303.38 1288.9810311.75 1288.98
 10312.7 1288.9710313.26 1288.96 10315.3 1288.9510324.12 1288.9310325.12 1288.93
10339.25 1288.8810341.69 1288.8610345.13 1288.8210354.53 1288.83 10355.3 1288.83
10358.25 1288.7710359.89 1288.7510367.06 1288.7310369.56 1288.6510373.06 1288.65
10380.93 1288.6510381.72 1288.6510382.58 1288.6410383.39 1288.6310384.13 1288.63
10384.76 1288.6410385.65 1288.6510392.11 1288.61 10393.4 1288.6310395.55 1288.66
10404.78  1288.810408.69 1288.8610412.56 1288.8710426.76    128910431.81 1288.98
10443.03 1288.9710449.05 1288.9810461.81 1288.9310467.44 1288.8910474.39 1288.91
10484.85 1288.9310492.39 1288.9110502.54 1288.9510510.53 1288.9110516.89 1288.95
10528.73 1289.1110534.25 1289.18 10542.3 1289.2110554.75 1289.4710560.97 1289.53
 10567.5 1289.6610572.04 1289.8410577.52 1289.9110582.62 1290.0610590.54 1290.31
10596.59 1290.3710603.22 1290.4410608.83 1290.4810616.52 1290.5110626.12 1290.51
10631.07 1290.5210640.91 1290.4810643.57  1290.510653.37  1290.510656.04 1290.52
10667.61 1290.4810669.14 1290.4910683.26 1290.6210683.94 1290.6310687.91 1290.72
10694.41 1290.86 10695.4 1290.88 10706.8 1290.9510710.33 1290.9810717.34 1291.03
10725.01 1291.1610730.88 1291.2710735.15 1291.3510738.54 1291.3810747.17 1291.49
10752.63 1291.5410762.84 1291.6110769.04 1291.7810776.21 1291.8710783.54 1291.93
10791.76 1292.0110799.76 1292.0610809.61 1292.1710817.55 1292.2610827.65 1292.26
10837.29 1292.3110847.76 1292.4410858.07 1292.49 10868.3 1292.5310876.98 1292.62
10889.71 1292.66 10900.8 1292.7310911.97 1292.8210923.55 1292.8510935.73 1292.91
10947.55 1292.9810959.31 1293.0310970.49  1293.110982.01 1293.2110993.96 1293.35
11002.43 1293.5111012.19 1293.7111019.79 1293.8111028.45  1293.911032.53  1293.9
11042.58 1294.0411055.28 1294.2211057.44 1294.2411063.61 1294.3211068.33 1294.36
11068.44 1294.36

Manning's n Values         num=       3
     Sta   n Val      Sta   n Val     Sta   n Val
***********************************************
 9468.44    .056 9892.27     .0410119.26    .056

Bank Sta: Left   Right    Coeff Contr.   Expan.
        9892.2710119.26           .3       .5
Ineffective Flow     num=       2
  Sta L   Sta R    Elev  Permanent
 9468.44 9934.72 1288.96        F
10056.9711068.44 1288.79        F

Upstream Embankment side slope              =       0 horiz. to 1.0 vertical
Downstream Embankment side slope            =       0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .98
Elevation at which weir flow begins         =
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Culverts =  1

Culvert Name      Shape      Rise    Span
Culvert #1            Box       6      10
FHWA Chart # 8 - flared wingwalls
FHWA Scale # 1 - Wingwall flared 30 to 75 deg.
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    Top n  Bottom n  Depth Blocked  Entrance Loss Coef   Exit Loss Coef
              13.8   176.8     .013     .013        0                    .4                1
Number of Barrels =  11
Upstream   Elevation =  1281.49
Centerline Stations
    Sta.    Sta.    Sta.    Sta.    Sta.    Sta.    Sta.    Sta.    Sta.
 9945.99 9957.03 9968.06  9979.1 9990.1410001.1710012.2110023.2510034.2810045.32
10056.36
Downstream Elevation =  1280.47
Centerline Stations
    Sta.    Sta.    Sta.    Sta.    Sta.    Sta.    Sta.    Sta.    Sta.    Sta.
  9940.7 9951.73 9962.76 9973.78 9984.81 9995.8410006.87 10017.910028.9310039.96
10050.99

CROSS SECTION


RIVER: MDOW
REACH: Reach1             RS: 3.310

INPUT
Description:
Station Elevation Data    num=     416
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*********************************************************************************
 9468.44 1292.74 9473.28 1292.78 9489.23  1292.9 9494.06 1292.88 9498.19 1292.87
 9503.07 1292.97 9504.44 1292.97 9526.54 1293.25  9527.8 1293.27 9529.21 1293.27
 9531.22 1293.27 9531.35 1293.27 9531.68 1293.26 9532.84 1293.22 9537.68 1293.08
 9540.13  1293.1 9543.02 1293.04 9545.75 1293.04 9546.01 1292.99 9546.13 1292.99
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 9555.31 1292.71  9556.9 1292.72 9563.22 1292.65 9563.93 1292.64 9565.14 1292.64
 9567.09 1292.61 9567.52  1292.6 9568.07 1292.58 9568.44 1292.54    9573 1292.48
 9577.87 1292.18 9579.71 1292.17 9583.41 1292.11 9586.15 1292.08 9590.44 1292.02
 9595.67 1291.98 9600.82 1291.74 9601.34 1291.73 9601.68 1291.72 9607.58 1291.66
 9612.89 1291.66 9613.89 1291.66 9614.72 1291.63 9615.92 1291.61 9624.82 1291.43
 9626.87  1291.4 9628.03 1291.42 9630.81 1291.39 9632.51 1291.42 9636.03 1291.36
 9637.21 1291.32 9639.55 1291.29 9640.78 1291.41   9640.8 1291.41 9642.36  1291.4
 9643.48 1291.35 9644.79 1291.35 9650.87 1291.28 9658.66 1291.19 9666.39 1291.11
 9671.12  1291.1 9687.79 1291.11 9688.64 1291.11    9700  1291.1 9705.77 1291.11
  9710.9 1291.08 9711.72 1291.08 9715.79 1291.07 9721.39 1291.14 9727.52 1291.22
  9736.3 1291.31 9742.45  1291.4  9751.6 1291.57 9754.75 1291.73 9758.63 1291.81
 9764.39 1291.83 9772.91 1291.92 9781.08 1291.93 9783.58 1291.97 9793.22 1292.08
 9796.81 1292.12 9800.27 1292.14 9807.12 1292.04 9812.24 1291.98 9816.56 1291.98
 9821.38 1292.02 9822.46    1292 9826.81 1291.83 9828.17 1291.81 9830.75 1291.78
    9834 1291.72 9834.68 1291.71  9840.1 1291.56  9844.5 1291.49 9844.85 1291.49
 9851.48 1291.45 9851.62 1291.45 9855.49 1291.41 9859.99 1291.35 9860.02 1291.35
 9862.65 1291.31 9862.68 1291.31 9862.72 1291.31 9865.28 1291.31  9865.3 1291.31
 9866.36 1291.31 9867.95 1291.29 9868.07 1291.29 9871.67 1291.27 9873.45 1291.06
 9878.17 1290.49 9881.56 1290.02 9882.85 1289.84 9884.06 1289.68 9892.27 1288.62
  9897.7 1287.76 9898.76  1287.6 9900.32 1287.29    9901 1287.17 9901.25 1287.13
 9904.05 1286.66 9904.31 1286.62 9905.94  1286.4 9907.61 1286.18 9908.72 1286.08
 9912.64 1285.62 9913.08 1285.57 9913.73 1285.47 9915.33 1284.89  9916.2 1284.61
 9916.38 1284.56 9917.43 1284.34 9919.22 1284.23 9921.64 1284.12 9922.04  1284.1
 9926.07 1283.59 9927.15  1283.1 9927.32  1283.1 9928.82 1282.81 9928.96 1282.81
 9930.76 1283.14 9930.95 1283.14 9930.98 1282.89 9931.51 1281.75 9932.51 1281.44
 9932.98 1281.41 9933.58  1281.4 9933.81 1281.36 9935.69 1281.19 9937.93 1281.13
 9941.38 1281.07 9942.29 1281.08 9943.83 1281.03 9945.28 1280.91 9946.09 1280.85
 9947.44 1281.02 9948.29 1281.13 9950.34 1280.94 9953.04 1280.64 9954.21 1280.62
 9959.18 1280.54 9961.42 1280.53 9964.32 1280.91 9965.37 1281.02 9965.55 1281.02
 9967.83 1280.85 9968.45 1280.76 9970.92 1280.63 9973.37 1280.51  9974.2 1280.51
 9977.23 1280.59 9977.25 1280.62 9977.44 1280.65 9979.68 1281.31  9980.2 1281.36
  9981.9  1281.7 9983.28 1281.96 9984.14 1281.96    9985 1282.02 9987.87 1282.03
 9989.34 1281.96 9990.14 1281.95 9990.99 1281.91 9993.47 1281.54 9994.12 1281.45
 9994.39 1281.45 9994.48 1281.45 9998.38 1281.51   10000 1281.4710000.33 1281.47
10001.08 1281.4610002.29 1281.48 10003.5 1281.5710006.08  1281.610007.26 1281.59
10009.14 1281.5910009.96 1281.5610010.21 1281.5510012.41  1281.610014.01  1281.6
10015.68 1281.41 10023.1 1280.1710023.82  1280.310024.36 1280.4110027.01  1280.9
10027.96 1280.9410027.97 1280.9410031.15 1281.0210031.84 1281.0810033.99 1281.04
10035.11 1281.0410035.49 1281.0610037.87 1280.5510038.74 1280.4410039.93 1280.28
10040.48 1280.27 10041.6 1280.2710043.15 1280.2510044.85 1280.2710045.89 1280.27
10046.99 1280.2610049.29 1280.2510050.62  1280.510051.52 1280.7510056.35 1280.81
10057.78 1280.8310059.26 1281.1110061.04 1281.4710061.76 1281.6310063.03 1281.91
10065.99 1282.5210066.38 1282.5210067.86 1282.7610068.17 1282.8610068.62 1283.02
10068.75 1283.0210070.68 1283.4510072.24 1283.96 10072.6 1283.9910074.26 1284.15
10074.36 1284.15 10075.1 1284.16 10076.4 1284.2210078.78 1284.2810081.92 1284.51
10085.11 1284.6910085.98 1284.7910086.51 1284.8410087.22 1284.8610092.18 1285.55
10093.65 1285.62 10095.1  1285.810097.12 1286.1610098.87  1286.310099.46 1286.36
10099.93 1286.36   10101 1286.5210102.92 1286.7110106.59  1287.210107.41 1287.34
 10108.4 1287.4910110.52 1287.9210111.07    128810111.84  1288.110112.79  1288.2
10113.08 1288.2310113.67 1288.2810114.43 1288.5410116.48 1288.6810119.26 1288.79
10122.05 1288.84 10124.7 1288.8710126.86 1288.8510127.62 1288.8610129.39 1288.84
 10133.6  1288.810133.81  1288.810134.06 1288.7910137.43 1288.7710139.74 1288.91
10139.85 1288.9210151.46 1289.0310151.58 1289.0310170.77 1288.8510171.08 1288.84
10193.19 1288.7410193.78 1288.7410205.98 1288.7310211.38 1288.71 10212.6 1288.71
 10218.2 1288.7110227.83  1288.710228.41  1288.7 10241.8 1288.7410246.15 1288.75
 10246.8 1288.7510264.65 1288.7510269.08 1288.7710279.71 1288.8110288.08 1288.84
10293.28 1288.8710300.27 1288.9510302.36 1288.9510303.38 1288.9810311.75 1288.98
 10312.7 1288.9710313.26 1288.96 10315.3 1288.9510324.12 1288.9310325.12 1288.93
10339.25 1288.8810341.69 1288.8610345.13 1288.8210354.53 1288.83 10355.3 1288.83
10358.25 1288.7710359.89 1288.7510367.06 1288.7310369.56 1288.6510373.06 1288.65
10380.93 1288.6510381.72 1288.6510382.58 1288.6410383.39 1288.6310384.13 1288.63
10384.76 1288.6410385.65 1288.6510392.11 1288.61 10393.4 1288.6310395.55 1288.66
10404.78  1288.810408.69 1288.8610412.56 1288.8710426.76    128910431.81 1288.98
10443.03 1288.9710449.05 1288.9810461.81 1288.9310467.44 1288.8910474.39 1288.91
10484.85 1288.9310492.39 1288.9110502.54 1288.9510510.53 1288.9110516.89 1288.95
10528.73 1289.1110534.25 1289.18 10542.3 1289.2110554.75 1289.4710560.97 1289.53
 10567.5 1289.6610572.04 1289.8410577.52 1289.9110582.62 1290.0610590.54 1290.31
10596.59 1290.3710603.22 1290.4410608.83 1290.4810616.52 1290.5110626.12 1290.51
10631.07 1290.5210640.91 1290.4810643.57  1290.510653.37  1290.510656.04 1290.52
10667.61 1290.4810669.14 1290.4910683.26 1290.6210683.94 1290.6310687.91 1290.72
10694.41 1290.86 10695.4 1290.88 10706.8 1290.9510710.33 1290.9810717.34 1291.03
10725.01 1291.1610730.88 1291.2710735.15 1291.3510738.54 1291.3810747.17 1291.49
10752.63 1291.5410762.84 1291.6110769.04 1291.7810776.21 1291.8710783.54 1291.93
10791.76 1292.0110799.76 1292.0610809.61 1292.1710817.55 1292.2610827.65 1292.26
10837.29 1292.3110847.76 1292.4410858.07 1292.49 10868.3 1292.5310876.98 1292.62
10889.71 1292.66 10900.8 1292.7310911.97 1292.8210923.55 1292.8510935.73 1292.91
10947.55 1292.9810959.31 1293.0310970.49  1293.110982.01 1293.2110993.96 1293.35
11002.43 1293.5111012.19 1293.7111019.79 1293.8111028.45  1293.911032.53  1293.9
11042.58 1294.0411055.28 1294.2211057.44 1294.2411063.61 1294.3211068.33 1294.36
11068.44 1294.36

Manning's n Values          num=       3
    Sta    n Val     Sta    n Val     Sta    n Val
**************************************************
 9468.44     .056 9892.27     .0410119.26     .056

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.    Expan.
      9892.2710119.26          237.1  233.89   231.2            .3        .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
 9468.44 9934.72 1288.96       F
10056.9711068.44 1288.79       F

CROSS SECTION


RIVER: MDOW
REACH: Reach1             RS: 3.266

INPUT
Description:
Station Elevation Data    num=     459
    Sta     Elev     Sta     Elev     Sta     Elev     Sta     Elev     Sta     Elev
*********************************************************************************
    9700 1291.03 9703.37 1290.96 9711.38 1290.78  9711.8 1290.77 9712.22 1290.77
 9721.27 1290.51 9723.72 1290.46 9729.22 1290.31 9733.74  1290.2 9740.44 1289.96
 9743.35 1289.89    9750 1289.84  9753.8 1289.61 9758.68 1289.31 9760.12 1289.27
  9763.1 1289.18 9768.13 1289.03 9773.55 1288.85  9774.8  1288.8 9775.89 1288.74
 9778.24 1288.57 9778.63 1288.54 9781.11 1288.24  9781.3 1288.24 9784.78 1288.09
 9784.96 1288.09 9789.23 1288.02 9789.45 1288.01 9793.49 1287.81 9793.95 1287.81
 9797.77  1287.7 9798.01  1287.7 9798.14 1287.69 9802.66 1287.66 9803.84 1287.67
  9807.2 1287.62 9808.17 1287.61  9808.9 1287.59 9810.32 1287.37 9813.28 1287.29
 9813.81 1287.27 9814.18 1287.25 9816.57 1287.35 9818.12 1287.43 9819.61 1287.44
 9820.21 1287.44 9824.13  1287.5 9825.43 1287.52 9825.84 1287.53 9827.07 1287.43
 9829.21 1287.28 9829.61 1287.29 9829.98 1287.29 9831.35 1287.29 9836.26 1287.36
 9838.06 1287.41 9841.97 1287.49  9843.9 1287.54 9846.84 1287.55 9847.27 1287.56
 9847.49 1287.56 9847.68 1287.57  9852.3 1287.61 9853.19 1287.61 9853.54 1287.62
 9853.89 1287.62 9854.98 1287.63 9855.61 1287.64 9858.46 1287.68 9862.04 1287.69
 9863.68 1287.72 9868.72  1287.8  9869.9 1287.81 9872.64 1287.74 9876.42 1287.72
 9876.88 1287.71 9880.19 1287.81 9881.45 1287.81 9884.22 1287.79 9884.33 1287.78
 9884.47 1287.78 9884.63 1287.77 9888.35 1287.61 9889.01 1287.58 9892.08  1287.5
 9892.98 1287.46  9895.3 1287.44 9896.85 1287.36 9899.06  1287.3 9900.57 1287.22
 9902.92 1287.12 9906.48 1286.85 9907.63 1286.74 9908.47 1286.68 9912.18 1286.46
 9912.36 1286.45 9916.36 1286.24 9916.43 1286.24  9916.7 1286.23 9921.27  1286.2
 9922.15 1286.18 9923.32 1286.14 9927.92 1286.01 9931.71 1285.91 9933.25 1285.89
 9934.97 1285.83 9937.36 1285.76 9939.39 1285.71 9940.55 1285.59 9941.67 1285.49
 9944.09 1285.92  9944.7 1285.96 9948.33    1286 9955.44 1286.09 9957.36 1286.11
 9965.58 1286.25  9965.7 1286.25 9965.93 1286.26 9966.48 1286.25    9970 1286.17
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  9971.6  1285.4 9977.27 1282.71  9978.8 1282.05 9980.54 1281.33 9982.58 1280.82
 9986.17 1280.22 9986.92 1279.93 9990.76 1278.21 9993.26 1277.69 9994.54 1277.75
 9995.47 1277.73   10000 1277.58 10000.47 1277.56 10003.22 1277.54 10008.1 1277.53
10009.56 1278.2210012.28 1279.4510014.86 1279.65 10015.2 1279.6810015.64 1280.31
10016.59  1281.710017.84 1282.4610019.08 1283.2510020.63 1284.4210022.16 1285.63
10022.59 1285.72 10023.4 1285.7810024.56 1285.8810024.87 1285.8810025.44 1285.84
10029.16 1285.6110030.41 1285.6610031.33 1285.6810031.44 1285.6810032.13 1285.85
10034.08 1286.33 10034.5 1286.4110038.28 1286.37 10040.6 1286.3510043.67 1286.28
10044.01 1286.2710044.29 1286.2610044.58 1286.2210047.02 1285.7710048.03 1285.84
 10049.3 1285.8110051.85 1285.7510054.58 1285.7210055.61 1285.68 10058.1 1285.81
10058.55 1285.7610060.18 1285.7710060.79 1285.6210061.48  1285.510062.02 1285.45
10062.41  1285.410062.55 1285.45 10063.4 1285.5310064.42 1285.5610064.96  1285.6
10067.56 1285.6210069.61 1285.7310070.31 1285.7710071.12 1285.8410072.98 1285.84
10074.99 1285.9210075.45 1285.9210077.11 1285.84 10078.8 1285.8210079.91 1285.82
10080.38  1285.810083.88 1285.08 10084.4 1284.9710084.57 1284.9910084.76 1285.04
10087.92 1285.8310088.46 1285.9110088.97 1285.9110092.05 1285.9410095.15 1285.91
10096.21 1285.9310099.29 1285.9510102.12 1285.9510105.62 1285.9210107.23 1285.98
10110.76 1285.9710112.13 1285.9510113.71 1286.0210114.75 1285.9910116.08  1285.9
10117.22 1285.9910117.73 1286.0410119.03 1286.0210122.94 1285.9910124.23 1285.88
10128.25 1285.6110130.71 1285.6610131.63 1285.5810133.05 1285.4410133.57 1285.37
10135.83  1285.710136.31 1285.7810136.66 1285.7610142.06 1285.56 10142.4 1285.56
10142.69 1285.5710145.29  1285.610147.85 1285.6110149.09 1285.1610150.15 1284.75
10150.64 1284.6410152.06 1284.4510154.56  1284.910155.02 1284.9810158.42 1285.58
10159.22 1285.74 10159.8 1285.6410161.07 1285.4210162.48 1285.3910163.23 1285.37
10163.56 1285.4510163.83 1285.4910164.45 1285.5110164.87 1285.49 10165.1 1285.49
10172.43 1285.5110174.88 1285.4810176.08 1285.4210179.78  1285.510184.03 1285.52
10184.63 1285.5210185.37 1285.5210187.89 1285.2410187.98 1285.23   10188 1285.23
10188.06 1285.2410190.95 1285.5610191.74 1285.6810193.73 1285.7510206.52 1285.82
10206.53 1285.8210208.76 1285.6510209.17  1285.710210.21 1285.9110210.84 1285.91
 10218.2 1285.7710218.41 1285.7710220.43 1285.6410220.64 1285.6210220.69 1285.62
10221.97 1285.5710222.36 1285.5510225.59 1285.55 10228.5 1285.5810230.78 1285.53
10234.03  1285.610236.22 1285.6410237.73 1285.7110239.45 1285.7510240.93 1285.78
10242.84 1285.7110244.26 1285.7310245.82 1285.6610246.85 1285.6610249.65 1285.58
10250.84 1285.5610251.87  1285.510254.44  1285.510255.88 1285.4710257.63 1285.52
10258.51 1285.5310259.71  1285.610261.15 1285.7110262.29 1285.6710263.78 1285.72
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10274.24 1285.1810274.51 1285.1710276.17  1285.3 10276.2  1285.310277.55 1285.34
10277.57 1285.3410279.19  1285.510279.24  1285.5 10279.5 1285.5110280.73 1285.46
10281.68  1285.4 10283.1 1284.6410284.42 1283.96 10285.6 1283.4310285.75 1283.36
10285.81 1283.3210286.92 1283.3610287.02 1283.3610287.26 1283.5910288.32 1284.36
10288.66 1284.8210290.26 1285.8710292.34 1285.8110300.03 1285.4910301.34 1285.43
10305.22 1285.2210307.04 1285.0610310.52 1284.9310312.56 1284.8610313.89 1284.89
10314.69 1284.89 10320.1 1285.0210321.19 1285.1110321.22 1285.1110321.65 1285.15
10322.86 1285.2410323.69 1285.2710324.99 1285.2310326.21 1284.9310326.52 1284.84
10327.51 1284.7710328.45 1284.6610330.31 1284.6610330.78 1284.6710330.93 1284.66
10330.98 1284.6610331.28 1284.7610332.15 1285.0110332.96 1285.2210334.47 1285.27
 10334.7 1285.2810336.86 1285.13 10336.9 1285.13 10337.2 1285.14   10344 1285.36
 10347.6 1285.4810349.36  1285.510352.84 1285.5710354.22 1285.5810355.18 1285.59
10358.36 1285.5910359.33  1285.6 10360.1 1285.59 10360.7 1285.57 10361.3 1285.56
10363.66 1285.5310364.54  1285.510365.36 1285.4910366.72 1285.4710370.83 1285.34
10373.39 1285.32 10375.4 1285.3310378.76 1285.3410379.35 1285.3210380.82 1285.32
10383.94 1285.2810386.82 1285.2410387.23 1285.19 10392.5 1284.3710394.77 1284.75
10395.36 1284.8210395.56 1284.82 10396.5 1284.8310397.14 1284.8410401.97 1285.02
10407.99 1285.1110408.71 1285.1210409.34 1285.1310410.11 1285.1310412.16 1285.17
10421.55 1285.3410423.88 1285.3910433.34 1285.7510435.23 1285.7710446.22 1286.16
10450.08 1286.2610460.38 1286.68 10461.7 1286.7410465.71 1287.0510468.38 1287.21
10473.38 1287.56 10474.3 1287.5610474.35 1287.5610474.41 1287.5610475.27 1287.64
10475.89 1287.65 10479.6 1288.0610481.35  1288.210483.76 1288.4210488.89 1288.74
10489.33 1288.7310489.78 1288.7110490.45 1288.6910491.94  1288.710492.63 1288.68
10493.74 1288.6210494.44 1288.61 10495.7 1288.5710496.75 1288.57 10497.9 1288.59
10498.62 1288.5810504.42 1288.77 10503.7 1288.7710503.87 1288.7810504.03 1288.78
10505.66 1288.8110506.43 1288.8210506.52 1288.8210509.87 1288.8310512.92 1288.87
10513.39 1288.8810516.92 1289.0110520.76 1289.1410523.79 1289.2710527.07 1289.39
10530.03 1289.4310531.97 1289.4910534.82 1289.4810535.57  1289.510537.94 1289.55
10538.16 1289.56 10540.9 1289.6510543.48 1289.6410543.61 1289.65 10545.5 1289.54
 10546.4 1289.5810552.61  1289.910553.22 1289.9310554.21 1289.9210560.29  1290.1
10562.68  1290.110566.02 1290.0510570.11 1290.0910573.07 1290.1110579.51 1290.12
 10581.4 1290.1310589.85  1290.310599.63 1290.24   10600 1290.24

Manning's n Values         num=        3
     Sta    n Val      Sta    n Val      Sta    n Val
*******************************************************
    9700     .056     9970     .0410024.56     .056

Bank Sta: Left   Right     Lengths: Left Channel   Right     Coeff Contr.    Expan.
          997010024.56              439.8     500   577.9             .1       .3

CROSS SECTION


RIVER: MDOW
REACH: Reach1              RS: 3.171

INPUT
Description:
Station Elevation Data     num=      451
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev
*********************************************************************************************
    9300 1286.17  9308.3 1286.14 9311.72 1286.15 9317.72 1286.16 9325.85 1286.24
 9333.34 1286.25 9342.27 1286.35 9350.58 1286.32 9356.79 1286.34 9362.46 1286.31
  9368.9 1286.31 9376.14 1286.27 9384.31 1286.25 9390.92 1286.21 9404.87 1286.06
9412.51 1285.99 9417.39 1285.97 9419.12 1285.98 9429.12 1285.85 9431.29 1285.82
9437.41 1285.74 9444.47 1285.68 9449.02 1285.62 9456.53 1285.41 9460.11 1285.29
9461.18 1285.27 9470.99 1285.12 9476.63 1285.02 9479.61 1284.98  9488.7 1284.82
9489.88  1284.8 9494.59 1284.68 9496.24 1284.67 9502.88 1284.58 9509.29 1284.59
    9512  1284.6 9516.45 1284.61 9520.52 1284.55 9528.07 1284.55 9531.72 1284.48
  9532.3 1284.38 9532.69 1284.28 9534.48 1284.16 9534.92 1284.16 9535.94 1284.14
9536.74  1284.1 9537.99 1284.06 9539.63 1284.03 9540.95    1284 9541.35    1284
9542.18 1283.99 9542.96 1283.98  9544.4 1283.98 9545.44 1283.98 9545.71 1283.98
9546.67 1283.98 9546.84 1283.97 9546.92 1283.97 9547.02 1283.97 9547.49    1284
9547.87 1284.01 9557.65 1284.12 9564.64 1284.09  9568.5 1283.99 9570.83 1283.89
9571.34 1283.88 9577.84 1283.88 9582.72 1283.58  9584.6 1283.47 9587.75 1283.37
9589.22 1283.35    9590 1283.35 9594.44  1283.3 9600.03 1281.29 9600.76 1281.02
9601.57 1280.83 9606.15  1279.8  9607.3 1279.52 9612.16 1278.27  9623.6 1278.27
9637.63 1278.31 9645.17 1280.33 9646.43 1280.64 9649.43 1281.51 9650.54 1281.84
9651.77 1283.37 9656.57 1283.35 9657.47 1283.38  9658.5 1283.42 9660.19 1283.42
9661.98 1283.45  9670.3 1283.56  9671.3 1283.57 9672.15  1283.6 9675.03 1283.63
   9676 1283.63 9676.96 1283.64 9681.15 1283.66 9682.02 1283.65 9683.07 1283.63
9684.46 1283.62 9686.76 1283.65 9693.07 1283.46 9694.52 1283.45 9696.48 1283.42
9698.69 1283.38 9701.35 1283.35 9706.41 1283.31 9708.94 1283.28 9710.54 1283.24
9711.22  1283.2 9712.71 1283.08 9713.76 1283.05 9714.97 1282.93 9716.76 1282.83
9718.76 1282.79 9722.85 1282.72 9725.89 1282.72 9736.61 1282.76    9744 1282.74
9752.21 1282.79 9756.65 1282.79 9756.86 1282.79 9757.24 1282.79 9757.61 1282.79
9759.04 1282.81 9770.35 1282.85 9785.71 1282.88 9789.33 1282.88 9803.78 1282.82
9807.28 1282.85  9820.4 1282.94 9822.28 1282.96 9824.86 1282.98 9836.68 1283.12
9847.84 1283.13 9858.39 1283.17 9862.84 1283.27 9871.55 1283.37 9875.47 1283.34
9876.42 1283.34  9879.1  1283.3 9884.66 1283.23 9885.04 1283.23 9886.92  1283.2
9891.32 1283.14 9891.68 1283.14 9892.93 1283.12 9898.41 1283.08 9904.39 1283.31
9912.43 1283.77 9912.73 1283.64 9913.86 1283.25 9916.65 1283.45 9919.61 1283.66
 9921.7 1283.81 9922.55 1283.82 9924.39 1284.25 9925.09 1284.61 9925.22 1284.61
9926.58 1284.63 9927.62 1284.45 9928.24 1284.49 9928.86 1284.54 9929.84 1284.92
9930.14    1285 9930.48 1285.08 9933.11 1285.35 9933.39 1285.38 9933.49 1285.39
 9933.5  1285.4 9933.52  1285.4 9933.54  1285.4 9933.63  1285.4 9934.68 1285.36
 9935.6 1284.74 9935.78 1284.66 9936.16 1284.64 9936.33 1284.63 9938.63 1283.96
9939.49 1283.81 9939.93  1283.8  9940.5 1283.79 9943.24 1283.93    9944 1283.96
9944.64 1283.96 9946.13  1284.2 9947.13 1284.35 9947.93 1284.36 9950.09 1284.39
 9950.8 1284.36 9951.78 1284.08 9952.83 1283.95 9953.63 1283.91 9955.12 1284.01
9955.71 1284.08 9956.63 1284.11 9957.62 1284.16 9958.58  1284.2 9959.48 1284.27
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 9968.57 1284.81 9969.47    1285 9969.95 1285.08 9970.11 1285.12  9971.4 1285.36
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 9975.78 1283.17 9978.27 1281.57 9978.74 1281.34 9980.16 1280.88 9980.95 1280.39
 9982.06 1279.73 9982.92  1279.1    9984 1278.25 9984.35 1278.06 9985.04 1278.14
  9985.5 1278.19 9986.99  1278.3 9988.76 1278.24 9989.28 1278.12 9989.39 1278.12
 9989.62  1278.1 9990.96 1277.76 9992.08  1277.5 9992.23 1277.45 9993.07  1277.2
 9995.07 1276.55 9995.38  1276.5 9997.02 1276.52   10000 1276.8210008.33 1276.98
   10009 1276.9910010.21 1277.4910011.65 1278.0610012.46 1278.2110015.77    1279
10017.61 1279.3710018.36  1279.510021.91 1280.5310022.43 1280.6510022.82 1280.75
10024.05 1281.3710026.45 1282.4810027.41 1282.9110027.53 1282.9310028.08 1283.02
 10028.9 1283.0910029.36 1283.1510030.36 1283.3310031.83 1283.9710033.14 1284.38
10035.72  1285.1   10036 1285.1710036.34 1285.1610038.42 1285.1910039.22 1285.11
10041.73  1285.410042.92  1285.510043.66 1285.6510045.58 1285.8610045.99 1285.89
10047.26 1286.0210047.91  1286.110048.83 1285.9410049.49 1285.8210049.87 1285.88
10051.08 1286.18 10054.7 1284.6710055.48 1284.2810056.52 1284.2410057.86 1284.21
10058.58  1284.210060.67 1284.7310061.25 1284.9110062.62  1284.510063.68 1284.27
10063.87 1284.2310064.66 1284.1410065.21 1284.1610066.88  1284.110068.12 1284.07
10068.97 1284.2210070.16 1284.5710071.44 1284.9210072.78 1284.2110072.95 1284.16
10073.18 1284.1510075.38 1284.0810080.88 1283.95 10082.8 1283.9110088.07 1283.91
10089.14  1283.910089.64 1283.9110094.84 1283.9710095.74 1283.9910095.82 1283.98
10099.55 1283.8410100.77 1283.8310101.46 1283.82 10103.8 1283.7910112.35 1283.83
10113.09 1283.8410114.17 1283.85 10115.9 1283.8910123.11 1284.0210125.15 1284.05
10125.72 1284.0410127.28 1283.8810127.99 1283.9210128.93 1284.1210128.96 1284.11
10131.38 1283.15 10131.8 1283.0610133.97 1282.6410135.83 1282.8710137.91 1283.09
10139.69 1283.3110140.78 1283.4310141.08 1283.3210142.82 1283.3210152.15 1282.02
10152.48 1281.9710152.59 1281.9510152.62 1281.9510152.68 1281.94 10152.8 1281.93
10152.92 1281.9110157.51 1281.2210159.82 1280.7210161.52 1280.2510162.22 1280.17
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10171.39 1282.3910174.23 1282.8410176.15 1283.25 10176.8  1283.310178.09  1283.5
10180.59 1283.9310181.22 1283.8210183.85 1283.3210186.26 1283.2610191.16 1283.27
 10197.2 1283.3110197.66 1283.3110198.43 1283.2610199.06  1283.3 10201.1 1283.41
10202.65 1283.3710203.24 1283.36 10205.5 1283.2710207.89  1283.2 10208.3 1283.18
10208.49 1283.1810209.08 1283.13    10210 1283.0810212.05 1282.9210212.27 1282.91
10212.52 1282.8910215.66 1282.82 10215.9 1282.8110218.07 1282.7910218.27 1282.79
10219.54 1282.8210222.24 1282.8910222.71  1282.9 10227.8    128310228.41    1283
10230.48 1283.0210233.86 1283.0510238.44 1283.11    10243 1283.1210245.94 1283.08
10246.99 1283.0910248.92 1283.0810249.74 1283.0410250.91 1282.9810250.94 1282.98
10250.95 1282.9810254.92 1282.9810255.14    128310256.22 1283.0910257.29 1283.12
 10264.3 1283.3210271.68 1283.4310278.83 1283.5910280.58 1283.6410282.05  1283.7
10290.83  1284.110293.36 1284.1510299.87 1284.33 10302.2 1284.3810302.69  1284.4
10311.16 1284.7310313.12 1284.7810318.23 1285.2110322.32 1285.4810328.04 1285.97
10331.82 1286.2210334.36 1286.4210338.63 1286.7510344.76    128710346.95 1287.14
10349.45 1287.2610353.28 1287.5310356.37 1287.6810357.62 1287.7910362.79 1287.85
10371.57 1288.3610371.73 1288.34 10373.6  1288.310379.19 1288.11 10379.8 1288.07
10393.31  1288.310401.31 1288.3910410.08 1288.5110424.35 1288.7210430.72 1288.81
10432.36 1288.8410446.93    128910455.93 1289.0810461.14 1289.0610462.66 1288.95
10467.37 1288.6410470.56  1288.710475.67 1288.6710479.79 1288.6810483.09 1288.68
10487.82 1288.7610489.22 1288.7810490.33 1288.8110495.97 1289.0510499.49 1289.13
   10500 1289.15

Manning's n Values         num=       5
    Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val
*********************************************************************************
    9300    .056 9594.44    .035 9655.77    .056  9971.4     .04   10036    .056

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        9971.4   10036             319.5     500   656.1             .1       .3

CROSS SECTION


RIVER: MDOW
REACH: Reach1             RS: 3.077

INPUT
Description:
Station Elevation Data     num=      303
    Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev
*********************************************************************************
 9357.94  1285.2 9358.36  1285.2 9360.37 1285.11 9363.02 1285.01 9365.37 1284.92
 9368.48 1284.85 9369.72 1284.82 9370.21 1284.82 9374.42 1284.76 9375.86 1284.72
 9378.09 1284.69 9380.11 1284.66 9381.55 1284.63 9386.19 1284.54  9386.5 1284.53
 9387.72 1284.53 9391.21 1284.54 9392.49 1284.54 9398.14 1284.47 9402.49 1284.42
 9403.36 1284.41 9404.01 1284.41 9407.86 1284.38 9414.95 1284.25    9418 1284.28
 9423.12  1284.2 9424.67  1284.2 9427.85 1284.11 9430.26 1284.06 9439.39    1284
 9443.84    1284 9449.67 1283.98 9451.01 1283.98 9454.16 1284.02 9455.83 1284.02
 9458.04 1284.02 9458.37 1284.01 9459.29 1283.99 9459.79 1283.99 9459.94 1283.98
 9462.07 1283.92 9463.33 1283.83 9463.92 1283.82 9472.89 1283.74 9473.17 1283.74
 9476.76 1283.71 9477.77 1283.74 9484.49 1283.75 9485.23 1283.63 9489.96  1283.5
 9491.31 1283.47 9493.65 1283.47 9494.69 1283.56 9503.04 1283.53 9510.72 1283.41
 9512.01 1283.42 9514.28 1283.47 9514.62 1283.43 9517.19 1283.36  9520.7  1283.3
 9525.51 1283.14 9526.63 1283.11 9527.14 1283.08 9528.86 1282.99 9531.53 1282.65
 9533.28 1282.46 9536.69  1282.1 9539.46 1281.84  9540.9 1281.75 9542.31 1281.67
 9546.41  1281.4 9548.49 1281.13 9549.46 1280.96 9553.51 1280.68 9553.81 1280.66
 9553.86 1280.64 9558.75 1278.87 9563.34 1277.49 9563.35 1277.48 9567.66 1276.62
 9568.49 1276.45 9571.24 1276.47 9583.99 1276.48 9595.27 1276.51 9596.93 1276.83
 9603.63 1278.03 9608.13  1279.7 9612.01 1281.21 9613.48 1281.26 9616.08 1281.31
 9618.02 1281.38 9619.58 1281.41 9623.75  1281.5 9630.39 1281.59 9632.49 1281.62
 9638.77 1281.73 9640.87 1281.74  9646.8 1281.74 9647.47 1281.73 9649.36 1281.69
 9655.17 1281.67 9656.51 1281.65 9662.46 1281.51 9665.91 1281.46 9672.11 1281.42
  9683.6 1281.37 9686.91 1281.31 9688.63 1281.33 9702.66 1281.36 9708.94 1281.32
 9710.72 1281.35 9712.42 1281.37 9717.44 1281.49 9718.26 1281.42 9718.96 1281.36
 9722.44 1281.11 9723.94    1281 9724.46 1280.96 9725.47 1280.84  9727.8 1280.62
  9728.5  1280.5  9733.5 1279.87 9736.37 1279.94 9741.78 1280.06 9750.36 1281.14
 9756.33 1281.86  9757.2 1281.83 9767.96 1282.13 9775.46 1282.21  9784.9 1282.19
 9793.53 1282.08  9802.8 1282.18 9812.93 1282.31  9831.3 1282.28 9834.81 1282.27
 9841.89    1282 9859.91 1281.32 9875.28 1281.23 9878.24  1281.2  9879.8 1281.29
 9889.03 1281.75 9898.49 1281.12  9900.2 1280.95 9901.78 1280.54 9904.68 1279.93
 9906.54 1278.82 9908.01 1277.84 9909.42 1276.95 9910.62 1276.96 9916.29 1277.15
 9919.17 1277.63 9923.29 1278.35 9923.85 1278.44 9924.35 1278.42 9925.63 1278.46
 9927.97 1278.69 9928.37 1278.78 9931.19 1278.85 9931.95  1278.9 9932.96 1278.95
 9935.24  1278.9 9938.51 1278.83 9939.25 1278.77 9941.02 1278.71 9942.14 1278.64
 9943.87 1278.52 9945.51 1278.49 9948.11 1278.35 9950.81  1278.2 9952.71  1278.2
 9959.76 1277.88 9959.93 1277.89 9960.88 1277.86 9962.02 1277.89 9963.99 1277.48
 9966.37 1276.89 9968.74 1276.84  9969.4 1276.78 9971.59 1277.43 9973.96 1278.26
 9977.59 1278.51 9978.01 1278.55 9984.38 1276.28 9985.43 1275.86  9985.9 1275.77
 9987.94 1275.44 9995.09 1274.23  9996.4 1273.99   10000 1273.9710000.25 1273.97
10000.55 1273.9610000.71    127410001.91 1274.23 10006.9  1275.210008.91  1275.5
10012.21 1275.9710012.92 1276.1710017.04 1277.2110018.16  1277.6 10022.8 1279.98
10023.97 1280.4810024.29 1280.4310024.88  1280.510025.54 1280.5910028.03 1280.76
 10033.2 1281.0310034.08 1281.0210034.93 1281.0610035.44 1281.1110041.74 1281.14
10045.72 1281.1610048.28  1281.210059.52  1281.210060.87 1281.2310066.01 1281.63
10067.25 1281.6510068.13 1281.6610080.21 1281.8310091.46 1282.04 10093.6 1282.09
10097.21  1282.110105.94 1282.2210109.09 1282.2810119.62 1282.5210127.57 1282.75
10129.84 1282.8210136.45 1283.0610138.42 1283.1310144.62 1283.2810146.72 1283.29
10154.75 1283.4310158.65 1283.4410164.02 1283.3910170.04 1283.4410174.12 1283.46
 10183.3 1283.4110185.86 1283.4310200.38  1283.610201.76 1283.6210202.45 1283.62
10217.78 1283.5910226.79 1283.6110233.89 1283.6210240.42 1283.6410241.82 1283.64
10243.85 1283.6310256.77 1283.5410268.85 1283.5110275.23 1283.4710285.35 1283.52
10286.81 1283.4810289.87 1283.5110299.32 1283.3710319.83 1283.3510319.99 1283.35
10320.19 1283.3510339.31 1283.2710350.42 1283.2110356.18 1283.3610358.68 1283.38
10360.23 1283.0510361.27 1282.8110363.27 1282.7510366.27 1282.66 10366.9 1282.65
10369.38 1282.5910371.75 1282.69 10376.5 1282.7910377.52 1283.1410378.54 1283.64
10379.67 1283.5810380.25 1283.4610381.37 1283.3510390.35 1283.1810394.68 1283.19
10395.72 1283.1810406.06 1283.3410417.92 1283.5410424.35 1283.5910434.17 1283.66
10444.89 1283.72 10451.4 1283.8210468.26 1284.0810487.03 1284.52   10488 1284.53
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10489.52 1284.5510510.68 1284.6610520.83 1284.8210533.78 1284.8710537.66 1284.8
10539.08 1284.8510541.29 1284.8310542.47 1284.810544.98 1284.8210545.41 1284.82
10546.32 1284.8410556.15 1284.9710557.37 1284.9710568.66 1285.04 10574.9 1285.05
10584.29 1285.110592.58 1285.22 10600 1285.27

Manning's n Values num= 5
Sta n Val Sta n Val Sta n Val Sta n Val Sta n Val
9357.94 .056 9548.49 .035 9612.01 .056 9898.49 .04 10033.2 .056

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
9898.49 10033.2 490 478.23 346.9 .1 .3

CROSS SECTION

RIVER: MDOW
REACH: Reach1 RS: 2.986

INPUT
Description:
Station Elevation Data num= 298
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
9700 1284.68 9700.41 1284.68 9707.12 1284.69 9731.01 1284.55 9733.92 1284.54
9736.86 1284.51 9751.43 1284.39 9770.51 1284.3 9771.31 1284.3 9771.71 1284.3
9774.49 1284.27 9786.16 1284.16 9787.98 1284.14 9788.69 1284.14 9799.56 1284.08
9801.92 1284.11 9802.83 1284.06 9804.33 1284.02 9813.26 1283.9 9815.04 1283.88
9817.79 1283.83 9828.94 1283.61 9830.76 1283.58 9832.21 1283.54 9836.75 1283.47
9839.15 1283.48 9844.19 1283.27 9858.03 1283.11 9859.57 1283.09 9860.99 1283.05
9875.31 1282.61 9876.92 1282.63 9877.67 1282.54 9877.71 1282.54 9885.37 1282.43
9885.69 1282.43 9886.13 1282.42 9886.36 1282.42 9888.3 1282.32 9888.44 1282.35
9888.71 1282.28 9889.43 1282.38 9889.69 1282.38 9893.44 1282.32 9893.57 1282.32
9894.22 1282.19 9894.72 1282.11 9895.17 1282.1 9895.3 1282.09 9895.33 1282.1
9895.35 1282.1 9895.97 1282.1 9899.49 1282.11 9909.43 1282.08 9915.9 1281.96
9923.74 1281.73 9932.87 1281.4 9933.53 1281.39 9938.04 1281.29 9944.39 1280.9
9947.18 1280.81 9951.56 1280.68 9958.49 1280.51 9962.43 1280.63 9970.58 1280.73
9971.45 1280.73 9971.93 1280.74 9973.83 1280.75 9982.99 1280.77 9983.96 1280.42
9993.08 1275.93 9999.8 1272.42 10000 1272.4210001.33 1272.4510003.74 1272.5
10008.38 1272.5510008.79 1272.5710009.49 1272.5910020.79 1273.4510021.17 1273.47
10023.25 1273.5110035.74 1273.3910040.17 1273.3510049.29 1273.9910049.85 1274.08
10050.4 1274.1310051.93 1274.5510058.61 1276.1310066.41 1278.310068.57 1278.48
10069.58 1278.6110071.94 1278.7710072.29 1278.7710076.01 1278.9710081.59 1278.89
10082.4 1278.8710083.78 1278.8910090.07 1279.0310091.91 1279.110096.31 1279.06
10097.28 1279.0610098.21 1279.0410101.97 1278.9910104.76 1278.9710105.84 1278.99
10110.56 1279 10112.1 1278.9410113.47 1278.7710114.78 1278.6110115.82 1277.41
10116.12 1276.9510116.61 1276.89 10118 1276.6610120.27 1275.4610120.48 1275.36
10120.52 1275.3410122.17 1274.8410127.57 1275.1710131.11 1275.3310134.69 1275.43
10136.57 1275.5110142.23 1275.7410142.62 1275.7510152.03 1276.8810153.09 1277.02
10153.74 1277.110154.16 1277.15 10162.3 1278.2210162.96 1278.3210163.85 1278.4
10165.36 1278.5510168.24 1278.8210169.65 1278.7710171.59 1278.6210175.23 1279.09
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10197.06 1279.3910200.93 1279.3410205.25 1279.2610213.02 1279.1710217.33 1279.35
10218.86 1279.4210220.71 1279.4710227.45 1279.7610230.29 1279.9410235.77 1280.21
10238.19 1280.3910241.25 1280.4910245.67 1280.5610255.21 1280.6210256.48 1280.63
10257 1280.6410257.85 1280.6310260.45 1280.610271.07 1280.4910276.62 1280.46
10278.2 1280.4110281.41 1280.3410286.63 1280.25 10288.6 1280.1810292.29 1280.03
10292.56 1280.0210296.02 1279.8110299.07 1279.7410300.13 1279.6410302.54 1279.34
10305.94 1279.2210308.31 1279.1510315.55 1279.2110323.28 1279.3210325.89 1279.3
10335.33 1279.510343.01 1279.6510347.11 1279.6310356.08 1279.7510363.05 1279.91
10363.51 1279.9210363.82 1279.9210364.99 1279.910369.94 1279.8110371.09 1279.85
10378.29 1280.0410393.08 1280.4210394.52 1280.4510403.82 1280.4510408.33 1280.47
10408.64 1280.4610409.51 1280.4310416.66 1280.2210419.79 1280.1110421.46 1280.05
10422.25 1280.0110426.73 1279.8810434.83 1280.05 10436.8 1280.09 10437.6 1280.11
10440.34 1280.1210456.54 1280.2610463.19 1280.3310473.93 1280.3810477.53 1280.4
10486.9 1280.310490.47 1280.2710493.18 1280.4210496.66 1280.4910498.94 1280.46
10503.29 1280.3610506.49 1280.4110511.86 1280.4 10513.3 1280.3610514.16 1280.37
10515.56 1280.3810525.16 1280.4610531.06 1280.4210534.02 1280.45 10536.3 1280.47
10541.86 1280.5510545.04 1280.510547.18 1280.5810551.39 1280.7810552.74 1280.8
10554.04 1280.7710554.93 1280.7810563.45 1280.9410569.99 1280.96 10571.9 1280.96
10572.26 1280.9410577.77 128110580.76 1281.1110588.67 1281.1910593.12 1281.29
10599.83 1281.3410606.85 1281.3910610.89 1281.4410618.74 1281.5210626.66 1281.59
10627.67 1281.590627.99 1281.610632.61 1281.6110637.87 1281.6910640.23 1281.63
10641.8 1281.4710642.45 1281.4410646.84 1281.1110650.03 1280.9910651.36 1280.98
10653.35 1281.1410656.47 1281.3910658.24 1281.7810658.29 1281.7910661.22 1281.58
10661.47 1281.5810672.41 1281.5310682.32 1281.5910688.73 1281.6310696.13 1281.67
10711.71 1281.7910712.61 1281.8 10712.9 1281.810713.13 1281.810728.31 1281.95
10732.37 1281.9910739.04 1282.1210749.51 1282.2310758.57 1282.4710760.46 1282.53
10765.92 1282.610767.18 1282.6110768.19 1282.6410773.36 1282.9110777.27 1282.88
10785.39 1282.9 10787.4 1282.910789.97 1282.9310803.71 1283.1210809.66 1283.16
10819.19 1283.2110824.44 1283.21 10834.4 1283.2610843.26 1283.4610844.39 1283.55
10844.59 1283.5610847.55 1283.5510851.89 1283.6210853.18 1283.6310856.08 1283.72
10861.65 1283.7910866.05 1283.9210869.31 1283.9910875.85 1284.0810879.42 1284.22
10887.64 1284.2910898.52 1284.44 10900 1284.48

Manning's n Values num= 3
Sta n Val Sta n Val Sta n Val
9700 .056 9982.99 .0410076.01 .056

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
9982.9910076.01 446.4 500 507.6 .1 .3

CROSS SECTION

RIVER: MDOW
REACH: Reach1 RS: 2.891

INPUT
Description:
Station Elevation Data num= 284
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
9700 1281.07 9700.58 1281.07 9701.03 1281.04 9701.92 1281.05 9703.38 1280.99
9705.49 1280.89 9710.45 1280.72 9717.3 1280.77 9719.99 1280.78 9722.67 1280.76
9724.35 1280.79 9726.48 1280.78 9731.19 1280.87 9731.65 1280.88 9734.09 1280.85
9738.9 1280.83 9742.9 1280.74 9746.83 1280.71 9756.94 1280.57 9761.16 1280.45
9767.34 1280.3 9771.24 1280.2 9773.06 1280.15 9782.65 1279.84 9782.98 1279.83
9783.56 1279.8 9790.74 1279.5 9791.34 1279.49 9791.99 1279.48 9798.58 1279.39
9800.49 1279.37 9802.16 1279.35 9804.54 1279.31 9810.34 1279.18 9812.5 1279.14
9815.39 1279.06 9819.42 1278.91 9820.52 1278.88 9821.06 1278.86 9825.57 1278.83
9827.69 1278.81 9827.96 1278.81 9828.12 1278.8 9828.39 1278.79 9835.82 1278.51
9837.76 1278.46 9844.5 1278.33 9846.66 1278.26 9848.2 1278.22 9850.27 1278.17
9852.96 1278.07 9856.14 1277.92 9857.38 1277.87 9859.82 1277.72 9860.16 1277.7
9864.51 1277.56 9866.83 1277.44 9877.7 1276.94 9878.84 1276.9 9879.35 1276.9
9881.81 1276.9 9890.2 1276.85 9893.65 1276.95 9905.1 1276.82 9905.25 1276.81
9905.34 1276.81 9919.48 1276.3 9923.05 1276.2 9928.57 1273.94 9932.19 1272.5
9933.6 1272.43 9937.88 1272.61 9938.59 1272.62 9938.81 1272.65 9941.34 1272.88
9941.71 1272.91 9946.05 1273.4 9946.45 1273.43 9948.95 1273.53 9949.5 1273.53
9953.48 1273.71 9954.01 1273.77 9954.75 1273.8 9959.61 1273.71 9960.28 1273.59
9961.17 1273.52 9963.99 1273.55 9964.92 1273.59 9966.49 1273.6 9968.98 1273.57
9970.14 1273.39 9972.65 1273.25 9973.99 1273.1 9975.89 1273.07 9979.23 1272.86
9980.44 1272.76 9983.84 1272.51 9984.99 1272 9986.14 1271.48 9988.16 1271.5
9990 1271.56 9990.58 1271.52 9993.11 1271.15 9994.26 1271.35 9994.57 1271.43
9994.94 1271.34 9997.29 1270.78 9999.76 1270.48 10000 1270.4510000.07 1270.44
10000.73 1270.5210002.54 1270.79 10003.9 1271.3710004.23 1271.5210006.96 1272.69
10008.62 1273.3710010.14 1273.2910010.24 1273.3110011.03 1273.0210012.92 1272.32

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10014.16 1272.4610015.89 1272.6810016.37 1273.0410018.83 1273.6110019.19 1273.71
10019.39 1273.7410019.77 1273.7510022.37 1273.6110023.46 1273.6610024.83 1273.54
10027.26 1273.5410029.76 1273.3910033.18 1273.27 10034.9 1273.0510035.53 1272.74
10036.93 1272.2410040.17 1272.4310041.34 1272.3510043.25 1271.4610044.76 1270.81
10046.92 1270.7810049.69 1270.7210050.15 1272.6710050.87 1274.8210052.43  1274.9
10054.88 1275.0710058.98 1275.2510062.17  1275.410064.75 1275.6410065.64 1275.71
10067.56 1275.8110072.72 1275.9510073.34 1275.9710074.36 1276.01 10082.2 1276.23
10082.59 1276.23 10082.8 1276.2510083.13 1276.2810086.15 1276.3610091.14 1276.52
10093.59 1276.5510101.37 1276.6310106.87 1276.6810119.32 1276.95 10121.7 1277.01
 10127.6 1277.0710134.15 1277.1410135.64 1277.1510146.93 1277.2210149.56 1277.27
10157.26 1277.35   10163 1277.43 10167.1 1277.5410170.19 1277.7210172.64 1277.73
10182.45 1277.9610184.03 1277.9910186.06 1278.0510187.52 1278.1110192.12 1278.16
10192.13 1278.1610192.14 1278.1610192.16 1278.1610202.58  1278.6 10207.1 1278.91
10209.43 1279.0510214.37 1279.1810214.88 1279.1910215.27  1279.210224.14 1279.46
10226.15 1279.4710238.95  1279.810239.23 1279.81   10240 1279.8110252.34 1279.92
10253.62 1279.95 10259.9 1280.1210263.22 1280.1510271.15 1280.3810280.12  1280.5
 10288.7 1280.4410295.62 1280.4110305.78 1280.5410312.87 1280.5810319.88 1280.59
10331.74 1280.6410334.79 1280.6410335.66 1280.6410356.17 1280.6710362.17 1280.63
10372.81 1280.6310382.53 1280.5610395.23 1280.5910399.85 1280.5610415.08 1280.41
10417.78 1280.38 10418.5 1280.3710432.72  1280.210445.07  1280.210451.77  1280.2
10459.75 1280.0610468.63 1279.9310481.27 1279.9910484.97 1279.9710487.45 1279.91
10498.59  1279.710500.16 1279.6910510.66 1279.3210514.83 1279.1810515.48 1279.18
10529.65  1279.110532.58 1279.0610539.21 1278.9210542.25 1278.8110543.66 1278.76
10549.88 1278.9910550.28   127910550.99 1279.0310552.23 1279.0910555.54 1279.27
10556.71  1279.210571.52  1279.110574.24 1279.1510578.73  1279.210591.61 1279.35
10597.68 1279.4110608.23 1279.53 10610.9 1279.5510623.87 1279.5610630.65 1279.59
 10633.5 1279.6610639.92 1279.7810640.76 1279.4910641.48 1279.2910642.81 1279.27
10647.51 1279.2210649.55 1279.1810651.14 1279.1810652.79  1279.310656.37  1279.6
10658.03 1280.1610658.09 1280.16 10658.2  1280.210658.29 1280.1810659.49 1279.91
 10660.5 1279.89 10664.6 1279.9310682.74 1280.2210685.94 1280.2610687.98  1280.3
10696.55 1280.4910704.87 1280.6610708.83 1280.7410722.02 1280.9910732.15 1281.23
 10739.5 1281.3210758.29 1281.3210760.17 1281.3310760.85 1281.3310761.98 1281.34
10781.58 1281.4210789.93 1281.2510797.32 1281.19   10800 1281.21

Manning's n Values         num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
**********************************************
    9700    .056 9923.05     .0410050.87    .056

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.    Expan.
       9923.0510050.87             575.3  551.08   504.9             .1       .3

CROSS SECTION


RIVER: MDOW
REACH: Reach1            RS: 2.787

INPUT
Description:
Station Elevation Data    num=     346
     Sta     Elev     Sta     Elev     Sta     Elev     Sta     Elev     Sta     Elev
*********************************************************************************
    9600 1278.45 9600.78 1278.43 9603.01 1278.43  9603.8 1278.42 9620.21 1278.39
 9621.03 1278.37 9624.79 1278.32 9627.14 1278.28 9628.87 1278.26 9637.28 1278.33
 9639.87  1278.4 9641.75 1278.52 9647.47 1278.85 9650.52    1279 9653.13 1279.07
 9654.19 1279.08 9654.95 1279.12 9654.98 1279.12 9659.72 1279.17 9659.76 1279.17
 9659.79 1279.17 9659.83 1279.17 9660.62  1279.1 9664.05 1278.94 9664.87 1278.87
 9669.91 1278.54 9679.04 1278.05 9681.85 1277.89 9682.29 1277.86  9683.8  1277.8
 9695.74 1277.41 9701.45 1277.27 9705.44 1277.17 9714.72  1277.1 9718.02 1277.07
 9722.71    1277 9735.78 1276.77 9739.59 1276.77 9745.92 1276.67 9752.44 1276.46
 9763.38 1276.12 9770.29 1275.95 9781.04 1275.65 9784.23 1275.59 9790.58 1275.43
 9792.04 1275.41 9799.81 1275.25 9802.37 1275.09 9802.96 1275.08 9804.35 1275.07
 9806.81    1275 9807.16 1274.98 9808.31 1274.92 9808.79 1274.86 9810.18 1274.97
 9811.36 1275.06 9812.23 1275.04 9813.43    1275 9813.47    1275 9814.29 1274.73
 9814.72 1274.77 9815.93  1274.9 9818.54 1274.93 9819.66 1274.95 9820.77 1274.95
 9823.62 1274.94  9826.2    1275 9830.05 1275.01 9833.81 1275.19 9837.11 1275.45
 9837.23 1275.45 9837.26 1275.45 9837.27 1275.45 9838.61  1274.7 9839.04 1274.67
 9840.17 1274.76 9844.83 1274.93 9848.17 1274.99 9854.94 1274.96 9855.43 1274.97
 9855.91 1274.98 9856.45 1275.05 9856.77  1275.1 9857.14 1275.15 9858.38 1275.22
 9858.96 1275.26  9860.6 1275.62 9860.71 1275.64 9860.86  1275.7 9861.06 1275.75
 9862.55 1276.16 9863.72 1276.67 9865.31 1276.13 9866.04 1275.81 9866.47 1275.67
 9867.34 1275.36 9870.04 1275.31 9874.65 1275.03 9878.02 1274.95  9881.6 1274.71
  9885.3 1274.66 9889.54 1274.54 9903.86 1274.35 9904.21 1274.35 9904.38 1274.35
 9916.87 1274.25 9921.64 1274.18 9936.78 1274.13  9938.3 1274.12 9939.19 1274.09
 9946.55  1273.8 9951.67 1273.74 9958.84 1273.65 9968.67 1273.53 9969.01 1273.52
 9970.03  1273.5 9976.96 1273.25 9977.24 1273.23 9979.13 1273.23 9979.56  1270.8
 9979.78 1270.57 9980.44 1269.91 9980.56 1269.79 9980.65 1269.62 9980.77 1269.55
 9982.22 1268.93 9982.92 1268.76 9985.06 1268.28  9987.3 1268.02 9989.85 1267.75
  9990.9 1267.56 9991.72 1267.35  9992.2 1267.34 9992.31 1267.44 9993.92 1267.41
   10000  1267.610000.61 1267.6110001.95 1267.6810003.21 1267.7310006.37 1267.82
10008.89 1267.9110013.35 1268.6410014.51 1268.8110016.66 1268.8510020.52 1268.84
10024.63 1268.7510028.96 1268.8510030.02 1268.8910033.25 1268.7710034.04 1268.71
10036.28 1268.9910037.73 1269.16 10038.3 1269.2510042.21 1269.9510042.47 1269.97
10043.12 1270.03   10049  1270.3 10049.5 1270.1310050.35 1269.9610053.41 1269.32
10055.12 1269.5410056.47 1269.76 10062.9 1270.1310064.84 1270.2510065.31 1270.27
10065.99 1270.1110069.64 1269.3710070.32 1269.5910074.34 1270.9510076.86 1272.02
 10081.1 1273.3910082.73  1273.410088.39 1273.4310092.36 1272.3510094.56 1271.92
10096.46 1271.5810099.39 1271.0510099.87 1270.9610100.44 1270.8510100.87 1270.97
10104.64 1271.9510107.18 1272.5210107.69 1272.6410109.95 1273.1510111.61 1273.21
10117.77 1273.3910122.78 1272.8210127.34  1272.310131.17 1272.4110146.82 1272.75
10149.71 1272.5210151.99 1272.4310156.12  1272.610156.49 1272.6110163.67 1272.67
10165.09 1272.7410168.23  1272.610170.03 1272.4210171.57 1272.5410173.84 1272.72
10177.16 1273.1110191.85 1274.9410194.44 1275.2510195.54 1275.3910200.33 1275.58
10210.04 1275.9310215.45 1276.1910218.21 1276.3110219.62 1276.3410225.02 1276.43
10238.37 1276.7410239.52 1276.7810240.02 1276.8110241.56 1276.84 10250.8 1276.95
10253.96  1277.110262.09 1277.3110268.75 1277.3510280.66 1277.3110280.94  1277.3
10286.88 1277.4510287.97 1277.4410290.86 1277.4110297.04 1277.3110297.63  1277.3
10299.92 1277.2210302.83 1277.2210302.85 1277.2210303.81 1277.2110307.72 1277.16
10307.78 1277.1610312.58 1277.1110312.76 1277.1110318.18 1277.1110318.52 1277.11
10326.92 1277.0910327.37 1277.0910334.63 1277.0710335.29 1277.0710339.77 1277.09
10341.11 1277.0810348.81 1277.0210349.64 1277.0210357.54 1277.02 10362.2 1277.02
 10362.4 1277.02 10363.8 1277.0310366.47 1277.0410366.51 1277.0410372.58 1276.96
10373.07 1276.9510377.45 1276.9110377.73 1276.9110380.71 1276.9310385.73 1276.95
10386.25 1276.9510394.15  1276.910395.06 1276.8910403.62 1276.8710409.55 1276.89
10411.24 1276.88 10418.8 1276.8910420.01  1276.910430.07 1276.8610431.38 1276.86
10442.68 1276.7610443.08 1276.74 10454.3 1276.7810455.12 1276.7910456.07 1276.79
10468.29 1276.8110469.19  1276.810475.71 1276.9110478.56 1276.8710479.75 1276.84
10483.35 1276.6510483.89 1276.6610484.63 1276.6710491.93 1276.6510492.73 1276.65
10493.79 1276.6510504.79 1276.6310505.63 1276.5810506.19 1276.5510511.29 1276.69
10511.51 1276.6910512.05 1276.7110512.74 1276.7610513.42 1276.7210513.79 1276.68
10514.87 1276.5710517.54 1276.2410519.73 1276.1810522.98 1276.1810528.14 1276.22
10536.37 1276.0310538.19    127610538.92 1276.1310540.83  1276.510540.99  1276.5
10544.66 1276.4810546.02 1276.4810546.26 1276.4810547.59 1276.32 10550.4 1275.85
10550.42 1275.8510550.91 1275.8110552.51 1275.9210552.88 1275.93 10556.6 1275.97
10559.81 1275.9610565.17 1275.95 10568.6 1275.8910569.91 1275.8910573.27 1275.71
10575.23 1275.6110575.86 1275.6110576.38 1275.6110577.46 1275.5710581.57 1275.91
 10584.7 1276.3110585.38 1276.3510585.57 1276.3610590.37  1276.310596.25 1276.24
10600.27 1276.0910604.92 1276.1210619.97 1276.2210621.42 1276.2710622.24 1276.31
10624.16  1276.410634.16  1276.810637.71 1277.0510639.31 1277.1510640.57 1277.17
10646.84  1277.410659.02 1277.6810660.61 1277.75 10662.1 1277.7810670.69 1278.06
 10683.4 1278.1810684.31  1278.2 10684.6  1278.210685.66 1278.1910696.56 1278.06
   10700    1278

Manning's n Values         num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
**********************************************
    9600    .056 9976.96     .04 10081.1    .056
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Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
       9976.96 10081.1              507.5     500   485.7             .1      .3

CROSS SECTION


RIVER: MDOW
REACH: Reach1             RS: 2.692

INPUT
Description:
Station Elevation Data    num=     229
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev
*********************************************************************************************
   9700 1276.73 9710.74 1276.73 9715.86  1276.7 9734.89 1276.75  9739.3 1276.75
 9744.36 1276.75 9760.51 1276.76 9763.86 1276.72  9780.1 1276.52 9783.76 1276.48
 9798.13 1276.36 9801.73 1276.34 9810.05 1276.16 9811.98 1276.12 9823.27  1275.9
 9824.66 1275.87 9825.74  1275.8 9834.87 1275.22 9835.79 1275.17 9843.96 1274.66
  9844.7 1274.62 9849.58 1273.96 9850.01 1273.89 9858.08 1272.32 9858.38 1272.26
 9863.77 1271.54 9863.91 1271.51 9869.16 1270.75 9869.23 1270.74 9872.79 1270.58
 9874.03 1270.52 9874.08 1270.52 9885.21 1270.54 9886.41 1270.53 9887.83 1270.52
 9895.01 1270.49 9897.58 1270.33 9901.58 1270.37 9905.54 1270.42 9910.01 1270.74
 9911.68 1270.76 9919.13 1270.74 9921.57 1270.73  9922.9 1270.25 9922.91 1270.24
 9925.79 1269.77 9926.43 1269.67 9926.68 1269.63  9926.9 1269.55 9927.47 1269.71
 9929.24 1270.15 9932.42 1270.97 9934.42 1271.05  9934.7 1271.06 9938.36  1271.2
 9939.12 1271.22 9939.47 1271.22 9939.72 1271.22 9940.03 1271.23 9945.21 1271.26
 9945.53 1271.27  9946.3 1271.21 9949.58 1271.19 9951.65 1271.03 9951.98 1271.02
 9952.28 1271.02 9954.51 1270.98 9956.23 1270.95 9957.34 1270.93 9958.04 1270.89
  9965.7 1270.48 9966.01 1270.46    9967 1270.27 9967.97 1269.99 9972.54 1268.81
 9977.32 1268.38 9982.48 1267.99 9984.64 1267.51 9985.76 1266.54 9986.98 1265.65
 9987.68 1265.15 9988.04    1265  9989.2 1264.49 9992.01 1263.48   10000 1263.59
10002.96 1263.6310021.82 1263.7710024.24  1264.710026.35 1265.5610027.64 1266.15
10030.15 1267.3710031.15 1267.7110035.94  1269.110036.07  1269.110039.25 1269.26
10040.07 1269.2610040.94 1269.2610045.45 1268.8510047.63 1268.7610047.99 1268.72
10051.26    126810052.79 1267.6610054.36 1267.39 10056.3 1267.7810058.73 1267.97
10061.93 1268.3710062.33 1268.4310063.78 1268.7510065.38 1269.4110065.47 1269.45
10065.58 1269.5110065.68 1269.5510066.76 1269.6810071.31 1270.1710074.72 1270.19
10077.31 1270.3110079.27 1270.3910079.66  1270.410081.79 1270.3610085.86 1270.28
10088.22 1270.2310093.93 1269.4110094.62 1269.3210095.62 1269.1710099.32 1269.03
10100.06 1269.0510103.25 1270.1610106.24 1270.9710106.92 1271.0810108.86 1271.25
10110.71  1271.310112.01 1271.5110114.03 1271.6310117.04 1271.7910119.53 1271.78
10122.18 1271.7710123.49 1271.6610124.37 1271.5310125.85 1271.2810127.07 1271.08
10131.21 1271.07 10132.5 1271.07 10134.4 1271.0510137.11 1271.0210140.14 1271.02
10141.65 1271.0210143.64  1271.110145.01 1271.1910147.34 1271.5810148.64 1271.65
10150.44 1271.7710151.75 1271.68 10153.1 1271.5410153.97 1271.5210158.75 1271.51
10159.47 1271.5210162.73 1271.6810163.18 1271.6910165.84 1271.9510173.21 1272.07
10173.42 1272.0710176.19 1272.0110180.63  1271.9 10181.9 1271.8710181.91 1271.87
10181.92 1271.8710184.14 1271.6610185.62 1271.3510185.87  1271.310186.16 1271.28
 10188.6 1271.33 10190.1 1271.3510192.41 1271.4610195.29 1271.3510195.36 1271.35
10202.76  1271.310203.07  1271.3 10204.1 1271.3110210.92 1271.3810216.89 1271.31
10219.23 1271.2210225.45 1271.1510230.49  1271.110236.38 1270.9610240.48 1270.86
10244.13 1270.9210248.51 1270.9610250.35 1271.0710252.07 1271.0310252.79 1270.75
10255.66 1270.3410257.99 1269.9210261.07 1269.8810262.15 1269.9710262.57 1269.98
10263.08 1270.0510266.75 1270.7110269.71 1270.8110270.88 1270.8310271.06 1270.85
10278.38 1270.8210281.31 1270.7910286.45 1270.7510291.25 1270.9910291.69 1271.04
10293.83 1271.1310298.64 1271.2810306.78 1271.6110311.02 1271.81 10319.8 1272.05
10327.07  1272.610332.24 1272.9810340.08 1273.5610343.26 1273.8210348.73 1274.07
10355.14 1274.4510357.23 1274.5810359.71 1274.6810364.27 1274.6410369.36 1274.81
10374.76 1274.8310379.87 1274.8810383.55 1274.8910387.39 1274.9510390.17 1275.01
10393.01 1275.0610395.92 1275.1610398.47 1275.13    10400 1275.12

Manning's n Values        num=       3
     Sta    n Val     Sta   n Val     Sta   n Val
***********************************************
    9700     .056 9966.01     .0410039.25    .056

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
       9966.0110039.25             318.43   317.3  316.92             .3      .5

CROSS SECTION


RIVER: MDOW
REACH: Reach1             RS: 2.632

INPUT
Description:
Station Elevation Data    num=     234
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev
*********************************************************************************************
 9395.81 1273.41 9411.58 1273.39 9413.94 1273.42 9416.51 1273.42 9417.43 1273.42
 9418.64 1273.42 9420.13 1273.44 9420.64 1273.47  9439.9 1273.44 9441.79  1273.4
 9443.79 1273.45 9444.75 1273.54 9445.71  1273.6 9446.94 1273.69 9449.57 1273.94
 9452.12 1273.93 9458.84 1274.08 9462.38 1273.96 9472.17 1273.63 9473.47 1273.59
 9479.35 1273.64 9482.23 1273.61 9482.41  1273.6 9491.82 1273.46 9492.51 1273.45
 9494.46 1273.53 9499.13 1273.71 9503.98 1273.91 9504.59 1273.93 9514.24  1274.1
 9517.04 1274.14  9519.9 1274.14  9524.8 1274.15 9526.95 1274.14 9532.72 1274.21
 9538.59 1274.32 9540.68 1274.38 9548.96 1274.51 9550.68 1274.56 9551.24 1274.55
 9553.63  1274.6 9560.83 1274.64 9562.22 1274.63 9568.97 1274.56 9571.62 1274.56
  9575.4 1274.61  9580.4  1274.6 9583.51 1274.62 9586.81 1274.62 9591.69  1274.6
 9601.46 1274.44 9603.03 1274.43 9606.92 1274.38  9608.2 1274.38 9616.93 1274.14
 9617.86  1274.1 9620.12 1274.18 9625.09 1274.37 9626.65 1274.36 9632.64 1274.36
 9635.44 1274.33 9641.12 1274.31 9646.32 1274.22 9648.45 1274.18 9656.43 1273.93
 9658.22  1273.9 9664.44 1273.62 9665.91 1273.61 9673.36  1273.5 9674.65  1273.5
 9683.82 1273.52 9685.25 1273.53 9694.28 1273.62 9696.27 1273.63 9704.93 1273.75
 9713.46 1273.79 9717.45  1273.8  9723.4 1273.84 9730.42 1273.71 9732.22  1273.7
 9735.31 1273.65 9737.87  1273.6 9747.35 1273.32 9754.04 1273.14 9758.36 1273.08
 9764.87 1272.97 9768.89 1272.87 9777.53 1272.62 9781.69 1272.47 9787.85 1272.33
  9790.5 1272.26 9795.73 1272.05 9798.26 1271.87 9805.72 1271.59 9809.01 1271.46
 9813.67 1271.25 9815.39 1271.15 9821.28 1270.63 9822.54 1270.53 9828.99 1269.98
  9829.1 1269.97 9837.75 1269.48 9842.07 1269.37  9846.9 1269.18 9852.64 1269.11
 9855.38 1269.13 9857.91 1269.17 9860.16 1269.47 9860.34 1269.49 9861.48 1269.45
 9868.82 1269.17 9873.94 1269.32 9874.31 1269.33 9879.14 1269.43 9881.01  1269.5
    9887 1269.65 9888.16 1269.68  9889.6 1269.65 9894.06 1269.56 9895.58 1269.43
 9896.33 1269.36 9896.84  1269.1 9900.43 1267.11 9900.47  1267.1 9912.85 1262.53
 9914.27 1262.56 9916.86 1262.58 9918.38 1262.48 9919.65 1262.36 9922.46  1262.7
 9926.54 1262.89 9927.17 1262.89 9928.03 1262.91 9932.04 1263.01 9933.98 1263.04
 9937.34 1262.71 9939.08 1262.51 9942.54 1263.13 9944.49 1263.46 9948.19 1263.58
 9954.69 1263.58 9954.95 1263.58 9955.46 1263.58 9958.84 1263.65 9961.26 1263.68
 9964.36 1263.45 9972.85 1263.27 9973.71 1263.24 9976.93 1263.46 9979.74 1263.41
 9979.96 1263.41 9980.07 1263.41 9984.64 1263.69  9988.8 1263.87 9991.78 1263.99
 9993.88  1264.1 9995.29 1264.12   10000  1264.210000.68 1264.2210001.42 1264.21
10004.06 1264.1910009.02 1264.1210020.31 1263.6210021.18 1263.5710021.94 1263.55
10032.92 1263.2410042.77 1263.2110047.13 1263.2210049.18 1263.1810051.01 1263.11
10054.84 1263.1610057.61 1263.1310062.52 1262.7110066.38 1262.3110068.86 1262.42
10070.67 1262.5710075.06 1262.9710075.32 1263.0910077.93 1264.3410081.32 1265.78
10084.72 1267.43 10088.6 1269.3110089.68 1269.8310093.31 1269.9410098.02 1270.06
10100.47 1270.1110108.46  1270.210114.31 1270.2710120.61  1270.410126.52 1270.48
10129.39 1270.5710137.98 1270.71 10143.3 1270.7610157.82 1270.8310160.94 1270.88
10168.93 1270.9110173.98    127110183.65 1271.1310187.84  1271.210196.34 1271.37
10199.19 1271.4510205.05 1271.6310211.74 1271.8110217.94 1272.01 10224.1  1272.3
10230.01 1272.4510234.61 1272.5610242.98 1272.6710247.15  1272.710256.61 1272.73
10264.89 1272.8410272.48 1272.8910278.25 1272.9310285.44 1272.9810289.96 1272.99
 10295.8 1272.9310302.09 1273.07 10303.5 1273.0810310.21 1273.5510310.73 1273.58
10317.75 1273.94 10317.9 1273.9510318.24 1273.9510329.59 1274.0410333.19 1274.07
10339.74 1274.2310345.17 1274.3410351.99 1274.4910354.98  1274.510369.66 1274.69
10370.82  1274.710386.24 1274.8910387.23 1274.8910395.81 1274.91
```

```
Manning's n Values         num=       3
    Sta    n Val      Sta    n Val      Sta    n Val
*********************************************
 9395.81     .056 9894.06      .0410089.68     .056

Bank Sta: Left   Right     Lengths: Left Channel   Right      Coeff Contr.    Expan.
       9894.0610089.68           154.48  154.48  154.48             .3         .5
Ineffective Flow     num=        2
   Sta L    Sta R    Elev  Permanent
 9395.81 9903.38 1271.45        F
10081.4410395.81 1271.01        F

CULVERT


RIVER: MDOW
REACH: Reach1              RS: 2.618

INPUT
Description: Williams Drive Culvert
Distance from Upstream XS =       36
Deck/Roadway Width        =       58
Weir Coefficient          =      2.6
Upstream  Deck/Roadway Coordinates
    num=         8
    Sta Hi Cord Lo Cord      Sta Hi Cord Lo Cord      Sta Hi Cord Lo Cord
*************************************************************************
 9395.81 1273.53           9560.7 1273.89           9736.53    1273
 9836.37    1272          9883.26  1271.5          10086.73    1271
10268.52    1272         10395.81 1272.64

Upstream Bridge Cross Section Data
Station Elevation Data    num=     234
    Sta     Elev     Sta     Elev     Sta     Elev     Sta     Elev     Sta     Elev
*********************************************************************************
 9395.81 1273.41 9411.58 1273.39 9413.94 1273.42 9416.51 1273.42 9417.43 1273.42
 9418.64 1273.42 9420.13 1273.44 9420.64 1273.47  9439.9 1273.44 9441.79  1273.4
 9443.79 1273.45 9444.75 1273.54 9445.71  1273.6 9446.94 1273.69 9449.57 1273.94
 9452.12 1273.93 9458.84 1274.08 9462.38 1273.96 9472.17 1273.63 9473.47 1273.59
 9479.35 1273.64 9482.23 1273.61 9482.41  1273.6 9491.82 1273.46 9492.51 1273.45
 9494.46 1273.53 9499.13 1273.71 9503.98 1273.91 9504.59 1273.93 9514.24  1274.1
 9517.04 1274.14  9519.9 1274.14  9524.8 1274.15 9526.95 1274.14 9532.72 1274.21
 9538.59 1274.32 9540.68 1274.38 9548.96 1274.51 9550.68 1274.56 9551.24 1274.55
 9553.63  1274.6 9560.83 1274.64 9562.22 1274.63 9568.97 1274.56 9571.62 1274.56
  9575.4 1274.61  9580.4  1274.6 9583.51 1274.62 9586.81 1274.62 9591.69  1274.6
 9601.46 1274.44 9603.03 1274.43 9606.92 1274.38  9608.2 1274.38 9616.93 1274.14
 9617.86  1274.1 9620.12 1274.18 9625.09 1274.37 9626.65 1274.36 9632.64 1274.36
 9635.44 1274.33 9641.12 1274.31 9646.32 1274.22 9648.45 1274.18 9656.43 1273.93
 9658.22  1273.9 9664.44 1273.62 9665.91 1273.61 9673.36  1273.5 9674.65  1273.5
 9683.82 1273.52 9685.25 1273.53 9694.28 1273.62 9696.27 1273.63 9704.93 1273.75
 9713.46 1273.79 9717.45  1273.8  9723.4 1273.84 9730.42 1273.71 9732.22  1273.7
 9735.31 1273.65 9737.87  1273.6 9747.35 1273.32 9754.04 1273.14 9758.36 1273.08
 9764.87 1272.97 9768.89 1272.87 9777.53 1272.62 9781.69 1272.47 9787.85 1272.33
  9790.5 1272.26 9795.73 1272.05 9798.26 1271.87 9805.72 1271.59 9809.01 1271.46
 9813.67 1271.25 9815.39 1271.15 9821.28 1270.63 9822.54 1270.53 9828.99 1269.98
  9829.1 1269.97 9837.75 1269.48 9842.07 1269.37  9846.9 1269.18 9852.64 1269.11
 9855.38 1269.13 9857.91 1269.17 9860.16 1269.47 9860.34 1269.49 9861.48 1269.45
 9868.82 1269.17 9873.94 1269.32 9874.31 1269.33 9879.14 1269.43 9881.01  1269.5
    9887 1269.65 9888.16 1269.68  9889.6 1269.65 9894.06 1269.56 9895.58 1269.43
 9896.33 1269.36 9896.84  1269.1 9900.43 1267.11 9900.47  1267.1 9912.85 1262.53
 9914.27 1262.56 9916.86 1262.58 9918.38 1262.48 9919.65 1262.36 9922.46  1262.7
 9926.54 1262.89 9927.17 1262.89 9928.03 1262.91 9932.04 1263.01 9933.98 1263.04
 9937.34 1262.71 9939.08 1262.51 9942.54 1263.13 9944.49 1263.46 9948.19 1263.58
 9954.69 1263.58 9954.95 1263.58 9955.46 1263.58 9958.84 1263.65 9961.26 1263.68
 9964.36 1263.45 9972.85 1263.27 9973.71 1263.24 9976.93 1263.46 9979.74 1263.41
 9979.96 1263.41 9980.07 1263.41 9984.64 1263.69  9988.8 1263.87 9991.78 1263.99
 9993.88  1264.1 9995.29 1264.12   10000  1264.210000.68 1264.2210001.42 1264.21
10004.06 1264.1910009.02 1264.1210020.31 1263.6210021.18 1263.5710021.94 1263.55
10032.92 1263.2410042.77 1263.2110047.13 1263.2210049.18 1263.1810051.01 1263.11
10054.84 1263.1610057.61 1263.1310062.52 1262.7110066.38 1262.3110068.86 1262.42
10070.67 1262.5710075.06 1262.9710075.32 1263.0910077.93 1264.3410081.32 1265.78
10084.72 1267.43 10088.6 1269.3110089.68 1269.8310093.31 1269.9410098.02 1270.06
10100.47 1270.1110108.46  1270.210114.31 1270.2710120.61  1270.410126.52 1270.48
10129.39 1270.5710137.98 1270.71 10143.3 1270.7610157.82 1270.8310160.94 1270.88
10168.93 1270.9110173.98    127110183.65 1271.1310187.84  1271.210196.34 1271.37
10199.19 1271.4510205.05 1271.6310211.74 1271.8110217.94 1272.01 10224.1  1272.3
10230.01 1272.4510234.61 1272.5610242.98 1272.6710247.15  1272.710256.61 1272.73
10264.89 1272.8410272.48 1272.8910278.25 1272.9310285.44 1272.9810289.96 1272.99
 10295.8 1272.9310302.09 1273.07 10303.5 1273.0810310.21 1273.5510310.73 1273.58
10317.75 1273.94 10317.9 1273.9510318.24 1273.9510329.59 1274.0410333.19 1274.07
10339.74 1274.2310345.17 1274.3410351.99 1274.4910354.98  1274.510369.66 1274.69
10370.82  1274.710386.24 1274.8910387.23 1274.8910395.81 1274.91

Manning's n Values         num=       3
    Sta    n Val      Sta    n Val      Sta    n Val
*********************************************
 9395.81     .056 9894.06      .0410089.68     .056

Bank Sta: Left   Right     Coeff Contr.    Expan.
       9894.0610089.68           .3         .5
Ineffective Flow     num=        2
   Sta L    Sta R    Elev  Permanent
 9395.81 9903.38 1271.45        F
10081.4410395.81 1271.01        F

Downstream  Deck/Roadway Coordinates
    num=         8
    Sta Hi Cord Lo Cord      Sta Hi Cord Lo Cord      Sta Hi Cord Lo Cord
*************************************************************************
 9435.21 1273.53           9600.1 1273.89           9775.93    1273
 9875.77    1272          9922.66  1271.5          10126.13    1271
10307.92    1272         10435.21 1272.64

Downstream Bridge Cross Section Data
Station Elevation Data    num=     273
    Sta     Elev     Sta     Elev     Sta     Elev     Sta     Elev     Sta     Elev
*********************************************************************************
 9435.21 1273.28 9437.88 1273.27 9443.78 1273.36 9444.54 1273.45 9444.85 1273.51
 9447.32 1273.85 9447.45 1273.87 9447.54 1273.87 9450.38 1273.87 9451.19 1273.81
 9451.62 1273.69 9454.38 1273.76 9461.47 1273.48  9467.8 1273.39 9470.04 1273.36
 9470.71 1273.32 9474.39 1273.29 9480.12 1273.24 9484.75 1273.17 9488.96 1273.07
 9489.97 1273.05  9491.2 1273.03 9495.51 1272.96 9500.15 1272.87 9506.22 1272.74
 9509.97 1272.66 9511.84 1272.64 9513.64 1272.57 9516.65 1272.39  9519.8 1272.14
 9525.12 1272.17 9525.66 1272.18 9531.36 1272.19 9532.95 1272.18 9533.26 1272.18
 9539.69 1272.07 9541.49 1272.01 9548.25 1271.97 9554.09 1271.97 9555.92 1271.98
 9560.47 1271.94 9568.33  1271.9    9569  1271.9 9570.28 1271.91 9573.62 1271.94
 9574.77 1271.97 9577.96 1272.19 9581.25 1272.34 9584.79  1272.3 9588.14 1272.15
 9590.26 1272.07 9592.94 1271.99 9594.78 1272.04 9599.37 1271.99 9600.07 1271.93
 9600.57 1271.91 9603.01 1271.96 9608.86 1272.12 9609.98 1272.12  9617.2 1272.16
 9621.08 1272.15 9626.02 1272.11 9631.37 1272.08 9639.27 1272.02 9639.75 1272.02
 9641.19 1272.01 9648.41 1271.93 9649.85 1271.91 9656.82 1271.66 9658.51 1271.69
 9663.47 1271.72 9665.39 1271.71 9668.41 1271.76 9670.52  1271.8 9672.81  1271.9
 9678.99    1272 9680.89 1271.99 9685.67 1271.98 9688.57 1271.99 9692.02 1272.09
 9697.72 1272.23 9704.98 1272.62 9706.81 1272.69 9713.68 1272.81  9717.5  1272.8
 9719.22 1272.79 9728.77 1272.62  9730.3 1272.59  9734.6 1272.58  9743.1 1272.51
 9747.26 1272.41  9752.4 1272.34 9754.23 1272.52 9759.21 1272.71 9764.72 1272.65
 9765.84 1272.64 9768.87 1272.43 9772.09 1272.16 9773.16 1272.12 9777.13 1271.96
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 9779.81 1271.98 9782.18 1271.87 9785.35 1271.85 9788.83  1271.7 9790.83 1271.64
 9794.61 1271.58 9796.44 1271.48 9801.08 1271.39 9807.82 1271.23 9808.19 1271.22
 9810.94 1271.07 9813.49 1270.95 9815.45 1270.82 9818.54 1270.01 9820.76 1269.47
 9823.46 1269.28 9825.26 1269.19 9826.77 1269.22 9830.15 1269.31 9832.89 1269.34
  9834.7 1269.36 9837.21 1269.39 9839.25 1269.34 9843.22 1269.07 9844.59 1268.95
  9848.5 1268.56 9848.88 1268.52 9854.11 1268.33 9855.08 1268.29 9863.03 1267.95
 9865.75 1267.86 9867.96 1267.84 9874.91 1267.82 9876.61 1267.82 9877.03 1267.83
 9877.43 1267.82 9882.91 1267.84 9886.28 1267.78 9890.28 1267.79 9892.82 1267.89
 9895.42 1268.05 9900.87 1268.17 9908.12 1268.33 9909.69 1268.37  9910.1 1268.38
 9912.68 1268.34 9922.38 1268.21 9939.16 1262.65 9943.18 1261.33 9943.96 1261.45
 9948.82 1262.26  9950.3 1262.14 9955.29 1261.81 9959.66  1261.7 9962.28  1261.7
 9963.65 1261.54 9965.06 1261.48  9968.7 1261.17 9970.61 1261.06 9975.73 1261.95
 9976.67 1262.18 9982.43 1262.47 9985.48 1262.55 9991.33    1262 9991.98 1261.93
  9994.2 1261.88  9996.7 1261.84  9997.2 1261.84 9997.83 1261.84 9999.01 1261.81
 9999.56  1261.8 9999.89 1261.86   10000 1261.8710001.24    126210003.14 1262.27
10009.72  1262.410015.58 1262.3910018.47 1262.7210020.18 1262.9610023.76 1263.11
10024.41 1263.1510031.12 1262.6110038.56 1262.0510039.69 1261.8810041.51 1261.74
10043.64 1261.4110045.25 1261.1210048.11 1261.1710054.56 1261.2910057.93 1260.82
 10059.2 1260.6710060.57 1260.4410063.44 1259.73 10064.4 1259.6310067.04 1260.45
10068.19 1260.7510073.81 1263.3310080.73 1266.0610082.62 1266.7110087.11 1268.13
10088.16 1268.2910092.35 1269.0410092.77 1269.1210092.84 1269.1310092.97 1269.16
10093.22 1269.1610101.54  1269.410109.34 1269.3610109.58 1269.3610109.84 1269.34
10118.91 1268.5610122.92 1268.5710124.74 1268.5610129.93 1268.8810130.25 1268.91
10131.01 1268.9810133.49  1269.2 10134.1 1269.2210135.98  1269.210136.12  1269.2
10137.14 1269.2810147.42 1270.0410147.76 1270.11 10149.9 1269.8610152.03  1269.6
10152.52 1269.5710155.36 1269.5210157.21 1269.5310160.26 1269.4610164.61 1269.46
10168.47 1269.5110173.92 1269.7910178.84 1269.9610180.83 1270.0610190.39 1270.47
 10192.6 1270.53   10201 1270.8410211.32 1270.9910212.96 1271.0410215.73 1271.02
10225.28 1271.0610232.67 1271.1410235.77 1271.1510245.16    127110248.84 1271.08
10263.04 1271.1110265.62 1271.1510268.42 1271.2710270.57 1271.3210283.79 1271.54
 10288.7 1271.5610298.69 1271.8710301.35 1271.9610309.96 1272.2810311.79 1272.36
10327.04 1272.5710328.61 1272.5910330.45 1272.6210350.09 1273.0110350.74 1273.03
10354.88  1273.110369.66 1273.3910371.46 1273.4410380.68 1273.66 10382.5 1273.71
10394.46 1273.9610397.49 1274.0310411.55 1274.1310415.76 1274.2110419.43 1274.22
10426.61 1274.39 10430.5  1274.410435.21  1274.4

Manning's n Values         num=       3
     Sta   n Val      Sta   n Val      Sta   n Val
************************************************
 9435.21    .056 9922.38     .0410092.35    .056

Bank Sta: Left   Right    Coeff Contr.   Expan.
       9922.3810092.35           .3         .5
Ineffective Flow      num=       2
   Sta L    Sta R    Elev  Permanent
 9435.21 9951.54 1269.44        F
10075.3710435.21 1269.29        F

Upstream Embankment side slope               =       0 horiz. to 1.0 vertical
Downstream Embankment side slope             =       0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .98
Elevation at which weir flow begins          =
Energy head used in spillway design          =
Spillway height used in design               =
Weir crest shape                             = Broad Crested

Number of Culverts =  1

Culvert Name      Shape      Rise     Span
Culvert #1          Box         6       10
FHWA Chart # 8 - flared wingwalls
FHWA Scale # 1 - Wingwall flared 30 to 75 deg.
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    Top n  Bottom n  Depth Blocked  Entrance Loss Coef   Exit Loss Coef
              28.5    86.7     .013     .013       0                  .4                 1
Number of Barrels =  11
Upstream   Elevation =  1262.44
Centerline Stations
    Sta.     Sta.     Sta.     Sta.     Sta.     Sta.     Sta.     Sta.     Sta.     Sta.
 9936.41 9947.56 9958.72 9969.87 9981.03 9992.1810003.3410014.4910025.65 10036.8
10047.96
Downstream Elevation =  1261.46
Centerline Stations
    Sta.     Sta.     Sta.     Sta.     Sta.     Sta.     Sta.     Sta.     Sta.     Sta.
 9957.88 9969.06 9980.23 9991.4110002.5810013.7510024.93 10036.110047.2710058.45
10069.62

CROSS SECTION


RIVER: MDOW
REACH: Reach1             RS: 2.603

INPUT
Description:
Station Elevation Data    num=     273
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev
**********************************************************************************************
 9435.21 1273.28 9437.88 1273.27 9443.78 1273.36 9444.54 1273.45 9444.85 1273.51
 9447.32 1273.85 9447.45 1273.87 9447.54 1273.87 9450.38 1273.87 9451.19 1273.81
 9451.62 1273.69 9454.38 1273.76 9461.47 1273.48  9467.8 1273.39 9470.04 1273.36
 9470.71 1273.32 9474.39 1273.29 9480.12 1273.24 9484.75 1273.17 9488.96 1273.07
 9489.97 1273.05  9491.2 1273.03 9495.51 1272.96 9500.15 1272.87 9506.22 1272.74
 9509.97 1272.66 9511.84 1272.64 9513.64 1272.57 9516.65 1272.39  9519.8 1272.14
 9525.12 1272.17 9525.66 1272.18 9531.36 1272.19 9532.95 1272.18 9533.26 1272.18
 9539.69 1272.07 9541.49 1272.01 9548.25 1271.97 9554.09 1271.97 9555.92 1271.98
 9560.47 1271.94 9568.33  1271.9    9569  1271.9 9570.28 1271.91 9573.62 1271.94
 9574.77 1271.97 9577.96 1272.19 9581.25 1272.34 9584.79  1272.3 9588.14 1272.15
 9590.26 1272.07 9592.94 1271.99 9594.78 1272.04 9599.37 1271.99 9600.07 1271.93
 9600.57 1271.91 9603.01 1271.96 9608.86 1272.12 9609.98 1272.12  9617.2 1272.16
 9621.08 1272.15 9626.02 1272.11 9631.37 1272.08 9639.27 1272.02 9639.75 1272.02
 9641.19 1272.01 9648.41 1271.93 9649.85 1271.91 9656.82 1271.66 9658.51 1271.69
 9663.47 1271.72 9665.39 1271.71 9668.41 1271.76 9670.52  1271.8 9672.81  1271.9
 9678.99   1272 9680.89 1271.99 9685.67 1271.98 9688.57 1271.99 9692.02 1272.09
 9697.72 1272.23 9704.98 1272.62 9706.81 1272.69 9713.68 1272.81  9717.5  1272.8
 9719.22 1272.79 9728.77 1272.62  9730.3 1272.59  9734.6 1272.58  9743.1 1272.51
 9747.26 1272.41  9752.4 1272.34 9754.23 1272.52 9759.21 1272.71 9764.72 1272.65
 9765.84 1272.64 9768.87 1272.43 9772.09 1272.16 9773.16 1272.12 9777.13 1271.96
 9779.81 1271.98 9782.18 1271.87 9785.35 1271.85 9788.83  1271.7 9790.83 1271.64
 9794.61 1271.58 9796.44 1271.48 9801.08 1271.39 9807.82 1271.23 9808.19 1271.22
 9810.94 1271.07 9813.49 1270.95 9815.45 1270.82 9818.54 1270.01 9820.76 1269.47
 9823.46 1269.28 9825.26 1269.19 9826.77 1269.22 9830.15 1269.31 9832.89 1269.34
  9834.7 1269.36 9837.21 1269.39 9839.25 1269.34 9843.22 1269.07 9844.59 1268.95
  9848.5 1268.56 9848.88 1268.52 9854.11 1268.33 9855.08 1268.29 9863.03 1267.95
 9865.75 1267.86 9867.96 1267.84 9874.91 1267.82 9876.61 1267.82 9877.03 1267.83
 9877.43 1267.82 9882.91 1267.84 9886.28 1267.78 9890.28 1267.79 9892.82 1267.89
 9895.42 1268.05 9900.87 1268.17 9908.12 1268.33 9909.69 1268.37  9910.1 1268.38
 9912.68 1268.34 9922.38 1268.21 9939.16 1262.65 9943.18 1261.33 9943.96 1261.45
 9948.82 1262.26  9950.3 1262.14 9955.29 1261.81 9959.66  1261.7 9962.28  1261.7
 9963.65 1261.54 9965.06 1261.48  9968.7 1261.17 9970.61 1261.06 9975.73 1261.95
 9976.67 1262.18 9982.43 1262.47 9985.48 1262.55 9991.33    1262 9991.98 1261.93
  9994.2 1261.88  9996.7 1261.84  9997.2 1261.84 9997.83 1261.84 9999.01 1261.81
 9999.56  1261.8 9999.89 1261.86   10000 1261.8710001.24    126210003.14 1262.27
10009.72  1262.410015.58 1262.3910018.47 1262.7210020.18 1262.9610023.76 1263.11
10024.41 1263.1510031.12 1262.6110038.56 1262.0510039.69 1261.8810041.51 1261.74
10043.64 1261.4110045.25 1261.1210048.11 1261.1710054.56 1261.2910057.93 1260.82
 10059.2 1260.6710060.57 1260.4410063.44 1259.73 10064.4 1259.6310067.04 1260.45
10068.19 1260.7510073.81 1263.3310080.73 1266.0610082.62 1266.7110087.11 1268.13
```

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10088.16 1268.2910092.35 1269.0410092.77 1269.1210092.84 1269.1310092.97 1269.16
10093.22 1269.1610101.54  1269.410109.34 1269.3610109.58 1269.3610109.84 1269.34
10118.91 1268.5610122.92 1268.5710124.74 1268.5610129.93 1268.8810130.25 1268.91
10131.01 1268.9810133.49  1269.2 10134.1 1269.2210135.98  1269.210136.12  1269.2
10137.14 1269.2810147.42 1270.0410147.76 1270.11 10149.9 1269.8610152.03  1269.6
10152.52 1269.5710155.36 1269.5210157.21 1269.5310160.26 1269.4610164.61 1269.46
10168.47 1269.5110173.92 1269.7910178.84 1269.9610180.83 1270.0610190.39 1270.47
 10192.6 1270.53   10201 1270.8410211.32 1270.9910212.96 1271.0410215.73 1271.02
10225.28 1271.0610232.67 1271.1410235.77 1271.1510245.16    127110248.84 1271.08
10263.04 1271.1110265.62 1271.1510268.42 1271.2710270.57 1271.3210283.79 1271.54
 10288.7 1271.5610298.69 1271.8710301.35 1271.9610309.96 1272.2810311.79 1272.36
10327.04 1272.5710328.61 1272.5910330.45 1272.6210350.09 1273.0110350.74 1273.03
10354.88  1273.110369.66 1273.3910371.46 1273.4410380.68 1273.66 10382.5 1273.71
10394.46 1273.9610397.49 1274.0310411.55 1274.1310415.76 1274.2110419.43 1274.22
10426.61 1274.39 10430.5  1274.410435.21  1274.4

Manning's n Values         num=       3
    Sta    n Val      Sta    n Val      Sta    n Val
**************************************************
 9435.21     .056 9922.38     .0410092.35     .056

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.    Expan.
       9922.3810092.35             228.7  247.72   290.6             .3       .5
Ineffective Flow     num=       2
   Sta L    Sta R    Elev  Permanent
 9435.21 9951.54 1269.44        F
10075.3710435.21 1269.29        F

CROSS SECTION


RIVER: MDOW
REACH: Reach1              RS: 2.556

INPUT
Description:
Station Elevation Data     num=     156
    Sta     Elev     Sta     Elev     Sta     Elev     Sta     Elev     Sta     Elev
**********************************************************************************
    9700 1273.92 9700.17 1273.91 9710.91 1273.58 9715.28 1273.44 9726.07 1272.94
  9730.8 1272.71  9735.4 1272.53  9740.8 1272.24 9745.91 1272.05  9748.6 1271.99
 9750.39 1271.92 9756.87 1271.55 9758.13 1271.47 9765.54  1271.1 9766.06 1271.07
 9771.17 1270.74 9772.94 1270.63 9773.44 1270.59 9779.39 1270.19 9784.36 1269.69
  9785.6 1269.55 9790.96  1269.1 9792.45 1269.02 9798.66 1268.71 9806.23 1268.58
 9806.65 1268.58 9811.89  1268.5 9816.72 1268.42 9816.83 1268.42 9823.14 1268.42
 9823.52 1268.42 9823.53 1268.42 9829.09 1268.15 9829.77 1268.08 9834.01 1267.66
 9840.84 1267.26 9841.54 1267.23 9850.07  1266.9 9851.95 1266.86 9862.47 1266.65
 9870.37 1266.53 9878.29 1266.39 9880.96  1266.4  9883.7 1266.38 9888.41 1266.36
 9890.34  1266.3 9890.87 1266.29 9893.11  1266.3 9896.56 1266.29 9898.57 1266.32
 9900.21 1266.35 9912.78  1266.6  9920.1 1266.75 9925.17 1266.33 9927.71 1266.17
 9927.93 1266.17 9929.33 1266.18 9929.72 1266.18 9947.03 1266.58 9948.03 1266.58
 9952.15 1266.69 9954.25 1266.88 9957.68 1267.28 9964.54 1267.34  9965.5 1267.36
 9971.92 1263.47 9972.42  1263.1 9973.25 1263.12 9974.14 1263.14 9974.99 1262.93
 9979.52 1261.66 9979.69  1261.6 9984.57 1259.81 9987.97  1259.6 9989.91  1259.5
 9990.29 1259.47 9994.33 1259.49   10000 1259.5110007.11 1259.5410009.89 1259.71
10011.66  1259.810015.58 1260.4610015.94 1260.5310018.53 1261.4710018.99 1261.66
10021.41 1262.0510021.95 1262.1310026.59 1262.9210027.55 1263.0710030.07 1264.26
10035.44 1266.8110040.61 1267.2410046.39 1267.7610051.65 1267.6310055.37 1267.57
10058.59  1267.610060.59 1267.4210061.82 1267.4710067.08 1266.8410067.12 1266.83
10067.14 1266.8310067.17 1266.8410070.71 1266.9810074.12 1267.0510076.87 1267.09
10077.59 1267.1110086.11  1267.210086.76 1267.2110092.92 1267.2910095.47 1267.27
10100.38 1267.3410104.89 1267.4310105.83 1267.5610107.43  1267.710112.67 1268.22
 10114.5 1268.5610116.68  1268.710119.94  1268.6 10124.1 1268.8610130.88 1269.23
10136.88 1269.5710137.78 1269.6110138.46 1269.6310141.67 1269.7510147.21 1269.97
10148.17 1270.0110150.02  1270.110161.31 1270.67 10167.1 1270.9510171.42 1271.22
 10176.9  1271.510180.77 1271.7510185.13    127210188.56 1272.1210191.96 1272.34
10196.32 1272.2510200.96  1272.410206.65 1272.3810213.52 1272.3910219.77 1272.41
 10225.5 1272.4610234.08 1272.47 10238.7  1272.510245.86 1272.4410249.41  1272.4
10249.96  1272.410250.13  1272.410251.16 1272.4210257.87 1272.5210260.03 1272.51
10270.67 1272.3110276.28 1272.2310280.54 1272.1910288.06 1272.1310295.24 1272.05
   10300 1272.05

Manning's n Values         num=       3
    Sta    n Val      Sta    n Val      Sta    n Val
**************************************************
    9700     .056  9965.5     .0410035.44     .056

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.    Expan.
       9965.510035.44             434.5     500   515.1             .1       .3

CROSS SECTION


RIVER: MDOW
REACH: Reach1              RS: 2.461

INPUT
Description:
Station Elevation Data     num=     223
    Sta     Elev     Sta     Elev     Sta     Elev     Sta     Elev     Sta     Elev
**********************************************************************************
    9500 1271.93 9501.12 1271.93 9501.63 1271.92 9515.62 1271.59 9515.87 1271.59
 9525.49 1271.64  9530.8 1271.61 9535.94 1271.37 9538.22 1271.37 9544.19 1271.25
 9550.16 1270.96 9550.84 1270.94  9551.7  1270.9 9559.94  1270.5 9567.42 1269.85
 9567.99 1269.81 9568.41 1269.78 9577.94 1269.38 9579.75 1269.24 9582.71 1268.98
 9587.69 1268.56 9589.03 1268.41 9591.04 1268.15 9600.29 1267.32 9610.82 1266.58
 9611.24 1266.54 9624.29 1265.13 9624.71 1265.09 9635.94  1264.2  9638.4    1264
 9641.53  1263.8 9643.73 1263.65 9648.15  1263.6 9649.31 1263.59 9653.59 1263.12
 9654.98 1262.95 9657.86 1262.92 9659.18 1262.88 9661.25 1262.72    9663 1262.61
 9664.94 1262.86 9666.24 1263.08 9667.38 1263.09 9668.04  1263.1 9672.73 1262.33
 9673.25 1262.24 9673.58 1262.23 9674.94 1262.13 9676.51  1262.7 9678.33 1263.42
 9682.53 1263.62  9688.7 1263.93  9691.9 1264.83 9696.74 1266.23 9700.28 1267.33
 9701.04 1267.53 9701.63 1267.57 9701.64 1267.57 9707.98 1267.45 9708.44 1267.45
 9715.94 1267.36 9717.68 1267.19 9720.95 1266.92 9724.77 1266.59 9729.08  1266.3
 9730.44 1266.35 9734.57 1266.31 9737.65  1265.9 9741.93 1265.29 9744.74  1265.1
 9746.72  1264.9 9750.51 1264.49 9753.64  1264.2 9757.01 1264.27 9760.99  1264.3
 9769.83  1264.4 9771.66 1264.43 9772.39 1264.46 9774.16 1264.51 9781.08 1264.76
 9793.94 1264.93 9793.97 1264.93 9793.98 1264.93 9801.05 1265.14 9804.58 1265.22
 9809.43 1265.12 9814.95 1265.01 9821.81 1264.55 9826.17 1264.26 9836.93 1264.47
 9837.33 1264.48 9837.66 1264.44 9844.93 1263.31 9850.66 1263.49  9854.5 1263.65
 9858.65 1263.66 9862.13 1263.69 9870.41 1263.57 9873.11 1263.51 9879.13 1263.33
 9884.02 1263.22 9888.52  1263.6 9890.41 1263.76 9892.19 1263.69 9900.71 1263.38
 9908.17  1263.6 9909.04 1263.62 9909.72 1263.61 9912.84  1263.6  9917.3 1263.59
 9918.04 1263.59 9919.15 1263.65 9925.48 1264.34 9931.78 1263.68 9931.91 1263.68
 9932.08 1263.67 9937.45 1263.38 9939.26 1263.49 9942.22 1263.67 9944.88 1263.78
  9949.2 1264.19 9951.43 1264.43  9953.9 1264.27 9958.92 1263.86 9959.76 1263.82
 9963.44 1263.97 9964.59 1263.97 9967.61 1264.01 9969.34 1264.13 9969.62 1264.08
 9970.88 1263.94 9972.98 1263.31 9973.57 1263.22 9975.74 1262.31 9976.71    1262
 9976.93 1261.93 9979.79 1260.77 9980.68 1260.43 9981.71    1260  9983.3 1259.36
 9984.87  1258.6 9985.68  1258.2 9986.71 1257.65 9987.27 1257.41 9987.67 1257.23
 9989.35 1256.35 9991.49 1255.69  9993.7 1255.29  9995.3 1255.19 9996.51 1255.14
   10000 1255.0710004.52 1254.9810006.72 1254.9510007.51 1254.9410012.26  1254.9
10017.14 1258.5510022.64  1262.610025.26 1263.3810026.66  1263.810027.93 1264.09
10029.85 1264.2710030.99 1264.3810032.58 1264.37 10036.9 1264.2910039.92 1264.13
10043.89 1264.0410045.06 1264.0110045.36 1264.0210050.84 1264.1610054.27 1264.26
10054.73 1264.2710055.79  1264.310067.64 1264.7610071.27 1264.9610071.78 1264.98
10075.07 1265.0610076.32 1265.1410077.28 1265.1910084.43 1265.5510087.19 1265.68
10089.04 1265.7710093.09 1265.9410099.14 1266.3510101.22 1266.4810103.91 1266.56
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10104.92 1266.6610107.37 1266.7710110.41 1266.9710119.97 1267.52 10123.7 1267.73
10132.18 1268.4110132.89 1268.4510134.42 1268.5610140.86 1268.9610142.92 1269.06
10148.28 1269.3110152.36 1269.5110158.17 1269.6510164.02 1269.8610171.48 1270.22
10173.09 1270.2810183.26 1270.4210184.88 1270.4710194.51 1270.5310196.76 1270.53
10207.5 1270.5510210.01 1270.5810211.67 1270.5710222.11 1270.44 10226.8 1270.38
10231.64 1270.3410238.07 1270.2910243.95 1270.27 10254.4 1270.210256.86 1270.17
10257.85 1270.1510266.11 1269.9910272.66 1269.8510275.55 1269.7810279.03 1269.71
10286.6 1269.5410295.14 1269.39 10300 1269.41

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
9500	.056	9969.34	.0410030.99	.056	

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
9969.3410030.99 523.4 500 496.4 .1 .3

CROSS SECTION

RIVER: MDOW
REACH: Reach1 RS: 2.367

INPUT
Description:
Station Elevation Data num= 202

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
9700	1269.02	9701.98	1269.03	9712.06	1268.84	9713.93	1268.81	9716.54	1268.75
9726.56	1268.6	9727.44	1268.54	9728.91	1268.51	9732.28	1268.58	9737.13	1268.58
9739.87	1268.54	9740.54	1268.53	9741.35	1268.53	9743.01	1268.51	9749.96	1268.47
9750.52	1268.47	9757.12	1268.47	9761.72	1268.5	9765.71	1268.54	9773.62	1268.53
9781.43	1268.5	9785.62	1268.48	9791.38	1268.49	9796.29	1268.47	9805.4	1268.45
9805.47	1268.45	9805.62	1268.45	9817.65	1268.78	9821.83	1268.86	9828.39	1268.93
9840.64	1268.84	9842.09	1268.84	9843.61	1268.82	9855.03	1268.6	9858.25	1268.54
9863.29	1268.4	9870.5	1267.95	9870.88	1267.93	9879.46	1267.18	9880.36	1267.1
9880.4	1267.09	9888.68	1266.47	9891.44	1266.08	9895.43	1265.48	9896.62	1265.31
9897.32	1265.16	9901.08	1264.35	9904.96	1263.05	9907.69	1262.07	9910.86	1261.2
9914.67	1260.14	9916.33	1260.02	9923.45	1259.67	9929.36	1259.56	9930.81	1259.55
9932.48	1259.56	9935.16	1259.61	9937.84	1259.64	9939.62	1259.83	9943.46	1260.21
9946.25	1260.51	9948.64	1260.98	9950.09	1261.02	9951.66	1261.08	9953.91	1261.03
9955.59	1261	9956.84	1260.87	9958.03	1260.81	9961.45	1260.43	9962.42	1260.39
9964.58	1260.89	9966.17	1261.17	9966.4	1261.12	9967.6	1260.91	9968.49	1260.69
9969.78	1260.23	9972.48	1259.09	9972.9	1258.94	9976.24	1257.68	9976.79	1257.45
9977.55	1257.09	9980.48	1255.77	9982.02	1254.93	9987.5	1252.74	9987.83	1252.61
9988.05	1252.51	9988.21	1252.51	9994.96	1252.37	9997.62	1252.44	10000	1252.49
10002.08	1252.5410006.08		1252.3910007.26		1252.3810012.03		1253.3510012.32		1253.41
10012.53	1253.5410018.41		1257.1310019.81		1258.8410021.65		1261.1710024.02		1261.57
10028.65	1262.310034.31		1262.41 10034.4		1262.4110034.44		1262.4110034.69		1262.4
10045.15	1262.10046.52		1262.1110048.81		1262.310049.83		1262.1810052.86		1261.85
10053.92	1261.4110057.25		1259.9910060.93		1259.45 10062.6		1259.2210064.48		1259.17
10068.95	1258.9510070.72		1259.3310072.39		1259.7510073.57		1260.110074.56		1260.49
10076.31	1261.1710080.58		1261.63 10080.9		1261.6710081.01		1261.6810081.31		1261.67
10090.4	1261.5110098.62		1261.6510101.82		1261.6810107.28		1261.8210108.04		1261.84
10108.26	1261.8410108.51		1261.8310112.47		1261.5310116.27		1261.4410118.28		1261.36
10119.72	1261.1710120.65		126110122.39		1261.6810123.17		1262.0110123.35		1262.02
10124.89	1262.0410128.55		1262.1510134.25		1262.1510135.94		1262.1510143.79		1262.27
10144.43	1262.2810146.92		1262.4210152.32		1262.7810154.43		1262.89 10161.8		1263.3
10166.81	1263.4810169.14		1263.5910174.82		1263.810175.75		1263.8210176.06		1263.83
10181.71	1263.910184.38		1263.8910189.39		1263.8610197.79		1263.7910198.53		1263.78
10200.19	1263.8110207.25		1263.8110210.34		1263.7910214.81		1263.6910223.92		1263.56
10224.16	1263.5510230.39		1263.5510232.35		1263.5310236.79		1263.410243.67		1263.45
10250.04	1263.5110253.76		1263.5710260.19		1263.6510264.17		1263.710271.23		1263.97
10273.94	1264.0910277.87		1264.4610281.96		1264.8510285.05		1265.1510293.62		1265.92
10301.85	1266.2910303.88		1266.3710306.23		1266.410315.26		1266.46	10322	1266.57
10329.3	1266.7110336.69		1266.86 10342.5		1266.8810344.25		1266.8910352.59		1266.87
10352.95	1266.8710353.22		1266.8710373.59		1266.7410376.03		1266.72 10379.8		1266.67
10382.75	1266.510384.08		1266.4 10388.2		1266.35 10395.7		1266.35 10397.2		1266.34
10398.01	1266.34	10400	1266.38						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
9700	.056	9966.17	.0410021.65	.056	

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
9966.1710021.65 505.9 500 430.1 .1 .3

CROSS SECTION

RIVER: MDOW
REACH: Reach1 RS: 2.272

INPUT
Description:
Station Elevation Data num= 135

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
9800	1267.37	9804.81	1267.34	9807.61	1267.34	9818.42	1267.2	9819.63	1267.2
9820.78	1267.18	9832.62	1267.14	9840.85	1266.82	9840.93	1266.82	9840.97	1266.82
9848.67	1266.83	9849	1266.86	9851.26	1267.17	9860.2	1267.12	9864.01	1267.1
9869.27	1267.1	9877	1267.1	9880.37	1267.11	9889.12	1267.12	9895.09	1267.13
9902.08	1267.18	9912.66	1267.12	9915.54	1267.09	9919.79	1267.09	9925.05	1267
9928.56	1266.91	9930.51	1266.89	9940.59	1266.65	9946.8	1266.47	9952.25	1266.31
9958.88	1266.13	9959.76	1266.11	9964.28	1266	9965.45	1265.9	9967.91	1265.75
9968.57	1265.62	9969.47	1265.48	9973.23	1264.85	9976.51	1256.65	9977.72	1253.68
9978.12	1252.68	9978.4	1252.56	9981.98	1251.24	9986.14	1249.1	9987.24	1248.57
9988.4	1248.57	9992.21	1248.59	9993.99	1248.56	9996.83	1248.65	9999.22	1248.74
10000	1248.7810002.85		1248.9110005.61		1248.9410007.47		1249.0410011.08		1250.47
10011.81	1250.7710011.99		1250.8910016.34		1253.6310020.82		1256.4710021.21		1256.72
10022.01	1256.7910025.06		1257.1610031.57		1257.8510039.16		1257.78	10043	1257.7
10044.92	1257.7310053.92		1257.7210061.26		1257.610063.93		1257.5410066.97		1257.55
10075.68	1257.5110081.54		1257.5110087.94		1257.5410095.36		1257.5710100.69		1257.6
10112.78	1257.5310113.52		1257.5210114.05		1257.5210125.22		1257.4210127.32		1257.44
10137.96	1257.5210138.57		1257.5310149.58		1257.6810151.33		1257.6810161.58		1257.64
10164.12	1257.6310164.42		1257.6310177.58		1257.7410178.19		1257.74 10191.4		1257.79
10199.15	1257.8910203.99		1257.9210209.12		1257.9110213.77		1257.9510222.19		1257.92
10224.49	1257.9210225.47		1257.9310234.15		1258.0910238.24		1258.0810243.94		1258.08
10251.49	1258.1110254.44		1258.5 10260.8		1259.3810261.14		1259.4210261.55		1259.47
10270.36	1260.5710276.49		1261.510278.79		1261.8810281.16		1261.9710287.15		1262.18
10292.34	1262.2810293.79		1262.31 10294.2		1262.2410297.12		1261.810300.63		1262.01
10307.01	1262.4210310.57		1262.6510312.92		1262.810315.44		1262.9310323.74		1263.44
10326.82	1263.6610337.66		1264.3910339.94		1264.5210349.51		1264.8110351.51		1264.87
10363.58	1265.09 10364.5		1265.1310364.94		1265.1510365.76		1265.1610367.49		1265.17
10380.01	1265.510386.12		1265.5610391.48		1265.5810399.66		1265.61	10400	1265.61

Manning's n Values num= 4

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
9800	.056	9976.51	.0410021.21	.0310251.49	.056		

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
9976.5110021.21 414.3 400.91 327.7 .3 .5

CROSS SECTION

RIVER: MDOW
REACH: Reach1 RS: 2.196

INPUT
Description:
Station Elevation Data num= 198

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
9700	1264.95	9706.16	1264.94	9707.73	1264.94	9707.91	1264.94	9708.49	1264.93
9721.74	1264.73	9729.75	1264.69	9735.82	1264.65	9741.68	1264.69	9749.48	1264.58
9756.96	1264.29	9759.03	1264.21	9759.91	1264.17	9760.86	1264.18	9767.96	1264.15
9771.31	1264.38	9771.59	1264.42	9781.26	1264.62	9781.87	1264.63	9782.66	1264.62
9795.42	1264.48	9797.81	1264.39	9804.11	1264.3	9808.76	1264.34	9813.73	1264.38
9820.95	1264.26	9821.94	1264.25	9824.29	1264.23	9830.54	1264.21	9837.28	1264.08
9840.68	1264.04	9844.17	1263.9	9854.8	1263.58	9857.87	1263.56	9858.9	1263.57
9859.24	1263.49	9861.89	1262.93	9865.49	1262.79	9866.75	1262.71	9868.79	1262.76
9870.72	1262.8	9877.34	1263.2	9878.62	1263.25	9882.46	1263.38	9885.77	1263.46
9889.06	1263.46	9894.71	1263.43	9896.61	1263.34	9898.84	1262.96	9898.98	1262.93
9899.24	1262.87	9900.29	1262.61	9908.49	1260.6	9910.55	1260.07	9917.86	1258.13
9925.79	1256.19	9926.47	1256.01	9935.3	1253.89	9937.18	1253.34	9938.91	1252.78
9940.84	1252.34	9943.02	1252.39	9945.15	1252.19	9946.78	1252.1	9950.32	1251.64
9950.8	1251.61	9951.03	1251.53	9951.36	1251.41	9952.69	1249.58	9953.08	1249.4
9958.73	1248.27	9959.5	1248.07	9965.04	1248.43	9965.56	1248.46	9966.1	1248.45
9971.66	1248.38	9973.45	1248.34	9974.72	1248.34	9981.86	1248.6	9982.63	1248.61
9983.48	1248.63	9991.26	1248.71	9999.72	1248.84	10000	1248.83	10000.4	1248.83
10000.52	1248.83	10001.4	1248.8410013.39		1248.72	10016.8	1248.610020.38		1248.46
10029.15	1248.9910029.61		1249.0210030.21		1249.0310039.79		1249.2710046.05		1249.26
10049.49	1249.3110053.08		1248.6610053.34		1248.5910053.71		1248.7 10059.7		1250.04
10060.69	1250.3710061.73		1250.74 10063.7		1251.0210064.16		1251.1910066.69		1251.84
10066.75	1251.8610066.79		1251.8710069.95		1252.4210071.25		1252.610075.21		1253.16
10078.01	1253.4510080.56		1253.810083.66		1254.1710089.92		1255.0910090.03		1255.1
10090.2	1255.1110092.92		1255.1610096.49		1255.3710100.67		1255.610103.55		1255.62
10108.79	1255.65 10111.7		1255.8110116.79		1255.9 10124.1		1256.110127.55		1256.15
10131.34	1256.1810137.76		1256.2110141.19		1256.2510147.58		1256.3210150.62		1256.45
10156.4	1256.5910159.49		1256.710162.87		1256.8310167.65		1257.0210170.65		1257.07
10178.1	1257.1610180.87		1257.2710187.36		1257.5110190.45		1257.6410192.42		1257.76
10195.09	1257.8410198.36		1258.4610203.24		1259.6510205.01		1260.0510206.88		1260.14
10209.68	1260.2410212.94		1260.34 10216.6		1260.3810217.61		1260.41 10226.1		1260.43
10228.85	1260.4710235.23		1260.54 10239.1		1260.5310247.48		1260.5610255.55		1260.56
10259.07	1260.5910267.48		1260.58 10271.5		1260.6110280.66		1260.5610284.56		1260.61
10294.77	1260.81 10297.8		1260.8610307.79		1261.21 10310.7		1261.2410321.04		1261.42
10322.01	1261.4610328.15		1261.5510331.84		1261.6310333.72		1261.7 10341.8		1261.75
10343.61	1261.7610344.22		1261.7710352.22		1261.710356.34		1261.78 10362.9		1261.86
10371.35	126210373.65		1262.0610375.14		1262.0710387.84		1262.310389.12		1262.3
10391.19	1262.310404.89		1262.3510405.76		1262.3810413.33		1262.5510418.24		1262.69
10422.77	1262.8510426.95		1262.9710434.67		1263.0610437.45		1263.1710447.18		1263.24
10450.16	1263.2910456.42		1263.3510458.69		1263.3810472.25		1263.5210472.95		1263.53
10486.11	1263.7810486.97		1263.8	10500	1263.99				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
9700	.056	9925.79	.0410100.67	.056	

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
9925.7910100.67 235.48 235.48 235.48 .3 .5
Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
9700	9916.58	1260.73	F
10069.92	10500	1260.51	F

CULVERT

RIVER: MDOW
REACH: Reach1 RS: 2.174

INPUT
Description: El Mirage Road North Culvert
Distance from Upstream XS = 57.6
Deck/Roadway Width = 130
Weir Coefficient = 2.6
Upstream Deck/Roadway Coordinates
num= 11

Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord
9700	1262.47	9756.3	1262	9874.32	1261
9998.63	1260.2	10184.01	1261	10253.8	1262
10317.34	1263	10370.29	1264	10412.45	1265
10455.91	1266	10500	1267		

Upstream Bridge Cross Section Data
Station Elevation Data num= 198

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
9700	1264.95	9706.16	1264.94	9707.73	1264.94	9707.91	1264.94	9708.49	1264.93
9721.74	1264.73	9729.75	1264.69	9735.82	1264.65	9741.68	1264.69	9749.48	1264.58
9756.96	1264.29	9759.03	1264.21	9759.91	1264.17	9760.86	1264.18	9767.96	1264.15
9771.31	1264.38	9771.59	1264.42	9781.26	1264.62	9781.87	1264.63	9782.66	1264.62
9795.42	1264.48	9797.81	1264.39	9804.11	1264.3	9808.76	1264.34	9813.73	1264.38
9820.95	1264.26	9821.94	1264.25	9824.29	1264.23	9830.54	1264.21	9837.28	1264.08
9840.68	1264.04	9844.17	1263.9	9854.8	1263.58	9857.87	1263.56	9858.9	1263.57
9859.24	1263.49	9861.89	1262.93	9865.49	1262.79	9866.75	1262.71	9868.79	1262.76
9870.72	1262.8	9877.34	1263.2	9878.62	1263.25	9882.46	1263.38	9885.77	1263.46
9889.06	1263.46	9894.71	1263.43	9896.61	1263.34	9898.84	1262.96	9898.98	1262.93
9899.24	1262.87	9900.29	1262.61	9908.49	1260.6	9910.55	1260.07	9917.86	1258.13
9925.79	1256.19	9926.47	1256.01	9935.3	1253.89	9937.18	1253.34	9938.91	1252.78
9940.84	1252.34	9943.02	1252.39	9945.15	1252.19	9946.78	1252.1	9950.32	1251.64
9950.8	1251.61	9951.03	1251.53	9951.36	1251.41	9952.69	1249.58	9953.08	1249.4
9958.73	1248.27	9959.5	1248.07	9965.04	1248.43	9965.56	1248.46	9966.1	1248.45
9971.66	1248.38	9973.45	1248.34	9974.72	1248.34	9981.86	1248.6	9982.63	1248.61
9983.48	1248.63	9991.26	1248.71	9999.72	1248.84	10000	1248.83	10000.4	1248.83
10000.52	1248.83	10001.4	1248.8410013.39		1248.72	10016.8	1248.610020.38		1248.46
10029.15	1248.9910029.61		1249.0210030.21		1249.0310039.79		1249.2710046.05		1249.26
10049.49	1249.3110053.08		1248.6610053.34		1248.5910053.71		1248.7 10059.7		1250.04
10060.69	1250.3710061.73		1250.74 10063.7		1251.0210064.16		1251.1910066.69		1251.84
10066.75	1251.8610066.79		1251.8710069.95		1252.4210071.25		1252.610075.21		1253.16
10078.01	1253.4510080.56		1253.810083.66		1254.1710089.92		1255.0910090.03		1255.1
10090.2	1255.1110092.92		1255.1610096.49		1255.3710100.67		1255.610103.55		1255.62
10108.79	1255.65 10111.7		1255.8110116.79		1255.9 10124.1		1256.110127.55		1256.15
10131.34	1256.1810137.76		1256.2110141.19		1256.2510147.58		1256.3210150.62		1256.45
10156.4	1256.5910159.49		1256.710162.87		1256.8310167.65		1257.0210170.65		1257.07
10178.1	1257.1610180.87		1257.2710187.36		1257.5110190.45		1257.6410192.42		1257.76
10195.09	1257.8410198.36		1258.4610203.24		1259.6510205.01		1260.0510206.88		1260.14
10209.68	1260.2410212.94		1260.34 10216.6		1260.3810217.61		1260.41 10226.1		1260.43
10228.85	1260.4710235.23		1260.54 10239.1		1260.5310247.48		1260.5610255.55		1260.56
10259.07	1260.5910267.48		1260.58 10271.5		1260.6110280.66		1260.5610284.56		1260.61
10294.77	1260.81 10297.8		1260.8610307.79		1261.21 10310.7		1261.2410321.04		1261.42
10322.01	1261.4610328.15		1261.5510331.84		1261.6310333.72		1261.7 10341.8		1261.75
10343.61	1261.7610344.22		1261.7710352.22		1261.710356.34		1261.78 10362.9		1261.86
10371.35	126210373.65		1262.0610375.14		1262.0710387.84		1262.310389.12		1262.3
10391.19	1262.310404.89		1262.3510405.76		1262.3810413.33		1262.5510418.24		1262.69
10422.77	1262.8510426.95		1262.9710434.67		1263.0610437.45		1263.1710447.18		1263.24
10450.16	1263.2910456.42		1263.3510458.69		1263.3810472.25		1263.5210472.95		1263.53
10486.11	1263.7810486.97		1263.8	10500	1263.99				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val

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**********************************************
    9700     .056 9925.79     .0410100.67     .056

Bank Sta: Left   Right    Coeff Contr.    Expan.
       9925.7910100.67             .3        .5
Ineffective Flow     num=       2
   Sta L    Sta R    Elev  Permanent
    9700 9916.58 1260.73        F
10069.92   10500 1260.51        F

Downstream  Deck/Roadway Coordinates
    num=       11
    Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
*****************************************************************************
 9779.74 1262.47          9836.04    1262          9954.06    1261
10078.37  1260.2         10263.75    1261         10333.54    1262
10397.08    1263         10450.03    1264         10492.19    1265
10535.65    1266         10579.74    1267

Downstream Bridge Cross Section Data
Station Elevation Data    num=     211
    Sta     Elev     Sta     Elev     Sta     Elev     Sta     Elev     Sta     Elev
*****************************************************************************
 9779.74 1261.66 9782.98 1261.85 9785.98 1262.03 9795.37 1262.57 9795.99 1262.57
 9796.16 1262.57 9806.78 1262.65 9807.99 1262.64 9810.31 1262.64 9820.62 1262.71
 9826.48 1262.65 9832.71 1262.52 9839.66 1262.58 9842.57 1262.56 9850.28 1262.41
 9850.93 1262.38 9854.13 1262.16 9857.18 1261.94 9857.46  1261.9 9862.88 1261.32
 9863.67 1261.18 9875.86 1258.98 9876.45 1258.86 9882.33 1257.87 9885.06 1257.49
 9886.54 1257.21 9889.45 1257.26 9894.15 1257.36 9900.14 1257.31 9901.97 1257.26
 9907.44 1256.08 9907.78 1256.01 9908.03 1255.96 9909.03 1255.75  9913.1 1254.94
 9913.67 1254.77 9916.94 1254.11 9922.46 1253.16 9924.13  1252.7 9926.77 1252.08
 9929.88 1251.28 9932.21 1251.25 9933.65 1251.27 9934.14 1251.18 9934.62 1250.87
 9937.67 1247.57 9940.59 1247.47 9946.61 1247.32 9947.97  1247.3 9951.98 1247.28
 9957.89 1247.15  9961.8 1247.14 9962.87 1247.13 9964.07 1247.12 9966.38 1247.02
 9974.24 1247.06 9975.88 1247.14    9982  1247.1 9988.26 1246.94 9996.58 1246.86
 9998.67 1246.87   10000 1246.8910000.38 1246.8910009.08 1246.8710010.22 1246.92
10010.94 1246.9310020.83 1247.1110024.33  1247.310031.35 1248.2210033.71 1248.35
10039.26 1248.8710040.26 1248.94 10044.8 1248.4810044.81 1248.4810044.82 1248.48
10045.09 1248.5910049.69 1250.4610050.16  1250.610051.36  1250.710051.45 1250.72
10054.24 1251.0510056.77 1251.6510058.13 1251.7410059.47  1251.910060.68 1251.98
10061.16 1252.0110063.31  1252.710067.27  1253.510070.82 1254.2710075.67 1255.08
10075.76 1255.0810076.14 1255.09 10085.7 1255.2710087.36 1255.2910088.35 1255.32
10099.48 1255.3610100.06 1255.3610101.06 1255.3610105.93 1255.2710114.64 1255.56
10115.32 1255.61 10118.6 1255.8110126.64 1256.2810127.49 1256.3310131.96 1256.63
10138.49 1257.0710140.86 1257.3910143.82 1257.7510146.06 1258.0110147.95 1258.18
10150.75 1258.51 10151.4 1258.6210154.87 1259.0710158.07 1259.2310160.63 1259.49
10165.89 1259.8310172.45 1260.32 10173.6 1260.3510173.89 1260.3610180.01 1260.39
10182.86 1260.4910189.12 1260.5710190.44 1260.59 10192.6 1260.63 10196.8 1260.64
10201.63 1260.7310203.36  1260.8 10208.2 1261.0110210.09 1261.0910215.23 1261.49
10220.33 1261.8110221.06 1261.8510225.65 1262.0410228.29 1262.1310228.74 1262.15
10229.29 1262.1810238.04 1262.5210243.37 1262.6110245.24  1262.710251.69 1262.83
10253.73 1262.94   10256 1263.09 10258.4 1263.1910262.26 1263.3610263.68 1263.41
10269.77 1263.4210271.55 1263.44 10274.6 1263.8710278.94 1263.8610281.11 1263.91
10285.33 1264.04 10287.5 1264.1110292.25 1264.1310297.46 1264.0510301.54 1264.07
10307.44 1263.9210309.98 1263.8810312.08 1263.8710313.78 1263.9510318.54    1264
 10322.7 1264.0610327.32 1264.1610329.98 1264.1610334.67 1264.26 10341.5 1264.32
10345.28 1264.3110350.04 1264.3110353.81 1264.3210358.65 1264.3210361.72 1264.37
10364.66 1264.4910366.77 1264.5310368.94 1264.7110371.38 1264.6410374.32 1264.63
10380.27 1264.5410383.25 1264.4910392.83 1264.4110393.24  1264.4 10394.6  1264.4
10404.42  1264.510405.24 1264.4510409.98 1264.53 10415.5 1264.6410418.38 1264.73
10424.68 1264.7610426.42 1264.7510431.89 1264.6410436.54  1264.610440.03 1264.64
 10448.7 1264.6510455.35 1264.7410464.91 1264.8210466.92 1264.8310480.87 1264.98
10482.94 1264.9910496.25 1265.0610497.88 1265.0710513.74 1265.1410515.04 1265.16
10529.97 1265.3210530.05 1265.3210542.28 1265.5710542.71 1265.5710555.43 1265.62
10556.47 1265.6210556.79 1265.6210568.03 1265.7310569.97 1265.7610579.68 1265.84
10579.74 1265.84

Manning's n Values        num=       3
    Sta    n Val     Sta    n Val     Sta    n Val
**********************************************
 9779.74     .056 9933.65     .0410054.24     .056

Bank Sta: Left   Right    Coeff Contr.    Expan.
       9901.9710075.67             .3        .5
Ineffective Flow     num=       2
   Sta L    Sta R    Elev  Permanent
 9779.74 9962.19 1258.09        F
10047.4210579.74 1257.81        F

Upstream Embankment side slope             =       0 horiz. to 1.0 vertical
Downstream Embankment side slope           =       0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .98
Elevation at which weir flow begins        =
Energy head used in spillway design        =
Spillway height used in design             =
Weir crest shape                           = Broad Crested

Number of Culverts =  1

Culvert Name     Shape      Rise    Span
Culvert #1           Box       7      10
FHWA Chart # 8 - flared wingwalls
FHWA Scale # 1 - Wingwall flared 30 to 75 deg.
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    Top n  Bottom n  Depth Blocked  Entrance Loss Coef   Exit Loss Coef
           35.88      168     .013     .013        0                  .4                1
Number of Barrels =  7
Upstream   Elevation =  1248.68
Centerline Stations
    Sta.    Sta.    Sta.    Sta.    Sta.    Sta.    Sta.
 9957.43 9969.38 9981.32 9993.2610005.2110017.1510029.09
Downstream Elevation =  1248.23
Centerline Stations
   Sta.    Sta.    Sta.    Sta.    Sta.    Sta.    Sta.
 9968.39 9980.53 9992.67 10004.810016.9410029.0810041.22

CROSS SECTION


RIVER: MDOW
REACH: Reach1             RS: 2.151

INPUT
Description:
Station Elevation Data    num=     211
    Sta     Elev     Sta     Elev     Sta     Elev     Sta     Elev     Sta     Elev
*****************************************************************************
 9779.74 1261.66 9782.98 1261.85 9785.98 1262.03 9795.37 1262.57 9795.99 1262.57
 9796.16 1262.57 9806.78 1262.65 9807.99 1262.64 9810.31 1262.64 9820.62 1262.71
 9826.48 1262.65 9832.71 1262.52 9839.66 1262.58 9842.57 1262.56 9850.28 1262.41
 9850.93 1262.38 9854.13 1262.16 9857.18 1261.94 9857.46  1261.9 9862.88 1261.32
 9863.67 1261.18 9875.86 1258.98 9876.45 1258.86 9882.33 1257.87 9885.06 1257.49
 9886.54 1257.21 9889.45 1257.26 9894.15 1257.36 9900.14 1257.31 9901.97 1257.26
 9907.44 1256.08 9907.78 1256.01 9908.03 1255.96 9909.03 1255.75  9913.1 1254.94
 9913.67 1254.77 9916.94 1254.11 9922.46 1253.16 9924.13  1252.7 9926.77 1252.08
 9929.88 1251.28 9932.21 1251.25 9933.65 1251.27 9934.14 1251.18 9934.62 1250.87
 9937.67 1247.57 9940.59 1247.47 9946.61 1247.32 9947.97  1247.3 9951.98 1247.28
 9957.89 1247.15  9961.8 1247.14 9962.87 1247.13 9964.07 1247.12 9966.38 1247.02
```

```
 9974.24 1247.06 9975.88 1247.14    9982  1247.1 9988.26 1246.94 9996.58 1246.86
 9998.67 1246.87   10000 1246.8910000.38 1246.8910009.08 1246.8710010.22 1246.92
10010.94 1246.9310020.83 1247.1110024.33  1247.310031.35 1248.2210033.71 1248.35
10039.26 1248.8710040.26 1248.94 10044.8 1248.4810044.81 1248.4810044.82 1248.48
10045.09 1248.5910049.69 1250.4610050.16  1250.610051.36  1250.710051.45 1250.72
10054.24 1251.0510056.77 1251.6510058.13 1251.7410059.47  1251.910060.68 1251.98
10061.16 1252.0110063.31  1252.710067.27  1253.510070.82 1254.2710075.67 1255.08
10075.76 1255.0810076.14 1255.09 10085.7 1255.2710087.36 1255.2910088.35 1255.32
10099.48 1255.3610100.06 1255.3610101.06 1255.3610105.93 1255.2710114.64 1255.56
10115.32 1255.61 10118.6 1255.8110126.64 1256.2810127.49 1256.3310131.96 1256.63
10138.49 1257.0710140.86 1257.3910143.82 1257.7510146.06 1258.0110147.95 1258.18
10150.75 1258.51 10151.4 1258.6210154.87 1259.0710158.07 1259.2310160.63 1259.49
10165.89 1259.8310172.45 1260.32 10173.6 1260.3510173.89 1260.3610180.01 1260.39
10182.86 1260.4910189.12 1260.5710190.44 1260.59 10192.6 1260.63 10196.8 1260.64
10201.63 1260.7310203.36  1260.8 10208.2 1261.0110210.09 1261.0910215.23 1261.49
10220.33 1261.8110221.06 1261.8510225.65 1262.0410228.29 1262.1310228.74 1262.15
10229.29 1262.1810238.04 1262.5210243.37 1262.6110245.24  1262.710251.69 1262.83
10253.73 1262.94   10256 1263.09 10258.4 1263.1910262.26 1263.3610263.68 1263.41
10269.77 1263.4210271.55 1263.44 10274.6 1263.8710278.94 1263.8610281.11 1263.91
10285.33 1264.04 10287.5 1264.1110292.25 1264.1310297.46 1264.0510301.54 1264.07
10307.44 1263.9210309.98 1263.8810312.08 1263.8710313.78 1263.9510318.54    1264
 10322.7 1264.0610327.32 1264.1610329.98 1264.1610334.67 1264.26 10341.5 1264.32
10345.28 1264.3110350.04 1264.3110353.81 1264.3210358.65 1264.3210361.72 1264.37
10364.66 1264.4910366.77 1264.5310368.94 1264.7110371.38 1264.6410374.32 1264.63
10380.27 1264.5410383.25 1264.4910392.83 1264.4110393.24  1264.4 10394.6  1264.4
10404.42  1264.510405.24 1264.4510409.98 1264.53 10415.5 1264.6410418.38 1264.73
10424.68 1264.7610426.42 1264.7510431.89 1264.6410436.54  1264.610440.03 1264.64
 10448.7 1264.6510455.35 1264.7410464.91 1264.8210466.92 1264.8310480.87 1264.98
10482.94 1264.9910496.25 1265.0610497.88 1265.0710513.74 1265.1410515.04 1265.16
10529.97 1265.3210530.05 1265.3210542.28 1265.5710542.71 1265.5710555.43 1265.62
10556.47 1265.6210556.79 1265.6210568.03 1265.7310569.97 1265.7610579.68 1265.84
10579.74 1265.84

Manning's n Values         num=        3
     Sta   n Val     Sta   n Val     Sta   n Val
*************************************************
 9779.74    .056 9933.65     .0410054.24    .056

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.    Expan.
      9901.9710075.67                 480.9  536.32   564.8             .3       .5
Ineffective Flow     num=        2
   Sta L    Sta R    Elev  Permanent
 9779.74 9962.19 1258.09        F
10047.4210579.74 1257.81        F

CROSS SECTION


RIVER: MDOW
REACH: Reach1               RS: 2.050

INPUT
Description:
Station Elevation Data    num=     106
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*********************************************************************************
    9800 1261.52 9801.05 1261.51 9803.91 1261.45 9812.63 1261.36 9814.81 1261.35
  9823.7 1261.44 9824.49 1261.45 9824.69 1261.45 9824.84 1261.44 9828.08 1261.39
 9835.24 1261.34 9836.32 1261.32 9842.28 1261.13  9845.1 1261.05 9849.06    1261
 9853.96 1260.96 9857.48 1260.91 9861.02 1260.85 9864.06 1260.82 9866.55 1260.79
 9869.83 1260.54 9872.15 1260.34 9873.84 1260.23 9876.35 1261.15  9878.7 1262.01
 9879.19 1262.04  9879.3 1262.05 9879.37 1262.06 9882.09 1260.71 9887.13 1258.23
 9888.48 1258.12 9889.76 1257.96 9893.17 1256.98  9896.1 1256.01 9898.52 1255.14
 9901.13 1254.13 9902.28 1253.78 9906.49 1252.33  9908.7 1251.54 9913.18 1249.94
 9914.23 1249.54 9916.53 1249.29 9920.87 1248.85 9923.65 1248.62 9926.21  1248.4
 9929.38 1248.05  9933.7 1247.66 9939.41 1247.24 9944.02 1246.93 9947.68 1246.78
 9948.43 1246.76 9949.94 1246.74 9961.25 1246.43 9967.27 1246.16 9971.16 1245.99
 9971.47 1245.97 9975.03 1245.82 9982.04  1245.5 9982.71 1245.47 9992.48  1245.1
  9995.2 1245.07   10000 1245.0110000.21 1245.0110004.27 1245.0510008.29 1245.09
10015.49 1245.15 10017.9 1245.1710019.64 1245.3510026.21 1246.0210032.64 1246.31
10038.54 1246.5310050.52 1246.8610052.27 1246.9110063.36 1247.2610065.01 1247.31
10075.11 1247.6710081.09 1247.8810086.98 1248.0810089.08 1248.1810091.66 1248.27
10097.05 1248.51 10097.6 1248.7210098.73 1249.1110099.34 1248.9810100.91 1248.65
10107.44 1248.7810111.29 1248.8410116.61 1248.8810116.81 1248.8710117.09 1248.91
10126.12 1250.0610128.41 1250.5710134.84  1252.110143.25 1253.69 10146.7 1254.35
10151.34 1254.4510157.55  1254.610158.95 1254.6210159.44  1254.710161.27 1255.01
10166.33 1255.0510173.73 1255.1610184.92 1255.2610187.69 1255.27 10192.9 1255.44
10196.79 1255.56

Manning's n Values         num=        3
     Sta   n Val     Sta   n Val     Sta   n Val
*************************************************
    9800     .05 9944.02     .03510091.66     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.    Expan.
      9901.13 10146.7                 816  797.41   747.7             .1       .3

CROSS SECTION


RIVER: MDOW
REACH: Reach1               RS: 1.899

INPUT
Description:
Station Elevation Data    num=     110
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*********************************************************************************
    9800 1258.84 9807.32 1258.62 9808.42 1258.58 9809.73 1258.58 9819.19 1258.45
 9826.78 1257.91 9831.07 1257.58 9840.56 1257.17 9842.95 1257.08 9852.95 1256.63
 9852.96 1256.63 9862.32 1255.99 9869.12 1255.46 9869.94 1255.41 9871.68 1255.24
 9877.03 1254.73 9883.48 1252.82 9888.83 1251.24 9891.57 1250.27 9898.09    1248
 9904.85 1245.45 9905.56 1245.21  9906.5 1244.99 9915.38  1243.2 9918.05 1242.66
 9918.33 1242.64  9923.1 1242.25 9924.57 1242.36 9926.43 1242.37 9934.63 1242.54
 9934.96 1242.54 9935.13 1242.55 9944.34 1242.57 9947.45 1242.47 9952.54 1242.37
 9958.29 1242.29 9963.32  1242.2 9969.54 1242.08 9974.71 1242.01 9977.25 1242.03
  9982.6 1241.98 9990.15 1242.06 9990.52 1242.07 9990.67 1242.07   10000 1241.93
 10002.2 1241.8910003.21 1241.9410014.83 1242.4410018.21 1242.51 10026.7 1242.69
10037.88 1242.9910039.43 1243.0310042.79 1243.0810050.49 1243.1610052.85 1243.22
10061.76 1243.3410067.43 1243.4610074.62 1243.5910080.52 1243.7110082.75 1243.77
 10083.6 1243.8210086.28 1243.8710087.31 1244.0710087.56  1244.110088.25 1244.07
10090.29 1244.1410093.34 1244.3110095.07  1244.410100.62 1247.2410103.83 1248.77
10109.13 1249.5810111.86 1249.9310112.62 1249.9810114.55 1250.2810115.37 1250.32
10123.82 1250.8910125.99 1250.9410139.57 1251.1910153.62 1251.5110153.63 1251.51
10153.64 1251.5110166.93 1251.8710169.55  1251.8 10172.4 1251.7510177.87  1252.1
10178.88 1252.1810179.39 1252.1710182.17 1252.1110185.68 1251.6110189.52 1251.01
10195.81 1251.2610198.32 1251.3510199.43 1251.4110201.33 1251.5210207.08 1251.95
10215.63    1252102221.76 1252.0710222.38 1252.06 10223.3 1252.0910227.47  1252.1
10231.26 1252.1510237.16 1252.2110261.37 1252.1210284.42 1251.7910284.43 1251.79
10285.67 1251.7910287.77 1251.6610295.45 1251.3610297.37 1251.28   10300 1251.09

Manning's n Values         num=        3
     Sta   n Val     Sta   n Val     Sta   n Val
*************************************************
    9800     .05 9934.63     .03510086.28     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.    Expan.
      9888.8310123.82                 500.5     500   499.5             .1       .3
```

CROSS SECTION

RIVER: MDOW
REACH: Reach1 RS: 1.804

INPUT
Description:
Station Elevation Data num= 130

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
9700	1256.65	9716.18	1256.99	9719.12	1257	9731.03	1257.06	9734.83	1257.08
9747.91	1257.08	9752.5	1257.08	9762.65	1257.08	9767	1257.08	9776.81	1257.14
9781.29	1257.14	9789.46	1257.18	9793.91	1257.1	9799.31	1257	9807.1	1256.82
9817.13	1256.55	9823.59	1256.38	9829.82	1256.37	9836.79	1256.12	9842.06	1255.94
9847.81	1255.9	9853.9	1255.71	9857.67	1255.51	9870.13	1254.97	9870.92	1254.93
9871.23	1254.9	9876.14	1253.21	9888.87	1248.77	9891.02	1248.03	9900.55	1244.62
9904.47	1243.58	9909.85	1241.62	9912.58	1240.7	9915.74	1240.51	9917.22	1240.49
9918.02	1240.47	9920.48	1240.45	9929.16	1240.4	9933.39	1240.43	9942.09	1240.58
9944.77	1240.58	9950.82	1240.75	9954.66	1240.75	9956.06	1240.75	9958.24	1240.71
9965.8	1240.55	9968.88	1240.53	9975.86	1240.6	9980.69	1240.48	9981.77	1240.44
9987.69	1240.26	9997.19	1239.76	9999.76	1239.75	10000	1239.7710004.45		1240.27
10005.57	1240.510007.44		1240.5510010.11		1240.5910017.37		1240.59 10023.5		1240.61
10024.91	1240.6110037.93		1240.7510038.77		1240.7610053.66		1240.7610054.18		1240.76
10054.49	1240.7610070.11		1240.7710070.23		1240.7710070.71		1240.7510075.99		1240.66
10081.93	1240.5510082.52		1240.5210089.05		1240.0810090.53		1240.2110094.63		1240.69
10098.85	1241.110105.81		1243.9110107.18		1244.4810107.85		1244.7610116.06		1248.06
10118.09	1248.6710118.98		1248.8510121.47		1249.0610127.57		1249.2610134.42		1249.38
10138.2	1249.3910141.04		1249.4410151.99		1249.6310162.18		1249.9610162.18		1249.93
10165.12	1249.9610167.02		1250.0310171.88		1250.2310174.03		1250.4610177.78		1250.93
10179.63	1250.9310181.07		1251.0210184.23		1250.7310187.48		1250.3310189.81		1250.06
10192.98	1250.2610200.66		1250.4310210.56		1250.5310213.12		1250.510216.28		1250.56
10220.88	1250.6610221.55		1250.7410223.23		1251.0110224.21		1251.1210224.66		1251.14
10225.84	1251.1310226.31		1251.1110229.66		1250.8910232.41		1250.710232.96		1250.63
10238.16	1250.5710239.44		1250.610240.64		1250.610241.05		1250.610243.37		1250.64
10253.6	1250.7510260.05		1250.7210270.43		1250.7510274.45		1250.7410276.01		1250.77
10278.6	1250.68	10294.6	1250.6110296.86		1250.6710298.59		1250.66	10300	1250.68

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
9700	.05	9915.74	.03510081.93		.05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

Left	Right	Left	Channel	Right	Coeff Contr.	Expan.
9888.8710118.98		700.3	702.71	704.1	.1	.3

CROSS SECTION

RIVER: MDOW
REACH: Reach1 RS: 1.671

INPUT
Description:
Station Elevation Data num= 207

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
9700	1251.48	9707.22	1251.88	9707.65	1251.89	9718.47	1251.97	9719.09	1251.98
9727.81	1252.4	9728.72	1252.41	9736.01	1252.48	9736.74	1252.5	9748.57	1252.64
9750.15	1252.66	9761.3	1252.8	9762.35	1252.8	9770.41	1252.87	9771.52	1252.88
9778.78	1252.89	9780.03	1252.88	9787.21	1252.68	9788.32	1252.65	9797.09	1252.53
9798.52	1252.48	9808.03	1252.11	9810.4	1252.01	9819.02	1251.7	9824.56	1251.51
9826.42	1251.41	9832.28	1251.16	9834.58	1251.01	9844.38	1250.16	9846.26	1249.98
9854.27	1249.09	9856.74	1248.75	9864.53	1248.09	9871.44	1247.51	9873.55	1247.31
9877.14	1246.84	9881.49	1246.6	9887.33	1246.32	9894.79	1244.09	9902.64	1241.75
9906.87	1240.28	9910.36	1239.01	9913.94	1238.67	9917.14	1238.35	9918.99	1238
9921.39	1237.55	9923.12	1237.43	9926.56	1237.4	9932.43	1237.2	9934.81	1237.26
9937.55	1237.42	9941.63	1237.58	9944.15	1237.67	9949.79	1237.72	9951.93	1237.75
9957.41	1237.75	9959.16	1237.72	9968.41	1237.83	9973.98	1237.85	9980.13	1237.85
9984.41	1237.83	9990.94	1237.88	9992.69	1237.9	9997.42	1237.8	10000	1237.68
10002.85	1237.5410004.86		1237.4310010.09		1237.7310010.36		1237.7510010.62		1237.76
10010.97	1237.7510019.39		1237.8710023.61		1237.9310031.31		1237.93	10037	1238.05
10044.06	1238.18	10046.8	1238.2110052.71		1238.2110058.17		1238.15	10063.3	1238.15
10066.94	1238.0210077.96		1237.6210079.19		1237.5310080.22		1237.5310082.11		1237.6
10092.81	1238.4	10098.7	1238.8	10105	1240.4610108.14		1241.3510113.62		1243.5
10117.33	1244.9810117.83		1245.2210118.94		1245.5310120.36		1245.8610123.75		1246.13
10138.69	1246.710148.33		1246.89 10152.6		1247.0310155.73		1247.0710165.57		1247.23
10169.53	1247.6910171.91		1247.8810174.44		1248.2710178.34		1248.7310181.32		1249.35
10181.52	1249.3910182.77		1249.2810188.47		1248.6610193.55		1249.0310198.69		1249.35
10200.27	1249.4610203.18		1249.5810203.23		1249.5810203.29		1249.5810203.34		1249.58
10203.4	1249.5910203.45		1249.5910203.51		1249.5910203.58		1249.5910203.64		1249.59
10203.71	1249.6102 03.78		1249.610203.85		1249.610203.92		1249.6	10204	1249.6
10204.08	1249.610204.16		1249.6110204.24		1249.6110204.33		1249.6110204.42		1249.61
10204.52	1249.6210204.62		1249.6210204.72		1249.6210204.82		1249.6310204.93		1249.63
10205.05	1249.6310205.17		1249.6310205.29		1249.6410205.42		1249.6410205.45		1249.64
10205.55	1249.6510205.71		1249.6510205.99		1249.6610206.21		1249.67 10206.4		1249.68
10206.56	1249.69 10206.7		1249.6910206.82		1249.710206.92		1249.710207.02		1249.7
10207.1	1249.7110207.18		1249.7110207.24		1249.71 10207.3		1249.7210207.36		1249.72
10207.41	1249.7210207.46		1249.72 10207.5		1249.7210207.54		1249.7310207.58		1249.73
10207.62	1249.7310207.65		1249.7310207.68		1249.7310207.71		1249.7310208.63		1249.77
10209.43	1249.7710210.65		1249.7710211.25		1249.7610211.65		1249.7610211.97		1249.76
10212.26	1249.7610212.56		1249.76 10212.9		1249.7610213.35		1249.7610214.03		1249.76
10215.32	1249.7710217.05		1249.7710217.29		1249.7710217.58		1249.7710217.78		1249.76
10218.05	1249.7610218.07		1249.7610218.34		1249.7610218.37		1249.7610218.39		1249.76
10218.67	1249.7610218.72		1249.7610218.77		1249.7510219.06		1249.7510219.32		1249.74
10219.52	1249.7310219.67		1249.7310219.77		1249.7210220.54		1249.7310224.92		1249.61
10244.14	1249.4610271.89		1249.5210276.11		1249.5410277.68		1249.5410286.23		1249.26
10286.26	1249.2610286.27		1249.2610286.28		1249.2610286.31		1249.2710295.68		1249.6
10297.17	1249.61	10300	1249.56						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
9700	.05	9923.12	.03510080.22		.05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

Left	Right	Left	Channel	Right	Coeff Contr.	Expan.
9887.3310120.36		489.9	500	506.8	.1	.3

CROSS SECTION

RIVER: MDOW
REACH: Reach1 RS: 1.576

INPUT
Description:
Station Elevation Data num= 176

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
9700	1247.7	9700.43	1247.69	9708.04	1247.88	9708.52	1247.89	9717.73	1248.2
9718.78	1248.24	9718.82	1248.24	9718.88	1248.24	9731.89	1248.59	9732.62	1248.59
9744.3	1248.64	9745.95	1248.66	9754.67	1248.65	9757.4	1248.61	9764.75	1248.54
9767.28	1248.6	9774.26	1248.54	9778.06	1248.49	9784.66	1248.39	9788.54	1248.19
9792.68	1248.04	9797.36	1247.78	9802.5	1247.47	9806.2	1247.16	9811.55	1246.92
9815.82	1246.71	9819.68	1246.46	9823.64	1246.39	9829.18	1246.29	9832.48	1246.09
9838.92	1245.79	9843.29	1245.65	9849.66	1245.16	9853.55	1245.03	9856.01	1244.87
9861.18	1244.63	9862.88	1244.58	9871.89	1244.32	9875.32	1244.24	9876.56	1244.22

```
 9878.16 1243.79 9879.26 1243.73 9880.06 1243.65 9880.84 1243.58 9881.71 1243.33
  9882.9 1243.04 9883.36 1242.82 9884.24  1242.6 9885.26 1242.26 9886.14 1242.27
 9886.38 1242.28 9886.46 1242.26 9886.73 1242.19 9890.77 1241.04 9893.02 1240.27
  9895.7 1239.55 9899.87 1238.54 9903.36 1237.48 9906.21 1237.07 9912.95    1236
 9915.21 1235.82 9918.34 1235.83 9923.08 1235.72  9931.5 1235.84 9932.87 1235.87
  9938.8 1235.93 9940.96 1235.93 9948.42 1235.87 9951.62 1235.85 9955.13  1235.9
 9959.04 1235.93 9963.66 1235.93 9966.96 1235.87 9972.18 1235.78 9978.47 1235.73
 9982.01 1235.69 9986.77 1235.65 9990.98 1235.41 9992.88 1235.41 9996.49 1235.27
 9999.51 1235.15   10000 1235.1710002.29 1235.2510002.96 1235.2810006.39 1235.33
10009.76 1235.4310012.33 1235.4910016.92 1235.4410020.55 1235.5210025.48 1235.56
10028.36 1235.7210030.69 1235.7210036.99 1235.7210039.52 1235.72   10047 1235.66
10048.57 1235.6610055.67 1235.6510056.76 1235.6810063.93 1235.6710064.39 1235.66
10065.92 1235.6910072.24 1235.53 10074.4 1235.9710074.79 1235.9910082.59 1236.35
10091.02 1237.0610091.36 1237.1110099.92 1238.4210102.48 1238.8210102.67 1238.85
10102.91 1238.9110119.14 1243.0410121.71 1243.1910122.53 1243.1810123.15 1243.42
10123.93 1243.7210124.42 1243.9110133.25 1244.1910142.28 1244.4410145.36 1244.54
10147.03 1244.5710157.86 1244.6410159.55 1244.6510159.99 1244.6610171.21  1244.9
10172.87 1245.0610176.57 1245.5410177.49 1245.6310180.79 1246.1110184.93 1246.67
10186.95  1246.24 10191.5 1245.3110191.91 1245.2110192.16 1245.1810196.73 1244.21
10197.14  1244.2 10201.4 1244.3410202.14 1244.3410205.11 1244.3810205.38  1244.4
10205.54 1244.4210209.21 1244.7610211.91 1245.0410213.96 1245.2410216.38 1245.55
10219.49 1245.1310223.16 1244.7610228.62  1244.810230.41 1244.8110237.46 1244.76
10239.96 1244.7410241.99 1244.7110252.48 1244.7310254.03 1244.7210257.45 1244.78
10265.78 1244.7610270.34 1244.9310272.53  1245.210273.37 1245.2310276.59  1245.3
10279.03  1245.410280.84  1245.410284.49 1245.3310284.84 1245.3410285.19 1245.34
 10285.6 1245.2910287.88 1245.0110289.34 1244.8710290.75 1244.7210296.99 1244.67
10297.55 1244.6710297.84 1244.6610298.09 1244.6710298.22 1244.6810298.63 1244.68
   10300  1244.7

Manning's n Values         num=       3
    Sta   n Val     Sta   n Val     Sta   n Val
*********************************************
    9700     .05 9915.21    .03510072.24     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
       9876.5610124.42              400.4  399.43   396.6             .1      .3

CROSS SECTION


RIVER: MDOW
REACH: Reach1             RS: 1.501

INPUT
Description:
Station Elevation Data    num=     178
    Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*************************************************************************************
   9700 1249.25 9706.53 1249.14 9708.11 1249.09 9711.38 1249.22    9712 1249.27
 9714.79 1249.29 9715.01 1249.28  9715.8 1249.18 9717.49 1249.11 9717.72  1249.1
 9717.79  1249.1 9717.87 1249.09  9722.6 1248.76 9731.03 1248.45 9734.85 1248.41
 9739.78 1248.21 9743.11 1248.02 9749.89 1247.71 9752.15 1247.69 9756.91 1247.35
 9759.42 1247.21  9765.4  1247.1 9766.71 1247.06 9773.25 1246.56 9774.46 1246.48
  9783.1 1246.22 9784.02 1246.15  9789.8 1245.82 9790.52 1245.77 9798.57 1245.15
 9798.73 1245.14 9798.78 1245.14 9798.95 1245.13 9803.73 1244.94 9807.22  1244.8
 9807.83 1244.74 9810.57 1244.55 9814.55 1244.24  9815.7 1243.85 9818.84 1242.74
 9819.65 1242.55  9821.6    1242  9826.9  1240.3  9827.3 1240.13 9827.98 1240.08
 9831.15 1239.79 9832.51 1239.87 9834.94 1240.33 9836.04 1240.61 9841.01 1242.17
 9843.27 1242.41 9847.08 1242.74 9848.82 1242.89 9850.05 1242.98 9855.34    1243
 9857.97 1243.01 9858.34 1242.97 9859.09 1242.89 9863.89 1242.37 9868.74 1240.83
 9869.82 1240.49 9872.96 1240.05 9874.21 1239.83 9876.07 1239.93 9878.54 1239.97
  9879.8 1240.35 9881.03 1240.65 9882.76 1241.02 9885.21 1241.64 9888.41 1242.44
 9892.56 1242.88 9895.54 1243.03 9896.94 1243.21 9903.78 1240.47 9904.09 1240.36
 9904.28 1240.29 9908.31 1239.14 9913.01 1237.47 9915.32 1236.82 9917.86 1236.15
 9923.59 1234.93 9925.16 1234.56 9926.33 1234.51 9927.88 1234.44  9929.5  1234.5
 9929.63  1234.5 9930.81 1234.43 9931.03 1234.42 9931.62 1234.43 9932.14 1234.43
 9940.35 1234.34 9946.48 1234.33 9949.02 1234.31 9955.85 1234.19 9957.91 1234.19
 9964.44 1234.06 9966.25 1234.03 9972.87  1233.9 9974.21 1233.87 9983.42 1233.93
 9984.33 1233.91 9994.66 1233.84 9995.07 1233.84 9995.46 1233.84   10000 1233.88
10004.53 1233.9110004.79 1233.9110004.84 1233.9110005.13 1233.9210009.61 1234.08
10010.67  1234.110012.56  1234.110018.55  1234.110023.38 1234.0210025.82 1233.97
10027.26 1233.9710032.88 1233.9610039.24 1234.01 10043.5 1234.0610049.43  1234.1
10055.53 1234.1510058.52 1234.1810063.16 1234.1310067.17 1234.0510072.15 1234.03
 10074.6 1234.0910080.19 1234.2310084.56 1234.3110085.46 1234.3310086.31 1234.36
10095.13 1234.5110105.75 1234.6910106.57 1234.65 10107.1 1234.7110107.92 1234.82
10110.86 1235.0410119.19  1236.210121.07 1236.4710128.17 1237.3610131.13 1237.73
10131.34 1237.7610136.64 1238.8510141.36 1239.5810142.12  1239.710144.01 1239.74
10151.04 1239.9410151.48 1240.0510152.22 1240.2510152.34 1240.2710152.75 1240.28
10173.09 1241.3710182.75 1241.6210187.28 1241.7410189.94 1241.7610200.69 1241.84
10201.83 1241.9110205.56 1242.2210206.04 1242.2310211.05 1242.7910213.15 1243.02
10213.41    124310216.13 1242.6610220.36 1242.4810224.15 1242.3410225.87 1241.37
10227.29 1240.5610230.23 1240.5610234.12 1240.6210237.65 1240.5610239.43 1240.52
10242.35 1240.5210252.93 1240.6810264.06 1240.8210278.36 1240.9510286.68 1241.09
10292.74 1241.1410297.68 1241.08   10300 1241.09

Manning's n Values         num=       3
    Sta   n Val     Sta   n Val     Sta   n Val
*********************************************
    9700     .05 9927.88    .03510106.57     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
       9908.3110142.12              99.2  102.63    108             .1      .3

CROSS SECTION


RIVER: MDOW
REACH: Reach1             RS: 1.481

INPUT
Description:
Station Elevation Data    num=     158
    Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*************************************************************************************
   9700 1248.86 9705.82 1248.86 9709.67 1248.76 9713.51 1248.65 9722.18  1248.5
 9722.98 1248.48 9723.54 1248.46 9723.86 1248.45 9730.51 1248.41 9730.69  1248.4
 9732.58 1248.42 9737.85 1248.42 9738.65  1248.4 9745.76 1248.05 9746.63 1248.02
 9752.92 1247.65 9755.29 1247.61 9759.31 1247.51    9761 1247.51 9764.66 1247.39
 9769.47 1247.17 9772.29 1246.95 9774.22 1246.96 9779.56    1247 9781.01  1246.9
 9785.02 1246.72 9788.89  1246.6 9790.65 1246.46 9793.93 1246.48 9799.18 1246.02
 9799.74    1246 9803.36 1246.22 9803.77 1246.18 9806.59 1245.53 9812.04 1245.15
 9812.42 1245.12 9813.01 1245.08  9818.1 1244.95 9818.56 1244.94 9819.12 1244.94
 9822.19 1245.27 9823.08 1245.32  9824.6 1245.26 9825.39 1245.24 9828.96 1245.06
 9830.48 1244.91 9833.53 1244.85 9835.89 1244.71 9836.45 1244.65 9837.13  1244.6
 9838.69 1244.39 9841.91 1243.96 9843.28 1244.09 9845.18 1244.21 9846.78 1244.24
  9849.4 1244.31 9850.16 1244.38 9855.31 1244.18 9857.73 1244.18 9860.36 1244.11
 9862.61 1243.85 9864.92 1243.89 9867.06 1243.68  9870.3 1243.41 9871.94 1243.33
  9874.5 1243.09 9877.97 1242.89 9879.48 1242.94  9883.6 1242.72 9885.04 1242.61
 9888.59 1241.92 9891.46 1241.36 9891.81 1241.29 9893.04 1240.97  9898.6 1239.56
 9900.02 1239.55 9903.47 1239.33 9907.55 1238.34 9922.88 1234.72 9924.86 1234.29
 9927.85 1234.18 9928.32 1234.14 9929.03 1234.03  9938.3 1233.81 9940.43 1233.78
 9942.41 1233.76 9961.64 1233.44 9964.35  1233.4 9981.07 1233.39 9983.12 1233.42
 9986.23 1233.53 9992.32 1233.67 9995.59 1233.62   10000 1233.6210002.68 1233.62
10004.82 1233.6310007.22 1233.5910013.22 1233.6110015.62 1233.6410025.34 1233.75
 10027.6 1233.7510047.82 1233.7610049.13 1233.7910054.21 1233.55 10055.1 1233.54
10055.88 1233.5510077.66 1233.7910078.06  1233.810078.26  1233.810079.75 1233.81
10102.49 1233.9410102.85 1233.9610103.24 1233.9910109.39 1234.5410109.88 1234.57
10121.71 1235.2910121.99 1235.3210135.25 1236.5210137.52 1236.6810150.43 1237.67
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10155.91 1238.01 10163.4 1238.5110166.57 1238.8610166.58 1238.8610166.61 1238.87
   10167 1238.8710176.23 1239.0710177.59 1239.1110190.99 1239.5510199.12 1239.56
10204.79 1239.5810205.66 1239.6510206.42 1239.6710207.43 1239.5510208.65  1239.6
 10210.1 1240.0910211.64 1240.6410213.24 1241.03 10217.3 1241.9510223.07 1240.71
10224.06 1240.4510228.27 1239.1910228.51 1239.1310228.74 1239.1210234.69 1239.15
 10235.3  1239.210236.68 1239.24 10248.9 1239.5110249.62 1239.54 10256.4  1239.9
10256.59 1239.9110258.11 1239.9110268.44  1239.910271.82 1239.9310272.77 1239.98
10278.59 1239.9410285.83 1239.94   10300 1239.95

Manning's n Values         num=        3
     Sta    n Val      Sta    n Val      Sta    n Val
*********************************************
    9700     .025 9903.47      .0210166.57     .025

Bank Sta: Left   Right     Lengths: Left Channel   Right     Coeff Contr.    Expan.
       9903.4710166.57              403.1  397.37   388.8             .1        .3

CROSS SECTION


RIVER: MDOW
REACH: Reach1              RS: 1.406

INPUT
Description:
Station Elevation Data     num=      263
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev
*********************************************************************************
    9700 1243.02 9700.12 1243.01 9706.38 1241.85 9708.23 1241.58 9708.87  1241.7
 9709.66 1241.63 9715.17 1240.63 9715.19 1240.63 9715.28 1240.61 9719.89 1240.43
 9720.73 1240.39 9724.93 1239.97 9727.49 1239.72 9728.59 1239.54 9729.14 1239.28
 9730.06 1239.15 9731.58 1238.94 9734.25 1239.82 9734.84 1240.02 9739.15 1241.24
 9740.98 1241.41 9744.61 1240.67  9746.5 1240.72 9748.31 1240.49 9751.15 1240.23
 9752.31 1240.07 9755.48  1240.2 9757.06 1240.48 9758.87 1240.76 9760.26  1240.8
 9762.83 1240.94 9764.82  1240.9 9766.59 1240.74 9769.11 1240.78  9772.6 1241.22
 9774.75 1241.47 9775.62 1241.52 9781.91 1242.17 9782.77 1242.18  9783.2 1242.15
 9787.26 1242.15 9789.75 1242.23 9792.61 1242.44 9796.25 1242.67 9800.44 1242.71
 9801.81 1242.82 9804.77 1242.98 9807.99 1243.14 9810.44 1242.47 9813.52 1241.78
  9819.6 1239.49 9821.71  1238.7 9824.48 1237.75 9833.37 1234.75 9842.01 1231.88
 9842.85  1231.6  9843.3 1231.45 9853.96 1228.04 9861.42 1225.31 9862.66 1224.91
  9863.6 1224.64  9868.7 1223.21 9877.54 1220.43 9880.62 1219.46 9891.47 1215.91
  9893.8 1215.21 9899.03 1213.89  9908.9 1211.47  9911.7 1211.08 9915.18 1210.59
 9917.81 1210.52 9921.81 1210.46 9926.45 1210.31 9928.77 1210.31 9930.89 1210.31
 9933.17 1210.44 9934.78  1210.5 9936.63 1210.33 9937.85 1210.19 9939.36 1210.14
 9940.41 1210.13 9942.77 1210.18 9947.76 1210.12 9951.96 1210.13 9956.65 1210.14
 9960.66 1210.15 9966.58 1210.06  9970.3 1209.96 9975.45 1209.96 9987.02 1210.18
 9988.38 1210.18 9994.99 1210.14 9996.52 1210.12   10000 1210.1510000.49 1210.15
10001.15 1210.1210002.45 1210.0310003.37 1209.9410003.59 1209.9410014.36 1210.07
10015.68 1210.0510016.87 1210.0510032.82 1210.1610034.05 1210.1910035.12  1210.2
10036.45  1210.210052.23 1210.3110053.44 1210.3210054.47 1210.3210071.23 1210.66
10075.29   121110077.84 1211.23 10082.2 1211.3310093.87 1214.47 10096.2 1214.98
10096.96 1215.1910109.74 1218.6910110.35 1218.9110119.32  1221.610122.34 1222.49
10127.29 1223.9810128.82 1224.4410132.08 1225.6310135.67 1226.8310139.61 1228.04
10144.97  1229.610152.65 1233.7310155.11 1234.9710157.48 1235.5710160.05  1236.2
10160.52 1236.3310161.53 1236.56 10164.7 1236.8110172.86 1237.4210177.34 1237.73
10179.67 1237.7710191.71 1237.7910194.41 1237.8210204.71 1238.0210209.27 1238.29
10211.17 1238.28 10213.4 1238.5410217.58 1239.1810223.01 1238.4210223.27 1238.38
10223.54 1238.3410223.94 1238.2710224.79 1238.0810226.64 1237.7910227.53 1237.85
10230.93 1238.24 10231.1 1238.26 10234.6 1238.3910235.43 1238.4410236.98 1238.58
10241.05 1238.7510241.25 1238.7710243.64 1238.92 10244.2 1238.9810247.73 1238.97
10247.81 1238.9710247.89 1238.9710247.98 1238.9710248.06 1238.9710248.15 1238.97
10248.23 1238.9710248.32 1238.97 10248.4 1238.9710248.48 1238.9710248.57 1238.97
10248.65 1238.9710248.73 1238.9710248.81 1238.9710248.89 1238.9710248.96 1238.97
10249.04 1238.9710249.11 1238.9710249.64 1238.9710249.72 1238.97 10249.8 1238.97
10252.77 1238.9510252.89 1238.95   10253 1238.9510253.11 1238.9510253.23 1238.95
10253.34 1238.9510253.45 1238.9510253.56 1238.9510253.66 1238.9510253.77 1238.95
10253.87 1238.9510253.97 1238.9510254.07 1238.9510254.17 1238.9510254.26 1238.95
10254.35 1238.9510254.44 1238.9510254.53 1238.9510254.61 1238.9510254.69 1238.95
10254.77 1238.9510254.85 1238.9510261.15 1238.97 10261.3 1238.9710261.46 1238.97
10261.61 1238.9710261.76 1238.9710261.91 1238.9710262.05 1238.9710262.19 1238.97
10262.33 1238.9710262.47 1238.9710262.61 1238.9710262.74 1238.9710262.87 1238.97
10262.99 1238.9710263.11 1238.9710263.23 1238.9710263.35 1238.9710263.46 1238.97
10263.58 1238.9710263.68 1238.97 10266.5 1238.9710268.84 1238.9710272.57 1238.97
10272.67 1238.9710272.68 1238.9710272.69 1238.97 10272.7 1238.9710272.71 1238.97
10272.72 1238.9710272.73 1238.9710272.74 1238.9710272.75 1238.9710272.76 1238.97
10272.77 1238.9710272.78 1238.9710272.79 1238.97 10272.8 1238.9710272.81 1238.97
10272.82 1238.9710272.83 1238.9710272.84 1238.9710272.85 1238.9710272.86 1238.97
10272.87 1238.9710272.88 1238.9710272.89 1238.97 10272.9 1238.9710272.91 1238.97
10272.92 1238.9710272.93 1238.9710272.94 1238.9710272.95 1238.9710272.96 1238.97
10272.97 1238.9710272.98 1238.9710272.99 1238.97   10273 1238.9710273.01 1238.97
10273.02 1238.9710291.39 1238.92   10300 1238.79

Manning's n Values         num=        3
     Sta    n Val      Sta    n Val      Sta    n Val
*********************************************
    9700     .025 9862.66      .0210128.82     .025

Bank Sta: Left   Right     Lengths: Left Channel   Right     Coeff Contr.    Expan.
       9862.6610128.82              236.5  234.93   233.4             .1        .3

CROSS SECTION


RIVER: MDOW
REACH: Reach1              RS: 1.362

INPUT
Description:
Station Elevation Data     num=      151
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev
*********************************************************************************
    9700 1246.31 9704.92 1246.31 9705.64 1246.29 9713.06 1246.15 9713.86 1246.15
 9714.33 1246.16 9730.94 1246.23 9731.28 1246.23  9731.9 1246.23 9746.94 1246.23
 9747.44 1246.22 9759.87 1246.22  9760.2 1246.23 9774.95 1246.15 9775.04 1246.15
 9775.13 1246.15 9783.14 1246.09 9785.39 1246.07  9785.4 1246.07 9789.15 1246.22
 9789.18 1246.22 9789.51 1246.23 9800.09 1246.02 9803.93 1246.37 9804.84 1246.43
 9804.88 1246.46 9804.97 1246.45 9809.04 1246.06 9815.24 1244.13 9819.96 1242.75
 9827.89 1240.35 9830.78 1239.45 9840.84 1235.98 9842.64 1235.35 9845.61 1234.32
 9852.25 1232.05 9856.09 1230.78 9862.63 1228.84 9873.99 1225.37  9875.3 1224.97
 9876.07  1224.7 9884.63 1221.62 9887.82 1220.39 9890.42 1219.32 9891.71 1218.83
 9896.67 1217.02  9898.9 1216.35 9905.59 1214.46 9905.91 1214.37 9906.65 1214.26
 9911.47 1213.57 9911.92 1213.41 9912.43 1213.36 9916.21 1212.94 9920.91 1212.76
 9921.68 1212.95 9923.01 1213.07  9924.2  1212.9 9924.69 1212.74 9928.82 1212.59
 9931.33 1212.39  9941.6 1212.15 9944.82 1212.04  9950.8 1211.66 9959.04 1211.23
 9963.79 1210.77 9966.02 1210.58 9966.47 1210.55 9968.03 1210.58 9971.62 1209.86
 9975.69  1209.6 9981.09 1209.15 9991.35    1209 9993.82  1208.9 9995.65 1208.87
 9997.45 1208.28 9997.97 1208.34   10000 1208.3310002.59  1208.310003.86 1208.31
10005.12 1208.7810006.01 1208.73 10009.9 1208.8910016.48 1208.6110019.63 1209.38
10025.69 1209.7710027.64 1209.7510034.83 1209.4410037.33  1209.5 10047.1 1209.78
 10051.7 1210.1610061.68 1210.4610066.07  1210.910068.66 1211.2110069.82 1211.34
10071.66 1211.4410073.48 1211.5710077.98 1211.9510079.09 1212.0510082.53 1212.46
10088.12 1212.9310088.55 1212.9710090.55 1213.2410092.28 1213.1510094.27 1213.39
10102.01  1215.410109.57 1217.4710113.36 1218.7310116.48 1219.7510119.54 1220.87
10124.42  1222.710125.97  1223.210131.78  1225.210134.81 1226.25 10136.4 1226.88
10140.54 1228.3810143.98 1229.8510152.88 1234.5410153.59 1234.8910153.92 1234.98
10157.49 1235.81 10164.8 1237.3910168.71  1237.6 10181.1 1238.0910192.21 1238.29
10194.63 1238.3410201.85 1238.4710207.46 1238.5710208.45  1238.610209.17 1238.67
10211.99 1238.9110218.35 1239.56 10220.7 1239.8710223.56 1239.5910227.57 1239.28
```

10231.41 1238.5610232.34 1238.3910233.49 1238.4710237.26 1238.7710238.62 1238.8
10240.11 1238.8410248.89 1239.4310251.42 1239.5710260.22 1239.8810260.49 1239.89
10266.13 1240.0310270.55 1240.1710275.89 1240.0810279.64 1239.9610283.82 1239.78
10300 1239.7

Manning's n Values num= 3
Sta n Val Sta n Val Sta n Val
9700 .025 9873.99 .0210134.81 .025

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
9873.9910134.81 500 500 499.7 .1 .3

CROSS SECTION

RIVER: MDOW
REACH: Reach1 RS: 1.267

INPUT
Description:
Station Elevation Data num= 146
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
9700 1242.44 9706.3 1242.37 9722.08 1242.39 9729.01 1242.37 9729.7 1242.51
9730.51 1242.61 9731.28 1242.62 9735.99 1242.89 9740.21 1243.04 9748.38 1243.2
9753.88 1243.14 9763.02 1243.24 9768.96 1243.33 9778.45 1243.5 9785.51 1243.58
9792.58 1243.54 9799.43 1243.49 9808.27 1243.47 9814.75 1243.49 9816.54 1243.38
9821.76 1243.26 9826.7 1242.29 9827.63 1242.12 9828.43 1241.85 9829.74 1241.4
9830.12 1239.3 9830.34 1238.39 9831.15 1238.06 9840.5 1233.19 9843.84 1231.41
9849.29 1228.32 9853.16 1226.01 9856.96 1224.21 9859.82 1223.25 9866.3 1221.34
9874.17 1219.13 9875.56 1218.97 9875.71 1218.95 9876.86 1218.86 9877.13 1218.89
9877.71 1218.89 9878.91 1218.93 9879.66 1218.98 9880.53 1219.11 9882.3 1219.05
9883.4 1219.05 9884.14 1218.91 9884.89 1218.71 9886.01 1218.65 9886.95 1218.73
9888.81 1218.93 9889.06 1218.97 9890.09 1218.63 9897.19 1216.36 9898.21 1216.01
9900.53 1215.33 9902.05 1214.78 9912.01 1211.33 9913.56 1211.48 9914.54 1211.63
9916.2 1211.69 9918.03 1211.81 9923.64 1211.91 9926.17 1211.97 9926.96 1212.24
9928.09 1212.63 9928.33 1212.42 9929.44 1211.71 9937.21 1211.31 9940.37 1211.14
9953.91 1209.93 9968.2 1208.64 9975.2 1207.83 9976.41 1207.68 9982.42 1207.24
9983.56 1207.14 9983.77 1207.13 9984.05 1207.11 9989.09 1206.73 9998.65 1206.32
10000 1206.2610001.35 1206.1910016.32 1206.7510016.83 1206.7810017.32 1206.82
10031.71 1208.3410047.92 1209.4810057.56 1210.1810058.15 1210.1610059.52 1210.1
10068.42 1210.6310073.37 1210.8410086.92 1210.5410089.49 1210.4910090.89 1210.84
10091.75 1210.5 10091.9 1210.5110092.16 1210.5510101.33 1211.9410101.94 1212.11
10111.82 1215.1910116.13 1216.4510131.06 1220.8510143.44 1225.310147.09 1226.43
10148.97 1227.2510162.55 1233.7610164.45 1234.6410164.92 1234.9110165.56 1234.93
10166.23 1234.9410167.24 1235.17 10169.8 1235.9910173.36 1235.9910174.01 1236.04
10175.63 1236.0910178.19 1236.3710181.18 1236.4210186.03 1236.7510197.89 1237
10199.59 1237.0410200.56 1237.0510212.82 1237.2310215.05 1237.5710215.62 1237.69
10224.97 1239.8510225.62 1240.0210226.42 1239.92 10235.8 1239.0310235.82 1238.88
10238.32 1238.910239.95 1239.0110247.71 1239.3210253.26 1239.5310263.06 1239.67
10268.77 1239.7810272.72 1239.69 10274.8 1239.7610278.61 1239.7810279.95 1239.84
10281.91 1239.8310282.85 1239.7910284.95 1239.8810285.46 1239.8710288.54 1239.86
10300 1239.8

Manning's n Values num= 3
Sta n Val Sta n Val Sta n Val
9700 .05 9923.64 .03510089.49 .05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
9889.0610131.06 685.8 686.37 686.4 .1 .3

CROSS SECTION

RIVER: MDOW
REACH: Reach1 RS: 1.137

INPUT
Description:
Station Elevation Data num= 151
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
9700 1234.79 9701.18 1234.72 9708.01 1233.85 9712.22 1233.38 9714.9 1233.08
9718.31 1232.6 9721.39 1232.18 9727.9 1231.76 9730.05 1231.56 9731.32 1231.64
9738.11 1231.22 9739.35 1231.07 9740.67 1230.93 9741.45 1230.81 9747.26 1230.14
9748.05 1230.09 9748.52 1230.04 9755.03 1228.88 9755.91 1228.71 9756.3 1228.61
9760.82 1228.05 9761.37 1227.92 9762.72 1227.6 9764.06 1227.38 9774.25 1225.23
9776.26 1224.97 9776.72 1224.83 9777.73 1224.55 9779.26 1224.18 9781.64 1223.62
9782.37 1223.44 9782.63 1223.38 9784.15 1222.85 9786.13 1222.31 9786.18 1222.3
9786.21 1222.29 9787.72 1222.43 9788.22 1222.54 9790.75 1222.85 9794.34 1223.15
9797.01 1223.4 9798.47 1223.54 9804.91 1223.17 9807.8 1223.25 9808.97 1223.25
9809.61 1223.16 9815.23 1222.22 9823.52 1220.09 9826.36 1219.4 9829.69 1218.19
9833.16 1217.2 9837.28 1215.79 9838.31 1215.57 9842.88 1215.36 9846.13 1215.17
9847.02 1215.22 9857.16 1215.3 9859.63 1215.28 9872.91 1215.45 9875.67 1215.51
9876.75 1215.56 9879.05 1215.66 9879.69 1215.67 9891.82 1212.05 9893.22 1211.63
9893.71 1211.47 9894.53 1211.21 9895.05 1211.05 9895.46 1210.91 9897.75 1210.19
9905.8 1207.64 9909.32 1208.49 9909.56 1208.54 9909.65 1208.57 9909.68 1208.56
9910.87 1208.21 9914.66 1208.15 9918.13 1208.02 9919.24 1208.25 9919.95 1208.48
9920.79 1208.09 9921.49 1207.75 9937.78 1206.7 9945.41 1206.16 9960.77 1205.15
9965.35 1204.87 9968.98 1204.6 9980.35 1203.83 9982.09 1203.69 9988.67 1203.22
9991.57 1203.09 9992.65 1203.08 9995.27 1203.07 9999.88 1203.09 10000 1203.1
10007.58 1203.6510010.41 1203.8610021.96 1204.5910053.29 1206.5310060.05 1206.94
10069.28 1207.5810078.85 1207.7310082.35 1207.7610084.54 1207.7910085.74 1207.79
10089.41 1208.4110093.42 1209.06 10107.6 1212.9210110.71 1213.7510116.39 1215.33
10120.73 1216.5210127.01 1218.510129.78 1219.3910142.55 1224.12 10154.1 1228.27
10155.17 1228.3710155.95 1228.3910156.82 1228.7710157.42 1229.0410161.66 1229.27
10161.74 1229.2810161.79 1229.2810161.86 1229.2910166.17 1229.8210170.91 1230.09
10174.7 1230.3510184.48 1230.4510188.89 1230.5210192.53 1230.5810202.07 1230.94
10202.74 1230.9410203.96 1231.1410204.16 1231.2210206.53 1231.8310209.35 1233.18
10211.23 1233.8410215.09 1235.4710218.63 1236.410224.55 1235.6810232.08 1234.74
10233.76 1234.9310235.79 1234.9710240.66 1234.8910240.76 1234.910241.47 1234.91
10254.73 1235.2710264.99 1235.4710272.17 1235.57 10278.8 1235.5710293.35 1235.61
10300 1235.59

Manning's n Values num= 3
Sta n Val Sta n Val Sta n Val
9700 .05 9905.8 .03510085.74 .05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
9879.6910116.39 500.4 500 499.5 .1 .3

CROSS SECTION

RIVER: MDOW
REACH: Reach1 RS: 1.042

INPUT
Description:
Station Elevation Data num= 166
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
9700 1215.04 9700.15 1215.04 9701.54 1215 9702.81 1214.94 9712 1214.89
9714.58 1214.86 9718.88 1214.87 9722.27 1214.87 9729.66 1214.94 9737.67 1214.97
9741.04 1215.01 9743.12 1214.98 9751.74 1215.02 9753.56 1215.04 9763.64 1215

```
 9766.76 1215.02 9775.92 1215.11 9779.26 1215.14 9787.97 1215.24 9791.07 1215.24
 9796.22 1215.18 9798.96 1215.19 9805.31 1215.15 9808.27 1215.28 9809.72 1215.18
 9814.55 1214.83 9815.48 1214.77  9816.4 1214.66 9820.36 1214.08 9821.02 1213.95
 9821.29 1213.89 9821.53 1213.77 9823.43  1212.8 9825.21 1213.42 9827.39 1214.16
  9829.2 1214.17 9830.67 1214.16 9831.26 1214.24 9833.43 1214.73 9837.17 1215.56
 9839.72 1216.24 9842.08 1216.65 9843.13 1216.71  9847.1 1216.75 9849.84 1216.59
 9850.42 1216.57 9853.02 1216.34 9853.48 1216.31 9856.45 1216.47  9856.8 1216.49
 9860.66 1216.53 9861.04 1216.53 9864.76 1216.53 9865.22 1216.54 9868.86 1216.21
 9869.12 1216.19 9869.42 1216.13 9875.13 1215.26 9875.35 1215.22 9882.37    1214
 9882.57 1213.95 9884.88 1213.33 9887.54 1212.58 9888.17 1212.49 9891.39 1211.31
 9892.68 1210.81 9893.37 1210.53 9896.69 1209.28 9897.12 1209.14 9900.69 1208.02
 9900.81 1207.96 9902.03 1207.41 9904.01  1206.8 9904.74 1206.58  9906.4 1206.09
 9910.43 1205.56 9910.81 1205.49 9911.05 1205.54 9913.32 1206.04 9914.74 1205.58
 9914.93  1205.5 9918.41 1205.62 9918.43 1205.62 9918.53 1205.65  9920.7 1206.25
 9922.08  1205.7 9922.11 1205.69 9922.63 1205.66 9941.37 1204.81 9948.36 1204.32
 9957.11  1203.7 9962.78 1203.33 9967.22 1202.91 9979.07 1201.76 9985.91 1201.23
 9987.28 1201.12  9987.7  1201.1 9990.89 1201.02 9996.49 1201.04   10000 1200.99
10000.27 1200.9910005.58 1201.2510015.43 1201.6210032.67 1203.1510051.26 1204.68
10062.07 1205.22 10065.6 1205.3610069.86 1205.37 10077.2 1205.3710081.51 1205.35
10082.79 1205.2610084.01 1205.2310085.36 1205.3210085.45 1205.3310085.49 1205.32
   10087 1205.0710088.75 1205.2810091.45 1205.6610097.94 1206.9510105.36 1208.19
10111.08 1209.4210118.83  1211.110127.49 1212.9510131.34 1213.7210133.24 1214.12
10143.09 1216.1310148.96 1217.8410150.19 1218.3210151.93 1218.9810154.17 1219.91
 10155.2  1219.610155.31 1219.5510155.37 1219.5310155.48 1219.5910156.53 1220.09
10161.56 1220.3210167.05 1220.6310170.48 1220.7510177.08 1220.97 10189.2 1221.38
10191.57 1221.4310196.51 1221.5110204.34 1221.7310207.05 1221.6710209.88 1221.64
10210.73 1221.6510212.02 1221.9510215.31 1222.9110220.97    122510222.13 1225.34
10224.58  1225.9 10235.2  1228.210238.69 1228.7310255.24    123010260.84 1229.68
10272.22 1229.1410272.32 1229.1310274.23 1229.1910274.77 1229.32 10275.8 1229.36
 10279.8 1229.4310280.07 1229.4810280.74 1229.2410284.45 1229.3510294.35 1229.68
   10300 1229.81

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
**********************************************
    9700     .05 9922.08    .03510085.36     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
       9864.7610143.09             553.8  555.03   555.9             .1      .3

CROSS SECTION


RIVER: MDOW
REACH: Reach1             RS: 0.937

INPUT
Description:
Station Elevation Data    num=     113
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
**************************************************************************************
    9800 1221.51 9802.62  1220.3 9805.72 1219.11 9808.16 1217.39 9810.46 1215.72
 9811.41 1215.25 9814.91 1213.44 9819.89 1211.49 9820.72 1211.14 9822.04 1211.34
 9826.79 1211.92 9829.89 1211.93 9831.84 1211.87 9832.35 1211.86 9834.37 1211.79
 9835.84  1211.8 9837.03 1211.79 9837.86 1211.79 9839.43 1211.85  9841.1 1211.94
 9842.53 1211.96 9843.82 1211.98 9845.25 1212.39 9845.26  1212.4 9846.52 1211.95
  9846.6 1211.91 9849.61 1211.92 9850.68 1211.92 9855.48 1211.98 9857.58 1212.03
 9859.33 1212.08 9860.55 1212.12  9861.5 1212.18 9862.29 1212.22 9863.21 1212.27
 9863.72  1212.28 9864.26 1212.42 9865.21 1212.64 9866.81  1213.1 9867.27  1213.2
  9873.2 1213.38 9874.39 1213.39 9874.52 1213.38 9874.91 1213.43 9878.12 1213.49
 9878.99  1213.5 9879.29 1213.51 9880.59 1213.61 9883.03 1213.83 9888.72 1213.69
 9892.58 1213.62 9893.51 1213.14 9894.37 1212.51 9903.42 1207.44 9907.42 1206.01
 9910.55 1204.85 9913.85 1204.13 9916.59 1203.49  9917.2 1203.52 9919.74 1203.71
 9921.53 1203.26 9921.82 1203.19 9922.01 1203.19 9930.27 1203.22 9940.17  1202.7
 9950.22 1202.09 9957.32 1201.59  9963.3  1201.1 9976.14 1199.99 9976.31 1199.97
 9976.44 1199.96 9977.66 1199.84 9987.92 1198.85 9989.06 1198.85   10000 1198.75
10001.75 1198.7410005.69 1198.9310008.92  1199.110024.63 1200.3510027.72 1200.59
10030.16 1200.7510033.92 1200.9910061.43 1202.7110066.18 1202.9110073.81 1203.23
10083.64 1203.3310088.47 1203.3910089.67 1203.2110090.16 1203.1210090.74 1203.14
 10093.75 1203.2310101.23 1204.14 10103.5 1204.4210108.79 1205.6410115.65 1207.25
10122.94 1209.2910128.66 1210.9110130.79 1211.5310138.29 1213.7110147.03 1216.62
10149.34 1217.3810150.13 1217.7310158.37 1221.2210163.89 1224.1110166.78 1225.59
10167.04 1225.6810168.78 1226.3310174.65 1226.6510176.72 1226.77   10181 1227.02
10185.25 1227.2510187.71 1227.35   10200  1227.7

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
**********************************************
    9800     .05 9921.82    .03510083.64     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
       9892.5810138.29              556  600.99   631.9             .1      .3

CROSS SECTION


RIVER: MDOW
REACH: Reach1             RS: 0.823

INPUT
Description:
Station Elevation Data    num=     235
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
**************************************************************************************
 9544.29 1218.72 9548.74 1218.53 9549.86 1218.48 9550.23 1218.45 9556.59 1217.97
 9559.22 1217.75 9560.43 1217.61 9561.12 1217.52 9562.49 1217.42 9565.97  1217.1
 9567.37  1217.1 9567.65 1217.02 9568.94 1216.48 9569.35 1216.43 9569.54 1216.41
 9571.85 1216.16 9572.34  1216.1 9573.46 1215.95 9573.59 1215.93  9574.2  1215.8
 9577.54 1215.23 9578.56 1215.11 9579.68 1215.04 9581.57 1214.95 9583.01 1214.87
 9585.27 1214.67 9587.08 1214.54  9588.2 1214.54 9588.81 1214.56 9590.91 1214.52
 9591.91 1214.43 9592.18 1214.42 9592.76 1214.42 9595.84 1214.37 9596.33 1214.36
 9596.35 1214.36 9596.93 1214.25 9600.82 1213.46 9603.41 1212.71 9605.17 1212.22
 9605.35 1212.11  9606.4 1211.74 9611.18 1209.87 9612.39 1209.59 9613.74 1209.24
 9616.92 1208.52 9617.45 1208.47 9619.21 1208.27 9620.62 1208.13 9621.03 1208.04
 9621.73 1207.81 9622.26 1207.55 9622.82 1207.34 9625.81 1207.11 9627.34 1207.06
 9627.78 1207.01 9628.86 1206.76 9631.77  1206.5  9633.9 1206.43 9634.48 1206.48
 9637.49 1206.45 9637.95 1206.45 9638.98 1206.46 9647.16 1206.23 9647.84 1206.24
 9648.59 1206.24 9650.86 1206.32 9651.39 1206.33 9653.18 1206.44 9653.78 1206.46
 9656.36 1206.57 9658.87 1206.77 9663.69 1207.18 9667.81 1207.31 9668.17 1207.32
  9668.5 1207.33 9675.06 1207.72 9675.62 1207.75 9676.46 1207.79 9684.74 1208.05
 9686.01 1208.09 9689.37 1208.33 9693.71 1208.32 9694.76 1208.35 9697.28 1208.27
 9701.04 1208.23 9704.84 1208.24 9706.79 1208.25 9708.92 1208.32 9714.28 1208.36
 9714.88 1208.36 9723.82 1208.36 9723.92 1208.36 9736.22 1208.17 9736.28 1208.17
 9736.56 1208.17 9736.72 1208.16 9744.19 1208.07 9752.75 1207.88 9752.96 1207.88
 9753.13 1207.87 9764.19 1207.44 9764.71 1207.42 9764.99  1207.4 9765.24 1207.39
 9775.36 1207.09 9775.68 1207.12 9776.47 1207.07 9777.54 1206.95 9778.71 1206.89
 9785.71 1206.67 9786.52  1206.7  9787.6 1206.66  9787.8 1206.59 9789.16 1206.56
 9790.67 1206.38 9790.77 1206.37 9791.18 1206.32  9792.5 1206.24 9793.02 1206.19
 9793.51 1206.13 9794.74 1206.18 9796.19 1206.07 9799.95 1205.82 9801.77  1205.8
 9804.27 1205.57  9807.8  1205.6 9809.18 1205.62 9814.43 1205.55 9816.07 1205.51
  9819.6 1205.54 9820.78 1205.53 9823.19 1205.59 9825.41  1205.4 9825.68 1205.38
 9825.72 1205.38  9828.5 1205.12 9834.26 1205.15 9837.42 1205.07 9838.15 1205.01
  9843.1 1205.12 9843.77 1205.09    9847 1205.25 9851.85 1205.13 9852.38 1205.12
 9857.14 1205.02 9860.07 1205.04 9864.31 1205.01 9866.07 1205.04 9868.66 1205.03
 9869.53 1205.13 9870.12  1205.2 9872.34 1204.62 9875.98 1203.68 9879.26 1202.97
 9882.01 1202.33  9890.6 1201.19 9893.25 1200.86 9897.55 1200.49  9898.2 1200.42
 9899.07 1200.35 9902.47 1200.16 9908.49  1199.8 9908.92 1199.87 9910.49 1200.13
 9911.61 1199.71 9911.88  1199.6 9922.78 1199.15 9928.71  1198.8 9936.46 1198.32
```

```
 9940.11 1198.11 9951.77 1197.28 9957.77 1196.83 9959.56 1196.69 9964.44 1196.33
 9966.11 1196.21 9967.62  1196.2 9984.17 1196.33 9991.85 1196.07 9993.53 1196.05
 9999.08 1195.8410000.01 1195.7910001.07 1195.7310002.78 1196.0210004.57 1196.33
10007.96 1196.6710012.56 1197.0910017.65 1197.4810028.97 1198.3110035.98 1198.82
10044.75 1199.4410055.13 1200.2210060.53 1200.5710064.84 1200.9110075.85 1201.47
10075.93 1201.4810078.09 1201.82 10081.8 1202.2710082.89 1202.43 10088.4 1203.27
10101.56 1205.2610115.03 1207.5710119.42 1208.2810131.71 1210.2110132.02 1210.26
10136.37 1211.1710137.83 1211.4710145.23 1212.9310148.88 1213.5510156.77 1215.26
10163.82    121710174.66 1219.9810183.57 1222.5810189.36 1224.9210192.63 1226.24
10194.42 1226.45 10197.3 1226.6210201.98 1226.8310204.15 1226.9710204.32 1227.03
10205.39 1227.3410206.31 1227.1210206.74    1227 10209.5 1227.0610218.43 1227.23
10223.99 1227.2910229.47 1227.3510244.82 1227.7810247.72 1227.8510254.32  1227.8
10262.15 1227.7210264.54 1227.8810265.55  1227.910268.78 1228.1810270.66 1228.38

Manning's n Values         num=       4
    Sta    n Val     Sta    n Val     Sta    n Val     Sta    n Val
**************************************************************************
 9544.29     .05 9870.12    .03510078.09     .0210132.02     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.    Expan.
       9595.8410148.88             103.9  165.71     207            .3       .5

CROSS SECTION


RIVER: MDOW
REACH: Reach1              RS: 0.792

INPUT
Description:
Station Elevation Data    num=     335
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev
**************************************************************************************
    9500 1219.74  9503.8 1219.76 9504.34 1219.76 9509.74 1219.81 9510.87 1219.82
 9511.34 1219.82 9516.33 1219.78 9519.78 1219.79 9524.93 1219.74 9527.21 1219.71
 9529.14 1219.68 9529.34 1219.68 9529.79 1219.68 9531.65 1219.68 9533.87 1219.67
  9535.2 1219.64 9535.31 1219.64 9535.56 1219.65 9535.93 1219.64 9537.53 1219.66
 9538.88   1219.6  9540.3 1219.57  9541.5 1219.57 9543.64 1219.51 9544.42 1219.47
 9547.72 1219.28 9547.75 1219.28  9547.8 1219.28 9552.45 1218.44 9555.38 1217.88
  9555.7 1217.77 9555.86 1217.71  9556.2 1217.58 9562.58 1215.19 9568.84 1212.77
  9569.5 1212.53 9570.32 1212.21 9578.64 1209.14 9583.09 1207.42 9588.92 1206.07
 9589.19    1206 9590.62 1205.87 9599.78 1205.03 9599.95 1205.02 9600.52 1205.04
 9600.95 1205.06  9603.8  1204.9  9605.2 1204.86 9607.37 1204.74 9609.08 1204.61
 9609.24 1204.61 9609.27 1204.59 9611.09 1204.56 9611.29 1204.55 9611.41 1204.56
 9611.52 1204.56 9614.79 1204.74 9616.64 1204.82 9618.27 1204.88 9621.67 1205.06
 9623.93 1205.08 9624.58 1205.08 9628.99 1205.18 9630.78 1205.21  9633.6 1205.15
 9635.88 1205.18 9639.31 1205.21 9641.22 1205.21 9642.76 1205.17 9643.73 1205.15
 9649.67  1205.2 9650.17 1205.22 9651.94 1205.19 9657.19 1205.29 9657.23 1205.29
 9657.75  1205.3 9662.94 1205.37 9663.47 1205.38 9669.66  1205.4 9672.54 1205.31
 9674.28 1205.31 9675.33 1205.39 9678.58 1205.37 9681.09 1205.34 9682.74 1205.28
 9683.48 1205.28 9685.36 1205.24 9685.96 1205.19 9687.47 1205.19 9688.25 1205.12
 9689.88 1205.13 9691.45 1205.13  9693.4 1205.19 9693.72  1205.2 9693.86  1205.2
 9695.33 1205.16 9696.29 1205.11 9696.71 1205.11 9698.33 1205.11 9700.16 1205.11
 9702.92 1205.12 9703.09 1205.13 9703.85 1205.16 9705.56 1205.33 9706.01 1205.32
 9707.82 1205.38 9710.32 1205.49 9712.48 1205.42 9712.65 1205.42 9712.73 1205.41
 9720.66 1205.22 9724.49 1205.07 9725.51    1205 9725.84 1204.98 9726.35 1204.93
  9730.3 1204.57 9733.52 1204.33 9735.38 1204.11 9738.48 1203.89 9738.74 1203.88
 9739.46 1203.83  9741.4 1203.66 9743.11 1203.43  9744.5 1203.27  9745.7 1203.14
 9746.16 1203.14 9747.15 1203.09  9749.2 1202.99 9749.84 1202.91 9751.07 1202.73
 9752.47 1202.55 9756.12 1202.96 9757.48 1203.12 9758.08 1203.12 9765.95 1203.05
 9766.98 1203.05 9768.43 1202.94 9769.77 1202.93 9770.34 1202.93 9777.37 1202.69
 9778.58 1202.69 9780.49 1202.66  9782.6 1202.69  9784.3 1202.73 9786.15 1202.73
 9787.41 1202.81 9789.36 1203.01 9790.58 1203.01 9792.07 1203.01 9793.77 1203.03
 9796.19 1203.08 9797.05 1203.12 9798.24 1203.17  9798.8 1203.22 9800.52 1203.26
 9801.11 1203.28 9802.79 1203.27 9804.78 1203.23 9805.12 1203.21 9807.22  1203.2
 9808.51  1203.3 9808.89 1203.28 9809.64 1203.27 9809.92 1203.29 9812.06 1203.27
 9817.45 1203.18 9819.31  1203.2 9820.91 1203.21 9821.47 1203.21 9824.81 1203.28
  9825.8 1203.33 9826.44 1203.34 9827.12 1203.46 9828.91 1203.86 9829.99 1204.04
 9831.66 1204.84 9834.41 1206.03 9834.46 1206.05 9834.48 1206.06  9834.5 1206.06
 9834.53 1206.06 9838.12 1205.76 9838.49 1205.69 9838.79 1205.66 9841.05 1205.23
 9841.51 1205.14  9841.6 1205.12 9845.13 1204.52 9845.39  1204.5 9845.69  1204.5
 9847.97 1204.36 9848.56 1204.53 9849.04 1204.66 9850.08 1204.71 9850.12 1204.71
  9857.4 1205.64 9858.38 1205.84 9858.65 1205.91 9859.02 1205.96 9859.67 1205.75
 9862.06 1205.15 9863.25 1205.42 9863.52 1205.48 9864.08 1205.24 9864.84 1204.95
 9868.15 1203.48 9870.31 1202.51 9872.02 1202.53 9872.75 1202.59 9873.76 1202.59
 9873.95 1202.58  9874.7  1202.5 9883.24  1201.9 9883.64 1201.86 9887.38 1201.59
 9891.58 1201.28 9891.94 1201.24  9897.3 1200.82 9897.58 1200.81 9903.76 1200.46
 9904.13 1200.56 9904.54 1200.64 9907.23 1199.99 9908.17 1199.75 9908.76 1199.89
 9912.41 1200.66 9916.09 1201.09 9916.48 1201.12 9917.91 1201.08 9924.72 1200.94
 9931.76 1200.13 9932.55 1200.06 9937.77 1199.82 9946.05 1199.44 9946.67 1199.42
 9946.82 1199.49 9946.92 1199.55 9947.14 1199.79 9947.79 1199.69 9950.82 1199.21
 9951.51 1199.19 9952.28 1199.22 9952.81 1198.73 9956.77  1196.4 9958.21 1195.58
 9960.29 1194.81 9962.12 1194.41 9962.54 1194.27 9965.07 1194.05 9965.46 1194.03
 9965.91 1194.04 9969.14 1194.46  9970.2 1194.66 9982.82 1194.72 9992.39  1194.8
 9998.77 1194.85   10000 1194.8510000.65 1194.8510005.03 1194.8210018.03 1194.76
10022.36 1194.6810024.36 1194.1310025.08 1193.8810025.54 1193.8710026.02 1193.86
10028.59 1193.84 10031.9 1193.7810034.42 1193.8210038.48 1193.7610039.79 1193.75
10041.57 1193.7510043.37 1193.7510047.17 1193.7710050.42 1193.7210057.17 1193.77
10057.25 1193.7810057.33 1193.7910057.51 1193.8110060.78 1194.38 10063.3 1194.38
10065.01 1194.2610068.89 1196.5110072.44 1198.0310073.31 1198.5610073.55 1198.83
10076.89 1199.8710079.63 1200.6610079.98  1200.5 10080.7 1200.18 10081.1  1200.3
10082.79 1200.9610084.66 1201.6810085.42    120210086.09 1202.3710090.41 1204.74
10091.66 1205.4210092.47 1205.8910093.39 1206.3610095.45 1207.25   10101 1209.56
 10103.5 1210.1110103.99 1210.4610104.69 1210.6810105.16 1210.5110107.04 1210.67
10107.13 1214.8510107.61 1224.0410110.86 1224.0610111.74 1224.1510115.48 1224.27
10118.42 1224.2910120.81 1224.3210125.26 1224.3710128.47 1224.3710139.47  1224.3
10143.01 1224.26   10157  1224.210159.59 1224.2110179.06 1224.1210180.82 1224.11
10181.96 1224.1210198.16 1224.1410199.19 1224.1410212.23 1224.2310213.78 1224.23
10224.12 1224.2410233.21 1224.2410234.33 1224.23 10254.5  1224.210257.48 1224.21
10260.83  1224.210277.95 1224.13 10283.9 1224.1110297.91 1224.08   10300 1224.07

Manning's n Values         num=       3
    Sta    n Val     Sta    n Val     Sta    n Val
**************************************************
    9500     .05 9960.29    .035 10063.3     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.    Expan.
       9547.7210107.61           250.88  250.88  250.88            .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
    9500 9953.12 1206.32         F
 10081.6   10300 1207.36         F

CULVERT


RIVER: MDOW
REACH: Reach1              RS: 0.768

INPUT
Description: El Mirage Road South Culvert
Distance from Upstream XS =       59
Deck/Roadway Width        =      130
Weir Coefficient          =      2.6
Upstream  Deck/Roadway Coordinates
    num=       9
    Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
**************************************************************************
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```
  9517.8    1210         9563.14    1209         9623.85    1208
 9732.67    1207         9906.28    1206        10054.48    1207
10129.64    1208        10185.81    1209        10233.22    1210

Upstream Bridge Cross Section Data
Station Elevation Data    num=      335
    Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*********************************************************************************
   9500 1219.74  9503.8 1219.76 9504.34 1219.76 9509.74 1219.81 9510.87 1219.82
 9511.34 1219.82 9516.33 1219.78 9519.78 1219.79 9524.93 1219.74 9527.21 1219.71
 9529.14 1219.68 9529.34 1219.68 9529.79 1219.68 9531.65 1219.68 9533.87 1219.67
  9535.2 1219.64 9535.31 1219.64 9535.56 1219.65 9535.93 1219.64 9537.53 1219.66
 9538.88  1219.6  9540.3 1219.57  9541.5 1219.57 9543.64 1219.51 9544.42 1219.47
 9547.72 1219.28 9547.75 1219.28  9547.8 1219.28 9552.45 1218.44 9555.38 1217.88
  9555.7 1217.77 9555.86 1217.71  9556.2 1217.58 9562.58 1215.19 9568.84 1212.77
  9569.5 1212.53 9570.32 1212.21 9578.64 1209.14 9583.09 1207.42 9588.92 1206.07
 9589.19    1206 9590.62 1205.87 9599.78 1205.03 9599.95 1205.02 9600.52 1205.04
 9600.95 1205.06  9603.8  1204.9  9605.2 1204.86 9607.37 1204.74 9609.08 1204.61
 9609.24 1204.61 9609.27 1204.59 9611.09 1204.56 9611.29 1204.55 9611.41 1204.56
 9611.52 1204.56 9614.79 1204.74 9616.64 1204.82 9618.27 1204.88 9621.67 1205.06
 9623.93 1205.08 9624.58 1205.08 9628.99 1205.18 9630.78 1205.21  9633.6 1205.15
 9635.88 1205.18 9639.31 1205.21 9641.22 1205.21 9642.76 1205.17 9643.73 1205.15
 9649.67  1205.2 9650.17 1205.22 9651.94 1205.19 9657.19 1205.29 9657.23 1205.29
 9657.75  1205.3 9662.94 1205.37  9663.47 1205.38 9669.66  1205.4 9672.54 1205.31
 9674.28 1205.31 9675.33 1205.39 9678.58 1205.37 9681.09 1205.34 9682.74 1205.28
 9683.48 1205.28 9685.36 1205.24 9685.96 1205.19 9687.47 1205.19 9688.25 1205.12
 9689.88 1205.13 9691.45 1205.13  9693.4 1205.19 9693.72  1205.2 9693.86  1205.2
 9695.33 1205.16 9696.29 1205.11 9696.71 1205.11 9698.33 1205.11 9700.16 1205.11
 9702.92 1205.12 9703.09 1205.13 9703.85 1205.16 9705.56 1205.33 9706.01 1205.32
 9707.82 1205.38 9710.32 1205.49 9712.48 1205.42 9712.65 1205.42 9712.73 1205.41
 9720.66 1205.22 9724.49 1205.07 9725.51    1205 9725.84 1204.98 9726.35 1204.93
  9730.3 1204.57 9733.52 1204.33 9735.38 1204.11 9738.48 1203.89 9738.74 1203.88
 9739.46 1203.83  9741.4 1203.66 9743.11 1203.43  9744.5 1203.27  9745.7 1203.14
 9746.16 1203.14 9747.15 1203.09  9749.2 1202.99 9749.84 1202.91 9751.07 1202.73
 9752.47 1202.55 9756.12 1202.96 9757.48 1203.12 9758.08 1203.12 9765.95 1203.05
 9766.98 1203.05 9768.43 1202.94 9769.77 1202.93 9770.34 1202.93 9777.37 1202.69
 9778.58 1202.69 9780.49 1202.66  9782.6 1202.69  9784.3 1202.73 9786.15 1202.73
 9787.41 1202.81 9789.36 1203.01 9790.58 1203.01 9792.07 1203.01 9793.77 1203.03
 9796.19 1203.08 9797.05 1203.12 9798.24 1203.17  9798.8 1203.22 9800.52 1203.26
 9801.11 1203.28 9802.79 1203.27 9804.78 1203.23 9805.12 1203.21 9807.22  1203.2
 9808.51  1203.3 9808.89 1203.28 9809.64 1203.27 9809.92 1203.29 9812.06 1203.27
 9817.45 1203.18 9819.31  1203.2 9820.91 1203.21 9821.47 1203.21 9824.81 1203.28
  9825.8 1203.33 9826.44 1203.34 9827.12 1203.46 9828.91 1203.86 9829.99 1204.04
 9831.66 1204.84 9834.41 1206.03 9834.46 1206.05 9834.48 1206.06  9834.5 1206.06
 9834.53 1206.06 9838.12 1205.76 9838.49 1205.69 9838.79 1205.66 9841.05 1205.23
 9841.51 1205.14  9841.6 1205.12 9845.13 1204.52 9845.39  1204.5 9845.69  1204.5
 9847.97 1204.36 9848.56 1204.53 9849.04 1204.66 9850.08 1204.71 9850.12 1204.71
  9857.4 1205.64 9858.38 1205.84 9858.65 1205.91 9859.02 1205.96 9859.67 1205.75
 9862.06 1205.15 9863.25 1205.42 9863.52 1205.48 9864.08 1205.24 9864.84 1204.95
 9868.15 1203.48 9870.31 1202.51 9872.02 1202.53 9872.75 1202.59 9873.76 1202.59
 9873.95 1202.58  9874.7  1202.5 9883.24  1201.9 9883.64 1201.86 9887.38 1201.59
 9891.58 1201.28 9891.94 1201.24  9897.3 1200.82 9897.58 1200.81 9903.76 1200.46
 9904.13 1200.56 9904.54 1200.64 9907.23 1199.99 9908.17 1199.75 9908.76 1199.89
 9912.41 1200.66 9916.09 1201.09 9916.48 1201.12 9917.91 1201.08 9924.72 1200.94
 9931.76 1200.13 9932.55 1200.06 9937.77 1199.82 9946.05 1199.44 9946.67 1199.42
 9946.82 1199.49 9946.92 1199.55 9947.14 1199.79 9947.79 1199.69 9950.82 1199.21
 9951.51 1199.19 9952.28 1199.22 9952.81 1198.73 9956.77  1196.4 9958.21 1195.58
 9960.29 1194.81 9962.12 1194.41 9962.54 1194.27 9965.07 1194.05 9965.46 1194.03
 9965.91 1194.04 9969.14 1194.46  9970.2 1194.66 9982.82 1194.72 9992.39  1194.8
 9998.77 1194.85    10000 1194.8510000.65 1194.8510005.03 1194.8210018.03 1194.76
10022.36 1194.6810024.36 1194.1310025.08 1193.8810025.54 1193.8710026.02 1193.86
10028.59 1193.84 10031.9 1193.7810034.42 1193.8210038.48 1193.7610039.79 1193.75
10041.57 1193.7510043.37 1193.7510047.17 1193.7710050.42 1193.7210057.17 1193.77
10057.25 1193.7810057.33 1193.7910057.51 1193.8110060.78 1194.38 10063.3 1194.38
10065.01 1194.2610068.89 1196.5110072.44 1198.0310073.31 1198.5610073.55 1198.83
10076.89 1199.8710079.63 1200.6610079.98  1200.5 10080.7 1200.18 10081.1  1200.3
10082.79 1200.9610084.66 1201.6810085.42    120210086.09 1202.3710090.41 1204.74
10091.66 1205.4210092.47 1205.8910093.39 1206.3610095.45 1207.25   10101 1209.56
 10103.5 1210.1110103.99 1210.4610104.69 1210.6810105.16 1210.5110107.04 1210.67
10107.13 1214.8510107.61 1224.0410110.86 1224.0610111.74 1224.1510115.48 1224.27
10118.42 1224.2910120.81 1224.3210125.26 1224.3710128.47 1224.3710139.47  1224.3
10143.01 1224.26   10157  1224.210159.59 1224.2110179.06 1224.1210180.82 1224.11
10181.96 1224.1210198.16 1224.1410199.19 1224.1410212.23 1224.2310213.78 1224.23
10224.12 1224.2410233.21 1224.2410234.33 1224.23 10254.5  1224.210257.48 1224.21
10260.83  1224.210277.95 1224.13 10283.9 1224.1110297.91 1224.08   10300 1224.07

Manning's n Values          num=       3
    Sta   n Val     Sta   n Val     Sta   n Val
*************************************************
   9500     .05 9960.29    .035 10063.3     .05

Bank Sta: Left   Right    Coeff Contr.   Expan.
     9547.7210107.61             .3         .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
    9500 9953.12 1206.32         F
 10081.6   10300 1207.36         F

Downstream  Deck/Roadway Coordinates
    num=       9
    Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
*********************************************************************************
 9406.69    1210         9452.03    1209         9512.74    1208
 9621.56    1207         9795.17    1206         9943.37    1207
10018.53    1208        10074.7     1209        10122.11    1210

Downstream Bridge Cross Section Data
Station Elevation Data    num=      194
    Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*********************************************************************************
 9388.89 1210.86 9395.87 1210.95 9400.19    1211 9402.27 1210.97 9403.44 1210.97
 9414.14 1211.37 9416.24 1211.43 9429.06 1211.89 9431.19 1211.98 9432.04    1212
 9438.45 1212.22  9447.8 1212.51 9448.47 1212.53 9457.27 1212.64 9462.39 1212.77
 9470.92 1212.82 9474.46 1212.79 9482.89 1212.78 9483.79 1212.75 9486.21 1212.66
 9489.96 1212.52 9491.83 1212.52 9493.15 1212.48  9498.9 1212.14 9502.07 1211.87
 9508.48 1211.03 9509.29 1210.93 9510.07 1210.77 9513.22 1210.17 9522.34  1208.6
 9526.82 1207.71  9528.7  1207.3 9530.66 1206.94  9535.1 1205.99 9542.16 1204.85
  9542.8 1204.75 9546.74 1204.23 9546.86 1204.18  9549.3 1203.48  9551.3 1203.05
 9553.91 1202.63  9555.3  1202.4 9557.96 1202.29 9562.49 1202.14 9565.03 1202.14
 9570.71 1202.16 9574.08  1202.2 9581.44 1202.45 9581.59 1202.44 9581.64 1202.44
 9581.71 1202.44 9587.88 1202.25 9590.84 1202.19 9593.63 1202.08 9596.78 1201.89
 9599.49  1201.8 9604.17 1201.74 9606.86 1201.69 9613.63 1201.64 9616.66 1201.56
 9620.41 1201.56 9628.81 1201.53 9632.44 1201.55 9635.95 1201.54 9639.99  1201.5
 9644.63  1201.4 9651.66 1201.28  9656.1 1201.23 9656.88 1201.23 9666.82  1201.2
 9669.87 1201.19 9670.33  1201.2  9674.1 1201.18 9680.77 1201.14 9692.98  1201.2
 9697.53 1201.22 9698.55 1201.23 9707.11 1201.23 9709.81 1201.24 9711.07 1201.24
 9722.01 1201.24 9723.25 1201.24 9731.53 1201.29 9734.46 1201.26 9737.27  1201.2
 9745.54 1201.03 9751.92 1200.89 9754.79 1200.85 9760.63 1200.74 9764.76 1200.61
 9768.52 1200.58 9783.55 1200.43 9784.62 1200.41 9785.63 1200.42 9798.66 1200.46
 9802.07 1200.42 9806.54 1200.43 9814.32 1200.37 9815.78 1200.27    9819 1200.24
 9821.89 1200.18 9824.78 1200.17 9825.16 1200.14 9832.23 1200.08 9843.23 1199.96
 9846.67 1199.88 9847.37 1199.87 9849.12 1199.69 9858.16 1198.91 9859.13 1198.54
 9859.72 1198.33 9861.08 1198.02 9861.85 1197.85 9862.35 1197.92  9863.6 1198.08
 9866.01 1198.76 9868.67 1199.47 9872.73 1200.54 9875.27 1201.28 9877.25 1201.73
  9878.2 1201.93 9879.29 1202.12 9881.95 1202.57 9886.24 1202.53 9889.97  1202.5
 9893.39 1202.34 9897.17  1202.2 9913.31 1200.41 9920.47 1199.62 9920.92 1199.78
 9921.68 1199.98 9924.65 1199.34 9927.32 1198.67 9932.94 1195.21 9938.97 1191.95
 9946.26 1193.04 9948.06 1193.29 9959.16 1193.44 9962.68 1193.47 9966.36 1193.42
```

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 9972.38 1193.27 9973.07 1193.25 9974.77 1193.26 9981.68 1193.33 9987.94 1193.34
 9989.14 1193.34 9989.21 1193.34 9993.32 1193.34 9997.36 1193.39   10000 1193.45
10002.49 1193.51 10008.3 1193.5210011.33 1193.5910016.04 1193.6410019.74 1193.63
10024.45 1193.38 10027.3 1193.2710030.86 1193.2210034.21 1193.0510035.16    1193
10039.74 1191.5110039.83 1191.4910043.58 1191.0210043.99 1190.9810054.53 1193.64
10056.25 1194.35 10057.6 1195.33 10060.4 1197.8110061.94 1200.0610063.63 1200.64
10073.24 1205.39 10074.9 1206.2410075.41 1206.4510079.88 1208.39 10081.6 1209.07
10086.96 1211.1610089.55 1211.5810098.74 1213.6410099.18 1218.8610099.58 1224.29
 10102.4 1223.9910104.43  1223.910106.17 1223.8710109.19 1223.8610113.06 1223.79
 10118.4 1223.7610125.49 1223.6710132.65 1223.6610141.47 1223.6510156.88 1223.71
10162.46 1223.74 10172.4  1223.8 10175.4 1223.8510188.89 1223.98

Manning's n Values         num=        3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
 9388.89     .06  9498.9     .0610098.74     .06

Bank Sta: Left   Right    Coeff Contr.   Expan.
        9498.910098.74             .3       .5
Ineffective Flow     num=        2
   Sta L    Sta R    Elev  Permanent
 9388.89 9949.16 1204.39       F
10034.5210188.89 1205.77       F

Upstream Embankment side slope              =       0 horiz. to 1.0 vertical
Downstream Embankment side slope            =       0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .98
Elevation at which weir flow begins         =
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Culverts =  1

Culvert Name      Shape      Rise    Span
Culvert #1            Box       8      10
FHWA Chart # 8 - flared wingwalls
FHWA Scale # 1 - Wingwall flared 30 to 75 deg.
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    Top n  Bottom n  Depth Blocked  Entrance Loss Coef   Exit Loss Coef
              24.5     197     .013     .013        0                  .4                1
Number of Barrels =  7
Upstream   Elevation =  1194.11
Centerline Stations
    Sta.    Sta.    Sta.    Sta.    Sta.    Sta.    Sta.
 9980.68 9992.8110004.9510017.0810029.2110041.3510053.48
Downstream Elevation =  1193.7
Centerline Stations
    Sta.    Sta.    Sta.    Sta.    Sta.    Sta.    Sta.
  9955.4 9967.55 9979.69 9991.8410003.9910016.1310028.28

CROSS SECTION


RIVER: MDOW
REACH: Reach1             RS: 0.744

INPUT
Description:
Station Elevation Data    num=     194
     Sta     Elev     Sta     Elev     Sta     Elev     Sta     Elev     Sta     Elev
*********************************************************************************
 9388.89 1210.86 9395.87 1210.95 9400.19    1211 9402.27 1210.97 9403.44 1210.97
 9414.14 1211.37 9416.24 1211.43 9429.06 1211.89 9431.19 1211.98 9432.04    1212
 9438.45 1212.22  9447.8 1212.51 9448.47 1212.53 9457.27 1212.64 9462.39 1212.77
 9470.92 1212.82 9474.46 1212.79 9482.89 1212.78 9483.79 1212.75 9486.21 1212.66
 9489.96 1212.52 9491.83 1212.52 9493.15 1212.48  9498.9 1212.14 9502.07 1211.87
 9508.48 1211.03 9509.29 1210.93 9510.07 1210.77 9513.22 1210.17 9522.34  1208.6
 9526.82 1207.71  9528.7  1207.3 9530.66 1206.94  9535.1 1205.99 9542.16 1204.85
  9542.8 1204.75 9546.74 1204.23 9546.86 1204.18  9549.3 1203.48  9551.3 1203.05
 9553.91 1202.63  9555.3  1202.4 9557.96 1202.29 9562.49 1202.14 9565.03 1202.14
 9570.71 1202.16 9574.08  1202.2 9581.44 1202.45 9581.59 1202.44 9581.64 1202.44
 9581.71 1202.44 9587.88 1202.25 9590.84 1202.19 9593.63 1202.08 9596.78 1201.89
 9599.49  1201.8 9604.17 1201.74 9606.86 1201.69 9613.63 1201.64 9616.66 1201.56
 9620.41 1201.56 9628.81 1201.53 9632.44 1201.55 9635.95 1201.54 9639.99  1201.5
 9644.63  1201.4 9651.66 1201.28  9656.1 1201.23 9656.88 1201.23 9666.82  1201.2
 9669.87 1201.19 9670.33  1201.2  9674.1 1201.18 9680.77 1201.14 9692.98  1201.2
 9697.53 1201.22 9698.55 1201.23 9707.11 1201.23 9709.81 1201.24 9711.07 1201.24
 9722.01 1201.24 9723.25 1201.24 9731.53 1201.29 9734.46 1201.26 9737.27  1201.2
 9745.54 1201.03 9751.92 1200.89 9754.79 1200.85 9760.63 1200.74 9764.76 1200.61
 9768.52 1200.58 9783.55 1200.43 9784.62 1200.41 9785.63 1200.42 9798.66 1200.46
 9802.07 1200.42 9806.54 1200.43 9814.32 1200.37 9815.78 1200.27    9819 1200.24
 9821.89 1200.18 9824.78 1200.17 9825.16 1200.14 9832.23 1200.08 9843.23 1199.96
 9846.67 1199.88 9847.37 1199.87 9849.12 1199.69 9858.16 1198.91 9859.13 1198.54
 9859.72 1198.33 9861.08 1198.02 9861.85 1197.85 9862.35 1197.92  9863.6 1198.08
 9866.01 1198.76 9868.67 1199.47 9872.73 1200.54 9875.27 1201.28 9877.25 1201.73
  9878.2 1201.93 9879.29 1202.12 9881.95 1202.57 9886.24 1202.53 9889.97  1202.5
 9893.39 1202.34 9897.17  1202.2 9913.31 1200.41 9920.47 1199.62 9920.92 1199.78
 9921.68 1199.98 9924.65 1199.34 9927.32 1198.67 9932.94 1195.21 9938.97 1191.95
 9946.26 1193.04 9948.06 1193.29 9959.16 1193.44 9962.68 1193.47 9966.36 1193.42
 9972.38 1193.27 9973.07 1193.25 9974.77 1193.26 9981.68 1193.33 9987.94 1193.34
 9989.14 1193.34 9989.21 1193.34 9993.32 1193.34 9997.36 1193.39   10000 1193.45
10002.49 1193.51 10008.3 1193.5210011.33 1193.5910016.04 1193.6410019.74 1193.63
10024.45 1193.38 10027.3 1193.2710030.86 1193.2210034.21 1193.0510035.16    1193
10039.74 1191.5110039.83 1191.4910043.58 1191.0210043.99 1190.9810054.53 1193.64
10056.25 1194.35 10057.6 1195.33 10060.4 1197.8110061.94 1200.0610063.63 1200.64
10073.24 1205.39 10074.9 1206.2410075.41 1206.4510079.88 1208.39 10081.6 1209.07
10086.96 1211.1610089.55 1211.5810098.74 1213.6410099.18 1218.8610099.58 1224.29
 10102.4 1223.9910104.43  1223.910106.17 1223.8710109.19 1223.8610113.06 1223.79
 10118.4 1223.7610125.49 1223.6710132.65 1223.6610141.47 1223.6510156.88 1223.71
10162.46 1223.74 10172.4  1223.8 10175.4 1223.8510188.89 1223.98

Manning's n Values         num=        3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
 9388.89     .06  9498.9     .0610098.74     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        9498.910098.74             240.4  185.96   179.9             .3       .5
Ineffective Flow     num=        2
   Sta L    Sta R    Elev  Permanent
 9388.89 9949.16 1204.39       F
10034.5210188.89 1205.77       F

CROSS SECTION


RIVER: MDOW
REACH: Reach1             RS: 0.709

INPUT
Description:
Station Elevation Data    num=     228
     Sta     Elev     Sta     Elev     Sta     Elev     Sta     Elev     Sta     Elev
*********************************************************************************
 9456.75 1216.56 9457.76 1216.22 9458.25 1215.97 9462.12 1214.81 9469.35 1211.66
 9475.81 1208.86 9481.98 1206.26 9482.44  1206.1  9483.4 1205.87 9489.28 1204.53
 9493.11 1204.08 9501.41 1202.79 9505.02 1202.39  9507.5    1202 9509.37 1201.84
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 9511.79 1201.57 9518.01 1201.37 9522.76 1201.32 9525.51  1201.3 9528.46 1201.27
 9531.61 1201.24 9534.89  1201.2 9539.75 1201.19 9541.52 1201.15 9545.81 1201.12
 9548.89 1200.99 9553.63 1200.96 9566.24 1201.03 9576.34 1200.94  9581.2 1200.88
 9590.59 1200.75 9600.76 1200.66 9604.16 1200.62 9607.83 1200.58 9619.32 1200.51
 9626.24 1200.49 9632.32 1200.53 9633.84 1200.53 9644.57 1200.57 9646.21 1200.57
 9646.32 1200.57  9647.1 1200.56 9658.94 1200.34 9660.89 1200.28 9661.84  1200.3
 9667.64 1200.33 9669.87 1200.42 9673.45 1200.42  9674.5  1200.5 9675.86  1200.6
 9677.71 1200.62  9680.6 1200.72 9682.58 1200.73 9685.07 1200.61 9686.41 1200.63
 9687.16 1200.78 9688.13  1200.7 9689.19 1200.75 9693.97 1200.76 9705.32 1200.87
  9705.8 1200.87 9707.86 1200.83 9713.56 1200.92 9715.49 1200.99  9718.3 1201.03
  9721.2 1201.08 9721.92 1201.07 9727.24 1201.13 9728.94 1201.09 9732.24 1200.96
 9735.85 1200.89 9736.62 1200.89 9742.67 1200.95 9742.75 1200.95  9742.8 1200.95
 9748.59 1200.99 9753.38 1200.84 9753.65 1200.82 9758.91  1200.7 9764.22 1200.52
  9765.2 1200.46  9766.1 1200.38  9772.2 1199.32 9772.21 1199.32 9773.11 1199.26
  9775.2 1199.05 9777.77 1198.89  9782.2 1198.67 9785.01 1198.53 9789.32 1198.31
 9792.41 1197.91 9793.44 1197.66 9795.33 1197.86 9800.15  1198.5 9808.24 1198.28
 9810.89 1198.23 9819.92 1197.89 9820.59 1197.78  9823.6 1196.98 9824.78 1196.96
 9826.82 1197.25 9829.21  1197.4  9831.7  1197.9 9832.33 1197.95 9832.57 1197.94
 9833.39 1197.93 9836.01 1197.69 9836.92 1197.59 9841.72 1197.18 9842.86 1197.06
 9845.27 1196.46 9847.01 1196.04 9849.95 1195.28 9852.39 1195.15 9857.08 1194.81
 9857.11 1194.82 9857.43  1194.9  9860.1 1195.51 9860.17 1195.55 9861.13 1196.04
 9863.52 1197.19 9864.46 1197.24 9874.39 1197.61 9879.66 1197.63 9885.19 1197.62
 9888.97 1197.59 9891.82 1197.59 9895.42 1197.57 9896.58 1197.56  9898.2 1197.89
 9903.08 1198.98 9904.52 1198.73 9910.08 1197.79  9914.8 1197.61 9917.98 1197.55
 9924.85 1197.37 9931.59 1197.21 9937.08 1196.74 9940.49 1196.44 9945.24 1196.15
 9946.29 1196.04 9948.59 1195.95  9951.6 1195.72 9953.59  1195.5 9957.17 1194.93
 9961.15 1194.61 9962.75 1194.53 9963.59 1194.47 9968.37 1194.26 9971.37 1194.07
    9976 1193.72 9977.14  1193.6 9979.73 1193.26 9982.43 1193.27  9985.2 1193.12
 9987.46 1192.96 9989.82 1192.79    9991 1192.66 9992.82  1192.5 9994.57 1192.39
 9996.07 1192.41 9999.41 1192.48 9999.99 1192.4810001.27 1192.4810002.58 1192.79
10006.37 1193.4610013.04 1194.9210013.74 1195.0610019.21  1194.310020.87  1194.1
10025.33 1194.3810027.47 1194.5810029.48 1194.4810035.59 1194.1110038.57 1194.09
10042.37 1194.2310048.07 1195.3710052.37 1196.3110055.89 1196.8810058.31 1197.04
10061.45 1197.3510067.02 1197.3310067.92 1197.35 10068.5 1197.3110073.19 1196.98
10077.15  1196.810080.37 1196.7610085.81 1196.6410088.08  1196.610089.64 1196.66
10092.75 1196.7110094.64 1196.8510097.14 1197.0410099.17 1197.1210103.17 1197.32
 10103.9 1197.33 10106.2 1197.4410113.55 1196.9610114.03 1196.9210114.54 1196.83
10119.72  1195.810124.09 1195.3810127.18 1195.07 10128.5 1195.1110133.72 1195.25
 10139.7 1197.0110142.53 1197.9110145.68 1198.7710147.24 1199.1810148.52 1199.82
10161.77 1207.0610163.95  1208.210170.05 1214.3510176.27 1220.4310176.54 1220.75
10178.97 1220.9110181.04 1221.0710184.44 1221.3510185.51 1221.4310189.23 1221.79
 10194.2  1222.210197.26 1222.32   10203 1222.4110203.48 1222.4110206.26 1222.59
10213.66 1222.87 10220.7 1223.2810221.05  1223.3

Manning's n Values          num=       3
    Sta    n Val      Sta    n Val      Sta    n Val
**************************************************
 9456.75      .06 9931.59      .0610061.45      .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.    Expan.
       9931.5910061.45             608.3  558.51   463.9             .1       .3

CROSS SECTION


RIVER: MDOW
REACH: Reach1               RS: 0.603

INPUT
Description:
Station Elevation Data    num=     236
    Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev
********************************************************************************
    9800 1197.77 9808.63 1197.86 9815.79 1198.23  9818.4 1198.32 9820.44 1198.46
 9831.61 1198.36 9831.97 1198.37 9844.96 1198.82 9852.73 1199.21 9858.39 1199.99
 9863.73 1200.71 9870.96 1201.33 9874.56 1201.63 9882.24 1202.26 9884.51 1202.39
 9886.03 1202.43 9900.38 1202.78 9906.88 1202.94 9912.37 1203.06 9921.06 1203.22
 9922.89 1203.26 9928.67 1203.35 9942.84 1203.44 9945.98 1203.46 9946.01 1203.47
 9946.03 1203.46 9946.05 1203.46  9954.9 1203.41 9957.83 1203.43 9963.89 1203.35
 9965.07 1203.35 9965.81 1203.32 9966.32 1203.29 9966.78 1202.57 9970.31 1197.77
 9970.74 1197.48 9975.71 1194.07  9978.1 1192.67 9978.77 1192.27 9979.08 1192.09
 9980.47 1191.17 9982.37 1189.45  9983.5 1188.64 9985.43  1187.6 9987.69 1186.51
 9992.13 1186.36 9992.15 1186.36 9992.17 1186.37 9995.32 1186.99   10000 1187.42
10000.93 1187.5110003.42  1187.810005.04 1188.0410009.71 1188.6610012.34 1188.97
10018.46 1190.2210018.93 1190.2910024.25 1190.45 10027.4 1190.5810029.28 1190.56
10033.62 1191.1710037.93 1191.8110040.15 1191.7210047.59  1191.4 10047.9 1191.37
 10048.2 1191.3410052.49 1190.9110057.16 1190.5810058.36 1190.6710059.29 1190.74
10063.53 1190.91 10066.9 1191.1310067.28 1191.22 10070.8 1191.39 10075.9 1191.34
10078.86  1191.410080.26 1191.4410083.59 1191.6310086.76 1191.7310089.67 1191.75
10095.23 1191.5810099.22 1191.4910100.39 1191.4710101.56 1191.41 10105.4 1190.99
10106.82 1190.9210109.79 1190.9410111.01 1190.7710115.54 1190.5210117.17 1190.35
10118.46 1190.3910121.15 1191.2710122.98 1191.8310126.25 1191.0110129.69  1190.2
10137.85 1191.1210140.02 1191.2410141.16 1191.1310148.63 1190.6210153.83 1191.44
10160.32 1192.5210162.52 1192.6910165.19 1192.9210168.52 1192.81   10174 1192.62
   10181 1192.2910184.06 1192.1410187.64 1192.2910189.06 1192.3110189.49 1192.35
10194.41 1192.5410197.56 1192.6810200.94 1192.8210209.41  1192.910211.58 1192.91
10213.66  1192.910217.38 1192.8510218.38 1192.8310221.23  1192.710222.55 1192.62
 10230.2 1191.6910232.62 1191.4810233.65 1191.5110238.43 1191.6110245.69 1192.05
10251.35 1192.4510253.39 1192.4610255.46  1192.510259.13 1192.4610262.47 1192.48
 10263.1 1192.49 10266.3 1192.3710270.84 1192.4510283.73 1192.4610292.99  1192.5
10295.34 1192.4610303.27 1191.6710303.51 1191.6510303.58 1191.6410309.29 1191.59
 10312.3 1191.3910317.67 1190.9910318.85 1191.0810325.17 1191.4710327.92 1191.42
10329.72 1191.4310333.24 1190.7910336.88 1190.1210338.36  1190.1   10339 1190.15
10341.95 1190.4110344.21 1190.6710344.73 1190.7410349.84 1191.1610350.13 1191.19
10350.44 1191.2710356.39 1192.8210357.68 1192.7610367.25 1192.1910369.39  1191.9
 10371.9 1191.5210373.32  1191.5 10377.5 1191.6110381.33 1191.7210384.43 1191.97
10389.69 1192.3910394.37 1192.7510396.75 1193.0110399.07  1192.7 10400.8 1192.49
10406.37 1191.7410409.85 1191.4510410.54 1191.4310410.94 1191.3910415.45 1190.94
10421.22 1190.8110423.68 1190.7610425.97 1192.2210426.29 1192.4410427.05 1192.64
10435.07 1194.9310437.26 1195.0310437.58 1195.0610440.51 1195.01 10443.1 1194.91
10445.21 1194.8810445.76 1194.8610448.92 1194.8710450.99 1194.8510451.15 1194.86
10452.56 1195.01 10454.9 1194.9810457.32 1194.9710460.77 1194.9610463.55 1194.87
10465.59 1194.7910466.84 1194.7710468.25 1194.7910472.35 1194.89 10475.6 1194.96
10483.05 1195.3110485.13 1195.2410487.61 1195.1410490.84 1195.2810492.39 1195.26
10496.06 1194.8210503.06 1194.2210507.02 1194.2210513.52 1194.2210515.72 1194.37
10519.25 1194.5710527.99 1196.9210531.03 1197.7210533.43 1198.7410540.64 1201.62
10548.98 1206.1910559.57 1211.7810561.32 1213.2810563.43 1215.02 10563.7  1215.1
10566.57 1215.8610566.75 1215.8910567.24 1215.9210569.46 1216.1110569.93 1216.02
10572.25 1215.7610574.04  1215.410581.04 1214.1610581.87 1214.0710584.81 1213.86
10585.56 1214.0110590.16 1214.9810594.24 1215.6210594.97 1215.75 10595.4 1215.83
   10600 1216.32

Manning's n Values          num=       3
    Sta    n Val      Sta    n Val      Sta    n Val
**************************************************
    9800      .06 9979.08      .0610037.93      .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.    Expan.
       9979.0810037.93             510.5     500   400.9             .1       .3

CROSS SECTION


RIVER: MDOW
REACH: Reach1               RS: 0.509

INPUT
Description:
```

Station Elevation Data num= 363

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
9255.91	1200.26	9256.62	1200.1	9260.53	1199.7	9262.43	1199.56	9262.75	1199.51
9263.45	1199.44	9268.53	1198.89	9274.25	1198.63	9276.8	1198.49	9286.83	1197.75
9288.36	1197.65	9293.62	1197.36	9294.5	1197.29	9296.65	1197	9300.94	1196.35
9302.65	1196.05	9305.13	1195.42	9305.27	1195.4	9311.91	1194.28	9315.61	1193.98
9319.55	1193.78	9321.79	1193.68	9323.38	1193.59	9329.92	1193.29	9335.33	1193.07
9341.02	1192.86	9346.54	1192.71	9355.64	1192.43	9355.8	1192.43	9355.92	1192.43
9356.52	1192.44	9363.82	1192.57	9366	1192.61	9367.27	1192.49	9368.33	1192.52
9372.08	1192.38	9372.09	1192.38	9372.1	1192.39	9372.25	1192.4	9378.03	1192.94
9378.19	1192.94	9379.86	1192.86	9381.1	1192.84	9384.43	1192.52	9386.44	1192.61
9386.93	1192.63	9388.44	1192.69	9389.75	1192.78	9391.17	1192.84	9392.15	1192.96
9394.9	1193.22	9395.38	1193.26	9395.48	1193.26	9397.63	1193.06	9399.29	1193.2
9400.98	1193.26	9405.02	1193.62	9408.66	1193.87	9410.19	1193.96	9412.74	1194.22
9414.09	1194.39	9416.19	1194.57	9419.08	1194.83	9423.93	1195.2	9430.91	1195.4
9435.87	1195.43	9436.09	1195.43	9436.3	1195.43	9436.66	1195.43	9442.4	1195.38
9444.38	1195.28	9451.69	1195.08	9453.2	1195.09	9454.53	1195.02	9463.64	1194.07
9464.26	1194.01	9464.4	1194.01	9474.52	1193.95	9480.82	1193.8	9483.97	1193.85
9491.17	1193.6	9491.3	1193.59	9491.52	1193.56	9495.12	1192.96	9496.98	1192.77
9498.28	1192.62	9498.49	1192.61	9498.7	1192.6	9498.92	1192.59	9499.16	1192.59
9499.42	1192.58	9499.71	1192.57	9500.03	1192.57	9500.39	1192.56	9500.82	1192.55
9501.32	1192.54	9501.94	1192.54	9502.74	1192.53	9503.79	1192.51	9505.27	1192.5
9507.56	1192.48	9511.58	1192.45	9515.62	1192.39	9516.73	1192.41	9517.19	1192.43
9519.63	1192.45	9531.99	1192.6	9535.89	1193.25	9536.49	1193.38	9537.65	1193.42
9539.13	1193.38	9543.09	1193.59	9544.32	1193.57	9551.92	1193.58	9553.18	1193.46
9559.05	1193.01	9564.98	1192.53	9566.41	1192.36	9572.13	1191.64	9575.57	1191.24
9577.35	1191.31	9583.08	1191.11	9584.23	1191.02	9587.98	1190.27	9589.7	1190.04
9590.94	1189.84	9595.54	1189.32	9597.44	1189.34	9607.86	1188.91	9621.81	1189.45
9625.5	1189.57	9633.17	1189.34	9636.59	1189.23	9638.36	1189.48	9640.61	1189.65
9648.25	1190.42	9651.11	1190.55	9654.27	1190.86	9659.48	1190.84	9663.07	1190.78
9669.84	1190.56	9685.11	1190.99	9687.19	1191.02	9703.24	1191.24	9705.67	1191.24
9706.84	1191.32	9713.04	1191.47	9715.28	1191.54	9725.82	1191.41	9730.56	1191.37
9733.48	1191.13	9746.79	1190.38	9766.92	1190.74	9775.02	1191.01	9790.87	1191.56
9797.34	1191.82	9798.86	1191.84	9801.14	1191.08	9805.56	1189.51	9806.15	1189.39
9806.44	1189.45	9812.02	1188.57	9815.34	1186.56	9816.28	1185.71	9820.23	1184.55
9822.04	1183.96	9822.83	1183.9	9823.4	1183.89	9825.58	1183.81	9829.51	1183.68
9831.42	1183.51	9834.23	1183.33	9841.91	1185.44	9842.49	1185.57	9845.83	1185.94
9846.02	1185.96	9849.61	1186.26	9850.45	1186.22	9851.5	1186.13	9852.27	1186.01
9856.77	1185.58	9858.89	1185.73	9861.14	1185.68	9863.19	1185.73	9865.96	1186.04
9866.62	1186.05	9868.27	1186.39	9869.05	1186.41	9869.69	1186.41	9870.08	1186.41
9887.04	1186.48	9889.2	1186.52	9889.44	1186.52	9889.86	1186.52	9896.22	1186.46
9897.35	1186.56	9899.38	1186.68	9899.82	1186.68	9900.33	1186.73	9902.95	1187.15
9906.36	1187.12	9908.27	1187.14	9910.67	1187.01	9911.89	1186.98	9912.57	1186.89
9916.03	1186.66	9918.87	1186.89	9920.49	1187.02	9924.13	1187.08	9925.11	1187.07
9928.49	1186.56	9933.63	1185.83	9940.83	1185.93	9947.04	1186.01	9948.22	1186.07
9952.05	1186.25	9956.25	1186.44	9958.66	1186.58	9961.31	1186.34	9963.79	1185.93
9966.1	1186	9966.77	1185.97	9967.34	1186	9968.66	1185.61	9971.53	1184.81
9975.51	1185.56	9978.78	1186.08	9980.5	1186.36	9980.62	1186.4	9985.16	1185.49
9985.4	1185.41	9991.43	1184.99	9999.62	1184.43	9999.99	1184.4410000.19		1184.44
10002.64	1184.610007.44		1186.2310008.58		1186.5910009.18		1186.6210013.47		1186.66
10015.45	1187.3910015.56		1187.4210017.66		1187.3810018.16		1187.4210023.35		1187.3
10027.92	1187.8510030.08		1187.7110030.45		1187.7510031.45		1188.12 10031.9		1188.14
10038.48	1188.410040.34		1188.4710041.88		1188.5610043.76		1188.5510046.59		1188.47
10049.74	1188.4110052.48		1189.110056.26		1190.1510060.27		1190.1910063.22		1190.08
10070.31	119010074.17		1189.9810079.82		1189.8910083.28		1189.8310089.38		1189.55
10092.9	1189.410093.81		1189.3110098.41		1189.0310101.31		1188.8510102.24		1188.88
10105.12	1188.9510112.02		1189.4410121.25		1190.4610121.78		1190.5110122.08		1190.55
10122.42	1190.5610129.97		1190.9610136.86		1191.3210137.03		1191.3310137.11		1191.34
10137.3	1191.3510147.69		1191.4410155.83		1191.5510162.03		1191.6110168.87		1191.63
10171.4	1191.6510185.81		1191.84 10186.5		1191.8410187.92		1191.910196.38		1191.55
10207.84	1191.0210208.38		1191.0310212.35		1190.910213.25		1190.6310214.28		1190.48
10215.01	1190.4810217.65		1190.4310219.05		1190.6810220.46		1190.6510221.59		1190.49
10221.85	1190.410223.44		1190.3510224.02		1190.510224.97		1190.4710241.36		1190.84
10247.39	1190.8610254.39		1191.1110257.12		1191.2710257.29		1191.210257.49		1191.21
10257.64	1191.2110259.26		1191.0910271.26		1191.5210273.94		1191.510281.15		1191.62
10282.54	1191.6410284.48		1191.710290.82		1192.3110292.87		1192.5510294.51		1192.8
10299.27	1193.45 10300.1		1193.6310300.85		1193.7210303.65		1194.2410304.25		1194.44
10306	1195.0210310.09		1196.39 10311.4		1196.89 10315.1		1198.9310315.98		1199.41
10317.58	1200.3210321.45		1202.5210322.81		1203.3110327.51		1205.89 10337.1		1209.89
10339.03	1210.4710342.02		1211.4510348.58		1213.7110349.34		1213.9810349.56		1214.06
10350.94	1214.210351.54		1214.2510352.02		1214.2310353.23		1214.3310354.06		1214.4
10355.55	1214.3610357.74		1214.4410359.71		1214.3910361.48		1214.3810367.15		1214.48
10370.1	1214.4810372.33		1214.4910382.35		1214.4510383.78		1214.3610384.29		1214.39
10385.75	1214.4310386.42		1214.3210387.78		1214.0410390.91		1213.2710393.98		1212.38
10394.98	1211.9910397.94		1211.1210400.06		1210.53				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
9255.91	.06	9798.86	.0610056.26		.06

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

9798.8610056.26		347.2	498.38	566.8	.1	.3	

CROSS SECTION

RIVER: MDOW
REACH: Reach1 RS: 0.414

INPUT
Description:
Station Elevation Data num= 267

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
9668.36	1211.62	9669.65	1210.72	9674.38	1207.36	9679.47	1204.31	9679.91	1204.09
9680.29	1203.79	9680.58	1203.66	9683.42	1202.35	9687.59	1199.84	9688.42	1199.35
9689.28	1198.89	9695.03	1196.6	9696.92	1195.81	9697.25	1195.65	9701.24	1193.45
9701.95	1193.28	9704	1192.4	9706.02	1191.74	9706.35	1191.64	9707.14	1191.43
9712.51	1189.75	9714.89	1189.2	9716.5	1189.04	9717.65	1188.85	9723.78	1187.36
9727.52	1187.27	9727.6	1187.27	9727.72	1187.26	9731.39	1187.1	9733.09	1187.05
9738.39	1186.79	9739.53	1186.8	9740.02	1186.78	9742.92	1186.66	9745.32	1186.61
9746.06	1186.49	9749.63	1186.15	9750.31	1185.39	9750.67	1184.82	9751.36	1184.41
9752.05	1184.1	9752.85	1184.12	9753.11	1184.07	9753.27	1184.16	9753.67	1185.42
9753.81	1185.67	9753.93	1185.7	9756.13	1186.06	9757.8	1186.31	9758.84	1186.53
9766.44	1186.51	9766.85	1186.5	9767.02	1186.49	9767.18	1186.48	9770.75	1186.24
9773.76	1186.14	9775.75	1186.14	9776.57	1186.16	9792.61	1186.85	9794.81	1186.94
9804.76	1187.54	9807.92	1187.86	9812.7	1187.84	9817.21	1188.03	9822.7	1188.09
9828.96	1187.74	9837.44	1187.83	9852.7	1187.55	9860.53	1187.39	9863.63	1187.41
9882.43	1187.79	9891.85	1188.05	9893.28	1187.11	9894.55	1184.99	9896.92	1184.08
9897.98	1183.43	9900.25	1181.95	9902.09	1180.6	9905.52	1179.67	9906.47	1179.36
9912.27	1179.21	9915.15	1179.16	9916.17	1179.32	9918.83	1179.86	9920.92	1180.24
9923.37	1180.74	9924.67	1180.72	9927.24	1180.92	9928.83	1180.91	9934.84	1180.97
9934.9	1180.97	9934.91	1180.98	9934.95	1180.99	9939.86	1182.65	9941.56	1183.21
9944.38	1183.4	9945.65	1183.61	9949.83	1183.9	9953.31	1183.79	9956.44	1183.65
9957.14	1183.53	9960	1183.08	9961.39	1182.86	9963.24	1182.93	9965.52	1182.87
9967.2	1182.82	9967.63	1182.81	9969.19	1182.62	9971.51	1182.27	9975.69	1181.73
9978.75	1181.32	9986.99	1181.1	9987.69	1181.08	9987.97	1181.08	9988.36	1181.07
9988.6	1181.05	9988.71	1181.03	9990.73	1180.37	9991.14	1180.32	9993	1180.07
9995.78	1179.9	9996.7	1179.8	9997.05	1179.81	9999.99	1179.8810000.34		1179.89
10005.15	1180.310008.16		1180.5410009.37		1180.7110012.14		1180.8610014.34		1181.1
10016.36	1181.3110018.97		1181.56 10021.2		1181.75 10026.9		1182.1210028.06		1182.28
10035.79	1182.5210036.43		1182.5610037.95		1182.5510044.41		1182.8110044.66		1182.92
10051.73	1184.8310060.46		1185.4510061.46		1185.4810061.82		1185.4810067.03		1185.63
10069.63	1185.710069.79		1185.710070.21		1185.7110071.12		1185.7210088.39		1185.82
10091.78	1185.8210096.06		1185.84 10104.2		1185.9610104.65		1185.9610104.97		1185.96
10105.25	1185.9410107.98		1185.7910115.33		1185.4610122.02		1185.3310124.52		1185.29

10127.88 1185.1210136.18 1184.57 10144.3 1184.4710145.87 1184.4310147.64 1184.32
10148.01 1184.2610149.63 1184.2310151.56 1184.210153.22 1184.1610158.03 1183.98
10159.12 1183.9410159.47 1183.8910160.07 1183.8810161.65 1183.8410166.27 1183.68
10170.84 1184.0310175.29 1184.0810176.24 118410186.62 1183.81 10187.1 1183.81
10187.36 1183.810195.97 1184.0410199.96 1183.9810202.89 1183.9510206.64 1183.98
10208.09 1183.9910208.75 1183.9110209.46 1183.8310214.69 1183.31 10215 1183.3
10223.75 1182.5510224.08 1182.5310228.93 1181.8610231.93 1181.4410238.81 1182.07
10246.7 1182.45 10249.5 1182.6310263.54 1184.3710271.24 1185.3710272.49 1185.35
10275.7 1185.2110279.87 1184.9210281.77 1184.84 10282.9 1184.8310292.17 1184.62
10294.36 1184.3410297.69 1183.57 10298.7 1183.8210304.51 1184.3910308.17 1184.42
10311.13 1184.41 10315.3 1184.5210319.85 1184.6710319.92 1184.6610323.02 1184.5
10327.33 1184.2910328.85 1184.3410335.65 1184.6610341.56 1184.8810343.11 1185.07
10344.86 1185.1810351.49 1185.7910355.62 1185.8210358.81 1185.8710360.49 1185.81
10371.58 1185.4410373.32 1185.1410375.44 1185.110387.67 1184.710389.35 1184.63
10389.85 1184.62 10390.4 1184.64 10391.5 1184.6810394.32 1184.7110403.82 1184.83
10422.47 1184.6610427.04 1184.59 10431.8 1184.6710438.01 1184.67 10439.8 1185.17
10441.02 1185.4610442.64 1185.610444.54 1185.9210445.13 1185.710447.64 1185.31
10449.71 1185.13 10452.8 1185.1610461.08 1185.1710467.04 1185.2710471.97 1185.24
10474.8 1185.2610482.54 1185.1110488.89 1185.02 10490.2 1184.7510490.92 1184.63
10491.37 1184.5610492.88 1184.3610493.88 1184.2410496.15 1184.2410501.35 1184.34
10507.97 1185.1410509.68 1185.5410512.89 1186.710517.35 1188.2910517.69 1188.39
10518.03 1188.5410519.95 1189.28

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
9668.36	.06	9894.55	.0610051.73	.06	

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
9894.5510051.73 430.6 475.19 507.1 .1 .3

CROSS SECTION

RIVER: MDOW
REACH: Reach1 RS: 0.324

INPUT
Description:
Station Elevation Data num= 360

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
9820.53	1195.16	9820.7	1195.04	9821.26	1194.67	9821.52	1194.53	9822.1	1194.32
9824.32	1193.73	9825.26	1193.61	9826.09	1193.47	9826.42	1193.41	9826.53	1193.4
9827.66	1193.15	9828.6	1192.97	9830.95	1192.16	9833.03	1190.05	9833.33	1189.85
9835.44	1185.33	9835.5	1185.21	9835.56	1185.15	9835.64	1185.03	9839.75	1181.18
9840.1	1180.84	9842.51	1179.41	9843.63	1177.76	9845.28	1176.36	9845.31	1176.35
9845.58	1176.3	9847.47	1175.92	9847.81	1175.89	9848.13	1175.86	9848.79	1175.83
9856.37	1175.78	9863.85	1175.56	9864.13	1175.56	9864.81	1175.52	9869.56	1175.19
9871.14	1175.26	9873.94	1175.23	9874.61	1175.2	9876.34	1175.31	9877.57	1175.42
9879.71	1175.73	9880.74	1175.9	9881.86	1176.13	9883.91	1176.5	9885.05	1176.73
9885.25	1176.72	9886.24	1176.72	9886.97	1176.92	9889.47	1177.69	9894.18	1179.12
9897.88	1179.4	9900.97	1179.6	9901.24	1179.59	9901.34	1179.59	9903.54	1179.49
9904.71	1179.42	9904.79	1179.41	9904.89	1179.41	9906.13	1179.3	9912.65	1178.69
9913.47	1178.67	9917.57	1178.59	9918.35	1178.64	9921.96	1178.9	9923.71	1178.92
9926.7	1178.93	9938.61	1179.18	9941.33	1179.26	9945.46	1179.3	9947.05	1179.3
9948.16	1179.26	9950.69	1178.88	9956.3	1179.27	9956.49	1179.29	9956.98	1179.28
9966.57	1179.2	9966.96	1179.09	9970.1	1178.54	9972.02	1178.78	9973.73	1178.91
9974.92	1178.98	9976.8	1179.04	9979.74	1179.2	9981.94	1178.48	9984.25	1178.02
9985.12	1178.03	9990.28	1178.36	9991.26	1178.39	9992.39	1178.13	9994.92	1178.04
9998.48	1178.04	9999.99	1177.98	10000	1177.9810002.95		1178.0210003.77		1177.98
10005.93	1178.34	10006.1	1178.3610006.23		1178.42	10007.8	1178.8710008.24		1179.87
10010.81	1181.6110014.53		1181.9310020.72		1181.9510023.58		1181.7810031.02		1181.99
10032.22	1181.9710032.51		1181.9610043.98		1181.6610046.63		1181.510059.38		1181.43
10066.97	1181.5810069.66		1181.5610072.93		1181.1510084.57		1180.9610091.73		1181.06
10094.77	1181.0310098.88		1181.0910107.35		1181.2710117.81		1180.6710120.13		1180.56
10124.53	1180.8310125.97		1180.9910126.88		1181.0610127.69		1181.1510130.18		1181.16
10133.72	1181.2510137.64		1181.0910151.88		1181.510154.07		1181.5410166.45		1180.98
10171.6	1180.9110176.92		1180.2110177.17		1180.1310178.69		1179.8510180.18		1179.64
10184.81	1180.2910186.43		1180.4910186.67		1180.4710189.18		1180.67	10191	1180.59
10192.12	1180.5710193.57		1179.910194.23		1179.6310197.15		1178.7610197.51		1178.69
10199.12	1178.54	10200.3	1178.4610204.54		1178.4810208.45		1178.810209.95		1178.95
10212.95	1179.0310214.21		1179.0610217.21		1179.610217.78		1179.7110222.32		1179.35
10222.99	1179.3610224.26		1179.3910227.05		1179.3410227.67		1179.34	10227.7	1179.34
10227.96	1179.3910229.46		1179.6910232.97		1179.7610235.37		1179.7710236.68		1179.77
10236.95	1179.78	10240.9	1179.7710243.69		1179.9110245.54		1180.4810246.15		1180.51
10254.17	1180.8310258.91		1180.8310263.16		1180.7210271.98		1180.710273.98		1180.73
10276.62	1180.7310278.81		1180.7410284.14		1180.9310284.66		1180.79	10288.7	1180
10291.74	1180.110292.79		1180.4210297.47		1180.7510301.45		1181.1310309.17		1180.83
10310.79	1180.7810318.15		1180.8810319.39		1180.8110320.07		1180.5310322.86		1178.66
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10828.24	1196.2410830.16		1196.2310831.38		1196.2510834.27		1196.4410836.76		1196.6
10842.71	1196.9810842.95		119710843.01		1196.9910843.11		119710843.96		1196.97

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
9820.53	.06	9839.75	.0610010.81	.06	

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
9839.7510010.81 0 0 0 .1 .3

SUMMARY OF REACH LENGTHS

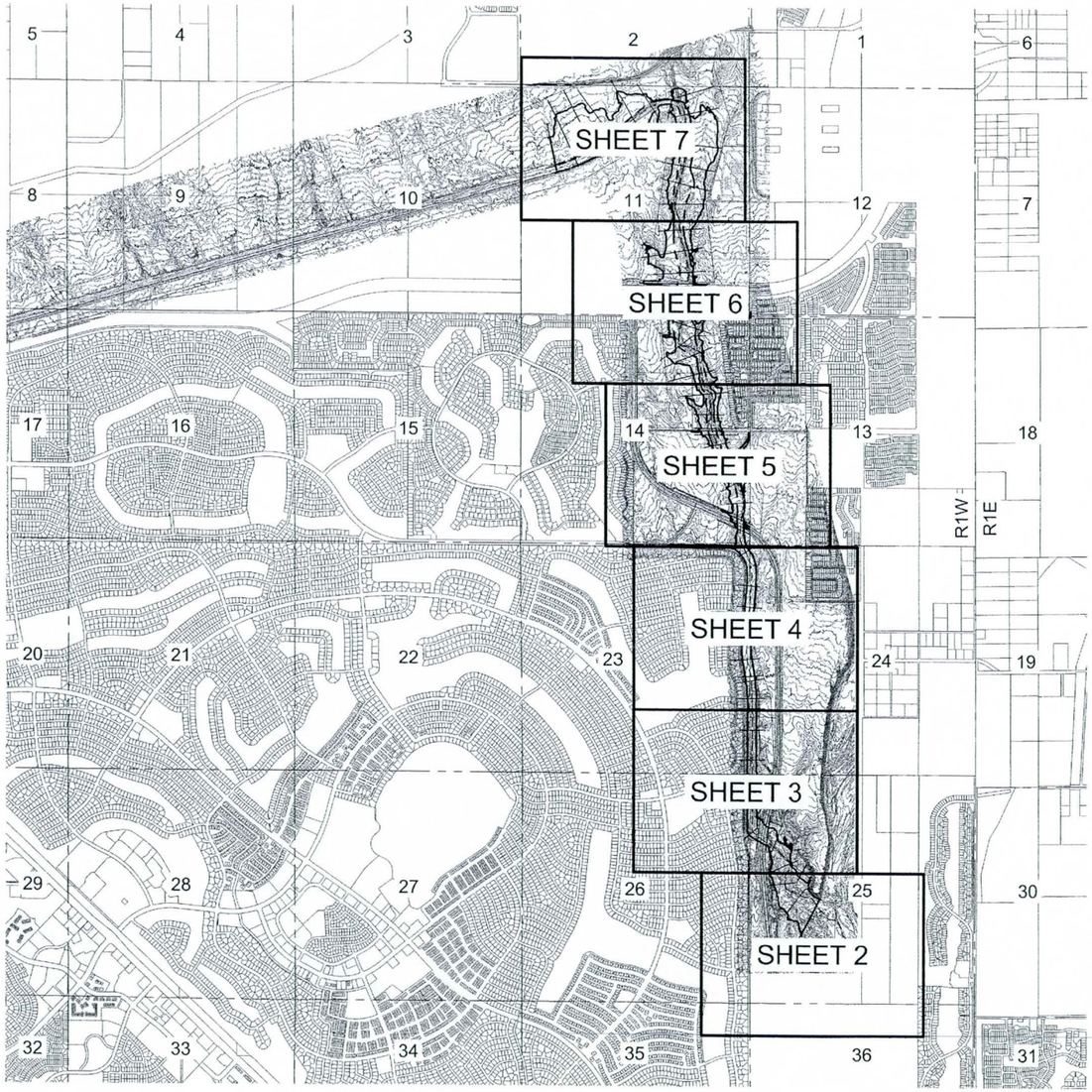
River: MDOW

Reach	River Sta.	Left	Channel	Right
Reach1	4.794	433.5	500	518.6
Reach1	4.699	493.3	519.12	522.8
Reach1	4.601	478.1	500	516.3
Reach1	4.506	666.5	624.32	600.9
Reach1	4.388	494.1	500	500.7
Reach1	4.293	543	500	409.9
Reach1	4.199	617.4	500	297.9
Reach1	4.104	793.5	693	658.3
Reach1	3.973	530	500	490
Reach1	3.878	433.4	410.73	399.9
Reach1	3.800	414.5	500	522
Reach1	3.706	590.8	617.7	623.3
Reach1	3.589	481.7	500	555.7
Reach1	3.494	485	500	514.4
Reach1	3.399	225.4	260.73	266.7
Reach1	3.350	208.5	208.5	208.5
Reach1	3.330	Culvert		
Reach1	3.310	237.1	233.89	231.2
Reach1	3.266	439.8	500	577.9
Reach1	3.171	319.5	500	656.1
Reach1	3.077	490	478.23	346.9
Reach1	2.986	446.4	500	507.6
Reach1	2.891	575.3	551.08	504.9
Reach1	2.787	507.5	500	485.7
Reach1	2.692	318.43	317.3	316.92
Reach1	2.632	154.48	154.48	154.48
Reach1	2.618	Culvert		
Reach1	2.603	228.7	247.72	290.6
Reach1	2.556	434.5	500	515.1
Reach1	2.461	523.4	500	496.4
Reach1	2.367	505.9	500	430.1
Reach1	2.272	414.3	400.91	327.7
Reach1	2.196	235.48	235.48	235.48
Reach1	2.174	Culvert		
Reach1	2.151	480.9	536.32	564.8
Reach1	2.050	816	797.41	747.7
Reach1	1.899	500.5	500	499.5
Reach1	1.804	700.3	702.71	704.1
Reach1	1.671	489.9	500	506.8
Reach1	1.576	400.4	399.43	396.6
Reach1	1.501	99.2	102.63	108
Reach1	1.481	403.1	397.37	388.8
Reach1	1.406	236.5	234.93	233.4
Reach1	1.362	500	500	499.7
Reach1	1.267	685.8	686.37	686.4
Reach1	1.137	500.4	500	499.5
Reach1	1.042	553.8	555.03	555.9
Reach1	0.937	556	600.99	631.9
Reach1	0.823	103.9	165.71	207
Reach1	0.792	250.88	250.88	250.88
Reach1	0.768	Culvert		
Reach1	0.744	240.4	185.96	179.9
Reach1	0.709	608.3	558.51	463.9
Reach1	0.603	510.5	500	400.9
Reach1	0.509	347.2	498.38	566.8
Reach1	0.414	430.6	475.19	507.1
Reach1	0.324	0	0	0

FLOODPLAIN WORK MAP
FOR

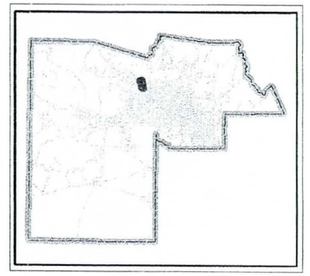
MCMICKEN DAM OUTLET WASH FLOODPLAIN DELINEATION STUDY

CONTRACT FCD 2011C003



KEY MAP

FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY



MCMICKEN DAM OUTLET WASH
FLOODPLAIN DELINEATION STUDY

SCALE 1"=1500'

1500 0 1500 3000 4500

SCALE: 1"=1500'

SHEET INDEX

1 COVER SHEET
2-7 FLOODPLAIN WORK MAP

ENGINEER

RBF CONSULTING
NATHAN E. FORD, P.E.
2929 N. CENTRAL AVENUE, STE 800
PHOENIX, ARIZONA 85012
PHONE (602) 279-1234
FAX (602) 279-1411

DATUM

HORIZONTAL: NORTH AMERICAN DATUM 1983

VERTICAL: NORTH AMERICAN VERTICAL DATUM 1988 (NAVD88)

ELEVATION REFERENCE MARKS

ERM 4GA2	N 960,390.13	E 578,380.86	(1165.9 FT)
ERM Q366	N 991,733.90	E 569,966.99	(1392.53 FT)

NOTE: DATA FOR ELEVATION REFERENCE MARKS (ERM) OBTAINED FROM THE NATIONAL GEODETIC SURVEY DATA SHEETS AVAILABLE AT WWW.NGS.NOAA.GOV

NOTE:
THIS MAP WAS PREPARED USING 1 FT CONTOUR DATA PROVIDED BY THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY FROM AERIAL PHOTOGRAPHS FLOWN IN OCTOBER 2012 BY WOOLPERT UNDER FCD CONTRACT 2011C033.

RBF CONSULTING
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DESIGNED	DRAFTED	CHECKED
NEF	DJP	NEF

PROJECT COORDINATION
NATHAN E. FORD, P.E.

DRAWING SCALE
1" = 1500'

REVISIONS

NO	BY	DESCRIPTION	APP'D	DATE

OWNER/SPONSOR
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

PROJECT NAME
MCMICKEN DAM OUTLET WASH FDS

PLAN TITLE
FLOODPLAIN WORK MAP

SEALED
Registered Professional Engineer
CERTIFICATE NO.
40054
NATHAN E. FORD
State of Arizona
Expires 12/31/15

ORIGINAL PLAN DATE
JUNE/2013

LATEST PLAN REVISION
—

SHEET NUMBER
1 OF 7

PROJECT NUMBER
133347

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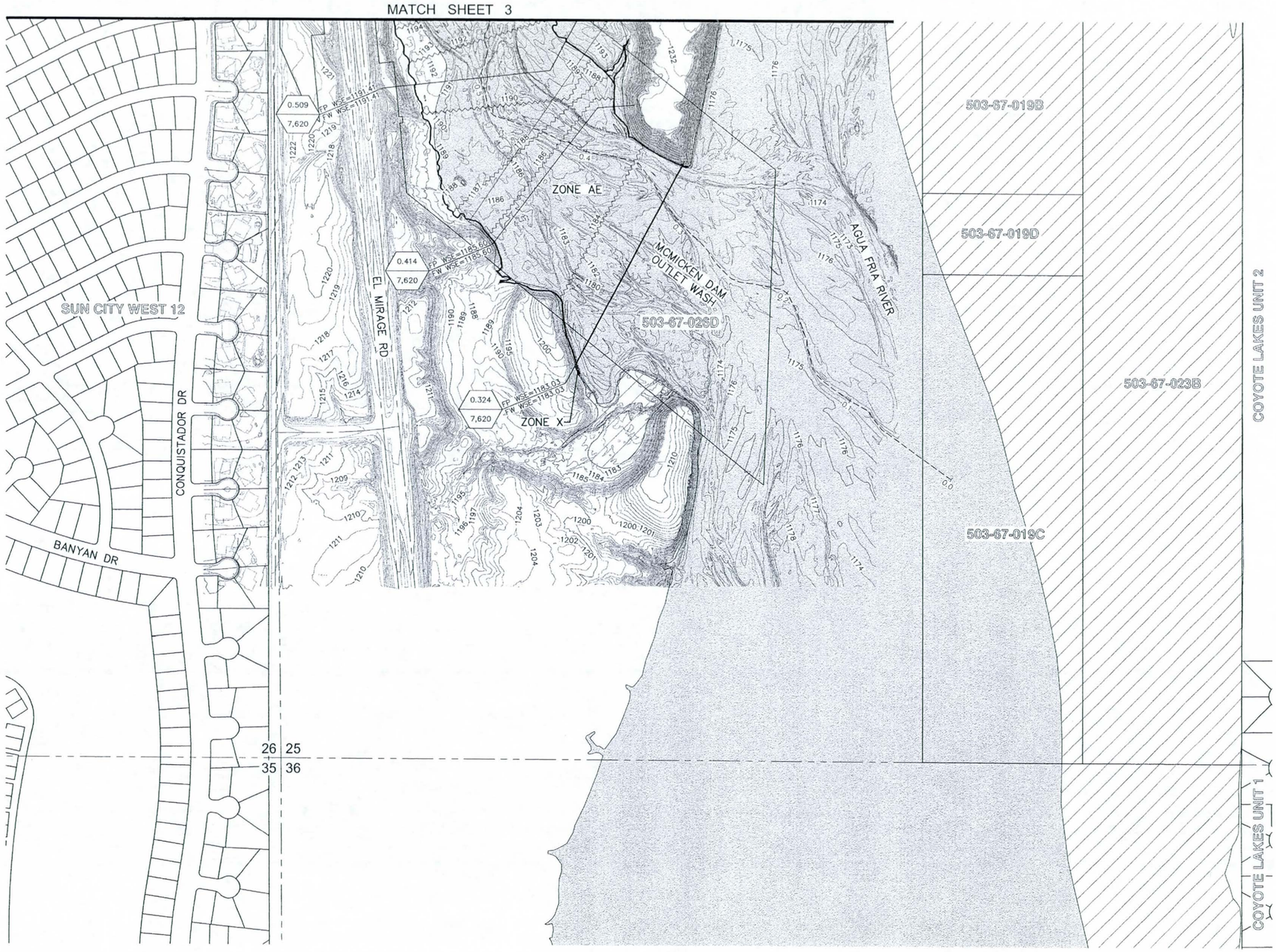
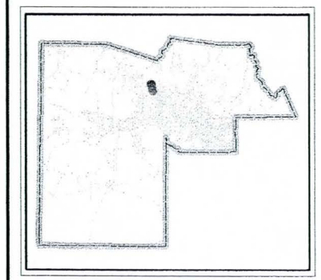


FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY



MCMICKEN DAM OUTLET WASH
FLOODPLAIN DELINEATION STUDY

200 100 0 200 400 600
SCALE: 1"=200'

LEGEND

- EXISTING ZONE A
- EXISTING ZONE AE
- EXISTING FLOODWAY
- HYDRAULIC BASE LINE
- 1S2WS18B(J37) WASH I.D.
- 0.189 / 1156 STATION RIVER MILE / CROSS SECTION / Q100 (CFS)
- CROSS SECTIONS
- ZONE A FLOODPLAIN
- ZONE AE FLOODPLAIN
- ZONE X FLOODPLAIN
- FLOODWAY
- 1700 EXISTING CONTOUR
- 1700 BASE FLOOD ELEVATION

NOTE:
THE PARCEL BOUNDARIES AND APN'S ON THIS SHEET ARE FOR ILLUSTRATIVE PURPOSES ONLY. THE EXACT RELATIONSHIPS OF PARCELS AND APN'S SHOULD BE INDEPENDENTLY RESEARCHED AND VERIFIED.

NO.	BY	DESCRIPTION	APP'D	DATE

REVISIONS

MCMICKEN DAM OUTLET WASH
FLOODPLAIN WORK MAP

RBF CONSULTING
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Registered Professional Engineer (Civil)
CERTIFICATE NO.
40054
NATHAN E. FORD
Date Signed 6/21/13
Expires 12/31/15

LAYOUT	DRAFTED	CHECKED
NEF	DLP	NEF

DRAWING SCALE(S)
1" = 200'

PLAN DATE
JUNE/2013

PROJECT NUMBER
133347

SHEET NO.
2
OF 7 SHEETS

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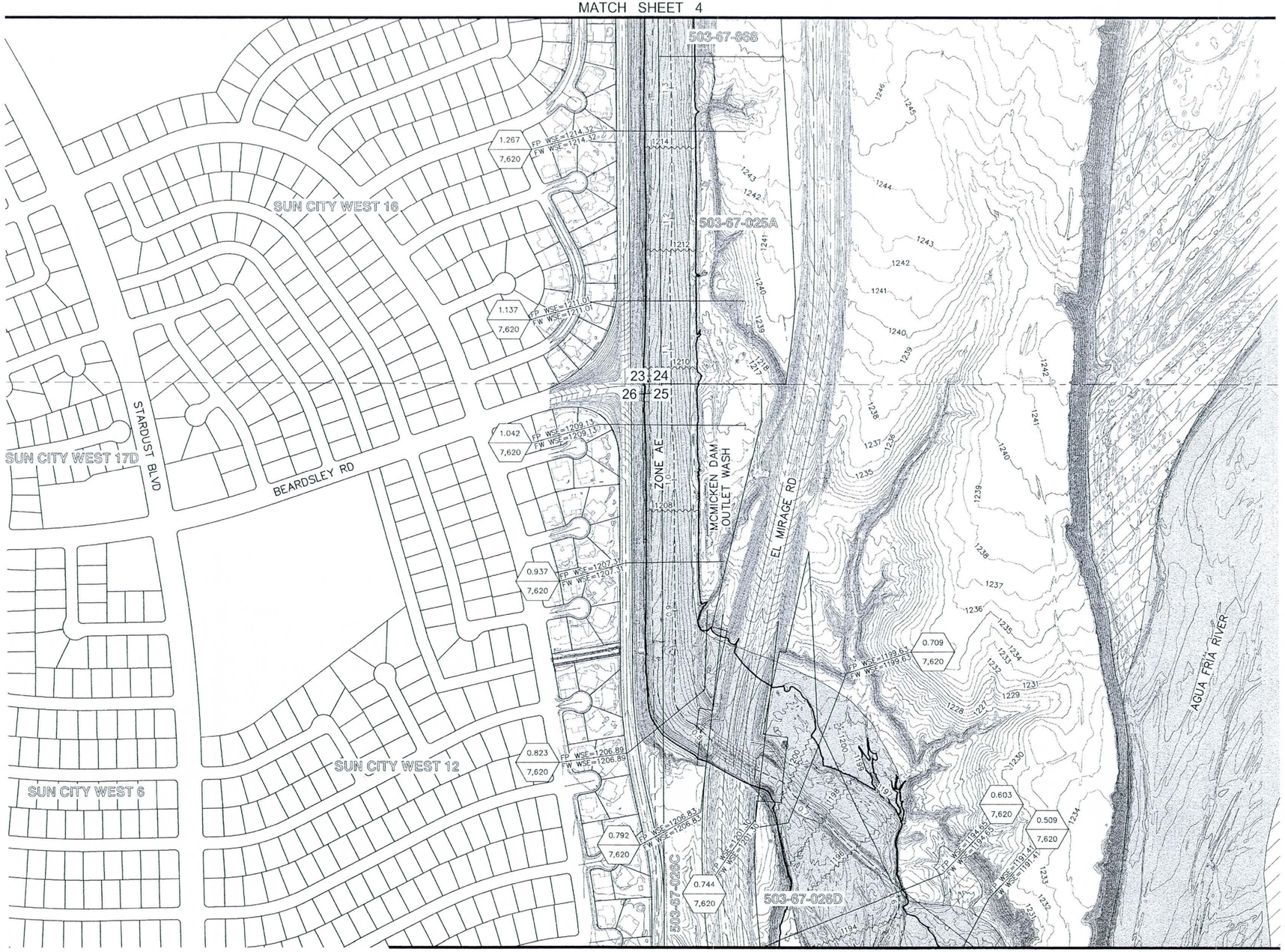
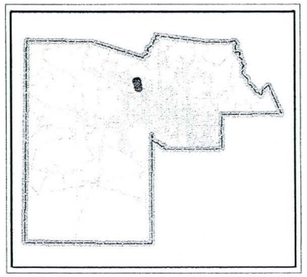
MATCH SHEET 4



MATCH SHEET 2

FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY



MCMICKEN DAM OUTLET WASH
FLOODPLAIN DELINEATION STUDY

200 100 0 200 400 600
SCALE: 1"=200'

LEGEND

- EXISTING ZONE A
- EXISTING ZONE AE
- EXISTING FLOODWAY
- HYDRAULIC BASE LINE
- 1S2WS18B(J37) WASH I.D.
- 0.189 / 1156 STATION RIVER MILE / CROSS SECTION / Q100 (CFS)
- CROSS SECTIONS
- ZONE A FLOODPLAIN
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REVISIONS

MCMICKEN DAM OUTLET WASH
FLOODPLAIN WORK MAP

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Registered Professional Engineer Certificate No. 40064 NATHAN E. FORD Date Signed 6/13/13 ARIZONA U.S.A. Expires 12/31/15

LAYOUT	DRAFTED	CHECKED
NEF	DLP	NEF

DRAWING SCALE(S)
1" = 200'

PLAN DATE
JUNE/2013

PROJECT NUMBER
133347

SHEET NO.
3
OF 7 SHEETS

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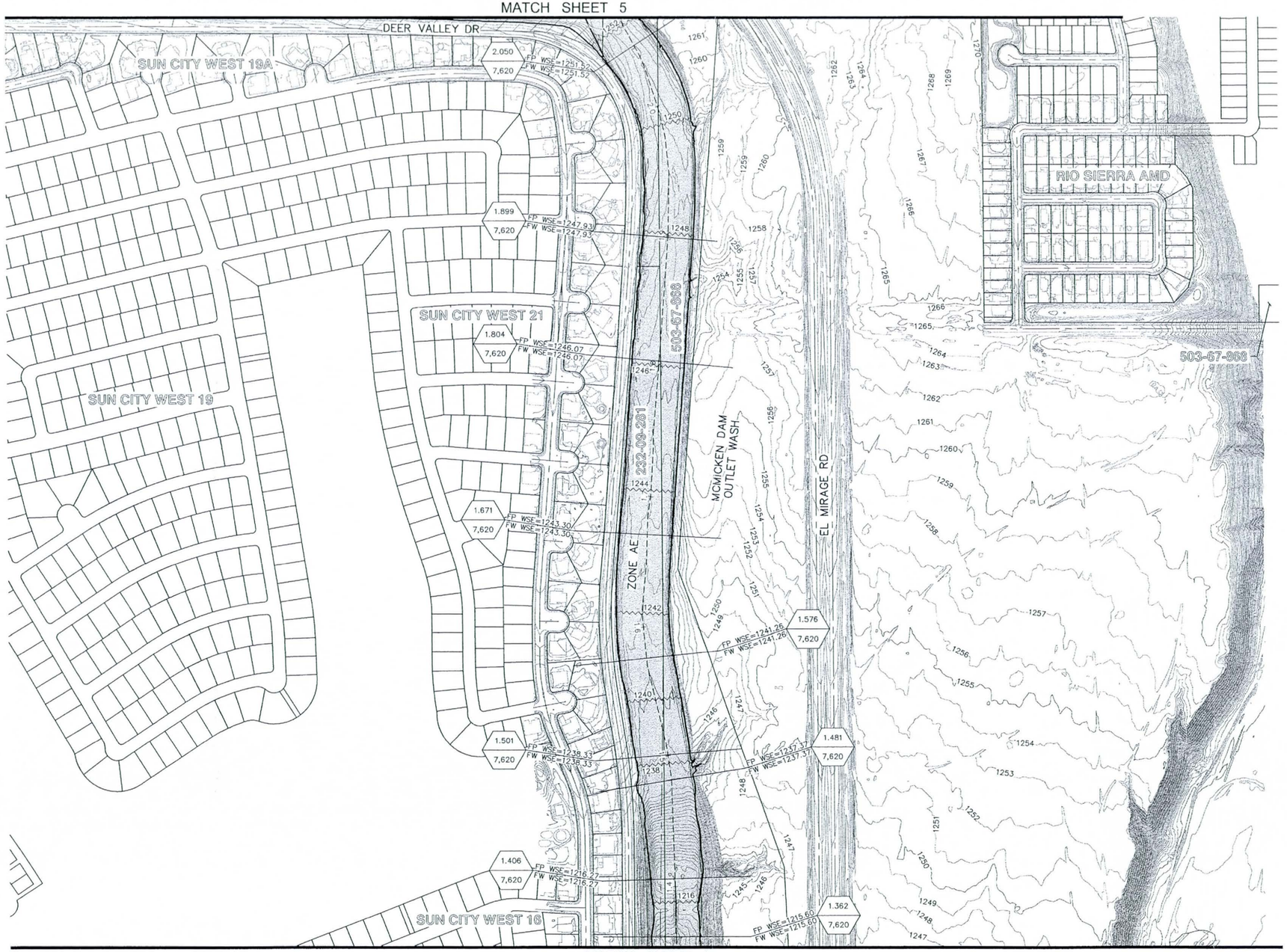
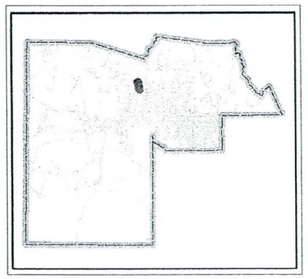
MATCH SHEET 5



MATCH SHEET 3

FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY



MCMICKEN DAM OUTLET WASH
FLOODPLAIN DELINEATION STUDY

200 100 0 200 400 600
SCALE: 1"=200'

LEGEND

- EXISTING ZONE A
- EXISTING ZONE AE
- EXISTING FLOODWAY
- HYDRAULIC BASE LINE
- 1S2WS18B(J37) WASH I.D.
- 0.189 / 1156 STATION RIVER MILE / CROSS SECTION / Q100 (CFS)
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NO.	BY	DESCRIPTION	APP'D	DATE

REVISIONS

MCMICKEN DAM OUTLET WASH
FLOODPLAIN WORK MAP

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Registered Professional Engineer (Civil)
CERTIFICATE NO.
40054
NATHAN E. FORD
Date Signed 6/24/13
ARIZONA U.S.A.
Expires 12/31/15

LAYOUT	DRAFTED	CHECKED
NEF	DLP	NEF

DRAWING SCALE(S)
1" = 200'

PLAN DATE
JUNE/2013

PROJECT NUMBER
133347

SHEET NO.
4
OF 7 SHEETS

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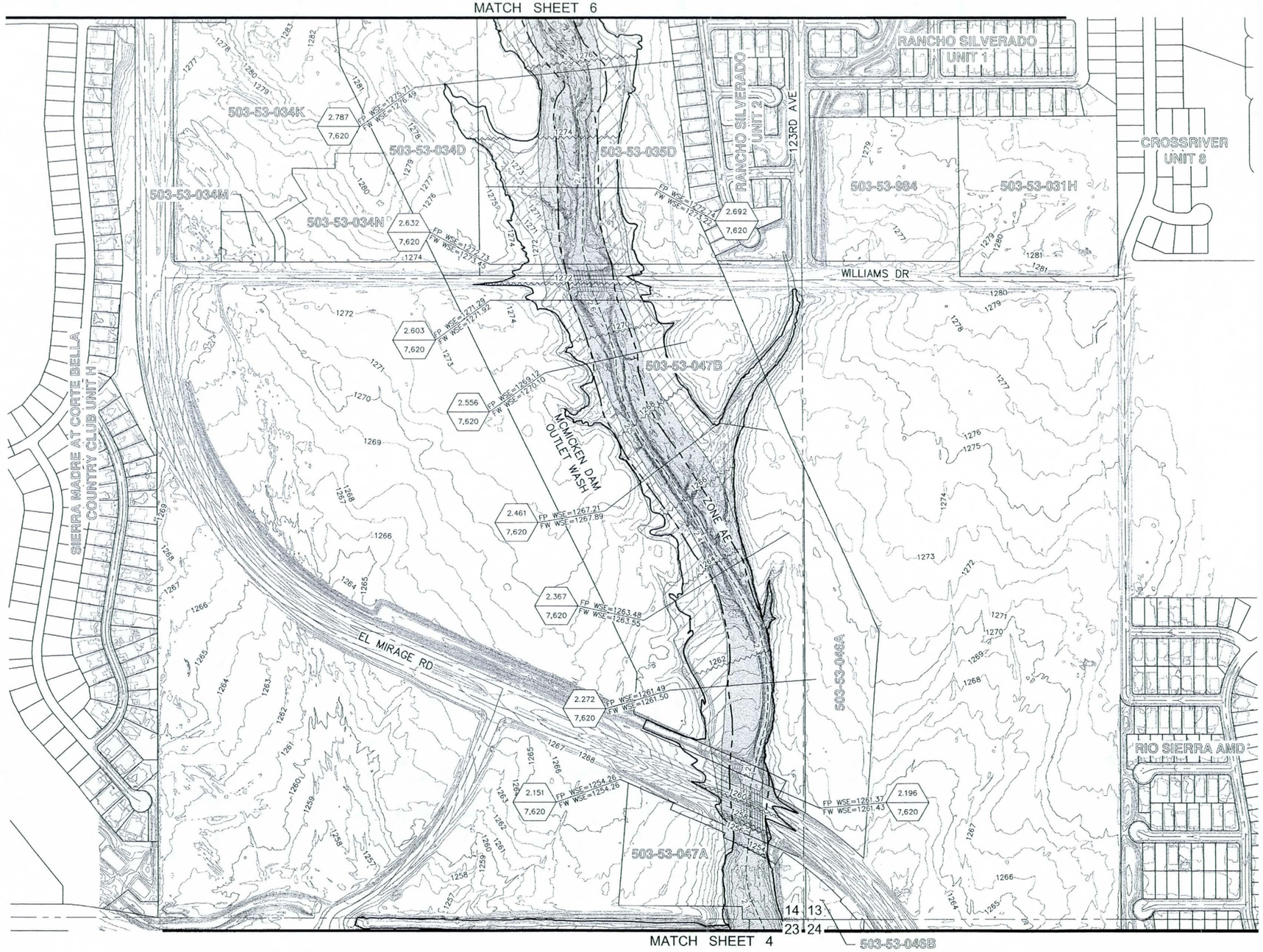
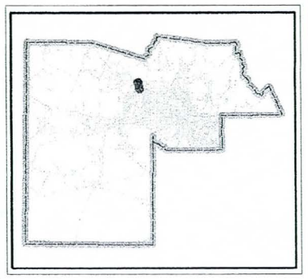
MATCH SHEET 6



MATCH SHEET 4

14 13
23 24

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY



MCMICKEN DAM OUTLET WASH
FLOODPLAIN DELINEATION STUDY

200 100 0 200 400 600
SCALE: 1"=200'

LEGEND

- EXISTING ZONE A
- EXISTING ZONE AE
- EXISTING FLOODWAY
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REVISIONS

MCMICKEN DAM OUTLET WASH
FLOODPLAIN WORK MAP

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Registered Professional Engineer (Civil) CERTIFICATE NO. 40054 NATHAN E. FORD ARIZONA, U.S.A. Date Signed 6/27/13 Nathan Ford Expires 12/31/15

LAYOUT	DRAFTED	CHECKED
NEF	DLP	NEF

DRAWING SCALE(S)
1" = 200'

PLAN DATE
JUNE/2013

PROJECT NUMBER
133347

SHEET NO.
5
OF 7 SHEETS

H:\PLAT\133347\CADD\Stormwater\Div\McMickenDam\133347-SW-005.dwg Pearce, Derek 6/24/13 10:39:47 AM

MATCH SHEET 7

503-53-034A

503-53-025J

503-53-025G

503-53-025K

503-53-025L

LIMIT OF STUDY

LOOP 303

3.589 / 7,481 — FP WSE=1296.52, FW WSE=1297.13

3.494 / 7,481 — FP WSE=1294.29, FW WSE=1295.21

3.399 / 7,481 — FP WSE=1291.72, FW WSE=1292.07

3.350 / 7,481 — FP WSE=1291.82, FW WSE=1292.18

3.310 / 7,481 — FP WSE=1289.12, FW WSE=1289.64

3.266 / 7,481 — FP WSE=1287.61, FW WSE=1288.43

3.171 / 7,620 — FP WSE=1284.63, FW WSE=1285.51

3.077 / 7,620 — FP WSE=1283.35, FW WSE=1283.92

2.986 / 7,620 — FP WSE=1281.46, FW WSE=1282.06

2.891 / 7,620 — FP WSE=1278.59, FW WSE=1278.98

ZONE AE

503-53-034B

503-53-034A

503-53-035J

503-53-034K

503-53-034D

503-53-035D

MCMICKEN DAM OUTLET WASH

EL MIRAGE RD

PINNACLE PEAK RD

DOS RIOS UNIT 2

SUNDERO

123RD AVE

RANCHO SILVERADO UNIT 1

RANCHO SILVERADO UNIT 2

EL CAMINO AT CORTE BELLA COUNTRY CLUB UNIT M

EL CAMINO AT CORTE BELLA COUNTRY CLUB UNIT L

11 12 14 13

MATCH SHEET 5

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

MCMICKEN DAM OUTLET WASH FLOODPLAIN DELINEATION STUDY

200 100 0 200 400 600

SCALE: 1"=200'

LEGEND

- EXISTING ZONE A
- EXISTING ZONE AE
- EXISTING FLOODWAY
- HYDRAULIC BASE LINE
- 1S2WS18B(J37) WASH I.D.
- 0.189 STATION RIVER MILE
- CROSS SECTION
- 1156 Q100 (CFS)
- CROSS SECTIONS
- ZONE A FLOODPLAIN
- ZONE AE FLOODPLAIN
- ZONE X FLOODPLAIN
- FLOODWAY
- 1700 EXISTING CONTOUR
- 1700 BASE FLOOD ELEVATION

NOTE:
THE PARCEL BOUNDARIES AND APN'S ON THIS SHEET ARE FOR ILLUSTRATIVE PURPOSES ONLY. THE EXACT RELATIONSHIPS OF PARCELS AND APN'S SHOULD BE INDEPENDENTLY RESEARCHED AND VERIFIED.

NO.	BY	DESCRIPTION	APPD	DATE

REVISIONS

MCMICKEN DAM OUTLET WASH

FLOODPLAIN WORK MAP

RBF CONSULTING
PLANNING ■ DESIGN ■ CONSTRUCTION
2929 NORTH CENTRAL AVENUE, SUITE 800
PHOENIX, ARIZONA 85012-2794
602.279.1234 • FAX 602.279.1141 • www.RBF.com

Registered Professional Engineer (Civil) CERTIFICATE NO. 40054 NATHAN E. FORD Date Signed 6/21/13 ARIZONA, U.S.A. Expires 09/30/14

LAYOUT	DRAFTED	CHECKED
NEF	DLP	NEF

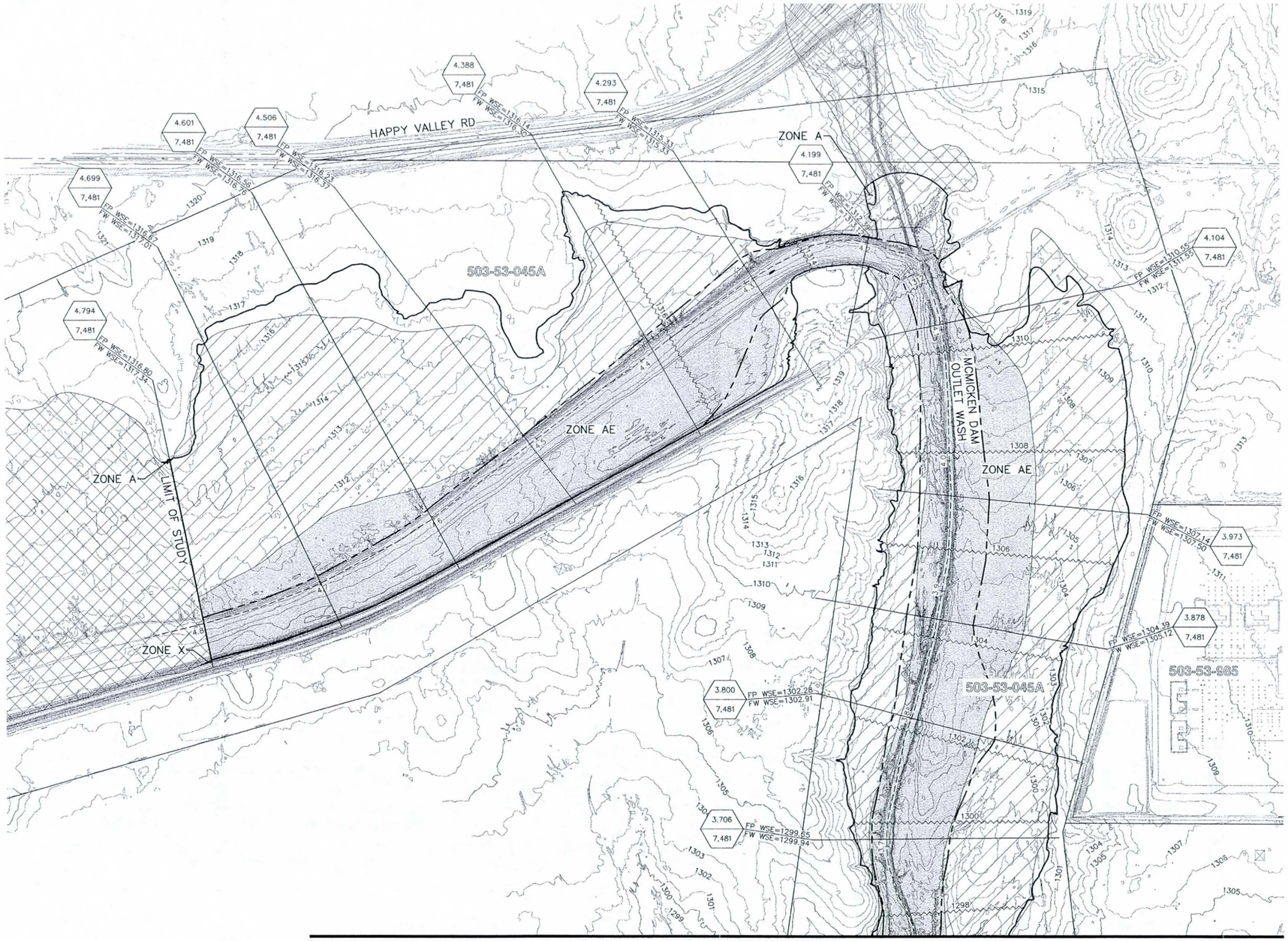
DRAWING SCALE(S)
1" = 200'

PLAN DATE
JUNE/2013

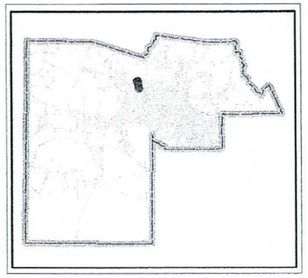
PROJECT NUMBER
133347

SHEET NO.
6
OF 7 SHEETS

H:\PDATA\133347\CADD\Stmwater\DRV\McMickenDam\133347-SW-006.dwg Pierce, Derek 6/21/13 10:51:24 AM



FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY



MCMICKEN DAM OUTLET WASH
FLOODPLAIN DELINEATION STUDY

200 100 0 200 400 600
SCALE: 1"=200'

LEGEND

- EXISTING ZONE A
- EXISTING ZONE AE
- EXISTING FLOODWAY
- HYDRAULIC BASE LINE
- 1S2WS18B(J37) WASH I.D.
- 0.189 / 1156 STATION RIVER MILE / CROSS SECTION / Q100 (CFS)
- CROSS SECTIONS
- ZONE A FLOODPLAIN
- ZONE AE FLOODPLAIN
- ZONE X FLOODPLAIN
- FLOODWAY
- 1700 EXISTING CONTOUR
- 1700 BASE FLOOD ELEVATION

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NO.	BY	DESCRIPTION	APP'D	DATE

REVISIONS

MCMICKEN DAM OUTLET WASH
FLOODPLAIN WORK MAP

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2929 NORTH CENTRAL AVENUE, SUITE 800
PHOENIX, ARIZONA 85012-2794
602.279.1234 • FAX 602.279.1481 • www.RBF.com

Registered Professional Engineer (Civil)
CERTIFICATE NO.
40054
NATHAN E. FORD
Date Signed 6/21/13
ARIZONA, U.S.A.
Expires 12/31/15

LAYOUT	DRAFTED	CHECKED
NEF	DLP	NEF

DRAWING SCALE(S)
1" = 200'

PLAN DATE
JUNE/2013

PROJECT NUMBER
133347

SHEET NO.
7
OF 7 SHEETS

H:\PDATA\133347\CADD\Stormwater\DWG\McMickenDam\133347-SW-007.dwg Pearce, Derek 6/21/13 10:42:49 AM