Gila Bend ADMP Hydrology Update

Stantec

8211 S. 48th Street
Phoenix, AZ 85044
(602) 438-2200
www.stantec.com

Technical Memorandum

November 2011

Gila Bend ADMP

Hydrology Update

Stantec
8211 S. 48th Street
Phoenix, AZ 85044
(602) 438-2200
www.stantec.com

Registered Professional Engineer (Civil)
CERTIFICATE NO. 35150
R. MICHAEL C. GERLACH
Date Signed 17 Nov 11
ARIZONA U.S.A.

Expires 09/30/2012

Technical Memorandum

November 2011

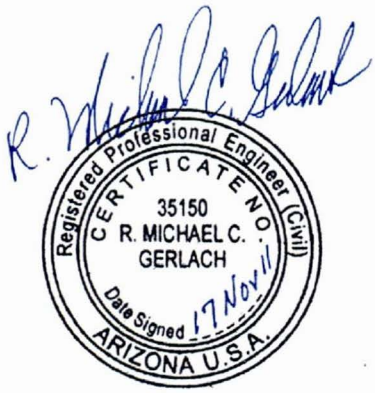
Table of Contents

1.0 INTRODUCTION 1.1
1.1 BACKGROUND 1.1
1.2 PURPOSE 1.1

2.0 MAPPING AND SURVEY 2.1
2.1 TOPOGRAPHIC MAPPING 2.1
2.2 SURVEY DATA 2.1

3.0 HYDROLOGIC ANALYSIS 3.1
3.1 HYDROLOGIC SETTING 3.1
3.2 APPROACH 3.1
3.3 WATERSHED DELINEATION 3.2
3.4 RAINFALL 3.6
3.5 SUBBASIN PARAMETERS 3.7
3.5.1 Rainfall Loss 3.7
3.5.2 Unit Hydrograph 3.12
3.6 HYDROLOGIC CHANNEL ROUTING 3.14
3.7 FLOW DIVERSIONS 3.14
3.8 STORAGE ROUTING 3.15

4.0 RESULTS 4.1
4.1 GENERAL 4.1
4.2 COMPARISON WITH PREVIOUS STUDIES 4.2
4.3 INDIRECT METHODS OF VERIFICATION 4.5
4.3.1 Method 1 ..... 4.5
4.3.2 Method 2 ..... 4.6
4.3.3 Method 3 ..... 4.7
4.4 CONCLUSION 4.8



Expires 09/30/2012

Table of Contents

List of Tables

Table 3.1 – Subwatershed area 3.3
Table 3.2 – 100-year, 6- and 24-hour equivalent uniform rainfall depths 3.6
Table 3.3 – Soil parameters 3.9
Table 3.4 – Land use parameters 3.11
Table 4.1 – 100-year, 24-hour results at the Gila Bend Canal 4.1
Table 4.2 – 100-year, 24-hour outflow from the watershed 4.2
Table 4.3 – Comparison of results at the Gila Bend Canal 4.3

Table of Contents

List of Figures

Figure 1.1 – Vicinity map 1.2
Figure 2.1 – Mapping limits 2.2
Figure 3.1 – Subbasin boundary modifications 3.4
Figure 3.2 – Subbasin 2VV boundary modifications 3.5
Figure 3.3 – Soil surveys 3.8
Figure 3.4 – Subbasin S-graphs 3.13
Figure 4.1 – Comparison of model results 4.4
Figure 4.2 – Comparison of subbasin S-graph 4.5
Figure 4.3 – Indirect Method 1 ..... 4.6
Figure 4.4 – Indirect Method 2 ..... 4.7
Figure 4.5 – Indirect Method 3 ..... 4.8

List of Appendices

Appendix A – Subbasin Infiltration Parametes
Appendix B – Unit Hydrograph Parameters
Appendix C – Digital Files

1.0 Introduction

The watershed for the Gila Bend Area Drainage Master Plan (ADMP) is approximately 600 square miles in size. The watershed is drained by three major tributaries; Sand Tank Wash, Quilotosa Wash and Sauceda Wash, all of which are tributary to the Gila River. The watershed is located in the southern portion of Maricopa County as shown in Figure 1.1 . The Town of Gila Bend corporate limits covers approximately 30 square miles and is located in the northern most (downstream) portion of the watershed. The watershed, in the vicinity of the Town, is bisected by three major features; SR-85, I-8 and the Gila Bend Canal. These features have a significant impact of flow patterns.

1.1 BACKGROUND

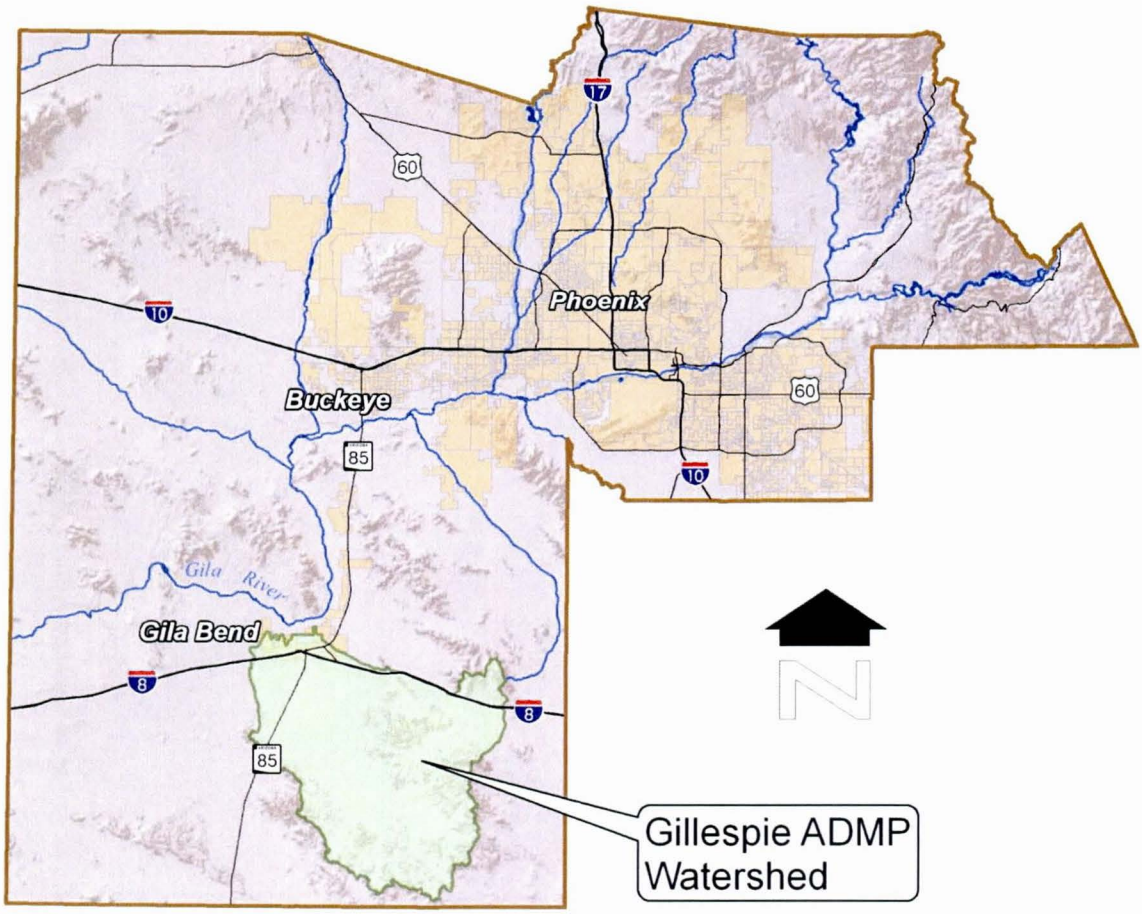
Hydrology for the watershed was completed in 1992 as part of the Gila Bend Floodplain Delineation Study, FCD 90-67. At the time hydrologic modeling for the watershed was being developed, new hydrologic modeling procedures were also being prepared by Maricopa County. To the extent practical, the new modeling procedures were applied for the Gila Bend Floodplain Delineation Study (FDS). However, at that time, detailed data for the watershed was not available, particularly soils data. Additionally, complete modeling procedures were not yet fully developed.

In 2000, the hydrology developed for the FDS were used to support investigates of alternatives to mitigate flooding problems within the Town of Gila Bend. This work was done as part of the Gila Bend ADMP. One conclusion formulated through the alternative analysis was that the FDS hydrology was overly conservative. Not only were some of the parameter assignments potentially conservative due to the lack of detailed data, but updated precipitation depths for the watershed per NOAA Atlas 14 are approximately 20-percent lower than those estimated for the FDS using NOAA Atlas 2 data. Therefore, it was determined that hydrology for the watershed be updated to reflect current refinements in parameter estimation, the most detailed hydrologic data currently available and precipitation depths based on NOAA Atlas 14 data.

1.2 PURPOSE

The purpose of this update is to provide detailed hydrologic modeling for the watershed using current modeling methodologies, procedures, techniques and parameters. The updated results will then be used in conjunction with more detailed 2-dimensional flow modeling in the heart of the Town of Gila Bend where the presence of I-8 and the Gila Bend Canal have created very complicated flow conditions in order to refine flood mitigation solutions developed through the ADMP.

Figure 1.1 – Vicinity map



2.0 Mapping and Survey

2.1 TOPOGRAPHIC MAPPING

Topographic mapping for the watershed was provided by the District. There are three mapping sets. The limits of these mapping sets are shown in Figure 2.1.

1. Circa 2000 10-foot contour interval mapping prepared for the entire county. The horizontal coordinate system is HARN, Arizona Central with units of international feet referenced to the North American Datum of 1983 (NAD 83). The vertical data is North American Vertical Datum of 1988 (NAVD 88). This mapping is provided in shapefile format as well as raw asci data for the breaklines and mass points.

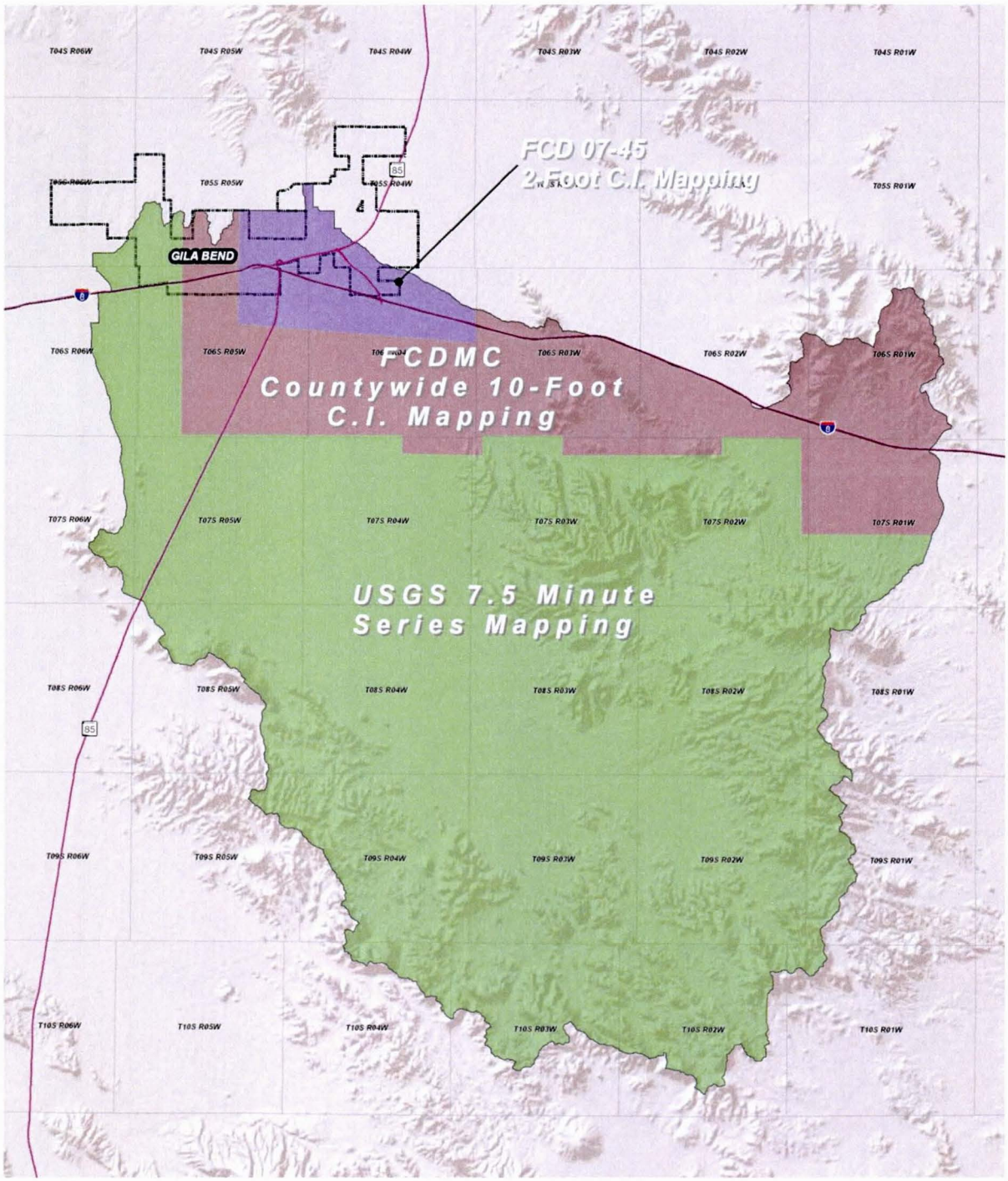
2. Circa 2008 2-foot contour interval mapping for the northern portion of the watershed was prepared under contract with the District (FCD 07-45). The horizontal coordinate system is HARN, Arizona Central with units of international feet referenced to NAD 83. The vertical data is NAVD 88. This mapping is provided in shapefile format as well as raw asci data for the breaklines and mass points.

3. USGS 7.5 minute quadrangle maps at a scale of 1:24,000. Photogrammetry for the mapping was prepared from 1972 to 1986. Map data was downloaded from the USGS seamless data server as a digital elevation model at a grid resolution of 10 meters. The horizontal coordinate system is the Universal Transverse Mercator referenced to the North American Datum of 1927. The vertical datum is National Geodetic Vertical Datum of 1929.

2.2 SURVEY DATA

Survey data available for the study was performed in support of the topographic mapping. Survey data provided as part of this project includes culvert invert data, roadway pavement spot elevations and Gila Canal embankment spot elevations. No additional survey was performed as part of the hydrologic update.

Figure 2.1 – Mapping limits



3.0 Hydrologic Analysis

3.1 HYDROLOGIC SETTING

The Gila Bend watershed lies in the southern portion of Maricopa County in the Basin and Range Physiographic Region. Elevations within the watershed range from approximately 600 feet at the Gila River to over 4,000 feet in the Sauceda and Sand Tank Mountains. Vegetation within the watershed can be characterized as sparse and is generally limited to wash corridors. The watershed is characterized by three major landforms; mountain, piedmont and alluvial plain, each with unique runoff characteristics.

The mountainous areas, Sauceda and Sand Tank Mountains, form the southern boundaries of the watershed. These areas are characterized by steep, rocky slopes and small, incised washes. The drainage pattern within these areas is dendritic.

The piedmont landform is moderately sloping (1 - 5%) and composed of numerous forms of fan features. The piedmont drainage network is a combination of parallel and distributive channels. In general, the conveyance capacity of the piedmont drainage system diminishes in the downstream direction.

The alluvial plain is comprised of gently sloping, uniform terrain that terminates at the Gila River, which forms the northern watershed boundary. Runoff occurs as sheet flow or is concentrated in very small parallel washes with the exception of the major washes; Bender, Sand Tank, Quilotosa and Sauceda. This alluvial plain landform is bisected by I-8, SR-85 and the Gila Bend Canal. I-8 and the Gila Bend Canal traverse the watershed from east to west and both features are elevated above the natural ground. Runoff reaching these features ponds against the embankment and is funneled through various crossing structures.

Land use within the watershed is, in general, limited to the extreme northern portion of the watershed and specifically within the Town of Gila Bend. The dominate land use within the corporate limits is agriculture. Beyond the agricultural area, there is an assortment of land uses ranging from residential to industrial. These land uses are generally concentrated around the I-8 and SR-85 corridor.

3.2 APPROACH

The existing hydrology prepared for the floodplain delineation was very detailed given the data available at that time. In particular, significant effort was invested in developing hydrologic channel routing data, flow split rating curves and stage-storage-discharge relations. Watershed boundaries were delineated using the best available mapping at the time which was USGS 7.5 minute series quadrangle mapping. Though more detailed mapping is now available, the coverage is limited and the best available mapping for the majority of the watershed is still

USGS mapping (see Figure 2.1). Therefore, updates to the hydrologic data are limited to the following:

- Rainfall data – use of NOAA Altas 14 and current depth-area reduction factors
- Unit hydrograph parameters – updated lag calculations and S-graph relations
- Rainfall loss parameters – use of detailed soils mapping and current parameter values
- Minor subbasin boundary modifications

Rainfall, rainfall loss and unit hydrograph parameters are calculated using the District's DDMSW software version 4.6. Default data values encoded in DDMSW are used in the calculations where applicable. Deviations from the default values are noted in the DDMSW database for the watershed and documented in the following sections. Runoff for the watershed is calculated using the U.S. Army Corps of Engineers HEC-1 software version 4.1. Runoff magnitudes are estimated for both 100-year, 6- and 24-hour storm events.

3.3 WATERSHED DELINEATION

Subbasin boundaries determined as part of the Gila Bend FDS were provided by the District in ESRI shapefile format. Per the scope of work, subbasin boundaries developed for the Gila Bend FDS are accepted as appropriate for this update with a few minor exceptions.

- As part of the original ADMP work, delineation of several subbasins immediately upstream of the Gila Bend Canal were modified to support floodplain delineation and to refine inflow to specific ponding areas behind the canal. The modifications are listed below and illustrated in Figure 3.1.
    - Subbasin 7A subdivided into three subbasins; 7AA, 7AB and 7AC
    - Subbasin 3K subdivided into three subbasins; 3KB, 3KC and 3KD
    - A new subbasin, 3KA, is added
- Several subbasins are modified to accommodate future 2-dimensional modeling. The modified subbasins are generally within the Sand Tank Wash subwatershed (major basin number 2) and within the Gila Bend corporate limits. The limits of the future 2-dimensional modeling are shown in Figure 3.2. Also shown in that figure are the previous subbasin delineation and the modified subbasins. The modifications include the addition of hydrologic concentration points near the limits of the 2-dimensional study area and the aggregation of all or portions of subbains that fall within the 2-dimensional study limits into a single subbasin. The subbasins affected by this are 2UU, 2VV, 2XX, 3K, 3KB, 7A, 7B, 7C and 7D. This new subbasin (FLO-2D) is included in the HEC-1 modeling only as a hydrologic modeling bridge between the inflow to the 2-dimensional area and the downstream areas. Temporary diversions are also added to the HEC-1 model at locations of anticipated outflow from the 2-dimensional study area. The

temporary diversions will eventually be replaced by inflow hydrographs from the 2-dimensional model.

- Subbasin 2VV, located in the northeast portion of the watershed, is subdivided into 8, small subbasins in the original Gila Bend FDS. This was done for floodplain delineation purposes. These subbasins, relative to the overall watershed are considerably different in size. At the District's direction these subbasins 2VV1 – 2VV8, are aggregated into a single subbasin, 2VV.

These modifications result in a total of 131 subbasins. The subbasin naming convention is alphanumeric (e.g. 1A). The first part of the subbasin identifies represents a unique major basin (e.g. 1 for Bender Wash, 2 for Sand Tank Wash, etc.). The second part of the identifier is an alpha sequence that, in general, starts with "A" for the upstream most subbasin in a subwatershed and then proceeds in order in the downstream direction. Subbasin area is calculated using the geometric processing routines within ArcGIS. Subbasin sizes range from 0.4 to 15.5 square miles. The total number of subbasins per each subwatershed and the corresponding area is listed in Table 3.1. Subbasin boundaries are shown in Plate 3 – Watershed Map.

Table 3.1 – Subwatershed area

Subwatershed		Area	Number of
ID	Name	sq. miles	Subbasins
1	Bender Wash	85.1	25
2	Sand Tank Wash	184.3	52
3	Quilotosa Wash	97.2	15
4	Suaceda Wash	111.2	15
5	Unnamed	16.6	3
6	Unnamed	113.9	17
7	Unnamed	3.5	4

Figure 3.1 – Subbasin boundary modifications

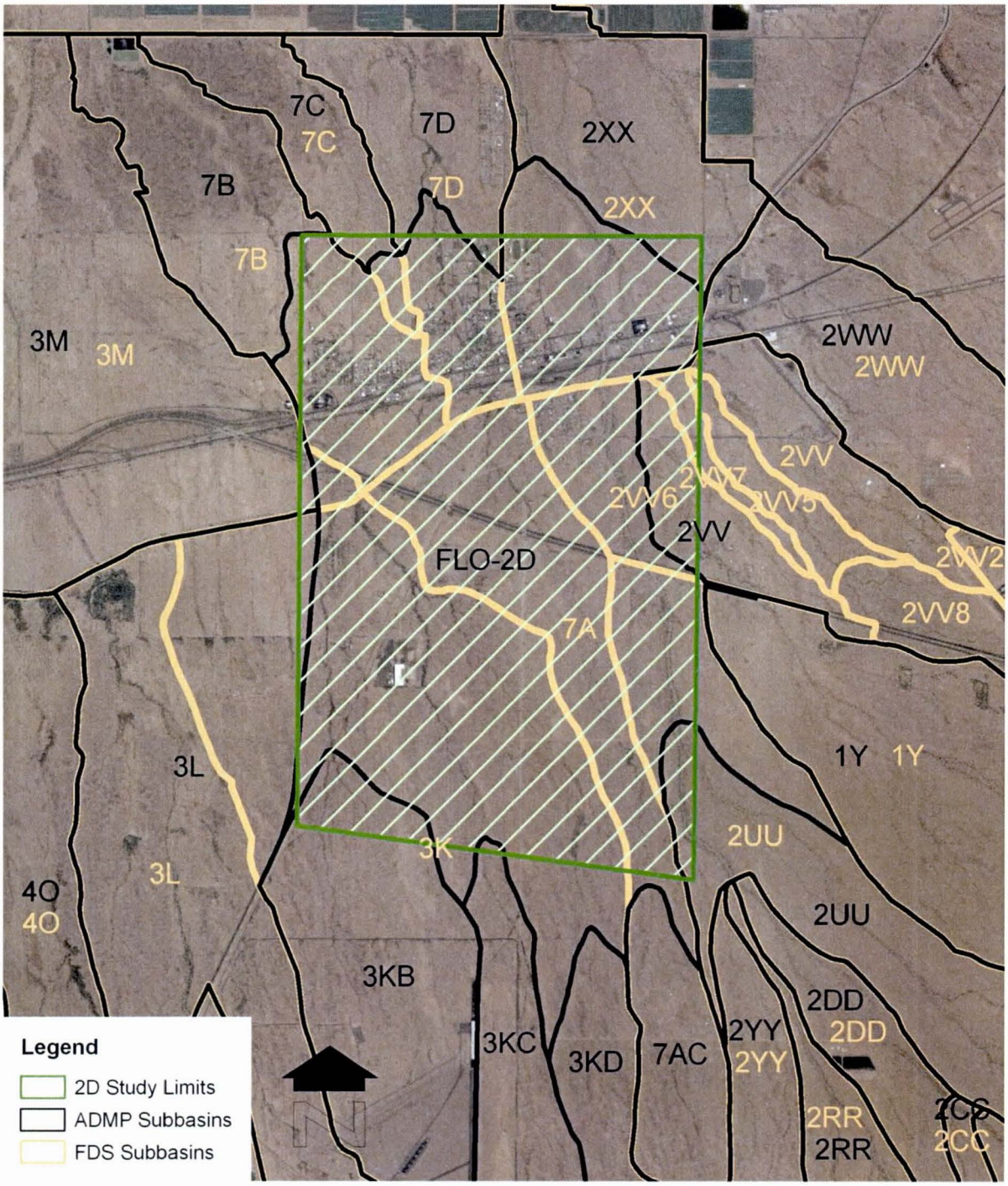
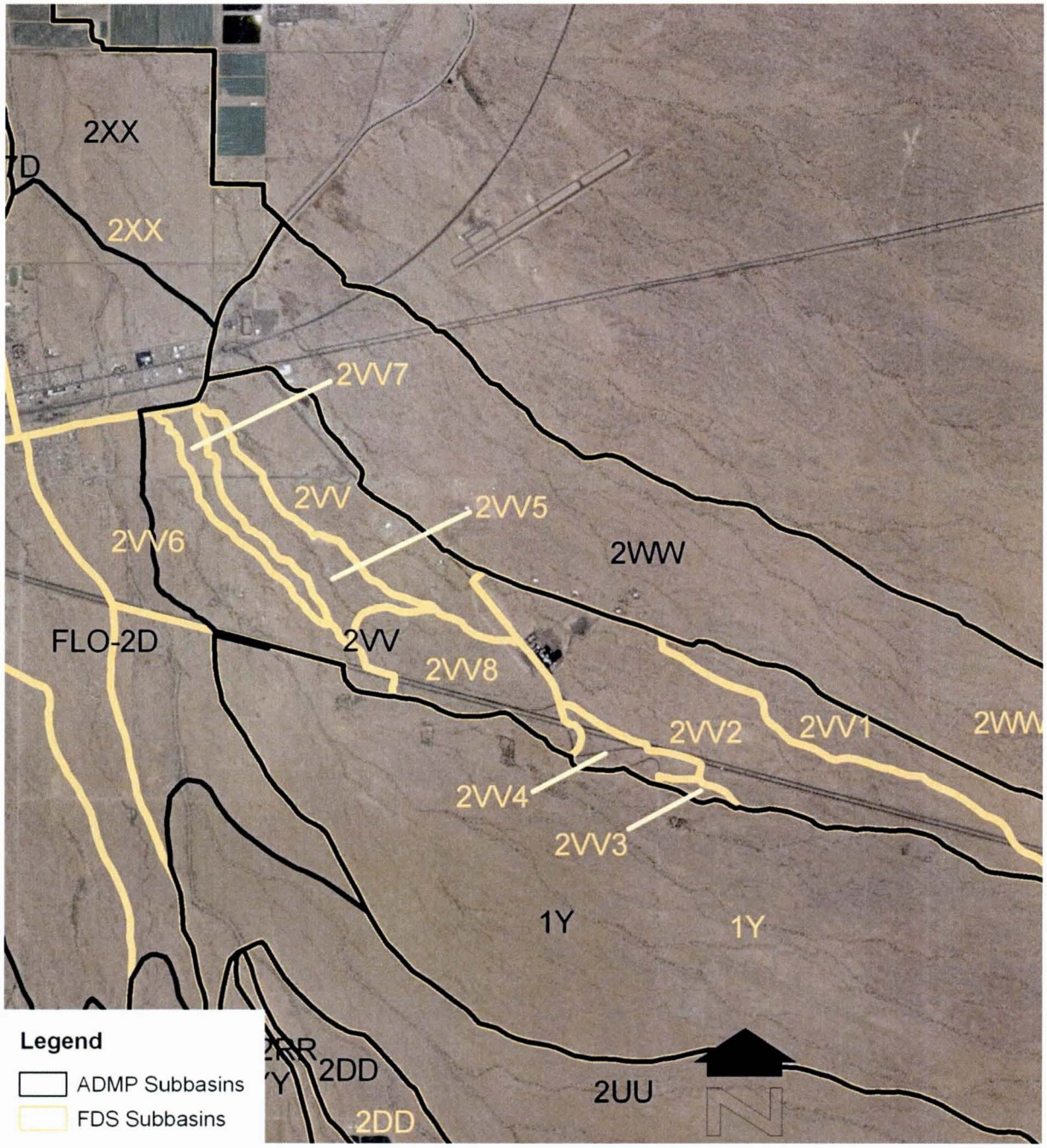


Figure 3.2 – Subbasin 2VV boundary modifications



3.4 RAINFALL

Point rainfall depth for the watershed is derived for the 100-year, 6- and 24-hour storm based on data published with the NOAA Atlas 14 and areal averaging procedures encoded in DDMSW. The resulting 100-year, 6- and 24-hour areally averaged point rainfall depths for the watershed are 2.82 and 3.71 inches, respectively. Although these rainfall depths are an areally averaged value for the watershed, they are areally averaged point precipitation values. Point precipitation values must be converted to an equivalent uniform rainfall depth for the entire watershed. This is accomplished for both the 6- and 24-hour storms using depth-area reduction factors specified in the Hydrology Manual. Simulation of equivalent uniform rainfall depth at any point in the watershed is accomplished using the JD record option of HEC-1. For the 6-hour storm, depth-area reduction factors are selected based on the corresponding area associated with temporal rainfall distribution patterns. For the 24-hour storm, depth-area reduction factors are selected to capture reasonable intervals of intermediate contributing drainage areas throughout the watershed. Depth-area reduction factors for both the 6- and 24-hour storm are listed in Table 3.2.

Table 3.2 – 100-year, 6- and 24-hour equivalent uniform rainfall depths

6-Hour		24-Hour	
Area sq. mi.	Depth inches	Area sq. mi.	Depth inches
0.01	2.82	0.01	3.71
0.5	2.80	5	3.62
2.8	2.75	10	3.53
16	2.60	50	3.26
90	2.29	80	3.18
100	2.56	100	3.15
500	2.19	200	3.04
		300	2.99
		500	2.91

The time distributions of the rainfall for the 6- and 24-hour storm are taken directly from the Hydrology Manual and those distributions are automatically populated in HEC-1 through DDMSW. The rainfall distribution for the 24-hour storm is the SCS Type II. For the 6-hour storm, the rainfall distribution consists of five dimensionless storm patterns that are a function of watershed area. These patterns were derived from the 19 August 1954 storm over the Queen Creek area.

3.5 SUBBASIN PARAMETERS

Subbasin parameters are estimated for existing land use conditions. Soil, land use and basin lag parameters are estimated from the best available information in accordance with the methodologies, techniques and procedures set forth in the District's Hydrology Manual as well as in accordance with Hydrologic Information System (HIS) specifications for data delivery.

3.5.1 Rainfall Loss

Rainfall losses for the watershed are estimated using the Green and Ampt infiltration equation as implemented in HEC-1. The variable XKSAT (hydraulic conductivity at natural saturation) is estimated by evaluating natural condition soil properties and textures as they occur on the watershed and assigning values to those soils. Variables PSIF (wetting front capillary suction) and DTHETA (antecedent volumetric soil moisture deficit) are functions of soil texture, and therefore, XKSAT. The variable DTHETA is additionally related to the moisture condition of the soil and is categorized as either; dry, normal, or saturated. Dry DTHETA is considered typical for natural land and normal DTHETA is considered typical for developed areas where irrigation and other factors tend to maintain higher moisture content in the soil, such as in residential or other urbanized areas. Saturated DTHETA is typically reserved for agricultural areas where regular, extensive irrigation practices maintain soil moisture content at high levels and create a reasonably high probability that the fields will be irrigated during the design rainfall event. Effective imperviousness, RTIMP, is attributed to rock outcrop in natural areas as well as roof tops, paving, permanent water surfaces, and compaction associated with gravel roads that occur in developed areas. Surface retention, IA, is an estimate of the initial surface storage that occurs during a storm event. Data used to calculate each of these parameters of the Green and Ampt infiltration equation are taken from both soil and land use characteristics for the watershed.

Soil Parameters

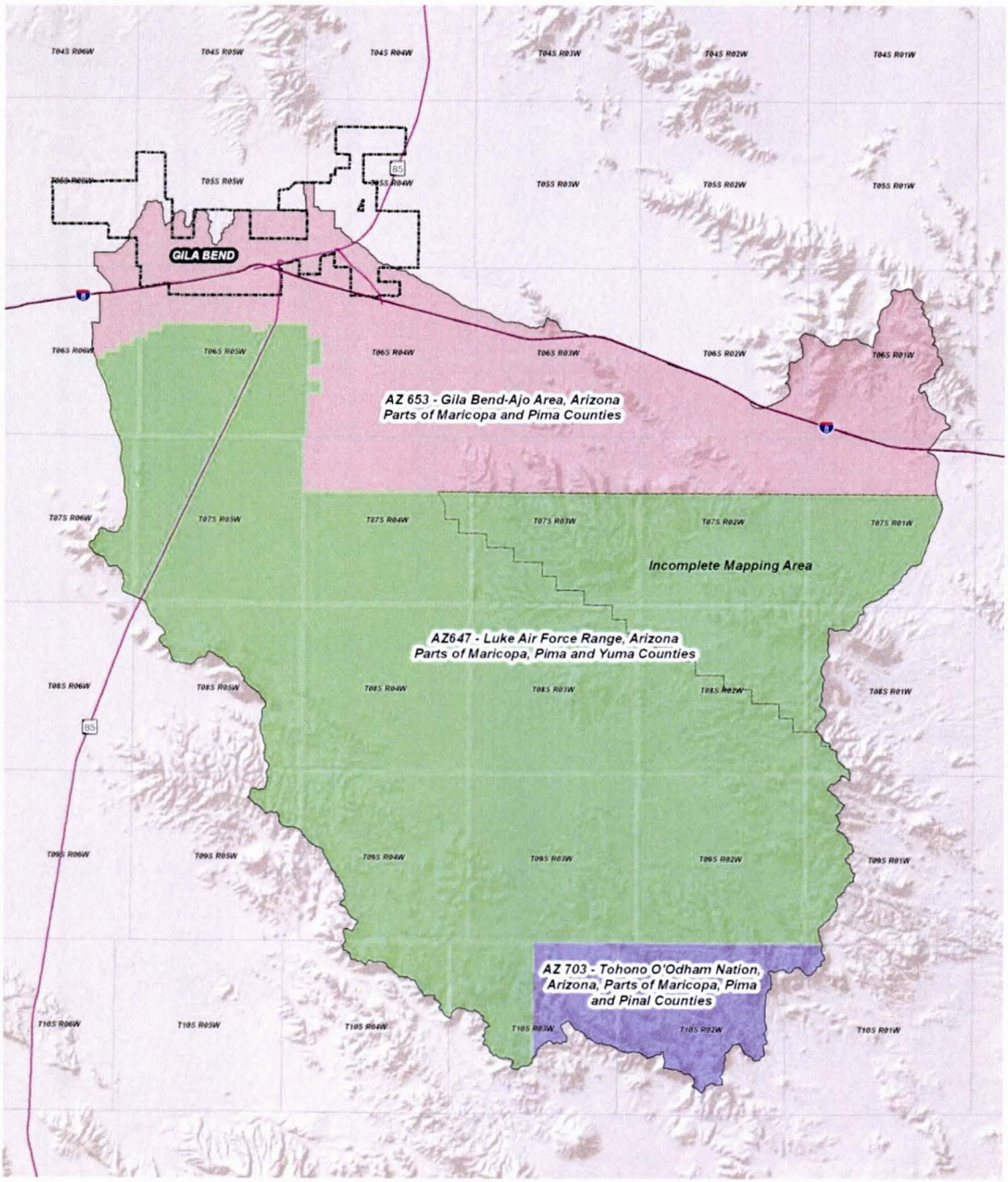
Soil parameters for the watershed are obtained from both detailed and general soil surveys prepared by the Natural Resource Conservation Service (NRCS). There are three detailed soil surveys that overlay the watershed.

- Gila Bend-Ajo Area, Arizona, Parts of Maricopa and Pima Counties
- Luke Air Force Range, Arizona, Parts of Maricopa, Pima and Yuma Counties,
- Tohono O'Odham Nation, Arizona, Parts of Maricopa, Pima and Pinal Counties

The extent of each survey within the watershed is shown in Figure 3.3. Mapped soil unit boundaries for the Gila Bend-Ajo Area and the Tohono O'Odham soil surveys were provided by the District in shapefile format. Mapped soil boundaries for the Luke Air Force Range soil survey were obtained from the NRCS. Assignments for XKSAT and Rock outcrop for each soil

map unit of the Gila Bend-Ajo Area soil survey were provided by the District in both the shape file attribute table and as part of the soils default data table in DDMSW.

Figure 3.3 – Soil surveys



Both the Luke Air Force Range and Tohono O'Odham soil surveys are relatively recent publications. At the time of this study, XKSAT assignments for each map unit occurring within the watershed were not available. Therefore, XKSAT and rock outcrop percentages for each soil map unit that occurs within the watershed were determined by the District. Those values were then added to the default soil tables of DDMSW for this project.

In addition to the detail soil surveys listed above, the General Soil Survey for the State of Arizona was also used as a supplement for an incomplete portion of the Luke Air Force Range soil survey. This incomplete area, approximately 79 square miles in size is located in the central portion of the watershed as shown in Figure 3.3. There are three soil map units from the General Soil Survey that overlap this portion of the Luke Air Force Range detailed soil survey. The map units are designated as S288, S289 and S399. Bare ground XKSAT and rock outcrop percentage for these map units are determined using procedures presented in the Hydrology Manual. Worksheets showing the data and calculations for these soil map units are provided in Appendix A.

Soil map units as they occur in the watershed are shown in Plate 1. Values of XKSAT and rock outcrop for each soil map unit present within the watershed are listed in Table 3.3. Also listed in the Table is the soil survey associated with each map unit.

Table 3.3 – Soil parameters

Book No.	Soil Map Unit	Description	XKSAT in/hr	Rock %
AZ647	20	Coolidge Denure and Rillito soils 0-3% slopes	0.40	0
AZ647	40	Growler-Mohall-Tucson complex 0-3% slopes	0.24	0
AZ647	50	Gunsight-Pinamt-Carrizo complex 1-5% slopes	0.40	0
AZ647	60	Gunsight-Hyder-Riverwash complex 1-45% slopes	0.30	0
AZ647	70	Hyder-Guvo-Rock outcrop complex 15-65% slopes	0.40	20
AZ647	80	Laposa-Schenco-Rock outcrop complex 10-40% slopes	0.13	20
AZ647	90	Lomitas-Rock outcrop-Quilotosa complex 15-65% slopes	0.40	25
AZ647	100	Rillito-Growler-Why complex 1-5% slopes	0.34	0
AZ647	110	Rillito-Gunsight-Carrizo complex 1-5% slopes	0.41	0
AZ647	120	Why-Denure complex 0-2% slopes	0.25	0
AZ647	300	Guvo-Rock outcrop complex stony 15-60% slopes	0.40	30
AZ647	315	Gunsight Momoli and Chuckawalla soils 1-8% slopes	0.34	0
AZ647	355	Lajitas-Bosa-Rock outcrop complex 15-50% slopes	0.40	25
AZ647	NOTCOM	Not Complete	---	---
AZ653	3	Ajo-Gunsight-Pompeii complex, 3-25% slopes	0.53	0
AZ653	5	Carrizo-Dateland complex, 0-3% slopes	0.79	0
AZ653	6	Carrizo-Momoli complex, 0-3% slopes	1.17	0

Table 3.3 – Soils parameters (Continued)

Book No.	Soil Map Unit	Description	XKSAT in/hr	Rock %
AZ653	9	Cipriano-Hyder-Rock outcrop complex, 15-65% slopes	1.05	15
AZ653	10	Cipriano-Momoli complex, 1-7% slopes	1.01	0
AZ653	12	Cuerda-Why-Lagunita complex	0.33	0
AZ653	14	Dateland-Cuerda complex, 0-3% slopes	0.27	0
AZ653	15	Dateland-Denure fine sandy loams, saline-Sodic, 0-3% slopes	0.50	0
AZ653	17	Denure gravelly fine sandy loam, 1-3% slopes	0.99	0
AZ653	20	Denure-Coolidge complex, 1-3% slopes	0.67	0
AZ653	21	Denure-Rillito-Why complex, 1-5% slopes	0.70	0
AZ653	31	Growler-Momoli complex, 1-3% slopes	0.55	0
AZ653	32	Growler-Wellton complex, 1-3% slopes	0.32	0
AZ653	33	Gunsight-Ajolito extremely gravelly sandy loams, 1-15% slopes	0.77	0
AZ653	34	Gunsight-Chuckawalla complex, 1-15% slopes	0.75	0
AZ653	35	Gunsight-Cipriano complex, 1-15% slopes	1.12	0
AZ653	36	Gunsight-Pinamt complex, 1-15% slopes	0.39	0
AZ653	37	Gunsight-Rillito-Carrizo complex, 1-15% slopes	0.79	0
AZ653	40	Hyder-Gachado-Gunsight ext. gravelly sandy loams, 1-25% slopes	0.46	0
AZ653	45	Mohall loam	0.26	0
AZ653	49	Momoli-Carrizo extremely gravelly sandy loams, 1-10% slopes	0.74	0
AZ653	50	Momoli-Carrizo, bench, very gravelly sandy loams, 1-3% slopes	1.06	0
AZ653	51	Momoli-Comobabi association, 5-15% slopes	0.95	0
AZ653	52	Pits	0.98	0
AZ653	53	Quilotosa-Momoli-Carrizo complex, 1-15% slopes	0.91	0
AZ653	54	Quilotosa-Rock outcrop complex, 15-55% slopes	0.86	25
AZ653	58	Schenco-Laposa-Rock outcrop complex, 10-55% slopes	0.35	20
AZ653	60	Tucson loam	0.28	0
AZ653	64	Wellton loam	0.36	0
AZ653	67	Why-Carrizo complex, 0-3% slopes	0.58	0
AZ703	16	Delnorte-stagecoach complex, 1-20% slopes	0.23	0
AZ703	18	Delthorny-garzona-rock outcrop complex, 15-60% slopes	0.14	20
AZ703	32	Granolite-rock outcrop complex, 15-65% slopes	0.05	30
AZ703	36	Hickiwan-gunsight-momoli complex, 3-15% slopes	0.36	0
AZ703	40	Lajitas-bosa-rock outcrop complex, 15-50% slopes	0.14	25
US	S288	Rillito-Gunsight-Denure-Chuckawalla complex - sandy loam	0.32	0
US	S289	Hyder-Coolidge-Cipriano-Cherioni-rock outcrop complex - sandy loam	0.38	9
US	S399	Pinamt-Momoli-Hickiwan-Gunsight-Denure complex - loam	0.23	0

Land Use Parameters

Land use parameters represent a broad range of hydrologic characteristics from impervious area associated with development to roughness conditions associated with unit hydrograph parameters. Therefore, identification of unique areas within a watershed that can reflect such a broad range of unique characteristics requires interpretation of several different data sets. The data sets used in the development of land use areas includes topographic mapping, aerial photography and soils mapping. In undeveloped areas, these three data sets are used in combination to identify areas of unique surface retention (IA) and surface roughness characteristics (Kn). In developed areas, aerial photography is used as the main data sources for mapping unique land use areas. Based on interpretation of these three data sources a land use map is generated and that map is provided as Plate 2.

Land use identifiers for each unique map unit shown in Plate 2 are based on the default land use table encoded in DDMSW. Custom land use categories, such as inactive agricultural, are created as necessary to reflect conditions not represented in the default data table. Land use parameters assigned to each land use type are based on judgment and using similar land use types defined in the default table as a guide. The resulting parameters for each land use type are listed in Table 3.4.

Table 3.4 – Land use parameters

Land Use Code	Land Use Category	IA inches	DTHETA Condition	RTIMP %	Veg. Cover %	Kn
155	Small Lot Single Family Residential	0.25	NORMAL	5	10	0.030
175	Medium Density Residential	0.25	DRY	20	10	0.020
195	High Density Residential	0.10	DRY	20	10	0.020
330	Power Transfer Station	0.10	DRY	30	10	0.020
340	Airfield	0.35	DRY	5	10	0.030
350	Dairy	0.35	NORMAL	25	10	0.030
360	Light Industrial	0.10	DRY	60	10	0.020
370	Mixed Use Industrial	0.35	DRY	10	10	0.030
755	Active Agricultural	0.50	WET	0	90	0.100
760	Inactive Agricultural	0.50	DRY	0	10	0.030
910	Vegetated Wash	0.35	DRY	0	50	0.045
920	Desert Rangeland - Mild Slopes	0.35	DRY	0	10	0.040
930	Natural Hillslope Terrain - Moderate Slopes	0.15	DRY	0	10	0.045
940	Natural Mountain Terrain - Steep Slopes	0.25	DRY	0	10	0.055

Area Weighted Parameters

For each subbasin, average values for IA, XKSAT and RTIMP are computed from the soils and land use parameters. Average values for each subbasin are weighted based on the contributing area of each unique soil and land use map unit as it occurs in each subbasin. The averaging process is computed in DDMSW. The area calculations involve intersecting the soil and land use map unit polygons with the subbasin polygons which are input to DDMSW in shapefile format. The unique map unit identifies are then referenced to the parameters listed in the DDMSW data files. Computation of subbasin average XKSAT is based on a log-area averaging method. Computation of the subbasin average IA and RTIMP values is based on an arithmetic averaging method. The subbasin average RTIMP value reflects contributions from both rock outcrop percentages as well as developed area impervious conditions.

Once the subbasin average XKSAT value is determined, PSIF and DTHETA values are calculated using the relations from the Hydrology Manual. Finally, XKSAT is adjusted for the effects of vegetation based on a relation in the Hydrology Manual. The resulting parameter values for each subbasin are listed in Table A.1 of Appendix A.

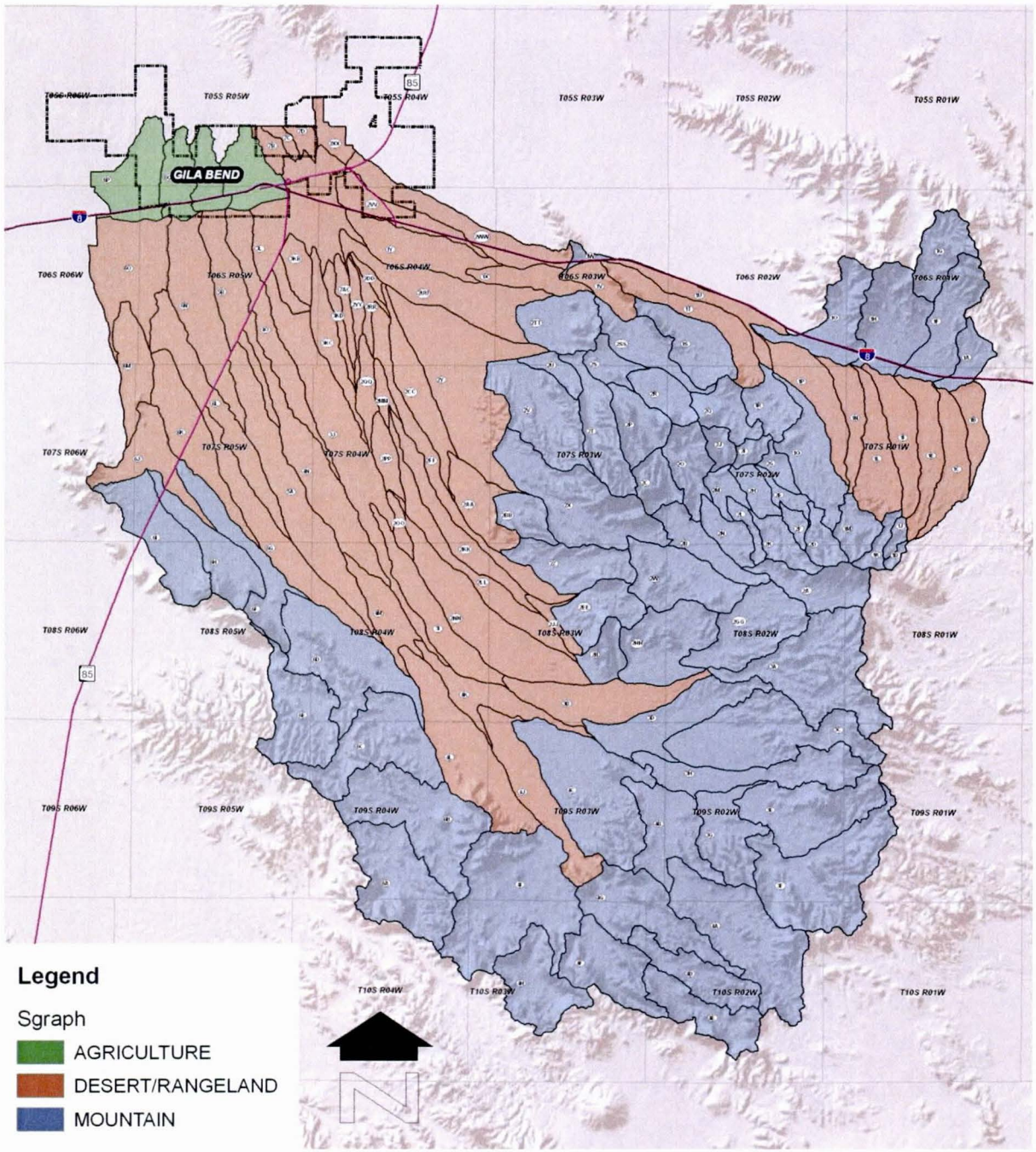
3.5.2 Unit Hydrograph

Unit hydrographs are developed from S-graphs provided in the Hydrology Manual. Three S-graphs are used for this analysis; Phoenix Mountain, Desert/Rangeland and Agricultural. The S-graph type assigned to each subbasin is based on overall slope and general inspection of the terrain and land use. S-graphs assigned to each subbasin are shown graphically in Figure 3.4. Application of the S graph requires the selection of the unit duration of rainfall excess (NMIN) and the estimation of the basin lag. Unit hydrographs developed from the S-graphs is accomplished by routines in DDMSW.

The basin lag is a function of the flow path length, the flow path length from the point opposite to the basin centroid, the slope of the flow path and a coefficient representing the hydraulic efficiency, Kn, of the watershed. The flow path for each subbasin is shown on Plate 3. The flow path length and slope for each subbasin is estimated using a combination of aerial photography and one or all of the topographic mapping sources discuss previously. Guidance for selection of the value for Kn is provided in the Hydrology Manual and is determined as part of the land use mapping (see Table 3.4). The basin lag for each subbasin along with the physical parameters is listed in Table A.2 of Appendix A.

Values of NMIN are typically selected to provide adequate definition of the unit hydrograph and should lie within the range of 0.1 to 0.25 times the minimum Lag occurring in the watershed. The minimum lag for the watershed is 21 minutes (subbasin 1D). Therefore an NMIN of 5 minutes was selected for the watershed.

Figure 3.4 – Subbasin S-graphs



3.6 HYDROLOGIC CHANNEL ROUTING

Hydrologic channel routing of runoff is accomplished using the normal depth option of the Modified Puls routing method in HEC-1. This method requires physical data representing the average routing reach hydraulic characteristics and a mathematical parameter, NSTPS, used in the solution of the routing numeric.

Physical parameters for each routing reach consist of the flow path length and slope, roughness coefficients and cross sectional geometry. Per the scope of work, the cross sectional geometry and roughness coefficients developed for the Gila Bend FDS are adopted without change for this study.

The routing flow paths within the watershed are shown on Plate 3. The flow path length and slope for each routing reach is estimated using a combination of aerial photography and one or all of the topographic mapping sources discuss previously.

Modified Puls is a storage routing method. For hydrologic channel routing, the method works as a series of cascading linear reservoirs. The number of sub-reaches in the linear system is set through the NSTPS parameter. The NSTPS parameter is a function of the distance that a floodwave can travel in one computational time interval (NMIN). Attenuation of the runoff hydrograph can be very sensitive to this parameter and therefore it is ideally a calibration parameter. In DDMSW, this parameter can be assigned manually or through an iterative process where the model is run three times. The first run, a default NSTPS value is assigned. The travel time through each routing reach is converted to an NSTPS value and the model is rerun a second time with the new values. This process is repeated one more time for convergence. The iterative process of assigning NSTPS is used for this model update. This process is performed for both the 6- and 24-hour storms.

The routing reach naming convention is based on the upstream and downstream concentration points (e.g. 100101 is the routing reach connection concentration point 100 to the downstream concentration point 101). When the concentration point identifiers are less than three digits, an "R" is added as a suffix and in some cases the two numbers are separated by a hyphen. There are a total of 141 routing reaches in the model. Flow path length, slope, subbasin the routing reach is located in and the assigned NSPTS is listed for each reach in Table A.3 of Appendix A.

3.7 FLOW DIVERSIONS

The Gila Bend watershed is hydrologically complex. Flow bifurcations occur throughout the watershed either due to natural distributive flow conditions or by man-made influences such as at I-8 culvert crossings. Rating curves that describe the flow split hydraulics were developed as part of the Gila Bend FDS study. Per the scope of work, those rating curves are accepted without change.

In addition to the flow split rating curves from the original Gila Bend FDS study, 4 new rating curves are developed. These new rating curves have a generic linear relation between inflow to the reach and flow that is diverted. The locations of these diversions are within the future 2-dimensional modeling area and only serve as serve as temporary place holders. In the future, it is assumed that the rating curves will be replaced with inflowing hydrographs from the 2-dimensional model. For similar reasons to the new diversion locations, several existing diversions from the Gila Bend FDS model occur within the limits of the future 2-diimensional modeling area and therefore are removed from the HEC-1 model.

There are a total of 22 diversions in the model. The diversion rating curve is the same for both the 6- and 24-hour storm. The location of each diversion is shown on the watershed map in Plate 3 as a triangular symbol. Due to a limitation of HEC-1 when diversions are used in combination with the JD record option, the drainage area downstream of the diversion is not carried over when the diverted hydrograph is retrieved. Therefore, the area at subsequent, downstream hydrograph combine operations needs to be hard coded. The watershed area at concentration points downstream of diversions established for the Gila Bend FDS are adopted without change for this update.

3.8 STORAGE ROUTING

The segment of the Gila Bend Canal that bisects the watershed is approximately 10 miles in length. Over this length the canal is elevated above natural ground with only 11 drainage crossings. The limited capacity of the crossing structures results in ponding behind the canal. Because of the relatively flat terrain behind the canal, ponding at several of the crossing structures is interconnected.

Per the scope of work, the storage routing calculations developed for the Gila Bend FDS are accepted without change except for the removal of storage routing operations within the future 2-dimensional study limits.

Storage routing for the six locations considered in the update model is accomplished using the HEC-1 Modified Puls method. The general nomenclature for the storage routing operations is the adoption of the upstream concentration point with a suffix of "I" for the inflow to the storage routing and "O" for the storage routing operation itself. The location of storage routing operations is shown on the Plate 3 as an inverted triangular symbol.

4.0 Results

4.1 GENERAL

Runoff magnitudes for the watershed are developed for both the 100-year, 6- and 24-hour storm. Tables summarizing the model results are provided in Appendix B. HEC-1 input and output files are provided digitally along with all supporting DDMSW data files on CD as Appendix C.

In general, the controlling runoff magnitudes for the watershed are produced with the 24-hour storm. The only operations that the 6-hour storm produces controlling runoff magnitudes are for the smaller subbasins and the subsequent routing reach. Of the 131 subbasins, only 18 yield higher runoff magnitudes for the 6-hour storm. The range in controlling peak discharge for the subbasin operations is 286 cfs (1U) to 5,592 cfs (4I).

The maximum peak discharge anywhere in the watershed occurs at concentration point C32. This concentration point is located on Sauceda Wash (see Sheet 3 of Plate 3). The contributing area at C32 is 118 square miles and the 100-year, 24-hour peak discharge is 16,025 cfs. The maximum runoff volume anywhere in the watershed occurs at concentration point FLOD3. This concentration point accounts for all the runoff from Sand Tank Wash and Bender Wash at the Gila Bend Canal (see Sheet 1 of the Plate 3). The contributing drainage area at this location is 351 square miles and the 100-year, 24-hour runoff volume is 9,136 acre-feet.

A summary of runoff magnitudes and water surface elevations for the storage routing operations at the Gila Bend Canal is provided in Table 4.1. As can be seen from that table, the canal is overtopped at concentration points C11O, C34O, C36O and PND1.

Table 4.1 – 100-year, 24-hour results at the Gila Bend Canal

HEC-1 ID	Area sq. mi.	Inflow cfs	Outflow cfs	Volume af	Max. WSEL feet	Top of Canal feet
C136O	5.8	1,267	507	209	740.0	748.0
C11O	87.4	8,350	8,350	4,147	742.8	742.5
C34O	131.2	9,774	9,716	4,202	742.3	741.9
C36O	236.4	9,354	8,913	5,508	743.4	741.0
C53O	7.8	1,975	504	349	740.9	741.1
PND1	98.0	5,746	5,746	3,849	740.2	739.5

Outflow from the watershed occurs at seven locations as identified on Sheet 1 of Plate 3. Drainage areas and corresponding runoff magnitudes associated with each outflow point are listed in Table 4.2. Four of the outflow points; C137, C139 and C18 represent the runoff from

the Sand Tank Wash subwatershed (which includes Bender Wash). Concentration point C16 is the outflall for Quilotosa Wash and C38 is the outflall for Suaceda Wash. Because of flow splits within the watershed and particularly the comingling of flow from different subwatersheds at the Gila Bend Canal, the drainage areas associated with each concentration point do not reflect the true, topographic area. The areas associated with C137, C139, C18 and C16 reflect the total hydrologic area associated with each location based on the philosophy for assigning drainage areas at flow split locations. Since runoff from Sand Tank Wash and Quilotosa Wash cross the subwatershed divides, the total contributing area from both those individual subwatersheds are added together at the outfall. In addition, the runoff magnitudes at C137, C139, C18 and C16 reflect an arbitrary redistribution of flow that will ultimately be determined through detailed 2-dimensional modeling. Therefore, runoff magnitudes at these locations will change once that modeling is complete.

Table 4.2 – 100-year, 24-hour outflow from the watershed

HEC-1 ID	Drainage Area sq. mi.	Peak Discharge cfs	Runoff Volume acre-ft
C137	358	11,220	7,017
C139	352	2,807	1,735
C18	352	697	454
C16	354	14,875	6,054
C38	242	4,784	4,213
C59	11	998	443
C58	103	5,677	4,035

4.2 COMPARISON WITH PREVIOUS STUDIES

There is no consistent pattern in comparing runoff magnitudes between the Gila Bend FDS study and the updated model. A summary comparison of the 100-year, 24-hour results is provided in Table B.6 of Appendix B. In many locations updated runoff magnitudes are as much as 61% lower than the corresponding magnitudes from the FDS study while in other locations the updated results are as much as 55% greater than the FDS study. Of the 131 subbasins, 19 have updated results that are higher than the FDS study. The locations of these subbasins are shown in Figure 4.1. For these subbasins, the common factor for the differences is the unit hydrograph. An example of the differences in the unit hydrograph between the FDS model and the updated model is shown in Figure 4.2 for subbasin 4D. The range in differences between the two models for these subbasins is a function of other factors besides the unit hydrograph. For example, subbasin 1G in addition to the unit hydrograph differences the updated XKSAT value is reduced from 1.02 in/hr for the FDS model to 0.084 in/hr. At subbasin 4G, the updated XKSAT is reduced from 0.44 in/hr for the FDS model to 0.25 in/hr. However, the updated RTIMP is increased from 0% for the FDS model to 16%.

Of the 106 concentration points within the watershed only 15 have updated peak discharges that are greater than the FDS model results. The locations of these concentration points are shown in Figure 4.1. As can be seen from that figure, the location of the concentration points with higher updated peak discharge compared to the FDS results directly correlates to the subbasin results with the exception of C10 and C38. The increase in peak discharge for both these locations is 5% and 2%, respectively. This difference is attributed to minor differences in routing and the timing of the hydrographs as they combine. Of the 15 concentration points with higher updated results compared to the FDS study, the maximum increase is 52% at C25. The maximum decrease in peak flow is 56% which occurs at C103.

In general, the updated model peak discharge is lower than the FDS study results and this is the anticipated outcome. This is primarily due to the reduction in point rainfall values associated with the NOAA Atlas 14 values. The NOAA Altas 14 point precipitation for the 100-year, 24-hour storm is 3.71 inches compared to 4.53 inches based on NOAA Atlas 2. This is an 18% reduction. The average change in peak discharge at any point in the watershed is a reduction in peak flow for the updated results of 25% compared to the FDS study. However, the overall reduction in peak discharge has little impact on the ponding condition behind the Gila Bend Canal. A comparison of peak discharge at HEC-1 storage routing locations is provided as Table 4.3. From the table, it can be seen that the only appreciable difference is at C53O where the peak outflow from the storage area is reduced from 2,188 cfs to 504 cfs. This difference is due to an overall reduction in runoff volume and that the canal is no longer overtopped at this location.

Table 4.3 – Comparison of results at the Gila Bend Canal

HEC-1 ID	Updated Model		FDS Model	
	Inflow cfs	Outflow cfs	Inflow cfs	Outflow cfs
C136O	1,267	507	1,574	542
C11O	8,350	8,350	9,237	9,173
C34O	9,774	9,716	10,686	10,318
C36O	9,354	8,913	9,638	8,713
C53O	1,975	504	3,207	2,188
PND1	5,746	5,746	8,696	8,630

Figure 4.1 – Comparison of model results

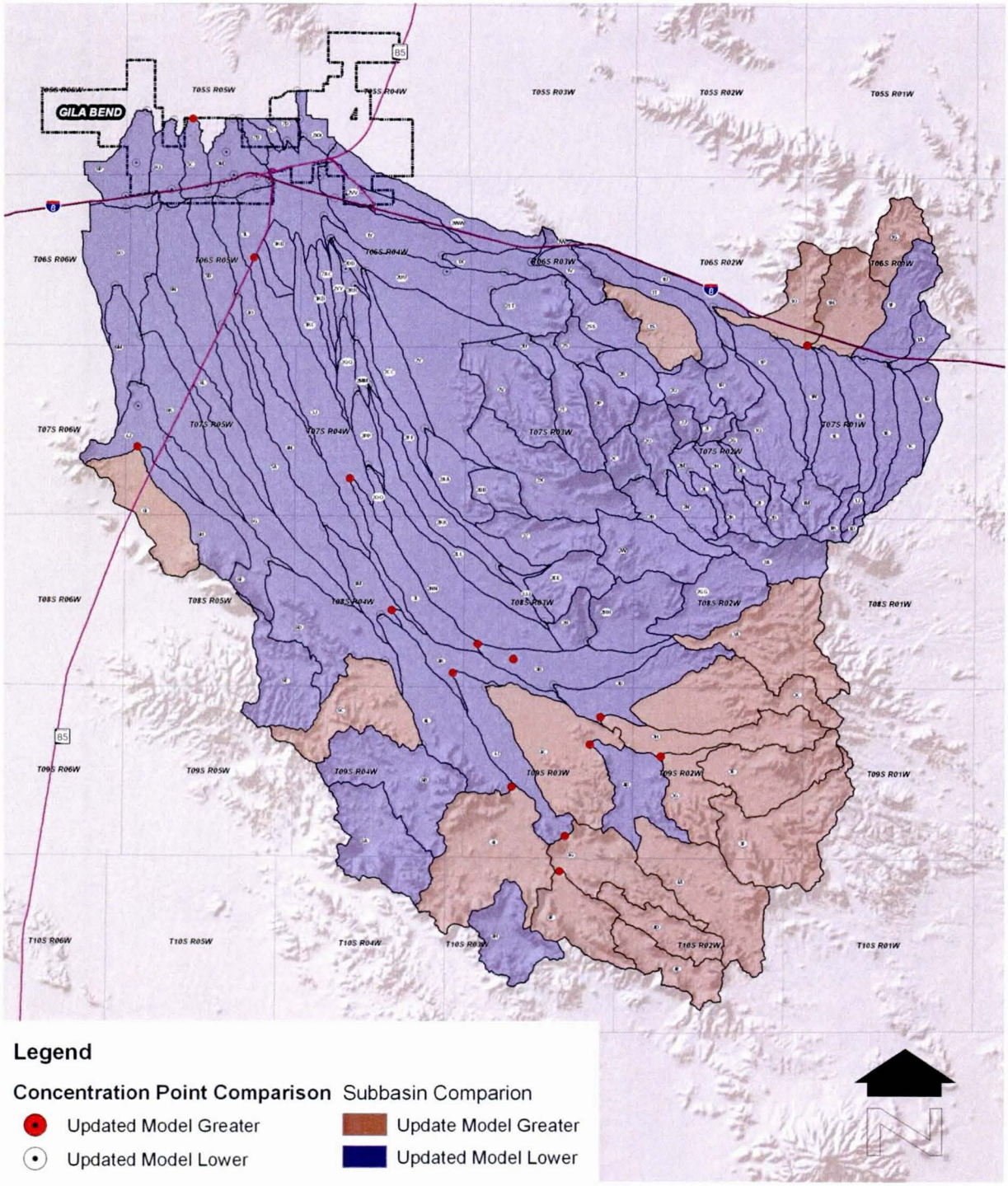
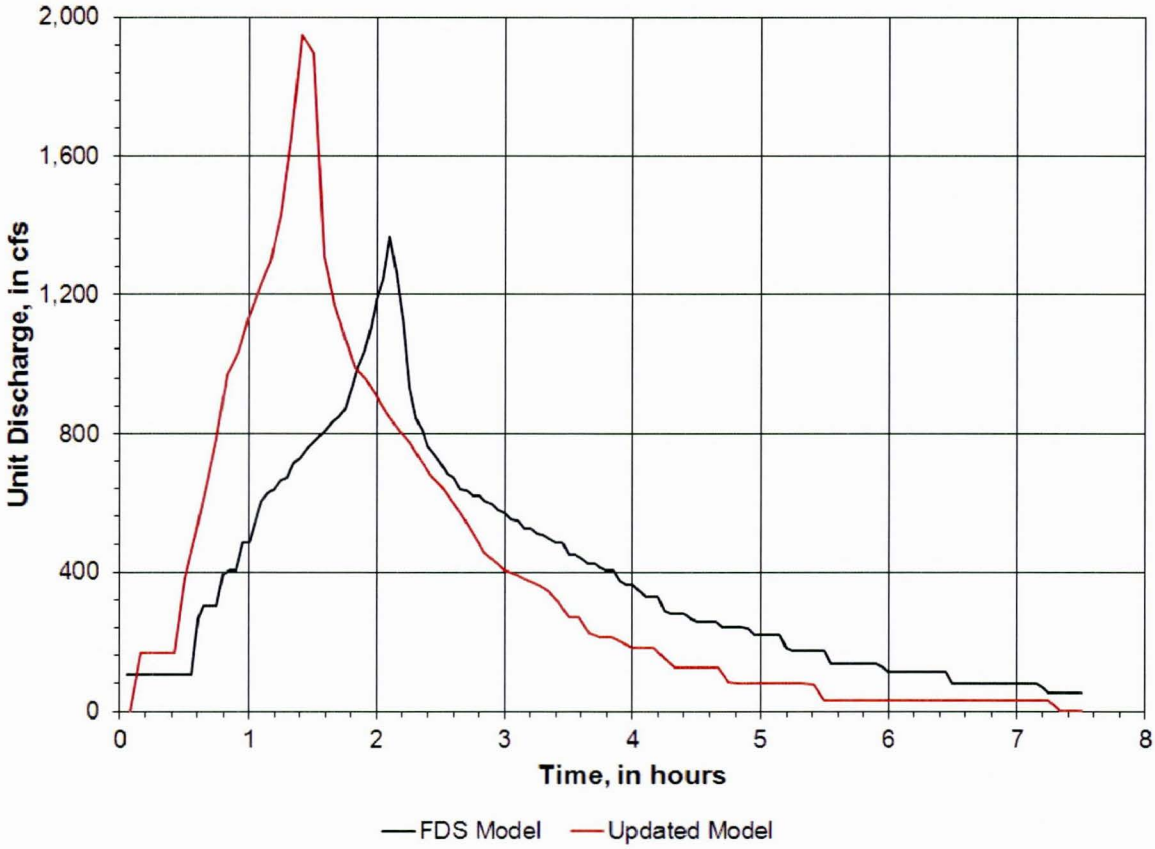


Figure 4.2 – Comparison of subbasin S-graph



4.3 INDIRECT METHODS OF VERIFICATION

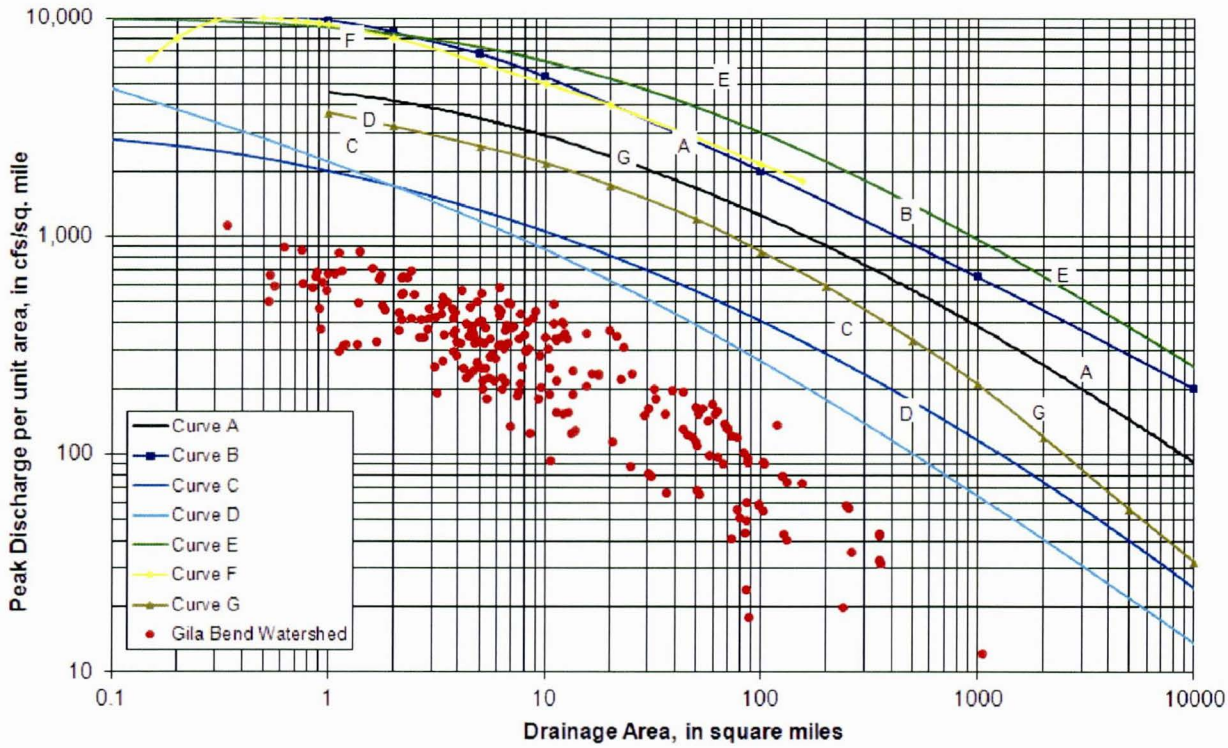
The results of the models were verified to check the reasonableness of the model results against regional data for Arizona. The results of the 100-year, 24-hour storm is verified against three indirect methods as described in Chapter 8 of the Hydrology Manual. Method 1 contains envelope curves that are based upon flood, discharge, and streamflow data that is generally collected from the western part of the United States. Method 2 focuses on USGS streamflow and statistical data for the entire state of Arizona. Lastly, Method 3 focuses more closely on USGS Flood Region 13, in which the Gila Bend Watershed is located. In general, the HEC-1 results fall within the expected ranges for each of the three methods of verification.

4.3.1 Method 1

The first method is a check of the results of the analytical model against a series of seven unit peak discharge relations and envelope curves. A description of each of the seven curves is

included in Chapter 8 of the Hydrology Manual. Figure 4.3 shows a comparison of subbasin and watershed combine unit peak discharges to the envelope curves. The unit discharge data plotted is for the 100-year, 24-hour storm. For plotted data points the unit peak discharge falls below all envelop curves. The is the expected result for this method since the curves are envelope curves that represent maximum observed flood discharges for different hydrologic regions.

Figure 4.3 – Indirect Method 1

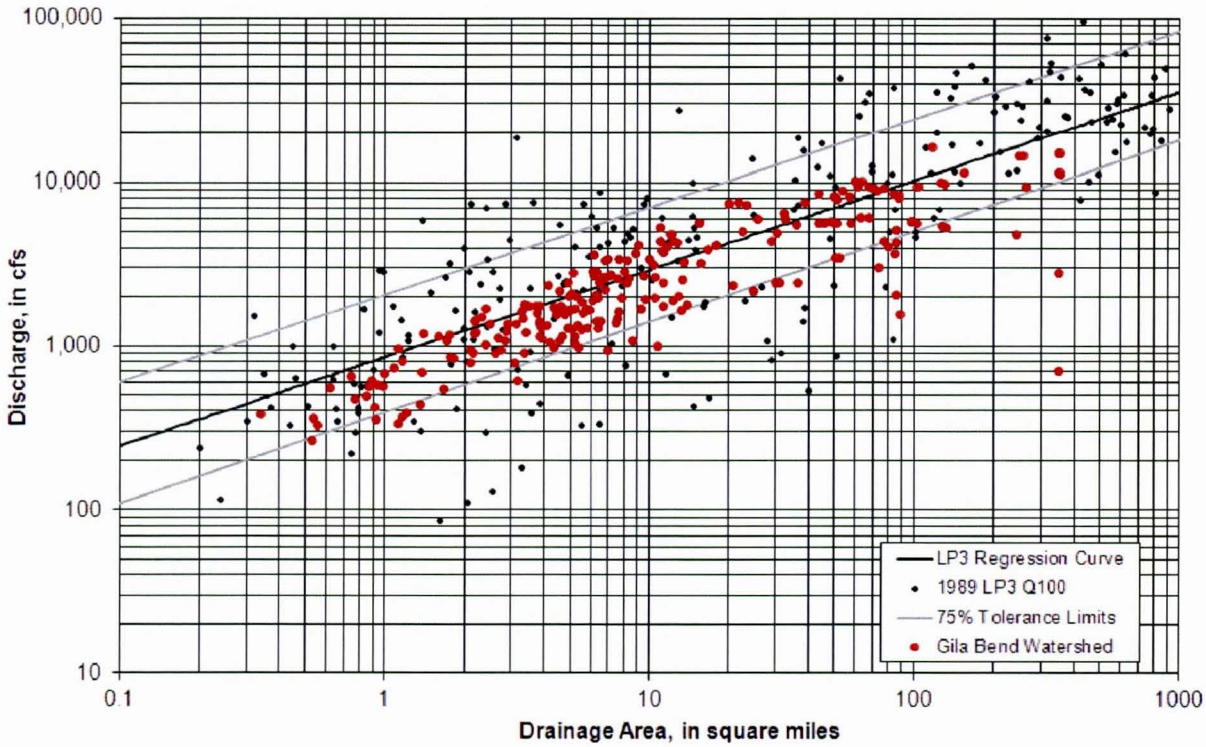


4.3.2 Method 2

The second indirect method is a check of the HEC-1 model results against streamflow and statistical data from the USGS for Arizona. The USGS data was analyzed using Log-Pearson Type 3 (LP3) analyses as described in Chapter 8 of the Hydrology Manual. The Method 2 Indirect Method verification is shown in Figure 4.4. The plot illustrates that the data falls within the 75% tolerance limits with few outliers. The outliers are due to flow diversion issues and the corresponding method of accounting for the total drainage area and the arbitrary diversion rating curves assigned to the diversions associated with the future 2-dimensional modeling area. The

model results are expected to plot within the tolerance limit lines of the graph. Although some data points fall outside of the 75% tolerance limits, the data is generally within the scatter of data for the LP3 Q100 data points.

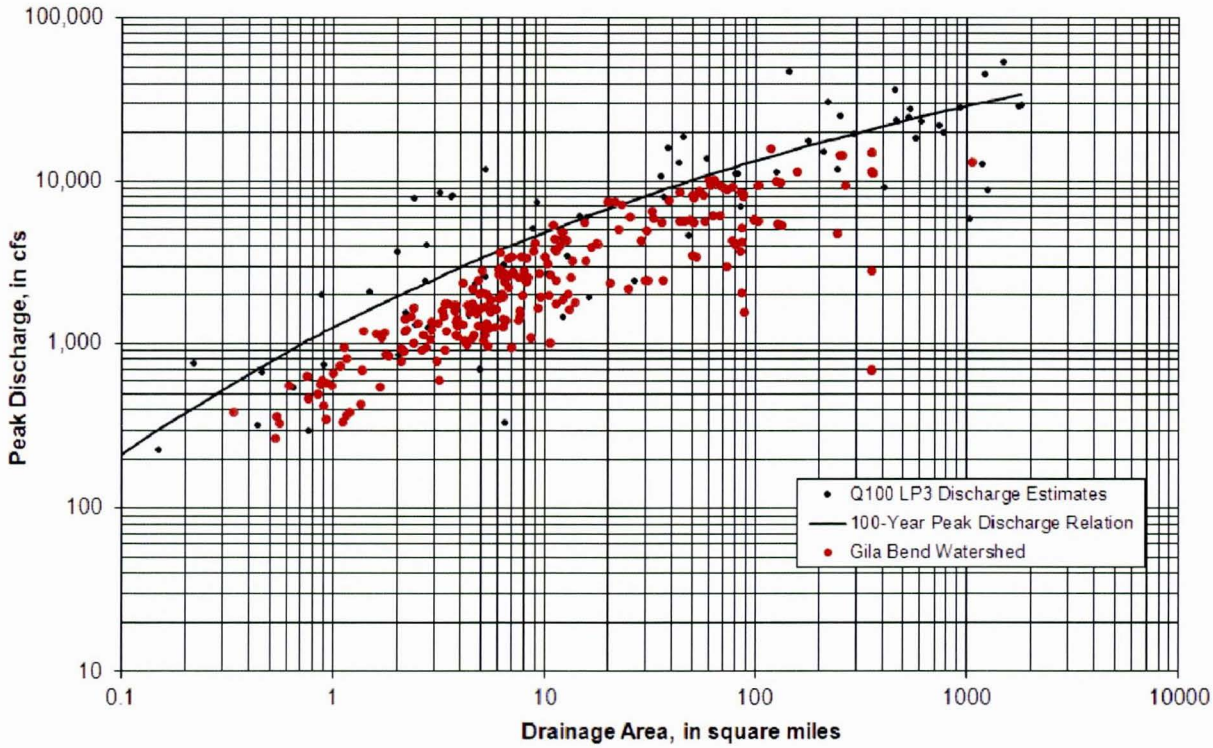
Figure 4.4 – Indirect Method 2



4.3.3 Method 3

The third method for verification of results is a check against regional regression equations. The watershed falls within Region 13 and the verification process follows that prescribed in Chapter 8 of the Hydrology Manual using Table 8.3 and Figure 8.9. In general, the model results plot just below the 100-year peak discharge relation curve but within the overall scatter of data for the Q100 LP3 discharge estimates as shown in Figure 4.5. Outliers within the plotted data occur for reasons stated previously.

Figure 4.5 – Indirect Method 3



4.4 CONCLUSION

In general, model results compare well with indirect methods of verification. Compared to the previous study the updated model results are lower which is to be expected given the data differences, particularly the rainfall depth derived using NOAA Atlas 14 statistics. Without other substantial data that can be used for comparison, the model results appear reasonable and are based on current methods, data and procedures.

Appendix A

Subbasin Infiltration Parameters

Component Legend

United States

[This report shows only the major soils in each map unit]

Map unit symbol and name	Pct. of map unit	Component name	XKSAT	Component kind	Pct. Slope Low	Pct. Slope RV	Pct. Slope High
s288: Rillito-Gunsight-Denure-Chuckawalla (s288)							
	40	Gunsight	0.40	Series	1	9	16
	25	Rillito	0.40	Series	1	2	3
	16	Chuckawalla	0.06	Series	1	3	5
	12	Denure	0.40	Series	1	2	3
	7	Carrizo	1.2	Series	1	5	10

$$\log \text{Avg XKSAT} = \text{Antilog}\left(0.77 * \log 0.4 + 0.16 * \log 0.06 + 0.07 * \log 1.2\right)$$

$$= 0.32 \text{ IN/HR}$$

Non Completed Area

Map Unit	XKSAT	Rock	% Area	
S288	0.32	0	2	6479288
S287	0.38	9	66	6479287
S399	0.23	0	32	6479399
	0.32 IN/HR	6 %		

Engineering Properties

United States

[Absence of an entry indicates that the data were not estimated. This report shows only the major soils in each map unit]

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percent passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 Inches	3-10 Inches	4	10	40	200		
	In				*Pct*	*Pct*					*Pct*	
s288: XKS47												
Gunsight 0.40	0-1	Extremely gravelly sandy loam	GC-GM, GM	A-1	0-5	0-10	25-35	20-30	15-25	5-15	15-20	NP-5
	1-6	Very gravelly coarse sandy loam, very gravelly sandy loam	GC-GM, GM	A-1, A-2	0-5	0-10	35-55	20-50	15-50	5-30	15-20	NP-5
	6-46	Extremely gravelly coarse sandy loam	GC-GM, GM	A-1	0-5	0-10	25-35	20-30	10-20	5-15	15-20	NP-5
	46-60	Gravelly coarse sandy loam, very gravelly coarse sandy loam	GC-GM, GM	A-1, A-2	0-5	0-10	35-60	20-55	10-40	5-30	15-20	NP-5
	60-70	Very gravelly sand	GP, GP-GM	A-1	0-5	0-10	35-45	30-40	10-15	0-5	---	NP
Rillito 0.40	0-2	Very gravelly sandy loam	GM, SM	A-1	0	0-5	35-60	25-50	15-40	5-20	15-25	NP-5
	2-9	Sandy loam	SC-SM, SM	A-2, A-4	0	0	95-100	80-100	60-70	30-40	15-25	NP-5
	9-42	Gravelly fine sandy loam, gravelly sandy loam	GC-GM, GM, SC-SM, SM	A-1, A-2, A-4	0	0	55-80	50-75	30-65	15-40	15-25	NP-5
	42-60	Very gravelly sandy loam	GM, SM	A-1	0	0	35-60	25-50	15-40	5-20	15-25	NP-5

Engineering Properties

United States

Map symbol and soil name	XKSAT	Depth	USDA texture	Classification		Fragments		Percent passing sieve number--				Liquid limit	Plasticity index
				Unified	AASHTO	>10 Inches	3-10 Inches	4	10	40	200		
		In				*Pct*	*Pct*					*Pct*	
s288:													
Chuckawalla	0.06	0-1	Extremely gravelly loam	GC-GM	A-1, A-2	0	0-5	30-60	20-50	15-45	10-35	20-30	5-10
		1-10	Very gravelly clay loam, very gravelly loam, very gravelly sandy clay loam	GC-GM, GM	A-1, A-2	0	0-5	30-60	20-50	15-45	10-35	25-35	5-10
		10-18	Very gravelly coarse sandy loam, very gravelly sandy loam, extremely gravelly sandy loam	GM, SM	A-1	0	0-5	30-60	20-50	10-35	5-20	15-25	NP-5
		18-60	Extremely gravelly loamy sand, extremely gravelly sandy loam	GW-GM	A-1	0	5-10	20-30	15-25	10-20	5-10	15-25	NP-5
Denure	0.4	0-4	Very gravelly sandy loam	GC-GM, GM	A-1, A-2	0	0	40-50	35-45	20-40	10-30	15-20	NP-5
		4-60	Fine sandy loam, gravelly sandy loam, sandy loam	SC, SC-SM, SM	A-2, A-4	0	0	80-100	70-95	50-70	30-40	15-25	NP-10
Carrizo	1.2	0-1	Extremely gravelly sandy loam	GM	A-1	0	0	35-50	20-30	10-25	5-15	20-25	NP-5
		1-54	Extremely gravelly loamy sand, extremely gravelly sand	GM, GP, SM, SP	A-1	0	0-25	30-65	15-60	5-35	0-15	0-14	NP
		54-60	Very gravelly loamy sand	GM, SM	A-1	0	0-5	40-70	25-50	15-40	5-15	0-14	NP

Component Legend

United States

[This report shows only the major soils in each map unit]

Map unit symbol and name	Pct. of map unit	Component name	XKSAT	Component kind	Pct. Slope		
					Low	RV	High
s289: Hyder-Coolidge-Cipriano-Cherioni (s289)							
	30	Cherioni	0.25	Series	3	14	25
	22	Hyder	0.40	Series	15	40	65
	21	Cipriano	0.40	Series	15	35	55
	11	Coolidge	0.40	Series	1	2	3
	9	Rock outcrop	---	Miscellaneous area	---	---	---
	7	Gunsight	0.40	Series	1	8	15

$$\log \text{Avg. XKSAT} = \text{Antilog}\left(0.3 * \log 0.25 + 0.61 * \log 0.40\right)$$
$$= 0.38 \ \text{IN/HR}$$

Engineering Properties

United States

[Absence of an entry indicates that the data were not estimated. This report shows only the major soils in each map unit]

Map symbol and soil name		Depth	USDA texture	Classification		Fragments		Percent passing sieve number--				Liquid limit	Plasticity index
				Unified	AASHTO	>10 Inches	3-10 Inches	4	10	40	200		
		In				*Pct*	*Pct*					*Pct*	
s289:	XKSAT												
Cherioni	0.25	0-2	Very gravelly loam	GC, GC-GM, SC, SC-SM	A-1, A-2	0	0	40-70	35-50	25-35	15-20	20-25	5-10
		2-9	Very gravelly loam, very gravelly sandy loam, very gravelly very fine sandy loam	GC-GM, GM	A-1, A-2	0	0	30-60	25-50	20-40	10-30	15-25	NP-5
		9-11	Indurated	---	---	---	---	---	---	---	---	---	---
		11-20	Unweathered bedrock	---	---	---	---	---	---	---	---	---	---
Hyder	0.4	0-2	Extremely stony fine sandy loam	SM	A-2	30-50	20-40	60-80	50-70	50-60	25-35	20-25	NP-5
		2-5	Very gravelly sandy loam, extremely gravelly fine sandy loam, extremely gravelly sandy loam	GM, GP-GM	A-1	0	10-20	20-60	10-50	5-35	5-25	20-25	NP-5
		5-9	Unweathered bedrock	---	---	---	---	---	---	---	---	---	---
Cipriano	0.4	0-1	Extremely cobbly sandy loam	SC, SC-SM, SM	A-2, A-4	0-5	50-70	70-85	60-75	35-55	25-40	20-30	NP-10
		1-6	Very cobbly loam, very gravelly sandy loam	CL-ML, GM, SC-SM, SM	A-1, A-2, A-3, A-4	0-5	10-50	35-80	25-75	15-70	5-55	15-30	NP-10
		6-15	Cemented	---	---	---	---	---	---	---	---	---	---
		15-20	Indurated	---	---	---	---	---	---	---	---	---	---
		20-60	Gravelly loam, very gravelly loam	GC, GC-GM, SC, SC-SM	A-1, A-2, A-4	---	0-5	35-70	30-65	25-60	15-45	20-30	5-10

Engineering Properties

United States

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percent passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 Inches	3-10 Inches	4	10	40	200		
	In				*Pct*	*Pct*					*Pct*	
s289: XKSAT												
Coolidge 0.40	0-2	Gravelly very fine sandy loam	SC, SC-SM, SM	A-2, A-4	0	0	75-85	65-75	55-70	30-45	15-20	NP-10
	2-21	Very fine sandy loam	CL, CL-ML, ML	A-4	0	0	100	100	80-95	50-65	15-25	NP-10
	21-36	Gravelly sandy loam	SC-SM, SM	A-1, A-2	0	0	65-80	60-75	35-50	20-30	15-20	NP-5
	36-60	Very gravelly sandy loam	GM, SC-SM, SM	A-1	0	0	45-65	40-50	25-35	10-20	15-20	NP-5
Rock outcrop	---	---	---	---	---	---	---	---	---	---	---	---
Gunsight 0.40	0-1	Extremely gravelly sandy loam	GC-GM, GM	A-1	0-5	0-10	25-35	20-30	15-25	5-15	15-20	NP-5
	1-6	Very gravelly coarse sandy loam, very gravelly sandy loam	GC-GM, GM	A-1, A-2	0-5	0-10	35-55	20-50	15-50	5-30	15-20	NP-5
	6-46	Extremely gravelly coarse sandy loam	GC-GM, GM	A-1	0-5	0-10	25-35	20-30	10-20	5-15	15-20	NP-5
	46-60	Very gravelly coarse sandy loam	GC-GM, GM	A-1, A-2	0-5	0-10	35-55	20-50	10-40	5-30	15-20	NP-5

Component Legend

United States

[This report shows only the major soils in each map unit]

Map unit symbol and name	Pct. of map unit	Component name	XKSAT	Component kind	Pct. Slope		
					Low	RV	High
s399: Pinamt-Momoli-Hickiwan-Gunsight-Denure (s399)							
	25	Momoli	0.40	Series	1	3	5
	25	Pinamt	0.06	Series	1	3	5
	23	Denure	0.40	Series	1	2	3
	12	Hickiwan	0.40	Series	3	9	15
	10	Gunsight	0.40	Series	5	10	15
	5	Ajo	0.06	Series	3	7	10

log Avg. XKSAT = Antilog (0.7 * log 0.4 + 0.3 * log 0.06)

= 0.23 IN/HR

Engineering Properties

United States

[Absence of an entry indicates that the data were not estimated. This report shows only the major soils in each map unit]

Map symbol and soil name		Depth	USDA texture	Classification		Fragments		Percent passing sieve number--				Liquid limit	Plasticity index
				Unified	AASHTO	>10 Inches	3-10 Inches	4	10	40	200		
		In				Pct	Pct					Pct	
s399:	XKSAT												
Momoli	0.40	0-2	Extremely gravelly sandy loam	GM, SM	A-1	0	0-15	30-60	25-50	15-35	5-20	15-20	NP-5
		2-21	Gravelly coarse sandy loam, gravelly sandy loam	GC-GM, GM, SC-SM, SM	A-1, A-2	0	0-5	50-85	45-75	25-65	15-30	15-20	NP-5
		21-33	Very gravelly coarse sandy loam, extremely gravelly coarse sandy loam	GM, SM	A-1	0	0-15	30-60	25-50	15-35	5-20	15-20	NP-5
		33-54	Very gravelly coarse sandy loam	GM, SM	A-1	0	0-10	45-60	35-50	20-35	5-20	15-20	NP-5
		54-60	Gravelly sandy loam	GC-GM, GM, SC-SM, SM	A-1, A-2	0	0-5	55-85	50-75	30-65	20-30	15-20	NP-5
Pinamt	0.06	0-2	Extremely gravelly loam	GC-GM, GM	A-1, A-2	0	0-15	25-60	15-50	10-45	5-30	15-25	NP-5
		2-30	Very gravelly clay loam, very gravelly sandy clay loam, extremely gravelly loam	GC	A-2	0	15-30	20-55	15-50	10-40	10-35	25-35	10-15
		30-60	Very gravelly loam, very gravelly sandy loam, extremely gravelly sandy loam	GC, GC-GM	A-1, A-2	0	15-30	20-55	15-50	10-40	5-35	20-30	5-10
Denure	0.40	0-2	Gravelly sandy loam	SC-SM, SM	A-2, A-4	0	0	75-85	65-75	55-65	25-40	15-20	NP-5
		2-60	Fine sandy loam, gravelly sandy loam, sandy loam	SC, SC-SM, SM	A-2, A-4	0	0	80-100	70-95	50-70	30-40	15-25	NP-10

Engineering Properties

United States

Map symbol and soil name		Depth	USDA texture	Classification		Fragments		Percent passing sieve number--				Liquid limit	Plasticity index
				Unified	AASHTO	>10 Inches	3-10 Inches	4	10	40	200		
s399:	XKSAT	In				Pct	Pct					Pct	
Hickiwan	0.40	0-2	Very gravelly sandy loam	GC-GM, GM	A-1	0	0-5	35-55	30-50	20-30	10-20	15-25	NP-5
		2-14	Very gravelly sandy loam	GC-GM, GM	A-1	0	0-5	35-55	30-50	20-30	10-20	15-25	NP-5
		14-60	Cemented	---	---	---	---	---	---	---	---	---	---
Gunsight	0.40	0-3	Extremely gravelly sandy loam	GW-GC	A-1, A-2	0	10-30	15-35	10-25	5-15	5-10	20-25	5-10
		3-23	Extremely gravelly sandy loam	GW-GC	A-1, A-2	0	0-20	15-35	10-25	5-15	5-10	20-25	5-10
		23-60	Extremely gravelly sandy loam	GW-GC	A-1, A-2	0	0-20	15-35	10-25	5-15	5-10	20-25	5-10
Ajo	0.06	0-2	Extremely gravelly loam	GC-GM	A-1, A-2	0	5-10	15-30	10-25	5-20	5-10	20-30	5-10
		2-8	Extremely gravelly sandy clay loam	GW-GM	A-1, A-2	0	10-15	15-30	10-25	10-20	5-10	25-35	5-10
		8-17	Very gravelly clay loam	GC	A-2, A-6	0	0-15	35-55	30-50	25-50	20-40	30-40	10-15
		17-25	Extremely cobbly clay loam	GC	A-2, A-6, A-7	0	60-80	30-60	20-50	20-50	15-40	30-45	10-20
		25-30	Extremely gravelly clay loam	GC	A-2	0	10-15	25-40	20-30	15-30	10-25	30-45	10-20
		30-60	Indurated	---	---	---	---	---	---	---	---	---	---

Table A.1 - Subbasin Iniltration Parameter Summary

FCD 2007C017

November 2011

HEC-1 ID	Drainage Area sq. mi.	IA inches	DTHETA	PSIF inches	XKSAT in/hr	RTIMP %
1A	2.10	0.24	0.35	3.01	0.77	7
FLO-2D	6.31	0.35	0.35	3.40	0.58	0
1B	2.10	0.35	0.35	3.81	0.44	0
1C	3.83	0.35	0.35	4.50	0.30	0
1D	0.34	0.25	0.35	4.10	0.38	9
1E	3.91	0.35	0.35	4.00	0.39	0
1F	5.55	0.23	0.35	3.03	0.76	10
1G	3.78	0.23	0.35	2.89	0.84	21
1H	6.77	0.25	0.35	3.25	0.65	13
1I	4.11	0.35	0.35	3.81	0.44	0
1J	0.62	0.25	0.35	4.10	0.38	9
1K	1.08	0.25	0.35	4.10	0.38	9
1L	4.69	0.34	0.35	4.30	0.34	1
1M	2.19	0.25	0.35	4.10	0.38	9
1N	2.75	0.35	0.35	3.40	0.58	0
1O	5.23	0.23	0.35	3.15	0.70	10
1P	4.57	0.35	0.35	3.15	0.70	0
1Q	5.31	0.32	0.35	4.30	0.34	3
1R	2.90	0.26	0.35	3.13	0.71	10
1S	4.77	0.26	0.35	2.97	0.79	9
1T	4.67	0.32	0.35	3.03	0.76	6
1U	3.19	0.35	0.35	2.88	0.85	0
1V	2.16	0.29	0.35	2.91	0.83	5
1W	0.53	0.29	0.35	2.82	0.89	9
1X	2.62	0.35	0.35	3.11	0.72	0
1Y	5.31	0.35	0.35	3.11	0.72	0
2A	4.33	0.25	0.35	4.10	0.38	9
2AA	3.73	0.33	0.35	4.20	0.36	5
2B	3.31	0.30	0.35	4.50	0.30	5
2BB	2.40	0.28	0.35	4.10	0.38	21
2C	2.32	0.25	0.35	4.10	0.38	9
2CC	4.34	0.35	0.35	3.53	0.53	0
2D	1.75	0.25	0.35	4.10	0.38	9
2DD	0.56	0.35	0.35	3.78	0.45	0
2E	1.00	0.34	0.35	4.80	0.25	1
2EE	4.13	0.20	0.35	4.45	0.31	7
2F	0.75	0.27	0.35	4.25	0.35	7
2FF	5.39	0.35	0.35	3.92	0.41	0
2G	1.13	0.34	0.35	4.90	0.24	1

Table A.1 - Subbasin Iniltration Parameter Summary
FCD 2007C017
November 2011

HEC-1 ID	Drainage Area sq. mi.	IA inches	DTHETA	PSIF inches	XKSAT in/hr	RTIMP %
2GG	6.69	0.25	0.35	4.15	0.37	11
2H	1.59	0.33	0.35	4.80	0.25	2
2HH	6.76	0.28	0.35	4.10	0.38	18
2I	0.87	0.25	0.35	4.10	0.38	9
2II	2.22	0.28	0.35	4.15	0.37	21
2J	1.16	0.25	0.35	4.10	0.38	9
2JJ	0.89	0.34	0.35	4.50	0.30	3
2K	2.19	0.26	0.35	4.25	0.35	8
2KK	4.19	0.35	0.35	4.20	0.36	0
2L	0.94	0.31	0.35	4.60	0.28	3
2LL	5.18	0.35	0.35	4.20	0.36	0
2M	1.40	0.29	0.35	4.50	0.30	5
2MM	0.91	0.35	0.35	3.09	0.73	0
2N	2.20	0.32	0.35	4.65	0.27	3
2NN	9.61	0.35	0.35	4.15	0.37	0
2O	3.37	0.25	0.35	4.10	0.38	9
2OO	0.85	0.35	0.35	3.92	0.41	0
2P	3.51	0.27	0.35	3.25	0.65	9
2PP	1.78	0.35	0.35	3.88	0.42	0
2Q	2.93	0.23	0.35	3.15	0.70	9
2QQ	1.67	0.35	0.35	3.19	0.68	0
2R	2.67	0.30	0.35	2.62	1.03	4
2RR	0.93	0.35	0.35	3.53	0.53	0
2S	1.82	0.32	0.35	2.57	1.08	5
2SS	3.83	0.30	0.35	2.71	0.96	5
2T	4.90	0.27	0.35	3.40	0.58	8
2TT	4.60	0.32	0.35	2.79	0.91	5
2U	1.38	0.33	0.35	2.70	0.97	3
2UU	7.50	0.35	0.35	3.19	0.68	0
2V	7.57	0.25	0.35	3.23	0.66	8
2VV	3.37	0.35	0.35	3.15	0.70	1
2W	6.29	0.27	0.35	4.25	0.35	13
2WW	5.80	0.34	0.35	3.07	0.74	1
2X	10.31	0.26	0.35	4.10	0.38	10
2XX	1.36	0.39	0.26	3.43	0.70	0
2Y	13.40	0.34	0.35	3.50	0.54	1
2YY	1.12	0.35	0.35	3.19	0.68	0
2Z	5.10	0.28	0.35	4.15	0.37	19
3A	11.19	0.22	0.35	4.20	0.36	10
3B	6.42	0.35	0.35	4.15	0.37	0

Table A.1 - Subbasin Iniltration Parameter Summary

FCD 2007C017

November 2011

HEC-1 ID	Drainage Area sq. mi.	IA inches	DTHETA	PSIF inches	XKSAT in/hr	RTIMP %
3C	11.27	0.24	0.35	4.25	0.35	3
3D	6.51	0.31	0.35	4.15	0.37	0
3E	8.24	0.23	0.35	4.20	0.36	14
3F	12.14	0.23	0.35	4.50	0.30	19
3G	5.12	0.22	0.35	4.25	0.35	7
3H	6.78	0.24	0.35	4.25	0.35	2
3I	5.10	0.35	0.35	3.95	0.40	0
3J	11.26	0.35	0.35	3.92	0.41	0
3KB	1.71	0.35	0.35	3.85	0.43	3
3KC	3.10	0.35	0.35	3.38	0.59	1
3KD	1.17	0.35	0.35	3.23	0.66	0
3L	3.35	0.37	0.35	3.74	0.46	1
3M	3.85	0.45	0.35	3.78	0.45	0
4A	11.75	0.23	0.38	5.60	0.18	20
4B	6.14	0.21	0.35	4.30	0.34	5
4C	12.33	0.31	0.35	4.15	0.37	4
4D	4.57	0.25	0.40	6.00	0.15	24
4E	4.88	0.24	0.40	6.00	0.15	20
4F	6.16	0.27	0.39	5.70	0.17	16
4G	7.71	0.28	0.35	4.80	0.25	16
4H	6.12	0.25	0.35	4.30	0.34	21
4I	15.52	0.28	0.35	4.15	0.37	13
4J	6.09	0.33	0.35	3.92	0.41	3
4K	3.91	0.35	0.35	3.92	0.41	0
4L	9.49	0.33	0.35	3.92	0.41	5
4M	3.43	0.35	0.35	3.95	0.40	0
4N	7.61	0.35	0.35	4.20	0.36	0
4O	5.50	0.35	0.35	4.20	0.36	0
5A	9.29	0.35	0.35	3.92	0.41	0
5B	4.88	0.35	0.35	3.85	0.43	0
5C	2.41	0.46	0.35	3.40	0.58	0
6A	9.04	0.21	0.35	4.20	0.36	14
6B	10.95	0.22	0.35	4.20	0.36	10
6C	8.83	0.26	0.35	4.15	0.37	10
6D	9.98	0.29	0.35	4.00	0.39	10
6E	7.12	0.22	0.35	4.15	0.37	14
6F	5.05	0.31	0.35	3.95	0.40	7
6G	6.37	0.35	0.35	3.92	0.41	0
6H	4.97	0.27	0.35	4.00	0.39	8
6I	6.97	0.25	0.35	4.35	0.33	8

Table A.1 - Subbasin Iniltration Parameter Summary
FCD 2007C017
November 2011

HEC-1 ID	Drainage Area sq. mi.	IA inches	DTHETA	PSIF inches	XKSAT in/hr	RTIMP %
6J	4.47	0.30	0.35	4.10	0.38	5
6K	5.95	0.35	0.35	4.10	0.38	0
6L	6.34	0.35	0.35	4.00	0.39	0
6M	3.86	0.34	0.35	4.30	0.34	3
6N	7.84	0.35	0.35	3.92	0.41	0
6O	8.13	0.37	0.30	4.40	0.36	0
6P	5.21	0.41	0.22	3.71	0.62	4
6Q	2.86	0.47	0.33	3.45	0.58	0
7AC	1.21	0.35	0.35	3.13	0.71	0
7B	0.99	0.39	0.35	3.40	0.58	0
7C	0.54	0.35	0.35	3.15	0.70	0
7D	0.77	0.34	0.35	3.33	0.61	2

Table A.2 - Subbasin Unit Hydrograph Parameter Summary
FCD 2007C017
November 2011

HEC-1 ID	Drainage Area sq. mi.	Upstream Elevation feet	Downstream Elevation feet	Length miles	Slope ft/mile	Kn	Lag hours	S-Graph
1A	2.10	2069.3	1780.4	3.865	74.7	0.05	1.13	MOUNTAIN
FLO-2D	6.31	825.8	707.8	4.609	25.6	0.04	1.20	DESERT/RANGELAND
1B	2.10	2025.2	1802.0	4.479	49.8	0.04	1.00	DESERT/RANGELAND
1C	3.83	2369.0	1780.4	7.160	82.2	0.04	1.43	DESERT/RANGELAND
1D	0.34	3869.3	2419.5	1.359	1066.8	0.06	0.35	MOUNTAIN
1E	3.91	2438.8	1745.0	7.549	91.9	0.04	1.43	DESERT/RANGELAND
1F	5.55	2769.5	1745.0	6.072	168.7	0.05	1.32	MOUNTAIN
1G	3.78	2850.4	1945.2	4.885	185.3	0.05	1.16	MOUNTAIN
1H	6.77	2715.6	1669.1	5.811	180.1	0.05	1.26	MOUNTAIN
1I	4.11	2246.7	1682.0	6.814	82.9	0.04	1.39	DESERT/RANGELAND
1J	0.62	3507.4	2226.7	2.052	624.1	0.06	0.50	MOUNTAIN
1K	1.08	3799.1	2199.9	2.930	545.8	0.06	0.72	MOUNTAIN
1L	4.69	2561.6	1669.1	6.805	131.2	0.04	1.39	DESERT/RANGELAND
1M	2.19	3799.1	2092.4	3.065	556.8	0.06	0.77	MOUNTAIN
1N	2.75	2206.7	1615.7	5.780	102.2	0.04	1.15	DESERT/RANGELAND
1O	5.23	3075.1	1507.5	6.728	233.0	0.05	1.47	MOUNTAIN
1P	4.57	2124.6	1507.5	8.010	77.0	0.04	1.52	DESERT/RANGELAND
1Q	5.31	2972.3	1625.5	7.486	179.9	0.04	1.46	MOUNTAIN
1R	2.90	2027.6	1595.6	3.626	119.1	0.05	1.03	MOUNTAIN
1S	4.77	1850.0	1294.4	5.574	99.7	0.05	1.37	MOUNTAIN
1T	4.67	2392.1	1205.9	8.601	137.9	0.04	1.60	DESERT/RANGELAND
1U	3.19	1579.1	1205.9	7.729	48.3	0.04	1.74	DESERT/RANGELAND
1V	2.16	1565.7	1129.6	3.690	118.2	0.04	0.87	DESERT/RANGELAND
1W	0.53	1238.3	1129.6	2.182	49.8	0.05	0.73	MOUNTAIN
1X	2.62	1145.2	961.5	3.568	51.5	0.04	1.02	DESERT/RANGELAND
1Y	5.31	1025.5	782.1	6.138	39.7	0.04	1.40	DESERT/RANGELAND
2A	4.33	3712.1	2149.9	6.068	257.4	0.06	1.44	MOUNTAIN

Table A.2 - Subbasin Unit Hydrograph Parameter Summary
FCD 2007C017
November 2011

HEC-1 ID	Drainage Area sq. mi.	Upstream Elevation feet	Downstream Elevation feet	Length miles	Slope ft/mile	Kn	Lag hours	S-Graph
2AA	3.73	1654.1	1117.0	4.725	113.7	0.04	1.07	DESERT/RANGELAND
2B	3.31	2502.2	1709.9	5.396	146.8	0.05	1.14	MOUNTAIN
2BB	2.40	2048.0	1227.6	3.213	255.3	0.05	0.76	MOUNTAIN
2C	2.32	2649.2	1560.0	3.265	333.6	0.06	0.77	MOUNTAIN
2CC	4.34	1211.2	853.0	8.422	42.5	0.04	1.84	DESERT/RANGELAND
2D	1.75	3788.4	2112.8	2.961	565.9	0.06	0.74	MOUNTAIN
2DD	0.56	882.9	812.0	2.411	29.4	0.04	0.74	DESERT/RANGELAND
2E	1.00	2363.9	1802.5	3.498	160.5	0.04	0.77	MOUNTAIN
2EE	4.13	2578.9	1534.3	4.768	219.1	0.05	0.95	MOUNTAIN
2F	0.75	3011.3	1997.3	2.212	458.4	0.05	0.53	MOUNTAIN
2FF	5.39	1650.4	870.7	14.185	55.0	0.04	2.57	DESERT/RANGELAND
2G	1.13	2081.9	1802.5	2.360	118.4	0.04	0.58	MOUNTAIN
2GG	6.69	2778.3	1989.5	5.663	139.3	0.05	1.47	MOUNTAIN
2H	1.59	2130.7	1758.1	3.003	124.1	0.04	0.72	MOUNTAIN
2HH	6.76	2841.3	1805.1	5.213	198.8	0.05	1.14	MOUNTAIN
2I	0.87	2161.3	1758.1	2.355	171.2	0.06	0.76	MOUNTAIN
2II	2.22	2754.7	1657.1	4.256	257.9	0.05	1.07	MOUNTAIN
2J	1.16	2459.5	1706.8	2.550	295.2	0.06	0.71	MOUNTAIN
2JJ	0.89	1808.4	1468.8	3.052	111.3	0.04	0.73	DESERT/RANGELAND
2K	2.19	3604.4	1919.5	4.444	379.1	0.05	0.99	MOUNTAIN
2KK	4.19	1526.5	1011.5	9.518	54.1	0.04	1.94	DESERT/RANGELAND
2L	0.94	2286.3	1818.1	3.349	139.8	0.05	0.85	MOUNTAIN
2LL	5.18	1685.0	1011.5	12.252	55.0	0.04	2.42	DESERT/RANGELAND
2M	1.40	2123.4	1706.8	2.153	193.5	0.05	0.55	MOUNTAIN
2MM	0.91	1052.2	941.5	2.583	42.9	0.04	0.75	DESERT/RANGELAND
2N	2.20	2224.6	1751.4	3.283	144.1	0.05	0.80	MOUNTAIN
2NN	9.61	1744.2	1131.6	11.227	54.6	0.04	2.27	DESERT/RANGELAND

Table A.2 - Subbasin Unit Hydrograph Parameter Summary
FCD 2007C017
November 2011

HEC-1 ID	Drainage Area sq. mi.	Upstream Elevation feet	Downstream Elevation feet	Length miles	Slope ft/mile	Kn	Lag hours	S-Graph
2O	3.37	1849.6	1560.0	3.443	84.1	0.06	1.01	MOUNTAIN
2OO	0.85	1263.0	1131.6	2.759	47.6	0.04	0.77	DESERT/RANGELAND
2P	3.51	2538.4	1333.0	3.696	326.1	0.05	0.85	MOUNTAIN
2PP	1.78	1172.4	1014.0	3.606	43.9	0.04	0.94	DESERT/RANGELAND
2Q	2.93	2190.1	1549.4	3.625	176.7	0.05	0.91	MOUNTAIN
2QQ	1.67	1076.1	909.3	4.389	38.0	0.04	1.11	DESERT/RANGELAND
2R	2.67	2164.2	1362.8	3.414	234.7	0.05	0.78	MOUNTAIN
2RR	0.93	943.3	812.0	3.902	33.6	0.04	1.10	DESERT/RANGELAND
2S	1.82	1405.9	1276.5	2.274	56.9	0.05	0.68	MOUNTAIN
2SS	3.83	1844.8	1201.9	6.563	98.0	0.04	1.29	MOUNTAIN
2T	4.90	2651.0	1208.0	6.719	214.8	0.05	1.49	MOUNTAIN
2TT	4.60	1498.7	1061.5	4.159	105.1	0.05	0.94	MOUNTAIN
2U	1.38	1840.1	1123.4	2.817	254.4	0.04	0.62	MOUNTAIN
2UU	7.50	1125.8	788.8	8.325	40.5	0.04	1.91	DESERT/RANGELAND
2V	7.57	2700.5	1071.5	6.746	241.5	0.05	1.33	MOUNTAIN
2VV	3.37	1002.0	738.0	6.517	40.5	0.04	1.36	DESERT/RANGELAND
2W	6.29	2688.6	1664.1	5.893	173.9	0.05	1.28	MOUNTAIN
2WW	5.80	1898.5	737.1	9.580	121.2	0.04	1.62	DESERT/RANGELAND
2X	10.31	1883.0	1193.2	7.522	91.7	0.05	1.91	MOUNTAIN
2XX	1.36	740.6	660.8	2.795	28.6	0.05	1.19	DESERT/RANGELAND
2Y	13.40	1335.3	861.6	9.844	48.1	0.04	2.03	DESERT/RANGELAND
2YY	1.12	983.3	812.0	5.042	34.0	0.04	1.22	DESERT/RANGELAND
2Z	5.10	1895.5	1344.4	6.222	88.6	0.05	1.52	MOUNTAIN
3A	11.19	3882.4	2104.9	8.005	222.0	0.05	1.70	MOUNTAIN
3B	6.42	2241.8	1531.4	8.466	83.9	0.04	1.54	DESERT/RANGELAND
3C	11.27	3393.4	1871.4	9.255	164.5	0.04	1.62	MOUNTAIN
3D	6.51	2579.2	1703.8	7.752	112.9	0.04	1.39	MOUNTAIN

Table A.2 - Subbasin Unit Hydrograph Parameter Summary
FCD 2007C017
November 2011

HEC-1 ID	Drainage Area sq. mi.	Upstream Elevation feet	Downstream Elevation feet	Length miles	Slope ft/mile	Kn	Lag hours	S-Graph
3E	8.24	3611.9	2041.7	7.668	204.8	0.05	1.44	MOUNTAIN
3F	12.14	3343.2	2109.2	7.386	167.1	0.05	1.58	MOUNTAIN
3G	5.12	2749.7	1964.5	4.345	180.7	0.05	0.97	MOUNTAIN
3H	6.78	3609.2	1817.9	9.715	184.4	0.04	1.71	MOUNTAIN
3I	5.10	1547.5	1143.1	8.563	47.2	0.04	1.89	DESERT/RANGELAND
3J	11.26	1445.0	812.0	16.460	38.5	0.04	2.79	DESERT/RANGELAND
3KB	1.71	866.5	772.0	2.895	32.6	0.03	0.70	DESERT/RANGELAND
3KC	3.10	1063.8	792.0	7.557	36.0	0.04	1.57	DESERT/RANGELAND
3KD	1.17	991.4	814.3	4.906	36.1	0.04	1.18	DESERT/RANGELAND
3L	3.35	871.9	733.8	4.545	30.4	0.04	1.00	DESERT/RANGELAND
3M	3.85	741.7	661.7	3.713	21.5	0.03	0.90	AGRICULTURE
4A	11.75	2609.0	2006.7	8.109	74.3	0.05	2.13	MOUNTAIN
4B	6.14	2453.5	1832.2	5.716	108.7	0.05	1.28	MOUNTAIN
4C	12.33	2488.3	1568.6	7.429	123.8	0.04	1.44	MOUNTAIN
4D	4.57	3087.4	2040.8	6.394	163.7	0.05	1.56	MOUNTAIN
4E	4.88	3316.7	2158.1	6.052	191.4	0.05	1.41	MOUNTAIN
4F	6.16	3510.1	1962.9	5.303	291.8	0.05	1.08	MOUNTAIN
4G	7.71	2610.0	1888.1	6.845	105.5	0.05	1.42	MOUNTAIN
4H	6.12	2720.9	1976.6	4.926	151.1	0.05	1.32	MOUNTAIN
4I	15.52	2534.0	1755.2	6.863	113.5	0.05	1.55	MOUNTAIN
4J	6.09	2395.1	1521.9	7.858	111.1	0.04	1.51	DESERT/RANGELAND
4K	3.91	1750.9	1370.3	7.856	48.4	0.04	1.63	DESERT/RANGELAND
4L	9.49	2534.4	1362.9	8.608	136.1	0.04	1.65	DESERT/RANGELAND
4M	3.43	1418.1	1195.3	5.281	42.2	0.04	1.32	DESERT/RANGELAND
4N	7.61	1284.1	845.3	11.377	38.6	0.04	2.44	DESERT/RANGELAND
4O	5.50	1102.8	738.2	10.892	33.5	0.04	2.13	DESERT/RANGELAND
5A	9.29	1361.5	868.5	12.648	39.0	0.04	2.47	DESERT/RANGELAND

Table A.2 - Subbasin Unit Hydrograph Parameter Summary
FCD 2007C017
November 2011

HEC-1 ID	Drainage Area sq. mi.	Upstream Elevation feet	Downstream Elevation feet	Length miles	Slope ft/mile	Kn	Lag hours	S-Graph
5B	4.88	991.7	732.0	8.167	31.8	0.04	1.72	DESERT/RANGELAND
5C	2.41	733.2	652.5	3.578	22.6	0.03	0.87	AGRICULTURE
6A	9.04	2746.0	1707.3	5.471	189.9	0.05	1.23	MOUNTAIN
6B	10.95	2479.6	1601.9	5.291	165.9	0.05	1.09	MOUNTAIN
6C	8.83	2358.6	1441.1	6.768	135.6	0.05	1.31	MOUNTAIN
6D	9.98	1885.3	1171.4	7.053	101.2	0.05	1.64	MOUNTAIN
6E	7.12	2146.7	1294.9	6.130	139.0	0.05	1.57	MOUNTAIN
6F	5.05	1851.1	956.6	8.486	105.4	0.04	1.71	MOUNTAIN
6G	6.37	1335.4	921.7	10.734	38.5	0.04	2.28	DESERT/RANGELAND
6H	4.97	2531.4	941.9	6.941	229.0	0.05	1.39	MOUNTAIN
6I	6.97	2676.1	941.9	6.148	282.1	0.05	1.11	MOUNTAIN
6J	4.47	1063.4	899.0	5.337	30.8	0.04	1.43	DESERT/RANGELAND
6K	5.95	1112.6	853.4	8.090	32.0	0.04	1.71	DESERT/RANGELAND
6L	6.34	1135.5	800.1	10.160	33.0	0.04	2.09	DESERT/RANGELAND
6M	3.86	950.2	800.1	5.270	28.5	0.04	1.38	DESERT/RANGELAND
6N	7.84	976.9	733.9	8.175	29.7	0.04	1.78	DESERT/RANGELAND
6O	8.13	860.9	731.9	5.498	23.5	0.05	1.59	DESERT/RANGELAND
6P	5.21	748.1	657.3	4.784	19.0	0.06	1.96	AGRICULTURE
6Q	2.86	739.6	654.1	3.796	22.5	0.04	0.99	AGRICULTURE
7AC	1.21	961.6	810.9	4.338	34.7	0.04	1.11	DESERT/RANGELAND
7B	0.99	721.2	661.5	2.189	27.3	0.04	0.67	DESERT/RANGELAND
7C	0.54	722.5	659.4	1.592	39.6	0.04	0.52	DESERT/RANGELAND
7D	0.77	725.0	667.2	1.953	29.6	0.04	0.63	DESERT/RANGELAND

Table A.3 - Hydrologyic Routing Parameter Summary

FCD 2007C017

November 2011

Route ID	Subbasin ID	Length feet	Slope ft/foot	Manning's n-values			NSTPS 24-Hour	NSTPS 6-Hour
				Left	Channel	Right		
R61-62	1C	3791	0.0058	0.06	0.046	0.06	2	1
R62-64	1E	4981	0.0046	0.06	0.046	0.06	6	7
R63-64	1E	37208	0.0178	0.07	0.058	0.07	24	23
R64-65	1E	2617	0.0046	0.06	0.046	0.06	3	3
R67-71	1H	2281	0.0057	0.06	0.038	0.06	1	1
R70-71	1H	22068	0.0125	0.06	0.038	0.08	13	15
R65-67	1I	6680	0.0094	0.06	0.038	0.06	4	3
R66-67	1I	35223	0.0155	0.06	0.038	0.06	24	21
R68-71	1L	31671	0.0168	0.07	0.058	0.07	16	16
R71-73	1N	7008	0.0076	0.06	0.05	0.06	6	6
R72-73	1N	30478	0.0156	0.06	0.048	0.06	20	19
R73-74	1O	13679	0.0079	0.06	0.05	0.06	10	12
R75-76	1R	3204	0.0091	0.06	0.052	0.06	2	3
R76-77	1T	36925	0.0106	0.06	0.052	0.06	25	30
R74-77	1U	30688	0.0098	0.05	0.039	0.05	18	14
78R-79	1V	18369	0.0089	0.05	0.034	0.07	7	9
R77-79	1W	8580	0.0089	0.05	0.034	0.07	4	4
79R-81	1X	17616	0.0095	0.05	0.04	0.06	9	11
79L-80	1X	5570	0.0093	0.05	0.04	0.06	3	3
80R-81	1X	12883	0.009	0.05	0.04	0.06	15	23
81R-82	1Y	24768	0.0044	0.05	0.041	0.05	30	52
81L-82	1Y	24993	0.0044	0.05	0.036	0.06	26	39
108111	2AA	13019	0.0085	0.05	0.065	0.05	12	11
110111	2AA	21603	0.0105	0.05	0.045	0.05	15	16
R83-84	2B	3537	0.0328	0.05	0.047	0.05	1	1
84L-85	2B	15046	0.0215	0.06	0.039	0.08	14	16
R85-96	2C	11327	0.0132	0.06	0.044	0.07	6	5
111113	2CC	35180	0.0075	0.05	0.046	0.05	23	25
113127	2DD	8581	0.0048	0.05	0.038	0.05	6	7
R87-89	2E	7304	0.0264	0.05	0.047	0.05	5	4
R88-89	2E	3353	0.023	0.05	0.047	0.05	3	3
R89-91	2E	6367	0.0184	0.05	0.047	0.05	4	5
121123	2FF	10519	0.0068	0.05	0.051	0.05	8	12
R91-92	2H	4768	0.0094	0.05	0.047	0.05	4	5
114115	2HH	15834	0.0117	0.05	0.049	0.06	13	14
115116	2II	10654	0.0139	0.05	0.049	0.06	8	9
116119	2JJ	14557	0.0129	0.05	0.055	0.05	11	12
118119	2JJ	5451	0.0119	0.05	0.055	0.05	4	4
119120	2KK	45761	0.01	0.05	0.055	0.05	32	34

Table A.3 - Hydrologyic Routing Parameter Summary

FCD 2007C017

November 2011

Route ID	Subbasin ID	Length feet	Slope ft/foot	Manning's n-values			NSTPS 24-Hour	NSTPS 6-Hour
				Left	Channel	Right		
R93-94	2L	4827	0.0209	0.05	0.047	0.05	2	3
116120	2LL	62949	0.0103	0.055	0.051	0.06	74	73
R92-95	2M	4419	0.0115	0.05	0.047	0.05	3	4
R94-95	2M	5942	0.0187	0.06	0.048	0.06	2	2
120121	2MM	9153	0.0075	0.05	0.051	0.05	52	9
84R-86	2N	12462	0.0227	0.07	0.043	0.06	17	18
R95-96	2O	11694	0.0126	0.07	0.043	0.06	10	11
R86-96	2O	13190	0.0145	0.07	0.043	0.06	14	15
R96-97	2P	16994	0.0134	0.06	0.044	0.07	12	14
124125	2PP	15742	0.0075	0.05	0.055	0.05	12	14
125126	2QQ	15368	0.0068	0.05	0.051	0.05	13	15
R98-99	2R	12960	0.0144	0.06	0.046	0.065	6	7
123140	2RR	3808	0.0058	0.05	0.051	0.05	5	5
126140	2RR	9487	0.0063	0.05	0.038	0.05	11	13
140127	2RR	6670	0.0056	0.05	0.038	0.05	6	9
97-100	2S	6060	0.0094	0.06	0.046	0.065	4	4
99-100	2S	9770	0.0089	0.06	0.046	0.065	5	6
78L128	2SS	9843	0.0094	0.06	0.039	0.06	12	15
100101	2T	4639	0.0147	0.06	0.047	0.06	2	3
128129	2TT	14750	0.0095	0.06	0.039	0.06	18	35
101102	2U	7664	0.0111	0.06	0.047	0.06	5	5
127131	2UU	4798	0.0048	0.05	0.038	0.05	3	4
129130	2UU	10060	0.0085	0.05	0.055	0.05	7	7
80L130	2UU	11606	0.0087	0.05	0.055	0.05	8	10
130131	2UU	28056	0.0067	0.05	0.038	0.05	21	29
102103	2V	5740	0.0089	0.06	0.047	0.06	3	4
82-135	2VV	5378	0.006	0.03	0.035	0.03	3	5
104105	2X	31138	0.0151	0.06	0.034	0.06	13	14
141149	2XX	3322	0.0042	0.06	0.03	0.05	2	2
136149	2XX	9706	0.0051	0.04	0.045	0.04	13	13
149137	2XX	5354	0.005	0.06	0.03	0.04	3	2
103107	2Y	24842	0.0085	0.05	0.05	0.05	17	18
105107	2Y	39703	0.0083	0.05	0.051	0.05	37	37
R7-90	3B	9423	0.0103	0.06	0.044	0.05	6	7
R90-8	3B	7798	0.0098	0.05	0.059	0.05	4	5
R6-90	3B	35857	0.0139	0.05	0.049	0.06	27	30
R5-7	3D	11550	0.0099	0.06	0.044	0.05	8	8
R4-7	3D	16339	0.0102	0.06	0.044	0.05	10	8
R1-3	3G	13988	0.0104	0.06	0.049	0.07	12	14
R2-3	3G	7558	0.0103	0.06	0.049	0.07	7	8

Table A.3 - Hydrologyic Routing Parameter Summary
FCD 2007C017
November 2011

Route ID	Subbasin ID	Length feet	Slope ft/foot	Manning's n-values Left	Channel	Right	NSTPS 24-Hour	NSTPS 6-Hour
R3-5	3H	14313	0.0102	0.06	0.043	0.07	5	6
R8-9	3I	43093	0.009	0.05	0.059	0.05	21	26
R9-10	3J	48494	0.0068	0.05	0.05	0.06	24	34
R10-11	3L	13691	0.0057	0.6	0.053	0.06	13	16
11A-11	3L	3285	0.0018	0.044	0.034	0.034	4	8
12-11A	3L	2844	0.0007	0.044	0.034	0.034	6	11
R14-13	3M	6658	0.0011	0.035	0.033	0.035	7	20
R11-17	3M	2917	0.0041	0.035	0.03	0.035	1	1
R17-13	3M	985	0.0071	0.04	0.035	0.04	1	12
11A11B	3M	2424	0.0074	0.044	0.034	0.044	1	1
11B-14	3M	2377	0.001	0.044	0.034	0.044	2	7
13-13A	3M	5043	0.0046	0.03	0.035	0.03	3	2
13A-16	3M	6575	0.0046	0.03	0.035	0.03	3	3
14A11B	3M	2591	0.0015	0.04	0.035	0.04	10	13
14A-14	3M	1220	0.0033	0.035	0.033	0.035	1	3
37A-17	3M	2291	0.0001	0.038	0.038	0.038	24	32
37L13A	3M	5868	0.0052	0.04	0.035	0.04	3	4
R14-16	3M	13717	0.0044	0.03	0.035	0.03	1	1
R34-17	3M	5475	0.0029	0.04	0.035	0.04	4	9
R26-27	4B	18745	0.0093	0.06	0.051	0.06	6	7
R27-28	4C	24911	0.0106	0.06	0.043	0.06	17	18
R20-21	4F	16124	0.0121	0.07	0.049	0.06	7	7
R21-23	4G	8015	0.0094	0.07	0.049	0.06	8	9
R22-23	4G	14490	0.0106	0.05	0.05	0.05	9	10
R24-25	4I	20066	0.0111	0.07	0.045	0.06	5	6
R28-29	4J	7449	0.0063	0.06	0.043	0.06	7	5
R23-29	4J	40390	0.0091	0.06	0.04	0.07	31	26
R29-31	4K	18364	0.0083	0.07	0.031	0.06	6	6
R25-30	4L	44229	0.0089	0.05	0.047	0.05	29	30
40R-30	4L	27787	0.0086	0.05	0.051	0.05	24	23
R31-32	4M	21839	0.008	0.07	0.031	0.06	8	8
R30-32	4M	21993	0.0076	0.05	0.047	0.05	12	13
R32-33	4N	50073	0.007	0.04	0.041	0.04	26	29
R33-34	4O	20563	0.0052	0.06	0.048	0.06	17	18
32L-35	5A	46946	0.007	0.05	0.054	0.05	28	30
R35-36	5B	25372	0.0054	0.06	0.048	0.06	17	16
R36-37	5C	2084	0.0048	0.035	0.03	0.035	1	1
R37-38	5C	13353	0.0052	0.03	0.036	0.03	8	8
R39-40	6B	11887	0.0088	0.07	0.045	0.06	4	5
40L-41	6C	18622	0.0087	0.05	0.044	0.05	13	13

Table A.3 - Hydrologyic Routing Parameter Summary

FCD 2007C017

November 2011

Route ID	Subbasin ID	Length feet	Slope ft/foot	Manning's n-values			NSTPS 24-Hour	NSTPS 6-Hour
				Left	Channel	Right		
R41-43	6D	31368	0.0086	0.05	0.051	0.05	24	22
R42-43	6D	13771	0.009	0.05	0.051	0.05	7	6
R43-44	6F	32247	0.0066	0.055	0.051	0.05	23	23
R44-69	6J	8326	0.0048	0.05	0.069	0.05	8	9
R46-69	6J	7756	0.0032	0.06	0.047	0.05	9	11
R69-47	6J	4649	0.0039	0.06	0.047	0.05	5	6
47R-48	6K	10151	0.0045	0.06	0.047	0.05	13	15
48R-50	6L	11406	0.0047	0.05	0.07	0.05	18	14
R45-50	6L	23329	0.0052	0.05	0.062	0.05	33	27
47L-49	6M	20029	0.0049	0.06	0.047	0.05	25	27
48L-49	6M	11281	0.0047	0.05	0.07	0.05	18	14
R50-52	6O	13788	0.0046	0.05	0.05	0.05	14	24
R49-51	6O	15177	0.0045	0.05	0.069	0.05	15	17
R51-54	6P	2411	0.0042	0.035	0.034	0.035	1	1
R54-57	6P	7156	0.0041	0.035	0.034	0.035	3	3
R52-55	6P	2571	0.0047	0.035	0.034	0.035	1	2
R55-57	6P	6600	0.0049	0.035	0.034	0.035	2	6
R57-58	6P	10737	0.0034	0.06	0.065	0.05	9	15
R53-56	6Q	3253	0.0037	0.035	0.037	0.035	2	2
R56-59	6Q	14716	0.0046	0.03	0.036	0.03	7	8
142-18	7B	8818	0.0044	0.035	0.07	0.035	8	14
142139	7D	7282	0.0056	0.035	0.05	0.035	3	6

Appendix B

Unit Hydrograph Parameters

Table B.1 - Subbasin Results Summary

FCD 2007C017

November 2011

Subbasin ID	Drainage Area sq. miles	100-Year, 6-Hour			100-Year, 24-Hour		
		Qp cfs	Tp hours	Vol acre-ft	Qp cfs	Tp hours	Vol acre-ft
1B	2.10	802	4.83	85	931	12.83	95
1C	3.83	1,138	5.25	168	1,362	13.17	195
1A	2.10	590	4.92	73	777	12.92	97
1D	0.34	481	4.25	23	384	12.25	21
1E	3.91	998	5.25	147	1,278	13.25	184
1F	5.55	1,070	5.00	167	1,868	13.08	281
1J	0.62	655	4.33	41	554	12.33	38
1I	4.11	978	5.17	140	1,323	13.17	184
1G	3.78	1,076	4.92	167	1,582	12.92	254
1H	6.77	1,589	5.00	247	2,577	13.00	386
1K	1.08	759	4.50	66	730	12.50	67
1L	4.69	1,309	5.17	190	1,671	13.17	237
1M	2.19	1,218	4.58	120	1,409	12.58	135
1N	2.75	681	5.00	81	942	13.00	108
1P	4.57	572	5.33	88	1,076	13.33	162
1O	5.23	1,036	5.17	173	1,694	13.17	272
1U	3.19	286	5.50	50	607	13.50	105
1Q	5.30	1,447	5.17	223	2,015	13.17	284
1R	2.90	840	4.83	106	1,220	12.83	151
1T	4.67	651	5.33	115	1,127	13.33	206
1W	0.53	347	4.58	28	265	12.58	25
1S	4.77	865	5.08	135	1,548	13.08	232
1V	2.16	630	4.75	62	895	12.75	90
1X	2.62	572	4.92	60	904	12.83	92
1Y	5.31	641	5.25	91	1,328	13.17	186
2VV	3.37	549	5.17	77	907	13.17	125
2D	1.75	1,069	4.58	100	1,162	12.50	108
2F	0.75	720	4.33	47	643	12.33	45
2E	1.00	712	4.58	61	669	12.58	56
2G	1.13	960	4.42	68	947	12.42	63
2I	0.87	626	4.58	55	567	12.58	54
2H	1.59	1,069	4.50	93	1,139	12.50	91
2K	2.19	1,043	4.75	121	1,182	12.75	135
2L	0.94	628	4.67	58	578	12.67	54
2M	1.40	1,140	4.42	83	1,185	12.42	83
2J	1.16	818	4.50	70	802	12.50	72
2A	4.33	1,323	5.17	213	1,715	13.17	267
2B	3.31	1,302	4.92	170	1,600	12.92	195

Table B.1 - Subbasin Results Summary
FCD 2007C017
November 2011

Subbasin ID	Drainage Area sq. miles	100-Year, 6-Hour			100-Year, 24-Hour		
		Qp cfs	Tp hours	Vol acre-ft	Qp cfs	Tp hours	Vol acre-ft
2N	2.20	1,245	4.58	121	1,429	12.58	126
2C	2.32	1,266	4.58	126	1,490	12.58	143
2O	3.37	1,401	4.75	173	1,771	12.75	208
2P	3.51	1,167	4.67	128	1,755	12.67	182
2Q	2.93	930	4.67	107	1,364	12.67	149
2R	2.67	510	4.58	47	1,114	12.58	98
2S	1.82	550	4.50	44	833	12.50	68
2T	4.90	1,081	5.17	176	1,643	13.17	257
2U	1.38	558	4.50	39	686	12.42	50
2V	7.57	1,429	5.08	220	2,560	13.08	369
2W	6.29	2,113	5.00	325	2,831	13.00	424
2X	10.31	2,159	5.50	443	3,121	13.58	621
2Y	13.40	1,287	5.75	267	2,534	13.75	522
2BB	2.40	1,458	4.58	158	1,671	12.58	189
2Z	5.10	1,656	5.17	298	2,073	13.17	388
2AA	3.73	1,418	4.92	169	1,737	12.92	208
2CC	4.34	663	5.58	123	977	13.58	178
2DD	0.56	394	4.58	30	328	12.58	25
2GG	6.69	1,928	5.17	324	2,633	13.17	427
2HH	6.76	2,483	4.92	369	3,330	12.92	494
2II	2.22	1,102	4.83	148	1,209	12.83	176
2EE	4.13	1,863	4.75	220	2,340	12.75	257
2JJ	0.89	663	4.58	53	608	12.58	50
2KK	4.19	828	5.67	162	1,047	13.67	202
2LL	5.18	786	6.08	191	1,034	14.00	248
2MM	0.91	450	4.67	35	422	12.67	32
2FF	5.39	705	6.25	182	970	14.17	247
2NN	9.61	1,308	6.00	299	1,940	13.92	437
2OO	0.85	536	4.67	43	494	12.58	39
2PP	1.78	768	4.83	77	851	12.75	82
2QQ	1.67	458	4.92	52	545	12.92	61
2RR	0.93	374	4.92	42	350	12.92	39
2YY	1.12	333	5.08	41	333	13.08	41
2SS	3.83	496	5.00	70	1,126	13.00	150
2TT	4.60	754	4.75	85	1,760	12.75	184
2UU	7.50	637	5.67	122	1,389	13.58	262
3KB	1.71	978	4.58	79	1,081	12.58	85
3KC	3.10	555	5.33	90	783	13.33	125

Table B.1 - Subbasin Results Summary
FCD 2007C017
November 2011

Subbasin ID	Drainage Area sq. miles	100-Year, 6-Hour			100-Year, 24-Hour		
		Qp cfs	Tp hours	Vol acre-ft	Qp cfs	Tp hours	Vol acre-ft
3KD	1.17	363	5.00	43	368	13.00	43
7AC	1.21	372	4.92	42	388	12.92	43
FLO-2D	6.31	1,149	5.00	142	2,025	13.00	242
2WW	5.80	598	5.42	99	1,267	13.42	209
2XX	1.36	410	5.00	49	436	13.00	52
7D	0.77	529	4.50	36	469	12.50	32
7C	0.54	460	4.42	25	360	12.42	20
7B	0.99	581	4.58	41	561	12.58	39
3F	12.14	3,645	5.25	694	4,850	13.25	917
3E	8.24	2,453	5.17	419	3,342	13.17	559
3G	5.12	2,075	4.75	247	2,790	12.75	308
3H	6.78	1,570	5.33	273	2,204	13.33	352
3C	11.27	2,463	5.25	418	3,725	13.33	580
3D	6.51	1,607	5.08	230	2,412	13.08	308
3A	11.19	2,632	5.33	496	3,783	13.33	684
3B	6.42	1,407	5.33	221	1,955	13.33	300
3I	5.10	926	5.58	178	1,260	13.58	237
3J	11.26	1,108	6.50	310	1,758	14.33	487
3L	3.35	1,090	4.83	117	1,463	12.83	151
4A	11.75	3,281	5.67	775	4,008	13.75	965
4B	6.14	1,955	5.00	280	2,673	13.00	352
4C	12.33	2,713	5.17	424	4,388	13.17	625
4E	4.88	2,126	5.08	363	2,434	13.08	427
4F	6.16	2,937	4.83	413	3,602	12.83	491
4D	4.57	1,924	5.25	357	2,173	13.25	423
4G	7.70	2,720	5.08	465	3,394	13.08	578
4J	6.09	1,389	5.25	222	1,903	13.25	305
4K	3.91	854	5.42	142	1,105	13.42	180
4H	6.11	2,268	5.00	375	2,854	13.00	486
4I	15.52	3,655	5.25	669	5,592	13.25	973
6A	9.04	2,971	4.92	457	4,107	13.00	613
6B	10.95	3,579	4.83	488	5,306	12.83	671
4L	9.49	1,869	5.42	332	2,700	13.42	488
4M	3.42	952	5.17	131	1,202	13.08	160
4N	7.61	1,047	6.08	256	1,470	14.00	355
4O	5.50	931	5.83	200	1,242	13.75	263
5A	9.29	1,092	6.17	270	1,670	14.08	409
5B	4.88	928	5.50	162	1,284	13.50	220

Table B.1 - Subbasin Results Summary

FCD 2007C017

November 2011

Subbasin ID	Drainage Area sq. miles	100-Year, 6-Hour			100-Year, 24-Hour		
		Qp cfs	Tp hours	Vol acre-ft	Qp cfs	Tp hours	Vol acre-ft
3M	3.85	1,190	4.75	119	1,730	12.75	164
5C	2.41	707	4.67	68	1,008	12.67	91
6N	7.84	1,327	5.50	239	1,975	13.50	349
6Q	2.86	706	4.83	77	1,064	12.75	109
6C	8.83	2,568	5.00	396	3,691	13.00	541
6D	9.98	2,303	5.33	422	3,417	13.33	597
6E	7.12	2,044	5.25	368	2,739	13.25	485
6F	5.05	1,216	5.33	220	1,658	13.42	289
6H	4.97	1,481	5.08	230	2,007	13.08	296
6I	6.97	2,477	4.83	331	3,414	12.83	425
6J	4.47	1,261	5.25	195	1,565	13.25	247
6K	5.95	1,180	5.50	205	1,631	13.42	277
6G	6.37	897	6.00	205	1,275	13.92	288
6L	6.34	1,012	5.83	213	1,413	13.75	293
6M	3.86	1,166	5.17	170	1,415	13.17	206
6O	8.13	1,736	5.33	283	2,435	13.33	387
6P	5.21	793	5.67	169	1,132	13.50	248

Table B.2 - Concentration Point Results Summary

FCD 2007C017

November 2011

C.P. ID	Drainage Area sq. miles	100-Year, 6-Hour			100-Year, 24-Hour		
		Qp cfs	Tp hours	Vol acre-ft	Qp cfs	Tp hours	Vol acre-ft
C62	8.03	1,780	5.00	253	2,820	12.92	374
C64	8.37	1,696	5.58	268	2,560	13.50	394
C65	17.83	2,330	5.17	429	4,150	13.08	794
C67	22.55	2,613	5.42	496	5,014	13.33	972
C71R	10.55	1,529	5.00	364	2,635	13.00	620
C71L	5.77	1,257	5.17	232	1,662	13.17	301
C71	38.87	3,427	5.50	796	7,594	13.58	1,745
C73	43.81	3,586	6.08	840	8,520	13.92	1,929
C74	53.61	3,246	7.08	891	8,736	14.67	2,256
C77R	56.80	3,024	8.33	868	8,147	16.17	2,329
C76	8.20	1,658	5.25	287	2,421	13.25	422
C77L	12.88	1,222	7.75	351	1,999	15.33	601
C77	69.68	3,056	8.42	935	9,251	16.17	2,806
C79RUP	70.21	3,035	8.67	941	9,119	16.50	2,826
C79LUP	6.93	469	5.83	125	936	13.67	245
C79	77.14	3,035	8.67	986	9,159	16.50	3,005
C81	79.75	907	9.58	205	4,058	17.25	1,131
C82	85.07	665	12.83	184	3,683	19.58	1,266
C135I	88.44	368	13.33	107	1,565	19.92	760
C89	2.50	1,200	4.83	134	1,352	12.83	153
C91	4.62	1,430	5.00	224	1,701	13.08	270
C92	7.08	2,063	4.83	321	2,699	12.67	405
C94	3.13	1,224	4.92	163	1,345	12.92	188
C95	12.78	3,128	5.00	519	4,316	12.92	711
C85	7.65	1,166	4.92	341	1,609	12.92	448
C86	6.53	993	4.58	102	1,400	12.58	126
C96	32.65	3,538	5.83	887	5,915	13.75	1,476
C97	36.16	3,154	7.17	935	5,529	14.75	1,620
C99	5.60	809	5.25	127	1,571	13.08	244
C100	43.57	3,057	7.42	953	5,665	15.00	1,856
C101	48.47	2,963	7.58	997	5,760	15.17	2,053
C102	49.85	2,889	8.00	991	5,664	15.58	2,091
C103	57.42	2,822	8.25	1,076	5,649	15.83	2,377
C105	16.59	2,712	6.00	679	3,892	13.67	997
C107	87.41	3,312	9.83	1,306	8,068	17.08	3,596
C111	11.24	1,884	6.33	531	2,432	14.25	748
C113	102.99	3,723	9.67	1,490	9,421	16.92	4,310
C127R	103.54	3,685	10.33	1,493	9,356	17.42	4,328

Table B.2 - Concentration Point Results Summary

FCD 2007C017

November 2011

C.P. ID	Drainage Area sq. miles	100-Year, 6-Hour			100-Year, 24-Hour		
		Qp cfs	Tp hours	Vol acre-ft	Qp cfs	Tp hours	Vol acre-ft
C115	13.45	2,216	4.92	618	3,245	12.92	881
C116	15.66	2,321	5.58	717	3,196	13.50	1,035
C119	20.68	1,719	6.33	642	2,353	14.25	931
C120R	24.87	1,551	9.17	722	2,175	16.92	1,094
C120	30.06	1,641	9.75	987	2,451	17.08	1,641
C121	30.97	1,608	10.58	987	2,443	17.67	1,668
C123	36.36	1,567	11.50	1,059	2,428	18.33	1,848
C124	10.46	1,308	5.92	317	1,960	13.92	471
C125	12.24	1,244	7.08	360	1,876	15.00	542
C126	13.91	1,141	8.33	367	1,793	16.08	594
C140	50.27	1,631	11.67	1,097	3,449	18.00	2,312
C127L	52.31	1,600	12.42	1,099	3,424	18.58	2,375
C127	155.86	3,759	10.42	2,028	11,451	17.58	6,322
C128	8.60	355	5.00	89	1,081	13.00	214
C129	13.20	458	4.75	132	1,642	12.75	377
C130	85.56	1,869	9.75	774	5,115	17.33	2,244
C131	248.92	4,129	11.17	2,434	14,458	18.67	8,346
FLO2D2	256.09	4,122	11.17	2,446	14,457	18.67	8,549
FLO2D3	350.84	4,107	11.17	2,507	15,026	18.83	9,137
C149	356.64	2,776	11.33	1,727	11,261	19.00	6,983
C137	358.00	2,769	11.50	1,725	11,220	19.25	7,017
C139	351.61	693	11.67	433	2,807	19.08	1,735
C18	351.83	172	12.33	108	697	19.58	454
C7T	1062.00	2,801	12.00	1,816	13,011	19.50	8,190
C11B	350.84	14	11.75	9	58	19.00	36
C14	350.84	14	12.25	9	58	19.17	36
C3	25.49	4,312	6.25	1,119	6,005	14.17	1,664
C5	32.27	4,305	6.67	1,232	6,458	14.50	1,945
C7	50.04	4,493	6.08	1,445	8,197	14.08	2,644
C90	61.23	4,947	7.92	1,652	9,435	15.58	3,199
C8	67.65	4,809	8.33	1,715	9,335	15.92	3,413
C9	72.75	4,346	10.50	1,721	8,869	17.67	3,588
C10	84.01	3,896	13.33	1,780	8,485	19.58	3,953
C11I	87.36	3,655	14.67	1,693	8,350	20.83	4,147
C27	17.89	3,397	6.17	958	4,101	14.17	1,265
C28	30.22	3,151	7.50	1,214	4,933	13.17	1,795
C21	11.04	3,580	5.00	719	4,361	12.92	885
C23	23.31	5,873	5.58	1,330	7,189	13.25	1,767

Table B.2 - Concentration Point Results Summary

FCD 2007C017

November 2011

C.P. ID	Drainage Area sq. miles	100-Year, 6-Hour			100-Year, 24-Hour		
		Qp cfs	Tp hours	Vol acre-ft	Qp cfs	Tp hours	Vol acre-ft
C29	59.62	6,956	7.58	2,152	10,172	15.83	3,600
C31	63.52	6,809	8.17	2,180	10,066	16.25	3,723
C25	21.63	4,768	5.33	929	7,485	13.25	1,398
C40	19.99	4,906	5.00	824	7,373	12.92	1,221
C30	51.12	4,359	7.17	1,310	7,841	15.33	2,448
C32	118.07	8,604	8.58	2,784	16,025	16.58	5,957
C33	125.68	5,006	10.92	1,773	9,997	18.67	4,011
C34I	131.18	4,787	12.50	1,799	9,774	20.08	4,202
C35	127.35	3,111	11.00	1,125	5,436	18.92	2,499
C36	132.23	2,966	12.42	1,133	5,335	20.33	2,659
C36I	263.40	6,230	12.67	2,480	9,354	20.33	5,508
C17	350.76	3,695	15.00	1,724	11,397	21.00	4,594
C13	350.76	2,145	16.08	1,060	11,444	21.08	4,630
C13A	350.76	2,591	14.33	1,304	14,980	21.42	5,946
C16	354.40	2,576	14.58	1,305	14,875	21.58	6,054
C38	242.09	4,299	13.83	2,191	4,784	21.83	4,213
C59	10.70	437	4.83	266	998	12.75	443
C41	28.82	2,715	5.08	593	4,344	13.08	924
C43	45.92	3,595	6.25	1,040	5,620	13.83	1,842
C44	50.97	3,428	8.08	1,119	5,598	15.58	2,066
C46	11.93	3,333	4.92	495	4,817	12.92	691
C69	62.91	3,411	8.67	1,336	6,119	16.08	2,633
C47	67.38	3,322	9.17	1,396	6,091	16.50	2,817
C48	73.32	1,566	10.42	752	3,006	17.58	1,616
C50	86.04	781	11.50	460	2,057	16.42	1,246
C49	77.19	2,213	11.58	1,078	4,335	18.83	2,360
C51I	85.32	2,141	13.00	1,178	4,263	20.08	2,672
CPND1	98.03	2,605	13.17	1,446	5,767	20.17	3,849
C57	98.03	1,313	16.17	1,446	5,723	20.67	3,849
C58	103.24	1,314	17.50	1,532	5,677	21.42	4,035

Table B.3 - Hydrologic Routing Results Summary

FCD 2007C017

November 2011

Route ID	Drainage Area sq. miles	100-Year, 6-Hour			100-Year, 24-Hour		
		Qp cfs	Tp hours	Vol acre-ft	Qp cfs	Tp hours	Vol acre-ft
R61-62	2.10	754	5.00	85	904	13.00	95
R62-64	8.03	1,696	5.58	253	2,560	13.50	374
R63-64	0.34	191	6.17	23	150	14.25	21
R64-65	8.37	1,635	5.83	265	2,473	13.83	393
R65-67	17.83	2,304	5.58	429	4,003	13.42	794
R66-67	0.62	278	6.08	41	235	14.33	38
R67-71	22.55	2,587	5.58	496	4,919	13.50	972
R70-71	3.78	880	6.17	167	1,176	14.08	254
R68-71	1.08	512	5.83	66	478	13.83	67
R71-73	38.87	3,354	6.08	796	7,549	13.92	1,745
R72-73	2.19	883	6.17	120	938	14.25	135
R73-74	43.81	3,361	7.08	840	8,280	14.67	1,929
R74-77	53.61	3,032	8.33	865	8,152	16.17	2,256
R75-76	5.30	1,399	5.33	223	1,852	13.33	284
R76-77	8.20	1,261	7.75	287	1,893	15.42	422
R77-79	69.68	3,035	8.67	935	9,119	16.50	2,806
78R-79	4.77	464	5.92	93	767	13.75	160
79R-81	77.14	910	9.58	203	4,058	17.25	1,055
79L-80	77.14	1,924	8.92	741	4,953	16.75	1,950
80R-81	77.14	2	10.75	0	42	18.17	8
81R-82	79.75	83	13.92	23	767	19.75	185
81L-82	79.75	627	12.83	174	2,973	19.50	945
82-135	85.07	375	13.25	106	1,565	19.92	664
R87-89	1.75	916	4.92	100	988	12.92	108
R88-89	0.75	653	4.58	47	576	12.58	45
R89-91	2.50	1,112	5.25	134	1,232	13.17	153
R91-92	4.62	1,413	5.33	224	1,639	13.33	270
R92-95	7.08	1,997	5.08	321	2,486	12.92	405
R93-94	2.19	956	5.00	121	1,005	13.00	135
R94-95	3.13	1,184	5.08	163	1,313	13.08	188
R95-96	12.78	2,902	5.92	519	3,895	13.83	711
R83-84	4.33	1,263	5.25	213	1,598	13.25	267
84L-85	4.33	1,008	6.50	212	1,233	14.42	265
R85-96	7.65	1,059	5.33	341	1,432	13.25	448
84R-86	4.33	12	6.75	1	23	14.67	2
R86-96	6.53	738	5.92	102	947	13.75	126
R96-97	32.65	3,205	7.17	887	5,482	14.75	1,476
97-100	36.16	3,091	7.42	922	5,400	15.08	1,620

Table B.3 - Hydrologic Routing Results Summary

FCD 2007C017

November 2011

Route ID	Drainage Area sq. miles	100-Year, 6-Hour			100-Year, 24-Hour		
		Qp cfs	Tp hours	Vol acre-ft	Qp cfs	Tp hours	Vol acre-ft
R98-99	2.93	809	5.25	107	1,115	13.17	149
99-100	5.60	726	5.75	127	1,442	13.50	244
100101	43.57	2,992	7.58	940	5,581	15.25	1,856
101102	48.47	2,900	8.00	988	5,664	15.58	2,053
102103	49.85	2,837	8.25	984	5,558	15.92	2,087
103107	57.42	2,591	9.75	1,034	5,413	17.25	2,377
104105	6.29	1,778	6.17	325	2,168	14.08	424
105107	16.59	2,378	9.00	679	3,353	16.67	997
108111	2.40	1,125	5.58	158	1,207	13.50	189
110111	5.10	1,408	6.50	298	1,647	14.42	388
111113	11.24	1,690	8.33	531	2,186	16.08	748
113127	102.99	3,685	10.33	1,490	9,356	17.42	4,310
114115	6.69	1,625	6.42	324	2,017	14.25	427
115116	13.45	1,982	5.67	618	2,698	13.50	881
116119	15.66	1,441	6.50	467	1,908	14.42	668
118119	4.13	1,722	5.08	220	2,077	13.00	257
119120	20.68	1,553	9.25	631	2,146	16.92	931
116120	15.66	642	11.75	250	842	19.58	367
120121	30.06	1,614	10.58	987	2,443	17.67	1,641
121123	30.97	1,583	11.50	982	2,404	18.33	1,664
123140	36.36	1,519	11.92	1,023	2,424	18.58	1,848
124125	10.46	1,246	7.08	316	1,876	15.00	471
125126	12.24	1,147	8.33	348	1,795	16.08	540
126140	13.91	1,066	9.42	354	1,718	17.00	589
140127	50.27	1,610	12.42	1,097	3,424	18.58	2,312
127131	155.86	3,730	10.75	2,028	11,423	17.83	6,322
78L128	4.77	237	6.33	43	415	14.17	72
128129	8.60	275	8.00	89	777	14.50	214
129130	13.20	372	5.33	132	1,331	13.25	377
80L130	77.14	1,888	9.75	741	4,814	17.42	1,942
130131	85.56	1,766	12.17	774	4,932	19.08	2,244
141149	350.84	2,780	11.33	1,726	11,238	19.00	6,852
136149	5.80	368	7.00	99	505	15.58	209
149137	356.64	2,770	11.50	1,725	11,221	19.25	6,983
142139	350.84	693	11.67	431	2,807	19.08	1,713
142-18	350.84	173	12.33	108	697	19.58	428
12-11A	350.84	43	12.17	27	175	19.33	107
11A11B	350.84	0	0.00	0	0	0.00	0

Table B.3 - Hydrologic Routing Results Summary

FCD 2007C017

November 2011

Route ID	Drainage Area sq. miles	100-Year, 6-Hour			100-Year, 24-Hour		
		Qp cfs	Tp hours	Vol acre-ft	Qp cfs	Tp hours	Vol acre-ft
14A-14	350.84	12	11.42	8	49	18.92	30
14A11B	350.84	2	12.25	1	9	19.75	6
11B-14	350.84	14	12.25	9	58	19.17	36
R14-13	350.84	14	13.75	9	58	19.83	36
R1-3	12.14	3,196	6.42	694	3,863	14.25	917
R2-3	8.24	2,227	5.75	419	2,810	13.75	559
R3-5	25.49	4,200	6.67	1,119	5,844	14.58	1,664
R5-7	32.27	4,200	7.33	1,232	6,268	15.17	1,945
R4-7	11.27	2,219	5.92	418	3,089	14.08	580
R7-90	50.04	4,401	6.67	1,445	7,945	14.58	2,644
R6-90	11.19	2,029	7.83	496	2,679	15.58	684
R90-8	61.23	4,864	8.33	1,652	9,315	15.92	3,199
R8-9	67.65	4,355	10.50	1,670	8,870	17.67	3,413
R9-10	72.75	3,894	13.33	1,674	8,482	19.67	3,575
R10-11	84.01	3,642	14.67	1,664	8,215	20.83	3,925
11A-11	350.84	43	12.75	27	174	19.75	107
R11-17	87.36	3,645	14.83	1,693	8,304	21.00	4,147
R26-27	11.75	3,082	6.25	775	3,509	14.25	965
R27-28	17.89	3,155	7.67	958	3,769	15.58	1,265
R28-29	30.22	3,012	8.00	1,177	4,344	13.83	1,795
R20-21	4.88	1,976	5.67	363	2,131	13.67	427
R21-23	11.04	3,490	5.75	719	3,905	13.58	885
R22-23	4.57	1,748	6.08	357	1,816	14.00	423
R23-29	23.31	5,499	7.67	1,330	6,673	15.83	1,767
R29-31	59.62	6,837	8.17	2,152	10,051	16.25	3,600
R31-32	63.52	6,605	8.75	2,156	9,920	16.92	3,723
R24-25	6.11	2,114	5.50	375	2,476	13.42	486
R25-30	21.63	3,895	7.75	929	5,522	15.67	1,398
R39-40	9.04	2,790	5.33	457	3,517	13.33	613
40R-30	19.99	2,525	6.83	502	3,684	14.83	779
R30-32	51.12	4,276	8.25	1,310	7,383	16.33	2,448
R32-33	118.07	5,006	10.92	1,713	9,997	18.67	3,757
R33-34	125.68	4,788	12.50	1,755	9,774	20.08	4,008
32L-35	118.07	3,111	11.00	1,071	5,436	18.92	2,200
R35-36	127.35	2,970	12.42	1,111	5,335	20.33	2,499
R36-37	263.40	6,052	13.17	2,480	8,874	21.17	5,508
37A-17	263.40	13	15.92	3	37	23.08	14
R34-17	131.18	426	13.50	40	5,370	20.50	1,111

Table B.3 - Hydrologic Routing Results Summary

FCD 2007C017

November 2011

Route ID	Drainage Area sq. miles	100-Year, 6-Hour			100-Year, 24-Hour		
		Qp cfs	Tp hours	Vol acre-ft	Qp cfs	Tp hours	Vol acre-ft
R17-13	350.76	2,133	16.08	1,051	11,394	21.08	4,594
13-13A	350.76	2,158	16.25	1,060	11,358	21.33	4,630
37L13A	263.40	1,727	13.58	314	3,922	21.42	1,358
13A-16	350.76	2,580	14.58	1,304	14,876	21.58	5,946
R14-16	350.84	0	0.00	0	0	0.00	0
R37-38	263.40	4,286	13.83	2,163	4,779	21.83	4,137
R53-56	7.84	368	7.33	239	503	15.25	349
R56-59	7.84	367	8.00	239	498	15.92	349
40L-41	19.99	1,765	6.00	321	2,410	13.92	442
R41-43	28.82	2,499	7.00	593	3,754	15.17	924
R42-43	7.12	1,866	5.75	368	2,309	13.83	485
R43-44	45.92	3,442	8.08	1,040	5,386	15.67	1,842
R44-69	50.97	3,372	8.75	1,119	5,552	16.25	2,066
R46-69	11.93	2,932	5.83	495	4,019	13.67	691
R69-47	62.91	3,367	9.17	1,336	6,078	16.50	2,633
47R-48	67.38	1,585	10.42	692	2,994	17.58	1,408
48R-50	73.32	761	11.58	368	1,469	19.08	808
R45-50	6.37	783	8.08	205	1,150	16.58	288
R50-52	86.04	752	13.42	454	1,978	17.58	1,246
47L-49	67.38	1,535	11.50	692	2,956	18.58	1,408
48L-49	73.32	762	11.58	368	1,470	19.08	808
R49-51	77.19	2,153	13.00	1,078	4,263	20.08	2,360
R51-54	98.03	1,202	15.92	1,288	5,034	20.42	3,436
R54-57	98.03	1,194	16.17	1,288	5,020	20.67	3,436
R52-55	98.03	121	16.00	158	706	20.42	413
R55-57	98.03	121	16.50	158	703	20.58	413
R57-58	98.03	1,276	17.42	1,446	5,677	21.42	3,849

Table B.4 - Diversion Results Summary

FCD 2007C017

November 2011

Diversion ID	Drainage Area sq. miles	100-Year, 6-Hour			100-Year, 24-Hour		
		Qp cfs	Tp hours	Vol acre-ft	Qp cfs	Tp hours	Vol acre-ft
DC78L	4.77	301	5.08	43	600	13.08	72
DC78R	4.77	564	5.08	93	948	13.08	160
DC79L	77.14	1,933	8.67	741	4,983	16.50	1,950
DC79R	77.14	944	8.67	203	4,176	16.50	1,055
RTC79R	77.14	1,933	8.67	741	4,983	16.50	1,950
DC80L	77.14	1,922	8.92	741	4,903	16.75	1,942
DC80R	77.14	2	8.92	0	51	16.75	8
DC81L	79.75	767	9.58	174	3,147	17.25	945
DC81R	79.75	111	9.58	23	907	17.25	185
BDC81L	79.75	767	9.58	174	3,147	17.25	945
DC82L	85.07	281	12.83	78	2,113	19.58	602
DC82R	85.07	384	12.83	106	1,571	19.58	664
DC84R	4.33	21	5.25	1	45	13.25	2
DC84L	4.33	1,241	5.25	212	1,553	13.25	265
RTC84L	4.33	21	5.25	1	45	13.25	2
DC116L	15.66	777	5.58	250	1,066	13.50	367
DC116R	15.66	1,544	5.58	467	2,130	13.50	668
BC116L	15.66	777	5.58	250	1,066	13.50	367
BDC78L	4.77	301	5.08	43	600	13.08	72
BDC80L	77.14	1,922	8.92	741	4,903	16.75	1,942
DT2D-1	350.84	927	11.25	575	3,756	18.83	2,284
DF2D-1	350.84	2,781	11.25	1,726	11,269	18.83	6,852
RT2D-1	350.84	927	11.25	575	3,756	18.83	2,284
DT2D-2	350.84	232	11.25	144	939	18.83	571
DF2D-2	350.84	695	11.25	431	2,817	18.83	1,713
RT2D-2	350.84	232	11.25	144	939	18.83	571
DT2D-3	350.84	58	11.25	36	235	18.83	143
DF2D-3	350.84	174	11.25	108	704	18.83	428
RT2D-3	350.84	58	11.25	36	235	18.83	143
DT2D-4	350.84	14	11.25	9	59	18.83	36
DF2D-4	350.84	43	11.25	27	176	18.83	107
DC11AL	350.84	43	12.17	27	175	19.33	107
DC11AR	350.84	0	0.00	0	0	0.00	0
RT2D-4	350.84	14	11.25	9	59	18.83	36
DC14AL	350.84	2	11.17	1	10	18.83	6
DC14AR	350.84	12	11.25	8	49	18.83	30
DC14AL	350.84	2	11.17	1	10	18.83	6
DC14R	350.84	0	0.00	0	0	0.00	0

Table B.4 - Diversion Results Summary

FCD 2007C017

November 2011

Diversion ID	Drainage Area sq. miles	100-Year, 6-Hour			100-Year, 24-Hour		
		Qp cfs	Tp hours	Vol acre-ft	Qp cfs	Tp hours	Vol acre-ft
DC14L	350.84	14	12.25	9	58	19.17	36
BDC11A	350.84	43	12.17	27	175	19.33	107
DC40L	19.99	1,913	5.00	321	2,674	12.92	442
DC40R	19.99	2,993	5.00	502	4,699	12.92	779
DC32L	118.07	3,280	8.50	1,071	5,657	16.58	2,200
DC32R	118.07	5,325	8.58	1,713	10,369	16.58	3,757
DC34R	131.18	477	12.83	40	5,416	20.17	1,111
DC34L	131.18	4,156	12.92	1,745	4,300	18.67	3,076
BDC32L	118.07	3,280	8.50	1,071	5,657	16.58	2,200
DC37L	263.40	4,291	13.17	2,163	4,796	21.17	4,137
DC37R	263.40	1,761	13.17	317	4,078	21.17	1,371
DC37AL	263.40	1,743	13.17	314	4,037	21.17	1,358
DC37AR	263.40	18	13.17	3	41	21.17	14
DC34R	131.18	477	12.83	40	5,416	20.17	1,111
DC37AL	263.40	1,743	13.17	314	4,037	21.17	1,358
DC14R	350.84	0	0.00	0	0	0.00	0
BDC37L	263.40	4,291	13.17	2,163	4,796	21.17	4,137
BDC40L	19.99	1,913	5.00	321	2,674	12.92	442
DC47L	67.38	1,649	9.17	692	3,045	16.50	1,408
DC47R	67.38	1,649	9.17	692	3,045	16.50	1,408
DC48L	73.32	770	10.42	368	1,503	17.58	808
DC48R	73.32	770	10.42	368	1,503	17.58	808
BDC47L	67.38	1,649	9.17	692	3,045	16.50	1,408
RTC48R	73.32	770	10.42	368	1,503	17.58	808
C52O	98.03	122	15.83	158	707	20.33	413
C51O	98.03	1,204	15.83	1,288	5,039	20.33	3,436
BC52O	98.03	122	15.83	158	707	20.33	413

Table B.5 - Storage Routing Results Summary

FCD 2007C017

November 2011

Diversion ID	Drainage Area sq. miles	100-Year, 6-Hour			100-Year, 24-Hour		
		Qp cfs	Tp hours	Vol acre-ft	Qp cfs	Tp hours	Vol acre-ft
C136O	5.80	377	5.92	99	507	14.50	209
C11O	87.36	3,648	14.83	1,693	8,350	20.83	4,147
C340	131.18	4,632	12.83	1,785	9,716	20.17	4,187
C360	263.40	6,053	13.17	2,480	8,913	21.08	5,508
C530	7.84	368	7.17	239	504	15.17	349
PND1	98.03	1,326	15.83	1,446	5,746	20.33	3,849

Table B.6-Model Results Summary

FCD 2007C017

November 2011

Subbasin ID	Drainage Area sq. miles	100-Year, 6-Hour			100-Year, 24-Hour		
		Qp cfs	Tp hours	Vol acre-ft	Qp cfs	Tp hours	Vol acre-ft
1B	2.10	802	4.83	85	931	12.83	95
R61-62	2.10	754	5.00	85	904	13.00	95
1C	3.83	1,138	5.25	168	1,362	13.17	195
1A	2.10	590	4.92	73	777	12.92	97
C62	8.03	1,780	5.00	253	2,820	12.92	374
R62-64	8.03	1,696	5.58	253	2,560	13.50	374
1D	0.34	481	4.25	23	384	12.25	21
R63-64	0.34	191	6.17	23	150	14.25	21
C64	8.37	1,696	5.58	268	2,560	13.50	394
R64-65	8.37	1,635	5.83	265	2,473	13.83	393
1E	3.91	998	5.25	147	1,278	13.25	184
1F	5.55	1,070	5.00	167	1,868	13.08	281
C65	17.83	2,330	5.17	429	4,150	13.08	794
R65-67	17.83	2,304	5.58	429	4,003	13.42	794
1J	0.62	655	4.33	41	554	12.33	38
R66-67	0.62	278	6.08	41	235	14.33	38
1I	4.11	978	5.17	140	1,323	13.17	184
C67	22.55	2,613	5.42	496	5,014	13.33	972
R67-71	22.55	2,587	5.58	496	4,919	13.50	972
1G	3.78	1,076	4.92	167	1,582	12.92	254
R70-71	3.78	880	6.17	167	1,176	14.08	254
1H	6.77	1,589	5.00	247	2,577	13.00	386
C71R	10.55	1,529	5.00	364	2,635	13.00	620
1K	1.08	759	4.50	66	730	12.50	67
R68-71	1.08	512	5.83	66	478	13.83	67
1L	4.69	1,309	5.17	190	1,671	13.17	237
C71L	5.77	1,257	5.17	232	1,662	13.17	301
C71	38.87	3,427	5.50	796	7,594	13.58	1,745
R71-73	38.87	3,354	6.08	796	7,549	13.92	1,745
1M	2.19	1,218	4.58	120	1,409	12.58	135
R72-73	2.19	883	6.17	120	938	14.25	135
1N	2.75	681	5.00	81	942	13.00	108
C73	43.81	3,586	6.08	840	8,520	13.92	1,929
R73-74	43.81	3,361	7.08	840	8,280	14.67	1,929
1P	4.57	572	5.33	88	1,076	13.33	162
1O	5.23	1,036	5.17	173	1,694	13.17	272
C74	53.61	3,246	7.08	891	8,736	14.67	2,256
R74-77	53.61	3,032	8.33	865	8,152	16.17	2,256

Table B.6-Model Results Summary

FCD 2007C017

November 2011

Subbasin ID	Drainage Area sq. miles	100-Year, 6-Hour			100-Year, 24-Hour		
		Qp cfs	Tp hours	Vol acre-ft	Qp cfs	Tp hours	Vol acre-ft
1U	3.19	286	5.50	50	607	13.50	105
C77R	56.80	3,024	8.33	868	8,147	16.17	2,329
1Q	5.30	1,447	5.17	223	2,015	13.17	284
R75-76	5.30	1,399	5.33	223	1,852	13.33	284
1R	2.90	840	4.83	106	1,220	12.83	151
C76	8.20	1,658	5.25	287	2,421	13.25	422
R76-77	8.20	1,261	7.75	287	1,893	15.42	422
1T	4.67	651	5.33	115	1,127	13.33	206
C77L	12.88	1,222	7.75	351	1,999	15.33	601
C77	69.68	3,056	8.42	935	9,251	16.17	2,806
R77-79	69.68	3,035	8.67	935	9,119	16.50	2,806
1W	0.53	347	4.58	28	265	12.58	25
C79RUP	70.21	3,035	8.67	941	9,119	16.50	2,826
1S	4.77	865	5.08	135	1,548	13.08	232
DC78L	4.77	301	5.08	43	600	13.08	72
DC78R	4.77	564	5.08	93	948	13.08	160
78R-79	4.77	464	5.92	93	767	13.75	160
1V	2.16	630	4.75	62	895	12.75	90
C79LUP	6.93	469	5.83	125	936	13.67	245
C79	77.14	3,035	8.67	986	9,159	16.50	3,005
DC79L	77.14	1,933	8.67	741	4,983	16.50	1,950
DC79R	77.14	944	8.67	203	4,176	16.50	1,055
79R-81	77.14	910	9.58	203	4,058	17.25	1,055
RTC79R	77.14	1,933	8.67	741	4,983	16.50	1,950
79L-80	77.14	1,924	8.92	741	4,953	16.75	1,950
DC80L	77.14	1,922	8.92	741	4,903	16.75	1,942
DC80R	77.14	2	8.92	0	51	16.75	8
80R-81	77.14	2	10.75	0	42	18.17	8
1X	2.62	572	4.92	60	904	12.83	92
C81	79.75	907	9.58	205	4,058	17.25	1,131
DC81L	79.75	767	9.58	174	3,147	17.25	945
DC81R	79.75	111	9.58	23	907	17.25	185
81R-82	79.75	83	13.92	23	767	19.75	185
BDC81L	79.75	767	9.58	174	3,147	17.25	945
81L-82	79.75	627	12.83	174	2,973	19.50	945
1Y	5.31	641	5.25	91	1,328	13.17	186
C82	85.07	665	12.83	184	3,683	19.58	1,266
DC82L	85.07	281	12.83	78	2,113	19.58	602

Table B.6-Model Results Summary

FCD 2007C017

November 2011

Subbasin ID	Drainage Area sq. miles	100-Year, 6-Hour			100-Year, 24-Hour		
		Qp cfs	Tp hours	Vol acre-ft	Qp cfs	Tp hours	Vol acre-ft
DC82R	85.07	384	12.83	106	1,571	19.58	664
82-135	85.07	375	13.25	106	1,565	19.92	664
2VV	3.37	549	5.17	77	907	13.17	125
C135I	88.44	368	13.33	107	1,565	19.92	760
2D	1.75	1,069	4.58	100	1,162	12.50	108
R87-89	1.75	916	4.92	100	988	12.92	108
2F	0.75	720	4.33	47	643	12.33	45
R88-89	0.75	653	4.58	47	576	12.58	45
C89	2.50	1,200	4.83	134	1,352	12.83	153
R89-91	2.50	1,112	5.25	134	1,232	13.17	153
2E	1.00	712	4.58	61	669	12.58	56
2G	1.13	960	4.42	68	947	12.42	63
C91	4.62	1,430	5.00	224	1,701	13.08	270
R91-92	4.62	1,413	5.33	224	1,639	13.33	270
2I	0.87	626	4.58	55	567	12.58	54
2H	1.59	1,069	4.50	93	1,139	12.50	91
C92	7.08	2,063	4.83	321	2,699	12.67	405
R92-95	7.08	1,997	5.08	321	2,486	12.92	405
2K	2.19	1,043	4.75	121	1,182	12.75	135
R93-94	2.19	956	5.00	121	1,005	13.00	135
2L	0.94	628	4.67	58	578	12.67	54
C94	3.13	1,224	4.92	163	1,345	12.92	188
R94-95	3.13	1,184	5.08	163	1,313	13.08	188
2M	1.40	1,140	4.42	83	1,185	12.42	83
2J	1.16	818	4.50	70	802	12.50	72
C95	12.78	3,128	5.00	519	4,316	12.92	711
R95-96	12.78	2,902	5.92	519	3,895	13.83	711
2A	4.33	1,323	5.17	213	1,715	13.17	267
R83-84	4.33	1,263	5.25	213	1,598	13.25	267
DC84R	4.33	21	5.25	1	45	13.25	2
DC84L	4.33	1,241	5.25	212	1,553	13.25	265
84L-85	4.33	1,008	6.50	212	1,233	14.42	265
2B	3.31	1,302	4.92	170	1,600	12.92	195
C85	7.65	1,166	4.92	341	1,609	12.92	448
R85-96	7.65	1,059	5.33	341	1,432	13.25	448
RTC84L	4.33	21	5.25	1	45	13.25	2
84R-86	4.33	12	6.75	1	23	14.67	2
2N	2.20	1,245	4.58	121	1,429	12.58	126

Table B.6-Model Results Summary

FCD 2007C017

November 2011

Subbasin ID	Drainage Area sq. miles	100-Year, 6-Hour			100-Year, 24-Hour		
		Qp cfs	Tp hours	Vol acre-ft	Qp cfs	Tp hours	Vol acre-ft
C86	6.53	993	4.58	102	1,400	12.58	126
R86-96	6.53	738	5.92	102	947	13.75	126
2C	2.32	1,266	4.58	126	1,490	12.58	143
2O	3.37	1,401	4.75	173	1,771	12.75	208
C96	32.65	3,538	5.83	887	5,915	13.75	1,476
R96-97	32.65	3,205	7.17	887	5,482	14.75	1,476
2P	3.51	1,167	4.67	128	1,755	12.67	182
C97	36.16	3,154	7.17	935	5,529	14.75	1,620
97-100	36.16	3,091	7.42	922	5,400	15.08	1,620
2Q	2.93	930	4.67	107	1,364	12.67	149
R98-99	2.93	809	5.25	107	1,115	13.17	149
2R	2.67	510	4.58	47	1,114	12.58	98
C99	5.60	809	5.25	127	1,571	13.08	244
99-100	5.60	726	5.75	127	1,442	13.50	244
2S	1.82	550	4.50	44	833	12.50	68
C100	43.57	3,057	7.42	953	5,665	15.00	1,856
100101	43.57	2,992	7.58	940	5,581	15.25	1,856
2T	4.9	1,081	5.17	176	1,643	13.17	257
C101	48.47	2,963	7.58	997	5,760	15.17	2,053
101102	48.47	2,900	8.00	988	5,664	15.58	2,053
2U	1.38	558	4.50	39	686	12.42	50
C102	49.85	2,889	8.00	991	5,664	15.58	2,091
102103	49.85	2,837	8.25	984	5,558	15.92	2,087
2V	7.57	1,429	5.08	220	2,560	13.08	369
C103	57.42	2,822	8.25	1,076	5,649	15.83	2,377
103107	57.42	2,591	9.75	1,034	5,413	17.25	2,377
2W	6.29	2,113	5.00	325	2,831	13.00	424
104105	6.29	1,778	6.17	325	2,168	14.08	424
2X	10.31	2,159	5.50	443	3,121	13.58	621
C105	16.59	2,712	6.00	679	3,892	13.67	997
105107	16.59	2,378	9.00	679	3,353	16.67	997
2Y	13.4	1,287	5.75	267	2,534	13.75	522
C107	87.41	3,312	9.83	1,306	8,068	17.08	3,596
2BB	2.4	1,458	4.58	158	1,671	12.58	189
108111	2.4	1,125	5.58	158	1,207	13.50	189
2Z	5.1	1,656	5.17	298	2,073	13.17	388
110111	5.1	1,408	6.50	298	1,647	14.42	388
2AA	3.73	1,418	4.92	169	1,737	12.92	208

Table B.6-Model Results Summary

FCD 2007C017

November 2011

Subbasin ID	Drainage Area sq. miles	100-Year, 6-Hour			100-Year, 24-Hour		
		Qp cfs	Tp hours	Vol acre-ft	Qp cfs	Tp hours	Vol acre-ft
C111	11.24	1,884	6.33	531	2,432	14.25	748
111113	11.24	1,690	8.33	531	2,186	16.08	748
2CC	4.34	663	5.58	123	977	13.58	178
C113	102.99	3,723	9.67	1,490	9,421	16.92	4,310
113127	102.99	3,685	10.33	1,490	9,356	17.42	4,310
2DD	0.56	394	4.58	30	328	12.58	25
C127R	103.54	3,685	10.33	1,493	9,356	17.42	4,328
2GG	6.69	1,928	5.17	324	2,633	13.17	427
114115	6.69	1,625	6.42	324	2,017	14.25	427
2HH	6.76	2,483	4.92	369	3,330	12.92	494
C115	13.45	2,216	4.92	618	3,245	12.92	881
115116	13.45	1,982	5.67	618	2,698	13.50	881
2II	2.22	1,102	4.83	148	1,209	12.83	176
C116	15.66	2,321	5.58	717	3,196	13.50	1,035
DC116L	15.66	777	5.58	250	1,066	13.50	367
DC116R	15.66	1,544	5.58	467	2,130	13.50	668
116119	15.66	1,441	6.50	467	1,908	14.42	668
2EE	4.13	1,863	4.75	220	2,340	12.75	257
118119	4.13	1,722	5.08	220	2,077	13.00	257
2JJ	0.89	663	4.58	53	608	12.58	50
C119	20.68	1,719	6.33	642	2,353	14.25	931
119120	20.68	1,553	9.25	631	2,146	16.92	931
2KK	4.19	828	5.67	162	1,047	13.67	202
C120R	24.87	1,551	9.17	722	2,175	16.92	1,094
2LL	5.18	786	6.08	191	1,034	14.00	248
BC116L	15.66	777	5.58	250	1,066	13.50	367
116120	15.66	642	11.75	250	842	19.58	367
C120	30.06	1,641	9.75	987	2,451	17.08	1,641
120121	30.06	1,614	10.58	987	2,443	17.67	1,641
2MM	0.91	450	4.67	35	422	12.67	32
C121	30.97	1,608	10.58	987	2,443	17.67	1,668
121123	30.97	1,583	11.50	982	2,404	18.33	1,664
2FF	5.39	705	6.25	182	970	14.17	247
C123	36.36	1,567	11.50	1,059	2,428	18.33	1,848
123140	36.36	1,519	11.92	1,023	2,424	18.58	1,848
2NN	9.61	1,308	6.00	299	1,940	13.92	437
2OO	0.85	536	4.67	43	494	12.58	39
C124	10.46	1,308	5.92	317	1,960	13.92	471

Table B.6-Model Results Summary

FCD 2007C017

November 2011

Subbasin ID	Drainage Area sq. miles	100-Year, 6-Hour			100-Year, 24-Hour		
		Qp cfs	Tp hours	Vol acre-ft	Qp cfs	Tp hours	Vol acre-ft
124125	10.46	1,246	7.08	316	1,876	15.00	471
2PP	1.78	768	4.83	77	851	12.75	82
C125	12.24	1,244	7.08	360	1,876	15.00	542
125126	12.24	1,147	8.33	348	1,795	16.08	540
2QQ	1.67	458	4.92	52	545	12.92	61
C126	13.91	1,141	8.33	367	1,793	16.08	594
126140	13.91	1,066	9.42	354	1,718	17.00	589
C140	50.27	1,631	11.67	1,097	3,449	18.00	2,312
140127	50.27	1,610	12.42	1,097	3,424	18.58	2,312
2RR	0.93	374	4.92	42	350	12.92	39
2YY	1.12	333	5.08	41	333	13.08	41
C127L	52.31	1,600	12.42	1,099	3,424	18.58	2,375
C127	155.86	3,759	10.42	2,028	11,451	17.58	6,322
127131	155.86	3,730	10.75	2,028	11,423	17.83	6,322
BDC78L	4.77	301	5.08	43	600	13.08	72
78L128	4.77	237	6.33	43	415	14.17	72
2SS	3.83	496	5.00	70	1,126	13.00	150
C128	8.6	355	5.00	89	1,081	13.00	214
128129	8.6	275	8.00	89	777	14.50	214
2TT	4.6	754	4.75	85	1,760	12.75	184
C129	13.2	458	4.75	132	1,642	12.75	377
129130	13.2	372	5.33	132	1,331	13.25	377
BDC80L	77.14	1,922	8.92	741	4,903	16.75	1,942
80L130	77.14	1,888	9.75	741	4,814	17.42	1,942
C130	85.56	1,869	9.75	774	5,115	17.33	2,244
130131	85.56	1,766	12.17	774	4,932	19.08	2,244
2UU	7.5	637	5.67	122	1,389	13.58	262
C131	248.92	4,129	11.17	2,434	14,458	18.67	8,346
3KB	1.71	978	4.58	79	1,081	12.58	85
3KC	3.1	555	5.33	90	783	13.33	125
3KD	1.17	363	5.00	43	368	13.00	43
7AC	1.21	372	4.92	42	388	12.92	43
FLO2D2	256.09	4,122	11.17	2,446	14,457	18.67	8,549
FLO-2D	6.31	1,149	5.00	142	2,025	13.00	242
FLO2D3	350.84	4,107	11.17	2,507	15,026	18.83	9,137
DT2D-1	350.84	927	11.25	575	3,756	18.83	2,284
DF2D-1	350.84	2,781	11.25	1,726	11,269	18.83	6,852
141149	350.84	2,780	11.33	1,726	11,238	19.00	6,852

Table B.6-Model Results Summary
FCD 2007C017
November 2011

Subbasin ID	Drainage Area sq. miles	100-Year, 6-Hour			100-Year, 24-Hour		
		Qp cfs	Tp hours	Vol acre-ft	Qp cfs	Tp hours	Vol acre-ft
2WW	5.8	598	5.42	99	1,267	13.42	209
C136O	5.8	377	5.92	99	507	14.50	209
136149	5.8	368	7.00	99	505	15.58	209
C149	356.64	2,776	11.33	1,727	11,261	19.00	6,983
149137	356.64	2,770	11.50	1,725	11,221	19.25	6,983
2XX	1.36	410	5.00	49	436	13.00	52
C137	358	2,769	11.50	1,725	11,220	19.25	7,017
RT2D-1	350.84	927	11.25	575	3,756	18.83	2,284
DT2D-2	350.84	232	11.25	144	939	18.83	571
DF2D-2	350.84	695	11.25	431	2,817	18.83	1,713
142139	350.84	693	11.67	431	2,807	19.08	1,713
7D	0.77	529	4.50	36	469	12.50	32
C139	351.61	693	11.67	433	2,807	19.08	1,735
7C	0.54	460	4.42	25	360	12.42	20
RT2D-2	350.84	232	11.25	144	939	18.83	571
DT2D-3	350.84	58	11.25	36	235	18.83	143
DF2D-3	350.84	174	11.25	108	704	18.83	428
142-18	350.84	173	12.33	108	697	19.58	428
7B	0.99	581	4.58	41	561	12.58	39
C18	351.83	172	12.33	108	697	19.58	454
C7T	1062	2,801	12.00	1,816	13,011	19.50	8,190
RT2D-3	350.84	58	11.25	36	235	18.83	143
DT2D-4	350.84	14	11.25	9	59	18.83	36
DF2D-4	350.84	43	11.25	27	176	18.83	107
12-11A	350.84	43	12.17	27	175	19.33	107
DC11AL	350.84	43	12.17	27	175	19.33	107
DC11AR	350.84	0	0.00	0	0	0.00	0
11A11B	350.84	0	0.00	0	0	0.00	0
RT2D-4	350.84	14	11.25	9	59	18.83	36
DC14AL	350.84	2	11.17	1	10	18.83	6
DC14AR	350.84	12	11.25	8	49	18.83	30
14A-14	350.84	12	11.42	8	49	18.92	30
DC14AL	350.84	2	11.17	1	10	18.83	6
14A11B	350.84	2	12.25	1	9	19.75	6
C11B	350.84	14	11.75	9	58	19.00	36
11B-14	350.84	14	12.25	9	58	19.17	36
C14	350.84	14	12.25	9	58	19.17	36
DC14R	350.84	0	0.00	0	0	0.00	0

Table B.6-Model Results Summary
FCD 2007C017
November 2011

Subbasin ID	Drainage Area sq. miles	100-Year, 6-Hour			100-Year, 24-Hour		
		Qp cfs	Tp hours	Vol acre-ft	Qp cfs	Tp hours	Vol acre-ft
DC14L	350.84	14	12.25	9	58	19.17	36
R14-13	350.84	14	13.75	9	58	19.83	36
3F	12.14	3,645	5.25	694	4,850	13.25	917
R1-3	12.14	3,196	6.42	694	3,863	14.25	917
3E	8.24	2,453	5.17	419	3,342	13.17	559
R2-3	8.24	2,227	5.75	419	2,810	13.75	559
3G	5.12	2,075	4.75	247	2,790	12.75	308
C3	25.49	4,312	6.25	1,119	6,005	14.17	1,664
R3-5	25.49	4,200	6.67	1,119	5,844	14.58	1,664
3H	6.78	1,570	5.33	273	2,204	13.33	352
C5	32.27	4,305	6.67	1,232	6,458	14.50	1,945
R5-7	32.27	4,200	7.33	1,232	6,268	15.17	1,945
3C	11.27	2,463	5.25	418	3,725	13.33	580
R4-7	11.27	2,219	5.92	418	3,089	14.08	580
3D	6.51	1,607	5.08	230	2,412	13.08	308
C7	50.04	4,493	6.08	1,445	8,197	14.08	2,644
R7-90	50.04	4,401	6.67	1,445	7,945	14.58	2,644
3A	11.19	2,632	5.33	496	3,783	13.33	684
R6-90	11.19	2,029	7.83	496	2,679	15.58	684
C90	61.23	4,947	7.92	1,652	9,435	15.58	3,199
R90-8	61.23	4,864	8.33	1,652	9,315	15.92	3,199
3B	6.42	1,407	5.33	221	1,955	13.33	300
C8	67.65	4,809	8.33	1,715	9,335	15.92	3,413
R8-9	67.65	4,355	10.50	1,670	8,870	17.67	3,413
3I	5.1	926	5.58	178	1,260	13.58	237
C9	72.75	4,346	10.50	1,721	8,869	17.67	3,588
R9-10	72.75	3,894	13.33	1,674	8,482	19.67	3,575
3J	11.26	1,108	6.50	310	1,758	14.33	487
C10	84.01	3,896	13.33	1,780	8,485	19.58	3,953
R10-11	84.01	3,642	14.67	1,664	8,215	20.83	3,925
3L	3.35	1,090	4.83	117	1,463	12.83	151
BDC11A	350.84	43	12.17	27	175	19.33	107
11A-11	350.84	43	12.75	27	174	19.75	107
C11I	87.36	3,655	14.67	1,693	8,350	20.83	4,147
C11O	87.36	3,648	14.83	1,693	8,350	20.83	4,147
R11-17	87.36	3,645	14.83	1,693	8,304	21.00	4,147
4A	11.75	3,281	5.67	775	4,008	13.75	965
R26-27	11.75	3,082	6.25	775	3,509	14.25	965

Table B.6-Model Results Summary
FCD 2007C017
November 2011

Subbasin ID	Drainage Area sq. miles	100-Year, 6-Hour			100-Year, 24-Hour		
		Qp cfs	Tp hours	Vol acre-ft	Qp cfs	Tp hours	Vol acre-ft
4B	6.14	1,955	5.00	280	2,673	13.00	352
C27	17.89	3,397	6.17	958	4,101	14.17	1,265
R27-28	17.89	3,155	7.67	958	3,769	15.58	1,265
4C	12.33	2,713	5.17	424	4,388	13.17	625
C28	30.22	3,151	7.50	1,214	4,933	13.17	1,795
R28-29	30.22	3,012	8.00	1,177	4,344	13.83	1,795
4E	4.88	2,126	5.08	363	2,434	13.08	427
R20-21	4.88	1,976	5.67	363	2,131	13.67	427
4F	6.16	2,937	4.83	413	3,602	12.83	491
C21	11.04	3,580	5.00	719	4,361	12.92	885
R21-23	11.04	3,490	5.75	719	3,905	13.58	885
4D	4.57	1,924	5.25	357	2,173	13.25	423
R22-23	4.57	1,748	6.08	357	1,816	14.00	423
4G	7.7	2,720	5.08	465	3,394	13.08	578
C23	23.31	5,873	5.58	1,330	7,189	13.25	1,767
R23-29	23.31	5,499	7.67	1,330	6,673	15.83	1,767
4J	6.09	1,389	5.25	222	1,903	13.25	305
C29	59.62	6,956	7.58	2,152	10,172	15.83	3,600
R29-31	59.62	6,837	8.17	2,152	10,051	16.25	3,600
4K	3.91	854	5.42	142	1,105	13.42	180
C31	63.52	6,809	8.17	2,180	10,066	16.25	3,723
R31-32	63.52	6,605	8.75	2,156	9,920	16.92	3,723
4H	6.11	2,268	5.00	375	2,854	13.00	486
R24-25	6.11	2,114	5.50	375	2,476	13.42	486
4I	15.52	3,655	5.25	669	5,592	13.25	973
C25	21.63	4,768	5.33	929	7,485	13.25	1,398
R25-30	21.63	3,895	7.75	929	5,522	15.67	1,398
6A	9.04	2,971	4.92	457	4,107	13.00	613
R39-40	9.04	2,790	5.33	457	3,517	13.33	613
6B	10.95	3,579	4.83	488	5,306	12.83	671
C40	19.99	4,906	5.00	824	7,373	12.92	1,221
DC40L	19.99	1,913	5.00	321	2,674	12.92	442
DC40R	19.99	2,993	5.00	502	4,699	12.92	779
40R-30	19.99	2,525	6.83	502	3,684	14.83	779
4L	9.49	1,869	5.42	332	2,700	13.42	488
C30	51.12	4,359	7.17	1,310	7,841	15.33	2,448
R30-32	51.12	4,276	8.25	1,310	7,383	16.33	2,448
4M	3.42	952	5.17	131	1,202	13.08	160

Table B.6-Model Results Summary
FCD 2007C017
November 2011

Subbasin ID	Drainage Area sq. miles	100-Year, 6-Hour			100-Year, 24-Hour		
		Qp cfs	Tp hours	Vol acre-ft	Qp cfs	Tp hours	Vol acre-ft
C32	118.07	8,604	8.58	2,784	16,025	16.58	5,957
DC32L	118.07	3,280	8.50	1,071	5,657	16.58	2,200
DC32R	118.07	5,325	8.58	1,713	10,369	16.58	3,757
R32-33	118.07	5,006	10.92	1,713	9,997	18.67	3,757
4N	7.61	1,047	6.08	256	1,470	14.00	355
C33	125.68	5,006	10.92	1,773	9,997	18.67	4,011
R33-34	125.68	4,788	12.50	1,755	9,774	20.08	4,008
4O	5.5	931	5.83	200	1,242	13.75	263
C34I	131.18	4,787	12.50	1,799	9,774	20.08	4,202
C34O	131.18	4,632	12.83	1,785	9,716	20.17	4,187
DC34R	131.18	477	12.83	40	5,416	20.17	1,111
DC34L	131.18	4,156	12.92	1,745	4,300	18.67	3,076
BDC32L	118.07	3,280	8.50	1,071	5,657	16.58	2,200
32L-35	118.07	3,111	11.00	1,071	5,436	18.92	2,200
5A	9.29	1,092	6.17	270	1,670	14.08	409
C35	127.35	3,111	11.00	1,125	5,436	18.92	2,499
R35-36	127.35	2,970	12.42	1,111	5,335	20.33	2,499
5B	4.88	928	5.50	162	1,284	13.50	220
C36	132.23	2,966	12.42	1,133	5,335	20.33	2,659
C36I	263.4	6,230	12.67	2,480	9,354	20.33	5,508
C36O	263.4	6,053	13.17	2,480	8,913	21.08	5,508
R36-37	263.4	6,052	13.17	2,480	8,874	21.17	5,508
DC37L	263.4	4,291	13.17	2,163	4,796	21.17	4,137
DC37R	263.4	1,761	13.17	317	4,078	21.17	1,371
DC37AL	263.4	1,743	13.17	314	4,037	21.17	1,358
DC37AR	263.4	18	13.17	3	41	21.17	14
37A-17	263.4	13	15.92	3	37	23.08	14
DC34R	131.18	477	12.83	40	5,416	20.17	1,111
R34-17	131.18	426	13.50	40	5,370	20.50	1,111
C17	350.76	3,695	15.00	1,724	11,397	21.00	4,594
R17-13	350.76	2,133	16.08	1,051	11,394	21.08	4,594
C13	350.76	2,145	16.08	1,060	11,444	21.08	4,630
13-13A	350.76	2,158	16.25	1,060	11,358	21.33	4,630
DC37AL	263.4	1,743	13.17	314	4,037	21.17	1,358
37L13A	263.4	1,727	13.58	314	3,922	21.42	1,358
C13A	350.76	2,591	14.33	1,304	14,980	21.42	5,946
13A-16	350.76	2,580	14.58	1,304	14,876	21.58	5,946
3M	3.85	1,190	4.75	119	1,730	12.75	164

Table B.6-Model Results Summary

FCD 2007C017

November 2011

Subbasin ID	Drainage Area sq. miles	100-Year, 6-Hour			100-Year, 24-Hour		
		Qp cfs	Tp hours	Vol acre-ft	Qp cfs	Tp hours	Vol acre-ft
DC14R	350.84	0	0.00	0	0	0.00	0
R14-16	350.84	0	0.00	0	0	0.00	0
C16	354.4	2,576	14.58	1,305	14,875	21.58	6,054
BDC37L	263.4	4,291	13.17	2,163	4,796	21.17	4,137
R37-38	263.4	4,286	13.83	2,163	4,779	21.83	4,137
5C	2.41	707	4.67	68	1,008	12.67	91
C38	242.09	4,299	13.83	2,191	4,784	21.83	4,213
6N	7.84	1,327	5.50	239	1,975	13.50	349
C530	7.84	368	7.17	239	504	15.17	349
R53-56	7.84	368	7.33	239	503	15.25	349
R56-59	7.84	367	8.00	239	498	15.92	349
6Q	2.86	706	4.83	77	1,064	12.75	109
C59	10.7	437	4.83	266	998	12.75	443
BDC40L	19.99	1,913	5.00	321	2,674	12.92	442
40L-41	19.99	1,765	6.00	321	2,410	13.92	442
6C	8.83	2,568	5.00	396	3,691	13.00	541
C41	28.82	2,715	5.08	593	4,344	13.08	924
R41-43	28.82	2,499	7.00	593	3,754	15.17	924
6D	9.98	2,303	5.33	422	3,417	13.33	597
6E	7.12	2,044	5.25	368	2,739	13.25	485
R42-43	7.12	1,866	5.75	368	2,309	13.83	485
C43	45.92	3,595	6.25	1,040	5,620	13.83	1,842
R43-44	45.92	3,442	8.08	1,040	5,386	15.67	1,842
6F	5.05	1,216	5.33	220	1,658	13.42	289
C44	50.97	3,428	8.08	1,119	5,598	15.58	2,066
R44-69	50.97	3,372	8.75	1,119	5,552	16.25	2,066
6H	4.97	1,481	5.08	230	2,007	13.08	296
6I	6.97	2,477	4.83	331	3,414	12.83	425
C46	11.93	3,333	4.92	495	4,817	12.92	691
R46-69	11.93	2,932	5.83	495	4,019	13.67	691
C69	62.91	3,411	8.67	1,336	6,119	16.08	2,633
R69-47	62.91	3,367	9.17	1,336	6,078	16.50	2,633
6J	4.47	1,261	5.25	195	1,565	13.25	247
C47	67.38	3,322	9.17	1,396	6,091	16.50	2,817
DC47L	67.38	1,649	9.17	692	3,045	16.50	1,408
DC47R	67.38	1,649	9.17	692	3,045	16.50	1,408
47R-48	67.38	1,585	10.42	692	2,994	17.58	1,408
6K	5.95	1,180	5.50	205	1,631	13.42	277

Table B.6-Model Results Summary
FCD 2007C017
November 2011

Subbasin ID	Drainage Area sq. miles	100-Year, 6-Hour			100-Year, 24-Hour		
		Qp cfs	Tp hours	Vol acre-ft	Qp cfs	Tp hours	Vol acre-ft
C48	73.32	1,566	10.42	752	3,006	17.58	1,616
DC48L	73.32	770	10.42	368	1,503	17.58	808
DC48R	73.32	770	10.42	368	1,503	17.58	808
48R-50	73.32	761	11.58	368	1,469	19.08	808
6G	6.37	897	6.00	205	1,275	13.92	288
R45-50	6.37	783	8.08	205	1,150	16.58	288
6L	6.34	1,012	5.83	213	1,413	13.75	293
C50	86.04	781	11.50	460	2,057	16.42	1,246
R50-52	86.04	752	13.42	454	1,978	17.58	1,246
BDC47L	67.38	1,649	9.17	692	3,045	16.50	1,408
47L-49	67.38	1,535	11.50	692	2,956	18.58	1,408
RTC48R	73.32	770	10.42	368	1,503	17.58	808
48L-49	73.32	762	11.58	368	1,470	19.08	808
6M	3.86	1,166	5.17	170	1,415	13.17	206
C49	77.19	2,213	11.58	1,078	4,335	18.83	2,360
R49-51	77.19	2,153	13.00	1,078	4,263	20.08	2,360
6O	8.13	1,736	5.33	283	2,435	13.33	387
C51I	85.32	2,141	13.00	1,178	4,263	20.08	2,672
CPND1	98.03	2,605	13.17	1,446	5,767	20.17	3,849
PND1	98.03	1,326	15.83	1,446	5,746	20.33	3,849
C52O	98.03	122	15.83	158	707	20.33	413
C51O	98.03	1,204	15.83	1,288	5,039	20.33	3,436
R51-54	98.03	1,202	15.92	1,288	5,034	20.42	3,436
R54-57	98.03	1,194	16.17	1,288	5,020	20.67	3,436
BC52O	98.03	122	15.83	158	707	20.33	413
R52-55	98.03	121	16.00	158	706	20.42	413
R55-57	98.03	121	16.50	158	703	20.58	413
C57	98.03	1,313	16.17	1,446	5,723	20.67	3,849
R57-58	98.03	1,276	17.42	1,446	5,677	21.42	3,849
6P	5.21	793	5.67	169	1,132	13.50	248
C58	103.24	1,314	17.50	1,532	5,677	21.42	4,035

Table B.7 - 100-Year, 24-Hour Results Comparison with Previous Study

FCD 2007C017

November 2011

Note:

Difference between FDS discharge and updated results - positive value indicates FDS study results are greater than updated model results

HEC-1	Peak Discharge, in cfs			Time to Peak, in cfs		Area, in sq. mi.	
ID	Regultory	Updated	% Diff	Regultory	Updated	Regultory	Updated
1B	1,288	931	28	12.80	12.83	2.10	2.10
R61-62	1,249	904	28	13.05	13.00	2.10	2.10
1C	2,254	1,362	40	13.10	13.17	3.83	3.83
1A	925	777	16	13.00	12.92	2.10	2.10
C62	4,265	2,820	34	13.05	12.92	8.03	8.03
R62-64	4,024	2,560	36	13.45	13.50	8.03	8.03
1D	452	384	15	12.20	12.25	0.34	0.34
R63-64	307	150	51	13.65	14.25	0.34	0.34
C64	4,215	2,560	39	13.50	13.50	8.37	8.37
R64-65	4,081	2,473	39	13.75	13.83	8.37	8.37
1E	1,911	1,278	33	13.25	13.25	3.91	3.91
1F	1,892	1,868	1	13.20	13.08	5.55	5.55
C65	6,348	4,150	35	13.50	13.08	17.83	17.83
R65-67	6,207	4,003	36	13.85	13.42	17.83	17.83
1J	731	554	24	12.30	12.33	0.62	0.62
R66-67	114	235	-106	14.05	14.33	0.62	0.62
1I	1,980	1,323	33	13.25	13.17	4.11	4.11
C67	7,228	5,014	31	13.75	13.33	22.56	22.55
R67-71	7,178	4,919	31	13.85	13.50	22.56	22.55
1G	1,421	1,582	-11	13.05	12.92	3.78	3.78
R70-71	1,210	1,176	3	14.05	14.08	3.78	3.78
1H	2,052	2,577	-26	13.25	13.00	6.77	6.77
C71R	2,304	2,635	-14	13.95	13.00	10.55	10.55
1K	998	730	27	12.60	12.50	1.08	1.08
R68-71	860	478	44	13.55	13.83	1.08	1.08
1L	2,362	1,671	29	13.50	13.17	4.69	4.69
C71L	3,177	1,662	48	13.50	13.17	5.77	5.77
C71	11,330	7,594	33	13.70	13.58	38.88	38.87
R71-73	11,118	7,549	32	14.05	13.92	38.88	38.87
1M	2,018	1,409	30	12.60	12.58	2.19	2.19
R72-73	1,616	938	42	14.25	14.25	2.19	2.19
1N	1,407	942	33	13.05	13.00	2.75	2.75
C73	12,652	8,520	33	14.10	13.92	43.82	43.81
R73-74	12,187	8,280	32	14.80	14.67	43.82	43.81
1P	1,747	1,076	38	13.50	13.33	4.56	4.57
1O	1,567	1,694	-8	13.55	13.17	5.23	5.23

Table B.7 - 100-Year, 24-Hour Results Comparison with Previous Study

FCD 2007C017

November 2011

Note:

Difference between FDS discharge and updated results - positive value indicates FDS study results are greater than updated model results

HEC-1	Peak Discharge, in cfs			Time to Peak, in cfs		Area, in sq. mi.	
ID	Regultory	Updated	% Diff	Regultory	Updated	Regultory	Updated
C74	13,013	8,736	33	14.75	14.67	53.61	53.61
R74-77	11,875	8,152	31	16.00	16.17	53.61	53.61
1U	878	607	31	13.60	13.50	3.19	3.19
C77R	11,875	8,147	31	16.00	16.17	56.80	56.80
1Q	2,511	2,015	20	13.75	13.17	5.30	5.30
R75-76	2,456	1,852	25	13.90	13.33	5.30	5.30
1R	1,499	1,220	19	12.80	12.83	2.90	2.90
C76	2,982	2,421	19	13.85	13.25	8.20	8.20
R76-77	2,430	1,893	22	15.55	15.42	8.20	8.20
1T	1,412	1,127	20	14.00	13.33	4.67	4.67
C77L	2,860	1,999	30	15.40	15.33	12.87	12.88
C77	13,685	9,251	32	15.95	16.17	69.67	69.68
R77-79	13,443	9,119	32	16.30	16.50	69.67	69.68
1W	337	265	21	12.55	12.58	0.53	0.53
C79RUP	13,441	9,119	32	16.30	16.50	70.20	70.21
1S	1,499	1,548	-3	13.30	13.08	4.77	4.77
DC78L	576	600	-4	13.30	13.08	4.77	4.77
DC78R	923	948	-3	13.30	13.08	4.77	4.77
78R-79	562	767	-36	14.00	13.75	4.77	4.77
1V	1,126	895	21	12.95	12.75	2.16	2.16
C79LUP	1,089	936	14	12.95	13.67	6.93	6.93
C79	13,438	9,159	32	16.30	16.50	77.13	77.14
DC79L	6,761	4,983	26	16.30	16.50	77.13	77.14
DC79R	6,578	4,176	37	16.30	16.50	77.13	77.14
79R-81	6,309	4,058	36	16.95	17.25	77.13	77.14
RTC79R	6,761	4,983	26	16.30	16.50	77.13	77.14
79L-80	6,684	4,953	26	16.50	16.75	77.13	77.14
DC80L	6,547	4,903	25	16.50	16.75	77.13	77.14
DC80R	138	51	63	16.50	16.75	77.13	77.14
80R-81	11	42	-282	17.80	18.17	77.13	77.14
1X	1,364	904	34	12.90	12.83	2.62	2.62
C81	6,308	4,058	36	16.95	17.25	79.75	79.75
DC81L	4,373	3,147	28	16.95	17.25	79.75	79.75
DC81R	1,908	907	52	16.95	17.25	79.75	79.75
81R-82	1,673	767	54	18.80	19.75	79.75	79.75
BDC81L	4,373	3,147	28	16.95	17.25	79.75	79.75

Table B.7 - 100-Year, 24-Hour Results Comparison with Previous Study

FCD 2007C017

November 2011

Note:

Difference between FDS discharge and updated results - positive value indicates FDS study results are greater than updated model results

HEC-1	Peak Discharge, in cfs			Time to Peak, in cfs		Area, in sq. mi.	
ID	Regultory	Updated	% Diff	Regultory	Updated	Regultory	Updated
81L-82	3,970	2,973	25	18.50	19.50	79.75	79.75
1Y	2,100	1,328	37	13.35	13.17	5.32	5.31
C82	5,530	3,683	33	18.65	19.58	85.07	85.07
DC82L	3,390	2,113	38	18.65	19.58	85.07	85.07
DC82R	2,154	1,571	27	18.80	19.58	85.07	85.07
82-135	2,062	1,565	24	19.05	19.92	85.07	85.07
2VV	1,493	907	39	13.20	13.17	3.74	3.37
C135I	2,062	1,565	24	19.05	19.92	88.81	88.44
2VV1	---	---	---	---	---	---	---
143144	---	---	---	---	---	---	---
2VV2	---	---	---	---	---	---	---
C144	---	---	---	---	---	---	---
144145	---	---	---	---	---	---	---
2VV6	---	---	---	---	---	---	---
2VV3	---	---	---	---	---	---	---
146147	---	---	---	---	---	---	---
2VV4	---	---	---	---	---	---	---
C147	---	---	---	---	---	---	---
147148	---	---	---	---	---	---	---
2VV8	---	---	---	---	---	---	---
C148	---	---	---	---	---	---	---
148145	---	---	---	---	---	---	---
2VV5	---	---	---	---	---	---	---
C145	---	---	---	---	---	---	---
2VV7	---	---	---	---	---	---	---
FLO2D1	---	---	---	---	---	---	---
2D	1,600	1,162	27	12.60	12.50	1.75	1.75
R87-89	1,504	988	34	13.05	12.92	1.75	1.75
2F	798	643	19	12.40	12.33	0.75	0.75
R88-89	779	576	26	12.60	12.58	0.75	0.75
C89	2,071	1,352	35	12.95	12.83	2.50	2.50
R89-91	2,003	1,232	38	13.30	13.17	2.50	2.50
2E	1,246	669	46	12.35	12.58	1.00	1.00
2G	1,248	947	24	12.50	12.42	1.13	1.13
C91	2,919	1,701	42	12.55	13.08	4.63	4.62
R91-92	2,840	1,639	42	12.80	13.33	4.63	4.62

Table B.7 - 100-Year, 24-Hour Results Comparison with Previous Study

FCD 2007C017

November 2011

Note:

Difference between FDS discharge and updated results - positive value indicates FDS study results are greater than updated model results

HEC-1	Peak Discharge, in cfs			Time to Peak, in cfs		Area, in sq. mi.	
ID	Regultory	Updated	% Diff	Regultory	Updated	Regultory	Updated
2I	1,054	567	46	12.30	12.58	0.87	0.87
2H	1,551	1,139	27	12.50	12.50	1.59	1.59
C92	4,892	2,699	45	12.60	12.67	7.09	7.08
R92-95	4,767	2,486	48	12.80	12.92	7.09	7.08
2K	1,596	1,182	26	12.95	12.75	2.19	2.19
R93-94	1,555	1,005	35	13.20	13.00	2.19	2.19
2L	762	578	24	12.70	12.67	0.94	0.94
C94	2,115	1,345	36	13.15	12.92	3.13	3.13
R94-95	2,062	1,313	36	13.30	13.08	3.13	3.13
2M	1,626	1,185	27	12.30	12.42	1.40	1.40
2J	1,022	802	22	12.65	12.50	1.16	1.16
C95	7,459	4,316	42	12.80	12.92	12.78	12.78
R95-96	7,024	3,895	45	13.50	13.83	12.78	12.78
2A	2,857	1,715	40	13.35	13.17	4.33	4.33
R83-84	2,755	1,598	42	13.70	13.25	4.33	4.33
DC84R	129	45	65	13.70	13.25	4.33	4.33
DC84L	2,625	1,553	41	13.70	13.25	4.33	4.33
84L-85	2,481	1,233	50	14.20	14.42	4.33	4.33
2B	2,263	1,600	29	12.95	12.92	3.31	3.31
C85	2,720	1,609	41	14.15	12.92	7.64	7.65
R85-96	2,548	1,432	44	14.95	13.25	7.64	7.65
RTC84L	129	45	65	13.70	13.25	4.33	4.33
84R-86	81	23	72	14.60	14.67	4.33	4.33
2N	1,872	1,429	24	12.65	12.58	2.20	2.20
C86	1,830	1,400	23	12.65	12.58	6.53	6.53
R86-96	1,568	947	40	13.60	13.75	6.53	6.53
2C	1,950	1,490	24	12.70	12.58	2.32	2.32
2O	2,985	1,771	41	12.65	12.75	3.37	3.37
C96	12,315	5,915	52	13.50	13.75	32.64	32.65
R96-97	11,514	5,482	52	14.25	14.75	32.64	32.65
2P	2,330	1,755	25	12.65	12.67	3.51	3.51
C97	11,891	5,529	54	14.25	14.75	36.15	36.16
97-100	11,570	5,400	53	14.60	15.08	36.15	36.16
2Q	1,660	1,364	18	12.85	12.67	2.93	2.93
R98-99	1,313	1,115	15	13.25	13.17	2.93	2.93
2R	1,343	1,114	17	12.80	12.58	2.67	2.67

Table B.7 - 100-Year, 24-Hour Results Comparison with Previous Study

FCD 2007C017

November 2011

Note:

Difference between FDS discharge and updated results - positive value indicates FDS study results are greater than updated model results

HEC-1	Peak Discharge, in cfs			Time to Peak, in cfs		Area, in sq. mi.	
ID	Regultory	Updated	% Diff	Regultory	Updated	Regultory	Updated
C99	2,243	1,571	30	13.05	13.08	5.60	5.60
99-100	2,039	1,442	29	13.40	13.50	5.60	5.60
2S	1,143	833	27	12.50	12.50	1.82	1.82
C100	11,974	5,665	53	14.55	15.00	43.57	43.57
100101	11,801	5,581	53	14.75	15.25	43.57	43.57
2T	2,329	1,643	29	13.50	13.17	4.90	4.90
C101	12,686	5,760	55	14.75	15.17	48.47	48.47
101102	12,367	5,664	54	15.10	15.58	48.47	48.47
2U	727	686	6	12.65	12.42	1.38	1.38
C102	12,365	5,664	54	15.10	15.58	49.85	49.85
102103	12,182	5,558	54	15.30	15.92	49.85	49.85
2V	3,205	2,560	20	13.40	13.08	7.57	7.57
C103	12,871	5,649	56	15.30	15.83	57.42	57.42
103107	12,258	5,413	56	16.40	17.25	57.42	57.42
2W	3,882	2,831	27	13.10	13.00	6.29	6.29
104105	3,173	2,168	32	14.10	14.08	6.29	6.29
2X	4,574	3,121	32	13.75	13.58	10.31	10.31
C105	7,037	3,892	45	13.95	13.67	16.60	16.59
105107	6,071	3,353	45	16.15	16.67	16.60	16.59
2Y	4,610	2,534	45	14.00	13.75	13.40	13.40
C107	17,469	8,068	54	16.35	17.08	87.42	87.41
2BB	2,154	1,671	22	12.50	12.58	2.40	2.40
108111	1,920	1,207	37	13.25	13.50	2.40	2.40
2Z	2,733	2,073	24	13.25	13.17	5.10	5.10
110111	2,297	1,647	28	14.30	14.42	5.10	5.10
2AA	2,471	1,737	30	13.05	12.92	3.73	3.73
C111	3,957	2,432	39	13.20	14.25	11.23	11.24
111113	3,240	2,186	33	14.95	16.08	11.23	11.24
2CC	1,600	977	39	13.75	13.58	4.38	4.34
C113	19,580	9,421	52	16.30	16.92	103.03	102.99
113127	19,236	9,356	51	16.70	17.42	103.03	102.99
2DD	384	328	15	12.60	12.58	0.54	0.56
C127R	19,236	9,356	51	16.70	17.42	103.57	103.54
2GG	3,979	2,633	34	13.50	13.17	6.69	6.69
114115	3,585	2,017	44	14.35	14.25	6.69	6.69
2HH	4,129	3,330	19	13.10	12.92	6.76	6.76

Table B.7 - 100-Year, 24-Hour Results Comparison with Previous Study

FCD 2007C017

November 2011

Note:

Difference between FDS discharge and updated results - positive value indicates FDS study results are greater than updated model results

HEC-1	Peak Discharge, in cfs			Time to Peak, in cfs		Area, in sq. mi.	
ID	Regultory	Updated	% Diff	Regultory	Updated	Regultory	Updated
C115	4,400	3,245	26	14.00	12.92	13.45	13.45
115116	4,293	2,698	37	14.50	13.50	13.45	13.45
2II	1,509	1,209	20	12.95	12.83	2.22	2.22
C116	4,850	3,196	34	13.75	13.50	15.67	15.66
DC116L	1,656	1,066	36	13.75	13.50	15.67	15.66
DC116R	3,194	2,130	33	13.75	13.50	15.67	15.66
116119	3,109	1,908	39	14.55	14.42	15.67	15.66
2EE	3,050	2,340	23	12.85	12.75	4.13	4.13
118119	2,947	2,077	30	13.15	13.00	4.13	4.13
2JJ	817	608	26	12.55	12.58	0.89	0.89
C119	4,308	2,353	45	14.30	14.25	20.69	20.68
119120	3,950	2,146	46	16.55	16.92	20.69	20.68
2KK	1,686	1,047	38	13.95	13.67	4.19	4.19
C120R	4,048	2,175	46	16.50	16.92	24.88	24.87
2LL	1,701	1,034	39	14.55	14.00	5.18	5.18
BC116L	1,656	1,066	36	13.75	13.50	15.67	15.66
116120	1,160	842	27	18.10	19.58	15.67	15.66
C120	4,526	2,451	46	16.35	17.08	30.06	30.06
120121	4,416	2,443	45	16.80	17.67	30.06	30.06
2MM	495	422	15	12.60	12.67	0.91	0.91
C121	4,416	2,443	45	16.80	17.67	30.97	30.97
121123	4,322	2,404	44	17.35	18.33	30.97	30.97
2FF	1,641	970	41	14.60	14.17	5.51	5.39
C123	4,460	2,428	46	17.35	18.33	36.48	36.36
123140	4,429	2,424	45	17.55	18.58	36.48	36.36
2NN	3,248	1,940	40	14.35	13.92	9.61	9.61
2OO	731	494	32	12.65	12.58	0.85	0.85
C124	3,248	1,960	40	14.30	13.92	10.46	10.46
124125	2,984	1,876	37	15.25	15.00	10.46	10.46
2PP	1,312	851	35	12.80	12.75	1.78	1.78
C125	2,984	1,876	37	15.25	15.00	12.24	12.24
125126	2,711	1,795	34	16.20	16.08	12.24	12.24
2QQ	813	545	33	12.80	12.92	1.67	1.67
C126	2,711	1,793	34	16.20	16.08	13.91	13.91
126140	2,569	1,718	33	16.95	17.00	13.91	13.91
C140	6,497	3,449	47	17.20	18.00	50.39	50.27

Table B.7 - 100-Year, 24-Hour Results Comparison with Previous Study

FCD 2007C017

November 2011

Note:

Difference between FDS discharge and updated results - positive value indicates FDS study results are greater than updated model results

HEC-1	Peak Discharge, in cfs			Time to Peak, in cfs		Area, in sq. mi.	
ID	Regultory	Updated	% Diff	Regultory	Updated	Regultory	Updated
140127	6,405	3,424	47	17.60	18.58	50.39	50.27
2RR	483	350	28	12.95	12.92	0.93	0.93
2YY	424	333	21	13.05	13.08	1.12	1.12
C127L	6,405	3,424	47	17.60	18.58	52.44	52.31
C127	22,611	11,451	49	16.75	17.58	156.01	155.86
127131	22,489	11,423	49	17.05	17.83	156.01	155.86
BDC78L	576	600	-4	13.30	13.08	4.77	4.77
78L128	414	415	0	14.35	14.17	4.77	4.77
2SS	1,402	1,126	20	13.35	13.00	3.83	3.83
C128	1,328	1,081	19	13.35	13.00	8.60	8.60
128129	1,079	777	28	14.60	14.50	8.60	8.60
2TT	2,248	1,760	22	13.00	12.75	4.60	4.60
C129	2,061	1,642	20	13.00	12.75	13.20	13.20
129130	1,868	1,331	29	13.65	13.25	13.20	13.20
BDC80L	6,547	4,903	25	16.50	16.75	77.13	77.14
80L130	6,343	4,814	24	17.15	17.42	77.13	77.14
C130	6,599	5,115	22	17.10	17.33	85.56	85.56
130131	6,162	4,932	20	18.70	19.08	85.56	85.56
2UU	1,967	1,389	29	14.30	13.58	8.10	7.50
C131	23,787	14,458	39	17.25	18.67	241.57	248.92
3KB	1,348	1,081	20	13.00	12.58	2.33	1.71
3KC	1,110	783	29	13.95	13.33	3.45	3.10
3KD	790	368	53	13.40	13.00	2.26	1.17
7AC	450	388	14	13.05	12.92	1.20	1.21
FLO2D2	---	14,457	---	---	18.67	---	256.09
FLO-2D	---	2,025	---	---	13.00	---	6.31
FLO2D3	---	15,026	---	---	18.83	---	350.84
DT2D-1	---	3,756	---	---	18.83	---	350.84
DF2D-1	---	11,269	---	---	18.83	---	350.84
141149	12,456	11,238	10	19.75	19.00	334.14	350.84
2WW	1,574	1,267	20	13.90	13.42	5.82	5.80
C136O	542	507	6	15.35	14.50	5.82	5.80
136149	291	505	-74	16.35	15.58	5.82	5.80
C149	12,456	11,261	10	19.75	19.00	339.96	356.64
149137	12,420	11,221	10	20.05	19.25	339.96	356.64
2XX	1,131	436	61	12.95	13.00	2.17	1.36

Table B.7 - 100-Year, 24-Hour Results Comparison with Previous Study

FCD 2007C017

November 2011

Note:

Difference between FDS discharge and updated results - positive value indicates FDS study results are greater than updated model results

HEC-1	Peak Discharge, in cfs			Time to Peak, in cfs		Area, in sq. mi.	
ID	Regultory	Updated	% Diff	Regultory	Updated	Regultory	Updated
C137	12,421	11,220	10	20.05	19.25	342.13	358.00
RT2D-1	---	3,756	---	---	18.83	---	350.84
DT2D-2	---	939	---	---	18.83	---	350.84
DF2D-2	---	2,817	---	---	18.83	---	350.84
142139	2,820	2,807	0	19.30	19.08	336.59	350.84
7D	732	469	36	12.65	12.50	1.17	0.77
C139	2,826	2,807	1	19.30	19.08	337.76	351.61
7C	387	360	7	12.35	12.42	0.60	0.54
RT2D-2	---	939	---	---	18.83	---	350.84
DT2D-3	---	235	---	---	18.83	---	350.84
DF2D-3	---	704	---	---	18.83	---	350.84
142-18	946	697	26	19.65	19.58	336.59	350.84
7B	944	561	41	12.85	12.58	1.67	0.99
C18	950	697	27	19.65	19.58	338.26	351.83
C7T	---	13,011	---	---	19.50	---	1,062.00
RT2D-3	---	235	---	---	18.83	---	350.84
DT2D-4	---	59	---	---	18.83	---	350.84
DF2D-4	---	176	---	---	18.83	---	350.84
12-11A	3,340	175	95	19.05	19.33	339.24	350.84
DC11AL	1,431	175	88	19.05	19.33	339.24	350.84
DC11AR	1,910	0	---	19.05	0.00	339.24	350.84
11A11B	1,891	0	---	19.15	0.00	339.24	350.84
RT2D-4	2,484	59	98	19.05	18.83	339.24	350.84
DC14AL	2,484	10	100	19.05	18.83	339.24	350.84
DC14AR	2,919	49	98	19.10	18.83	339.24	350.84
14A-14	2,895	49	98	19.20	18.92	339.24	350.84
DC14AL	2,484	10	100	19.05	18.83	339.24	350.84
14A11B	2,456	9	100	19.20	19.75	339.24	350.84
C11B	4,346	58	99	19.20	19.00	339.24	350.84
11B-14	4,244	58	99	19.35	19.17	339.24	350.84
C14	7,135	58	99	19.35	19.17	339.24	350.84
DC14R	6,685	0	100	19.35	0.00	339.24	350.84
DC14L	450	58	87	16.75	19.17	339.24	350.84
R14-13	419	58	86	17.40	19.83	339.24	350.84
3F	3,798	4,850	-28	13.55	13.25	12.14	12.14
R1-3	3,374	3,863	-14	14.65	14.25	12.14	12.14

Table B.7 - 100-Year, 24-Hour Results Comparison with Previous Study

FCD 2007C017

November 2011

Note:

Difference between FDS discharge and updated results - positive value indicates FDS study results are greater than updated model results

HEC-1	Peak Discharge, in cfs			Time to Peak, in cfs		Area, in sq. mi.	
ID	Regultory	Updated	% Diff	Regultory	Updated	Regultory	Updated
3E	2,834	3,342	-18	13.40	13.17	8.24	8.24
R2-3	2,610	2,810	-8	14.05	13.75	8.24	8.24
3G	2,297	2,790	-21	12.95	12.75	5.12	5.12
C3	5,468	6,005	-10	14.45	14.17	25.50	25.49
R3-5	5,370	5,844	-9	14.85	14.58	25.50	25.49
3H	2,039	2,204	-8	13.85	13.33	6.78	6.78
C5	6,235	6,458	-4	14.70	14.50	32.28	32.27
R5-7	6,028	6,268	-4	15.35	15.17	32.28	32.27
3C	3,632	3,725	-3	13.55	13.33	11.27	11.27
R4-7	3,159	3,089	2	14.35	14.08	11.27	11.27
3D	3,044	2,412	21	13.50	13.08	6.51	6.51
C7	9,053	8,197	9	14.40	14.08	50.06	50.04
R7-90	8,758	7,945	9	14.80	14.58	50.06	50.04
3A	2,925	3,783	-29	14.00	13.33	11.19	11.19
R6-90	2,319	2,679	-16	16.10	15.58	11.19	11.19
C90	8,875	9,435	-6	15.95	15.58	61.25	61.23
R90-8	8,790	9,315	-6	16.25	15.92	61.25	61.23
3B	3,140	1,955	38	13.50	13.33	6.42	6.42
C8	8,915	9,335	-5	14.95	15.92	67.67	67.65
R8-9	8,522	8,870	-4	16.65	17.67	67.67	67.65
3I	2,046	1,260	38	13.95	13.58	5.10	5.10
C9	8,614	8,869	-3	16.65	17.67	72.77	72.75
R9-10	7,974	8,482	-6	18.90	19.67	72.77	72.75
3J	2,882	1,758	39	14.90	14.33	11.25	11.26
C10	8,079	8,485	-5	18.90	19.58	84.02	84.01
R10-11	7,849	8,215	-5	20.15	20.83	84.02	84.01
3L	1,979	1,463	26	13.15	12.83	3.34	3.35
BDC11A	1,431	175	88	19.05	19.33	339.24	350.84
11A-11	1,424	174	88	19.30	19.75	339.24	350.84
C11I	9,237	8,350	10	20.10	20.83	87.36	87.36
C11O	9,173	8,350	9	20.15	20.83	87.36	87.36
R11-17	9,095	8,304	9	20.25	21.00	87.36	87.36
4A	3,079	4,008	-30	14.05	13.75	11.75	11.75
R26-27	2,608	3,509	-35	14.60	14.25	11.75	11.75
4B	2,913	2,673	8	13.35	13.00	6.14	6.14
C27	3,404	4,101	-20	13.55	14.17	17.89	17.89

Table B.7 - 100-Year, 24-Hour Results Comparison with Previous Study

FCD 2007C017

November 2011

Note:

Difference between FDS discharge and updated results - positive value indicates FDS study results are greater than updated model results

HEC-1	Peak Discharge, in cfs			Time to Peak, in cfs		Area, in sq. mi.	
ID	Regultory	Updated	% Diff	Regultory	Updated	Regultory	Updated
R27-28	3,144	3,769	-20	16.00	15.58	17.89	17.89
4C	3,830	4,388	-15	14.20	13.17	12.33	12.33
C28	5,031	4,933	2	14.30	13.17	30.22	30.22
R28-29	4,918	4,344	12	14.60	13.83	30.22	30.22
4E	1,631	2,434	-49	13.50	13.08	4.88	4.88
R20-21	1,495	2,131	-43	14.00	13.67	4.88	4.88
4F	2,626	3,602	-37	13.00	12.83	6.16	6.16
C21	3,159	4,361	-38	13.15	12.92	11.04	11.04
R21-23	3,000	3,905	-30	13.75	13.58	11.04	11.04
4D	1,400	2,173	-55	13.75	13.25	4.57	4.57
R22-23	1,269	1,816	-43	14.45	14.00	4.57	4.57
4G	2,724	3,394	-25	13.25	13.08	7.70	7.70
C23	5,670	7,189	-27	13.50	13.25	23.31	23.31
R23-29	4,973	6,673	-34	15.60	15.83	23.31	23.31
4J	2,619	1,903	27	13.75	13.25	6.09	6.09
C29	9,294	10,172	-9	15.30	15.83	59.62	59.62
R29-31	9,013	10,051	-12	15.90	16.25	59.62	59.62
4K	1,893	1,105	42	13.55	13.42	3.91	3.91
C31	9,099	10,066	-11	15.75	16.25	63.53	63.52
R31-32	8,791	9,920	-13	16.30	16.92	63.53	63.52
4H	2,851	2,854	0	13.30	13.00	6.11	6.11
R24-25	2,302	2,476	-8	16.30	13.42	6.11	6.11
4I	5,001	5,592	-12	13.50	13.25	15.52	15.52
C25	4,918	7,485	-52	13.50	13.25	21.63	21.63
R25-30	4,252	5,522	-30	15.20	15.67	21.63	21.63
6A	4,582	4,107	10	13.40	13.00	9.04	9.04
R39-40	4,337	3,517	19	13.95	13.33	9.04	9.04
6B	6,008	5,306	12	13.15	12.83	10.95	10.95
C40	8,551	7,373	14	13.25	12.92	19.99	19.99
DC40L	2,827	2,674	5	13.25	12.92	19.99	19.99
DC40R	5,724	4,699	18	13.25	12.92	19.99	19.99
40R-30	5,142	3,684	28	15.00	14.83	19.99	19.99
4L	3,312	2,700	18	14.15	13.42	9.49	9.49
C30	10,427	7,841	25	15.05	15.33	51.11	51.12
R30-32	10,062	7,383	27	16.00	16.33	51.11	51.12
4M	1,975	1,202	39	13.25	13.08	3.42	3.42

Table B.7 - 100-Year, 24-Hour Results Comparison with Previous Study

FCD 2007C017

November 2011

Note:

Difference between FDS discharge and updated results - positive value indicates FDS study results are greater than updated model results

HEC-1	Peak Discharge, in cfs			Time to Peak, in cfs		Area, in sq. mi.	
ID	Regultory	Updated	% Diff	Regultory	Updated	Regultory	Updated
C32	17,710	16,025	10	16.00	16.58	118.06	118.07
DC32L	6,242	5,657	9	16.00	16.58	118.06	118.07
DC32R	11,467	10,369	10	16.00	16.58	118.06	118.07
R32-33	10,878	9,997	8	18.05	18.67	118.06	118.07
4N	2,459	1,470	40	14.60	14.00	7.61	7.61
C33	10,987	9,997	9	18.00	18.67	125.67	125.68
R33-34	10,687	9,774	9	19.25	20.08	125.67	125.68
4O	2,173	1,242	43	13.95	13.75	5.50	5.50
C34I	10,686	9,774	9	19.25	20.08	131.17	131.18
C34O	10,318	9,716	6	19.40	20.17	131.17	131.18
DC34R	6,018	5,416	10	19.40	20.17	131.17	131.18
DC34L	4,300	4,300	0	18.30	18.67	131.17	131.18
BDC32L	6,242	5,657	9	16.00	16.58	118.06	118.07
32L-35	5,891	5,436	8	18.25	18.92	118.06	118.07
5A	3,034	1,670	45	14.50	14.08	9.29	9.29
C35	5,995	5,436	9	18.15	18.92	127.35	127.35
R35-36	5,685	5,335	6	19.55	20.33	127.35	127.35
5B	2,156	1,284	40	13.55	13.50	4.88	4.88
C36	5,685	5,335	6	19.55	20.33	132.23	132.23
C36I	9,638	9,354	3	19.55	20.33	263.40	263.40
C36O	8,713	8,913	-2	20.30	21.08	263.40	263.40
R36-37	8,654	8,874	-3	20.45	21.17	263.40	263.40
DC37L	4,755	4,796	-1	20.65	21.17	263.40	263.40
DC37R	3,910	4,078	-4	20.40	21.17	263.40	263.40
DC37AL	3,871	4,037	-4	20.40	21.17	263.40	263.40
DC37AR	39	41	-5	20.40	21.17	263.40	263.40
37A-17	37	37	0	21.30	23.08	263.40	263.40
DC34R	6,018	5,416	10	19.40	20.17	131.17	131.18
R34-17	5,990	5,370	10	19.50	20.50	131.17	131.18
C17	12,005	11,397	5	20.30	21.00	350.76	350.76
R17-13	11,994	11,394	5	20.30	21.08	350.76	350.76
C13	12,413	11,444	8	20.30	21.08	350.76	350.76
13-13A	12,186	11,358	7	20.50	21.33	350.76	350.76
DC37AL	3,871	4,037	-4	20.40	21.17	263.40	263.40
37L13A	3,855	3,922	-2	20.80	21.42	263.40	263.40
C13A	15,540	14,980	4	20.55	21.42	350.76	350.76

Table B.7 - 100-Year, 24-Hour Results Comparison with Previous Study

FCD 2007C017

November 2011

Note:

Difference between FDS discharge and updated results - positive value indicates FDS study results are greater than updated model results

HEC-1	Peak Discharge, in cfs			Time to Peak, in cfs		Area, in sq. mi.	
ID	Regultory	Updated	% Diff	Regultory	Updated	Regultory	Updated
13A-16	15,032	14,876	1	20.90	21.58	350.76	350.76
3M	2,520	1,730	31	12.90	12.75	3.64	3.85
DC14R	6,685	0	100	19.35	0.00	339.24	350.84
R14-16	6,180	0	100	19.80	0.00	339.24	350.84
C16	19,565	14,875	24	20.80	21.58	354.40	354.40
BDC37L	4,755	4,796	-1	20.65	21.17	263.40	263.40
R37-38	4,669	4,779	-2	21.25	21.83	263.40	263.40
5C	1,381	1,008	27	12.95	12.67	2.41	2.41
C38	4,683	4,784	-2	21.20	21.83	242.09	242.09
6N	3,207	1,975	38	13.75	13.50	7.84	7.84
C530	2,188	504	77	14.25	15.17	7.84	7.84
R53-56	2,079	503	76	14.45	15.25	7.84	7.84
R56-59	1,811	498	73	15.15	15.92	7.84	7.84
6Q	1,647	1,064	35	13.05	12.75	2.86	2.86
C59	1,813	998	45	15.20	12.75	10.70	10.70
BDC40L	2,827	2,674	5	13.25	12.92	19.99	19.99
40L-41	2,760	2,410	13	14.20	13.92	19.99	19.99
6C	3,628	3,691	-2	13.05	13.00	8.83	8.83
C41	4,392	4,344	1	13.15	13.08	28.82	28.82
R41-43	4,081	3,754	8	15.35	15.17	28.82	28.82
6D	4,768	3,417	28	13.95	13.33	9.98	9.98
6E	3,344	2,739	18	13.85	13.25	7.12	7.12
R42-43	3,076	2,309	25	14.60	13.83	7.12	7.12
C43	9,550	5,620	41	14.60	13.83	45.92	45.92
R43-44	9,125	5,386	41	16.10	15.67	45.92	45.92
6F	1,888	1,658	12	14.15	13.42	5.05	5.05
C44	9,435	5,598	41	16.00	15.58	50.97	50.97
R44-69	9,328	5,552	40	16.45	16.25	50.97	50.97
6H	1,957	2,007	-3	13.95	13.08	4.97	4.97
6I	3,085	3,414	-11	13.55	12.83	6.97	6.97
C46	4,442	4,817	-8	13.75	12.92	11.94	11.93
R46-69	4,249	4,019	5	14.35	13.67	11.94	11.93
C69	10,194	6,119	40	16.30	16.08	62.91	62.91
R69-47	10,104	6,078	40	16.65	16.50	62.91	62.91
6J	2,227	1,565	30	13.35	13.25	4.47	4.47
C47	10,104	6,091	40	16.65	16.50	67.38	67.38

Table B.7 - 100-Year, 24-Hour Results Comparison with Previous Study

FCD 2007C017

November 2011

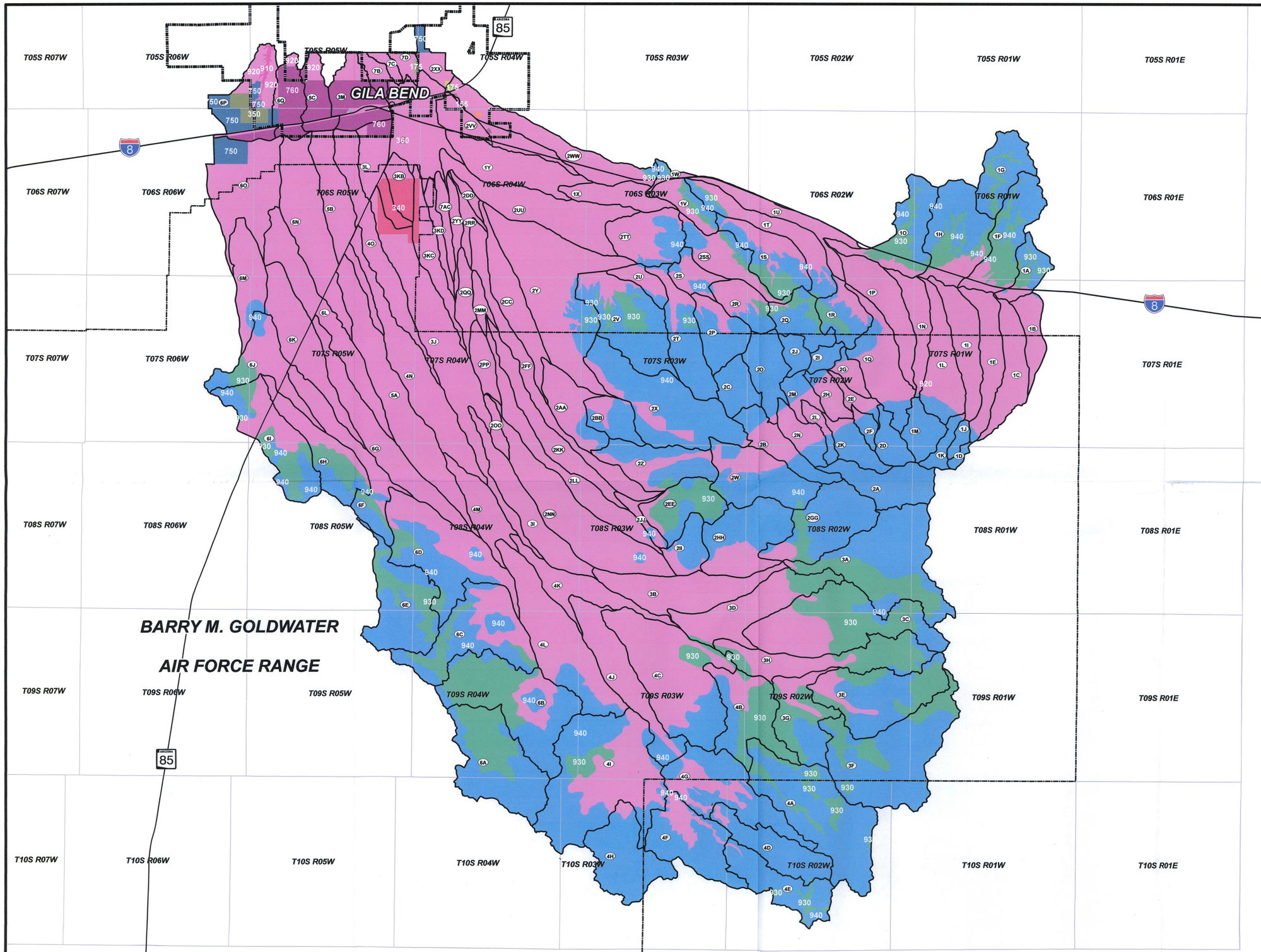
Note:

Difference between FDS discharge and updated results - positive value indicates FDS study results are greater than updated model results

HEC-1	Peak Discharge, in cfs			Time to Peak, in cfs		Area, in sq. mi.	
ID	Regultory	Updated	% Diff	Regultory	Updated	Regultory	Updated
DC47L	5,052	3,045	40	16.65	16.50	67.38	67.38
DC47R	5,052	3,045	40	16.65	16.50	67.38	67.38
47R-48	4,941	2,994	39	17.45	17.58	67.38	67.38
6K	2,579	1,631	37	13.75	13.42	5.95	5.95
C48	4,966	3,006	39	17.45	17.58	73.33	73.32
DC48L	2,483	1,503	39	17.45	17.58	73.33	73.32
DC48R	2,483	1,503	39	17.45	17.58	73.33	73.32
48R-50	2,314	1,469	37	18.65	19.08	73.33	73.32
6G	2,222	1,275	43	14.40	13.92	6.37	6.37
R45-50	1,800	1,150	36	16.80	16.58	6.37	6.37
6L	2,374	1,413	40	14.15	13.75	6.34	6.34
C50	3,136	2,057	34	17.20	16.42	86.04	86.04
R50-52	2,359	1,978	16	18.35	17.58	86.04	86.04
BDC47L	5,052	3,045	40	16.65	16.50	67.38	67.38
47L-49	4,831	2,956	39	18.25	18.58	67.38	67.38
RTC48R	2,483	1,503	39	17.45	17.58	73.33	73.32
48L-49	2,314	1,470	36	18.65	19.08	73.33	73.32
6M	2,160	1,415	34	13.25	13.17	3.86	3.86
C49	7,036	4,335	38	18.40	18.83	77.19	77.19
R49-51	6,891	4,263	38	19.50	20.08	77.19	77.19
6O	4,355	2,435	44	13.25	13.33	8.13	8.13
C51I	6,891	4,263	38	19.50	20.08	85.32	85.32
CPND1	8,696	5,767	34	19.40	20.17	98.03	98.03
PND1	8,630	5,746	33	19.55	20.33	98.03	98.03
C52O	1,217	707	42	19.55	20.33	98.03	98.03
C51O	7,414	5,039	32	19.55	20.33	98.03	98.03
R51-54	7,401	5,034	32	19.65	20.42	98.03	98.03
R54-57	7,346	5,020	32	19.90	20.67	98.03	98.03
BC52O	1,217	707	42	19.55	20.33	98.03	98.03
R52-55	1,207	706	42	19.65	20.42	98.03	98.03
R55-57	1,181	703	40	19.80	20.58	98.03	98.03
C57	8,525	5,723	33	19.90	20.67	98.03	98.03
R57-58	8,406	5,677	32	20.55	21.42	98.03	98.03
6P	2,649	1,132	57	13.30	13.50	5.21	5.21
C58	8,407	5,677	32	20.55	21.42	103.24	103.24

Appendix C

Digital Files



GILA BEND WATERSHED
DETAILED FDS
F.C.D. CONTRACT NO. 2008C046

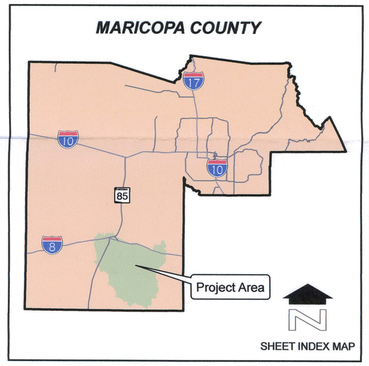
LEGEND

LANDUSE	
LUCODE	
155	360
175	370
195	750
330	760
340	910
350	920
	930
	940

Range Boundary

NOTES

1. Land use polygons determined using soils data and current aerial photography



0 3,000 6,000
Feet

NO.	REVISION	BY	DATE
2			
1	UPDATED BASINS AND FLOW PATHS	BGS	09/02/11

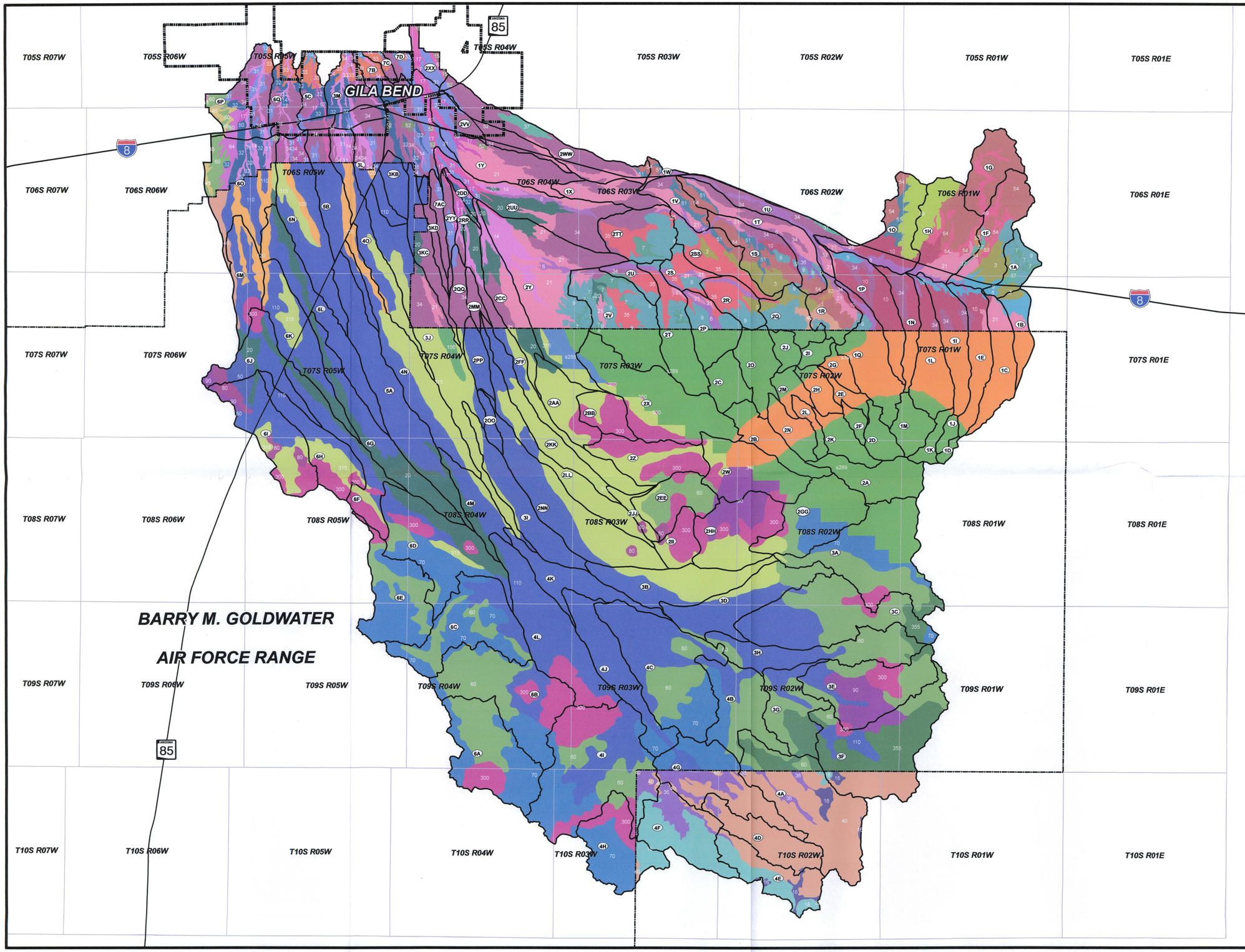
Stantec
Stantec Consulting Inc.
8211 S. 48th Street
Phoenix, AZ U.S.A. 85044

Land Use Map

FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY

	BY	DATE
DESIGN	MG	09/02/11
DESIGN CHK.	PE	09/02/11
PLANS	MG	09/02/11
PLANS CHK.	PE	09/02/11

SHEET 1 of 1



GILA BEND WATERSHED
DETAILED FDS
F.C.D. CONTRACT NO. 2008C046

LEGEND

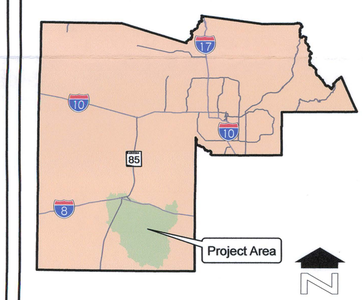
Soil Map Unit			
10	20	36	58
100	21	37	6
110	3	40	60
12	300	45	64
120	31	49	67
14	315	5	7
15	32	50	70
16	33	51	80
17	34	52	9
18	35	53	90
	355	54	s288
			s289
			s399

Range Boundary

NOTES

1. Soil map unit data source is the NRCS as published in the following surveys
   a. Gila Bend-Ajo Area, Parts of Maricopa and Pima Counties (NRCS, 1997)
   b. Luke Air Force Range, Parts of Maricopa, Pima and Yuma Counties (NRCS, on-going)
   c. Tohono O'odham Nation, Parts of Maricopa, Pima, and Pinal Counties
   d. U.S. General Soil Map (NRCS, 2008)
2. The U.S. general Soil Survey is used to suppliment uncompleted areas of the Luke Air Force Range Soil Survey

MARICOPA COUNTY



SHEET INDEX MAP

0 3,000 6,000
Feet

NO.	REVISION	BY	DATE
2			
1	UPDATED BASINS AND FLOW PATHS	BGS	09/02/11

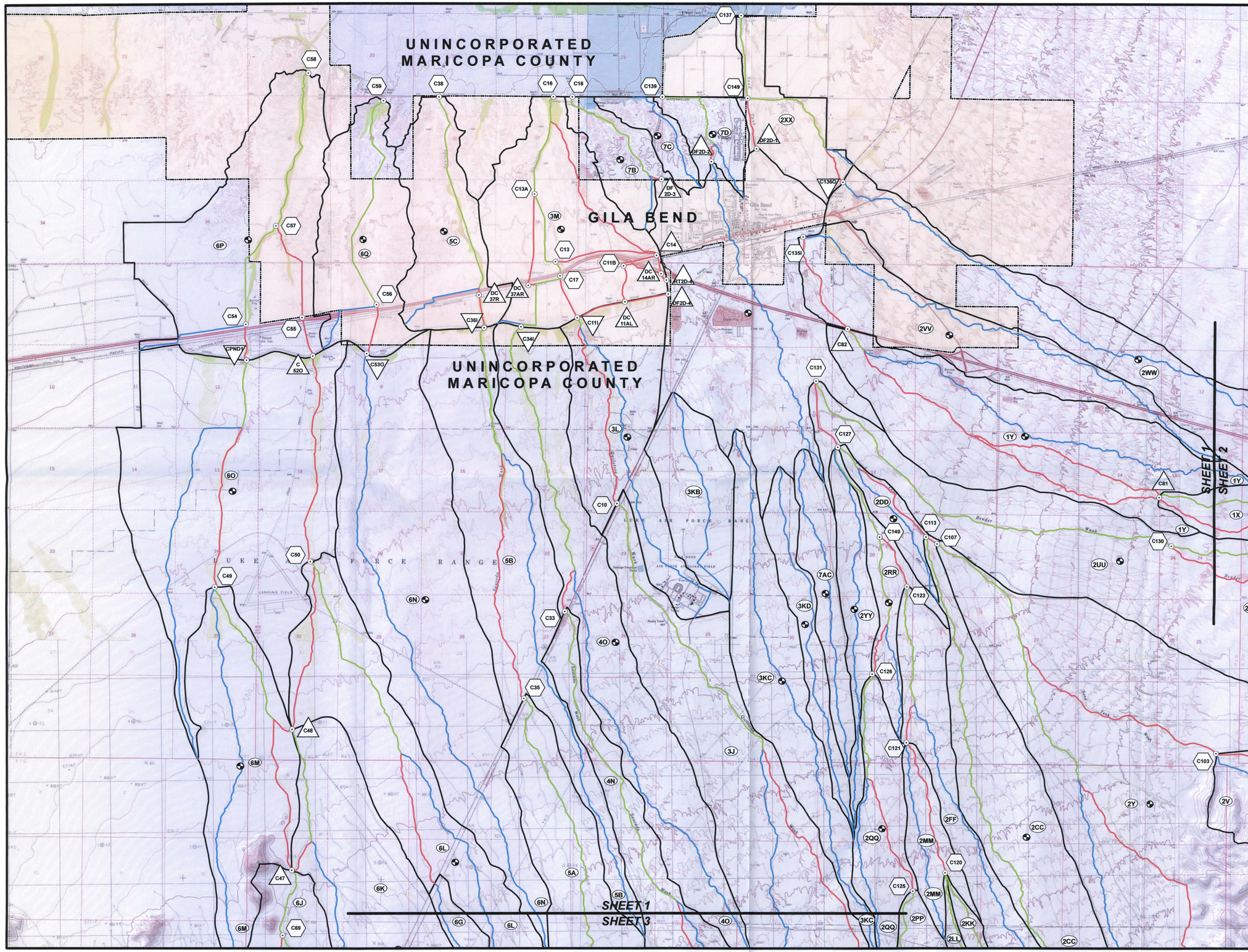
Stantec Consulting Inc.
8211 S. 48th Street
Phoenix, AZ U.S.A. 85044

Soils Map

FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY

	BY	DATE
DESIGN	MG	09/02/11
DESIGN CHK.	PE	09/02/11
PLANS	MG	09/02/11
PLANS CHK.	PE	09/02/11

SHEET 1 of 1



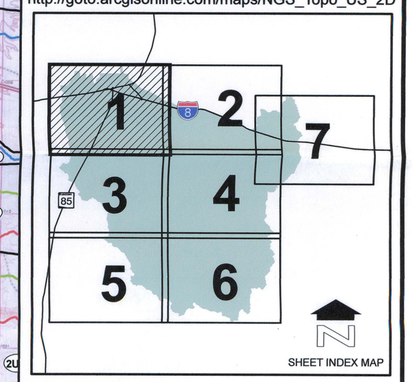
GILA BEND AREA DRAINAGE MASTER PLAN HYDROLOGY UPDATE
F.C.D. CONTRACT NO. FCD2007C017

LEGEND

- CENTROIDS
- Routing Reach
- Time of Concentration
- Routing Reach and Time of Concentration
- DRNBSN
- City Boundary
- Concentration Point
- Subbasin ID
- Diversion ID
- Storage ID
- Concentration Point ID

NOTES

Base mapping is referenced from national Geographic TOPO!, an on-line server housing a seamless image set of USGS quadrangle maps. The on-line server is hosted by ESRI and available at: http://goto.arcgisonline.com/maps/NGS_Topo_US_2D



N

0 3,000 6,000

Feet

NO.	REVISION	BY	DATE
2			
1	UPDATED BASINS AND FLOW PATHS	BGS	09/02/11

Stantec

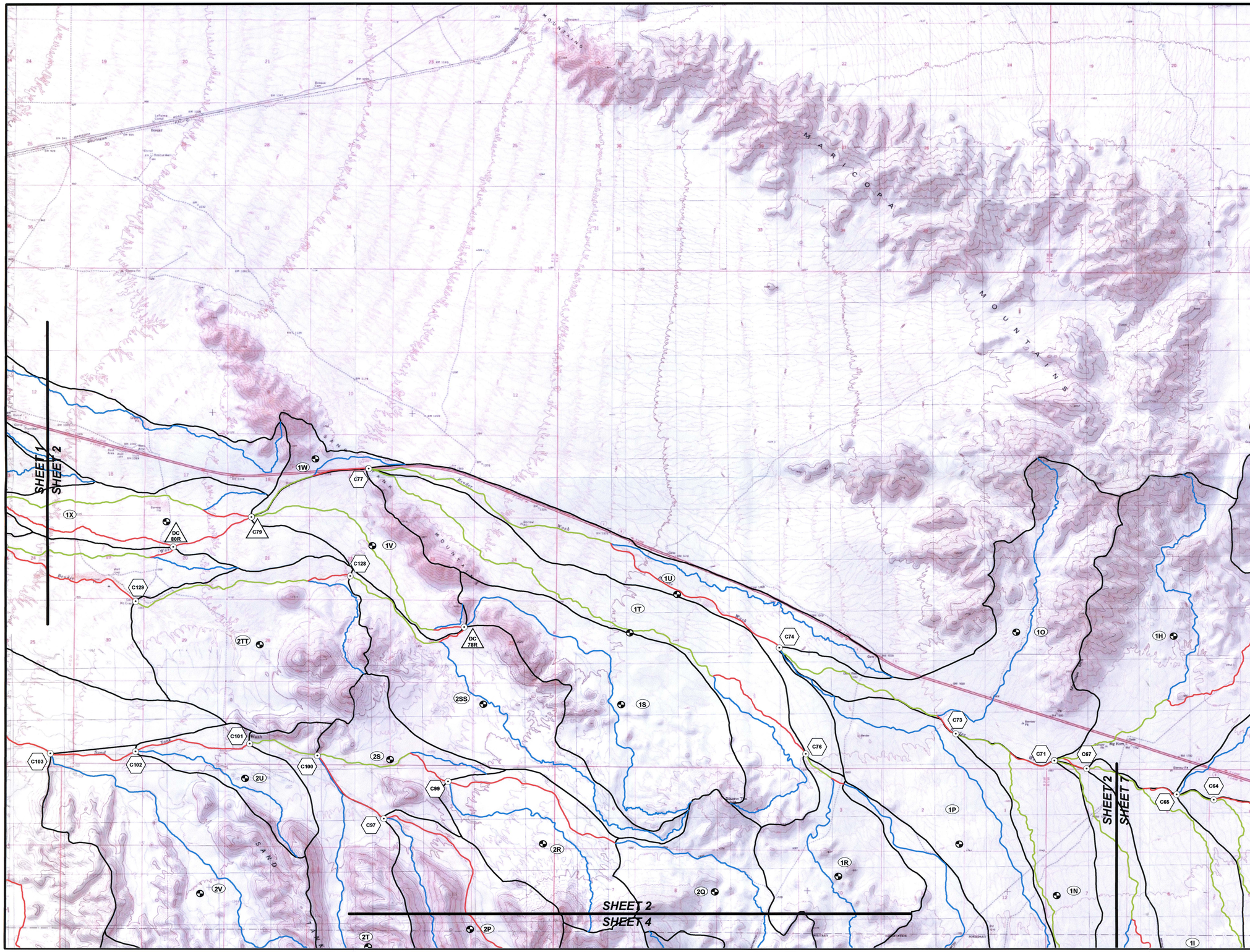
Stantec Consulting Inc.
8211 S. 48th Street
Phoenix, AZ U.S.A. 85044

Watershed Maps

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

	BY	DATE
DESIGN	MG	09/02/11
DESIGN CHK.	PE	09/02/11
PLANS	MG	09/02/11
PLANS CHK.	PE	09/02/11

SHEET 1 of 7



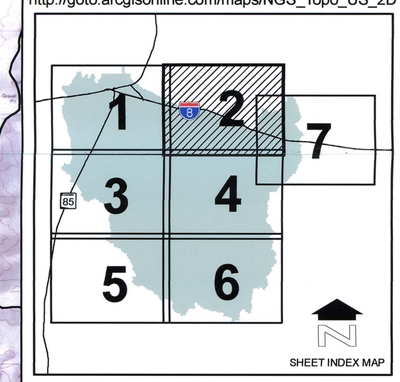
GILA BEND AREA DRAINAGE MASTER PLAN HYDROLOGY UPDATE F.C.D. CONTRACT NO. FCD2007C017

LEGEND

- CENTROIDS
- Routing Reach
- Time of Concentration
- Routing Reach and Time of Concentration
- DRNBSN
- City Boundary
- Concentration Point
- Subbasin ID
- Diversion ID
- Storage ID
- Concentration Point ID

NOTES

Base mapping is referenced from national Geographic TOPO!, an on-line server housing a seamless image set of USGS quadrangle maps. The on-line server is hosted by ESRI and available at: http://goto.arcgisonline.com/maps/NGS_Topo_US_2D



0 3,000 6,000
Feet

NO.	REVISION	BY	DATE
2			
1	UPDATED BASINS AND FLOW PATHS	BGS	09/02/11

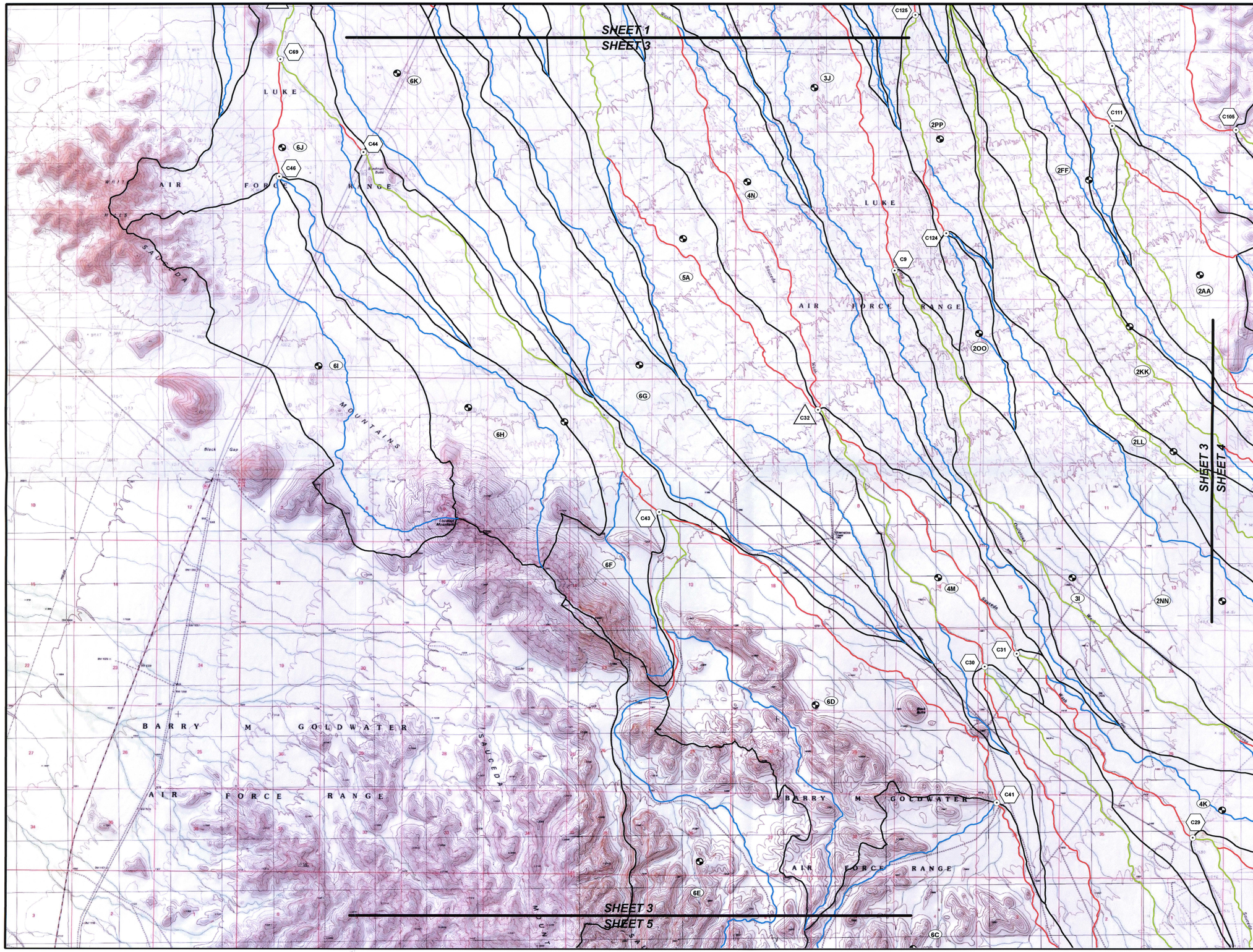
Stantec
Stantec Consulting Inc.
8211 S. 48th Street
Phoenix, AZ U.S.A. 85044

Watershed Maps

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

	BY	DATE
DESIGN	MG	09/02/11
DESIGN CHK.	PE	09/02/11
PLANS	MG	09/02/11
PLANS CHK.	PE	09/02/11

SHEET 2 of 7



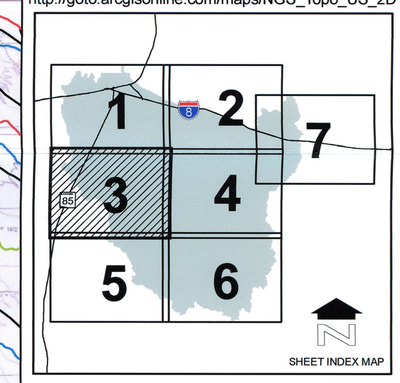
GILA BEND AREA DRAINAGE MASTER PLAN HYDROLOGY UPDATE
F.C.D. CONTRACT NO. FCD2007C017

LEGEND

- CENTROIDS
- Routing Reach
- Time of Concentration
- Routing Reach and Time of Concentration
- DRNBSN
- City Boundary
- Concentration Point
- Subbasin ID
- Diversion ID
- Storage ID
- Concentration Point ID

NOTES

Base mapping is referenced from national Geographic TOPO!, an on-line server housing a seamless image set of USGS quadrangle maps. The on-line server is hosted by ESRI and available at: http://goto.arcgisonline.com/maps/NGS_Topo_US_2D



0 3,000 6,000
Feet

NO.	REVISION	BY	DATE
2			
1	UPDATED BASINS AND FLOW PATHS	BGS	09/02/11

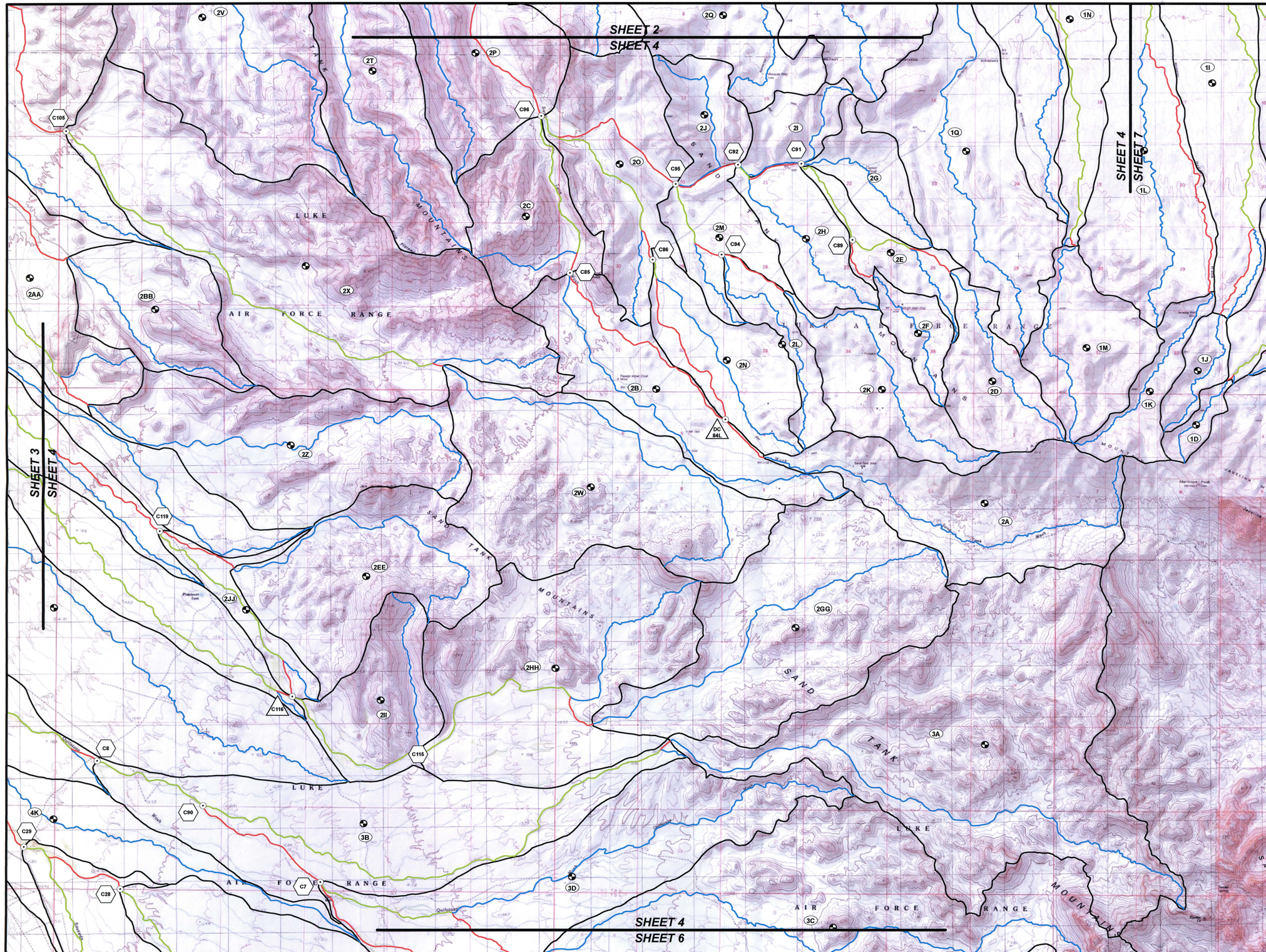
Stantec
Stantec Consulting Inc.
8211 S. 48th Street
Phoenix, AZ U.S.A. 85044

Watershed Maps

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

	BY	DATE
DESIGN	MG	09/02/11
DESIGN CHK.	PE	09/02/11
PLANS	MG	09/02/11
PLANS CHK.	PE	09/02/11

SHEET 3 of 7



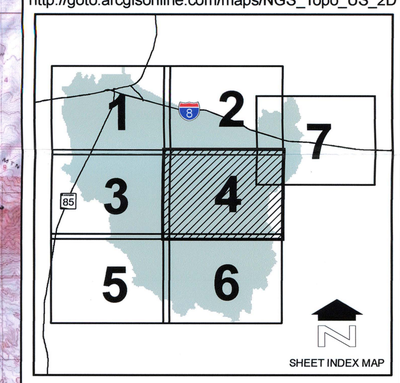
GILA BEND AREA DRAINAGE MASTER PLAN HYDROLOGY UPDATE
F.C.D. CONTRACT NO. FCD2007C017

LEGEND

- CENTROIDS
- Routing Reach
- Time of Concentration
- Routing Reach and Time of Concentration
- DRNBSN
- City Boundary
- Concentration Point
- Subbasin ID
- Diversion ID
- Storage ID
- Concentration Point ID

NOTES

Base mapping is referenced from national Geographic TOPO!, an on-line server housing a seamless image set of USGS quadrangle maps. The on-line server is hosted by ESRI and available at: http://goto.arcgisonline.com/maps/NGS_Topo_US_2D



0 3,000 6,000
Feet

NO.	REVISION	BY	DATE
2			
1	UPDATED BASINS AND FLOW PATHS	BGS	09/02/11

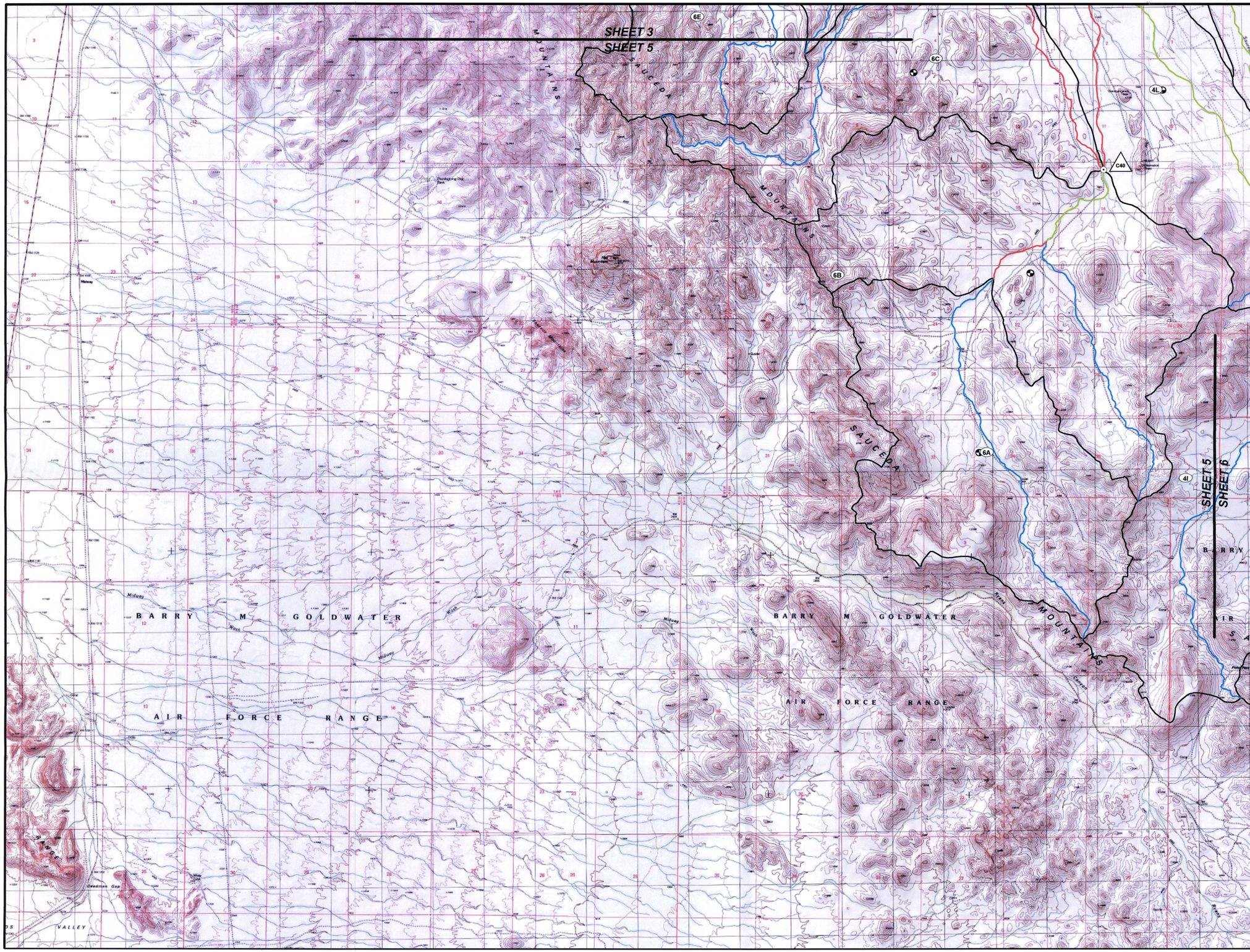
Stantec
Stantec Consulting Inc.
8211 S. 48th Street
Phoenix, AZ U.S.A. 85044

Watershed Maps

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

	BY	DATE
DESIGN	MG	09/02/11
DESIGN CHK.	PE	09/02/11
PLANS	MG	09/02/11
PLANS CHK.	PE	09/02/11

SHEET 4 of 7



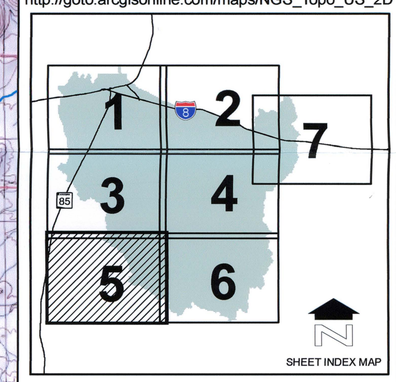
GILA BEND AREA DRAINAGE MASTER PLAN HYDROLOGY UPDATE
F.C.D. CONTRACT NO. FCD2007C017

LEGEND

- CENTROIDS
- Routing Reach
- Time of Concentration
- Routing Reach and Time of Concentration
- DRNBSN
- City Boundary
- Concentration Point
- Subbasin ID
- Diversion ID
- Storage ID
- Concentration Point ID

NOTES

Base mapping is referenced from national Geographic TOPO!, an on-line server housing a seamless image set of USGS quadrangle maps. The on-line server is hosted by ESRI and available at: http://goto.arcgisonline.com/maps/NGS_Topo_US_2D



0 3,000 6,000
Feet

NO.	REVISION	BY	DATE
2			
1	UPDATED BASINS AND FLOW PATHS	BGS	09/02/11

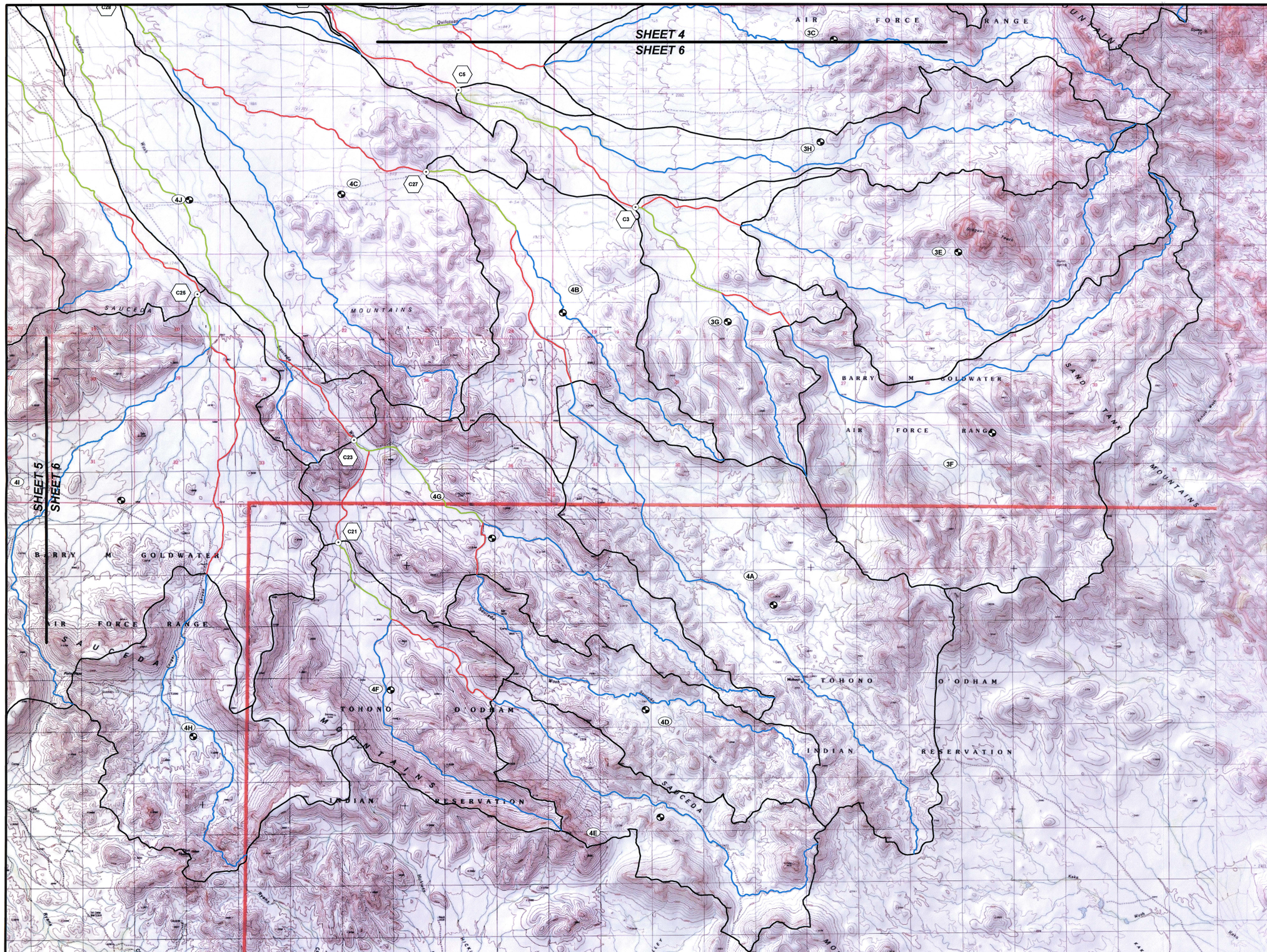
Stantec
Stantec Consulting Inc.
8211 S. 48th Street
Phoenix, AZ U.S.A. 85044

Watershed Maps

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

	BY	DATE
DESIGN	MG	09/02/11
DESIGN CHK.	PE	09/02/11
PLANS	MG	09/02/11
PLANS CHK.	PE	09/02/11

SHEET 5 of 7



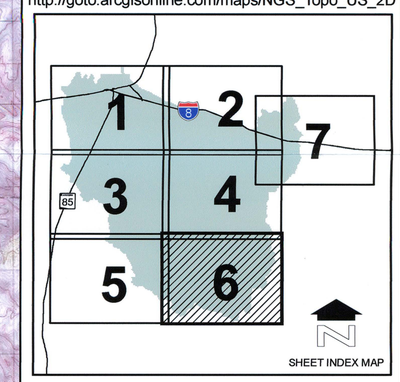
GILA BEND AREA DRAINAGE MASTER PLAN HYDROLOGY UPDATE
F.C.D. CONTRACT NO. FCD2007C017

LEGEND

- CENTROIDS
- Routing Reach
- Time of Concentration
- Routing Reach and Time of Concentration
- DRNBSN
- City Boundary
- Concentration Point
- Subbasin ID
- Diversion ID
- Storage ID
- Concentration Point ID

NOTES

Base mapping is referenced from national Geographic TOPO!, an on-line server housing a seamless image set of USGS quadrangle maps. The on-line server is hosted by ESRI and available at: http://goto.arcgisonline.com/maps/NGS_Topo_US_2D



SHEET INDEX MAP

N

0 3,000 6,000

Feet

NO.	REVISION	BY	DATE
2			
1	UPDATED BASINS AND FLOW PATHS	BGS	09/02/11

Stantec

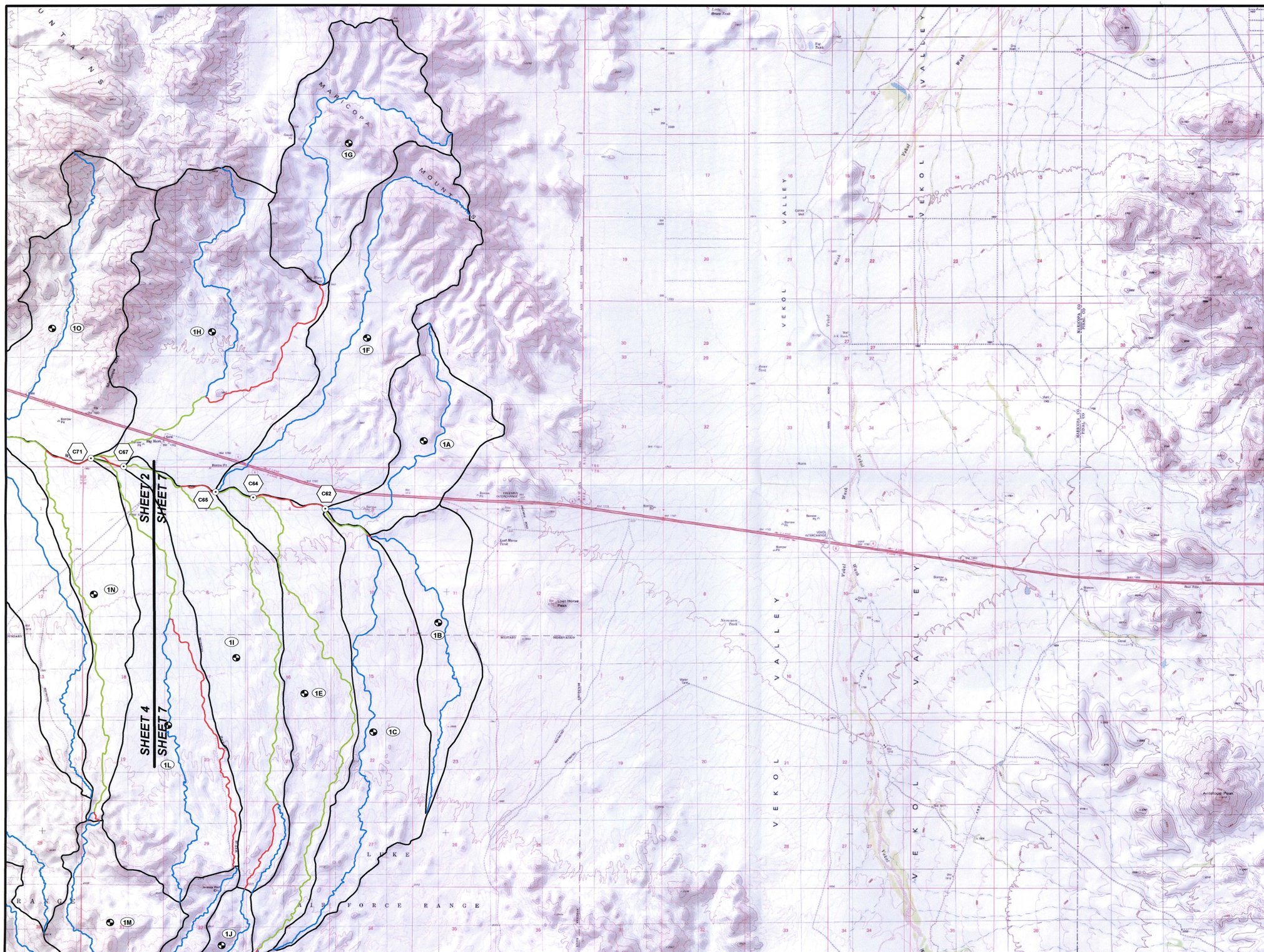
Stantec Consulting Inc.
8211 S. 48th Street
Phoenix, AZ U.S.A. 85044

Watershed Maps

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

	BY	DATE
DESIGN	MG	09/02/11
DESIGN CHK.	PE	09/02/11
PLANS	MG	09/02/11
PLANS CHK.	PE	09/02/11

SHEET 6 of 7



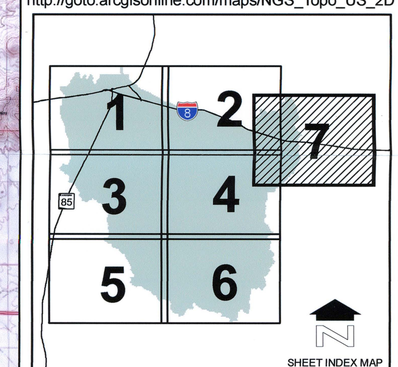
GILA BEND AREA DRAINAGE MASTER PLAN HYDROLOGY UPDATE
F.C.D. CONTRACT NO. FCD2007C017

LEGEND

- CENTROIDS
- Routing Reach
- Time of Concentration
- Routing Reach and Time of Concentration
- DRNBSN
- City Boundary
- Concentration Point
- Subbasin ID
- Diversion ID
- Storage ID
- Concentration Point ID

NOTES

Base mapping is referenced from national Geographic TOPO!, an on-line server housing a seamless image set of USGS quadrangle maps. The on-line server is hosted by ESRI and available at: http://goto.arcgisonline.com/maps/NGS_Topo_US_2D



0 3,000 6,000
Feet

NO.	REVISION	BY	DATE
2			
1	UPDATED BASINS AND FLOW PATHS	BGS	09/02/11

Stantec
Stantec Consulting Inc.
8211 S. 48th Street
Phoenix, AZ U.S.A. 85044

Watershed Maps

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

	BY	DATE
DESIGN	MG	09/02/11
DESIGN CHK	PE	09/02/11
PLANS	MG	09/02/11
PLANS CHK	PE	09/02/11

SHEET 7 of 7