Drainage Reports

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Water Study

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Stormwater Waiver Application

PRELIMINARY DRAINAGE REPORT
FOR
DESERT MOUNTAIN PARCEL 19

June 16, 2016
WP# 164434

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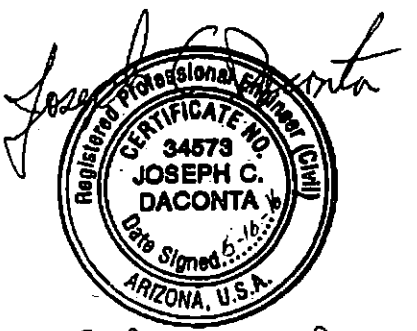

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1.0 INTRODUCTION

1.1 Project Description

Desert Mountain Parcel 19 (DM 19), herein referred to as the "Site," is an approximate 92-acre parcel of land located in north Scottsdale and is proposed to be rezoned to R4 zoning and OS (Open Space). The Site is located in Section 31, Township 6 North, Range 5 East, of the Gila and Salt River Base and Meridian. The Site is currently an undeveloped parcel, bound to the west by Pima Road and the Carefree Fore More Development (located within the Town of Carefree), to the east by the Desert Mountain Club Golf Course, to the north by the Gambel Quail Preserve 2 Development (both located in the City of Scottsdale), and to the south and southeast by the Velvet Shadows 3 Development and two churches (Christ the Lord Lutheran Church and Our Lady of Joy Roman Catholic Church; all within the Town of Carefree). The Site was originally part of the Desert Mountain Master Development Plan. Exhibit 1 – *Vicinity Map* shows the general location of the project and surrounding areas.

1.2 Type of Report

This Report is being prepared as a Preliminary Drainage Report for the DM 19 rezoning submittal to the City of Scottsdale. At this time, only preliminary grading, roadways and a general land use plan has been completed for the Site.

1.3 Purpose

The Preliminary Drainage Report for DM 19 has been prepared to meet the drainage design requirements outlined in Chapter 4 of the *City of Scottsdale Design Standards and Policies Manual* (*DS&PM*), the *Flood Control District of Maricopa County* (FCDMC), *Drainage Design Manual for Maricopa County, Arizona: Volume I – Hydrology*, and the *Flood Control District of Maricopa County, Drainage Design Manual for Maricopa County, Arizona: Volume II – Hydraulics*. This report presents the results of the hydrological and hydraulic modeling of the Site's proposed preliminary drainage systems.

The main purpose of this Report is to illustrate the following:

- Compliance with the City of Scottsdale's Floodplain Ordinance stormwater storage requirements for the property subject to the Environmentally Sensitive Land Ordinance (ESLO). The Site will provide the first flush stormwater storage for the first 0.5-inch of runoff and/or first flush treatment for the property's improved areas. A Request for a Stormwater Storage Waiver is anticipated to be submitted to the City of Scottsdale.

- Reduction of post-development flows to at or below the pre-development flows for 2-year, 10-year, and 100-year, 6-hour storm events using the *U.S. Army Corps of Engineers, HEC-1, Flood Hydrograph Package*. Hence, it is anticipated that the downstream properties shall be provided with similar or potentially better flood protection than the pre-development conditions.

- Maintaining the two main water courses traversing through the Site in their natural locations (the Galloway Wash and Wash A).

- Delineation of the 100-year water surface inundation extents, along with determination of the 100-year water surface elevations for the two main drainage courses using the *U.S. Army Corps of Engineers, HEC-RAS* (Version 4.1.0).

- Delineation of the 100-year water surface inundation extents for all washes determined to have peak flows equal to or greater than 50 cfs using hydraulic analysis software such as AutoCad Civil 3D *Hydroflow* (Version 10.5).

- Hydraulic analyses of preliminary drainage structures and wash conveyance corridors.

2.0 EXISTING ON-SITE DRAINAGE CONDITIONS AND CHARACTERISTICS

2.1 On-Site Drainage

The Site lies in the northern planning section of the City of Scottsdale. The elevations range from 2,612 in the middle of the Site, to 2,650 feet in the east and 2,587 feet in the west. Based on the existing topography, the Site drains primarily from east to west with an approximate average slope of 2%. There are two primary outflow concentration points, one located at the northwest corner and one at the center of the western property boundary. There are several additional minor outflow concentration points along the southern and western property boundary.

Vegetation is typical Sonoran Desert type with creosote bush, jumping cholla, saguaro cacti, palo verde, ironwood, and mesquite trees. The Site lies within the areas identified as Environmentally Sensitive Lands (ESL) by the City of Scottsdale. The Site is further classified as 'Upper Desert' within the ESL areas as shown on Exhibit 2 – *ESL Classification Map.*

The USDA Natural Resources Conservation Service (NRCS), formerly known as the Soil Conservation Service (SCS), provides soils data for all of Maricopa County. This data is reproduced on Exhibit 4 – *Soils Classification Map.* Soils data is the basis of the rainfall loss parameters, as discussed in Section 5.2.3.

There is one wash, the Galloway Wash, that traverses the Site and is categorized as a 'Vista Corridor' or 'Major Wash', as the calculated 100-year, 6-hour flow is greater than 750 cfs. There is also one other significant watercourse traversing the Site that has a 100-year, 6-hour flow greater than 400 cfs and is referred to as "Wash A". The Galloway Wash and Wash A are identified on Exhibit 9 – *Existing Conditions Hydraulics Map.* Wash A was determined to have a 100-year flow of approximately 470 cfs. Both washes will be maintained in their natural locations and will not be re-aligned.

2.2 Existing On-Site Drainage Network

Existing on-site drainage sub-basin boundaries were identified using aerial mapped 1-foot contours; refer to Exhibit 7 – *Existing Conditions Sub-Basin HEC-1 Map.*

The on-site watersheds primarily drain east to west or southwest with only one wash exiting the property along the southern boundary with a 100-year peak flow greater than 50 cfs. This wash appears to enter the Velvet Shadows 3 Development and continues west combining with some additional runoff from the Site before flowing through the Our Lady of Joy Roman Catholic Parish Carefree church parking lot and ultimately over Pima Road by an at-grade drainage crossing. The flow exiting the Site has an estimated existing 100-year peak flow of 65 cfs.

Based on the results of the wash hydraulic analysis, a delineation of this wash's existing condition 100-year, 6-hour floodplain limits has been illustrated on Exhibit 9 – *Existing Conditions Hydraulic Map.* Pre-development sub-critical flow water surface elevations for each cross-section are included on Exhibit 9. The hydrologic and hydraulic analysis procedures are discussed in Section 5.0. It is anticipated that this wash will be modified and an Application for Wash Modification will be submitted to the City of Scottsdale.

2.3 Off-Site Watersheds

The off-site drainage areas impacting the Site lay to the east and are in the northern planning section of the City of Scottsdale. The off-site watersheds contain primarily large rural lot single family residential subdivisions and are part of the Desert Mountain Master Development Plan community. These drainage areas are identified on Exhibit 7. The off-site areas are also classified as 'Upper Desert' ESL landform areas by the City of Scottsdale.

2.4 Existing Off-Site Drainage Network

The *Floodplain Delineation Study of Andora Hills & Galloway Washes Technical Data Notebook* (TDN), the *Master Drainage Report for Desert Mountain Parcel C* Offsite Drainage Map, the *Master Drainage Report for Desert Mountain Development* Master Development Plan exhibit and the City of Scottsdale 2-foot contour interval topographic Quarter Section Maps were used to identify and confirm the off-site drainage areas impacting the Site. Refer to Exhibit 7 for the limits of the drainage areas and concentration points.

Off-site flows from the east enter the Site's eastern property boundary at five locations. Four of the concentration points are washes with 100-year peak discharges greater than

50 cfs and one location has a discharge of only 3 cfs. Starting at the northeast property boundary and continuing south, the washes' approximate 100-year peak flows were determined to be: Wash A's flow is 468 cfs, two unnamed washes' flows are 72 cfs and 111 cfs, and the Galloway Wash is 1,111 cfs.

Based on the results of the HEC-RAS and hydraulic wash analyses, a delineation of the existing condition 100-year, 6-hour floodplain limits for the Galloway Wash, Wash A and the two unnamed washes have been illustrated on Exhibit 9 – *Exist Condition Hydraulics Map*. Pre-development subcritical flow water surface elevations for each cross-section are included on Exhibit 9. The hydrologic and hydraulic analysis procedures are discussed in Section 5.0.

2.5 Existing Drainage Relative to Adjacent Projects

Existing washes exit the Site as concentrated flows at various locations along the western and southern property boundary. As Wash A exits the Site it immediately combines with additional flow from the north and is conveyed over Pima Road by an at-grade drainage crossing. The Galloway Wash also is conveyed over Pima Road by an at-grade drainage crossing and the preliminary hydraulic results determined that the depth of flow over Pima Road is greater than one foot. As detailed within the *Floodplain Delineation Study of Andora Hills & Galloway Washes* TDN, when the flow leaves Pima Road it splits around the existing single-family residence before recombining downstream and continuing to the west.

There are an additional six concentrated flow exit locations along the western property boundary and three concentrated flow exit locations along the southern property boundary. These 100-year peak flows vary from a maximum discharge of 67 cfs to only 4 cfs. Refer to Exhibit 7 for the exiting concentration point locations.

There is also a small piece of the Site that is not within the City of Scottsdale and is located at the southeast corner of the property. This portion of the Site is located within the Town of Carefree and also has two existing concentration points that exit the Site to the west.

2.6 FEMA Regulated Flood Zones

The Site is located within the Flood Insurance Rate Map (FIRM) for Maricopa County, Arizona and Incorporated Areas, Panel Number 04013C0884L, effective date October 16, 2013. The FIRM, published by the Federal Emergency Management Agency (FEMA), indicates that the Site is located within Special Flood Hazard Areas (SFHAs) Zone AE, Other Flood Areas Zone "X" (Shaded) and Other Areas Zone "X".

Zone "X" is defined by FEMA as follows:

> *"Areas determined to be outside 500-year floodplain."*

Zone "X (Shaded)" is defined by FEMA as follows:

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

Special Flood Hazard Areas (SFHAs) Subject To Inundation By the 1% Annual Chance Flood is defined as follows:

> *"The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Aras is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE AH, AO, AR, A99, V and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.*

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

The approximate location of the Site relative to the FEMA FIRM panel is illustrated on Exhibit 3- *Flood Insurance Rate Map (FIRM)*.

The proposed Site's development will not alter the effective FEMA SFHA floodplain and/or floodway and will not change the effective FEMA SFHA base flood elevations. This will be documented in more detail as the Site progresses into the pre-plat phase of development.

3.0 PROPOSED DRAINAGE PLAN

3.1 General Description of Proposed Drainage System

The Site is being rezoned to approximately 44-acres of R4 zoning and approximately 48-acres of Open Space zoning. Preliminary site grading is shown on Exhibit 11 – *Preliminary Grading Plan.* The proposed drainage system is being designed to allow existing drainage patterns to be maintained in their natural location and condition where possible. Where the proposed development will disturb existing washes with 100-year peak discharges equal to or greater than 50 cfs, the washes will be modified to re-direct flow around and/or through the development to maintain historical flow patterns.

The off-site flow of the Galloway Wash will be conveyed through the Site with as little disturbance to the natural wash corridor as possible. The Galloway Wash will have two proposed 3-barrel, 10-foot wide by 4-foot high box culvert roadway drainage crossings to pass the 100-year discharge under the streets. One crossing is located near the eastern property boundary and one crossing is located within the middle of the Site. There is no anticipated disturbance to the Galloway Wash natural wash bottom between these proposed drainage crossings. Downstream of the middle box culvert roadway crossing to approximately 200-feet upstream of the western property boundary, the Galloway Wash will have a relatively small pilot channel (20-foot wide by 1-foot deep) to offset some potential open space encroachment grading proposed within the existing FEMA SHFA. Any grading proposed within the existing FEMA 100-year floodplain will require an FCDMC floodplain use permit.

The off-site flow of Wash A will be conveyed through the Site. The post-development design is not anticipated to disturb the existing natural wash corridor. In addition, any post-development adjacent to the wash is being designed to drain away from Wash A. Therefore, there is no foreseen modification to the wash and/or change to the existing 100-year peak flow of Wash A due to development.

3.2 Future Conditions

Currently, the upstream off-site watersheds located within Desert Mountain have been fully developed. The Desert Mountain development land uses were obtained from the

Floodplain Delineation Study of Andora Hills & Galloway Washes TDN and were duplicated in the HEC-1 hydrologic models.

The drainage plan for the Site proposes to maintain the 2-year, 10-year, and 100-year, 6-hour storm event post-development peak discharges at or below the pre-development flows. In addition, the two significant drainage courses, Wash A and the Galloway Wash, will be maintained in their historic locations at the property boundary. No adverse impact is anticipated on the adjacent properties downstream of the project Site for the 2-year, 10-year, and 100-year, 6-hour storm events.

3.3 Stormwater Storage Requirements

According to the City of Scottsdale's Floodplain Ordinance for property located within the ESL, all runoff generated from the developed portion of the Site must be managed, and the peak discharges from the Site reduced to at least pre-development values during the 100-year, 10-year and 2-year storm frequencies. Proposed retention and/or detention basins will be strategically located along several exiting flow locations and along the Galloway Wash which will attenuate the post-development peak discharges to at or below the pre-development values. Stormwater storage basins will also be designed to intercept flow from upstream proposed developed areas to retain the post-development required first flush retention volume and/or flow will be treated prior to exiting into the adjacent washes. 18-inch bleed-off pipes with removable 6-inch orifice plates are proposed for the dissipation of the retained storm water.

Table 3.3 below summarizes the required first flush stormwater storage for the Site and Exhibit 8 and Exhibit 11 detail the on-site drainage areas and preliminary first flush basin locations, respectively.

Table 3.3
Required First Flush Stormwater Storage

Drainage Area	Area (SF)	Area (ac)	Weighted Runoff Coefficient	First Flush Volume (ac-ft)	Required Pre vs Post Volume (ac-ft)
B5	165024	3.79	1.00	0.16	0.42
B6	239591	5.50	1.00	0.23	N/A
B8	300366	6.90	1.00	0.29	N/A
B9	217378	4.99	1.00	0.21	N/A
B10	335363	7.70	1.00	0.32	N/A
B11	269364	6.18	1.00	0.26	N/A
B13	80916	1.86	1.00	0.08	N/A
B14	1072718	24.63	1.00	1.03	N/A
B14A	115650	2.65	1.00	0.11	N/A
C1	636403	14.61	1.00	0.61	N/A

3.4 Pre- and Post-Runoff Characteristics

The U.S. Army Corps of Engineers' HEC-1 computer analysis program was used for hydrologic modeling, including routing of flow through storage basins and combining hydrographs. The HEC-1 model was also used to compare the pre- and post-development runoff at concentration points exiting the property. Runoff for each drainage sub-basin was computed and if required, hydrographs were then combined. Drainage basins were further divided into sub-basins to simulate the developed conditions. The parameters were selected per the guidelines provided in the *DS&PM*. The parameters selected and the inputs for the HEC-1 models are discussed in Section 5.1.

The HEC-1 input data and output files for the existing conditions are included in Appendix A. The developed conditions data is included in Appendix B. The data analysis procedures are discussed in Section 5.0.

Table 3.4-1 below provides the comparative peak flows for the pre- vs. post-developed conditions for 100-year, 10-year, and 2-year, 6-hour events at concentration point where flow leaves the property. For the location of these concentration points and corresponding 100-year, 6-hour flow values, refer to Exhibit 7 and Exhibit 8.

Table 3.4-1
Pre – vs. Post-Peak Flow Analysis

HEC-1 ID PRE/POST	100-yr, 6-hr Existing Condition Peak Flow (cfs)	100-yr, 6-hr Post-Dev. Condition Peak Flow (cfs)	100-yr, 6-hr Difference in Peak Flow (cfs)	10-yr, 6-hr Existing Condition Peak Flow (cfs)	10-yr, 6-hr Post-Dev. Condition Peak Flow (cfs)	10-yr, 6-hr Difference in Peak Flow (cfs)	2-yr, 6-hr Existing Condition Peak Flow (cfs)	2-yr, 6-hr Post-Dev. Condition Peak Flow (cfs)	2-yr, 6-hr Difference in Peak Flow (cfs)
CP-A2/CP-A2	469	467	2	261	260	1	128	128	0
B1/DVB11	35	30	5	19	15	4	8	0	8
C1/DTC11	26	5	21	14	5	9	6	5	1
CP-E5/CPGAL	1124	1025	99	549	527	22	230	222	8
F1/DTGF	4	3	1	2	1	1	1	1	0
G1/DTC-H	23	15	8	13	8	5	6	0	6
H1/DV-B5	17	17	0	10	0	10	5	0	5
I1	20			11			5		
J1	10			6			3		
K1	65			36	29		17		
I1,J1,K1/DTC-K	95	50	45	53	18	35	25	1	24
L1	10	10	0	6	6	0	3	3	0
M1	3	3	0	2	2	0	1	1	0

3.5 Proposed Drainage Structures

3.5.1 On-site First Flush Storage Basins

On-site first flush storage basins will be used to capture the first 0.5-inch of runoff from the post-development disturbed areas. The design of the basins will be at a maximum depth of 3-feet and have 4:1 side slopes. 18-inch bleed-off pipes with 6-inch orifice plates will be used to drain the stormwater storage within a 36-hour period. Outlet weirs will be incorporated into the basin design for overflow conveyance. When the capacity of the basin is reached, the runoff will overtop the weir and be released at historic flow locations. Erosion protection will be incorporated within the design of the outlets.

3.5.2 Off-Site & On-Site Galloway Wash Detention Basins

As detailed on Exhibit 8, there are two off-site off-line detention basins (Basin 3 and Basin 4) and one on-site off-line detention basin (Basin 1) proposed along the Galloway Wash. The two off-site off-line detention basins will require improved wash channel sections and erosion protected weir inlets to remove a

portion of the 100-year peak flow from the wash. The runoff will enter the detention basin and pond a maximum depth of 4-feet during the 100-year event and have a minimum of an 18-inch outflow pipe that will drain the basin within a few hours. The proposed detention basins will have storage volume capacities of approximately 2.0 acre-feet (Basin 3) and 1.4 acre-feet (Basin 4). Contractual agreements are being prepared with the upstream land owners to allow for the construction and maintenance of these off-line detention basins.

One on-site off-line detention basin will be located downstream of the Galloway Wash middle box culvert crossing and will receive flow from an 18-inch pipe located upstream of the roadway crossing. This detention basin will collect some of the low-flow stormwater runoff to reduce the 2-year and 10-year peak flow of the Galloway Wash. There will be a weir outlet from the detention basin that will drain excess flow back into the Galloway Wash. The proposed detention basin will have approximately 1.1 acre-feet of storage volume at a maximum ponding depth of 4-feet during the 100-year runoff event. The bottom 1-foot will be used for on-site first flush storage. The basin will have an 18-inch outflow pipe with a 6-inch orifice plate that will also drain back into the Galloway Wash. It is anticipated that the basin will drain within a few hours.

The three off-line detention basins were included in the post-development HEC-1 model. The hydrology results can be found within Appendix B.

In several critical locations along the wash, bank protection is necessary to protect proposed off-line detention basins. The bank protection is planned to be aesthetically pleasing and may be either integrally colored soil cement and/or reinforced gunnite/concrete, seated grouted rock riprap and/or gabion baskets/mattresses. Bank protection will be designed to extend to a maximum calculated scour depth of 4-5 feet below the wash bottom. Refer to Exhibit 10 for bank protection locations and Appendix E for scour depth calculations.

3.5.3 Roadway Crossing Structures

There are currently two proposed on-site roadway drainage crossing structures that have been designed to convey the anticipated post-development 100-year

flow of the Galloway Wash. The flows were calculated at the box culvert locations using the results of the post-development HEC-1 model analysis. Refer to Appendix B for the flow calculations.

Both crossing locations will be designed with a 3-barrel, 10-foot wide by 4-foot high box culvert roadway drainage crossing. The roadway crossings were analyzed within the wash's hydraulic analysis using the U.S. Army Corps of Engineers *HEC-RAS (Version 4.1.0)*, such that the estimated upstream 100-year peak flow is contained within the wash and no overtopping of the roadway is anticipated. The box culverts will be designed with drop inlets and a longitudinal slope such that sediment deposition is not anticipated within the culverts.

Riprap and/or erosion protection will be designed at the inlets and outlets of the box culverts to control velocities and prevent erosion. In several critical locations along the wash, bank protection is necessary to protect the proposed roadway improvements. The bank protection shall extend to a maximum calculated scour depth of 4-5 feet below the wash bottom. Refer to Exhibit 10 for bank protection locations and Appendix E for scour depth calculations.

Although the land use is still in a preliminary stage, there are additional locations within the Site that are anticipated to require culverts to pass the flow under roadways and/or to convey flow from the eastern property boundary to the Galloway Wash. These culverts will be designed using AutoCad Civil 3D *Hydroflow* (Version 10.5), Bentley's *CulvertMaster*® *v3.1*, Copyright© 1995-2007, and/or the Federal Highway Administration HY-8 v7.3, 2013 program to determine the pipe sizes, headwater elevations and pipe velocities.

3.5.4 On-site Roadway Drainage Structures

3.5.4.1 Street Flow

The Rational Method will be used to calculate the storm water runoff generated from the roadways and any on-site adjacent developments that drain into the residential roadways. The 100-year and 10-year flow will be calculated for the street flow based on the FCDMC Rational Method, as discussed in Section 5.1.3.

3.5.4.2 Street Capacity Hydraulics

There are no anticipated arterial, major and/or minor collector roadways proposed within the development. For all local interior streets, the street conveyance capacity will be calculated using Manning's Equation. The streets will be designed such that the 10-year peak flow is contained within the street curbs and the 100-year peak flow does not exceed a maximum depth of 8-inches. A Manning's "n" value of 0.015 will be used for the standard street cross-section. Roadway capacities will be calculated based on 4-inch and/or 6-inch roll curb (where necessary). The drainage for local residential roadways will be designed consistent with the City of Scottsdale Ordinance 37-42(4) for the allowable depth of water on the street when the street is being utilized as a water carrier. The methodology developed by the Federal Highway Administration will be used to calculate, in spreadsheet format, the allowable street cross-section capacities.

3.5.4.3 Curb Openings

Catch basins, scuppers and/or depressed curb openings will be designed to convey runoff from the streets such that street flow depths do not exceed 8-inches for the 100-year flow, and the 10-year flow is contained within the curbs. On-site storm water runoff generated by the residential roadways is planned to exit the street via on-grade and/or low point sump curb openings. Flow will then be directed within storm drain, roadside drainage swales and/or along natural grade to the closest receiving wash, retention basin, and/or culvert inlet. All scupper and catch basin curb openings will be designed to include a 0.80 reduction factor.

4.0 SPECIAL CONDITIONS

4.1 Section 404 Washes

To the best of our knowledge, the US Army Corps of Engineers (Corps) Section 404 of the Clean Water Act (CWA) Jurisdictional Waters of the United States has not yet been determined within the Site. Potential CWA Section 404 Jurisdictional Washes are under investigation and an approved jurisdictional determination submittal inclusive of a significant nexus analysis is being prepared for the Site by Del Sol Group to identify if any of the washes may be deemed jurisdictional. It is understood that an approved jurisdictional delineation of the Waters of the United States is required for the Site.

5.0 DATA ANALYSIS METHODS

5.1 Hydrologic Method Description

This section documents the engineering procedures and methodologies used to generate the existing and developed condition hydrologic models for the Site. The results of the hydrologic models were used in the conceptual design of drainage facilities and to assure compliance with current drainage design standards.

Precipitation was input by use of the FCDMC 6-hour local storm. Key rainfall statistics were obtained from the *NOAA Atlas 14*, Arizona. The FCDMC DDMSW program was used to develop the necessary point rainfall depth-duration-frequency statistics. Table 5.1 below provides a summary of the point rainfall depth-duration-frequency data. Rainfall losses were calculated by use of the Green and Ampt infiltration equation with an allowance for surface retention loss. Synthetic unit hydrographs for each sub-basin were developed using the Phoenix Desert/Rangeland unit hydrograph as was used within the approved *Floodplain Delineation Study of Andora Hills & Galloway Washes* TDN. Existing and proposed discharges for the 100-year, 10-year and 2-year, 6-hour storm events were modeled using HEC-1 at various concentration points as shown on Exhibit 7 and Exhibit 8, respectively. The HEC-1 results are provided within Appendix A and Appendix B for the existing and proposed condition watersheds, respectively.

Table 5.1

Point Rainfall Depth-Duration-Frequency Data

Frequency→	2-year	5-year	10-year	25-year	50-year	100-year
Duration↓	Rainfall (in)					
5 min	0.33	0.44	0.53	0.64	0.73	0.82
10 min	0.50	0.67	0.80	0.98	1.11	1.24
15 min	0.62	0.83	1.00	1.21	1.37	1.54
30 min	0.83	1.12	1.34	1.63	1.85	2.07
1 hour	1.03	1.39	1.66	2.02	2.29	2.56
2 hour	1.19	1.57	1.87	2.27	2.58	2.90
3 hour	1.26	1.64	1.94	2.36	2.70	3.04
6 hour	1.48	1.87	2.18	2.62	2.96	3.31
12 hour	1.78	2.23	2.59	3.08	3.45	3.84
24 hour	2.08	2.73	3.27	4.02	4.65	5.32

5.2 Parameter Estimation

The physical parameters of the sub-basins modeled by HEC-1 were estimated by the procedures in the *FCDMC Hydrology Manual*. The information and procedures used to estimate the aforementioned parameters are contained in the following sections. Parameter values are summarized for each sub-basin within the *FCDMC Drainage Design Management System for Windows* (DDMSW) software output located in Appendices A and Appendix B, for the existing and proposed conditions, respectively.

5.2.1 Drainage Area

For the existing conditions, the sub-basin drainage areas were determined for use in the HEC-1 model and are shown on Exhibit 7. For the proposed condition, the sub-basin drainage areas were determined for use in the HEC-1 model and are shown on Exhibit 8.

5.2.2 Precipitation

Due to the approximate one square mile size of the largest contributing watershed of the Galloway Wash, the 100-year, 6-hour storm frequency was used for the hydrology analysis. Rainfall distributions based on watershed area are furnished by the FCDMC. The contributing watershed area and corresponding precipitation pattern were determined and input into the HEC-1 model using the JD and PC record option.

Point precipitation values used in this study were derived from the isopluvial maps in the *FCDMC Hydrology Manual* which, in turn, were derived from the *NOAA Atlas XIV, Volume III*. The 100-year, 6-hour point rainfall depth used for the Site is 3.31 inches.

5.2.3 Soil Data

A description of the soils in the watershed is contained within the *NRCS Soil Survey of Aguila-Carefree Area, Parts of Maricopa and Pinal Counties, Arizona.* Based on the NRCS surveys, the Site's watersheds lie mainly within several soil map units: Unit 93, 96, 34 and for the Galloway Wash Unit 6, with the upstream watersheds consisting of primarily Unit 33. According to the soil survey, the soil

surface is primarily gravely clay and sandy loam. Exhibit 4 – *Soils Classification Map* depicts the contributing watersheds and soil designations.

5.2.4 Rainfall Losses

Rainfall losses were estimated using the Green and Ampt infiltration equation. The procedures used are described in the following paragraphs and were utilized for both existing and proposed condition HEC-1 modeling.

The composite (unadjusted) XKSAT parameter was calculated in the *FCDMC DDMSW* program using the log-average method for each sub-basin. This was accomplished by multiplying the total area of each soil map unit in the sub-basin by the common logarithm of the associated XKSAT value. The resultant products were then totaled and the sum was divided by the total area of the sub-basin. The result is the composite log-average bare ground XKSAT parameter. The log-average XKSAT parameter was then adjusted for the effects of vegetation cover using data from Figure 4.4 of the *FCDMC Hydrology Manual.* The volumetric soil moisture deficit at the start of rainfall (DTHETA) and wetting front capillary suction (PSIF) parameters are directly related to the composite bare ground hydraulic conductivity (XKSAT) by Figure 4.3 in the *FCDMC Hydrology Manual.*

The DTHETA parameters were read from lookup tables within the DDMSW program using the unadjusted XKSAT value calculated as described above. Two (2) DTHETA conditions are possible, dry and normal. The "dry" condition was used for all areas in the existing condition model for undeveloped desert areas. The "normal" condition was used for all other land uses occurring within the project watershed for the proposed condition model. DTHETA values were read from the lookup tables corresponding to the unadjusted XKSAT value, and were averaged by land use area-weighting within the DDMSW program. The value of PSIF was also read from lookup tables based on the unadjusted XKSAT value.

Initial abstraction (IA) and percent impervious (RTIMP) values correlate to soil types and land use. The following section further discusses the hydrologic significance of the IA and RTIMP parameters.

5.2.5 Land Use Characteristics

Land use characteristics upstream of the study area were obtained from the *Floodplain Delineation Study of Andora Hills & Galloway Washes* TDN and were verified from aerial photographs. Surface characteristics affecting the hydrology include terrain (land use classification), the proportion of impervious surfaces, and vegetative cover density. *DDMSW* values for initial abstraction (IA), percent impervious (RTIMP) were obtained from the FCDMC Hydrology Manual. The *Floodplain Delineation Study of Andora Hills & Galloway Washes* TDN was used to estimate the hydraulic efficiency (Kn) for the *Rural Density Residential* land use parameters. Assigned values for all parameters are shown in Appendices A and Appendix B for existing and proposed land use conditions, respectively.

5.2.6 Unit Hydrographs

To be consistent with the approved *Floodplain Delineation Study of Andora Hills & Galloway Washes* TDN, the *FCDMC Hydrology Manual* Phoenix Desert/ Rangeland unit hydrograph was used for watersheds upstream of the project Site and for the undeveloped on-site areas. The Phoenix Valley S-graph unit hydrograph was used for the post-development on-site conditions. Separate unit hydrographs are generated for each sub-basin by the use of the DDMSW program. This program calculates the basin lag time. Assigned values for all parameters are shown within the printouts of the FCDMC DDMSW located within Appendix A and Appendix B for the existing and proposed conditions, respectively.

5.2.7 Computation Time Interval

The computation time interval (NMIN) used in the HEC-1 models was based on guidelines in the *FCDMC Hydrology Manual,* which recommends an NMIN value of 0.15 *Tc. Due to the small post-development on-site watershed areas, a minimum NMIN value of 1 minute was used and a 15-minute hydrograph time interval was used for the entire study area. For comparison purposes, a 1-minute NMIN value and a 15-minute hydrograph time interval was also used for the existing condition model.

5.2.8 Routing Parameters

Routing of sub-basin hydrographs in the study area will be performed utilizing the normal depth/storage channel routing option of HEC-1.

5.2 Rational Method

The Rational Method will be used to compute peak discharges to size on-site culverts with watersheds less than or equal to 160 acres. Parameters necessary for this procedure are the measurement of drainage sub-basin areas, runoff coefficient ("C" values), and calculation of rainfall intensity. Runoff coefficients will be calculated using the values based on Figure 4-5 "Runoff Coefficients for Use with Rational Method" in the *DS&PM.*

5.3 Storm Water Storage

Based on the City of Scottsdale's Drainage Ordinance stormwater storage requirements, on-site first flush storm water storage is proposed to be provided for the first 0.5-inch of runoff. The Rational Method is used to estimate the first flush stormwater storage volumes. The required volume is based on the areas of the proposed disturbances within the development. The equations used to calculate the required and provided retention volumes are presented below.

5.3.1 Required Retention Volume

Retention volume required for the 100-year, 2-hour event is:

$$V_{REQUIRED} = C * \left(\frac{P}{12}\right) * A$$

Where:

- V is the required retention volume in acre-feet.
- C is the weighted "C" coefficient.
- P is the precipitation in inches for the 100-year, 2-hour rainfall; 2.70- inches for the proposed developed areas.
- A is the drainage area in acres.

5.3.2 Provided Retention Volume

Retention volume provided for the 100-year, 2-hour event is:

$$V_{PROVIDED} = \left[\left(\frac{A_1 + A_2}{2}\right) * (ELEV_2 - ELEV_1)\right]$$

Where:

- V is the provided retention volume in acre-feet.
- A is the contour area in acres.
- ELEV is the contour elevation.

Section 3.3 of this Report describes the preliminary storm water storage proposed basin locations. Assumptions that were made when determining provided volume were maximum side slopes of 4:1. Refer to stormwater storage basin volume calculations in Appendix C.

5.4 Hydraulic Procedures

5.4.1 Hydraulic Analysis of Open Channels

Due to the fact that the Galloway Wash and Wash A have significant 100-year peak flows, the U.S. Army Corps of Engineers' HEC-RAS computer program was used for the hydraulic analysis of both washes. Washes that were determined to be less than a 100-year peak flow of 150 cfs will use hydraulic analysis software such as AutoCad Civil 3D *Hydroflow* (Version 10.5) to determine their existing wash hydraulic conditions.

5.4.2 HEC-RAS Errors, Warnings, and Notes

The HEC-RAS cross sections were placed such that significant variations in the channel cross-sectional geometry are adequately represented. Due to the relatively steep slopes on the Site, it was not feasible to put enough cross-sections such that the difference in energy grade elevations is less than 1-foot between cross sections. The HEC-RAS computer program gives a warning message for a difference in energy grade elevation of greater than 1-foot between cross sections. Hence, a wash was analyzed at an elevation difference of 1-foot to demonstrate the impact of additional cross sections on the HEC-RAS analysis. It was found that increasing the number of cross-sections did not impact the flow depths, as long as adequate cross-sections representative of the geometry of the channel are included.

HEC-RAS gives multiple warning messages when the energy equation could not be balanced, resulting in the program using the critical depth for the water

surface elevation. This is due to the fact that a sub-critical flow regime was selected for the steady flow computations on a site that is relatively steep. The on-site washes are flowing super-critical, but a sub-critical flow regime was chosen because it results in the highest water surface elevations.

Since the proposed culverts generally follow the same slope as the washes, the flow in the culverts is also flowing super-critical, as noted by HEC-RAS with a note for each culvert within the model. These warnings and notes are expected when running sub-critical flow regimes for a steady flow analysis on steep sites.

HEC-RAS gives a warning message when the upstream conveyance ratio divided by the downstream conveyance ratio is less than 0.7 or greater than 1.4. Again, this is a result of the steep slopes on the Site, and it was not feasible to put enough cross-sections such that the difference in the conveyance ratio is less than 0.7 or greater than 1.4.

There are a number of warning messages generated by the HEC-RAS computer program for the hydraulic analysis of the project. These warnings do not affect the accuracy of the results and are intended to alert the user of any conditions outside of the expected norm. These warning messages, and notes for both the Developed Conditions and the Existing Conditions models were ignored, and the model was determined to be acceptable.

5.4.3 Hydraulic Analysis of Culverts

For analysis of anticipated additional culvert roadway crossings, the computer programs AutoCad Civil 3D *Hydroflow* (Version 10.5), CulvertMaster and/or HY-8 will be used for final design. Site characteristics and flow are entered into the program and the resulting pipe sizes, flow regime, headwater and tailwater values are calculated.

6.0 DRAINAGE PLAN REQUIREMENTS

6.1 Drainage System Requirements

The Site is being rezoned to approximately 44-acres of R4 zoning and approximately 48-acres of Open Space (OS) zoning. There are specific drainage system requirements in order for the proposed drainage design to be approved for the Site by the City of Scottsdale and are as follows:

1. According to the City of Scottsdale's Floodplain Ordinance for property located within the ESL, storm water storage may be waived under certain conditions and peak discharges from the Site reduced to at least pre-development values during the 100-year, 10-year and 2-year storm frequencies. The development must obtain a Stormwater Storage Waiver from the City of Scottsdale. In addition to the Stormwater Storage Waiver, the Site must either provide first-flush treatment and/or first-flush stormwater storage for the first 0.5-inch of runoff from the property's developed areas.

2. The proposed drainage system is being designed to allow existing drainage patterns to be maintained in their natural condition and location where possible. When the proposed development will disturb existing washes with peak 100-year discharges of 50 cfs or more, the washes will be modified to re-direct flow around and/or through the development to maintain historical flow patterns. The development must obtain a Wash Modification approval from the City of Scottsdale.

3. Any proposed development encroachment into the FEMA FIRM SFHAs must obtain an FCDMC Floodplain Use Permit.

4. The determination of the CWA Section 404 Jurisdictional Washes for the Site must be approved by the U.S. Army Corps.

5. Before any construction activities that will disturb one or more acres begin, these activities must be authorized by ADEQ under the Arizona Pollutant Discharge Elimination System (AZPDES) Construction General Permit. The City of Scottsdale also requires evidence of compliance before issuing development permits.

6.2 Easement Requirements

Where flows from the 100-year storm event are greater than 50 cfs, drainage easements will be required around the limits of the 100-year floodplain inundation. In addition, drainage easements will also be dedicated around the limits of the 100-year ponding for the retention and detention basins.

6.3 Roadway Crossing Requirements

In all cases, the depth of flow over streets will be in accordance with the City of Scottsdale Floodplain Ordinance and Design Standards & Policies Manual (2010).

6.4 Lowest Floor Elevations

Lowest floor (LF) elevations are to be a minimum of 12-inches above the highest adjacent 100-year water surface elevation and 14-inches above the low-site outfall. Lowest floor elevations on the grading and drainage plans for residential units reflect slab on grade conditions and cannot be lowered without agency approval in locations where 'Special Flood Hazard Areas' exist. In non-flood hazard locations, to ensure that adequate residential lot drainage can be achieved, a professional engineer should be consulted if the lowest floor elevation for the slab is proposed to be lowered, or if a basement is to be constructed.

6.5 Maintenance

Ongoing maintenance of the designed or recommended drainage systems is required to preserve the design integrity and purpose of the drainage system. Failure to provide maintenance can prevent the drainage system from performing to its intended design purpose and can result in reduced performance. Maintenance within the public right-of-way is the responsibility of the governing municipality. However, it is the responsibility of private developers, homeowner associations, etc. for facilities on private property within drainage easements and includes private streets. A regular maintenance program is required so that drainage systems perform to the level of protection or service as presented in this report and the project's plans and specifications.

Regular maintenance must be performed on detention/retention basins that are designed with sediment pools and/or are susceptible to wash sediment loads. Observation is required annually and after major storm events to monitor basin sediment load. Basins should be maintained and cleaned out in order for the drainage system to function properly.

6.6 Bank Protection

Scour protection shall be provided at all locations where the wash banks are being modified, where development is encroaching within the wash's erosion hazard setback limits and where it is necessary to protect proposed retention/detention basins. The bank protection considered may be one of a variety of choices: integrally colored soil cement and/or reinforced shotcrete/concrete, seated grouted rock riprap and/or gabion baskets. Bank protection will be designed to extend to a maximum calculated scour depth of 4-5 feet below the wash bottom. Refer to Exhibit 10 – *Developed Condition Hydraulics Map* for bank protection locations, and Appendix E for scour depth calculations.

6.7 Erosion Protection

Culverts that convey flow beneath roadways are to incorporate erosion protection at both the inlet and the outlet of the structures to dissipate energy and provide flow line scour protection. Detention and/or retention basins that utilize weir inlet and/or outlet structures will require erosion protection to prevent scour when flows overtops the weir. Bleed-off pipes will also incorporate riprap protection at pipe outlets.

7.0 CONCLUSIONS

1. The Site is located within the Flood Insurance Rate Map (FIRM) for Maricopa County, Arizona and Incorporated Areas, Panel Number 04013C0884L, effective date October 16, 2013 and is located within Special Flood Hazard Areas (SFHAs) Zone AE, Other Flood Areas Zone "X" (Shaded) and Other Areas Zone "X".

2. The proposed Site development will not alter the effective FEMA SFHA floodplain and/or floodway and will not change the effective FEMA SFHA base flood elevations. This will be documented in more detail as the Site progresses into the pre-plat phase of development.

3. The Galloway Wash and Wash 'A' will be maintained in their natural location and condition where possible and will not be re-aligned.

4. According to the City of Scottsdale's Floodplain Ordinance the Site is located within the ESL and will apply for a stormwater storage waiver

5. Peak discharges from the Site will be reduced to at least pre-development values during the 100-year, 10-year and 2-year storm frequencies.

6. The Site will must provide either first flush stormwater storage for the first 0.5-inch of runoff and/or first flush treatment for the property's developed areas.

7. The proposed drainage system is being designed to allow existing drainage patterns to be maintained in their natural location and condition where possible. Where the proposed development will disturb existing washes with peak 100-year discharges of 50 cfs or more, the washes will be modified to re-direct flow around and/or through the development to maintain historical flow patterns. The development will obtain a Wash Modification approval from the City of Scottsdale.

8. Any proposed development encroachment into the FEMA FIRM SFHAs must obtain an FCDMC Floodplain Use Permit.

9. The determination of the CWA Section 404 Jurisdictional Washes for the Site must be approved by the U.S. Army Corps.

10. Before any construction activities that will disturb one or more acres begin, these activities must be authorized by ADEQ under the Arizona Pollutant Discharge Elimination System (AZPDES) Construction General Permit. The City of Scottsdale also requires evidence of compliance before issuing development permits.

11. The design of hydraulic structures is based on generally accepted engineering practices and in accordance with City of Scottsdale's requirements.

12. The drainage for the local residential roadways will be designed consistent with City of Scottsdale Ordinance 37-42(4) for the allowable depth of water on the street when the street is being utilized as a water carrier.

13. Ongoing maintenance is required for all drainage systems in order to assure design performance. Regular maintenance must be performed on detention/retention basins that are designed with sediment pools and/or are susceptible to wash sediment loads. Observation is required annually and after major storm events to monitor basin sediment load. Basins should be maintained and cleaned out in order for the drainage system to function properly.

8.0 WARNING & DISCLAIMER OF LIABILITY

Per the requirements outlined in Chapter 4 of the *City of Scottsdale Design Standards and Policies Manual* (*DS&PM*), each drainage report must include a completed 'Warning and Disclaimer of Liability' as provided within the *DS&PM* Appendix 4-1C. As such, below is a City of Scottsdale 'Warning and Disclaimer of Liability' that will be completed as the Site progress into the pre-plat phase of development.

Appendix 4-1C

WARNING & DISCLAIMER OF LIABILITY

The Drainage and Floodplain Regulations and Ordinances of the City of Scottsdale are intended to "minimize the occurrence of losses, hazards and conditions adversely affecting the public health, safety and general welfare which might result from flooding caused by the surface runoff of rainfall" (Scottsdale Revised Code §37-16).

As defined in S.R.C. §37-17, a flood plain or "*Special flood hazard* area means an area having flood and/or flood related erosion hazards as shown on a FHBM or FIRM as zone A, AO, A1-30, AE, A99, AH, or E, and those areas identified as such by the floodplain administrator, delineated in accordance with subsection 37-18(b) and adopted by the floodplain board." It is possible that a property could be inundated by greater frequency flood events or by a flood greater in magnitude than a 100-year flood. Additionally, much of the Scottsdale area is a dynamic flood area; that is, the floodplains may shift from one location to another, over time, due to natural processes.

WARNING AND DISCLAIMER OF LIABILITY PURSUANT TO S.R.C §37-22
"The degree of flood protection provided by the requirements in this article is considered reasonable for regulatory purposes and is based on scientific and engineering considerations. Floods larger than the base flood can and will occur on rare occasions. Floodwater heights may be increased by man-made or natural causes. This article (Chapter 37, Article II) shall not create liability on the part of the city, any officer or employee thereof, or the federal government for any flood damages that result from reliance on this article or any administrative decision lawfully made thereunder."

Compliance with Drainage and Floodplain Regulations and Ordinances does not insure complete protection from flooding. The Floodplain Regulations and Ordinances meet established local and federal standards for floodplain management, but neither this review nor the Regulations and Ordinances take into account such flood related problems as natural erosion, streambed meander or man-made obstructions and diversions, all of which may have an adverse affect in the event of a flood. You are advised to consult your own engineer or other expert regarding these considerations.

I have read and understand the above. If I am an agent for an owner I have made the owner aware of and explained this disclaimer.

Plan Check No. _____ Owner or Agent _____ Date _____

Design Standards & Policies Manual
City of Scottsdale - January 2010

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APPENDIX A

Existing Condition Hydrologic Calculations

DDMSW Output Data

2-year HEC-1 Model

10-year HEC-1 Model

100-year HEC-1 Model

DDMSW Output Data

Flood Control District of Maricopa County
Drainage Design Management System
LAND USE
Project Reference: DM19 EX

Sub Basin	Land Use Code	Area (sq mi)	Area (%)	Initial Loss (IA)	Percent Impervious (RTIMP)	Vegetation Cover (%)	DTHETA	Kn	Description
Major Basin ID: 01									
A1	901	0.0181	9.2	0.20	0	75.0	NORMAL	0.030	Recreational Open Space
	902	0.1792	90.8	0.30	5	30.0	NORMAL	0.040	Rural (1 dwelling unit per acre or less)
		0.1973	**100.0**						
A2	900	0.0146	100.0	0.35	0	30.0	DRY	0.040	Vacant (Existing land use database only)
		0.0146	**100.0**						
B1	900	0.0115	100.0	0.35	0	30.0	DRY	0.040	Vacant (Existing land use database only)
		0.0115	**100.0**						
C1	900	0.0084	100.0	0.35	0	30.0	DRY	0.040	Vacant (Existing land use database only)
		0.0084	**100.0**						
D1	900	0.0024	100.0	0.35	0	30.0	DRY	0.040	Vacant (Existing land use database only)
		0.0024	**100.0**						
E1	900	0.0018	8.3	0.35	0	30.0	DRY	0.040	Vacant (Existing land use database only)
	901	0.0045	20.7	0.20	0	75.0	NORMAL	0.030	Recreational Open Space
	902	0.0154	71.0	0.30	5	30.0	NORMAL	0.040	Rural (1 dwelling unit per acre or less)
		0.0217	**100.0**						
E2	900	0.0012	100.0	0.35	0	30.0	DRY	0.040	Vacant (Existing land use database only)
		0.0012	**100.0**						
E3	900	0.0038	10.0	0.35	0	30.0	DRY	0.040	Vacant (Existing land use database only)
	901	0.0057	15.0	0.20	0	75.0	NORMAL	0.030	Recreational Open Space
	902	0.0285	75.0	0.30	5	30.0	NORMAL	0.040	Rural (1 dwelling unit per acre or less)
		0.0380	**100.0**						

* Non default value

Flood Control District of Maricopa County
Drainage Design Management System
LAND USE
Project Reference: DM19 EX

Sub Basin	Land Use Code	Area (sq mi)	Area (%)	Initial Loss (IA)	Percent Impervious (RTIMP)	Vegetation Cover (%)	DTHETA	Kn	Description
Major Basin ID: 01									
		0.0200	**100.0**						
L1	900	0.0027	100.0	0.35	0	30.0	DRY	0.040	Vacant (Existing land use database only)
		0.0027	**100.0**						
M1	900	0.0015	100.0	0.35	0	30.0	DRY	0.040	Vacant (Existing land use database only)
		0.0015	**100.0**						

* Non default value

Flood Control District of Maricopa County
Drainage Design Management System
SUB BASINS
Project Reference: DM19 EX

Area ID	Sub Basin Parameters								Rainfall Losses				
	Area (sq mi)	Length (mi)	Slope (ft/mi)	S-Graph	Lca (mi)	Lag (min)	Velocity (f/s)	Kn	IA (in)	DTHETA	PSIF (in)	XKSAT (in/hr)	RTIMP (%)
Major Basin ID: 01													
A1	0.197	0.95	134.1	DESERT/RANGE	0.51	16.80	4.96	0.039	0.29	0.25	5.34	0.258	5
A2	0.015	0.19	118.3	DESERT/RANGE	0.10	5.10	3.20	0.040	0.35	0.37	5.24	0.250	
B1	0.011	0.22	209.1	DESERT/RANGE	0.10	4.90	3.96	0.040	0.35	0.35	4.33	0.401	
C1	0.008	0.21	216.3	DESERT/RANGE	0.09	4.60	4.00	0.040	0.35	0.35	4.33	0.403	
D1	0.002	0.09	252.9	DESERT/RANGE	0.04	2.30	3.27	0.040	0.35	0.35	4.33	0.403	
E1	0.022	0.31	184.7	DESERT/RANGE	0.15	6.40	4.35	0.038	0.28	0.26	5.05	0.306	4
E2	0.001	0.05	297.9	DESERT/RANGE	0.02	1.40	3.00	0.040	0.35	0.36	5.05	0.281	
E3	0.038	0.57	146.3	DESERT/RANGE	0.25	10.40	4.85	0.039	0.29	0.26	5.05	0.299	4
E4	0.921	3.33	259.5	DESERT/RANGE	1.69	36.70	7.99	0.038	0.28	0.27	5.24	0.281	6
E5	0.063	0.39	123.7	DESERT/RANGE	0.23	9.20	3.71	0.040	0.35	0.36	5.14	0.272	
F1	0.001	0.05	215.7	DESERT/RANGE	0.02	1.50	2.96	0.040	0.35	0.30	7.94	0.085	
G1	0.007	0.24	167.4	DESERT/RANGE	0.09	5.10	4.15	0.040	0.35	0.36	5.14	0.264	
H1	0.005	0.17	189.3	DESERT/RANGE	0.07	3.90	3.77	0.040	0.35	0.36	5.05	0.281	
I1	0.006	0.23	191.1	DESERT/RANGE	0.11	5.20	3.80	0.040	0.35	0.36	5.05	0.281	
J1	0.003	0.16	206.5	DESERT/RANGE	0.07	3.80	3.64	0.040	0.35	0.36	5.14	0.262	
K1	0.020	0.23	171.7	DESERT/RANGE	0.15	6.10	3.38	0.040	0.35	0.37	5.24	0.257	
L1	0.003	0.12	243.7	DESERT/RANGE	0.05	2.90	3.62	0.040	0.35	0.36	5.05	0.281	
M1	0.001	0.10	204.1	DESERT/RANGE	0.04	2.60	3.38	0.040	0.35	0.36	5.05	0.281	

* Non default value

2-year HEC-1 Model

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1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*             JUN  1998                 *
*          VERSION 4.1                  *
*                                       *
*  RUN DATE   15JUN16  TIME  20:29:19   *
*                                       *
*****************************************
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*****************************************
*                                       *
*    U.S. ARMY CORPS OF ENGINEERS       *
*    HYDROLOGIC ENGINEERING CENTER      *
*          609 SECOND STREET            *
*        DAVIS, CALIFORNIA 95616        *
*           (916) 756-1104              *
*                                       *
*****************************************
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X     X  XXXXXXX   XXXXX           X
X     X  X        X     X         XX
X     X  X        X               X
XXXXXXX  XXXX     X         XXXXX X
X     X  X        X               X
X     X  X        X     X         X
X     X  XXXXXXX   XXXXX          XXX
```

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

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


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

   1          ID        Flood Control District of Maricopa County
   2          ID        DM19 EX - Desert Mountain 19 Existing Condition
   3          ID        2 YEAR
   4          ID        6 Hour  Storm
   5          ID        Unit Hydrograph: S-Graph
   6          ID        Storm: Multiple
   7          ID        06/14/2016
   8          ID        WOOD/PATEL FILE NAME: DM19EX2.DAT
              *DIAGRAM
   9          IT       1  1JAN99       0    2000
  10          IO       5
  11          IN      15
              *
  12          JD  1.475 0.0001
  13          PC   0.000   0.008   0.016   0.025   0.033   0.041   0.050   0.058   0.066   0.074
  14          PC   0.087   0.099   0.118   0.138   0.216   0.377   0.834   0.911   0.931   0.950
  15          PC   0.962   0.972   0.983   0.991   1.000
  16          JD  1.466 0.5000
  17          PC   0.000   0.008   0.016   0.025   0.033   0.041   0.050   0.058   0.066   0.074
  18          PC   0.087   0.099   0.118   0.138   0.216   0.377   0.834   0.911   0.931   0.950
  19          PC   0.962   0.972   0.983   0.991   1.000
  20          JD  1.438 2.8
  21          PC   0.000   0.009   0.016   0.025   0.034   0.042   0.051   0.059   0.067   0.076
  22          PC   0.087   0.100   0.120   0.163   0.252   0.451   0.694   0.837   0.900   0.938
  23          PC   0.950   0.963   0.975   0.988   1.000
              *
  24          KK      A1   BASIN
  25          BA   0.197
  26          LG    0.29    0.25    5.34    0.26       5
  27          UI       0      39      39      39      50     114     146     182     223     254
  28          UI     279     323     344     355     374     378     378     369     357     338
  29          UI     302     275     245     222     200     181     164     147     133     120
  30          UI     108      94      88      75      74      62      61      53      42      42
  31          UI      42      31      27      27      27      27      25      10      10      10
  32          UI      10      10      10      10      10      10      10      10      10      10
  33          UI      10      10       0       0       0       0       0       0       0       0
              *
  34          KK    R-A1   ROUTE
  35          RS       4    FLOW
  36          RC   0.060   0.040   0.060     980  0.0224   19.00
  37          RX    0.00   42.00   73.00  106.00  196.00  225.00  251.00  295.00
  38          RY   20.00   15.00   10.00    7.00    6.00    5.00   13.00   19.00
              *
  39          KK      A2   BASIN
  40          BA   0.015
  41          LG    0.35    0.37    5.24    0.25       0
  42          UI       0      10      31      61      85      95      85      63      45      32
  43          UI      22      16      11       8       6       2       2       2       2       0
  44          UI       0       0       0       0       0       0       0       0       0       0
  45          UI       0       0       0       0       0       0       0       0       0       0
  46          UI       0       0       0       0       0       0       0       0       0       0
              *
```



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

  47          KK   CP-A2 COMBINE
  48          HC       2     .212
              *
  49          KK      B1   BASIN
  50          BA   0.011
  51          LG    0.35    0.35    4.33    0.40       0
```

```
 52         UI       0       8      25      49      67      72      62      44      31      21
 53         UI      15      10       7       5       3       2       2       2       2       0
 54         UI       0       0       0       0       0       0       0       0       0       0
 55         UI       0       0       0       0       0       0       0       0       0       0
 56         UI       0       0       0       0       0       0       0       0       0       0
            *

 57         KK      C1   BASIN
 58         BA   0.008
 59         LG    0.35    0.35    4.33    0.40       0
 60         UI       0       6      22      41      54      55      43      29      20      13
 61         UI      10       6       4       3       1       1       1       0       0       0
 62         UI       0       0       0       0       0       0       0       0       0       0
 63         UI       0       0       0       0       0       0       0       0       0       0
 64         UI       0       0       0       0       0       0       0       0       0       0
            *

 65         KK      D1   BASIN
 66         BA   0.002
 67         LG    0.35    0.35    4.33    0.40       0
 68         UI       0       7      24      24      12       6       3       1       1       0
 69         UI       0       0       0       0       0       0       0       0       0       0
 70         UI       0       0       0       0       0       0       0       0       0       0
 71         UI       0       0       0       0       0       0       0       0       0       0
 72         UI       0       0       0       0       0       0       0       0       0       0
            *

 73         KK   CLEAR COMBINE
 74         HC       3
            *
            *

 75         KK      E1   BASIN
 76         BA   0.022
 77         LG    0.28    0.26    5.05    0.31       4
 78         UI       0      12      23      55      81     101     111     106      88      66
 79         UI      51      39      29      23      17      12       9       8       5       3
 80         UI       3       3       3       3       0       0       0       0       0       0
 81         UI       0       0       0       0       0       0       0       0       0       0
 82         UI       0       0       0       0       0       0       0       0       0       0
            *
```



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

 83         KK      E2   BASIN
 84         BA   0.001
 85         LG    0.35    0.36    5.05    0.28       0
 86         UI       0      10      19       7       2       1       0       0       0       0
 87         UI       0       0       0       0       0       0       0       0       0       0
 88         UI       0       0       0       0       0       0       0       0       0       0
 89         UI       0       0       0       0       0       0       0       0       0       0
 90         UI       0       0       0       0       0       0       0       0       0       0
            *

 91         KK      E3   BASIN
 92         BA   0.038
 93         LG    0.29    0.26    5.05    0.30       4
 94         UI       0      12      12      26      47      66      83      99     110     117
 95         UI     118     113     105      88      74      63      54      45      38      32
 96         UI      27      23      19      17      13      13       8       8       8       5
 97         UI       3       3       3       3       3       3       3       3       3       0
 98         UI       0       0       0       0       0       0       0       0       0       0
            *

 99         KK      E4   BASIN
100         BA   0.921
101         LG    0.28    0.27    5.24    0.28       6
102         UI       0      84      84      84      84      84      84      84      84     173
103         UI     243     243     297     329     364     405     445     470     511     545
104         UI     580     602     598     694     695     721     747     752     771     764
105         UI     810     810     810     810     810     810     803     777     766     760
106         UI     748     720     694     650     614     589     589     531     511     494
107         UI     463     445     432     399     393     367     360     329     329     299
108         UI     299     274     259     259     235     231     231     198     189     189
109         UI     188     159     159     159     159     143     130     130     130     130
110         UI     128      90      90      90      90      90      90      90      87      58
111         UI      58      58      58      58      58      58      58      58      58      58
112         UI      58      30      21      21      21      21      21      21      21      21
113         UI      21      21      21      21      21      21      21      21      21      21
114         UI      21      21      21      21      21      21      21      21      21      21
115         UI      21      21      21      21      21       0       0       0       0       0
            *

116         KK   CP-E4 COMBINE
117         HC       4    .982
            *

118         KK  R-CPE4   ROUTE
119         RS       1    FLOW
120         RC   0.060   0.040   0.060    2050  0.0234 2635.00
121         RX    0.00   33.00   50.00  130.00  345.00  390.00  447.00  530.00
122         RY   34.00   25.00   18.00   19.00   18.00   20.00   26.00   32.00
            *
```



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

123         KK      E5   BASIN
124         BA   0.063
125         LG    0.35    0.36    5.14    0.27       0
126         UI       0      23      23      65     105     143     176     204     217     221
127         UI     209     184     152     126     105      86      71      58      48      41
```

```
128          UI       35       25       24       16       16       16        7        6        6        6
129          UI        6        6        6        6        0        0        0        0        0        0
130          UI        0        0        0        0        0        0        0        0        0        0
             *

131          KK   CP-E5 COMBINE
132          HC        2    1.044
             *

133          KK       F1   BASIN
134          BA    0.001
135          LG    0.35     0.30     7.94     0.09        0
136          UI        0        9       19        8        2        1        0        0        0        0
137          UI        0        0        0        0        0        0        0        0        0        0
138          UI        0        0        0        0        0        0        0        0        0        0
139          UI        0        0        0        0        0        0        0        0        0        0
140          UI        0        0        0        0        0        0        0        0        0        0
             *

141          KK       G1   BASIN
142          BA    0.007
143          LG    0.35     0.36     5.14     0.26        0
144          UI        0        5       14       28       40       44       40       29       21       15
145          UI       10        8        5        4        3        1        1        1        1        0
146          UI        0        0        0        0        0        0        0        0        0        0
147          UI        0        0        0        0        0        0        0        0        0        0
148          UI        0        0        0        0        0        0        0        0        0        0
             *

149          KK       H1   BASIN
150          BA    0.005
151          LG    0.35     0.36     5.05     0.28        0
152          UI        0        5       20       35       41       34       22       14        9        6
153          UI        4        2        1        1        1        0        0        0        0        0
154          UI        0        0        0        0        0        0        0        0        0        0
155          UI        0        0        0        0        0        0        0        0        0        0
156          UI        0        0        0        0        0        0        0        0        0        0
             *

157          KK       I1   BASIN
158          BA    0.006
159          LG    0.35     0.36     5.05     0.28        0
160          UI        0        4       12       24       33       37       34       26       18       13
161          UI        9        7        5        3        3        1        1        1        1        1
162          UI        0        0        0        0        0        0        0        0        0        0
163          UI        0        0        0        0        0        0        0        0        0        0
164          UI        0        0        0        0        0        0        0        0        0        0
             *
```



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

165          KK      CLR2 COMBINE
166          HC        4
             *
             *

167          KK       J1   BASIN
168          BA    0.003
169          LG    0.35     0.36     5.14     0.26        0
170          UI        0        3       13       22       25       20       13        8        5        3
171          UI        2        1        1        1        0        0        0        0        0        0
172          UI        0        0        0        0        0        0        0        0        0        0
173          UI        0        0        0        0        0        0        0        0        0        0
174          UI        0        0        0        0        0        0        0        0        0        0
             *

175          KK       K1   BASIN
176          BA    0.020
177          LG    0.35     0.37     5.24     0.26        0
178          UI        0       11       25       55       81      100      106       97       75       57
179          UI       43       32       23       18       13       10        8        6        3        3
180          UI        3        3        3        0        0        0        0        0        0        0
181          UI        0        0        0        0        0        0        0        0        0        0
182          UI        0        0        0        0        0        0        0        0        0        0
             *

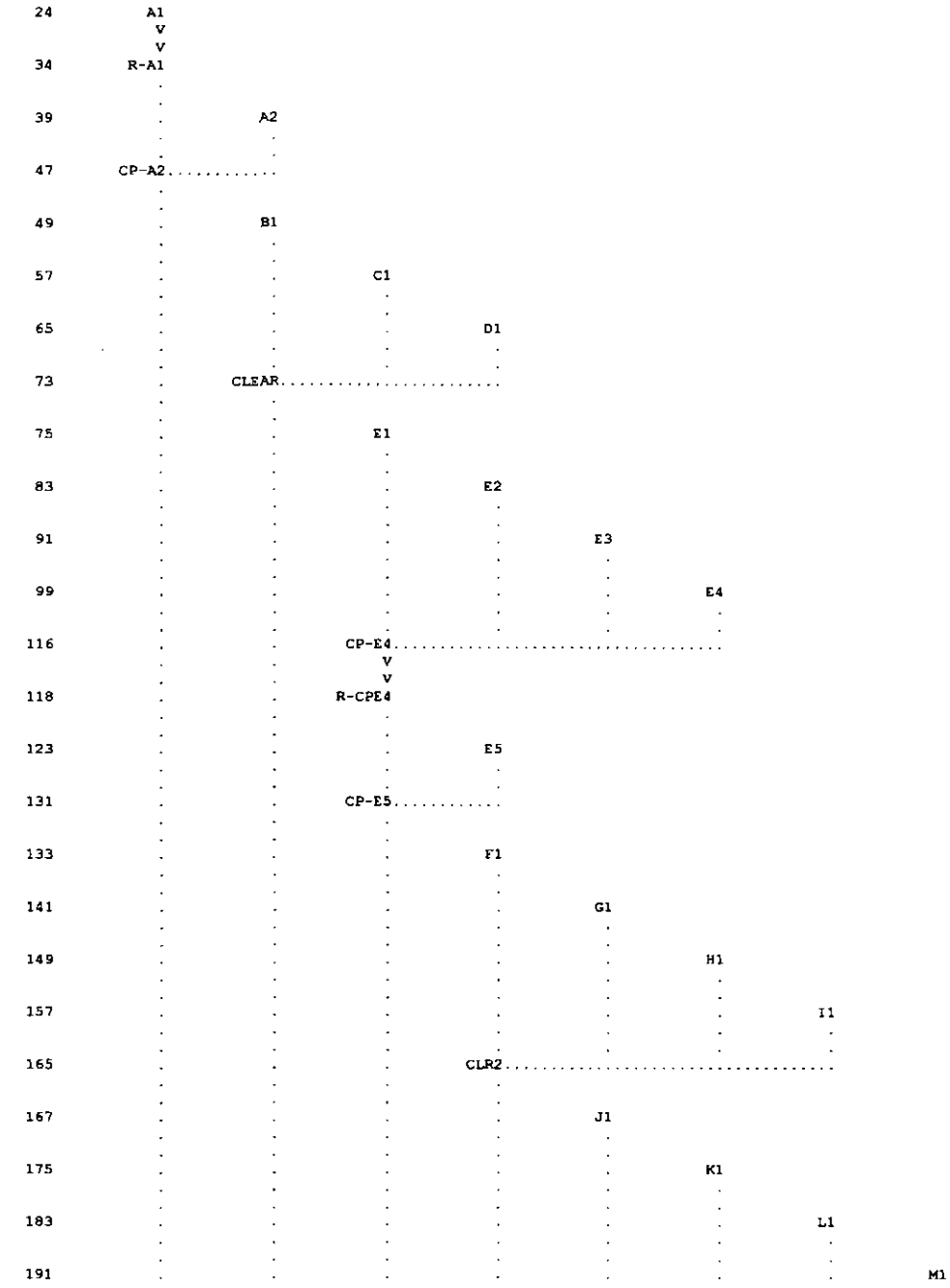
183          KK       L1   BASIN
184          BA    0.003
185          LG    0.35     0.36     5.05     0.28        0
186          UI        0        6       23       33       25       14        7        4        2        1
187          UI        1        0        0        0        0        0        0        0        0        0
188          UI        0        0        0        0        0        0        0        0        0        0
189          UI        0        0        0        0        0        0        0        0        0        0
190          UI        0        0        0        0        0        0        0        0        0        0
             *

191          KK       M1   BASIN
192          BA    0.001
193          LG    0.35     0.36     5.05     0.28        0
194          UI        0        3        9       12        7        4        2        1        0        0
195          UI        0        0        0        0        0        0        0        0        0        0
196          UI        0        0        0        0        0        0        0        0        0        0
197          UI        0        0        0        0        0        0        0        0        0        0
198          UI        0        0        0        0        0        0        0        0        0        0
             *
199          ZZ
```

SCHEMATIC DIAGRAM OF STREAM NETWORK

INPUT LINE NO.

(V) ROUTING
(.) CONNECTOR
(---->) DIVERSION OR PUMP FLOW
(<----) RETURN OF DIVERTED OR PUMPED FLOW



(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1****************************************                                      ****************************************
 *                                      *                                      *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                      *  U.S. ARMY CORPS OF ENGINEERS        *
 *             JUN  1998                *                                      *  HYDROLOGIC ENGINEERING CENTER       *
 *           VERSION 4.1                *                                      *        609 SECOND STREET             *
 *                                      *                                      *     DAVIS, CALIFORNIA 95616          *
 * RUN DATE   15JUN16  TIME  20:29:19   *                                      *        (916) 756-1104                *
 *                                      *                                      *                                      *
****************************************                                      ****************************************



                              Flood Control District of Maricopa County
                              DM19 EX - Desert Mountain 19 Existing Condition
                              2 YEAR
                              6 Hour  Storm
                              Unit Hydrograph: S-Graph
                              Storm: Multiple
                              06/14/2016
                              WOOD/PATEL FILE NAME: DM19EX2.DAT

 10 IO          OUTPUT CONTROL VARIABLES
                      IPRNT          5  PRINT CONTROL
                      IPLOT          0  PLOT CONTROL
                      QSCAL         0.  HYDROGRAPH PLOT SCALE

    IT          HYDROGRAPH TIME DATA
                       NMIN          1  MINUTES IN COMPUTATION INTERVAL
                      IDATE     1JAN99  STARTING DATE
                      ITIME       0000  STARTING TIME
                         NQ       2000  NUMBER OF HYDROGRAPH ORDINATES
                     NDDATE     2JAN99  ENDING DATE
                     NDTIME       0919  ENDING TIME
                      ICENT         19  CENTURY MARK

                COMPUTATION INTERVAL     .02 HOURS
                     TOTAL TIME BASE   33.32 HOURS

        ENGLISH UNITS
             DRAINAGE AREA          SQUARE MILES
             PRECIPITATION DEPTH    INCHES
             LENGTH, ELEVATION      FEET
             FLOW                   CUBIC FEET PER SECOND
             STORAGE VOLUME         ACRE-FEET
             SURFACE AREA           ACRES
             TEMPERATURE            DEGREES FAHRENHEIT

 12 JD          INDEX STORM NO. 1
                      STRM        1.48  PRECIPITATION DEPTH
                      TRDA         .00  TRANSPOSITION DRAINAGE AREA

 13 PI           PRECIPITATION PATTERN
                   .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                   .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                   .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                   .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                   .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                   .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                   .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                   .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                   .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
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                   .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                   .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                   .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                   .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                   .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                   .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                   .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                   .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                   .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                   .00       .00       .00       .00       .00       .01       .01       .01       .01       .01
                   .01       .01       .01       .01       .01       .01       .01       .01       .01       .01
                   .01       .01       .01       .01       .01       .01       .01       .01       .01       .01
                   .01       .01       .01       .01       .01       .03       .03       .03       .03       .03
                   .03       .03       .03       .03       .03       .03       .03       .03       .03       .03
                   .01       .01       .01       .01       .01       .01       .01       .01       .01       .01
                   .01       .01       .01       .01       .01       .00       .00       .00       .00       .00
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                   .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                   .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                   .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                   .00       .00       .00       .00       .00       .00       .00       .00       .00       .00

 16 JD          INDEX STORM NO. 2
                      STRM        1.47  PRECIPITATION DEPTH
                      TRDA         .50  TRANSPOSITION DRAINAGE AREA

 17 PI           PRECIPITATION PATTERN
                   .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                   .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                   .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                   .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                   .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                   .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                   .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                   .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                   .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
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.00	.00	.00	.00	.00	.01	.01	.01	.01	.01
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.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.03	.03	.03	.03	.03
.03	.03	.03	.03	.03	.03	.03	.03	.03	.03
.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
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.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00

20 JD INDEX STORM NO. 3

STRM 1.44 PRECIPITATION DEPTH

TRDA 2.80 TRANSPOSITION DRAINAGE AREA

21 PI PRECIPITATION PATTERN

.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.02	.02	.02	.02	.02
.02	.02	.02	.02	.02	.02	.02	.02	.02	.02
.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.00	.00	.00	.00	.00
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1

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+	HYDROGRAPH AT	A1	131.	4.15	9.	2.	2.	.20		
+	ROUTED TO	R-A1	128.	4.22	9.	2.	2.	.20		
+	HYDROGRAPH AT	A2	13.	4.03	0.	0.	0.	.01		
+	2 COMBINED AT	CP-A2	128.	4.22	10.	2.	2.	.21		
+	HYDROGRAPH AT	B1	8.	4.03	0.	0.	0.	.01		
+	HYDROGRAPH AT	C1	6.	4.03	0.	0.	0.	.01		
+	HYDROGRAPH AT	D1	2.	4.02	0.	0.	0.	.00		
+	3 COMBINED AT	CLEAR	16.	4.03	0.	0.	0.	.02		
+	HYDROGRAPH AT	E1	21.	4.03	1.	0.	0.	.02		
+	HYDROGRAPH AT	E2	1.	4.02	0.	0.	0.	.00		
+	HYDROGRAPH AT	E3	31.	4.08	2.	0.	0.	.04		
+	HYDROGRAPH AT	E4	236.	4.43	33.	8.	6.	.92		
+	4 COMBINED AT	CP-E4	230.	4.43	34.	9.	6.	.98		
+	ROUTED TO	R-CPE4	230.	4.43	34.	9.	6.	.98		
+	HYDROGRAPH AT	E5	44.	4.07	2.	0.	0.	.06		
+	2 COMBINED AT	CP-E5	230.	4.43	35.	9.	6.	1.04		
+	HYDROGRAPH AT	F1	1.	4.02	0.	0.	0.	.00		
+	HYDROGRAPH AT	G1	6.	4.03	0.	0.	0.	.01		
+	HYDROGRAPH AT	H1	5.	4.03	0.	0.	0.	.00		
+	HYDROGRAPH AT	I1	5.	4.03	0.	0.	0.	.01		
+	4 COMBINED AT	CLR2	17.	4.02	1.	0.	0.	.02		
+	HYDROGRAPH AT	J1	3.	4.02	0.	0.	0.	.00		
+	HYDROGRAPH AT	K1	17.	4.05	1.	0.	0.	.02		
+	HYDROGRAPH AT	L1	3.	4.02	0.	0.	0.	.00		
+	HYDROGRAPH AT	M1	1.	4.02	0.	0.	0.	.00		

*** NORMAL END OF HEC-1 ***

10-year HEC-1 Model

```
1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*             JUN  1998                 *
*           VERSION 4.1                 *
*                                       *
*  RUN DATE   15JUN16  TIME  20:29:28   *
*                                       *
*****************************************
```

```
*****************************************
*                                       *
*    U.S. ARMY CORPS OF ENGINEERS       *
*    HYDROLOGIC ENGINEERING CENTER      *
*          609 SECOND STREET            *
*       DAVIS, CALIFORNIA 95616         *
*           (916) 756-1104              *
*                                       *
*****************************************
```

```
X     X  XXXXXXX   XXXXX           X
X     X  X        X     X        XX
X     X  X        X              X
XXXXXXX  XXXX     X        XXXXX  X
X     X  X        X              X
X     X  X        X     X        X
X     X  XXXXXXX   XXXXX         XXX
```

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

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

1 HEC-1 INPUT PAGE 1

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

   1          ID        Flood Control District of Maricopa County
   2          ID        DM19 EX - Desert Mountain 19 Existing Condition
   3          ID        10 YEAR
   4          ID        6 Hour  Storm
   5          ID        Unit Hydrograph: S-Graph
   6          ID        Storm: Multiple
   7          ID        06/14/2016
   8          ID        WOOD/PATEL FILE NAME: DM19EX10.DAT
              *DIAGRAM
   9          IT       1  1JAN99       0    2000
  10          IO       5
  11          IN      15
              *
  12          JD  2.182 0.0001
  13          PC   0.000   0.008   0.016   0.025   0.033   0.041   0.050   0.058   0.066   0.074
  14          PC   0.087   0.099   0.118   0.138   0.216   0.377   0.834   0.911   0.931   0.950
  15          PC   0.962   0.972   0.983   0.991   1.000
  16          JD  2.169 0.5000
  17          PC   0.000   0.008   0.016   0.025   0.033   0.041   0.050   0.058   0.066   0.074
  18          PC   0.087   0.099   0.118   0.138   0.216   0.377   0.834   0.911   0.931   0.950
  19          PC   0.962   0.972   0.983   0.991   1.000
  20          JD  2.127 2.8
  21          PC   0.000   0.009   0.016   0.025   0.034   0.042   0.051   0.059   0.067   0.076
  22          PC   0.087   0.100   0.120   0.163   0.252   0.451   0.694   0.837   0.900   0.938
  23          PC   0.950   0.963   0.975   0.988   1.000
              *

  24          KK      A1   BASIN
  25          BA   0.197
  26          LG    0.29    0.25    5.34    0.26       5
  27          UI       0      39      39      39      50     114     146     182     223     254
  28          UI     279     323     344     355     374     378     378     369     357     338
  29          UI     302     275     245     222     200     181     164     147     133     120
  30          UI     108      94      88      75      74      62      61      53      42      42
  31          UI      42      31      27      27      27      27      25      10      10      10
  32          UI      10      10      10      10      10      10      10      10      10      10
  33          UI      10      10       0       0       0       0       0       0       0       0
              *

  34          KK    R-A1   ROUTE
  35          RS       3    FLOW
  36          RC   0.060   0.040   0.060     980  0.0224   19.00
  37          RX    0.00   42.00   73.00  106.00  196.00  225.00  251.00  295.00
  38          RY   20.00   15.00   10.00    7.00    6.00    5.00   13.00   19.00
              *

  39          KK      A2   BASIN
  40          BA   0.015
  41          LG    0.35    0.37    5.24    0.25       0
  42          UI       0      10      31      61      85      95      85      63      45      32
  43          UI      22      16      11       8       6       2       2       2       2       0
  44          UI       0       0       0       0       0       0       0       0       0       0
  45          UI       0       0       0       0       0       0       0       0       0       0
  46          UI       0       0       0       0       0       0       0       0       0       0
              *
```

1 HEC-1 INPUT PAGE 2

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

  47          KK   CP-A2 COMBINE
  48          HC       2     .212
              *

  49          KK      B1   BASIN
  50          BA   0.011
  51          LG    0.35    0.35    4.33    0.40       0
```

```
 52          UI        0        8       25       49       67       72       62       44       31       21
 53          UI       15       10        7        5        3        2        2        2        2        0
 54          UI        0        0        0        0        0        0        0        0        0        0
 55          UI        0        0        0        0        0        0        0        0        0        0
 56          UI        0        0        0        0        0        0        0        0        0        0
             *

 57          KK       C1    BASIN
 58          BA    0.008
 59          LG     0.35     0.35     4.33     0.40        0
 60          UI        0        6       22       41       54       55       43       29       20       13
 61          UI       10        6        4        3        1        1        1        0        0        0
 62          UI        0        0        0        0        0        0        0        0        0        0
 63          UI        0        0        0        0        0        0        0        0        0        0
 64          UI        0        0        0        0        0        0        0        0        0        0
             *

 65          KK       D1    BASIN
 66          BA    0.002
 67          LG     0.35     0.35     4.33     0.40        0
 68          UI        0        7       24       24       12        6        3        1        1        0
 69          UI        0        0        0        0        0        0        0        0        0        0
 70          UI        0        0        0        0        0        0        0        0        0        0
 71          UI        0        0        0        0        0        0        0        0        0        0
 72          UI        0        0        0        0        0        0        0        0        0        0
             *

 73          KK    CLEAR COMBINE
 74          HC        3
             *
             *

 75          KK       E1    BASIN
 76          BA    0.022
 77          LG     0.28     0.26     5.05     0.31        4
 78          UI        0       12       23       55       81      101      111      106       88       66
 79          UI       51       39       29       23       17       12        9        8        5        3
 80          UI        3        3        3        3        0        0        0        0        0        0
 81          UI        0        0        0        0        0        0        0        0        0        0
 82          UI        0        0        0        0        0        0        0        0        0        0
             *
```



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

 83          KK       E2    BASIN
 84          BA    0.001
 85          LG     0.35     0.36     5.05     0.28        0
 86          UI        0       10       19        7        2        1        0        0        0        0
 87          UI        0        0        0        0        0        0        0        0        0        0
 88          UI        0        0        0        0        0        0        0        0        0        0
 89          UI        0        0        0        0        0        0        0        0        0        0
 90          UI        0        0        0        0        0        0        0        0        0        0
             *

 91          KK       E3    BASIN
 92          BA    0.038
 93          LG     0.29     0.26     5.05     0.30        4
 94          UI        0       12       12       26       47       66       83       99      110      117
 95          UI      118      113      105       88       74       63       54       45       38       32
 96          UI       27       23       19       17       13       13        8        8        8        5
 97          UI        3        3        3        3        3        3        3        3        3        0
 98          UI        0        0        0        0        0        0        0        0        0        0
             *

 99          KK       E4    BASIN
100          BA    0.921
101          LG     0.28     0.27     5.24     0.28        6
102          UI        0       84       84       84       84       84       84       84       84      173
103          UI      243      243      297      329      364      405      445      470      511      545
104          UI      580      602      598      694      695      721      747      752      771      764
105          UI      810      810      810      810      810      810      803      777      766      760
106          UI      748      720      694      650      614      589      589      531      511      494
107          UI      463      445      432      399      393      367      360      329      329      299
108          UI      299      274      259      259      235      231      231      198      189      189
109          UI      188      159      159      159      159      143      130      130      130      130
110          UI      128       90       90       90       90       90       90       90       87       58
111          UI       58       58       58       58       58       58       58       58       58       58
112          UI       58       30       21       21       21       21       21       21       21       21
113          UI       21       21       21       21       21       21       21       21       21       21
114          UI       21       21       21       21       21       21       21       21       21       21
115          UI       21       21       21       21       21        0        0        0        0        0
             *

116          KK    CP-E4 COMBINE
117          HC        4     .982
             *

118          KK  R-CPE4    ROUTE
119          RS        1     FLOW
120          RC    0.060    0.040    0.060     2050   0.0234  2635.00
121          RX     0.00    33.00    50.00   130.00   345.00   390.00   447.00   530.00
122          RY    34.00    25.00    18.00    19.00    18.00    20.00    26.00    32.00
             *
```



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

123          KK       E5    BASIN
124          BA    0.063
125          LG     0.35     0.36     5.14     0.27        0
126          UI        0       23       23       65      105      143      176      204      217      221
127          UI      209      184      152      126      105       86       71       58       48       41
```

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128          UI       35       25       24       16       16       16        7        6        6        6
129          UI        6        6        6        6        0        0        0        0        0        0
130          UI        0        0        0        0        0        0        0        0        0        0
             *

131          KK    CP-E5 COMBINE
132          HC        2    1.044
             *

133          KK       F1    BASIN
134          BA    0.001
135          LG    0.35     0.30     7.94     0.09        0
136          UI        0        9       19        8        2        1        0        0        0        0
137          UI        0        0        0        0        0        0        0        0        0        0
138          UI        0        0        0        0        0        0        0        0        0        0
139          UI        0        0        0        0        0        0        0        0        0        0
140          UI        0        0        0        0        0        0        0        0        0        0
             *

141          KK       G1    BASIN
142          BA    0.007
143          LG    0.35     0.36     5.14     0.26        0
144          UI        0        5       14       28       40       44       40       29       21       15
145          UI       10        8        5        4        3        1        1        1        1        0
146          UI        0        0        0        0        0        0        0        0        0        0
147          UI        0        0        0        0        0        0        0        0        0        0
148          UI        0        0        0        0        0        0        0        0        0        0
             *

149          KK       H1    BASIN
150          BA    0.005
151          LG    0.35     0.36     5.05     0.28        0
152          UI        0        5       20       35       41       34       22       14        9        6
153          UI        4        2        1        1        1        0        0        0        0        0
154          UI        0        0        0        0        0        0        0        0        0        0
155          UI        0        0        0        0        0        0        0        0        0        0
156          UI        0        0        0        0        0        0        0        0        0        0
             *

157          KK       I1    BASIN
158          BA    0.006
159          LG    0.35     0.36     5.05     0.28        0
160          UI        0        4       12       24       33       37       34       26       18       13
161          UI        9        7        5        3        3        1        1        1        1        1
162          UI        0        0        0        0        0        0        0        0        0        0
163          UI        0        0        0        0        0        0        0        0        0        0
164          UI        0        0        0        0        0        0        0        0        0        0
             *
```



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

165          KK     CLR2 COMBINE
166          HC        4
             *
             *
             *

167          KK       J1    BASIN
168          BA    0.003
169          LG    0.35     0.36     5.14     0.26        0
170          UI        0        3       13       22       25       20       13        8        5        3
171          UI        2        1        1        1        0        0        0        0        0        0
172          UI        0        0        0        0        0        0        0        0        0        0
173          UI        0        0        0        0        0        0        0        0        0        0
174          UI        0        0        0        0        0        0        0        0        0        0
             *

175          KK       K1    BASIN
176          BA    0.020
177          LG    0.35     0.37     5.24     0.26        0
178          UI        0       11       25       55       81      100      106       97       75       57
179          UI       43       32       23       18       13       10        8        6        3        3
180          UI        3        3        3        0        0        0        0        0        0        0
181          UI        0        0        0        0        0        0        0        0        0        0
182          UI        0        0        0        0        0        0        0        0        0        0
             *

183          KK       L1    BASIN
184          BA    0.003
185          LG    0.35     0.36     5.05     0.28        0
186          UI        0        6       23       33       25       14        7        4        2        1
187          UI        1        0        0        0        0        0        0        0        0        0
188          UI        0        0        0        0        0        0        0        0        0        0
189          UI        0        0        0        0        0        0        0        0        0        0
190          UI        0        0        0        0        0        0        0        0        0        0
             *

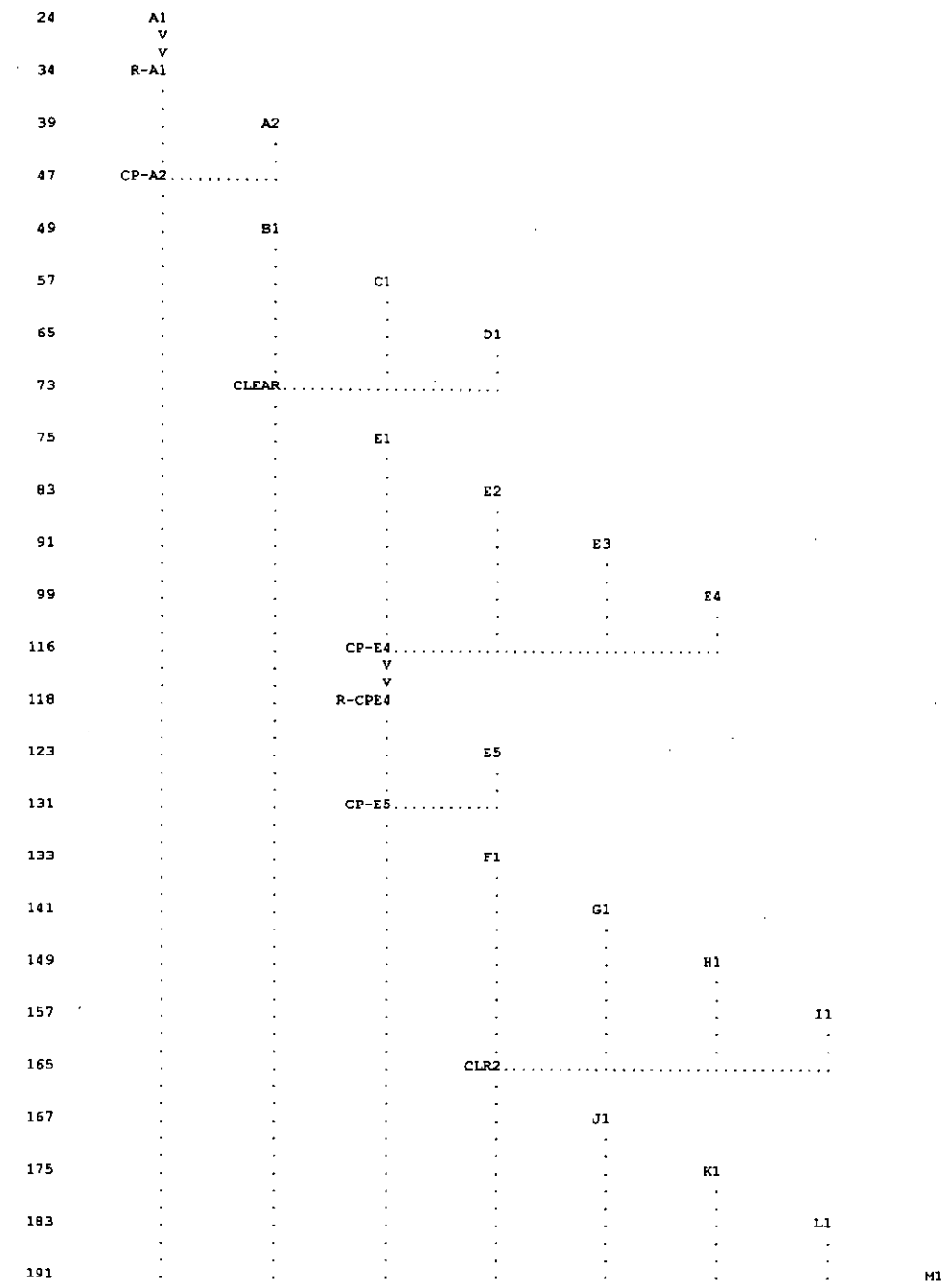
191          KK       M1    BASIN
192          BA    0.001
193          LG    0.35     0.36     5.05     0.28        0
194          UI        0        3        9       12        7        4        2        1        0        0
195          UI        0        0        0        0        0        0        0        0        0        0
196          UI        0        0        0        0        0        0        0        0        0        0
197          UI        0        0        0        0        0        0        0        0        0        0
198          UI        0        0        0        0        0        0        0        0        0        0
             *
199          ZZ
```

1

SCHEMATIC DIAGRAM OF STREAM NETWORK

INPUT LINE NO.

(V) ROUTING
(.) CONNECTOR
(---->) DIVERSION OR PUMP FLOW
(<----) RETURN OF DIVERTED OR PUMPED FLOW



(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1**************************************                    **************************************
*                                    *                    *                                    *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                  *  U.S. ARMY CORPS OF ENGINEERS      *
*              JUN   1998            *                    *  HYDROLOGIC ENGINEERING CENTER     *
*           VERSION 4.1              *                    *        609 SECOND STREET           *
*                                    *                    *    DAVIS, CALIFORNIA 95616         *
* RUN DATE   15JUN16  TIME  20:29:28 *                    *         (916) 756-1104             *
*                                    *                    *                                    *
**************************************                    **************************************
```

```
                    Flood Control District of Maricopa County
                    DM19 EX - Desert Mountain 19 Existing Condition
                    10 YEAR
                    6 Hour  Storm
                    Unit Hydrograph: S-Graph
                    Storm: Multiple
                    06/14/2016
                    WOOD/PATEL FILE NAME: DM19EX10.DAT
```

```
 10 IO        OUTPUT CONTROL VARIABLES
                   IPRNT          5  PRINT CONTROL
                   IPLOT          0  PLOT CONTROL
                   QSCAL         0.  HYDROGRAPH PLOT SCALE

    IT        HYDROGRAPH TIME DATA
                    NMIN          1  MINUTES IN COMPUTATION INTERVAL
                   IDATE     1JAN99  STARTING DATE
                   ITIME       0000  STARTING TIME
                      NQ       2000  NUMBER OF HYDROGRAPH ORDINATES
                  NDDATE     2JAN99  ENDING DATE
                  NDTIME       0919  ENDING TIME
                   ICENT         19  CENTURY MARK

                COMPUTATION INTERVAL     .02 HOURS
                     TOTAL TIME BASE   33.32 HOURS

        ENGLISH UNITS
             DRAINAGE AREA          SQUARE MILES
             PRECIPITATION DEPTH    INCHES
             LENGTH, ELEVATION      FEET
             FLOW                   CUBIC FEET PER SECOND
             STORAGE VOLUME         ACRE-FEET
             SURFACE AREA           ACRES
             TEMPERATURE            DEGREES FAHRENHEIT

 12 JD        INDEX STORM NO. 1
                    STRM       2.18  PRECIPITATION DEPTH
                    TRDA        .00  TRANSPOSITION DRAINAGE AREA

 13 PI          PRECIPITATION PATTERN
```

.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
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.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.03	.03	.03	.03	.03
.03	.03	.03	.03	.03	.03	.03	.03	.03	.03
.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.00	.00	.00	.00	.00
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.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
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.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
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.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00

```
 16 JD        INDEX STORM NO. 2
                    STRM       2.17  PRECIPITATION DEPTH
                    TRDA        .50  TRANSPOSITION DRAINAGE AREA

 17 PI          PRECIPITATION PATTERN
```

.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
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.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
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.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.03	.03	.03	.03	.03
.03	.03	.03	.03	.03	.03	.03	.03	.03	.03
.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.00	.00	.00	.00	.00
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.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00

20 JD INDEX STORM NO. 3

STRM 2.13 PRECIPITATION DEPTH
TRDA 2.80 TRANSPOSITION DRAINAGE AREA

21 PI PRECIPITATION PATTERN

.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
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.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
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.00	.00	.00	.00	.00	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.02	.02	.02	.02	.02
.02	.02	.02	.02	.02	.02	.02	.02	.02	.02
.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.00	.00	.00	.00	.00
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1

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+	HYDROGRAPH AT	A1	262.	4.13	19.	5.	3.	.20		
+	ROUTED TO	R-A1	258.	4.18	19.	5.	3.	.20		
+	HYDROGRAPH AT	A2	28.	4.02	1.	0.	0.	.01		
+	2 COMBINED AT	CP-A2	261.	4.18	20.	5.	4.	.21		
+	HYDROGRAPH AT	B1	19.	4.02	1.	0.	0.	.01		
+	HYDROGRAPH AT	C1	14.	4.02	1.	0.	0.	.01		
+	HYDROGRAPH AT	D1	4.	4.02	0.	0.	0.	.00		
+	3 COMBINED AT	CLEAR	36.	4.02	1.	0.	0.	.02		
+	HYDROGRAPH AT	E1	42.	4.02	2.	0.	0.	.02		
+	HYDROGRAPH AT	E2	2.	4.02	0.	0.	0.	.00		
+	HYDROGRAPH AT	E3	63.	4.07	3.	1.	1.	.04		
+	HYDROGRAPH AT	E4	553.	4.43	78.	19.	14.	.92		
+	4 COMBINED AT	CP-E4	549.	4.42	82.	20.	15.	.98		
+	ROUTED TO	R-CPE4	549.	4.43	82.	20.	15.	.98		
+	HYDROGRAPH AT	E5	102.	4.05	5.	1.	1.	.06		
+	2 COMBINED AT	CP-E5	549.	4.42	85.	21.	15.	1.04		
+	HYDROGRAPH AT	F1	2.	4.02	0.	0.	0.	.00		
+	HYDROGRAPH AT	G1	13.	4.02	1.	0.	0.	.01		
+	HYDROGRAPH AT	H1	10.	4.02	0.	0.	0.	.00		
+	HYDROGRAPH AT	I1	11.	4.02	0.	0.	0.	.01		
+	4 COMBINED AT	CLR2	36.	4.02	2.	0.	0.	.02		
+	HYDROGRAPH AT	J1	6.	4.02	0.	0.	0.	.00		
+	HYDROGRAPH AT	K1	36.	4.03	2.	0.	0.	.02		
+	HYDROGRAPH AT	L1	6.	4.02	0.	0.	0.	.00		
+	HYDROGRAPH AT	M1	2.	4.02	0.	0.	0.	.00		

*** NORMAL END OF HEC-1 ***

100-year HEC-1 Model

```
1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*             JUN  1998                 *
*          VERSION 4.1                  *
*                                       *
*  RUN DATE   15JUN16  TIME  20:29:36   *
*                                       *
*****************************************
```

```
*****************************************
*                                       *
*    U.S. ARMY CORPS OF ENGINEERS       *
*    HYDROLOGIC ENGINEERING CENTER      *
*          609 SECOND STREET            *
*        DAVIS, CALIFORNIA 95616        *
*           (916) 756-1104              *
*                                       *
*****************************************
```

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X    X  XXXXXXX   XXXXX          X
X    X  X        X    X        XX
X    X  X        X             X
XXXXXXX  XXXX    X       XXXXX X
X    X  X        X             X
X    X  X        X    X        X
X    X  XXXXXXX  XXXXX         XXX
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THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

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

1 HEC-1 INPUT PAGE 1

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

   1          ID        Flood Control District of Maricopa County
   2          ID        DM19 EX - Desert Mountain 19 Existing Condition
   3          ID        100 YEAR
   4          ID        6 Hour  Storm
   5          ID        Unit Hydrograph: S-Graph
   6          ID        Storm: Multiple
   7          ID        06/14/2016
   8          ID        WOOD/PATEL FILE NAME: DM19EX100.DAT
              *DIAGRAM
   9          IT       1  1JAN99       0    2000
  10          IO       5
  11          IN      15
              *
  12          JD  3.313 0.0001
  13          PC   0.000   0.008   0.016   0.025   0.033   0.041   0.050   0.058   0.066   0.074
  14          PC   0.087   0.099   0.118   0.138   0.216   0.377   0.834   0.911   0.931   0.950
  15          PC   0.962   0.972   0.983   0.991   1.000
  16          JD  3.293 0.5000
  17          PC   0.000   0.008   0.016   0.025   0.033   0.041   0.050   0.058   0.066   0.074
  18          PC   0.087   0.099   0.118   0.138   0.216   0.377   0.834   0.911   0.931   0.950
  19          PC   0.962   0.972   0.983   0.991   1.000
  20          JD  3.230 2.8
  21          PC   0.000   0.009   0.016   0.025   0.034   0.042   0.051   0.059   0.067   0.076
  22          PC   0.087   0.100   0.120   0.163   0.252   0.451   0.694   0.837   0.900   0.938
  23          PC   0.950   0.963   0.975   0.988   1.000
              *

  24          KK      A1   BASIN
  25          BA   0.197
  26          LG    0.29    0.25    5.34    0.26       5
  27          UI       0      39      39      39      50     114     146     182     223     254
  28          UI     279     323     344     355     374     378     378     369     357     338
  29          UI     302     275     245     222     200     181     164     147     133     120
  30          UI     108      94      88      75      74      62      61      53      42      42
  31          UI      42      31      27      27      27      27      25      10      10      10
  32          UI      10      10      10      10      10      10      10      10      10      10
  33          UI      10      10       0       0       0       0       0       0       0       0
              *

  34          KK    R-A1   ROUTE
  35          RS       3    FLOW
  36          RC   0.060   0.040   0.060     980  0.0224   19.00
  37          RX    0.00   42.00   73.00  106.00  196.00  225.00  251.00  295.00
  38          RY   20.00   15.00   10.00    7.00    6.00    5.00   13.00   19.00
              *

  39          KK      A2   BASIN
  40          BA   0.015
  41          LG    0.35    0.37    5.24    0.25       0
  42          UI       0      10      31      61      85      95      85      63      45      32
  43          UI      22      16      11       8       6       2       2       2       2       0
  44          UI       0       0       0       0       0       0       0       0       0       0
  45          UI       0       0       0       0       0       0       0       0       0       0
  46          UI       0       0       0       0       0       0       0       0       0       0
              *
```

1 HEC-1 INPUT PAGE 2

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

  47          KK   CP-A2 COMBINE
  48          HC       2
              *

  49          KK      B1   BASIN
  50          BA   0.011
  51          LG    0.35    0.35    4.33    0.40       0
```

```
 52     UI      0      8     25     49     67     72     62     44     31     21
 53     UI     15     10      7      5      3      2      2      2      2      0
 54     UI      0      0      0      0      0      0      0      0      0      0
 55     UI      0      0      0      0      0      0      0      0      0      0
 56     UI      0      0      0      0      0      0      0      0      0      0
        *

 57     KK     C1  BASIN
 58     BA  0.008
 59     LG   0.35   0.35   4.33   0.40      0
 60     UI      0      6     22     41     54     55     43     29     20     13
 61     UI     10      6      4      3      1      1      1      0      0      0
 62     UI      0      0      0      0      0      0      0      0      0      0
 63     UI      0      0      0      0      0      0      0      0      0      0
 64     UI      0      0      0      0      0      0      0      0      0      0
        *

 65     KK     D1  BASIN
 66     BA  0.002
 67     LG   0.35   0.35   4.33   0.40      0
 68     UI      0      7     24     24     12      6      3      1      1      0
 69     UI      0      0      0      0      0      0      0      0      0      0
 70     UI      0      0      0      0      0      0      0      0      0      0
 71     UI      0      0      0      0      0      0      0      0      0      0
 72     UI      0      0      0      0      0      0      0      0      0      0
        *

 73     KK  CLEAR COMBINE
 74     HC      3
        *
        *

 75     KK     E1  BASIN
 76     BA  0.022
 77     LG   0.28   0.26   5.05   0.31      4
 78     UI      0     12     23     55     81    101    111    106     88     66
 79     UI     51     39     29     23     17     12      9      8      5      3
 80     UI      3      3      3      3      0      0      0      0      0      0
 81     UI      0      0      0      0      0      0      0      0      0      0
 82     UI      0      0      0      0      0      0      0      0      0      0
        *
```



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

 83     KK     E2  BASIN
 84     BA  0.001
 85     LG   0.35   0.36   5.05   0.28      0
 86     UI      0     10     19      7      2      1      0      0      0      0
 87     UI      0      0      0      0      0      0      0      0      0      0
 88     UI      0      0      0      0      0      0      0      0      0      0
 89     UI      0      0      0      0      0      0      0      0      0      0
 90     UI      0      0      0      0      0      0      0      0      0      0
        *

 91     KK     E3  BASIN
 92     BA  0.038
 93     LG   0.29   0.26   5.05   0.30      4
 94     UI      0     12     12     26     47     66     83     99    110    117
 95     UI    118    113    105     88     74     63     54     45     38     32
 96     UI     27     23     19     17     13     13      8      8      8      5
 97     UI      3      3      3      3      3      3      3      3      3      0
 98     UI      0      0      0      0      0      0      0      0      0      0
        *

 99     KK     E4  BASIN
100     BA  0.921
101     LG   0.28   0.27   5.24   0.28      6
102     UI      0     84     84     84     84     84     84     84     84    173
103     UI    243    243    297    329    364    405    445    470    511    545
104     UI    580    602    598    694    695    721    747    752    771    764
105     UI    810    810    810    810    810    810    803    777    766    760
106     UI    748    720    694    650    614    589    589    531    511    494
107     UI    463    445    432    399    393    367    360    329    329    299
108     UI    299    274    259    259    235    231    231    198    189    189
109     UI    188    159    159    159    159    143    130    130    130    130
110     UI    128     90     90     90     90     90     90     90     87     58
111     UI     58     58     58     58     58     58     58     58     58     58
112     UI     58     30     21     21     21     21     21     21     21     21
113     UI     21     21     21     21     21     21     21     21     21     21
114     UI     21     21     21     21     21     21     21     21     21     21
115     UI     21     21     21     21     21      0      0      0      0      0
        *

116     KK  CP-E4 COMBINE
117     HC      4   .982
        *

118     KK R-CPE4  ROUTE
119     RS      1   FLOW
120     RC  0.060  0.040  0.060   2050 0.0234 2635.00
121     RX   0.00  33.00  50.00 130.00 345.00 390.00 447.00 530.00
122     RY  34.00  25.00  18.00  19.00  18.00  20.00  26.00  32.00
        *
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LINE    ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

123     KK     E5  BASIN
124     BA  0.063
125     LG   0.35   0.36   5.14   0.27      0
126     UI      0     23     23     65    105    143    176    204    217    221
127     UI    209    184    152    126    105     86     71     58     48     41
```

```
128     UI       35      25      24      16      16      16       7       6       6       6
129     UI        6       6       6       6       0       0       0       0       0       0
130     UI        0       0       0       0       0       0       0       0       0       0
        *

131     KK    CP-E5 COMBINE
132     HC        2   1.044
        *

133     KK       F1   BASIN
134     BA    0.001
135     LG     0.35    0.30    7.94    0.09       0
136     UI        0       9      19       8       2       1       0       0       0       0
137     UI        0       0       0       0       0       0       0       0       0       0
138     UI        0       0       0       0       0       0       0       0       0       0
139     UI        0       0       0       0       0       0       0       0       0       0
140     UI        0       0       0       0       0       0       0       0       0       0
        *

141     KK       G1   BASIN
142     BA    0.007
143     LG     0.35    0.36    5.14    0.26       0
144     UI        0       5      14      28      40      44      40      29      21      15
145     UI       10       8       5       4       3       1       1       1       1       0
146     UI        0       0       0       0       0       0       0       0       0       0
147     UI        0       0       0       0       0       0       0       0       0       0
148     UI        0       0       0       0       0       0       0       0       0       0
        *

149     KK       H1   BASIN
150     BA    0.005
151     LG     0.35    0.36    5.05    0.28       0
152     UI        0       5      20      35      41      34      22      14       9       6
153     UI        4       2       1       1       1       0       0       0       0       0
154     UI        0       0       0       0       0       0       0       0       0       0
155     UI        0       0       0       0       0       0       0       0       0       0
156     UI        0       0       0       0       0       0       0       0       0       0
        *

157     KK       I1   BASIN
158     BA    0.006
159     LG     0.35    0.36    5.05    0.28       0
160     UI        0       4      12      24      33      37      34      26      18      13
161     UI        9       7       5       3       3       1       1       1       1       1
162     UI        0       0       0       0       0       0       0       0       0       0
163     UI        0       0       0       0       0       0       0       0       0       0
164     UI        0       0       0       0       0       0       0       0       0       0
        *
```



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

165     KK     CLR2 COMBINE
166     HC        4
        *
        *

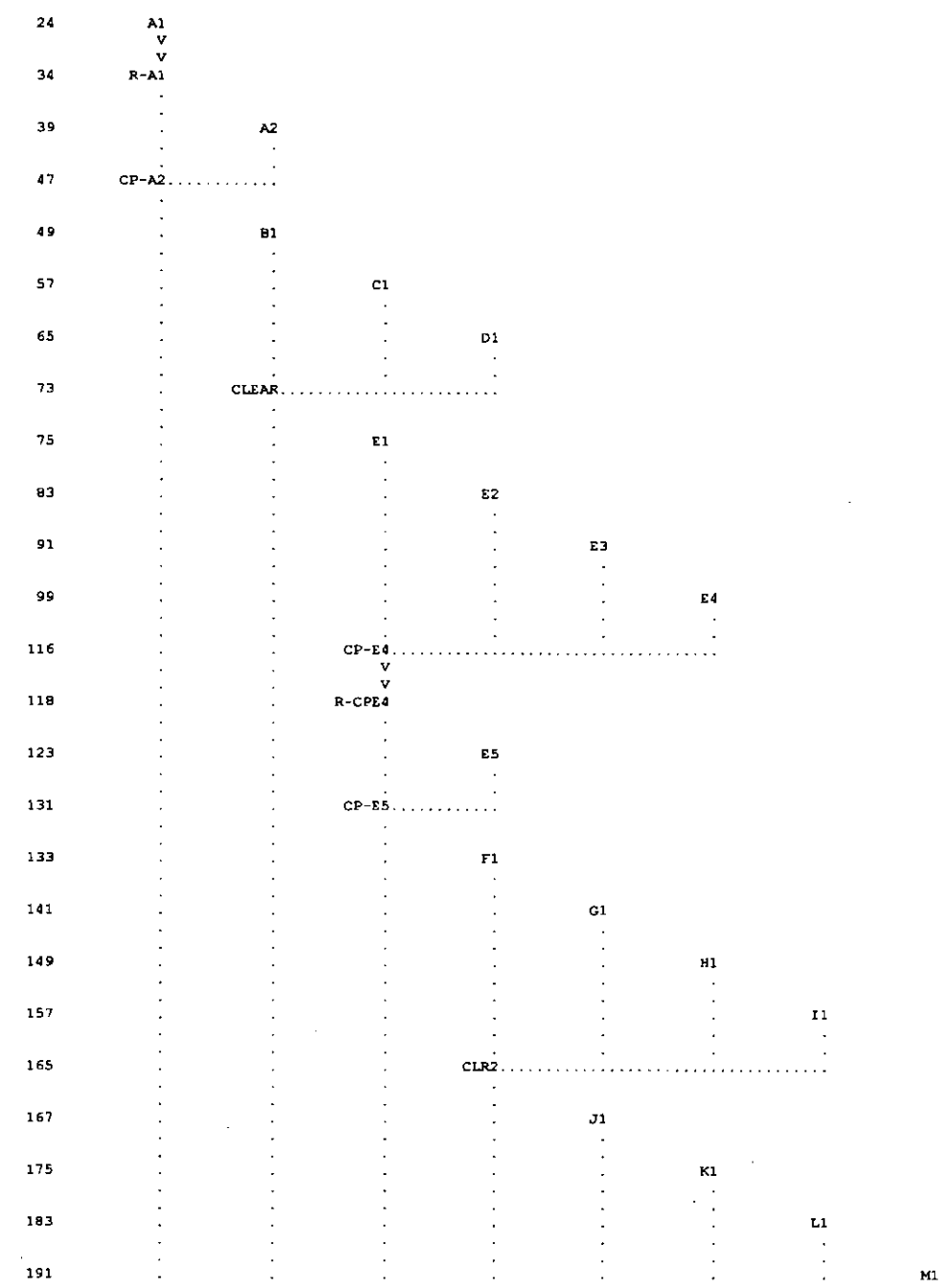
167     KK       J1   BASIN
168     BA    0.003
169     LG     0.35    0.36    5.14    0.26       0
170     UI        0       3      13      22      25      20      13       8       5       3
171     UI        2       1       1       1       0       0       0       0       0       0
172     UI        0       0       0       0       0       0       0       0       0       0
173     UI        0       0       0       0       0       0       0       0       0       0
174     UI        0       0       0       0       0       0       0       0       0       0
        *

175     KK       K1   BASIN
176     BA    0.020
177     LG     0.35    0.37    5.24    0.26       0
178     UI        0      11      25      55      81     100     106      97      75      57
179     UI       43      32      23      18      13      10       8       6       3       3
180     UI        3       3       3       0       0       0       0       0       0       0
181     UI        0       0       0       0       0       0       0       0       0       0
182     UI        0       0       0       0       0       0       0       0       0       0
        *

183     KK       L1   BASIN
184     BA    0.003
185     LG     0.35    0.36    5.05    0.28       0
186     UI        0       6      23      33      25      14       7       4       2       1
187     UI        1       0       0       0       0       0       0       0       0       0
188     UI        0       0       0       0       0       0       0       0       0       0
189     UI        0       0       0       0       0       0       0       0       0       0
190     UI        0       0       0       0       0       0       0       0       0       0
        *

191     KK       M1   BASIN
192     BA    0.001
193     LG     0.35    0.36    5.05    0.28       0
194     UI        0       3       9      12       7       4       2       1       0       0
195     UI        0       0       0       0       0       0       0       0       0       0
196     UI        0       0       0       0       0       0       0       0       0       0
197     UI        0       0       0       0       0       0       0       0       0       0
198     UI        0       0       0       0       0       0       0       0       0       0
        *
199     ZZ
```

SCHEMATIC DIAGRAM OF STREAM NETWORK



(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1****************************************                                        ****************************************
*                                       *                                        *                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                                        *  U.S. ARMY CORPS OF ENGINEERS        *
*             JUN   1998                *                                        *  HYDROLOGIC ENGINEERING CENTER       *
*           VERSION 4.1                 *                                        *       609 SECOND STREET              *
*                                       *                                        *    DAVIS, CALIFORNIA 95616           *
* RUN DATE   15JUN16  TIME  20:29:36    *                                        *        (916) 756-1104                *
*                                       *                                        *                                      *
****************************************                                         ****************************************
```

```
                    Flood Control District of Maricopa County
                    DM19 EX - Desert Mountain 19 Existing Condition
                    100 YEAR
                    6 Hour  Storm
                    Unit Hydrograph: S-Graph
                    Storm: Multiple
                    06/14/2016
                    WOOD/PATEL FILE NAME: DM19EX100.DAT

10 IO        OUTPUT CONTROL VARIABLES
                  IPRNT           5  PRINT CONTROL
                  IPLOT           0  PLOT CONTROL
                  QSCAL          0.  HYDROGRAPH PLOT SCALE

   IT        HYDROGRAPH TIME DATA
                   NMIN           1  MINUTES IN COMPUTATION INTERVAL
                  IDATE      1JAN99  STARTING DATE
                  ITIME        0000  STARTING TIME
                     NQ        2000  NUMBER OF HYDROGRAPH ORDINATES
                 NDDATE      2JAN99  ENDING DATE
                 NDTIME        0919  ENDING TIME
                  ICENT          19  CENTURY MARK

               COMPUTATION INTERVAL     .02 HOURS
                    TOTAL TIME BASE   33.32 HOURS

      ENGLISH UNITS
           DRAINAGE AREA          SQUARE MILES
           PRECIPITATION DEPTH    INCHES
           LENGTH, ELEVATION      FEET
           FLOW                   CUBIC FEET PER SECOND
           STORAGE VOLUME         ACRE-FEET
           SURFACE AREA           ACRES
           TEMPERATURE            DEGREES FAHRENHEIT

12 JD        INDEX STORM NO. 1
                   STRM        3.31  PRECIPITATION DEPTH
                   TRDA         .00  TRANSPOSITION DRAINAGE AREA

13 PI          PRECIPITATION PATTERN
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.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
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.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.03	.03	.03	.03	.03
.03	.03	.03	.03	.03	.03	.03	.03	.03	.03
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16 JD        INDEX STORM NO. 2
                   STRM        3.29  PRECIPITATION DEPTH
                   TRDA         .50  TRANSPOSITION DRAINAGE AREA

17 PI          PRECIPITATION PATTERN
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.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
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20 JD INDEX STORM NO. 3

STRM 3.23 PRECIPITATION DEPTH

TRDA 2.80 TRANSPOSITION DRAINAGE AREA

21 PI PRECIPITATION PATTERN

.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
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RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+	HYDROGRAPH AT	A1	468.	4.13	38.	10.	7.	.20		
+	ROUTED TO	R-A1	462.	4.18	38.	10.	7.	.20		
+	HYDROGRAPH AT	A2	50.	4.02	3.	1.	0.	.01		
+	2 COMBINED AT	CP-A2	469.	4.17	41.	10.	7.	.21		
+	HYDROGRAPH AT	B1	35.	4.02	2.	0.	0.	.01		
+	HYDROGRAPH AT	C1	26.	4.02	1.	0.	0.	.01		
+	HYDROGRAPH AT	D1	7.	4.02	0.	0.	0.	.00		
+	3 COMBINED AT	CLEAR	67.	4.02	3.	1.	1.	.02		
+	HYDROGRAPH AT	E1	72.	4.02	4.	1.	1.	.02		
+	HYDROGRAPH AT	E2	3.	4.02	0.	0.	0.	.00		
+	HYDROGRAPH AT	E3	111.	4.07	7.	2.	1.	.04		
+	HYDROGRAPH AT	E4	1111.	4.42	165.	41.	30.	.92		
+	4 COMBINED AT	CP-E4	1115.	4.40	174.	44.	31.	.98		
+	ROUTED TO	R-CPE4	1116.	4.40	174.	44.	31.	.98		
+	HYDROGRAPH AT	E5	186.	4.05	11.	3.	2.	.06		
+	2 COMBINED AT	CP-E5	1124.	4.38	183.	46.	33.	1.04		
+	HYDROGRAPH AT	F1	4.	4.02	0.	0.	0.	.00		
+	HYDROGRAPH AT	G1	23.	4.02	1.	0.	0.	.01		
+	HYDROGRAPH AT	H1	17.	4.02	1.	0.	0.	.00		
+	HYDROGRAPH AT	I1	20.	4.02	1.	0.	0.	.01		
+	4 COMBINED AT	CLR2	63.	4.02	3.	1.	1.	.02		
+	HYDROGRAPH AT	J1	10.	4.02	1.	0.	0.	.00		
+	HYDROGRAPH AT	K1	65.	4.02	3.	1.	1.	.02		
+	HYDROGRAPH AT	L1	10.	4.02	1.	0.	0.	.00		
+	HYDROGRAPH AT	M1	3.	4.02	0.	0.	0.	.00		

*** NORMAL END OF HEC-1 ***

APPENDIX B

Developed Condition Hydrologic Calculations

DDMSW Output Data

2-year HEC-1 Model

10-year HEC-1 Model

100-year HEC-1 Model

DDMSW Output Data

Area ID	Book Number	Map Unit	Soil ID	Area (sq mi)	Area (%)	XKSAT	Rock Percent (%)	Effective Rock (%)	Comments
Major Basin ID: 01									
A1	645	33	64533	0.085	43.00	0.230	-	100	
	645	40	64540	0.083	42.20	0.170	-	100	
	645	93	64593	0.023	11.50	0.330	-	100	
	645	96	64596	0.007	3.30	0.070	-	100	
A2	645	93	64593	0.010	69.20	0.330	-	100	
	645	96	64596	0.005	30.80	0.070	-	100	
B1	645	33	64533	0.022	100.00	0.230	-	100	
B10	645	93	64593	0.012	100.00	0.330	-	100	
B11	645	93	64593	0.009	92.70	0.330	-	100	
	645	34	64534	0.001	7.30	0.230	-	100	
B12	645	6	6456	0.002	49.00	0.620	-	100	
	645	93	64593	0.003	51.00	0.330	-	100	
B13	645	34	64534	0.000	3.40	0.230	-	100	
	645	96	64596	0.003	86.20	0.070	-	100	
	645	6	6456	0.000	10.30	0.620	-	100	
B14	645	6	6456	0.009	22.90	0.620	-	100	
	645	96	64596	0.016	41.60	0.070	-	100	
	645	34	64534	0.011	29.60	0.230	-	100	
	645	33	64533	0.002	5.20	0.230	-	100	
	645	93	64593	0.000	0.80	0.330	-	100	
B14A	645	96	64596	0.003	69.00	0.070	-	100	
	645	6	6456	0.001	31.00	0.620	-	100	
B2	645	33	64533	0.001	100.00	0.230	-	100	
B3	645	33	64533	0.038	100.00	0.230	-	100	
B4	645	6	6456	0.043	4.60	0.620	-	100	
	645	33	64533	0.712	77.30	0.230	-	100	
	645	34	64534	0.004	0.50	0.230	-	100	
	645	40	64540	0.014	1.50	0.170	-	100	
	645	63	64563	0.079	8.60	0.140	25.00	100	
	645	96	64596	0.069	7.50	0.070	-	100	
B5	645	34	64534	0.006	100.00	0.230	-	100	
B6	645	6	6456	0.002	20.90	0.620	-	100	
	645	33	64533	0.005	54.70	0.230	-	100	
	645	93	64593	0.002	24.40	0.330	-	100	
B6W	645	93	64593	0.000	3.30	0.330	-	100	
	645	33	64533	0.000	3.30	0.230	-	100	
	645	6	6456	0.003	93.30	0.620	-	100	
B8	645	33	64533	0.008	75.90	0.230	-	100	
	645	93	64593	0.002	22.20	0.330	-	100	
	645	6	6456	0.000	1.90	0.620	-	100	
B9	645	93	64593	0.008	100.00	0.330	-	100	
C1	645	33	64533	0.001	3.10	0.230	-	100	
	645	34	64534	0.022	94.70	0.230	-	100	
	645	96	64596	0.001	2.20	0.070	-	100	
L1	645	33	64533	0.003	100.00	0.230	-	100	
M1	645	33	64533	0.002	100.00	0.230	-	100	

Flood Control District of Maricopa County
Drainage Design Management System
LAND USE
Project Reference: DM19 PROP

Sub Basin	Land Use Code	Area (sq mi)	Area (%)	Initial Loss (IA)	Percent Impervious (RTIMP)	Vegetation Cover (%)	DTHETA	Kn	Description
Major Basin ID: 01									
A1	901	0.0181	9.2	0.20	0	75.0	NORMAL	0.030	Recreational Open Space
	902	0.1792	90.8	0.30	5	30.0	NORMAL	0.040	Rural (1 dwelling unit per acre or less)
		0.1973	**100.0**						
A2	900	0.0110	100.0	0.35	0	30.0	DRY	0.040	Vacant (Existing land use database only)
		0.0110	**100.0**						
B1	900	0.0018	8.3	0.35	0	30.0	DRY	0.040	Vacant (Existing land use database only)
	901	0.0045	20.7	0.20	0	75.0	NORMAL	0.030	Recreational Open Space
	902	0.0154	71.0	0.30	5	30.0	NORMAL	0.040	Rural (1 dwelling unit per acre or less)
		0.0217	**100.0**						
B10	110	0.0010	8.3	0.30	5	30.0	NORMAL	0.020	Rural Residential (<= 1/5 du per acre)
	150	0.0010	8.3	0.15	25	30.0	NORMAL	0.040	Small Lot Residential - (2-5 dwelling units per acre)
	901	0.0100	83.3	0.20	0	75.0	NORMAL	0.030	Recreational Open Space
		0.0120	**99.9**						
B11	150	0.0080	80.0	0.15	25	30.0	NORMAL	0.040	Small Lot Residential - (2-5 dwelling units per acre)
	600	0.0020	20.0	0.05	95	0.0	DRY	0.015	General Transportation (Transportation where no detail avai
		0.0100	**100.0**						
B12	730	0.0050	100.0	0.10	0	90.0	NORMAL	0.030	Passive Open Space (Includes mountain preserves and washes)
		0.0050	**100.0**						
B13	150	0.0004	13.3	0.15	25	30.0	NORMAL	0.040	Small Lot Residential - (2-5 dwelling units per acre)
	600	0.0015	50.0	0.05	95	0.0	DRY	0.015	General Transportation (Transportation where no detail avai
	901	0.0011	36.7	0.20	0	75.0	NORMAL	0.030	Recreational Open Space

* Non default value

Flood Control District of Maricopa County
Drainage Design Management System
LAND USE
Project Reference: DM19 PROP

Sub Basin	Land Use Code	Area (sq mi)	Area (%)	Initial Loss (IA)	Percent Impervious (RTIMP)	Vegetation Cover (%)	DTHETA	Kn	Description
Major Basin ID: 01									
		0.0030	**100.0**						
B14	150	0.0070	17.9	0.15	25	30.0	NORMAL	0.040	Small Lot Residential - (2-5 dwelling units per acre)
	230	0.0040	10.3	0.10	80	30.0	NORMAL	0.020	Community Commercial (100,000 to 500,000 sq. ft.)
	600	0.0040	10.3	0.05	95	0.0	DRY	0.015	General Transportation (Transportation where no detail avail
	901	0.0240	61.5	0.20	0	75.0	NORMAL	0.030	Recreational Open Space
		0.0390	**100.0**						
B14A	150	0.0040	80.0	0.15	25	30.0	NORMAL	0.040	Small Lot Residential - (2-5 dwelling units per acre)
	600	0.0010	20.0	0.05	95	0.0	DRY	0.015	General Transportation (Transportation where no detail avail
		0.0050	**100.0**						
B2	900	0.0012	100.0	0.35	0	30.0	DRY	0.040	Vacant (Existing land use database only)
		0.0012	**100.0**						
B3	900	0.0038	10.0	0.35	0	30.0	DRY	0.040	Vacant (Existing land use database only)
	901	0.0057	15.0	0.20	0	75.0	NORMAL	0.030	Recreational Open Space
	902	0.0285	75.0	0.30	5	30.0	NORMAL	0.040	Rural (1 dwelling unit per acre or less)
		0.0380	**100.0**						
B4	130	0.0074	0.8	0.18	15	35.0	NORMAL	0.040	Large Lot Residential - Single Family (1 du per acre to 2 du
	150	0.0250	2.7	0.15	25	30.0	NORMAL	0.040	Small Lot Residential - (2-5 dwelling units per acre)
	220	0.0067	0.7	0.07	80	10.0	NORMAL	0.020	Neighborhood Retail Center
	900	0.1237	13.5	0.35	0	30.0	DRY	0.040	Vacant (Existing land use database only)
	901	0.2047	22.3	0.20	0	75.0	NORMAL	0.030	Recreational Open Space
	902	0.5446	59.3	0.30	5	30.0	NORMAL	0.040	Rural (1 dwelling unit per acre or less)

* Non default value

Flood Control District of Maricopa County
Drainage Design Management System
LAND USE
Project Reference: DM19 PROP

Sub Basin	Land Use Code	Area (sq mi)	Area (%)	Initial Loss (IA)	Percent Impervious (RTIMP)	Vegetation Cover (%)	DTHETA	Kn	Description
Major Basin ID: 01									
B4	903	0.0066	0.7	0.20	0	35.0	NORMAL	0.050	Dedicated Open Space
		0.9187	**100.0**						
B5	900	0.0010	16.7	0.35	0	30.0	DRY	0.040	Vacant (Existing land use database only)
	901	0.0050	83.3	0.20	0	75.0	NORMAL	0.030	Recreational Open Space
		0.0060	**100.0**						
B6	600	0.0003	3.4	0.05	95	0.0	DRY	0.015	General Transportation (Transportation where no detail avail
	730	0.0001	1.1	0.10	0	90.0	NORMAL	0.030	Passive Open Space (Includes mountain preserves and washes)
	901	0.0083	95.4	0.20	0	75.0	NORMAL	0.030	Recreational Open Space
		0.0087	**99.9**						
B6W	600	0.0002	6.5	0.05	95	0.0	DRY	0.015	General Transportation (Transportation where no detail avail
	730	0.0019	61.3	0.10	0	90.0	NORMAL	0.030	Passive Open Space (Includes mountain preserves and washes)
	901	0.0010	32.3	0.20	0	75.0	NORMAL	0.030	Recreational Open Space
		0.0031	**100.1**						
B8	150	0.0090	81.8	0.15	25	30.0	NORMAL	0.040	Small Lot Residential - (2-5 dwelling units per acre)
	600	0.0020	18.2	0.05	95	0.0	DRY	0.015	General Transportation (Transportation where no detail avail
		0.0110	**100.0**						
B9	150	0.0060	75.0	0.15	25	30.0	NORMAL	0.040	Small Lot Residential - (2-5 dwelling units per acre)
	600	0.0020	25.0	0.05	95	0.0	DRY	0.015	General Transportation (Transportation where no detail avail
		0.0080	**100.0**						
C1	150	0.0060	25.0	0.15	25	30.0	NORMAL	0.040	Small Lot Residential - (2-5 dwelling units per acre)
	600	0.0020	8.3	0.05	95	0.0	DRY	0.015	General Transportation (Transportation where no detail avail

* Non default value

Flood Control District of Maricopa County
Drainage Design Management System
LAND USE
Project Reference: DM19 PROP

Sub Basin	Land Use Code	Area (sq mi)	Area (%)	Initial Loss (IA)	Percent Impervious (RTIMP)	Vegetation Cover (%)	DTHETA	Kn	Description
Major Basin ID: 01									
C1	901	0.0160	66.7	0.20	0	75.0	NORMAL	0.030	Recreational Open Space
		0.0240	**100.0**						
L1	900	0.0027	100.0	0.35	0	30.0	DRY	0.040	Vacant (Existing land use database only)
		0.0027	**100.0**						
M1	900	0.0015	100.0	0.35	0	30.0	DRY	0.040	Vacant (Existing land use database only)
		0.0015	**100.0**						

* Non default value

Flood Control District of Maricopa County
Drainage Design Management System
SUB BASINS
Project Reference: DM19 PROP

Area ID	Sub Basin Parameters								Rainfall Losses				
	Area (sq mi)	Length (mi)	Slope (ft/mi)	S-Graph	Lca (mi)	Lag (min)	Velocity (f/s)	Kn	IA (in)	DTHETA	PSIF (in)	XKSAT (in/hr)	RTIMP (%)
Major Basin ID: 01													
B14A	0.004	0.04	394.7	VALLEY	0.02	1.10	3.17	0.035	0.13	0.26	6.16	0.160	39
A1	0.197	0.95	134.1	DESERT/RANGE	0.51	16.80	4.96	0.039	0.29	0.25	5.34	0.258	5
B6W	0.003	0.17	126.5	VALLEY	0.08	3.20	4.53	0.029	0.13	0.28	3.37	1.041	6
A2	0.011	0.19	118.3	DESERT/RANGE	0.10	5.10	3.20	0.040	0.35	0.37	5.24	0.250	
B5	0.006	0.11	136.4	VALLEY	0.06	2.70	3.60	0.032	0.23	0.27	5.05	0.377	
B6	0.009	0.11	133.9	VALLEY	0.06	2.50	4.01	0.029	0.19	0.25	4.45	0.524	3
B8	0.010	0.18	61.5	VALLEY	0.09	4.80	3.28	0.035	0.13	0.27	4.87	0.295	38
B1	0.022	0.31	184.7	DESERT/RANGE	0.15	6.40	4.35	0.038	0.28	0.26	5.05	0.306	4
B9	0.008	0.08	144.6	VALLEY	0.04	2.20	3.36	0.034	0.13	0.28	4.33	0.376	43
B2	0.001	0.05	297.9	DESERT/RANGE	0.02	1.40	3.00	0.040	0.35	0.36	5.05	0.281	
B10	0.012	0.22	113.6	VALLEY	0.11	4.30	4.53	0.030	0.20	0.25	4.33	0.541	2
B3	0.038	0.57	146.3	DESERT/RANGE	0.25	10.40	4.85	0.039	0.29	0.26	5.05	0.299	4
B11	0.010	0.18	107.3	VALLEY	0.09	4.30	3.62	0.035	0.13	0.27	4.39	0.374	39
B4	0.921	3.33	259.5	DESERT/RANGE	1.69	36.70	7.99	0.038	0.28	0.27	5.24	0.281	6
B12	0.005	0.13	150.4	DESERT/RANGE	0.07	2.80	4.15	0.030	0.10	0.25	3.79	0.851	
B13	0.003	0.05	408.2	VALLEY	0.02	.80	5.44	0.024	0.12	0.24	7.27	0.114	51
B14	0.038	0.33	121.2	VALLEY	0.16	5.50	5.29	0.029	0.17	0.26	5.58	0.266	23
C1	0.023	0.30	82.5	VALLEY	0.15	6.00	4.47	0.031	0.18	0.26	5.05	0.344	14
L1	0.003	0.12	243.7	DESERT/RANGE	0.05	2.90	3.62	0.040	0.35	0.36	5.05	0.281	
M1	0.001	0.10	204.1	DESERT/RANGE	0.04	2.60	3.38	0.040	0.35	0.36	5.05	0.281	

* Non default value

2-year HEC-1 Model

```
1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*             JUN  1998                 *
*          VERSION 4.1                  *
*                                       *
*  RUN DATE   15JUN16  TIME  20:59:37   *
*                                       *
*****************************************
```

```
*****************************************
*                                       *
*   U.S. ARMY CORPS OF ENGINEERS        *
*   HYDROLOGIC ENGINEERING CENTER       *
*        609 SECOND STREET              *
*      DAVIS, CALIFORNIA 95616          *
*        (916) 756-1104                 *
*                                       *
*****************************************
```

```
X     X  XXXXXXX   XXXXX          X
X     X  X        X     X        XX
X     X  X        X              X
XXXXXXX  XXXX     X        XXXXX  X
X     X  X        X              X
X     X  X        X     X        X
X     X  XXXXXXX   XXXXX         XXX
```

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

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

1 HEC-1 INPUT PAGE 1

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

    1         ID        Flood Control District of Maricopa County
    2         ID        DM19 PROP - Desert Mountain 19 Post Online Det Basins 1st Flush
    3         ID        2 YEAR
    4         ID        6 Hour  Storm
    5         ID        Unit Hydrograph: S-Graph
    6         ID        Storm: Multiple
    7         ID        06/14/2016
    8         ID        WOOD/PATEL FILE NAME: DM19FT2.DAT
              *DIAGRAM
    9         IT      1  1JAN99       0    2000
   10         IO      5
   11         IN     15
              *
   12         JD  1.475  0.0001
   13         PC  0.000   0.008   0.016   0.025   0.033   0.041   0.050   0.058   0.066   0.074
   14         PC  0.087   0.099   0.118   0.138   0.216   0.377   0.834   0.911   0.931   0.950
   15         PC  0.962   0.972   0.983   0.991   1.000
   16         JD  1.466  0.5000
   17         PC  0.000   0.008   0.016   0.025   0.033   0.041   0.050   0.058   0.066   0.074
   18         PC  0.087   0.099   0.118   0.138   0.216   0.377   0.834   0.911   0.931   0.950
   19         PC  0.962   0.972   0.983   0.991   1.000
   20         JD  1.456     1.0
   21         PC  0.000   0.008   0.016   0.025   0.033   0.041   0.050   0.058   0.066   0.075
   22         PC  0.087   0.099   0.119   0.148   0.230   0.407   0.778   0.881   0.919   0.945
   23         PC  0.957   0.968   0.980   0.990   1.000
   24         JD  1.438     2.8
   25         PC  0.000   0.009   0.016   0.025   0.034   0.042   0.051   0.059   0.067   0.076
   26         PC  0.087   0.100   0.120   0.163   0.252   0.451   0.694   0.837   0.900   0.938
   27         PC  0.950   0.963   0.975   0.988   1.000
              *

   28         KK     A1   BASIN
   29         BA  0.197
   30         LG   0.29    0.25    5.34    0.26       5
   31         UI      0      39      39      39      50     114     146     182     223     254
   32         UI    279     323     344     355     374     378     378     369     357     338
   33         UI    302     275     245     222     200     181     164     147     133     120
   34         UI    108      94      88      75      74      62      61      53      42      42
   35         UI     42      31      27      27      27      27      25      10      10      10
   36         UI     10      10      10      10      10      10      10      10      10      10
   37         UI     10      10       0       0       0       0       0       0       0       0
              *

   38         KK   R-A1   ROUTE
   39         RS      4    FLOW
   40         RC  0.060   0.040   0.060     980  0.0224   19.00
   41         RX   0.00   42.00   73.00  106.00  196.00  225.00  251.00  295.00
   42         RY  20.00   15.00   10.00    7.00    6.00    5.00   13.00   19.00
              *
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1 HEC-1 INPUT PAGE 2

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

   43         KK     A2   BASIN
   44         BA  0.011
   45         LG   0.35    0.37    5.24    0.25       0
   46         UI      0       7      22      45      62      70      63      46      33      23
   47         UI     16      12       8       6       5       2       2       2       2       0
   48         UI      0       0       0       0       0       0       0       0       0       0
   49         UI      0       0       0       0       0       0       0       0       0       0
   50         UI      0       0       0       0       0       0       0       0       0       0
              *

   51         KK   CP-A2 COMBINE
   52         HC      2
              *
```

```
  53          KK      B1   BASIN
  54          BA   0.022
  55          LG    0.28    0.26    5.05    0.31       4
  56          UI       0      12      23      55      81     101     111     106      88      66
  57          UI      51      39      29      23      17      12       9       8       5       3
  58          UI       3       3       3       3       0       0       0       0       0       0
  59          UI       0       0       0       0       0       0       0       0       0       0
  60          UI       0       0       0       0       0       0       0       0       0       0
              *

  61          KK    R-B1   ROUTE
  62          RK     500  0.0200   0.013            CIRC   3.500
              *

  63          KK      B2   BASIN
  64          BA   0.001
  65          LG    0.35    0.36    5.05    0.28       0
  66          UI       0      10      19       7       2       1       0       0       0       0
  67          UI       0       0       0       0       0       0       0       0       0       0
  68          UI       0       0       0       0       0       0       0       0       0       0
  69          UI       0       0       0       0       0       0       0       0       0       0
  70          UI       0       0       0       0       0       0       0       0       0       0
              *

  71          KK      B3   BASIN
  72          BA   0.038
  73          LG    0.29    0.26    5.05    0.30       4
  74          UI       0      12      12      26      47      66      83      99     110     117
  75          UI     118     113     105      88      74      63      54      45      38      32
  76          UI      27      23      19      17      13      13       8       8       8       5
  77          UI       3       3       3       3       3       3       3       3       3       0
  78          UI       0       0       0       0       0       0       0       0       0       0
              *

  79          KK   CP-B3 COMBINE
  80          HC       2
              *
1                                        HEC-1 INPUT                                        PAGE  3

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

  81          KK  R-CPB3   ROUTE
  82          RS       2    FLOW
  83          RC   0.060   0.040   0.060     300  0.0100   10.00
  84          RX    0.00    7.50   15.00   18.00   21.00   23.00   30.50   38.00
  85          RY   10.00    7.50    5.00    5.00    5.00    5.00    7.50   10.00
              *

  86          KK      B4   BASIN
  87          BA   0.921
  88          LG    0.28    0.27    5.24    0.28       6
  89          UI       0      84      84      84      84      84      84      84      84     173
  90          UI     243     243     297     329     364     405     445     470     511     545
  91          UI     580     602     598     694     695     721     747     752     771     764
  92          UI     810     810     810     810     810     810     803     777     766     760
  93          UI     748     720     694     650     614     589     589     531     511     494
  94          UI     463     445     432     399     393     367     360     329     329     299
  95          UI     299     274     259     259     235     231     231     198     189     189
  96          UI     188     159     159     159     159     143     130     130     130     130
  97          UI     128      90      90      90      90      90      90      90      87      58
  98          UI      58      58      58      58      58      58      58      58      58      58
  99          UI      58      30      21      21      21      21      21      21      21      21
 100          UI      21      21      21      21      21      21      21      21      21      21
 101          UI      21      21      21      21      21      21      21      21      21      21
 102          UI      21      21      21      21      21       0       0       0       0       0
              *

 103          KK    DVOC  DIVERT
 104          DT    DTOC    0.00  1050.0
 105          DI     0.0  2000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
 106          DQ     0.0  2000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
              *

 107          KK   DETOC STORAGE
 108          KO
 109          RS       1    STOR
 110          SV            0.26    0.59    0.99    1.48
 111          SQ            4.00    9.00   12.00   15.00
 112          SE            1.00    2.00    3.00    4.00
              *

 113          KK    DVOCRETRIEVE
 114          DR    DTOC
              *

 115          KK     B4C COMBINE
 116          HC       2
              *

 117          KK    DVOD  DIVERT
 118          DT    DTOD    0.00   975.0
 119          DI     0.0 20000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
 120          DQ     0.0 20000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
              *
1                                        HEC-1 INPUT                                        PAGE  4

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

 121          KK   DETOD STORAGE
 122          KO
 123          RS       1    STOR
 124          SV            0.42    0.89    1.42    2.01
```

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125          SQ           4.00    9.00   12.00   15.00
126          SE           1.00    2.00    3.00    4.00
             *

127          KK    DVODRETRIEVE
128          DR    DTOD
             *

129          KK     B4D COMBINE
130          HC       2
             *

131          KK   CP-B4 COMBINE
132          HC       2
             *

133          KK  R-CPB4   ROUTE
134          RS       1    FLOW
135          RC   0.060   0.040   0.060     300  0.0300 2631.00
136          RX    0.00   18.90   43.80   54.80   81.50   91.60  120.00  160.00
137          RY 2635.0 2630.00 2629.00 2625.00 2625.00 2629.00 2630.00 2631.00
             *

138          KK   CP-B5 COMBINE
139          HC       2
             *

140          KK  R-CPB5   ROUTE
141          RS       2    FLOW
142          RC   0.060   0.040   0.060     650  0.0300 2631.00
143          RX    0.00   18.90   43.80   54.80   81.50   91.60  120.00  160.00
144          RY 2635.0 2630.00 2629.00 2625.00 2625.00 2629.00 2630.00 2631.00
             *

145          KK      B6   BASIN
146          BA   0.009
147          LG    0.19    0.25    4.45    0.52       3
148          UI       0      26      78     129      74      27       9       4       0       0
149          UI       0       0       0       0       0       0       0       0       0       0
150          UI       0       0       0       0       0       0       0       0       0       0
151          UI       0       0       0       0       0       0       0       0       0       0
152          UI       0       0       0       0       0       0       0       0       0       0
             *

153          KK      B8   BASIN
154          BA   0.010
155          LG    0.13    0.27    4.87    0.30      38
156          UI       0       7      25      39      55      83      63      46      31      15
157          UI      10       6       2       2       2       0       0       0       0       0
158          UI       0       0       0       0       0       0       0       0       0       0
```



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

159          UI       0       0       0       0       0       0       0       0       0       0
160          UI       0       0       0       0       0       0       0       0       0       0
             *

161          KK    CP68 COMBINE
162          HC       2
             *

163          KK   DET68 STORAGE
164          KO
165          RS       1    STOR
166          SV            0.09    0.21    0.37    0.58
167          SQ            1.00    1.00    2.00    2.00
168          SE 2608.0 2609.00 2610.00 2611.00 2612.00
169          SS 2612.0   20.00    2.80    1.50
             *

170          KK     B6W   BASIN
171          BA   0.003
172          LG    0.13    0.28    3.37    1.04       6
173          UI       0       5      16      29      32      19       9       4       1       1
174          UI       0       0       0       0       0       0       0       0       0       0
175          UI       0       0       0       0       0       0       0       0       0       0
176          UI       0       0       0       0       0       0       0       0       0       0
177          UI       0       0       0       0       0       0       0       0       0       0
             *

178          KK   CP-6W COMBINE
179          HC       3
             *

180          KK   DV-B7  DIVERT
181          DT   DT-B7     0.00     0.0
182          DI      0.0   150.0   300.0   450.0   600.0   750.0   900.0  1050.0  1200.0     0.0
183          DQ      0.0     4.0     9.0    12.0    15.0    18.0    20.0    22.0    24.0     0.0
             *

184          KK   DV-B7RETRIEVE
185          DR   DT-B7
             *

186          KK    B14A   BASIN
187          BA   0.004
188          LG    0.13    0.26    6.16    0.16      39
189          UI       0      62      83       9       0       0       0       0       0       0
190          UI       0       0       0       0       0       0       0       0       0       0
191          UI       0       0       0       0       0       0       0       0       0       0
192          UI       0       0       0       0       0       0       0       0       0       0
193          UI       0       0       0       0       0       0       0       0       0       0
             *
```

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

  194     KK   CP-V7 COMBINE
  195     HC       2
          *

  196     KK  DETBV7 STORAGE
  197     KO
  198     RS       1    STOR
  199     SV            0.22    0.47    0.77    1.10
  200     SQ            1.00    1.00    2.00   50.00
  201     SE  2606.0 2607.00 2608.00 2609.00 2610.00
          *

  202     KK      B9   BASIN
  203     BA   0.008
  204     LG    0.13    0.28    4.33    0.38      43
  205     UI       0      31      93     116      50      15       4       0       0       0
  206     UI       0       0       0       0       0       0       0       0       0       0
  207     UI       0       0       0       0       0       0       0       0       0       0
  208     UI       0       0       0       0       0       0       0       0       0       0
  209     UI       0       0       0       0       0       0       0       0       0       0
          *

  210     KK   DV-B9  DIVERT
  211     DT   DT-B9    0.21     0.0
  212     DI      0.0  1000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
  213     DQ      0.0  1000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
          *

  214     KK   CP-B9 COMBINE
  215     HC       3
          *

  216     KK  R-CPB9   ROUTE
  217     RS       1    FLOW
  218     RC   0.060   0.040   0.060     750  0.0300 2605.00
  219     RX    0.00   55.30  123.80  129.00  141.80  146.00  155.20  188.60
  220     RY  2608.0 2600.00 2598.00 2596.00 2596.00 2597.80 2598.00 2605.00
          *

  221     KK     B10   BASIN
  222     BA   0.012
  223     LG    0.20    0.25    4.33    0.54       2
  224     UI       0      10      39      58      90     102      69      47      23      13
  225     UI       7       3       3       0       0       0       0       0       0       0
  226     UI       0       0       0       0       0       0       0       0       0       0
  227     UI       0       0       0       0       0       0       0       0       0       0
  228     UI       0       0       0       0       0       0       0       0       0       0
          *

1                                        HEC-1 INPUT                                        PAGE  7

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

  229     KK  DV-B10  DIVERT
  230     DT  DT-B10    0.32     0.0
  231     DI      0.0  1000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
  232     DQ      0.0  1000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
          *

  233     KK     B12   BASIN
  234     BA   0.005
  235     LG    0.10    0.25    3.79    0.85       0
  236     UI       0      11      41      56      40      22      12       6       3       1
  237     UI       1       0       0       0       0       0       0       0       0       0
  238     UI       0       0       0       0       0       0       0       0       0       0
  239     UI       0       0       0       0       0       0       0       0       0       0
  240     UI       0       0       0       0       0       0       0       0       0       0
          *

  241     KK     B14   BASIN
  242     BA   0.038
  243     LG    0.17    0.26    5.58    0.27      23
  244     UI       0      23      67     119     155     222     274     198     149     108
  245     UI      58      39      24      12       7       7       7       0       0       0
  246     UI       0       0       0       0       0       0       0       0       0       0
  247     UI       0       0       0       0       0       0       0       0       0       0
  248     UI       0       0       0       0       0       0       0       0       0       0
          *

  249     KK  DV-B14  DIVERT
  250     DT  DT-B14    1.03     0.0
  251     DI      0.0  1000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
  252     DQ      0.0  1000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
          *

  253     KK  CP-B14 COMBINE
  254     HC       4
          *

  255     KK      C1   BASIN
  256     BA   0.023
  257     LG    0.18    0.26    5.05    0.34      14
  258     UI       0      13      33      61      79     104     155     128      99      76
  259     UI      55      29      22      13       8       4       4       4       0       0
  260     UI       0       0       0       0       0       0       0       0       0       0
  261     UI       0       0       0       0       0       0       0       0       0       0
  262     UI       0       0       0       0       0       0       0       0       0       0
          *

  263     KK   DV-C1  DIVERT
  264     DT   DT-C1    0.61     0.0
```

```
   265          DI     0.0  1000.0     0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0
   266          DQ     0.0  1000.0     0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0
                *
1                                              HEC-1 INPUT                                                 PAGE  8

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


   267          KK   DVC-K  DIVERT
   268          DT   DTC-K    0.00       1
   269          DI     0.0    1000     0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0
   270          DQ     0.0    1000     0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0
                *

   271          KK   DVC-H  DIVERT
   272          DT   DTC-H    0.00       4
   273          DI     0.0    1000     0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0
   274          DQ     0.0    1000     0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0
                *

   275          KK     B13   BASIN
   276          BA   0.003
   277          LG    0.12    0.24    7.27     0.11       51
   278          UI       0      82      33        0        0        0        0        0        0        0
   279          UI       0       0       0        0        0        0        0        0        0        0
   280          UI       0       0       0        0        0        0        0        0        0        0
   281          UI       0       0       0        0        0        0        0        0        0        0
   282          UI       0       0       0        0        0        0        0        0        0        0
                *

   283          KK  DV-B13  DIVERT
   284          DT  DT-B13    0.08     0.0
   285          DI     0.0  1000.0     0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0
   286          DQ     0.0  1000.0     0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0
                *

   287          KK   CPB13 COMBINE
   288          HC       2
                *

   289          KK    DVGF  DIVERT
   290          DT    DVGF    0.00       1
   291          DI     0.0    1000     0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0
   292          DQ     0.0    1000     0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0
                *

   293          KK   R-B13   ROUTE
   294          RK     450  0.0090   0.013             CIRC    4.000
                *

   295          KK   CPGAL COMBINE
   296          HC       2
                *

   297          KK      B5   BASIN
   298          BA   0.006
   299          LG    0.23    0.27    5.05     0.38        0
   300          UI       0      15      45       80       54       25       10        2        2        0
   301          UI       0       0       0        0        0        0        0        0        0        0
   302          UI       0       0       0        0        0        0        0        0        0        0
   303          UI       0       0       0        0        0        0        0        0        0        0
   304          UI       0       0       0        0        0        0        0        0        0        0
                *
1                                              HEC-1 INPUT                                                 PAGE  9

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


   305          KK   DV-B5  DIVERT
   306          DT   DT-B5    0.55     0.0
   307          DI     0.0  1000.0     0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0
   308          DQ     0.0  1000.0     0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0
                *

   309          KK     B11   BASIN
   310          BA   0.010
   311          LG    0.13    0.27    4.39     0.37       39
   312          UI       0       8      32       48       75       85       57       39       19       11
   313          UI       6       2       2        0        0        0        0        0        0        0
   314          UI       0       0       0        0        0        0        0        0        0        0
   315          UI       0       0       0        0        0        0        0        0        0        0
   316          UI       0       0       0        0        0        0        0        0        0        0
                *

   317          KK  DV-C11  DIVERT
   318          DT  DT-C11     0.0     5.0
   319          DI     0.0  1000.0     0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0
   320          DQ     0.0  1000.0     0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0
                *

   321          KK  DV-B11  DIVERT
   322          DT  DT-B11    0.26     0.0
   323          DI     0.0  1000.0     0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0
   324          DQ     0.0  1000.0     0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0
                *
                *

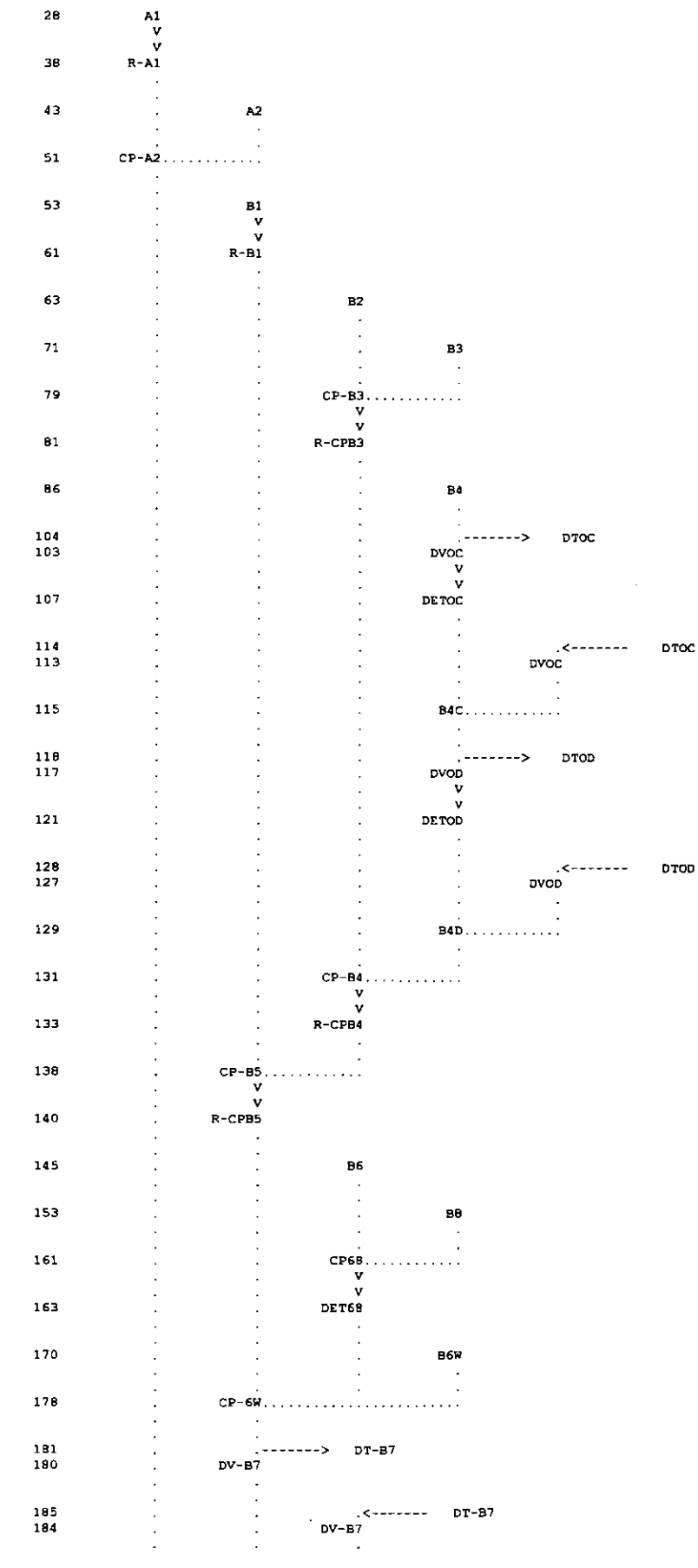
   325          KK      L1   BASIN
   326          BA   0.003
   327          LG    0.35    0.36    5.05     0.28        0
   328          UI       0       6      23       33       25       14        7        4        2        1
   329          UI       1       0       0        0        0        0        0        0        0        0
   330          UI       0       0       0        0        0        0        0        0        0        0
   331          UI       0       0       0        0        0        0        0        0        0        0
   332          UI       0       0       0        0        0        0        0        0        0        0
```

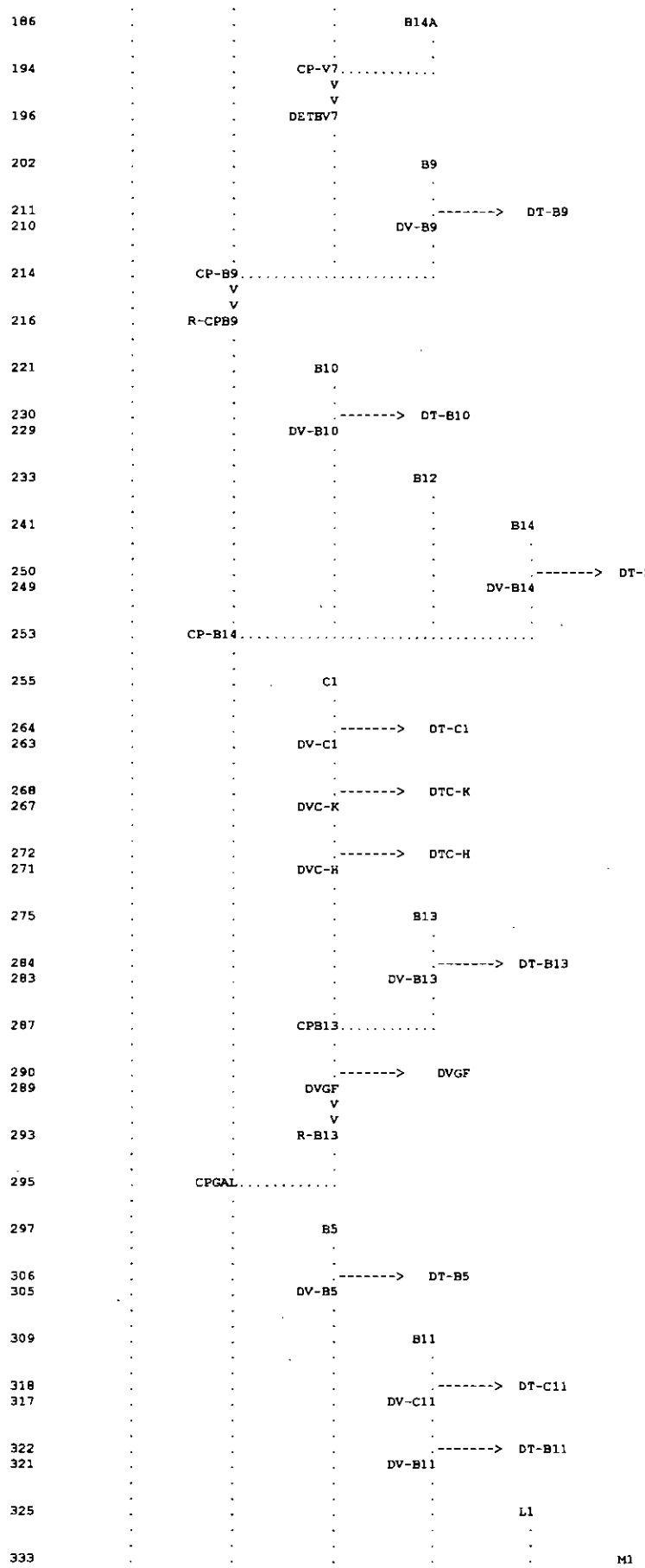
SCHEMATIC DIAGRAM OF STREAM NETWORK

INPUT LINE NO.

(V) ROUTING (---->) DIVERSION OR PUMP FLOW

(.) CONNECTOR (<----) RETURN OF DIVERTED OR PUMPED FLOW





(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

FLOOD HYDROGRAPH PACKAGE (HEC-1)
JUN 1998
VERSION 4.1

RUN DATE 15JUN16 TIME 20:59:37

U.S. ARMY CORPS OF ENGINEERS
HYDROLOGIC ENGINEERING CENTER
609 SECOND STREET
DAVIS, CALIFORNIA 95616
(916) 756-1104

Flood Control District of Maricopa County
DM19 PROP - Desert Mountain 19 Post Online Det Basins 1st Flush
2 YEAR
6 Hour Storm
Unit Hydrograph: S-Graph
Storm: Multiple
06/14/2016
WOOD/PATEL FILE NAME: DM19FT2.DAT

10 IO OUTPUT CONTROL VARIABLES

IPRNT	5	PRINT CONTROL
IPLOT	0	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE

IT HYDROGRAPH TIME DATA

NMIN	1	MINUTES IN COMPUTATION INTERVAL
IDATE	1JAN99	STARTING DATE
ITIME	0000	STARTING TIME
NQ	2000	NUMBER OF HYDROGRAPH ORDINATES
NDDATE	2JAN99	ENDING DATE
NDTIME	0919	ENDING TIME
ICENT	19	CENTURY MARK

COMPUTATION INTERVAL .02 HOURS
TOTAL TIME BASE 33.32 HOURS

ENGLISH UNITS

DRAINAGE AREA	SQUARE MILES
PRECIPITATION DEPTH	INCHES
LENGTH, ELEVATION	FEET
FLOW	CUBIC FEET PER SECOND
STORAGE VOLUME	ACRE-FEET
SURFACE AREA	ACRES
TEMPERATURE	DEGREES FAHRENHEIT

12 JD INDEX STORM NO. 1

STRM	1.48	PRECIPITATION DEPTH
TRDA	.00	TRANSPOSITION DRAINAGE AREA

13 PI PRECIPITATION PATTERN

.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
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16 JD INDEX STORM NO. 2

STRM	1.47	PRECIPITATION DEPTH
TRDA	.50	TRANSPOSITION DRAINAGE AREA

17 PI PRECIPITATION PATTERN

.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
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20 JD INDEX STORM NO. 3
STRM 1.46 PRECIPITATION DEPTH
TRDA 1.00 TRANSPOSITION DRAINAGE AREA

21 PI PRECIPITATION PATTERN

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24 JD INDEX STORM NO. 4
STRM 1.44 PRECIPITATION DEPTH
TRDA 2.80 TRANSPOSITION DRAINAGE AREA

25 PI PRECIPITATION PATTERN

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.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.02	.02	.02	.02	.02
.02	.02	.02	.02	.02	.02	.02	.02	.02	.02
.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.00	.00	.00	.00	.00
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                .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
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                .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
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*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


          **************
          *            *
107 KK    *     DETOC  *      STORAGE
          *            *
          **************

108 KO          OUTPUT CONTROL VARIABLES
                      IPRNT           5  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


          **************
          *            *
121 KK    *     DETOD  *      STORAGE
          *            *
          **************

122 KO          OUTPUT CONTROL VARIABLES
                      IPRNT           5  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


          **************
          *            *
163 KK    *     DET68  *      STORAGE
          *            *
          **************

164 KO          OUTPUT CONTROL VARIABLES
                      IPRNT           5  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


          **************
          *            *
196 KK    *    DETBV7  *      STORAGE
          *            *
          **************

197 KO          OUTPUT CONTROL VARIABLES
                      IPRNT           5  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE
```

1

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+	HYDROGRAPH AT	A1	131.	4.15	9.	2.	2.	.20		
+	ROUTED TO	R-A1	128.	4.22	9.	2.	2.	.20		
+	HYDROGRAPH AT	A2	10.	4.03	0.	0.	0.	.01		
+	2 COMBINED AT	CP-A2	128.	4.22	10.	2.	2.	.21		
+	HYDROGRAPH AT	B1	21.	4.03	1.	0.	0.	.02		
+	ROUTED TO	R-B1	21.	4.05	1.	0.	0.	.02		
+	HYDROGRAPH AT	B2	1.	4.02	0.	0.	0.	.00		
+	HYDROGRAPH AT	B3	31.	4.08	2.	0.	0.	.04		
+	2 COMBINED AT	CP-B3	31.	4.07	2.	0.	0.	.04		
+	ROUTED TO	R-CPB3	31.	4.10	2.	0.	0.	.04		
+	HYDROGRAPH AT	B4	236.	4.43	33.	8.	6.	.92		
+	DIVERSION TO	DTOC	236.	4.43	33.	8.	6.	.92		
+	HYDROGRAPH AT	DVOC	0.	.00	0.	0.	0.	.92		
+	ROUTED TO	DETOC	0.	.00	0.	0.	0.	.92		
+	HYDROGRAPH AT	DVOC	236.	4.43	33.	8.	6.	.92		
+	2 COMBINED AT	B4C	236.	4.43	33.	8.	6.	.92		
+	DIVERSION TO	DTOD	236.	4.43	33.	8.	6.	.92		
+	HYDROGRAPH AT	DVOD	0.	.00	0.	0.	0.	.92		
+	ROUTED TO	DETOD	0.	.00	0.	0.	0.	.92		
+	HYDROGRAPH AT	DVOD	236.	4.43	33.	8.	6.	.92		
+	2 COMBINED AT	B4D	236.	4.43	33.	8.	6.	.92		
+	2 COMBINED AT	CP-B4	234.	4.43	34.	8.	6.	.96		
+	ROUTED TO	R-CPB4	233.	4.43	34.	8.	6.	.96		
+	2 COMBINED AT	CP-B5	231.	4.43	34.	9.	6.	.98		
+	ROUTED TO	R-CPB5	230.	4.47	34.	9.	6.	.98		
+	HYDROGRAPH AT	B6	8.	4.02	0.	0.	0.	.01		
+	HYDROGRAPH AT	B8	13.	4.02	1.	0.	0.	.01		
+	2 COMBINED AT	CP68	21.	4.02	1.	0.	0.	.02		
+	ROUTED TO	DET68	2.	4.03	1.	0.	0.	.02		
+	HYDROGRAPH AT	B6W	1.	4.03	0.	0.	0.	.00		
+	3 COMBINED AT	CP-6W	230.	4.47	35.	9.	6.	1.00		
+	DIVERSION TO	DT-B7	7.	4.47	1.	0.	0.	1.00		

+	HYDROGRAPH AT DV-B7	223.	4.47	34.	8.	6.	1.00
+	HYDROGRAPH AT DV-B7	7.	4.47	1.	0.	0.	1.00
+	HYDROGRAPH AT B14A	6.	4.02	0.	0.	0.	.00
+	2 COMBINED AT CP-V7	10.	4.45	2.	0.	0.	.00
+	ROUTED TO DETBV7	2.	5.22	1.	0.	0.	.00
+	HYDROGRAPH AT B9	11.	4.02	1.	0.	0.	.01
+	DIVERSION TO DT-B9	10.	3.92	0.	0.	0.	.01
+	HYDROGRAPH AT DV-B9	11.	4.02	0.	0.	0.	.01
+	3 COMBINED AT CP-B9	223.	4.47	34.	9.	6.	1.02
+	ROUTED TO R-CPB9	222.	4.48	34.	9.	6.	1.02
+	HYDROGRAPH AT B10	10.	4.03	0.	0.	0.	.01
+	DIVERSION TO DT-B10	10.	4.03	0.	0.	0.	.01
+	HYDROGRAPH AT DV-B10	0.	.00	0.	0.	0.	.01
+	HYDROGRAPH AT B12	3.	4.02	0.	0.	0.	.00
+	HYDROGRAPH AT B14	47.	4.02	3.	1.	0.	.04
+	DIVERSION TO DT-B14	47.	4.02	2.	1.	0.	.04
+	HYDROGRAPH AT DV-B14	37.	4.08	1.	0.	0.	.04
+	4 COMBINED AT CP-B14	222.	4.48	34.	9.	6.	1.07
+	HYDROGRAPH AT C1	25.	4.03	1.	0.	0.	.02
+	DIVERSION TO DT-C1	25.	4.03	1.	0.	0.	.02
+	HYDROGRAPH AT DV-C1	1.	4.30	0.	0.	0.	.02
+	DIVERSION TO DTC-K	1.	4.30	0.	0.	0.	.02
+	HYDROGRAPH AT DVC-K	0.	4.23	0.	0.	0.	.02
+	DIVERSION TO DTC-H	0.	4.23	0.	0.	0.	.02
+	HYDROGRAPH AT DVC-H	0.	.00	0.	0.	0.	.02
+	HYDROGRAPH AT B13	5.	4.02	0.	0.	0.	.00
+	DIVERSION TO DT-B13	5.	3.85	0.	0.	0.	.00
+	HYDROGRAPH AT DV-B13	5.	4.02	0.	0.	0.	.00
+	2 COMBINED AT CPB13	5.	4.02	0.	0.	0.	.03
+	DIVERSION TO DVGF	1.	3.87	0.	0.	0.	.03
+	HYDROGRAPH AT DVGF	4.	4.02	0.	0.	0.	.03
+	ROUTED TO R-B13	4.	4.00	0.	0.	0.	.03
+	2 COMBINED AT CPGAL	222.	4.48	34.	9.	6.	1.10
+	HYDROGRAPH AT B5	6.	4.02	0.	0.	0.	.01
+	DIVERSION TO DT-B5	6.	4.02	0.	0.	0.	.01

	HYDROGRAPH AT						
+		DV-B5	0.	.00	0.	0.	0.	.01
	HYDROGRAPH AT						
+		B11	13.	4.02	1.	0.	0.	.01
	DIVERSION TO						
+		DT-C11	5.	3.83	1.	0.	0.	.01
	HYDROGRAPH AT						
+		DV-C11	8.	4.02	0.	0.	0.	.01
	DIVERSION TO						
+		DT-B11	8.	4.02	0.	0.	0.	.01
	HYDROGRAPH AT						
+		DV-B11	0.	.00	0.	0.	0.	.01
	HYDROGRAPH AT						
+		L1	3.	4.02	0.	0.	0.	.00
	HYDROGRAPH AT						
+		M1	1.	4.02	0.	0.	0.	.00

1

SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
(FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)

ISTAQ	ELEMENT	DT	PEAK	TIME TO PEAK	VOLUME	INTERPOLATED TO COMPUTATION INTERVAL DT	PEAK	TIME TO PEAK	VOLUME
		(MIN)	(CFS)	(MIN)	(IN)	(MIN)	(CFS)	(MIN)	(IN)
FOR STORM = 1 STORM AREA (SQ MI) = .00									
R-B1	MANE	.31	21.32	242.49	.40	1.00	21.29	243.00	.40

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4734E+00 EXCESS= .0000E+00 OUTFLOW= .4734E+00 BASIN STORAGE= .3981E-14 PERCENT ERROR= .0

FOR STORM = 2 STORM AREA (SQ MI) = .50									
R-B1	MANE	.31	21.05	242.51	.40	1.00	21.01	243.00	.40

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4667E+00 EXCESS= .0000E+00 OUTFLOW= .4667E+00 BASIN STORAGE= .3958E-14 PERCENT ERROR= .0

FOR STORM = 3 STORM AREA (SQ MI) = 1.00									
R-B1	MANE	.32	14.69	242.84	.29	1.00	14.68	243.00	.29

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3390E+00 EXCESS= .0000E+00 OUTFLOW= .3390E+00 BASIN STORAGE= .3900E-14 PERCENT ERROR= .0

FOR STORM = 4 STORM AREA (SQ MI) = 2.80									
R-B1	MANE	.31	5.30	243.35	.13	1.00	5.26	243.00	.13

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1480E+00 EXCESS= .0000E+00 OUTFLOW= .1480E+00 BASIN STORAGE= .3907E-14 PERCENT ERROR= .0

FOR STORM = 1 STORM AREA (SQ MI) = .00									
R-B13	MANE	.41	3.71	240.86	.04	1.00	3.71	240.00	.04

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5032E-01 EXCESS= .0000E+00 OUTFLOW= .5052E-01 BASIN STORAGE= .7473E-14 PERCENT ERROR= -.4

FOR STORM = 2 STORM AREA (SQ MI) = .50									
R-B13	MANE	.42	3.68	240.73	.04	1.00	3.67	240.00	.04

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4921E-01 EXCESS= .0000E+00 OUTFLOW= .4924E-01 BASIN STORAGE= .7400E-14 PERCENT ERROR= -.1

FOR STORM = 3 STORM AREA (SQ MI) = 1.00									
R-B13	MANE	.38	2.69	240.74	.03	1.00	2.69	241.00	.03

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3451E-01 EXCESS= .0000E+00 OUTFLOW= .3471E-01 BASIN STORAGE= .7444E-14 PERCENT ERROR= -.6

FOR STORM = 4 STORM AREA (SQ MI) = 2.80									
R-B13	MANE	.47	1.24	240.99	.01	1.00	1.24	241.00	.01

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1741E-01 EXCESS= .0000E+00 OUTFLOW= .1761E-01 BASIN STORAGE= .7703E-14 PERCENT ERROR= -1.1

*** NORMAL END OF HEC-1 ***

10-year HEC-1 Model

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1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*             JUN  1998                 *
*           VERSION 4.1                 *
*                                       *
*  RUN DATE   15JUN16  TIME  20:59:46   *
*                                       *
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*                                       *
*    U.S. ARMY CORPS OF ENGINEERS       *
*    HYDROLOGIC ENGINEERING CENTER      *
*          609 SECOND STREET            *
*       DAVIS, CALIFORNIA 95616         *
*           (916) 756-1104              *
*                                       *
*****************************************
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X     X  XXXXXXX   XXXXX           X
X     X  X        X     X         XX
X     X  X        X               X
XXXXXXX  XXXX     X        XXXXX  X
X     X  X        X               X
X     X  X        X     X         X
X     X  XXXXXXX   XXXXX          XXX
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THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

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

1 HEC-1 INPUT PAGE 1

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

    1         ID        Flood Control District of Maricopa County
    2         ID        DM19 PROP - Desert Mountain 19 Post Online Det Basins 1st Flush
    3         ID        10 YEAR
    4         ID        6 Hour  Storm
    5         ID        Unit Hydrograph: S-Graph
    6         ID        Storm: Multiple
    7         ID        06/14/2016
    8         ID        WOOD/PATEL FILE NAME: DM19FT10.DAT
              *DIAGRAM
    9         IT     1  1JAN99       0    2000
   10         IO     5
   11         IN    15
              *
   12         JD  2.182  0.0001
   13         PC  0.000   0.008   0.016   0.025   0.033   0.041   0.050   0.058   0.066   0.074
   14         PC  0.087   0.099   0.118   0.138   0.216   0.377   0.834   0.911   0.931   0.950
   15         PC  0.962   0.972   0.983   0.991   1.000
   16         JD  2.169  0.5000
   17         PC  0.000   0.008   0.016   0.025   0.033   0.041   0.050   0.058   0.066   0.074
   18         PC  0.087   0.099   0.118   0.138   0.216   0.377   0.834   0.911   0.931   0.950
   19         PC  0.962   0.972   0.983   0.991   1.000
   20         JD  2.154     1.0
   21         PC  0.000   0.008   0.016   0.025   0.033   0.041   0.050   0.058   0.066   0.075
   22         PC  0.087   0.099   0.119   0.148   0.230   0.407   0.778   0.881   0.919   0.945
   23         PC  0.957   0.968   0.980   0.990   1.000
   24         JD  2.127     2.8
   25         PC  0.000   0.009   0.016   0.025   0.034   0.042   0.051   0.059   0.067   0.076
   26         PC  0.087   0.100   0.120   0.163   0.252   0.451   0.694   0.837   0.900   0.938
   27         PC  0.950   0.963   0.975   0.988   1.000
              *

   28         KK      A1   BASIN
   29         BA   0.197
   30         LG   0.29    0.25    5.34    0.26       5
   31         UI      0      39      39      39      50     114     146     182     223     254
   32         UI    279     323     344     355     374     378     378     369     357     338
   33         UI    302     275     245     222     200     181     164     147     133     120
   34         UI    108      94      88      75      74      62      61      53      42      42
   35         UI     42      31      27      27      27      27      25      10      10      10
   36         UI     10      10      10      10      10      10      10      10      10      10
   37         UI     10      10       0       0       0       0       0       0       0       0
              *

   38         KK   R-A1   ROUTE
   39         RS      3    FLOW
   40         RC  0.060   0.040   0.060     980  0.0224   19.00
   41         RX   0.00   42.00   73.00  106.00  196.00  225.00  251.00  295.00
   42         RY  20.00   15.00   10.00    7.00    6.00    5.00   13.00   19.00
              *
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1 HEC-1 INPUT PAGE 2

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

   43         KK      A2   BASIN
   44         BA   0.011
   45         LG   0.35    0.37    5.24    0.25       0
   46         UI      0       7      22      45      62      70      63      46      33      23
   47         UI     16      12       8       6       5       2       2       2       2       0
   48         UI      0       0       0       0       0       0       0       0       0       0
   49         UI      0       0       0       0       0       0       0       0       0       0
   50         UI      0       0       0       0       0       0       0       0       0       0
              *

   51         KK   CP-A2 COMBINE
   52         HC      2
              *
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```
 53        KK      B1   BASIN
 54        BA   0.022
 55        LG    0.28    0.26    5.05    0.31       4
 56        UI       0      12      23      55      81     101     111     106      88      66
 57        UI      51      39      29      23      17      12       9       8       5       3
 58        UI       3       3       3       3       0       0       0       0       0       0
 59        UI       0       0       0       0       0       0       0       0       0       0
 60        UI       0       0       0       0       0       0       0       0       0       0
           *

 61        KK    R-B1   ROUTE
 62        RK     500  0.0200   0.013            CIRC   3.500
           *

 63        KK      B2   BASIN
 64        BA   0.001
 65        LG    0.35    0.36    5.05    0.28       0
 66        UI       0      10      19       7       2       1       0       0       0       0
 67        UI       0       0       0       0       0       0       0       0       0       0
 68        UI       0       0       0       0       0       0       0       0       0       0
 69        UI       0       0       0       0       0       0       0       0       0       0
 70        UI       0       0       0       0       0       0       0       0       0       0
           *

 71        KK      B3   BASIN
 72        BA   0.038
 73        LG    0.29    0.26    5.05    0.30       4
 74        UI       0      12      12      26      47      66      83      99     110     117
 75        UI     118     113     105      88      74      63      54      45      38      32
 76        UI      27      23      19      17      13      13       8       8       8       5
 77        UI       3       3       3       3       3       3       3       3       3       0
 78        UI       0       0       0       0       0       0       0       0       0       0
           *

 79        KK   CP-B3 COMBINE
 80        HC       2
           *
1                                      HEC-1 INPUT                                           PAGE  3

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

 81        KK  R-CPB3   ROUTE
 82        RS       1    FLOW
 83        RC   0.060   0.040   0.060     300  0.0100   10.00
 84        RX    0.00    7.50   15.00   18.00   21.00   23.00   30.50   38.00
 85        RY   10.00    7.50    5.00    5.00    5.00    5.00    7.50   10.00
           *

 86        KK      B4   BASIN
 87        BA   0.921
 88        LG    0.28    0.27    5.24    0.28       6
 89        UI       0      84      84      84      84      84      84      84      84     173
 90        UI     243     243     297     329     364     405     445     470     511     545
 91        UI     580     602     598     694     695     721     747     752     771     764
 92        UI     810     810     810     810     810     810     803     777     766     760
 93        UI     748     720     694     650     614     589     589     531     511     494
 94        UI     463     445     432     399     393     367     360     329     329     299
 95        UI     299     274     259     259     235     231     231     198     189     189
 96        UI     188     159     159     159     159     143     130     130     130     130
 97        UI     128      90      90      90      90      90      90      90      87      58
 98        UI      58      58      58      58      58      58      58      58      58      58
 99        UI      58      30      21      21      21      21      21      21      21      21
100        UI      21      21      21      21      21      21      21      21      21      21
101        UI      21      21      21      21      21      21      21      21      21      21
102        UI      21      21      21      21      21       0       0       0       0       0
           *

103        KK    DVOC  DIVERT
104        DT    DTOC    0.00  1050.0
105        DI     0.0  2000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
106        DQ     0.0  2000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
           *

107        KK   DETOC STORAGE
108        KO
109        RS       1    STOR
110        SV            0.26    0.59    0.99    1.48
111        SQ            4.00    9.00   12.00   15.00
112        SE            1.00    2.00    3.00    4.00
           *

113        KK    DVOCRETRIEVE
114        DR    DTOC
           *

115        KK     B4C COMBINE
116        HC       2
           *

117        KK    DVOD  DIVERT
118        DT    DTOD    0.00   975.0
119        DI     0.0 20000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
120        DQ     0.0 20000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
           *
1                                      HEC-1 INPUT                                           PAGE  4

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

121        KK   DETOD STORAGE
122        KO
123        RS       1    STOR
124        SV            0.42    0.89    1.42    2.01
```

```
125          SQ           4.00    9.00   12.00   15.00
126          SE           1.00    2.00    3.00    4.00
             *

127          KK    DVODRETRIEVE
128          DR    DTOD
             *

129          KK     B4D COMBINE
130          HC       2
             *

131          KK   CP-B4 COMBINE
132          HC       2
             *

133          KK  R-CPB4    ROUTE
134          RS       1     FLOW
135          RC   0.060   0.040   0.060     300  0.0300 2631.00
136          RX    0.00   18.90   43.80   54.80   81.50   91.60  120.00  160.00
137          RY  2635.0 2630.00 2629.00 2625.00 2625.00 2629.00 2630.00 2631.00
             *

138          KK   CP-B5 COMBINE
139          HC       2
             *

140          KK  R-CPB5    ROUTE
141          RS       1     FLOW
142          RC   0.060   0.040   0.060     650  0.0300 2631.00
143          RX    0.00   18.90   43.80   54.80   81.50   91.60  120.00  160.00
144          RY  2635.0 2630.00 2629.00 2625.00 2625.00 2629.00 2630.00 2631.00
             *

145          KK      B6    BASIN
146          BA   0.009
147          LG    0.19    0.25    4.45    0.52       3
148          UI       0      26      78     129      74      27       9       4       0       0
149          UI       0       0       0       0       0       0       0       0       0       0
150          UI       0       0       0       0       0       0       0       0       0       0
151          UI       0       0       0       0       0       0       0       0       0       0
152          UI       0       0       0       0       0       0       0       0       0       0
             *

153          KK      B8    BASIN
154          BA   0.010
155          LG    0.13    0.27    4.87    0.30      38
156          UI       0       7      25      39      55      83      63      46      31      15
157          UI      10       6       2       2       2       0       0       0       0       0
158          UI       0       0       0       0       0       0       0       0       0       0
```



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

159          UI       0       0       0       0       0       0       0       0       0       0
160          UI       0       0       0       0       0       0       0       0       0       0
             *

161          KK    CP6B COMBINE
162          HC       2
             *

163          KK   DET6B STORAGE
164          KO
165          RS       1     STOR
166          SV            0.09    0.21    0.37    0.58
167          SQ            1.00    1.00    2.00    2.00
168          SE  2608.0 2609.00 2610.00 2611.00 2612.00
169          SS  2612.0   20.00    2.80    1.50
             *

170          KK     B6W    BASIN
171          BA   0.003
172          LG    0.13    0.29    3.37    1.04       6
173          UI       0       5      16      29      32      19       9       4       1       1
174          UI       0       0       0       0       0       0       0       0       0       0
175          UI       0       0       0       0       0       0       0       0       0       0
176          UI       0       0       0       0       0       0       0       0       0       0
177          UI       0       0       0       0       0       0       0       0       0       0
             *

178          KK   CP-6W COMBINE
179          HC       3
             *

180          KK   DV-B7  DIVERT
181          DT   DT-B7     0.00     0.0
182          DI      0.0   150.0   300.0   450.0   600.0   750.0   900.0  1050.0  1200.0     0.0
183          DQ      0.0     4.0     9.0    12.0    15.0    18.0    20.0    22.0    24.0     0.0
             *

184          KK   DV-B7RETRIEVE
185          DR   DT-B7
             *

186          KK    B14A    BASIN
187          BA   0.004
188          LG    0.13    0.26    6.16    0.16      39
189          UI       0      62      83       9       0       0       0       0       0       0
190          UI       0       0       0       0       0       0       0       0       0       0
191          UI       0       0       0       0       0       0       0       0       0       0
192          UI       0       0       0       0       0       0       0       0       0       0
193          UI       0       0       0       0       0       0       0       0       0       0
             *
```

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

 194          KK   CP-V7 COMBINE
 195          HC       2
              *

 196          KK  DETBV7 STORAGE
 197          KO
 198          RS       1    STOR
 199          SV            0.22    0.47    0.77    1.10
 200          SQ            1.00    1.00    2.00   50.00
 201          SE  2606.0 2607.00 2608.00 2609.00 2610.00
              *

 202          KK      B9   BASIN
 203          BA   0.008
 204          LG    0.13    0.28    4.33    0.38      43
 205          UI       0      31      93     116      50      15       4       0       0       0
 206          UI       0       0       0       0       0       0       0       0       0       0
 207          UI       0       0       0       0       0       0       0       0       0       0
 208          UI       0       0       0       0       0       0       0       0       0       0
 209          UI       0       0       0       0       0       0       0       0       0       0
              *

 210          KK   DV-B9  DIVERT
 211          DT   DT-B9    0.21     0.0
 212          DI      0.0  1000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
 213          DQ      0.0  1000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
              *

 214          KK   CP-B9 COMBINE
 215          HC       3
              *

 216          KK  R-CPB9   ROUTE
 217          RS       2    FLOW
 218          RC   0.060   0.040   0.060     750  0.0300 2605.00
 219          RX    0.00   55.30  123.80  129.00  141.80  146.00  155.20  188.60
 220          RY  2608.0 2600.00 2598.00 2596.00 2596.00 2597.80 2598.00 2605.00
              *

 221          KK      B10  BASIN
 222          BA   0.012
 223          LG    0.20    0.25    4.33    0.54       2
 224          UI       0      10      39      58      90     102      69      47      23      13
 225          UI       7       3       3       0       0       0       0       0       0       0
 226          UI       0       0       0       0       0       0       0       0       0       0
 227          UI       0       0       0       0       0       0       0       0       0       0
 228          UI       0       0       0       0       0       0       0       0       0       0
              *

1                                        HEC-1 INPUT                                        PAGE  7

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

 229          KK  DV-B10  DIVERT
 230          DT  DT-B10    0.32     0.0
 231          DI      0.0  1000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
 232          DQ      0.0  1000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
              *

 233          KK      B12  BASIN
 234          BA   0.005
 235          LG    0.10    0.25    3.79    0.85       0
 236          UI       0      11      41      56      40      22      12       6       3       1
 237          UI       1       0       0       0       0       0       0       0       0       0
 238          UI       0       0       0       0       0       0       0       0       0       0
 239          UI       0       0       0       0       0       0       0       0       0       0
 240          UI       0       0       0       0       0       0       0       0       0       0
              *

 241          KK      B14  BASIN
 242          BA   0.038
 243          LG    0.17    0.26    5.58    0.27      23
 244          UI       0      23      67     119     155     222     274     198     149     108
 245          UI      58      39      24      12       7       7       7       0       0       0
 246          UI       0       0       0       0       0       0       0       0       0       0
 247          UI       0       0       0       0       0       0       0       0       0       0
 248          UI       0       0       0       0       0       0       0       0       0       0
              *

 249          KK  DV-B14  DIVERT
 250          DT  DT-B14    1.03     0.0
 251          DI      0.0  1000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
 252          DQ      0.0  1000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
              *

 253          KK  CP-B14 COMBINE
 254          HC       4
              *

 255          KK      C1   BASIN
 256          BA   0.023
 257          LG    0.18    0.26    5.05    0.34      14
 258          UI       0      13      33      61      79     104     155     128      99      76
 259          UI      55      29      22      13       8       4       4       4       0       0
 260          UI       0       0       0       0       0       0       0       0       0       0
 261          UI       0       0       0       0       0       0       0       0       0       0
 262          UI       0       0       0       0       0       0       0       0       0       0
              *

 263          KK   DV-C1  DIVERT
 264          DT   DT-C1    0.61     0.0
```

```
 265          DI     0.0  1000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
 266          DQ     0.0  1000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
              *
```



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

 267          KK   DVC-K  DIVERT
 268          DT   DTC-K    0.00      18
 269          DI     0.0    1000      0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
 270          DQ     0.0    1000      0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
              *

 271          KK   DVC-H  DIVERT
 272          DT   DTC-H    0.00       8
 273          DI     0.0    1000      0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
 274          DQ     0.0    1000      0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
              *

 275          KK     B13   BASIN
 276          BA   0.003
 277          LG    0.12    0.24    7.27    0.11      51
 278          UI       0      82      33       0       0       0       0       0       0       0
 279          UI       0       0       0       0       0       0       0       0       0       0
 280          UI       0       0       0       0       0       0       0       0       0       0
 281          UI       0       0       0       0       0       0       0       0       0       0
 282          UI       0       0       0       0       0       0       0       0       0       0
              *

 283          KK   DV-B13  DIVERT
 284          DT   DT-B13    0.08     0.0
 285          DI     0.0  1000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
 286          DQ     0.0  1000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
              *

 287          KK   CPB13 COMBINE
 288          HC       2
              *

 289          KK    DVGF  DIVERT
 290          DT    DTGF    0.00       1
 291          DI     0.0    1000      0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
 292          DQ     0.0    1000      0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
              *

 293          KK   R-B13   ROUTE
 294          RK     450  0.0090   0.013            CIRC   4.000
              *

 295          KK   CPGAL COMBINE
 296          HC       2
              *

 297          KK      B5   BASIN
 298          BA   0.006
 299          LG    0.23    0.27    5.05    0.38       0
 300          UI       0      15      45      80      54      25      10       2       2       0
 301          UI       0       0       0       0       0       0       0       0       0       0
 302          UI       0       0       0       0       0       0       0       0       0       0
 303          UI       0       0       0       0       0       0       0       0       0       0
 304          UI       0       0       0       0       0       0       0       0       0       0
              *
```



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

 305          KK   DV-B5  DIVERT
 306          DT   DT-B5    0.42     0.0
 307          DI     0.0  1000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
 308          DQ     0.0  1000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
              *

 309          KK     B11   BASIN
 310          BA   0.010
 311          LG    0.13    0.27    4.39    0.37      39
 312          UI       0       8      32      48      75      85      57      39      19      11
 313          UI       6       2       2       0       0       0       0       0       0       0
 314          UI       0       0       0       0       0       0       0       0       0       0
 315          UI       0       0       0       0       0       0       0       0       0       0
 316          UI       0       0       0       0       0       0       0       0       0       0
              *

 317          KK   DV-C11  DIVERT
 318          DT   DT-C11     0.0     5.0
 319          DI     0.0  1000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
 320          DQ     0.0  1000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
              *

 321          KK   DV-B11  DIVERT
 322          DT   DV-B11    0.26     0.0
 323          DI     0.0  1000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
 324          DQ     0.0  1000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
              *
              *

 325          KK      L1   BASIN
 326          BA   0.003
 327          LG    0.35    0.36    5.05    0.28       0
 328          UI       0       6      23      33      25      14       7       4       2       1
 329          UI       1       0       0       0       0       0       0       0       0       0
 330          UI       0       0       0       0       0       0       0       0       0       0
 331          UI       0       0       0       0       0       0       0       0       0       0
 332          UI       0       0       0       0       0       0       0       0       0       0
```

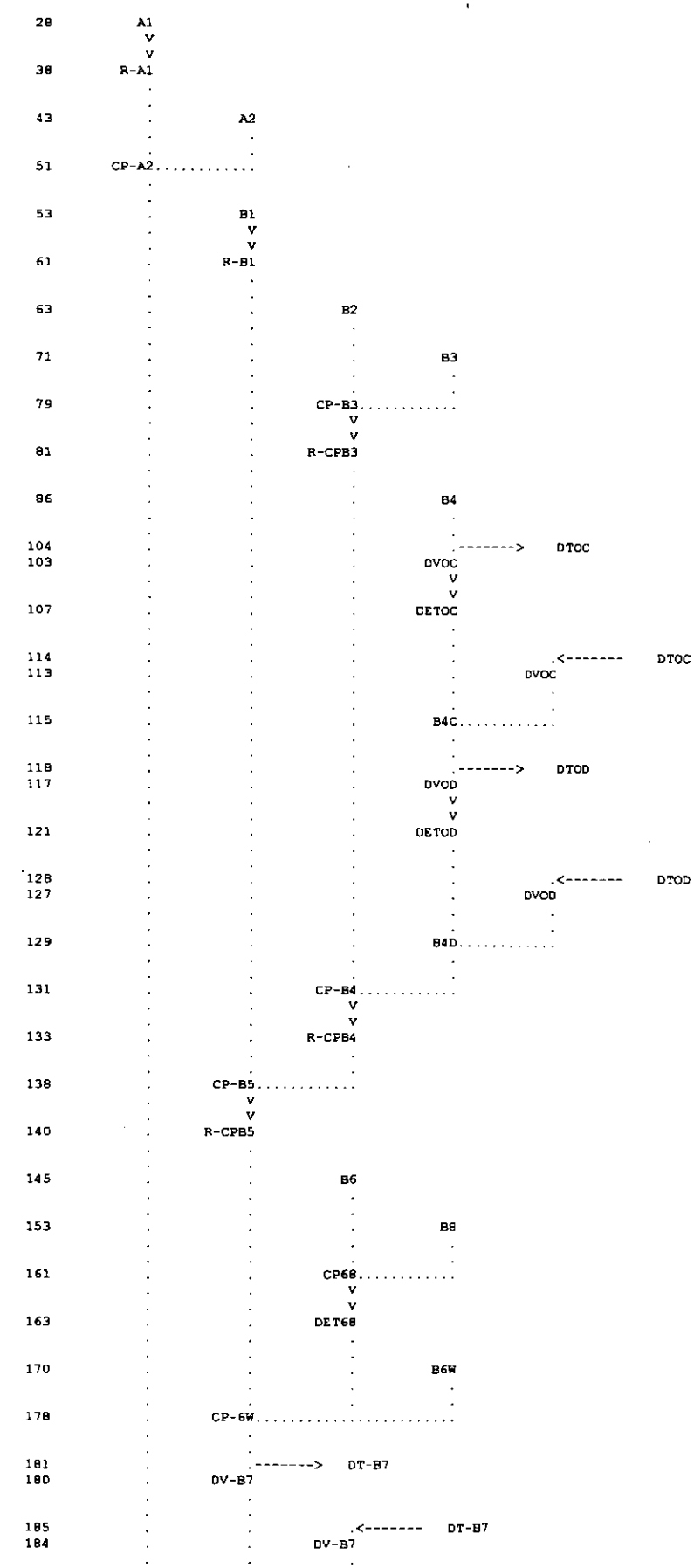
```
            *
333         KK      M1    BASIN
334         BA   0.001
335         LG    0.35    0.36    5.05    0.28       0
336         UI       0       3       9      12       7       4       2       1       0       0
337         UI       0       0       0       0       0       0       0       0       0       0
338         UI       0       0       0       0       0       0       0       0       0       0
339         UI       0       0       0       0       0       0       0       0       0       0
340         UI       0       0       0       0       0       0       0       0       0       0
            *
341         ZZ
```

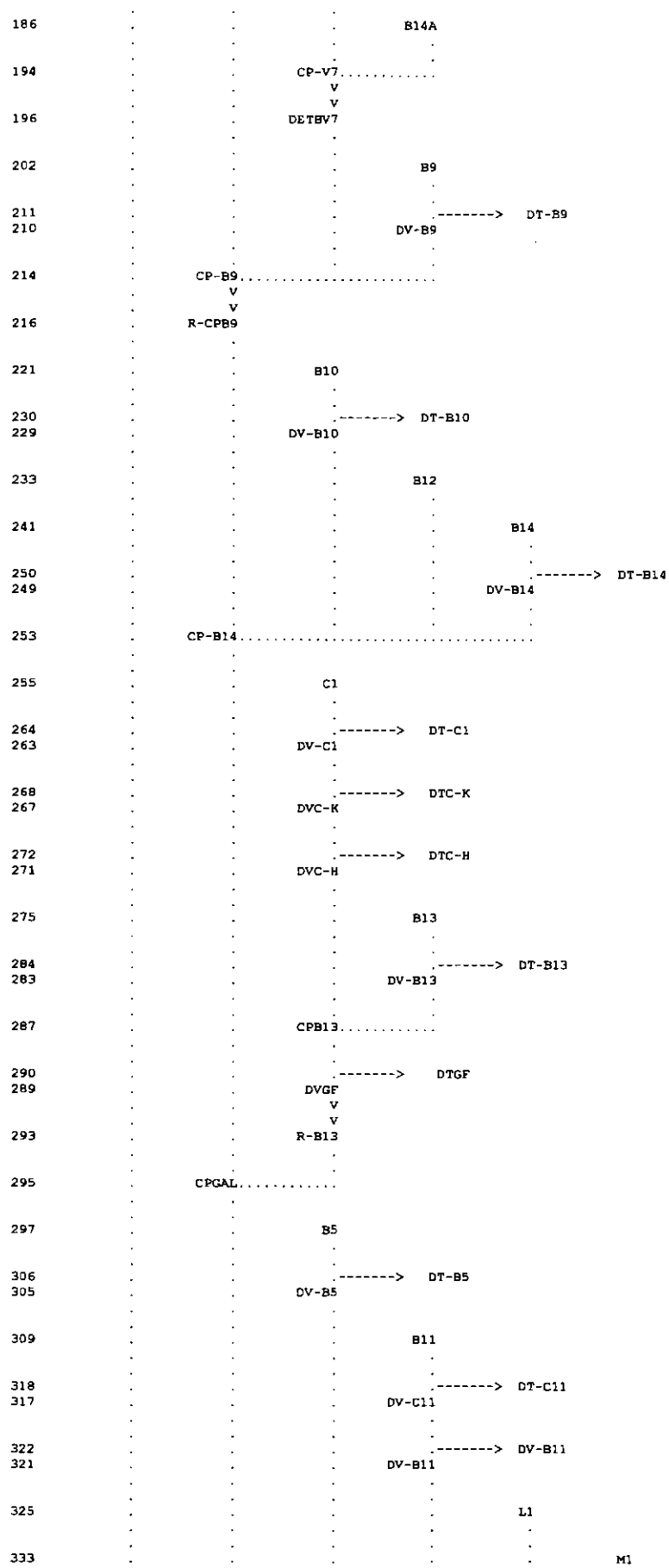
SCHEMATIC DIAGRAM OF STREAM NETWORK

INPUT LINE NO.

(V) ROUTING (---->) DIVERSION OR PUMP FLOW

(.) CONNECTOR (<----) RETURN OF DIVERTED OR PUMPED FLOW





(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1****************************************                                     ****************************************
*                                       *                                     *                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                                     *   U.S. ARMY CORPS OF ENGINEERS       *
*              JUN   1998               *                                     *   HYDROLOGIC ENGINEERING CENTER      *
*            VERSION 4.1                *                                     *        609 SECOND STREET             *
*                                       *                                     *     DAVIS, CALIFORNIA 95616          *
* RUN DATE   15JUN16  TIME  20:59:46    *                                     *        (916) 756-1104                *
*                                       *                                     *                                      *
****************************************                                     ****************************************
```

Flood Control District of Maricopa County
DM19 PROP - Desert Mountain 19 Post Online Det Basins 1st Flush
10 YEAR
6 Hour Storm
Unit Hydrograph: S-Graph
Storm: Multiple
06/14/2016
WOOD/PATEL FILE NAME: DM19FT10.DAT

```
10 IO          OUTPUT CONTROL VARIABLES
                     IPRNT          5  PRINT CONTROL
                     IPLOT          0  PLOT CONTROL
                     QSCAL         0.  HYDROGRAPH PLOT SCALE

   IT          HYDROGRAPH TIME DATA
                      NMIN          1  MINUTES IN COMPUTATION INTERVAL
                     IDATE     1JAN99  STARTING DATE
                     ITIME       0000  STARTING TIME
                        NQ       2000  NUMBER OF HYDROGRAPH ORDINATES
                    NDDATE     2JAN99  ENDING DATE
                    NDTIME       0919  ENDING TIME
                     ICENT         19  CENTURY MARK

                COMPUTATION INTERVAL     .02 HOURS
                     TOTAL TIME BASE   33.32 HOURS

       ENGLISH UNITS
            DRAINAGE AREA           SQUARE MILES
            PRECIPITATION DEPTH     INCHES
            LENGTH, ELEVATION       FEET
            FLOW                    CUBIC FEET PER SECOND
            STORAGE VOLUME          ACRE-FEET
            SURFACE AREA            ACRES
            TEMPERATURE             DEGREES FAHRENHEIT

12 JD          INDEX STORM NO. 1
                      STRM       2.18  PRECIPITATION DEPTH
                      TRDA        .00  TRANSPOSITION DRAINAGE AREA
```

13 PI PRECIPITATION PATTERN

.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
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.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00

```
16 JD          INDEX STORM NO. 2
                      STRM       2.17  PRECIPITATION DEPTH
                      TRDA        .50  TRANSPOSITION DRAINAGE AREA
```

17 PI PRECIPITATION PATTERN

.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
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.00	.00	.00	.00	.00	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.03	.03	.03	.03	.03
.03	.03	.03	.03	.03	.03	.03	.03	.03	.03
.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.00	.00	.00	.00	.00
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.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00

20 JD INDEX STORM NO. 3
STRM 2.15 PRECIPITATION DEPTH
TRDA 1.00 TRANSPOSITION DRAINAGE AREA

21 PI PRECIPITATION PATTERN

.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
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.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.02	.02	.02	.02	.02
.02	.02	.02	.02	.02	.02	.02	.02	.02	.02
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24 JD INDEX STORM NO. 4
STRM 2.13 PRECIPITATION DEPTH
TRDA 2.80 TRANSPOSITION DRAINAGE AREA

25 PI PRECIPITATION PATTERN

.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
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.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.02	.02	.02	.02	.02
.02	.02	.02	.02	.02	.02	.02	.02	.02	.02
.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.00	.00	.00	.00	.00
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                .00       .00       .00       .00       .00       .00       .00       .00       .00       .00

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          **************
          *            *
107 KK    *     DETOC  *      STORAGE
          *            *
          **************

108 KO          OUTPUT CONTROL VARIABLES
                     IPRNT           5  PRINT CONTROL
                     IPLOT           0  PLOT CONTROL
                     QSCAL          0.  HYDROGRAPH PLOT SCALE


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


          **************
          *            *
121 KK    *     DETOD  *      STORAGE
          *            *
          **************

122 KO          OUTFUT CONTROL VARIABLES
                     IPRNT           5  PRINT CONTROL
                     IPLOT           0  PLOT CONTROL
                     QSCAL          0.  HYDROGRAPH PLOT SCALE


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


          **************
          *            *
163 KK    *     DET68  *      STORAGE
          *            *
          **************

164 KO          OUTPUT CONTROL VARIABLES
                     IPRNT           5  PRINT CONTROL
                     IPLOT           0  PLOT CONTROL
                     QSCAL          0.  HYDROGRAPH PLOT SCALE


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


          **************
          *            *
196 KK    *    DETBV7  *      STORAGE
          *            *
          **************

197 KO          OUTPUT CONTROL VARIABLES
                     IPRNT           5  PRINT CONTROL
                     IPLOT           0  PLOT CONTROL
                     QSCAL          0.  HYDROGRAPH PLOT SCALE
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RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+	HYDROGRAPH AT	A1	252.	4.13	19.	5.	3.	.20		
+	ROUTED TO	R-A1	258.	4.18	19.	5.	3.	.20		
+	HYDROGRAPH AT	A2	21.	4.02	1.	0.	0.	.01		
+	2 COMBINED AT	CP-A2	260.	4.18	20.	5.	4.	.21		
+	HYDROGRAPH AT	B1	42.	4.02	2.	0.	0.	.02		
+	ROUTED TO	R-B1	42.	4.03	2.	0.	0.	.02		
+	HYDROGRAPH AT	B2	2.	4.02	0.	0.	0.	.00		
+	HYDROGRAPH AT	B3	63.	4.07	3.	1.	1.	.04		
+	2 COMBINED AT	CP-B3	64.	4.07	3.	1.	1.	.04		
+	ROUTED TO	R-CPB3	63.	4.08	3.	1.	1.	.04		
+	HYDROGRAPH AT	B4	546.	4.43	76.	19.	14.	.92		
+	DIVERSION TO	DTOC	546.	4.43	76.	19.	14.	.92		
+	HYDROGRAPH AT	DVOC	0.	.00	0.	0.	0.	.92		
+	ROUTED TO	DETOC	0.	.00	0.	0.	0.	.92		
+	HYDROGRAPH AT	DVOC	546.	4.43	76.	19.	14.	.92		
+	2 COMBINED AT	B4C	546.	4.43	76.	19.	14.	.92		
+	DIVERSION TO	DTOD	546.	4.43	76.	19.	14.	.92		
+	HYDROGRAPH AT	DVOD	0.	.00	0.	0.	0.	.92		
+	ROUTED TO	DETOD	0.	.00	0.	0.	0.	.92		
+	HYDROGRAPH AT	DVOD	546.	4.43	76.	19.	14.	.92		
+	2 COMBINED AT	B4D	546.	4.43	76.	19.	14.	.92		
+	2 COMBINED AT	CP-B4	546.	4.42	79.	20.	14.	.96		
+	ROUTED TO	R-CPB4	546.	4.43	79.	20.	14.	.96		
+	2 COMBINED AT	CP-B5	543.	4.43	80.	20.	14.	.98		
+	ROUTED TO	R-CPB5	543.	4.43	80.	20.	14.	.98		
+	HYDROGRAPH AT	B6	16.	4.02	1.	0.	0.	.01		
+	HYDROGRAPH AT	B8	22.	4.02	1.	0.	0.	.01		
+	2 COMBINED AT	CP68	39.	4.02	2.	1.	0.	.02		
+	ROUTED TO	DET68	2.	3.92	2.	1.	0.	.02		
+	HYDROGRAPH AT	B6W	4.	4.02	0.	0.	0.	.00		
+	3 COMBINED AT	CP-6W	543.	4.43	81.	20.	15.	1.00		
+	DIVERSION TO	DT-B7	14.	4.43	2.	1.	0.	1.00		

+	HYDROGRAPH AT DV-B7	527.	4.43	79.	20.	14.	1.00
+	HYDROGRAPH AT DV-B7	14.	4.43	2.	1.	0.	1.00
+	HYDROGRAPH AT B14A	9.	4.02	1.	0.	0.	.00
+	2 COMBINED AT CP-V7	16.	4.02	3.	1.	1.	.00
+	ROUTED TO DETBV7	13.	4.65	2.	1.	1.	.00
+	HYDROGRAPH AT B9	18.	4.02	1.	0.	0.	.01
+	DIVERSION TO DT-B9	16.	3.83	0.	0.	0.	.01
+	HYDROGRAPH AT DV-B9	18.	4.02	1.	0.	0.	.01
+	3 COMBINED AT CP-B9	528.	4.43	81.	21.	15.	1.02
+	ROUTED TO R-CPB9	527.	4.47	81.	21.	15.	1.02
+	HYDROGRAPH AT B10	21.	4.02	1.	0.	0.	.01
+	DIVERSION TO DT-B10	21.	4.00	1.	0.	0.	.01
+	HYDROGRAPH AT DV-B10	21.	4.03	0.	0.	0.	.01
+	HYDROGRAPH AT B12	8.	4.02	0.	0.	0.	.00
+	HYDROGRAPH AT B14	82.	4.02	5.	1.	1.	.04
+	DIVERSION TO DT-B14	77.	3.93	2.	1.	0.	.04
+	HYDROGRAPH AT DV-B14	82.	4.02	3.	1.	0.	.04
+	4 COMBINED AT CP-B14	527.	4.47	83.	21.	15.	1.07
+	HYDROGRAPH AT C1	47.	4.02	2.	1.	0.	.02
+	DIVERSION TO DT-C1	45.	3.97	1.	0.	0.	.02
+	HYDROGRAPH AT DV-C1	47.	4.02	1.	0.	0.	.02
+	DIVERSION TO DTC-K	18.	4.00	1.	0.	0.	.02
+	HYDROGRAPH AT DVC-K	29.	4.02	0.	0.	0.	.02
+	DIVERSION TO DTC-H	8.	4.00	0.	0.	0.	.02
+	HYDROGRAPH AT DVC-H	21.	4.02	0.	0.	0.	.02
+	HYDROGRAPH AT B13	7.	4.02	1.	0.	0.	.00
+	DIVERSION TO DT-B13	2.	3.75	0.	0.	0.	.00
+	HYDROGRAPH AT DV-B13	7.	4.02	0.	0.	0.	.00
+	2 COMBINED AT CPB13	28.	4.02	1.	0.	0.	.03
+	DIVERSION TO DTGF	1.	3.78	0.	0.	0.	.03
+	HYDROGRAPH AT DVGF	27.	4.02	1.	0.	0.	.03
+	ROUTED TO R-B13	27.	4.02	1.	0.	0.	.03
+	2 COMBINED AT CPGAL	527.	4.47	83.	21.	15.	1.10
+	HYDROGRAPH AT B5	11.	4.02	0.	0.	0.	.01
+	DIVERSION TO DT-B5	11.	4.02	0.	0.	0.	.01

	HYDROGRAPH AT						
+		DV-B5	0.	.00	0.	0.	0.	.01
	HYDROGRAPH AT						
+		B11	22.	4.02	1.	0.	0.	.01
	DIVERSION TO						
+		DT-C11	5.	3.80	1.	0.	0.	.01
	HYDROGRAPH AT						
+		DV-C11	17.	4.02	1.	0.	0.	.01
	DIVERSION TO						
+		DV-B11	17.	4.02	1.	0.	0.	.01
	HYDROGRAPH AT						
+		DV-B11	15.	4.05	0.	0.	0.	.01
	HYDROGRAPH AT						
+		L1	6.	4.02	0.	0.	0.	.00
	HYDROGRAPH AT						
+		M1	2.	4.02	0.	0.	0.	.00

SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
(FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)

ISTAQ	ELEMENT	DT	PEAK	TIME TO PEAK	VOLUME	INTERPOLATED TO COMPUTATION INTERVAL DT	PEAK	TIME TO PEAK	VOLUME
		(MIN)	(CFS)	(MIN)	(IN)	(MIN)	(CFS)	(MIN)	(IN)
FOR STORM = 1 STORM AREA (SQ MI) = .00									
R-B1	MANE	.17	42.15	241.37	.84	1.00	42.13	242.00	.84

CONTINUITY SUMMARY (AC-FT) - INFLOW= .9822E+00 EXCESS= .0000E+00 OUTFLOW= .9825E+00 BASIN STORAGE= .3951E-14 PERCENT ERROR= .0

FOR STORM = 2 STORM AREA (SQ MI) = .50									
R-B1	MANE	.18	41.78	241.51	.83	1.00	41.77	242.00	.83

CONTINUITY SUMMARY (AC-FT) - INFLOW= .9720E+00 EXCESS= .0000E+00 OUTFLOW= .9723E+00 BASIN STORAGE= .3979E-14 PERCENT ERROR= .0

FOR STORM = 3 STORM AREA (SQ MI) = 1.00									
R-B1	MANE	.17	31.78	241.47	.70	1.00	31.77	242.00	.70

CONTINUITY SUMMARY (AC-FT) - INFLOW= .8268E+00 EXCESS= .0000E+00 OUTFLOW= .8269E+00 BASIN STORAGE= .3940E-14 PERCENT ERROR= .0

FOR STORM = 4 STORM AREA (SQ MI) = 2.80									
R-B1	MANE	.27	16.95	242.35	.57	1.00	16.94	242.00	.57

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6687E+00 EXCESS= .0000E+00 OUTFLOW= .6687E+00 BASIN STORAGE= .3984E-14 PERCENT ERROR= .0

FOR STORM = 1 STORM AREA (SQ MI) = .00									
R-B13	MANE	.30	26.83	241.14	.21	1.00	26.82	241.00	.21

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2869E+00 EXCESS= .0000E+00 OUTFLOW= .2870E+00 BASIN STORAGE= .7598E-14 PERCENT ERROR= -.1

FOR STORM = 2 STORM AREA (SQ MI) = .50									
R-B13	MANE	.37	26.43	241.00	.20	1.00	26.43	241.00	.20

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2821E+00 EXCESS= .0000E+00 OUTFLOW= .2826E+00 BASIN STORAGE= .7502E-14 PERCENT ERROR= -.2

FOR STORM = 3 STORM AREA (SQ MI) = 1.00									
R-B13	MANE	.34	13.15	241.76	.11	1.00	12.37	242.00	.11

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1582E+00 EXCESS= .0000E+00 OUTFLOW= .1584E+00 BASIN STORAGE= .7731E-14 PERCENT ERROR= -.2

FOR STORM = 4 STORM AREA (SQ MI) = 2.80									
R-B13	MANE	.44	2.57	240.86	.06	1.00	2.57	240.00	.06

CONTINUITY SUMMARY (AC-FT) - INFLOW= .8541E-01 EXCESS= .0000E+00 OUTFLOW= .8564E-01 BASIN STORAGE= .7698E-14 PERCENT ERROR= -.3

*** NORMAL END OF HEC-1 ***

100-year HEC-1 Model

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1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*              JUN  1998                *
*            VERSION 4.1                *
*                                       *
*  RUN DATE   15JUN16  TIME  20:59:52   *
*                                       *
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*                                       *
*    U.S. ARMY CORPS OF ENGINEERS       *
*    HYDROLOGIC ENGINEERING CENTER      *
*          609 SECOND STREET            *
*        DAVIS, CALIFORNIA 95616        *
*           (916) 756-1104              *
*                                       *
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XXXXXXX  XXXX     X        XXXXX  X
X     X  X        X               X
X     X  X        X     X         X
X     X  XXXXXXX   XXXXX          XXX
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THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

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

1 HEC-1 INPUT PAGE 1

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

   1          ID        Flood Control District of Maricopa County
   2          ID        DM19 PROP - Desert Mountain 19 Post Online Det Basins 1st Flush
   3          ID        100 YEAR
   4          ID        6 Hour  Storm
   5          ID        Unit Hydrograph: S-Graph
   6          ID        Storm: Multiple
   7          ID        06/14/2016
   8          ID        WOOD/PATEL FILE NAME: DM19FT100.DAT
              *DIAGRAM
   9          IT     1  1JAN99       0    2000
  10          IO     5
  11          IN    15
              *
  12          JD  3.313  0.0001
  13          PC  0.000   0.008   0.016   0.025   0.033   0.041   0.050   0.058   0.066   0.074
  14          PC  0.087   0.099   0.118   0.138   0.216   0.377   0.834   0.911   0.931   0.950
  15          PC  0.962   0.972   0.983   0.991   1.000
  16          JD  3.293  0.5000
  17          PC  0.000   0.008   0.016   0.025   0.033   0.041   0.050   0.058   0.066   0.074
  18          PC  0.087   0.099   0.118   0.138   0.216   0.377   0.834   0.911   0.931   0.950
  19          PC  0.962   0.972   0.983   0.991   1.000
  20          JD  3.270     1.0
  21          PC  0.000   0.008   0.016   0.025   0.033   0.041   0.050   0.058   0.066   0.075
  22          PC  0.087   0.099   0.119   0.148   0.230   0.407   0.778   0.881   0.919   0.945
  23          PC  0.957   0.968   0.980   0.990   1.000
  24          JD  3.230     2.8
  25          PC  0.000   0.009   0.016   0.025   0.034   0.042   0.051   0.059   0.067   0.076
  26          PC  0.087   0.100   0.120   0.163   0.252   0.451   0.694   0.837   0.900   0.938
  27          PC  0.950   0.963   0.975   0.988   1.000
              *

  28          KK     A1   BASIN
  29          BA  0.197
  30          LG   0.29    0.25    5.34    0.26       5
  31          UI      0      39      39      39      50     114     146     182     223     254
  32          UI    279     323     344     355     374     378     378     369     357     338
  33          UI    302     275     245     222     200     181     164     147     133     120
  34          UI    108      94      88      75      74      62      61      53      42      42
  35          UI     42      31      27      27      27      27      25      10      10      10
  36          UI     10      10      10      10      10      10      10      10      10      10
  37          UI     10      10       0       0       0       0       0       0       0       0
              *

  38          KK   R-A1   ROUTE
  39          RS      3    FLOW
  40          RC  0.060   0.040   0.060     980  0.0224   19.00
  41          RX   0.00   42.00   73.00  106.00  196.00  225.00  251.00  295.00
  42          RY  20.00   15.00   10.00    7.00    6.00    5.00   13.00   19.00
              *
```

1 HEC-1 INPUT PAGE 2

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

  43          KK     A2   BASIN
  44          BA  0.011
  45          LG   0.35    0.37    5.24    0.25       0
  46          UI      0       7      22      45      62      70      63      46      33      23
  47          UI     16      12       8       6       5       2       2       2       2       0
  48          UI      0       0       0       0       0       0       0       0       0       0
  49          UI      0       0       0       0       0       0       0       0       0       0
  50          UI      0       0       0       0       0       0       0       0       0       0
              *

  51          KK   CP-A2 COMBINE
  52          HC      2
              *
```

```
 53          KK      B1   BASIN
 54          BA   0.022
 55          LG    0.28    0.26    5.05    0.31       4
 56          UI       0      12      23      55      81     101     111     106      88      66
 57          UI      51      39      29      23      17      12       9       8       5       3
 58          UI       3       3       3       3       0       0       0       0       0       0
 59          UI       0       0       0       0       0       0       0       0       0       0
 60          UI       0       0       0       0       0       0       0       0       0       0
             *

 61          KK    R-B1   ROUTE
 62          RK     500  0.0200   0.013            CIRC   3.500
             *

 63          KK      B2   BASIN
 64          BA   0.001
 65          LG    0.35    0.36    5.05    0.28       0
 66          UI       0      10      19       7       2       1       0       0       0       0
 67          UI       0       0       0       0       0       0       0       0       0       0
 68          UI       0       0       0       0       0       0       0       0       0       0
 69          UI       0       0       0       0       0       0       0       0       0       0
 70          UI       0       0       0       0       0       0       0       0       0       0
             *

 71          KK      B3   BASIN
 72          BA   0.038
 73          LG    0.29    0.26    5.05    0.30       4
 74          UI       0      12      12      26      47      66      83      99     110     117
 75          UI     118     113     105      88      74      63      54      45      38      32
 76          UI      27      23      19      17      13      13       8       8       8       5
 77          UI       3       3       3       3       3       3       3       3       3       0
 78          UI       0       0       0       0       0       0       0       0       0       0
             *

 79          KK   CP-B3 COMBINE
 80          HC       2
             *

1                                        HEC-1 INPUT                                        PAGE  3

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

 81          KK  R-CPB3   ROUTE
 82          RS       1    FLOW
 83          RC   0.060   0.040   0.060     300  0.0100   10.00
 84          RX    0.00    7.50   15.00   18.00   21.00   23.00   30.50   38.00
 85          RY   10.00    7.50    5.00    5.00    5.00    5.00    7.50   10.00
             *

 86          KK      B4   BASIN
 87          BA   0.921
 88          LG    0.28    0.27    5.24    0.28       6
 89          UI       0      84      84      84      84      84      84      84      84     173
 90          UI     243     243     297     329     364     405     445     470     511     545
 91          UI     580     602     598     694     695     721     747     752     771     764
 92          UI     810     810     810     810     810     810     803     777     766     760
 93          UI     748     720     694     650     614     589     589     531     511     494
 94          UI     463     445     432     399     393     367     360     329     329     299
 95          UI     299     274     259     259     235     231     231     198     189     189
 96          UI     188     159     159     159     159     143     130     130     130     130
 97          UI     128      90      90      90      90      90      90      90      87      58
 98          UI      58      58      58      58      58      58      58      58      58      58
 99          UI      58      30      21      21      21      21      21      21      21      21
100          UI      21      21      21      21      21      21      21      21      21      21
101          UI      21      21      21      21      21      21      21      21      21      21
102          UI      21      21      21      21      21       0       0       0       0       0
             *

103          KK    DVOC  DIVERT
104          DT    DTOC    0.00  1050.0
105          DI     0.0  2000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
106          DQ     0.0  2000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
             *

107          KK   DETOC STORAGE
108          KO
109          RS       1    STOR
110          SV            0.26    0.59    0.99    1.48
111          SQ            4.00    9.00   12.00   15.00
112          SE            1.00    2.00    3.00    4.00
             *

113          KK    DVOCRETRIEVE
114          DR    DTOC
             *

115          KK     B4C COMBINE
116          HC       2
             *

117          KK    DVOD  DIVERT
118          DT    DTOD    0.00  975.0
119          DI     0.0 20000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
120          DQ     0.0 20000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
             *

1                                        HEC-1 INPUT                                        PAGE  4

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

121          KK   DETOD STORAGE
122          KO
123          RS       1    STOR
124          SV            0.42    0.89    1.42    2.01
```

```
125          SQ            4.00    9.00   12.00   15.00
126          SE            1.00    2.00    3.00    4.00
             *

127          KK    DVODRETRIEVE
128          DR    DTOD
             *

129          KK     B4D COMBINE
130          HC       2
             *

131          KK   CP-B4 COMBINE
132          HC       2
             *

133          KK  R-CPB4    ROUTE
134          RS       1     FLOW
135          RC   0.060   0.040   0.060     300  0.0300 2631.00
136          RX    0.00   18.90   43.80   54.80   81.50   91.60  120.00  160.00
137          RY 2635.0 2630.00 2629.00 2625.00 2625.00 2629.00 2630.00 2631.00
             *

138          KK   CP-B5 COMBINE
139          HC       2
             *

140          KK  R-CPB5    ROUTE
141          RS       1     FLOW
142          RC   0.060   0.040   0.060     650  0.0300 2631.00
143          RX    0.00   18.90   43.80   54.80   81.50   91.60  120.00  160.00
144          RY 2635.0 2630.00 2629.00 2625.00 2625.00 2629.00 2630.00 2631.00
             *

145          KK      B6   BASIN
146          BA   0.009
147          LG    0.19    0.25    4.45    0.52       3
148          UI       0      26      78     129      74      27       9       4       0       0
149          UI       0       0       0       0       0       0       0       0       0       0
150          UI       0       0       0       0       0       0       0       0       0       0
151          UI       0       0       0       0       0       0       0       0       0       0
152          UI       0       0       0       0       0       0       0       0       0       0
             *

153          KK      B8   BASIN
154          BA   0.010
155          LG    0.13    0.27    4.87    0.30      38
156          UI       0       7      25      39      55      83      63      46      31      15
157          UI      10       6       2       2       2       0       0       0       0       0
158          UI       0       0       0       0       0       0       0       0       0       0
```



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

159          UI       0       0       0       0       0       0       0       0       0       0
160          UI       0       0       0       0       0       0       0       0       0       0
             *

161          KK    CP68 COMBINE
162          HC       2
             *

163          KK   DET68 STORAGE
164          KO
165          RS       1    STOR
166          SV            0.09    0.21    0.37    0.58
167          SQ            1.00    1.00    2.00    2.00
168          SE 2608.0 2609.00 2610.00 2611.00 2612.00
169          SS 2612.0   20.00    2.80    1.50
             *

170          KK     B6W   BASIN
171          BA   0.003
172          LG    0.13    0.28    3.37    1.04       6
173          UI       0       5      16      29      32      19       9       4       1       1
174          UI       0       0       0       0       0       0       0       0       0       0
175          UI       0       0       0       0       0       0       0       0       0       0
176          UI       0       0       0       0       0       0       0       0       0       0
177          UI       0       0       0       0       0       0       0       0       0       0
             *

178          KK   CP-6W COMBINE
179          HC       3
             *

180          KK   DV-B7  DIVERT
181          DT   DT-B7     0.00     0.0
182          DI      0.0   150.0   300.0   450.0   600.0   750.0   900.0  1050.0  1200.0     0.0
183          DQ      0.0     4.0     9.0    12.0    15.0    18.0    20.0    22.0    24.0     0.0
             *

184          KK   DV-B7RETRIEVE
185          DR   DT-B7
             *

186          KK    B14A   BASIN
187          BA   0.004
188          LG    0.13    0.26    6.16    0.16      39
189          UI       0      62      83       9       0       0       0       0       0       0
190          UI       0       0       0       0       0       0       0       0       0       0
191          UI       0       0       0       0       0       0       0       0       0       0
192          UI       0       0       0       0       0       0       0       0       0       0
193          UI       0       0       0       0       0       0       0       0       0       0
             *
```

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

 194      KK   CP-V7 COMBINE
 195      HC       2
          *

 196      KK  DETBV7 STORAGE
 197      KO
 198      RS       1    STOR
 199      SV            0.22    0.47    0.77    1.10
 200      SQ            1.00    1.00    2.00   50.00
 201      SE  2606.0 2607.00 2608.00 2609.00 2610.00
          *

 202      KK      B9   BASIN
 203      BA   0.008
 204      LG    0.13    0.28    4.33    0.38      43
 205      UI       0      31      93     116      50      15       4       0       0       0
 206      UI       0       0       0       0       0       0       0       0       0       0
 207      UI       0       0       0       0       0       0       0       0       0       0
 208      UI       0       0       0       0       0       0       0       0       0       0
 209      UI       0       0       0       0       0       0       0       0       0       0
          *

 210      KK   DV-B9  DIVERT
 211      DT   DT-B9    0.21     0.0
 212      DI      0.0  1000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
 213      DQ      0.0  1000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
          *

 214      KK   CP-B9 COMBINE
 215      HC       3
          *

 216      KK  R-CPB9   ROUTE
 217      RS       1    FLOW
 218      RC   0.060   0.040   0.060     750  0.0300 2605.00
 219      RX    0.00   55.30  123.80  129.00  141.80  146.00  155.20  188.60
 220      RY  2608.0 2600.00 2598.00 2596.00 2596.00 2597.80 2598.00 2605.00
          *

 221      KK     B10   BASIN
 222      BA   0.012
 223      LG    0.20    0.25    4.33    0.54       2
 224      UI       0      10      39      58      90     102      69      47      23      13
 225      UI       7       3       3       0       0       0       0       0       0       0
 226      UI       0       0       0       0       0       0       0       0       0       0
 227      UI       0       0       0       0       0       0       0       0       0       0
 228      UI       0       0       0       0       0       0       0       0       0       0
          *

1                                        HEC-1 INPUT                                        PAGE  7

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

 229      KK  DT-B10  DIVERT
 230      DT  DT-B10    0.32     0.0
 231      DI      0.0  1000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
 232      DQ      0.0  1000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
          *

 233      KK     B12   BASIN
 234      BA   0.005
 235      LG    0.10    0.25    3.79    0.85       0
 236      UI       0      11      41      56      40      22      12       6       3       1
 237      UI       1       0       0       0       0       0       0       0       0       0
 238      UI       0       0       0       0       0       0       0       0       0       0
 239      UI       0       0       0       0       0       0       0       0       0       0
 240      UI       0       0       0       0       0       0       0       0       0       0
          *

 241      KK     B14   BASIN
 242      BA   0.038
 243      LG    0.17    0.26    5.58    0.27      23
 244      UI       0      23      67     119     155     222     274     198     149     108
 245      UI      58      39      24      12       7       7       7       0       0       0
 246      UI       0       0       0       0       0       0       0       0       0       0
 247      UI       0       0       0       0       0       0       0       0       0       0
 248      UI       0       0       0       0       0       0       0       0       0       0
          *

 249      KK  DV-B14  DIVERT
 250      DT  DT-B14    1.03     0.0
 251      DI      0.0  1000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
 252      DQ      0.0  1000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
          *

 253      KK  CP-B14 COMBINE
 254      HC       4
          *

 255      KK      C1   BASIN
 256      BA   0.023
 257      LG    0.18    0.26    5.05    0.34      14
 258      UI       0      13      33      61      79     104     155     128      99      76
 259      UI      55      29      22      13       8       4       4       4       0       0
 260      UI       0       0       0       0       0       0       0       0       0       0
 261      UI       0       0       0       0       0       0       0       0       0       0
 262      UI       0       0       0       0       0       0       0       0       0       0
          *

 263      KK   DV-C1  DIVERT
 264      DT   DT-C1    0.61     0.0
```

```
      265          DI     0.0  1000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
      266          DQ     0.0  1000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
                   *
1                                          HEC-1 INPUT                                          PAGE  8

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

      267          KK   DVC-K  DIVERT
      268          DT   DTC-K    0.00      50
      269          DI     0.0    1000     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
      270          DQ     0.0    1000     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
                   *

      271          KK   DVC-H  DIVERT
      272          DT   DTC-H    0.00      15
      273          DI     0.0    1000     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
      274          DQ     0.0    1000     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
                   *

      275          KK     B13   BASIN
      276          BA   0.003
      277          LG    0.12    0.24    7.27    0.11      51
      278          UI       0      82      33       0       0       0       0       0       0       0
      279          UI       0       0       0       0       0       0       0       0       0       0
      280          UI       0       0       0       0       0       0       0       0       0       0
      281          UI       0       0       0       0       0       0       0       0       0       0
      282          UI       0       0       0       0       0       0       0       0       0       0
                   *

      283          KK  DV-B13  DIVERT
      284          DT  DT-B13    0.08     0.0
      285          DI     0.0  1000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
      286          DQ     0.0  1000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
                   *

      287          KK   CPB13 COMBINE
      288          HC       2
                   *

      289          KK    DVGF  DIVERT
      290          DT    DTGF    0.00       3
      291          DI     0.0    1000     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
      292          DQ     0.0    1000     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
                   *

      293          KK   R-B13   ROUTE
      294          RK     450  0.0090   0.013            CIRC   4.000
                   *

      295          KK   CPGAL COMBINE
      296          HC       2
                   *

      297          KK      B5   BASIN
      298          BA   0.006
      299          LG    0.23    0.27    5.05    0.38       0
      300          UI       0      15      45      80      54      25      10       2       2       0
      301          UI       0       0       0       0       0       0       0       0       0       0
      302          UI       0       0       0       0       0       0       0       0       0       0
      303          UI       0       0       0       0       0       0       0       0       0       0
      304          UI       0       0       0       0       0       0       0       0       0       0
                   *

1                                          HEC-1 INPUT                                          PAGE  9

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

      305          KK   DV-B5  DIVERT
      306          DT   DT-B5    0.42     0.0
      307          DI     0.0  1000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
      308          DQ     0.0  1000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
                   *

      309          KK     B11   BASIN
      310          BA   0.010
      311          LG    0.13    0.27    4.39    0.37      39
      312          UI       0       8      32      48      75      85      57      39      19      11
      313          UI       6       2       2       0       0       0       0       0       0       0
      314          UI       0       0       0       0       0       0       0       0       0       0
      315          UI       0       0       0       0       0       0       0       0       0       0
      316          UI       0       0       0       0       0       0       0       0       0       0
                   *

      317          KK  DV-C11  DIVERT
      318          DT  DT-C11     0.0     5.0
      319          DI     0.0  1000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
      320          DQ     0.0  1000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
                   *

      321          KK  DV-B11  DIVERT
      322          DT  DT-B11    0.26     0.0
      323          DI     0.0  1000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
      324          DQ     0.0  1000.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
                   *
                   *

      325          KK     L1   BASIN
      326          BA   0.003
      327          LG    0.35    0.36    5.05    0.28       0
      328          UI       0       6      23      33      25      14       7       4       2       1
      329          UI       1       0       0       0       0       0       0       0       0       0
      330          UI       0       0       0       0       0       0       0       0       0       0
      331          UI       0       0       0       0       0       0       0       0       0       0
      332          UI       0       0       0       0       0       0       0       0       0       0
```

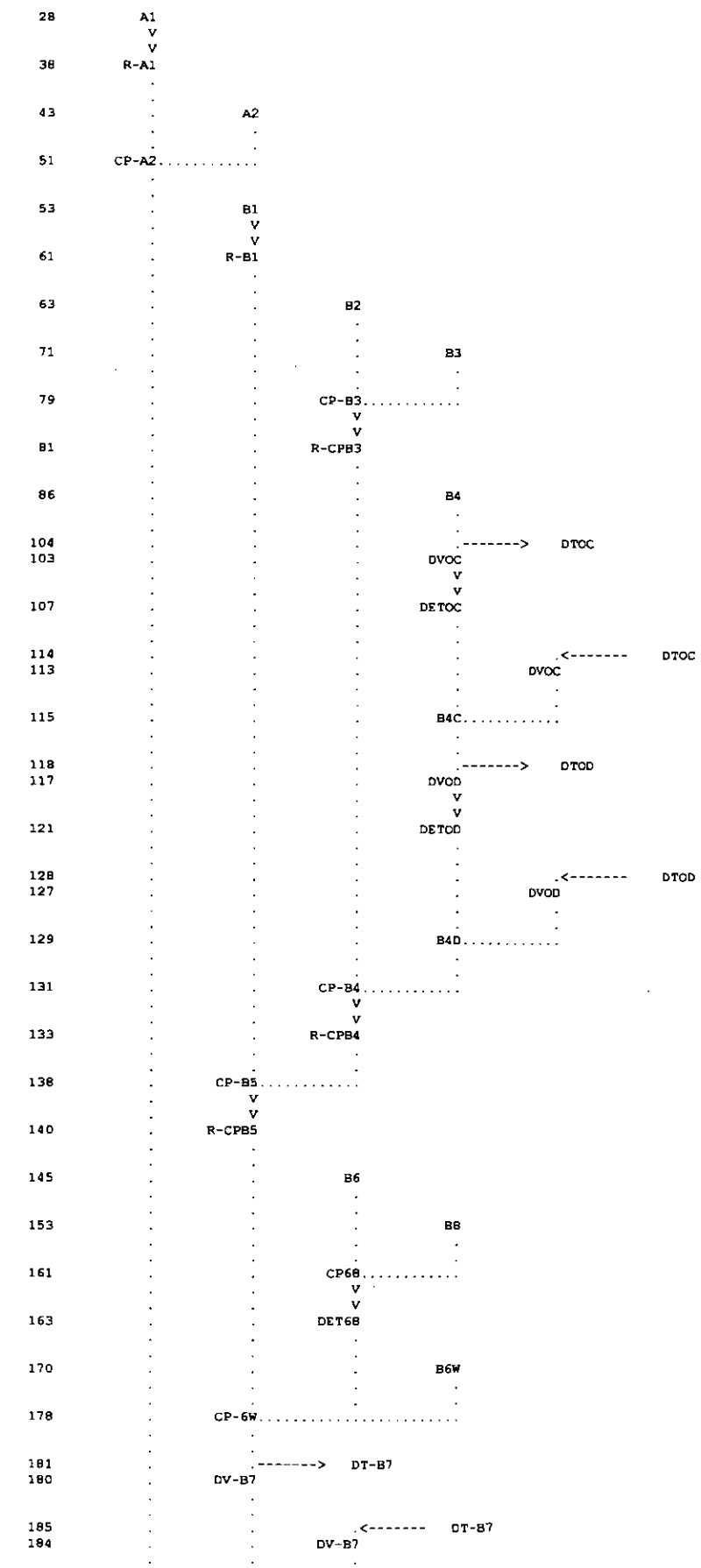
```
                *
333             KK      M1    BASIN
334             BA   0.001
335             LG    0.35    0.36    5.05    0.28       0
336             UI       0       3       9      12       7       4       2       1       0       0
337             UI       0       0       0       0       0       0       0       0       0       0
338             UI       0       0       0       0       0       0       0       0       0       0
339             UI       0       0       0       0       0       0       0       0       0       0
340             UI       0       0       0       0       0       0       0       0       0       0
                *
341             ZZ
```

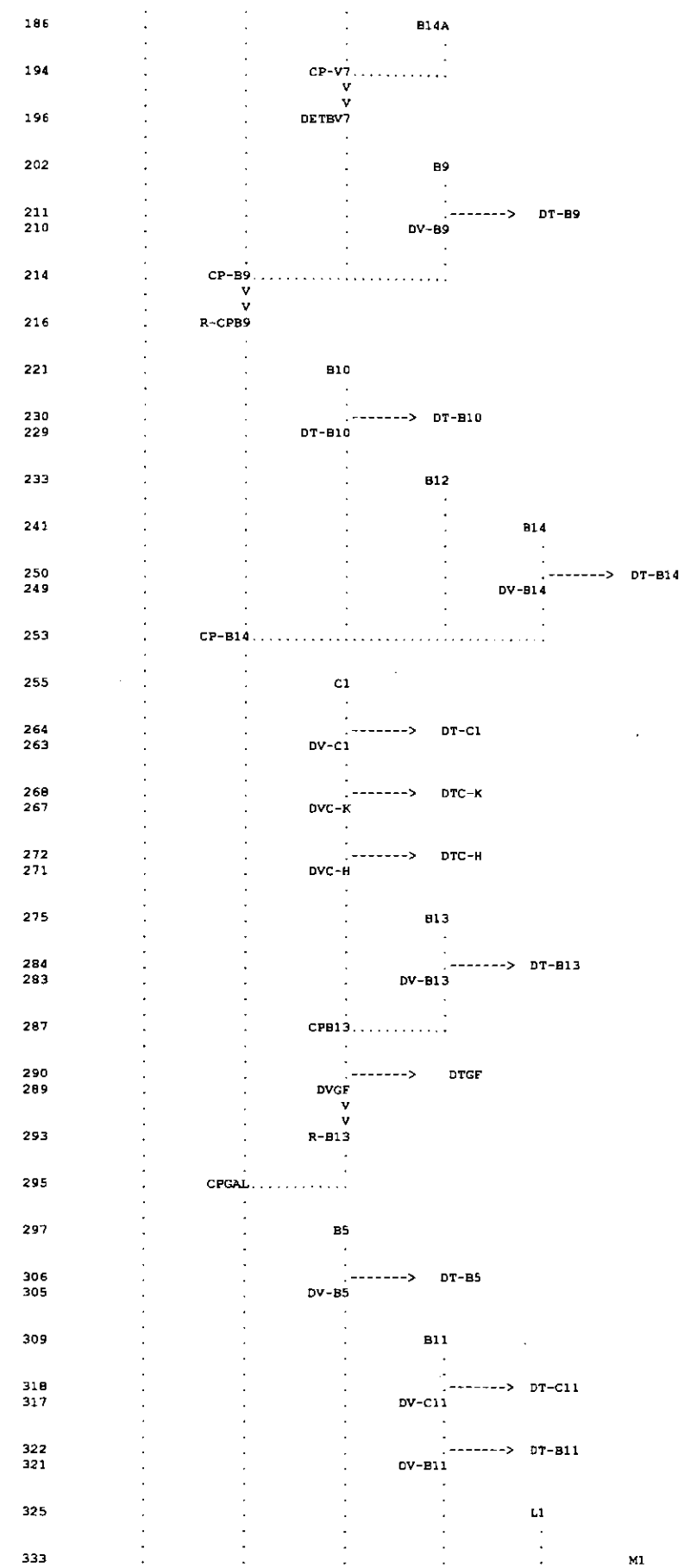
SCHEMATIC DIAGRAM OF STREAM NETWORK

INPUT LINE NO.

(V) ROUTING (---->) DIVERSION OR PUMP FLOW

(.) CONNECTOR (<----) RETURN OF DIVERTED OR PUMPED FLOW





(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1****************************************                                       ****************************************
*                                       *                                       *                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                                       *   U.S. ARMY CORPS OF ENGINEERS       *
*              JUN   1998               *                                       *   HYDROLOGIC ENGINEERING CENTER      *
*            VERSION 4.1                *                                       *         609 SECOND STREET            *
*                                       *                                       *       DAVIS, CALIFORNIA 95616        *
* RUN DATE   15JUN16  TIME  20:59:52    *                                       *          (916) 756-1104              *
*                                       *                                       *                                      *
****************************************                                       ****************************************
```

Flood Control District of Maricopa County
DM19 PROP - Desert Mountain 19 Post Online Det Basins 1st Flush
100 YEAR
6 Hour Storm
Unit Hydrograph: S-Graph
Storm: Multiple
06/14/2016
WOOD/PATEL FILE NAME: DM19FT100.DAT

```
10 IO         OUTPUT CONTROL VARIABLES
                   IPRNT          5  PRINT CONTROL
                   IPLOT          0  PLOT CONTROL
                   QSCAL         0.  HYDROGRAPH PLOT SCALE

   IT         HYDROGRAPH TIME DATA
                    NMIN          1  MINUTES IN COMPUTATION INTERVAL
                   IDATE     1JAN99  STARTING DATE
                   ITIME       0000  STARTING TIME
                      NQ       2000  NUMBER OF HYDROGRAPH ORDINATES
                  NDDATE     2JAN99  ENDING DATE
                  NDTIME       0919  ENDING TIME
                   ICENT         19  CENTURY MARK

                COMPUTATION INTERVAL     .02 HOURS
                     TOTAL TIME BASE   33.32 HOURS

      ENGLISH UNITS
           DRAINAGE AREA          SQUARE MILES
           PRECIPITATION DEPTH    INCHES
           LENGTH, ELEVATION      FEET
           FLOW                   CUBIC FEET PER SECOND
           STORAGE VOLUME         ACRE-FEET
           SURFACE AREA           ACRES
           TEMPERATURE            DEGREES FAHRENHEIT

12 JD         INDEX STORM NO. 1
                    STRM       3.31  PRECIPITATION DEPTH
                    TRDA        .00  TRANSPOSITION DRAINAGE AREA

13 PI           PRECIPITATION PATTERN
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16 JD         INDEX STORM NO. 2
                    STRM       3.29  PRECIPITATION DEPTH
                    TRDA        .50  TRANSPOSITION DRAINAGE AREA

17 PI           PRECIPITATION PATTERN
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.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
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20 JD        INDEX STORM NO. 3
                STRM      3.27  PRECIPITATION DEPTH
                TRDA      1.00  TRANSPOSITION DRAINAGE AREA

21 PI          PRECIPITATION PATTERN
                .00     .00     .00     .00     .00     .00     .00     .00     .00     .00
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24 JD        INDEX STORM NO. 4
                STRM      3.23  PRECIPITATION DEPTH
                TRDA      2.80  TRANSPOSITION DRAINAGE AREA

25 PI          PRECIPITATION PATTERN
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          *            *
107 KK    *     DETOC  *      STORAGE
          *            *
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108 KO          OUTPUT CONTROL VARIABLES
                      IPRNT           5  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE
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          **************
          *            *
121 KK    *     DETOD  *      STORAGE
          *            *
          **************

122 KO          OUTPUT CONTROL VARIABLES
                      IPRNT           5  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE
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          *            *
163 KK    *     DET68  *      STORAGE
          *            *
          **************

164 KO          OUTPUT CONTROL VARIABLES
                      IPRNT           5  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE
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          **************
          *            *
196 KK    *    DETBV7  *      STORAGE
          *            *
          **************

197 KO          OUTPUT CONTROL VARIABLES
                      IPRNT           5  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE
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1

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+	HYDROGRAPH AT	A1	468.	4.13	38.	10.	7.	.20		
+	ROUTED TO	R-A1	462.	4.18	38.	10.	7.	.20		
+	HYDROGRAPH AT	A2	36.	4.02	2.	0.	0.	.01		
+	2 COMBINED AT	CP-A2	467.	4.18	40.	10.	7.	.21		
+	HYDROGRAPH AT	B1	72.	4.02	4.	1.	1.	.02		
+	ROUTED TO	R-B1	72.	4.03	4.	1.	1.	.02		
+	HYDROGRAPH AT	B2	3.	4.02	0.	0.	0.	.00		
+	HYDROGRAPH AT	B3	111.	4.07	7.	2.	1.	.04		
+	2 COMBINED AT	CP-B3	111.	4.05	7.	2.	1.	.04		
+	ROUTED TO	R-CPB3	111.	4.07	7.	2.	1.	.04		
+	HYDROGRAPH AT	B4	1110.	4.42	163.	41.	29.	.92		
+	DIVERSION TO	DTOC	1050.	4.33	161.	40.	29.	.92		
+	HYDROGRAPH AT	DVOC	60.	4.42	2.	0.	0.	.92		
+	ROUTED TO	DETOC	8.	4.52	2.	0.	0.	.92		
+	HYDROGRAPH AT	DVOC	1050.	4.33	161.	40.	29.	.92		
+	2 COMBINED AT	B4C	1058.	4.50	163.	41.	29.	.92		
+	DIVERSION TO	DTOD	975.	4.28	159.	40.	29.	.92		
+	HYDROGRAPH AT	DVOD	83.	4.50	3.	1.	1.	.92		
+	ROUTED TO	DETOD	12.	4.58	3.	1.	1.	.92		
+	HYDROGRAPH AT	DVOD	975.	4.28	159.	40.	29.	.92		
+	2 COMBINED AT	B4D	987.	4.57	162.	41.	29.	.92		
+	2 COMBINED AT	CP-B4	1012.	4.27	168.	42.	30.	.96		
+	ROUTED TO	R-CPB4	1013.	4.28	168.	42.	30.	.96		
+	2 COMBINED AT	CP-B5	1024.	4.28	172.	43.	31.	.98		
+	ROUTED TO	R-CPB5	1021.	4.30	172.	43.	31.	.98		
+	HYDROGRAPH AT	B6	29.	4.02	1.	0.	0.	.01		
+	HYDROGRAPH AT	B8	36.	4.02	2.	1.	0.	.01		
+	2 COMBINED AT	CP68	65.	4.02	4.	1.	1.	.02		
+	ROUTED TO	DET68	2.	3.83	2.	1.	1.	.02		
+	HYDROGRAPH AT	B6W	9.	4.02	0.	0.	0.	.00		
+	3 COMBINED AT	CP-6W	1022.	4.30	173.	44.	32.	1.00		
+	DIVERSION TO	DT-B7	22.	4.30	4.	1.	1.	1.00		

+	HYDROGRAPH AT	DV-B7	1001.	4.30	169.	43.	31.	1.00
+	HYDROGRAPH AT	DV-B7	22.	4.30	4.	1.	1.	1.00
+	HYDROGRAPH AT	B14A	15.	4.02	1.	0.	0.	.00
+	2 COMBINED AT	CP-V7	29.	4.02	5.	1.	1.	.00
+	ROUTED TO	DETBV7	22.	4.53	5.	1.	1.	.00
+	HYDROGRAPH AT	B9	29.	4.02	2.	1.	0.	.01
+	DIVERSION TO	DT-B9	8.	3.67	0.	0.	0.	.01
+	HYDROGRAPH AT	DV-B9	29.	4.02	2.	0.	0.	.01
+	3 COMBINED AT	CP-B9	1022.	4.30	174.	45.	32.	1.02
+	ROUTED TO	R-CPB9	1016.	4.33	174.	45.	32.	1.02
+	HYDROGRAPH AT	B10	38.	4.02	2.	0.	0.	.01
+	DIVERSION TO	DT-B10	35.	3.88	1.	0.	0.	.01
+	HYDROGRAPH AT	DT-B10	38.	4.02	1.	0.	0.	.01
+	HYDROGRAPH AT	B12	15.	4.02	1.	0.	0.	.00
+	HYDROGRAPH AT	B14	134.	4.02	9.	2.	2.	.04
+	DIVERSION TO	DT-B14	50.	3.82	2.	1.	0.	.04
+	HYDROGRAPH AT	DV-B14	134.	4.02	6.	2.	1.	.04
+	4 COMBINED AT	CP-B14	1027.	4.32	181.	46.	33.	1.07
+	HYDROGRAPH AT	C1	78.	4.02	5.	1.	1.	.02
+	DIVERSION TO	DT-C1	48.	3.87	1.	0.	0.	.02
+	HYDROGRAPH AT	DV-C1	78.	4.02	3.	1.	1.	.02
+	DIVERSION TO	DTC-K	50.	3.88	3.	1.	0.	.02
+	HYDROGRAPH AT	DVC-K	28.	4.02	1.	0.	0.	.02
+	DIVERSION TO	DTC-H	15.	3.92	1.	0.	0.	.02
+	HYDROGRAPH AT	DVC-H	13.	4.02	0.	0.	0.	.02
+	HYDROGRAPH AT	B13	11.	4.02	1.	0.	0.	.00
+	DIVERSION TO	DT-B13	4.	3.55	0.	0.	0.	.00
+	HYDROGRAPH AT	DV-B13	11.	4.02	1.	0.	0.	.00
+	2 COMBINED AT	CPB13	24.	4.02	1.	0.	0.	.03
+	DIVERSION TO	DTGF	3.	3.58	0.	0.	0.	.03
+	HYDROGRAPH AT	DVGF	21.	4.02	1.	0.	0.	.03
+	ROUTED TO	R-B13	21.	4.02	1.	0.	0.	.03
+	2 COMBINED AT	CPGAL	1025.	4.32	181.	46.	33.	1.10
+	HYDROGRAPH AT	B5	20.	4.02	1.	0.	0.	.01
+	DIVERSION TO	DT-B5	20.	4.02	1.	0.	0.	.01

	HYDROGRAPH AT						
+	DV-B5	17.	4.03	0.	0.	0.	.01
	HYDROGRAPH AT						
+	B11	35.	4.02	2.	1.	0.	.01
	DIVERSION TO						
+	DT-C11	5.	3.58	1.	0.	0.	.01
	HYDROGRAPH AT						
+	DV-C11	30.	4.02	1.	0.	0.	.01
	DIVERSION TO						
+	DT-B11	28.	3.90	1.	0.	0.	.01
	HYDROGRAPH AT						
+	DV-B11	30.	4.02	1.	0.	0.	.01
	HYDROGRAPH AT						
+	L1	10.	4.02	1.	0.	0.	.00
	HYDROGRAPH AT						
+	M1	3.	4.02	0.	0.	0.	.00

SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
(FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)

ISTAQ	ELEMENT	DT	PEAK	TIME TO PEAK	VOLUME	INTERPOLATED TO COMPUTATION INTERVAL DT	PEAK	TIME TO PEAK	VOLUME
		(MIN)	(CFS)	(MIN)	(IN)	(MIN)	(CFS)	(MIN)	(IN)
FOR STORM = 1 STORM AREA (SQ MI) = .00									
	R-B1 MANE	.30	72.25	241.40	1.72	1.00	72.12	242.00	1.72

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2021E+01 EXCESS= .0000E+00 OUTFLOW= .2021E+01 BASIN STORAGE= .3970E-14 PERCENT ERROR= .0

FOR STORM = 2 STORM AREA (SQ MI) = .50									
	R-B1 MANE	.18	71.78	241.39	1.71	1.00	71.60	242.00	1.71

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2002E+01 EXCESS= .0000E+00 OUTFLOW= .2003E+01 BASIN STORAGE= .3981E-14 PERCENT ERROR= .0

FOR STORM = 3 STORM AREA (SQ MI) = 1.00									
	R-B1 MANE	.17	56.32	241.36	1.57	1.00	56.19	242.00	1.57

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1841E+01 EXCESS= .0000E+00 OUTFLOW= .1842E+01 BASIN STORAGE= .3970E-14 PERCENT ERROR= .0

FOR STORM = 4 STORM AREA (SQ MI) = 2.80									
	R-B1 MANE	.17	33.58	241.35	1.40	1.00	33.53	242.00	1.40

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1647E+01 EXCESS= .0000E+00 OUTFLOW= .1647E+01 BASIN STORAGE= .3963E-14 PERCENT ERROR= .0

FOR STORM = 1 STORM AREA (SQ MI) = .00									
	R-B13 MANE	.35	21.50	240.86	.23	1.00	21.47	241.00	.23

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3152E+00 EXCESS= .0000E+00 OUTFLOW= .3155E+00 BASIN STORAGE= .7448E-14 PERCENT ERROR= -.1

FOR STORM = 2 STORM AREA (SQ MI) = .50									
	R-B13 MANE	.39	20.87	240.84	.22	1.00	20.79	241.00	.22

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3053E+00 EXCESS= .0000E+00 OUTFLOW= .3054E+00 BASIN STORAGE= .7516E-14 PERCENT ERROR= .0

FOR STORM = 3 STORM AREA (SQ MI) = 1.00									
	R-B13 MANE	.31	5.94	240.94	.10	1.00	5.94	241.00	.10

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1403E+00 EXCESS= .0000E+00 OUTFLOW= .1408E+00 BASIN STORAGE= .7520E-14 PERCENT ERROR= -.4

FOR STORM = 4 STORM AREA (SQ MI) = 2.80									
	R-B13 MANE	.45	2.67	240.59	.06	1.00	2.67	240.00	.06

CONTINUITY SUMMARY (AC-FT) - INFLOW= .8898E-01 EXCESS= .0000E+00 OUTFLOW= .8918E-01 BASIN STORAGE= .7557E-14 PERCENT ERROR= -.2

*** NORMAL END OF HEC-1 ***

APPENDIX C

Site Retention Calculations

Required First Flush Storm Water Calculations

Provided Storm Water Calculations

Required First Flush Storm Water Calculations

First Flush Volume Required

Description: Desert Mountain Parcel 19
Date: 05/06/16
Location: City of Scottsdale
Reference:

City of Scottsdale, *Design Standards and Policies Manual Chapter 4 Grading & Drainage*, January 2010.

Known Values: First Flush
0.5 inches

Calc. Values: V=(P/12)*A*C

V = Retention Volume Required
C = Runoff Coefficient
P = Precipitation amount=100-year 2 hour rainfall
A = Area of Watershed Contributing

Drainage Area	Area (SF)	Area (ac)	Weighted Runoff Coefficient	First Flush Volume (ac-ft)	Required Pre vs Post Volume (ac ft)
B5	165024	3.79	1.00	0.16	0.42
B6	322261	5.50	1.00	0.23	N/A
B8	300366	6.90	1.00	0.29	N/A
B9	217378	4.99	1.00	0.21	N/A
B10	335363	7.70	1.00	0.32	N/A
B11	269364	6.18	1.00	0.26	N/A
B13	80916	1.86	1.00	0.08	N/A
B14	1072718	24.63	1.00	1.03	N/A
B14A	115650	2.65	1.00	0.11	N/A
C1	636403	14.61	1.00	0.61	N/A
			TOTAL =	**3.28**	

Provided Storm Water Calculations

Off-Site Detention Basin Capacity

Description: Proposed Detention Basin Capacities
Project: **Desert Mountain Parcel 19**
Reference: *Drainage Design Manual for Maricopa County, Arizona - Hydrology*
City of Scottsdale, *Design Standards and Policies Manual*

Basin IDs	Bottom Contour Area	Top Contour	Bottom Elevation	Top Elevation	Volume Provided	Volume Provided
Basin 3	17,184	19,439	0.0	1	**0.42**	**2.01**
	19,439	21,796	1.0	2	**0.47**	
	21,796	24,252	2.0	3	**0.53**	
	24,252	26,810.00	3.0	4	**0.59**	

Basin IDs	Bottom Contour Area	Top Contour	Bottom Elevation	Top Elevation	Volume Provided	Volume Provided
Basin 4	10,798	13,254	2680.0	2681.0	**0.28**	**1.39**
	13,254	15,028	2681.0	2682.0	**0.32**	
	15,028	17,134	2682.0	2683.0	**0.37**	
	17,134	19,270	2683.0	2684.0	**0.42**	
	19,270	22,350	2684.0	2684.0	**0.00**	

On-Site Detention Basin Capacity

Description: Proposed Detention Basin Capacities
Project: **Desert Mountain Parcel 19**
Reference: *Drainage Design Manual for Maricopa County, Arizona - Hydrology*
City of Scottsdale, *Design Standards and Policies Manual*

Basin IDs	Bottom Contour Area	Top Contour	Bottom Elevation	Top Elevation	Volume Provided	Volume Provided
Basin 1	8,584	10,210	2,606.0	2,607	**0.22**	**1.10**
	10,210	11,949	2,607.0	2,608	**0.25**	
	11,949	13,800	2,608.0	2,609	**0.30**	
	13,800	15,757	2,609.0	2,610	**0.34**	

Basin IDs	Bottom Contour Area	Top Contour	Bottom Elevation	Top Elevation	Volume Provided	Volume Provided
Basin 2	3,232	4,553	2,608.0	2,609	**0.09**	**0.58**
	4,553	6,056	2,609.0	2,610	**0.12**	
	6,056	7,964	2,610.0	2,611	**0.16**	
	7,964	10,184	2,611.0	2,612	**0.21**	

APPENDIX D

Hydraulic Calculations

HEC-RAS Output Files Existing & Proposed Conditions

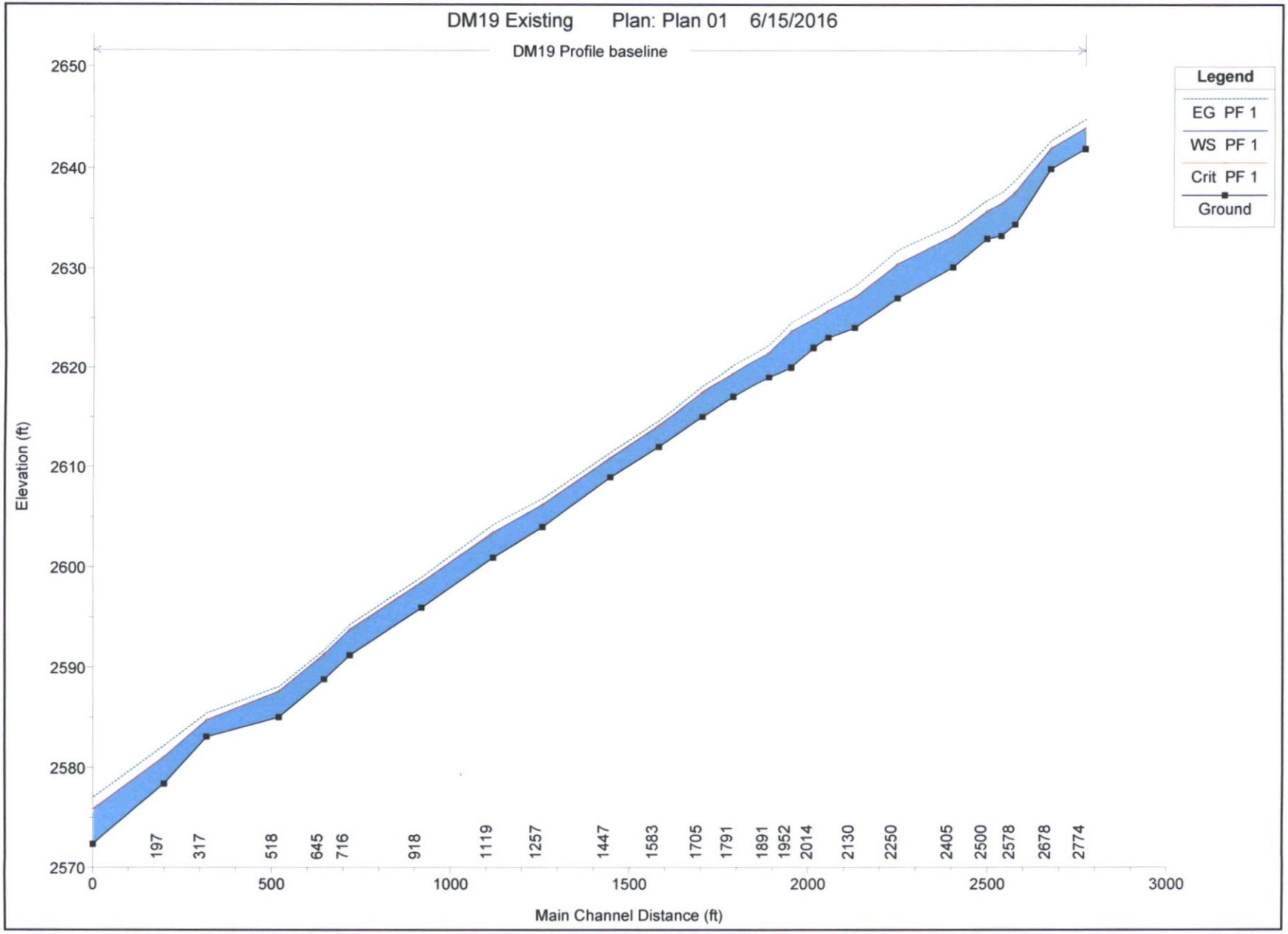
Scour Calculations

Erosion Hazard Setback Calculations

HEC-RAS Output Files Existing & Proposed Conditions

EXISTING

GALLOWAY WASH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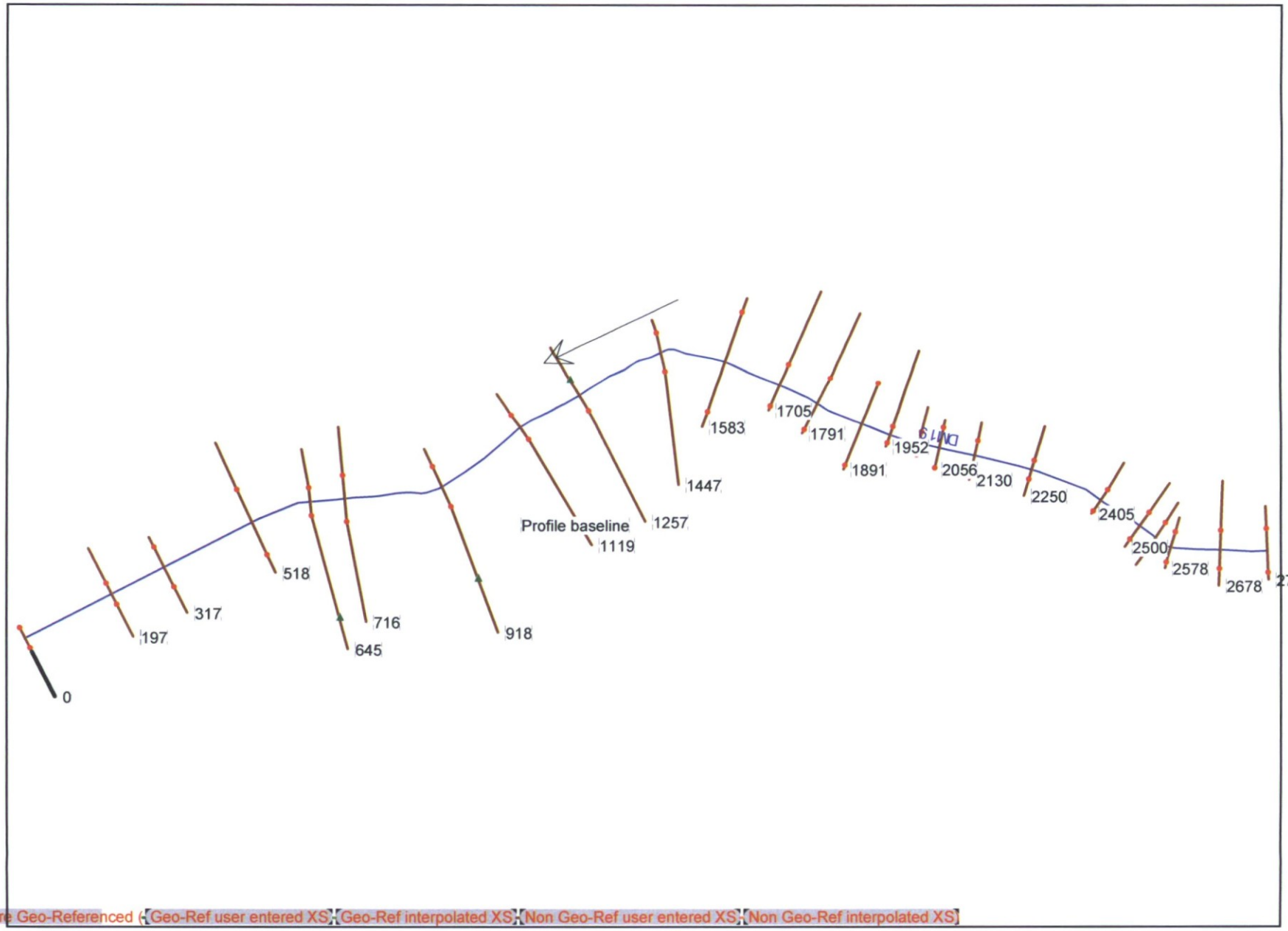
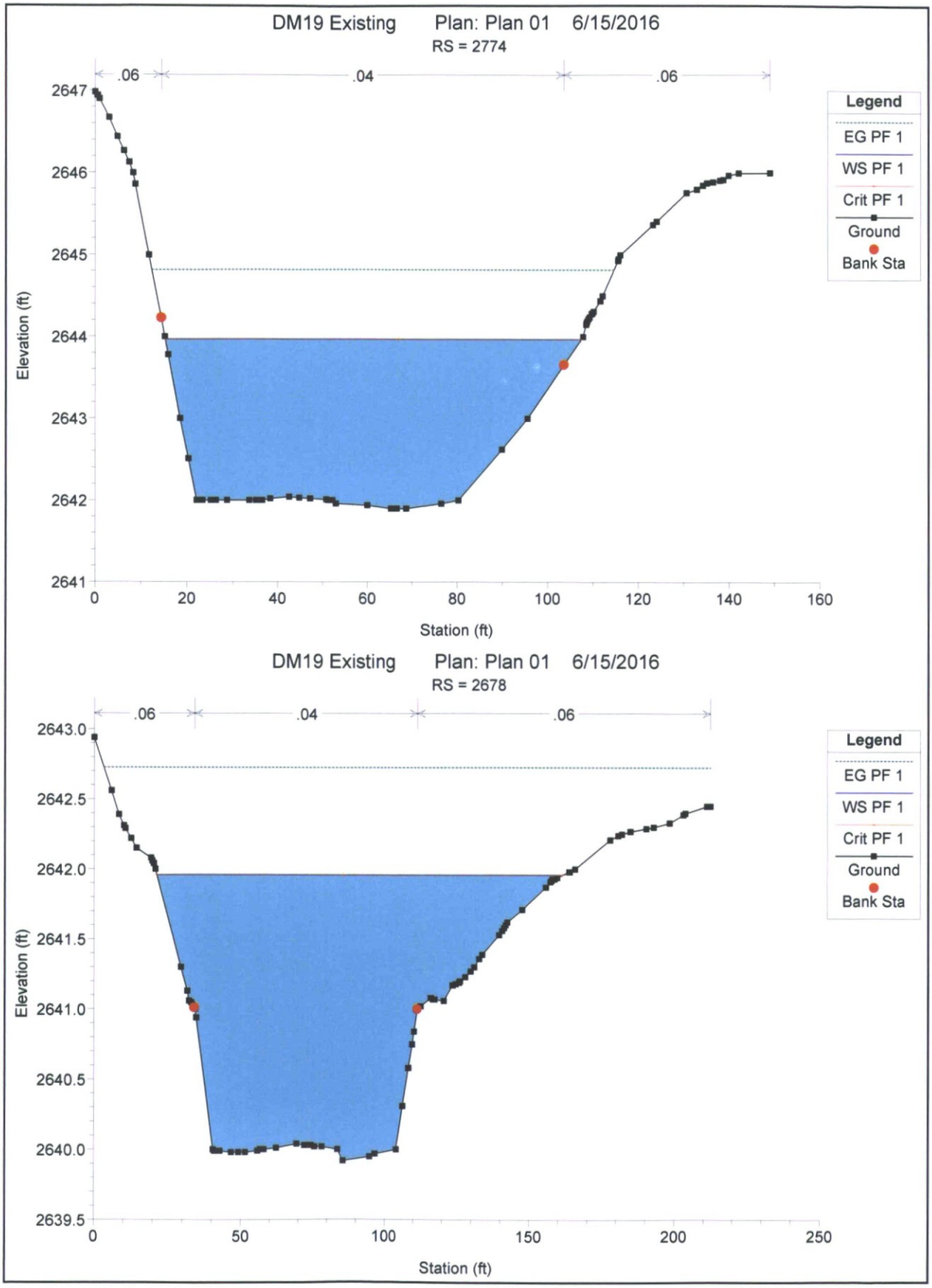
DM19 Profile baseline
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Elevation (ft)
2650
2640
2630
2620
2610
2600
2590
2580
2570
197
317
518
645
716
918
1119
1257
1447
1583
1705
1791
1891
1952
2014
2130
2250
2405
2500
2578
2678
2774
0
500
1000
1500
2000
2500
3000
Main Channel Distance (ft)


0
197
317
518
645
716
918
Profile baseline
1119
1257
1447
1583
1705
1791
1891
1952
2056
2130
2250
2405
2500
2578
2678
2774
one of the XS's are Geo-Referenced (Geo-Ref user entered XS Geo-Ref interpolated XS Non Geo-Ref user entered XS Non Geo-Ref interpolated XS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.06
.04
.06
Legend
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WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
DM19 Existing Plan: Plan 01 6/15/2016
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.04
.06
Legend
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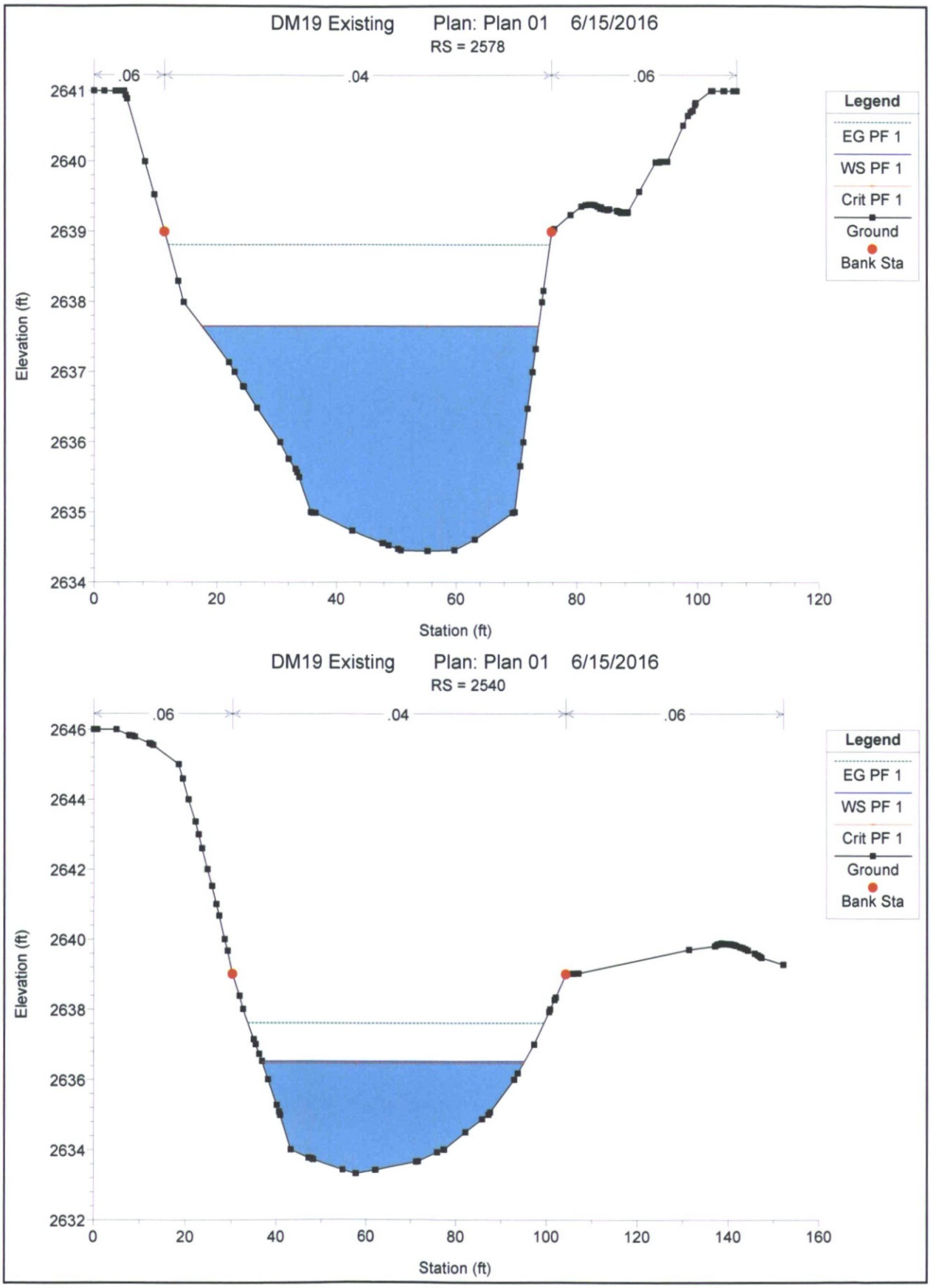
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)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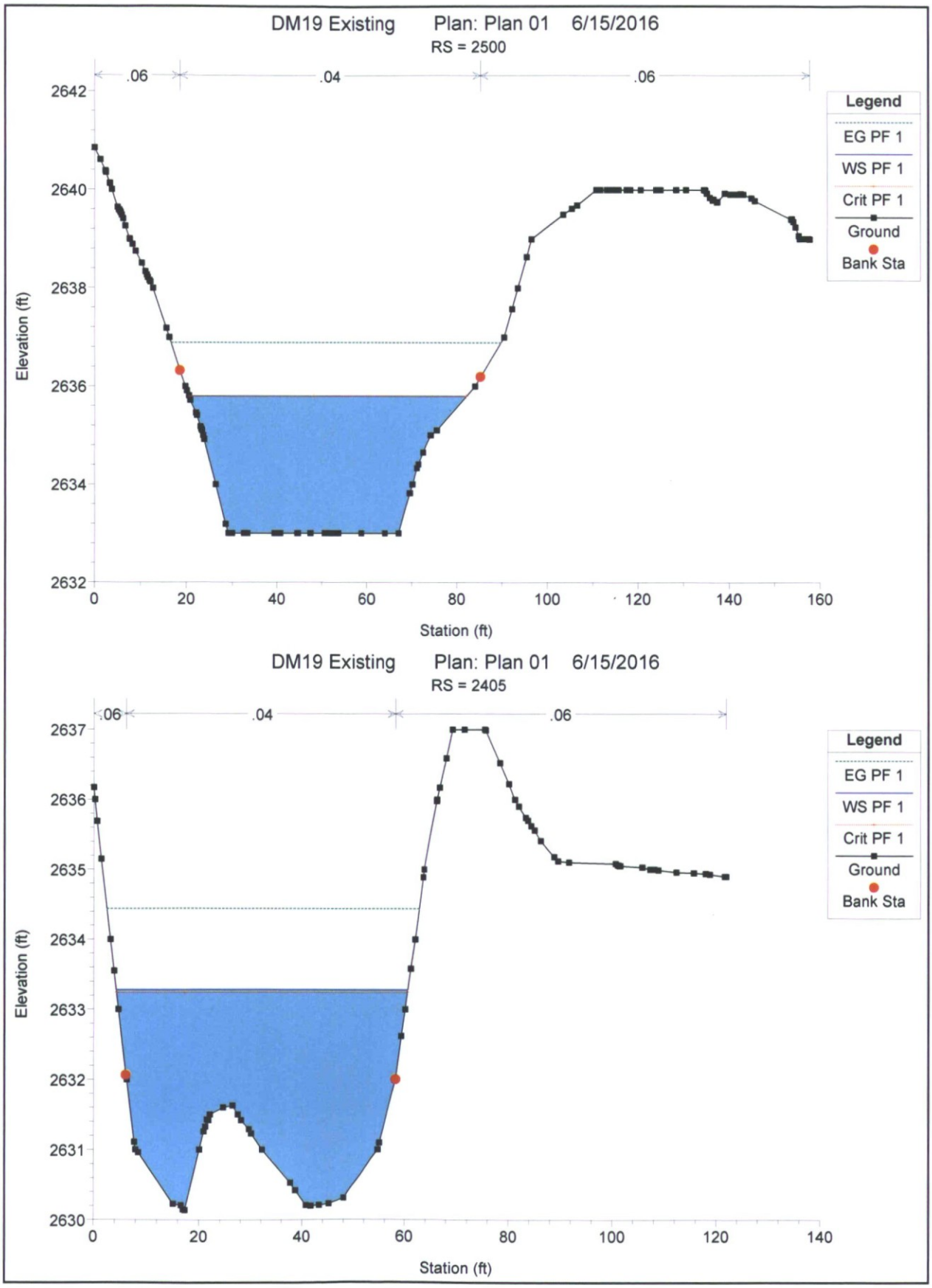
RS = 2578
.06
.04
.06
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2641
2640
2639
2638
2637
2636
2635
2634
0
20
40
60
80
100
120
Station (ft)
DM19 Existing Plan: Plan 01 6/15/2016
RS = 2540
.06
.04
.06
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2646
2644
2642
2640
2638
2636
2634
2632
0
20
40
60
80
100
120
140
160
Station (ft)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RS = 2500
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.04
.06
Legend
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WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
DM19 Existing Plan: Plan 01 6/15/2016
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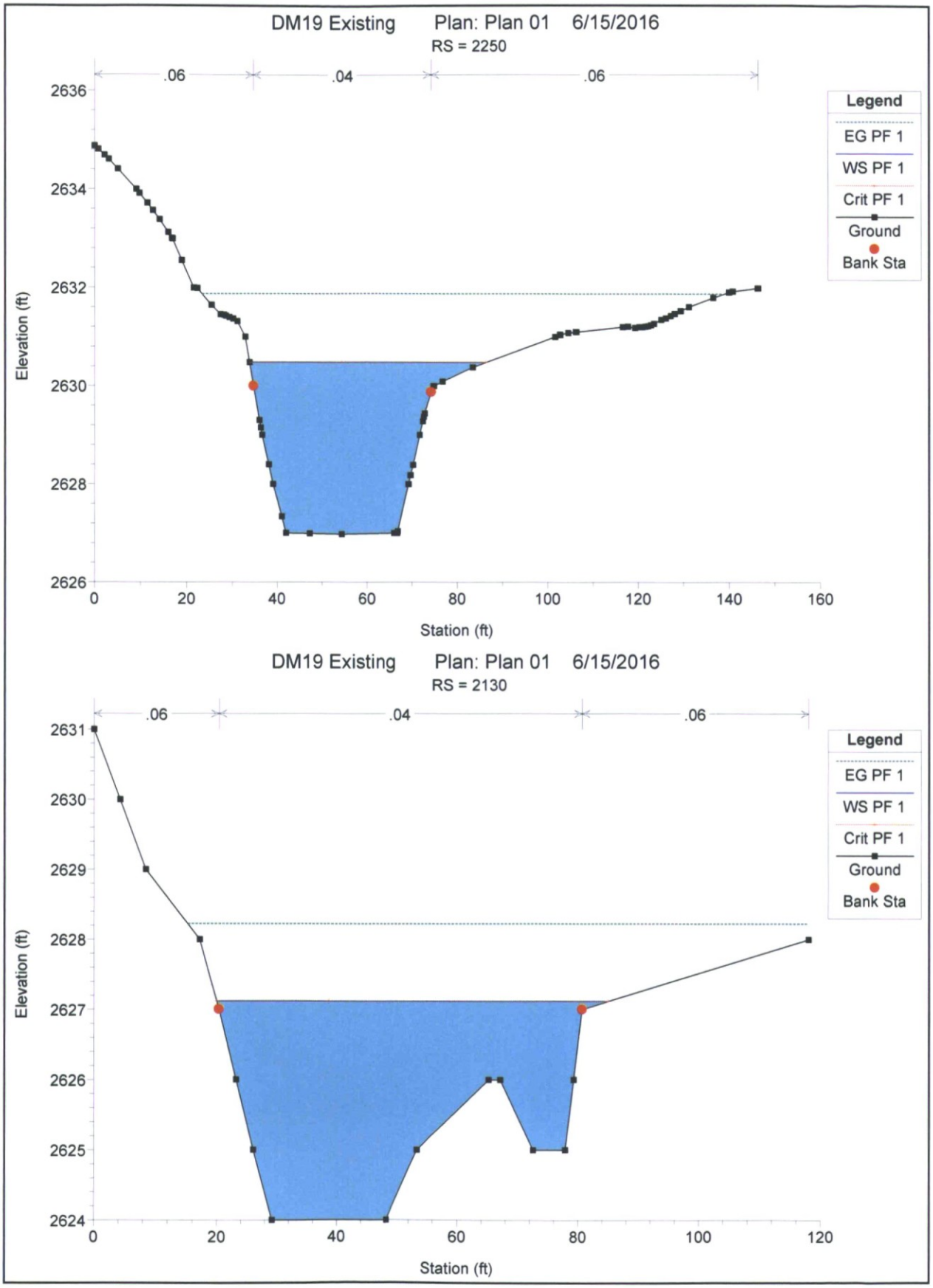
.04
.06
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)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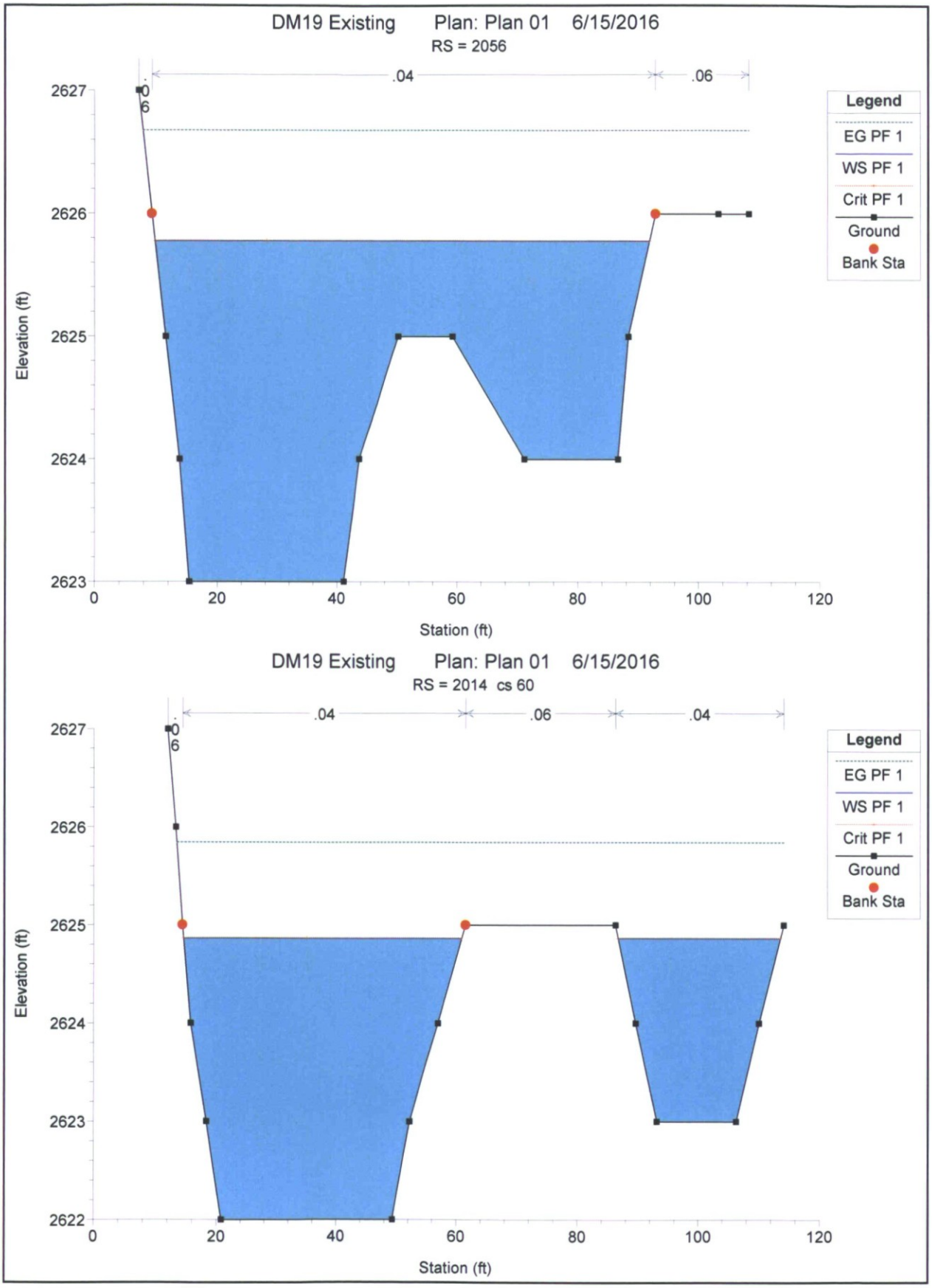
RS = 2250
.06
.04
.06
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2636
2634
2632
2630
2628
2626
0
20
40
60
80
100
120
140
160
Station (ft)
DM19 Existing Plan: Plan 01 6/15/2016
RS = 2130
.06
.04
.06
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2631
2630
2629
2628
2627
2626
2625
2624
0
20
40
60
80
100
120
Station (ft)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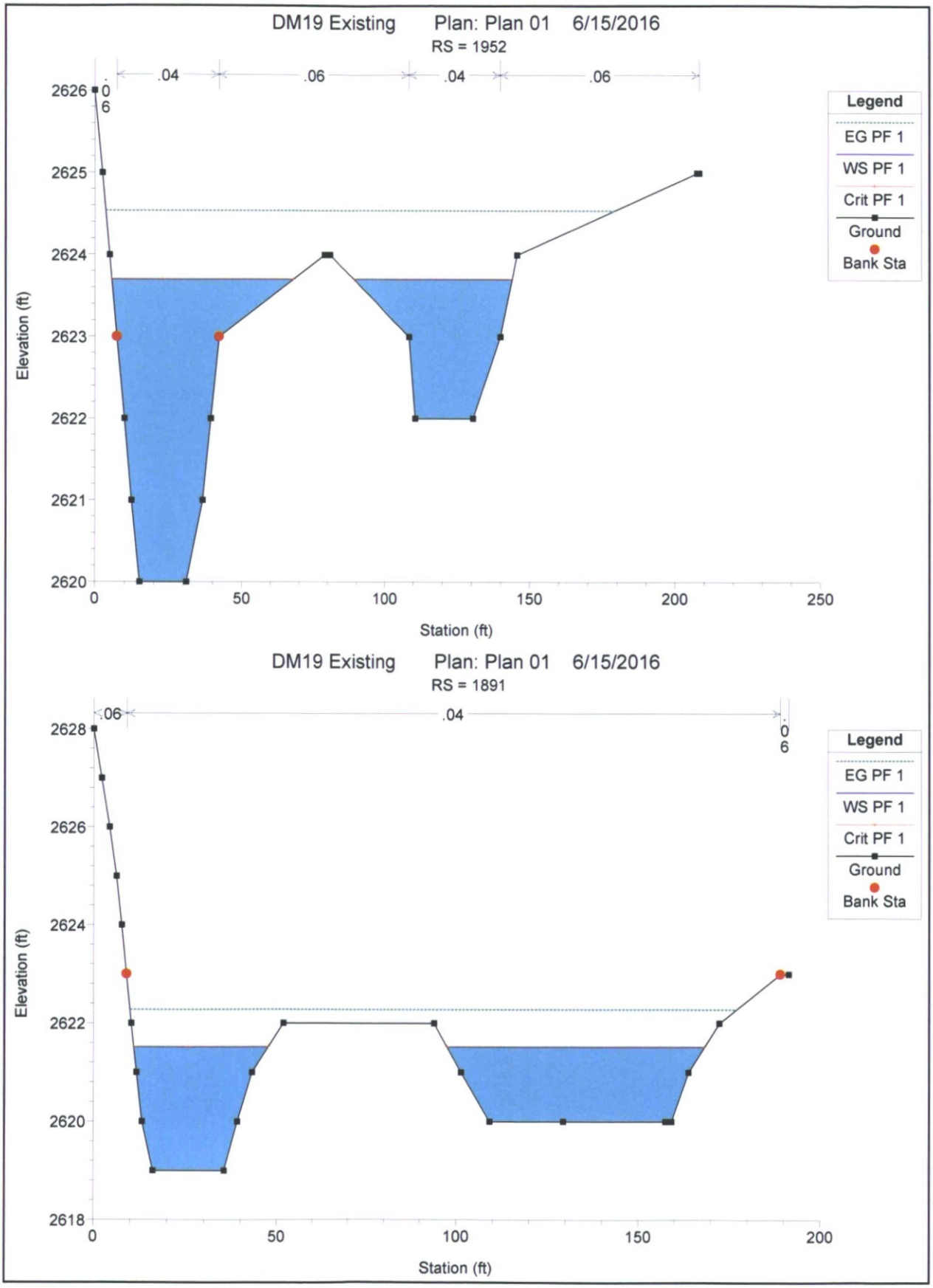
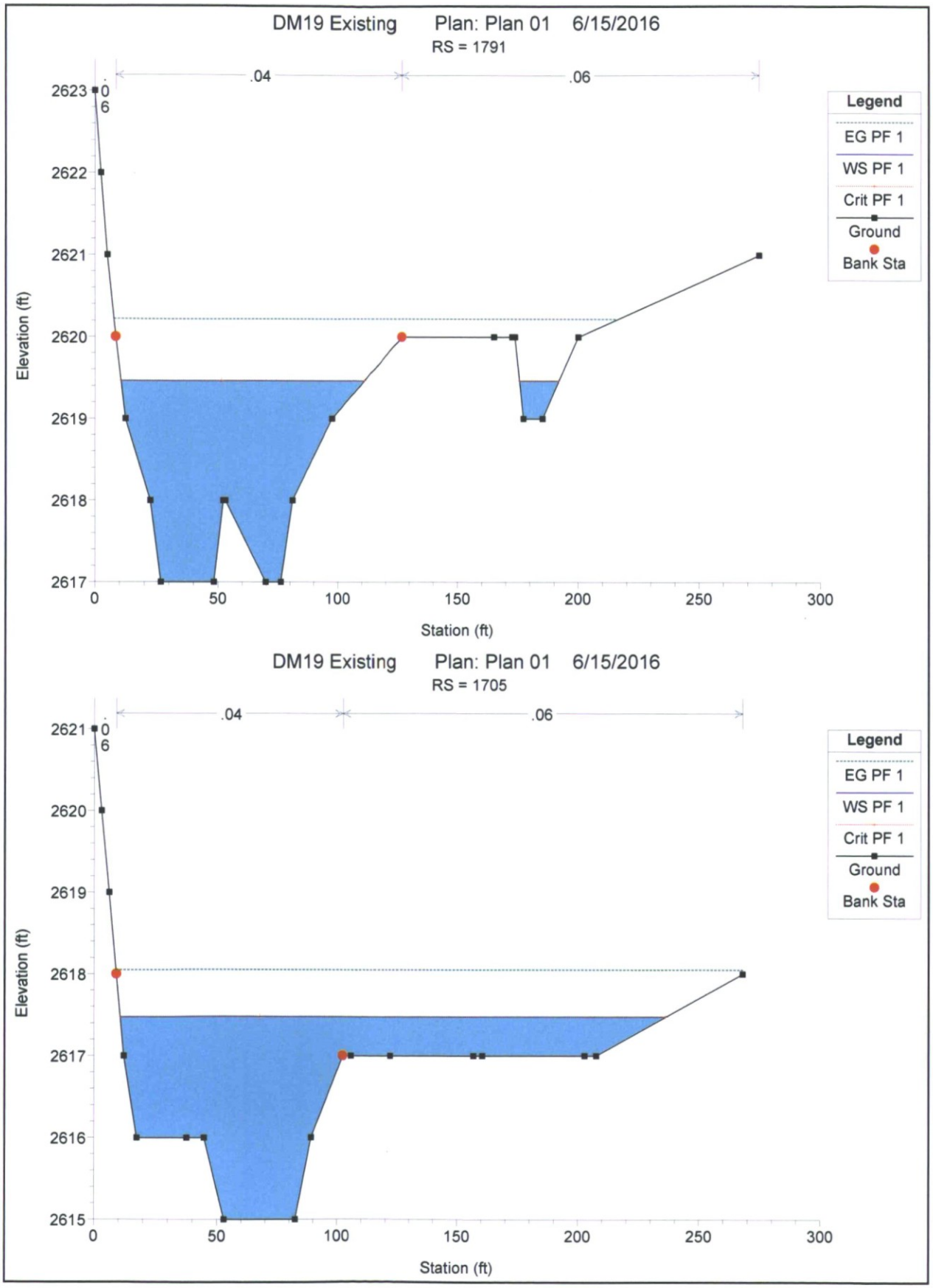
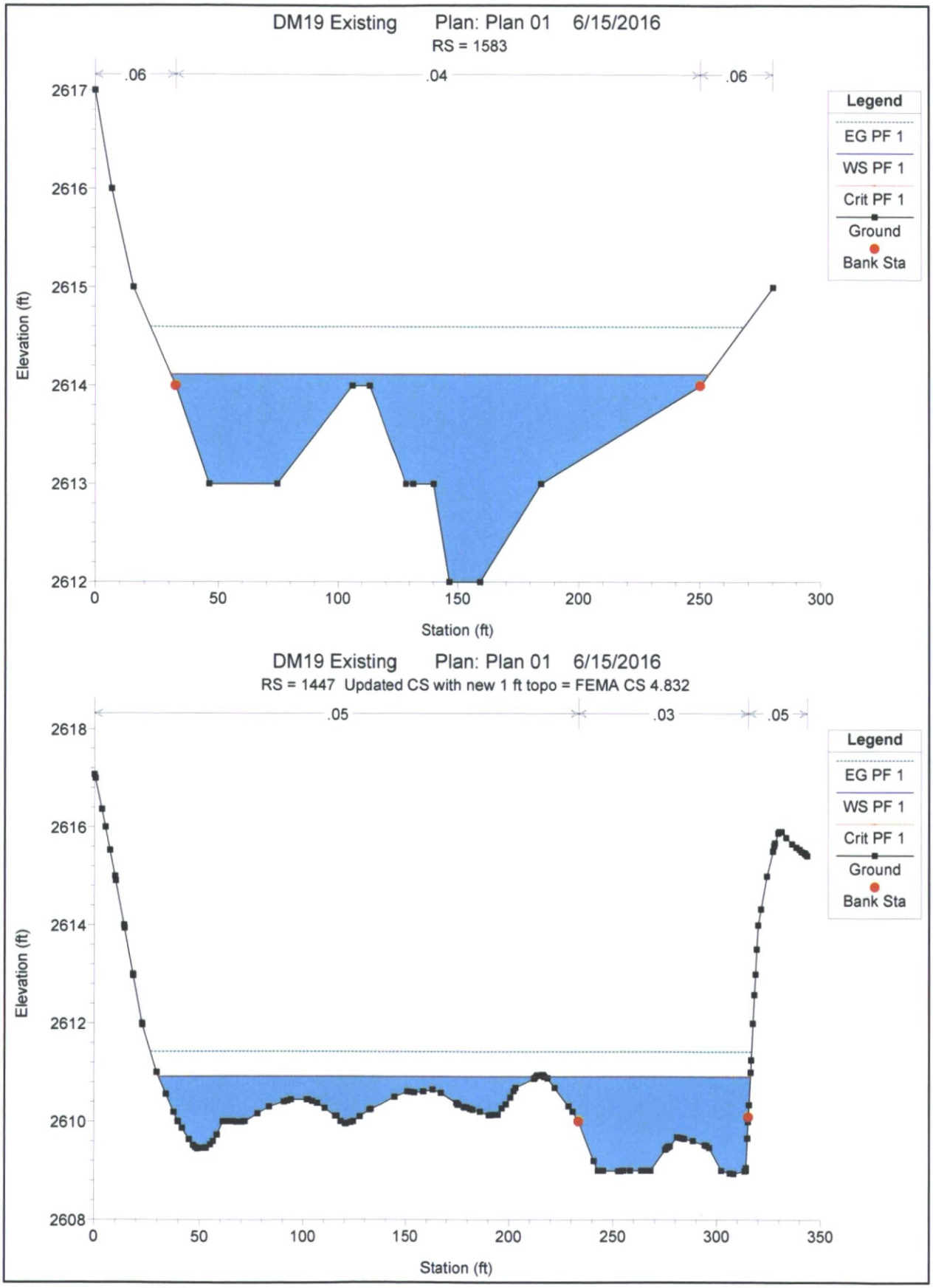
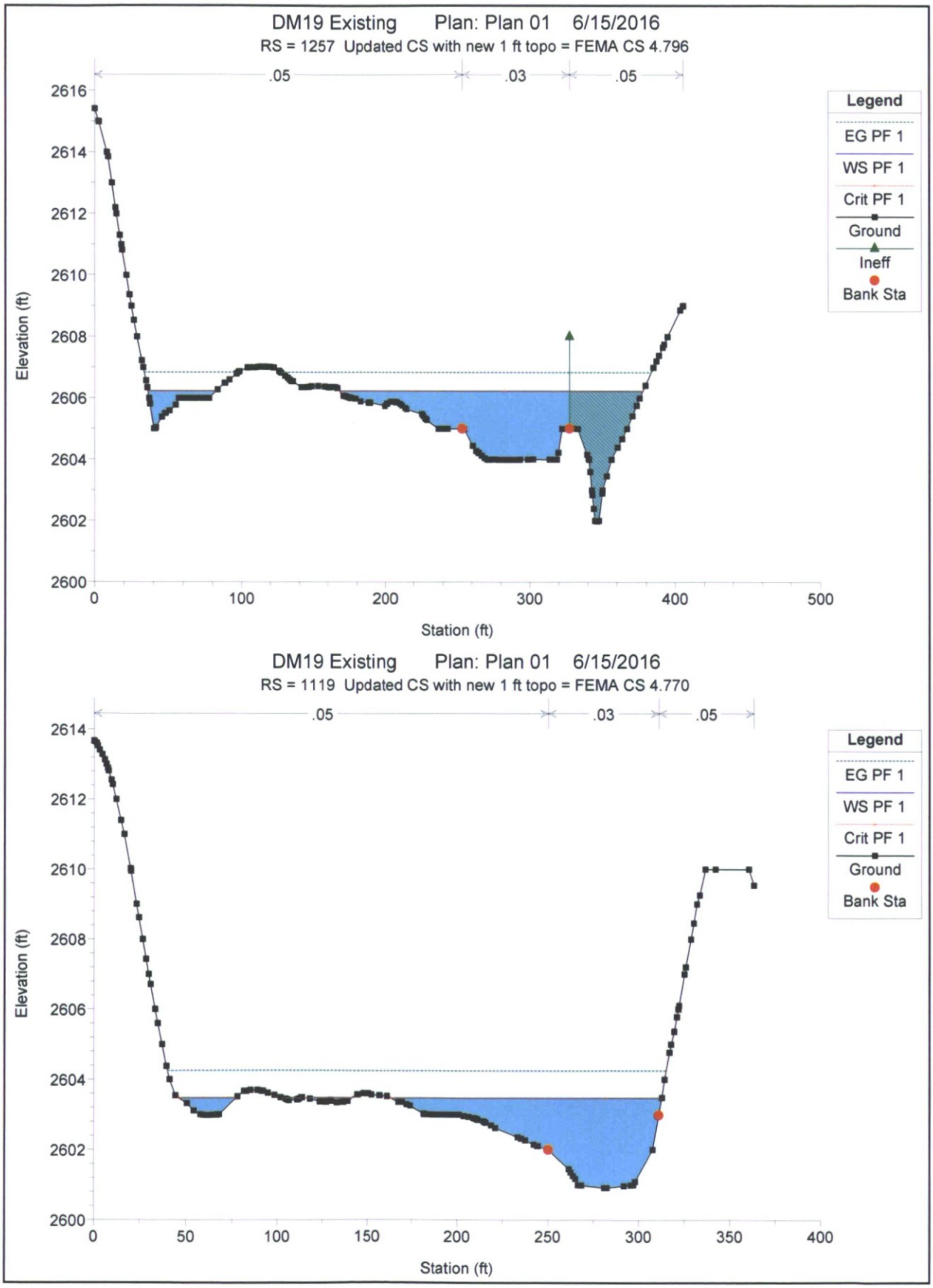
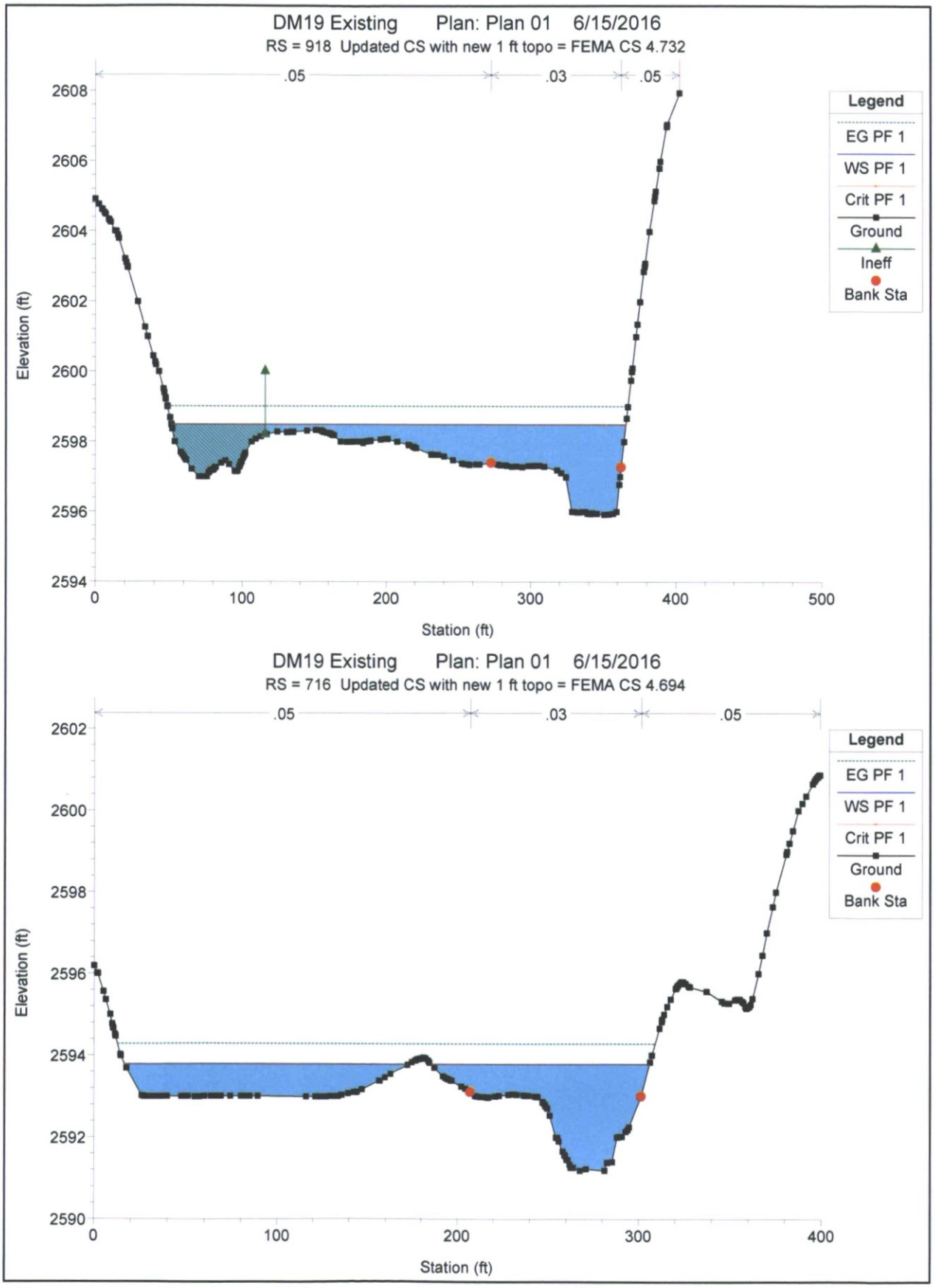
RS = 2056
.04
.06
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
DM19 Existing Plan: Plan 01 6/15/2016
RS = 2014 cs 60
.04
.06
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

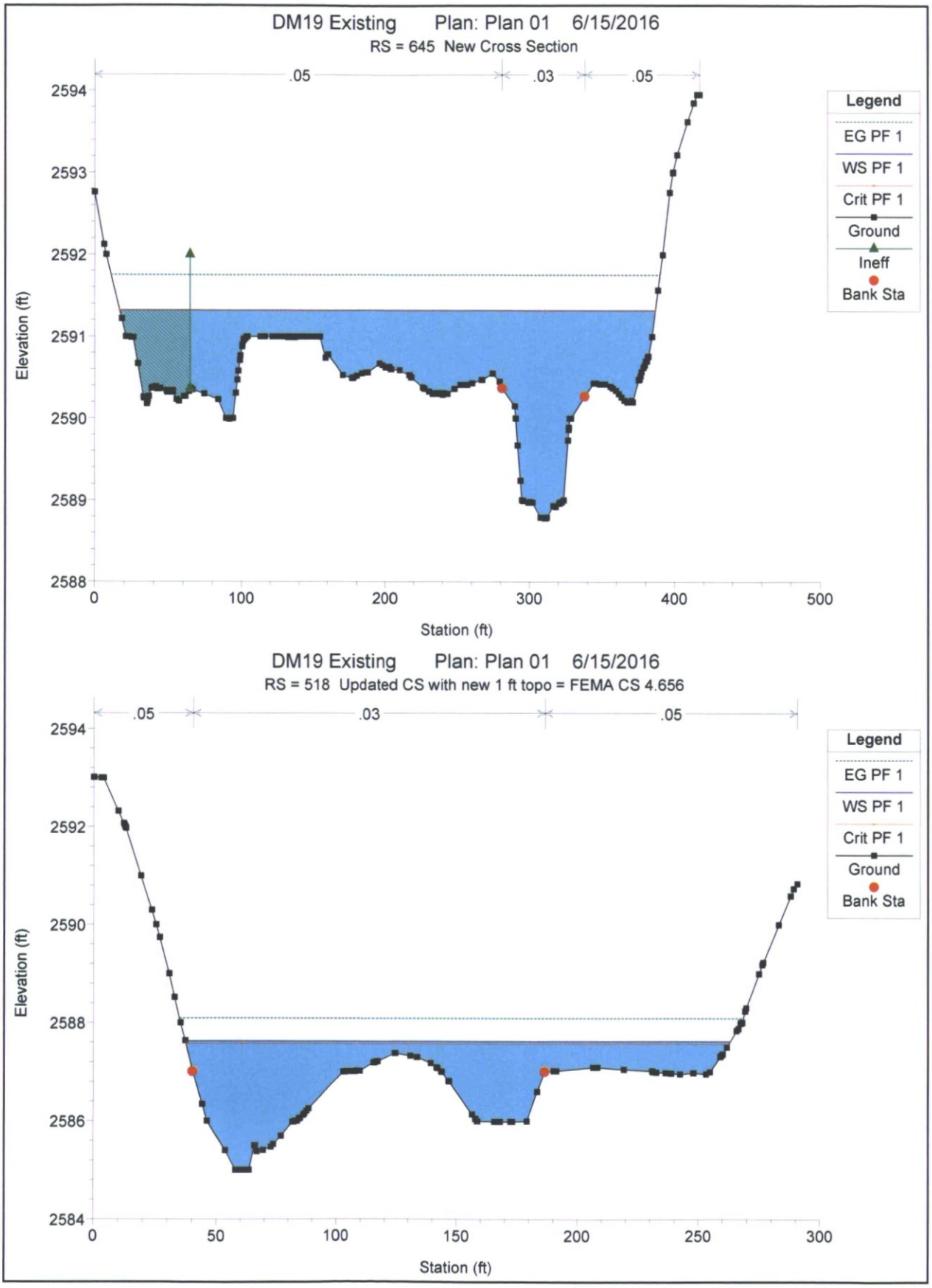

DM19 Existing Plan: Plan 01 6/15/2016
RS = 1952
.04
.06
.04
.06
.06
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2626
2625
2624
2623
2622
2621
2620
0
50
100
150
200
250
Station (ft)
DM19 Existing Plan: Plan 01 6/15/2016
RS = 1891
.06
.04
.06
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2628
2626
2624
2622
2620
2618
0
50
100
150
200
Station (ft)

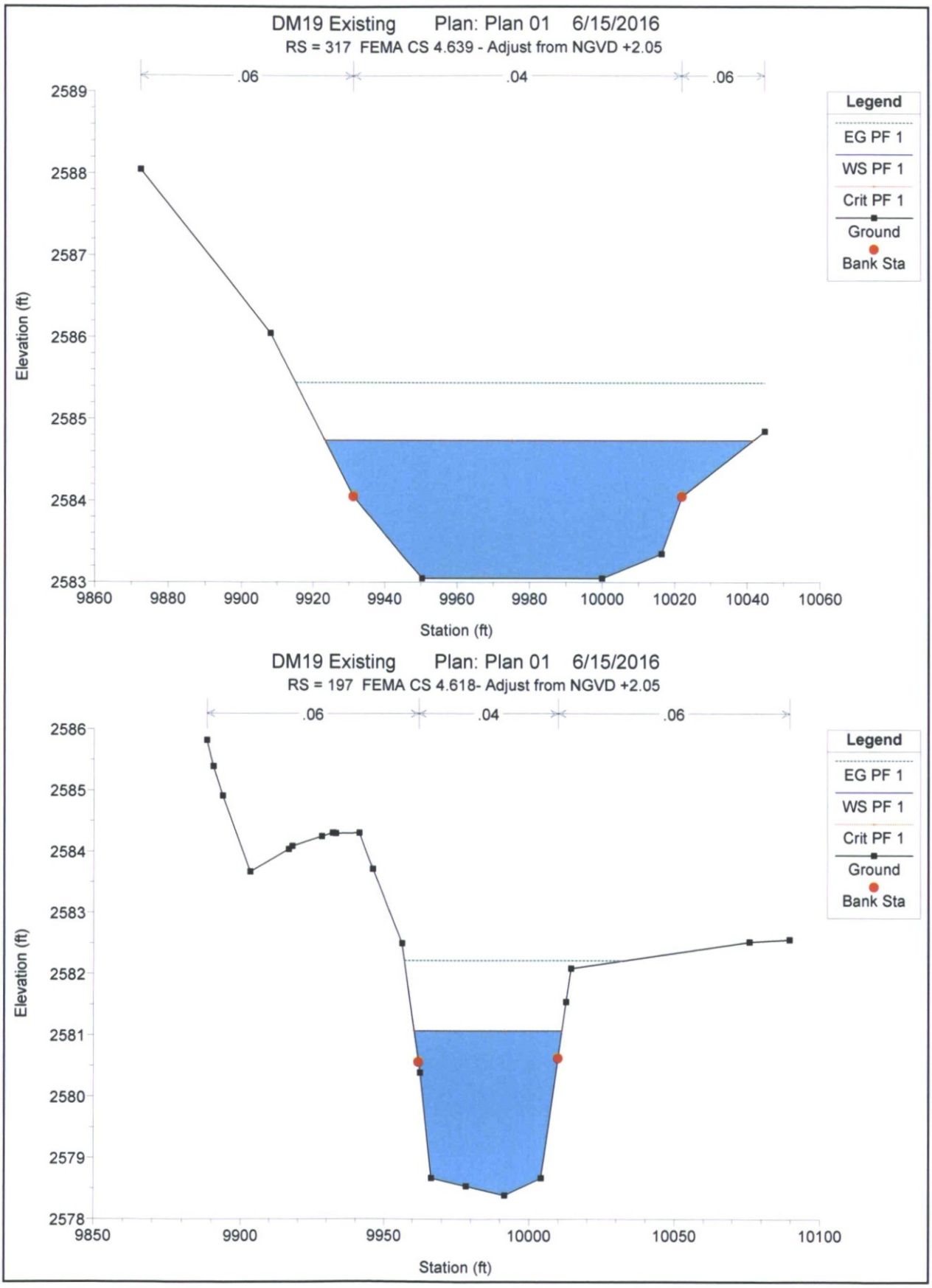

DM19 Existing Plan: Plan 01 6/15/2016
RS = 1791
.04
.06
.06
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
2623
2622
2621
2620
2619
2618
2617
0
50
100
150
200
250
300
DM19 Existing Plan: Plan 01 6/15/2016
RS = 1705
.04
.06
.06
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
2621
2620
2619
2618
2617
2616
2615
0
50
100
150
200
250
300

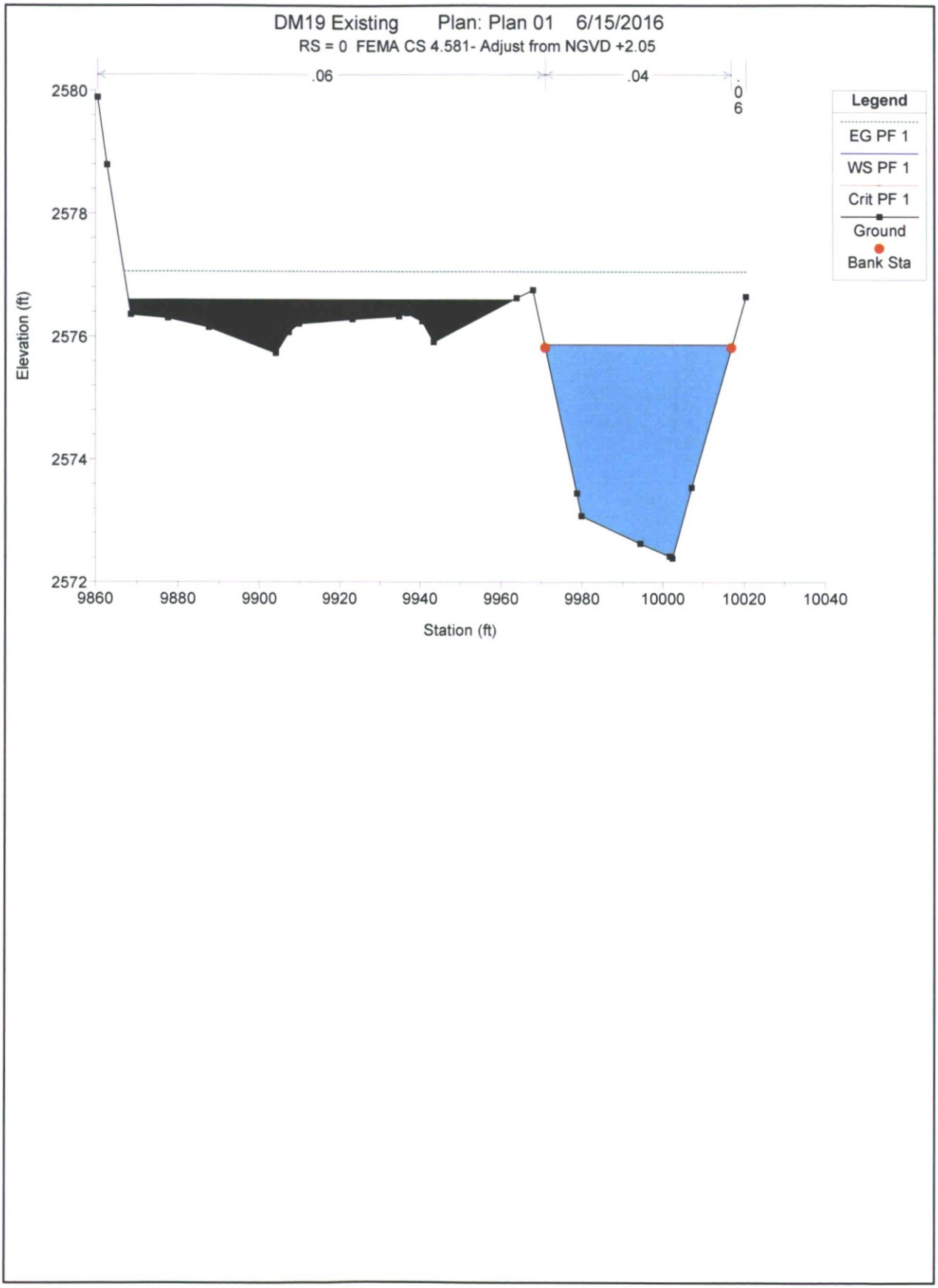

DM19 Existing Plan: Plan 01 6/15/2016
RS = 1583
.06
.04
.06
2617
2616
2615
2614
2613
2612
Elevation (ft)
0
50
100
150
200
250
300
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
DM19 Existing Plan: Plan 01 6/15/2016
RS = 1447 Updated CS with new 1 ft topo = FEMA CS 4.832
.05
.03
.05
2618
2616
2614
2612
2610
2608
Elevation (ft)
0
50
100
150
200
250
300
350
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta


DM19 Existing Plan: Plan 01 6/15/2016
RS = 1257 Updated CS with new 1 ft topo = FEMA CS 4.796
.05
.03
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
2616
2614
2612
2610
2608
2606
2604
2602
2600
0
100
200
300
400
500
Station (ft)
DM19 Existing Plan: Plan 01 6/15/2016
RS = 1119 Updated CS with new 1 ft topo = FEMA CS 4.770
.05
.03
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2614
2612
2610
2608
2606
2604
2602
2600
0
50
100
150
200
250
300
350
400
Station (ft)


DM19 Existing Plan: Plan 01 6/15/2016
RS = 918 Updated CS with new 1 ft topo = FEMA CS 4.732
.05
.03
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
2608
2606
2604
2602
2600
2598
2596
2594
0
100
200
300
400
500
Station (ft)
DM19 Existing Plan: Plan 01 6/15/2016
RS = 716 Updated CS with new 1 ft topo = FEMA CS 4.694
.05
.03
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2602
2600
2598
2596
2594
2592
2590
0
100
200
300
400
Station (ft)

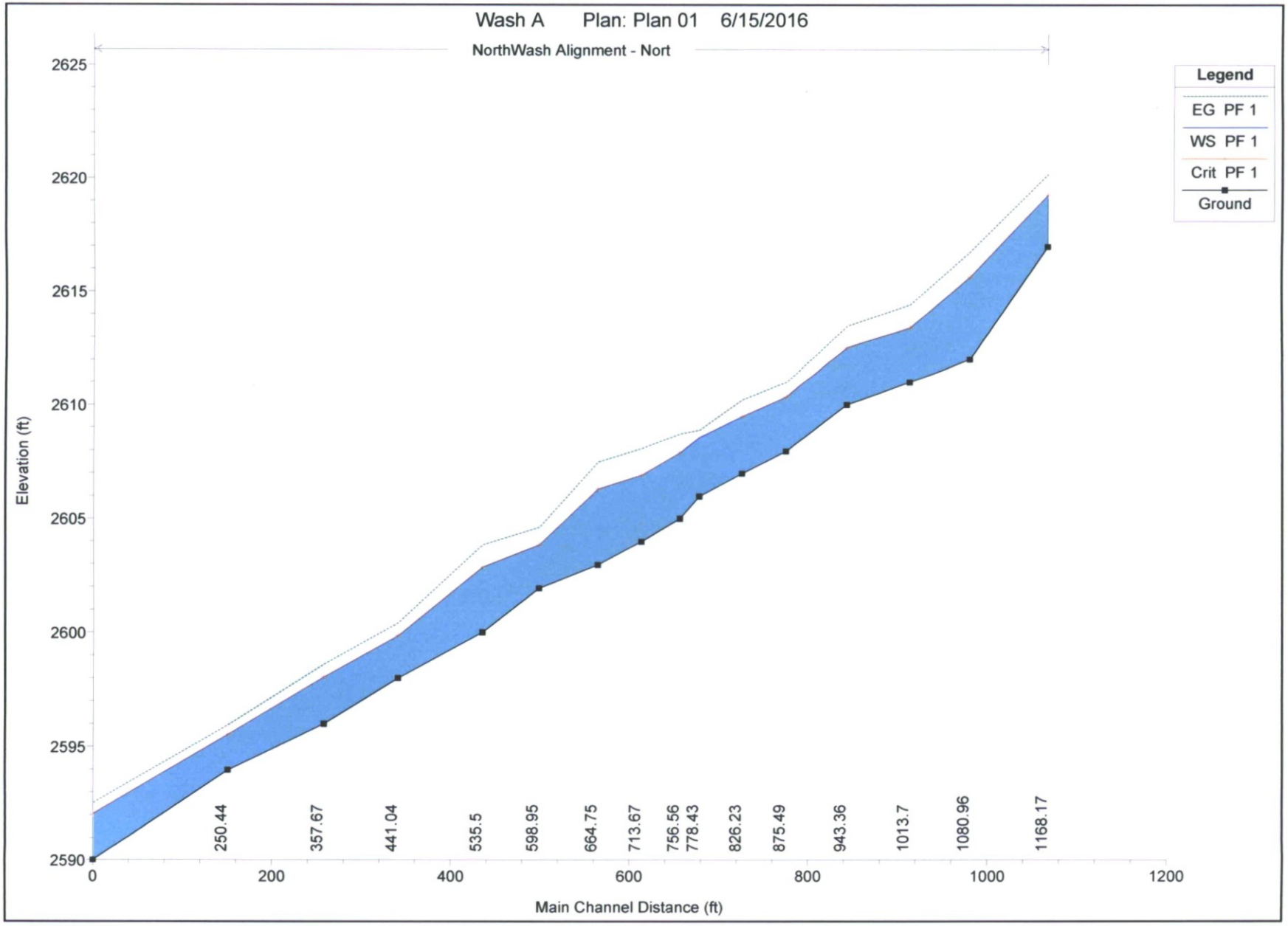

DM19 Existing Plan: Plan 01 6/15/2016
RS = 645 New Cross Section
.05
.03
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
2594
2593
2592
2591
2590
2589
2588
0
100
200
300
400
500
Station (ft)
DM19 Existing Plan: Plan 01 6/15/2016
RS = 518 Updated CS with new 1 ft topo = FEMA CS 4.656
.05
.03
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2594
2592
2590
2588
2586
2584
0
50
100
150
200
250
300
Station (ft)

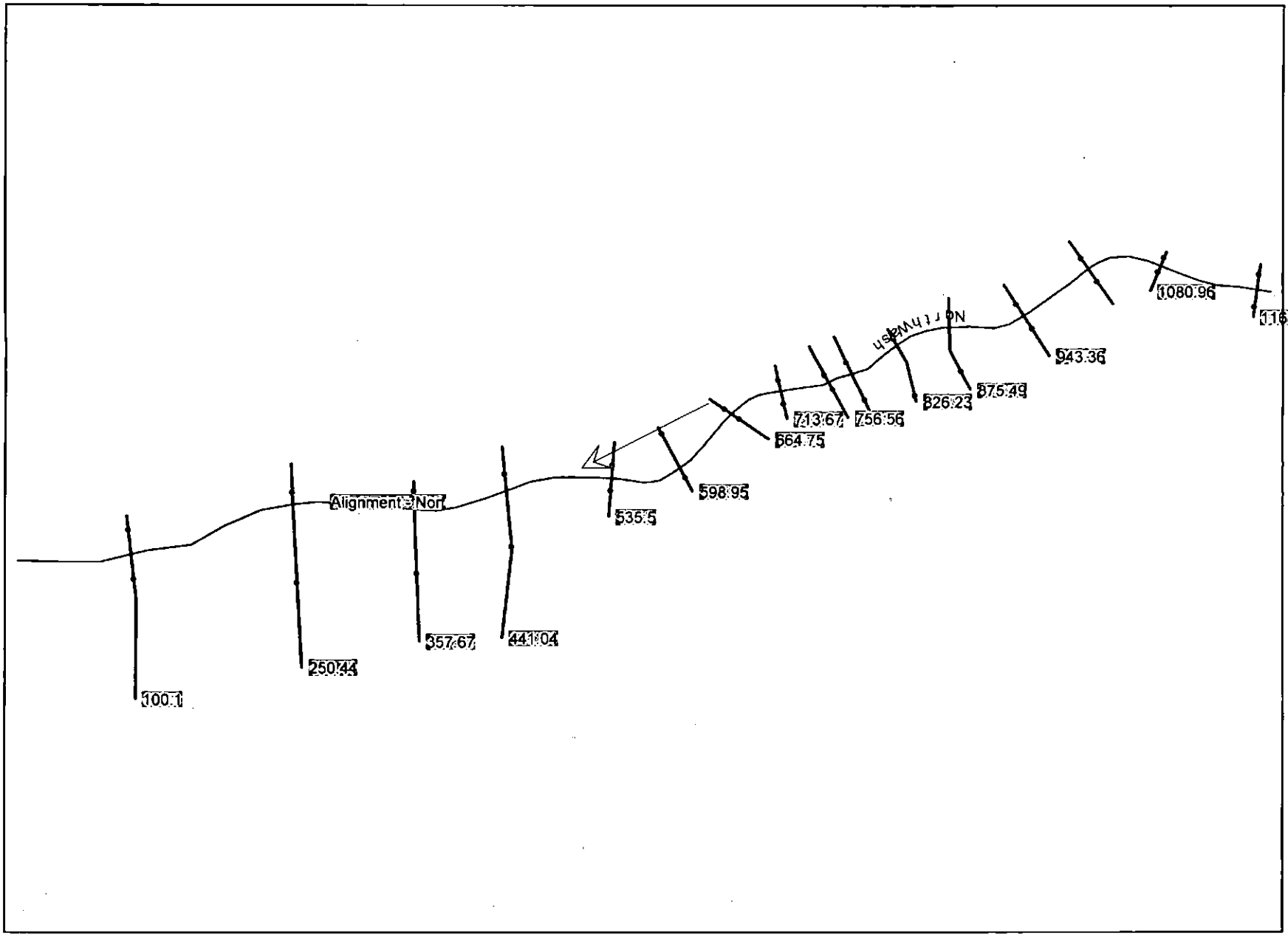

DM19 Existing Plan: Plan 01 6/15/2016
RS = 317 FEMA CS 4.639 - Adjust from NGVD +2.05
.06
.04
.06
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2589
2588
2587
2586
2585
2584
2583
9860
9880
9900
9920
9940
9960
9980
10000
10020
10040
10060
Station (ft)
DM19 Existing Plan: Plan 01 6/15/2016
RS = 197 FEMA CS 4.618- Adjust from NGVD +2.05
.06
.04
.06
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2586
2585
2584
2583
2582
2581
2580
2579
2578
9850
9900
9950
10000
10050
10100
Station (ft)

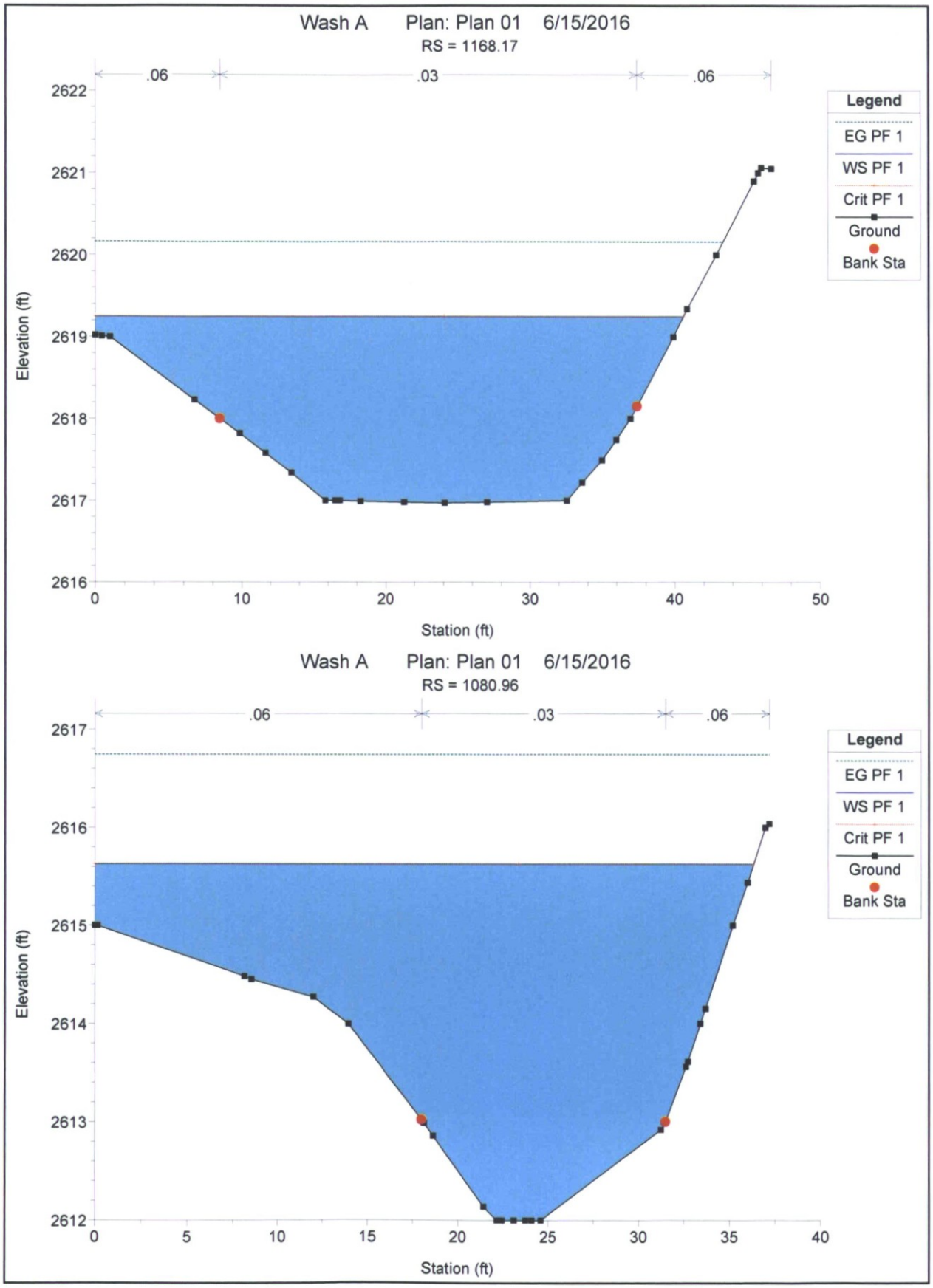

DM19 Existing Plan: Plan 01 6/15/2016
RS = 0 FEMA CS 4.581- Adjust from NGVD +2.05
.06
.04
.06
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2580
2578
2576
2574
2572
9860
9880
9900
9920
9940
9960
9980
10000
10020
10040
Station (ft)

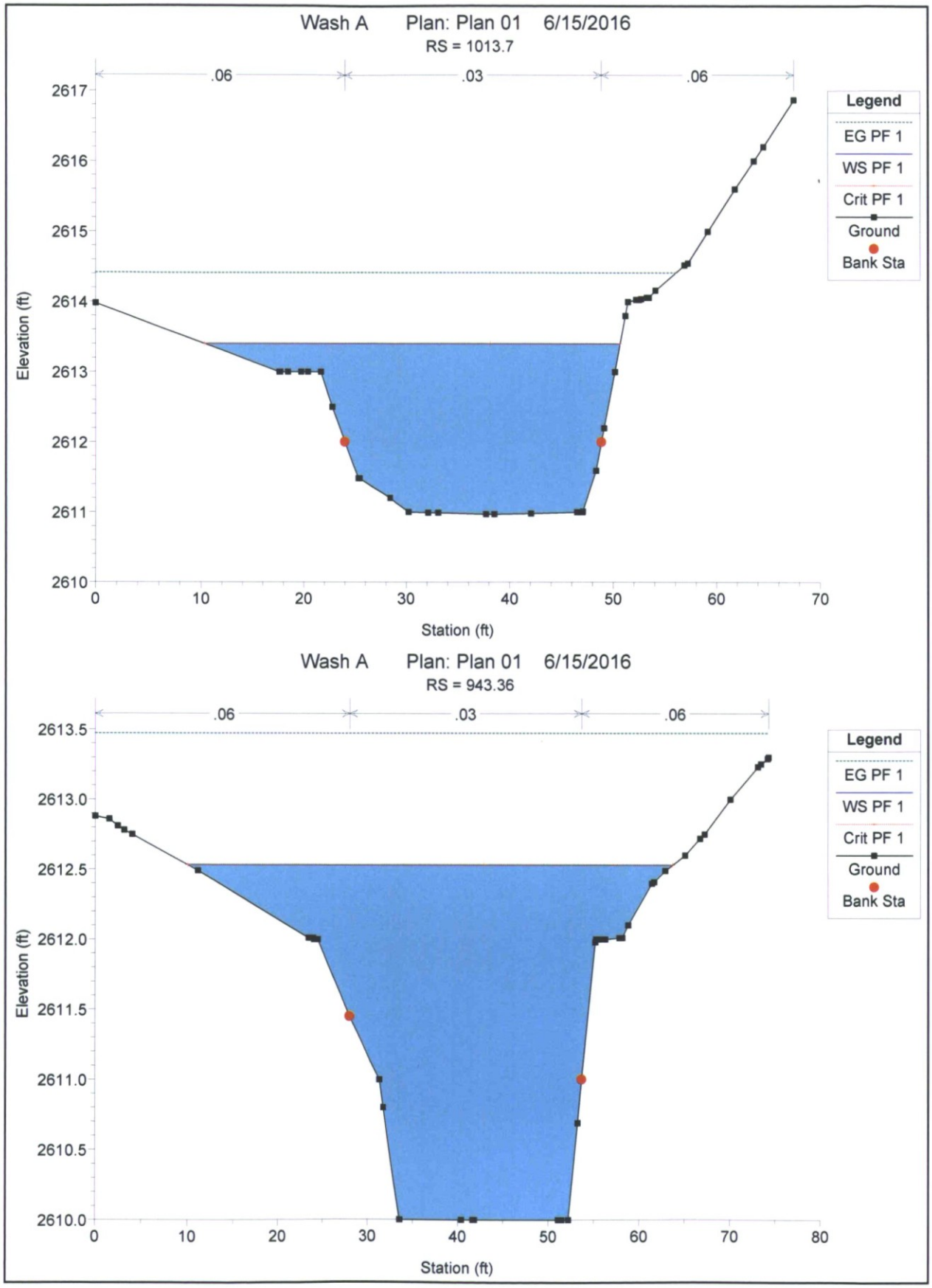
EXISTING

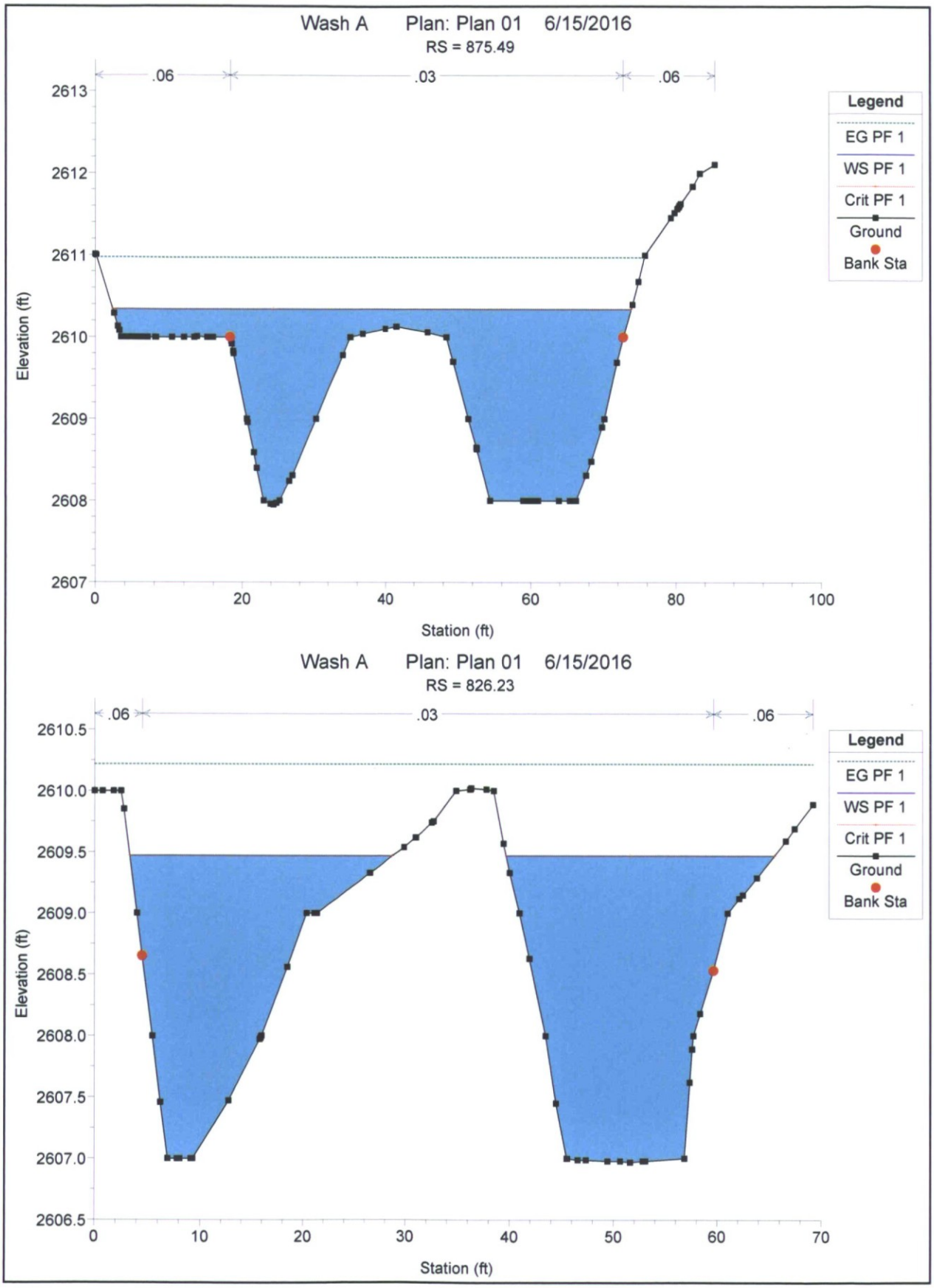
WASH A

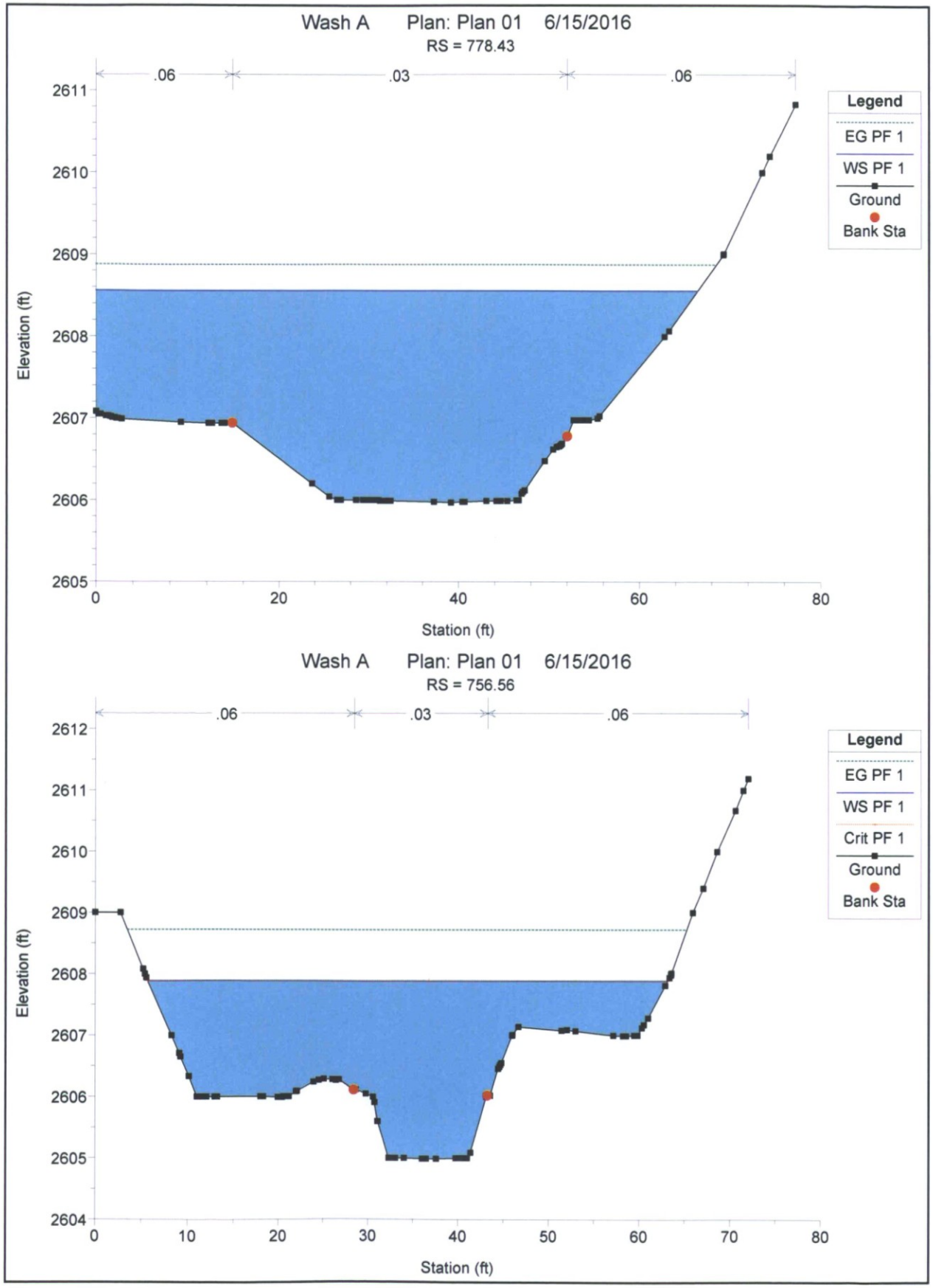

Wash A Plan: Plan 01 6/15/2016
NorthWash Alignment - Nort
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Elevation (ft)
2625
2620
2615
2610
2605
2600
2595
2590
250.44
357.67
441.04
535.5
598.95
664.75
713.67
756.56
778.43
826.23
875.49
943.36
1013.7
1080.96
1168.17
0
200
400
600
800
1000
1200
Main Channel Distance (ft)

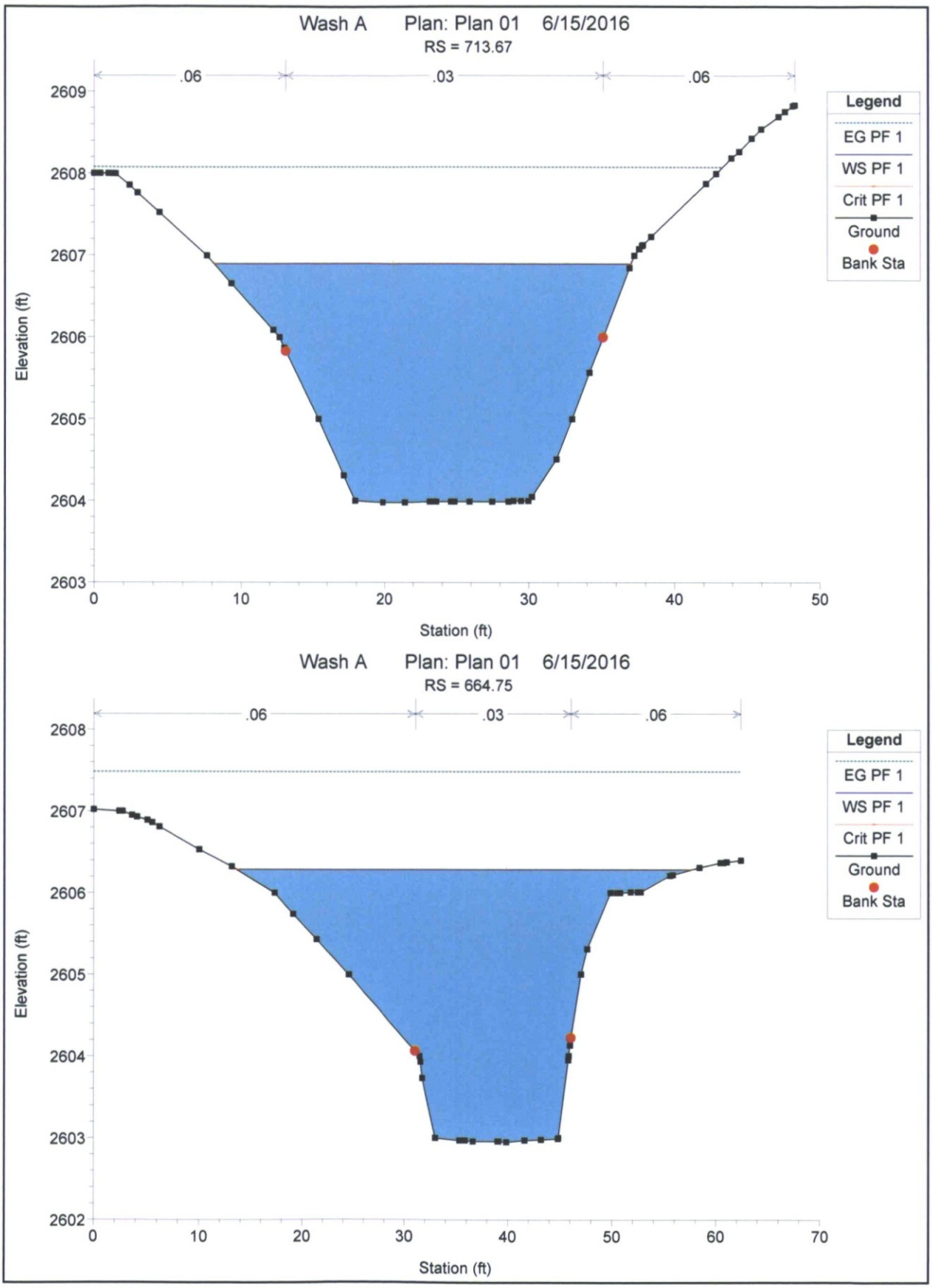

Alignment: Nor
100.1
250.44
357.67
441.04
535.5
598.95
564.75
713.67
756.56
826.23
875.49
943.36
1080.96
1168.17

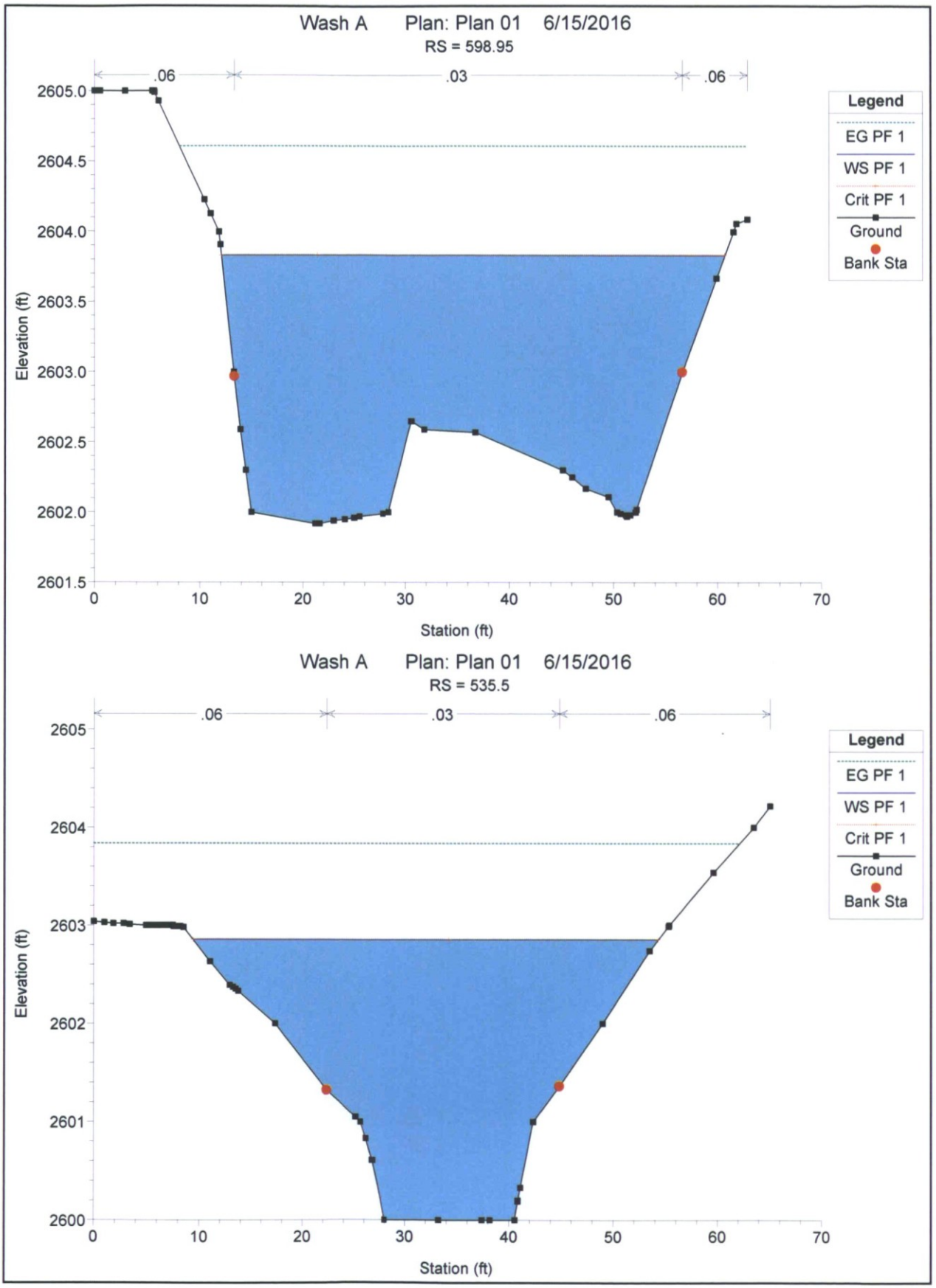

Wash A Plan: Plan 01 6/15/2016
RS = 1168.17
.06
.03
.06
2622
2621
2620
2619
2618
2617
2616
Elevation (ft)
0
10
20
30
40
50
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Wash A Plan: Plan 01 6/15/2016
RS = 1080.96
.06
.03
.06
2617
2616
2615
2614
2613
2612
Elevation (ft)
0
5
10
15
20
25
30
35
40
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta

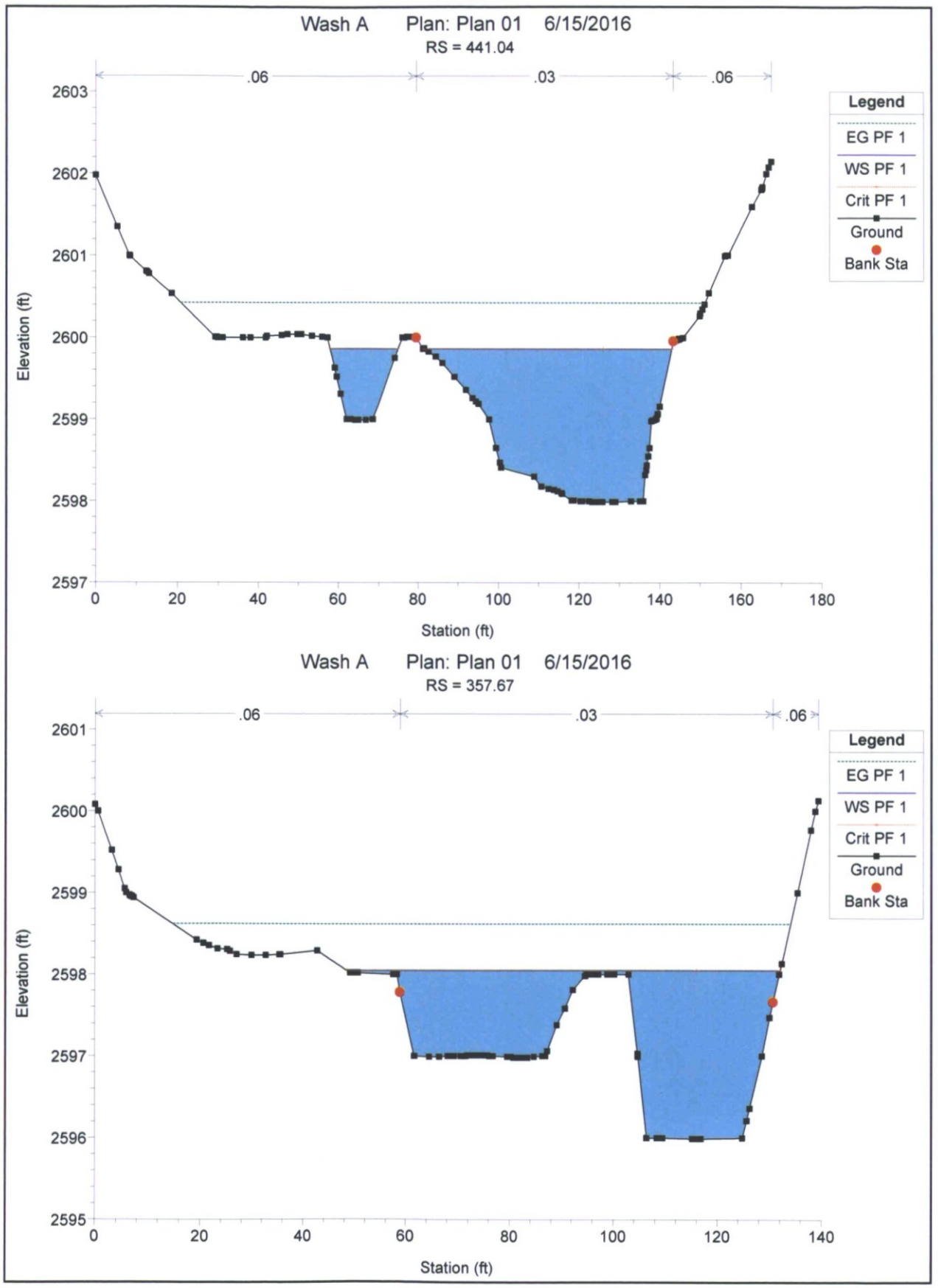

Wash A Plan: Plan 01 6/15/2016
RS = 1013.7
.06
.03
.06
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Wash A Plan: Plan 01 6/15/2016
RS = 943.36
.06
.03
.06
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

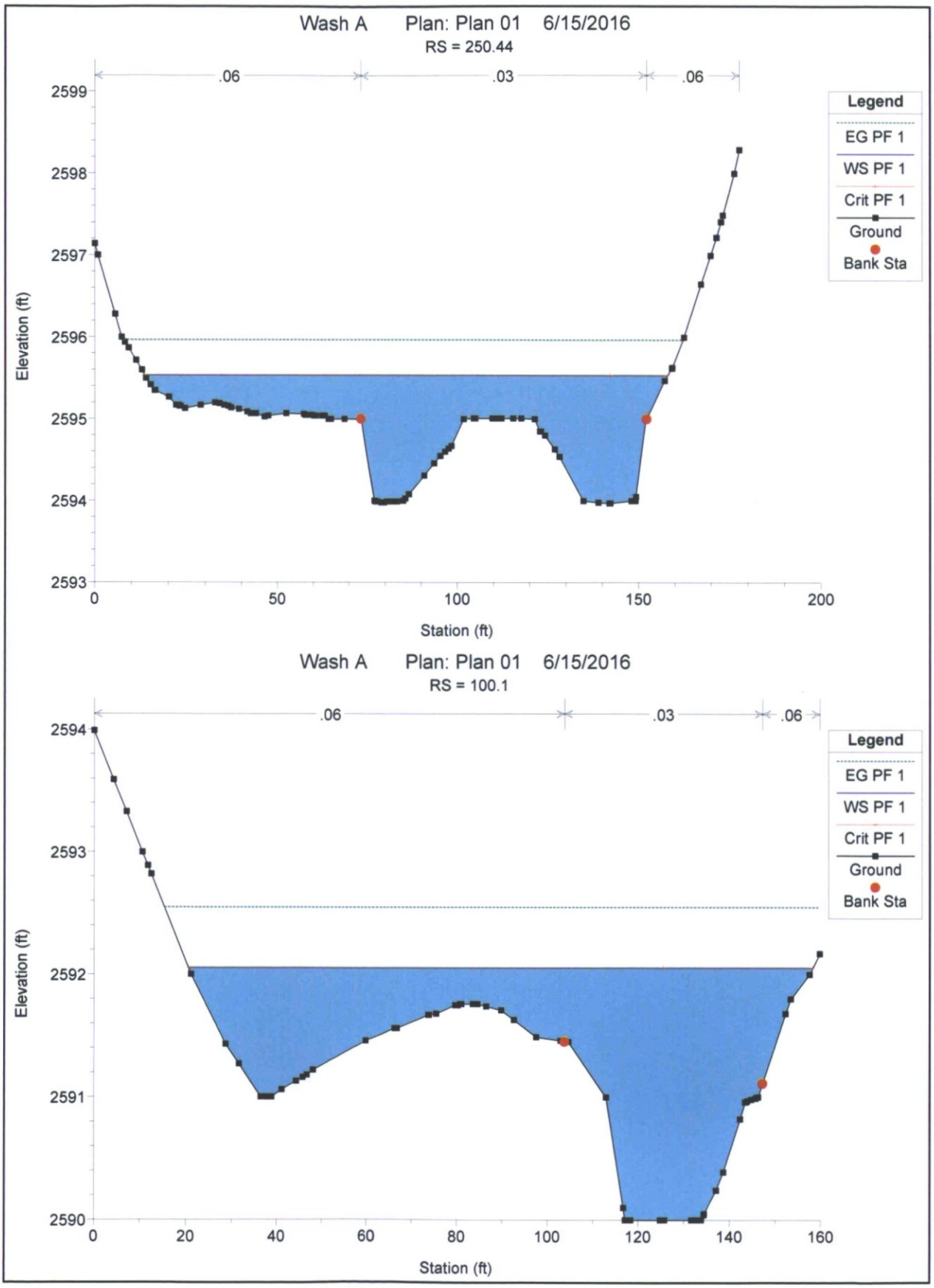

Wash A Plan: Plan 01 6/15/2016
RS = 875.49
.06
.03
.06
2613
2612
2611
2610
2609
2608
2607
Elevation (ft)
0
20
40
60
80
100
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Wash A Plan: Plan 01 6/15/2016
RS = 826.23
.06
.03
.06
2610.5
2610.0
2609.5
2609.0
2608.5
2608.0
2607.5
2607.0
2606.5
Elevation (ft)
0
10
20
30
40
50
60
70
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta


Wash A Plan: Plan 01 6/15/2016
RS = 778.43
.06
.03
.06
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Wash A Plan: Plan 01 6/15/2016
RS = 756.56
.06
.03
.06
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


Wash A Plan: Plan 01 6/15/2016
RS = 713.67
.06
.03
.06
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Wash A Plan: Plan 01 6/15/2016
RS = 664.75
.06
.03
.06
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


Wash A Plan: Plan 01 6/15/2016
RS = 598.95
.06
.03
.06
2605.0
2604.5
2604.0
2603.5
2603.0
2602.5
2602.0
2601.5
Elevation (ft)
0
10
20
30
40
50
60
70
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Wash A Plan: Plan 01 6/15/2016
RS = 535.5
.06
.03
.06
2605
2604
2603
2602
2601
2600
Elevation (ft)
0
10
20
30
40
50
60
70
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta


Wash A Plan: Plan 01 6/15/2016
RS = 441.04
.06
.03
.06
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Wash A Plan: Plan 01 6/15/2016
RS = 357.67
.06
.03
.06
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

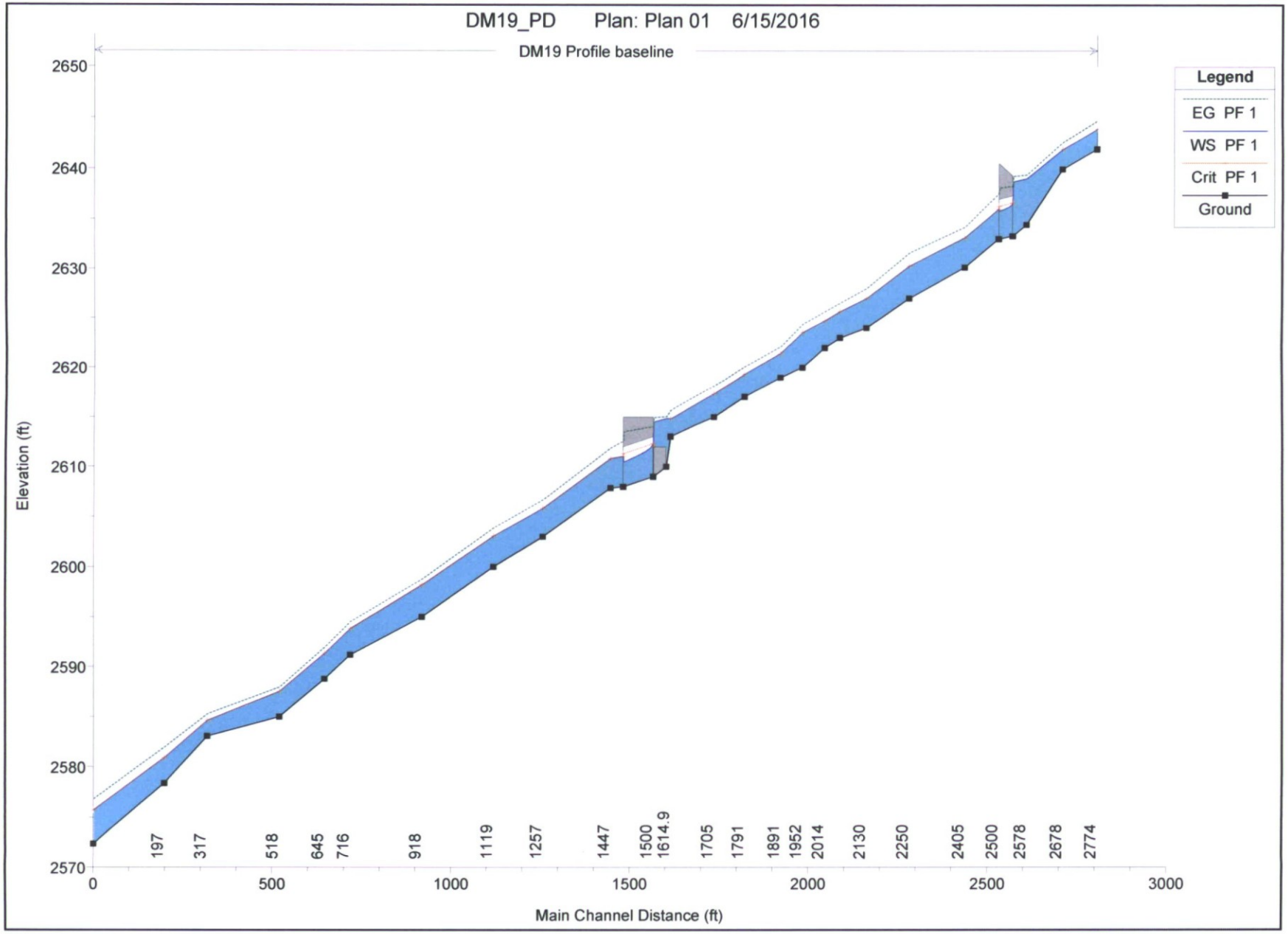

Wash A Plan: Plan 01 6/15/2016
RS = 250.44
.06
.03
.06
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2599
2598
2597
2596
2595
2594
2593
0
50
100
150
200
Station (ft)
Wash A Plan: Plan 01 6/15/2016
RS = 100.1
.06
.03
.06
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2594
2593
2592
2591
2590
0
20
40
60
80
100
120
140
160
Station (ft)

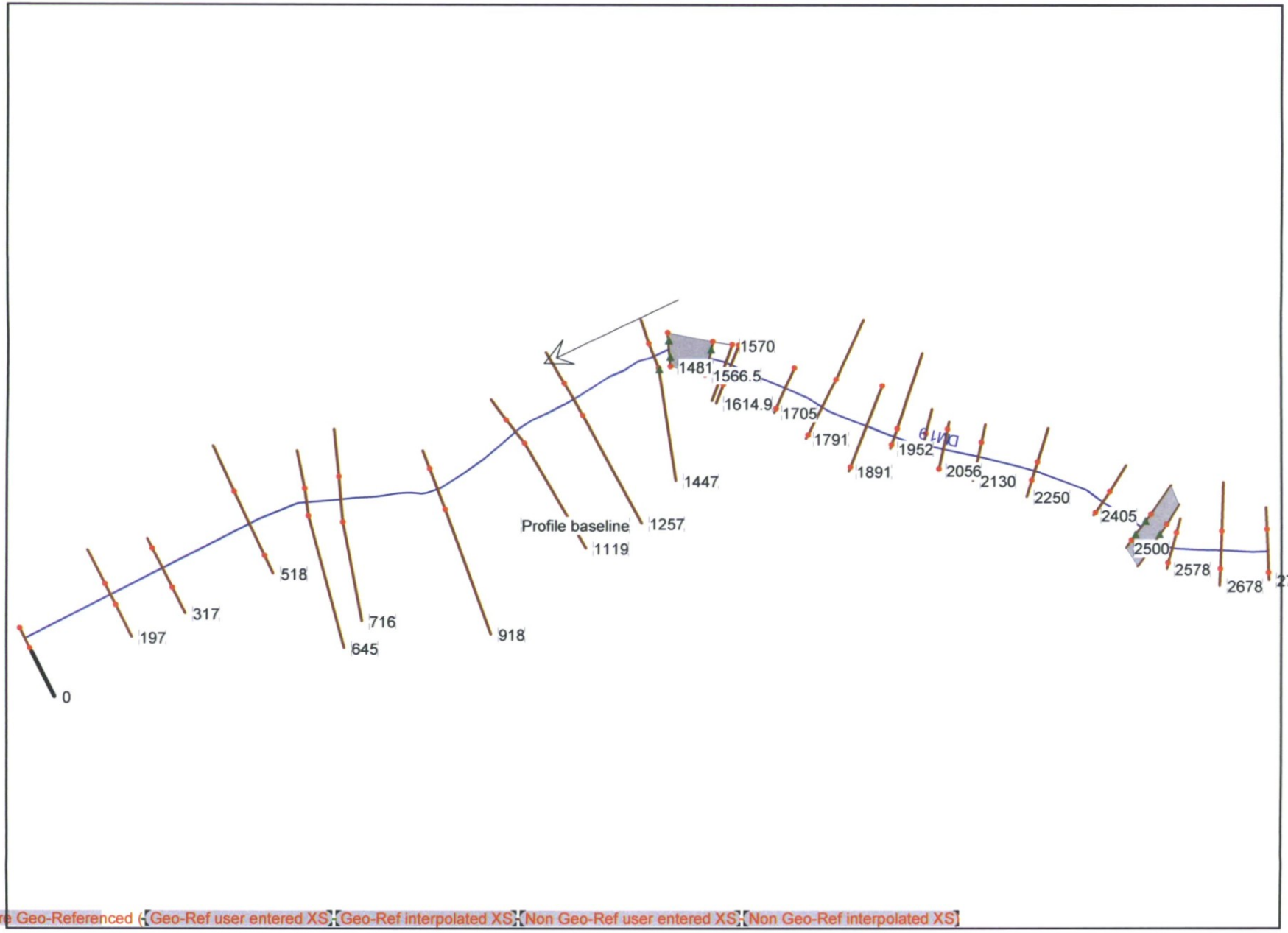
HEC-RAS Plan: Plan 01 River: NorthWash Reach: Alignment - Nort Profile: PF 1

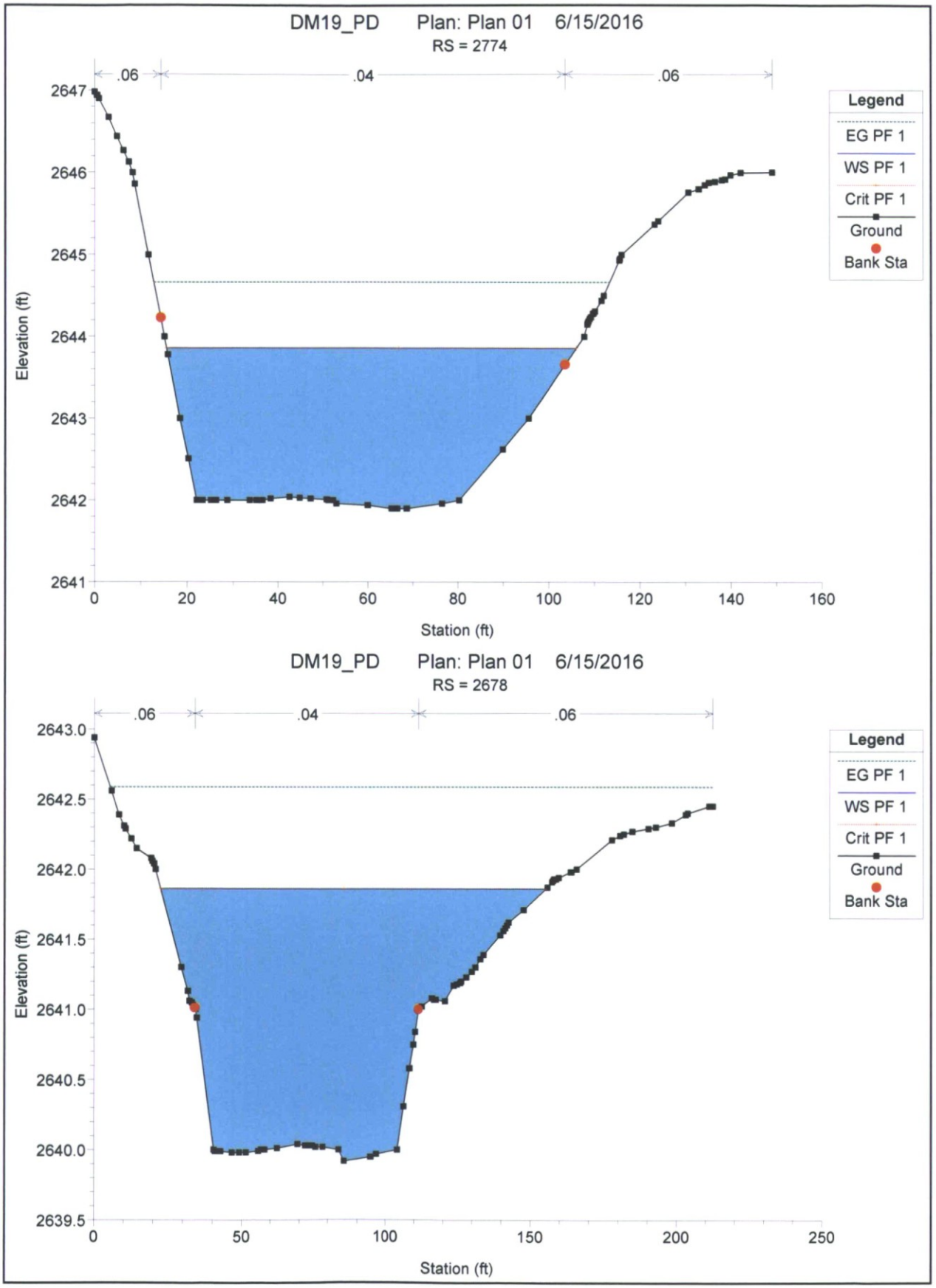
Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Alignment - Nort	1168.17	472.00	2616.97	2619.25	2619.25	2620.16	0.009615	7.77	66.58	40.60	0.96
Alignment - Nort	1080.96	472.00	2612.00	2615.63	2615.63	2616.74	0.007289	9.15	73.61	36.33	0.90
Alignment - Nort	1013.7	472.00	2610.97	2613.40	2613.40	2614.41	0.009090	8.13	63.57	40.35	0.95
Alignment - Nort	943.36	480.00	2610.00	2612.53	2612.53	2613.47	0.008585	7.89	70.29	53.67	0.92
Alignment - Nort	875.49	480.00	2607.95	2610.34	2610.34	2610.97	0.011524	6.41	79.21	71.47	0.97
Alignment - Nort	826.23	480.00	2606.97	2609.47	2609.47	2610.22	0.011584	6.96	71.02	51.19	0.98
Alignment - Nort	778.43	480.00	2605.97	2608.56		2608.88	0.002981	4.79	125.60	66.45	0.55
Alignment - Nort	756.56	480.00	2604.99	2607.89	2607.89	2608.72	0.008770	8.59	91.77	57.49	0.94
Alignment - Nort	713.67	485.00	2603.98	2606.90	2606.90	2608.08	0.009615	8.74	58.25	28.88	0.98
Alignment - Nort	664.75	485.00	2602.95	2606.28	2606.28	2607.48	0.007889	9.19	70.56	44.05	0.91
Alignment - Nort	598.95	485.00	2601.92	2603.83	2603.83	2604.61	0.011333	7.08	70.34	48.65	0.99
Alignment - Nort	535.5	485.00	2600.00	2602.85	2602.85	2603.84	0.008559	8.21	72.00	44.88	0.92
Alignment - Nort	441.04	490.00	2597.99	2599.86	2599.86	2600.43	0.011514	6.13	87.05	78.67	0.97
Alignment - Nort	357.67	490.00	2595.99	2598.05	2598.05	2598.61	0.012877	6.04	81.71	83.58	1.00
Alignment - Nort	250.44	495.00	2593.97	2595.54	2595.54	2595.97	0.011294	5.46	110.14	144.51	0.93
Alignment - Nort	100.1	495.00	2590.00	2592.05	2592.05	2592.55	0.008482	6.12	119.82	137.73	0.86

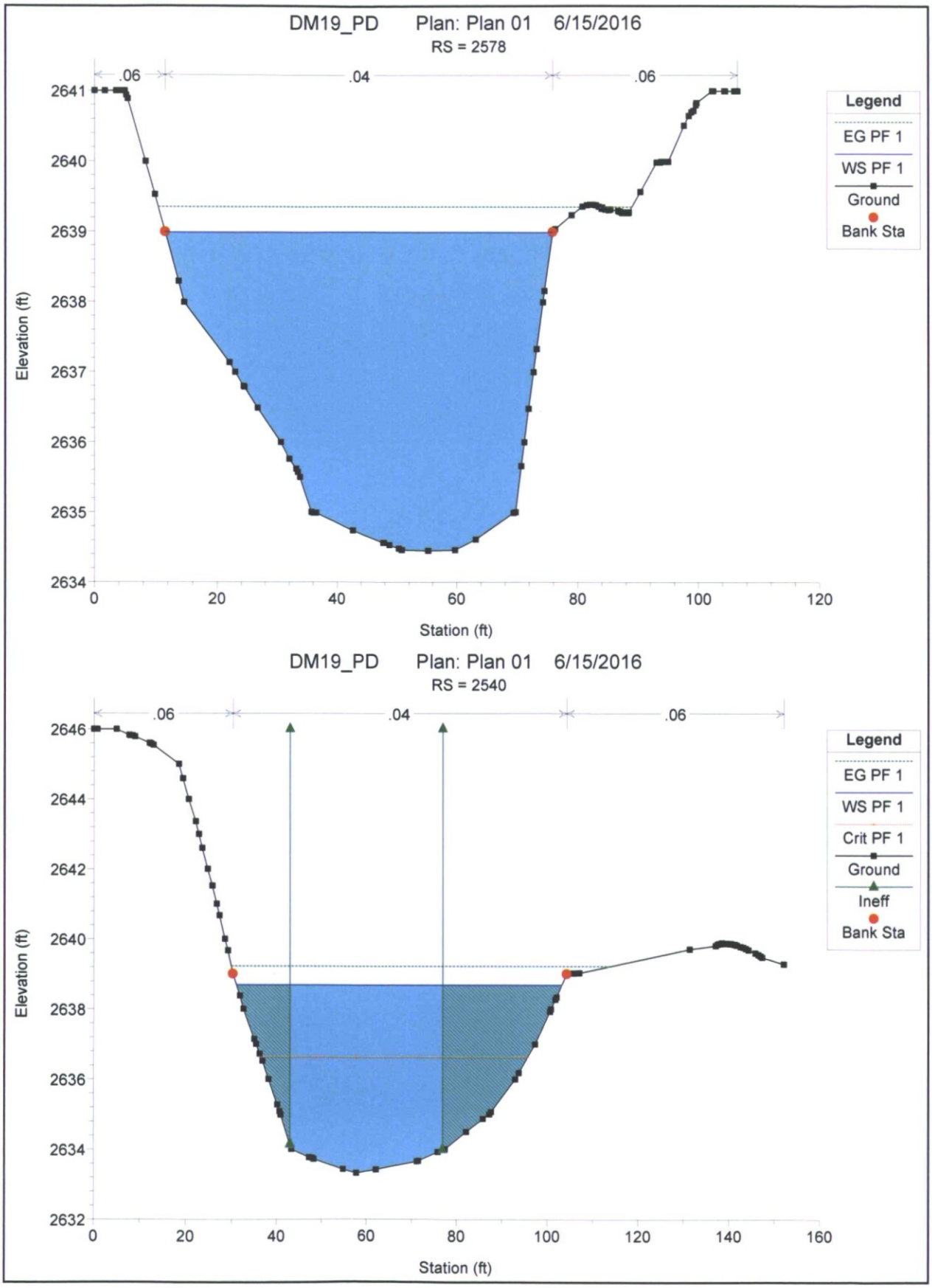
POST-DEVELOPMENT

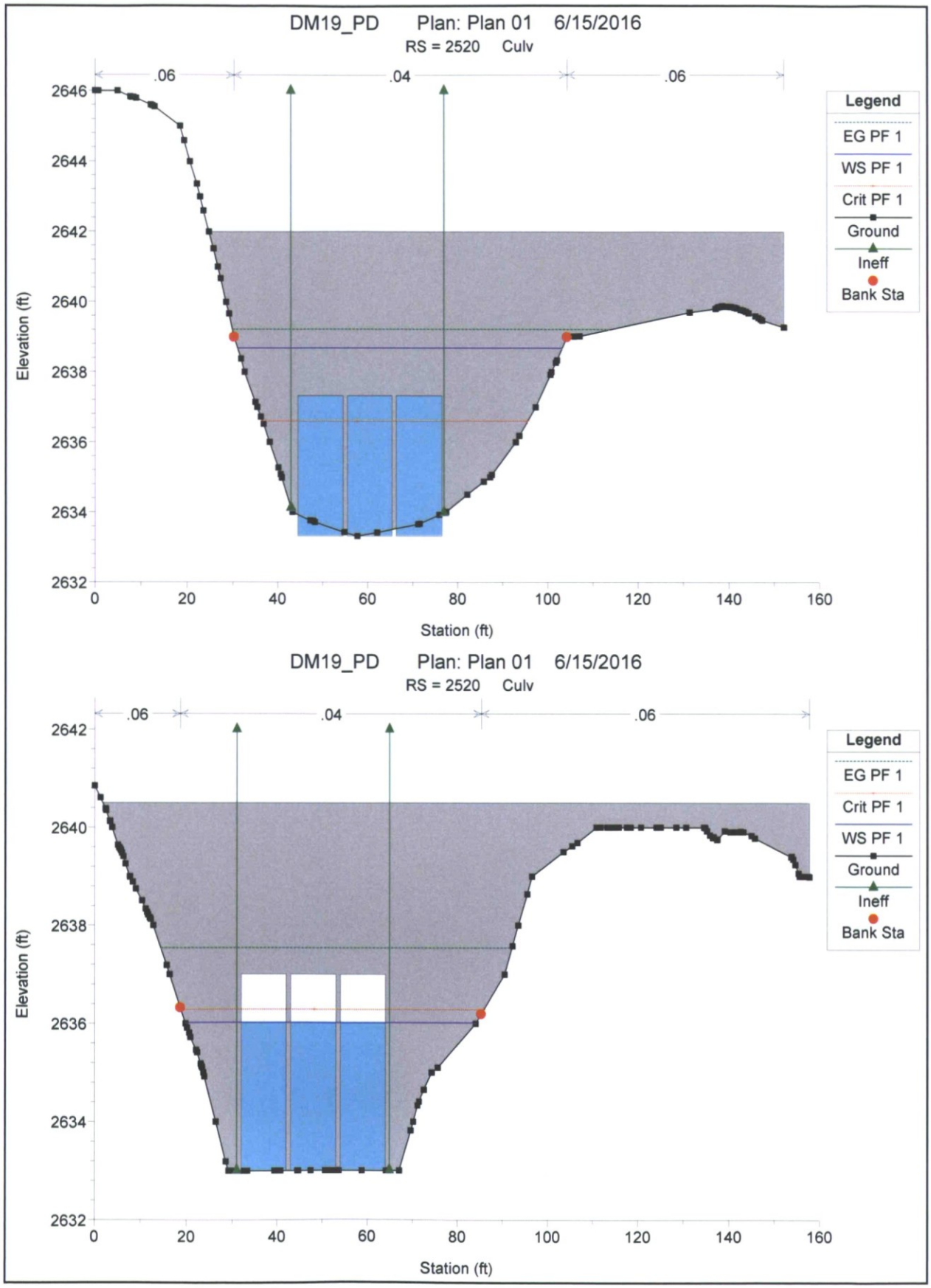
GALLOWAY WASH

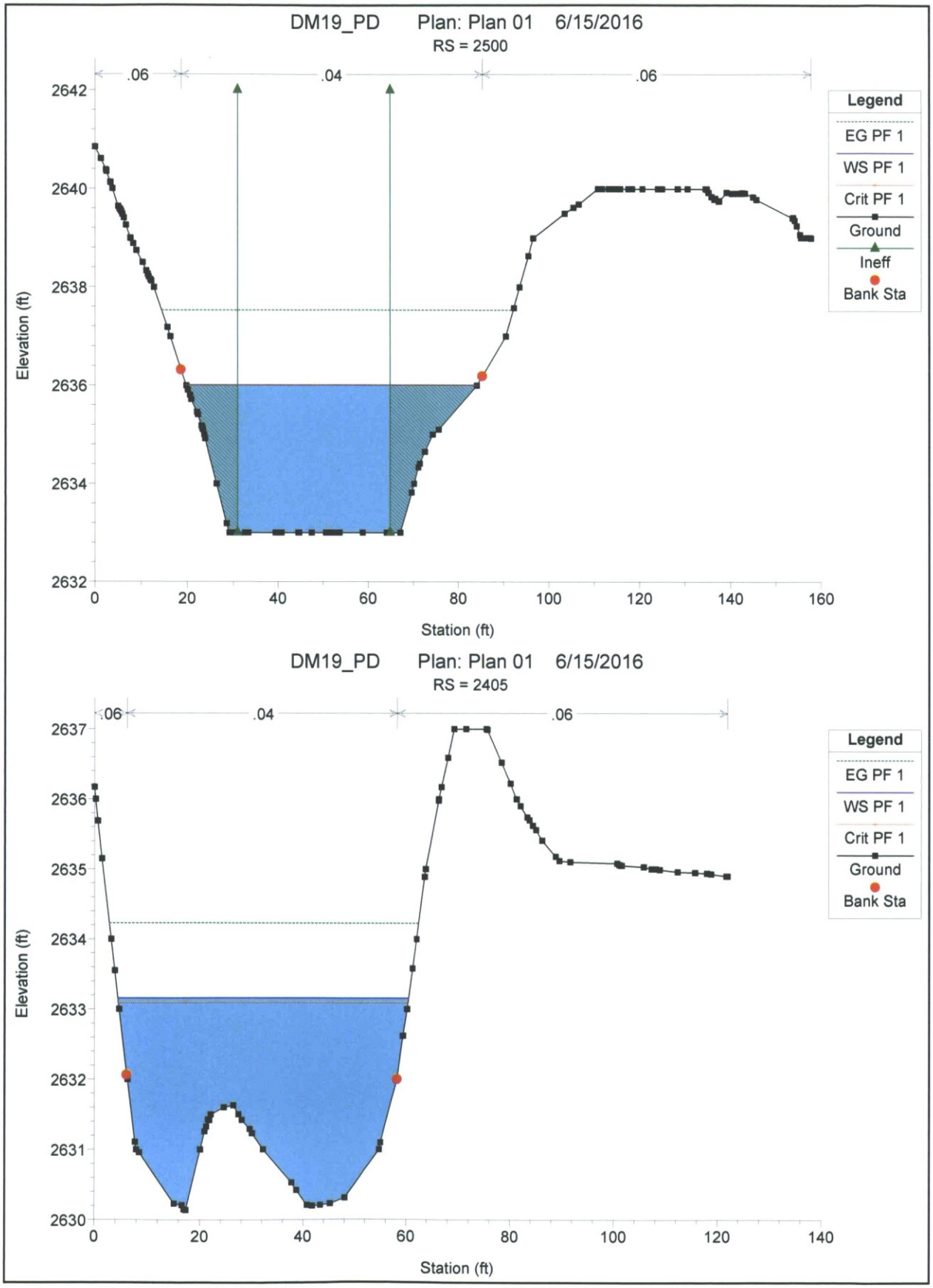

DM19_PD Plan: Plan 01 6/15/2016
DM19 Profile baseline
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Elevation (ft)
2650
2640
2630
2620
2610
2600
2590
2580
2570
0
500
1000
1500
2000
2500
3000
Main Channel Distance (ft)
197
317
518
645
716
918
1119
1257
1447
1500
1614.9
1705
1791
1891
1952
2014
2130
2250
2405
2500
2578
2678
2774

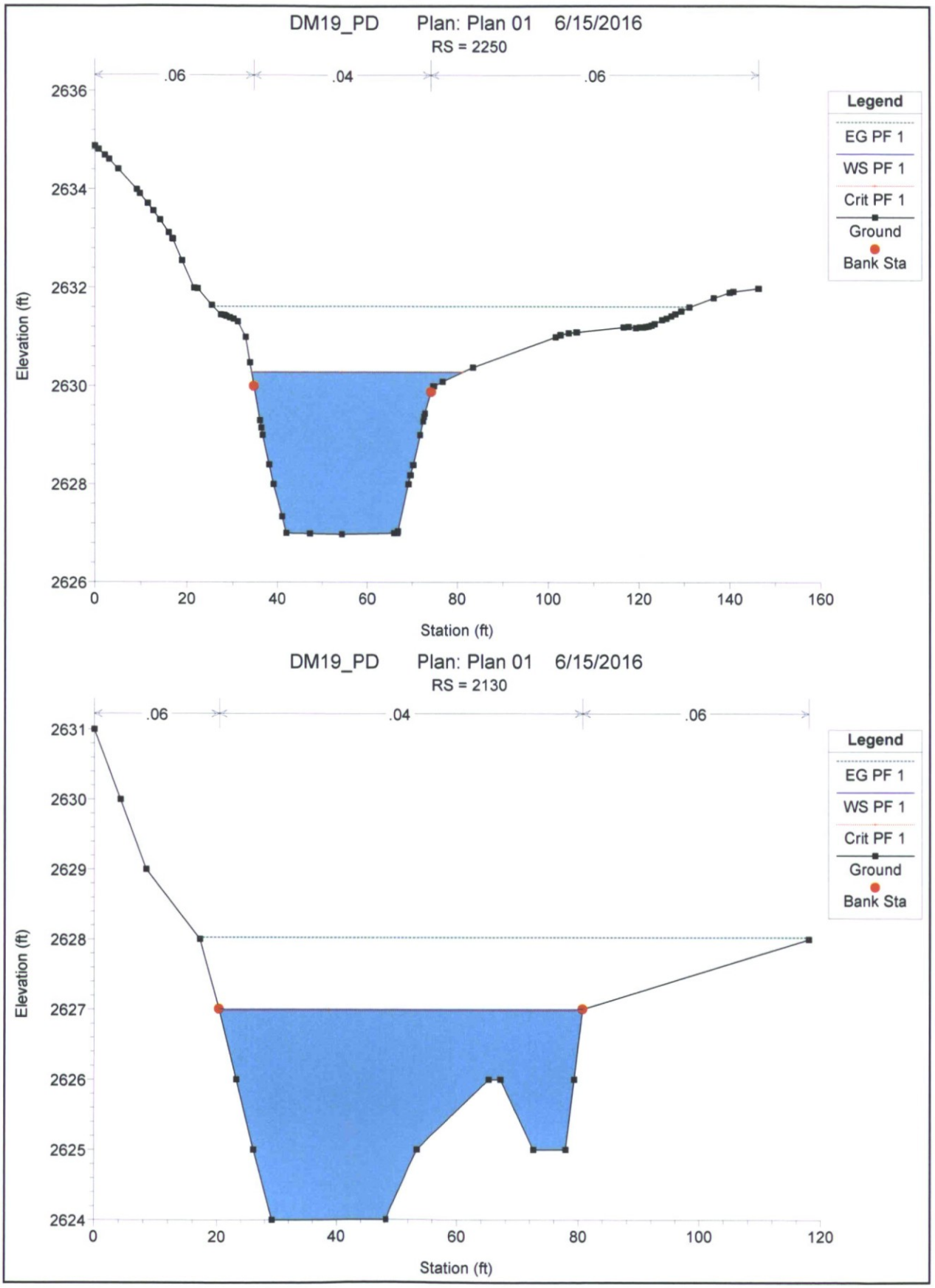

1570
1481
1566.5
1614.9
1705
1791
1952
1891
2056
2130
2250
2405
2500
2578
2678
2774
1447
Profile baseline
1257
1119
518
317
197
716
645
918
0
one of the XS's are Geo-Referenced (Geo-Ref user entered XS Geo-Ref interpolated XS Non Geo-Ref user entered XS Non Geo-Ref interpolated XS)

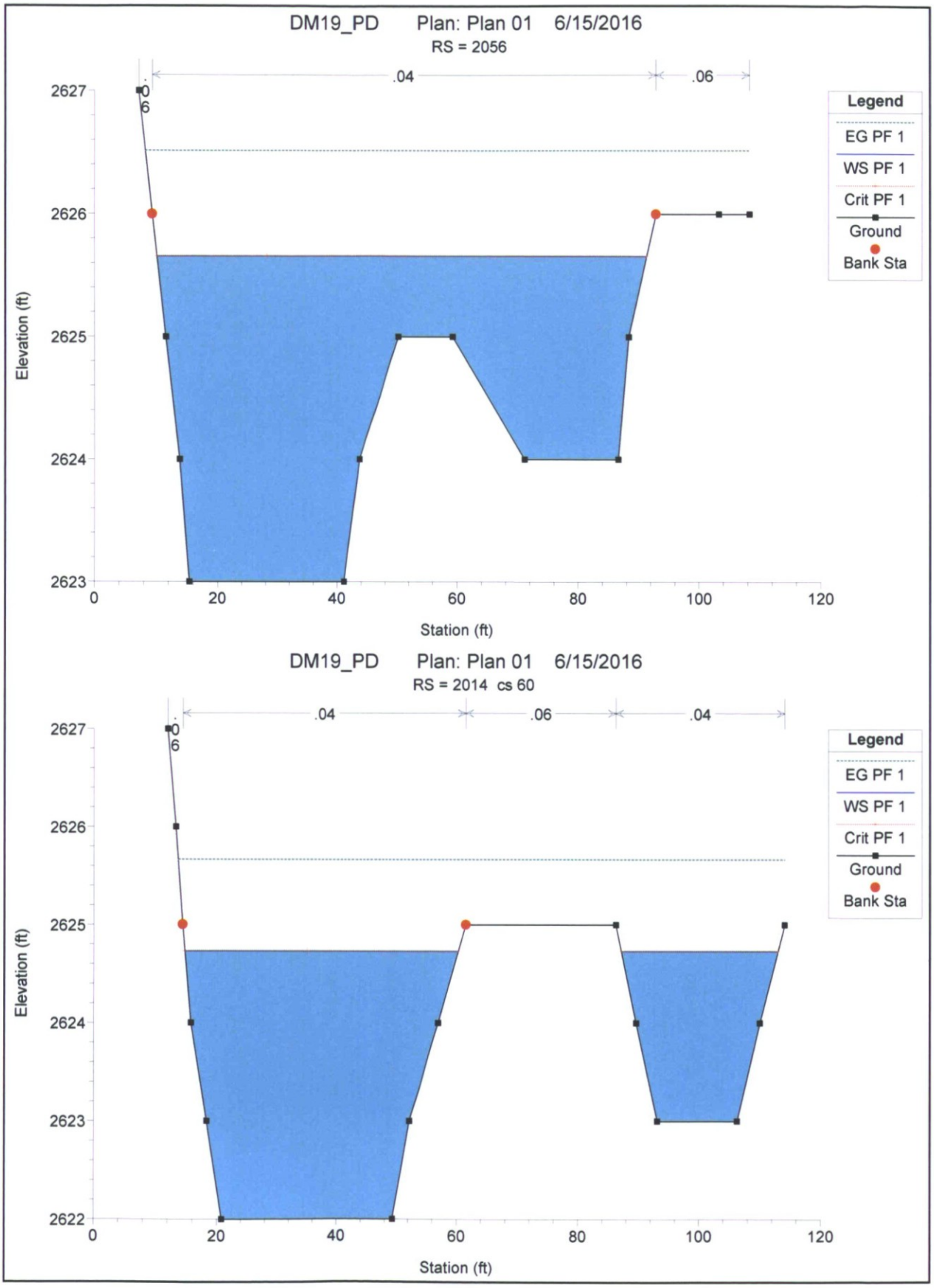

DM19_PD Plan: Plan 01 6/15/2016
RS = 2774
.06
.04
.06
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
DM19_PD Plan: Plan 01 6/15/2016
RS = 2678
.06
.04
.06
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

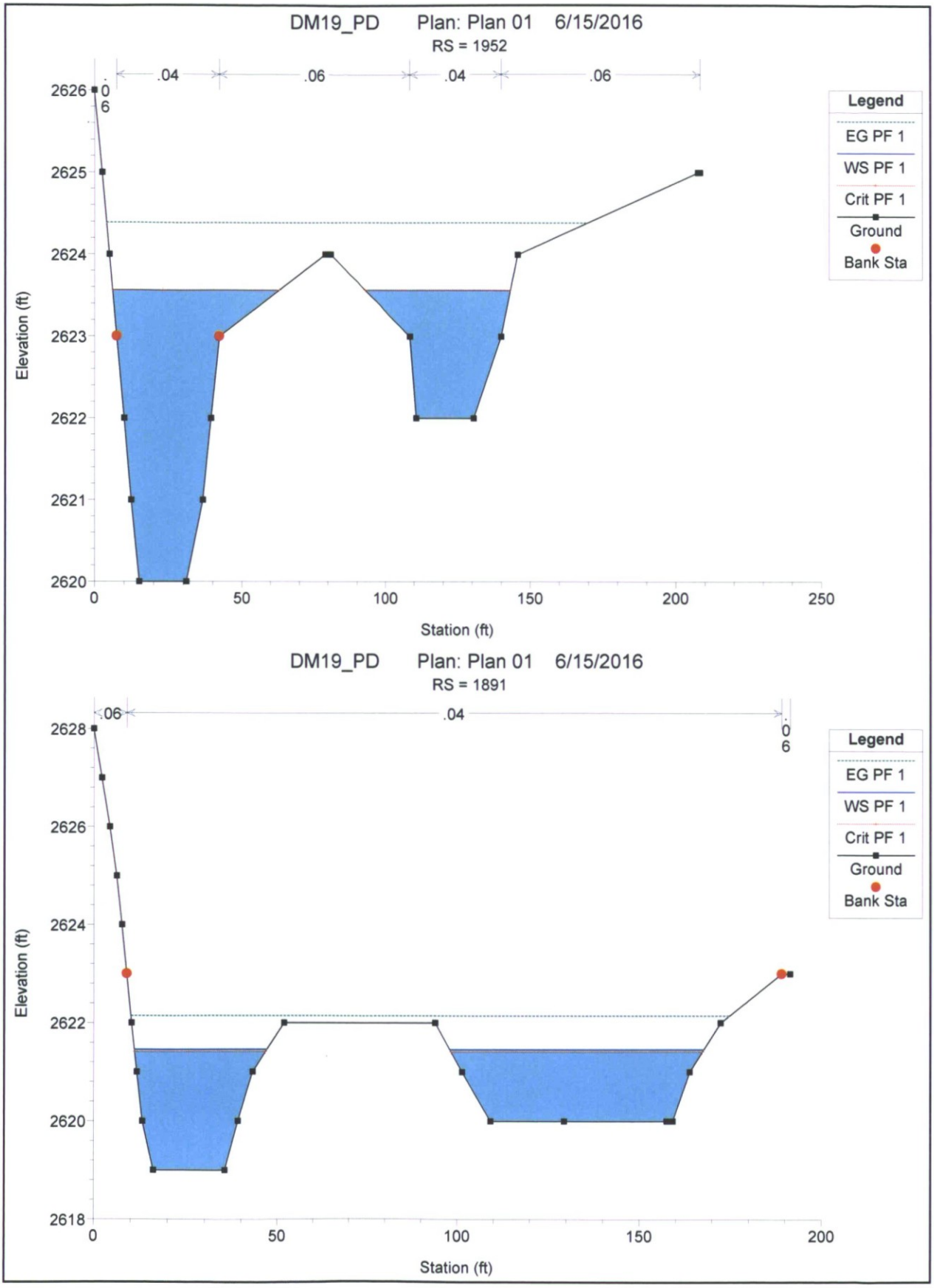

DM19_PD Plan: Plan 01 6/15/2016
RS = 2578
.06
.04
.06
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
2641
2640
2639
2638
2637
2636
2635
2634
0
20
40
60
80
100
120
Station (ft)
DM19_PD Plan: Plan 01 6/15/2016
RS = 2540
.06
.04
.06
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
2646
2644
2642
2640
2638
2636
2634
2632
0
20
40
60
80
100
120
140
160
Station (ft)

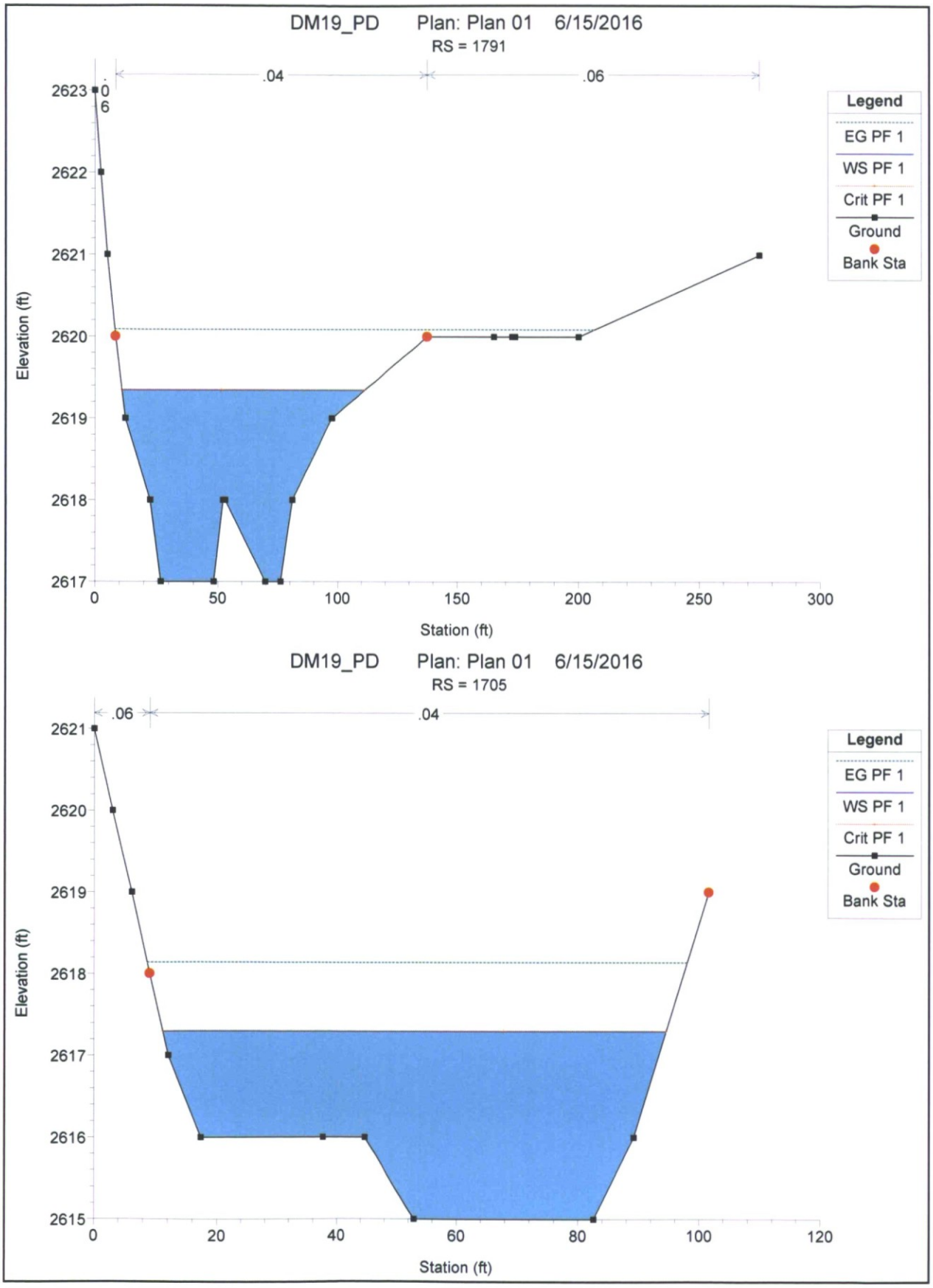

DM19_PD Plan: Plan 01 6/15/2016
RS = 2520 Culv
.06
.04
.06
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
2646
2644
2642
2640
2638
2636
2634
2632
0
20
40
60
80
100
120
140
160
DM19_PD Plan: Plan 01 6/15/2016
RS = 2520 Culv
.06
.04
.06
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
2642
2640
2638
2636
2634
2632
0
20
40
60
80
100
120
140
160

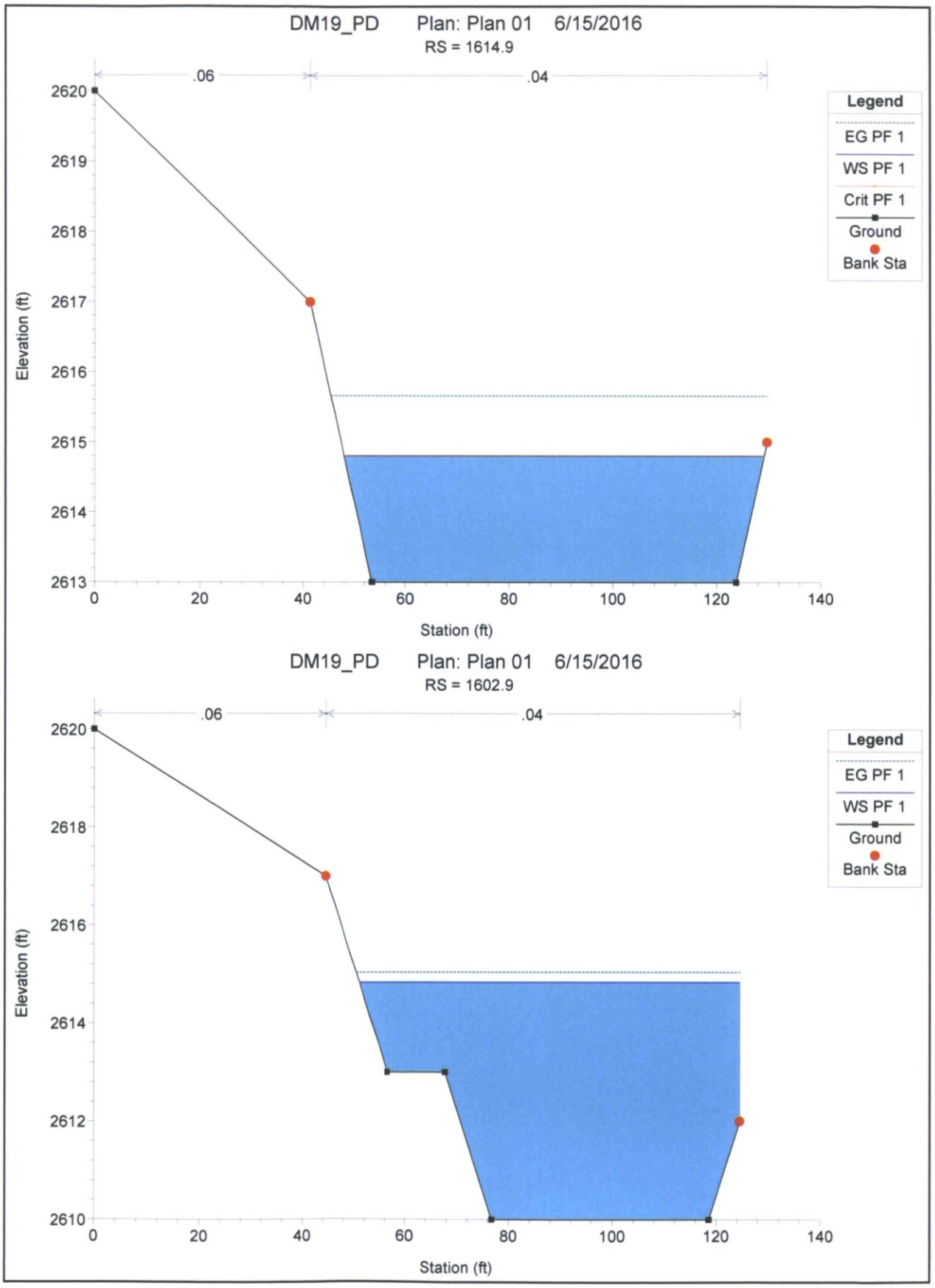

DM19_PD Plan: Plan 01 6/15/2016
RS = 2500
.06
.04
.06
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
DM19_PD Plan: Plan 01 6/15/2016
RS = 2405
.06
.04
.06
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

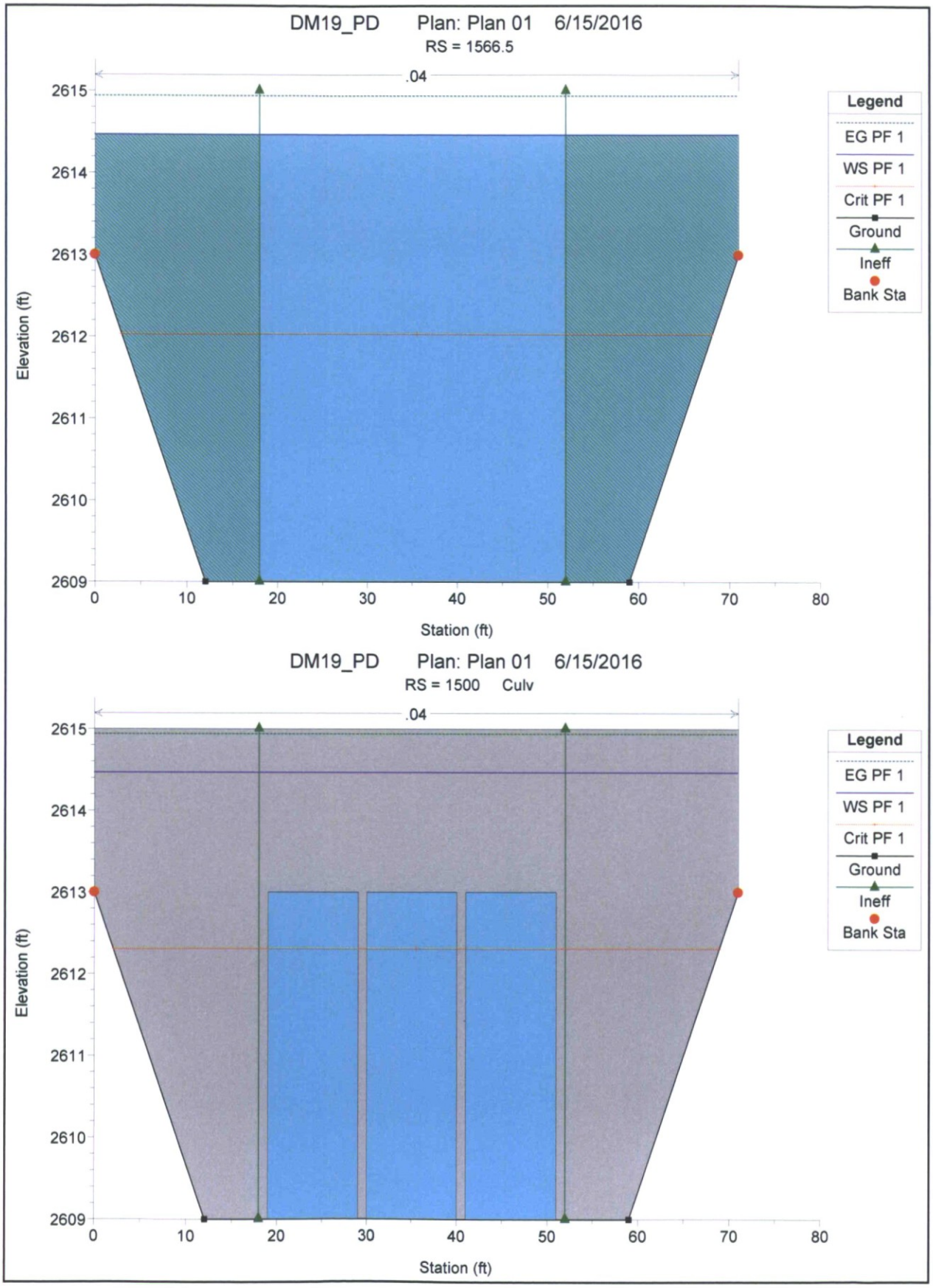

DM19_PD Plan: Plan 01 6/15/2016
RS = 2250
.06
.04
.06
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2636
2634
2632
2630
2628
2626
0
20
40
60
80
100
120
140
160
Station (ft)
DM19_PD Plan: Plan 01 6/15/2016
RS = 2130
.06
.04
.06
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2631
2630
2629
2628
2627
2626
2625
2624
0
20
40
60
80
100
120
Station (ft)

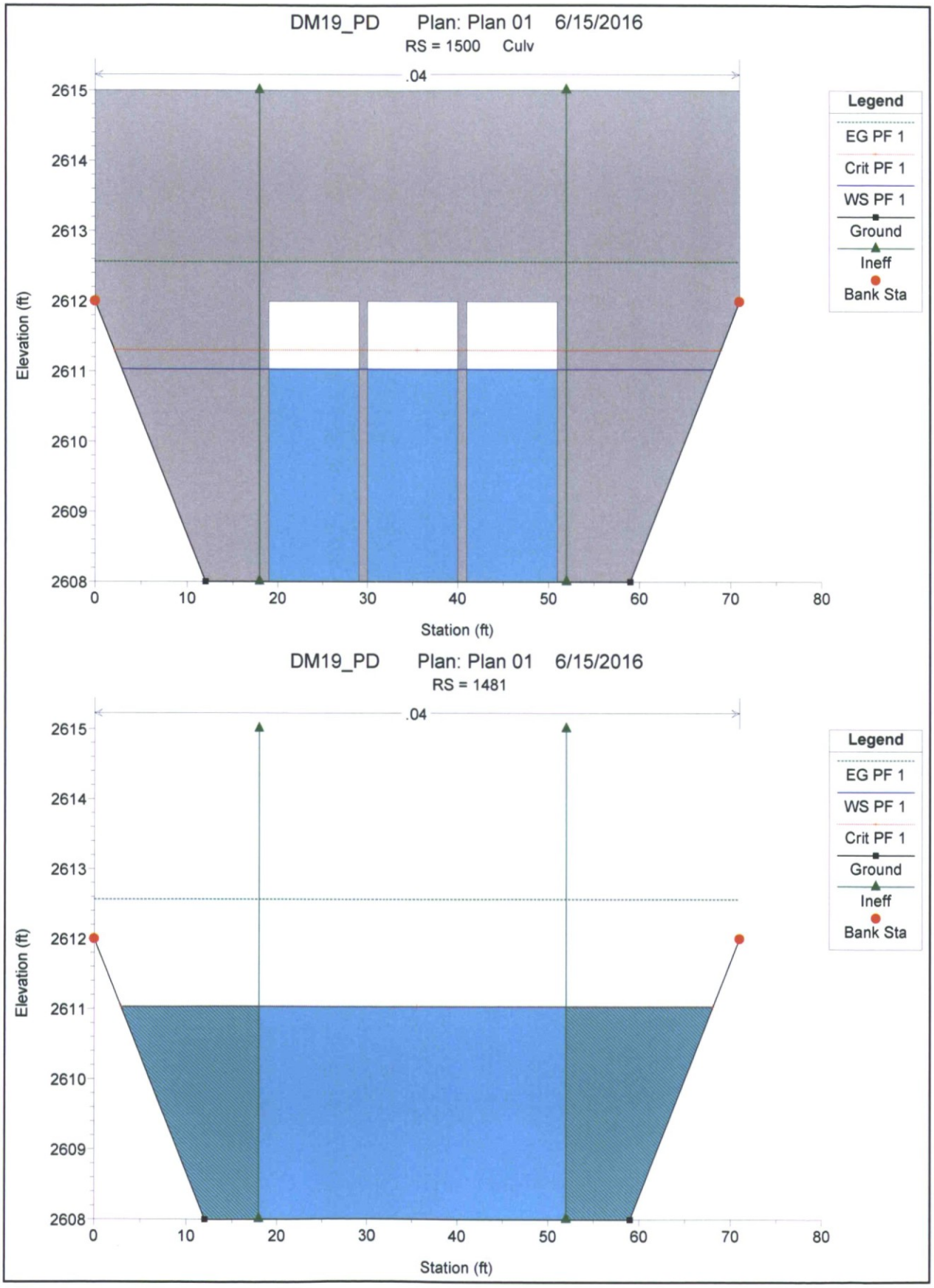

DM19_PD Plan: Plan 01 6/15/2016
RS = 2056
.04
.06
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
2627
2626
2625
2624
2623
0
20
40
60
80
100
120
DM19_PD Plan: Plan 01 6/15/2016
RS = 2014 cs 60
.04
.06
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
2627
2626
2625
2624
2623
2622
0
20
40
60
80
100
120

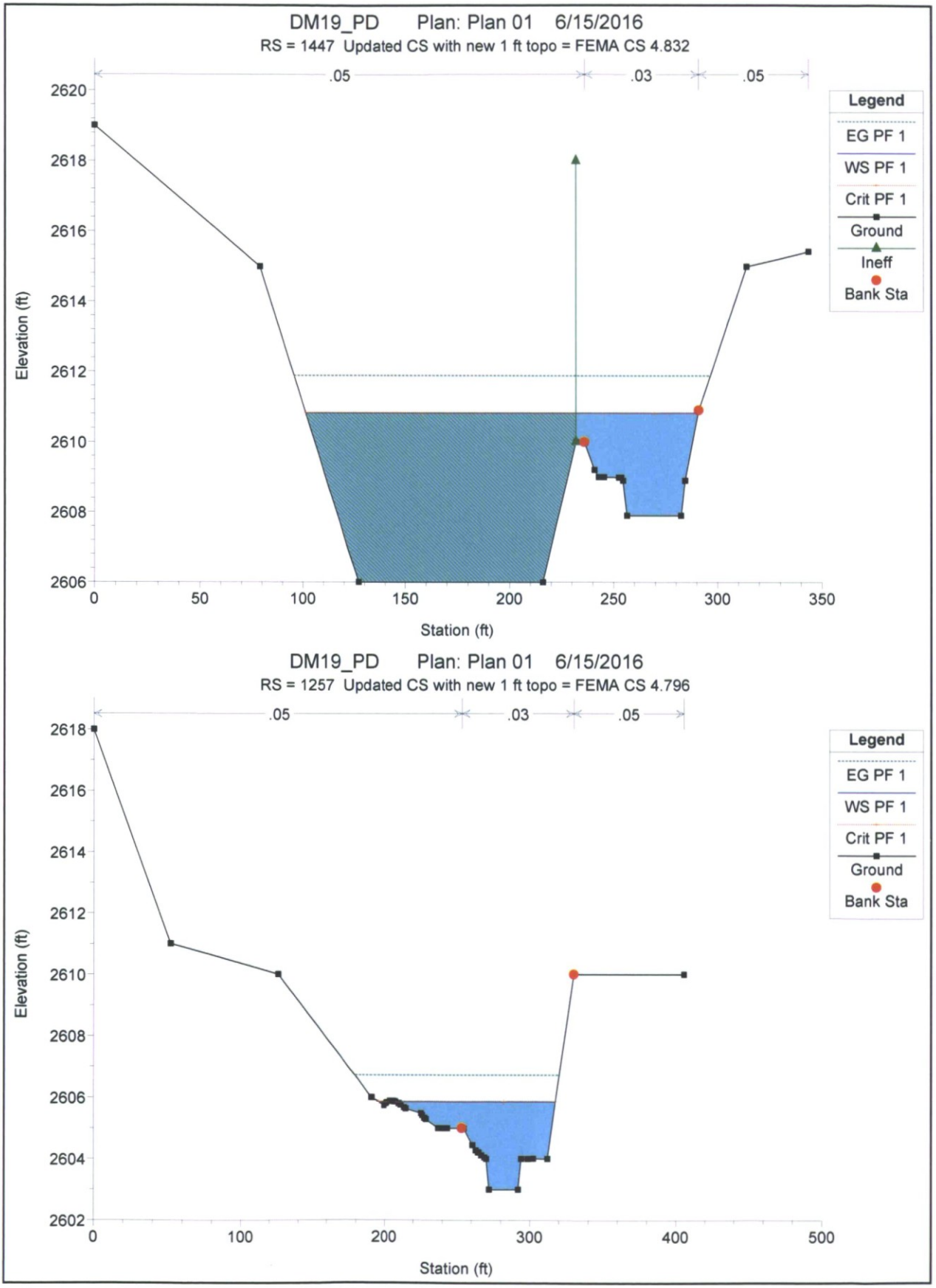

DM19_PD Plan: Plan 01 6/15/2016
RS = 1952
.06
.04
.06
.04
.06
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2626
2625
2624
2623
2622
2621
2620
0
50
100
150
200
250
Station (ft)
DM19_PD Plan: Plan 01 6/15/2016
RS = 1891
.06
.04
.06
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2628
2626
2624
2622
2620
2618
0
50
100
150
200
Station (ft)

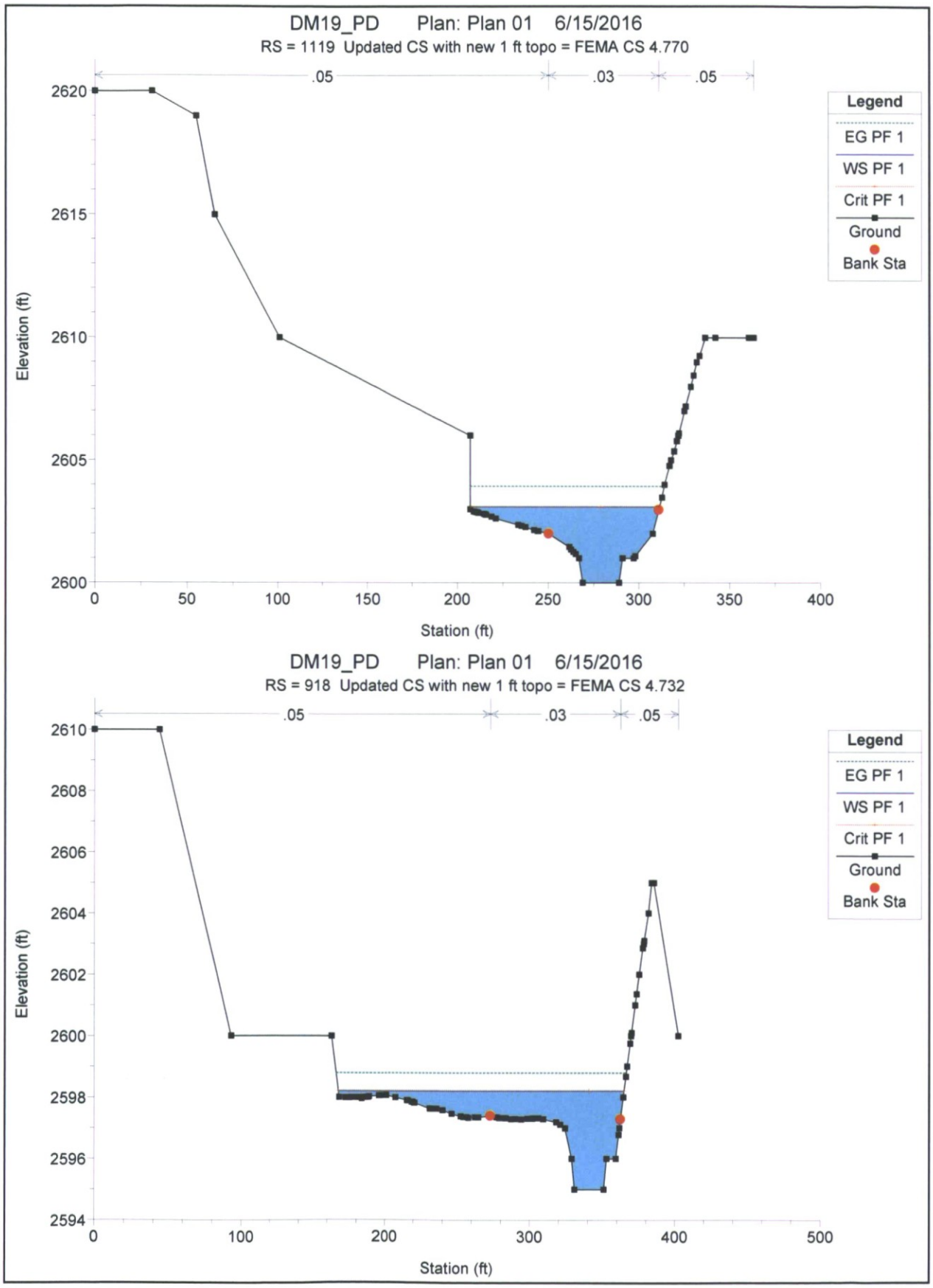

DM19_PD Plan: Plan 01 6/15/2016
RS = 1791
.04
.06
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
DM19_PD Plan: Plan 01 6/15/2016
RS = 1705
.06
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

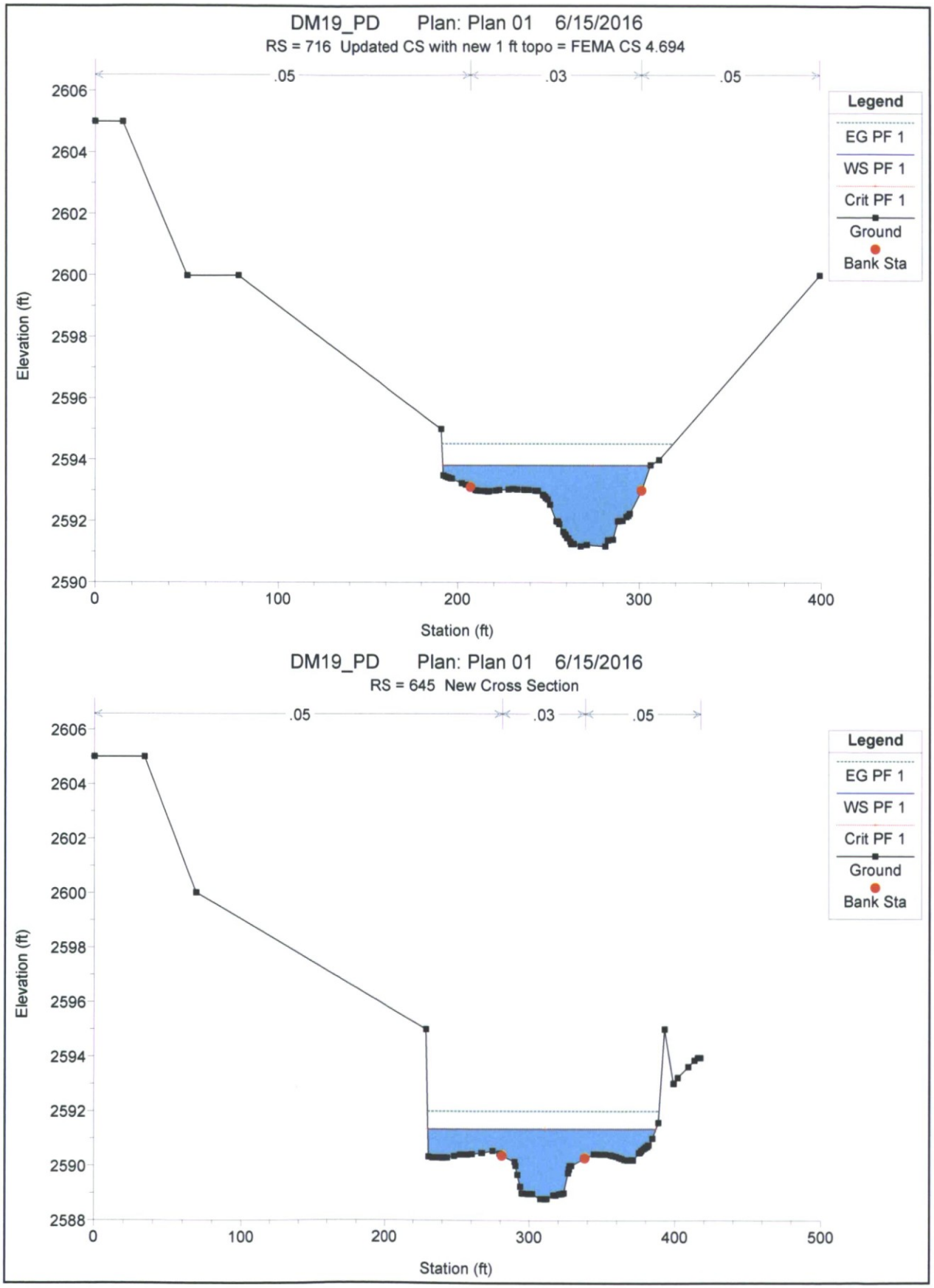

DM19_PD Plan: Plan 01 6/15/2016
RS = 1614.9
.06
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
2620
2619
2618
2617
2616
2615
2614
2613
0
20
40
60
80
100
120
140
DM19_PD Plan: Plan 01 6/15/2016
RS = 1602.9
.06
.04
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
2620
2618
2616
2614
2612
2610
0
20
40
60
80
100
120
140

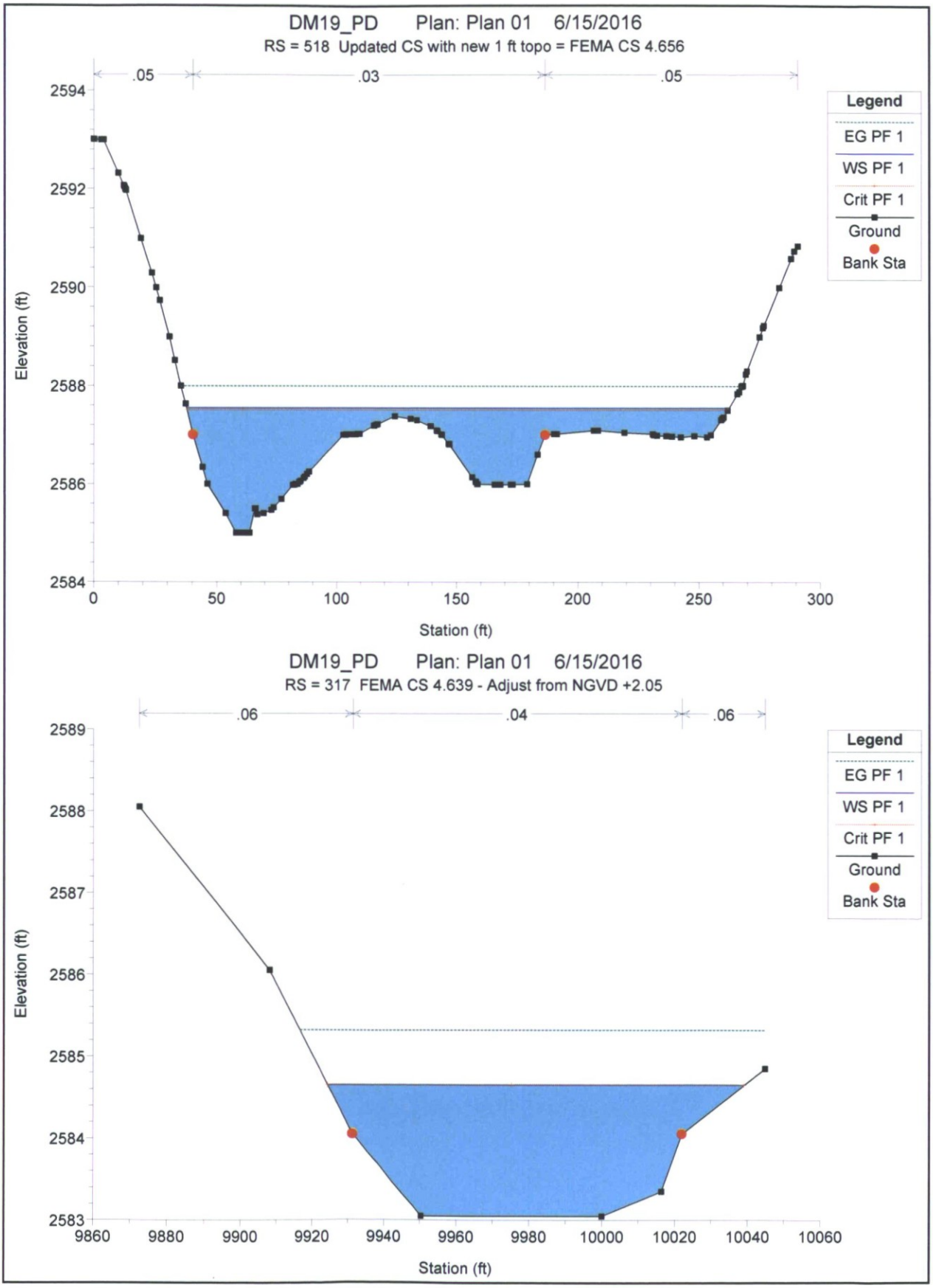

DM19_PD Plan: Plan 01 6/15/2016
RS = 1566.5
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
DM19_PD Plan: Plan 01 6/15/2016
RS = 1500 Culv
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

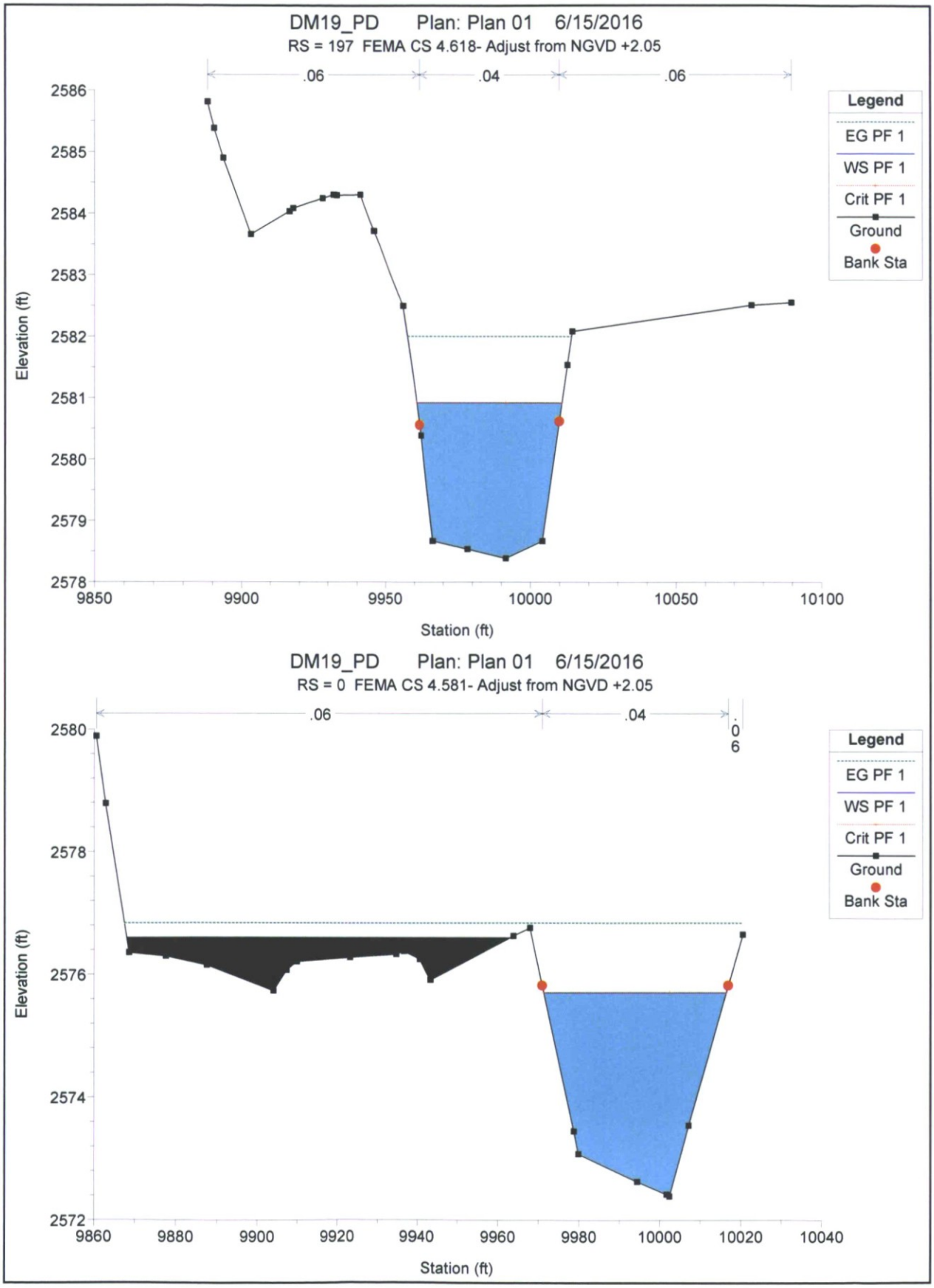

DM19_PD Plan: Plan 01 6/15/2016
RS = 1500 Culv
.04
Elevation (ft)
Station (ft)
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Ineff
Bank Sta
DM19_PD Plan: Plan 01 6/15/2016
RS = 1481
.04
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta


DM19_PD Plan: Plan 01 6/15/2016
RS = 1447 Updated CS with new 1 ft topo = FEMA CS 4.832
.05
.03
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
DM19_PD Plan: Plan 01 6/15/2016
RS = 1257 Updated CS with new 1 ft topo = FEMA CS 4.796
.05
.03
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


DM19_PD Plan: Plan 01 6/15/2016
RS = 1119 Updated CS with new 1 ft topo = FEMA CS 4.770
.05
.03
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
2620
2615
2610
2605
2600
0
50
100
150
200
250
300
350
400
DM19_PD Plan: Plan 01 6/15/2016
RS = 918 Updated CS with new 1 ft topo = FEMA CS 4.732
.05
.03
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
2610
2608
2606
2604
2602
2600
2598
2596
2594
0
100
200
300
400
500


DM19_PD Plan: Plan 01 6/15/2016
RS = 716 Updated CS with new 1 ft topo = FEMA CS 4.694
.05
.03
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
2606
2604
2602
2600
2598
2596
2594
2592
2590
0
100
200
300
400
DM19_PD Plan: Plan 01 6/15/2016
RS = 645 New Cross Section
.05
.03
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
2606
2604
2602
2600
2598
2596
2594
2592
2590
2588
0
100
200
300
400
500


DM19_PD Plan: Plan 01 6/15/2016
RS = 518 Updated CS with new 1 ft topo = FEMA CS 4.656
.05
.03
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2594
2592
2590
2588
2586
2584
0
50
100
150
200
250
300
Station (ft)
DM19_PD Plan: Plan 01 6/15/2016
RS = 317 FEMA CS 4.639 - Adjust from NGVD +2.05
.06
.04
.06
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2589
2588
2587
2586
2585
2584
2583
9860
9880
9900
9920
9940
9960
9980
10000
10020
10040
10060
Station (ft)


DM19_PD Plan: Plan 01 6/15/2016
RS = 197 FEMA CS 4.618- Adjust from NGVD +2.05
.06
.04
.06
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2586
2585
2584
2583
2582
2581
2580
2579
2578
9850
9900
9950
10000
10050
10100
Station (ft)
DM19_PD Plan: Plan 01 6/15/2016
RS = 0 FEMA CS 4.581- Adjust from NGVD +2.05
.06
.04
.06
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2580
2578
2576
2574
2572
9860
9880
9900
9920
9940
9960
9980
10000
10020
10040
Station (ft)

HEC-RAS Plan: Plan 01 River: DM19 Reach: Profile baseline Profile: PF 1

Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Profile baseline	2774	1012.00	2641.90	2643.86	2643.86	2644.66	0.020167	7.19	140.92	90.46	1.00
Profile baseline	2678	1012.00	2639.92	2641.86	2641.86	2642.59	0.016480	6.99	163.50	132.82	0.92
Profile baseline	2578	1012.00	2634.45	2638.99		2639.35	0.003594	4.82	209.95	64.34	0.47
Profile baseline	2540	1012.00	2633.32	2638.68	2636.62	2639.21	0.002881	5.88	172.24	72.12	0.46
Profile baseline	2520	Culvert									
Profile baseline	2500	1012.00	2633.00	2636.01	2636.01	2637.53	0.016380	9.90	102.20	64.35	1.01
Profile baseline	2405	1012.00	2630.14	2633.15	2633.09	2634.22	0.016536	8.31	123.48	55.97	0.96
Profile baseline	2250	1012.00	2626.98	2630.28	2630.28	2631.62	0.016755	9.27	110.19	46.98	0.98
Profile baseline	2130	1012.00	2624.00	2626.99	2626.98	2628.02	0.018886	8.14	124.27	60.32	1.00
Profile baseline	2056	1012.00	2623.00	2625.66	2625.66	2626.51	0.020458	7.42	136.31	81.23	1.01
Profile baseline	2014	1012.00	2622.00	2624.73	2624.73	2625.66	0.017239	8.15	134.02	71.27	0.97
Profile baseline	1952	1012.00	2620.00	2623.56	2623.56	2624.38	0.011822	7.94	153.49	107.14	0.83
Profile baseline	1891	1012.00	2619.00	2621.45	2621.41	2622.13	0.019903	6.64	152.39	105.72	0.97
Profile baseline	1791	1012.00	2617.00	2619.35	2619.35	2620.09	0.020971	6.90	146.65	100.43	1.01
Profile baseline	1705	1012.00	2615.00	2617.29	2617.29	2618.13	0.020197	7.35	137.63	83.30	1.01
Profile baseline	1614.9	1012.00	2613.00	2614.81	2614.81	2615.66	0.019987	7.40	136.75	81.17	1.00
Profile baseline	1602.9	1012.00	2610.00	2614.83		2615.03	0.001702	3.61	280.14	73.48	0.33
Profile baseline	1570	Lat Struct									
Profile baseline	1566.5	1022.00	2609.00	2614.46	2612.03	2614.93	0.002280	5.50	185.74	71.00	0.41
Profile baseline	1500	Culvert									
Profile baseline	1481	1022.00	2608.00	2611.03	2611.03	2612.56	0.016291	9.93	102.97	65.17	1.01
Profile baseline	1447	1022.00	2607.90	2610.82	2610.82	2611.88	0.009809	8.30	125.44	189.41	0.98
Profile baseline	1257	1022.00	2603.00	2605.85	2605.85	2606.71	0.009504	7.59	153.46	115.91	0.95
Profile baseline	1119	1022.00	2600.00	2603.09	2603.09	2603.92	0.008530	7.50	155.99	104.42	0.91
Profile baseline	918	1022.00	2595.00	2598.20	2598.20	2598.78	0.008361	6.33	197.76	197.40	0.86
Profile baseline	716	1022.00	2591.19	2593.82	2593.82	2594.52	0.011845	6.70	153.95	114.34	1.00
Profile baseline	645	1022.00	2588.78	2591.34	2591.34	2591.98	0.008972	7.19	199.69	156.65	0.92
Profile baseline	518	1022.00	2585.00	2587.54	2587.51	2587.99	0.009998	5.52	210.58	224.44	0.90
Profile baseline	317	861.00	2583.05	2584.65	2584.65	2585.31	0.019510	6.57	136.54	114.75	0.97
Profile baseline	197	861.00	2578.39	2580.92	2580.92	2582.00	0.018503	8.34	103.55	49.95	1.00
Profile baseline	0	861.00	2572.39	2575.70	2575.70	2576.83	0.018487	8.54	100.84	45.09	1.01

Scour Calculations

GALLOWAY WASH

Level 1 Analysis of Stream Degradation

Reference: ADWR, Flood Warning and Dam Safety Section, 1996.
State Standard 5-96: "Watercourse System Sediment Balance - Guideline 2:
Channel Degradation Estimation for Alluvial Channels in Arizona"

Assumptions: Channel reaches without major disturbances, such as dams and bridges.

Equations:

Ds = Dgs + Dlts

where:
Ds = total scour depth, in feet;
Dgs = general degradation, in feet;
Dlts = long term degradation, in feet;

For straight channel reaches:
Dgs = 0.157*Q100^0.4

For channel reaches with curvature:
Dgs = 0.219*Q100^0.4

Long term degradation:
Dlts = 0.02*Q100^0.6

Project Name: DM 19 **Location:** Galloway Wash

Input Data:

Q100 = 1025 cfs

Ds =	3.79 ft	for straight channel
Ds =	4.79 ft	otherwise

Recommended Scour Depth = 5.0 ft

Note: the minimum total scour depth, Ds, shall be 3 feet.

WASH A

Level 1 Analysis of Stream Degradation

Reference: ADWR, Flood Warning and Dam Safety Section, 1996.
State Standard 5-96: "Watercourse System Sediment Balance - Guideline 2:
Channel Degradation Estimation for Alluvial Channels in Arizona"

Assumptions: Channel reaches without major disturbances, such as dams and bridges.

Equations:

$$Ds = Dgs + Dlts$$

where:
Ds = total scour depth, in feet;
Dgs = general degradation, in feet;
Dlts = long term degradation, in feet;

For straight channel reaches:

$$Dgs = 0.157*Q100^{0.4}$$

For channel reaches with curvature:

$$Dgs = 0.219*Q100^{0.4}$$

Long term degradation:

$$Dlts = 0.02*Q100^{0.6}$$

Project Name: DM 19 **Location:** Wash A

Input Data:

Q100 = 468 cfs

Ds =	2.64 ft	for straight channel
Ds =	3.36 ft	otherwise

Recommended Scour Depth = 4.0 ft

Note: the minimum total scour depth, Ds, shall be 3 feet.

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CIVIL ENGINEERS * HYDROLOGISTS * LAND SURVEYORS * CONSTRUCTION MANAGERS

Project:	*Desert Mountain Parcel 19*
Location:	*Phoenix, Maricopa County Arizona*
Date:	*16-Jun-16*
References:	Storm Water Policies & Standards, City of Phoenix (12/2013)

ADWR Erosion Hazard Setback Equations
State Standard for Watercourse System Sediment Balance
SSA 5-96, LMSA-5, September 1996

For straight channel reaches or reaches with minor curvature	*setback = 1.0(Q100)^0.5*
For channels with obvious curvature or channel bend	*setback = 2.5(Q100)^0.5*

The setback allowance is to be measured outward from the 100-year floodway
Or the top of the channel bank, whichever is greater

EROSION HAZARD SETBACK CALCULATIONS

Wash Name	Q100 Discharge (cfs)	ADWR Erosion Hazard Setback (EHS) (ft)
Galloway Wash		
Off-Site Wash	1025	80.0
(bend)		
Off-Site Wash	1025	32.0

Note:
The minimum EHS is 20' for Straight Channels

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CIVIL ENGINEERS * HYDROLOGISTS * LAND SURVEYORS * CONSTRUCTION MANAGERS

Project: *Desert Mountain Parcel 19*
Location: *Phoenix, Maricopa County Arizona*
Date: *16-Jun-16*
References: Storm Water Policies & Standards, City of Phoenix (12/2013)

ADWR Erosion Hazard Setback Equations
State Standard for Watercourse System Sediment Balance
SSA 5-96, LMSA-5, September 1996

For straight channel reaches or reaches with minor curvature — *setback = 1.0(Q100)^0.5*

For channels with obvious curvature or channel bend — *setback = 2.5(Q100)^0.5*

The setback allowance is to be measured outward from the 100-year floodway
Or the top of the channel bank, whichever is greater

EROSION HAZARD SETBACK CALCULATIONS

Wash Name	Q100 Discharge (cfs)	ADWR Erosion Hazard Setback (EHS) (ft)
Wash A		
Off-Site Wash	468	54
(bend)		
Off-Site Wash	468	22

Note:
The minimum EHS is 20' for Straight Channels

APPENDIX E

Electronic Versions:

PDF of DM 19 Preliminary Drainage Report

DDMSW DM 19 Existing & Proposed ZIP files

Existing & Proposed 2-year, 10-year & 100-year HEC-1 Files

Existing Wash A & Existing & Proposed Galloway Wash HEC-RAS Files

EXHIBIT 1

Vicinity Map

VICINITY MAP

N.T.S.

N

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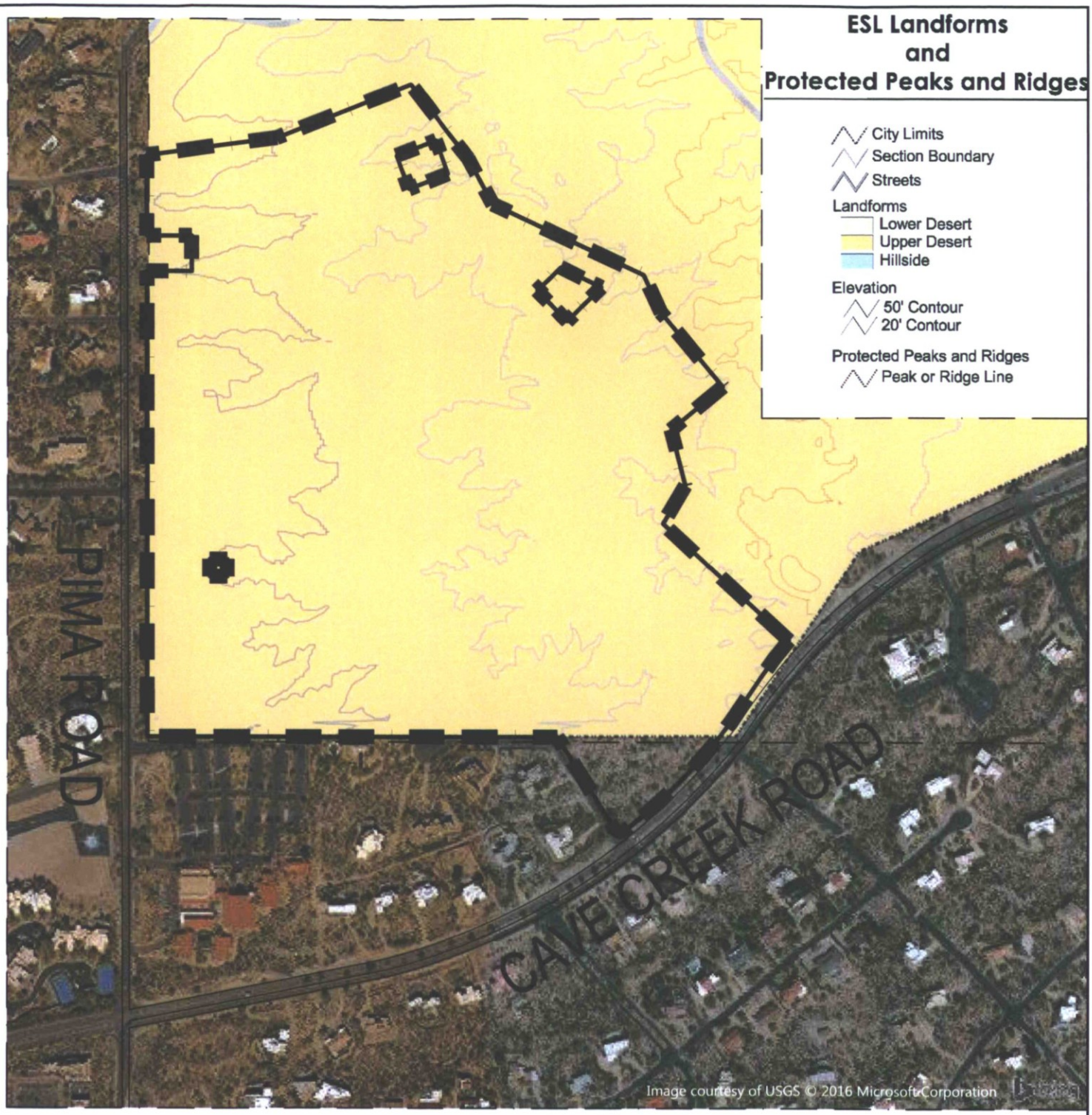
DESERT MOUNTAIN 19

EXHIBIT 1
VICINITY MAP

DATE: 06/15/2016	SCALE: N.T.S.	SHEET 1 OF 1
JOB NO.: 164434	DESIGN: RMH DRAWN: RMH	

EXHIBIT 2

ESL Classification Map



VICINITY MAP

N.T.S.

N

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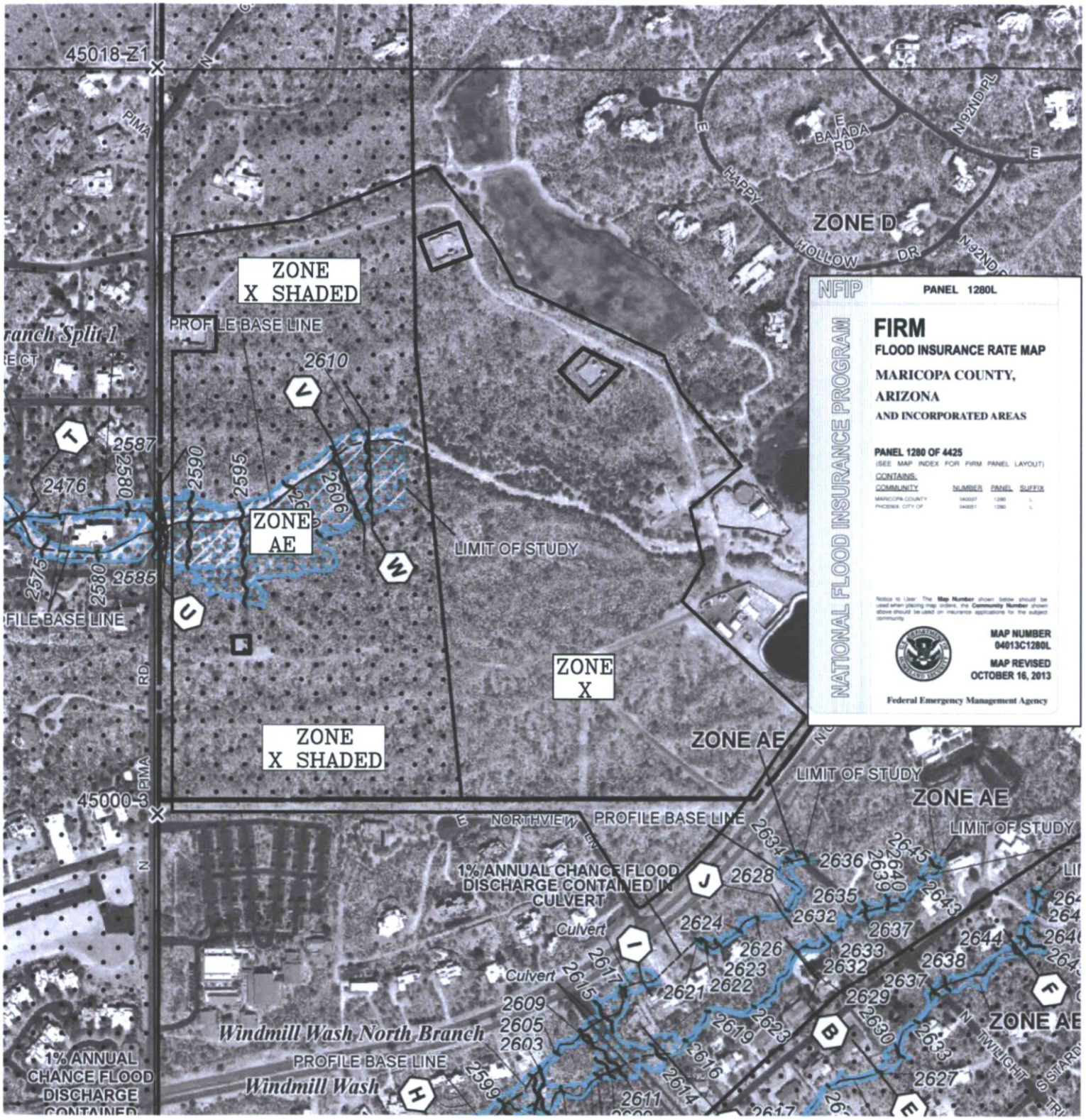
EXHIBIT 2
ESL Classification Map

DATE: 06/09/2016	SCALE: N.T.S.	SHEET 1 OF 1
JOB NO.: 164434	DESIGN: SES DRAWN: SES	

EXHIBIT 3

Flood Insurance Rate Map (FIRM)



N

0 250 500

Horz. 1 in. = 500 ft.

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EXHIBIT 3
FLOOD INSURANCE RATE MAP

DATE	SCALE	SHEET
6/15/2016	1" = 500'	1 OF 1
JOB NO.	DESIGN RMH	CHECK JCD
164434	DRAWN RMH	RFI #

EXHIBIT 4

Soils Classification Map

N

LEGEND

- NRCS MAP UNIT LEGEND
- SUB BASIN ID
- SOIL BOUNDARY
- SUB BASIN BOUNDARY

0 1200 2400

Horz. 1 in. = 1200 ft.

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EXHIBIT 4
SOILS CLASSIFICATION MAP

DATE	SCALE	SHEET
06/09/2016	1" = 1200'	1 OF 1
JOB NO. 164434	DESIGN JCD	CHECK ???
	DRAWN SES	RFI #

N:\2016\164434\Project Support\Reports\Drainage\PDR\Exhibits\4434-Exhibit 4- Soils Classification Map.dwg

EXHIBIT 5

Aerial Map

N

0 250 500

Horz. 1 in. = 500 ft.

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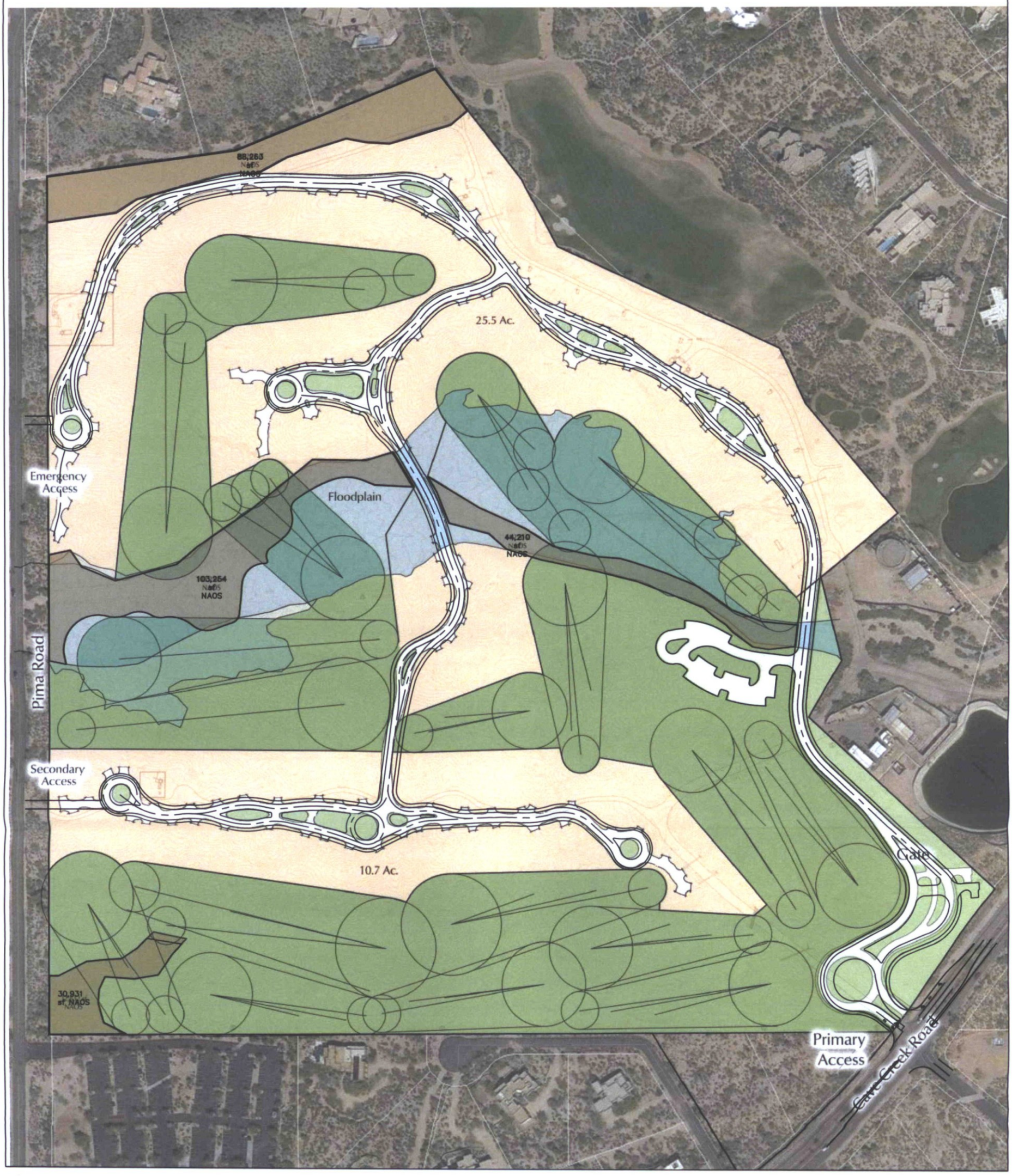
EXHIBIT 5
AERIAL MAP

DATE: 06/15/2016	SCALE: 1" = 500'	SHEET 1 OF 1
JOB NO.: 164434	DESIGN: RMH DRAWN: RMH	

EXHIBIT 6

Developed Conditions Land Use Map



0 250 500

Horz. 1 in. = 250 ft.

N

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DESERT MOUNTAIN 19

EXHIBIT 6
POST DEVELOPMENT LAND USE MAP

DATE	SCALE	SHEET
6/15/2016	1" = 500'	1 OF 1
JOB NO.	DESIGN SES	CHECK JCD
164434	DRAWN SES	RFI #

N:\2016\164434\Project Support\Reports\Drainage\PDR\Exhibits\4434-Exhibit 6-Developed Conditions Land Use Map.dwg

EXHIBIT 7

Existing Conditions Sub-Basin HEC-1 Map

LEGEND

- K1 — SUB-BASIN
- R-CPE4 — CHANNEL ROUTING
- DET OD — STORAGE ROUTING
- CP E5 — HYDROGRAPH COMBINING
- DV B7 — FLOW DIVERSION
- ——— DRAINAGE AREA BOUNDARY

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EXHIBIT 7
EXISTING CONDITIONS
SUB-BASIN HEC-1 MAP

DATE: 06-16-2016	SCALE: VARIES	SHEET 1 OF 1
JOB NO.: 164434	DESIGN: SES	
	DRAWN: SES	

N:\2016\164434\Project Support\Reports\Drainage\DP\EXHIBITS\EXHIBIT 7-Existing Condition HEC-1 Sbmwtth Map.dwg

EXHIBIT 8

Developed Conditions Sub-Basin HEC-1 Map

LEGEND

- C1 — SUB-BASIN
- R-CPE4 — CHANNEL ROUTING
- DET OD — STORAGE ROUTING
- CP E5 — HYDROGRAPH COMBINING
- DV B7 — FLOW DIVERSION
- DRAINAGE AREA BOUNDARY

N

0 500 1000

Horz. 1 in. = 500 ft.

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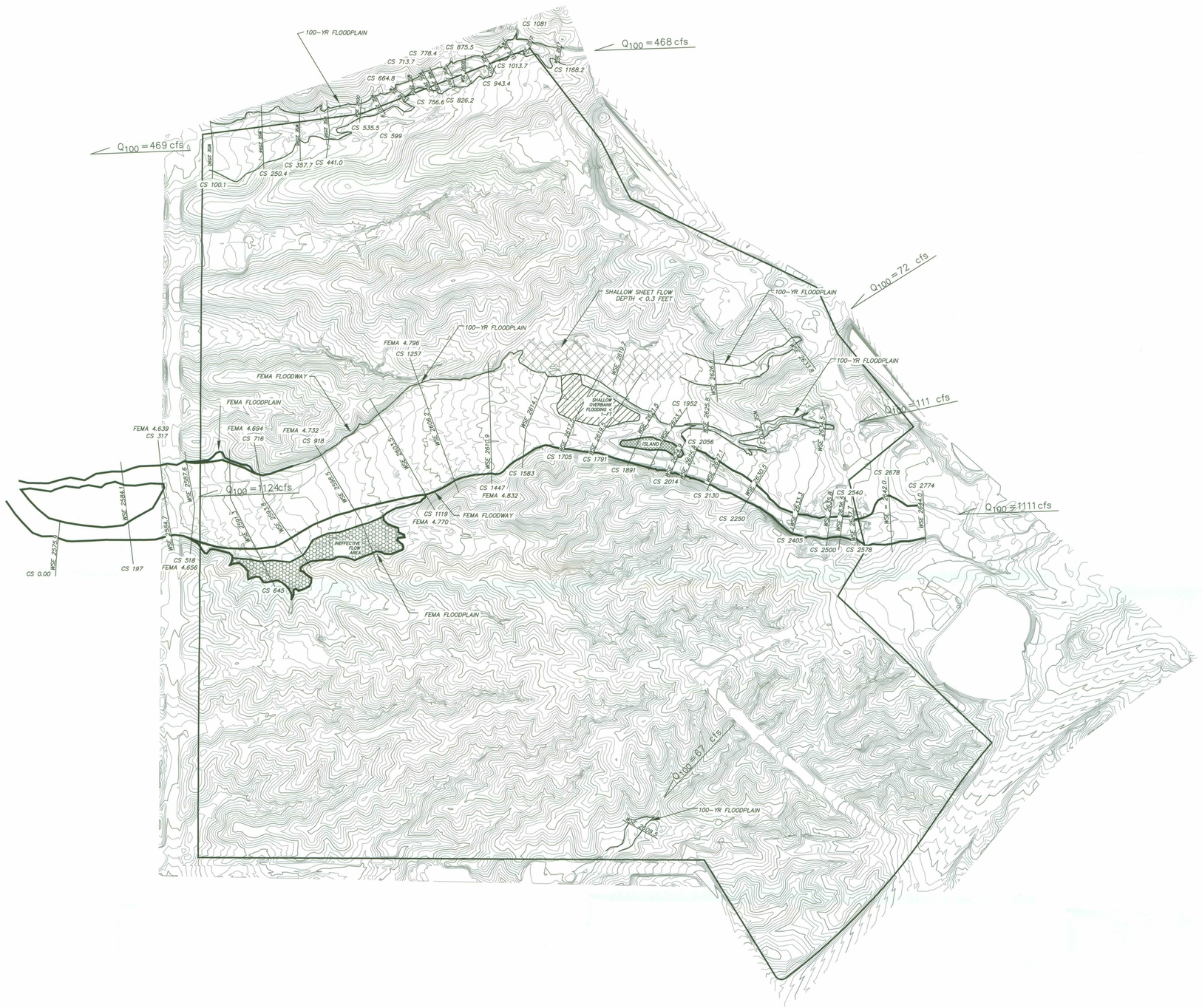
EXHIBIT 8
DEVELOPED CONDITIONS
SUB-BASIN HEC-1 MAP

DATE: 06-16-2016	SCALE: 1" = 250'	SHEET 1 OF 1
JOB NO.: 164434	DESIGN: SES	
	DRAWN: SES	

N:\2016\164434\Project Support\report\Drainage\PDR\Exhibits\HEC-1 Exhibit 8-Post Development HEC-1 Schematic Map.dwg

EXHIBIT 9

Existing Conditions Hydraulics Map



N

0 150 300
Horz. 1 in. = 150 ft.

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EXHIBIT 9
EXISTING CONDITIONS
HYDRAULICS MAP

DATE: 06-16-2016	SCALE: 1" = 150	SHEET 1 OF 1
JOB NO.: 164434	DESIGN: SES	
	DRAWN: SES	

N:\2016\164434\Project Support\Reports\Drainage\PDR\Exhibits\164434-Exhibit 9-Existing Hydraulics Map.dwg

EXHIBIT 10

Developed Conditions Hydraulics Map

N

0 150 300

Horz. 1 in. = 150 ft.

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EXHIBIT 10
DEVELOPED CONDITIONS HYRAULICS MAP

DATE: 06-16-2016	SCALE: 1" = 150'	SHEET 1 OF 1
JOB NO.: 164434	DESIGN: JCD	
	DRAWN: JCD	

N:\2016\164434\Project Support\Reports\Drainage\PDR\Exhibits\164434-Exhibit 10-Developed Conditions Hydraulics Map.dwg

EXHIBIT 11

Preliminary Grading Plan


N
0 80 160
Horz. 1 in. = 80 ft.
PIMA ROAD
DOUBLE EAGLE DRIVE
CAREFREE DRIVE
SHORT PUTT PLACE
NORTHVIEW LANE
CAVE CREEK ROAD
TWIGHLIGHT TRAIL
STREET A
STREET B
STREET C
GAMBEL QUAIL PRESERVE II BOOK 612, PAGE 49, MCR
DESERT MOUNTAIN PHASE I, UNIT ONE BOOK 293, PAGE 41, MCR
EXISTING "RENEGADE" GOLF COUSE
CAREFREE AIRPARK ESTATES BOOK 119, PAGE 36, MCR LOT 801
OUR LADY OF JOY ROMAN CATHOLIC PARISH
VELVET SHADOWS, UNIT III BOOK 121, PAGE 49, MCR
PROPOSED CLUBHOUSE
EXISTING FIRE STATION
EXISTING LAKE
BASIN #1
BASIN #2
BASIN #3
BASIN #4
LEGEND
OPEN SPACE BOUNDARY
FEMA FLOODPLAIN
FEMA FLOODWAY
PRELIMINARY 100-YEAR FLOODPLAIN
RETENTION/DETENTION BASINS
DRAIN FLOW
BANK PROTECTION
WALL
CULVERT W/ HEADWALL
SURFACE FLOW
EROSION ROCK
EXISTING Q100
POST DEVELOPMENT Q100
NOT FOR CONSTRUCTION OR RECORDING
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DESERT MOUNTAIN PARCEL 19
PRELIMINARY GRADING PLAN
DATE 6/16/16
SCALE 1" = 80'
SHEET 1 OF 1
JOB NO. 164434
DESIGN DC
CHECK DC
DRAWN CD
RFI #