FINAL DRAINAGE REPORT
FOR
SERENO CANYON PHASE 1

February 5, 2007

WP# 062654

Prepared for:

Crown Community Development
3600 Thayer Court
Suite 100
Aurora, IL 60504
Phone: (630) 851-5490
Fax: (630) 898-0480

Submitted to:

City of Scottsdale
7447 East Indian School Road
Scottsdale, AZ 85251
Phone: (480) 312-7080
Fax: (480) 312-7781

Prepared by:

Wood, Patel & Associates, Inc.
2051 West Northern Avenue
Suite 100
Phoenix, AZ 85021
Phone: (602) 335-8500
Fax: (602) 335-8580
Website: www.woodpatel.com

Peer Reviewer

Registered Professional Engineer (Civil)
CERTIFICATE NO
42317
GEOFFREY SCOTT BROWNELL
Date Signed 2-5-07
ARIZONA U.S.A.

Engineer

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Registered Professional Engineer (Civil)
CERTIFICATE NO
42317
GEOFFREY SCOTT
BROWNELL
Date Signed 2-5-07
ARIZONA, U.S.A.

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Registered Professional Engineer (Civil)
CERTIFICATE NO
42317
GEOFFREY SCOTT BROWNELL
Date Signed 2-5-07
ARIZONA, U.S.A.

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Registered Professional Engineer (Civil)
CERTIFICATE NO
42317
GEOFFREY SCOTT
BROWNELL
Date Signed 2-5-07
ARIZONA U.S.A.

1.0 INTRODUCTION

1.1 Project Description

Sereno Canyon is a custom-lot residential subdivision located in the northeastern portion of Scottsdale, Arizona. The Site is located in Section 11, Township 4 North, Range 5 East of the Gila and Salt River Base and Meridian. The Site is currently an assemblage of undeveloped parcels bound to the west by the existing Sonoran Crest Development (122nd Street alignment), to the east by the 128th Street alignment, to the north by the Happy Valley Road alignment, and to the south by the McDowell Mountain Sonoran Preserve. Access to the development is planned from the west via the ½-mile section roadway, Alameda Road. Plate 1 provides a vicinity map for the project and surrounding areas.

Phase 1 of the Sereno Canyon development consists of 46 lots, ranging in size from 2 to 3 acres, south of Happy Valley Road and north of Alameda Road. Plate 2 identifies the Phase 1 portion of the Sereno Canyon development.

1.2 Type of Report

This report is being prepared as a Final Drainage Report for the Sereno Canyon Phase 1 development.

1.3 Purpose

This Final Drainage Report for Sereno Canyon Phase 1, herein referred to as the Site, has been prepared to meet the drainage plan requirements outlined in Chapter 4 of the City of Scottsdale's *Design Standards and Policies Manual* (*DS&PM*). This report presents a description of the hydrological and hydraulic modeling of the proposed drainage systems.

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

- Compliance with City of Scottsdale's Drainage Ordinance storm water storage requirements by providing storm water storage for 100-year, 2-hour storm event runoff for improved areas computed by Rational Method.
- 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. Hence, the downstream properties are provided with similar or better flood protection as the pre-development condition.
- Maintenance of the major water courses traversing through the Site in their natural location.
- Delineation of the 100-year water surface extents, along with determination of the 100-year water surface elevations for the major drainage courses using HEC-RAS.
- Hydraulic analysis of the drainage structures and drainage conveyance systems.
- Identification of interim drainage solutions as part of the phased construction and evaluation of the interim drainage plan

2.0 EXISTING ON-SITE DRAINAGE CONDITIONS AND CHARACTERISTICS

2.1 On-Site Drainage

The proposed project lies in the northern planning section of the City of Scottsdale. The elevations range from 2,830 feet in the south to 2,675 feet in the northeast. Based on the existing topography of the Site, a ridgeline runs through the property from the southern property boundary (approximately at the center) in the northwest direction.

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 in Plate 3 – *ESL Classification.*

Plate 4 presents the soils classification (type D) based on the Soil Conservation Service (SCS) Map for the project area. SCS is now referred to as the Natural Resource Conservation Service (NRCS). The site photos for the Site are included in the *Conceptual Master Drainage Report for Sereno Canyon*, herein referred to as the *Master Drainage Report.* The cover type and hydrologic condition were estimated as desert shrub areas with poor hydrologic conditions. From Figure 4-6 of the *DS&PM*, a runoff curve number of 88 was used for the corresponding soils group D that occurs within the watershed area.

Currently, the Site contains no development; hence an effective impervious area of zero percent was used. The soil characteristics of the Site are included in the model in terms of the curve number discussed above. Also, minor rock outcroppings on the Site are not considered a factor in computing the percent effective impervious areas, as they do not interfere with the drainage pattern and are not hydraulically connected to the sub basin concentration points. This conclusion is made based on the photographs of the Site and washes included in Appendix A. Please note that the Site will not be mass graded and the outcroppings will be the same in both the existing and proposed conditions. Therefore, the rock outcroppings do not impact the pre- and post-development runoff comparison.

There are no washes on the Site that are categorized as a 'Vista Corridor', as the calculated 100-year, 6-hour flows are less than 750 cfs for all washes. The major watercourses traversing the project with a 100-year, 6-hour flow greater than 50 cfs are identified, as the Site lies within ESL areas. These washes are identified on Plate 10 – *Pre-Development Grading and Drainage Plan.* These washes will be maintained in their natural location 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; please refer to Plate 6 – *Color Topographic Aerial Photograph.* Also refer to Plate 9 – *Pre-Development Drainage Site Plan* for the on-site sub basins and concentration points. The Phase 1 development of Sereno Canyon includes drainage basins E1, E2, F1, F2, F3, G, H1, L, M, & N.

Runoff generated on-site drains northeasterly or northwesterly/westerly from the ridgeline. Washes E2, F1, and H1 are identified as washes with a 100-year, 6-hour peak flow greater than 50 cfs. These washes traverse the Site in the northeast direction and exit at the property boundary. The other minor washes (100-year, 6-hour flow less than 50 cfs) traverse either northeasterly or westerly until they exit at the property boundary.

A delineation of the 100-year, 6-hour water surface extents for washes with 100-year, 6-hour peak flow of 50 cfs or greater has been drawn based on the HEC-RAS analysis. Water surface elevations and top widths for pre-development flows at each cross section are included on Plate 10 – *Pre-Development Grading and Drainage Plan.* The hydrologic and hydraulic analysis procedures are discussed in Section 5.0. The boundary conditions water surface elevations were determined using normal depth for the given channel slope in HEC-RAS.

2.3 Off-Site Watershed

The off-site areas impacting the Phase 1 drainage network are within the future phases of Sereno Canyon. These areas are currently undeveloped and will be developed in the future. These drainage areas are identified on Plate 7 – *Off-Site Watershed Area Map.* Vegetation is typical Sonoran Desert type with Creosote bush, Jumping Cholla, Saguaro cacti, Palo Verde, Ironwood, and Mesquite trees. The off-site areas lie within the 'Upper Desert' and 'Hillside' (ESL) landform areas.

Based on the SCS Map, the cover type and hydrologic condition were estimated as desert shrub areas with poor hydrologic conditions. From Figure 4-6 of the *DS&PM*, a runoff curve number of 88 was used for the corresponding soils group D that occurs within the off-site watershed area.

2.4 Existing Off-Site Drainage Network

The off-site areas impacting the drainage network for Phase 1 are within the future phases of Sereno Canyon. Please refer to Plate 7 – *Off-Site Watershed Area Map* for the limits of the drainage sub basins and concentration points. The off-site areas impact the drainage pattern of wash H1. This wash is analyzed for the existing interim-developed and ultimate-developed conditions. The interim-developed condition depicts the Phase 1 development. The ultimate-developed condition illustrates the proposed build-out of all the phases of Sereno Canyon. The drainage basins impacted by the Phase 1 development are analyzed in this report.

2.5 Existing Drainage Relative to Adjacent Projects

Existing washes exit the Site as concentrated flows at various locations on the eastern, western, and northern property boundaries. These locations will be maintained with peak flows for the 2-year, 10-year, and 100-year, 6-hour storm events at or below pre-developed amounts.

2.6 Flood Insurance Rate Map (FIRM)

The Flood Insurance Rate Maps (FIRM) for Maricopa County, Arizona and incorporated areas, Panel Numbers 04013C1255G and 04013C1260F, effective date September 30, 2005, indicates the Site is within Zone "X" (shaded), and Zone "D".

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

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

Zone "D" is defined by FEMA as follows:

> *Areas in which flood hazards are undetermined.*

The location of the parcel relative to the FIRM panels is illustrated on Plate 5 – *Flood Insurance Rate Map (FIRM)* using the FEMA Firmettes.

3.0 PROPOSED DRAINAGE PLAN

3.1 General Description of Proposed Drainage System

The proposed drainage system will allow existing drainage patterns to be maintained in their natural location and condition where possible. The Site is being developed as large custom lots with minimum lot sizes of approximately 2 acres. The runoff impacting the Site will traverse the Site through natural washes and drainage courses in the northeastern and western direction, exiting at the property boundary.

Runoff generated in the off-site areas (within future phases of Sereno Canyon) and impacting the Site is conveyed through wash H1. The drainage plan is evaluated for the interim condition (Phase 1 development) and ultimate condition (completion of Sereno Canyon). A pre-development vs. post-development analysis is performed for both the interim and ultimate conditions. Drainage structures (culverts and detention basins) proposed to be built in Phase 1 are designed for the ultimate conditions and are consistent with the *Master Drainage Report.*

Detention basins with bleed-off pipes (with an orifice plate) are proposed at strategic locations to provide storm water storage for the runoff generated during the 100-year, 2-hour storm event. The detention basins are designed as in-line detention basins along the existing on-site washes, due to the steep slopes encountered within the Site. Drop inlet structures are proposed at culvert crossings downstream of a detention basin. Rock walls are proposed to mitigate the need for large constructed slopes to attain ponding areas at detention basins.

According to the City's drainage ordinance, all runoff generated from the developed portion of the Site must be managed, and the peak discharge from the Site reduced to at least pre-development values. With the development being sparse in nature at approximately 0.37 dwelling units per acre and no mass grading being proposed, post-development flows are only slightly higher than pre-development flows. The proposed detention basins located along several existing on-site washes and at roadway crossings attenuate the post-development peak discharges to at or below the pre-development values. A detailed description of the design and analysis of these basins is provided in Section 3.5.1.

Roadway runoff will be conveyed along the street up to the capacity of the street within the required stipulations outlined in Figure 4-2 – *Hydraulic Design Criteria* of the *DS&PM*. Please refer to Appendix A for a copy of this figure. The street runoff is released through curb openings and catch basins located along the street. Please refer to Plate 12 – *Post-Development Grading and Drainage Plan.*

3.2 Future Conditions

Currently, the off-site areas impacting the Site are undeveloped desert lands located within the future phases of Sereno Canyon. Drainage systems constructed in Phase 1 are designed based on the ultimate-developed conditions of Sereno Canyon. The proposed drainage systems are designed such that there will be no increase in peak flows upon development of future phases during the 2-year, 10-year, and 100-year, 6-hour storm events.

A portion of drainage basin E1 is being developed in Phase 1, whereas the infrastructure improvements are proposed to be constructed in a future phase. An interim analysis is performed for basin E1, wherein the portion in Phase 1 only is developed. This flow combines with flow from basin E2 and is routed through a detention basin before exiting the property. The combined flow is lower than the existing condition at the property boundary. Additional storm water storage detention will be provided for this area during the construction and the development of future phases of Sereno Canyon.

The drainage plan for Sereno Canyon 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. Also, the drainage courses will be maintained at their historic locations at the property boundary. Thus, no adverse impact is anticipated on the adjacent properties downstream of the Site for the 2-year, 10-year, and 100-year, 6-hour storm events.

Minimum low floor elevations for future lot-specific development were set by checking three (3) criteria; low floor elevations must be at least one foot above the 100-year, 6-hour water surface elevation of washes running through or adjacent to the lot; 14 inches above the local low site outfall; and 14 inches above the emergency outfall of the entire site. Minimum elevations for each lot can be found on Plate 14.

3.3 Stormwater Storage Requirements

Based on the City of Scottsdale's Drainage Ordinance storm water storage requirements, on-site storm water storage is to be provided for runoff generated during the 100-year, 2-hour storm event for improved areas. Rational Method is used to estimate the 100-year, 2-hour storm water storage volumes. 100-year, 2-hour event storm water runoff is proposed to be detained on-site through detention basins upstream of culvert crossings and at other strategic locations along existing on-site washes. Several of the detention basins are designed to retain runoff at a depth greater than 3 feet, in order to meet the volume provided requirements and due to ESL and NAOS constraints. These basins are located at roadway crossings and at the property boundaries. Rock berms and bleed-off pipes are proposed at the basin outlets. The equations and the assumptions used to calculate the required and provided retention volumes are discussed in Section 5.2.4.

Provided below is a summary of the storm water storage required and provided for each individual drainage basin. Table 3.3 indicates that the storm water storage provided is in excess of the storm water storage required for the entire Site by 32,215 ft^3. Please refer to Appendix D for detailed storm water storage calculations. Please note that the storm water retention required calculations for basin H1 is based on the ultimate-development conditions.

3.3.1 Dissipation of Stormwater

18-inch bleedoff pipes with removable orifice plates are proposed for the dissipation of the storm water detained within the stipulated time of 12-24 hours, and not to exceed 36 hours, per the City of Scottsdale Drainage Ordinance; thus, no dry wells will be required. The orifice plates are preliminarily sized using the orifice equation. A 6-inch diameter orifice plate is proposed to dissipate at an average rate of about 1 cfs, and a maximum rate no larger than 1.5 cfs. Calculations performed with the orifice equation were used to check the basins at half- and full-storage volumes, and are included in Appendix F.

Table 3.3

Storm Water Storage

Drainage Basin	Total Developed Area (Acre)	Required Volume (ft^3)	Provided Volume (ft^3)	Volume Excess / Shortage ± (ft^3)
E2	13.23	81,457	82,644	1,187
F1	10.24	62,726	82,216	19,490
F2	3.56	21,780	24,923	3,143
F3	2.93	17,860	19,088	1,228
G	3.7	22,651	23,033	382
H1	12.94	79,279	81,033	1,754
L	1.49	9,148	11,033	1,886
M	1.44	8,712	9,804	1,092
N	2.81	17,424	19,477	2,053
Total	**52.34**	**321,037**	**353,251**	**32,215**

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. Based on the site topographic conditions, the Kinematic Wave routing technique was used for both the existing and proposed conditions hydrologic modeling. Runoff for each drainage sub basin was computed and then routed, if required, through downstream drainage sub basins where the 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 parameters, changed to model developed conditions, are also discussed in Section 5.1.1.

Tables 3.4-1 and 3.4-2 provide the comparative peak flows for the pre- vs. post-developed conditions for the interim and ultimate conditions for 2-year, 10-year, and 100-year, 6-hour events, respectively, at each concentration point. For the location of these concentration points and corresponding 100-year, 6-hour flow values, please refer to Plates 9 and 10 for existing conditions, and Plates 11 and 12 for developed conditions.

The developed conditions HEC-1 model with detention basins upstream of the culvert road crossings and other strategic locations reduced the post-development flows to below the pre-development flows at each concentration point exiting the Site for the 2-year, 10-year, and 100-year, 6-hour storm events.

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

Project: *SERENO CANYON PHASE 1*
Date: 17-Jan-2007

Project Engineer: Geoff Brownell, P.E
Project Number: 062654

Table 3.4.-1
Pre - Vs -Post Peak Flow Analysis
Interim Condition

	2-year 6-hour Flow			10-year 6-hour Flow			100-year 6-hour Flow		
Concentration Point	Existing Flow (cfs)	Developed Flow (cfs)	Net Downstream effect	Existing Flow (cfs)	Developed Flow (cfs)	Net Downstream effect	Existing Flow (cfs)	Developed Flow (cfs)	Net Downstream effect
E1	26	28	2	67	69	2	146	148	2
E2	27	0	-27	65	21	-44	131	99	-32
COMBE	49	28	-21	126	69	-57	275	238	-37
F1	19	0	-19	47	4	-43	99	32	-67
F2	8	3	-5	21	6	-15	43	15	-28
F3	7	0	-7	19	7	-12	39	27	-12
G	7	1	-6	19	11	-8	41	33	-8
H1	28	14	-14	70	44	-26	152	93	-59
L	8	1	-7	19	10	-9	36	28	-8
M	11	5	-6	27	18	-9	52	43	-9
N	8	0	-8	18	3	-15	35	17	-18

WOOD/PATEL

CIVIL ENGINEERS * HYDROLOGISTS * LAND SURVEYORS * CONSTRUCTION MANAGERS

Project: *SERENO CANYON PHASE 1*
Date: 17-Jan-2007

Project Engineer: Geoff Brownell, P.E
Project Number: 062654

Table 3.4.-2
Pre - Vs -Post Peak Flow Analysis
Ultimate Condition

	2-year 6-hour Flow			10-year 6-hour Flow			100-year 6-hour Flow		
Concentration Point	Existing Flow (cfs)	Developed Flow (cfs)	Net Downstream effect	Existing Flow (cfs)	Developed Flow (cfs)	Net Downstream effect	Existing Flow (cfs)	Developed Flow (cfs)	Net Downstream effect
E1	26	27	1	67	68	1	146	146	0
E2	27	0	-27	65	21	-44	131	99	-32
COMBE	49	27	-22	126	68	-58	275	245	-30
F1	19	0	-19	47	4	-43	99	32	-67
F2	8	3	-5	21	2	-19	43	15	-28
F3	7	0	-7	19	7	-12	39	27	-12
G	7	1	-6	19	11	-8	41	33	-8
H1	28	18	-10	70	50	-20	152	98	-54
L	8	1	-7	19	10	-9	36	28	-8
M	11	5	-6	27	18	-9	52	43	-9
N	8	0	-8	18	3	-15	35	17	-18

3.5 Proposed Drainage Structures

3.5.1 On-Site Detention

On-site detention basins are proposed at the upstream end of culvert roadway crossings and at other strategic locations along existing on-site washes to provide storm water storage as discussed in Section 3.3. Please refer to Appendix D for the 100-year, 2-hour storm water storage calculations.

Storm water volumes for storm events greater than the 100-year, 2-hour event will overflow over the rock berms. Water surface elevations for the 100 year, 6-hour event are less than the low site outfall elevations for all of the surrounding lots, and therefore will not affect the low floor elevations. For the 2-year, 10-year, and 100-year, 6-hour storm events, these basins attenuate the post-development flows to at or below the pre-development flows. Peak flows are routed through these basins for the 2-year, 10-year, and 100-year, 6-hour storm events. The peak flow volume during the smaller events (2-year, 6-hour) will not overflow the rock berm and will be drained through the bleed-off pipe. This attenuation is modeled using HEC-1. Provided below in Figure 3.5.1 is a graphical illustration of storm water routing/storage through a detention basin.

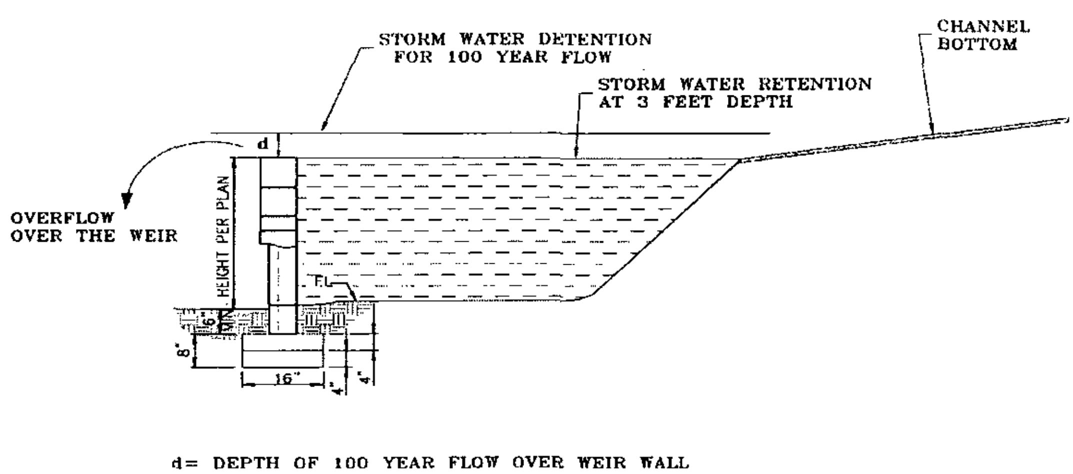


Figure 3.5.1 – Storm Water Routing through a Detention Basin

Weir walls are provided at the basin outlets that outfall into a natural course at the property boundary. These weir walls are modeled in the HEC-1 program to attenuate the post-development peak flows to the pre-development peak flows. Please refer to Appendix F - *Hydraulic Calculations* for weir wall storage routing curves used in HEC-1 modeling. The weir wall lengths are estimated based on the weir equation. These calculations are provided in Appendix F - *Hydraulic Calculations / Weir Wall Calculations*.

3.5.2 Roadway Crossing Structures

There are a total of 26 proposed roadway crossing structures within the project that have been designed to convey the anticipated 100-year flows. The 8 culverts downstream of the detention basins were sized to attenuate the peak flows to post-development flows. These culverts were designed based on flows from the HEC-1 analysis. Drop inlet structures are proposed at the culverts to convey the overflow from the detention basin to the culvert. The design headwater (DHW) elevation for these 8 culverts was also estimated, based on *The Federal Highway Administration's Culvert Analysis HY8, Version 6.1*.

The capacity of the drop inlet structures is dependent on the cross sectional area of the inlet in the direction of flow and the headwater over the inlet. The drop inlet size, per culvert size, is specified by the Maricopa Association of Government detail used for these structures. A simplified hydraulic analysis approach was formulated to ensure sufficient capacity of the drop inlets relative to the pipe culverts. The cross sectional area of each inlet was calculated assuming a factor of 50% to account for clogging. The flow velocity in the inlet was estimated at each culvert using Q=V*A. As long as the required flow velocity in the inlet is lower than the flow velocity in the culvert, it was assumed that the inlet had sufficient capacity and was not the controlling structure. Further, the top of wall on the high side of the inlet structure is proposed such that the estimated 100-year peak flow is contained within the basin and no overtopping on the road is anticipated. Please refer to Appendix F- *Hydraulic Calculations* for the inlet hydraulic calculations.

The remaining 18 culverts were sized based on flows estimated from Rational Method, as the individual sub basins within the Site had an area of less than 160 acres. The Flood Control District of Maricopa County (FCDMC) computer program *DDMSW* was utilized to compute the Rational peak storm water discharge rates for the 100-year storm event. Please refer to Appendix E – *Rational Method* for the flow calculations.

The design head water (DHW) elevation for these 17 culverts was computed using the HY8 computer program. All the culverts were analyzed to ensure the DHW elevation resulting from the analysis is lower than the roadway crest elevation. That is, the water does not overtop the roadway. The results of the *HY8* culvert modeling and a summary of the results are included under Appendix F – *Hydraulic Calculations*. The approximate 100-year backwater limits (ponding) have been incorporated with the proposed floodplain delineations and are shown on Plate 11 – *Post-Development Drainage Site Plan*.

Rip rap has been designed within the channels to dissipate velocities on the upstream and downstream sides of the proposed culverts. Based on the HEC-RAS and HY8 analyses, the majority of the washes yielded velocities less than 8 ft/s, and therefore, Type I rip rap with a d_{50} = 9" has been utilized for design. Please refer to Appendix F – *Hydraulic Calculations* for the rip rap dimensions for all 26 proposed culverts.

Rip rap has also been designed to prevent scour at a major wash crossing the graded offsite sewer access. Scour calculations can be found at the end of Appendix F, and the location of the crossing (O1.1) can be found on Plate 12.

3.5.3 On-Site Roadway Drainage Structures

3.5.3.1 Street Flow

Rational Method was used to calculate the storm water runoff generated by the on-site residential roadways. Rational Method sub basins were determined based on the roadway profile high and low points. The 'Rational for Windows' computer program was used to estimate the street flow based on the FCDMC Rational Method as discussed in

Section 5.1.3. Please refer to Appendix E – *Rational Method* for summary and individual calculations of these on-site flows. Plate 13 – *On-Site Roadway Drainage Map* provides the locations of the sub basins, concentration points, and 100-year flow values.

3.5.3.2 Street Capacity Hydraulics

This final drainage report quantifies roadway capacities based on 4-inch roll curb for consideration of the development. The drainage for local residential roadways has been 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 is used to calculate, in spreadsheet format, the allowable street cross-section capacities. Please refer to Appendix F – *Hydraulic Calculations* for the street capacity calculations.

3.5.3.3 Depressed Curb Openings

Curb openings are designed to convey the flow so 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 depressed curb openings located at the low points along the roadways. From here, flow will be directed along natural grade to the closest receiving wash or culvert inlet. These openings have been designed based on the 100-year flow values from the street flow Rational Method calculations. Please refer to Plate 13 – *On-Site Roadway Drainage Map* for the locations of the depressed curb openings, and to Appendix F – *Hydraulic Calculations* for the calculations of required curb opening lengths.

3.5.3.4 Storm Drain Systems

Catch basins and storm drain systems are proposed where the street drainage cannot be released through a depressed curb opening. StormCAD is used to size these catch basins and storm drain systems. Please refer to Appendix F – *Hydraulic Calculations / StormCAD Results* for the analysis of the storm drain systems, and Plate 13 – *On-Site Roadway Drainage Map* for the location of these storm drain systems.

3.6 Project Phasing

This project is being constructed as part of Phase 1 of the Sereno Canyon project. The drainage structures proposed within this phase are designed to meet the *DS&PM* guidelines. Phase 1 does not adversely impact the future phases of Sereno Canyon and the adjacent properties. Further, the structures proposed to be constructed with Phase 1 are designed for the ultimate conditions consistent with the *Master Drainage Report*.

4.0 SPECIAL CONDITIONS

4.1 Section 404 Washes

All washes within the project were investigated to identify those that may be deemed jurisdictional. The United States Army Corps of Engineers' approved Section 404 Jurisdictional Delineation is presented on Plate 8 – *Section 404 Washes.* This plate provides the approved Section 404 wash locations within the Site. The Section 404 washes are also illustrated on the pre- and post-development grading and drainage plans.

5.0 DATA ANALYSIS METHODS

5.1 Hydrologic Procedures

The U.S. Army Corps of Engineers' HEC-1 hydrologic model is used to compute the 2-year, 10-year, and 100-year, 6-hour storm events runoff, as outlined in Chapter 4 of the *DS&PM.* Further, Rational Method is used to compute the 100-year, 2-hour storm event storage volume required. Below is a description of the hydrologic procedures specific to this project.

5.1.1 HEC-1 Procedures

The U.S. Army Corps of Engineers' HEC-1 hydrologic model is used for computing hydrographs, routing the flow through sub basins, and combining hydrographs. Based on the site topographic conditions, the Kinematic Wave routing technique was used for both the existing and proposed conditions hydrologic modeling. The main components for runoff computation are overland flow, collector channel flow, and main channel flow. Input data necessary for the computer analysis included definition and measurement of the overland flow characteristics, drainage sub basins, assignment of soil curve numbers, and calculations of the proposed impervious factors. Provided below is a more detailed explanation of the parameter selection and the data inputs for HEC-1 modeling.

5.1.1.1 Rainfall Event

The precipitation amount for the 2-year, 10-year, and 100-year events, 6-hour duration period was obtained from *NOAA Atlas 2 Volume VIII* maps located in the *DS&PM.* An illustration of the location of the Site on these maps is provided in Appendix A. These values were further analyzed using the Maricopa County Drainage Design Management Systems for Windows (DDMSW) program to determine the precipitation depths for intervals lower than 1 hour, which are input values in the HEC-1 model. The DDMSW report of this analysis is included in Appendix A. The total calculated rainfall depths for the 2-year, 10-year, and 100-year, 6-hour storm events are 1.57, 2.29, and 3.37 inches, respectively. The drainage sub basins have also been depicted on the

NOAA maps. Based on the size of the drainage area, a single-point rainfall amount without aerial reduction was justified for each storm event analyzed.

5.1.1.2 Soil Curve Numbers

Soil curve numbers are used to account for interception/infiltration losses. Soil curve numbers for the HEC-1 models were calculated based on published guidelines and engineering experience for the type of soils present within the drainage sub basins. The cover type (less than 30% vegetation cover due to wild fire) and hydrologic condition were estimated as desert shrub areas with poor hydrologic conditions. Plate 3 presents the soils classification (type D) based on the SCS Map for the project area. A runoff curve number of 88 was used for the corresponding soils group D that occurs within the watershed area. Figure 4-6 "Runoff Curve Numbers for Arid and Semi-Arid Rangelands", located in the *DS&PM*, was used to determine the soil curve number and has been included in Appendix A. Wood/Patel is in agreement with the City's published curve numbers.

5.1.1.3 Impervious Area

Impervious percentages were determined for each sub basin for the developed conditions HEC-1 model. Currently, the Site contains no development, and hence an effective impervious area of zero percent (0%) was used. The rock outcroppings on the Site are not considered a factor in computing the percent impervious, as they do not have a pattern that may impact the drainage characteristics and are not hydraulically connected to the basin outlets. Please refer to photographs of the Site and washes in Appendix A. For the on-site developed conditions, calculations were performed using impervious percentages from the approved *Conceptual Master Drainage Report for Sereno Canyon.* Based on the lot sizes (average lot size = 101,500 sq.ft), an impervious percentage of 10 percent (10%) was used for the proposed developed areas.

5.1.1.4 Overland Flow Resistance Factor

The resistance factor for overland flow was estimated with guidance from descriptive information and site photographs. Based on the site conditions illustrated by the photographs in Appendix A, the site is considered to most closely resemble the sparse rangeland with Debris-20% cover, as well as the sparse vegetation categories identified in Table 3.5 of the HEC-1 manual. Based on the site photos and field observations, vegetative cover is estimated to be greater than twenty-percent (20%). Thus, a mid-range value from the sparse rangeland with Debris-20% cover category was deemed appropriate. Since a mid-range value from this category corresponded with the upper value of the sparse vegetation category, a value of 0.13 was chosen to best fit both categories with actual site conditions. From Table 3.5 in the HEC-1 manual, a resistance factor for overland flow of 0.13 was chosen. A copy of this table is included in Appendix A.

5.1.1.5 HEC-1 Input Records

This section provides additional description for the input records used in the HEC-1 modeling for this project. The computation time interval for hydrograph generation used was 2 minutes, which is within the range of 1 to 5 minutes specified in the *DS&PM.*

BA Record

This record is a direct input for computing runoff. The element of this record is the drainage area in square miles estimated by measuring the area of the drainage boundary.

LS Record

This record is a loss rate data record and computes rainfall losses based on the geological characteristics of the Site. The elements on this record are the soil curve numbers and the percent impervious. Both of these data are estimated based on the soil characteristics and site conditions. The derivation of these parameters is discussed in detail in Section 5.1.1.

UK Record

This record defines the characteristics of overland flow. The elements on this record are the overland flow length, slope, resistance factor, and percent of sub basin area represented. All of the input values are measurements and calculated values except for the resistance factor. The resistance factor for overland flow was estimated based on Table 3.5 in the HEC-1 manual. Based on the site conditions illustrated by the photographs in Appendix A, a resistance factor value of 0.13 was chosen. Further discussion on overland flow resistance factor was provided in Section 5.1.1.4.

RK Record

This record defines the characteristics of the main channel. The elements on this record are the channel length, channel slope, channel roughness, and geometry of the channel. All of the values were measured and calculated values. The channel roughness ('n' value) was chosen based on the site conditions as discussed in Section 5.2. Per the HEC-1 manual, the 'n' value that best represents the channel was chosen. The 'n' value of 0.032 for the channel bottom was chosen to best represent the channel characteristics. Also, this value is conservative, as it results in a higher estimate of peak flows. The HEC-1 model was calibrated to the HEC-RAS hydraulic model as accurately as possible. However, the HEC-1 model is simplified by using average dimensions of the channel to account for the irregularity in the channel dimensions.

SE Record

This record is used for defining the parameters to facilitate routing of flows through a storage basin. The elements on this record are the elevations corresponding to values in the same field in the SV and SQ Records. These values are obtained from the detention basin elevations and/or head water elevations where storage routing is proposed. Please refer to Appendices D and F for the detention basin calculations and routing calculations, respectively. Please note that the elevation values are extrapolated for modeling purposes to determine the headwater elevation over the weir and the limits of inundation.

SV Record

This record is used for defining the storage volumes in the storage routing of flows. These values are obtained from the storage volumes at different elevations of the ponding at the control structures provided as defined by the SE Records. These values are calculated and are provided in Appendix F. Please note that the storage volumes are extrapolated to represent the proposed detention volumes.

SQ Record

This record is used to define outflow discharge data for storage routing. Please refer to Appendix F for the rating curves for storage intervals. The elements in this field indicate the discharge at different stages for the proposed structures. Appendix F includes calculations for weir flows.

5.1.2 Parameter Changes for Developed Conditions

The parameter changes depicting the developed conditions are based on the guidelines provided in the *DS&PM*. The drainage basins were divided into sub basins to represent the developed conditions where necessary. The percent impervious used in the HEC-1 modeling was increased to depict the developed conditions. For the on-site developed conditions, effective impervious percentages were calculated utilizing Figure 2.2-16 "Percent of Impervious Area vs. Dwelling Units/Acre" in Chapter 2 of the old *DS&PM*. Please refer to Appendix A for a copy of this figure. Based on the lot sizes (average lot size = 101,500 sq.ft) and dwelling density of 0.37 du/acre, an effective impervious percentage of ten percent (10%) was used for the proposed developed areas in the HEC-1 model. An effective impervious area of ten percent (10%) was used for the developed areas within the project Site, while zero percent (0%) was used for the current and proposed undeveloped areas. A weighted percent impervious value was used in the HEC-1 model for each drainage basin, based on the proposed developed and undeveloped areas.

5.1.3 Rational Method

The Rational Method was used to compute peak discharges for watersheds less than or equal to *160* acres, as a comparison with HEC-1 results. Parameters necessary for this procedure are measurement of drainage sub basin areas, runoff coefficient ("C" values), and calculation of rainfall intensity. Runoff values are calculated using the following 100-year "C" values:

- 0.56 for undeveloped desert land with slopes less than ten percent (10%) - Hydrologic Soil Group D.
- 0.59 for single family residential area R1-130 – Hydrologic Soil Group D.

These values are based on Figure 4-5 "Runoff Coefficients for Use with Rational Method" in the *DS&PM.* This figure is included in Appendix A. The Maricopa County Flood Control District's Drainage Design Management System (DDMS) software, or the 'Rational for Windows' computer program, was used to determine the peak discharges by Rational Method.

5.1.4 *Stormwater Storage*

Based on the City of Scottsdale's Drainage Ordinance storm water storage requirements, on-site storm water storage is proposed to be provided for 100-year, 2-hour storm events. The Rational Method is used to estimate the 100-year, 2-hour storm water storage volumes. 100-year, 2-hour storm water retention volume is to be provided for the proposed development. The precipitation values for the *100*-year, 2-hour storm event were obtained from the *NOAA Atlas 2 Volume VIII* maps. The equations used to calculate the required and provided retention volumes are presented below.

5.1.4.1 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; 0.59 for the proposed developed areas.

- P is the precipitation in inches for the 100-year, 2-hour rainfall; 2.82 inches for the proposed developed areas.
- A is the drainage area in acres.

5.1.4.2 Provided Retention Volume

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

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

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 storm water storage provided through proposed detention basins. Assumptions that were made when determining provided volume were maximum side slopes of 3:1. Please refer to detention basin volume calculations in Appendix D.

5.2 Hydraulic Procedures

5.2.1 Hydraulic Analysis of Open Channels

The U.S. Army Corps of Engineers' HEC-RAS computer program was used for the hydraulic analysis of the washes greater than 50 cfs. HEC-RAS was used to determine the 100-year water surface elevations. Cross sections were placed such that significant variations in the channel cross-sectional geometry are adequately represented. The Manning's 'n' value was estimated using the Cowan Method, based on the following parameters:

- Channel material,
- Degree of irregularity,
- Effects of obstruction,
- Vegetation,
- Variations in channel cross section, and
- Degree of meandering.

The investigation of the site photos presented in Appendix A, and aerial photos provided on Plate 6, indicated gradual variations in channel cross sections within the Site and a minor degree of meandering. The vegetation on the Site was minimal, due to the wild fire that occurred recently, and is typical of the local desert climate. The channel material was coarse gravel and the degree of irregularity was minor. Based on the above, 'n' values of 0.032 and 0.045 were chosen for channel bottom and channel over banks respectively. Site photos have been included representative of on-site washes that support the "n" value determination. The site photos are included in Appendix A.

Cross sections were placed such that significant variations in the channel cross-sectional geometry are adequately represented. Due to the steep slopes on the project 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.

5.2.2 Hydraulic Analysis of Culverts

For analysis of culvert roadway crossings, the computer program HY-8 was used for final design. HY-8 is a culvert analysis program that was developed for the Federal Highway Administration. Site characteristics and flow are entered into the program and the resulting flow regime and headwater values are calculated.

6.0 DRAINAGE PLAN REQUIREMENTS

6.1 Drainage System Requirements

The existing drainage patterns will be maintained in their natural location and condition, where possible. The Site is being developed as large custom lots with an average lot size of 101,500 sq.ft. As lots are developed, individual lot engineering will be required to provide drainage documentation to substantiate the development of the lot. In the event of any future development within the off-site watershed areas, it will be the responsibility of the future developer to attenuate the post-development flows and volume to at or below the pre-development values.

6.2 Easement Requirements

Where flows from the 100-year storm event are greater than 50 cfs, drainage easements will be provided. In addition, drainage easements shall be dedicated to the limits of inundation for the 100-year, 2-hour storm event in each retention basin.

6.3 Roadway Crossing Requirements

In all cases, the depth of flow over streets will be in accordance with the City of Scottsdale Flood Plain and Drainage Ordinance.

6.4 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. It is the responsibility of private developers, homeowner associations, etc. to maintain facilities on private property within all drainage easements, private streets, and rights-of-way, unless accepted by the City for maintenance. 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.

6.5 Scour Protection

Scour protection is provided at all culvert crossings within the Site. Scour protection in the form of loose rock rip rap is specified at culvert inlets and outlets. Rip rap size, dimensions, and thickness are based on hydraulic conditions at the culvert outlets. Rip rap calculations are included in Appendix F – *Hydraulic Calculations*.

6.6 Annual Sediment Yield

Sediment yield is defined as that portion of eroded material that travels through a drainage system to a downstream measuring or control point (*Bureau of Reclamation, 1987*). The units used for this study are acre-feet/square mile/year (ac-ft/sq.mi./yr.). The prediction of sediment yields is not an exact science. Many complex variables influence the erosion process, and any sediment yields analysis requires considerable engineering judgment. For this reason, two (2) methods were used to arrive at a conservative estimate of the average annual sediment yield rate. The following provides a detailed discussion of each method and its results.

Sediment yield was calculated using the Pacific Southwest Inter-Agency Committee (PSIAC) method. This method was obtained from the following source: Pacific Southwest Inter-Agency Committee, *Report of the Water Management Subcommittee on Factors Affecting Sediment Yield in the Pacific Southwest Area and Selection and Evaluation of Measures for Reduction of Erosion and Sediment Yield*, October 1968.

Nine (9) factors are evaluated in determining the sediment yield classification. These are geology, soils, climate, runoff, topography, ground cover, land use, upland erosion, and channel erosion and sediment transport. Characteristics of each of the 9 factors, which give that factor high-, moderate-, or low-sediment yield, are evaluated and the factor is assigned a numerical value representing its significance in the yield rating. The yield rating is the sum of values for the appropriate characteristics for each of the nine factors. For the purpose of avoiding complexity, the factors are generally described as independently influencing the amount of sediment yield. Table 7.6 provides the sediment yield classification based on sediment yield rating.

Table 7.6

Sediment Yield Classification Table

Classification	Rating	Sediment Yield acre-ft/sq. mile
1	> 100	3.0
2	75 – 100	1.0 – 3.0
3	50 – 75	0.5 – 1.0
4	25 – 50	0.2 – 0.5
5	0 – 25	< 0.2

Application of the 9 sediment yield factors to the watershed discussed in this report generated a total numerical rating of 77 to 85, the actual rating being dependant upon the interpretation of the guidelines that are used to assign rating values to each factor. Regardless of the actual number, i.e. 77 or 85, both values fall within Classification 2 (75 – 100), which indicates a sediment yield range of 1.0 to 3.0 ac-ft/sq.mi./yr.

6.6.1 Bureau of Reclamation Sediment Surveys

The 1987 edition of *Design of Small Dams* (BuRec) publishes data on sediment measurements from 28 reservoirs in semi-arid regions of the United States. A regression line through these data points produces the following equation:

$$Q_s = 1.84\,A^{-0.24}$$

Where:

Q_s = annual sediment yield (ac-ft/sq.mi./yr.)

A = drainage area (sq.mi.)

Using a drainage area size of 1.95 sq.mi., this equation predicts an annual sediment yield of 1.57 ac-ft/sq.mi./yr. or 4,920 cubic yards.

6.6.2 Recommended Annual Sediment Yield

In consideration of the complex processes under investigation, the two (2) methods used exhibit fairly good agreement. Based on comparison of sediment yield calculations to actual sediment yield measurements, Renard & Stone (1981), concluded that "the PSIAC method appears to give the best results for the amount of work required to make the estimate." Based on the results of the sediment yield equations, a design value of 1.6 ac-ft/sq.mi./yr. was selected.

6.6.3 Short-/Long-Term Aggradation, Degradation, Local Scour, and Deposition

Sediment transport analyses need to distinguish between short-term and long-term changes. Short-term changes are event specific and occur to some extent during each flood hydrograph. Examples of short-term changes would be local scour, general scour, bend scour, bedform troughs, and to some extent low-flow channel incisement. With the exception of low-flow channel incisement, any visual signs of these processes may be difficult to detect after the flow has subsided. Short-term scour processes can usually be quantified with empirical and/or theoretical relationships.

Vertical incisement of the channel bed can occur in response to the following six (6) processes:

1. Long-term degradation,
2. Local scour,
3. General scour,
4. Bend scour,
5. Low-flow channel incisement, and
6. Antidune troughs.

Precise prediction of long-term channel impacts can be much more elusive than their short-term counterparts because of the time span involved and the numerous variables that impact long-term changes. The major drainage corridors within the project site will be designed as protected channels.

6.7 Protective Devices

Roadway crossing culverts will incorporate rip rap at both the inlet and the outlet to dissipate energy and provide flow line scour protection. Retention basins upstream of the roadways will incorporate a protected overflow area (using native rip rap and filter fabric) in the event of overtopping. The bleed-off pipes will also incorporate rip rap protection.

7.0 CONCLUSIONS

7.1 Phase 1 Project

1. The Site is located within FEMA Zone "X" (shaded) and Zone "D", as shown on Plate 5.
2. The major watercourses traversing through the project will be maintained in their natural location and condition, and will not be re-aligned wherever possible.
3. Drainage corridors have been designated for the identified washes in accordance with the appropriate City of Scottsdale ordinance requirements.
4. Storm water storage is provided for the 100-year, 2-hour storm water event through detention basins. The stormwater will be drained within 36 hours through bleed-off pipes with orifice plates at a rate not greater than 1.5 cfs.
5. Online detention on the upstream side of the road culvert crossings and other strategic locations reduces post-development peak flows for the 2-year, 10-year, and 100-year, 6-hour storm events to at or below pre-development flows.
6. Detention basins were designed to detain runoff at a depth of up to seven and a half feet (7.5') in order to meet the volume provided requirements, and due to ESL and NAOS constraints.
7. The design of hydraulic structures is based on generally accepted engineering practices and in accordance with City of Scottsdale's requirements.
8. The drainage for the local residential roadways has been 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.
9. Ongoing maintenance is required for all drainage systems in order to assure design performance.
10. All low floor elevations are to be designed to be above the 100-year water surface elevation.
11. It is the responsibility of the individual lot engineer preparing the individual grading and drainage plans for development of the home site to set low floor elevations.

7.2 Project Phasing

1. Phase 1 does not adversely impact the future phases of Sereno Canyon and adjacent properties.

2. Drainage structures proposed to be constructed with Phase 1 are designed for the ultimate conditions consistent with the *Master Drainage Report*.

8.0 REFERENCES

1. City of Scottsdale, *Design Standards and Policies Manual Chapter 2 Drainage*, December 1999.
2. City of Scottsdale, *Design Standards and Policies Manual Chapter 4 Drainage*, June 2005.
3. Flood Control District of Maricopa County, *Drainage Design Manual for Maricopa County, Arizona: Volume I – Hydrology*, revised January 1995.
4. Flood Control District of Maricopa County, *Drainage Design Manual for Maricopa County, Arizona: Volume II – Hydraulics*, January 28, 1996.
5. U.S. Army Corps of Engineers, *HEC-1, Flood Hydrograph Package*, June 1998.
6. U.S. Army Corps of Engineers, *HEC-RAS, Version 3.1.2*, April 2004.
7. Arizona Department of Water Resources, *State Standards for Floodplain Management*.
8. US Army Corps of Engineers Hydrologic Engineering Center, *HEC-1 Manual, Flood Hydrograph Package User's Manual*.
9. US Army Corps of Engineers Hydrologic Engineering Center, *Introduction and Application of Kinematic Wave Routing Techniques using HEC-1*.
10. Flood Control District of Maricopa County, *Drainage Design Management System for Windows*.
11. Flood Control District of Maricopa County, *Drainage Design Management System*.
12. Pacific Southwest Inter-Agency Committee, *Report of the Water Management Subcommittee on Factors Affecting Sediment Yield in the Pacific Southwest Area and Selection and Evaluation of Measures for Reduction of Erosion and Sediment Yield*, October 1968.
13. *Conceptual Master Drainage Report for Sereno Canyon*, Wood Patel & Associates, Inc. November 15, 2006.
14. *Design of Small Dams*, 1987 Edition.

APPENDIX A

Supporting Information for Parameter Selection

Site Photo Vicinity Map

Site Photos

Soil Survey Data

FCDMC Rainfall Data

Precipitation Maps

Runoff Curve Numbers and Percent Impervious Area Chart

Resistance Factor for Overland Flow

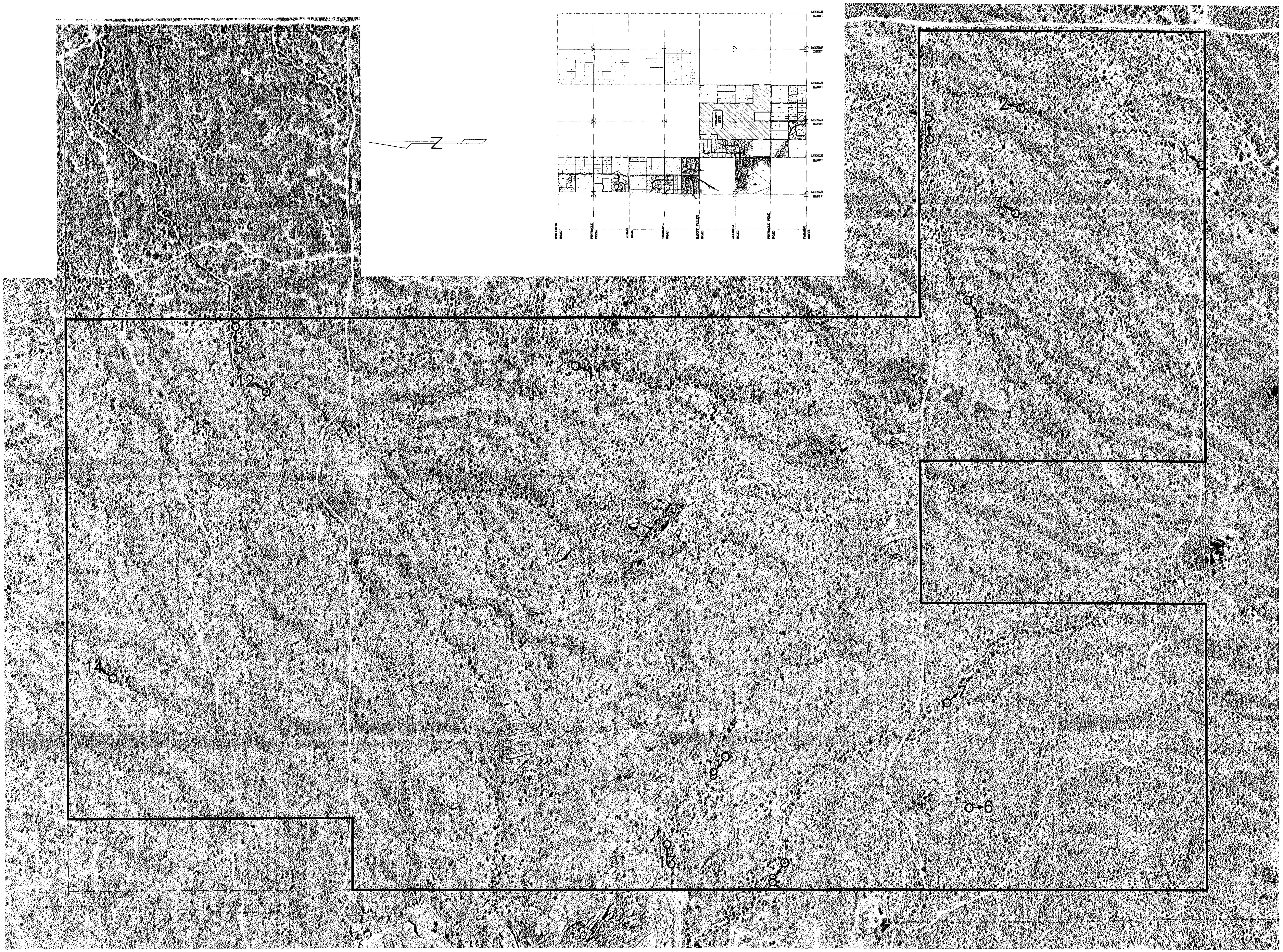
Runoff Coefficients for use with Rational Method

Hydraulic Design Criteria

Site Photo Vicinity Map

McDOWELL MOUNTAIN BACK BOWL

SITE PHOTO VICINITY MAP



WOOD/PATEL
CIVIL ENGINEERS
HYDROLOGISTS
LAND SURVEYORS
CONSTRUCTION MANAGERS
2051 West Northern
Suite 100
Phoenix, AZ 85021
Phone: (602) 335-8500
Fax: (602) 335-8580

ENGINEER	
DESIGNER	
CAD TECHNICIAN	K. LOPEZ
SCALE (HORIZ)	1" = 200'
SCALE (VERT)	N/A
DATE	02/16/06
JOB NUMBER	042054
SHEET	1 OF 1

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Site Photos

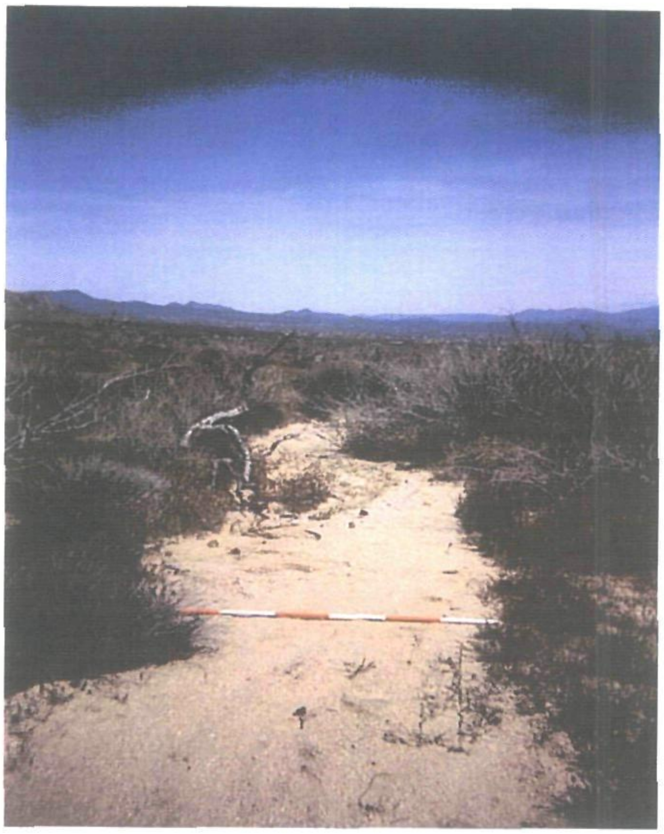


Photo 1

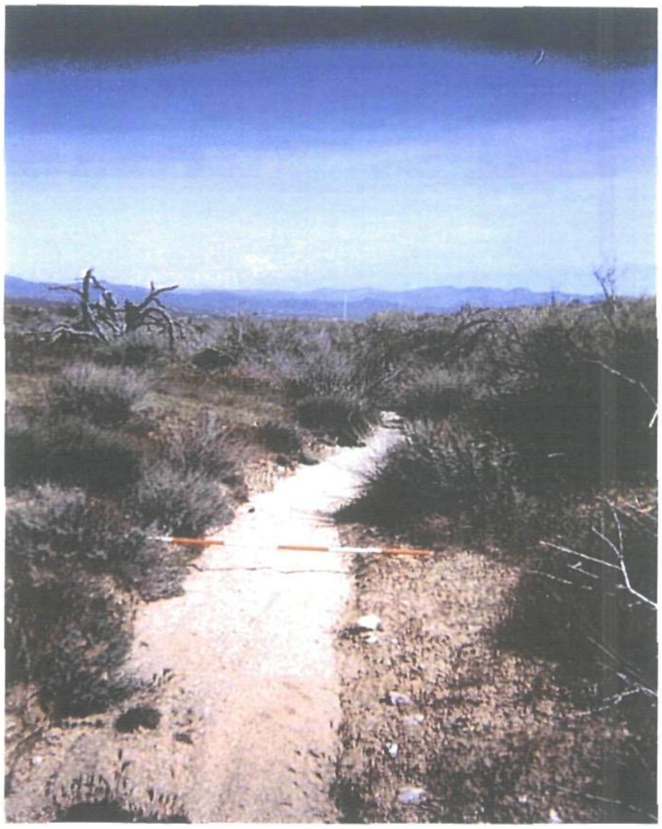


Photo 2

Photo 3

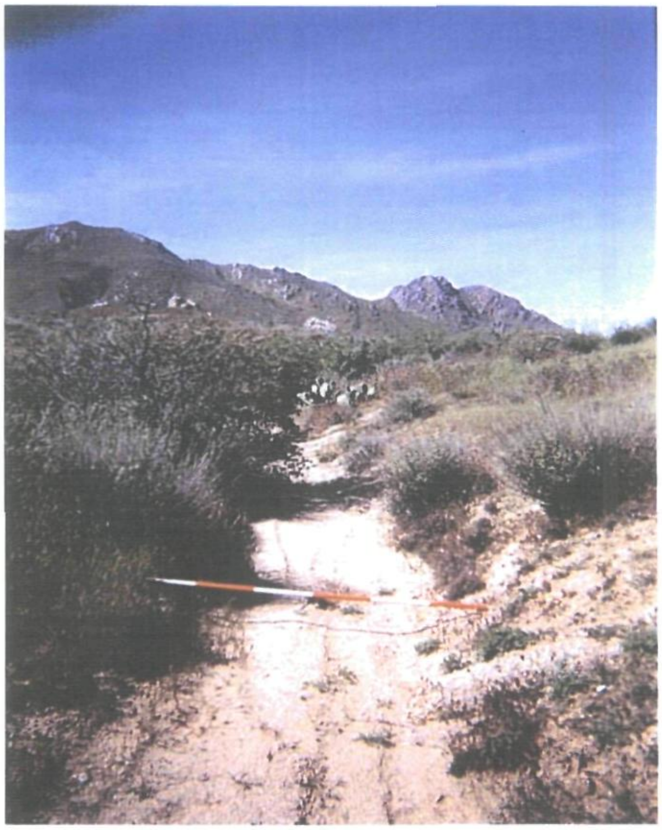


Photo 4

Photo 5

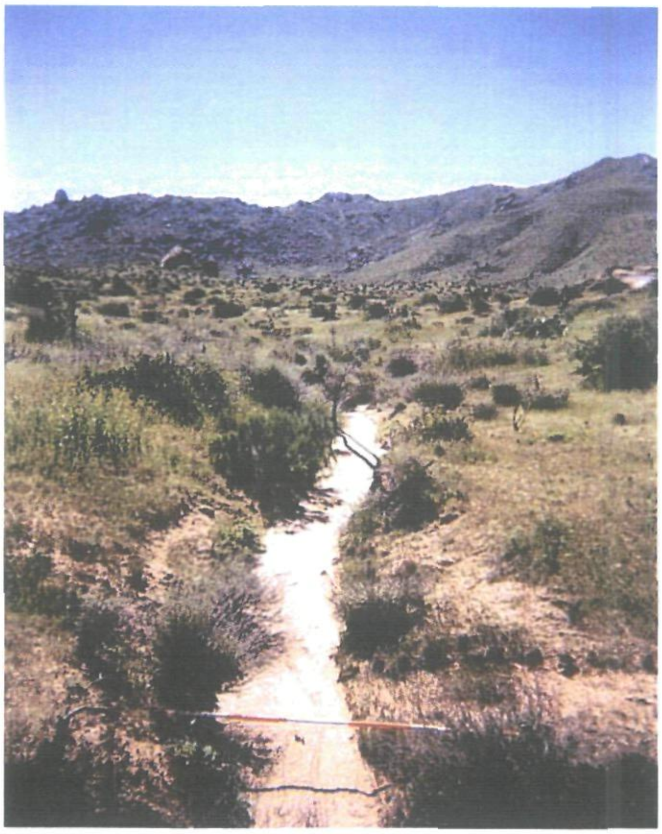


Photo 6

Photo 7

Photo 8

Photo 9

Photo 10

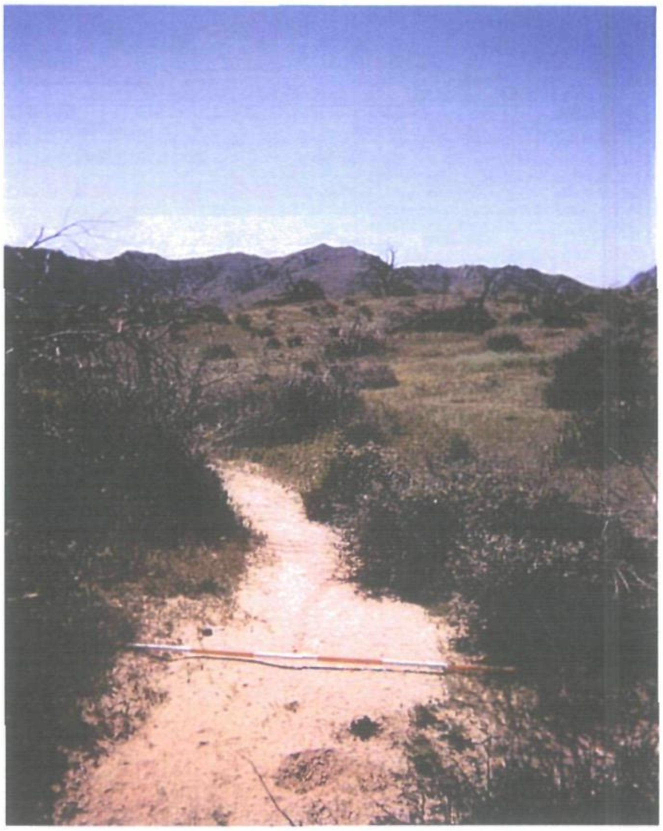


Photo 11

Photo 12

Photo 13

Photo 14

Soil Survey Data

TABLE 15.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	Bedrock: Depth	Bedrock: Hardness	Cemented pan: Depth	Cemented pan: Hardness	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
					In		In			
[illegible]9*:										
[illegible]ore----------	B	None--------	---	---	>60	---	---	---	High-----	Low.
[illegible]bar---------- calcareous	B	Rare--------	---	---	>60	---	---	---	High-----	Low.
[illegible]enbar---------- calcareous	B	Rare--------	---	---	>60	---	---	---	High-----	Low.
[illegible]62*:										
[illegible]n-------------	D	None--------	---	---	20-40	Hard	---	---	High-----	Low.
[illegible]enburg--------	D	None--------	---	---	3-20	Soft	---	---	High-----	Low.
[illegible]64*:										
[illegible]n-------------	D	None--------	---	---	20-40	Hard	---	---	High-----	Low.
[illegible]nburg---------	D	None--------	---	---	3-20	Soft	---	---	High-----	Low.
[illegible] outcrop.										
[illegible]										
[illegible]agle----------	D	None--------	---	---	>60	---	4-20	Thick	High-----	Low.
[illegible]inental-------	C	None--------	---	---	>60	---	---	---	High-----	Low.
[illegible]kel-----------	B	None--------	---	---	>60	---	---	---	High-----	Low.
[illegible]agle----------	D	None--------	---	---	>60	---	4-20	Thick	High-----	Low.
[illegible]city Variant--	D	None--------	---	---	>60	---	5-20	Thick	High-----	Low.
[illegible]--------------	D	Rare--------	---	---	>60	---	---	---	High-----	Low.
[illegible], 69*:										
[illegible]ght-----------	B	None--------	---	---	>60	---	---	---	High-----	Low.
[illegible]ano-----------	D	None--------	---	---	>60	---	5-20	Thick	High-----	Low.
[illegible], 71*:										
[illegible]ght-----------	B	None--------	---	---	>60	---	---	---	High-----	Low.
[illegible]to------------	B	None--------	---	---	>60	---	---	---	High-----	Low.
[illegible], 73*:										
[illegible]na------------	D	None--------	---	---	6-20	Hard	---	---	High-----	Low.
[illegible] outcrop.										
[illegible]:										
[illegible]--------------	C	None--------	---	---	>60	---	20-40	Thick	High-----	Low.
[illegible]ano-----------	D	None--------	---	---	>60	---	4-20	Thick	High-----	Low.
[illegible]76, 77, 78, ---------- [illegible]11	B	None--------	---	---	>60	---	---	---	High-----	Low.
[illegible]81*:										
[illegible]ll------------	B	None--------	---	---	>60	---	---	---	High-----	Low.

[illegible] footnote at end of table.

FCDMC Rainfall Data

Rainfall Data

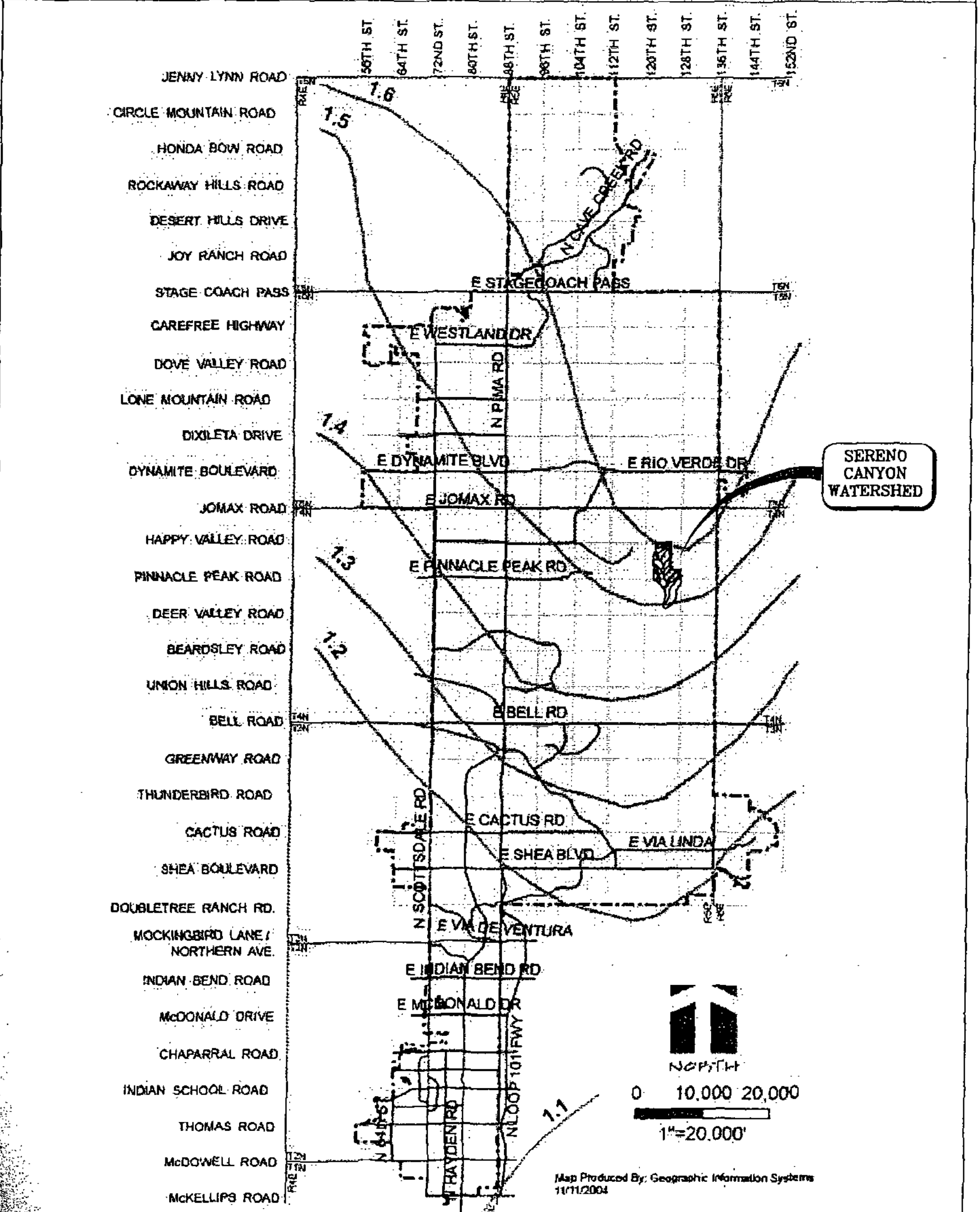
Primary Zone Number:	7	Latitude:	0.0	Elevation:	0
Short Duration Zone Number:	8	Longitude:	0.0		

	Point Values (in)					
Duration	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
5 MIN	0.38	0.46	0.52	0.60	0.66	0.73
10 MIN	0.57	0.70	0.78	0.91	1.01	1.11
15 MIN	0.70	0.87	0.99	1.16	1.29	1.43
30 MIN	0.92	1.16	1.33	1.56	1.75	1.94
1 HOUR	1.12	1.43	1.64	1.95	2.19	2.42
2 HOUR	1.27	1.62	1.87	2.21	2.48	2.74
3 HOUR	1.38	1.75	2.01	2.38	2.67	2.96
6 HOUR	1.57	2.00	2.29	2.71	3.04	3.37
12 HOUR	1.81	2.31	2.66	3.15	3.53	3.91
24 HOUR	2.05	2.62	3.02	3.58	4.02	4.45

Precipitation Maps

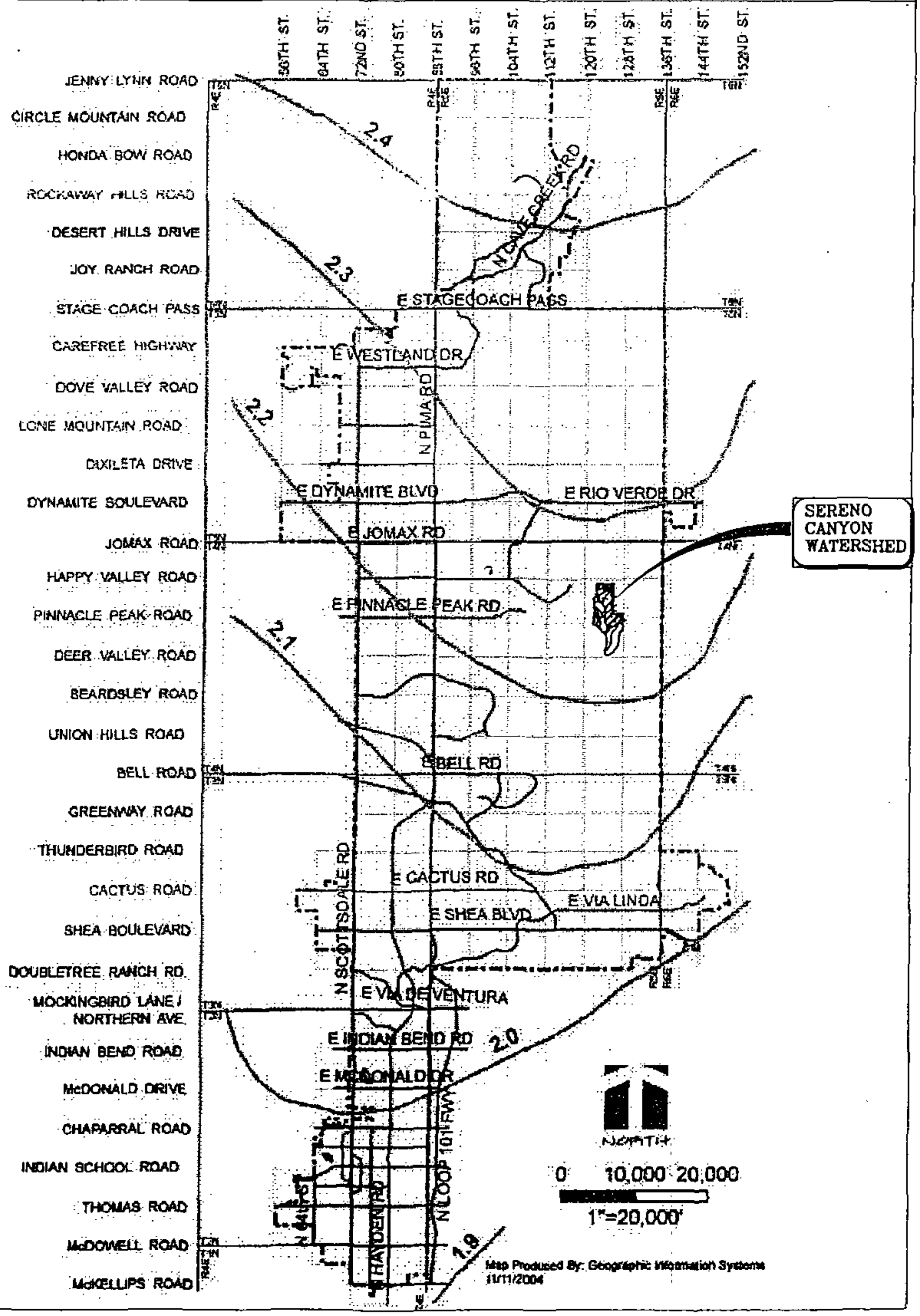
ISOPLUVIALS

2 Year 6 Hour Precipitation in Inches



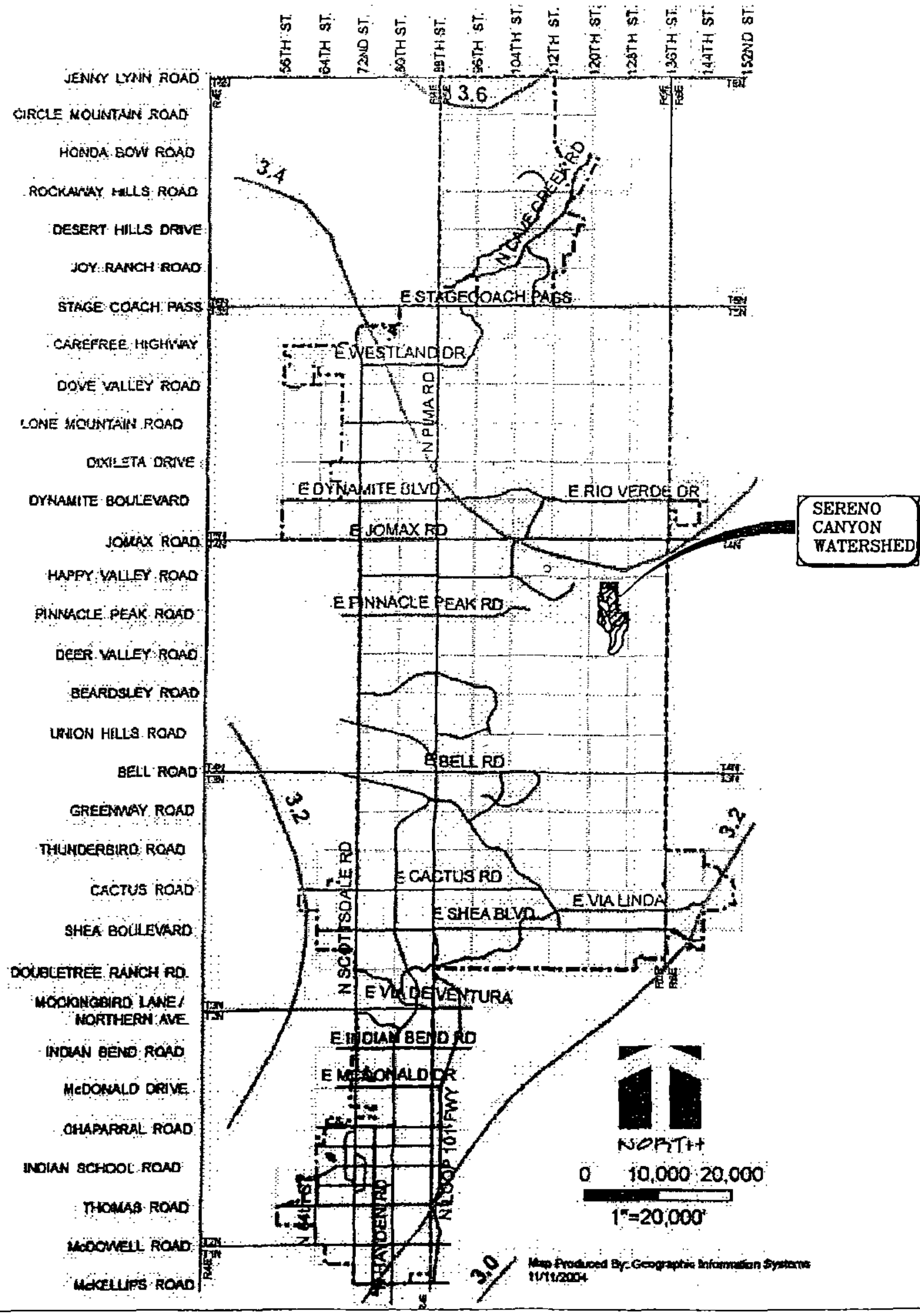
ISOPLUVIALS

10 Year 6 Hour Precipitation in Inches



ISOPLUVIALS

100 Year 6 Hour Precipitation in Inches



Runoff Curve Numbers and Percent Impervious Area Chart

2. Infiltration

Infiltration or soil losses will be determined using Green and Ampt (G&A) procedures per FCDMC Hydrology Manual. Use the most recent published SCS soil survey maps of the area to determine the hydrologic soil group or surface soil texture for the G&A procedures. Use USDA Natural Resources Conservation Services (previously the Soil Conservation Services) maps, Soil Survey of Aguila-Carefree Area, Parts of Maricopa and Pinal Counties, or the Soil Survey of Eastern Maricopa and Northern Pinal Counties, Arizona; depending on what part of the city you are located.

3. Runoff Curve Numbers

Where detailed mapping is not available from the SCS or other sources, the use of curve numbers is acceptable. When using runoff curve numbers (ROCN) within Scottsdale:

1. Assume poor hydrologic condition and desert shrub cover type for natural undisturbed desert conditions in Figure 4-6.
2. For lawns, golf courses, and other grassed open space areas, assume good condition in Figure 4-7 to determine the ROCN. Then adjust the ROCN to antecedent moisture condition III (use Figure 4-8).
3. For developed conditions, increase the percent impervious on the LS card without changing the ROCN (except in the case of grassed areas, in which the curve number should be adjusted up according to the above). Use the actual or estimated percent impervious; a minimum of 85 percent for commercial and 72 percent industrial.

RUNOFF CURVE NUMBERS FOR ARID & SEMIARID RANGELANDS[1]

Cover Type and Hydrologic Condition	Hydrologic Condition[2]	Curve Numbers for Hydrologic Soil Group			
		A[3]	B	C	D
Herbaceous: mixture of grass, weeds, and low-growing brush, with brush the minor element	Poor		80	87	93
	Fair		71	81	89
	Good		62	74	85
Oak-aspen: mountain brush mixture of oak brush, aspen, mountain mahogany, bitter brush, maple, and other brush	Poor		66	74	79
	Fair		48	57	63
	Good		30	41	48
Pinyon-juniper: pinyon, juniper, or both; grass understory	Poor		75	85	89
	Fair		58	73	80
	Good		41	61	71
Sagebrush with grass understory	Poor		67	80	85
	Fair		51	63	70
	Good		35	47	55
Desert shrub: major plants include saltbush, greasewood, creosote bush, blackbrush, bursage, Palo Verde, mesquite, and cactus	Poor	63	77	85	88
	Fair	55	72	81	86
	Good	49	68	79	84

[1] Average Runoff Condition, and $I_a = 0.2S$.

[2] Poor: < 30% ground cover (litter, grass, and brush overstory)
Fair: 30 to 70% ground cover (not applicable in Scottsdale)
Good: >70% ground cover (not applicable in Scottsdale)

[3] Curve Numbers for Group A have been developed only for desert shrub

FIGURE 4-6. RUNOFF CURVE NUMBERS FOR ARID & SEMIARID RANGELANDS

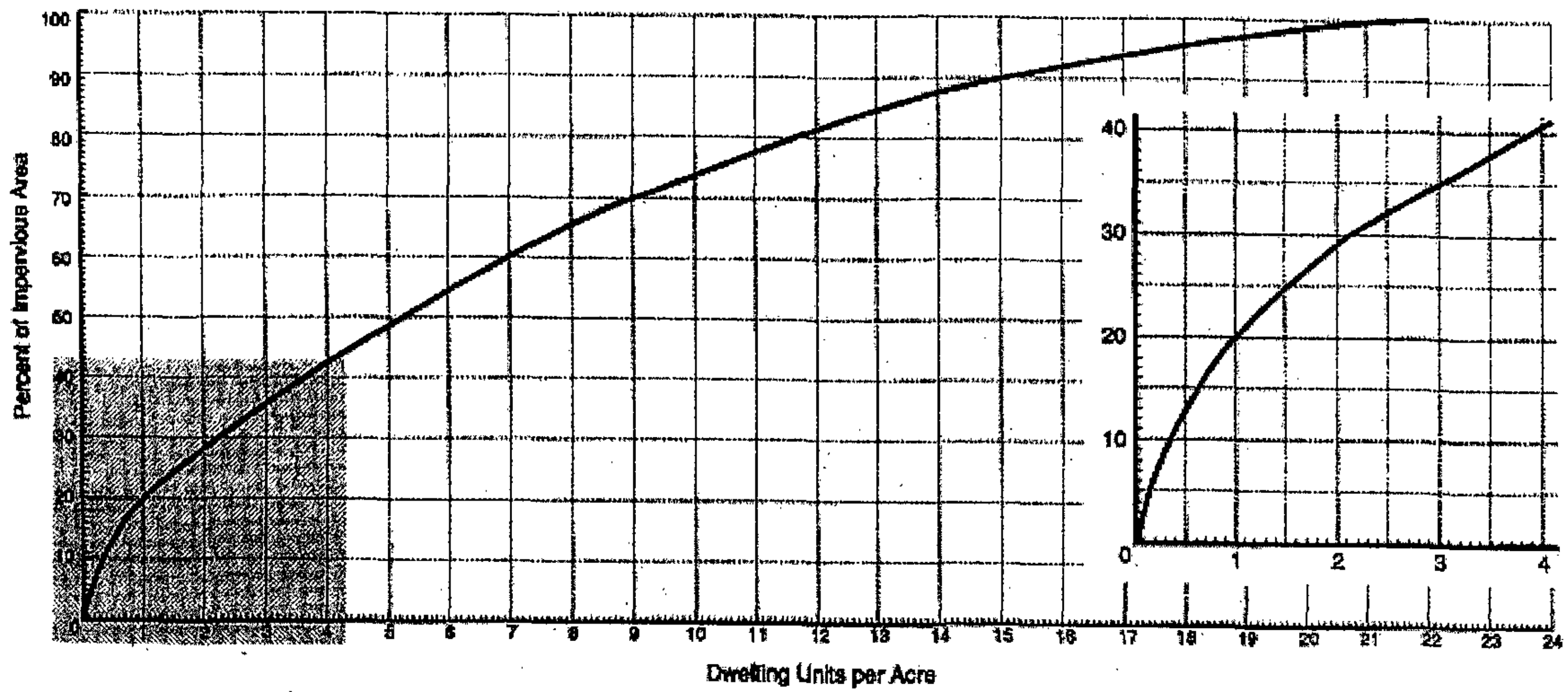


FIGURE 2.2-16

Percent of Impervious Area vs. Dwelling Density

Developed by Water Resources Associates, Inc. from data in Table 2.2a of TR-55, Urban Hydrology For Small Watersheds, and from discussions with Scottsdale city staff.

Resistance Factor for Overland Flow

The model requires that at least one overland flow plane and one main channel be used in kinematic wave applications. In the above example, fewer elements might have been used depending on the level of detail required for the hydrologic analysis.

3.5 Base Flow

Two distinguishable contributions to a stream flow hydrograph are direct runoff (described earlier) and base flow which results from releases of water from subsurface storage. The HEC-1 model provides means to include the effects of base flow on the streamflow hydrograph as a function of three input parameters, STRTQ, QRCSN and RTIOR. Figure 3.~~8~~ defines the relation between the streamflow hydrograph and these variables. 9

Table 3.6

Typical Kinematic Wave/Muskingum-Cunge Data

Overland Flow Plane Data

Identification	Overland Flow Length (ft)	Average Slope (ft/ft)	Roughness Coefficient	Percentage of Subbasin Area
Pervious Area	200	.01	.3	80%
Impervious Area	100	.01	.1	20%

Channel Data

	Channel Length (ft)	Channel Slope (ft/ft)	Channel Roughness	Contributing Area (sq mi)	Shape
Collector Channel	500	.005	.02	.05	2.0 (ft) (Diameter)
Collector Channel	1500	.001	.015	.25	2.0 (ft) (Diameter)
**Main Channel	4000	.001	.03	1.0 *	Trapezoidal

* Main channel always assumed to service total subbasin area.

** Note main channel may be eight-point cross section when using Muskingum-Cunge routing. Muskingum-Cunge and kinematic wave channel elements cannot be inter-mixed.

Runoff Coefficients for use with Rational Method

RUNOFF COEFFICIENTS - "C" VALUE			
LAND USE	Hydrologic Soil Group		
Composite Area-wide Values	B	C	D
Commercial & Industrial Areas	0.90		
Residential Areas-Single Family (average lot size)			
R1-1-1901	0.33	0.50	0.58
R1-130	0.35	0.51	0.59
R1-70	0.37	0.52	0.60
R1-43	0.38	0.55	0.61
R1-35 (35,000 square feet/lot)	0.40	0.56	0.62
R1-18 (18,000 square feet/lot)	0.43	0.58	0.64
R1-10 (10,000 square feet/lot)	0.47	0.62	0.67
R1-7 (7,000 square feet/lot)	0.51	0.64	0.70
Townhouses (R-2, R-4)	0.63	0.74	0.78
Apartments & Condominiums (R-3, R-5)	0.76	0.83	0.87
Specific Surface Type Values			
Paved streets, parking lots (concrete or asphalt), roofs, driveways, etc.	0.95		
Lawns, golf courses, & parks (grassed areas)	0.33	0.56	0.66
Undisturbed natural desert or desert landscaping (no impervious weed barrier)	0.31	0.48	0.56
Desert landscaping (with impervious weed barrier)	0.83	0.83	0.83
Mountain terrain – slopes greater than 10%	0.70	0.70	0.70
Agricultural areas (flood-irrigated fields)	0.20	0.20	0.20

FIGURE 4-5. RUNOFF COEFFICIENTS FOR USE WITH RATIONAL METHOD

D. The Army Corps of Engineers' HEC-1 Computer Model

HEC-1 procedures are applicable for any watershed area over 160 acres and up to 100 square miles in size. HEC-1 is required for analyzing drainage areas over 160 acres in size. **HEC-HMS is not an acceptable substitute for HEC-1**. Minimum required submittals when using HEC-1 are:

- A printout of the input data
- A schematic (routing) diagram of the stream network
- The runoff summary output table
- Electronic input file(s), on CD or floppy
- Supporting Documentation and Source Material for parameter selection
- HEC-1 models shall be submitted without warnings or error messages.
- Adjustments to the modeling parameters made to address warnings and error messages will have a narrative section to detail the impact of the adjustments on the output.

1. Precipitation

Precipitation values for HEC-1 modeling shall be determined using the Flood Control Manual, specifically PD and JD records for point rainfall and area reduction factors. Capital Projects shall use the ADOT manual and methodology when specified. Precipitation values are to be obtained from the Isopluvial maps for the specific frequency desired (see Appendix 4-D).

Hydraulic Design Criteria

HYDRAULIC DESIGN CRITERIA *(Italics indicate citations from Floodplain and Stormwater Regulation)*			
Drainage Feature	**Peak Frequencies**		
	10 Year	**50 Year**	**100 Year**
Street with Curb & Gutter	Contain runoff within street curbs. For collector and arterial streets maintain one 12-foot dry driving lane in each direction.	N/A	Contain runoff below the building's finished floor. *Runoff to be confined to road rights-of-way or to drainage easements.* [37-42, (4)] *dmax=8 inches above the street.* [37-42, (4)]
Street without Curb & Gutter (Dirt Roads, Ribbon Curbs)	Contain runoff within roadside channels with water surface elevation below roadway pavement's subgrade.	N/A	Same as Street with Curb and Gutter.
Street with Storm Drain System	Add pipes or roadside channels if 10-year runoff exceeds street capacity.	N/A	Use storm drain systems if 100-year runoff inundates building's first floor. *Catch basins, scuppers, etc. to be provided to remove water so as not to exceed dmax =8 inches.* [37-42, (4)]
Cross Road Culvert or Bridge for Major Collector & Arterial Streets	N/A	*Runoff to be conveyed by culvert or bridge under road with no flow overtopping the road.* [37-42, (3) a. 2]	*Runoff to be conveyed by culvert and by flow over the road with maximum 6-inch flow depth over the road.* [37-42, (3) a. 2]
Cross Road Culvert or Bridge for Local and Minor Collector Streets	*Runoff to be conveyed by culvert or bridge under road with no flow overtopping the road.* [37-42, (3)a.1]	*For a 25-year frequency storm runoff to be conveyed by culvert or bridge and by flow over the road with maximum 6-inch flow depth over the road.* [37-42, (3) a.1]	Maximum depth over road 12 inches.
Any street or watercourse crossing that provides the only access to residential area.	N/A	N/A	*All lots and structures must be accessible by at least 1 route with the depth of flow no greater than 1 foot during the 100-year runoff event.* [37-42, (3) a. 3]
FEMA Floodplain Channel (1)	N/A	N/A	100-year peak discharge
Open Channel for Off-site Flow through Development	N/A	N/A	100-year peak discharge
Detention / Retention Storage Basin	N/A	N/A	100-year 2-hour storm for determining on-site retention volume

FIGURE 4-2. HYDRAULIC DESIGN CRITERIA

APPENDIX B

Existing Condition Hydrologic Calculations

2-year HEC-1 Model

10-year HEC-1 Model

100-year HEC-1 Model

2-year HEC-1 Model

```
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   05DEC06  TIME  13:42:36  *                    *         (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        SERENO CANYON PHASE 1
   2         ID        HEC-1 MODEL FOR SERENO CANYON
   3         ID        2-YEAR, 6-HOUR STORM
   4         ID        RAINFALL FROM NOAA ATLAS
   5         ID        SCS CURVE NUMBER SOIL LOSS PARAMETERS
   6         ID        KINEMATIC WAVE HYDROGRAPH ROUTING
   7         ID        EXISTING CONDITIONS
   8         ID        SERENO CANYON PHASE 1 INCLUDES DRAINAGE BASINS E1,E2,F1,F2,F3,G,H1,L,M,N
   9         ID
  10         ID        PREPARED BY WOOD/PATEL, 8.21.2006
  11         ID        FILE NAME:  EX-2.DAT
  12         ID
             *DIAGRAM
  13         IT       2                 900
  14         IO       5
  15         JD              .01
  16         PH                      .38     0.7    1.12    1.27    1.38    1.57
             *

  17         KK      E1
  18         KM  RUNOFF FROM SUB-BASIN E1
  19         BA    .061
  20         LS               88
  21         UK     400      .02    0.13     100
  22         RK    2050     .013    .032            TRAP       7       5
  23         KO                                       22

  24         KK      E2
  25         KM  RUNOFF FROM SUB-BASIN E2
  26         BA    .046
  27         LS               88
  28         UK     200      .02    0.13     100
  29         RK    2370     .013    .032            TRAP      10       5
  30         KO                                       22

  31         KK   COMBE
  32         KM  COMBINE SECTIONS E1 AND E2
  33         HC       2
  34         KO                                       22
             *

  35         KK      F1
  36         KM  RUNOFF FROM SUB-BASIN F1
  37         BA    .036
  38         LS               88
  39         UK     225     .018    0.13     100
  40         RK    2500     .012    .032            TRAP       7       5
  41         KO                                       22
             *
1                                         HEC-1 INPUT                                          PAGE  2

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


  42         KK      F2
  43         KM  RUNOFF FROM SUB-BASIN F2
  44         BA    .014
  45         LS               88
  46         UK     200     .018    0.13     100
  47         RK    1440     .028    .032            TRAP       6       5
  48         KO                                       22
             *

  49         KK      F3
  50         KM  RUNOFF FROM SUB-BASIN F3
  51         BA    .013
  52         LS               88
  53         UK     225     .018    0.13     100
```

```
                                                      EX-2.OH1
 54          RK     850    .026    .032              TRAP      6       5
 55          KO                                       22
             *

 56          KK       G
 57          KM  RUNOFF FROM SUB-BASIN G
 58          BA   0.016
 59          LS             88
 60          UK     400    .025    0.13     100
 61          RK     720    .022    .032              TRAP      4       5
 62          KO                                       22
             *

 63          KK      H1
 64          KM  RUNOFF FROM SUB-BASIN H1
 65          BA    .059
 66          LS             88
 67          UK     375    .025    0.13     100
 68          RK    2210    .019    .032              TRAP      8       5
 69          KO                                       22
             *

 70          KK       L
 71          KM  RUNOFF FROM SUB-BASIN L
 72          BA  0.0099
 73          LS             88       0
 74          UK     113    .018    0.13     100
 75          RK     450    .012    .032              TRAP      5       5
 76          KO                                       22
             *

 77          KK       M
 78          KM  RUNOFF FROM SUB-BASIN M
 79          BA   0.015
 80          LS             88       0
 81          UK     137    .018    0.13     100
 82          RK     960    .012    .032              TRAP      4       5
 83          KO                                       22
             *
1                                          HEC-1 INPUT                                        PAGE  3

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

 84          KK       N
 85          KM  RUNOFF FROM SUB-BASIN N
 86          BA    0.01
 87          LS             88       0
 88          UK     117    .018    0.13     100
 89          RK    1036    .012    .032              TRAP      5       5
 90          KO                                       22
             *

 91          KK   CLEAR
 92          KM  CLEAR HYDROGRAPH STACK
 93          HC       8
 94          ZZ
1
              SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE     (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

   NO.     (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

   17        E1
             .
   24        .        E2
             .        .
   31      COMBE.......
             .
   35        .        F1
             .        .
   42        .        .        F2
             .        .        .
   49        .        .        .        F3
             .        .        .        .
   56        .        .        .        .        G
             .        .        .        .        .
   63        .        .        .        .        .        H1
             .        .        .        .        .        .
   70        .        .        .        .        .        .        L
             .        .        .        .        .        .        .
   77        .        .        .        .        .        .        .        M
             .        .        .        .        .        .        .        .
   84        .        .        .        .        .        .        .        .        N
             .        .        .        .        .        .        .        .        .
   91        .      CLEAR.......................................................

(***) 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          *
```

```
                          SERENO CANYON PHASE 1
                          HEC-1 MODEL FOR SERENO CANYON
                          2-YEAR, 6-HOUR STORM
                          RAINFALL FROM NOAA ATLAS
                          SCS CURVE NUMBER SOIL LOSS PARAMETERS
                          KINEMATIC WAVE HYDROGRAPH ROUTING
                          EXISTING CONDITIONS
                          SERENO CANYON PHASE 1 INCLUDES DRAINAGE BASINS E1,E2,F1,F2,F3,G,H1,L,M,N

                          PREPARED BY WOOD/PATEL, 8.21.2006
                          FILE NAME:  EX-2.DAT

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

     IT        HYDROGRAPH TIME DATA
                      NMIN          2  MINUTES IN COMPUTATION INTERVAL
                     IDATE      1   0  STARTING DATE
                     ITIME       0000  STARTING TIME
                        NQ        900  NUMBER OF HYDROGRAPH ORDINATES
                    NDDATE      2   0  ENDING DATE
                    NDTIME       0558  ENDING TIME
                     ICENT         19  CENTURY MARK

                 COMPUTATION INTERVAL     .03 HOURS
                      TOTAL TIME BASE   29.97 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

  15 JD        INDEX STORM NO. 1
                     STRM        1.57  PRECIPITATION DEPTH
                     TRDA         .01  TRANSPOSITION DRAINAGE AREA

  16 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     .01
                    .01     .01     .01     .01     .01     .01     .01     .01     .01     .01
                    .02     .02     .02     .02     .03     .03     .04     .06     .08     .15
                    .15     .12     .07     .05     .03     .03     .03     .02     .02     .02
                    .01     .01     .01     .01     .01     .01     .01     .01     .01     .01
                    .01     .01     .00     .00     .00     .00     .00     .00     .00     .00
                    .00     .00     .00     .00     .00     .00     .00     .00     .00     .00
                    .00     .00     .00     .00     .00     .00     .00     .00     .00     .00
                    .00     .00     .00     .00     .00     .00     .00     .00     .00     .00
                    .00     .00     .00     .00     .00     .00     .00     .00     .00     .00
                    .00     .00     .00     .00     .00     .00     .00     .00     .00     .00
                    .00     .00     .00     .00     .00     .00     .00     .00     .00     .00

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

           **************
           *            *
  17 KK    *      E1    *
           *            *
           **************

  23 KO        OUTPUT CONTROL VARIABLES
                     IPRNT          5  PRINT CONTROL
                     IPLOT          0  PLOT CONTROL
                     QSCAL         0.  HYDROGRAPH PLOT SCALE
                     IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                      IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                     ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                     ISAV2        900  LAST ORDINATE PUNCHED OR SAVED
                    TIMINT       .033  TIME INTERVAL IN HOURS

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

           **************
           *            *
  24 KK    *      E2    *
           *            *
           **************

  30 KO        OUTPUT CONTROL VARIABLES
                     IPRNT          5  PRINT CONTROL
```

```
                IPLOT           0  PLOT CONTROL
                QSCAL          0.  HYDROGRAPH PLOT SCALE
                IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                 IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                ISAV2         900  LAST ORDINATE PUNCHED OR SAVED
               TIMINT        .033  TIME INTERVAL IN HOURS


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

            **************
            *            *
  31 KK     *    COMBE   *
            *            *
            **************

  34 KO          OUTPUT CONTROL VARIABLES
                IPRNT           5  PRINT CONTROL
                IPLOT           0  PLOT CONTROL
                QSCAL          0.  HYDROGRAPH PLOT SCALE
                IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                 IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                ISAV2         900  LAST ORDINATE PUNCHED OR SAVED
               TIMINT        .033  TIME INTERVAL IN HOURS


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

            **************
            *            *
  35 KK     *        F1  *
            *            *
            **************

  41 KO          OUTPUT CONTROL VARIABLES
                IPRNT           5  PRINT CONTROL
                IPLOT           0  PLOT CONTROL
                QSCAL          0.  HYDROGRAPH PLOT SCALE
                IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                 IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                ISAV2         900  LAST ORDINATE PUNCHED OR SAVED
               TIMINT        .033  TIME INTERVAL IN HOURS

      *** FDKRUT - NEWTON RAPHSON FAILEDFIXED POINT ITERATION USED - ITERATION=  1


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

            **************
            *            *
  42 KK     *        F2  *
            *            *
            **************

  48 KO          OUTPUT CONTROL VARIABLES
                IPRNT           5  PRINT CONTROL
                IPLOT           0  PLOT CONTROL
                QSCAL          0.  HYDROGRAPH PLOT SCALE
                IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                 IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                ISAV2         900  LAST ORDINATE PUNCHED OR SAVED
               TIMINT        .033  TIME INTERVAL IN HOURS


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

            **************
            *            *
  49 KK     *        F3  *
            *            *
            **************

  55 KO          OUTPUT CONTROL VARIABLES
                IPRNT           5  PRINT CONTROL
                IPLOT           0  PLOT CONTROL
                QSCAL          0.  HYDROGRAPH PLOT SCALE
                IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                 IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                ISAV2         900  LAST ORDINATE PUNCHED OR SAVED
               TIMINT        .033  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
```

```
           **************
           *            *
 56 KK     *       G    *
           *            *
           **************

 62 KO          OUTPUT CONTROL VARIABLES
                      IPRNT          5  PRINT CONTROL
                      IPLOT          0  PLOT CONTROL
                      QSCAL         0.  HYDROGRAPH PLOT SCALE
                      IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                       IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                      ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                      ISAV2        900  LAST ORDINATE PUNCHED OR SAVED
                     TIMINT       .033  TIME INTERVAL IN HOURS


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

           **************
           *            *
 63 KK     *       H1   *
           *            *
           **************

 69 KO          OUTPUT CONTROL VARIABLES
                      IPRNT          5  PRINT CONTROL
                      IPLOT          0  PLOT CONTROL
                      QSCAL         0.  HYDROGRAPH PLOT SCALE
                      IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                       IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                      ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                      ISAV2        900  LAST ORDINATE PUNCHED OR SAVED
                     TIMINT       .033  TIME INTERVAL IN HOURS


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

           **************
           *            *
 70 KK     *       L    *
           *            *
           **************

 76 KO          OUTPUT CONTROL VARIABLES
                      IPRNT          5  PRINT CONTROL
                      IPLOT          0  PLOT CONTROL
                      QSCAL         0.  HYDROGRAPH PLOT SCALE
                      IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                       IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                      ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                      ISAV2        900  LAST ORDINATE PUNCHED OR SAVED
                     TIMINT       .033  TIME INTERVAL IN HOURS


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

           **************
           *            *
 77 KK     *       M    *
           *            *
           **************

 83 KO          OUTPUT CONTROL VARIABLES
                      IPRNT          5  PRINT CONTROL
                      IPLOT          0  PLOT CONTROL
                      QSCAL         0.  HYDROGRAPH PLOT SCALE
                      IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                       IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                      ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                      ISAV2        900  LAST ORDINATE PUNCHED OR SAVED
                     TIMINT       .033  TIME INTERVAL IN HOURS


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

           **************
           *            *
 84 KK     *       N    *
           *            *
           **************

 90 KO          OUTPUT CONTROL VARIABLES
                      IPRNT          5  PRINT CONTROL
                      IPLOT          0  PLOT CONTROL
                      QSCAL         0.  HYDROGRAPH PLOT SCALE
                      IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                       IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                      ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                      ISAV2        900  LAST ORDINATE PUNCHED OR SAVED
                     TIMINT       .033  TIME INTERVAL IN HOURS
1
```

EX-2.OH1
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	E1	26.	3.43	4.	1.	1.	.06		
+	HYDROGRAPH AT	E2	27.	3.30	3.	1.	1.	.05		
+	2 COMBINED AT	COMBE	49.	3.33	7.	2.	1.	.11		
+	HYDROGRAPH AT	F1	19.	3.33	2.	1.	0.	.04		
+	HYDROGRAPH AT	F2	9.	3.27	1.	0.	0.	.01		
+	HYDROGRAPH AT	F3	8.	3.27	1.	0.	0.	.01		
+	HYDROGRAPH AT	G	7.	3.37	1.	0.	0.	.02		
+	HYDROGRAPH AT	H1	28.	3.37	4.	1.	1.	.06		
+	HYDROGRAPH AT	L	8.	3.17	1.	0.	0.	.01		
+	HYDROGRAPH AT	M	11.	3.20	1.	0.	0.	.01		
+	HYDROGRAPH AT	N	8.	3.20	1.	0.	0.	.01		
+	8 COMBINED AT	CLEAR	85.	3.30	12.	3.	2.	.17		

1

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

ISTAQ	ELEMENT	DT (MIN)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)	INTERPOLATED TO COMPUTATION INTERVAL DT (MIN)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)
FOR STORM = 1 STORM AREA (SQ MI) = .01									
E1	MANE	1.85	25.97	206.70	.63	2.00	25.95	206.00	.63

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .2057E+01 OUTFLOW= .2042E+01 BASIN STORAGE= .1681E-02 PERCENT ERROR= .7

FOR STORM = 1 STORM AREA (SQ MI) = .01									
E2	MANE	2.00	27.30	196.30	.63	2.00	27.05	198.00	.63

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1551E+01 OUTFLOW= .1541E+01 BASIN STORAGE= .5151E-03 PERCENT ERROR= .7

FOR STORM = 1 STORM AREA (SQ MI) = .01									
F1	MANE	1.98	19.30	199.10	.63	2.00	19.19	200.00	.63

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1214E+01 OUTFLOW= .1204E+01 BASIN STORAGE= .5067E-03 PERCENT ERROR= .8

FOR STORM = 1 STORM AREA (SQ MI) = .01									
F2	MANE	1.71	8.55	195.83	.63	2.00	8.53	196.00	.63

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .4722E+00 OUTFLOW= .4686E+00 BASIN STORAGE= .1519E-03 PERCENT ERROR= .7

FOR STORM = 1 STORM AREA (SQ MI) = .01									
F3	MANE	1.06	7.64	196.27	.63	2.00	7.63	196.00	.63

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .4385E+00 OUTFLOW= .4352E+00 BASIN STORAGE= .1636E-03 PERCENT ERROR= .7

FOR STORM = 1 STORM AREA (SQ MI) = .01									
G	MANE	1.01	7.50	201.08	.63	2.00	7.49	202.00	.63

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .5396E+00 OUTFLOW= .5361E+00 BASIN STORAGE= .3341E-03 PERCENT ERROR= .6

FOR STORM = 1 STORM AREA (SQ MI) = .01									
H1	MANE	2.00	27.81	202.87	.63	2.00	27.65	202.00	.63

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1990E+01 OUTFLOW= .1974E+01 BASIN STORAGE= .1180E-02 PERCENT ERROR= .7

FOR STORM = 1 STORM AREA (SQ MI) = .01									
L	MANE	.74	8.57	189.29	.63	2.00	8.42	190.00	.63

```
CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .3339E+00 OUTFLOW= .3322E+00 BASIN STORAGE= .3873E-04 PERCENT ERROR=    .5

          FOR STORM = 1  STORM AREA (SQ MI) =        .01
                 M  MANE          1.40      11.45    191.90       .63       2.00      11.43    192.00        .63

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .5059E+00 OUTFLOW= .5031E+00 BASIN STORAGE= .9639E-04 PERCENT ERROR=    .5

          FOR STORM = 1  STORM AREA (SQ MI) =        .01
                 N  MANE          1.73       7.98    191.88       .63       2.00       7.94    192.00        .63

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .3373E+00 OUTFLOW= .3355E+00 BASIN STORAGE= .5160E-04 PERCENT ERROR=    .5


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

10-year HEC-1 Model

```
                                                  EX-10.OH1
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   05DEC06  TIME  13:41:51   *                                       *        (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       SERENO CANYON PHASE 1
           2        ID       HEC-1 MODEL FOR SERENO CANYON
           3        ID       10-YEAR, 6-HOUR STORM
           4        ID       RAINFALL FROM NOAA ATLAS
           5        ID       SCS CURVE NUMBER SOIL LOSS PARAMETERS
           6        ID       KINEMATIC WAVE HYDROGRAPH ROUTING
           7        ID       EXISTING CONDITIONS
           8        ID       SERENO CANYON PHASE 1 INCLUDES DRAINAGE BASINS E1,E2,F1,F2,F3,G,H1,L,M,N
           9        ID
          10        ID       PREPARED BY WOOD/PATEL, 8.21.2006
          11        ID       FILE NAME:  EX-10.DAT
          12        ID
                    *DIAGRAM
          13        IT       2                 900
          14        IO       5
          15        JD              .01
          16        PH                     0.52    0.99    1.64    1.87    2.01    2.29

          17        KK      E1
          18        KM  RUNOFF FROM SUB-BASIN E1
          19        BA    .061
          20        LS              88
          21        UK     400     .02    0.13     100
          22        RK    2050    .013    .032            TRAP       7       5
          23        KO                                      22

          24        KK      E2
          25        KM  RUNOFF FROM SUB-BASIN E2
          26        BA    .046
          27        LS              88
          28        UK     200     .02    0.13     100
          29        RK    2370    .013    .032            TRAP      10       5
          30        KO                                      22

          31        KK   COMBE
          32        KM  COMBINE SECTIONS E1 AND E2
          33        HC       2
          34        KO                                      22

          35        KK      F1
          36        KM  RUNOFF FROM SUB-BASIN F1
          37        BA    .036
          38        LS              88
          39        UK     225    .018    0.13     100
          40        RK    2500    .012    .032            TRAP       7       5
          41        KO                                      22

          42        KK      F2
          43        KM  RUNOFF FROM SUB-BASIN F2
          44        BA    .014
          45        LS              88
          46        UK     200    .018    0.13     100
          47        RK    1440    .028    .032            TRAP       6       5
          48        KO                                      22
1                                         HEC-1 INPUT                                          PAGE  2

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

          49        KK      F3
          50        KM  RUNOFF FROM SUB-BASIN F3
          51        BA    .013
          52        LS              88
          53        UK     225    .018    0.13     100
          54        RK     850    .026    .032            TRAP       6       5
          55        KO                                      22

          56        KK       G
```

```
 57          KM   RUNOFF FROM SUB-BASIN G
 58          BA    0.016
 59          LS              88
 60          UK     400    .025    0.13      100
 61          RK     720    .022    .032                TRAP        4       5
 62          KO                                         22

 63          KK      H1
 64          KM   RUNOFF FROM SUB-BASIN H1
 65          BA     .059
 66          LS              88
 67          UK     375    .025    0.13      100
 68          RK    2210    .019    .032                TRAP        8       5
 69          KO                                         22

 70          KK       L
 71          KM   RUNOFF FROM SUB-BASIN L
 72          BA   0.0099
 73          LS              88       0
 74          UK     113    .018    0.13      100
 75          RK     450    .012    .032                TRAP        5       5
 76          KO                                         22

 77          KK       M
 78          KM   RUNOFF FROM SUB-BASIN M
 79          BA    0.015
 80          LS              88       0
 81          UK     137    .018    0.13      100
 82          RK     960    .012    .032                TRAP        4       5
 83          KO                                         22
             *

 84          KK    CLEAR
 85          KM   CLEAR HYDROGRAPH STACK
 86          HC        8
             *

 87          KK       N
 88          KM   RUNOFF FROM SUB-BASIN N
 89          BA     0.01
 90          LS              88       0
 91          UK     117    .018    0.13      100
 92          RK    1036    .012    .032                TRAP        5       5
 93          KO                                         22
 94          ZZ
```

```
1
               SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING           (--->) DIVERSION OR PUMP FLOW

  NO.       (.) CONNECTOR         (<---) RETURN OF DIVERTED OR PUMPED FLOW

  17        E1
             .
  24         .         E2
             .          .
  31    COMBE...........
             .
  35         .         F1
             .          .
  42         .          .         F2
             .          .          .
  49         .          .          .         F3
             .          .          .          .
  56         .          .          .          .         G
             .          .          .          .         .
  63         .          .          .          .         .         H1
             .          .          .          .         .          .
  70         .          .          .          .         .          .         L
             .          .          .          .         .          .         .
  77         .          .          .          .         .          .         .         M
             .          .          .          .         .          .         .         .
  84    CLEAR......................................................................................

             .
  87         .         N

(***) 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    05DEC06  TIME  13:41:51  *                  *          (916) 756-1104              *
 *                                      *                  *                                      *
****************************************                  ****************************************
```

```
                        SERENO CANYON PHASE 1
                        HEC-1 MODEL FOR SERENO CANYON
                        10-YEAR, 6-HOUR STORM
                        RAINFALL FROM NOAA ATLAS
```

```
                                        EX-10.OH1
                        SCS CURVE NUMBER SOIL LOSS PARAMETERS
                        KINEMATIC WAVE HYDROGRAPH ROUTING
                        EXISTING CONDITIONS
                        SERENO CANYON PHASE 1 INCLUDES DRAINAGE BASINS E1,E2,F1,F2,F3,G,H1,L,M,N

                        PREPARED BY WOOD/PATEL, 8.21.2006
                        FILE NAME:  EX-10.DAT

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

    IT           HYDROGRAPH TIME DATA
                        NMIN           2  MINUTES IN COMPUTATION INTERVAL
                       IDATE      1    0  STARTING DATE
                       ITIME        0000  STARTING TIME
                          NQ         900  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE      2    0  ENDING DATE
                      NDTIME        0558  ENDING TIME
                       ICENT          19  CENTURY MARK

              COMPUTATION INTERVAL     .03 HOURS
                   TOTAL TIME BASE   29.97 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

 15 JD           INDEX STORM NO. 1
                        STRM        2.29  PRECIPITATION DEPTH
                        TRDA         .01  TRANSPOSITION DRAINAGE AREA

 16 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       .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       .03       .03       .04       .04       .05       .06       .08       .11       .21
                     .21       .17       .10       .08       .05       .04       .04       .04       .03       .02
                     .02       .02       .02       .02       .02       .01       .01       .01       .01       .01
                     .01       .01       .01       .01       .01       .01       .01       .01       .01       .01
                     .01       .01       .01       .01       .00       .00       .00       .00       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .00       .00       .00

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

           **************
           *            *
 17 KK     *     E1     *
           *            *
           **************

 23 KO           OUTPUT CONTROL VARIABLES
                       IPRNT           5  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE
                       IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                        IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                       ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                       ISAV2         900  LAST ORDINATE PUNCHED OR SAVED
                      TIMINT        .033  TIME INTERVAL IN HOURS


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

           **************
           *            *
 24 KK     *     E2     *
           *            *
           **************

 30 KO           OUTPUT CONTROL VARIABLES
                       IPRNT           5  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE
                       IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                        IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                       ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                       ISAV2         900  LAST ORDINATE PUNCHED OR SAVED
                      TIMINT        .033  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
```

```
              **************
              *            *
 31 KK        *    COMBE   *
              *            *
              **************

 34 KO            OUTPUT CONTROL VARIABLES
                        IPRNT           5  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
                        IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                         IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2         900  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT        .033  TIME INTERVAL IN HOURS


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

              **************
              *            *
 35 KK        *       F1   *
              *            *
              **************

 41 KO            OUTPUT CONTROL VARIABLES
                        IPRNT           5  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
                        IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                         IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2         900  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT        .033  TIME INTERVAL IN HOURS


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

              **************
              *            *
 42 KK        *       F2   *
              *            *
              **************

 48 KO            OUTPUT CONTROL VARIABLES
                        IPRNT           5  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
                        IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                         IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2         900  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT        .033  TIME INTERVAL IN HOURS


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

              **************
              *            *
 49 KK        *       F3   *
              *            *
              **************

 55 KO            OUTPUT CONTROL VARIABLES
                        IPRNT           5  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
                        IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                         IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2         900  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT        .033  TIME INTERVAL IN HOURS


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

              **************
              *            *
 56 KK        *        G   *
              *            *
              **************

 62 KO            OUTPUT CONTROL VARIABLES
                        IPRNT           5  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
                        IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                         IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2         900  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT        .033  TIME INTERVAL IN HOURS
```

```
*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

             **************
             *            *
  63 KK      *       H1   *
             *            *
             **************

  69 KO          OUTPUT CONTROL VARIABLES
                       IPRNT          5  PRINT CONTROL
                       IPLOT          0  PLOT CONTROL
                       QSCAL         0.  HYDROGRAPH PLOT SCALE
                       IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                        IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                       ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                       ISAV2        900  LAST ORDINATE PUNCHED OR SAVED
                      TIMINT       .033  TIME INTERVAL IN HOURS


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

             **************
             *            *
  70 KK      *        L   *
             *            *
             **************

  76 KO          OUTPUT CONTROL VARIABLES
                       IPRNT          5  PRINT CONTROL
                       IPLOT          0  PLOT CONTROL
                       QSCAL         0.  HYDROGRAPH PLOT SCALE
                       IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                        IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                       ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                       ISAV2        900  LAST ORDINATE PUNCHED OR SAVED
                      TIMINT       .033  TIME INTERVAL IN HOURS


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

             **************
             *            *
  77 KK      *        M   *
             *            *
             **************

  83 KO          OUTPUT CONTROL VARIABLES
                       IPRNT          5  PRINT CONTROL
                       IPLOT          0  PLOT CONTROL
                       QSCAL         0.  HYDROGRAPH PLOT SCALE
                       IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                        IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                       ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                       ISAV2        900  LAST ORDINATE PUNCHED OR SAVED
                      TIMINT       .033  TIME INTERVAL IN HOURS


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

             **************
             *            *
  87 KK      *        N   *
             *            *
             **************

  93 KO          OUTPUT CONTROL VARIABLES
                       IPRNT          5  PRINT CONTROL
                       IPLOT          0  PLOT CONTROL
                       QSCAL         0.  HYDROGRAPH PLOT SCALE
                       IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                        IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                       ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                       ISAV2        900  LAST ORDINATE PUNCHED OR SAVED
                      TIMINT       .033  TIME INTERVAL IN HOURS
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	E1	67.	3.27	8.	2.	2.	.06		
+	HYDROGRAPH AT	E2	65.	3.20	6.	1.	1.	.05		
+	2 COMBINED AT	COMBE	126.	3.23	14.	3.	3.	.11		

+ HYDROGRAPH AT	F1	47.	3.23	5.	1.	1.	.04
+ HYDROGRAPH AT	F2	21.	3.17	2.	0.	0.	.01
+ HYDROGRAPH AT	F3	19.	3.17	2.	0.	0.	.01
+ HYDROGRAPH AT	G	19.	3.23	2.	1.	0.	.02
+ HYDROGRAPH AT	H1	70.	3.23	8.	2.	2.	.06
+ HYDROGRAPH AT	L	19.	3.10	1.	0.	0.	.01
+ HYDROGRAPH AT	M	27.	3.13	2.	0.	0.	.01
+ 8 COMBINED AT	CLEAR	324.	3.20	35.	9.	7.	.27
+ HYDROGRAPH AT	N	18.	3.13	1.	0.	0.	.01

1

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

ISTAQ	ELEMENT	DT (MIN)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)	DT (MIN)	INTERPOLATED TO COMPUTATION INTERVAL PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)
FOR STORM = 1 STORM AREA (SQ MI) = .01									
E1	MANE	1.86	66.55	195.99	1.20	2.00	66.55	196.00	1.20

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .3915E+01 OUTFLOW= .3895E+01 BASIN STORAGE= .1651E-02 PERCENT ERROR= .5

FOR STORM = 1 STORM AREA (SQ MI) = .01									
E2	MANE	2.00	65.93	191.46	1.20	2.00	65.44	192.00	1.20

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .2953E+01 OUTFLOW= .2937E+01 BASIN STORAGE= .5186E-03 PERCENT ERROR= .5

FOR STORM = 1 STORM AREA (SQ MI) = .01									
F1	MANE	1.88	47.77	193.48	1.20	2.00	47.39	194.00	1.20

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .2311E+01 OUTFLOW= .2297E+01 BASIN STORAGE= .5291E-03 PERCENT ERROR= .6

FOR STORM = 1 STORM AREA (SQ MI) = .01									
F2	MANE	1.37	21.16	190.57	1.20	2.00	21.06	190.00	1.20

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .8986E+00 OUTFLOW= .8950E+00 BASIN STORAGE= .1544E-03 PERCENT ERROR= .4

FOR STORM = 1 STORM AREA (SQ MI) = .01									
F3	MANE	.85	19.08	190.44	1.20	2.00	19.04	190.00	1.20

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .8344E+00 OUTFLOW= .8306E+00 BASIN STORAGE= .1711E-03 PERCENT ERROR= .4

FOR STORM = 1 STORM AREA (SQ MI) = .01									
G	MANE	.84	18.87	194.76	1.20	2.00	18.84	194.00	1.20

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1027E+01 OUTFLOW= .1020E+01 BASIN STORAGE= .3250E-03 PERCENT ERROR= .6

FOR STORM = 1 STORM AREA (SQ MI) = .01									
H1	MANE	1.68	70.36	194.24	1.20	2.00	69.96	194.00	1.20

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .3787E+01 OUTFLOW= .3764E+01 BASIN STORAGE= .1280E-02 PERCENT ERROR= .6

FOR STORM = 1 STORM AREA (SQ MI) = .01									
L	MANE	.59	19.27	186.51	1.20	2.00	19.19	186.00	1.20

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .6355E+00 OUTFLOW= .6340E+00 BASIN STORAGE= .4611E-04 PERCENT ERROR= .2

FOR STORM = 1 STORM AREA (SQ MI) = .01									
M	MANE	1.18	26.72	188.17	1.20	2.00	26.64	188.00	1.20

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .9628E+00 OUTFLOW= .9601E+00 BASIN STORAGE= .8983E-04 PERCENT ERROR= .3

FOR STORM = 1 STORM AREA (SQ MI) = .01									
N	MANE	1.44	18.20	187.71	1.20	2.00	18.08	188.00	1.20

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .6419E+00 OUTFLOW= .6400E+00 BASIN STORAGE= .5152E-04 PERCENT ERROR= .3

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

100-year HEC-1 Model

```
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   05DEC06  TIME  13:41:22  *                     *       (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        SERENO CANYON PHASE 1
      2         ID        HEC-1 MODEL FOR SERENO CANYON
      3         ID        100-YEAR, 6-HOUR STORM
      4         ID        RAINFALL FROM NOAA ATLAS
      5         ID        SCS CURVE NUMBER SOIL LOSS PARAMETERS
      6         ID        KINEMATIC WAVE HYDROGRAPH ROUTING
      7         ID        EXISTING CONDITIONS
      8         ID        SERENO CANYON PHASE 1 INCLUDES DRAINAGE BASINS E1,E2,F1,F2,F3,G,H1,L,M,N
      9         ID
     10         ID        PREPARED BY WOOD/PATEL, 8.21.2006
     11         ID        FILE NAME:  EX-100.DAT
     12         ID
                *DIAGRAM
     13         IT       2                       900
     14         IO       5
     15         JD               .01
     16         PH                       .73    1.43    2.42    2.74    2.96    3.37

     17         KK      E1
     18         KM  RUNOFF FROM SUB-BASIN E1
     19         BA    .061
     20         LS               88
     21         UK     400      .02     0.13     100
     22         RK    2050     .013     .032             TRAP       7       5
     23         KO                                         22

     24         KK      E2
     25         KM  RUNOFF FROM SUB-BASIN E2
     26         BA   0.046
     27         LS               88
     28         UK     200      .02     0.13     100
     29         RK    2370     .013     .032             TRAP      10       5
     30         KO                                         22

     31         KK   COMBE
     32         KM  COMBINE SECTIONS E1 AND E2
     33         HC       2
     34         KO                                         22
                *

     35         KK      F1
     36         KM  RUNOFF FROM SUB-BASIN F1
     37         BA    .036
     38         LS               88
     39         UK     225     .018     0.13     100
     40         RK    2500     .012     .032             TRAP       7       5
     41         KO                                         22

     42         KK      F2
     43         KM  RUNOFF FROM SUB-BASIN F2
     44         BA    .014
     45         LS               88
     46         UK     200     .018     0.13     100
     47         RK    1440     .028     .032             TRAP       6       5
     48         KO                                         22
1                                    HEC-1 INPUT                                                PAGE  2

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

     49         KK      F3
     50         KM  RUNOFF FROM SUB-BASIN F3
     51         BA    .013
     52         LS               88
     53         UK     225     .018     0.13     100
     54         RK     850     .026     .032             TRAP       6       5
     55         KO                                         22
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 56           KK       G
 57           KM   RUNOFF FROM SUB-BASIN G
 58           BA   0.016
 59           LS             88
 60           UK      400   .025     0.13      100
 61           RK      720   .022     .032                TRAP        4         5
 62           KO                                           22

 63           KK      H1
 64           KM   RUNOFF FROM SUB-BASIN H1
 65           BA    .059
 66           LS             88
 67           UK      375   .025     0.13      100
 68           RK     2210   .019     .032                TRAP        8         5
 69           KO                                           22

 70           KK       L
 71           KM   RUNOFF FROM SUB-BASIN L
 72           BA   0.0099
 73           LS             88        0
 74           UK      113   .018     0.13      100
 75           RK      450   0.02     .032                TRAP        5         5
 76           KO                                           22

 77           KK       M
 78           KM   RUNOFF FROM SUB-BASIN M
 79           BA    0.015
 80           LS             88        0
 81           UK      137   .018     0.13      100
 82           RK      960  0.012    0.032                TRAP        4         5
 83           KO                                           22

 84           KK    CLEAR
 85           KM   CLEAR HYDROGRAPH STACK
 86           HC       8
              *

 87           KK       N
 88           KM   RUNOFF FROM SUB-BASIN N
 89           BA    0.01
 90           LS             88        0
 91           UK      117   .018     0.13      100
 92           RK     1036   .012     .032                TRAP        5         5
 93           KO                                           22
 94           ZZ
1
              SCHEMATIC DIAGRAM OF STREAM NETWORK
INPUT
 LINE     (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

  NO.     (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

  17        E1
            .
  24        .         E2
            .         .
            .         .
  31    COMBE..........
            .
  35        .         F1
            .         .
  42        .         .         F2
            .         .         .
  49        .         .         .         F3
            .         .         .         .
  56        .         .         .         .         G
            .         .         .         .         .
  63        .         .         .         .         .         H1
            .         .         .         .         .         .
  70        .         .         .         .         .         .         L
            .         .         .         .         .         .         .
  77        .         .         .         .         .         .         .         M
            .         .         .         .         .         .         .         .
  84    CLEAR...........................................................................
            .
  87        .         N

(***) 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   05DEC06  TIME  13:41:22   *                     *           (916) 756-1104              *
 *                                       *                     *                                       *
 *****************************************                     *****************************************


                    SERENO CANYON PHASE 1
                    HEC-1 MODEL FOR SERENO CANYON
                    100-YEAR, 6-HOUR STORM
                    RAINFALL FROM NOAA ATLAS
```

```
                                                  EX-100.OH1
                      SCS CURVE NUMBER SOIL LOSS PARAMETERS
                      KINEMATIC WAVE HYDROGRAPH ROUTING
                      EXISTING CONDITIONS
                      SERENO CANYON PHASE 1 INCLUDES DRAINAGE BASINS E1,E2,F1,F2,F3,G,H1,L,M,N

                      PREPARED BY WOOD/PATEL, 8.21.2006
                      FILE NAME:  EX-100.DAT

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

     IT          HYDROGRAPH TIME DATA
                        NMIN          2  MINUTES IN COMPUTATION INTERVAL
                       IDATE      1   0  STARTING DATE
                       ITIME       0000  STARTING TIME
                          NQ        900  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE      2   0  ENDING DATE
                      NDTIME       0558  ENDING TIME
                       ICENT         19  CENTURY MARK

                  COMPUTATION INTERVAL     .03 HOURS
                       TOTAL TIME BASE   29.97 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

  15 JD           INDEX STORM NO. 1
                        STRM       3.37  PRECIPITATION DEPTH
                        TRDA        .01  TRANSPOSITION DRAINAGE AREA

  16 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       .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       .01       .01       .01       .01       .01       .01       .01       .01
                     .01       .01       .01       .01       .01       .03       .03       .03       .03       .03
                     .04       .04       .04       .06       .06       .07       .09       .12       .17       .29
                     .29       .24       .15       .11       .07       .07       .06       .05       .04       .04
                     .04       .03       .03       .03       .03       .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       .01       .01       .01       .01       .01
                     .01       .01       .01       .01       .01       .01       .01       .01       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .00       .00       .00

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

            **************
            *            *
  17 KK     *      E1    *
            *            *
            **************

  23 KO          OUTPUT CONTROL VARIABLES
                       IPRNT          5  PRINT CONTROL
                       IPLOT          0  PLOT CONTROL
                       QSCAL         0.  HYDROGRAPH PLOT SCALE
                       IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                        IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                       ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                       ISAV2        900  LAST ORDINATE PUNCHED OR SAVED
                      TIMINT       .033  TIME INTERVAL IN HOURS


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

            **************
            *            *
  24 KK     *      E2    *
            *            *
            **************

  30 KO          OUTPUT CONTROL VARIABLES
                       IPRNT          5  PRINT CONTROL
                       IPLOT          0  PLOT CONTROL
                       QSCAL         0.  HYDROGRAPH PLOT SCALE
                       IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                        IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                       ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                       ISAV2        900  LAST ORDINATE PUNCHED OR SAVED
                      TIMINT       .033  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
```

```
            **************
            *            *
 31 KK      *    COMBE   *
            *            *
            **************

 34 KO          OUTPUT CONTROL VARIABLES
                        IPRNT          5  PRINT CONTROL
                        IPLOT          0  PLOT CONTROL
                        QSCAL         0.  HYDROGRAPH PLOT SCALE
                        IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                         IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2        900  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT       .033  TIME INTERVAL IN HOURS


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

            **************
            *            *
 35 KK      *       F1   *
            *            *
            **************

 41 KO          OUTPUT CONTROL VARIABLES
                        IPRNT          5  PRINT CONTROL
                        IPLOT          0  PLOT CONTROL
                        QSCAL         0.  HYDROGRAPH PLOT SCALE
                        IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                         IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2        900  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT       .033  TIME INTERVAL IN HOURS


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

            **************
            *            *
 42 KK      *       F2   *
            *            *
            **************

 48 KO          OUTPUT CONTROL VARIABLES
                        IPRNT          5  PRINT CONTROL
                        IPLOT          0  PLOT CONTROL
                        QSCAL         0.  HYDROGRAPH PLOT SCALE
                        IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                         IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2        900  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT       .033  TIME INTERVAL IN HOURS


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

            **************
            *            *
 49 KK      *       F3   *
            *            *
            **************

 55 KO          OUTPUT CONTROL VARIABLES
                        IPRNT          5  PRINT CONTROL
                        IPLOT          0  PLOT CONTROL
                        QSCAL         0.  HYDROGRAPH PLOT SCALE
                        IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                         IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2        900  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT       .033  TIME INTERVAL IN HOURS


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

            **************
            *            *
 56 KK      *        G   *
            *            *
            **************

 62 KO          OUTPUT CONTROL VARIABLES
                        IPRNT          5  PRINT CONTROL
                        IPLOT          0  PLOT CONTROL
                        QSCAL         0.  HYDROGRAPH PLOT SCALE
                        IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                         IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2        900  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT       .033  TIME INTERVAL IN HOURS
```

*** ***

```
              **************
              *            *
  63 KK       *       H1   *
              *            *
              **************

  69 KO          OUTPUT CONTROL VARIABLES
                       IPRNT          5  PRINT CONTROL
                       IPLOT          0  PLOT CONTROL
                       QSCAL         0.  HYDROGRAPH PLOT SCALE
                       IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                        IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                       ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                       ISAV2        900  LAST ORDINATE PUNCHED OR SAVED
                      TIMINT       .033  TIME INTERVAL IN HOURS
```

*** ***

```
              **************
              *            *
  70 KK       *        L   *
              *            *
              **************

  76 KO          OUTPUT CONTROL VARIABLES
                       IPRNT          5  PRINT CONTROL
                       IPLOT          0  PLOT CONTROL
                       QSCAL         0.  HYDROGRAPH PLOT SCALE
                       IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                        IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                       ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                       ISAV2        900  LAST ORDINATE PUNCHED OR SAVED
                      TIMINT       .033  TIME INTERVAL IN HOURS
```

*** ***

```
              **************
              *            *
  77 KK       *        M   *
              *            *
              **************

  83 KO          OUTPUT CONTROL VARIABLES
                       IPRNT          5  PRINT CONTROL
                       IPLOT          0  PLOT CONTROL
                       QSCAL         0.  HYDROGRAPH PLOT SCALE
                       IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                        IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                       ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                       ISAV2        900  LAST ORDINATE PUNCHED OR SAVED
                      TIMINT       .033  TIME INTERVAL IN HOURS
```

*** ***

```
              **************
              *            *
  87 KK       *        N   *
              *            *
              **************

  93 KO          OUTPUT CONTROL VARIABLES
                       IPRNT          5  PRINT CONTROL
                       IPLOT          0  PLOT CONTROL
                       QSCAL         0.  HYDROGRAPH PLOT SCALE
                       IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                        IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                       ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                       ISAV2        900  LAST ORDINATE PUNCHED OR SAVED
                      TIMINT       .033  TIME INTERVAL IN HOURS
```

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	E1	146.	3.20	14.	4.	3.	.06		
+	HYDROGRAPH AT	E2	131.	3.13	11.	3.	2.	.05		
+	2 COMBINED AT	COMBE	275.	3.17	25.	6.	5.	.11		

```
          HYDROGRAPH AT
+                            F1        99.    3.17          8.          2.          2.       .04
          HYDROGRAPH AT
+                            F2        43.    3.13          3.          1.          1.       .01
          HYDROGRAPH AT
+                            F3        39.    3.13          3.          1.          1.       .01
          HYDROGRAPH AT
+                            G         41.    3.17          4.          1.          1.       .02
          HYDROGRAPH AT
+                            H1       152.    3.17         14.          3.          3.       .06
          HYDROGRAPH AT
+                            L         36.    3.07          2.          1.          0.       .01
          HYDROGRAPH AT
+                            M         52.    3.10          3.          1.          1.       .01
          8 COMBINED AT
+                          CLEAR      704.    3.17         62.         16.         12.       .27
          HYDROGRAPH AT
+                            N         35.    3.10          2.          1.          0.       .01
1
                                 SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                    (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                         INTERPOLATED TO
                                                                     COMPUTATION INTERVAL
        ISTAQ    ELEMENT      DT       PEAK     TIME TO    VOLUME      DT       PEAK    TIME TO      VOLUME
                                                  PEAK                                    PEAK

                             (MIN)     (CFS)     (MIN)      (IN)      (MIN)     (CFS)    (MIN)        (IN)

         FOR STORM = 1  STORM AREA (SQ MI) =       .01
              E1  MANE        1.50    146.93    191.32      2.14      2.00    145.90    192.00        2.14

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .6996E+01 OUTFLOW= .6964E+01 BASIN STORAGE= .1588E-02 PERCENT ERROR=    .4

         FOR STORM = 1  STORM AREA (SQ MI) =       .01
              E2  MANE        1.80    135.47    188.91      2.14      2.00    131.38    188.00        2.14

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .5275E+01 OUTFLOW= .5261E+01 BASIN STORAGE= .4665E-03 PERCENT ERROR=    .3

         FOR STORM = 1  STORM AREA (SQ MI) =       .01
              F1  MANE        2.00     99.30    190.12      2.14      2.00     98.91    190.00        2.15

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .4129E+01 OUTFLOW= .4114E+01 BASIN STORAGE= .4961E-03 PERCENT ERROR=    .3

         FOR STORM = 1  STORM AREA (SQ MI) =       .01
              F2  MANE        1.05     42.99    186.95      2.15      2.00     42.74    188.00        2.15

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1606E+01 OUTFLOW= .1603E+01 BASIN STORAGE= .1464E-03 PERCENT ERROR=    .2

         FOR STORM = 1  STORM AREA (SQ MI) =       .01
              F3  MANE         .79     39.63    187.38      2.15      2.00     39.33    188.00        2.15

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1491E+01 OUTFLOW= .1487E+01 BASIN STORAGE= .1603E-03 PERCENT ERROR=    .2

         FOR STORM = 1  STORM AREA (SQ MI) =       .01
               G  MANE         .64     41.98    189.23      2.14      2.00     41.19    190.00        2.14

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1835E+01 OUTFLOW= .1829E+01 BASIN STORAGE= .3183E-03 PERCENT ERROR=    .3

         FOR STORM = 1  STORM AREA (SQ MI) =       .01
              H1  MANE        1.38    152.54    190.65      2.14      2.00    152.20    190.00        2.14

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .6766E+01 OUTFLOW= .6742E+01 BASIN STORAGE= .1371E-02 PERCENT ERROR=    .3

         FOR STORM = 1  STORM AREA (SQ MI) =       .01
               L  MANE         .39     36.58    184.64      2.15      2.00     35.71    184.00        2.15

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1135E+01 OUTFLOW= .1133E+01 BASIN STORAGE= .3883E-04 PERCENT ERROR=    .2

         FOR STORM = 1  STORM AREA (SQ MI) =       .01
               M  MANE         .89     51.81    186.09      2.15      2.00     51.71    186.00        2.15

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1720E+01 OUTFLOW= .1719E+01 BASIN STORAGE= .9343E-04 PERCENT ERROR=    .1

         FOR STORM = 1  STORM AREA (SQ MI) =       .01
               N  MANE        1.23     35.08    186.42      2.15      2.00     34.66    186.00        2.15

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1147E+01 OUTFLOW= .1146E+01 BASIN STORAGE= .4527E-04 PERCENT ERROR=    .1
```

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

APPENDIX C

Developed Condition Hydrologic Calculations

<u>**Interim Condition**</u>

2-year HEC-1 Model

10-year HEC-1 Model

100-year HEC-1 Model

<u>**Ultimate Condition**</u>

2-year HEC-1 Model

10-year HEC-1 Model

100-year HEC-1 Model

Interim Condition:

2-year HEC-1 Model

```
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   07DEC06  TIME  12:38:00    *                              *         (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        SERENO CANTON PHASE 1
          2      ID        HEC-1 MODEL
          3      ID        2-YEAR, 6-HOUR STORM
          4      ID        RAINFALL FROM NOAA ATLAS
          5      ID        SCS CURVE NUMBER SOIL LOSS PARAMETERS
          6      ID        KINEMATIC WAVE HYDROGRAPH ROUTING
          7      ID        DEVELOPED CONDITIONS
          8      ID        10% IMPERVIOUS AREA USED FOR SITE
          9      ID        Sereno Canyon Phase 1 includes draiange basins E1,E2,F1,F2,F3,G,H1,L,M,N
         10      ID        Original Master Plan HEC1 model updated for Phase 1 drainage basins
         11      ID        DRAINAGE BASINS E2,F1,F2,H1 FURTHER DIVIDED INTO SUBBASINS
         12      ID        INTERIM CONDITION - ONLY PHASE 1 DEVELOPED
         13      ID
         14      ID  PREPARED BY WOOD/PATEL, 8.24.2006
         15      ID  FILE NAME:  DEV-2.DAT
         16      ID
                 *DIAGRAM
         17      IT       2                     900
         18      IO       5
         19      JD               .01
         20      PH                      0.38     0.7    1.12    1.27    1.38    1.57
                 *

         21      KK      E1       5
         22      KM  RUNOFF FROM DRAINAGE SUB-BASIN E1
         23      BA    .061
         24      LS                88    2.92
         25      UK     400       .02    0.13     100
         26      RK    2050      .013    .032            TRAP       7       5
                 *

         27      KK      E2
         28      KM  RUNOFF FROM DRAINAGE SUB-BASIN E2
         29      BA    .046
         30      LS                88      10
         31      UK     200       .02    0.13     100
         32      RK    2370      .013    .032            TRAP      10       5
                 *

         33      KK  B-E2-1
         34      KM  FLOW ROUTED THROUGH DETENTION BASIN E2-1
         35      KM  2-42" PIPE CULVERT
         36      RS       1      STOR       0
         37      SV       0     0.098   0.228   0.411   0.678   1.062   1.583   1.897   2.257
         38      SE    2696      2697    2698    2699    2700    2701    2702  2702.5    2703
         39      SQ       0         0       0       0       0       0       0       0     180
         40      KO                                        22
                 *

         41      KK   COMBE
         42      KM  COMBINE RUNOFF FROM E1 AND E2
         43      HC       2
         44      KO                                        22
                 *
1                                     HEC-1 INPUT                                                 PAGE  2

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

         45      KK     F1a
         46      KM  RUNOFF FROM DRAINAGE SUB-BASIN F1a
         47      BA  0.0096
         48      LS                88      10
         49      UK     225      .018    0.13     100
         50      RK     600      .012    .032            TRAP       7       5
                 *

         51      KK  B-F1-1
```

```
 52          KM   FLOW ROUTED THROUGH DETENTION BASIN F1-1
 53          KM   30" PIPE CULVERT
 54          RS      1    STOR       0
 55          SV      0   0.118   0.251   0.402   0.553
 56          SE   2725    2726    2727    2728    2729
 57          SQ      0       0       0       0      37
 58          KO                                     22
             *

 59          KK    F1b
 60          KM   RUNOFF FROM DRAIANGE SUB-BASIN F1b
 61          BA   0.004
 62          LS             88      10
 63          UK    140   0.018    0.13     100
 64          RK    600   0.012   0.032            TRAP       7       5
             *

 65          KK    F1c
 66          KM   RUNOFF FROM SUB-BASIN F1c
 67          BA    0.01
 68          LS             88      10
 69          UK    200   0.018    0.13     100
 70          RK   1200   0.012   0.032            TRAP       7       5
             *

 71          KK   CBF1c
 72          KM   COMBINE RUNOFF FROM F1c AND CBF1b
 73          HC      2
             *

 74          KK   B-F1-2
 75          KM   FLOW ROUTED THROUGH DETENTION BASIN
 76          KM   36" PIPE CULVERT
 77          RS      1    STOR       0
 78          SV      0   0.116   0.264   0.446   0.666
 79          SE   2708    2709    2710    2711    2712
 80          SQ      0       0       0       0      50
             *

 81          KK    RF1d
 82          KM   ROUTE FLOW FROM DETENTION BASIN B-F1-2
 83          RK    700   0.012   0.032            TRAP       7       5
             *
1                                   HEC-1 INPUT                                         PAGE  3

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

 84          KK    F1d
 85          KM   RUNOFF FROM SUB-BASIN F1d
 86          BA   0.005
 87          LS             88      10
 88          UK    150   0.018    0.13     100
 89          RK    700   0.012   0.032            TRAP       7       5
             *

 90          KK   CBF1d
 91          KM   COMBINE RUNOFF FROM F1d AND RF1d
 92          HC      2
             *

 93          KK   B-F1-3
 94          KM   FLOW ROUTED THROUGH BASIN
 95          KM   30" PIPE CULVERT
 96          RS      1    STOR       0
 97          SV      0   0.196   0.418   0.671   0.958   1.286
 98          SE   2696    2697    2698    2699    2700    2701
 99          SQ      0       0       0       0      37      45
             *

100          KK    F1e
101          KM   RUNOFF FROM DRAINAGE SUB-BASIN F1e
102          BA   0.0067
103          LS             88      10
104          UK    140   0.018    0.13     100
105          RK    930   0.012   0.032            TRAP       7       5
             *

106          KK   CBF1e
107          KM   COMBINE RUNOFF FROM F1e AND RF1e
108          HC      2
             *

109          KK   B-F1-4
110          KM   FLOW ROUTED THROUGH BASIN
111          KM   12' WEIR AT HEAD WALL
112          RS      1    STOR       0
113          SV      0   0.085   0.206   0.369   0.583
114          SE   2676    2677    2678    2679    2680
115          SQ      0       0       0       0      34
116          KO                                     22
             *

117          KK    F2a
118          KM   RUNOFF FROM DRAINAGE SUBBASIN F2a
119          BA   0.0044
120          LS             88      10
121          UK    180   0.018    0.13     100
122          RK    650   0.028   0.032            TRAP       6       5
             *
1                                   HEC-1 INPUT                                         PAGE  4

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

123          KK   B-F2-1        1
```

```
KK
KM  FLOW ROUTED THROUGH DETENTION BASIN F2-1
KM  24" PIPE CULVERT
RS       1    STOR       0
SV       0   0.039   0.101   0.189   0.307
SE    2700    2701    2702    2703    2704
SQ       0       0       0       0      26
*

KK     F2b
KM  RUNOFF FROM DRAINAGE SUB-BASIN F2b
BA  0.0065
LS              88      10
UK     350    .018    0.13     100
RK     760    .028    .032            TRAP       6       5
*

KK   CBF2b
KM  COMBINE RUNOFF FROM F2b AND RF2b
HC       2
*

KK  B-F2-2
KM  FLOW ROUTED THROUGH DETENTION BASIN F2-2
KM  24" PIPE CULVERT
RS       1    STOR       0
SV       0   0.101   0.227   0.383   0.571
SE    2681    2682    2683    2684    2685
SQ       0       0       0       0      26
KO                                      22
*

KK     F2c
KM  RUNOFF FROM DRAINAGE SUB-BASIN F2c
BA  0.0034
LS              88      10
UK     175    .018    0.13     100
RK     500    .028    .032            TRAP       6       5
*

KK   CBF2c
KM  COMBINE RUNOFF FROM F2c AND RF2c
HC       2
*

KK      F3
KM  RUNOFF FROM DRAINAGE SUB-BASIN F3
BA    .013
LS              88      10
UK     225    .018    0.13     100
RK     850    .026    .032            TRAP       6       5
*
```



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

KK  B-F3-1
KM  FLOW ROUTED THROUGH DETENTION BASIN F3-1
KM  14' WEIR ROCK BERM AT OUTLET
RS       1    STOR       0
SV       0   0.033    0.09   0.175   0.289   0.438   0.625
SE    2704    2705    2706    2707    2708    2709    2710
SQ       0       0       0       0       0       0      39
KO                                      22
*

KK       G
KM  RUNOFF FROM DRAINAGE SUB-BASIN G
BA   0.016
LS              88      10
UK     400    .025    0.13     100
RK     720    .022    .032            TRAP       4       5
*

KK   B-G-1
KM  FLOW ROUTED THROUGH DETENTION BASIN G-1
KM  15' WEIR
RS       1    STOR       0
SV       0    0.07   0.162   0.282   0.437   0.632
SE    2722    2723    2724    2725    2726    2727
SQ       0       0       0       0       0      42
KO                                      22

KK   CLEAR
KM  CLEAR HYDROGRAPH STACK
HC       6
*

KK     H1a
KM  RUNOFF FROM DRAINAGE SUB-BASIN H1a
BA   0.027
LS              88
UK     150    .025    0.13     100
RK    1850    .019    .032            TRAP       8       5
*

KK  B-H1-1
KM  FLOW ROUTED THROUGH DETENTION BASIN H1-1
KM  2-36" PIPE CULVERT
RS       1    STOR       0
SV       0   0.009   0.046   0.132   0.284    0.51   0.822    1.24   1.497   1.809
SE    2738    2739    2740    2741    2742    2743    2744    2745  2745.5    2746
SQ       0       0       0       0       0       0       0       0       0     170
*
```

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

 200          KK     H1b
 201          KM  RUNOFF FROM DRAINAGE SUB-BASIN H1b
 202          BA  0.0041
 203          LS              88
 204          UK     160    .025    0.13     100
 205          RK     550    .019    .032             TRAP       8       5
              *

 206          KK     H1c
 207          KM  RUNOFF FROM DRAINAGE SUB-BASIN H1c
 208          BA   0.014
 209          LS              88    2.76
 210          UK     200    .025    0.13     100
 211          RK     950    .019    .032             TRAP       8       5
              *

 212          KK   CBH1c
 213          KM  COMBINE RUNOFF FROM H1a, H1b & H1c
 214          HC       3
              *

 215          KK    RH1d
 216          KM  ROUTE FLOW COMBINED CBH1c
 217          RK     700   0.028   0.032             TRAP       6       5
              *

 218          KK     H1d
 219          KM  RUNOFF FROM DRAINAGE SUB-BASIN H1d
 220          BA   0.013
 221          LS              88    1.47
 222          UK     250    .025    0.13     100
 223          RK     700    .019    .032             TRAP       8       5
              *

 224          KK   CBH1d
 225          KM  COMBINE RUNOFF FROM H1d AND CBH1c
 226          HC       2
              *

 227          KK  B-H1-2
 228          KM  FLOW ROUTED THROUGH DETENTION BASIN H1-2
 229          KM  36' WEIR
 230          RS       1    STOR       0
 231          SV       0   0.038   0.104   0.212   0.363   0.579
 232          SE    2721    2722    2723    2724    2725  2726.1
 233          SQ       0       0       0       0       0     102
 234          KO                                      22
              *
```

1 HEC-1 INPUT PAGE 7

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

 235          KK       L
 236          KM  RUNOFF FROM DRAINAGE SUB-BASIN L
 237          BA  0.0099
 238          LS              88    9.09
 239          UK     113   0.018    0.13     100
 240          RK     450    .012    .032             TRAP       5       5
              *

 241          KK   B-L-1
 242          KM  FLOW ROUTED THROUGH DETENTION BASIN L-1
 243          KM  13' WEIR
 244          RS       1    STOR       0
 245          SV       0   0.056   0.139   0.253   0.403
 246          SE    2722    2723    2724    2725    2726
 247          SQ       0       0       0       0      36
 248          KO                                      22
              *

 249          KK       M
 250          KM  RUNOFF FROM DRAINAGE SUB-BASIN M
 251          BA   0.015
 252          LS              88     5.3
 253          UK     137    .018    0.13     100
 254          RK     960    .012    .032             TRAP       4       5
              *

 255          KK   B-M-1
 256          KM  FLOW ROUTED THROUGH DETENTION BASIN M-1
 257          KM  7' WEIR
 258          RS       1    STOR       0
 259          SV       0    0.06   0.134   0.225   0.334   0.463
 260          SE    2713    2714    2715    2716    2717    2718
 261          SQ       0       0       0       0      20      55
 262          KO                                      22
              *

 263          KK       N
 264          KM  RUNOFF FROM DRAINAGE SUB-BASIN N
 265          BA     .01
 266          LS              88      10
 267          UK     117    .018    0.13     100
 268          RK    1036    .012    .032             TRAP       5       5
              *

 269          KK   B-N-1
 270          KM  FLOW ROUTED THROUGH DETENTION BASIN N-1
 271          KM  100' ROCK BERM AT OUTLET
 272          RS       1    STOR       0
 273          SV       0   0.066    0.16   0.286   0.447   0.646
 274          SE    2688    2689    2690    2691    2692    2693
```

```
                                                                   DEV-INT-2.OH1
     275           SQ      0       0       0       0       0      36
     276           KO                                     22
     277           ZZ
1
                 SCHEMATIC DIAGRAM OF STREAM NETWORK
INPUT
 LINE     (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

  NO.     (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

   21       E1
             .
             .
   27        .          E2
             .           V
             .           V
   33        .      B-E2-1
             .           .
             .           .
   41    COMBE............
             .
             .
   45        .         F1a
             .           V
             .           V
   51        .      B-F1-1
             .           .
             .           .
   59        .           .         F1b
             .           .           .
             .           .           .
   65        .           .           .         F1c
             .           .           .           .
             .           .           .           .
   71        .           .       CBF1c............
             .           .           V
             .           .           V
   74        .           .      B-F1-2
             .           .           V
             .           .           V
   81        .           .        RF1d
             .           .           .
             .           .           .
   84        .           .           .         F1d
             .           .           .           .
             .           .           .           .
   90        .           .       CBF1d............
             .           .           V
             .           .           V
   93        .           .      B-F1-3
             .           .           .
             .           .           .
  100        .           .           .         F1e
             .           .           .           .
             .           .           .           .
  106        .           .       CBF1e............
             .           .           V
             .           .           V
  109        .           .      B-F1-4
             .           .           .
             .           .           .
  117        .           .           .         F2a
             .           .           .           V
             .           .           .           V
  123        .           .           .      B-F2-1
             .           .           .           .
             .           .           .           .
  130        .           .           .           .         F2b
             .           .           .           .           .
             .           .           .           .           .
  136        .           .           .       CBF2b............
             .           .           .           V
             .           .           .           V
  139        .           .           .      B-F2-2
             .           .           .           .
             .           .           .           .
  147        .           .           .           .         F2c
             .           .           .           .           .
             .           .           .           .           .
  153        .           .           .       CBF2c............
             .           .           .           .
             .           .           .           .
  156        .           .           .           .          F3
             .           .           .           .           V
             .           .           .           .           V
  162        .           .           .           .      B-F3-1
             .           .           .           .           .
             .           .           .           .           .
  170        .           .           .           .           .           G
             .           .           .           .           .           V
             .           .           .           .           .           V
  176        .           .           .           .           .       B-G-1
             .           .           .           .           .           .
             .           .           .           .           .           .
  184    CLEAR............................................................
             .
             .
  187        .         H1a
             .           V
             .           V
  193        .      B-H1-1
             .           .
             .           .
  200        .           .         H1b
             .           .           .
             .           .           .
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 206          .           .           .          H1c
              .           .           .           .
              .           .           .           .
 212          .         CBH1c.......................
              .           V
              .           V
 215          .         RH1d
              .           .
              .           .
 218          .           .          H1d
              .           .           .
              .           .           .
 224          .         CBH1d...........
              .           V
              .           V
 227          .        B-H1-2
              .           .
              .           .
 235          .           .           L
              .           .           V
              .           .           V
 241          .           .        B-L-1
              .           .           .
              .           .           .
 249          .           .           .           M
              .           .           .           V
              .           .           .           V
 255          .           .           .   -    B-M-1
              .           .           .           .
              .           .           .           .
 263          .           .           .           .           N
              .           .           .           .           V
              .           .           .           .           V
 269          .           .           .           .        B-N-1

(***) 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   07DEC06  TIME  12:38:00   *                              *          (916) 756-1104               *
 *                                       *                              *                                       *
 *****************************************                              *****************************************


                         SERENO CANTON PHASE 1
                         HEC-1 MODEL
                         2-YEAR, 6-HOUR STORM
                         RAINFALL FROM NOAA ATLAS
                         SCS CURVE NUMBER SOIL LOSS PARAMETERS
                         KINEMATIC WAVE HYDROGRAPH ROUTING
                         DEVELOPED CONDITIONS
                         10% IMPERVIOUS AREA USED FOR SITE
                         Sereno Canyon Phase 1 includes draiange basins E1,E2,F1,F2,F3,G,H1,L,M,N
                         Original Master Plan HEC1 model updated for Phase 1 drainage basins
                         DRAINAGE BASINS E2,F1,F2,H1 FURTHER DIVIDED INTO SUBBASINS
                         INTERIM CONDITION - ONLY PHASE 1 DEVELOPED

                   PREPARED BY WOOD/PATEL, 8.24.2006
                   FILE NAME:  DEV-2.DAT


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

    IT          HYDROGRAPH TIME DATA
                       NMIN          2  MINUTES IN COMPUTATION INTERVAL
                      IDATE      1   0  STARTING DATE
                      ITIME       0000  STARTING TIME
                         NQ        900  NUMBER OF HYDROGRAPH ORDINATES
                     NDDATE      2   0  ENDING DATE
                     NDTIME       0558  ENDING TIME
                      ICENT         19  CENTURY MARK

                  COMPUTATION INTERVAL     .03 HOURS
                       TOTAL TIME BASE   29.97 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

 19 JD          INDEX STORM NO. 1
                      STRM        1.57  PRECIPITATION DEPTH
                      TRDA         .01  TRANSPOSITION DRAINAGE AREA

 20 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       .01
                       .01       .01       .01       .01       .01       .01       .01       .01       .01       .01
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   .02      .02      .02      .02      .03      .03      .04      .06      .08      .15
   .15      .12      .07      .05      .03      .03      .03      .02      .02      .02
   .01      .01      .01      .01      .01      .01      .01      .01      .01      .01
   .01      .01      .00      .00      .00      .00      .00      .00      .00      .00
   .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
   .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
   .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
   .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
   .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
   .00      .00      .00      .00      .00      .00      .00      .00      .00      .00

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

          **************
          *            *
 33 KK    *   B-E2-1   *
          *            *
          **************

 40 KO         OUTPUT CONTROL VARIABLES
                    IPRNT          5  PRINT CONTROL
                    IPLOT          0  PLOT CONTROL
                    QSCAL         0.  HYDROGRAPH PLOT SCALE
                    IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                     IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                    ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                    ISAV2        900  LAST ORDINATE PUNCHED OR SAVED
                   TIMINT       .033  TIME INTERVAL IN HOURS

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

          **************
          *            *
 41 KK    *    COMBE   *
          *            *
          **************

 44 KO         OUTPUT CONTROL VARIABLES
                    IPRNT          5  PRINT CONTROL
                    IPLOT          0  PLOT CONTROL
                    QSCAL         0.  HYDROGRAPH PLOT SCALE
                    IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                     IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                    ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                    ISAV2        900  LAST ORDINATE PUNCHED OR SAVED
                   TIMINT       .033  TIME INTERVAL IN HOURS

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

          **************
          *            *
 51 KK    *   B-F1-1   *
          *            *
          **************

 58 KO         OUTPUT CONTROL VARIABLES
                    IPRNT          5  PRINT CONTROL
                    IPLOT          0  PLOT CONTROL
                    QSCAL         0.  HYDROGRAPH PLOT SCALE
                    IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                     IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                    ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                    ISAV2        900  LAST ORDINATE PUNCHED OR SAVED
                   TIMINT       .033  TIME INTERVAL IN HOURS

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

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          *            *
109 KK    *   B-F1-4   *
          *            *
          **************

116 KO         OUTPUT CONTROL VARIABLES
                    IPRNT          5  PRINT CONTROL
                    IPLOT          0  PLOT CONTROL
                    QSCAL         0.  HYDROGRAPH PLOT SCALE
                    IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                     IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                    ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                    ISAV2        900  LAST ORDINATE PUNCHED OR SAVED
                   TIMINT       .033  TIME INTERVAL IN HOURS

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

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          *            *
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139 KK      *    B-F2-2  *
            *            *
            **************

146 KO           OUTPUT CONTROL VARIABLES
                         IPRNT          5  PRINT CONTROL
                         IPLOT          0  PLOT CONTROL
                         QSCAL         0.  HYDROGRAPH PLOT SCALE
                         IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                         IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                         ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                         ISAV2        900  LAST ORDINATE PUNCHED OR SAVED
                        TIMINT       .033  TIME INTERVAL IN HOURS


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

            **************
            *            *
162 KK      *    B-F3-1  *
            *            *
            **************

169 KO           OUTPUT CONTROL VARIABLES
                         IPRNT          5  PRINT CONTROL
                         IPLOT          0  PLOT CONTROL
                         QSCAL         0.  HYDROGRAPH PLOT SCALE
                         IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                         IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                         ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                         ISAV2        900  LAST ORDINATE PUNCHED OR SAVED
                        TIMINT       .033  TIME INTERVAL IN HOURS


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

            **************
            *            *
176 KK      *     B-G-1  *
            *            *
            **************

183 KO           OUTPUT CONTROL VARIABLES
                         IPRNT          5  PRINT CONTROL
                         IPLOT          0  PLOT CONTROL
                         QSCAL         0.  HYDROGRAPH PLOT SCALE
                         IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                         IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                         ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                         ISAV2        900  LAST ORDINATE PUNCHED OR SAVED
                        TIMINT       .033  TIME INTERVAL IN HOURS


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

            **************
            *            *
227 KK      *    B-H1-2  *
            *            *
            **************

234 KO           OUTPUT CONTROL VARIABLES
                         IPRNT          5  PRINT CONTROL
                         IPLOT          0  PLOT CONTROL
                         QSCAL         0.  HYDROGRAPH PLOT SCALE
                         IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                         IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                         ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                         ISAV2        900  LAST ORDINATE PUNCHED OR SAVED
                        TIMINT       .033  TIME INTERVAL IN HOURS


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

            **************
            *            *
241 KK      *     B-L-1  *
            *            *
            **************

248 KO           OUTPUT CONTROL VARIABLES
                         IPRNT          5  PRINT CONTROL
                         IPLOT          0  PLOT CONTROL
                         QSCAL         0.  HYDROGRAPH PLOT SCALE
                         IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                         IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                         ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                         ISAV2        900  LAST ORDINATE PUNCHED OR SAVED
                        TIMINT       .033  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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              **************
              *            *
 255 KK       *   B-M-1    *
              *            *
              **************

 262 KO         OUTPUT CONTROL VARIABLES
                      IPRNT           5  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE
                      IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                       IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                      ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                      ISAV2         900  LAST ORDINATE PUNCHED OR SAVED
                     TIMINT        .033  TIME INTERVAL IN HOURS


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

              **************
              *            *
 269 KK       *   B-N-1    *
              *            *
              **************

 276 KO         OUTPUT CONTROL VARIABLES
                      IPRNT           5  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE
                      IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                       IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                      ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                      ISAV2         900  LAST ORDINATE PUNCHED OR SAVED
                     TIMINT        .033  TIME INTERVAL IN HOURS
1
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RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+	HYDROGRAPH AT	E1	28.	3.40	4.	1.	1.	.06		
+	HYDROGRAPH AT	E2	33.	3.27	4.	1.	1.	.05		
+ +	ROUTED TO	B-E2-1	0.	.00	0.	0.	0.	.05	2702.30	28.47
+	2 COMBINED AT	COMBE	28.	3.40	4.	1.	1.	.11		
+	HYDROGRAPH AT	F1a	7.	3.23	1.	0.	0.	.01		
+ +	ROUTED TO	B-F1-1	0.	.00	0.	0.	0.	.01	2727.79	29.17
+	HYDROGRAPH AT	F1b	4.	3.17	0.	0.	0.	.00		
+	HYDROGRAPH AT	F1c	7.	3.23	1.	0.	0.	.01		
+	2 COMBINED AT	CBF1c	10.	3.20	1.	0.	0.	.01		
+ +	ROUTED TO	B-F1-2	1.	4.77	0.	0.	0.	.01	2711.01	4.77
+	ROUTED TO	RF1d	1.	4.87	0.	0.	0.	.01		
+	HYDROGRAPH AT	F1d	4.	3.17	0.	0.	0.	.00		
+	2 COMBINED AT	CBF1d	4.	3.17	1.	0.	0.	.02		
+ +	ROUTED TO	B-F1-3	0.	.00	0.	0.	0.	.02	2697.41	28.03
+	HYDROGRAPH AT	F1e	6.	3.20	1.	0.	0.	.01		
+	2 COMBINED AT	CBF1e	6.	3.20	1.	0.	0.	.03		
+ +	ROUTED TO	B-F1-4	0.	.00	0.	0.	0.	.03	2678.32	22.10
	HYDROGRAPH AT									

```
+                     F2a       4.    3.20         0.          0.          0.        .00
          ROUTED TO
+                   B-F2-1      0.     .00         0.          0.          0.        .00
+                                                                                              2702.78      25.80
          HYDROGRAPH AT
+                     F2b       4.    3.33         0.          0.          0.        .01
          2 COMBINED AT
+                   CBF2b       4.    3.33         0.          0.          0.        .01
          ROUTED TO
+                   B-F2-2      0.     .00         0.          0.          0.        .01
+                                                                                              2683.15      28.23
          HYDROGRAPH AT
+                     F2c       3.    3.17         0.          0.          0.        .00
          2 COMBINED AT
+                   CBF2c       3.    3.17         0.          0.          0.        .01
          HYDROGRAPH AT
+                      F3       9.    3.23         1.          0.          0.        .01
          ROUTED TO
+                   B-F3-1      0.    5.23         0.          0.          0.        .01
+                                                                                              2709.01       5.20
          HYDROGRAPH AT
+                       G       9.    3.30         1.          0.          0.        .02
          ROUTED TO
+                    B-G-1      1.    4.20         0.          0.          0.        .02
+                                                                                              2726.03       4.20
          6 COMBINED AT
+                   CLEAR      29.    3.40         5.          1.          1.        .19
          HYDROGRAPH AT
+                     H1a      20.    3.20         2.          0.          0.        .03
          ROUTED TO
+                   B-H1-1      0.     .00         0.          0.          0.        .03
+                                                                                              2744.20      27.60
          HYDROGRAPH AT
+                     H1b       3.    3.17         0.          0.          0.        .00
          HYDROGRAPH AT
+                     H1c      10.    3.20         1.          0.          0.        .01
          3 COMBINED AT
+                   CBH1c      13.    3.20         1.          0.          0.        .05
          ROUTED TO
+                    RH1d      13.    3.23         1.          0.          0.        .05
          HYDROGRAPH AT
+                     H1d       8.    3.23         1.          0.          0.        .01
          2 COMBINED AT
+                   CBH1d      21.    3.23         2.          1.          0.        .06
          ROUTED TO
+                   B-H1-2     14.    3.40         1.          0.          0.        .06
+                                                                                              2725.15       3.40
          HYDROGRAPH AT
+                       L      10.    3.13         1.          0.          0.        .01
          ROUTED TO
+                    B-L-1      1.    3.70         0.          0.          0.        .01
+                                                                                              2725.04       3.70
          HYDROGRAPH AT
+                       M      12.    3.20         1.          0.          0.        .01
          ROUTED TO
+                    B-M-1      5.    3.43         1.          0.          0.        .01
+                                                                                              2716.25       3.43
          HYDROGRAPH AT
+                       N       9.    3.17         1.          0.          0.        .01
          ROUTED TO
+                    B-N-1      0.     .00         0.          0.          0.        .01
+                                                                                              2691.62      22.90
1
                                   SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                        (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                INTERPOLATED TO
                                                                              COMPUTATION INTERVAL
            ISTAQ     ELEMENT       DT        PEAK     TIME TO     VOLUME        DT        PEAK    TIME TO      VOLUME
                                                         PEAK                                        PEAK

                                  (MIN)      (CFS)      (MIN)       (IN)       (MIN)      (CFS)     (MIN)        (IN)

           FOR STORM = 1  STORM AREA (SQ MI) =        .01
                E1   MANE         1.81      27.93    203.87        .66        2.00      27.91    204.00         .66

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .2146E+01 OUTFLOW= .2133E+01 BASIN STORAGE= .1638E-02 PERCENT ERROR=    .5

           FOR STORM = 1  STORM AREA (SQ MI) =        .01
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       E2  MANE          2.00     33.11     195.30        .72       2.00      32.69     196.00          .72

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1781E+01 OUTFLOW= .1774E+01 BASIN STORAGE= .4574E-03 PERCENT ERROR=    .4

          FOR STORM = 1  STORM AREA (SQ MI) =       .01
       F1a  MANE         1.00      6.82     194.26        .72       2.00       6.81     194.00          .72

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .3718E+00 OUTFLOW= .3705E+00 BASIN STORAGE= .1250E-03 PERCENT ERROR=    .3

          FOR STORM = 1  STORM AREA (SQ MI) =       .01
       F1b  MANE         1.29      3.64     190.36        .72       2.00       3.61     190.00          .72

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1549E+00 OUTFLOW= .1544E+00 BASIN STORAGE= .2586E-04 PERCENT ERROR=    .3

          FOR STORM = 1  STORM AREA (SQ MI) =       .01
       F1c  MANE         2.00      7.30     193.52        .72       2.00       7.28     194.00          .72

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .3873E+00 OUTFLOW= .3847E+00 BASIN STORAGE= .1026E-03 PERCENT ERROR=    .6

          FOR STORM = 1  STORM AREA (SQ MI) =       .01
      RF1d  MANE         1.83       .70     292.71        .13       2.00        .70     292.00          .13

CONTINUITY SUMMARY (AC-FT) - INFLOW= .9302E-01 EXCESS= .0000E+00 OUTFLOW= .9364E-01 BASIN STORAGE= .1137E-04 PERCENT ERROR=   -.7

          FOR STORM = 1  STORM AREA (SQ MI) =       .01
       F1d  MANE         1.40      4.29     191.42        .72       2.00       4.26     190.00          .72

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1936E+00 OUTFLOW= .1930E+00 BASIN STORAGE= .3262E-04 PERCENT ERROR=    .3

          FOR STORM = 1  STORM AREA (SQ MI) =       .01
       F1e  MANE         1.67      5.87     190.60        .72       2.00       5.82     192.00          .72

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .2595E+00 OUTFLOW= .2586E+00 BASIN STORAGE= .4462E-04 PERCENT ERROR=    .3

          FOR STORM = 1  STORM AREA (SQ MI) =       .01
       F2a  MANE         1.05      3.52     191.84        .72       2.00       3.51     192.00          .72

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1704E+00 OUTFLOW= .1697E+00 BASIN STORAGE= .3894E-04 PERCENT ERROR=    .4

          FOR STORM = 1  STORM AREA (SQ MI) =       .01
       F2b  MANE         1.10      3.64     199.76        .72       2.00       3.64     200.00          .72

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .2517E+00 OUTFLOW= .2506E+00 BASIN STORAGE= .1450E-03 PERCENT ERROR=    .4

          FOR STORM = 1  STORM AREA (SQ MI) =       .01
       F2c  MANE          .79      2.80     191.08        .72       2.00       2.77     190.00          .72

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1317E+00 OUTFLOW= .1311E+00 BASIN STORAGE= .2729E-04 PERCENT ERROR=    .4

          FOR STORM = 1  STORM AREA (SQ MI) =       .01
        F3  MANE         1.03      9.22     193.01        .72       2.00       9.21     194.00          .72

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .5035E+00 OUTFLOW= .5017E+00 BASIN STORAGE= .1687E-03 PERCENT ERROR=    .3

          FOR STORM = 1  STORM AREA (SQ MI) =       .01
         G  MANE          .86      9.19     198.87        .72       2.00       9.13     198.00          .72

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .6196E+00 OUTFLOW= .6177E+00 BASIN STORAGE= .3650E-03 PERCENT ERROR=    .3

          FOR STORM = 1  STORM AREA (SQ MI) =       .01
       H1a  MANE         1.99     19.92     191.96        .63       2.00      19.91     192.00          .63

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .9106E+00 OUTFLOW= .9048E+00 BASIN STORAGE= .1419E-03 PERCENT ERROR=    .6

          FOR STORM = 1  STORM AREA (SQ MI) =       .01
       H1b  MANE         1.08      3.20     190.81        .63       2.00       3.14     190.00          .63

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1383E+00 OUTFLOW= .1375E+00 BASIN STORAGE= .2169E-04 PERCENT ERROR=    .6

          FOR STORM = 1  STORM AREA (SQ MI) =       .01
       H1c  MANE         1.22     10.09     192.06        .65       2.00      10.07     192.00          .65

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .4915E+00 OUTFLOW= .4890E+00 BASIN STORAGE= .1238E-03 PERCENT ERROR=    .5

          FOR STORM = 1  STORM AREA (SQ MI) =       .01
      RH1d  MANE          .83     13.16     193.66        .26       2.00      13.06     194.00          .26
```

```
CONTINUITY SUMMARY (AC-FT) - INFLOW= .6264E+00 EXCESS= .0000E+00 OUTFLOW= .6264E+00 BASIN STORAGE= .6747E-05 PERCENT ERROR=    .0

          FOR STORM = 1  STORM AREA (SQ MI) =        .01
               H1d  MANE          1.02      8.17     195.22       .64       2.00       8.14    194.00         .64

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .4480E+00 OUTFLOW= .4452E+00 BASIN STORAGE= .1568E-03 PERCENT ERROR=    .6

          FOR STORM = 1  STORM AREA (SQ MI) =        .01
                 L  MANE           .72      9.87     187.95       .72       2.00       9.87    188.00         .72

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .3789E+00 OUTFLOW= .3779E+00 BASIN STORAGE= .4313E-04 PERCENT ERROR=    .3

          FOR STORM = 1  STORM AREA (SQ MI) =        .01
                 M  MANE          1.32     12.65     190.77       .68       2.00      12.33    192.00         .68

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .5457E+00 OUTFLOW= .5432E+00 BASIN STORAGE= .8523E-04 PERCENT ERROR=    .4

          FOR STORM = 1  STORM AREA (SQ MI) =        .01
                 N  MANE          1.55      9.31     190.77       .72       2.00       9.23    190.00         .72

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .3873E+00 OUTFLOW= .3863E+00 BASIN STORAGE= .4529E-04 PERCENT ERROR=    .2


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

Interim Condition:

10-year HEC-1 Model

```
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   07DEC06  TIME  12:35:42    *                          *        (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        SERENO CANTON PHASE 1
             2        ID        HEC-1 MODEL
             3        ID        10-YEAR, 6-HOUR STORM
             4        ID        RAINFALL FROM NOAA ATLAS
             5        ID        SCS CURVE NUMBER SOIL LOSS PARAMETERS
             6        ID        KINEMATIC WAVE HYDROGRAPH ROUTING
             7        ID        DEVELOPED CONDITIONS
             8        ID        10% IMPERVIOUS AREA USED FOR SITE
             9        ID        Sereno Canyon Phase 1 includes draiange basins E1,E2,F1,F2,F3,G,H1,L,M,N
            10        ID        Original Master Plan HEC1 model updated for Phase 1 drainage basins
            11        ID        DRAINAGE BASINS E2,F1,F2,H1 FURTHER DIVIDED INTO SUBBASINS
            12        ID        INTERIM CONDITION - ONLY PHASE 1 DEVELOPED
            13        ID
            14        ID  PREPARED BY WOOD/PATEL, 8.24.2006
            15        ID  FILE NAME:  DEV-10.DAT
            16        ID
                      *DIAGRAM
            17        IT       2                       900
            18        IO       5
            19        JD               .01
            20        PH                       0.52    0.99    1.64    1.87    2.01    2.29
                      *

            21        KK      E1       5
            22        KM  RUNOFF FROM DRAINAGE SUB-BASIN E1
            23        BA    .061
            24        LS              88    2.92
            25        UK     400     .02    0.13     100
            26        RK    2050    .013    .032            TRAP       7       5
                      *

            27        KK      E2
            28        KM  RUNOFF FROM DRAINAGE SUB-BASIN E2
            29        BA    .046
            30        LS              88      10
            31        UK     200     .02    0.13     100
            32        RK    2370    .013    .032            TRAP      10       5
                      *

            33        KK  B-E2-1
            34        KM  FLOW ROUTED THROUGH DETENTION BASIN E2-1
            35        KM  42" PIPE CULVERT
            36        RS       1    STOR       0
            37        SV       0   0.098   0.228   0.411   0.678   1.062   1.583   1.897   2.257
            38        SE    2696    2697    2698    2699    2700    2701    2702  2702.5    2703
            39        SQ       0       0       0       0       0       0       0       0     180
            40        KO                                      22
                      *

            41        KK   COMBE
            42        KM  COMBINE RUNOFF FROM E1 AND E2
            43        HC       2
            44        KO                                      22
                      *
1                                          HEC-1 INPUT                                              PAGE  2

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


            45        KK     F1a
            46        KM  RUNOFF FROM DRAINAGE SUB-BASIN F1a
            47        BA  0.0096
            48        LS              88      10
            49        UK     225    .018    0.13     100
            50        RK     600    .012    .032            TRAP       7       5
                      *

            51        KK  B-F1-1
```

```
KM  FLOW ROUTED THROUGH DETENTION BASIN F1-1
KM  30" PIPE CULVERT
RS     1    STOR     0
SV     0  0.0118   0.251   0.402   0.553
SE  2725    2726    2727    2728    2729
SQ     0       0       0       0      37
KO                                    22
*

KK    RF1b
KM  ROUTE FLOW FROM B-F1-1 THROUGH DRAINAGE BASIN F1b
RK   600   0.012   0.032            TRAP       7       5
*

KK     F1b
KM  RUNOFF FROM DRAIANGE SUB-BASIN F1b
BA  0.004
LS            88      10
UK   140   0.018    0.13     100
RK   600   0.012   0.032            TRAP       7       5
*

KK  CBF1b
KM  COMBINE RUNOFF FROM F1b AND ROUTED FLOW RF1b
HC     2
*

KK     F1c
KM  RUNOFF FROM SUB-BASIN F1c
BA   0.01
LS            88      10
UK   200   0.018    0.13     100
RK  1200   0.012   0.032            TRAP       7       5
*

KK  CBF1c
KM  COMBINE RUNOFF FROM F1c AND CBF1b
HC     2
*
```

1 HEC-1 INPUT PAGE 3

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

KK  B-F1-2
KM  FLOW ROUTED THROUGH DETENTION BASIN
KM  36" PIPE CULVERT
RS     1    STOR     0
SV     0   0.116   0.264   0.446   0.666
SE  2708    2709    2710    2711    2712
SQ     0       0       0       0      50
*

KK    RF1d
KM  ROUTE FLOW FROM DETENTION BASIN B-F1-2
RK   700   0.012   0.032            TRAP       7       5
*

KK     F1d
KM  RUNOFF FROM SUB-BASIN F1d
BA  0.005
LS            88      10
UK   150   0.018    0.13     100
RK   700   0.012   0.032            TRAP       7       5
*

KK  CBF1d
KM  COMBINE RUNOFF FROM F1d AND RF1d
HC     2
*

KK  B-F1-3
KM  FLOW ROUTED THROUGH BASIN
KM  30" PIPE CULVERT
RS     1    STOR     0
SV     0   0.196   0.418   0.671   0.958   1.286
SE  2696    2697    2698    2699    2700    2701
SQ     0       0       0       0      37      45
*

KK    RF1e
KM  ROUTE FLOW FROM DETENTION BASIN B-F1-3
RK   930   0.012   0.032            TRAP       7       5
*

KK     F1e
KM  RUNOFF FROM DRAINAGE SUB-BASIN F1e
BA  0.0067
LS            88      10
UK   140   0.018    0.13     100
RK   930   0.012   0.032            TRAP       7       5
*
```

1 HEC-1 INPUT PAGE 4

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

KK  CBF1e
KM  COMBINE RUNOFF FROM F1e AND RF1e
HC     2
*

KK  B-F1-4
KM  FLOW ROUTED THROUGH BASIN
KM  12' WEIR AT HEAD WALL
RS     1    STOR     0
```

```
 122            SV        0   0.085   0.206   0.369   0.583
 123            SE     2676    2677    2678    2679    2680
 124            SQ        0       0       0       0      34
 125            KO                                       22
                *

 126            KK      F2a
 127            KM   RUNOFF FROM DRAINAGE SUBBASIN F2a
 128            BA   0.0044
 129            LS               88      10
 130            UK      180   0.018    0.13     100
 131            RK      650   0.028   0.032            TRAP       6       5
                *

 132            KK   B-F2-1       1
 133            KM   FLOW ROUTED THROUGH DETENTION BASIN F2-1
 134            KM   24" PIPE CULVERT
 135            RS        1    STOR       0
 136            SV        0   0.039   0.101   0.189   0.307
 137            SE     2700    2701    2702    2703    2704
 138            SQ        0       0       0       0      26
                *

 139            KK     RF2b
 140            KM   ROUTE FLOW FROM DETENTION BASIN B-F2-1
 141            RK      760   0.028   0.032            TRAP       6       5
                *

 142            KK      F2b
 143            KM   RUNOFF FROM DRAINAGE SUB-BASIN F2b
 144            BA   0.0065
 145            LS               88      10
 146            UK      350    .018    0.13     100
 147            RK      760    .028    .032            TRAP       6       5
                *

 148            KK    CBF2b
 149            KM   COMBINE RUNOFF FROM F2b AND RF2b
 150            HC        2
                *
1                                     HEC-1 INPUT                                        PAGE  5

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

 151            KK   B-F2-2
 152            KM   FLOW ROUTED THROUGH DETENTION BASIN F2-2
 153            KM   24" PIPE CULVERT
 154            RS        1    STOR       0
 155            SV        0   0.101   0.227   0.383   0.571
 156            SE     2681    2682    2683    2684    2685
 157            SQ        0       0       0       0      26
 158            KO                                       22
                *

 159            KK     RF2c
 160            KM   ROUTE FLOW FROM DETENTION BASIN B-F2-2
 161            RK      500   0.028   0.032            TRAP       6       5
                *

 162            KK      F2c
 163            KM   RUNOFF FROM DRAINAGE SUB-BASIN F2c
 164            BA   0.0034
 165            LS               88      10
 166            UK      175    .018    0.13     100
 167            RK      500    .028    .032            TRAP       6       5
                *

 168            KK    CBF2c
 169            KM   COMBINE RUNOFF FROM F2c AND RF2c
 170            HC        2
                *

 171            KK       F3
 172            KM   RUNOFF FROM DRAINAGE SUB-BASIN F3
 173            BA     .013
 174            LS               88      10
 175            UK      225    .018    0.13     100
 176            RK      850    .026    .032            TRAP       6       5
                *

 177            KK   B-F3-1
 178            KM   FLOW ROUTED THROUGH DETENTION BASIN F3-1
 179            KM   14' WEIR ROCK BERM AT OUTLET
 180            RS        1    STOR       0
 181            SV        0   0.033    0.09   0.175   0.289   0.438   0.625
 182            SE     2704    2705    2706    2707    2708    2709    2710
 183            SQ        0       0       0       0       0       0      39
 184            KO                                       22
                *

 185            KK        G
 186            KM   RUNOFF FROM DRAINAGE SUB-BASIN G
 187            BA    0.016
 188            LS               88      10
 189            UK      400    .025    0.13     100
 190            RK      720    .022    .032            TRAP       4       5
                *
1                                     HEC-1 INPUT                                        PAGE  6

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

 191            KK    B-G-1
 192            KM   FLOW ROUTED THROUGH DETENTION BASIN G-1
 193            KM   15' WEIR
```

DEV-INT-10.OH1

```
RS       1    STOR       0
SV       0    0.07   0.162   0.282   0.437   0.632
SE    2722    2723    2724    2725    2726    2727
SQ       0       0       0       0       0      42
KO                                      22
*

KK     H1a
KM RUNOFF FROM DRAINAGE SUB-BASIN H1a
BA  0.027
LS              88
UK     150    .025    0.13     100
RK    1850    .019    .032            TRAP       8       5
*

KK B-H1-1
KM FLOW ROUTED THROUGH DETENTION BASIN H1-1
KM 2-36" PIPE CULVERT
RS       1    STOR       0
SV       0   0.009   0.046   0.132   0.284    0.51   0.822    1.24   1.497   1.809
SE    2738    2739    2740    2741    2742    2743    2744    2745  2745.5    2746
SQ       0       0       0       0       0       0       0       0       0     170
*

KK     H1b
KM RUNOFF FROM DRAINAGE SUB-BASIN H1b
BA 0.0041
LS              88
UK     160    .025    0.13     100
RK     550    .019    .032            TRAP       8       5
*

KK     H1c
KM RUNOFF FROM DRAINAGE SUB-BASIN H1c
BA  0.014
LS              88    2.76
UK     200    .025    0.13     100
RK     950    .019    .032            TRAP       8       5
*

KK   CBH1c
KM COMBINE RUNOFF FROM H1a, H1b & H1c
HC       3
*

KK    RH1d
KM ROUTE FLOW COMBINED CBH1c
RK     700   0.028   0.032            TRAP       6       5
*
```

1 HEC-1 INPUT PAGE 7

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

KK     H1d
KM RUNOFF FROM DRAINAGE SUB-BASIN H1d
BA  0.013
LS              88    1.47
UK     250    .025    0.13     100
RK     700    .019    .032            TRAP       8       5
*

KK   CBH1d
KM COMBINE RUNOFF FROM H1d AND CBH1c
HC       2
*

KK B-H1-2
KM FLOW ROUTED THROUGH DETENTION BASIN H1-2
KM 36' WEIR
RS       1    STOR       0
SV       0   0.038   0.104   0.212   0.363   0.572
SE    2721    2722    2723    2724    2725    2726
SQ       0       0       0       0       0     101
KO                                      22
*

KK       L
KM RUNOFF FROM DRAINAGE SUB-BASIN L
BA 0.0099
LS              88    9.09
UK     113   0.018    0.13     100
RK     450    .012    .032            TRAP       5       5
*

KK  B-L-1
KM FLOW ROUTED THROUGH DETENTION BASIN L-1
KM 13' WEIR
RS       1    STOR       0
SV       0   0.056   0.139   0.253   0.403
SE    2722    2723    2724    2725    2726
SQ       0       0       0       0      36
KO                                      22
*

KK       M
KM RUNOFF FROM DRAINAGE SUB-BASIN M
BA  0.015
LS              88     5.3
UK     137    .018    0.13     100
RK     960    .012    .032            TRAP       4       5
*
```

1 HEC-1 INPUT PAGE 8

```
LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10
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```
267         KK   B-M-1
268         KM  FLOW ROUTED THROUGH DETENTION BASIN M-1
269         KM  7' WEIR
270         RS     1    STOR      0
271         SV     0    0.06   0.134   0.225   0.334   0.463
272         SE  2713    2714    2715    2716    2717    2718
273         SQ     0       0       0       0      20      55
274         KO                                    22
            *

275         KK     N
276         KM  RUNOFF FROM DRAINAGE SUB-BASIN N
277         BA   .01
278         LS            88      10
279         UK   117    .018    0.13     100
280         RK  1036    .012    .032            TRAP        5       5
            *

281         KK   B-N-1
282         KM  FLOW ROUTED THROUGH DETENTION BASIN N-1
283         KM  100' ROCK BERM AT OUTLET
284         RS     1    STOR       0
285         SV     0   0.066    0.16   0.286   0.447   0.646
286         SE  2688    2689    2690    2691    2692    2693
287         SQ     0       0       0       0       0      36
288         KO                                    22

289         KK   CLEAR
290         KM  CLEAR HYDROGRAPH STACK
291         HC     8
292         ZZ
```

```
1
             SCHEMATIC DIAGRAM OF STREAM NETWORK
INPUT
 LINE    (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

  NO.    (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

  21        E1
            .
  27        .          E2
            .          V
            .          V
  33        .     B-E2-1
            .          .
            .          .
  41     COMBE............
            .
            .
  45        .         F1a
            .          V
            .          V
  51        .     B-F1-1
            .          V
            .          V
  59        .       RF1b
            .          .
            .          .
  62        .          .          F1b
            .          .            .
            .          .            .
  68        .      CBF1b............
            .          .
            .          .
  71        .          .          F1c
            .          .            .
            .          .            .
  77        .      CBF1c............
            .          V
            .          V
  80        .     B-F1-2
            .          V
            .          V
  87        .       RF1d
            .          .
            .          .
  90        .          .          F1d
            .          .            .
            .          .            .
  96        .      CBF1d............
            .          V
            .          V
  99        .     B-F1-3
            .          V
            .          V
 106        .       RF1e
            .          .
            .          .
 109        .          .          F1e
            .          .            .
            .          .            .
 115        .      CBF1e............
            .          V
            .          V
 118        .     B-F1-4
            .          .
            .          .
 126        .          .          F2a
            .          .            V
            .          .            V
 132        .          .       B-F2-1
            .          .            V
            .          .            V
 139        .          .         RF2b
```

```
142           .           .           .          F2b
              .           .           .           .
148           .           .         CBF2b..........
              .           .           V
              .           .           V
151           .           .        B-F2-2
              .           .           V
              .           .           V
159           .           .         RF2c
              .           .           .
162           .           .           .          F2c
              .           .           .           .
168           .           .         CBF2c..........
              .           .           .
171           .           .           .          F3
              .           .           .           V
              .           .           .           V
177           .           .           .        B-F3-1
              .           .           .           .
185           .           .           .           .           G
              .           .           .           .           V
              .           .           .           .           V
191           .           .           .           .         B-G-1
              .           .           .           .           .
199           .           .           .           .           .          H1a
              .           .           .           .           .           V
              .           .           .           .           .           V
205           .           .           .           .           .        B-H1-1
              .           .           .           .           .           .
212           .           .           .           .           .           .          H1b
              .           .           .           .           .           .           .
218           .           .           .           .           .           .           .          H1c
              .           .           .           .           .           .           .           .
224           .           .           .           .           .         CBH1c.......................
              .           .           .           .           .           V
              .           .           .           .           .           V
227           .           .           .           .           .         RH1d
              .           .           .           .           .           .
230           .           .           .           .           .           .          H1d
              .           .           .           .           .           .           .
236           .           .           .           .           .         CBH1d..........
              .           .           .           .           .           V
              .           .           .           .           .           V
239           .           .           .           .           .        B-H1-2
              .           .           .           .           .           .
247           .           .           .           .           .           .           L
              .           .           .           .           .           .           V
              .           .           .           .           .           .           V
253           .           .           .           .           .           .         B-L-1
              .           .           .           .           .           .           .
261           .           .           .           .           .           .           .           M
              .           .           .           .           .           .           .           V
              .           .           .           .           .           .           .           V
267           .           .           .           .           .           .           .         B-M-1
              .           .           .           .           .           .           .           .
275           .           .           .           .           .           .           .           .           N
              .           .           .           .           .           .           .           .           V
              .           .           .           .           .           .           .           .           V
281           .           .           .           .           .           .           .           .         B-N-1
              .           .           .           .           .           .           .           .           .
289           .         CLEAR.........................................................................
```

(***) 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   07DEC06  TIME  12:35:42    *                  *        (916) 756-1104                 *
 *                                       *                  *                                       *
 *****************************************                  *****************************************
```

SERENO CANTON PHASE 1
HEC-1 MODEL
100-YEAR, 6-HOUR STORM
RAINFALL FROM NOAA ATLAS
SCS CURVE NUMBER SOIL LOSS PARAMETERS
KINEMATIC WAVE HYDROGRAPH ROUTING
DEVELOPED CONDITIONS
10% IMPERVIOUS AREA USED FOR SITE
Sereno Canyon Phase 1 includes draiange basins E1,E2,F1,F2,F3,G,H1,L,M,N
Original Master Plan HEC1 model updated for Phase 1 drainage basins
DRAINAGE BASINS E2,F1,F2,H1 FURTHER DIVIDED INTO SUBBASINS
INTERIM CONDITION - ONLY PHASE 1 DEVELOPED

```
                    PREPARED BY WOOD/PATEL, 8.24.2006
                    FILE NAME:  DEV-100.DAT

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

    IT        HYDROGRAPH TIME DATA
                     NMIN          2  MINUTES IN COMPUTATION INTERVAL
                    IDATE     1    0  STARTING DATE
                    ITIME       0000  STARTING TIME
                       NQ        900  NUMBER OF HYDROGRAPH ORDINATES
                   NDDATE     2    0  ENDING DATE
                   NDTIME       0558  ENDING TIME
                    ICENT         19  CENTURY MARK

                COMPUTATION INTERVAL      .03 HOURS
                     TOTAL TIME BASE    29.97 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

 19 JD        INDEX STORM NO. 1
                     STRM       2.29  PRECIPITATION DEPTH
                     TRDA        .01  TRANSPOSITION DRAINAGE AREA

 20 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      .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      .03      .03      .04      .04      .05      .06      .08      .11      .21
                    .21      .17      .10      .08      .05      .04      .04      .04      .03      .02
                    .02      .02      .02      .02      .02      .01      .01      .01      .01      .01
                    .01      .01      .01      .01      .01      .01      .01      .01      .01      .01
                    .01      .01      .01      .01      .00      .00      .00      .00      .00      .00
                    .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                    .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                    .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                    .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                    .00      .00      .00      .00      .00      .00      .00      .00      .00      .00

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

           **************
           *            *
 33 KK     *   B-E2-1   *
           *            *
           **************

 40 KO        OUTPUT CONTROL VARIABLES
                    IPRNT          5  PRINT CONTROL
                    IPLOT          0  PLOT CONTROL
                    QSCAL         0.  HYDROGRAPH PLOT SCALE
                    IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                     IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                    ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                    ISAV2        900  LAST ORDINATE PUNCHED OR SAVED
                   TIMINT       .033  TIME INTERVAL IN HOURS


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

           **************
           *            *
 41 KK     *    COMBE   *
           *            *
           **************

 44 KO        OUTPUT CONTROL VARIABLES
                    IPRNT          5  PRINT CONTROL
                    IPLOT          0  PLOT CONTROL
                    QSCAL         0.  HYDROGRAPH PLOT SCALE
                    IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                     IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                    ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                    ISAV2        900  LAST ORDINATE PUNCHED OR SAVED
                   TIMINT       .033  TIME INTERVAL IN HOURS


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

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           *            *
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 51 KK      *    B-F1-1  *
            *            *
            **************

 58 KO          OUTPUT CONTROL VARIABLES
                      IPRNT           5  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE
                      IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                       IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                      ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                      ISAV2         900  LAST ORDINATE PUNCHED OR SAVED
                     TIMINT        .033  TIME INTERVAL IN HOURS


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

            **************
            *            *
118 KK      *    B-F1-4  *
            *            *
            **************

125 KO          OUTPUT CONTROL VARIABLES
                      IPRNT           5  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE
                      IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                       IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                      ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                      ISAV2         900  LAST ORDINATE PUNCHED OR SAVED
                     TIMINT        .033  TIME INTERVAL IN HOURS


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

            **************
            *            *
151 KK      *    B-F2-2  *
            *            *
            **************

158 KO          OUTPUT CONTROL VARIABLES
                      IPRNT           5  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE
                      IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                       IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                      ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                      ISAV2         900  LAST ORDINATE PUNCHED OR SAVED
                     TIMINT        .033  TIME INTERVAL IN HOURS


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

            **************
            *            *
177 KK      *    B-F3-1  *
            *            *
            **************

184 KO          OUTPUT CONTROL VARIABLES
                      IPRNT           5  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE
                      IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                       IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                      ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                      ISAV2         900  LAST ORDINATE PUNCHED OR SAVED
                     TIMINT        .033  TIME INTERVAL IN HOURS


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

            **************
            *            *
191 KK      *    B-G-1   *
            *            *
            **************

198 KO          OUTPUT CONTROL VARIABLES
                      IPRNT           5  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE
                      IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                       IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                      ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                      ISAV2         900  LAST ORDINATE PUNCHED OR SAVED
                     TIMINT        .033  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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              **************
              *            *
 239 KK       *   B-H1-2   *
              *            *
              **************

 246 KO           OUTPUT CONTROL VARIABLES
                        IPRNT          5  PRINT CONTROL
                        IPLOT          0  PLOT CONTROL
                        QSCAL         0.  HYDROGRAPH PLOT SCALE
                        IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                         IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2        900  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT       .033  TIME INTERVAL IN HOURS


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

              **************
              *            *
 253 KK       *    B-L-1   *
              *            *
              **************

 260 KO           OUTPUT CONTROL VARIABLES
                        IPRNT          5  PRINT CONTROL
                        IPLOT          0  PLOT CONTROL
                        QSCAL         0.  HYDROGRAPH PLOT SCALE
                        IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                         IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2        900  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT       .033  TIME INTERVAL IN HOURS


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

              **************
              *            *
 267 KK       *    B-M-1   *
              *            *
              **************

 274 KO           OUTPUT CONTROL VARIABLES
                        IPRNT          5  PRINT CONTROL
                        IPLOT          0  PLOT CONTROL
                        QSCAL         0.  HYDROGRAPH PLOT SCALE
                        IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                         IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2        900  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT       .033  TIME INTERVAL IN HOURS


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

              **************
              *            *
 281 KK       *    B-N-1   *
              *            *
              **************

 288 KO           OUTPUT CONTROL VARIABLES
                        IPRNT          5  PRINT CONTROL
                        IPLOT          0  PLOT CONTROL
                        QSCAL         0.  HYDROGRAPH PLOT SCALE
                        IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                         IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                        ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                        ISAV2        900  LAST ORDINATE PUNCHED OR SAVED
                       TIMINT       .033  TIME INTERVAL IN HOURS
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	E1	69.	3.27	8.	2.	2.	.06		
+	HYDROGRAPH AT	E2	71.	3.20	6.	2.	1.	.05		
+	ROUTED TO	B-E2-1	21.	3.57	3.	1.	1.	.05		
+									2702.56	3.57
+	2 COMBINED AT	COMBE	69.	3.27	11.	3.	2.	.11		

+	HYDROGRAPH AT	F1a	15.	3.17	1.	0.	0.	.01		
+ +	ROUTED TO	B-F1-1	4.	3.57	1.	0.	0.	.01	2728.10	3.57
+	ROUTED TO	RF1b	4.	3.63	1.	0.	0.	.01		
+	HYDROGRAPH AT	F1b	8.	3.13	1.	0.	0.	.00		
+	2 COMBINED AT	CBF1b	8.	3.13	1.	0.	0.	.01		
+	HYDROGRAPH AT	F1c	16.	3.17	1.	0.	0.	.01		
+	2 COMBINED AT	CBF1c	23.	3.17	2.	1.	1.	.02		
+ +	ROUTED TO	B-F1-2	9.	3.40	2.	0.	0.	.02	2711.19	3.40
+	ROUTED TO	RF1d	9.	3.43	2.	0.	0.	.02		
+	HYDROGRAPH AT	F1d	9.	3.13	1.	0.	0.	.00		
+	2 COMBINED AT	CBF1d	12.	3.43	2.	1.	0.	.03		
+ +	ROUTED TO	B-F1-3	4.	4.23	1.	0.	0.	.03	2699.10	4.23
+	ROUTED TO	RF1e	4.	4.30	1.	0.	0.	.03		
+	HYDROGRAPH AT	F1e	12.	3.13	1.	0.	0.	.01		
+	2 COMBINED AT	CBF1e	12.	3.13	2.	0.	0.	.04		
+ +	ROUTED TO	B-F1-4	4.	4.43	1.	0.	0.	.04	2679.12	4.43
+	HYDROGRAPH AT	F2a	8.	3.13	1.	0.	0.	.00		
+ +	ROUTED TO	B-F2-1	2.	3.57	0.	0.	0.	.00	2703.06	3.57
+	ROUTED TO	RF2b	2.	3.60	0.	0.	0.	.00		
+	HYDROGRAPH AT	F2b	8.	3.23	1.	0.	0.	.01		
+	2 COMBINED AT	CBF2b	8.	3.23	1.	0.	0.	.01		
+ +	ROUTED TO	B-F2-2	1.	4.17	0.	0.	0.	.01	2684.06	4.17
+	ROUTED TO	RF2c	1.	4.20	0.	0.	0.	.01		
+	HYDROGRAPH AT	F2c	6.	3.13	0.	0.	0.	.00		
+	2 COMBINED AT	CBF2c	6.	3.13	1.	0.	0.	.01		
+	HYDROGRAPH AT	F3	21.	3.17	2.	0.	0.	.01		
+ +	ROUTED TO	B-F3-1	7.	3.43	1.	0.	0.	.01	2709.19	3.43
+	HYDROGRAPH AT	G	21.	3.20	2.	1.	0.	.02		
+ +	ROUTED TO	B-G-1	11.	3.40	1.	0.	0.	.02	2726.27	3.40
+	HYDROGRAPH AT	H1a	45.	3.17	3.	1.	1.	.03		
+ +	ROUTED TO	B-H1-1	2.	4.80	0.	0.	0.	.03	2745.51	4.80
+	HYDROGRAPH AT	H1b	7.	3.13	1.	0.	0.	.00		

HYDROGRAPH AT

```
+                      H1c      24.    3.13        2.         0.         0.        .01
       3 COMBINED AT
+                      CBH1c    31.    3.13        3.         1.         1.        .05
       ROUTED TO
+                      RH1d     30.    3.17        3.         1.         1.        .05
       HYDROGRAPH AT
+                      H1d      20.    3.17        2.         0.         0.        .01
       2 COMBINED AT
+                      CBH1d    50.    3.17        5.         1.         1.        .06
       ROUTED TO
+                      B-H1-2   44.    3.20        4.         1.         1.        .06
+                                                                                          2725.44      3.20
       HYDROGRAPH AT
+                      L        20.    3.10        1.         0.         0.        .01
       ROUTED TO
+                      B-L-1    10.    3.23        1.         0.         0.        .01
+                                                                                          2725.27      3.23
       HYDROGRAPH AT
+                      M        27.    3.13        2.         1.         0.        .01
       ROUTED TO
+                      B-M-1    18.    3.23        2.         0.         0.        .01
+                                                                                          2716.88      3.23
       HYDROGRAPH AT
+                      N        19.    3.13        1.         0.         0.        .01
       ROUTED TO
+                      B-N-1     3.    3.60        1.         0.         0.        .01
+                                                                                          2692.09      3.60
       8 COMBINED AT
+                      CLEAR    75.    3.23       11.         3.         2.        .17
1
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SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
(FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)

```
                                                                  INTERPOLATED TO
                                                               COMPUTATION INTERVAL
     ISTAQ    ELEMENT     DT      PEAK    TIME TO    VOLUME     DT      PEAK    TIME TO     VOLUME
                                            PEAK                                  PEAK

                         (MIN)    (CFS)    (MIN)      (IN)     (MIN)    (CFS)    (MIN)       (IN)

      FOR STORM = 1  STORM AREA (SQ MI) =       .01
         E1  MANE         1.88    69.33    196.82     1.23     2.00     69.05    196.00      1.23

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .4019E+01 OUTFLOW= .4002E+01 BASIN STORAGE= .1616E-02 PERCENT ERROR=    .4

      FOR STORM = 1  STORM AREA (SQ MI) =       .01
         E2  MANE         2.00    72.17    190.70     1.30     2.00     70.61    192.00      1.30

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .3219E+01 OUTFLOW= .3199E+01 BASIN STORAGE= .5220E-03 PERCENT ERROR=    .6

      FOR STORM = 1  STORM AREA (SQ MI) =       .01
        F1a  MANE          .79    15.32    188.82     1.30     2.00     15.19    190.00      1.30

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .6718E+00 OUTFLOW= .6672E+00 BASIN STORAGE= .1306E-03 PERCENT ERROR=    .7

      FOR STORM = 1  STORM AREA (SQ MI) =       .01
       RF1b  MANE         1.04     3.67    217.58      .52     2.00      3.66    218.00       .52

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2646E+00 EXCESS= .0000E+00 OUTFLOW= .2663E+00 BASIN STORAGE= .9703E-05 PERCENT ERROR=   -.6

      FOR STORM = 1  STORM AREA (SQ MI) =       .01
        F1b  MANE         1.10     7.63    187.95     1.31     2.00      7.62    188.00      1.31

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .2799E+00 OUTFLOW= .2794E+00 BASIN STORAGE= .2454E-04 PERCENT ERROR=    .2

      FOR STORM = 1  STORM AREA (SQ MI) =       .01
        F1c  MANE         1.67    16.06    190.87     1.31     2.00     15.93    190.00      1.31

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .6998E+00 OUTFLOW= .6967E+00 BASIN STORAGE= .1044E-03 PERCENT ERROR=    .4

      FOR STORM = 1  STORM AREA (SQ MI) =       .01
       RF1d  MANE         1.16     9.23    206.66      .63     2.00      9.13    206.00       .63

CONTINUITY SUMMARY (AC-FT) - INFLOW= .7956E+00 EXCESS= .0000E+00 OUTFLOW= .7970E+00 BASIN STORAGE= .1563E-04 PERCENT ERROR=   -.2

      FOR STORM = 1  STORM AREA (SQ MI) =       .01
        F1d  MANE         1.14     9.32    188.07     1.31     2.00      9.30    188.00      1.31

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .3499E+00 OUTFLOW= .3491E+00 BASIN STORAGE= .3324E-04 PERCENT ERROR=    .2
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         FOR STORM = 1  STORM AREA (SQ MI) =        .01
             RF1e  MANE           2.00     3.63   259.70       .31       2.00       3.63    260.00         .31

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4754E+00 EXCESS= .0000E+00 OUTFLOW= .4760E+00 BASIN STORAGE= .2443E-04 PERCENT ERROR=   -.1

         FOR STORM = 1  STORM AREA (SQ MI) =        .01
              F1e  MANE           1.40    12.46   188.41      1.31       2.00      12.36    188.00        1.31

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .4689E+00 OUTFLOW= .4680E+00 BASIN STORAGE= .4243E-04 PERCENT ERROR=    .2

         FOR STORM = 1  STORM AREA (SQ MI) =        .01
              F2a  MANE            .79     7.78   188.28      1.31       2.00       7.76    188.00        1.31

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .3079E+00 OUTFLOW= .3073E+00 BASIN STORAGE= .4045E-04 PERCENT ERROR=    .2

         FOR STORM = 1  STORM AREA (SQ MI) =        .01
             RF2b  MANE           1.55     1.64   217.10       .51       2.00       1.62    216.00         .51

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1182E+00 EXCESS= .0000E+00 OUTFLOW= .1187E+00 BASIN STORAGE= .2926E-05 PERCENT ERROR=   -.4

         FOR STORM = 1  STORM AREA (SQ MI) =        .01
              F2b  MANE            .86     8.49   192.85      1.31       2.00       8.42    194.00        1.31

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .4549E+00 OUTFLOW= .4533E+00 BASIN STORAGE= .1448E-03 PERCENT ERROR=    .3

         FOR STORM = 1  STORM AREA (SQ MI) =        .01
             RF2c  MANE            .96     1.47   252.26       .33       2.00       1.47    252.00         .33

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1890E+00 EXCESS= .0000E+00 OUTFLOW= .1892E+00 BASIN STORAGE= .5779E-05 PERCENT ERROR=   -.1

         FOR STORM = 1  STORM AREA (SQ MI) =        .01
              F2c  MANE            .73     6.10   187.59      1.31       2.00       6.10    188.00        1.31

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .2379E+00 OUTFLOW= .2373E+00 BASIN STORAGE= .2671E-04 PERCENT ERROR=    .3

         FOR STORM = 1  STORM AREA (SQ MI) =        .01
               F3  MANE            .78    20.87   189.80      1.30       2.00      20.72    190.00        1.30

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .9098E+00 OUTFLOW= .9034E+00 BASIN STORAGE= .1756E-03 PERCENT ERROR=    .7

         FOR STORM = 1  STORM AREA (SQ MI) =        .01
                G  MANE            .84    20.91   191.73      1.30       2.00      20.91    192.00        1.30

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1120E+01 OUTFLOW= .1113E+01 BASIN STORAGE= .3816E-03 PERCENT ERROR=    .5

         FOR STORM = 1  STORM AREA (SQ MI) =        .01
              H1a  MANE           1.56    46.26   188.88      1.20       2.00      45.04    190.00        1.20

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1733E+01 OUTFLOW= .1727E+01 BASIN STORAGE= .1474E-03 PERCENT ERROR=    .3

         FOR STORM = 1  STORM AREA (SQ MI) =        .01
              H1b  MANE            .91     7.49   187.57      1.20       2.00       7.39    188.00        1.20

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .2632E+00 OUTFLOW= .2623E+00 BASIN STORAGE= .2579E-04 PERCENT ERROR=    .3

         FOR STORM = 1  STORM AREA (SQ MI) =        .01
              H1c  MANE           1.08    23.80   188.94      1.23       2.00      23.53    188.00        1.23

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .9210E+00 OUTFLOW= .9185E+00 BASIN STORAGE= .1155E-03 PERCENT ERROR=    .3

         FOR STORM = 1  STORM AREA (SQ MI) =        .01
             RH1d  MANE            .76    30.55   189.73       .59       2.00      30.34    190.00         .59

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1410E+01 EXCESS= .0000E+00 OUTFLOW= .1410E+01 BASIN STORAGE= .1202E-04 PERCENT ERROR=    .0

         FOR STORM = 1  STORM AREA (SQ MI) =        .01
              H1d  MANE            .75    20.06   189.65      1.21       2.00      19.85    190.00        1.21

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .8455E+00 OUTFLOW= .8423E+00 BASIN STORAGE= .1362E-03 PERCENT ERROR=    .4

         FOR STORM = 1  STORM AREA (SQ MI) =        .01
                L  MANE            .54    20.46   185.75      1.30       2.00      20.45    186.00        1.30

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .6876E+00 OUTFLOW= .6862E+00 BASIN STORAGE= .3899E-04 PERCENT ERROR=    .2
```

```
          FOR STORM = 1  STORM AREA (SQ MI) =        .01
                 M  MANE          1.12      27.66    187.54      1.26      2.00      27.48    188.00        1.26

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1009E+01 OUTFLOW= .1006E+01 BASIN STORAGE= .1004E-03 PERCENT ERROR=    .2

          FOR STORM = 1  STORM AREA (SQ MI) =        .01
                 N  MANE          1.38      19.77    187.36      1.31      2.00      19.48    188.00        1.31

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .6998E+00 OUTFLOW= .6992E+00 BASIN STORAGE= .5151E-04 PERCENT ERROR=    .1


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

Interim Condition:

100-year HEC-1 Model

```
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   05DEC06  TIME  13:38:40    *                           *         (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        SERENO CANTON PHASE 1
         2        ID        HEC-1 MODEL
         3        ID        100-YEAR, 6-HOUR STORM
         4        ID        RAINFALL FROM NOAA ATLAS
         5        ID        SCS CURVE NUMBER SOIL LOSS PARAMETERS
         6        ID        KINEMATIC WAVE HYDROGRAPH ROUTING
         7        ID        DEVELOPED CONDITIONS
         8        ID        10% IMPERVIOUS AREA USED FOR SITE
         9        ID        Sereno Canyon Phase 1 includes draiange basins E1,E2,F1,F2,F3,G,H1,L,M,N
        10        ID        Original Master Plan HEC1 model updated for Phase 1 drainage basins
        11        ID        DRAINAGE BASINS E2,F1,F2,H1 FURTHER DIVIDED INTO SUBBASINS
        12        ID        INTERIM CONDITION - ONLY PHASE 1 DEVELOPED
        13        ID
        14        ID  PREPARED BY WOOD/PATEL, 8.24.2006
        15        ID  FILE NAME:  DEV-100.DAT
        16        ID
                  *DIAGRAM
        17        IT       2                   900
        18        IO       5
        19        JD               .01
        20        PH                       .73    1.43    2.42    2.74    2.96    3.37
                  *

        21        KK      E1       5
        22        KM  RUNOFF FROM DRAINAGE SUB-BASIN E1
        23        BA    .061
        24        LS               88     2.92
        25        UK     400      .02     0.13     100
        26        RK    2050     .013     .032             TRAP       7       5
                  *

        27        KK      E2
        28        KM  RUNOFF FROM DRAINAGE SUB-BASIN E2
        29        BA    .046
        30        LS               88       10
        31        UK     200      .02     0.13     100
        32        RK    2370     .013     .032             TRAP      10       5
                  *

        33        KK  B-E2-1
        34        KM  FLOW ROUTED THROUGH DETENTION BASIN E2-1
        35        KM  42" PIPE CULVERT
        36        RS       1     STOR        0
        37        SV       0    0.098    0.228   0.411   0.678   1.062   1.583   1.897   2.257
        38        SE    2696     2697     2698    2699    2700    2701    2702  2702.5    2703
        39        SQ       0        0        0       0       0       0       0       0     180
        40        KO                                      22
                  *

        41        KK   COMBE
        42        KM  COMBINE RUNOFF FROM E1 AND E2
        43        HC       2
        44        KO                                      22
                  *
1                                          HEC-1 INPUT                                              PAGE  2

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

        45        KK     F1a
        46        KM  RUNOFF FROM DRAINAGE SUB-BASIN F1a
        47        BA  0.0096
        48        LS               88       10
        49        UK     225     .018     0.13     100
        50        RK     600     .012     .032             TRAP       7       5
                  *

        51        KK  B-F1-1
```

```
  52         KM  FLOW ROUTED THROUGH DETENTION BASIN F1-1
  53         KM  30" PIPE CULVERT
  54         RS       1    STOR       0
  55         SV       0   0.118   0.251   0.402   0.553
  56         SE    2725    2726    2727    2728    2729
  57         SQ       0       0       0       0      37
  58         KO                                      22
             *

  59         KK    RF1b
  60         KM  ROUTE FLOW FROM B-F1-1 THROUGH DRAINAGE BASIN F1b
  61         RK     600   0.012   0.032            TRAP       7       5
             *

  62         KK     F1b
  63         KM  RUNOFF FROM DRAIANGE SUB-BASIN F1b
  64         BA   0.004
  65         LS              88      10
  66         UK     140   0.018    0.13     100
  67         RK     600   0.012   0.032            TRAP       7       5
             *

  68         KK   CBF1b
  69         KM  COMBINE RUNOFF FROM F1b AND ROUTED FLOW RF1b
  70         HC       2
             *

  71         KK     F1c
  72         KM  RUNOFF FROM SUB-BASIN F1c
  73         BA    0.01
  74         LS              88      10
  75         UK     200   0.018    0.13     100
  76         RK    1200   0.012   0.032            TRAP       7       5
             *

  77         KK   CBF1c
  78         KM  COMBINE RUNOFF FROM F1c AND CBF1b
  79         HC       2
             *
1                                        HEC-1 INPUT                                        PAGE  3

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

  80         KK  B-F1-2
  81         KM  FLOW ROUTED THROUGH DETENTION BASIN
  82         KM  36" PIPE CULVERT
  83         RS       1    STOR       0
  84         SV       0   0.116   0.264   0.446   0.666
  85         SE    2708    2709    2710    2711    2712
  86         SQ       0       0       0       0      50
             *

  87         KK    RF1d
  88         KM  ROUTE FLOW FROM DETENTION BASIN B-F1-2
  89         RK     700   0.012   0.032            TRAP       7       5
             *

  90         KK     F1d
  91         KM  RUNOFF FROM SUB-BASIN F1d
  92         BA   0.005
  93         LS              88      10
  94         UK     150   0.018    0.13     100
  95         RK     700   0.012   0.032            TRAP       7       5
             *

  96         KK   CBF1d
  97         KM  COMBINE RUNOFF FROM F1d AND RF1d
  98         HC       2
             *

  99         KK  B-F1-3
 100         KM  FLOW ROUTED THROUGH BASIN
 101         KM  30" PIPE CULVERT
 102         RS       1    STOR       0
 103         SV       0   0.196   0.418   0.671   0.958   1.286
 104         SE    2696    2697    2698    2699    2700    2701
 105         SQ       0       0       0       0      37      45
             *

 106         KK    RF1e
 107         KM  ROUTE FLOW FROM DETENTION BASIN B-F1-3
 108         RK     930   0.012   0.032            TRAP       7       5
             *

 109         KK     F1e
 110         KM  RUNOFF FROM DRAINAGE SUB-BASIN F1e
 111         BA  0.0067
 112         LS              88      10
 113         UK     140   0.018    0.13     100
 114         RK     930   0.012   0.032            TRAP       7       5
             *
1                                        HEC-1 INPUT                                        PAGE  4

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

 115         KK   CBF1e
 116         KM  COMBINE RUNOFF FROM F1e AND RF1e
 117         HC       2
             *

 118         KK  B-F1-4
 119         KM  FLOW ROUTED THROUGH BASIN
 120         KM  12' WEIR AT HEAD WALL
 121         RS       1    STOR       0
```

```
 122          SV       0   0.085   0.206   0.369   0.583
 123          SE    2676    2677    2678    2679    2680
 124          SQ       0       0       0       0      34
 125          KO                                      22
              *

 126          KK     F2a
 127          KM  RUNOFF FROM DRAINAGE SUBBASIN F2a
 128          BA  0.0044
 129          LS              88      10
 130          UK     180   0.018    0.13     100
 131          RK     650   0.028   0.032            TRAP       6       5
              *

 132          KK  B-F2-1       1
 133          KM  FLOW ROUTED THROUGH DETENTION BASIN F2-1
 134          KM  24" PIPE CULVERT
 135          RS       1    STOR       0
 136          SV       0   0.039   0.101   0.189   0.307
 137          SE    2700    2701    2702    2703    2704
 138          SQ       0       0       0       0      26
              *

 139          KK    RF2b
 140          KM  ROUTE FLOW FROM DETENTION BASIN B-F2-1
 141          RK     760   0.028   0.032            TRAP       6       5
              *

 142          KK     F2b
 143          KM  RUNOFF FROM DRAINAGE SUB-BASIN F2b
 144          BA  0.0065
 145          LS              88      10
 146          UK     350    .018    0.13     100
 147          RK     760    .028    .032            TRAP       6       5
              *

 148          KK   CBF2b
 149          KM  COMBINE RUNOFF FROM F2b AND RF2b
 150          HC       2
              *
1                                   HEC-1 INPUT                                   PAGE  5

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

 151          KK  B-F2-2
 152          KM  FLOW ROUTED THROUGH DETENTION BASIN F2-2
 153          KM  24" PIPE CULVERT
 154          RS       1    STOR       0
 155          SV       0   0.101   0.227   0.383   0.571
 156          SE    2681    2682    2683    2684    2685
 157          SQ       0       0       0       0      26
 158          KO                                      22
              *

 159          KK    RF2c
 160          KM  ROUTE FLOW FROM DETENTION BASIN B-F2-2
 161          RK     500   0.028   0.032            TRAP       6       5
              *

 162          KK     F2c
 163          KM  RUNOFF FROM DRAINAGE SUB-BASIN F2c
 164          BA  0.0034
 165          LS              88      10
 166          UK     175    .018    0.13     100
 167          RK     500    .028    .032            TRAP       6       5
              *

 168          KK   CBF2c
 169          KM  COMBINE RUNOFF FROM F2c AND RF2c
 170          HC       2
              *

 171          KK      F3
 172          KM  RUNOFF FROM DRAINAGE SUB-BASIN F3
 173          BA    .013
 174          LS              88      10
 175          UK     225    .018    0.13     100
 176          RK     850    .026    .032            TRAP       6       5
              *

 177          KK  B-F3-1
 178          KM  FLOW ROUTED THROUGH DETENTION BASIN F3-1
 179          KM  14' WEIR ROCK BERM AT OUTLET
 180          RS       1    STOR       0
 181          SV       0   0.033    0.09   0.175   0.289   0.438   0.625
 182          SE    2704    2705    2706    2707    2708    2709    2710
 183          SQ       0       0       0       0       0       0      39
 184          KO                                      22
              *

 185          KK       G
 186          KM  RUNOFF FROM DRAINAGE SUB-BASIN G
 187          BA   0.016
 188          LS              88      10
 189          UK     400    .025    0.13     100
 190          RK     720    .022    .032            TRAP       4       5
              *
1                                   HEC-1 INPUT                                   PAGE  6

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

 191          KK   B-G-1
 192          KM  FLOW ROUTED THROUGH DETENTION BASIN G-1
 193          KM  15' WEIR
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```
 194          RS       1    STOR       0
 195          SV       0    0.07   0.162   0.282   0.437   0.632
 196          SE    2722    2723    2724    2725    2726    2727
 197          SQ       0       0       0       0       0      42
 198          KO                                      22
              *

 199          KK     H1a
 200          KM  RUNOFF FROM DRAINAGE SUB-BASIN H1a
 201          BA   0.027
 202          LS              88
 203          UK     150    .025    0.13     100
 204          RK    1850    .019    .032            TRAP       8       5
              *

 205          KK  B-H1-1
 206          KM  FLOW ROUTED THROUGH DETENTION BASIN H1-1
 207          KM  2-36" PIPE CULVERT
 208          RS       1    STOR       0
 209          SV       0   0.009   0.046   0.132   0.284    0.51   0.822    1.24   1.497   1.809
 210          SE    2738    2739    2740    2741    2742    2743    2744    2745  2745.5    2746
 211          SQ       0       0       0       0       0       0       0       0       0     170
              *

 212          KK     H1b
 213          KM  RUNOFF FROM DRAINAGE SUB-BASIN H1b
 214          BA  0.0041
 215          LS              88
 216          UK     160    .025    0.13     100
 217          RK     550    .019    .032            TRAP       8       5
              *

 218          KK     H1c
 219          KM  RUNOFF FROM DRAINAGE SUB-BASIN H1c
 220          BA   0.014
 221          LS              88    2.76
 222          UK     200    .025    0.13     100
 223          RK     950    .019    .032            TRAP       8       5
              *

 224          KK   CBH1c
 225          KM  COMBINE RUNOFF FROM H1a, H1b & H1c
 226          HC       3
              *

 227          KK    RH1d
 228          KM  ROUTE FLOW COMBINED CBH1c
 229          RK     700   0.028   0.032            TRAP       6       5
              *
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 230          KK     H1d
 231          KM  RUNOFF FROM DRAINAGE SUB-BASIN H1d
 232          BA   0.013
 233          LS              88    1.47
 234          UK     250    .025    0.13     100
 235          RK     700    .019    .032            TRAP       8       5
              *

 236          KK   CBH1d
 237          KM  COMBINE RUNOFF FROM H1d AND CBH1c
 238          HC       2
              *

 239          KK  B-H1-2
 240          KM  FLOW ROUTED THROUGH DETENTION BASIN H1-2
 241          KM  36' WEIR
 242          RS       1    STOR       0
 243          SV       0   0.038   0.104   0.212   0.363   0.579
 244          SE    2721    2722    2723    2724    2725  2726.1
 245          SQ       0       0       0       0       0     102
 246          KO                                      22
              *

 247          KK       L
 248          KM  RUNOFF FROM DRAINAGE SUB-BASIN L
 249          BA  0.0099
 250          LS              88    9.09
 251          UK     113   0.018    0.13     100
 252          RK     450    .012    .032            TRAP       5       5
              *

 253          KK   B-L-1
 254          KM  FLOW ROUTED THROUGH DETENTION BASIN L-1
 255          KM  13' WEIR
 256          RS       1    STOR       0
 257          SV       0   0.056   0.139   0.253   0.403
 258          SE    2722    2723    2724    2725    2726
 259          SQ       0       0       0       0      36
 260          KO                                      22
              *

 261          KK       M
 262          KM  RUNOFF FROM DRAINAGE SUB-BASIN M
 263          BA   0.015
 264          LS              88     5.3
 265          UK     137    .018    0.13     100
 266          RK     960    .012    .032            TRAP       4       5
              *
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10
```

```
267          KK    B-M-1
268          KM   FLOW ROUTED THROUGH DETENTION BASIN M-1
269          KM   7' WEIR
270          RS       1     STOR       0
271          SV       0     0.06   0.134   0.225   0.334   0.463
272          SE    2713     2714    2715    2716    2717    2718
273          SQ       0        0       0       0      20      55
274          KO                                       22
             *

275          KK       N
276          KM   RUNOFF FROM DRAINAGE SUB-BASIN N
277          BA     .01
278          LS               88      10
279          UK     117     .018    0.13     100
280          RK    1036     .012    .032            TRAP       5       5
             *

281          KK    B-N-1
282          KM   FLOW ROUTED THROUGH DETENTION BASIN N-1
283          KM   100' ROCK BERM AT OUTLET
284          RS       1     STOR       0
285          SV       0    0.066    0.16   0.286   0.447   0.646
286          SE    2688     2689    2690    2691    2692    2693
287          SQ       0        0       0       0       0      36
288          KO                                       22

289          KK    CLEAR
290          KM   CLEAR HYDROGRAPH STACK
291          HC       8
292          ZZ
1
          SCHEMATIC DIAGRAM OF STREAM NETWORK
INPUT
 LINE    (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

 NO.     (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

  21        E1
            .
  27        .          E2
            .          V
            .          V
  33        .      B-E2-1
            .          .
            .          .
  41    COMBE............
            .
            .
  45        .         F1a
            .          V
            .          V
  51        .      B-F1-1
            .          V
            .          V
  59        .        RF1b
            .          .
            .          .
  62        .          .          F1b
            .          .           .
            .          .           .
  68        .      CBF1b............
            .          .
            .          .
  71        .          .          F1c
            .          .           .
            .          .           .
  77        .      CBF1c............
            .          V
            .          V
  80        .      B-F1-2
            .          V
            .          V
  87        .        RF1d
            .          .
            .          .
  90        .          .          F1d
            .          .           .
            .          .           .
  96        .      CBF1d............
            .          V
            .          V
  99        .      B-F1-3
            .          V
            .          V
 106        .        RF1e
            .          .
            .          .
 109        .          .          F1e
            .          .           .
            .          .           .
 115        .      CBF1e............
            .          V
            .          V
 118        .      B-F1-4
            .          .
            .          .
 126        .          .          F2a
            .          .           V
            .          .           V
 132        .          .       B-F2-1
            .          .           V
            .          .           V
 139        .          .         RF2b
```

```
               .           .           .
142            .           .           .         F2b
               .           .           .           .
148            .           .       CBF2b............
               .           .           V
               .           .           V
151            .           .      B-F2-2
               .           .           V
               .           .           V
159            .           .        RF2c
               .           .           .
162            .           .           .         F2c
               .           .           .           .
168            .           .       CBF2c............
               .           .           .
171            .           .           .          F3
               .           .           .           V
               .           .           .           V
177            .           .           .      B-F3-1
               .           .           .           .
185            .           .           .           .           G
               .           .           .           .           V
               .           .           .           .           V
191            .           .           .           .       B-G-1
               .           .           .           .           .
199            .           .           .           .           .         H1a
               .           .           .           .           .           V
               .           .           .           .           .           V
205            .           .           .           .           .      B-H1-1
               .           .           .           .           .           .
212            .           .           .           .           .           .         H1b
               .           .           .           .           .           .           .
218            .           .           .           .           .           .           .         H1c
               .           .           .           .           .           .           .           .
224            .           .           .           .           .       CBH1c........................
               .           .           .           .           .           V
               .           .           .           .           .           V
227            .           .           .           .           .        RH1d
               .           .           .           .           .           .
230            .           .           .           .           .           .         H1d
               .           .           .           .           .           .           .
236            .           .           .           .           .       CBH1d............
               .           .           .           .           .           V
               .           .           .           .           .           V
239            .           .           .           .           .      B-H1-2
               .           .           .           .           .           .
247            .           .           .           .           .           .           L
               .           .           .           .           .           .           V
               .           .           .           .           .           .           V
253            .           .           .           .           .           .       B-L-1
               .           .           .           .           .           .           .
261            .           .           .           .           .           .           .           M
               .           .           .           .           .           .           .           V
               .           .           .           .           .           .           .           V
267            .           .           .           .           .           .           .       B-M-1
               .           .           .           .           .           .           .           .
275            .           .           .           .           .           .           .           .           N
               .           .           .           .           .           .           .           .           V
               .           .           .           .           .           .           .           .           V
281            .           .           .           .           .           .           .           .       B-N-1
               .           .           .           .           .           .           .           .           .
289            .       CLEAR....................................................................................
```

(***) 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    05DEC06  TIME  13:38:40  *                         *           (916) 756-1104              *
 *                                       *                         *                                       *
 *****************************************                         *****************************************
```

```
SERENO CANTON PHASE 1
HEC-1 MODEL
100-YEAR, 6-HOUR STORM
RAINFALL FROM NOAA ATLAS
SCS CURVE NUMBER SOIL LOSS PARAMETERS
KINEMATIC WAVE HYDROGRAPH ROUTING
DEVELOPED CONDITIONS
10% IMPERVIOUS AREA USED FOR SITE
Sereno Canyon Phase 1 includes draiange basins E1,E2,F1,F2,F3,G,H1,L,M,N
Original Master Plan HEC1 model updated for Phase 1 drainage basins
DRAINAGE BASINS E2,F1,F2,H1 FURTHER DIVIDED INTO SUBBASINS
INTERIM CONDITION - ONLY PHASE 1 DEVELOPED
```

```
                 PREPARED BY WOOD/PATEL, 8.24.2006
                 FILE NAME:  DEV-100.DAT

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

     IT       HYDROGRAPH TIME DATA
                     NMIN          2  MINUTES IN COMPUTATION INTERVAL
                    IDATE      1   0  STARTING DATE
                    ITIME       0000  STARTING TIME
                       NQ        900  NUMBER OF HYDROGRAPH ORDINATES
                   NDDATE      2   0  ENDING DATE
                   NDTIME       0558  ENDING TIME
                    ICENT         19  CENTURY MARK

               COMPUTATION INTERVAL     .03 HOURS
                    TOTAL TIME BASE   29.97 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

  19 JD        INDEX STORM NO. 1
                     STRM       3.37  PRECIPITATION DEPTH
                     TRDA        .01  TRANSPOSITION DRAINAGE AREA

  20 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       .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       .01       .01       .01       .01       .01       .01       .01       .01
                    .01       .01       .01       .01       .01       .03       .03       .03       .03       .03
                    .04       .04       .04       .06       .06       .07       .09       .12       .17       .29
                    .29       .24       .15       .11       .07       .07       .06       .05       .04       .04
                    .04       .03       .03       .03       .03       .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       .01       .01       .01       .01       .01
                    .01       .01       .01       .01       .01       .01       .01       .01       .00       .00
                    .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                    .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                    .00       .00       .00       .00       .00       .00       .00       .00       .00       .00


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

           **************
           *            *
  33 KK    *   B-E2-1   *
           *            *
           **************

  40 KO       OUTPUT CONTROL VARIABLES
                    IPRNT          5  PRINT CONTROL
                    IPLOT          0  PLOT CONTROL
                    QSCAL         0.  HYDROGRAPH PLOT SCALE
                    IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                     IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                    ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                    ISAV2        900  LAST ORDINATE PUNCHED OR SAVED
                   TIMINT       .033  TIME INTERVAL IN HOURS


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

           **************
           *            *
  41 KK    *    COMBE   *
           *            *
           **************

  44 KO       OUTPUT CONTROL VARIABLES
                    IPRNT          5  PRINT CONTROL
                    IPLOT          0  PLOT CONTROL
                    QSCAL         0.  HYDROGRAPH PLOT SCALE
                    IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                     IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                    ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                    ISAV2        900  LAST ORDINATE PUNCHED OR SAVED
                   TIMINT       .033  TIME INTERVAL IN HOURS


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

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           *            *
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 51 KK      *    B-F1-1  *
            *            *
            **************

 58 KO           OUTPUT CONTROL VARIABLES
                         IPRNT          5  PRINT CONTROL
                         IPLOT          0  PLOT CONTROL
                         QSCAL         0.  HYDROGRAPH PLOT SCALE
                         IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                          IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                         ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                         ISAV2        900  LAST ORDINATE PUNCHED OR SAVED
                        TIMINT       .033  TIME INTERVAL IN HOURS


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

            **************
            *            *
118 KK      *    B-F1-4  *
            *            *
            **************

125 KO           OUTPUT CONTROL VARIABLES
                         IPRNT          5  PRINT CONTROL
                         IPLOT          0  PLOT CONTROL
                         QSCAL         0.  HYDROGRAPH PLOT SCALE
                         IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                          IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                         ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                         ISAV2        900  LAST ORDINATE PUNCHED OR SAVED
                        TIMINT       .033  TIME INTERVAL IN HOURS


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

            **************
            *            *
151 KK      *    B-F2-2  *
            *            *
            **************

158 KO           OUTPUT CONTROL VARIABLES
                         IPRNT          5  PRINT CONTROL
                         IPLOT          0  PLOT CONTROL
                         QSCAL         0.  HYDROGRAPH PLOT SCALE
                         IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                          IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                         ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                         ISAV2        900  LAST ORDINATE PUNCHED OR SAVED
                        TIMINT       .033  TIME INTERVAL IN HOURS


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

            **************
            *            *
177 KK      *    B-F3-1  *
            *            *
            **************

184 KO           OUTPUT CONTROL VARIABLES
                         IPRNT          5  PRINT CONTROL
                         IPLOT          0  PLOT CONTROL
                         QSCAL         0.  HYDROGRAPH PLOT SCALE
                         IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                          IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                         ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                         ISAV2        900  LAST ORDINATE PUNCHED OR SAVED
                        TIMINT       .033  TIME INTERVAL IN HOURS


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

            **************
            *            *
191 KK      *    B-G-1   *
            *            *
            **************

198 KO           OUTPUT CONTROL VARIABLES
                         IPRNT          5  PRINT CONTROL
                         IPLOT          0  PLOT CONTROL
                         QSCAL         0.  HYDROGRAPH PLOT SCALE
                         IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                          IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                         ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                         ISAV2        900  LAST ORDINATE PUNCHED OR SAVED
                        TIMINT       .033  TIME INTERVAL IN HOURS


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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              **************
              *            *
 239 KK       *   B-H1-2   *
              *            *
              **************

 246 KO          OUTPUT CONTROL VARIABLES
                      IPRNT          5  PRINT CONTROL
                      IPLOT          0  PLOT CONTROL
                      QSCAL         0.  HYDROGRAPH PLOT SCALE
                      IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                       IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                      ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                      ISAV2        900  LAST ORDINATE PUNCHED OR SAVED
                     TIMINT       .033  TIME INTERVAL IN HOURS


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

              **************
              *            *
 253 KK       *   B-L-1    *
              *            *
              **************

 260 KO          OUTPUT CONTROL VARIABLES
                      IPRNT          5  PRINT CONTROL
                      IPLOT          0  PLOT CONTROL
                      QSCAL         0.  HYDROGRAPH PLOT SCALE
                      IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                       IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                      ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                      ISAV2        900  LAST ORDINATE PUNCHED OR SAVED
                     TIMINT       .033  TIME INTERVAL IN HOURS


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

              **************
              *            *
 267 KK       *   B-M-1    *
              *            *
              **************

 274 KO          OUTPUT CONTROL VARIABLES
                      IPRNT          5  PRINT CONTROL
                      IPLOT          0  PLOT CONTROL
                      QSCAL         0.  HYDROGRAPH PLOT SCALE
                      IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                       IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                      ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                      ISAV2        900  LAST ORDINATE PUNCHED OR SAVED
                     TIMINT       .033  TIME INTERVAL IN HOURS


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

              **************
              *            *
 281 KK       *   B-N-1    *
              *            *
              **************

 288 KO          OUTPUT CONTROL VARIABLES
                      IPRNT          5  PRINT CONTROL
                      IPLOT          0  PLOT CONTROL
                      QSCAL         0.  HYDROGRAPH PLOT SCALE
                      IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                       IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                      ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                      ISAV2        900  LAST ORDINATE PUNCHED OR SAVED
                     TIMINT       .033  TIME INTERVAL IN HOURS
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	E1	148.	3.20	14.	4.	3.	.06		
+	HYDROGRAPH AT	E2	138.	3.13	11.	3.	2.	.05		
+	ROUTED TO	B-E2-1	99.	3.23	7.	2.	1.	.05		
+									2702.77	3.23
+	2 COMBINED AT	COMBE	238.	3.23	22.	5.	4.	.11		

+	HYDROGRAPH AT	F1a	30.	3.13	2.	1.	0.	.01		
+ +	ROUTED TO	B-F1-1	18.	3.23	2.	0.	0.	.01	2728.48	3.23
+	ROUTED TO	RF1b	18.	3.27	2.	0.	0.	.01		
+	HYDROGRAPH AT	F1b	14.	3.10	1.	0.	0.	.00		
+	2 COMBINED AT	CBF1b	23.	3.27	2.	1.	1.	.01		
+	HYDROGRAPH AT	F1c	31.	3.13	2.	1.	0.	.01		
+	2 COMBINED AT	CBF1c	44.	3.13	5.	1.	1.	.02		
+ +	ROUTED TO	B-F1-2	39.	3.30	4.	1.	1.	.02	2711.78	3.30
+	ROUTED TO	RF1d	39.	3.30	4.	1.	1.	.02		
+	HYDROGRAPH AT	F1d	17.	3.10	1.	0.	0.	.00		
+	2 COMBINED AT	CBF1d	45.	3.30	5.	1.	1.	.03		
+ +	ROUTED TO	B-F1-3	31.	3.47	4.	1.	1.	.03	2699.84	3.47
+	ROUTED TO	RF1e	31.	3.50	4.	1.	1.	.03		
+	HYDROGRAPH AT	F1e	23.	3.10	2.	0.	0.	.01		
+	2 COMBINED AT	CBF1e	35.	3.50	6.	1.	1.	.04		
+ +	ROUTED TO	B-F1-4	32.	3.60	5.	1.	1.	.04	2679.94	3.60
+	HYDROGRAPH AT	F2a	15.	3.10	1.	0.	0.	.00		
+ +	ROUTED TO	B-F2-1	8.	3.23	1.	0.	0.	.00	2703.31	3.23
+	ROUTED TO	RF2b	8.	3.27	1.	0.	0.	.00		
+	HYDROGRAPH AT	F2b	17.	3.17	2.	0.	0.	.01		
+	2 COMBINED AT	CBF2b	21.	3.23	2.	1.	0.	.01		
+ +	ROUTED TO	B-F2-2	12.	3.40	2.	0.	0.	.01	2684.47	3.40
+	ROUTED TO	RF2c	12.	3.43	1.	0.	0.	.01		
+	HYDROGRAPH AT	F2c	12.	3.10	1.	0.	0.	.00		
+	2 COMBINED AT	CBF2c	15.	3.43	2.	1.	0.	.01		
+	HYDROGRAPH AT	F3	41.	3.13	3.	1.	1.	.01		
+ +	ROUTED TO	B-F3-1	27.	3.23	2.	1.	0.	.01	2709.69	3.23
+	HYDROGRAPH AT	G	43.	3.13	4.	1.	1.	.02		
+ +	ROUTED TO	B-G-1	33.	3.23	3.	1.	1.	.02	2726.80	3.23
+	HYDROGRAPH AT	H1a	88.	3.10	6.	2.	1.	.03		
+ +	ROUTED TO	B-H1-1	38.	3.30	3.	1.	1.	.03	2745.61	3.30
+	HYDROGRAPH AT	H1b	14.	3.10	1.	0.	0.	.00		
	HYDROGRAPH AT									

```
+                            H1c        46.    3.10          3.         1.          1.       .01

          3 COMBINED AT
+                          CBH1c        61.    3.30          7.         2.          1.       .05

          ROUTED TO
+                           RH1d        60.    3.30          7.         2.          1.       .05

          HYDROGRAPH AT
+                            H1d        40.    3.10          3.         1.          1.       .01

          2 COMBINED AT
+                          CBH1d        98.    3.13         10.         3.          2.       .06

          ROUTED TO
+                         B-H1-2        93.    3.17         10.         2.          2.       .06
+                                                                                                    2726.00       3.17

          HYDROGRAPH AT
+                              L        37.    3.07          2.         1.          0.       .01

          ROUTED TO
+                          B-L-1        28.    3.13          2.         0.          0.       .01
+                                                                                                    2725.77       3.13

          HYDROGRAPH AT
+                              M        52.    3.10          4.         1.          1.       .01

          ROUTED TO
+                          B-M-1        43.    3.17          3.         1.          1.       .01
+                                                                                                    2717.66       3.17

          HYDROGRAPH AT
+                              N        36.    3.10          2.         1.          0.       .01

          ROUTED TO
+                          B-N-1        17.    3.23          2.         0.          0.       .01
+                                                                                                    2692.48       3.23

          8 COMBINED AT
+                          CLEAR       226.    3.20         29.         7.          6.       .17
1
                                SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                    (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                         INTERPOLATED TO
                                                                      COMPUTATION INTERVAL
            ISTAQ     ELEMENT       DT        PEAK    TIME TO    VOLUME       DT       PEAK   TIME TO      VOLUME
                                                        PEAK                                    PEAK

                                  (MIN)      (CFS)     (MIN)      (IN)      (MIN)     (CFS)    (MIN)        (IN)

             FOR STORM = 1  STORM AREA (SQ MI) =          .01
                 E1  MANE           1.51    148.62    191.85      2.18      2.00     148.02   192.00        2.17

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .7111E+01 OUTFLOW= .7078E+01 BASIN STORAGE= .1605E-02 PERCENT ERROR=    .4

             FOR STORM = 1  STORM AREA (SQ MI) =          .01
                 E2  MANE           1.74    141.10    188.83      2.27      2.00     137.93   188.00        2.27

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .5574E+01 OUTFLOW= .5564E+01 BASIN STORAGE= .4962E-03 PERCENT ERROR=    .2

             FOR STORM = 1  STORM AREA (SQ MI) =          .01
                F1a  MANE            .81     30.56    187.26      2.27      2.00      29.97   188.00        2.27

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1163E+01 OUTFLOW= .1162E+01 BASIN STORAGE= .1238E-03 PERCENT ERROR=    .1

             FOR STORM = 1  STORM AREA (SQ MI) =          .01
               RF1b  MANE            .86     17.66    195.75      1.49      2.00      17.63   196.00        1.49

CONTINUITY SUMMARY (AC-FT) - INFLOW= .7608E+00 EXCESS= .0000E+00 OUTFLOW= .7614E+00 BASIN STORAGE= .7530E-05 PERCENT ERROR=   -.1

             FOR STORM = 1  STORM AREA (SQ MI) =          .01
                F1b  MANE            .96     14.23    185.51      2.27      2.00      14.20   186.00        2.27

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .4847E+00 OUTFLOW= .4844E+00 BASIN STORAGE= .2418E-04 PERCENT ERROR=    .1

             FOR STORM = 1  STORM AREA (SQ MI) =          .01
                F1c  MANE           1.35     31.55    187.59      2.27      2.00      31.37   188.00        2.27

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1212E+01 OUTFLOW= .1210E+01 BASIN STORAGE= .1130E-03 PERCENT ERROR=    .1

             FOR STORM = 1  STORM AREA (SQ MI) =          .01
               RF1d  MANE            .78     38.82    199.68      1.60      2.00      38.57   198.00        1.60

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2011E+01 EXCESS= .0000E+00 OUTFLOW= .2013E+01 BASIN STORAGE= .1529E-04 PERCENT ERROR=   -.1

             FOR STORM = 1  STORM AREA (SQ MI) =          .01
                F1d  MANE            .93     17.45    186.43      2.27      2.00      17.36   186.00        2.27

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .6059E+00 OUTFLOW= .6056E+00 BASIN STORAGE= .3414E-04 PERCENT ERROR=    .0
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FOR STORM = 1  STORM AREA (SQ MI) =      .01
    RF1e  MANE         1.12     30.92    210.12     1.28     2.00     30.87    210.00      1.28

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1947E+01 EXCESS= .0000E+00 OUTFLOW= .1954E+01 BASIN STORAGE= .2508E-04 PERCENT ERROR=  -.4

FOR STORM = 1  STORM AREA (SQ MI) =      .01
     F1e  MANE         1.22     23.28    186.95     2.27     2.00     23.13    186.00      2.27

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .8119E+00 OUTFLOW= .8114E+00 BASIN STORAGE= .4165E-04 PERCENT ERROR=   .1

FOR STORM = 1  STORM AREA (SQ MI) =      .01
     F2a  MANE          .72     14.95    186.47     2.27     2.00     14.85    186.00      2.27

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .5332E+00 OUTFLOW= .5325E+00 BASIN STORAGE= .3733E-04 PERCENT ERROR=   .1

FOR STORM = 1  STORM AREA (SQ MI) =      .01
    RF2b  MANE         1.06      7.90    196.66     1.47     2.00      7.89    196.00      1.47

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3432E+00 EXCESS= .0000E+00 OUTFLOW= .3446E+00 BASIN STORAGE= .2846E-05 PERCENT ERROR=  -.4

FOR STORM = 1  STORM AREA (SQ MI) =      .01
     F2b  MANE          .72     17.48    189.43     2.27     2.00     17.40    190.00      2.27

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .7877E+00 OUTFLOW= .7855E+00 BASIN STORAGE= .1507E-03 PERCENT ERROR=   .3

FOR STORM = 1  STORM AREA (SQ MI) =      .01
    RF2c  MANE          .62     12.29    205.45     1.29     2.00     12.27    206.00      1.28

CONTINUITY SUMMARY (AC-FT) - INFLOW= .7480E+00 EXCESS= .0000E+00 OUTFLOW= .7477E+00 BASIN STORAGE= .5997E-05 PERCENT ERROR=   .0

FOR STORM = 1  STORM AREA (SQ MI) =      .01
     F2c  MANE          .56     11.68    185.86     2.27     2.00     11.65    186.00      2.27

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .4120E+00 OUTFLOW= .4115E+00 BASIN STORAGE= .2778E-04 PERCENT ERROR=   .1

FOR STORM = 1  STORM AREA (SQ MI) =      .01
      F3  MANE          .68     41.31    186.98     2.27     2.00     40.52    188.00      2.27

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1575E+01 OUTFLOW= .1573E+01 BASIN STORAGE= .1671E-03 PERCENT ERROR=   .1

FOR STORM = 1  STORM AREA (SQ MI) =      .01
       G  MANE          .69     43.96    189.19     2.27     2.00     43.37    188.00      2.27

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1939E+01 OUTFLOW= .1934E+01 BASIN STORAGE= .3297E-03 PERCENT ERROR=   .3

FOR STORM = 1  STORM AREA (SQ MI) =      .01
     H1a  MANE         1.43     90.61    186.78     2.15     2.00     87.84    186.00      2.15

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .3096E+01 OUTFLOW= .3091E+01 BASIN STORAGE= .1664E-03 PERCENT ERROR=   .2

FOR STORM = 1  STORM AREA (SQ MI) =      .01
     H1b  MANE          .65     14.37    185.59     2.15     2.00     14.31    186.00      2.15

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .4702E+00 OUTFLOW= .4699E+00 BASIN STORAGE= .2207E-04 PERCENT ERROR=   .1

FOR STORM = 1  STORM AREA (SQ MI) =      .01
     H1c  MANE          .91     46.32    186.17     2.18     2.00     45.99    186.00      2.18

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1631E+01 OUTFLOW= .1629E+01 BASIN STORAGE= .1238E-03 PERCENT ERROR=   .1

FOR STORM = 1  STORM AREA (SQ MI) =      .01
    RH1d  MANE          .65     60.58    198.91     1.54     2.00     60.35    198.00      1.54

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3695E+01 EXCESS= .0000E+00 OUTFLOW= .3696E+01 BASIN STORAGE= .1226E-04 PERCENT ERROR=   .0

FOR STORM = 1  STORM AREA (SQ MI) =      .01
     H1d  MANE          .67     40.39    186.96     2.16     2.00     39.77    186.00      2.16

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1503E+01 OUTFLOW= .1500E+01 BASIN STORAGE= .1420E-03 PERCENT ERROR=   .2

FOR STORM = 1  STORM AREA (SQ MI) =      .01
       L  MANE          .58     37.47    184.91     2.26     2.00     36.74    184.00      2.26

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1194E+01 OUTFLOW= .1193E+01 BASIN STORAGE= .4421E-04 PERCENT ERROR=   .1
```

```
         FOR STORM = 1  STORM AREA (SQ MI) =        .01
                M  MANE          .91     52.47    185.88      2.21      2.00     52.40    186.00        2.21

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1772E+01 OUTFLOW= .1770E+01 BASIN STORAGE= .8575E-04 PERCENT ERROR=    .1

         FOR STORM = 1  STORM AREA (SQ MI) =        .01
                N  MANE         1.07     36.42    185.94      2.27      2.00     36.37    186.00        2.27

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1212E+01 OUTFLOW= .1212E+01 BASIN STORAGE= .4858E-04 PERCENT ERROR=    .0


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

Ultimate Condition:

2-year HEC-1 Model

DEV-2.OH1

```
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   05DEC06  TIME  13:42:07    *                  *       (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        SERENO CANTON PHASE 1
            2         ID        HEC-1 MODEL
            3         ID        2-YEAR, 6-HOUR STORM
            4         ID        RAINFALL FROM NOAA ATLAS
            5         ID        SCS CURVE NUMBER SOIL LOSS PARAMETERS
            6         ID        KINEMATIC WAVE HYDROGRAPH ROUTING
            7         ID        DEVELOPED CONDITIONS
            8         ID        10% IMPERVIOUS AREA USED FOR SITE
            9         ID        Sereno Canyon Phase 1 includes draiange basins E1,E2,F1,F2,F3,G,H1,L,M,N
           10         ID        Original Master Plan HEC1 model updated for Phase 1 drainage basins
           11         ID        DRAINAGE BASINS E2,F1,F2,H1 FURTHER DIVIDED INTO SUBBASINS
           12         ID
           13         ID  PREPARED BY WOOD/PATEL, 8.24.2006
           14         ID  FILE NAME:  DEV-2.DAT
           15         ID
                      *DIAGRAM
           16         IT       2                       900
           17         IO       5
           18         JD               .01
           19         PH                       0.38     0.7    1.12    1.27    1.38    1.57
                      *

           20         KK      E1       5
           21         KM  RUNOFF FROM DRAINAGE SUB-BASIN E1
           22         BA    .061
           23         LS              88      10
           24         UK     400     .02    0.13     100
           25         RK    2050    .013    .032            TRAP       7       5
                      *

           26         KK  B-E1-2
           27         KM  FLOW ROUTED THROUGH DETENTION BASIN E1-2
           28         KM  19' WEIR AT HEADWALL
           29         RS       1    STOR       0
           30         SV       0   0.138   0.316   0.532   0.788    1.09
           31         SE    2695    2696    2697    2698    2699    2700
           32         SQ       0       0       0       0      53     150
                      *

           33         KK      E2
           34         KM  RUNOFF FROM DRAINAGE SUB-BASIN E2
           35         BA    .046
           36         LS              88      10
           37         UK     200     .02    0.13     100
           38         RK    2370    .013    .032            TRAP      10       5
                      *

           39         KK  B-E2-1
           40         KM  FLOW ROUTED THROUGH DETENTION BASIN E2-1
           41         KM  2-42" PIPE CULVERT
           42         RS       1    STOR       0
           43         SV       0   0.098   0.228   0.411   0.678   1.062   1.583   1.897   2.257
           44         SE    2696    2697    2698    2699    2700    2701    2702  2702.5    2703
           45         SQ       0       0       0       0       0       0       0       0     180
           46         KO                                      22
                      *
1                                        HEC-1 INPUT                                              PAGE  2

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

           47         KK   COMBE
           48         KM  COMBINE RUNOFF FROM E1 AND E2
           49         HC       2
           50         KO                                      22
                      *

           51         KK     F1a
```

```
  52          KM  RUNOFF FROM DRAINAGE SUB-BASIN F1a
  53          BA  0.0096
  54          LS              88       10
  55          UK     225    .018     0.13      100
  56          RK     600    .012     .032               TRAP        7        5
              *

  57          KK  B-F1-1
  58          KM  FLOW ROUTED THROUGH DETENTION BASIN F1-1
  59          KM  30" PIPE CULVERT
  60          RS       1    STOR        0
  61          SV       0   0.118    0.251    0.402    0.553
  62          SE    2725    2726     2727     2728     2729
  63          SQ       0       0        0        0       37
  64          KO                                         22
              *

  65          KK     F1b
  66          KM  RUNOFF FROM DRAIANGE SUB-BASIN F1b
  67          BA   0.004
  68          LS              88       10
  69          UK     140   0.018     0.13      100
  70          RK     600   0.012    0.032               TRAP        7        5
              *

  71          KK     F1c
  72          KM  RUNOFF FROM SUB-BASIN F1c
  73          BA    0.01
  74          LS              88       10
  75          UK     200   0.018     0.13      100
  76          RK    1200   0.012    0.032               TRAP        7        5
              *

  77          KK   CBF1c
  78          KM  COMBINE RUNOFF FROM F1c AND CBF1b
  79          HC       2
              *

  80          KK  B-F1-2
  81          KM  FLOW ROUTED THROUGH DETENTION BASIN
  82          KM  36" PIPE CULVERT
  83          RS       1    STOR        0
  84          SV       0   0.116    0.264    0.446    0.666
  85          SE    2708    2709     2710     2711     2712
  86          SQ       0       0        0        0       50
              *
1                                        HEC-1 INPUT                                                PAGE  3

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

  87          KK    RF1d
  88          KM  ROUTE FLOW FROM DETENTION BASIN B-F1-2
  89          RK     700   0.012    0.032               TRAP        7        5
              *

  90          KK     F1d
  91          KM  RUNOFF FROM SUB-BASIN F1d
  92          BA   0.005
  93          LS              88       10
  94          UK     150   0.018     0.13      100
  95          RK     700   0.012    0.032               TRAP        7        5
              *
              *  CBF1d
              * COMBINE RUNOFF FROM F1d AND RF1d
              *        2
              *

  96          KK  B-F1-3
  97          KM  FLOW ROUTED THROUGH BASIN
  98          KM  30" PIPE CULVERT
  99          RS       1    STOR        0
 100          SV       0   0.196    0.418    0.671    0.958    1.286
 101          SE    2696    2697     2698     2699     2700     2701
 102          SQ       0       0        0        0       37       45
              *

 103          KK     F1e
 104          KM  RUNOFF FROM DRAINAGE SUB-BASIN F1e
 105          BA  0.0067
 106          LS              88       10
 107          UK     140   0.018     0.13      100
 108          RK     930   0.012    0.032               TRAP        7        5
              *

 109          KK   CBF1e
 110          KM  COMBINE RUNOFF FROM F1e AND RF1e
 111          HC       2
              *

 112          KK  B-F1-4
 113          KM  FLOW ROUTED THROUGH BASIN
 114          KM  12' WEIR AT HEAD WALL
 115          RS       1    STOR        0
 116          SV       0   0.085    0.206    0.369    0.583
 117          SE    2676    2677     2678     2679     2680
 118          SQ       0       0        0        0       34
 119          KO                                         22
              *
1                                        HEC-1 INPUT                                                PAGE  4

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

 120          KK     F2a
 121          KM  RUNOFF FROM DRAINAGE SUBBASIN F2a
```

```
 122          BA  0.0044
 123          LS            88       10
 124          UK    180  0.018     0.13      100
 125          RK    650  0.028    0.032             TRAP       6       5
              *

 126          KK  B-F2-1
 127          KM  FLOW ROUTED THROUGH DETENTION BASIN F2-1
 128          KM  24" PIPE CULVERT
 129          RS      1   STOR        0
 130          SV      0  0.039    0.101    0.189    0.307
 131          SE   2700   2701     2702     2703     2704
 132          SQ      0      0        0        0       26
              *

 133          KK     F2b
 134          KM  RUNOFF FROM DRAINAGE SUB-BASIN F2b
 135          BA  0.0065
 136          LS            88       10
 137          UK    350   .018     0.13      100
 138          RK    760   .028     .032             TRAP       6       5
              *

 139          KK   CBF2b
 140          KM  COMBINE RUNOFF FROM F2b AND RF2b
 141          HC      2
              *

 142          KK  B-F2-2
 143          KM  FLOW ROUTED THROUGH DETENTION BASIN F2-2
 144          KM  24" PIPE CULVERT
 145          RS      1   STOR        0
 146          SV      0  0.101    0.227    0.383    0.571
 147          SE   2681   2682     2683     2684     2685
 148          SQ      0      0        0        0       26
 149          KO                                     22
              *

 150          KK     F2c
 151          KM  RUNOFF FROM DRAINAGE SUB-BASIN F2c
 152          BA  0.0034
 153          LS            88       10
 154          UK    175   .018     0.13      100
 155          RK    500   .028     .032             TRAP       6       5
              *

 156          KK   CBF2c
 157          KM  COMBINE RUNOFF FROM F2c AND RF2c
 158          HC      2
              *
1                                          HEC-1 INPUT                                          PAGE  5

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

 159          KK      F3
 160          KM  RUNOFF FROM DRAINAGE SUB-BASIN F3
 161          BA   .013
 162          LS            88       10
 163          UK    225   .018     0.13      100
 164          RK    850   :026     .032             TRAP       6       5
              *

 165          KK  B-F3-1
 166          KM  FLOW ROUTED THROUGH DETENTION BASIN F3-1
 167          KM  14' WEIR ROCK BERM AT OUTLET
 168          RS      1   STOR        0
 169          SV      0  0.033     0.09    0.175    0.289    0.438    0.625
 170          SE   2704   2705     2706     2707     2708     2709     2710
 171          SQ      0      0        0        0        0        0       39
 172          KO                                     22
              *

 173          KK       G
 174          KM  RUNOFF FROM DRAINAGE SUB-BASIN G
 175          BA  0.016
 176          LS            88       10
 177          UK    400   .025     0.13      100
 178          RK    720   .022     .032             TRAP       4       5
              *

 179          KK   B-G-1
 180          KM  FLOW ROUTED THROUGH DETENTION BASIN G-1
 181          KM  15' WEIR
 182          RS      1   STOR        0
 183          SV      0   0.07    0.162    0.282    0.437    0.632
 184          SE   2722   2723     2724     2725     2726     2727
 185          SQ      0      0        0        0        0       42
 186          KO                                     22
              *

 187          KK   CLEAR
 188          KM  CLEAR HYDROGRAPH STACK
 189          HC      7
              *

 190          KK     H1a
 191          KM  RUNOFF FROM DRAINAGE SUB-BASIN H1a
 192          BA  0.027
 193          LS            88    8.805
 194          UK    150   .025     0.13      100
 195          RK   1850   .019     .032             TRAP       8       5
              *
1                                          HEC-1 INPUT                                          PAGE  6

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

```
          KK  B-H1-1
          KM  FLOW ROUTED THROUGH DETENTION BASIN H1-1
          KM  2-36" PIPE CULVERT
          RS       1    STOR       0
          SV       0   0.009   0.046   0.132   0.284    0.51   0.822    1.24   1.497   1.809
          SE    2738    2739    2740    2741    2742    2743    2744    2745  2745.5    2746
          SQ       0       0       0       0       0       0       0       0       0     170
          *

          KK     H1b
          KM  RUNOFF FROM DRAINAGE SUB-BASIN H1b
          BA  0.0041
          LS              88      10
          UK     160    .025    0.13     100
          RK     550    .019    .032            TRAP       8       5
          *

          KK     H1c
          KM  RUNOFF FROM DRAINAGE SUB-BASIN H1c
          BA   0.014
          LS              88      10
          UK     200    .025    0.13     100
          RK     950    .019    .032            TRAP       8       5
          *

          KK   CBH1c
          KM  COMBINE RUNOFF FROM H1a, H1b & H1c
          HC       3
          *

          KK    RH1d
          KM  ROUTE FLOW COMBINED CBH1c
          RK     700   0.028   0.032            TRAP       6       5
          *

          KK     H1d
          KM  RUNOFF FROM DRAINAGE SUB-BASIN H1d
          BA   0.013
          LS              88      10
          UK     250    .025    0.13     100
          RK     700    .019    .032            TRAP       8       5
          *

          KK   CBH1d
          KM  COMBINE RUNOFF FROM H1d AND CBH1c
          HC       2
          *

          KK  B-H1-2
          KM  FLOW ROUTED THROUGH DETENTION BASIN H1-2
          KM  36' WEIR
          RS       1    STOR       0
          SV       0   0.038   0.104   0.212   0.363   0.579
          SE    2721    2722    2723    2724    2725  2726.1
1                                      HEC-1 INPUT                                              PAGE  7

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

          SQ       0       0       0       0       0     102
          KO                                      22
          *

          KK       L
          KM  RUNOFF FROM DRAINAGE SUB-BASIN L
          BA  0.0099
          LS              88    9.09
          UK     113   0.018    0.13     100
          RK     450    .012    .032            TRAP       5       5
          *

          KK   B-L-1
          KM  FLOW ROUTED THROUGH DETENTION BASIN L-1
          KM  13' WEIR
          RS       1    STOR       0
          SV       0   0.056   0.139   0.253   0.403
          SE    2722    2723    2724    2725    2726
          SQ       0       0       0       0      36
          KO                                      22
          *

          KK       M
          KM  RUNOFF FROM DRAINAGE SUB-BASIN M
          BA   0.015
          LS              88     5.3
          UK     137    .018    0.13     100
          RK     960    .012    .032            TRAP       4       5
          *

          KK   B-M-1
          KM  FLOW ROUTED THROUGH DETENTION BASIN M-1
          KM  7' WEIR
          RS       1    STOR       0
          SV       0    0.06   0.134   0.225   0.334   0.463
          SE    2713    2714    2715    2716    2717    2718
          SQ       0       0       0       0      20      55
          KO                                      22
          *

          KK       N
          KM  RUNOFF FROM DRAINAGE SUB-BASIN N
          BA     .01
          LS              88      10
          UK     117    .018    0.13     100
          RK    1036    .012    .032            TRAP       5       5
```

```
                       *
          272          KK   B-N-1
          273          KM  FLOW ROUTED THROUGH DETENTION BASIN N-1
          274          KM  100' ROCK BERM AT OUTLET
          275          RS       1    STOR       0
          276          SV       0   0.066    0.16   0.286   0.447   0.646
          277          SE    2688    2689    2690    2691    2692    2693
          278          SQ       0       0       0       0       0      36
1                                               HEC-1 INPUT                                        PAGE  8

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

          279          KO                                      22
          280          ZZ
1
               SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE    (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

   NO.    (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

    20          E1
                 V
                 V
    26      B-E1-2
                 .
                 .
    33           .          E2
                 .           V
                 .           V
    39           .      B-E2-1
                 .           .
                 .           .
    47       COMBE............
                 .
                 .
    51           .         F1a
                 .           V
                 .           V
    57           .      B-F1-1
                 .           .
                 .           .
    65           .           .         F1b
                 .           .           .
                 .           .           .
    71           .           .           .         F1c
                 .           .           .           .
                 .           .           .           .
    77           .           .       CBF1c............
                 .           .           V
                 .           .           V
    80           .           .      B-F1-2
                 .           .           V
                 .           .           V
    87           .           .        RF1d
                 .           .           .
                 .           .           .
    90           .           .           .         F1d
                 .           .           .           V
                 .           .           .           V
    96           .           .           .      B-F1-3
                 .           .           .           .
                 .           .           .           .
   103           .           .           .           .         F1e
                 .           .           .           .           .
                 .           .           .           .           .
   109           .           .           .       CBF1e............
                 .           .           .           V
                 .           .           .           V
   112           .           .           .      B-F1-4
                 .           .           .           .
                 .           .           .           .
   120           .           .           .           .         F2a
                 .           .           .           .           V
                 .           .           .           .           V
   126           .           .           .           .      B-F2-1
                 .           .           .           .           .
                 .           .           .           .           .
   133           .           .           .           .           .         F2b
                 .           .           .           .           .           .
                 .           .           .           .           .           .
   139           .           .           .           .       CBF2b............
                 .           .           .           .           V
                 .           .           .           .           V
   142           .           .           .           .      B-F2-2
                 .           .           .           .           .
                 .           .           .           .           .
   150           .           .           .           .           .         F2c
                 .           .           .           .           .           .
                 .           .           .           .           .           .
   156           .           .           .           .       CBF2c............
                 .           .           .           .           .
                 .           .           .           .           .
   159           .           .           .           .           .          F3
                 .           .           .           .           .           V
                 .           .           .           .           .           V
   165           .           .           .           .           .      B-F3-1
                 .           .           .           .           .           .
                 .           .           .           .           .           .
   173           .           .           .           .           .           .           G
                 .           .           .           .           .           .           V
                 .           .           .           .           .           .           V
   179           .           .           .           .           .           .       B-G-1
                 .           .           .           .           .           .           .
                 .           .           .           .           .           .           .
```

```
                                                                    DEV-2.OH1
187       CLEAR.................................................................
            .
190         .       H1a
            .        V
            .        V
196         .     B-H1-1
            .        .
203         .        .         H1b
            .        .          .
209         .        .          .         H1c
            .        .          .          .
215         .      CBH1c.......................
            .        V
            .        V
218         .      RH1d
            .        .
221         .        .         H1d
            .        .          .
227         .      CBH1d...........
            .        V
            .        V
230         .     B-H1-2
            .        .
238         .        .          L
            .        .          V
            .        .          V
244         .        .        B-L-1
            .        .          .
252         .        .          .          M
            .        .          .          V
            .        .          .          V
258         .        .          .        B-M-1
            .        .          .          .
266         .        .          .          .         N
            .        .          .          .         V
            .        .          .          .         V
272         .        .          .          .       B-N-1

(***) 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   05DEC06  TIME  13:42:07   *                   *           (916) 756-1104              *
 *                                       *                   *                                       *
 *****************************************                   *****************************************



                            SERENO CANTON PHASE 1
                            HEC-1 MODEL
                            2-YEAR, 6-HOUR STORM
                            RAINFALL FROM NOAA ATLAS
                            SCS CURVE NUMBER SOIL LOSS PARAMETERS
                            KINEMATIC WAVE HYDROGRAPH ROUTING
                            DEVELOPED CONDITIONS
                            10% IMPERVIOUS AREA USED FOR SITE
                            Sereno Canyon Phase 1 includes draiange basins E1,E2,F1,F2,F3,G,H1,L,M,N
                            Original Master Plan HEC1 model updated for Phase 1 drainage basins
                            DRAINAGE BASINS E2,F1,F2,H1 FURTHER DIVIDED INTO SUBBASINS

                        PREPARED BY WOOD/PATEL, 8.24.2006
                        FILE NAME:  DEV-2.DAT


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

   IT         HYDROGRAPH TIME DATA
                     NMIN           2  MINUTES IN COMPUTATION INTERVAL
                    IDATE     1     0  STARTING DATE
                    ITIME        0000  STARTING TIME
                       NQ         900  NUMBER OF HYDROGRAPH ORDINATES
                   NDDATE     2     0  ENDING DATE
                   NDTIME        0558  ENDING TIME
                    ICENT          19  CENTURY MARK

                COMPUTATION INTERVAL     .03 HOURS
                     TOTAL TIME BASE   29.97 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

18 JD          INDEX STORM NO. 1
                    STRM        1.57  PRECIPITATION DEPTH
```

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                TRDA           .01  TRANSPOSITION DRAINAGE AREA

  19 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      .01
                   .01      .01      .01      .01      .01      .01      .01      .01      .01      .01
                   .02      .02      .02      .02      .03      .03      .04      .06      .08      .15
                   .15      .12      .07      .05      .03      .03      .03      .02      .02      .02
                   .01      .01      .01      .01      .01      .01      .01      .01      .01      .01
                   .01      .01      .00      .00      .00      .00      .00      .00      .00      .00
                   .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                   .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                   .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                   .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                   .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                   .00      .00      .00      .00      .00      .00      .00      .00      .00      .00

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            **************
            *            *
  39 KK     *   B-E2-1   *
            *            *
            **************

  46 KO        OUTPUT CONTROL VARIABLES
                  IPRNT          5  PRINT CONTROL
                  IPLOT          0  PLOT CONTROL
                  QSCAL         0.  HYDROGRAPH PLOT SCALE
                  IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                   IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                  ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                  ISAV2        900  LAST ORDINATE PUNCHED OR SAVED
                 TIMINT       .033  TIME INTERVAL IN HOURS

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

            **************
            *            *
  47 KK     *    COMBE   *
            *            *
            **************

  50 KO        OUTPUT CONTROL VARIABLES
                  IPRNT          5  PRINT CONTROL
                  IPLOT          0  PLOT CONTROL
                  QSCAL         0.  HYDROGRAPH PLOT SCALE
                  IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                   IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                  ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                  ISAV2        900  LAST ORDINATE PUNCHED OR SAVED
                 TIMINT       .033  TIME INTERVAL IN HOURS

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

            **************
            *            *
  57 KK     *   B-F1-1   *
            *            *
            **************

  64 KO        OUTPUT CONTROL VARIABLES
                  IPRNT          5  PRINT CONTROL
                  IPLOT          0  PLOT CONTROL
                  QSCAL         0.  HYDROGRAPH PLOT SCALE
                  IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                   IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                  ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                  ISAV2        900  LAST ORDINATE PUNCHED OR SAVED
                 TIMINT       .033  TIME INTERVAL IN HOURS

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

            **************
            *            *
 112 KK     *   B-F1-4   *
            *            *
            **************

 119 KO        OUTPUT CONTROL VARIABLES
                  IPRNT          5  PRINT CONTROL
                  IPLOT          0  PLOT CONTROL
                  QSCAL         0.  HYDROGRAPH PLOT SCALE
                  IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                   IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                  ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
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                  ISAV2        900  LAST ORDINATE PUNCHED OR SAVED
                 TIMINT       .033  TIME INTERVAL IN HOURS


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

            **************
            *            *
 142 KK     *   B-F2-2   *
            *            *
            **************

 149 KO          OUTPUT CONTROL VARIABLES
                  IPRNT          5  PRINT CONTROL
                  IPLOT          0  PLOT CONTROL
                  QSCAL         0.  HYDROGRAPH PLOT SCALE
                  IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                   IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                  ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                  ISAV2        900  LAST ORDINATE PUNCHED OR SAVED
                 TIMINT       .033  TIME INTERVAL IN HOURS


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

            **************
            *            *
 165 KK     *   B-F3-1   *
            *            *
            **************

 172 KO          OUTPUT CONTROL VARIABLES
                  IPRNT          5  PRINT CONTROL
                  IPLOT          0  PLOT CONTROL
                  QSCAL         0.  HYDROGRAPH PLOT SCALE
                  IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                   IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                  ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                  ISAV2        900  LAST ORDINATE PUNCHED OR SAVED
                 TIMINT       .033  TIME INTERVAL IN HOURS


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

            **************
            *            *
 179 KK     *    B-G-1   *
            *            *
            **************

 186 KO          OUTPUT CONTROL VARIABLES
                  IPRNT          5  PRINT CONTROL
                  IPLOT          0  PLOT CONTROL
                  QSCAL         0.  HYDROGRAPH PLOT SCALE
                  IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                   IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                  ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                  ISAV2        900  LAST ORDINATE PUNCHED OR SAVED
                 TIMINT       .033  TIME INTERVAL IN HOURS

         *** FDKRUT - NEWTON RAPHSON FAILEDFIXED POINT ITERATION USED - ITERATION=  1


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

            **************
            *            *
 230 KK     *   B-H1-2   *
            *            *
            **************

 237 KO          OUTPUT CONTROL VARIABLES
                  IPRNT          5  PRINT CONTROL
                  IPLOT          0  PLOT CONTROL
                  QSCAL         0.  HYDROGRAPH PLOT SCALE
                  IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                   IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                  ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                  ISAV2        900  LAST ORDINATE PUNCHED OR SAVED
                 TIMINT       .033  TIME INTERVAL IN HOURS


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

            **************
            *            *
 244 KK     *    B-L-1   *
            *            *
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          **************

251 KO        OUTPUT CONTROL VARIABLES
                    IPRNT           5  PRINT CONTROL
                    IPLOT           0  PLOT CONTROL
                    QSCAL          0.  HYDROGRAPH PLOT SCALE
                    IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                     IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                    ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                    ISAV2         900  LAST ORDINATE PUNCHED OR SAVED
                   TIMINT        .033  TIME INTERVAL IN HOURS


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

          **************
          *            *
258 KK    *   B-M-1    *
          *            *
          **************

265 KO        OUTPUT CONTROL VARIABLES
                    IPRNT           5  PRINT CONTROL
                    IPLOT           0  PLOT CONTROL
                    QSCAL          0.  HYDROGRAPH PLOT SCALE
                    IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                     IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                    ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                    ISAV2         900  LAST ORDINATE PUNCHED OR SAVED
                   TIMINT        .033  TIME INTERVAL IN HOURS


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

          **************
          *            *
272 KK    *   B-N-1    *
          *            *
          **************

279 KO        OUTPUT CONTROL VARIABLES
                    IPRNT           5  PRINT CONTROL
                    IPLOT           0  PLOT CONTROL
                    QSCAL          0.  HYDROGRAPH PLOT SCALE
                    IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                     IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                    ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                    ISAV2         900  LAST ORDINATE PUNCHED OR SAVED
                   TIMINT        .033  TIME INTERVAL IN HOURS
```

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	E1	32.	3.37	5.	1.	1.	.06		
+	ROUTED TO	B-E1-2	27.	3.50	4.	1.	1.	.06		
+									2698.51	3.50
+	HYDROGRAPH AT	E2	33.	3.27	4.	1.	1.	.05		
+	ROUTED TO	B-E2-1	0.	.00	0.	0.	0.	.05		
+									2702.30	28.47
+	2 COMBINED AT	COMBE	27.	3.50	4.	1.	1.	.11		
+	HYDROGRAPH AT	F1a	7.	3.23	1.	0.	0.	.01		
+	ROUTED TO	B-F1-1	0.	.00	0.	0.	0.	.01		
+									2727.79	29.17
+	HYDROGRAPH AT	F1b	4.	3.17	0.	0.	0.	.00		
+	HYDROGRAPH AT	F1c	7.	3.23	1.	0.	0.	.01		
+	2 COMBINED AT	CBF1c	10.	3.20	1.	0.	0.	.01		
+	ROUTED TO	B-F1-2	1.	4.77	0.	0.	0.	.01		
+									2711.01	4.77
+	ROUTED TO	RF1d	1.	4.87	0.	0.	0.	.01		
	HYDROGRAPH AT									

+		F1d	4.	3.17	0.	0.	0.	.00		
+ +	ROUTED TO	B-F1-3	0.	.00	0.	0.	0.	.00	2696.98	20.60
+	HYDROGRAPH AT	F1e	6.	3.20	1.	0.	0.	.01		
+	2 COMBINED AT	CBF1e	6.	3.20	1.	0.	0.	.01		
+ +	ROUTED TO	B-F1-4	0.	.00	0.	0.	0.	.01	2678.32	22.10
+	HYDROGRAPH AT	F2a	4.	3.20	0.	0.	0.	.00		
+ +	ROUTED TO	B-F2-1	0.	.00	0.	0.	0.	.00	2702.78	25.80
+	HYDROGRAPH AT	F2b	4.	3.33	0.	0.	0.	.01		
+	2 COMBINED AT	CBF2b	4.	3.33	0.	0.	0.	.01		
+ +	ROUTED TO	B-F2-2	0.	.00	0.	0.	0.	.01	2683.15	28.23
+	HYDROGRAPH AT	F2c	3.	3.17	0.	0.	0.	.00		
+	2 COMBINED AT	CBF2c	3.	3.17	0.	0.	0.	.01		
+	HYDROGRAPH AT	F3	9.	3.23	1.	0.	0.	.01		
+ +	ROUTED TO	B-F3-1	0.	5.23	0.	0.	0.	.01	2709.01	5.20
+	HYDROGRAPH AT	G	9.	3.30	1.	0.	0.	.02		
+ +	ROUTED TO	B-G-1	1.	4.20	0.	0.	0.	.02	2726.03	4.20
+	7 COMBINED AT	CLEAR	28.	3.50	5.	1.	1.	.19		
+	HYDROGRAPH AT	H1a	23.	3.20	2.	1.	0.	.03		
+ +	ROUTED TO	B-H1-1	0.	.00	0.	0.	0.	.03	2744.49	25.87
+	HYDROGRAPH AT	H1b	4.	3.17	0.	0.	0.	.00		
+	HYDROGRAPH AT	H1c	11.	3.20	1.	0.	0.	.01		
+	3 COMBINED AT	CBH1c	15.	3.17	1.	0.	0.	.05		
+	ROUTED TO	RH1d	15.	3.20	1.	0.	0.	.05		
+	HYDROGRAPH AT	H1d	9.	3.20	1.	0.	0.	.01		
+	2 COMBINED AT	CBH1d	24.	3.20	2.	1.	0.	.06		
+ +	ROUTED TO	B-H1-2	18.	3.33	2.	0.	0.	.06	2725.20	3.33
+	HYDROGRAPH AT	L	10.	3.13	1.	0.	0.	.01		
+ +	ROUTED TO	B-L-1	1.	3.70	0.	0.	0.	.01	2725.04	3.70
+	HYDROGRAPH AT	M	12.	3.20	1.	0.	0.	.01		
+ +	ROUTED TO	B-M-1	5.	3.43	1.	0.	0.	.01	2716.25	3.43
+	HYDROGRAPH AT	N	9.	3.17	1.	0.	0.	.01		
+ +	ROUTED TO	B-N-1	0.	.00	0.	0.	0.	.01	2691.62	22.90

1

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                                                DEV-2.OH1
                               SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                   (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                   INTERPOLATED TO
                                                             COMPUTATION INTERVAL
        ISTAQ    ELEMENT      DT       PEAK     TIME TO    VOLUME       DT       PEAK    TIME TO     VOLUME
                                                 PEAK                                     PEAK

                            (MIN)     (CFS)      (MIN)      (IN)      (MIN)     (CFS)     (MIN)       (IN)

       FOR STORM = 1  STORM AREA (SQ MI) =         .01
            E1  MANE          2.27     31.91    202.20       .72       2.00     31.86    202.00        .72

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .2362E+01 OUTFLOW= .2349E+01 BASIN STORAGE= .1516E-02 PERCENT ERROR=    .5

       FOR STORM = 1  STORM AREA (SQ MI) =         .01
            E2  MANE          2.00     33.11    195.30       .72       2.00     32.69    196.00        .72

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1781E+01 OUTFLOW= .1774E+01 BASIN STORAGE= .4574E-03 PERCENT ERROR=    .4

       FOR STORM = 1  STORM AREA (SQ MI) =         .01
           F1a  MANE          1.00      6.82    194.26       .72       2.00      6.81    194.00        .72

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .3718E+00 OUTFLOW= .3705E+00 BASIN STORAGE= .1250E-03 PERCENT ERROR=    .3

       FOR STORM = 1  STORM AREA (SQ MI) =         .01
           F1b  MANE          1.29      3.64    190.36       .72       2.00      3.61    190.00        .72

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1549E+00 OUTFLOW= .1544E+00 BASIN STORAGE= .2586E-04 PERCENT ERROR=    .3

       FOR STORM = 1  STORM AREA (SQ MI) =         .01
           F1c  MANE          2.00      7.30    193.52       .72       2.00      7.28    194.00        .72

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .3873E+00 OUTFLOW= .3847E+00 BASIN STORAGE= .1026E-03 PERCENT ERROR=    .6

       FOR STORM = 1  STORM AREA (SQ MI) =         .01
          RF1d  MANE          1.83       .70    292.71       .13       2.00       .70    292.00        .13

CONTINUITY SUMMARY (AC-FT) - INFLOW= .9302E-01 EXCESS= .0000E+00 OUTFLOW= .9364E-01 BASIN STORAGE= .1137E-04 PERCENT ERROR=   -.7

       FOR STORM = 1  STORM AREA (SQ MI) =         .01
           F1d  MANE          1.40      4.29    191.42       .72       2.00      4.26    190.00        .72

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1936E+00 OUTFLOW= .1930E+00 BASIN STORAGE= .3262E-04 PERCENT ERROR=    .3

       FOR STORM = 1  STORM AREA (SQ MI) =         .01
           F1e  MANE          1.67      5.87    190.60       .72       2.00      5.82    192.00        .72

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .2595E+00 OUTFLOW= .2586E+00 BASIN STORAGE= .4462E-04 PERCENT ERROR=    .3

       FOR STORM = 1  STORM AREA (SQ MI) =         .01
           F2a  MANE          1.05      3.52    191.84       .72       2.00      3.51    192.00        .72

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1704E+00 OUTFLOW= .1697E+00 BASIN STORAGE= .3894E-04 PERCENT ERROR=    .4

       FOR STORM = 1  STORM AREA (SQ MI) =         .01
           F2b  MANE          1.10      3.64    199.76       .72       2.00      3.64    200.00        .72

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .2517E+00 OUTFLOW= .2506E+00 BASIN STORAGE= .1450E-03 PERCENT ERROR=    .4

       FOR STORM = 1  STORM AREA (SQ MI) =         .01
           F2c  MANE           .79      2.80    191.08       .72       2.00      2.77    190.00        .72

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1317E+00 OUTFLOW= .1311E+00 BASIN STORAGE= .2729E-04 PERCENT ERROR=    .4

       FOR STORM = 1  STORM AREA (SQ MI) =         .01
            F3  MANE          1.03      9.22    193.01       .72       2.00      9.21    194.00        .72

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .5035E+00 OUTFLOW= .5017E+00 BASIN STORAGE= .1687E-03 PERCENT ERROR=    .3

       FOR STORM = 1  STORM AREA (SQ MI) =         .01
             G  MANE           .86      9.19    198.87       .72       2.00      9.13    198.00        .72

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .6196E+00 OUTFLOW= .6177E+00 BASIN STORAGE= .3650E-03 PERCENT ERROR=    .3

       FOR STORM = 1  STORM AREA (SQ MI) =         .01
           H1a  MANE          1.91     23.17    190.47       .71       2.00     23.06    192.00        .71

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1030E+01 OUTFLOW= .1025E+01 BASIN STORAGE= .1656E-03 PERCENT ERROR=    .4
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        FOR STORM = 1  STORM AREA (SQ MI) =        .01
            H1b  MANE            .95      3.79   190.01      .72      2.00      3.79   190.00        .72

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1588E+00 OUTFLOW= .1583E+00 BASIN STORAGE= .2231E-04 PERCENT ERROR=    .3

        FOR STORM = 1  STORM AREA (SQ MI) =        .01
            H1c  MANE           1.26     11.50   191.18      .72      2.00     11.40   192.00        .72

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .5422E+00 OUTFLOW= .5402E+00 BASIN STORAGE= .1179E-03 PERCENT ERROR=    .3

        FOR STORM = 1  STORM AREA (SQ MI) =        .01
           RH1d  MANE            .83     14.94   191.84      .29      2.00     14.93   192.00        .29

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6988E+00 EXCESS= .0000E+00 OUTFLOW= .6992E+00 BASIN STORAGE= .6543E-05 PERCENT ERROR=    .0

        FOR STORM = 1  STORM AREA (SQ MI) =        .01
            H1d  MANE            .97      9.51   192.49      .72      2.00      9.46   192.00        .72

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .5035E+00 OUTFLOW= .5006E+00 BASIN STORAGE= .1332E-03 PERCENT ERROR=    .5

        FOR STORM = 1  STORM AREA (SQ MI) =        .01
              L  MANE            .72      9.87   187.95      .72      2.00      9.87   188.00        .72

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .3789E+00 OUTFLOW= .3779E+00 BASIN STORAGE= .4313E-04 PERCENT ERROR=    .3

        FOR STORM = 1  STORM AREA (SQ MI) =        .01
              M  MANE           1.32     12.65   190.77      .68      2.00     12.33   192.00        .68

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .5457E+00 OUTFLOW= .5432E+00 BASIN STORAGE= .8523E-04 PERCENT ERROR=    .4

        FOR STORM = 1  STORM AREA (SQ MI) =        .01
              N  MANE           1.55      9.31   190.77      .72      2.00      9.23   190.00        .72

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .3873E+00 OUTFLOW= .3863E+00 BASIN STORAGE= .4529E-04 PERCENT ERROR=    .2


*** NORMAL END OF HEC-1 ***
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Ultimate Condition:

10-year HEC-1 Model

```
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   05DEC06  TIME  13:42:00    *                              *       (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       SERENO CANTON PHASE 1
            2         ID       HEC-1 MODEL
            3         ID       10-YEAR, 6-HOUR STORM
            4         ID       RAINFALL FROM NOAA ATLAS
            5         ID       SCS CURVE NUMBER SOIL LOSS PARAMETERS
            6         ID       KINEMATIC WAVE HYDROGRAPH ROUTING
            7         ID       DEVELOPED CONDITIONS
            8         ID       10% IMPERVIOUS AREA USED FOR SITE
            9         ID       Sereno Canyon Phase 1 includes draiange basins E1,E2,F1,F2,F3,G,H1,L,M,N
           10         ID       Original Master Plan HEC1 model updated for Phase 1 drainage basins
           11         ID       DRAINAGE BASINS E2,F1,F2,H1 FURTHER DIVIDED INTO SUBBASINS
           12         ID
           13         ID  PREPARED BY WOOD/PATEL, 8.24.2006
           14         ID  FILE NAME:  DEV-10.DAT
           15         ID
                      *DIAGRAM
           16         IT       2                   900
           17         IO       5
           18         JD               .01
           19         PH                      0.52    0.99    1.64    1.87    2.01    2.29
                      *

           20         KK      E1       5
           21         KM  RUNOFF FROM DRAINAGE SUB-BASIN E1
           22         BA    .061
           23         LS              88      10
           24         UK     400     .02    0.13     100
           25         RK    2050    .013    .032            TRAP       7       5
                      *

           26         KK  B-E1-2
           27         KM  FLOW ROUTED THROUGH DETENTION BASIN E1-2
           28         KM  19' WEIR AT HEADWALL
           29         RS       1    STOR       0
           30         SV       0   0.138   0.316   0.532   0.788    1.09
           31         SE    2695    2696    2697    2698    2699    2700
           32         SQ       0       0       0       0      53     150
                      *

           33         KK      E2
           34         KM  RUNOFF FROM DRAINAGE SUB-BASIN E2
           35         BA    .046
           36         LS              88      10
           37         UK     200     .02    0.13     100
           38         RK    2370    .013    .032            TRAP      10       5
                      *

           39         KK  B-E2-1
           40         KM  FLOW ROUTED THROUGH DETENTION BASIN E2-1
           41         KM  2-42" PIPE CULVERT
           42         RS       1    STOR       0
           43         SV       0   0.098   0.228   0.411   0.678   1.062   1.583   1.897   2.257
           44         SE    2696    2697    2698    2699    2700    2701    2702  2702.5    2703
           45         SQ       0       0       0       0       0       0       0       0     180
           46         KO                                      22
                      *
1                                               HEC-1 INPUT                                              PAGE  2

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

           47         KK   COMBE
           48         KM  COMBINE RUNOFF FROM E1 AND E2
           49         HC       2
           50         KO                                      22
                      *

           51         KK     F1a
```

```
 52          KM  RUNOFF FROM DRAINAGE SUB-BASIN F1a
 53          BA  0.0096
 54          LS            88       10
 55          UK     225   .018     0.13      100
 56          RK     600   .012     .032             TRAP        7        5
             *

 57          KK  B-F1-1
 58          KM  FLOW ROUTED THROUGH DETENTION BASIN F1-1
 59          KM  30" PIPE CULVERT
 60          RS       1   STOR        0
 61          SV       0  0.118    0.251    0.402    0.553
 62          SE    2725   2726     2727     2728     2729
 63          SQ       0      0        0        0       37
 64          KO                                      22
             *

 65          KK    RF1b
 66          KM  ROUTE FLOW FROM B-F1-1 THROUGH DRAINAGE BASIN F1b
 67          RK     600  0.012    0.032             TRAP        7        5
             *

 68          KK     F1b
 69          KM  RUNOFF FROM DRAIANGE SUB-BASIN F1b
 70          BA   0.004
 71          LS            88       10
 72          UK     140  0.018     0.13      100
 73          RK     600  0.012    0.032             TRAP        7        5
             *

 74          KK   CBF1b
 75          KM  COMBINE RUNOFF FROM F1b AND ROUTED FLOW RF1b
 76          HC       2
             *

 77          KK     F1c
 78          KM  RUNOFF FROM SUB-BASIN F1c
 79          BA    0.01
 80          LS            88       10
 81          UK     200  0.018     0.13      100
 82          RK    1200  0.012    0.032             TRAP        7        5
             *
1                                    HEC-1 INPUT                                        PAGE  3

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

 83          KK   CBF1c
 84          KM  COMBINE RUNOFF FROM F1c AND CBF1b
 85          HC       2
             *

 86          KK  B-F1-2
 87          KM  FLOW ROUTED THROUGH DETENTION BASIN
 88          KM  36" PIPE CULVERT
 89          RS       1   STOR        0
 90          SV       0  0.116    0.264    0.446    0.666
 91          SE    2708   2709     2710     2711     2712
 92          SQ       0      0        0        0       50
             *

 93          KK    RF1d
 94          KM  ROUTE FLOW FROM DETENTION BASIN B-F1-2
 95          RK     700  0.012    0.032             TRAP        7        5
             *

 96          KK     F1d
 97          KM  RUNOFF FROM SUB-BASIN F1d
 98          BA   0.005
 99          LS            88       10
100          UK     150  0.018     0.13      100
101          RK     700  0.012    0.032             TRAP        7        5
             *

102          KK   CBF1d
103          KM  COMBINE RUNOFF FROM F1d AND RF1d
104          HC       2
             *

105          KK  B-F1-3
106          KM  FLOW ROUTED THROUGH BASIN
107          KM  30" PIPE CULVERT
108          RS       1   STOR        0
109          SV       0  0.196    0.418    0.671    0.958    1.286
110          SE    2696   2697     2698     2699     2700     2701
111          SQ       0      0        0        0       37       45
             *

112          KK    RF1e
113          KM  ROUTE FLOW FROM DETENTION BASIN B-F1-3
114          RK     930  0.012    0.032             TRAP        7        5
             *

115          KK     F1e
116          KM  RUNOFF FROM DRAINAGE SUB-BASIN F1e
117          BA  0.0067
118          LS            88       10
119          UK     140  0.018     0.13      100
120          RK     930  0.012    0.032             TRAP        7        5
             *
1                                    HEC-1 INPUT                                        PAGE  4

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

121          KK   CBF1e
```

```
122            KM  COMBINE RUNOFF FROM F1e AND RF1e
123            HC       2
               *

124            KK  B-F1-4
125            KM  FLOW ROUTED THROUGH BASIN
126            KM  12' WEIR AT HEAD WALL
127            RS       1    STOR       0
128            SV       0   0.085   0.206   0.369   0.583
129            SE    2676    2677    2678    2679    2680
130            SQ       0       0       0       0      34
131            KO                                      22
               *

132            KK     F2a
133            KM  RUNOFF FROM DRAINAGE SUBBASIN F2a
134            BA  0.0044
135            LS             88      10
136            UK     180   0.018    0.13     100
137            RK     650   0.028   0.032            TRAP       6       5
               *

138            KK  B-F2-1        1
139            KM  FLOW ROUTED THROUGH DETENTION BASIN F2-1
140            KM  24" PIPE CULVERT
141            RS       1    STOR       0
142            SV       0   0.039   0.101   0.189   0.307
143            SE    2700    2701    2702    2703    2704
144            SQ       0       0       0       0      26
               *

145            KK    RF2b
146            KM  ROUTE FLOW FROM DETENTION BASIN B-F2-1
147            RK     760   0.028   0.032            TRAP       6       5
               *

148            KK     F2b
149            KM  RUNOFF FROM DRAINAGE SUB-BASIN F2b
150            BA  0.0065
151            LS             88      10
152            UK     350    .018    0.13     100
153            RK     760    .028    .032            TRAP       6       5
               *

154            KK   CBF2b
155            KM  COMBINE RUNOFF FROM F2b AND RF2b
156            HC       2
               *
1                                  HEC-1 INPUT                                        PAGE  5

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

157            KK  B-F2-2
158            KM  FLOW ROUTED THROUGH DETENTION BASIN F2-2
159            KM  24" PIPE CULVERT
160            RS       1    STOR       0
161            SV       0   0.101   0.227   0.383   0.571
162            SE    2681    2682    2683    2684    2685
163            SQ       0       0       0       0      26
164            KO                                      22
               *

165            KK    RF2c
166            KM  ROUTE FLOW FROM DETENTION BASIN B-F2-2
167            RK     500   0.028   0.032            TRAP       6       5
               *

168            KK     F2c
169            KM  RUNOFF FROM DRAINAGE SUB-BASIN F2c
170            BA  0.0034
171            LS             88      10
172            UK     175    .018    0.13     100
173            RK     500    .028    .032            TRAP       6       5
               *

174            KK   CBF2c
175            KM  COMBINE RUNOFF FROM F2c AND RF2c
176            HC       2
               *

177            KK      F3
178            KM  RUNOFF FROM DRAINAGE SUB-BASIN F3
179            BA    .013
180            LS             88      10
181            UK     225    .018    0.13     100
182            RK     850    .026    .032            TRAP       6       5
               *

183            KK  B-F3-1
184            KM  FLOW ROUTED THROUGH DETENTION BASIN F3-1
185            KM  14' WEIR ROCK BERM AT OUTLET
186            RS       1    STOR       0
187            SV       0   0.033    0.09   0.175   0.289   0.438   0.625
188            SE    2704    2705    2706    2707    2708    2709    2710
189            SQ       0       0       0       0       0       0      39
190            KO                                      22
               *

191            KK       G
192            KM  RUNOFF FROM DRAINAGE SUB-BASIN G
193            BA   0.016
194            LS             88      10
195            UK     400    .025    0.13     100
196            RK     720    .022    .032            TRAP       4       5
               *
```

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

 197          KK  B-G-1
 198          KM  FLOW ROUTED THROUGH DETENTION BASIN G-1
 199          KM  15' WEIR
 200          RS       1    STOR       0
 201          SV       0    0.07   0.162   0.282   0.437   0.632
 202          SE    2722    2723    2724    2725    2726    2727
 203          SQ       0       0       0       0       0      42
 204          KO                                      22
              *

 205          KK     H1a
 206          KM  RUNOFF FROM DRAINAGE SUB-BASIN H1a
 207          BA  0.027
 208          LS              88   8.805
 209          UK     150    .025    0.13     100
 210          RK    1850    .019    .032            TRAP       8       5
              *

 211          KK  B-H1-1
 212          KM  FLOW ROUTED THROUGH DETENTION BASIN H1-1
 213          KM  2-36" PIPE CULVERT
 214          RS       1    STOR       0
 215          SV       0   0.009   0.046   0.132   0.284    0.51   0.822    1.24   1.497   1.809
 216          SE    2738    2739    2740    2741    2742    2743    2744    2745  2745.5    2746
 217          SQ       0       0       0       0       0       0       0       0       0     170
              *

 218          KK     H1b
 219          KM  RUNOFF FROM DRAINAGE SUB-BASIN H1b
 220          BA  0.0041
 221          LS              88      10
 222          UK     160    .025    0.13     100
 223          RK     550    .019    .032            TRAP       8       5
              *

 224          KK     H1c
 225          KM  RUNOFF FROM DRAINAGE SUB-BASIN H1c
 226          BA   0.014
 227          LS              88      10
 228          UK     200    .025    0.13     100
 229          RK     950    .019    .032            TRAP       8       5
              *

 230          KK   CBH1c
 231          KM  COMBINE RUNOFF FROM H1a, H1b & H1c
 232          HC       3
              *

 233          KK    RH1d
 234          KM  ROUTE FLOW COMBINED CBH1c
 235          RK     700   0.028   0.032            TRAP       6       5
              *
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 236          KK     H1d
 237          KM  RUNOFF FROM DRAINAGE SUB-BASIN H1d
 238          BA   0.013
 239          LS              88      10
 240          UK     250    .025    0.13     100
 241          RK     700    .019    .032            TRAP       8       5
              *

 242          KK   CBH1d
 243          KM  COMBINE RUNOFF FROM H1d AND CBH1c
 244          HC       2
              *

 245          KK  B-H1-2
 246          KM  FLOW ROUTED THROUGH DETENTION BASIN H1-2
 247          KM  36' WEIR
 248          RS       1    STOR       0
 249          SV       0   0.038   0.104   0.212   0.363   0.572
 250          SE    2721    2722    2723    2724    2725  2726.1
 251          SQ       0       0       0       0       0     102
 252          KO                                      22
              *

 253          KK       L
 254          KM  RUNOFF FROM DRAINAGE SUB-BASIN L
 255          BA  0.0099
 256          LS              88    9.09
 257          UK     113   0.018    0.13     100
 258          RK     450    .012    .032            TRAP       5       5
              *

 259          KK   B-L-1
 260          KM  FLOW ROUTED THROUGH DETENTION BASIN L-1
 261          KM  13' WEIR
 262          RS       1    STOR       0
 263          SV       0   0.056   0.139   0.253   0.403
 264          SE    2722    2723    2724    2725    2726
 265          SQ       0       0       0       0      36
 266          KO                                      22
              *

 267          KK       M
 268          KM  RUNOFF FROM DRAINAGE SUB-BASIN M
 269          BA   0.015
```

```
 270          LS              88      5.3
 271          UK     137    .018     0.13      100
 272          RK     960    .012     .032              TRAP        4        5
              *
1                                                   HEC-1 INPUT                                            PAGE  8

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

 273          KK    B-M-1
 274          KM   FLOW ROUTED THROUGH DETENTION BASIN M-1
 275          KM   7' WEIR
 276          RS       1    STOR        0
 277          SV       0    0.06    0.134    0.225    0.334    0.463
 278          SE    2713    2714     2715     2716     2717     2718
 279          SQ       0       0        0        0       20       55
 280          KO                                         22
              *

 281          KK       N
 282          KM   RUNOFF FROM DRAINAGE SUB-BASIN N
 283          BA     .01
 284          LS              88       10
 285          UK     117    .018     0.13      100
 286          RK    1036    .012     .032              TRAP        5        5
              *

 287          KK    B-N-1
 288          KM   FLOW ROUTED THROUGH DETENTION BASIN N-1
 289          KM   100' ROCK BERM AT OUTLET
 290          RS       1    STOR        0
 291          SV       0   0.066     0.16    0.286    0.447    0.646
 292          SE    2688    2689     2690     2691     2692     2693
 293          SQ       0       0        0        0        0       36
 294          KO                                         22

 295          KK    CLEAR
 296          KM   CLEAR HYDROGRAPH STACK
 297          HC       8
 298          ZZ
1
                SCHEMATIC DIAGRAM OF STREAM NETWORK
INPUT
 LINE      (V) ROUTING           (--->) DIVERSION OR PUMP FLOW

  NO.      (.) CONNECTOR         (<---) RETURN OF DIVERTED OR PUMPED FLOW

  20          E1
               V
               V
  26       B-E1-2
               .
               .
  33           .         E2
               .          V
               .          V
  39           .     B-E2-1
               .          .
               .          .
  47        COMBE............
               .
               .
  51           .        F1a
               .          V
               .          V
  57           .     B-F1-1
               .          V
               .          V
  65           .       RF1b
               .          .
               .          .
  68           .          .           F1b
               .          .             .
               .          .             .
  74           .      CBF1b.............
               .          .
               .          .
  77           .          .           F1c
               .          .             .
               .          .             .
  83           .      CBF1c.............
               .          V
               .          V
  86           .     B-F1-2
               .          V
               .          V
  93           .       RF1d
               .          .
               .          .
  96           .          .           F1d
               .          .             .
               .          .             .
 102           .      CBF1d.............
               .          V
               .          V
 105           .     B-F1-3
               .          V
               .          V
 112           .       RF1e
               .          .
               .          .
 115           .          .           F1e
               .          .             .
               .          .             .
 121           .      CBF1e.............
               .          V
```

```
                      V
124         .    B-F1-4
            .         .
132         .         .       F2a
            .         .         V
            .         .         V
138         .         .    B-F2-1
            .         .         V
            .         .         V
145         .         .      RF2b
            .         .         .
148         .         .         .       F2b
            .         .         .         .
154         .         .     CBF2b..........
            .         .         V
            .         .         V
157         .         .    B-F2-2
            .         .         V
            .         .         V
165         .         .      RF2c
            .         .         .
168         .         .         .       F2c
            .         .         .         .
174         .         .     CBF2c..........
            .         .         .
177         .         .         .        F3
            .         .         .         V
            .         .         .         V
183         .         .         .    B-F3-1
            .         .         .         .
191         .         .         .         .         G
            .         .         .         .         V
            .         .         .         .         V
197         .         .         .         .     B-G-1
            .         .         .         .         .
205         .         .         .         .         .       H1a
            .         .         .         .         .         V
            .         .         .         .         .         V
211         .         .         .         .         .    B-H1-1
            .         .         .         .         .         .
218         .         .         .         .         .         .       H1b
            .         .         .         .         .         .         .
224         .         .         .         .         .         .         .       H1c
            .         .         .         .         .         .         .         .
230         .         .         .         .         .     CBH1c....................
            .         .         .         .         .         V
            .         .         .         .         .         V
233         .         .         .         .         .      RH1d
            .         .         .         .         .         .
236         .         .         .         .         .         .       H1d
            .         .         .         .         .         .         .
242         .         .         .         .         .     CBH1d..........
            .         .         .         .         .         V
            .         .         .         .         .         V
245         .         .         .         .         .    B-H1-2
            .         .         .         .         .         .
253         .         .         .         .         .         .         L
            .         .         .         .         .         .         V
            .         .         .         .         .         .         V
259         .         .         .         .         .         .     B-L-1
            .         .         .         .         .         .         .
267         .         .         .         .         .         .         .         M
            .         .         .         .         .         .         .         V
            .         .         .         .         .         .         .         V
273         .         .         .         .         .         .         .     B-M-1
            .         .         .         .         .         .         .         .
281         .         .         .         .         .         .         .         .         N
            .         .         .         .         .         .         .         .         V
            .         .         .         .         .         .         .         .         V
287         .         .         .         .         .         .         .         .     B-N-1
            .         .         .         .         .         .         .         .         .
295         .    CLEAR.......................................................................
```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*              JUN   1998               *
*            VERSION 4.1                *
*                                       *
*  RUN DATE   05DEC06  TIME  13:42:00   *
*                                       *
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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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                                          DEV-10.OH1
                       HEC-1 MODEL
                       10-YEAR, 6-HOUR STORM
                       RAINFALL FROM NOAA ATLAS
                       SCS CURVE NUMBER SOIL LOSS PARAMETERS
                       KINEMATIC WAVE HYDROGRAPH ROUTING
                       DEVELOPED CONDITIONS
                       10% IMPERVIOUS AREA USED FOR SITE
                       Sereno Canyon Phase 1 includes draiange basins E1,E2,F1,F2,F3,G,H1,L,M,N
                       Original Master Plan HEC1 model updated for Phase 1 drainage basins
                       DRAINAGE BASINS E2,F1,F2,H1 FURTHER DIVIDED INTO SUBBASINS

                    PREPARED BY WOOD/PATEL, 8.24.2006
                    FILE NAME:  DEV-10.DAT

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

    IT          HYDROGRAPH TIME DATA
                       NMIN          2  MINUTES IN COMPUTATION INTERVAL
                      IDATE     1    0  STARTING DATE
                      ITIME       0000  STARTING TIME
                         NQ        900  NUMBER OF HYDROGRAPH ORDINATES
                     NDDATE     2    0  ENDING DATE
                     NDTIME       0558  ENDING TIME
                      ICENT         19  CENTURY MARK

                COMPUTATION INTERVAL     .03 HOURS
                     TOTAL TIME BASE   29.97 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

 18 JD          INDEX STORM NO. 1
                       STRM       2.29  PRECIPITATION DEPTH
                       TRDA        .01  TRANSPOSITION DRAINAGE AREA

 19 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     .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     .03     .03     .04     .04     .05     .06     .08     .11     .21
                   .21     .17     .10     .08     .05     .04     .04     .04     .03     .02
                   .02     .02     .02     .02     .02     .01     .01     .01     .01     .01
                   .01     .01     .01     .01     .01     .01     .01     .01     .01     .01
                   .01     .01     .01     .01     .00     .00     .00     .00     .00     .00
                   .00     .00     .00     .00     .00     .00     .00     .00     .00     .00
                   .00     .00     .00     .00     .00     .00     .00     .00     .00     .00
                   .00     .00     .00     .00     .00     .00     .00     .00     .00     .00
                   .00     .00     .00     .00     .00     .00     .00     .00     .00     .00
                   .00     .00     .00     .00     .00     .00     .00     .00     .00     .00

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

            **************
            *            *
 39 KK      *   B-E2-1   *
            *            *
            **************

 46 KO          OUTPUT CONTROL VARIABLES
                      IPRNT          5  PRINT CONTROL
                      IPLOT          0  PLOT CONTROL
                      QSCAL         0.  HYDROGRAPH PLOT SCALE
                      IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                       IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                      ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                      ISAV2        900  LAST ORDINATE PUNCHED OR SAVED
                     TIMINT       .033  TIME INTERVAL IN HOURS


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

            **************
            *            *
 47 KK      *    COMBE   *
            *            *
            **************

 50 KO          OUTPUT CONTROL VARIABLES
                      IPRNT          5  PRINT CONTROL
                      IPLOT          0  PLOT CONTROL
                      QSCAL         0.  HYDROGRAPH PLOT SCALE
                      IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                       IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                      ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                      ISAV2        900  LAST ORDINATE PUNCHED OR SAVED
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                 TIMINT        .033  TIME INTERVAL IN HOURS


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

              **************
              *            *
  57 KK       *   B-F1-1   *
              *            *
              **************

  64 KO          OUTPUT CONTROL VARIABLES
                       IPRNT           5  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE
                       IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                        IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                       ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                       ISAV2         900  LAST ORDINATE PUNCHED OR SAVED
                      TIMINT        .033  TIME INTERVAL IN HOURS


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

              **************
              *            *
 124 KK       *   B-F1-4   *
              *            *
              **************

 131 KO          OUTPUT CONTROL VARIABLES
                       IPRNT           5  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE
                       IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                        IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                       ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                       ISAV2         900  LAST ORDINATE PUNCHED OR SAVED
                      TIMINT        .033  TIME INTERVAL IN HOURS


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

              **************
              *            *
 157 KK       *   B-F2-2   *
              *            *
              **************

 164 KO          OUTPUT CONTROL VARIABLES
                       IPRNT           5  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE
                       IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                        IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                       ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                       ISAV2         900  LAST ORDINATE PUNCHED OR SAVED
                      TIMINT        .033  TIME INTERVAL IN HOURS


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

              **************
              *            *
 183 KK       *   B-F3-1   *
              *            *
              **************

 190 KO          OUTPUT CONTROL VARIABLES
                       IPRNT           5  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE
                       IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                        IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                       ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                       ISAV2         900  LAST ORDINATE PUNCHED OR SAVED
                      TIMINT        .033  TIME INTERVAL IN HOURS


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

              **************
              *            *
 197 KK       *    B-G-1   *
              *            *
              **************

 204 KO          OUTPUT CONTROL VARIABLES
                       IPRNT           5  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE
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                IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                 IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                ISAV2        900  LAST ORDINATE PUNCHED OR SAVED
               TIMINT       .033  TIME INTERVAL IN HOURS


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

          **************
          *            *
 245 KK   *   B-H1-2   *
          *            *
          **************

 252 KO        OUTPUT CONTROL VARIABLES
                IPRNT          5  PRINT CONTROL
                IPLOT          0  PLOT CONTROL
                QSCAL         0.  HYDROGRAPH PLOT SCALE
                IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                 IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                ISAV2        900  LAST ORDINATE PUNCHED OR SAVED
               TIMINT       .033  TIME INTERVAL IN HOURS


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

          **************
          *            *
 259 KK   *   B-L-1    *
          *            *
          **************

 266 KO        OUTPUT CONTROL VARIABLES
                IPRNT          5  PRINT CONTROL
                IPLOT          0  PLOT CONTROL
                QSCAL         0.  HYDROGRAPH PLOT SCALE
                IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                 IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                ISAV2        900  LAST ORDINATE PUNCHED OR SAVED
               TIMINT       .033  TIME INTERVAL IN HOURS


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

          **************
          *            *
 273 KK   *   B-M-1    *
          *            *
          **************

 280 KO        OUTPUT CONTROL VARIABLES
                IPRNT          5  PRINT CONTROL
                IPLOT          0  PLOT CONTROL
                QSCAL         0.  HYDROGRAPH PLOT SCALE
                IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                 IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                ISAV2        900  LAST ORDINATE PUNCHED OR SAVED
               TIMINT       .033  TIME INTERVAL IN HOURS


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

          **************
          *            *
 287 KK   *   B-N-1    *
          *            *
          **************

 294 KO        OUTPUT CONTROL VARIABLES
                IPRNT          5  PRINT CONTROL
                IPLOT          0  PLOT CONTROL
                QSCAL         0.  HYDROGRAPH PLOT SCALE
                IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                 IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                ISAV2        900  LAST ORDINATE PUNCHED OR SAVED
               TIMINT       .033  TIME INTERVAL IN HOURS
1
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RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+	HYDROGRAPH AT	E1	74.	3.27	8.	2.	2.	.06		

+ +	ROUTED TO	B-E1-2	68.	3.33	7.	2.	2.	.06	2699.16	3.33
+	HYDROGRAPH AT	E2	71.	3.20	6.	2.	1.	.05		
+ +	ROUTED TO	B-E2-1	21.	3.57	3.	1.	1.	.05	2702.56	3.57
+	2 COMBINED AT	COMBE	68.	3.33	10.	3.	2.	.11		
+	HYDROGRAPH AT	F1a	15.	3.17	1.	0.	0.	.01		
+ +	ROUTED TO	B-F1-1	4.	3.57	1.	0.	0.	.01	2728.10	3.57
+	ROUTED TO	RF1b	4.	3.63	1.	0.	0.	.01		
+	HYDROGRAPH AT	F1b	8.	3.13	1.	0.	0.	.00		
+	2 COMBINED AT	CBF1b	8.	3.13	1.	0.	0.	.01		
+	HYDROGRAPH AT	F1c	16.	3.17	1.	0.	0.	.01		
+	2 COMBINED AT	CBF1c	23.	3.17	2.	1.	1.	.02		
+ +	ROUTED TO	B-F1-2	9.	3.40	2.	0.	0.	.02	2711.19	3.40
+	ROUTED TO	RF1d	9.	3.43	2.	0.	0.	.02		
+	HYDROGRAPH AT	F1d	9.	3.13	1.	0.	0.	.00		
+	2 COMBINED AT	CBF1d	12.	3.43	2.	1.	0.	.03		
+ +	ROUTED TO	B-F1-3	4.	4.23	1.	0.	0.	.03	2699.10	4.23
+	ROUTED TO	RF1e	4.	4.30	1.	0.	0.	.03		
+	HYDROGRAPH AT	F1e	12.	3.13	1.	0.	0.	.01		
+	2 COMBINED AT	CBF1e	12.	3.13	2.	0.	0.	.04		
+ +	ROUTED TO	B-F1-4	4.	4.43	1.	0.	0.	.04	2679.12	4.43
+	HYDROGRAPH AT	F2a	8.	3.13	1.	0.	0.	.00		
+ +	ROUTED TO	B-F2-1	2.	3.57	0.	0.	0.	.00	2703.06	3.57
+	ROUTED TO	RF2b	2.	3.60	0.	0.	0.	.00		
+	HYDROGRAPH AT	F2b	8.	3.23	1.	0.	0.	.01		
+	2 COMBINED AT	CBF2b	8.	3.23	1.	0.	0.	.01		
+ +	ROUTED TO	B-F2-2	1.	4.17	0.	0.	0.	.01	2684.06	4.17
+	ROUTED TO	RF2c	1.	4.20	0.	0.	0.	.01		
+	HYDROGRAPH AT	F2c	6.	3.13	0.	0.	0.	.00		
+	2 COMBINED AT	CBF2c	6.	3.13	1.	0.	0.	.01		
+	HYDROGRAPH AT	F3	21.	3.17	2.	0.	0.	.01		
+ +	ROUTED TO	B-F3-1	7.	3.43	1.	0.	0.	.01	2709.19	3.43
+	HYDROGRAPH AT	G	21.	3.20	2.	1.	0.	.02		
	ROUTED TO									

+		B-G-1	11.	3.40	1.	0.	0.	.02		
+									2726.27	3.40
+	HYDROGRAPH AT	H1a	50.	3.13	4.	1.	1.	.03		
+	ROUTED TO	B-H1-1	3.	4.13	1.	0.	0.	.03		
+									2745.51	4.13
+	HYDROGRAPH AT	H1b	8.	3.13	1.	0.	0.	.00		
+	HYDROGRAPH AT	H1c	25.	3.13	2.	0.	0.	.01		
+	3 COMBINED AT	CBH1c	33.	3.13	3.	1.	1.	.05		
+	ROUTED TO	RH1d	32.	3.17	3.	1.	1.	.05		
+	HYDROGRAPH AT	H1d	21.	3.13	2.	0.	0.	.01		
+	2 COMBINED AT	CBH1d	53.	3.17	5.	1.	1.	.06		
+	ROUTED TO	B-H1-2	50.	3.20	4.	1.	1.	.06		
+									2725.54	3.20
+	HYDROGRAPH AT	L	20.	3.10	1.	0.	0.	.01		
+	ROUTED TO	B-L-1	10.	3.23	1.	0.	0.	.01		
+									2725.27	3.23
+	HYDROGRAPH AT	M	27.	3.13	2.	1.	0.	.01		
+	ROUTED TO	B-M-1	18.	3.23	2.	0.	0.	.01		
+									2716.88	3.23
+	HYDROGRAPH AT	N	19.	3.13	1.	0.	0.	.01		
+	ROUTED TO	B-N-1	3.	3.60	1.	0.	0.	.01		
+									2692.09	3.60
+	8 COMBINED AT	CLEAR	79.	3.20	12.	3.	2.	.17		

1

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

ISTAQ	ELEMENT	DT	PEAK	TIME TO PEAK	VOLUME	DT	INTERPOLATED TO COMPUTATION INTERVAL PEAK	TIME TO PEAK	VOLUME
		(MIN)	(CFS)	(MIN)	(IN)	(MIN)	(CFS)	(MIN)	(IN)
FOR STORM = 1 STORM AREA (SQ MI) = .01									
E1	MANE	1.75	74.37	195.04	1.31	2.00	73.87	196.00	1.31

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .4269E+01 OUTFLOW= .4253E+01 BASIN STORAGE= .1659E-02 PERCENT ERROR= .3

FOR STORM = 1 STORM AREA (SQ MI) = .01									
E2	MANE	2.00	72.17	190.70	1.30	2.00	70.61	192.00	1.30

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .3219E+01 OUTFLOW= .3199E+01 BASIN STORAGE= .5220E-03 PERCENT ERROR= .6

FOR STORM = 1 STORM AREA (SQ MI) = .01									
F1a	MANE	.79	15.32	188.82	1.30	2.00	15.19	190.00	1.30

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .6718E+00 OUTFLOW= .6672E+00 BASIN STORAGE= .1306E-03 PERCENT ERROR= .7

FOR STORM = 1 STORM AREA (SQ MI) = .01									
RF1b	MANE	1.04	3.67	217.58	.52	2.00	3.66	218.00	.52

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2646E+00 EXCESS= .0000E+00 OUTFLOW= .2663E+00 BASIN STORAGE= .9703E-05 PERCENT ERROR= -.6

FOR STORM = 1 STORM AREA (SQ MI) = .01									
F1b	MANE	1.10	7.63	187.95	1.31	2.00	7.62	188.00	1.31

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .2799E+00 OUTFLOW= .2794E+00 BASIN STORAGE= .2454E-04 PERCENT ERROR= .2

FOR STORM = 1 STORM AREA (SQ MI) = .01									
F1c	MANE	1.67	16.06	190.87	1.31	2.00	15.93	190.00	1.31

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .6998E+00 OUTFLOW= .6967E+00 BASIN STORAGE= .1044E-03 PERCENT ERROR= .4

FOR STORM = 1 STORM AREA (SQ MI) = .01
RF1d MANE 1.16 9.23 206.66 .63 2.00 9.13 206.00 .63

CONTINUITY SUMMARY (AC-FT) - INFLOW= .7956E+00 EXCESS= .0000E+00 OUTFLOW= .7970E+00 BASIN STORAGE= .1563E-04 PERCENT ERROR= -.2

FOR STORM = 1 STORM AREA (SQ MI) = .01
F1d MANE 1.14 9.32 188.07 1.31 2.00 9.30 188.00 1.31

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .3499E+00 OUTFLOW= .3491E+00 BASIN STORAGE= .3324E-04 PERCENT ERROR= .2

FOR STORM = 1 STORM AREA (SQ MI) = .01
RF1e MANE 2.00 3.63 259.70 .31 2.00 3.63 260.00 .31

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4754E+00 EXCESS= .0000E+00 OUTFLOW= .4760E+00 BASIN STORAGE= .2443E-04 PERCENT ERROR= -.1

FOR STORM = 1 STORM AREA (SQ MI) = .01
F1e MANE 1.40 12.46 188.41 1.31 2.00 12.36 188.00 1.31

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .4689E+00 OUTFLOW= .4680E+00 BASIN STORAGE= .4243E-04 PERCENT ERROR= .2

FOR STORM = 1 STORM AREA (SQ MI) = .01
F2a MANE .79 7.78 188.28 1.31 2.00 7.76 188.00 1.31

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .3079E+00 OUTFLOW= .3073E+00 BASIN STORAGE= .4045E-04 PERCENT ERROR= .2

FOR STORM = 1 STORM AREA (SQ MI) = .01
RF2b MANE 1.55 1.64 217.10 .51 2.00 1.62 216.00 .51

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1182E+00 EXCESS= .0000E+00 OUTFLOW= .1187E+00 BASIN STORAGE= .2926E-05 PERCENT ERROR= -.4

FOR STORM = 1 STORM AREA (SQ MI) = .01
F2b MANE .86 8.49 192.85 1.31 2.00 8.42 194.00 1.31

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .4549E+00 OUTFLOW= .4533E+00 BASIN STORAGE= .1448E-03 PERCENT ERROR= .3

FOR STORM = 1 STORM AREA (SQ MI) = .01
RF2c MANE .96 1.47 252.26 .33 2.00 1.47 252.00 .33

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1890E+00 EXCESS= .0000E+00 OUTFLOW= .1892E+00 BASIN STORAGE= .5779E-05 PERCENT ERROR= -.1

FOR STORM = 1 STORM AREA (SQ MI) = .01
F2c MANE .73 6.10 187.59 1.31 2.00 6.10 188.00 1.31

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .2379E+00 OUTFLOW= .2373E+00 BASIN STORAGE= .2671E-04 PERCENT ERROR= .3

FOR STORM = 1 STORM AREA (SQ MI) = .01
F3 MANE .78 20.87 189.80 1.30 2.00 20.72 190.00 1.30

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .9098E+00 OUTFLOW= .9034E+00 BASIN STORAGE= .1756E-03 PERCENT ERROR= .7

FOR STORM = 1 STORM AREA (SQ MI) = .01
G MANE .84 20.91 191.73 1.30 2.00 20.91 192.00 1.30

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1120E+01 OUTFLOW= .1113E+01 BASIN STORAGE= .3816E-03 PERCENT ERROR= .5

FOR STORM = 1 STORM AREA (SQ MI) = .01
H1a MANE 1.53 49.93 188.15 1.30 2.00 49.55 188.00 1.30

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1871E+01 OUTFLOW= .1865E+01 BASIN STORAGE= .1617E-03 PERCENT ERROR= .3

FOR STORM = 1 STORM AREA (SQ MI) = .01
H1b MANE .81 8.05 187.13 1.31 2.00 7.82 188.00 1.31

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .2869E+00 OUTFLOW= .2862E+00 BASIN STORAGE= .2494E-04 PERCENT ERROR= .3

FOR STORM = 1 STORM AREA (SQ MI) = .01
H1c MANE 1.08 25.05 188.24 1.31 2.00 24.92 188.00 1.31

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .9797E+00 OUTFLOW= .9774E+00 BASIN STORAGE= .1117E-03 PERCENT ERROR= .2

FOR STORM = 1 STORM AREA (SQ MI) = .01
RH1d MANE .61 32.67 189.25 .68 2.00 31.91 190.00 .68

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1633E+01 EXCESS= .0000E+00 OUTFLOW= .1635E+01 BASIN STORAGE= .1205E-04 PERCENT ERROR= -.1

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         FOR STORM = 1  STORM AREA (SQ MI) =        .01
             H1d  MANE          .86    21.58    189.30      1.31      2.00     21.20     188.00       1.31

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .9098E+00 OUTFLOW= .9069E+00 BASIN STORAGE= .1360E-03 PERCENT ERROR=    .3

         FOR STORM = 1  STORM AREA (SQ MI) =        .01
               L  MANE          .54    20.46    185.75      1.30      2.00     20.45     186.00       1.30

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .6876E+00 OUTFLOW= .6862E+00 BASIN STORAGE= .3899E-04 PERCENT ERROR=    .2

         FOR STORM = 1  STORM AREA (SQ MI) =        .01
               M  MANE         1.12    27.66    187.54      1.26      2.00     27.48     188.00       1.26

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1009E+01 OUTFLOW= .1006E+01 BASIN STORAGE= .1004E-03 PERCENT ERROR=    .2

         FOR STORM = 1  STORM AREA (SQ MI) =        .01
               N  MANE         1.38    19.77    187.36      1.31      2.00     19.48     188.00       1.31

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .6998E+00 OUTFLOW= .6992E+00 BASIN STORAGE= .5151E-04 PERCENT ERROR=    .1


*** NORMAL END OF HEC-1 ***
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Ultimate Condition:

100-year HEC-1 Model

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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   05DEC06  TIME  13:41:32   *                      *        (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        SERENO CANYON PHASE 1
   2          ID        HEC-1 MODEL
   3          ID        100-YEAR, 6-HOUR STORM
   4          ID        RAINFALL FROM NOAA ATLAS
   5          ID        SCS CURVE NUMBER SOIL LOSS PARAMETERS
   6          ID        KINEMATIC WAVE HYDROGRAPH ROUTING
   7          ID        DEVELOPED CONDITIONS
   8          ID        10% IMPERVIOUS AREA USED FOR SITE
   9          ID        Sereno Canyon Phase 1 includes draiange basins E1,E2,F1,F2,F3,G,H1,L,M,N
  10          ID        Original Master Plan HEC1 model updated for Phase 1 drainage basins
  11          ID        DRAINAGE BASINS E2,F1,F2,H1 FURTHER DIVIDED INTO SUBBASINS
  12          ID
  13          ID  PREPARED BY WOOD/PATEL, 8.24.2006
  14          ID  FILE NAME:  DEV-100.DAT
  15          ID
              *DIAGRAM
  16          IT       2                 900
  17          IO       5
  18          JD              .01
  19          PH                      .73    1.43    2.42    2.74    2.96    3.37
              *

  20          KK      E1       5
  21          KM  RUNOFF FROM DRAINAGE SUB-BASIN E1
  22          BA    .061
  23          LS              88      10
  24          UK     400     .02    0.13     100
  25          RK    2050    .013    .032            TRAP       7       5
              *

  26          KK  B-E1-2
  27          KM  FLOW ROUTED THROUGH DETENTION BASIN E1-2
  28          KM  19' WEIR AT HEADWALL
  29          RS       1    STOR       0
  30          SV       0   0.138   0.316   0.532   0.788    1.09
  31          SE    2695    2696    2697    2698    2699    2700
  32          SQ       0       0       0       0      53     150
              *

  33          KK      E2
  34          KM  RUNOFF FROM DRAINAGE SUB-BASIN E2
  35          BA    .046
  36          LS              88      10
  37          UK     200     .02    0.13     100
  38          RK    2370    .013    .032            TRAP      10       5
              *

  39          KK  B-E2-1
  40          KM  FLOW ROUTED THROUGH DETENTION BASIN E2-1
  41          KM  2-42" PIPE CULVERT
  42          RS       1    STOR       0
  43          SV       0   0.098   0.228   0.411   0.678   1.062   1.583   1.897   2.257
  44          SE    2696    2697    2698    2699    2700    2701    2702  2702.5    2703
  45          SQ       0       0       0       0       0       0       0       0     180
  46          KO                                      22
              *
1                                    HEC-1 INPUT                                          PAGE  2

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

  47          KK   COMBE
  48          KM  COMBINE RUNOFF FROM E1 AND E2
  49          HC       2
  50          KO                                      22
              *

  51          KK     F1a
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```
 52          KM  RUNOFF FROM DRAINAGE SUB-BASIN F1a
 53          BA  0.0096
 54          LS            88       10
 55          UK     225  .018     0.13      100
 56          RK     600  .012     .032              TRAP       7       5
             *

 57          KK  B-F1-1
 58          KM  FLOW ROUTED THROUGH DETENTION BASIN F1-1
 59          KM  30" PIPE CULVERT
 60          RS       1  STOR        0
 61          SV       0  0.118   0.251    0.402   0.553
 62          SE    2725   2726    2727     2728    2729
 63          SQ       0      0       0        0      37
 64          KO                                      22
             *

 65          KK   RF1b
 66          KM  ROUTE FLOW FROM B-F1-1 THROUGH DRAINAGE BASIN F1b
 67          RK     600  0.012   0.032              TRAP       7       5
             *

 68          KK     F1b
 69          KM  RUNOFF FROM DRAIANGE SUB-BASIN F1b
 70          BA   0.004
 71          LS            88       10
 72          UK     140  0.018    0.13      100
 73          RK     600  0.012   0.032              TRAP       7       5
             *

 74          KK   CBF1b
 75          KM  COMBINE RUNOFF FROM F1b AND ROUTED FLOW RF1b
 76          HC       2
             *

 77          KK     F1c
 78          KM  RUNOFF FROM SUB-BASIN F1c
 79          BA    0.01
 80          LS            88       10
 81          UK     200  0.018    0.13      100
 82          RK    1200  0.012   0.032              TRAP       7       5
             *
1                                      HEC-1 INPUT                                 PAGE  3

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

 83          KK   CBF1c
 84          KM  COMBINE RUNOFF FROM F1c AND CBF1b
 85          HC       2
             *

 86          KK  B-F1-2
 87          KM  FLOW ROUTED THROUGH DETENTION BASIN
 88          KM  36" PIPE CULVERT
 89          RS       1  STOR        0
 90          SV       0  0.116   0.264    0.446   0.666
 91          SE    2708   2709    2710     2711    2712
 92          SQ       0      0       0        0      50
             *

 93          KK    RF1d
 94          KM  ROUTE FLOW FROM DETENTION BASIN B-F1-2
 95          RK     700  0.012   0.032              TRAP       7       5
             *

 96          KK     F1d
 97          KM  RUNOFF FROM SUB-BASIN F1d
 98          BA   0.005
 99          LS            88       10
100          UK     150  0.018    0.13      100
101          RK     700  0.012   0.032              TRAP       7       5
             *

102          KK   CBF1d
103          KM  COMBINE RUNOFF FROM F1d AND RF1d
104          HC       2
             *

105          KK  B-F1-3
106          KM  FLOW ROUTED THROUGH BASIN
107          KM  30" PIPE CULVERT
108          RS       1  STOR        0
109          SV       0  0.196   0.418    0.671   0.958   1.286
110          SE    2696   2697    2698     2699    2700    2701
111          SQ       0      0       0        0      37      45
             *

112          KK    RF1e
113          KM  ROUTE FLOW FROM DETENTION BASIN B-F1-3
114          RK     930  0.012   0.032              TRAP       7       5
             *

115          KK     F1e
116          KM  RUNOFF FROM DRAINAGE SUB-BASIN F1e
117          BA  0.0067
118          LS            88       10
119          UK     140  0.018    0.13      100
120          RK     930  0.012   0.032              TRAP       7       5
             *
1                                      HEC-1 INPUT                                 PAGE  4

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

121          KK   CBF1e
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122        KM  COMBINE RUNOFF FROM F1e AND RF1e
123        HC        2
           *

124        KK  B-F1-4
125        KM  FLOW ROUTED THROUGH BASIN
126        KM  12' WEIR AT HEAD WALL
127        RS        1    STOR       0
128        SV        0   0.085   0.206   0.369   0.583
129        SE     2676    2677    2678    2679    2680
130        SQ        0       0       0       0      34
131        KO                                      22
           *

132        KK      F2a
133        KM  RUNOFF FROM DRAINAGE SUBBASIN F2a
134        BA  0.0044
135        LS               88      10
136        UK      180   0.018    0.13     100
137        RK      650   0.028   0.032            TRAP       6       5
           *

138        KK  B-F2-1        1
139        KM  FLOW ROUTED THROUGH DETENTION BASIN F2-1
140        KM  24" PIPE CULVERT
141        RS        1    STOR       0
142        SV        0   0.039   0.101   0.189   0.307
143        SE     2700    2701    2702    2703    2704
144        SQ        0       0       0       0      26
           *

145        KK     RF2b
146        KM  ROUTE FLOW FROM DETENTION BASIN B-F2-1
147        RK      760   0.028   0.032            TRAP       6       5
           *

148        KK      F2b
149        KM  RUNOFF FROM DRAINAGE SUB-BASIN F2b
150        BA  0.0065
151        LS               88      10
152        UK      350    .018    0.13     100
153        RK      760    .028    .032            TRAP       6       5
           *

154        KK     CBF2b
155        KM  COMBINE RUNOFF FROM F2b AND RF2b
156        HC        2
           *
1                                    HEC-1 INPUT                                      PAGE  5

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

157        KK  B-F2-2
158        KM  FLOW ROUTED THROUGH DETENTION BASIN F2-2
159        KM  24" PIPE CULVERT
160        RS        1    STOR       0
161        SV        0   0.101   0.227   0.383   0.571
162        SE     2681    2682    2683    2684    2685
163        SQ        0       0       0       0      26
164        KO                                      22
           *

165        KK     RF2c
166        KM  ROUTE FLOW FROM DETENTION BASIN B-F2-2
167        RK      500   0.028   0.032            TRAP       6       5
           *

168        KK      F2c
169        KM  RUNOFF FROM DRAINAGE SUB-BASIN F2c
170        BA  0.0034
171        LS               88      10
172        UK      175    .018    0.13     100
173        RK      500    .028    .032            TRAP       6       5
           *

174        KK     CBF2c
175        KM  COMBINE RUNOFF FROM F2c AND RF2c
176        HC        2
           *

177        KK       F3
178        KM  RUNOFF FROM DRAINAGE SUB-BASIN F3
179        BA     .013
180        LS               88      10
181        UK      225    .018    0.13     100
182        RK      850    .026    .032            TRAP       6       5
           *

183        KK  B-F3-1
184        KM  FLOW ROUTED THROUGH DETENTION BASIN F3-1
185        KM  14' WEIR ROCK BERM AT OUTLET
186        RS        1    STOR       0
187        SV        0   0.033    0.09   0.175   0.289   0.438   0.625
188        SE     2704    2705    2706    2707    2708    2709    2710
189        SQ        0       0       0       0       0       0      39
190        KO                                      22
           *

191        KK        G
192        KM  RUNOFF FROM DRAINAGE SUB-BASIN G
193        BA   0.016
194        LS               88      10
195        UK      400    .025    0.13     100
196        RK      720    .022    .032            TRAP       4       5
           *
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```
 270         LS            88      5.3
 271         UK    137   .018     0.13      100
 272         RK    960   .012     .032              TRAP      4      5
                   *
1                                          HEC-1 INPUT                                              PAGE  8

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


 273         KK    B-M-1
 274         KM   FLOW ROUTED THROUGH DETENTION BASIN M-1
 275         KM   7' WEIR
 276         RS      1    STOR       0
 277         SV      0    0.06   0.134    0.225   0.334   0.463
 278         SE   2713    2714    2715     2716    2717    2718
 279         SQ      0       0       0        0      20      55
 280         KO                                      22
             *

 281         KK      N
 282         KM   RUNOFF FROM DRAINAGE SUB-BASIN N
 283         BA    .01
 284         LS             88      10
 285         UK    117    .018     0.13      100
 286         RK   1036    .012     .032              TRAP       5       5
             *

 287         KK    B-N-1
 288         KM   FLOW ROUTED THROUGH DETENTION BASIN N-1
 289         KM   100' ROCK BERM AT OUTLET
 290         RS      1    STOR       0
 291         SV      0   0.066    0.16    0.286   0.447   0.646
 292         SE   2688    2689    2690     2691    2692    2693
 293         SQ      0       0       0        0       0      36
 294         KO                                      22

 295         KK    CLEAR
 296         KM   CLEAR HYDROGRAPH STACK
 297         HC      8
 298         ZZ
1
           SCHEMATIC DIAGRAM OF STREAM NETWORK
INPUT
 LINE    (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

 NO.     (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

  20          E1
              V
              V
  26     B-E1-2
              .
              .
  33          .         E2
              .         V
              .         V
  39          .     B-E2-1
              .         .
              .         .
  47       COMBE.........

              .
  51          .        F1a
              .         V
              .         V
  57          .     B-F1-1
              .         V
              .         V
  65          .       RF1b
              .         .
              .         .
  68          .         .          F1b
              .         .          .
              .         .          .
  74          .      CBF1b..........
              .         .
              .         .
  77          .         .          F1c
              .         .          .
              .         .          .
  83          .      CBF1c..........
              .         V
              .         V
  86          .     B-F1-2
              .         V
              .         V
  93          .       RF1d
              .         .
              .         .
  96          .         .          F1d
              .         .          .
              .         .          .
 102          .      CBF1d..........
              .         V
              .         V
 105          .     B-F1-3
              .         V
              .         V
 112          .       RF1e
              .         .
              .         .
 115          .         .          F1e
              .         .          .
              .         .          .
 121          .      CBF1e..........
              .         V
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                             V
  124            .      B-F1-4
                 .           .
  132            .           .         F2a
                 .           .           V
                 .           .           V
  138            .           .      B-F2-1
                 .           .           V
                 .           .           V
  145            .           .        RF2b
                 .           .           .
  148            .           .           .         F2b
                 .           .           .           .
  154            .           .       CBF2b............
                 .           .           V
                 .           .           V
  157            .           .      B-F2-2
                 .           .           V
                 .           .           V
  165            .           .        RF2c
                 .           .           .
  168            .           .           .         F2c
                 .           .           .           .
  174            .           .       CBF2c............
                 .           .           .
  177            .           .           .          F3
                 .           .           .           V
                 .           .           .           V
  183            .           .           .      B-F3-1
                 .           .           .           .
  191            .           .           .           .           G
                 .           .           .           .           V
                 .           .           .           .           V
  197            .           .           .           .       B-G-1
                 .           .           .           .           .
  205            .           .           .           .           .         H1a
                 .           .           .           .           .           V
                 .           .           .           .           .           V
  211            .           .           .           .           .      B-H1-1
                 .           .           .           .           .           .
  218            .           .           .           .           .           .         H1b
                 .           .           .           .           .           .           .
  224            .           .           .           .           .           .           .         H1c
                 .           .           .           .           .           .           .           .
  230            .           .           .           .           .       CBH1c........................
                 .           .           .           .           .           V
                 .           .           .           .           .           V
  233            .           .           .           .           .        RH1d
                 .           .           .           .           .           .
  236            .           .           .           .           .           .         H1d
                 .           .           .           .           .           .           .
  242            .           .           .           .           .       CBH1d............
                 .           .           .           .           .           V
                 .           .           .           .           .           V
  245            .           .           .           .           .      B-H1-2
                 .           .           .           .           .           .
  253            .           .           .           .           .           .           L
                 .           .           .           .           .           .           V
                 .           .           .           .           .           .           V
  259            .           .           .           .           .           .       B-L-1
                 .           .           .           .           .           .           .
  267            .           .           .           .           .           .           .           M
                 .           .           .           .           .           .           .           V
                 .           .           .           .           .           .           .           V
  273            .           .           .           .           .           .           .       B-M-1
                 .           .           .           .           .           .           .           .
  281            .           .           .           .           .           .           .           .           N
                 .           .           .           .           .           .           .           .           V
                 .           .           .           .           .           .           .           .           V
  287            .           .           .           .           .           .           .           .       B-N-1
                 .           .           .           .           .           .           .           .           .
  295            .       CLEAR....................................................................................
```

(***) 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    05DEC06  TIME  13:41:32   *                              *         (916) 756-1104                *
*                                        *                              *                                       *
******************************************                              *****************************************
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```
                    HEC-1 MODEL
                    100-YEAR, 6-HOUR STORM
                    RAINFALL FROM NOAA ATLAS
                    SCS CURVE NUMBER SOIL LOSS PARAMETERS
                    KINEMATIC WAVE HYDROGRAPH ROUTING
                    DEVELOPED CONDITIONS
                    10% IMPERVIOUS AREA USED FOR SITE
                    Sereno Canyon Phase 1 includes draiange basins E1,E2,F1,F2,F3,G,H1,L,M,N
                    Original Master Plan HEC1 model updated for Phase 1 drainage basins
                    DRAINAGE BASINS E2,F1,F2,H1 FURTHER DIVIDED INTO SUBBASINS

                 PREPARED BY WOOD/PATEL, 8.24.2006
                 FILE NAME:  DEV-100.DAT

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

    IT        HYDROGRAPH TIME DATA
                     NMIN          2  MINUTES IN COMPUTATION INTERVAL
                    IDATE      1   0  STARTING DATE
                    ITIME       0000  STARTING TIME
                       NQ        900  NUMBER OF HYDROGRAPH ORDINATES
                   NDDATE      2   0  ENDING DATE
                   NDTIME       0558  ENDING TIME
                    ICENT         19  CENTURY MARK

                COMPUTATION INTERVAL     .03 HOURS
                     TOTAL TIME BASE   29.97 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

 18 JD        INDEX STORM NO. 1
                    STRM        3.37  PRECIPITATION DEPTH
                    TRDA         .01  TRANSPOSITION DRAINAGE AREA

 19 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      .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      .01      .01      .01      .01      .01      .01      .01      .01
                   .01      .01      .01      .01      .01      .03      .03      .03      .03      .03
                   .04      .04      .04      .06      .06      .07      .09      .12      .17      .29
                   .29      .24      .15      .11      .07      .07      .06      .05      .04      .04
                   .04      .03      .03      .03      .03      .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      .01      .01      .01      .01      .01
                   .01      .01      .01      .01      .01      .01      .01      .01      .00      .00
                   .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                   .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                   .00      .00      .00      .00      .00      .00      .00      .00      .00      .00

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

           **************
           *            *
 39 KK     *   B-E2-1   *
           *            *
           **************

 46 KO        OUTPUT CONTROL VARIABLES
                    IPRNT          5  PRINT CONTROL
                    IPLOT          0  PLOT CONTROL
                    QSCAL         0.  HYDROGRAPH PLOT SCALE
                    IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                     IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                    ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                    ISAV2        900  LAST ORDINATE PUNCHED OR SAVED
                   TIMINT       .033  TIME INTERVAL IN HOURS

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

           **************
           *            *
 47 KK     *    COMBE   *
           *            *
           **************

 50 KO        OUTPUT CONTROL VARIABLES
                    IPRNT          5  PRINT CONTROL
                    IPLOT          0  PLOT CONTROL
                    QSCAL         0.  HYDROGRAPH PLOT SCALE
                    IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                     IOUT         22  SAVE HYDROGRAPH ON THIS UNIT
                    ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                    ISAV2        900  LAST ORDINATE PUNCHED OR SAVED
```

```
                    TIMINT        .033  TIME INTERVAL IN HOURS


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

           **************
           *            *
   57 KK   *   B-F1-1   *
           *            *
           **************

   64 KO        OUTPUT CONTROL VARIABLES
                    IPRNT            5  PRINT CONTROL
                    IPLOT            0  PLOT CONTROL
                    QSCAL           0.  HYDROGRAPH PLOT SCALE
                    IPNCH            0  PUNCH COMPUTED HYDROGRAPH
                     IOUT           22  SAVE HYDROGRAPH ON THIS UNIT
                    ISAV1            1  FIRST ORDINATE PUNCHED OR SAVED
                    ISAV2          900  LAST ORDINATE PUNCHED OR SAVED
                   TIMINT         .033  TIME INTERVAL IN HOURS


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

           **************
           *            *
  124 KK   *   B-F1-4   *
           *            *
           **************

  131 KO        OUTPUT CONTROL VARIABLES
                    IPRNT            5  PRINT CONTROL
                    IPLOT            0  PLOT CONTROL
                    QSCAL           0.  HYDROGRAPH PLOT SCALE
                    IPNCH            0  PUNCH COMPUTED HYDROGRAPH
                     IOUT           22  SAVE HYDROGRAPH ON THIS UNIT
                    ISAV1            1  FIRST ORDINATE PUNCHED OR SAVED
                    ISAV2          900  LAST ORDINATE PUNCHED OR SAVED
                   TIMINT         .033  TIME INTERVAL IN HOURS


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

           **************
           *            *
  157 KK   *   B-F2-2   *
           *            *
           **************

  164 KO        OUTPUT CONTROL VARIABLES
                    IPRNT            5  PRINT CONTROL
                    IPLOT            0  PLOT CONTROL
                    QSCAL           0.  HYDROGRAPH PLOT SCALE
                    IPNCH            0  PUNCH COMPUTED HYDROGRAPH
                     IOUT           22  SAVE HYDROGRAPH ON THIS UNIT
                    ISAV1            1  FIRST ORDINATE PUNCHED OR SAVED
                    ISAV2          900  LAST ORDINATE PUNCHED OR SAVED
                   TIMINT         .033  TIME INTERVAL IN HOURS


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

           **************
           *            *
  183 KK   *   B-F3-1   *
           *            *
           **************

  190 KO        OUTPUT CONTROL VARIABLES
                    IPRNT            5  PRINT CONTROL
                    IPLOT            0  PLOT CONTROL
                    QSCAL           0.  HYDROGRAPH PLOT SCALE
                    IPNCH            0  PUNCH COMPUTED HYDROGRAPH
                     IOUT           22  SAVE HYDROGRAPH ON THIS UNIT
                    ISAV1            1  FIRST ORDINATE PUNCHED OR SAVED
                    ISAV2          900  LAST ORDINATE PUNCHED OR SAVED
                   TIMINT         .033  TIME INTERVAL IN HOURS


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

           **************
           *            *
  197 KK   *   B-G-1    *
           *            *
           **************

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

```
                IPNCH         0  PUNCH COMPUTED HYDROGRAPH
                 IOUT        22  SAVE HYDROGRAPH ON THIS UNIT
                ISAV1         1  FIRST ORDINATE PUNCHED OR SAVED
                ISAV2       900  LAST ORDINATE PUNCHED OR SAVED
               TIMINT      .033  TIME INTERVAL IN HOURS


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

          **************
          *            *
245 KK    *   B-H1-2   *
          *            *
          **************

252 KO        OUTPUT CONTROL VARIABLES
                IPRNT         5  PRINT CONTROL
                IPLOT         0  PLOT CONTROL
                QSCAL        0.  HYDROGRAPH PLOT SCALE
                IPNCH         0  PUNCH COMPUTED HYDROGRAPH
                 IOUT        22  SAVE HYDROGRAPH ON THIS UNIT
                ISAV1         1  FIRST ORDINATE PUNCHED OR SAVED
                ISAV2       900  LAST ORDINATE PUNCHED OR SAVED
               TIMINT      .033  TIME INTERVAL IN HOURS


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

          **************
          *            *
259 KK    *   B-L-1    *
          *            *
          **************

266 KO        OUTPUT CONTROL VARIABLES
                IPRNT         5  PRINT CONTROL
                IPLOT         0  PLOT CONTROL
                QSCAL        0.  HYDROGRAPH PLOT SCALE
                IPNCH         0  PUNCH COMPUTED HYDROGRAPH
                 IOUT        22  SAVE HYDROGRAPH ON THIS UNIT
                ISAV1         1  FIRST ORDINATE PUNCHED OR SAVED
                ISAV2       900  LAST ORDINATE PUNCHED OR SAVED
               TIMINT      .033  TIME INTERVAL IN HOURS


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

          **************
          *            *
273 KK    *   B-M-1    *
          *            *
          **************

280 KO        OUTPUT CONTROL VARIABLES
                IPRNT         5  PRINT CONTROL
                IPLOT         0  PLOT CONTROL
                QSCAL        0.  HYDROGRAPH PLOT SCALE
                IPNCH         0  PUNCH COMPUTED HYDROGRAPH
                 IOUT        22  SAVE HYDROGRAPH ON THIS UNIT
                ISAV1         1  FIRST ORDINATE PUNCHED OR SAVED
                ISAV2       900  LAST ORDINATE PUNCHED OR SAVED
               TIMINT      .033  TIME INTERVAL IN HOURS


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

          **************
          *            *
287 KK    *   B-N-1    *
          *            *
          **************

294 KO        OUTPUT CONTROL VARIABLES
                IPRNT         5  PRINT CONTROL
                IPLOT         0  PLOT CONTROL
                QSCAL        0.  HYDROGRAPH PLOT SCALE
                IPNCH         0  PUNCH COMPUTED HYDROGRAPH
                 IOUT        22  SAVE HYDROGRAPH ON THIS UNIT
                ISAV1         1  FIRST ORDINATE PUNCHED OR SAVED
                ISAV2       900  LAST ORDINATE PUNCHED OR SAVED
               TIMINT      .033  TIME INTERVAL IN HOURS
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									
+		E1	154.	3.17	15.	4.	3.	.06		

+	ROUTED TO	B-E1-2	146.	3.23	14.	3.	3.	.06		
+									2699.96	3.23
+	HYDROGRAPH AT	E2	138.	3.13	11.	3.	2.	.05		
+	ROUTED TO	B-E2-1	99.	3.23	7.	2.	1.	.05		
+									2702.77	3.23
+	2 COMBINED AT	COMBE	245.	3.23	21.	5.	4.	.11		
+	HYDROGRAPH AT	F1a	30.	3.13	2.	1.	0.	.01		
+	ROUTED TO	B-F1-1	18.	3.23	2.	0.	0.	.01		
+									2728.48	3.23
+	ROUTED TO	RF1b	18.	3.27	2.	0.	0.	.01		
+	HYDROGRAPH AT	F1b	14.	3.10	1.	0.	0.	.00		
+	2 COMBINED AT	CBF1b	23.	3.27	2.	1.	1.	.01		
+	HYDROGRAPH AT	F1c	31.	3.13	2.	1.	0.	.01		
+	2 COMBINED AT	CBF1c	44.	3.13	5.	1.	1.	.02		
+	ROUTED TO	B-F1-2	39.	3.30	4.	1.	1.	.02		
+									2711.78	3.30
+	ROUTED TO	RF1d	39.	3.30	4.	1.	1.	.02		
+	HYDROGRAPH AT	F1d	17.	3.10	1.	0.	0.	.00		
+	2 COMBINED AT	CBF1d	45.	3.30	5.	1.	1.	.03		
+	ROUTED TO	B-F1-3	31.	3.47	4.	1.	1.	.03		
+									2699.84	3.47
+	ROUTED TO	RF1e	31.	3.50	4.	1.	1.	.03		
+	HYDROGRAPH AT	F1e	23.	3.10	2.	0.	0.	.01		
+	2 COMBINED AT	CBF1e	35.	3.50	6.	1.	1.	.04		
+	ROUTED TO	B-F1-4	32.	3.60	5.	1.	1.	.04		
+									2679.94	3.60
+	HYDROGRAPH AT	F2a	15.	3.10	1.	0.	0.	.00		
+	ROUTED TO	B-F2-1	8.	3.23	1.	0.	0.	.00		
+									2703.31	3.23
+	ROUTED TO	RF2b	8.	3.27	1.	0.	0.	.00		
+	HYDROGRAPH AT	F2b	17.	3.17	2.	0.	0.	.01		
+	2 COMBINED AT	CBF2b	21.	3.23	2.	1.	0.	.01		
+	ROUTED TO	B-F2-2	12.	3.40	2.	0.	0.	.01		
+									2684.47	3.40
+	ROUTED TO	RF2c	12.	3.43	1.	0.	0.	.01		
+	HYDROGRAPH AT	F2c	12.	3.10	1.	0.	0.	.00		
+	2 COMBINED AT	CBF2c	15.	3.43	2.	1.	0.	.01		
+	HYDROGRAPH AT	F3	41.	3.13	3.	1.	1.	.01		
+	ROUTED TO	B-F3-1	27.	3.23	2.	1.	0.	.01		
+									2709.69	3.23
+	HYDROGRAPH AT	G	43.	3.13	4.	1.	1.	.02		
	ROUTED TO									

```
+                      B-G-1      33.    3.23          3.        1.         1.       .02
+                                                                                              2726.80        3.23

           HYDROGRAPH AT
+                        H1a      91.    3.10          7.        2.         1.       .03

           ROUTED TO
+                      B-H1-1     45.    3.27          4.        1.         1.       .03
+                                                                                              2745.63        3.27

           HYDROGRAPH AT
+                        H1b      15.    3.10          1.        0.         0.       .00

           HYDROGRAPH AT
+                        H1c      48.    3.10          3.        1.         1.       .01

           3 COMBINED AT
+                      CBH1c      73.    3.27          8.        2.         2.       .05

           ROUTED TO
+                       RH1d      71.    3.27          8.        2.         2.       .05

           HYDROGRAPH AT
+                        H1d      42.    3.10          3.        1.         1.       .01

           2 COMBINED AT
+                      CBH1d     101.    3.13         11.        3.         2.       .06

           ROUTED TO
+                      B-H1-2     97.    3.13         10.        3.         2.       .06
+                                                                                              2726.05        3.13

           HYDROGRAPH AT
+                          L      37.    3.07          2.        1.         0.       .01

           ROUTED TO
+                       B-L-1     28.    3.13          2.        0.         0.       .01
+                                                                                              2725.77        3.13

           HYDROGRAPH AT
+                          M      52.    3.10          4.        1.         1.       .01

           ROUTED TO
+                       B-M-1     43.    3.17          3.        1.         1.       .01
+                                                                                              2717.66        3.17

           HYDROGRAPH AT
+                          N      36.    3.10          2.        1.         0.       .01

           ROUTED TO
+                       B-N-1     17.    3.23          2.        0.         0.       .01
+                                                                                              2692.48        3.23

           8 COMBINED AT
+                      CLEAR     228.    3.20         29.        7.         6.       .17
1
                              SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                 (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                          INTERPOLATED TO
                                                                    COMPUTATION INTERVAL
     ISTAQ    ELEMENT      DT      PEAK     TIME TO    VOLUME      DT      PEAK    TIME TO      VOLUME
                                              PEAK                                   PEAK

                          (MIN)    (CFS)     (MIN)      (IN)      (MIN)    (CFS)    (MIN)       (IN)

           FOR STORM = 1  STORM AREA (SQ MI) =       .01
                E1  MANE        1.46    154.45    191.31      2.27     2.00    153.59    190.00       2.27

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .7392E+01 OUTFLOW= .7370E+01 BASIN STORAGE= .1786E-02 PERCENT ERROR=    .3

           FOR STORM = 1  STORM AREA (SQ MI) =       .01
                E2  MANE        1.74    141.10    188.83      2.27     2.00    137.93    188.00       2.27

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .5574E+01 OUTFLOW= .5564E+01 BASIN STORAGE= .4962E-03 PERCENT ERROR=    .2

           FOR STORM = 1  STORM AREA (SQ MI) =       .01
               F1a  MANE         .81     30.56    187.26      2.27     2.00     29.97    188.00       2.27

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1163E+01 OUTFLOW= .1162E+01 BASIN STORAGE= .1238E-03 PERCENT ERROR=    .1

           FOR STORM = 1  STORM AREA (SQ MI) =       .01
              RF1b  MANE         .86     17.66    195.75      1.49     2.00     17.63    196.00       1.49

CONTINUITY SUMMARY (AC-FT) - INFLOW= .7608E+00 EXCESS= .0000E+00 OUTFLOW= .7614E+00 BASIN STORAGE= .7530E-05 PERCENT ERROR=   -.1

           FOR STORM = 1  STORM AREA (SQ MI) =       .01
               F1b  MANE         .96     14.23    185.51      2.27     2.00     14.20    186.00       2.27

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .4847E+00 OUTFLOW= .4844E+00 BASIN STORAGE= .2418E-04 PERCENT ERROR=    .1

           FOR STORM = 1  STORM AREA (SQ MI) =       .01
               F1c  MANE        1.35     31.55    187.59      2.27     2.00     31.37    188.00       2.27

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1212E+01 OUTFLOW= .1210E+01 BASIN STORAGE= .1130E-03 PERCENT ERROR=    .1
```

```
          FOR STORM = 1  STORM AREA (SQ MI) =         .01
               RF1d  MANE          .78     38.82    199.68      1.60      2.00     38.57    198.00        1.60

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2011E+01 EXCESS= .0000E+00 OUTFLOW= .2013E+01 BASIN STORAGE= .1529E-04 PERCENT ERROR=   -.1

          FOR STORM = 1  STORM AREA (SQ MI) =         .01
                F1d  MANE          .93     17.45    186.43      2.27      2.00     17.36    186.00        2.27

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .6059E+00 OUTFLOW= .6056E+00 BASIN STORAGE= .3414E-04 PERCENT ERROR=    .0

          FOR STORM = 1  STORM AREA (SQ MI) =         .01
               RF1e  MANE         1.12     30.92    210.12      1.28      2.00     30.87    210.00        1.28

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1947E+01 EXCESS= .0000E+00 OUTFLOW= .1954E+01 BASIN STORAGE= .2508E-04 PERCENT ERROR=   -.4

          FOR STORM = 1  STORM AREA (SQ MI) =         .01
                F1e  MANE         1.22     23.28    186.95      2.27      2.00     23.13    186.00        2.27

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .8119E+00 OUTFLOW= .8114E+00 BASIN STORAGE= .4165E-04 PERCENT ERROR=    .1

          FOR STORM = 1  STORM AREA (SQ MI) =         .01
                F2a  MANE          .72     14.95    186.47      2.27      2.00     14.85    186.00        2.27

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .5332E+00 OUTFLOW= .5325E+00 BASIN STORAGE= .3733E-04 PERCENT ERROR=    .1

          FOR STORM = 1  STORM AREA (SQ MI) =         .01
               RF2b  MANE         1.06      7.90    196.66      1.47      2.00      7.89    196.00        1.47

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3432E+00 EXCESS= .0000E+00 OUTFLOW= .3446E+00 BASIN STORAGE= .2846E-05 PERCENT ERROR=   -.4

          FOR STORM = 1  STORM AREA (SQ MI) =         .01
                F2b  MANE          .72     17.48    189.43      2.27      2.00     17.40    190.00        2.27

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .7877E+00 OUTFLOW= .7855E+00 BASIN STORAGE= .1507E-03 PERCENT ERROR=    .3

          FOR STORM = 1  STORM AREA (SQ MI) =         .01
               RF2c  MANE          .62     12.29    205.45      1.29      2.00     12.27    206.00        1.28

CONTINUITY SUMMARY (AC-FT) - INFLOW= .7480E+00 EXCESS= .0000E+00 OUTFLOW= .7477E+00 BASIN STORAGE= .5997E-05 PERCENT ERROR=    .0

          FOR STORM = 1  STORM AREA (SQ MI) =         .01
                F2c  MANE          .56     11.68    185.86      2.27      2.00     11.65    186.00        2.27

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .4120E+00 OUTFLOW= .4115E+00 BASIN STORAGE= .2778E-04 PERCENT ERROR=    .1

          FOR STORM = 1  STORM AREA (SQ MI) =         .01
                 F3  MANE          .68     41.31    186.98      2.27      2.00     40.52    188.00        2.27

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1575E+01 OUTFLOW= .1573E+01 BASIN STORAGE= .1671E-03 PERCENT ERROR=    .1

          FOR STORM = 1  STORM AREA (SQ MI) =         .01
                  G  MANE          .69     43.96    189.19      2.27      2.00     43.37    188.00        2.27

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1939E+01 OUTFLOW= .1934E+01 BASIN STORAGE= .3297E-03 PERCENT ERROR=    .3

          FOR STORM = 1  STORM AREA (SQ MI) =         .01
                H1a  MANE         1.32     93.65    186.72      2.26      2.00     90.89    186.00        2.26

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .3251E+01 OUTFLOW= .3248E+01 BASIN STORAGE= .1497E-03 PERCENT ERROR=    .1

          FOR STORM = 1  STORM AREA (SQ MI) =         .01
                H1b  MANE          .65     14.86    185.69      2.27      2.00     14.71    186.00        2.27

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .4969E+00 OUTFLOW= .4964E+00 BASIN STORAGE= .2636E-04 PERCENT ERROR=    .1

          FOR STORM = 1  STORM AREA (SQ MI) =         .01
                H1c  MANE          .84     48.07    186.42      2.27      2.00     47.60    186.00        2.27

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1697E+01 OUTFLOW= .1696E+01 BASIN STORAGE= .1101E-03 PERCENT ERROR=    .1

          FOR STORM = 1  STORM AREA (SQ MI) =         .01
               RH1d  MANE          .57     72.26    196.57      1.64      2.00     71.37    196.00        1.64

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3948E+01 EXCESS= .0000E+00 OUTFLOW= .3949E+01 BASIN STORAGE= .1235E-04 PERCENT ERROR=    .0
```

```
         FOR STORM = 1  STORM AREA (SQ MI) =        .01
              H1d  MANE           .63     42.28    186.65      2.27      2.00     41.82    186.00        2.27

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1575E+01 OUTFLOW= .1573E+01 BASIN STORAGE= .1542E-03 PERCENT ERROR=    .2

         FOR STORM = 1  STORM AREA (SQ MI) =        .01
                L  MANE           .58     37.47    184.91      2.26      2.00     36.74    184.00        2.26

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1194E+01 OUTFLOW= .1193E+01 BASIN STORAGE= .4421E-04 PERCENT ERROR=    .1

         FOR STORM = 1  STORM AREA (SQ MI) =        .01
                M  MANE           .91     52.47    185.88      2.21      2.00     52.40    186.00        2.21

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1772E+01 OUTFLOW= .1770E+01 BASIN STORAGE= .8575E-04 PERCENT ERROR=    .1

         FOR STORM = 1  STORM AREA (SQ MI) =        .01
                N  MANE          1.07     36.42    185.94      2.27      2.00     36.37    186.00        2.27

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1212E+01 OUTFLOW= .1212E+01 BASIN STORAGE= .4858E-04 PERCENT ERROR=    .0


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

APPENDIX D

Detention Basin Calculations

WOOD/PATEL

CIVIL ENGINEERS * HYDROLOGISTS * LAND SURVEYORS * CONSTRUCTION MANAGERS

Project: *Sereno Canyon Phase 1*
Location: *City of Scottsdale*
Date: *12-Dec-06*

Project Number: *062654*
Project Engineer: *Geoff Brownell, P.E.*

Summary of 100-yr, 2-hr Storm Water Storage Calculations

Drainage Basin	Total Developed Area (Acre)	Required Volume (ft^3)	Provided Volume (ft^3)	Volume Excess / Shortage ± (ft3)
E2	13.23	81,457	82,644	1,187
F1	10.24	62,726	82,216	19,490
F2	3.56	21,780	24,923	3,143
F3	2.93	17,860	19,088	1,228
G	3.7	22,651	23,033	382
HI	12.94	79,279	81,033	1,754
L	1.49	9,148	11,033	1,886
M	1.44	8,712	9,804	1,092
N	2.81	17,424	19,477	2,053
Total	52.34	321,037	353,251	32,213

2708	5664.4	0.130	4,977	12,597	
2709	7317.4	0.168	6,491	19,088	5' depth

TOTAL PROVIDED VOLUME: **19,088**

BASIN - G-1					
STAGE	AREA		VOLUME		
	[ft²]	[acres]	INC [ft³]	CUM [ft³]	
2722	2612.7	0.060	0.000	0.000	
2723	3455.4	0.079	3,034	3,034	
2724	4552.3	0.105	4,004	7,038	
2725	5924.4	0.136	5,238	12,276	
2726	7564.7	0.174	6,745	19,021	
2726.5	8484.4	0.195	4,012	23,033	4.5' depth

TOTAL PROVIDED VOLUME: **19,021**

VOLUME BREAKDOWN

Drainage Boundary	Sub-Basin Volumes	Disturbance Areas [acres]	100yr-2hr. provided [ft³]	100yr-2hr. required [ft³]	Volume Shortage / Excess ±
G	G-1	0.1948	23,033		
TOTAL		0.1948	23,033	22,651	382

BASIN - H1-1					
STAGE	AREA		VOLUME		
	[ft²]	[acres]	INC [ft³]	CUM [ft³]	
2738	37.4	0.001	0.000	0.000	
2739	715.4	0.016	376	376	
2740	2504.5	0.057	1,610	1,986	
2741	5064.6	0.116	3,785	5,771	
2742	8155.3	0.187	6,610	12,381	
2743	11514.5	0.264	9,835	22,216	
2744	15653.7	0.359	13,584	35,800	
2745	20773.6	0.477	18,214	54,013	
2745.5	24017.5	0.551	11,198	65,211	7.5' ret

TOTAL PROVIDED VOLUME: **65,211**

VOLUME BREAKDOWN

Drainage Boundary	Sub-Basin Volumes	Disturbance Areas [acres]	100yr-2hr. provided [ft³]	100yr-2hr. required [ft³]	Volume Shortage / Excess ±
H1	H1-1	0.5514	65,211		
	H1-2	0.1678	15,822		
TOTAL		0.7192	81,033	79,279	1,754

BASIN - H1-2					
STAGE	AREA		VOLUME		
	[ft²]	[acres]	INC [ft³]	CUM [ft³]	
2721	1061.6	0.024	0.000	0.000	
2722	2214.3	0.051	1,638	1,638	
2723	3583.8	0.082	2,899	4,537	
2724	5837.4	0.134	4,711	9,248	
2725	7310.5	0.168	6,574	15,822	4' depth

TOTAL PROVIDED VOLUME: **15,822**

BASIN - L-1					
STAGE	AREA		VOLUME		
	[ft²]	[acres]	INC [ft³]	CUM [ft³]	
2722	1935.4	0.044	0	0	
2723	2972.2	0.068	2,454	2,454	
2724	4244.7	0.097	3,608	6,062	
2725	5697.8	0.131	4,971	11,033	3' depth

TOTAL PROVIDED VOLUME: **11,033**

VOLUME BREAKDOWN

Drainage Boundary	Sub-Basin Volumes	Disturbance Areas [acres]	100yr-2hr. provided [ft³]	100yr-2hr. required [ft³]	Volume Shortage / Excess ±
L	L-1	0.1308	11,033		
TOTAL		0.1308	11,033	9,148	1,886

BASIN - M-1					
STAGE	AREA		VOLUME		
	[ft²]	[acres]	INC [ft³]	CUM [ft³]	
2713	2286.4	0.052	0	0	
2714	2904.3	0.067	2,595	2,595	
2715	3586.4	0.082	3,245	5,841	
2716	4339.9	0.100	3,963	9,804	3' depth

TOTAL PROVIDED VOLUME: **9,804**

VOLUME BREAKDOWN

Drainage Boundary	Sub-Basin Volumes	Disturbance Areas [acres]	100yr-2hr. provided [ft³]	100yr-2hr. required [ft³]	Volume Shortage / Excess ±
M	M-1	0.0996	9,804		
TOTAL		0.0996	9,804	8,712	1,092

BASIN - N-1					
STAGE	AREA		VOLUME		
	[ft²]	[acres]	INC [ft³]	CUM [ft³]	
2688	2349.7	0.054	0	0	
2689	3432.0	0.079	2,891	2,891	
2690	4765.7	0.109	4,099	6,990	
2691	6209.6	0.143	5,488	12,477	
2692	7789.7	0.179	7,000	19,477	4' depth

TOTAL PROVIDED VOLUME: **19,477**

VOLUME BREAKDOWN

Drainage Boundary	Sub-Basin Volumes	Disturbance Areas [acres]	100yr-2hr. provided [ft³]	100yr-2hr. required [ft³]	Volume Shortage / Excess ±
N	N-1	0.1788	19,477		
TOTAL		0.1788	19,477	17,424	2,053

WOOD/PATEL

CIVIL ENGINEERS • HYDROLOGISTS • LAND SURVEYORS • CONSTRUCTION MANAGERS

Project: *Sereno Canyon Phase 1*
Location: *City of Scottsdale*
Date: *08-Dec-06*

Project Number: *062654*
Project Engineer: *Geoff Brownell, P.E.*

DETENTION BASIN PROVIDED STORAGE VOLUME CALCULATIONS

BASIN - E2-1

STAGE	AREA [ft²]	AREA [acres]	VOLUME INC [ft³]	VOLUME CUM [ft³]	
2696	3687.4	0.085	0.000	0.000	
2697	4837.8	0.111	4,263	4,263	
2698	6514.8	0.150	5,676	9,939	
2699	9417.4	0.216	7,966	17,905	
2700	13847.3	0.318	11,632	29,537	
2701	19633.4	0.451	16,740	46,278	
2702	25742.7	0.591	22,688	68,966	
2702.5	28970.3	0.665	13,678	82,644	6.5' depth

TOTAL PROVIDED VOLUME: **82,644**

VOLUME BREAKDOWN

Drainage Boundary	Sub-Basin Volumes	Disturbance Areas [acres]	100yr-2hr. provided [ft³]	100yr-2hr. required [ft³]	Volume Shortage / Excess ±
E2	E2-1	0.3179	82,644		
	TOTAL	0.3179	82,644	81,457	1,187

BASIN - F1-1

STAGE	AREA [ft²]	AREA [acres]	VOLUME INC [ft³]	VOLUME CUM [ft³]	
2725	4825.4	0.111	0	0	
2726	5460.2	0.125	5,143	5,143	
2727	6149.3	0.141	5,805	10,948	
2728	6964.7	0.160	6,557	17,505	3' depth

TOTAL PROVIDED VOLUME: **17,505**

VOLUME BREAKDOWN

Drainage Boundary	Sub-Basin Volumes	Disturbance Areas [acres]	100yr-2hr. provided [ft³]	100yr-2hr. required [ft³]	Volume Shortage / Excess ±
F1	F1-1	0.1599	17,505		
	F1-2	0.2009	19,445		
	F1-3	0.2685	29,213		
	F1-4	0.1848	16,054		
	TOTAL	0.8141	82,216	62,726	19,490

BASIN - F1-2

STAGE	AREA [ft²]	AREA [acres]	VOLUME INC [ft³]	VOLUME CUM [ft³]	
2708	4349.7	0.100	0	0	
2709	5716.6	0.131	5,033	5,033	
2710	7178.0	0.165	6,447	11,480	
2711	8750.9	0.201	7,964	19,445	3' depth

TOTAL PROVIDED VOLUME: **19,445**

BASIN - F1-3

STAGE	AREA [ft²]	AREA [acres]	VOLUME INC [ft³]	VOLUME CUM [ft³]	
2696	7972.2	0.183	0	0	
2697	9081.7	0.208	8,527	8,527	
2698	10298.1	0.236	9,690	18,217	
2699	11693.8	0.268	10,996	29,213	3' depth

TOTAL PROVIDED VOLUME: **29,213**

BASIN - F1-4

STAGE	AREA [ft²]	AREA [acres]	VOLUME INC [ft³]	VOLUME CUM [ft³]	
2676	3011.3	0.069	0	0	
2677	4420.9	0.101	3,716	3,716	
2678	6101.9	0.140	5,261	8,978	
2679	8050.6	0.185	7,076	16,054	3' depth

TOTAL PROVIDED VOLUME: **16,054**

BASIN - F2-1

STAGE	AREA [ft²]	AREA [acres]	VOLUME INC [ft³]	VOLUME CUM [ft³]	
2700	1222.8	0.028	0	0	
2701	2146.0	0.049	1,684	1,684	
2702	3243.9	0.074	2,695	4,379	
2703	4504.0	0.103	3,874	8,253	3' depth

TOTAL PROVIDED VOLUME: **8,253**

VOLUME BREAKDOWN

Drainage Boundary	Sub-Basin Volumes	Disturbance Areas [acres]	100yr-2hr. provided [ft³]	100yr-2hr. required [ft³]	Volume Shortage / Excess ±
F2	F2-1	0.1034	8,253		
	F2-2	0.1711	16,670		
	TOTAL	0.2745	24,923	21,780	3,143

BASIN - F2-2

STAGE	AREA [ft²]	AREA [acres]	VOLUME INC [ft³]	VOLUME CUM [ft³]	
2681	3838.7	0.088	0	0	
2682	4937.5	0.113	4,388	4,388	
2683	6086.7	0.140	5,512	9,900	
2684	7453.0	0.171	6,770	16,670	3' depth

TOTAL PROVIDED VOLUME: **16,670**

BASIN - F3-1

STAGE	AREA [ft²]	AREA [acres]	VOLUME INC [ft³]	VOLUME CUM [ft³]
2704	904.7	0.021	0	0
2705	1950.8	0.045	1,428	1,428
2706	3070.9	0.070	2,511	3,939
2707	4290.4	0.098	3,681	7,619

VOLUME BREAKDOWN

Drainage Boundary	Sub-Basin Volumes	Disturbance Areas [acres]	100yr-2hr. provided [ft³]	100yr-2hr. required [ft³]	Volume Shortage / Excess ±
F3	F3-1	0.1680	19,088		
	TOTAL	0.1680	19,088	17,860	1,228

APPENDIX E

Rational Method

100-year Flows for Roadway Crossings - DDMSW Output
10-year and 100-year Flows for Street Flows

- Summary of Street Flows
- Rational for Windows

100-year Flows for Roadway Crossings - DDMSW Output

Flood Control District of Maricopa County
062654 - SERENO CANYON PHASE 1
Sub Basin Data - Rational Method

 9/3/2006

Sub Basin	Sub Basin Parameters: Area (acres)	Length (ft)	Slope (ft/ft)	Kb		Return Period (Years): 2	5	10	25	50	100
C	2.40	480	0.0750	0.075	Q (cfs)	5	6	7	10	12	14
D	1.40	190	0.0474	0.078	Q (cfs)	3	4	4	6	7	8
E	2.10	406	0.0862	0.075	Q (cfs)	4	6	7	9	11	12
F	1.70	460	0.0913	0.077	Q (cfs)	4	5	5	7	9	10
G	1.40	300	0.0367	0.078	Q (cfs)	3	4	4	6	7	8
H	2.00	440	0.0182	0.076	Q (cfs)	3	5	6	8	10	12
J	0.20	66	0.0606	0.089	Q (cfs)	0	1	1	1	1	1
N	2.80	560	0.0357	0.074	Q (cfs)	5	7	8	11	14	17
O	5.40	950	0.0263	0.070	Q (cfs)	8	11	14	19	24	28
P	1.40	480	0.0438	0.078	Q (cfs)	3	4	4	6	7	8
Q	1.30	400	0.0550	0.078	Q (cfs)	3	3	4	5	7	8
R	0.20	90	0.0889	0.090	Q (cfs)	0	1	1	1	1	1
T	2.10	500	0.0420	0.075	Q (cfs)	4	5	7	9	11	12
U	2.20	430	0.0767	0.075	Q (cfs)	5	6	7	9	11	13
V	0.90	290	0.1138	0.080	Q (cfs)	2	2	3	4	5	5
W	0.40	150	0.0733	0.085	Q (cfs)	1	1	1	2	2	2

10-year and 100-year Flows for Street Flows

Summary of Street Flows

Project: *SERENO CANYON PHASE 1*
Location: *City of Scottsdale*
Date: *########*
References: *Drainage Design Manual for Maricopa County, Volume I - Hydrology*
City of Scottsdale Design Standards and Policies Manual, Sep 2006.

Project Number: *062654*
Project Engineer: *Geoff Brownell, P.E*

Known Values: *Design Storm: 10-Year / 100-Year*

RATIONAL METHOD CALCULATIONS: STREET FLOW

Street flows calculated by FCDMC Rational Method using rational for Windows software

Concentration Point	Area	Street Width (B/C-B/C)	Length of Area	10 - Year				100 - Year			
				Weighted "C" Value	Time of Concen.	Intensity	Q	Weighted "C" Value	Time of Concen.	Intensity	Q
	(ac)	(ft)	(ft)		(min)	(in/hr)	(cfs)		(min)	(in/hr)	(cfs)
S1.1	0.07	24	170	0.76	5.00	6.5	0.0	0.95	5.00	10	1.0
S1.2	0.20	24	390	0.76	5.00	6.5	1.0	0.95	5.00	10	2.0
S1							**1.0**				**3.0**
S2.1	0.07	24	170	0.76	5.00	6.5	0.0	0.95	5.00	10	1.0
S2.2	0.17	24	350	0.76	5.00	6.5	1.0	0.95	5.00	10	2.0
S2							**1.0**				**3.0**
S3.1	0.12	24	200	0.76	5.00	6.5	1.0	0.95	5.00	10	1.0
S3.2	0.18	24	210	0.76	5.00	6.5	1.0	0.95	5.00	10	2.0
S3							**2.0**				**3.0**
S4.1	0.08	24	145	0.76	5.00	6.5	0.0	0.95	5.00	10	1.0
S4.2	0.12	24	215	0.76	5.00	6.5	1.0	0.95	5.00	10	1.0
S4							**1.0**				**2.0**
S7	0.25	24	335	0.76	5.00	6.5	1.0	0.95	5.00	10	2.0
S5.1	0.13	24	410	0.76	6.30	6.0	1.0	0.95	5.20	9.8	1.0
S5.2	0.38	24	1,190	0.76	6.90	5.8	2.0	0.95	5.70	9.7	3.0
S5 (1)							**4.0**				**6.0**
S6.1	0.13	24	410	0.76	6.20	6.0	1.0	0.95	5.20	9.9	1.0
S6.2	0.32	24	1,190	0.76	6.90	5.9	2.0	0.95	5.70	9.7	3.0
S6							**3.0**				**4.0**
S8	0.14	24	180	0.76	5.00	6.5	1.0	0.95	5.00	10	1.0
S9.1	0.09	24	162	0.76	5.00	6.5	0.0	0.95	5.00	10	1.0
S9.2	0.04	24	70	0.76	5.00	6.5	0.0	0.95	5.00	10	0.0
S9							**0.0**				**1.0**
S10.1	0.19	24	350	0.76	5.00	6.5	1.0	0.95	5.00	10	2.0
S10.2	0.19	24	220	0.76	5.00	6.5	1.0	0.95	5.00	10	2.0
S10							**2.0**				**4.0**
S11.1	0.05	24	90	0.76	5.00	6.5	0.0	0.95	5.00	10	0.0
S11.2	0.36	24	490	0.76	5.00	6.5	2.0	0.95	5.00	10	3.0
S11							**2.0**				**3.0**
S12.1	0.12	24	192	0.76	5.00	6.5	1.0	0.95	5.00	10	1.0
S12.2	0.10	24	110	0.76	5.00	6.5	0.0	0.95	5.00	10	1.0
S12							**1.0**				**2.0**
S13.1	0.08	32	150	0.76	5.00	6.5	0.0	0.95	5.00	10	1.0
S13.2	0.27	32	462	0.76	5.00	6.5	1.0	0.95	5.00	10	3.0
S13							**1.0**				**4.0**
S14.1	0.08	32	150	0.76	5.00	6.5	0.0	0.95	5.00	10	1.0
S14.2	0.41	32	791	0.76	5.60	6.2	2.0	0.95	5.00	10	4.0
S14							**2.0**				**6.0**
S15.1	0.07	32	85	0.76	5.00	6.5	0.0	0.95	5.00	10	1.0
S15.2	0.19	24	250	0.76	5.00	6.5	1.0	0.95	5.00	10	2.0
S15							**1.0**				**3.0**
S16	0.11	32	114	0.76	5.00	6.5	1.0	0.95	5.0	10	1.0
S17.1	0.08	32	125	0.76	5.00	6.5	0.0	0.95	5.0	10	1.0
S17.2	0.06	32	80	0.76	5.00	6.5	0.0	0.95	5.0	10	1.0
S17							**0.0**				**2.0**
S18.1	0.07	32	120	0.76	5.00	6.5	0.0	0.95	5.0	10	1.0
S18.2	0.07	32	125	0.76	5.00	6.5	0.0	0.95	5.0	10	1.0
S18							**0.0**				**2.0**
S19	0.70	32	1,100	0.76	5.80	6.2	4.0	0.95	5.0	10	7.0
S20	0.83	32	1,090	0.76	5.50	6.3	4.0	0.95	5.0	10	8.0
S21.1	0.31	32	672	0.76	5.00	6.5	2.0	0.95	5.0	10	3.0
S21.2	0.03	32	102	0.76	5.00	6.5	0.0	0.95	5.0	10	0.0
S21							**2.0**				**3.0**

RATIONAL METHOD CALCULATIONS: STREET FLOW

Street flows calculated by FCDMC Rational Method using rational for Windows software

Concentration Point	Area	Street Width (B/C-B/C)	Length of Area	10 - Year				100 - Year			
				Weighted "C" Value	Time of Concen.	Intensity	Q	Weighted "C" Value	Time of Concen.	Intensity	Q
	(ac)	(ft)	(ft)		(min)	(in/hr)	(cfs)		(min)	(in/hr)	(cfs)
S22.1	0.23	32	620	0.76	5.00	6.5	1.0	0.95	5.0	10	2.0
S22.2	0.04	32	105	0.76	5.00	6.5	0.0	0.95	5.0	10	0.0
S22							***1.0***				***2.0***
S23.1	0.11	24	100	0.76	5.00	6.5	1.0	0.95	5.0	10	1.0
S23.2	0.17	24	230	0.76	5.00	6.5	1.0	0.95	5.0	10	2.0
S23							***2.0***				***3.0***
S24.1	0.08	24	100	0.76	5.00	6.5	0.0	0.95	5.0	10	1.0
S24.2	0.13	24	150	0.76	5.00	6.5	1.0	0.95	5.0	10	1.0
S24							***1.0***				***2.0***
S25.1	0.11	24	185	0.76	5.00	6.5	1.0	0.95	5.0	10	1.0
S25.2	0.03	24	53	0.76	5.00	6.5	0.0	0.95	5.0	10	0.0
S25							***1.0***				***1.0***
S26.1	0.15	24	135	0.76	5.00	6.5	0.0	0.95	5.0	10	1.0
S26.2	0.45	24	640	0.76	5.00	6.5	2.0	0.95	5.0	10	4.0
S26							***2.0***				***5.0***
S27.1	0.25	24	460	0.76	5.00	6.5	1.0	0.95	5.0	10	2.0
S27.2	0.09	24	167	0.76	5.00	6.5	0.0	0.95	5.0	10	1.0
S27							***1.0***				***3.0***

10-year and 100-year Flows for Street Flows

Rational for Windows

RATIONAL FOR WINDOWS

Flood Control District of Maricopa County Rational Method

Project Information

Project Name: SERENO CANYON ONSITE RATIONAL

Project Description:

Drainage Point: S1.1

Location: SERENO CANYON PHASE 1

Drainage Basin Data

Water Course Length: 170.00 ft

Basin Area: 0.070 acres

High Elevation: 2728.30 ft

Low Elevation: 2721.53 ft

Average Slope: 0.0398 ft/ft

Roughness, Kb: 0.0472 (A)

10-Year Runoff Coefficient: 0.760

10-Year 6 Hour Rainfall Depth: 2.29 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	0	0	0	0	1	1
C	0.760	0.760	0.760	0.836	0.912	0.950
Tc (min)	5.0	5.0	5.0	5.0	5.0	5.0
i (in/hr)	4.2	5.6	6.5	7.7	8.8	10.0

Computed by: , WOOD/PATEL
Tuesday, December 12, 2006 2:43:42 p

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RATIONAL FOR WINDOWS

Flood Control District of Maricopa County Rational Method

Project Information

Project Name: SERENO CANYON ONSITE RATIONAL

Project Description:

Drainage Point: S2.1

Location: SERENO CANYON PHASE 1

Drainage Basin Data

Water Course Length: 170.00 ft

Basin Area: 0.070 acres

High Elevation: 2728.30 ft

Low Elevation: 2721.46 ft

Average Slope: 0.0402 ft/ft

Roughness, Kb: 0.0472 (A)

10-Year Runoff Coefficient: 0.760

10-Year 6 Hour Rainfall Depth: 2.29 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	0	0	0	0	1	1
C	0.760	0.760	0.760	0.836	0.912	0.950
Tc (min)	5.0	5.0	5.0	5.0	5.0	5.0
i (in/hr)	4.2	5.6	6.5	7.7	8.8	10.0

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RATIONAL FOR WINDOWS

Flood Control District of Maricopa County Rational Method

Project Information

Project Name: SERENO CANYON ONSITE RATIONAL

Project Description:

Drainage Point: S1.2

Location: SERENO CANYON PHASE 1

Drainage Basin Data

Water Course Length: 390.00 ft

Basin Area: 0.200 acres

High Elevation: 2736.45 ft

Low Elevation: 2721.46 ft

Average Slope: 0.0384 ft/ft

Roughness, Kb: 0.0444 (A)

10-Year Runoff Coefficient: 0.760

10-Year 6 Hour Rainfall Depth: 2.29 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	1	1	1	1	2	2
C	0.760	0.760	0.760	0.836	0.912	0.950
Tc (min)	5.0	5.0	5.0	5.0	5.0	5.0
i (in/hr)	4.2	5.6	6.5	7.7	8.8	10.0

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RATIONAL FOR WINDOWS

Flood Control District of Maricopa County Rational Method

Project Information

Project Name: SERENO CANYON ONSITE RATIONAL

Project Description:

Drainage Point: S2.2

Location: SERENO CANYON PHASE 1

Drainage Basin Data

Water Course Length: 350.00 ft

Basin Area: 0.170 acres

High Elevation: 2736.45 ft

Low Elevation: 2721.53 ft

Average Slope: 0.0426 ft/ft

Roughness, Kb: 0.0448 (A)

10-Year Runoff Coefficient: 0.760

10-Year 6 Hour Rainfall Depth: 2.29 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	1	1	1	1	1	2
C	0.760	0.760	0.760	0.836	0.912	0.950
Tc (min)	5.0	5.0	5.0	5.0	5.0	5.0
i (in/hr)	4.2	5.6	6.5	7.7	8.8	10.0

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RATIONAL FOR WINDOWS

Flood Control District of Maricopa County Rational Method

Project Information

Project Name: SERENO CANYON ONSITE RATIONAL

Project Description:

Drainage Point: S3.1

Location: SERENO CANYON PHASE 1

Drainage Basin Data

Water Course Length: 200.00 ft

Basin Area: 0.110 acres

High Elevation: 2736.45 ft

Low Elevation: 2728.37 ft

Average Slope: 0.0404 ft/ft

Roughness, Kb: 0.0460 (A)

10-Year Runoff Coefficient: 0.760

10-Year 6 Hour Rainfall Depth: 2.29 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	0	0	1	1	1	1
C	0.760	0.760	0.760	0.836	0.912	0.950
Tc (min)	5.0	5.0	5.0	5.0	5.0	5.0
i (in/hr)	4.2	5.6	6.5	7.7	8.8	10.0

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RATIONAL FOR WINDOWS

Flood Control District of Maricopa County Rational Method

Project Information

Project Name: SERENO CANYON ONSITE RATIONAL

Project Description:

Drainage Point: S4.1

Location: SERENO CANYON PHASE 1

Drainage Basin Data

Water Course Length: 145.00 ft

Basin Area: 0.080 acres

High Elevation: 2733.30 ft

Low Elevation: 2731.08 ft

Average Slope: 0.0153 ft/ft

Roughness, Kb: 0.0469 (A)

10-Year Runoff Coefficient: 0.760

10-Year 6 Hour Rainfall Depth: 2.29 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	0	0	0	1	1	1
C	0.760	0.760	0.760	0.836	0.912	0.950
Tc (min)	5.0	5.0	5.0	5.0	5.0	5.0
i (in/hr)	4.2	5.6	6.5	7.7	8.8	10.0

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RATIONAL FOR WINDOWS

Flood Control District of Maricopa County Rational Method

Project Information

Project Name: SERENO CANYON ONSITE RATIONAL

Project Description:

Drainage Point: S4.2

Location: SERENO CANYON PHASE 1

Drainage Basin Data

Water Course Length: 215.00 ft

Basin Area: 0.120 acres

High Elevation: 2737.54 ft

Low Elevation: 2731.08 ft

Average Slope: 0.0300 ft/ft

Roughness, Kb: 0.0458 (A)

10-Year Runoff Coefficient: 0.760

10-Year 6 Hour Rainfall Depth: 2.29 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	0	1	1	1	1	1
C	0.760	0.760	0.760	0.836	0.912	0.950
Tc (min)	5.0	5.0	5.0	5.0	5.0	5.0
i (in/hr)	4.2	5.6	6.5	7.7	8.8	10.0

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RATIONAL FOR WINDOWS

Flood Control District of Maricopa County Rational Method

Project Information

Project Name: SERENO CANYON ONSITE RATIONAL

Project Description:

Drainage Point: S5.1

Location: SERENO CANYON PHASE 1

Drainage Basin Data

Water Course Length: 410.00 ft

Basin Area: 0.130 acres

High Elevation: 2737.54 ft

Low Elevation: 2734.60 ft

Average Slope: 0.0072 ft/ft

Roughness, *Kb*: *0.0455 (A)*

10-Year Runoff Coefficient: 0.760

10-Year 6 Hour Rainfall Depth: 2.29 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	0	0	1	1	1	1
C	0.760	0.760	0.760	0.836	0.912	0.950
Tc (min)	7.6	6.7	6.3	5.8	5.5	5.2
i (in/hr)	3.6	5.0	6.0	7.4	8.5	9.8

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RATIONAL FOR WINDOWS

Flood Control District of Maricopa County Rational Method

Project Information

Project Name: SERENO CANYON ONSITE RATIONAL

Project Description:

Drainage Point: S6.1

Location: SERENO CANYON PHASE 1

Drainage Basin Data

Water Course Length: 410.00 ft

Basin Area: 0.130 acres

High Elevation: 2737.54 ft

Low Elevation: 2734.56 ft

Average Slope: 0.0073 ft/ft

Roughness, Kb: 0.0455 (A)

10-Year Runoff Coefficient: 0.760

10-Year 6 Hour Rainfall Depth: 2.29 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	0	0	1	1	1	1
C	0.760	0.760	0.760	0.836	0.912	0.950
Tc (min)	7.6	6.7	6.2	5.8	5.5	5.2
i (in/hr)	3.6	5.0	6.0	7.4	8.6	9.9

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RATIONAL FOR WINDOWS

Flood Control District of Maricopa County Rational Method

Project Information

Project Name: SERENO CANYON ONSITE RATIONAL

Project Description:

Drainage Point: S8

Location: SERENO CANYON PHASE 1

Drainage Basin Data

Water Course Length: 180.00 ft

Basin Area: 0.140 acres

High Elevation: 2754.63 ft

Low Elevation: 2753.03 ft

Average Slope: 0.0089 ft/ft

Roughness, Kb: 0.0453 (A)

10-Year Runoff Coefficient: 0.760

10-Year 6 Hour Rainfall Depth: 2.29 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	0	1	1	1	1	1
C	0.760	0.760	0.760	0.836	0.912	0.950
Tc (min)	5.0	5.0	5.0	5.0	5.0	5.0
i (in/hr)	4.2	5.6	6.5	7.7	8.8	10.0

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RATIONAL FOR WINDOWS

Flood Control District of Maricopa County Rational Method

Project Information

Project Name: SERENO CANYON ONSITE RATIONAL

Project Description:

Drainage Point: S9.1

Location: SERENO CANYON PHASE 1

Drainage Basin Data

Water Course Length: 162.00 ft

Basin Area: 0.090 acres

High Elevation: 2754.63 ft

Low Elevation: 2751.13 ft

Average Slope: 0.0216 ft/ft

Roughness, Kb: 0.0465 (A)

10-Year Runoff Coefficient: 0.760

10-Year 6 Hour Rainfall Depth: 2.29 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	0	0	0	1	1	1
C	0.760	0.760	0.760	0.836	0.912	0.950
Tc (min)	5.0	5.0	5.0	5.0	5.0	5.0
i (in/hr)	4.2	5.6	6.5	7.7	8.8	10.0

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RATIONAL FOR WINDOWS

Flood Control District of Maricopa County Rational Method

Project Information

Project Name: SERENO CANYON ONSITE RATIONAL

Project Description:

Drainage Point: S10.1

Location: SERENO CANYON PHASE 1

Drainage Basin Data

Water Course Length: 350.00 ft

Basin Area: 0.190 acres

High Elevation: 2753.90 ft

Low Elevation: 2739.77 ft

Average Slope: 0.0404 ft/ft

Roughness, Kb: 0.0445 (A)

10-Year Runoff Coefficient: 0.760

10-Year 6 Hour Rainfall Depth: 2.29 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	1	1	1	1	2	2
C	0.760	0.760	0.760	0.836	0.912	0.950
Tc (min)	5.0	5.0	5.0	5.0	5.0	5.0
i (in/hr)	4.2	5.6	6.5	7.7	8.8	10.0

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RATIONAL FOR WINDOWS

Flood Control District of Maricopa County Rational Method

Project Information

Project Name: SERENO CANYON ONSITE RATIONAL

Project Description:

Drainage Point: S10.2

Location: SERENO CANYON PHASE 1

Drainage Basin Data

Water Course Length: 220.00 ft

Basin Area: 0.190 acres

High Elevation: 2753.90 ft

Low Elevation: 2739.77 ft

Average Slope: 0.0642 ft/ft

Roughness, Kb: 0.0445 (A)

10-Year Runoff Coefficient: 0.760

10-Year 6 Hour Rainfall Depth: 2.29 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	1	1	1	1	2	2
C	0.760	0.760	0.760	0.836	0.912	0.950
Tc (min)	5.0	5.0	5.0	5.0	5.0	5.0
i (in/hr)	4.2	5.6	6.5	7.7	8.8	10.0

Author: Frank M. Koo, P.E.
Email: gufrank@engsoftwarecenter.com
URL: http://www.engsoftwarecenter.com/rational.html

RATIONAL FOR WINDOWS

Flood Control District of Maricopa County Rational Method

Project Information

Project Name: SERENO CANYON ONSITE RATIONAL

Project Description:

Drainage Point: S9.2

Location: SERENO CANYON PHASE 1

Drainage Basin Data

Water Course Length: 70.00 ft

Basin Area: 0.040 acres

High Elevation: 2753.50 ft

Low Elevation: 2751.13 ft

Average Slope: 0.0339 ft/ft

Roughness, Kb: 0.0487 (A)

10-Year Runoff Coefficient: 0.760

10-Year 6 Hour Rainfall Depth: 2.29 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	0	0	0	0	0	0
C	0.760	0.760	0.760	0.836	0.912	0.950
Tc (min)	5.0	5.0	5.0	5.0	5.0	5.0
i (in/hr)	4.2	5.6	6.5	7.7	8.8	10.0

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RATIONAL FOR WINDOWS

Flood Control District of Maricopa County Rational Method

Project Information

Project Name: SERENO CANYON ONSITE RATIONAL

Project Description:

Drainage Point: S7

Location: SERENO CANYON PHASE 1

Drainage Basin Data

Water Course Length: 335.00 ft

Basin Area: 0.250 acres

High Elevation: 2753.90 ft

Low Elevation: 2738.59 ft

Average Slope: 0.0457 ft/ft

Roughness, Kb: 0.0438 (A)

10-Year Runoff Coefficient: *0.760*

10-Year 6 Hour Rainfall Depth: 2.29 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	1	1	1	2	2	2
C	0.760	0.760	0.760	0.836	0.912	0.950
Tc (min)	5.0	5.0	5.0	5.0	5.0	5.0
i (in/hr)	4.2	5.6	6.5	7.7	8.8	10.0

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RATIONAL FOR WINDOWS

Flood Control District of Maricopa County Rational Method

Project Information

Project Name: SERENO CANYON ONSITE RATIONAL

Project Description:

Drainage Point: S11.1

Location: SERENO CANYON PHASE 1

Drainage Basin Data

Water Course Length: 90.00 ft

Basin Area: 0.050 acres

High Elevation: 2733.70 ft

Low Elevation: 2732.57 ft

Average Slope: 0.0126 ft/ft

Roughness, Kb: 0.0481 (A)

10-Year Runoff Coefficient: 0.760

10-Year 6 Hour Rainfall Depth: 2.29 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	0	0	0	0	0	0
C	0.760	0.760	0.760	0.836	0.912	0.950
Tc (min)	5.0	5.0	5.0	5.0	5.0	5.0
i (in/hr)	4.2	5.6	6.5	7.7	8.8	10.0

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RATIONAL FOR WINDOWS

Flood Control District of Maricopa County Rational Method

Project Information

Project Name: SERENO CANYON ONSITE RATIONAL

Project Description:

Drainage Point: S11.2

Location: SERENO CANYON PHASE 1

Drainage Basin Data

Water Course Length: 490.00 ft

Basin Area: 0.360 acres

High Elevation: 2750.06 ft

Low Elevation: 2732.57 ft

Average Slope: 0.0357 ft/ft

Roughness, Kb: 0.0428 (A)

10-Year Runoff Coefficient: 0.760

10-Year 6 Hour Rainfall Depth: 2.29 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	1	2	2	2	3	3
C	0.760	0.760	0.760	0.836	0.912	0.950
Tc (min)	5.0	5.0	5.0	5.0	5.0	5.0
i (in/hr)	4.2	5.6	6.5	7.7	8.8	10.0

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RATIONAL FOR WINDOWS

Flood Control District of Maricopa County Rational Method

Project Information

Project Name: SERENO CANYON ONSITE RATIONAL

Project Description:

Drainage Point: S12.1

Location: SERENO CANYON PHASE 1

Drainage Basin Data

Water Course Length: 190.00 ft

Basin Area: 0.120 acres

High Elevation: 2733.70 ft

Low Elevation: 2729.44 ft

Average Slope: 0.0224 ft/ft

Roughness, Kb: 0.0458 (A)

10-Year Runoff Coefficient: 0.760

10-Year 6 Hour Rainfall Depth: 2.29 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	0	1	1	1	1	1
C	0.760	0.760	0.760	0.836	0.912	0.950
Tc (min)	5.0	5.0	5.0	5.0	5.0	5.0
i (in/hr)	4.2	5.6	6.5	7.7	8.8	10.0

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RATIONAL FOR WINDOWS

Flood Control District of Maricopa County Rational Method

Project Information

Project Name: SERENO CANYON ONSITE RATIONAL
Project Description:

Drainage Point: S12.2
Location: SERENO CANYON PHASE 1

Drainage Basin Data

Water Course Length: 110.00 ft
Basin Area: 0.100 acres

High Elevation: 2730.80 ft
Low Elevation: 2729.44 ft

Average Slope: 0.0124 ft/ft
Roughness, Kb: 0.0463 (A)

10-Year Runoff Coefficient: 0.760

10-Year 6 Hour Rainfall Depth: 2.29 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	0	0	0	1	1	1
C	0.760	0.760	0.760	0.836	0.912	0.950
Tc (min)	5.0	5.0	5.0	5.0	5.0	5.0
i (in/hr)	4.2	5.6	6.5	7.7	8.8	10.0

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RATIONAL FOR WINDOWS

Flood Control District of Maricopa County Rational Method

Project Information

Project Name: SERENO CANYON ONSITE RATIONAL

Project Description:

Drainage Point: S5.2

Location: SERENO CANYON PHASE 1

Drainage Basin Data

Water Course Length: 1190.00 ft

Basin Area: 0.380 acres

High Elevation: 2767.30 ft

Low Elevation: 2734.56 ft

Average Slope: 0.0275 ft/ft

Roughness, Kb: 0.0426 (A)

10-Year Runoff Coefficient: 0.760

10-Year 6 Hour Rainfall Depth: 2.29 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	1	1	2	2	3	3
C	0.760	0.760	0.760	0.836	0.912	0.950
Tc (min)	8.4	7.4	6.9	6.4	6.0	5.7
i (in/hr)	3.5	4.8	5.8	7.2	8.3	9.5

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RATIONAL FOR WINDOWS

Flood Control District of Maricopa County Rational Method

Project Information

Project Name: SERENO CANYON ONSITE RATIONAL

Project Description:

Drainage Point: S6.2

Location: SERENO CANYON PHASE 1

Drainage Basin Data

Water Course Length: 1190.00 ft

Basin Area: 0.350 acres

High Elevation: 2767.30 ft

Low Elevation: 2734.56 ft

Average Slope: 0.0275 ft/ft

Roughness, Kb: 0.0428 (A)

10-Year Runoff Coefficient: 0.760

10-Year 6 Hour Rainfall Depth: 2.32 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	1	1	2	2	3	3
C	0.760	0.760	0.760	0.836	0.912	0.950
Tc (min)	8.3	7.4	6.9	6.3	6.0	5.7
i (in/hr)	3.5	4.9	5.9	7.3	8.4	9.7

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RATIONAL FOR WINDOWS

Flood Control District of Maricopa County Rational Method

Project Information

Project Name: SERENO CANYON ONSITE RATIONAL

Project Description:

Drainage Point: S13.1

Location: SERENO CANYON PHASE 1

Drainage Basin Data

Water Course Length: 150.00 ft

Basin Area: 0.080 acres

High Elevation: 2767.30 ft

Low Elevation: 2764.00 ft

Average Slope: 0.0220 ft/ft

Roughness, Kb: 0.0469 (A)

10-Year Runoff Coefficient: 0.760

10-Year 6 Hour Rainfall Depth: 2.29 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	0	0	0	1	1	1
C	0.760	0.760	0.760	0.836	0.912	0.950
Tc (min)	5.0	5.0	5.0	5.0	5.0	5.0
i (in/hr)	4.2	5.6	6.5	7.7	8.8	10.0

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RATIONAL FOR WINDOWS

Flood Control District of Maricopa County Rational Method

Project Information

Project Name: SERENO CANYON ONSITE RATIONAL

Project Description:

Drainage Point: S14.1

Location: SERENO CANYON PHASE I

Drainage Basin Data

Water Course Length: 150.00 ft

Basin Area: 0.080 acres

High Elevation: 2767.30 ft

Low Elevation: 2764.00 ft

Average Slope: 0.0220 ft/ft

Roughness, Kb: 0.0469 (A)

10-Year Runoff Coefficient: 0.760

10-Year 6 Hour Rainfall Depth: 2.29 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	0	0	0	1	1	1
C	0.760	0.760	0.760	0.836	0.912	0.950
Tc (min)	5.0	5.0	5.0	5.0	5.0	5.0
i (in/hr)	4.2	5.6	6.5	7.7	8.8	10.0

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RATIONAL FOR WINDOWS

Flood Control District of Maricopa County Rational Method

Project Information

Project Name: SERENO CANYON ONSITE RATIONAL

Project Description:

Drainage Point: S13.2

Location: SERENO CANYON PHASE 1

Drainage Basin Data

Water Course Length: 462.00 ft

Basin Area: 0.273 acres

High Elevation: 2777.20 ft

Low Elevation: 2764.00 ft

Average Slope: 0.0286 ft/ft

Roughness, Kb: 0.0435 (A)

10-Year Runoff Coefficient: 0.760

10-Year 6 Hour Rainfall Depth: 2.29 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	1	1	1	2	2	3
C	0.760	0.760	0.760	0.836	0.912	0.950
Tc (min)	5.0	5.0	5.0	5.0	5.0	5.0
i (in/hr)	4.2	5.6	6.5	7.7	8.8	10.0

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RATIONAL FOR WINDOWS

Flood Control District of Maricopa County Rational Method

Project Information

Project Name: SERENO CANYON ONSITE RATIONAL

Project Description:

Drainage Point: S15.1

Location: SERENO CANYON PHASE 1

Drainage Basin Data

Water Course Length: 85.00 ft

Basin Area: 0.070 acres

High Elevation: 2777.20 ft

Low Elevation: 2776.06 ft

Average Slope: 0.0134 ft/ft

Roughness, Kb: 0.0472 (A)

10-Year Runoff Coefficient: 0.760

10-Year 6 Hour Rainfall Depth: 2.29 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	0	0	0	0	1	1
C	0.760	0.760	0.760	0.836	0.912	0.950
Tc (min)	5.0	5.0	5.0	5.0	5.0	5.0
i (in/hr)	4.2	5.6	6.5	7.7	8.8	10.0

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RATIONAL FOR WINDOWS

Flood Control District of Maricopa County Rational Method

Project Information

Project Name: SERENO CANYON ONSITE RATIONAL

Project Description:

Drainage Point: S15.2

Location: SERENO CANYON PHASE 1

Drainage Basin Data

Water Course Length: 250.00 ft

Basin Area: 0.190 acres

High Elevation: 2781.95 ft

Low Elevation: 2776.06 ft

Average Slope: 0.0236 ft/ft

Roughness, Kb: 0.0445 (A)

10-Year Runoff Coefficient: 0.760

10-Year 6 Hour Rainfall Depth: 2.29 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	1	1	1	1	2	2
C	0.760	0.760	0.760	0.836	0.912	0.950
Tc (min)	5.0	5.0	5.0	5.0	5.0	5.0
i (in/hr)	4.2	5.6	6.5	7.7	8.8	10.0

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RATIONAL FOR WINDOWS

Flood Control District of Maricopa County Rational Method

Project Information

Project Name: SERENO CANYON ONSITE RATIONAL

Project Description:

Drainage Point: S16

Location: SERENO CANYON PHASE 1

Drainage Basin Data

Water Course Length: 114.00 ft

Basin Area: 0.110 acres

High Elevation: 2781.95 ft

Low Elevation: 2779.40 ft

Average Slope: 0.0224 ft/ft

Roughness, Kb: 0.0460 (A)

10-Year Runoff Coefficient: 0.760

10-Year 6 Hour Rainfall Depth: 2.29 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	0	0	1	1	1	1
C	0.760	0.760	0.760	0.836	0.912	0.950
Tc (min)	5.0	5.0	5.0	5.0	5.0	5.0
i (in/hr)	4.2	5.6	6.5	7.7	8.8	10.0

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RATIONAL FOR WINDOWS

Flood Control District of Maricopa County Rational Method

Project Information

Project Name: SERENO CANYON ONSITE RATIONAL

Project Description:

Drainage Point: S14.2

Location: SERENO CANYON PHASE 1

Drainage Basin Data

Water Course Length: 791.00 ft

Basin Area: 0.410 acres

High Elevation: 2781.85 ft

Low Elevation: 2762.37 ft

Average Slope: 0.0246 ft/ft

Roughness, Kb: 0.0424 (A)

10-Year Runoff Coefficient: 0.760

10-Year 6 Hour Rainfall Depth: 2.29 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	1	2	2	3	3	4
C	0.760	0.760	0.760	0.836	0.912	0.950
Tc (min)	6.8	6.0	5.6	5.2	5.0	5.0
i (in/hr)	3.8	5.2	6.2	7.6	8.8	10.0

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RATIONAL FOR WINDOWS

Flood Control District of Maricopa County Rational Method

Project Information

Project Name: SERENO CANYON ONSITE RATIONAL

Project Description:

Drainage Point: S17.1

Location: SERENO CANYON PHASE 1

Drainage Basin Data

Water Course Length: 125.00 ft

Basin Area: 0.080 acres

High Elevation: 2767.71 ft

Low Elevation: 2762.55 ft

Average Slope: 0.0413 ft/ft

Roughness, Kb: 0.0469 (A)

10-Year Runoff Coefficient: 0.760

10-Year 6 Hour Rainfall Depth: 2.29 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	0	0	0	1	1	1
C	0.760	0.760	0.760	0.836	0.912	0.950
Tc (min)	5.0	5.0	5.0	5.0	5.0	5.0
i (in/hr)	4.2	5.6	6.5	7.7	8.8	10.0

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RATIONAL FOR WINDOWS

Flood Control District of Maricopa County Rational Method

Project Information

Project Name: SERENO CANYON ONSITE RATIONAL

Project Description:

Drainage Point: S17.2

Location: SERENO CANYON PHASE 1

Drainage Basin Data

Water Course Length: 80.00 ft

Basin Area: 0.060 acres

High Elevation: 2763.32 ft

Low Elevation: 2762.55 ft

Average Slope: 0.0096 ft/ft

Roughness, Kb: 0.0476 (A)

10-Year Runoff Coefficient: 0.760

10-Year 6 Hour Rainfall Depth: 2.29 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	0	0	0	0	0	1
C	0.760	0.760	0.760	0.836	0.912	0.950
Tc (min)	5.0	5.0	5.0	5.0	5.0	5.0
i (in/hr)	4.2	5.6	6.5	7.7	8.8	10.0

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RATIONAL FOR WINDOWS

Flood Control District of Maricopa County Rational Method

Project Information

Project Name: SERENO CANYON ONSITE RATIONAL

Project Description:

Drainage Point: S19

Location: SERENO CANYON PHASE 1

Drainage Basin Data

Water Course Length: 1100.00 ft

Basin Area: 0.750 acres

High Elevation: 2763.32 ft

Low Elevation: 2723.74 ft

Average Slope: 0.0360 ft/ft

Roughness, Kb: 0.0408 (A)

10-Year Runoff Coefficient: 0.760

10-Year 6 Hour Rainfall Depth: 2.29 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	2	3	4	5	6	7
C	0.760	0.760	0.760	0.836	0.912	0.950
Tc (min)	7.0	6.2	5.8	5.4	5.1	5.0
i (in/hr)	3.7	5.2	6.2	7.6	8.8	10.0

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RATIONAL FOR WINDOWS

Flood Control District of Maricopa County Rational Method

Project Information

Project Name: SERENO CANYON ONSITE RATIONAL

Project Description:

Drainage Point: S18.1

Location: SERENO CANYON PHASE 1

Drainage Basin Data

Water Course Length: 120.00 ft

Basin Area: 0.070 acres

High Elevation: 2767.97 ft

Low Elevation: 2764.11 ft

Average Slope: 0.0322 ft/ft

Roughness, Kb: 0.0472 (A)

10-Year Runoff Coefficient: 0.760

10-Year 6 Hour Rainfall Depth: 2.29 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	0	0	0	0	1	1
C	0.760	0.760	0.760	0.836	0.912	0.950
Tc (min)	5.0	5.0	5.0	5.0	5.0	5.0
i (in/hr)	4.2	5.6	6.5	7.7	8.8	10.0

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RATIONAL FOR WINDOWS

Flood Control District of Maricopa County Rational Method

Project Information

Project Name: SERENO CANYON ONSITE RATIONAL

Project Description:

Drainage Point: S18.2

Location: SERENO CANYON PHASE 1

Drainage Basin Data

Water Course Length: 125.00 ft

Basin Area: 0.070 acres

High Elevation: 2766.07 ft

Low Elevation: 2764.11 ft

Average Slope: 0.0157 ft/ft

Roughness, Kb: 0.0472 (A)

10-Year Runoff Coefficient: 0.760

10-Year 6 Hour Rainfall Depth: 2.29 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	0	0	0	0	1	1
C	0.760	0.760	0.760	0.836	0.912	0.950
Tc (min)	5.0	5.0	5.0	5.0	5.0	5.0
i (in/hr)	4.2	5.6	6.5	7.7	8.8	10.0

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RATIONAL FOR WINDOWS

Flood Control District of Maricopa County Rational Method

Project Information

Project Name: SERENO CANYON ONSITE RATIONAL

Project Description:

Drainage Point: S20

Location: SERENO CANYON PHASE 1

Drainage Basin Data

Water Course Length: 1090.00 ft

Basin Area: 0.830 acres

High Elevation: 2766.07 ft

Low Elevation: 2720.25 ft

Average Slope: 0.0420 ft/ft

Roughness, Kb: 0.0405 (A)

10-Year Runoff Coefficient: 0.760

10-Year 6 Hour Rainfall Depth: 2.29 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	2	3	4	5	7	8
C	0.760	0.760	0.760	0.836	0.912	0.950
Tc (min)	6.6	5.8	5.5	5.1	5.0	5.0
i (in/hr)	3.8	5.3	6.3	7.7	8.8	10.0

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RATIONAL FOR WINDOWS

Flood Control District of Maricopa County Rational Method

Project Information

Project Name: SERENO CANYON ONSITE RATIONAL

Project Description:

Drainage Point: S21.1

Location: SERENO CANYON PHASE 1

Drainage Basin Data

Water Course Length: 672.00 ft

Basin Area: 0.310 acres

High Elevation: 2736.80 ft

Low Elevation: 2709.95 ft

Average Slope: 0.0400 ft/ft

Roughness, Kb: 0.0432 (A)

10-Year Runoff Coefficient: 0.760

10-Year 6 Hour Rainfall Depth: 2.29 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	1	1	2	2	2	3
C	0.760	0.760	0.760	0.836	0.912	0.950
Tc (min)	5.3	5.0	5.0	5.0	5.0	5.0
i (in/hr)	4.2	5.6	6.5	7.7	8.8	10.0

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RATIONAL FOR WINDOWS

Flood Control District of Maricopa County Rational Method

Project Information

Project Name: SERENO CANYON ONSITE RATIONAL

Project Description:

Drainage Point: S21.2

Location: SERENO CANYON PHASE 1

Drainage Basin Data

Water Course Length: 102.00 ft

Basin Area: 0.030 acres

High Elevation: 2711.30 ft

Low Elevation: 2709.95 ft

Average Slope: 0.0132 ft/ft

Roughness, Kb: 0.0495 (A)

10-Year Runoff Coefficient: 0.760

10-Year 6 Hour Rainfall Depth: 2.29 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	0	0	0	0	0	0
C	0.760	0.760	0.760	0.836	0.912	0.950
Tc (min)	5.0	5.0	5.0	5.0	5.0	5.0
i (in/hr)	4.2	5.6	6.5	7.7	8.8	10.0

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RATIONAL FOR WINDOWS

Flood Control District of Maricopa County Rational Method

Project Information

Project Name: SERENO CANYON ONSITE RATIONAL

Project Description:

Drainage Point: S22.1

Location: SERENO CANYON PHASE 1

Drainage Basin Data

Water Course Length: 620.00 ft

Basin Area: 0.230 acres

High Elevation: 2733.30 ft

Low Elevation: 2709.95 ft

Average Slope: 0.0377 ft/ft

Roughness, Kb: 0.0440 (A)

10-Year Runoff Coefficient: 0.760

10-Year 6 Hour Rainfall Depth: 2.29 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	1	1	1	1	2	2
C	0.760	0.760	0.760	0.836	0.912	0.950
Tc (min)	5.2	5.0	5.0	5.0	5.0	5.0
i (in/hr)	4.2	5.6	6.5	7.7	8.8	10.0

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RATIONAL FOR WINDOWS

Flood Control District of Maricopa County Rational Method

Project Information

Project Name: SERENO CANYON ONSITE RATIONAL

Project Description:

Drainage Point: S23.1

Location: SERENO CANYON PHASE 1

Drainage Basin Data

Water Course Length: 100.00 ft

Basin Area: 0.110 acres

High Elevation: 2711.29 ft

Low Elevation: 2708.11 ft

Average Slope: 0.0318 ft/ft

Roughness, Kb: 0.0460 (A)

10-Year Runoff Coefficient: 0.760

10-Year 6 Hour Rainfall Depth: 2.29 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	0	0	1	1	1	1
C	0.760	0.760	0.760	0.836	0.912	0.950
Tc (min)	5.0	5.0	5.0	5.0	5.0	5.0
i (in/hr)	4.2	5.6	6.5	7.7	8.8	10.0

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RATIONAL FOR WINDOWS

Flood Control District of Maricopa County Rational Method

Project Information

Project Name: SERENO CANYON ONSITE RATIONAL

Project Description:

Drainage Point: S23.2

Location: SERENO CANYON PHASE 1

Drainage Basin Data

Water Course Length: 230.00 ft

Basin Area: 0.170 acres

High Elevation: 2715.53 ft

Low Elevation: 2708.11 ft

Average Slope: 0.0323 ft/ft

Roughness, Kb: 0.0448 (A)

10-Year Runoff Coefficient: 0.760

10-Year 6 Hour Rainfall Depth: 2.29 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	1	1	1	1	1	2
C	0.760	0.760	0.760	0.836	0.912	0.950
Tc (min)	5.0	5.0	5.0	5.0	5.0	5.0
i (in/hr)	4.2	5.6	6.5	7.7	8.8	10.0

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RATIONAL FOR WINDOWS

Flood Control District of Maricopa County Rational Method

Project Information

Project Name: SERENO CANYON ONSITE RATIONAL

Project Description:

Drainage Point: S24.1

Location: SERENO CANYON PHASE 1

Drainage Basin Data

Water Course Length: 100.00 ft

Basin Area: 0.075 acres

High Elevation: 2715.53 ft

Low Elevation: 2714.36 ft

Average Slope: 0.0117 ft/ft

Roughness, Kb: 0.0470 (A)

10-Year Runoff Coefficient: 0.760

10-Year 6 Hour Rainfall Depth: 2.29 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	0	0	0	0	1	1
C	0.760	0.760	0.760	0.836	0.912	0.950
Tc (min)	5.0	5.0	5.0	5.0	5.0	5.0
i (in/hr)	4.2	5.6	6.5	7.7	8.8	10.0

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RATIONAL FOR WINDOWS

Flood Control District of Maricopa County Rational Method

Project Information

Project Name: SERENO CANYON ONSITE RATIONAL

Project Description:

Drainage Point: S24.2

Location: SERENO CANYON PHASE 1

Drainage Basin Data

Water Course Length: 150.00 ft

Basin Area: 0.130 acres

High Elevation: 2716.23 ft

Low Elevation: 2714.36 ft

Average Slope: 0.0125 ft/ft

Roughness, Kb: 0.0455 (A)

10-Year Runoff Coefficient: 0.760

10-Year 6 Hour Rainfall Depth: 2.29 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	0	1	1	1	1	1
C	0.760	0.760	0.760	0.836	0.912	0.950
Tc (min)	5.0	5.0	5.0	5.0	5.0	5.0
i (in/hr)	4.2	5.6	6.5	7.7	8.8	10.0

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RATIONAL FOR WINDOWS

Flood Control District of Maricopa County Rational Method

Project Information

Project Name: SERENO CANYON ONSITE RATIONAL

Project Description:

Drainage Point: S25.1

Location: SERENO CANYON PHASE 1

Drainage Basin Data

Water Course Length: 185.00 ft

Basin Area: 0.110 acres

High Elevation: 2711.59 ft

Low Elevation: 2705.72 ft

Average Slope: 0.0317 ft/ft

Roughness, Kb: 0.0460 (A)

10-Year Runoff Coefficient: 0.760

10-Year 6 Hour Rainfall Depth: 2.29 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	0	0	1	1	1	1
C	0.760	0.760	0.760	0.836	0.912	0.950
Tc (min)	5.0	5.0	5.0	5.0	5.0	5.0
i (in/hr)	4.2	5.6	6.5	7.7	8.8	10.0

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RATIONAL FOR WINDOWS

Flood Control District of Maricopa County Rational Method

Project Information

Project Name: SERENO CANYON ONSITE RATIONAL

Project Description:

Drainage Point: S25.2

Location: SERENO CANYON PHASE 1

Drainage Basin Data

Water Course Length: 53.00 ft

Basin Area: 0.030 acres

High Elevation: 2706.15 ft

Low Elevation: 2705.72 ft

Average Slope: 0.0081 ft/ft

Roughness, Kb: 0.0495 (A)

10-Year Runoff Coefficient: 0.760

10-Year 6 Hour Rainfall Depth: 2.29 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	0	0	0	0	0	0
C	0.760	0.760	0.760	0.836	0.912	0.950
Tc (min)	5.0	5.0	5.0	5.0	5.0	5.0
i (in/hr)	4.2	5.6	6.5	7.7	8.8	10.0

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RATIONAL FOR WINDOWS

Flood Control District of Maricopa County Rational Method

Project Information

Project Name: SERENO CANYON ONSITE RATIONAL

Project Description:

Drainage Point: S26.1

Location: SERENO CANYON PHASE 1

Drainage Basin Data

Water Course Length: 135.00 ft

Basin Area: 0.150 acres

High Elevation: 2686.63 ft

Low Elevation: 2686.58 ft

Average Slope: 0.0004 ft/ft

Roughness, Kb: 0.0451 (A)

10-Year Runoff Coefficient: 0.760

10-Year 6 Hour Rainfall Depth: 2.29 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	0	0	1	1	1	1
C	0.760	0.760	0.760	0.836	0.912	0.950
Tc (min)	11.7	10.3	9.6	8.7	8.3	7.9
i (in/hr)	3.0	4.2	5.0	6.4	7.4	8.5

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RATIONAL FOR WINDOWS

Flood Control District of Maricopa County Rational Method

Project Information

Project Name: SERENO CANYON ONSITE RATIONAL

Project Description:

Drainage Point: S26.2

Location: SERENO CANYON PHASE 1

Drainage Basin Data

Water Course Length: 640.00 ft

Basin Area: 0.450 acres

High Elevation: 2703.25 ft

Low Elevation: 2686.58 ft

Average Slope: 0.0260 ft/ft

Roughness, Kb: 0.0422 (A)

10-Year Runoff Coefficient: 0.760

10-Year 6 Hour Rainfall Depth: 2.29 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	1	2	2	3	4	4
C	0.760	0.760	0.760	0.836	0.912	0.950
Tc (min)	5.9	5.2	5.0	5.0	5.0	5.0
i (in/hr)	4.0	5.5	6.5	7.7	8.8	10.0

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RATIONAL FOR WINDOWS

Flood Control District of Maricopa County Rational Method

Project Information

Project Name: SERENO CANYON ONSITE RATIONAL

Project Description:

Drainage Point: S27.1

Location: SERENO CANYON PHASE 1

Drainage Basin Data

Water Course Length: 460.00 ft

Basin Area: 0.250 acres

High Elevation: 2706.15 ft

Low Elevation: 2698.98 ft

Average Slope: 0.0156 ft/ft

Roughness, Kb: 0.0438 (A)

10-Year Runoff Coefficient: 0.760

10-Year 6 Hour Rainfall Depth: 2.29 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	1	1	1	2	2	2
C	0.760	0.760	0.760	0.836	0.912	0.950
Tc (min)	6.0	5.3	5.0	5.0	5.0	5.0
i (in/hr)	4.0	5.5	6.5	7.7	8.8	10.0

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RATIONAL FOR WINDOWS

Flood Control District of Maricopa County Rational Method

Project Information

Project Name: SERENO CANYON ONSITE RATIONAL

Project Description:

Drainage Point: S27.2

Location: SERENO CANYON PHASE 1

Drainage Basin Data

Water Course Length: 167.00 ft

Basin Area: 0.090 acres

High Elevation: 2700.68 ft

Low Elevation: 2698.98 ft

Average Slope: 0.0102 ft/ft

Roughness, Kb: 0.0465 (A)

10-Year Runoff Coefficient: 0.760

10-Year 6 Hour Rainfall Depth: 2.29 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	0	0	0	1	1	1
C	0.760	0.760	0.760	0.836	0.912	0.950
Tc (min)	5.0	5.0	5.0	5.0	5.0	5.0
i (in/hr)	4.2	5.6	6.5	7.7	8.8	10.0

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RATIONAL FOR WINDOWS

Flood Control District of Maricopa County Rational Method

Project Information

Project Name: SERENO CANYON ONSITE RATIONAL

Project Description:

Drainage Point: S3.2

Location: SERENO CANYON PHASE 1

Drainage Basin Data

Water Course Length: 210.00 ft

Basin Area: 0.180 acres

High Elevation: 2733.64 ft

Low Elevation: 2728.37 ft

Average Slope: 0.0251 ft/ft

Roughness, Kb: 0.0447 (A)

10-Year Runoff Coefficient: 0.760

10-Year 6 Hour Rainfall Depth: 2.29 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	1	1	1	1	1	2
C	0.760	0.760	0.760	0.836	0.912	0.950
Tc (min)	5.0	5.0	5.0	5.0	5.0	5.0
i (in/hr)	4.2	5.6	6.5	7.7	8.8	10.0

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RATIONAL FOR WINDOWS

Flood Control District of Maricopa County Rational Method

Project Information

Project Name: SERENO CANYON ONSITE RATIONAL

Project Description:

Drainage Point: S22.2

Location: SERENO CANYON PHASE 1

Drainage Basin Data

Water Course Length: 105.00 ft

Basin Area: 0.035 acres

High Elevation: 2711.30 ft

Low Elevation: 2709.95 ft

Average Slope: 0.0129 ft/ft

Roughness, Kb: 0.0491 (A)

10-Year Runoff Coefficient: 0.760

10-Year 6 Hour Rainfall Depth: 2.29 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	0	0	0	0	0	0
C	0.760	0.760	0.760	0.836	0.912	0.950
Tc (min)	5.0	5.0	5.0	5.0	5.0	5.0
i (in/hr)	4.2	5.6	6.5	7.7	8.8	10.0

Computed by: , WOOD/PATEL
Tuesday, December 12, 2006 2:43:49 p

File: N:\2006\062654\Project Support\Hydro\Rational\RATIONAL STREET.rat

APPENDIX F

Hydraulic Calculations

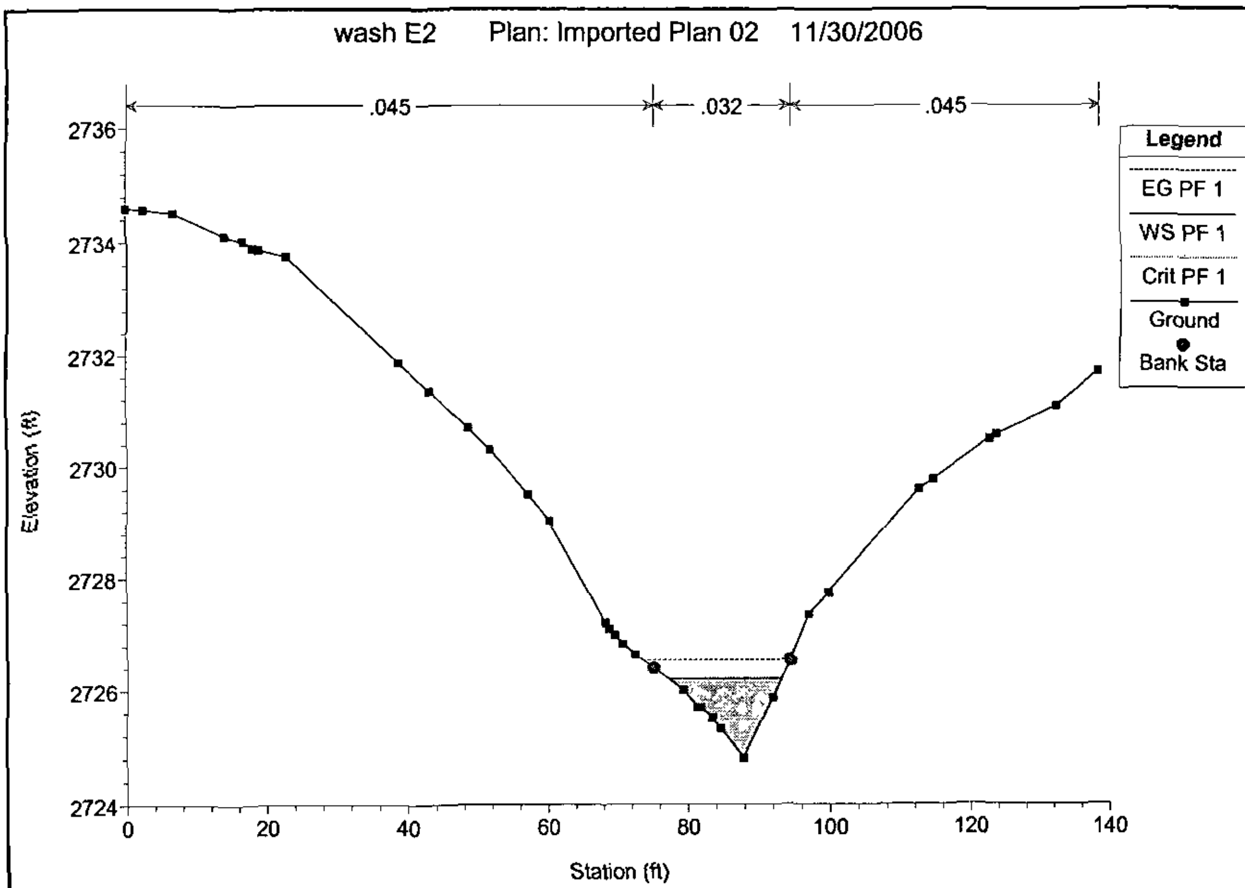
HEC-RAS Output Files
Storage Rating Curves
Culvert Summary/HY8 Output Files
Rip Rap Design Calculations
Drop Inlet Hydraulic Calculations
Weir Wall Calculations
Orifice Plate Calculation
Street Capacities
Depressed Curb Opening Calculations
StormCAD Results
Scour Analysis

HEC-RAS Output Files

WASH E2 - EXISTING

HEC-RAS Plan: Imported Pla River: RIVER-1 Reach: Reach-1 Profile: PF 1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	11	PF 1	50.00	2724.80	2726.21	2726.21	2726.55	0.018084	4.69	10.67	16.13	1.02
Reach-1	10	PF 1	50.00	2719.82	2721.45	2721.45	2721.87	0.015739	5.17	9.85	14.80	0.98
Reach-1	9	PF 1	50.00	2715.71	2717.28	2717.28	2717.71	0.013081	5.64	10.87	14.46	0.94
Reach-1	8	PF 1	76.00	2709.10	2711.09	2711.09	2711.56	0.010532	5.65	16.18	22.55	0.86
Reach-1	7.5	PF 1	76.00	2708.00	2709.19	2709.19	2709.63	0.013510	5.51	15.67	19.94	0.95
Reach-1	7	PF 1	76.00	2705.46	2706.95	2706.95	2707.37	0.015093	5.20	15.05	20.36	0.98
Reach-1	6	PF 1	76.00	2701.53	2703.59	2703.59	2704.12	0.014438	5.86	13.38	15.07	0.97
Reach-1	5	PF 1	76.00	2697.79	2699.89	2699.89	2700.45	0.010523	6.49	15.62	16.56	0.88
Reach-1	4.5	PF 1	76.00	2697.00	2698.53	2698.53	2699.01	0.012171	5.79	15.07	18.00	0.92
Reach-1	4	PF 1	76.00	2694.91	2696.39	2696.39	2696.79	0.015906	5.10	15.08	21.31	0.99
Reach-1	3	PF 1	131.00	2687.45	2689.81	2689.81	2690.44	0.012765	6.41	21.80	21.14	0.95
Reach-1	2	PF 1	275.00	2679.83	2682.39	2682.39	2683.11	0.009982	7.12	46.76	38.39	0.90
Reach-1	1	PF 1	275.00	2677.00	2679.55	2679.55	2680.11	0.016423	7.02	51.48	41.70	0.83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.032
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Legend
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WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
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2730
2728
2726
2724
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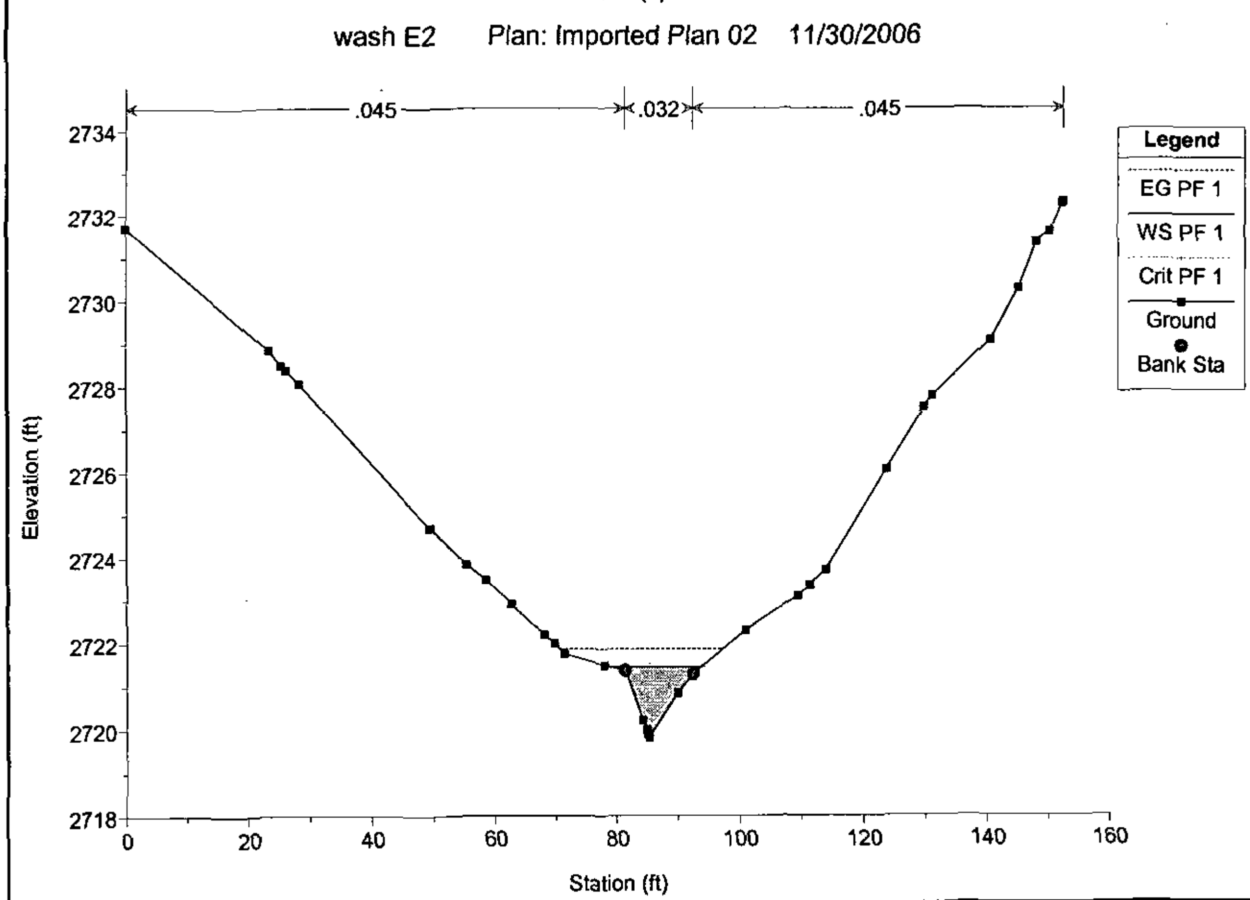
40
60
80
100
120
140
Station (ft)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Legend
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WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
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2732
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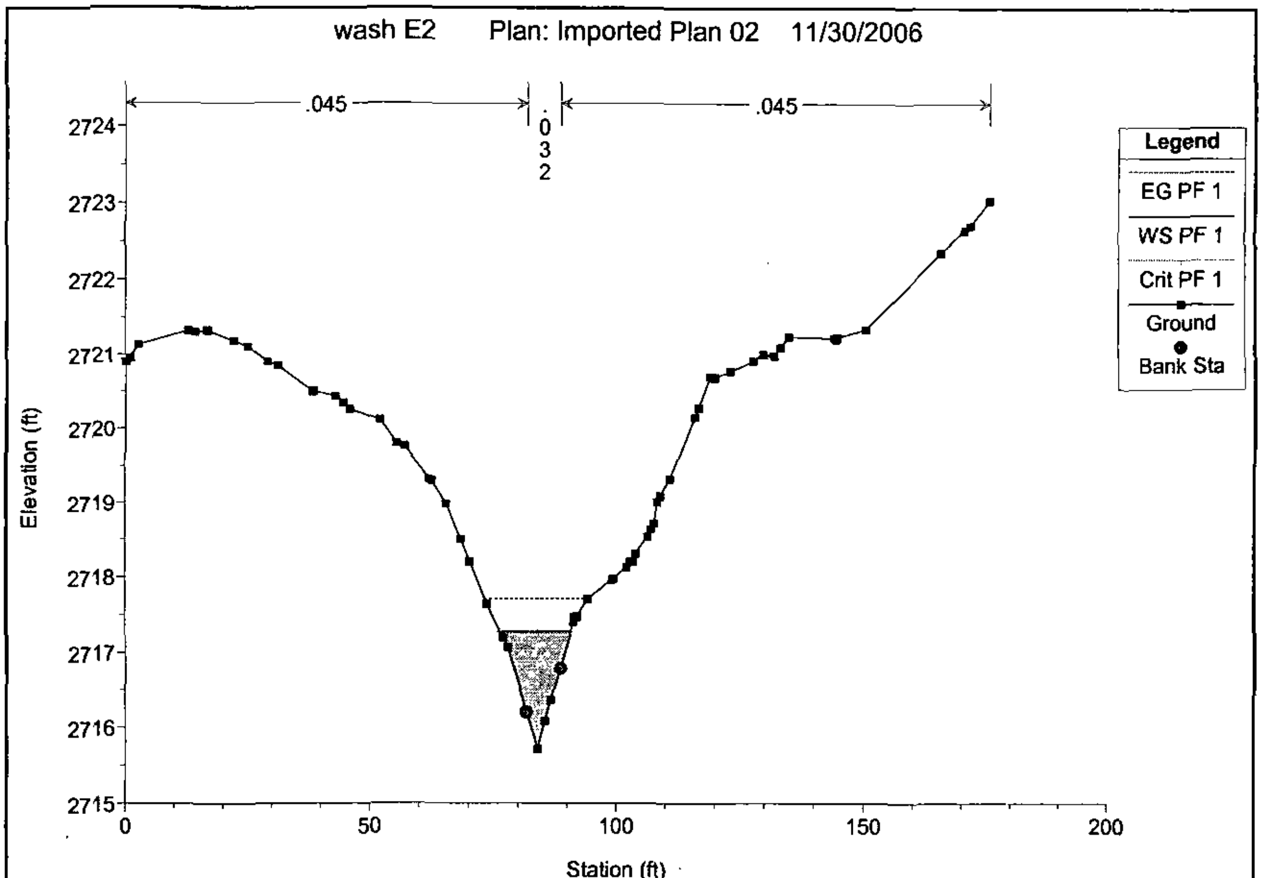
140
160
Station (ft)



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Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
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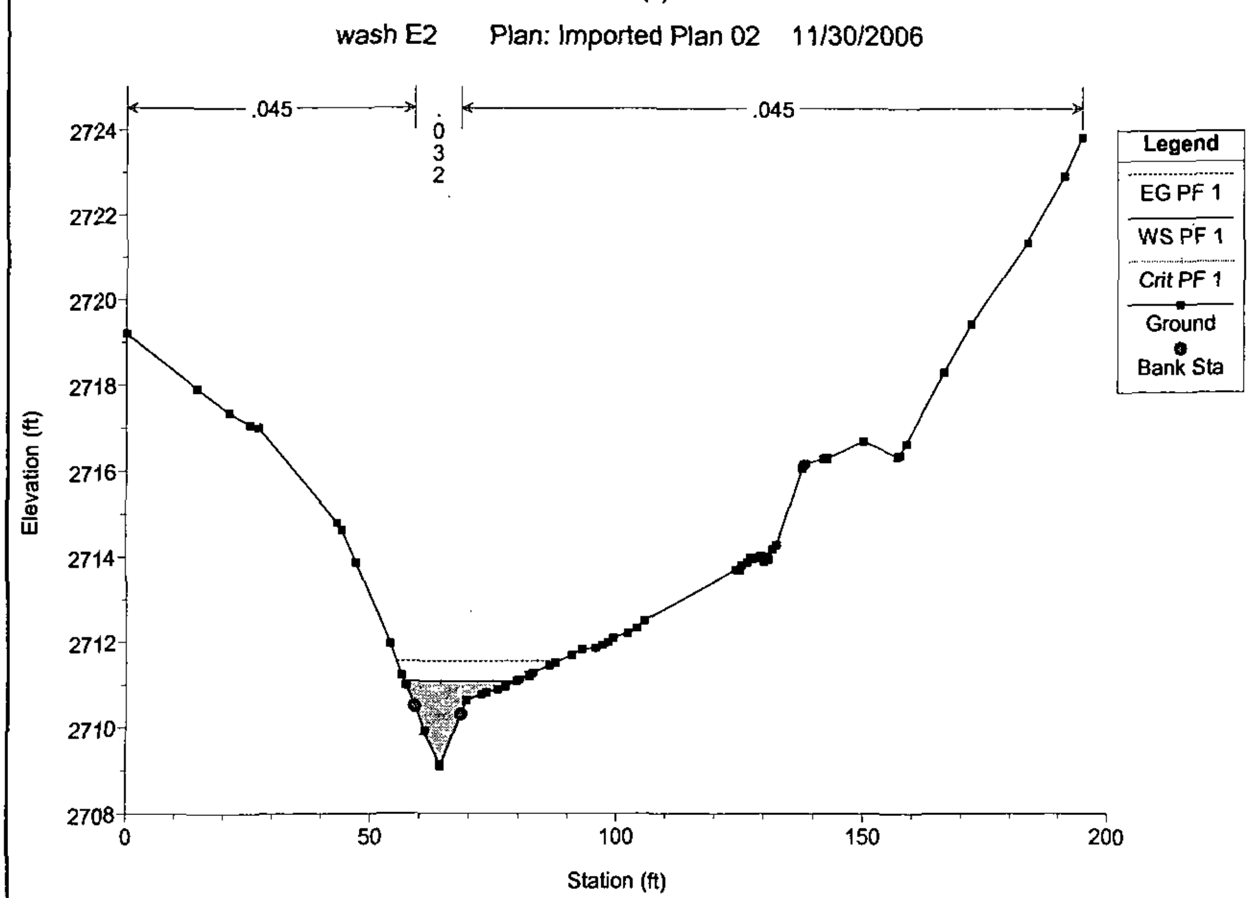
150
200
Station (ft)



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Legend
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WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
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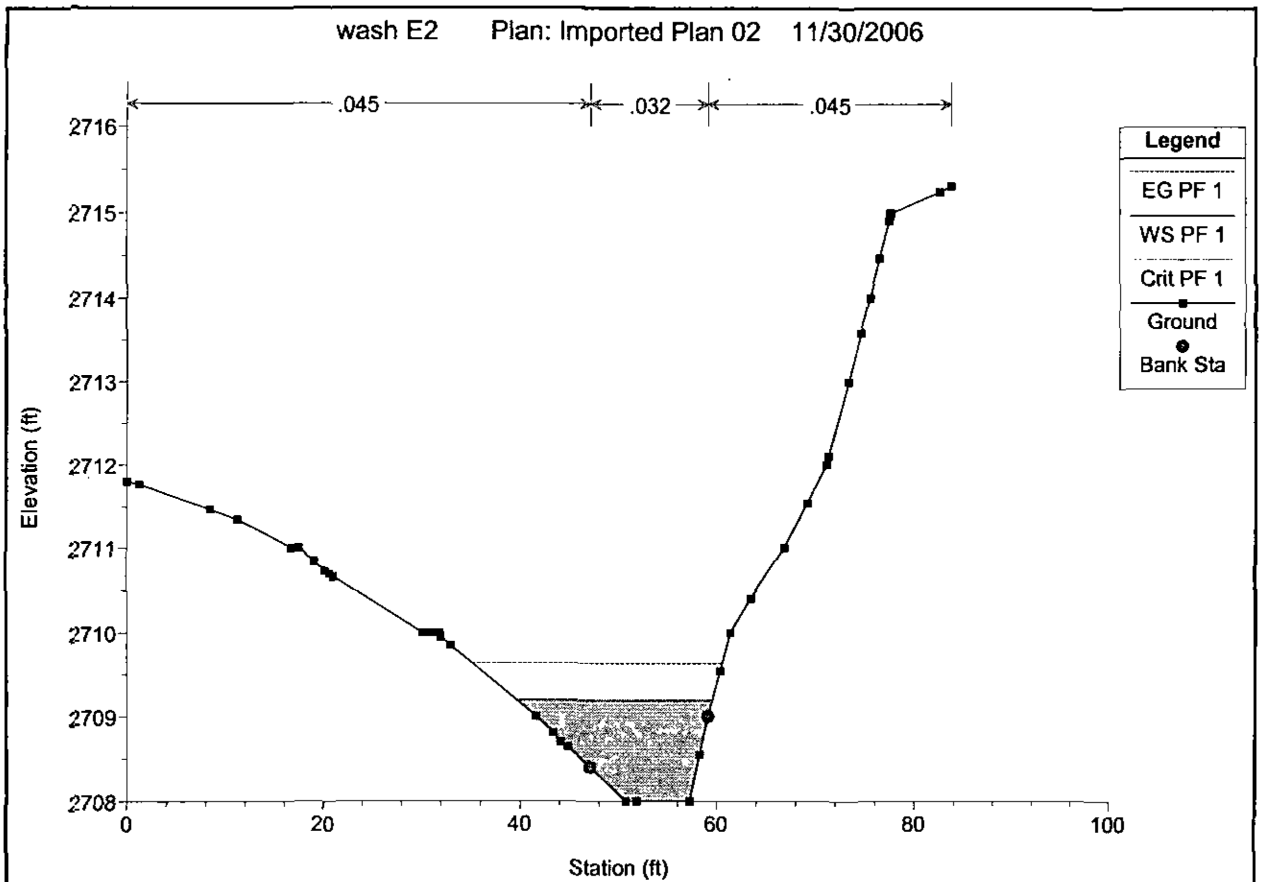
Station (ft)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Legend
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WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
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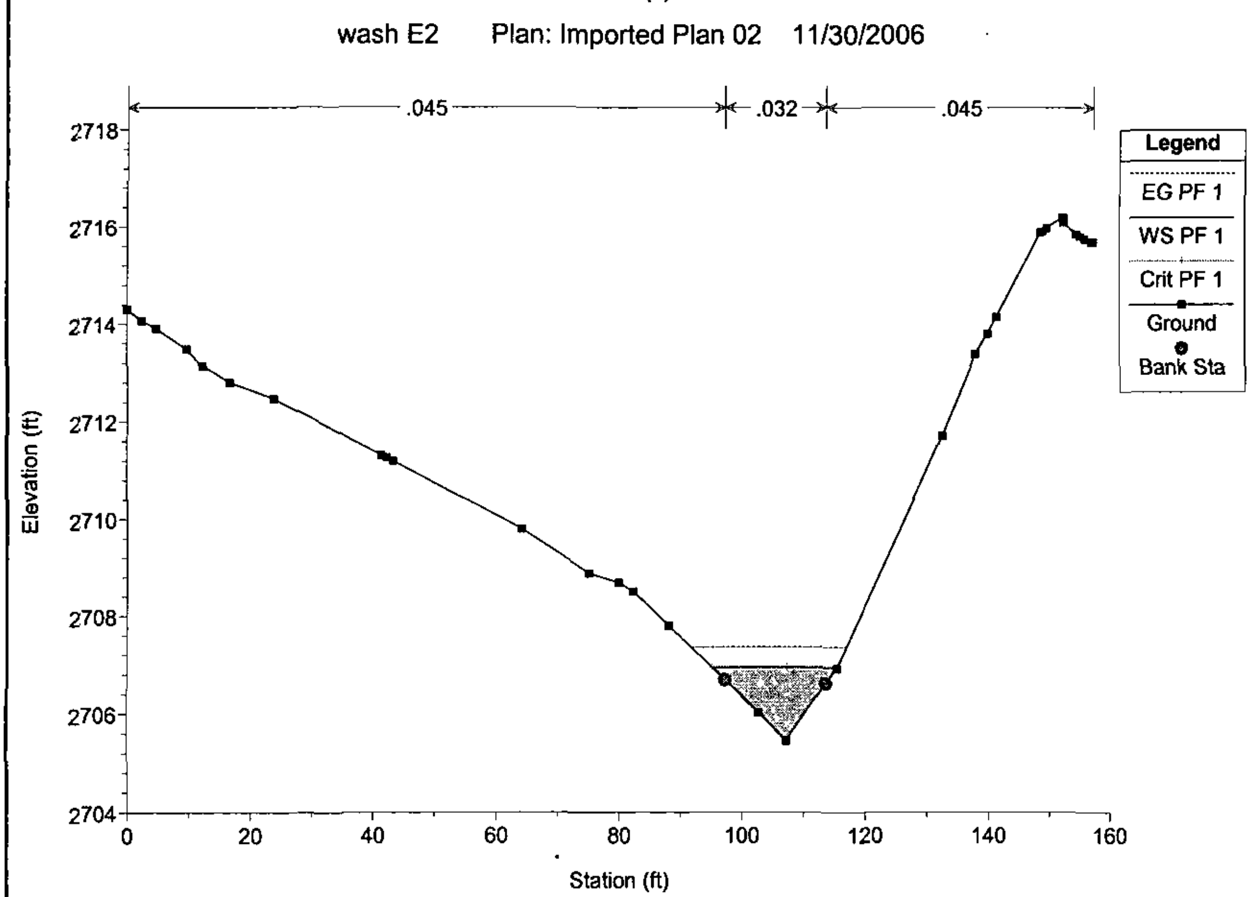
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Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
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100
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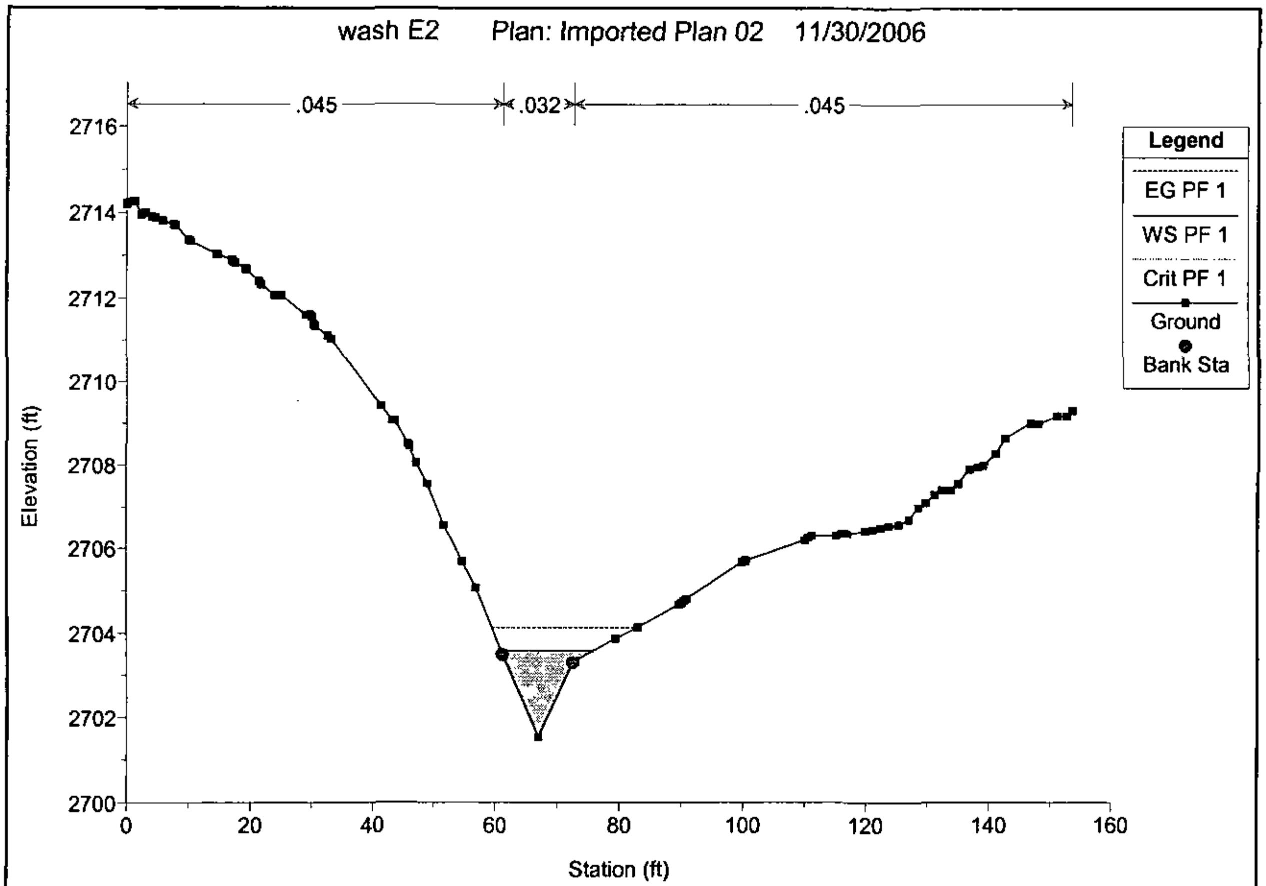
160



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Legend
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WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2716
2714
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2700
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20
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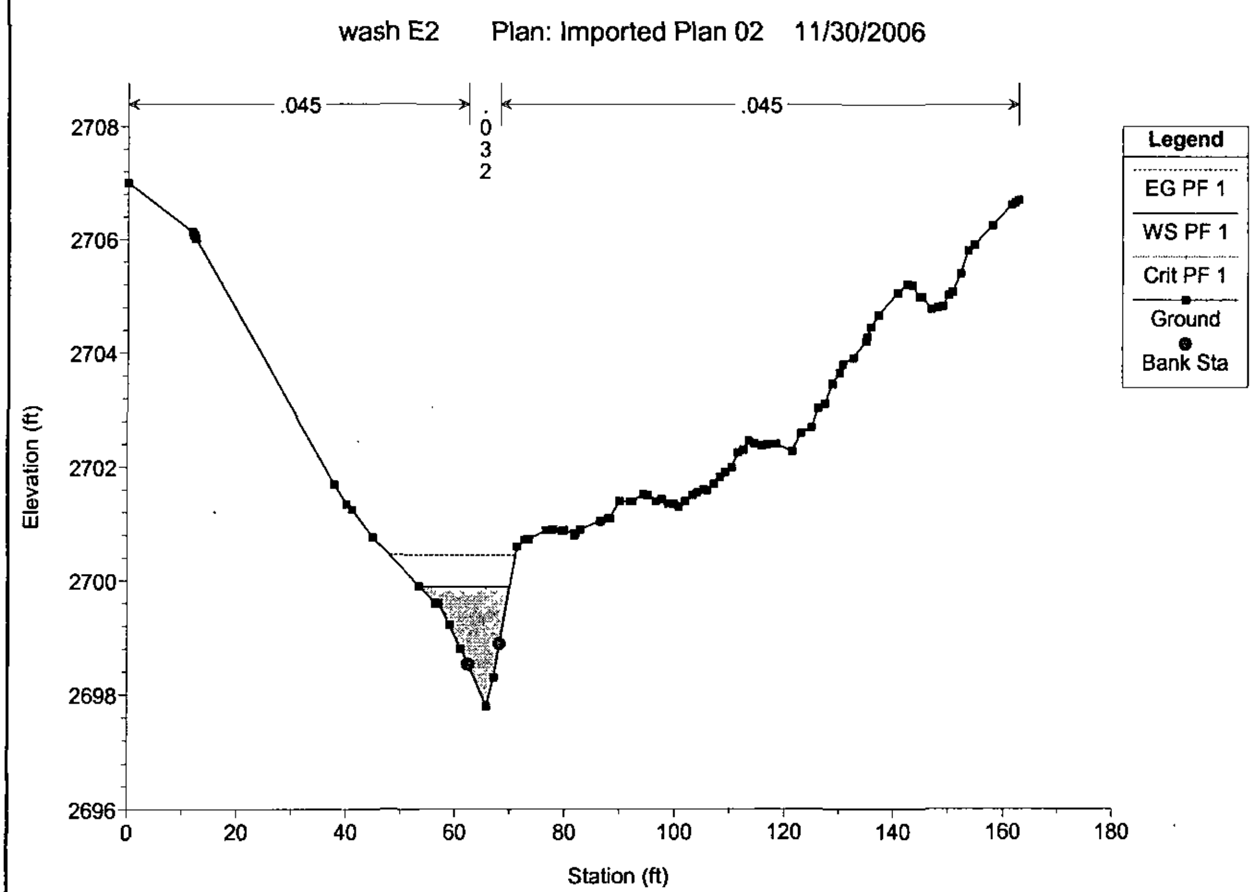
60
80
100
120
140
160
Station (ft)



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Legend
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WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
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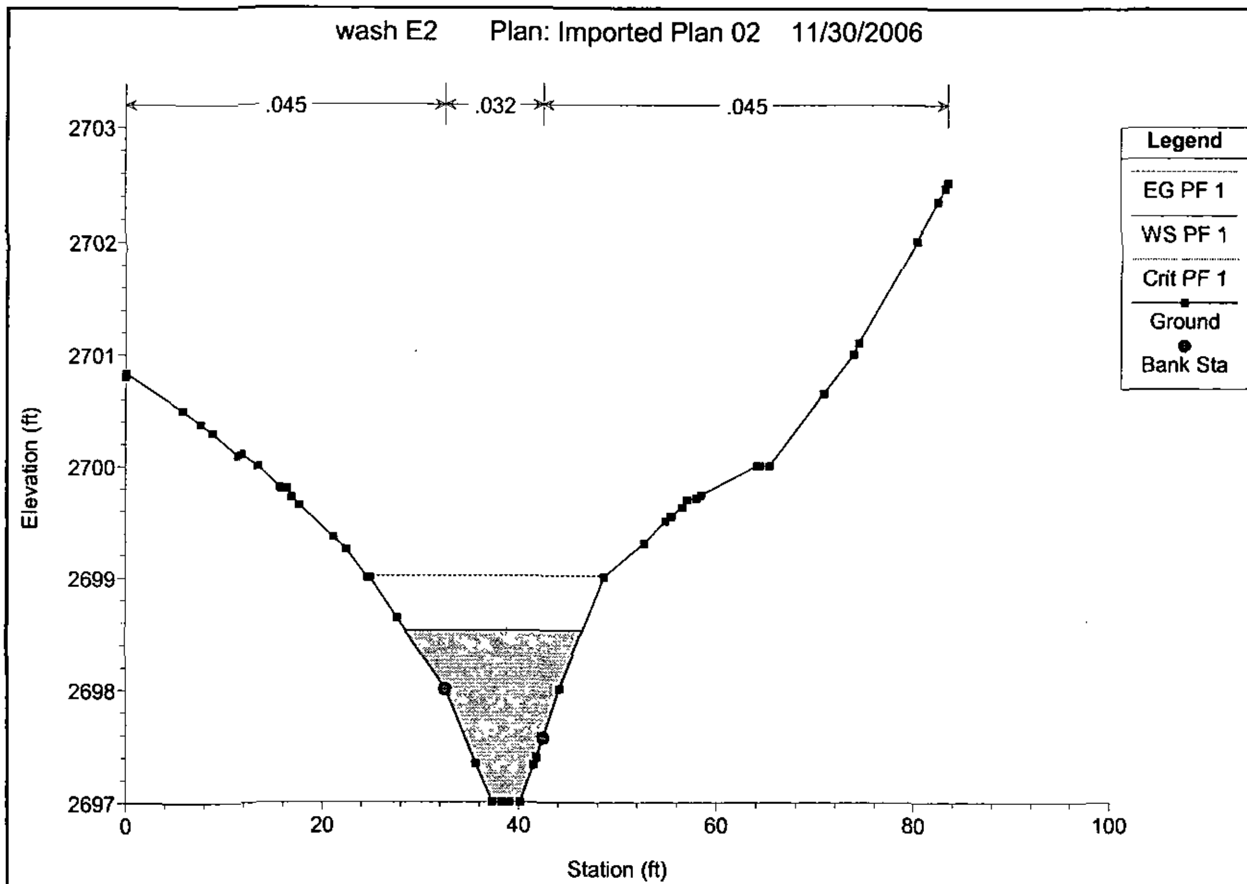
80
100
120
140
160
180
Station (ft)



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WS PF 1
Crit PF 1
Ground
Bank Sta
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Station (ft)
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2697
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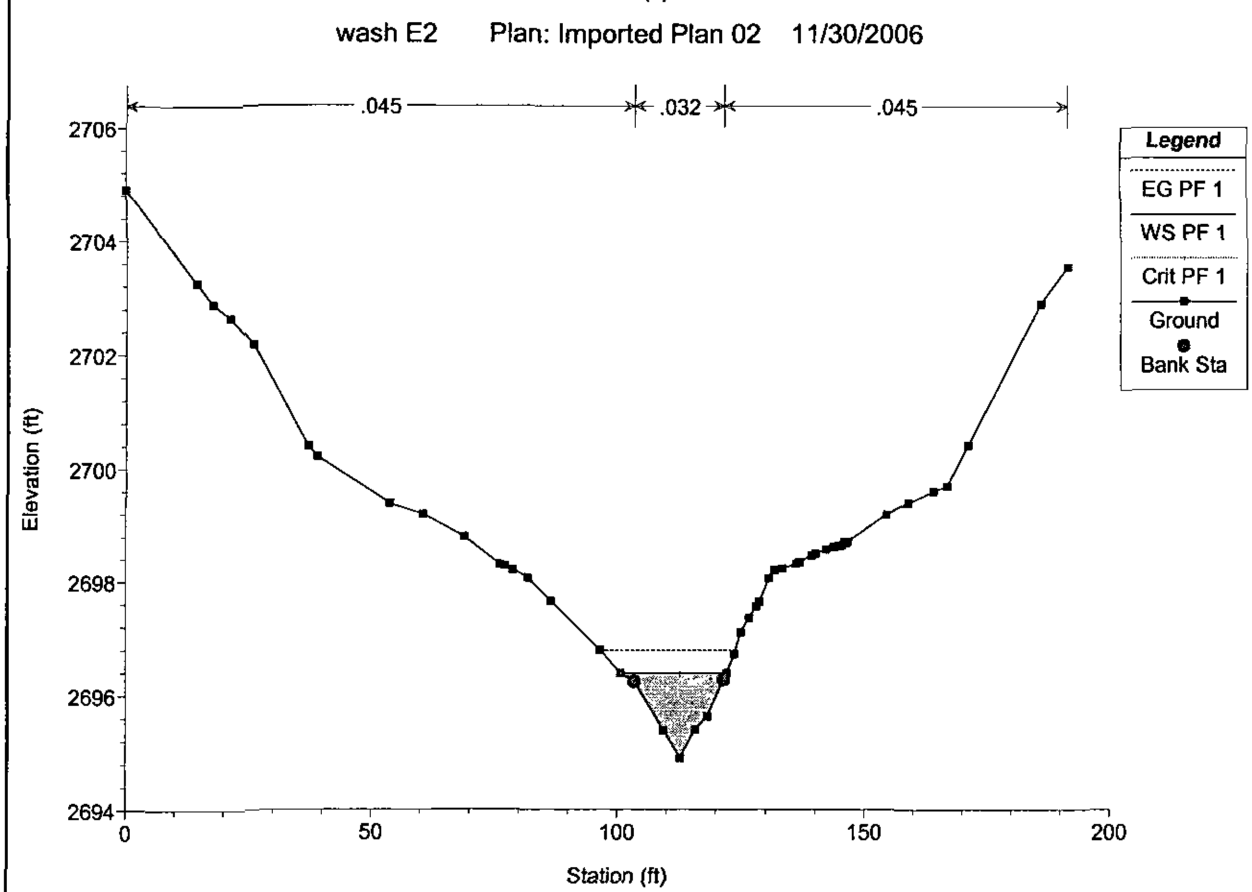
100



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Legend
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WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
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2704
2702
2700
2698
2696
2694
0
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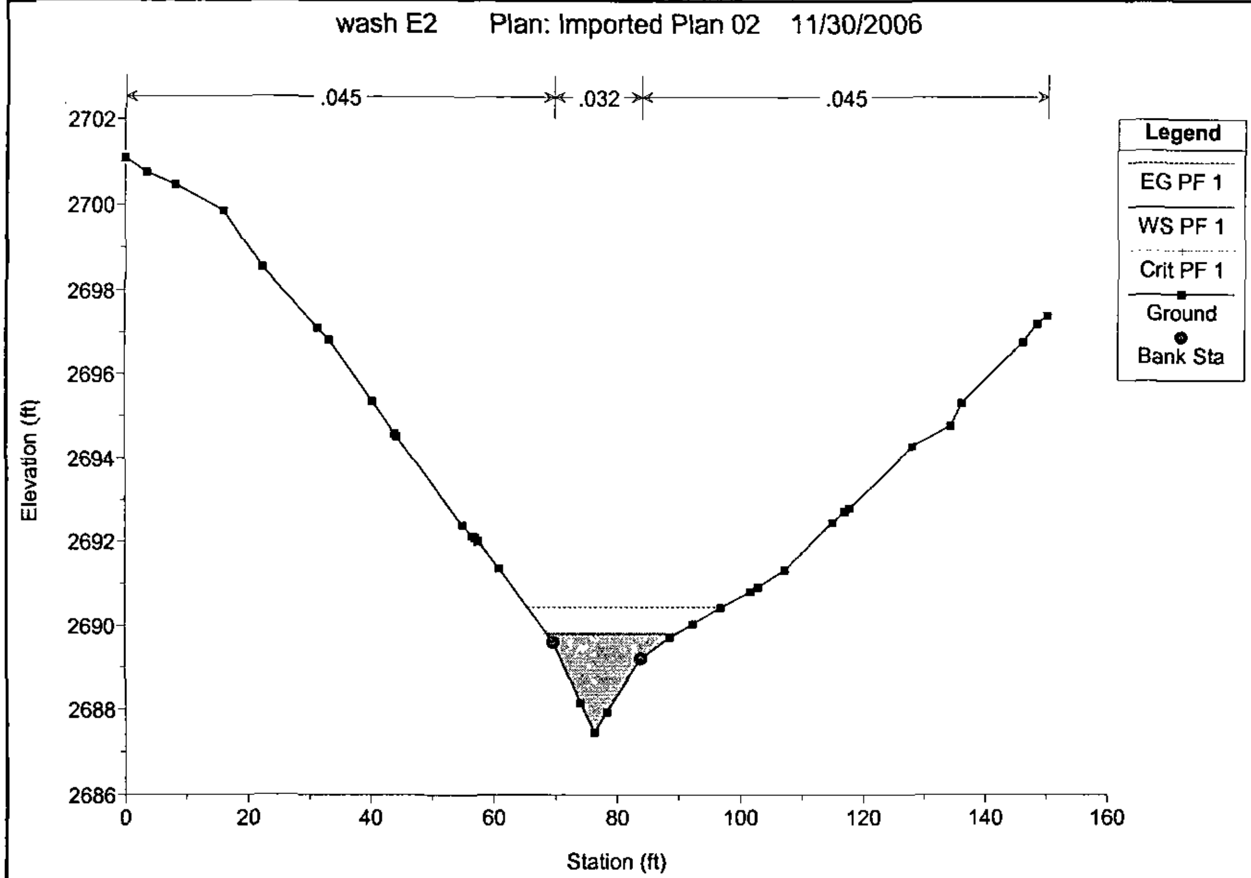
100
150
200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.032
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Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
2702
2700
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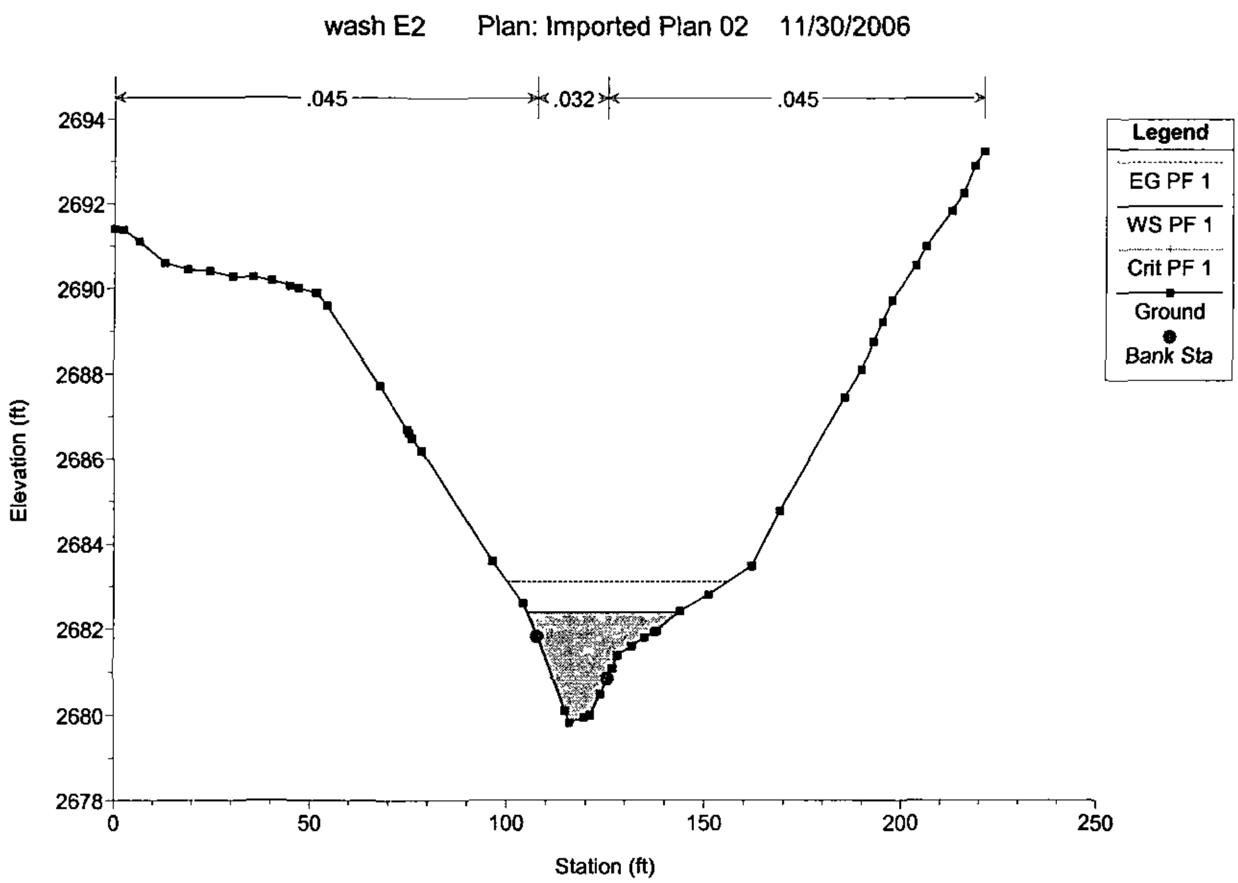
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Legend
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WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
2694
2692
2690
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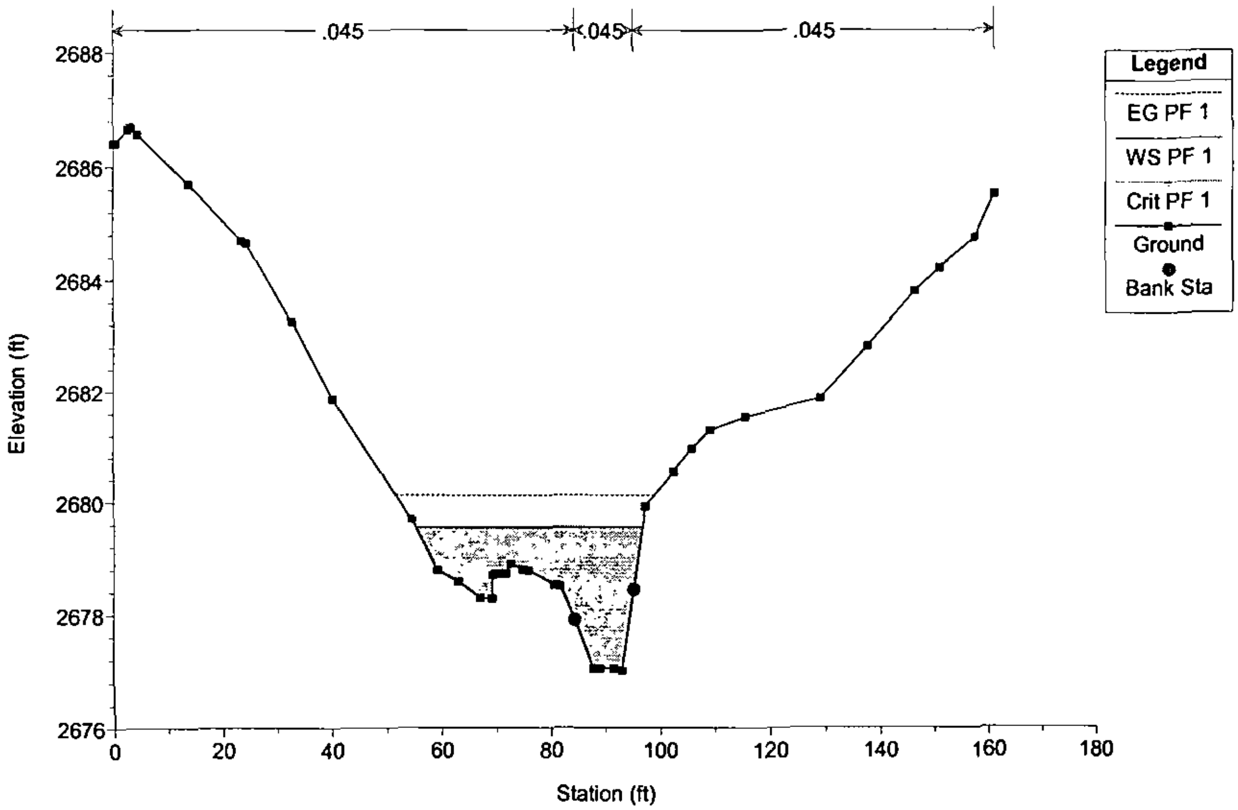
200
250

wash E2   Plan: Imported Plan 02   11/30/2006



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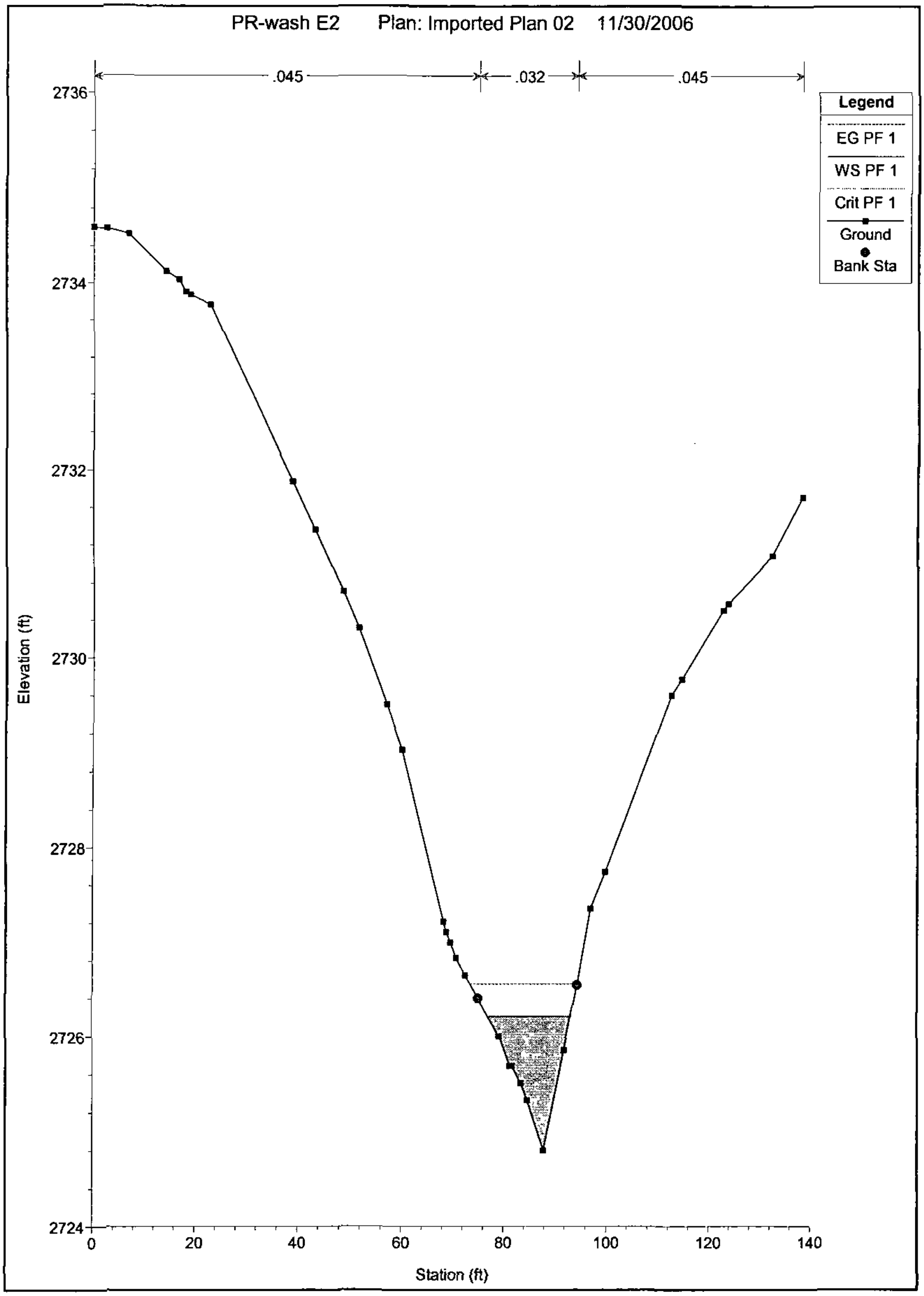
HEC-RAS Plan: Imported Pla River: RIVER-1 Reach: Reach-1 Profile: PF 1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	11	PF 1	50.00	2724.80	2726.21	2726.21	2726.55	0.018084	4.69	10.67	16.13	1.02
Reach-1	10	PF 1	50.00	2719.82	2721.45	2721.45	2721.87	0.015739	5.17	9.65	14.80	0.98
Reach-1	9	PF 1	50.00	2715.71	2717.28	2717.28	2717.71	0.013081	5.64	10.67	14.46	0.94
Reach-1	8	PF 1	81.00	2709.10	2711.15	2711.15	2711.62	0.010153	5.70	17.47	23.81	0.85
Reach-1	7.5	PF 1	81.00	2708.00	2709.24	2709.24	2709.69	0.013289	5.61	16.53	20.47	0.94
Reach-1	7	PF 1	81.00	2705.46	2706.99	2706.99	2707.42	0.014949	5.32	15.79	20.78	0.98
Reach-1	6	PF 1	81.00	2701.53	2703.65	2703.65	2704.19	0.013727	5.91	14.30	15.96	0.95
Reach-1	5	PF 1	138.00	2697.79	2700.50	2700.50	2701.15	0.009213	7.46	27.84	23.70	0.87
Reach-1	4.5	PF 1	138.00	2697.00	2699.00	2699.00	2699.66	0.011513	6.99	24.89	23.70	0.95
Reach-1	4	PF 1	138.00	2694.91	2696.80	2696.80	2697.33	0.012575	5.96	25.23	27.45	0.94
Reach-1	3	PF 1	99.00	2687.45	2689.57	2689.57	2690.11	0.014062	5.95	17.13	17.50	0.97
Reach-1	2	PF 1	245.00	2679.83	2682.21	2682.21	2682.85	0.012233	6.48	40.09	35.30	0.95
Reach-1	1	PF 1	245.00	2677.00	2679.33	2679.33	2679.87	0.027761	5.96	42.56	40.27	0.97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WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
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Station (ft)
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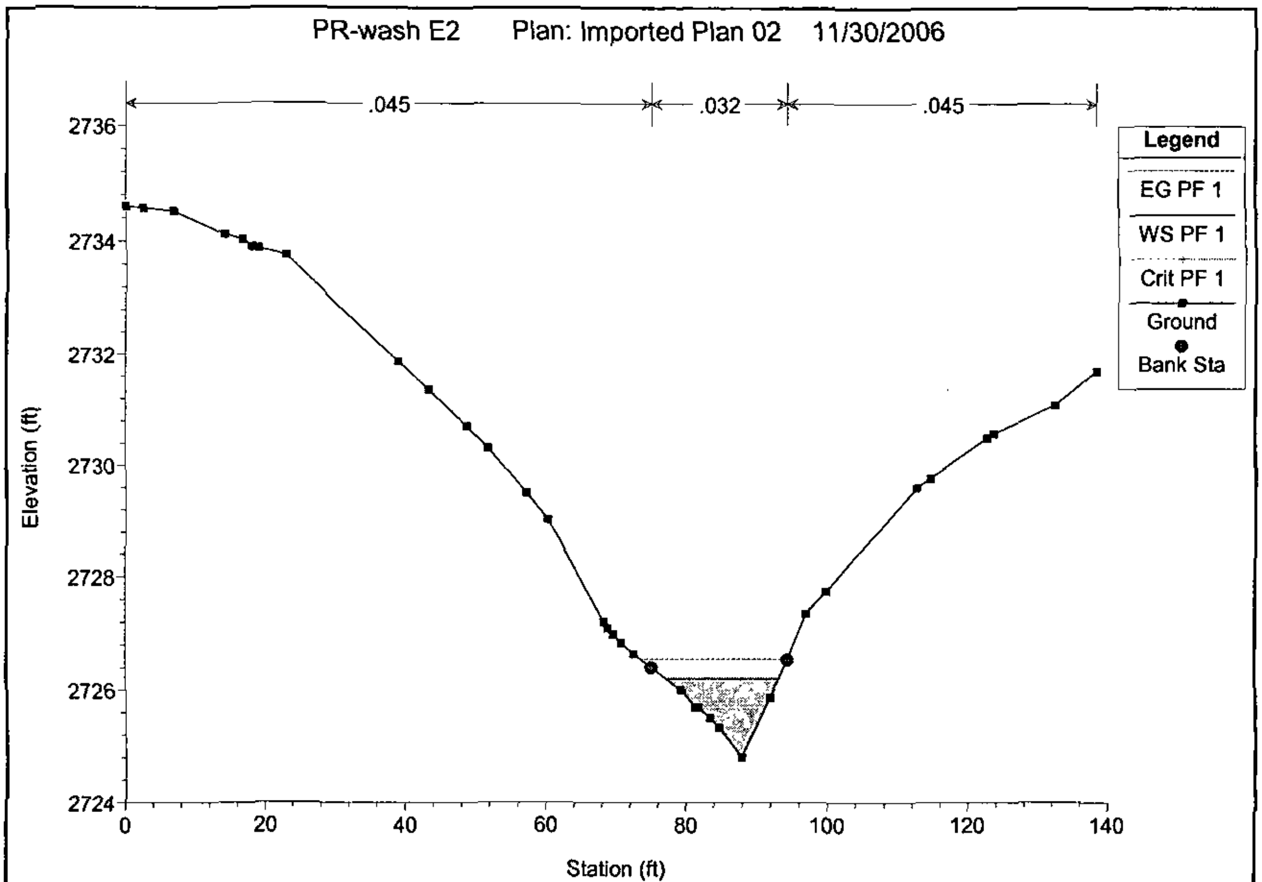
40
60
80
100
120
140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EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
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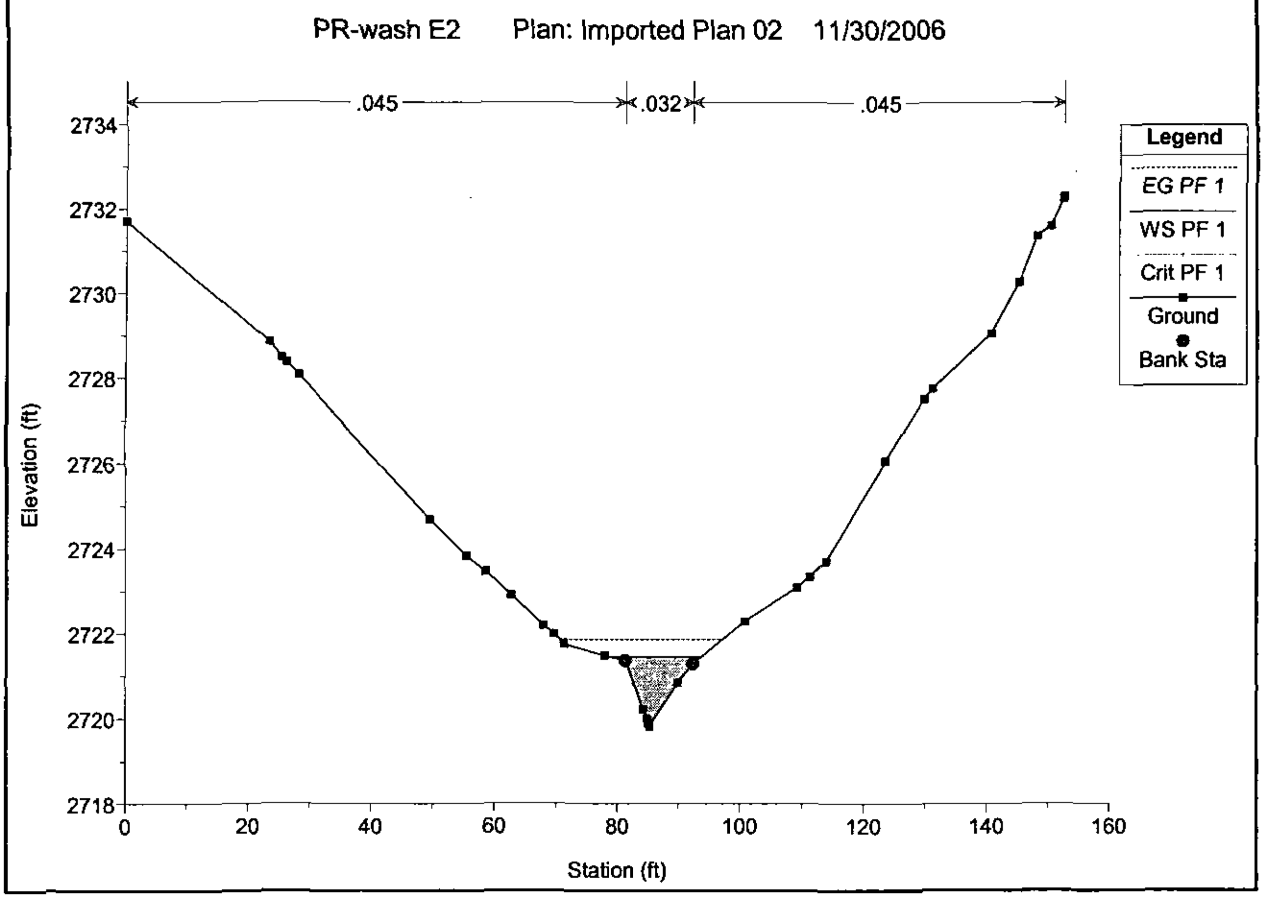
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Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
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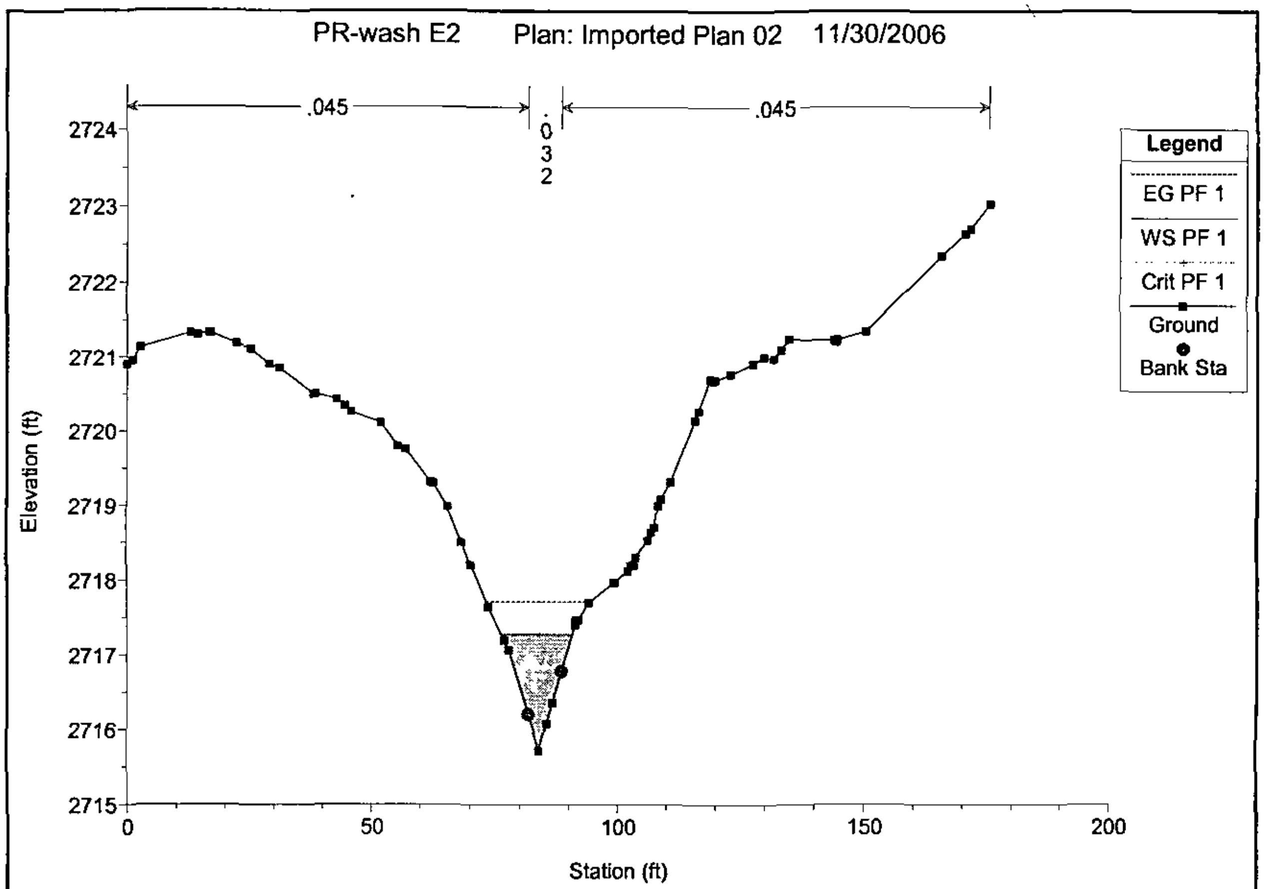
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.032
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
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2718
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2716
2715
0
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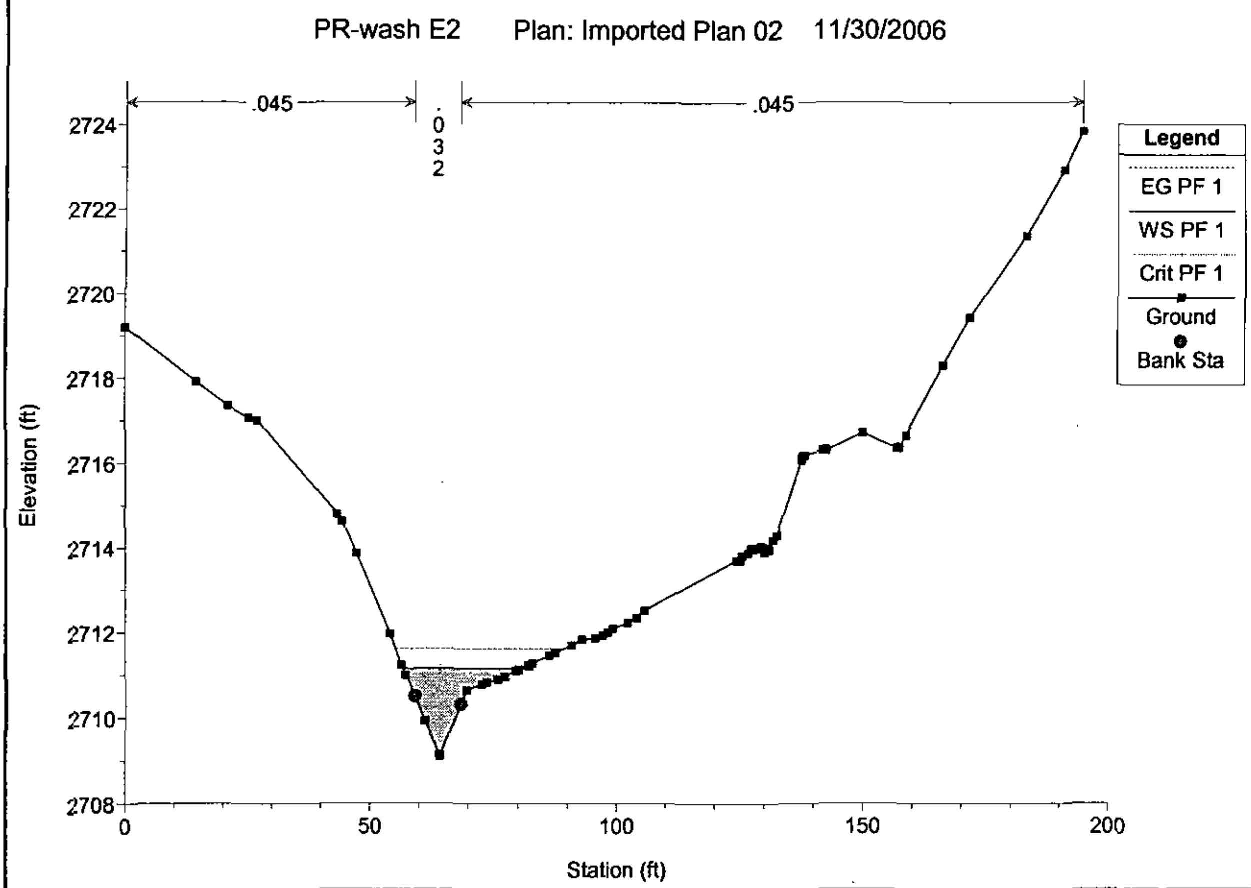
100
150
200
Station (ft)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.032
.045
Legend
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WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
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2716
2714
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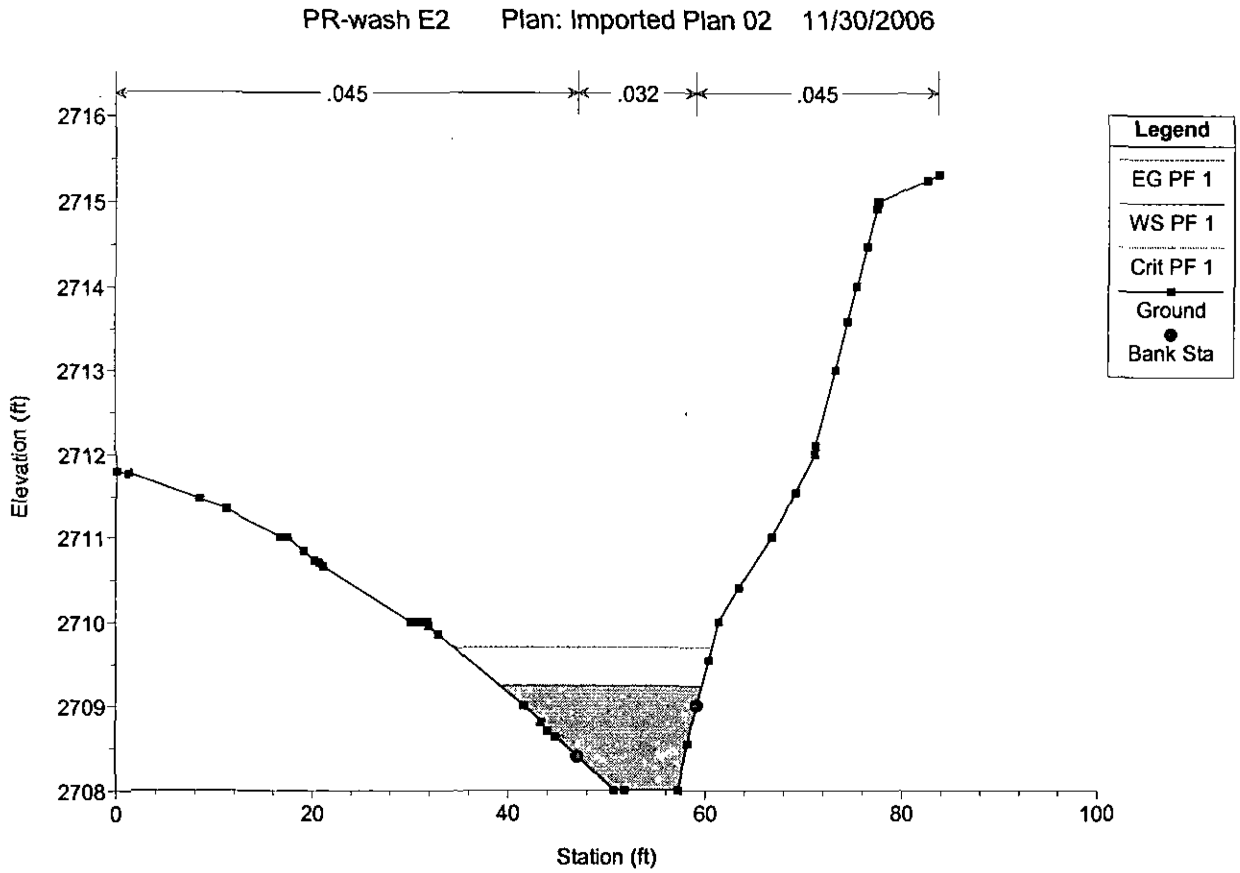
2710
2708
0
50
100
150
200
Station (ft)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.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
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2708
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20
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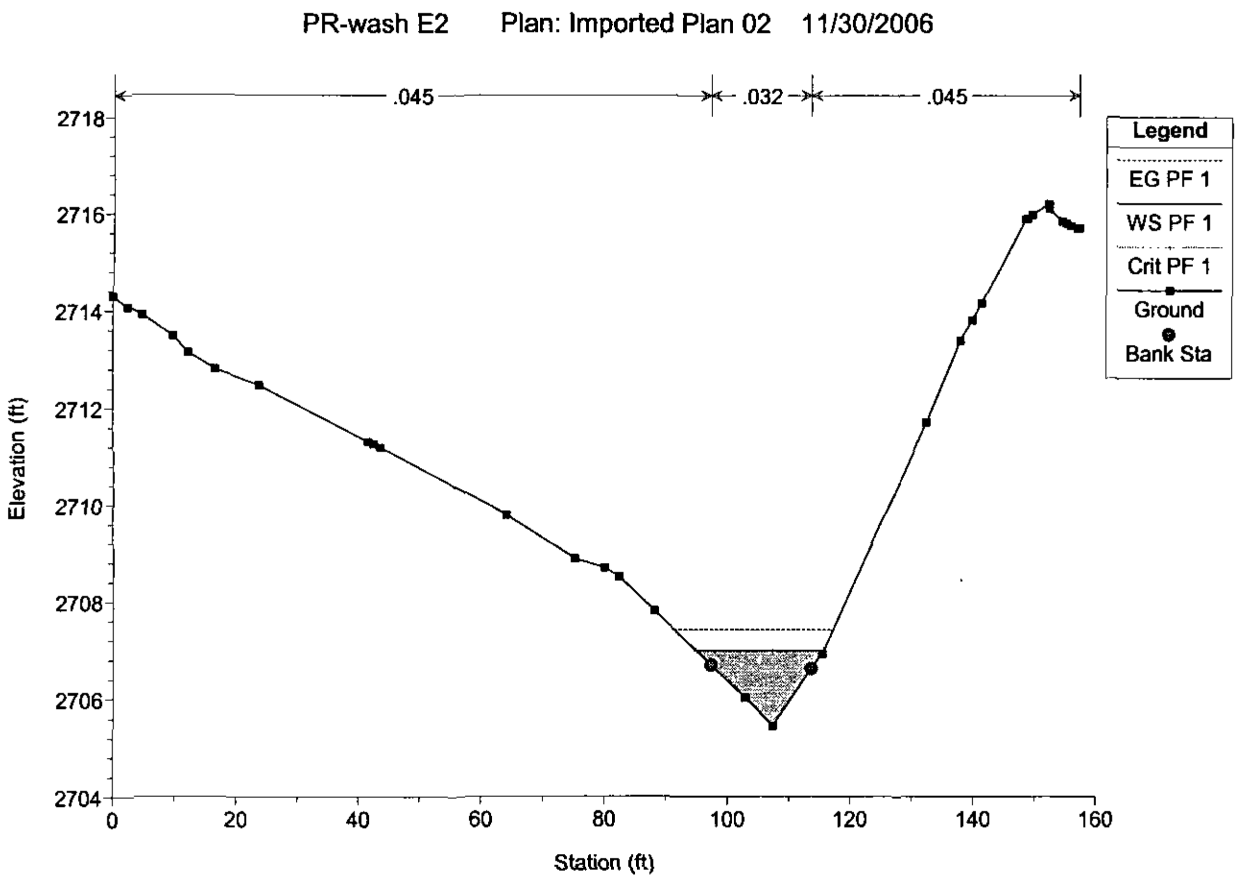
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.032
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Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
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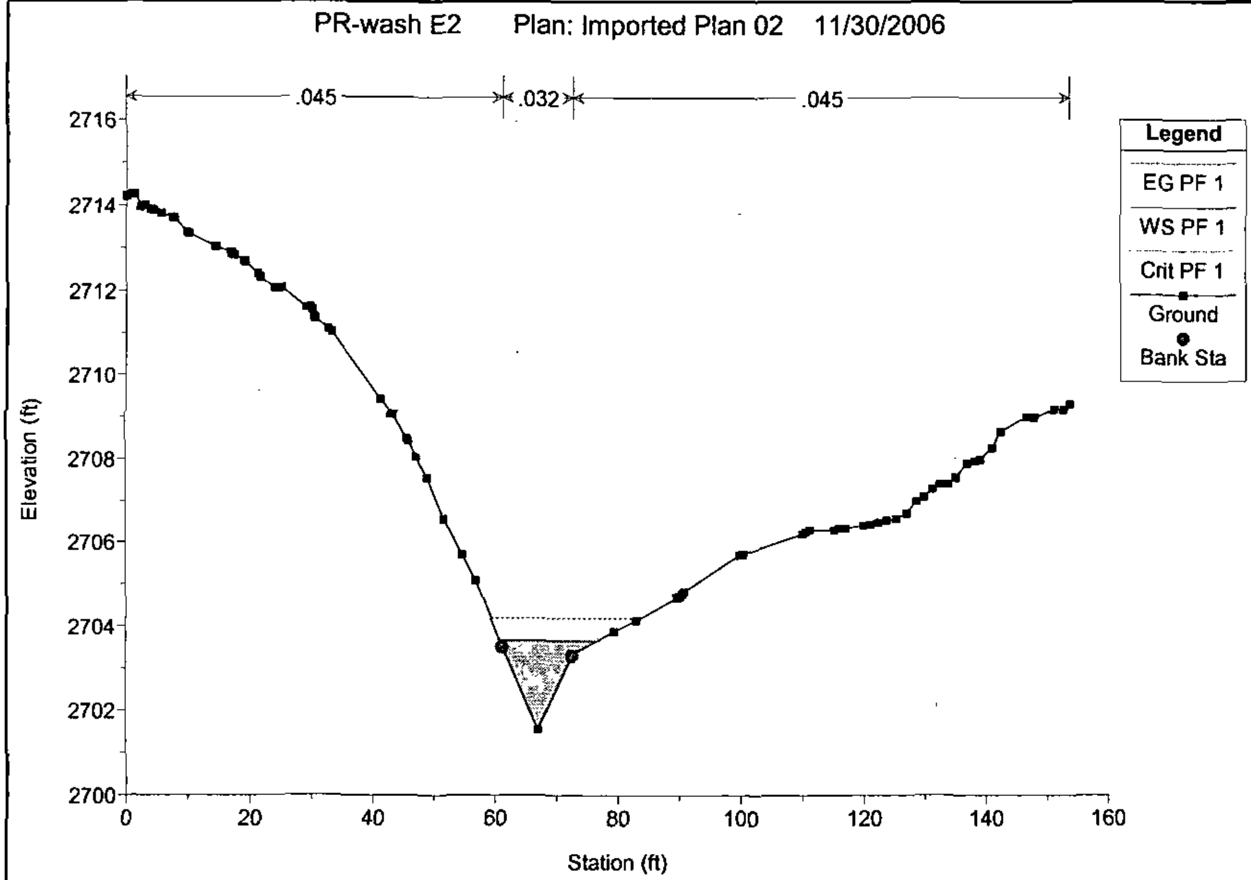
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Legend
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Crit PF 1
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Bank Sta
Elevation (ft)
2700
2702
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Station (ft)
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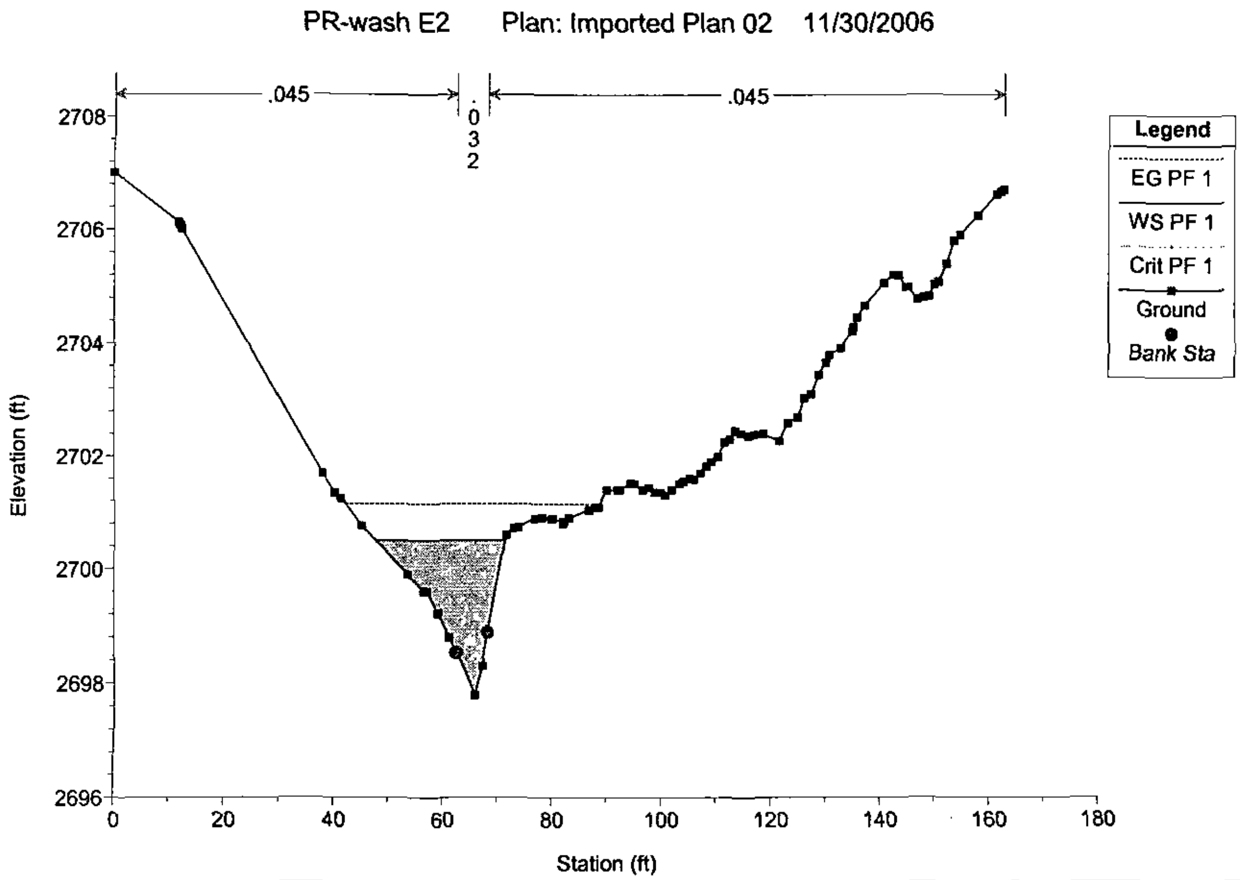
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Legend
EG PF 1
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Crit PF 1
Ground
Bank Sta
Elevation (ft)
2696
2698
2700
2702
2704
2706
2708
Station (ft)
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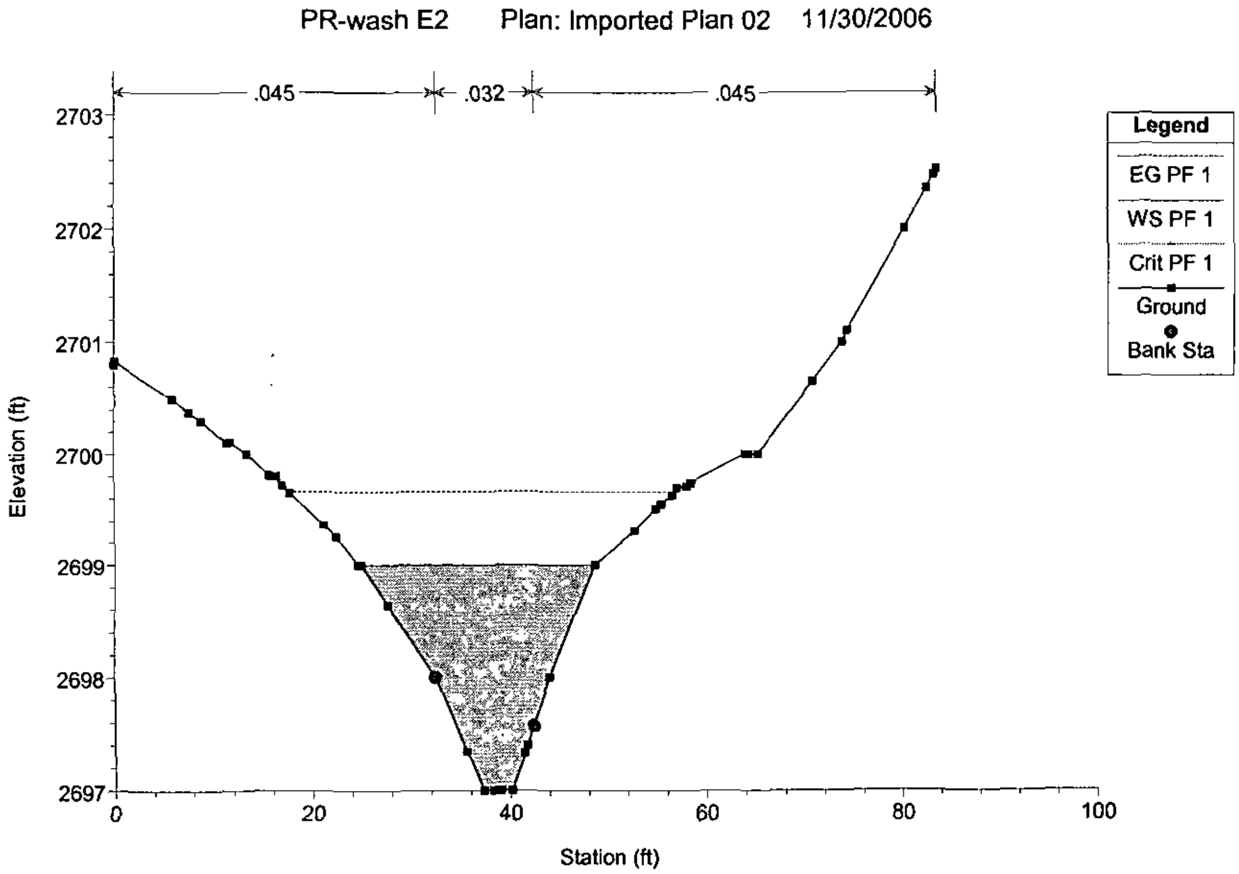
60
80
100
120
140
160
180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Legend
EG PF 1
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Crit PF 1
Ground
Bank Sta
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2698
2699
2700
2701
2702
2703
Station (ft)
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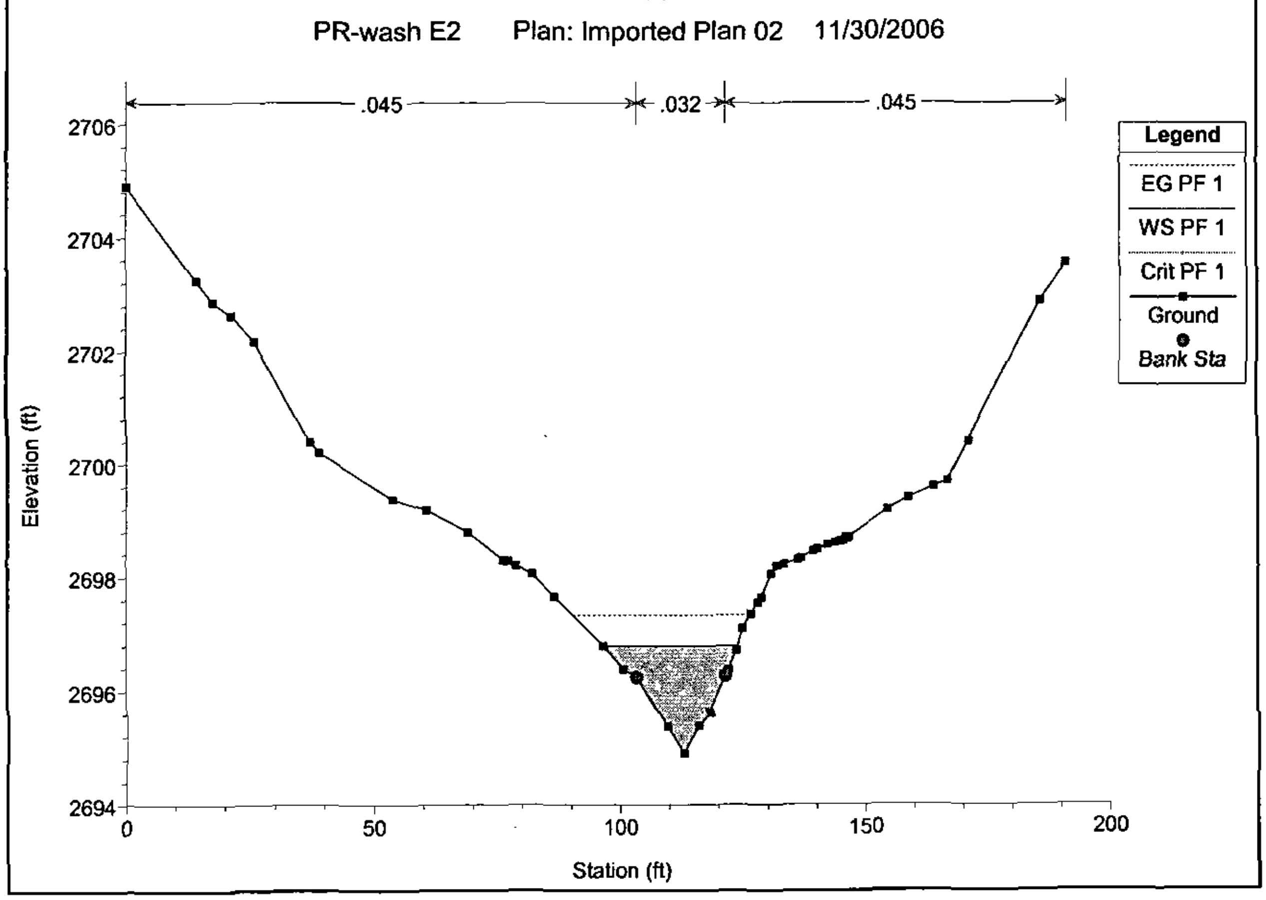
60
80
100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.032
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Legend
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WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
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2700
2702
2704
2706
Station (ft)
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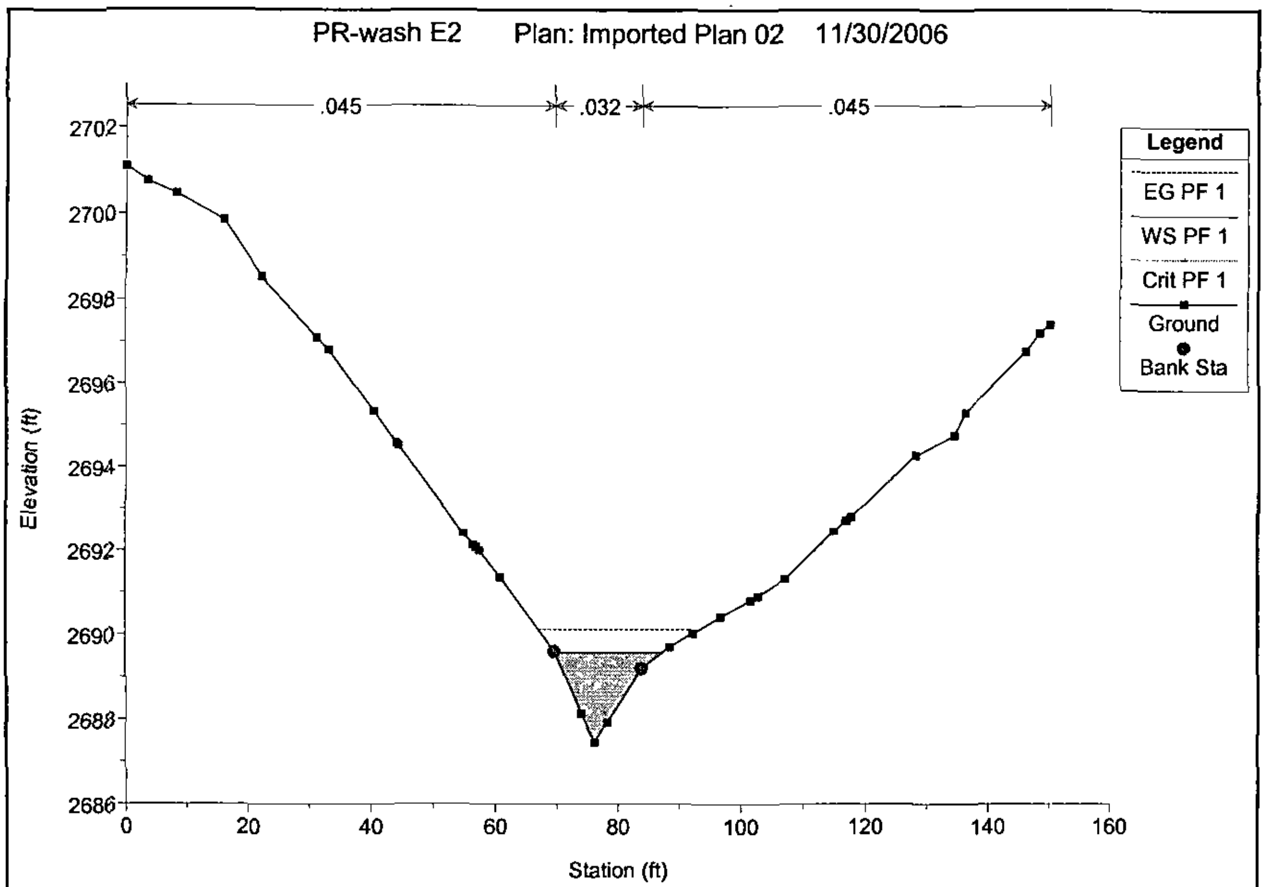
100
150
200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Legend
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Crit PF 1
Ground
Bank Sta
Elevation (ft)
2686
2688
2690
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2698
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2702
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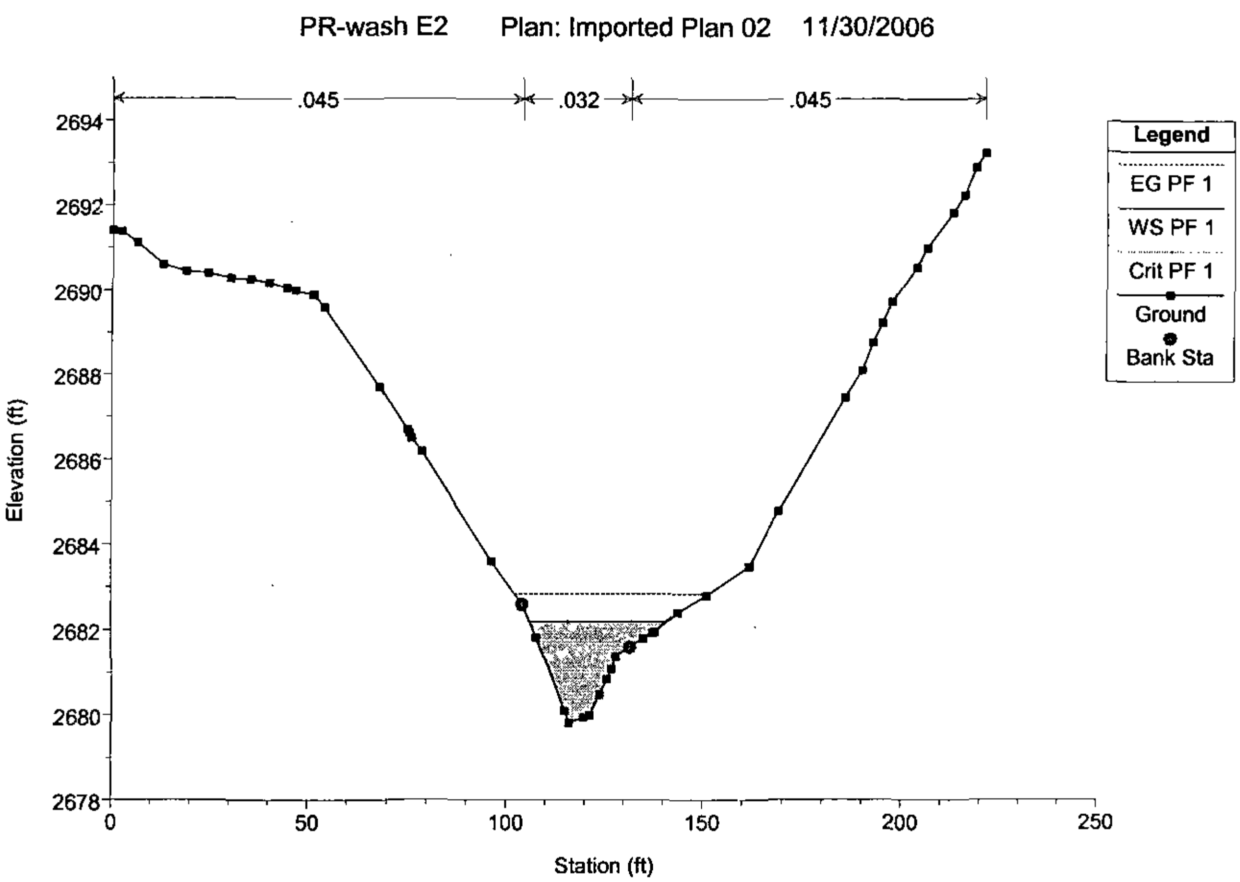
120
140
160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.032
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Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
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2686
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2690
2692
2694
Station (ft)
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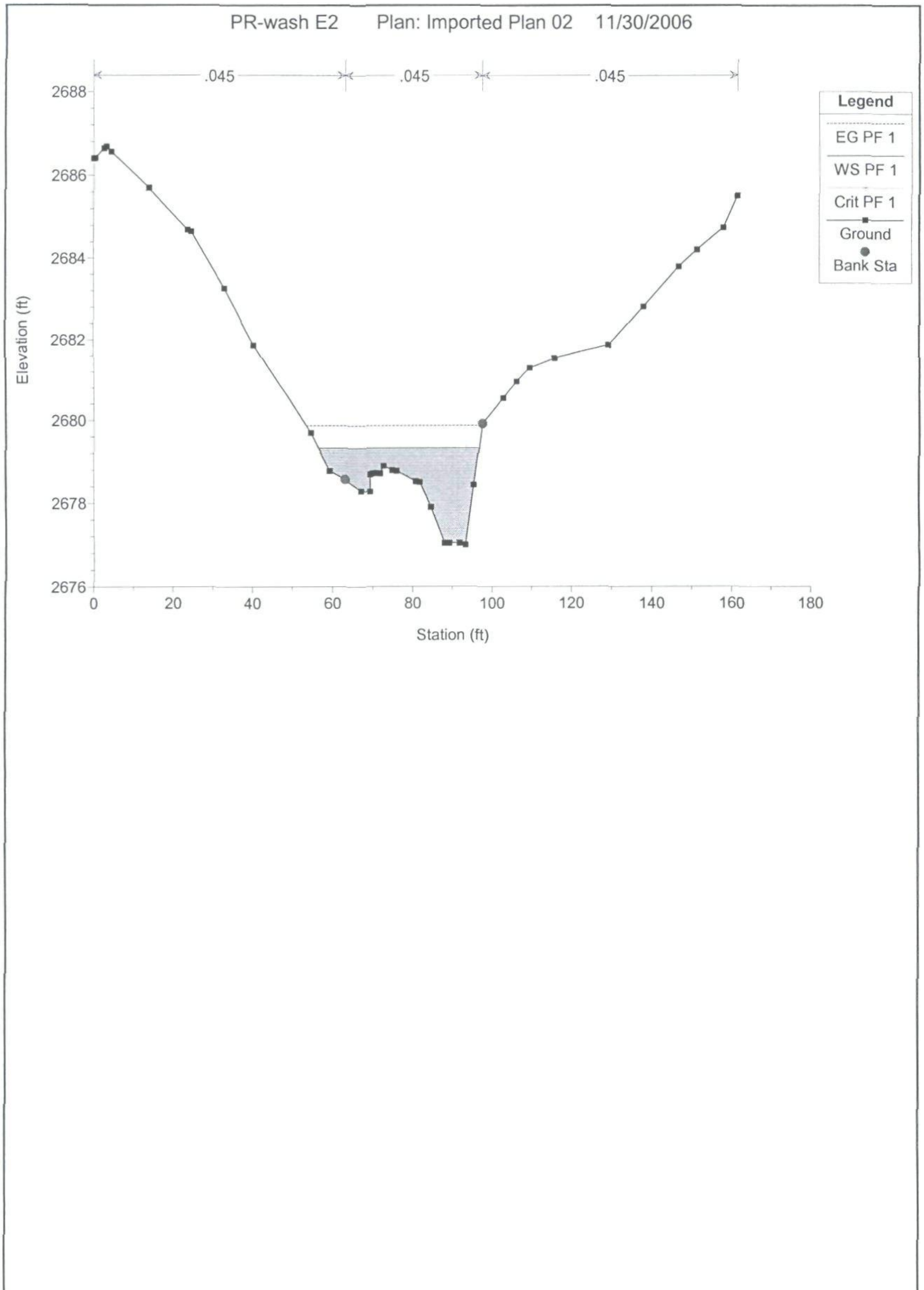
50
100
150
200
250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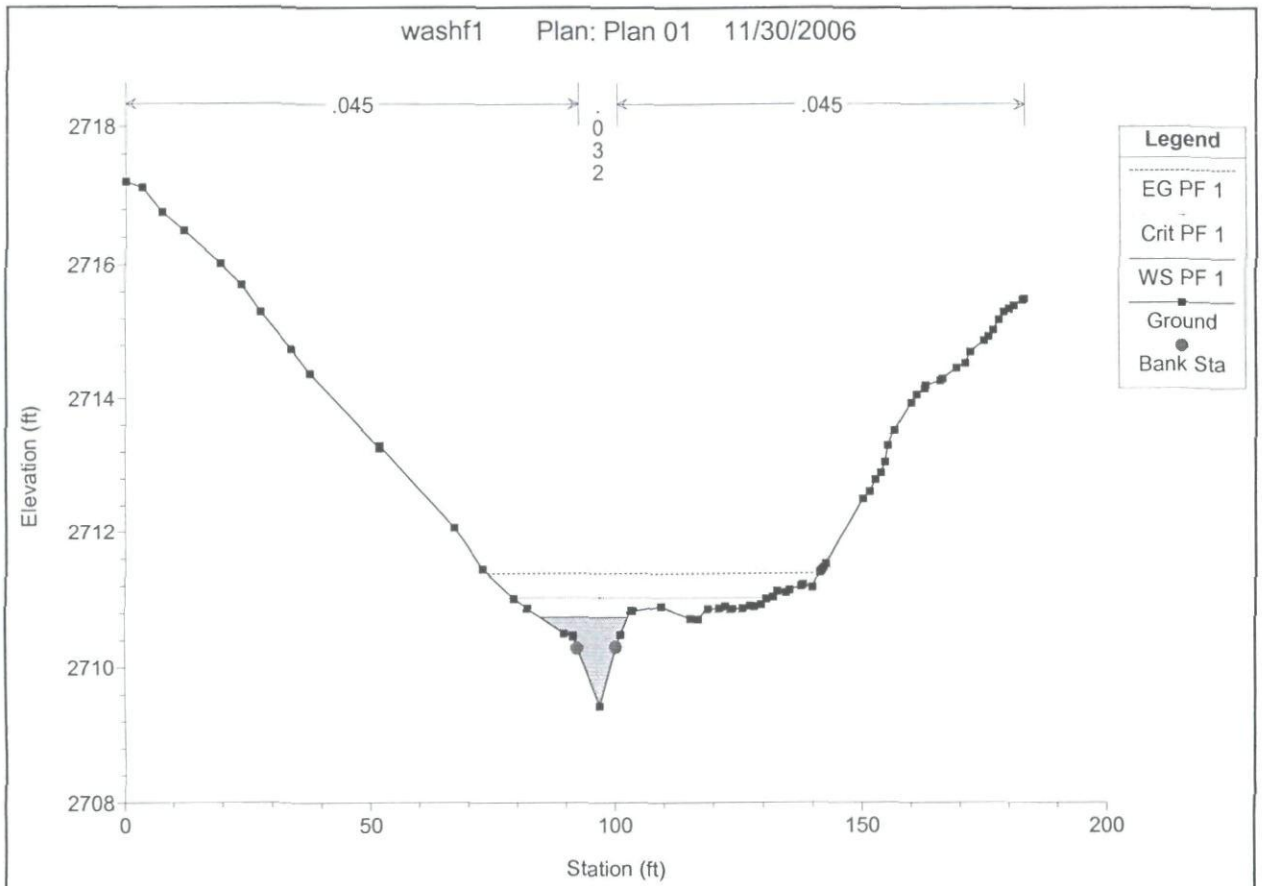
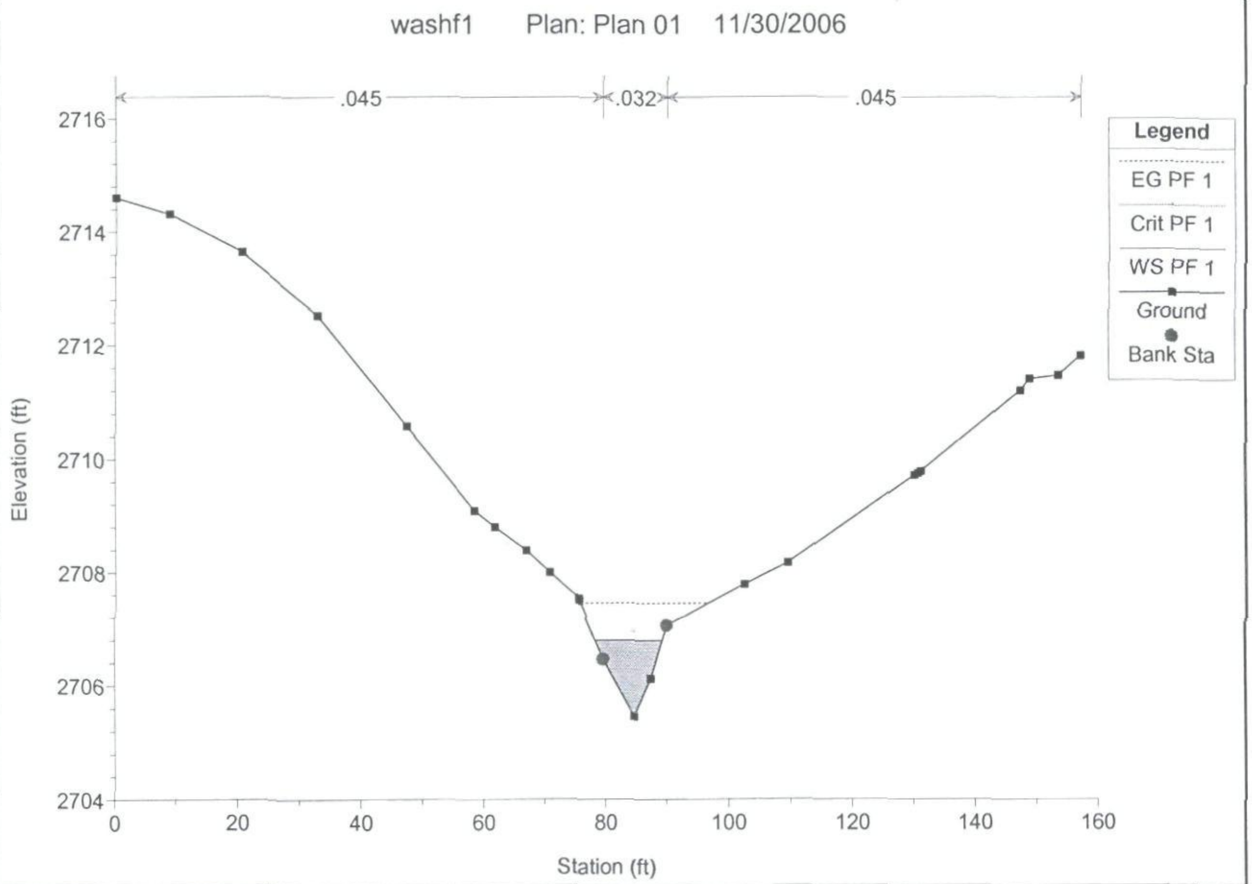
.045
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2676
2678
2680
2682
2684
2686
2688
Station (ft)
0
20
40
60
80
100
120
140
160
180

WASH F1 - EXISTING

HEC-RAS Plan: Plan 01 River: RIVER-1 Reach: Reach-1 Profile: PF 1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	8	PF 1	50.00	2709.42	2710.74	2711.03	2711.38	0.025021	6.65	8.95	20.46	1.25
Reach-1	7	PF 1	50.00	2705.46	2706.81	2706.97	2707.46	0.027912	6.49	7.87	11.03	1.29
Reach-1	6	PF 1	50.00	2700.54	2701.76	2702.06	2702.68	0.039439	7.86	7.10	12.34	1.54
Reach-1	5	PF 1	50.00	2698.48	2699.81	2699.89	2700.28	0.022728	5.49	9.24	14.33	1.15
Reach-1	4.5	PF 1	50.00	2697.00	2697.81	2697.96	2698.38	0.028656	6.06	8.42	13.96	1.29
Reach-1	4	PF 1	73.00	2692.65	2693.91	2694.06	2694.54	0.029914	6.39	11.55	17.64	1.33
Reach-1	3.5	PF 1	73.00	2689.00	2690.62	2690.62	2691.02	0.010708	5.39	16.76	*22.70*	*0.86*
Reach-1	3	PF 1	73.00	2686.57	2687.77	2688.07	2688.68	0.037750	7.70	9.81	14.75	1.52
Reach-1	2	PF 1	73.00	2681.90	2683.30	2683.32	2683.62	0.018233	4.63	17.31	34.70	1.02
Reach-1	1	PF 1	99.00	2677.60	2678.81	2679.01	2679.48	0.032873	6.89	18.76	54.21	1.41


washf1 Plan: Plan 01 11/30/2006
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
2718
2716
2714
2712
2710
2708
0
50
100
150
200
Station (ft)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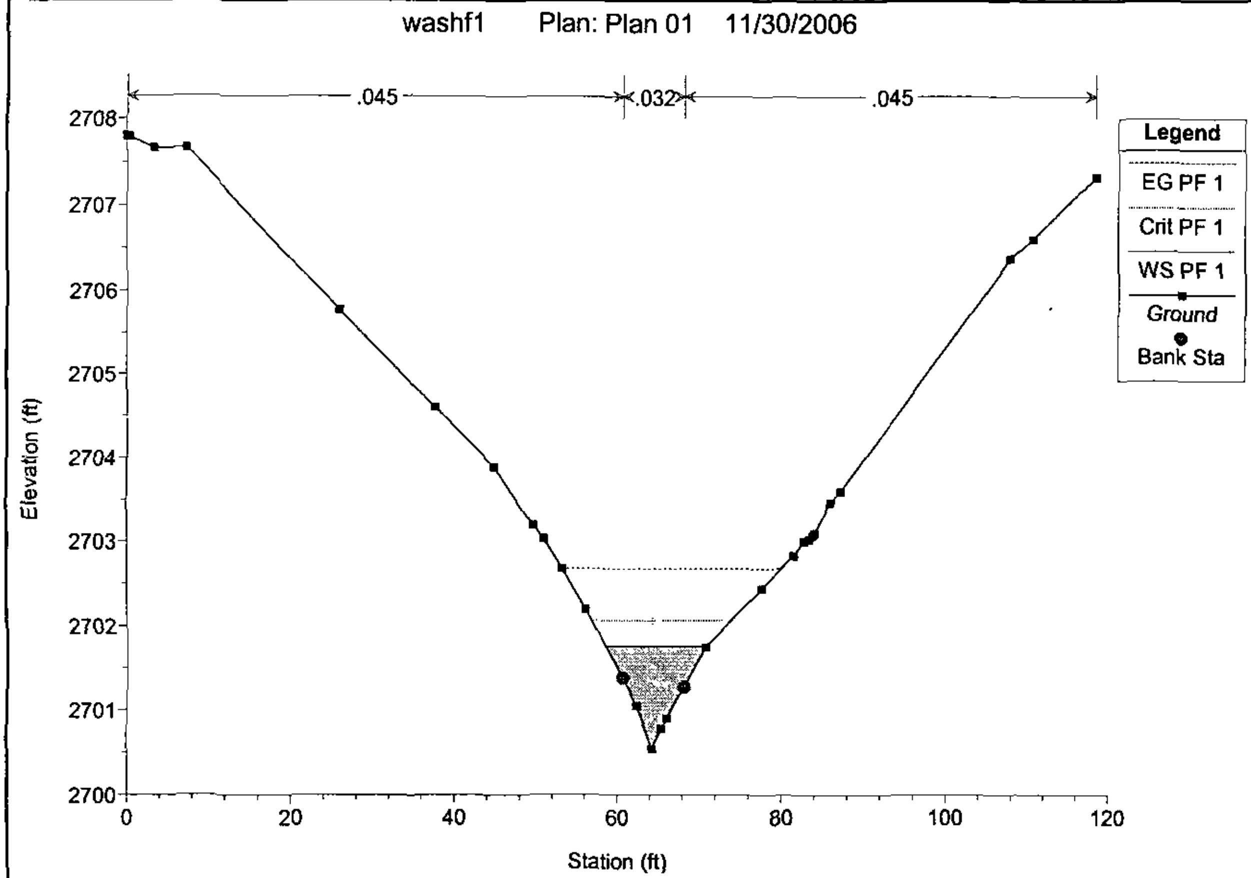
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
2716
2714
2712
2710
2708
2706
2704
0
20
40
60
80
100
120
140
160
Station (ft)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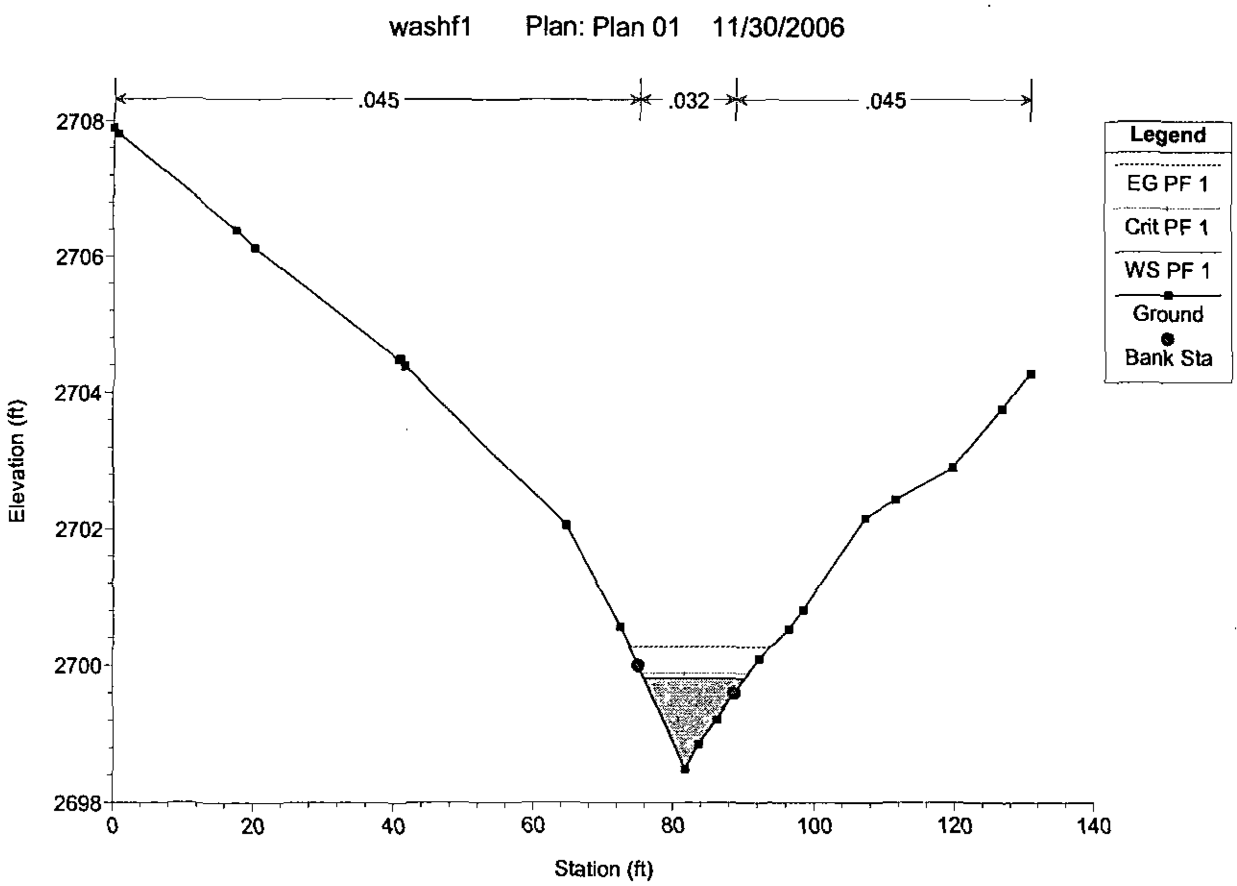
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
2708
2707
2706
2705
2704
2703
2702
2701
2700
0
20
40
60
80
100
120
Station (ft)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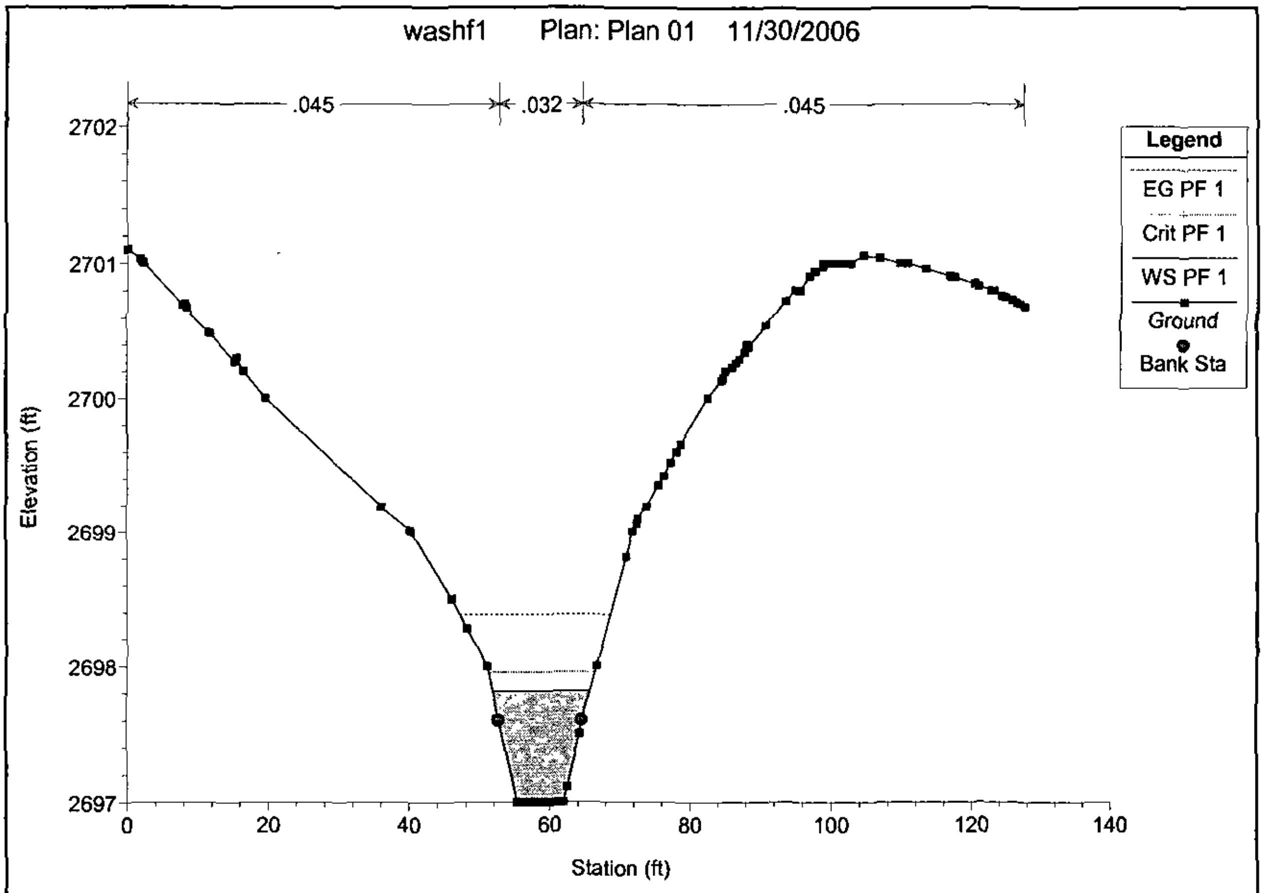
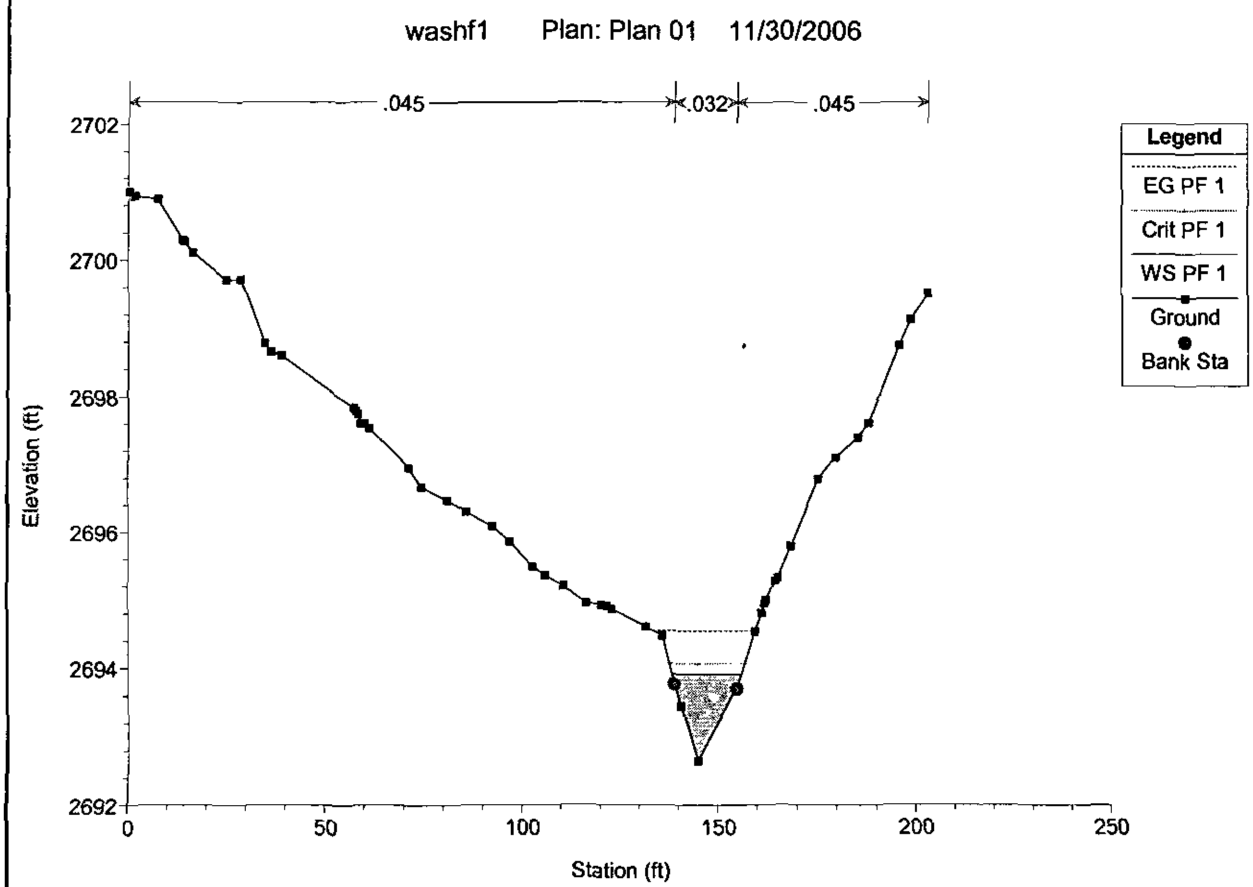
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
2708
2706
2704
2702
2700
2698
0
20
40
60
80
100
120
140
Station (ft)


washf1 Plan: Plan 01 11/30/2006
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
2697
2698
2699
2700
2701
2702
0
20
40
60
80
100
120
140


washf1 Plan: Plan 01 11/30/2006
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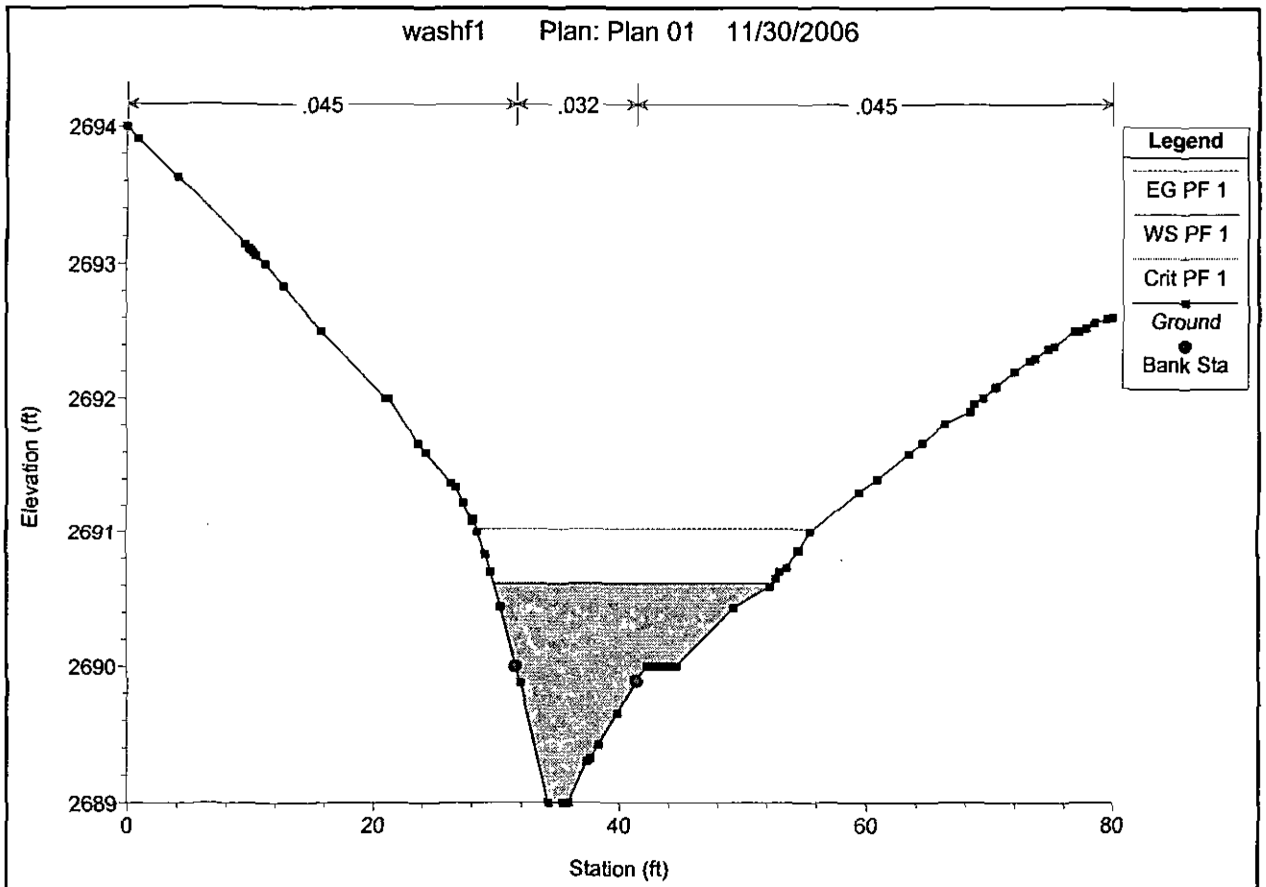
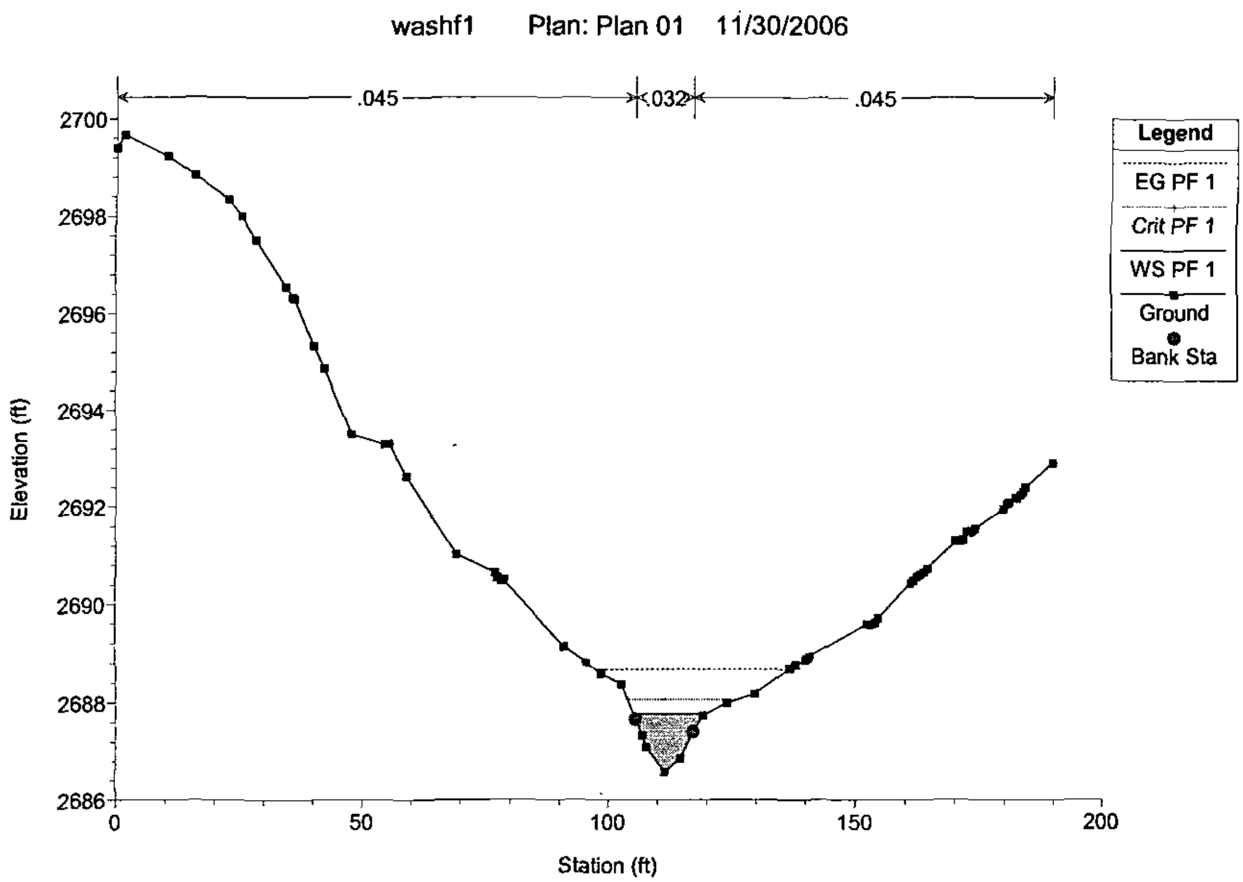
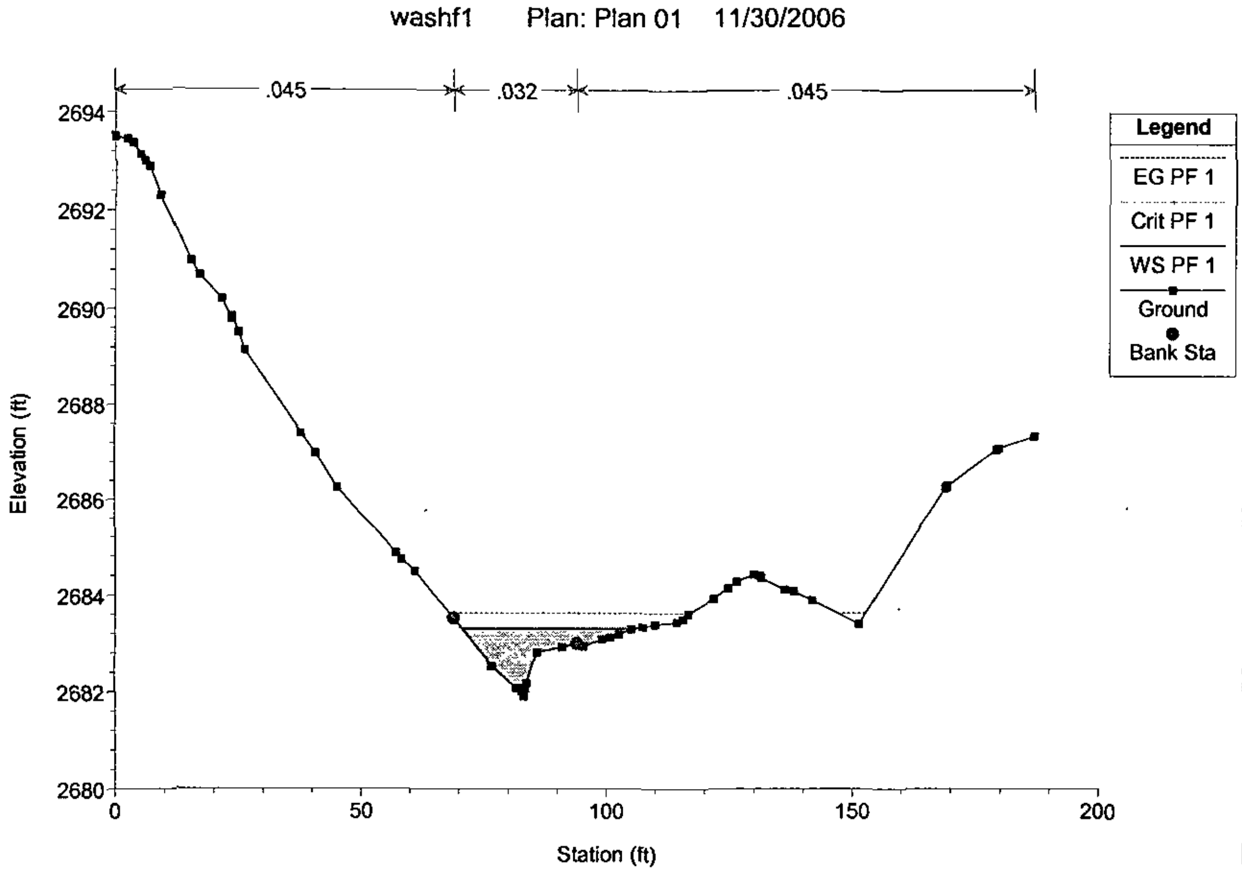
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
2692
2694
2696
2698
2700
2702
0
50
100
150
200
250



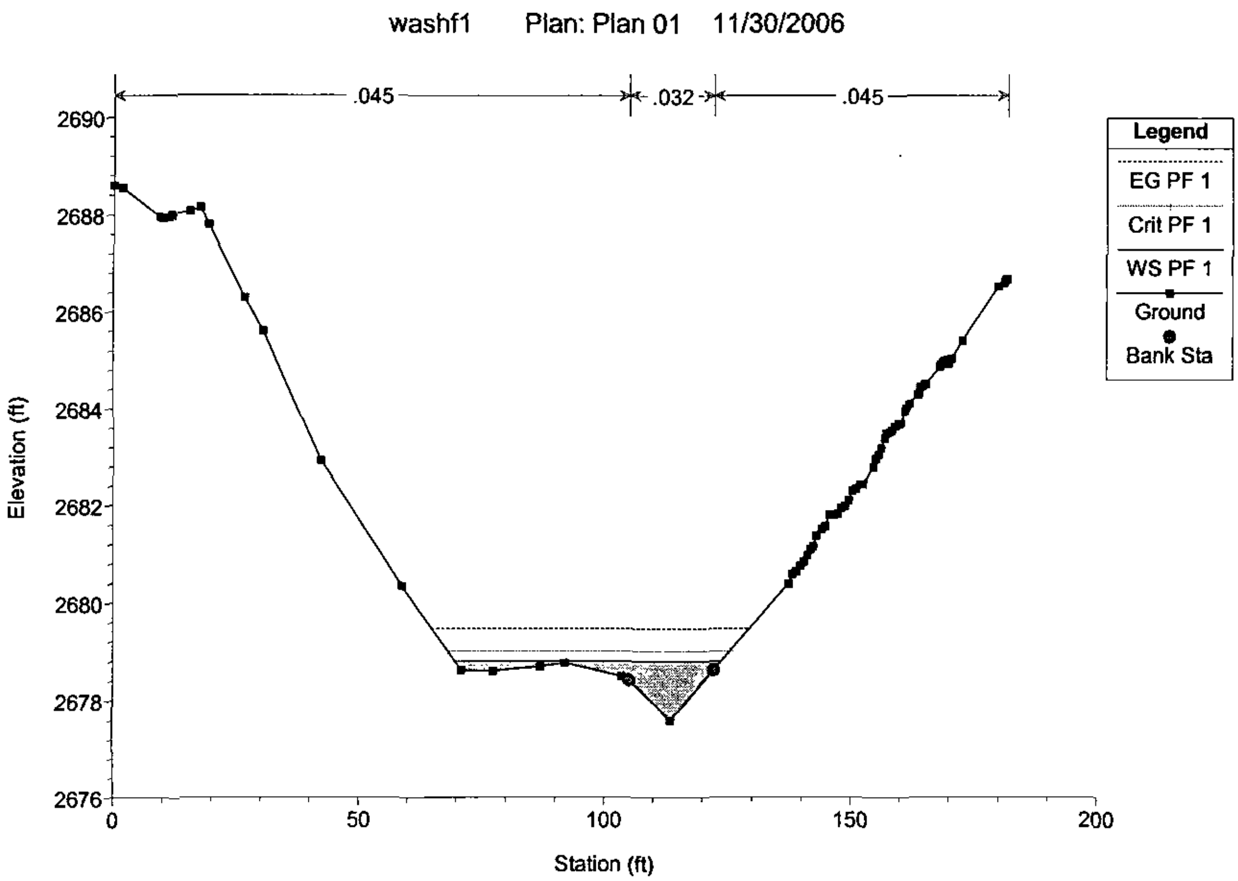
washf1 Plan: Plan 01 11/30/2006
.045
.032
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2694
2693
2692
2691
2690
2689
0
20
40
60
80
Station (ft)



washf1 Plan: Plan 01 11/30/2006
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
2700
2698
2696
2694
2692
2690
2688
2686
0
50
100
150
200
Station (ft)



washf1 Plan: Plan 01 11/30/2006
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
2694
2692
2690
2688
2686
2684
2682
2680
0
50
100
150
200
Station (ft)

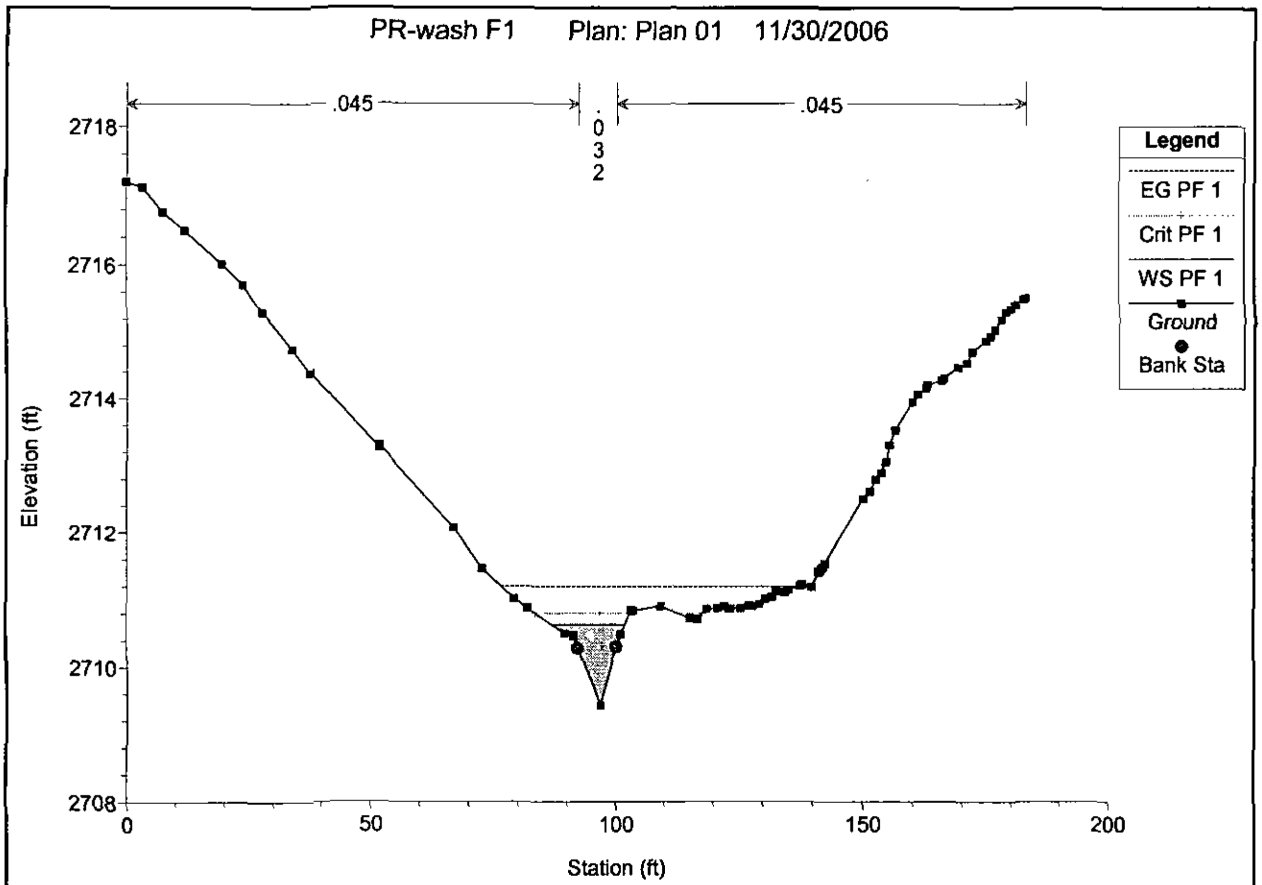


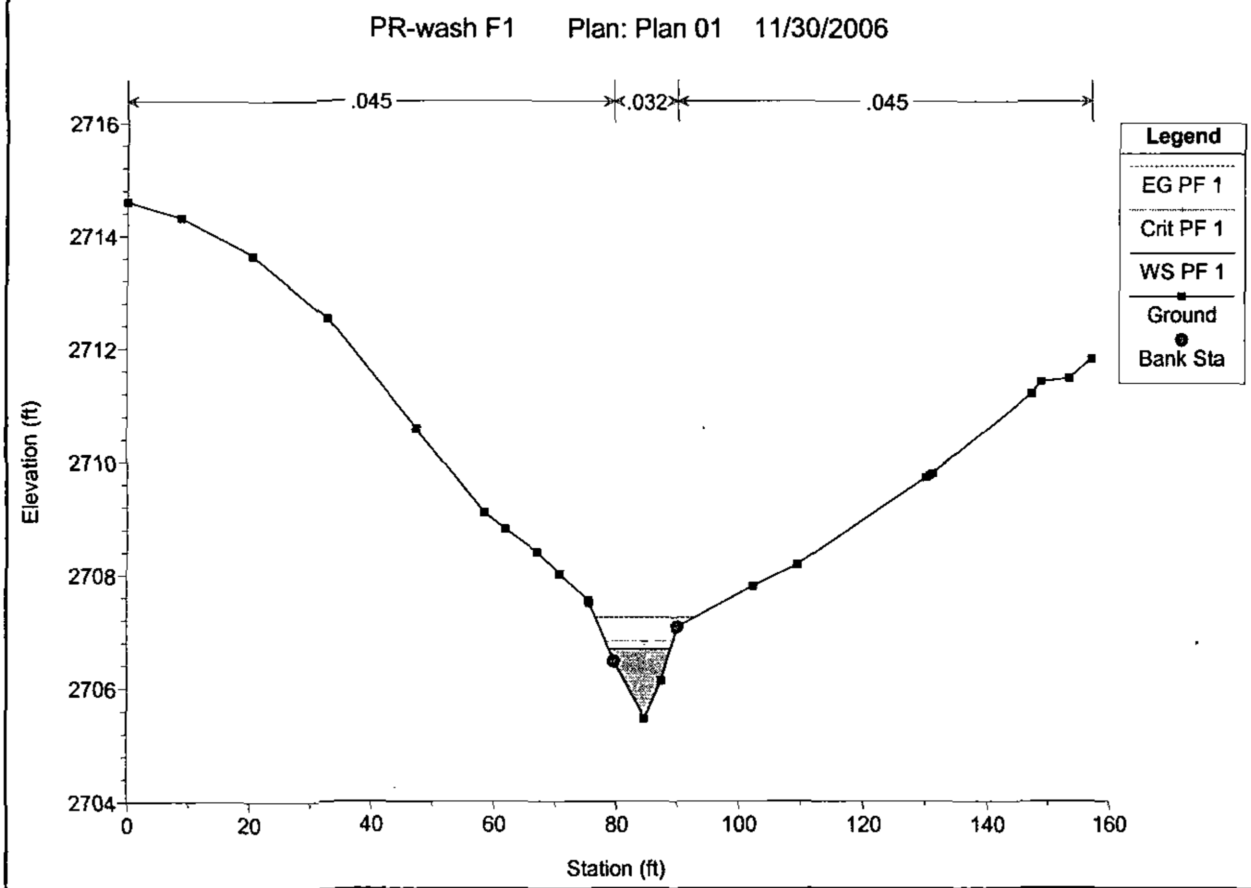
washf1 Plan: Plan 01 11/30/2006
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
2690
2688
2686
2684
2682
2680
2678
2676
0
50
100
150
200
Station (ft)

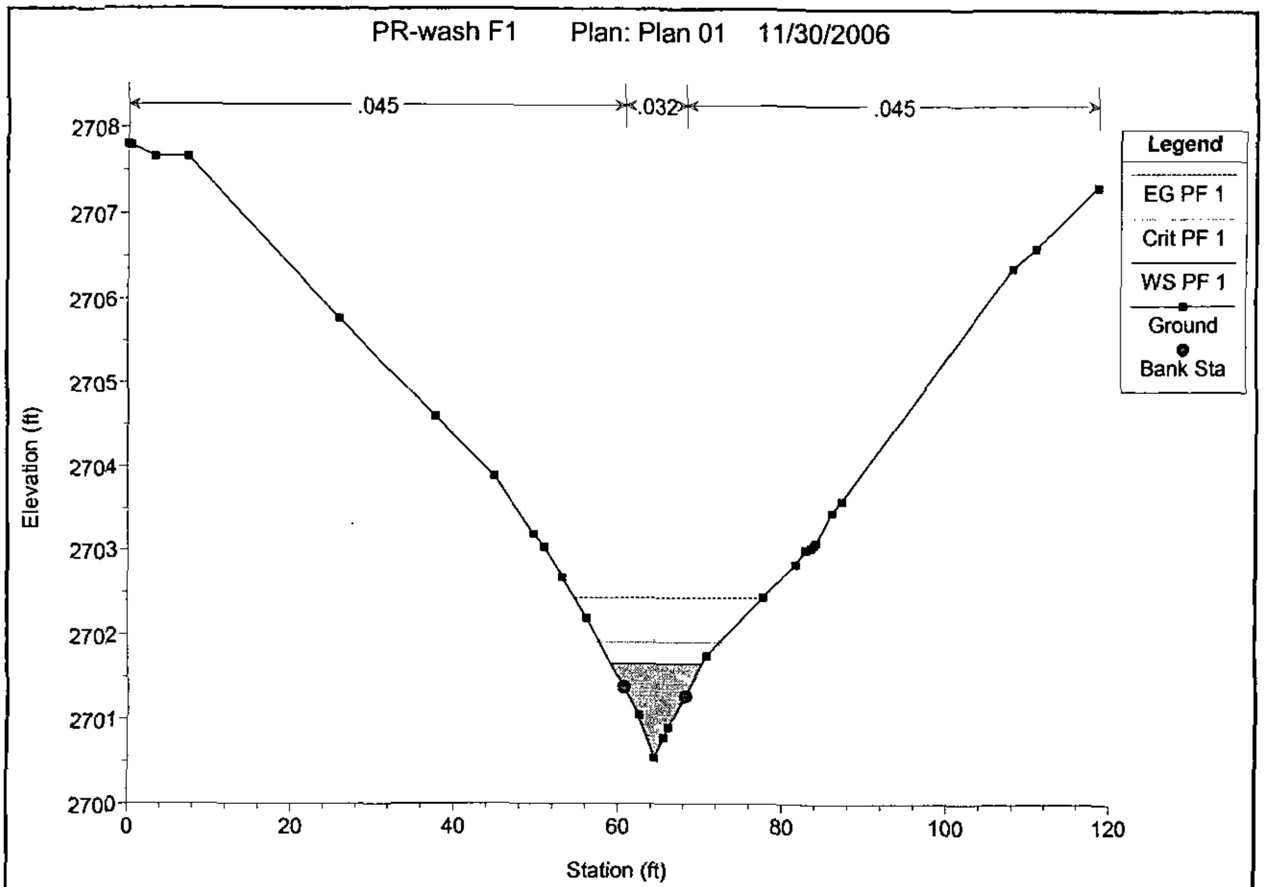
WASH F - DEVELOPED

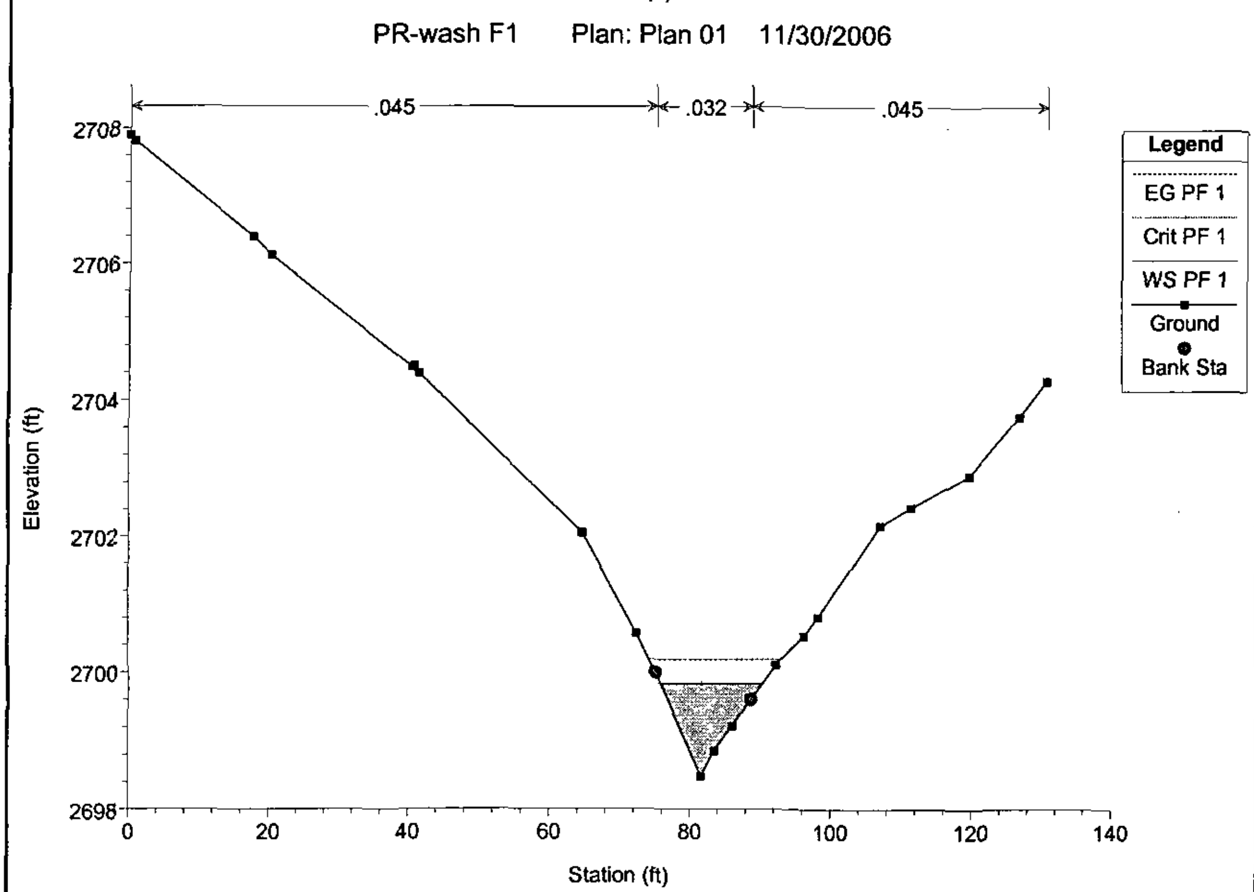
HEC-RAS Plan: Plan 01 River: RIVER-1 Reach: Reach-1 Profile: PF 1

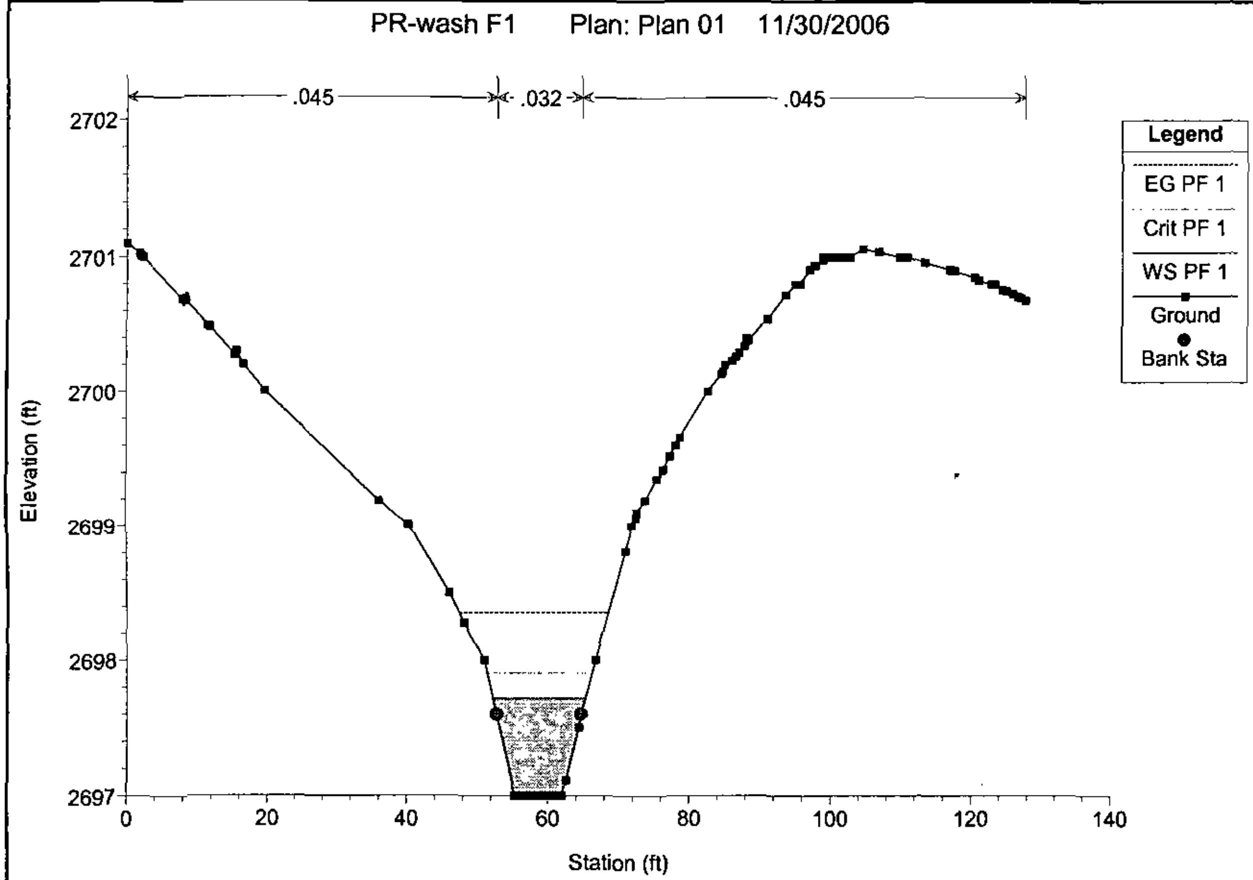
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	8	PF 1	39.00	2709.42	2710.63	2710.80	2711.19	0.025046	6.11	7.13	15.15	1.22
Reach-1	7	PF 1	39.00	2705.46	2706.68	2706.81	2707.24	0.028309	6.00	6.57	10.20	1.27
Reach-1	6	PF 1	39.00	2700.54	2701.66	2701.91	2702.43	0.039440	7.17	5.88	11.16	1.51
Reach-1	5	PF 1	45.00	2698.48	2699.83	2699.83	2700.19	0.016894	4.80	9.53	14.56	0.99
Reach-1	4.5	PF 1	45.00	2697.00	2697.72	2697.90	2698.35	0.039178	6.39	7.09	13.06	1.47
Reach-1	4	PF 1	31.00	2692.65	2693.75	2693.67	2693.94	0.012919	3.54	8.75	15.98	0.84
Reach-1	3.5	PF 1	31.00	2689.00	2690.09	2690.09	2690.40	0.015482	4.47	7.27	14.40	0.94
Reach-1	3	PF 1	31.00	2686.57	2687.48	2687.56	2687.89	0.027504	5.13	6.06	11.40	1.22
Reach-1	2	PF 1	35.00	2681.90	2683.06	2683.07	2683.27	0.018857	3.68	9.76	25.89	0.97
Reach-1	1	PF 1	32.00	2677.60	2678.41	2678.53	2678.84	0.043359	5.26	6.09	15.10	1.46

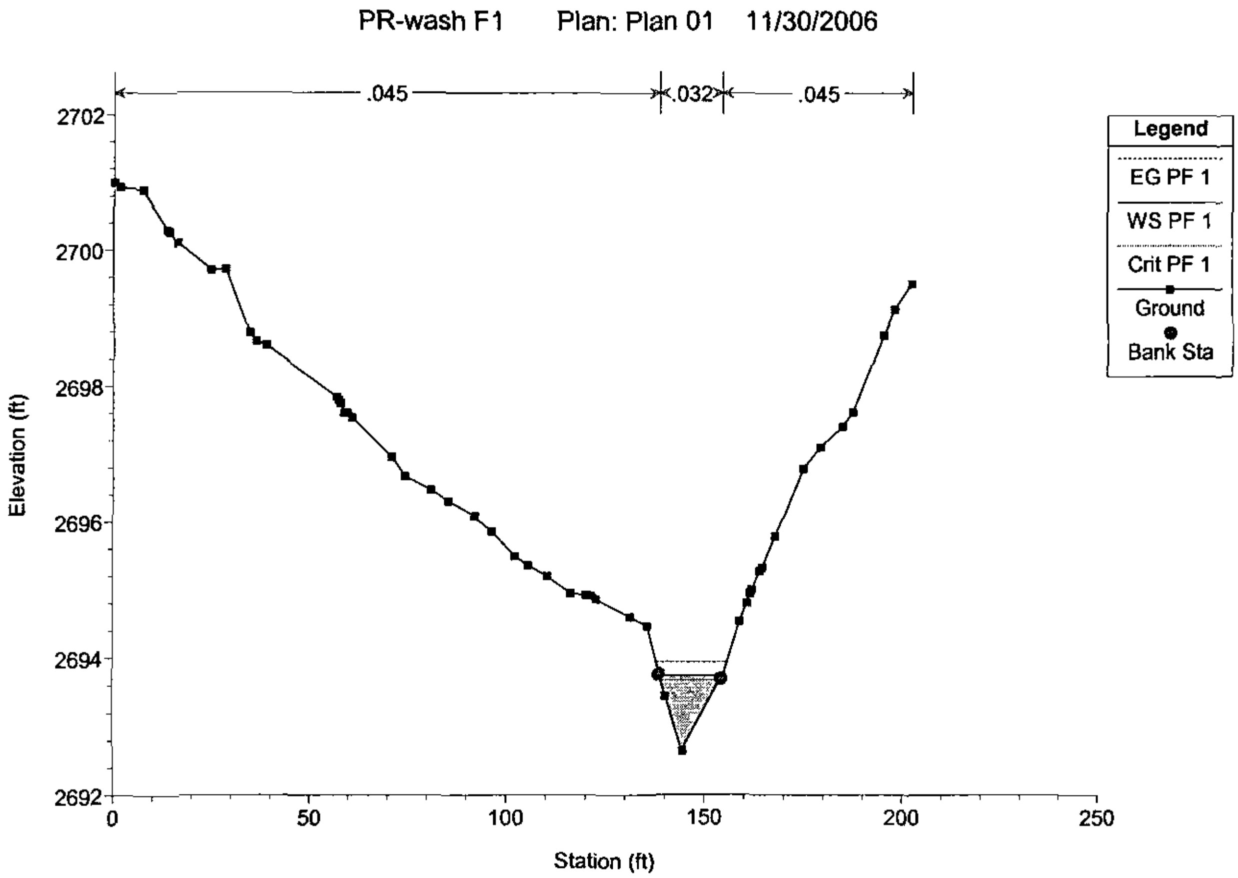

PR-wash F1 Plan: Plan 01 11/30/2006
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
2708
2710
2712
2714
2716
2718
0
50
100
150
200


PR-wash F1 Plan: Plan 01 11/30/2006
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
2704
2706
2708
2710
2712
2714
2716
0
20
40
60
80
100
120
140
160

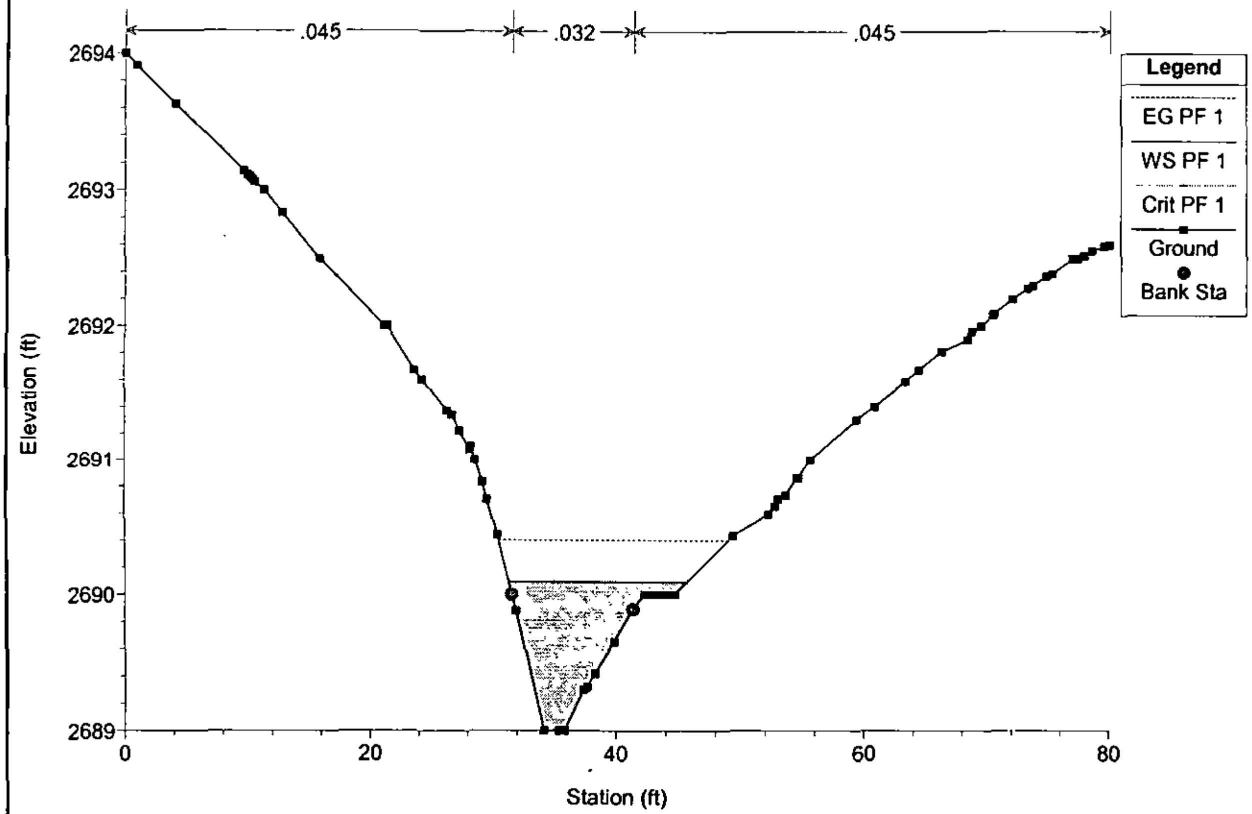

PR-wash F1 Plan: Plan 01 11/30/2006
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
2708
2707
2706
2705
2704
2703
2702
2701
2700
Station (ft)
0
20
40
60
80
100
120


PR-wash F1 Plan: Plan 01 11/30/2006
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
2708
2706
2704
2702
2700
2698
Station (ft)
0
20
40
60
80
100
120
140

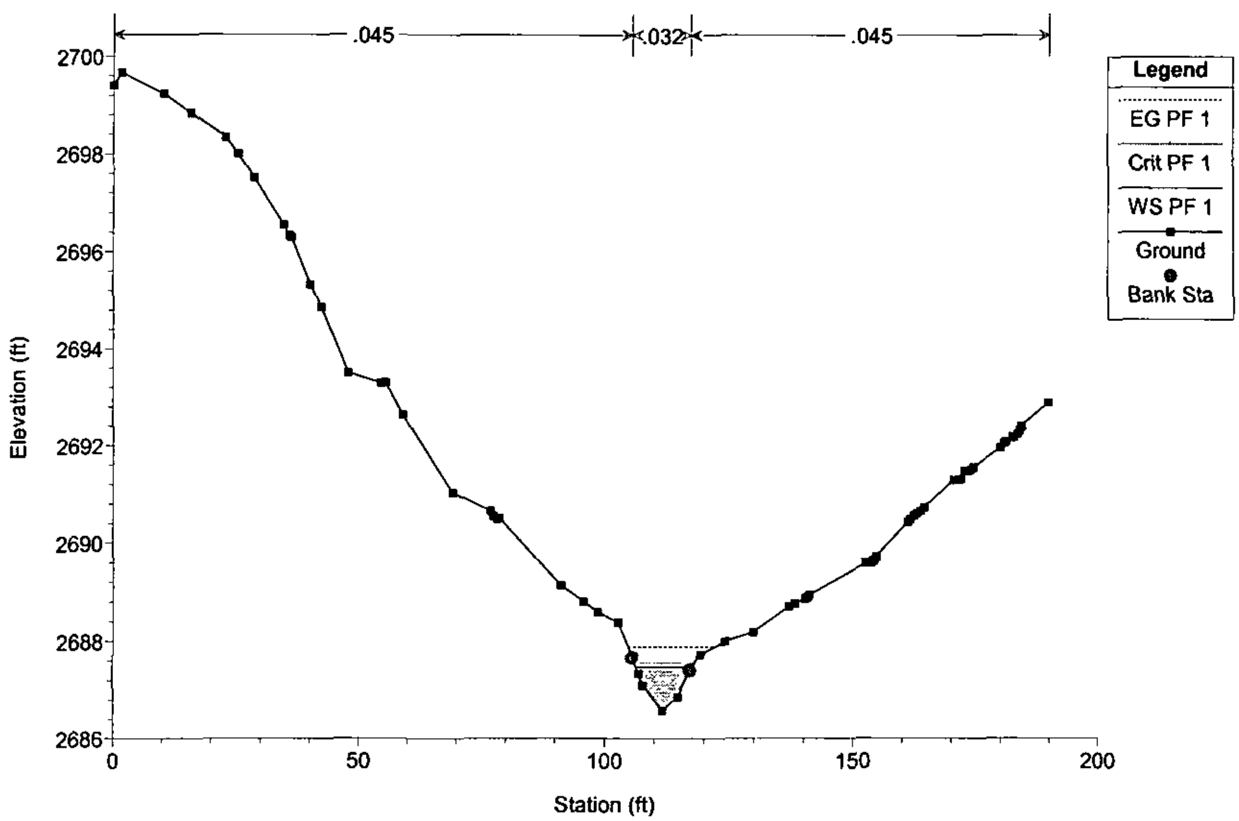

PR-wash F1 Plan: Plan 01 11/30/2006
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
2697
2698
2699
2700
2701
2702
0
20
40
60
80
100
120
140
Station (ft)

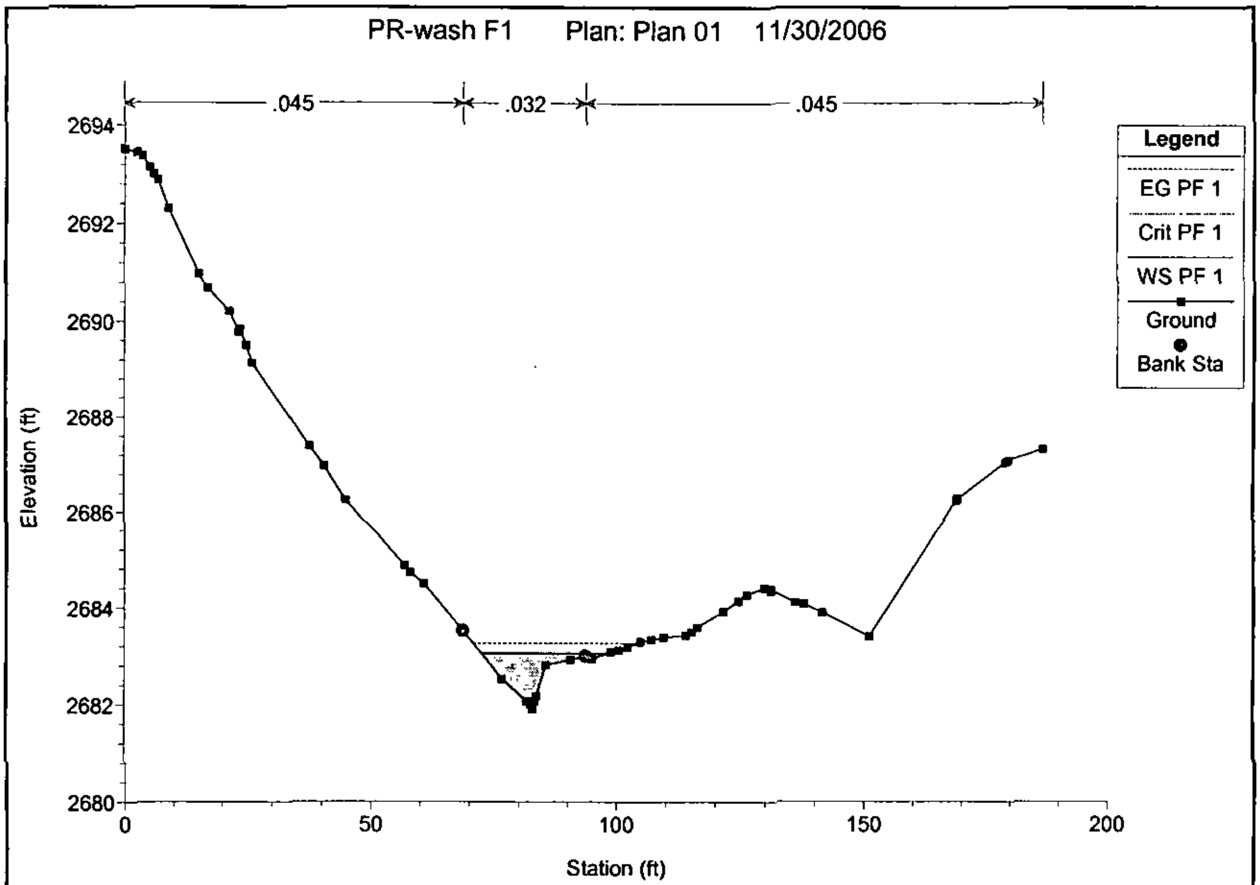

PR-wash F1 Plan: Plan 01 11/30/2006
.045
.032
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2692
2694
2696
2698
2700
2702
0
50
100
150
200
250
Station (ft)

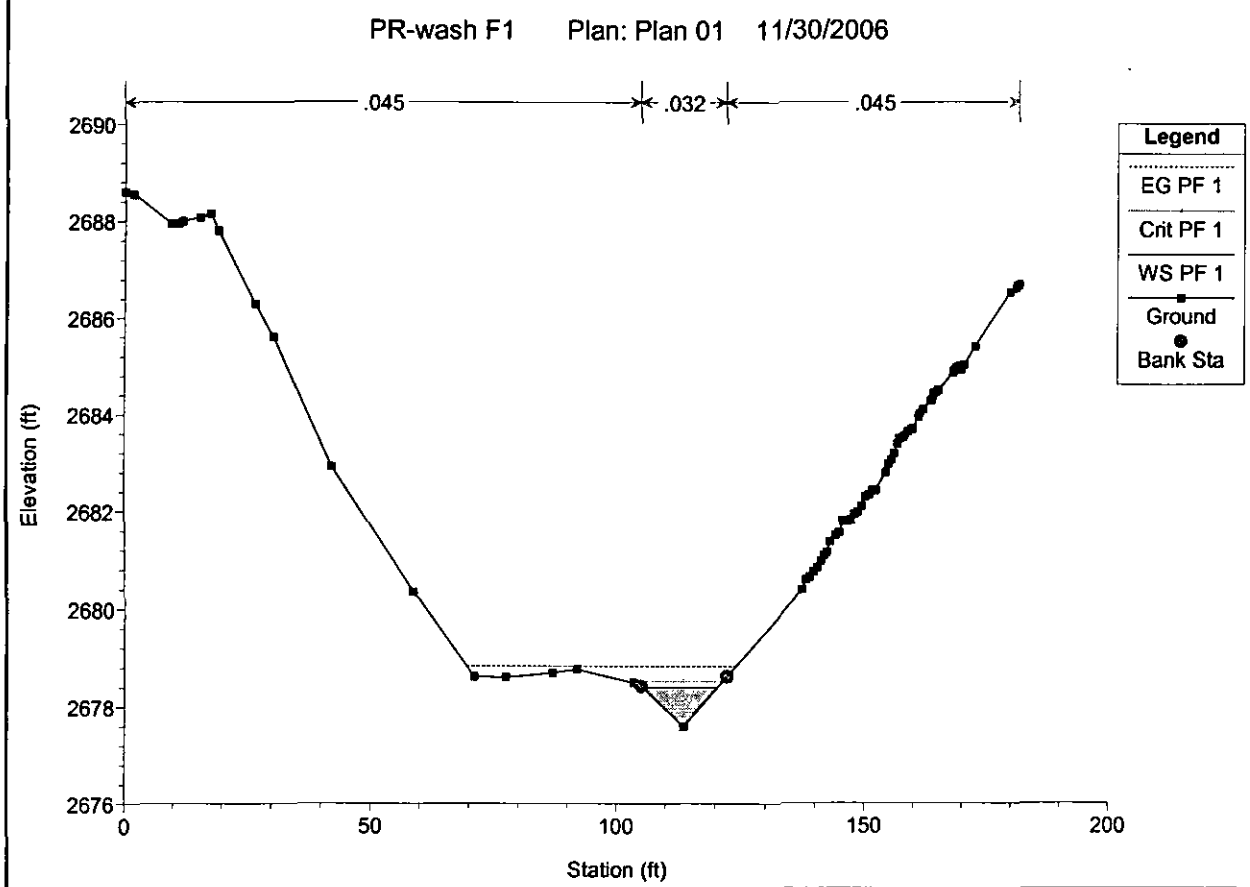
PR-wash F1 Plan: Plan 01 11/30/2006



PR-wash F1 Plan: Plan 01 11/30/2006



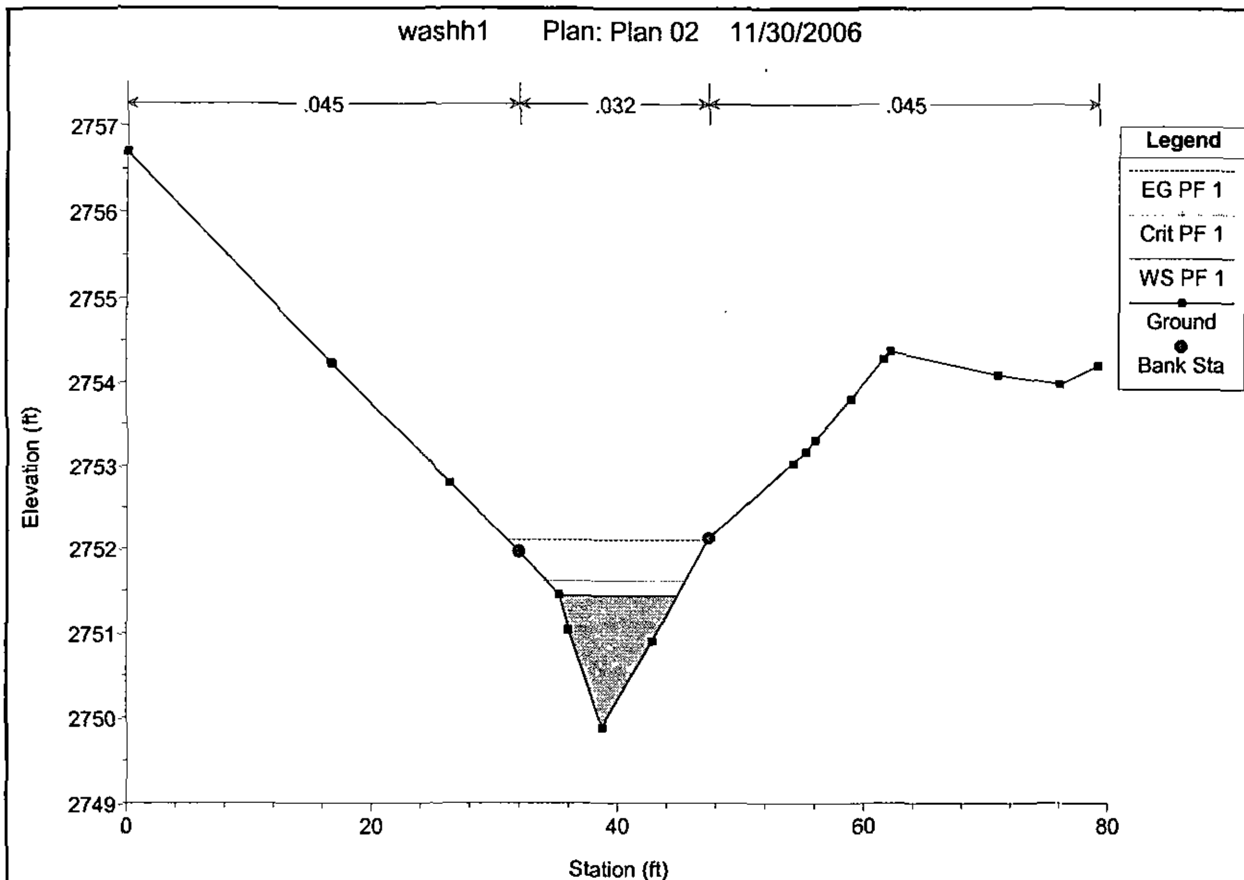

PR-wash F1 Plan: Plan 01 11/30/2006
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
2694
2692
2690
2688
2686
2684
2682
2680
0
50
100
150
200
Station (ft)

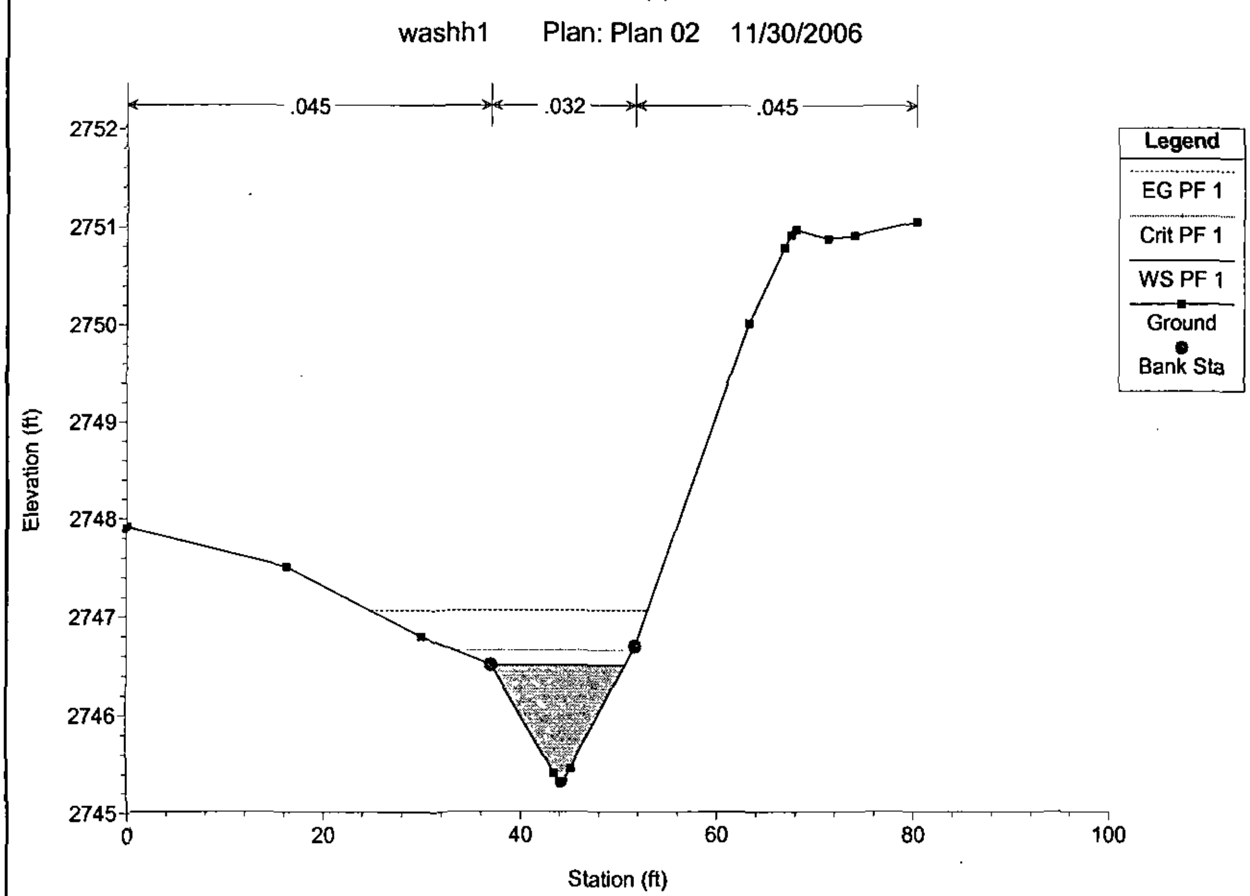

PR-wash F1 Plan: Plan 01 11/30/2006
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
2690
2688
2686
2684
2682
2680
2678
2676
0
50
100
150
200
Station (ft)

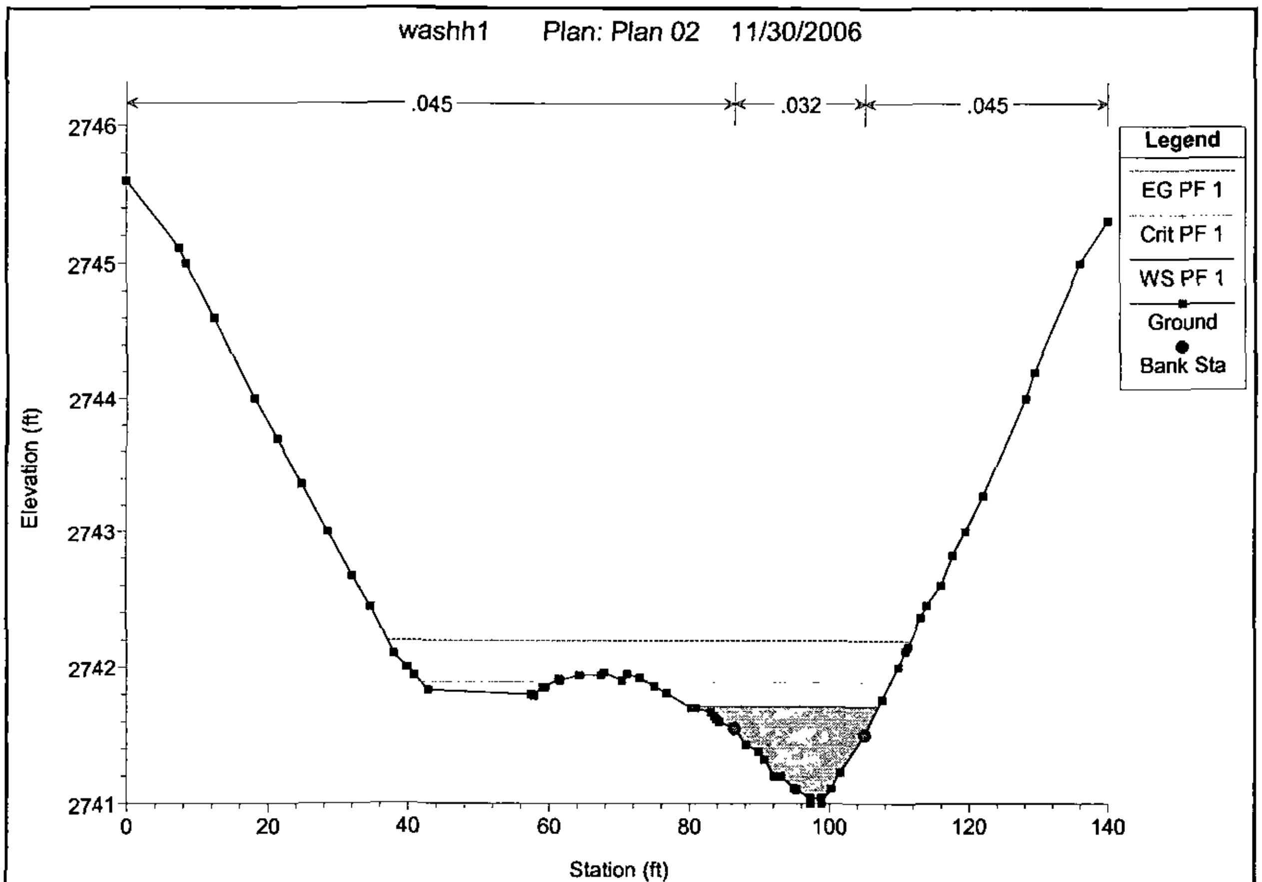
WASH HI EXISTING

HEC-RAS Plan: Plan 02 River: RIVER-1 Reach: Reach-1 Profile: PF 1

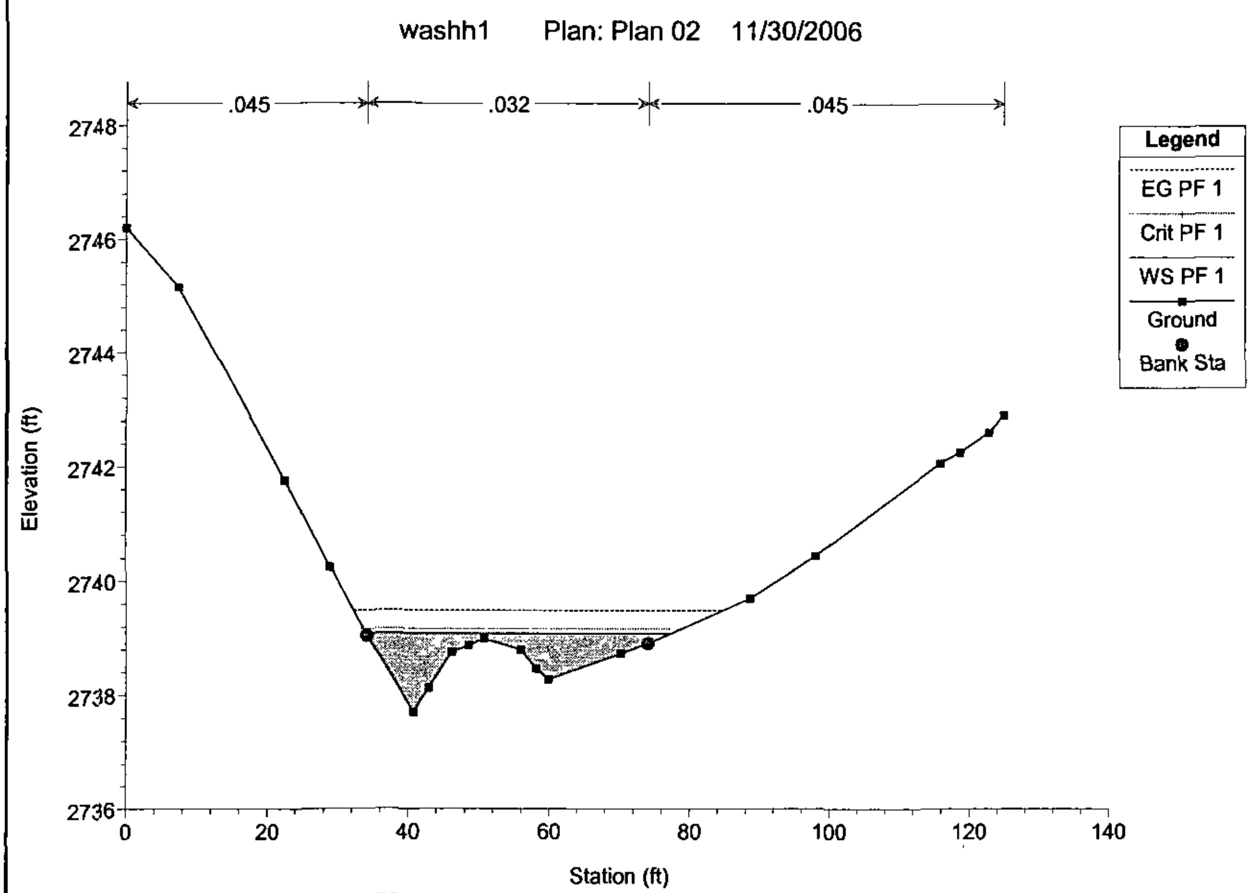
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	6	PF 1	50.00	2749.88	2751.43	2751.61	2752.10	0.028975	6.55	7.63	9.59	1.29
Reach-1	5	PF 1	50.00	2745.29	2746.49	2746.65	2747.06	0.033087	6.02	8.30	13.57	1.36
Reach-1	4.5	PF 1	50.00	2741.00	2741.71	2741.89	2742.19	0.040197	5.61	9.42	27.11	1.44
Reach-1	4	PF 1	105.00	2737.70	2739.09	2739.16	2739.48	0.028862	5.06	20.97	43.38	1.24
Reach-1	3	PF 1	105.00	2732.24	2733.48	2733.74	2734.23	0.032630	7.07	17.15	47.26	1.41
Reach-1	2	PF 1	152.00	2725.11	2726.80	2726.97	2727.46	0.035735	6.56	23.30	37.06	1.43
Reach-1	1.5	PF 1	152.00	2723.00	2724.16	2724.25	2724.68	0.017874	5.94	28.64	41.85	1.08
Reach-1	1	PF 1	152.00	2720.27	2721.00	2720.98	2721.22	0.028998	4.37	40.92	87.59	1.20


washh1 Plan: Plan 02 11/30/2006
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
2757
2756
2755
2754
2753
2752
2751
2750
2749
0
20
40
60
80

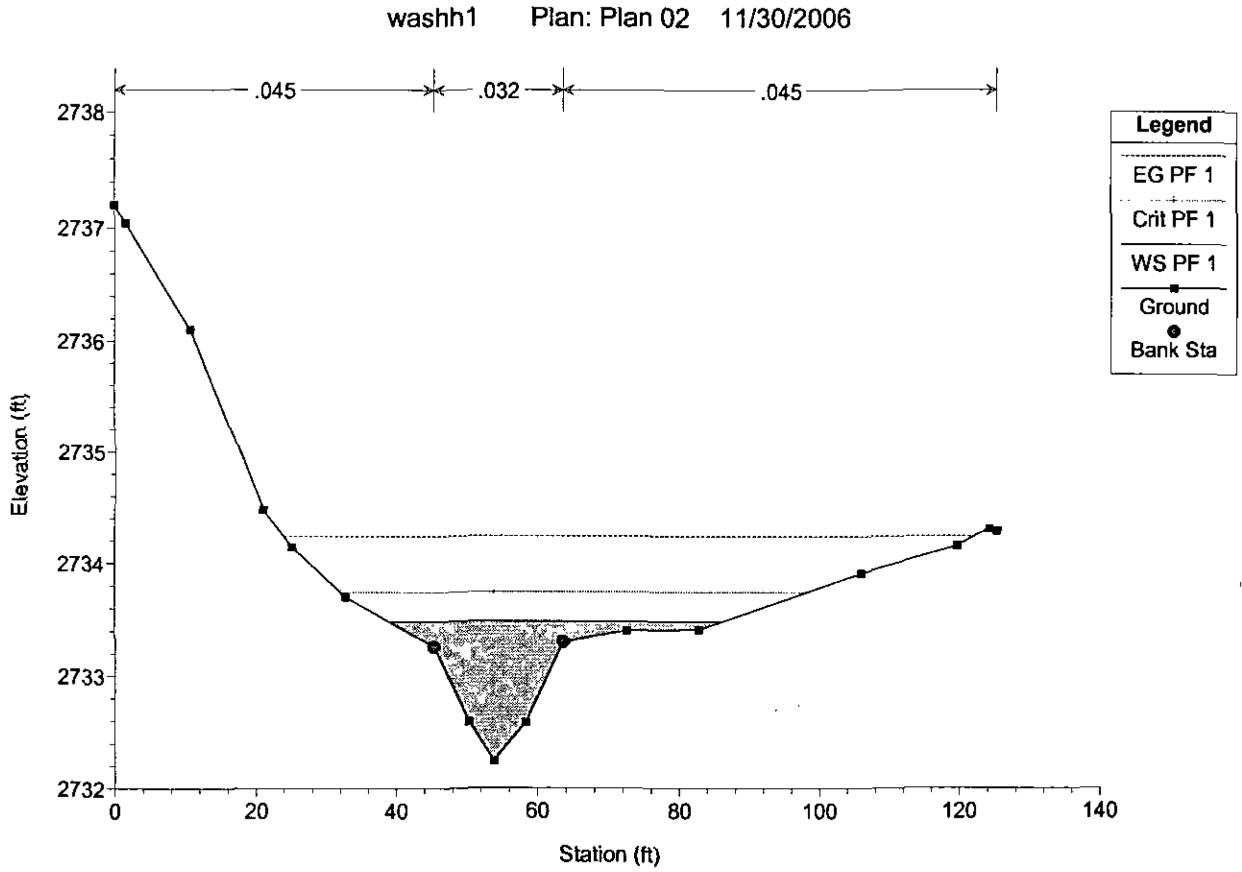

washh1 Plan: Plan 02 11/30/2006
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
2752
2751
2750
2749
2748
2747
2746
2745
0
20
40
60
80
100

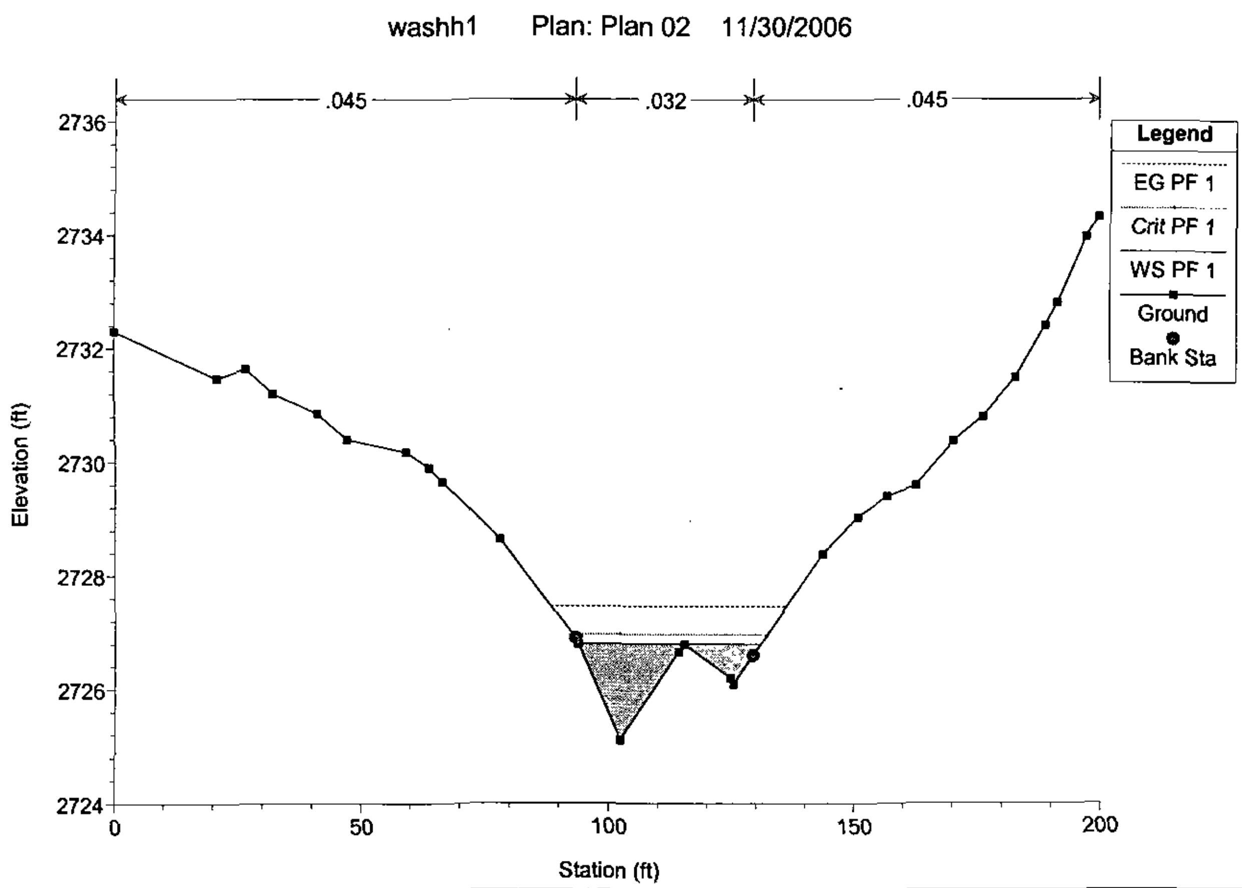


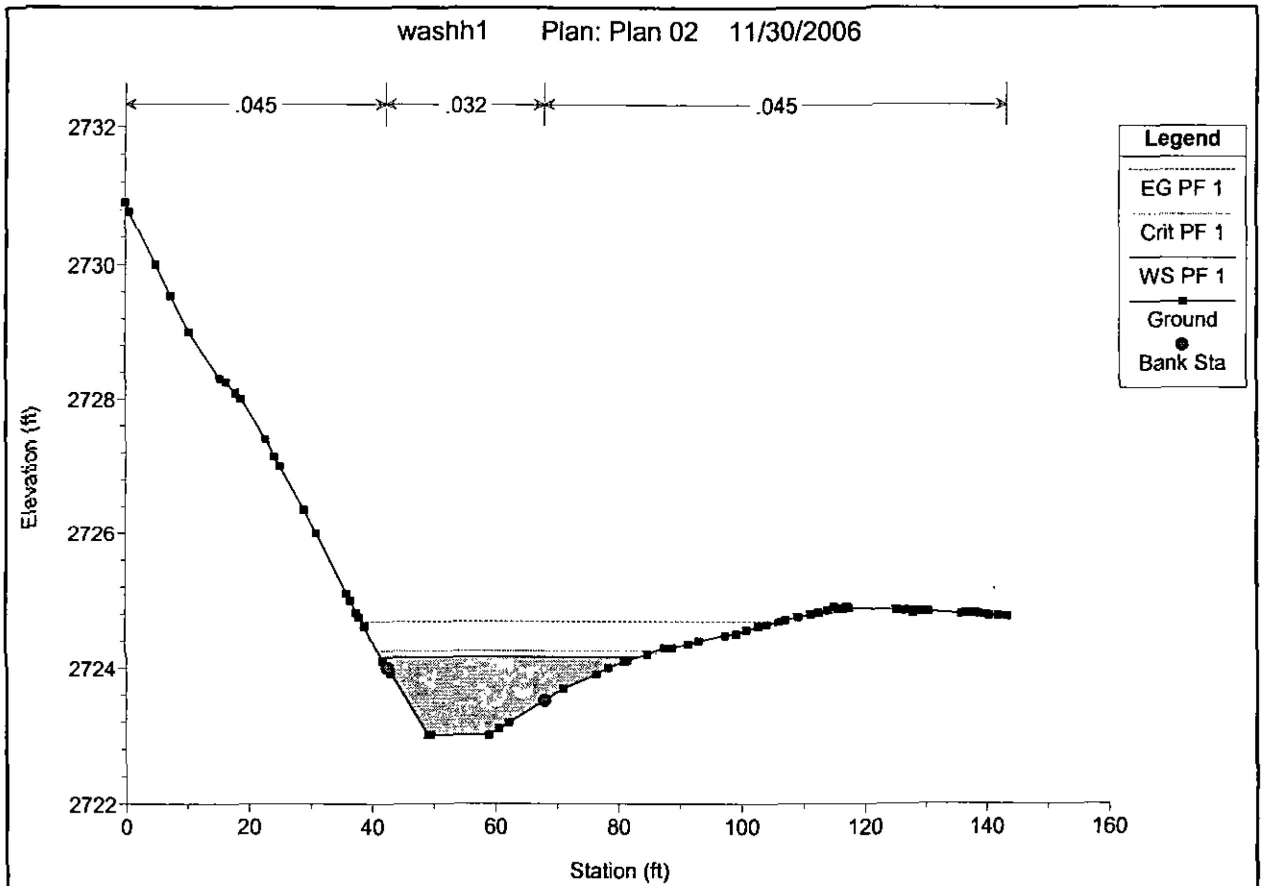
washh1 Plan: Plan 02 11/30/2006
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
2746
2745
2744
2743
2742
2741
0
20
40
60
80
100
120
140

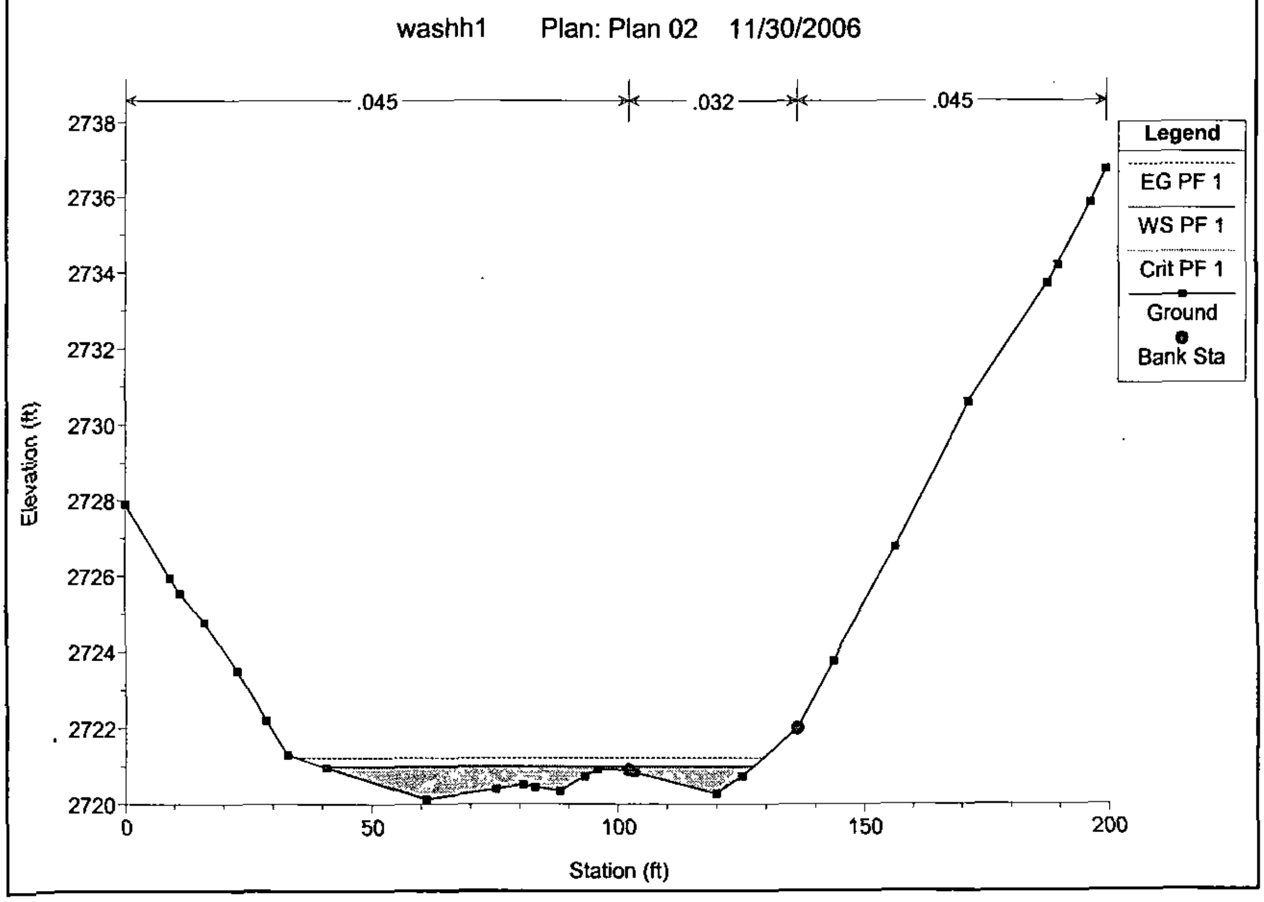


washh1 Plan: Plan 02 11/30/2006
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
2748
2746
2744
2742
2740
2738
2736
0
20
40
60
80
100
120
140


washh1 Plan: Plan 02 11/30/2006
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
2738
2737
2736
2735
2734
2733
2732
0
20
40
60
80
100
120
140
Station (ft)


washh1 Plan: Plan 02 11/30/2006
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
2736
2734
2732
2730
2728
2726
2724
0
50
100
150
200
Station (ft)

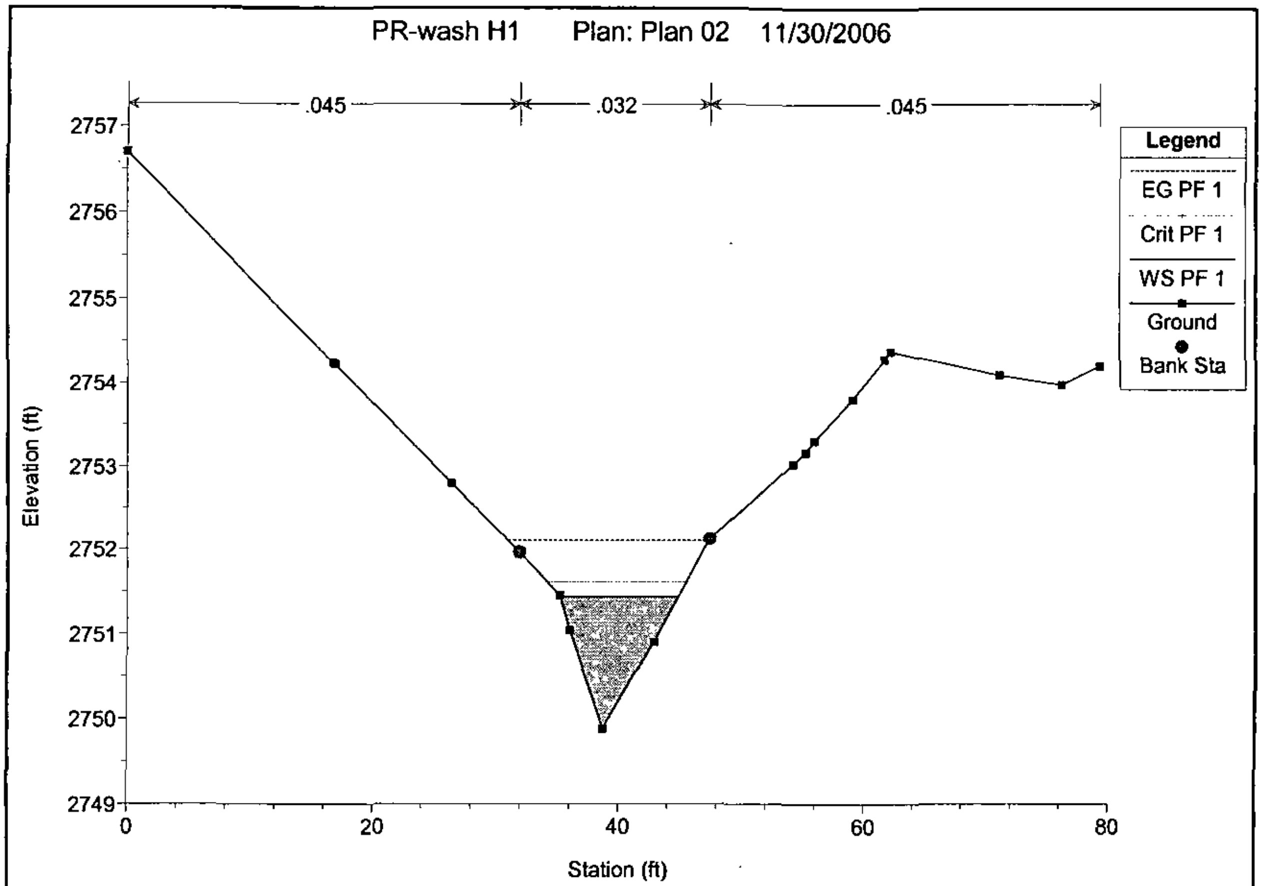

washh1 Plan: Plan 02 11/30/2006
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
2722
2724
2726
2728
2730
2732
0
20
40
60
80
100
120
140
160
Station (ft)

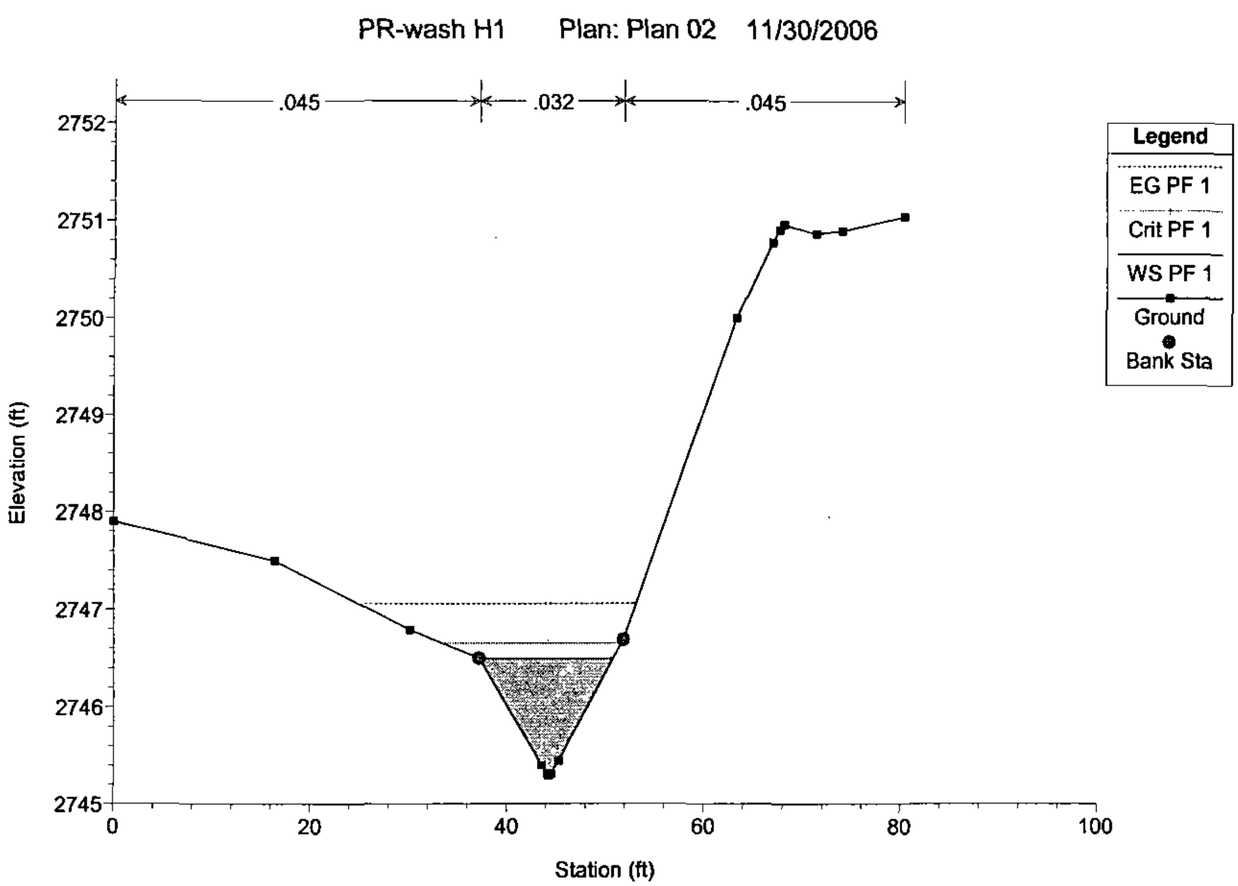

washh1 Plan: Plan 02 11/30/2006
.045
.032
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2720
2722
2724
2726
2728
2730
2732
2734
2736
2738
0
50
100
150
200
Station (ft)

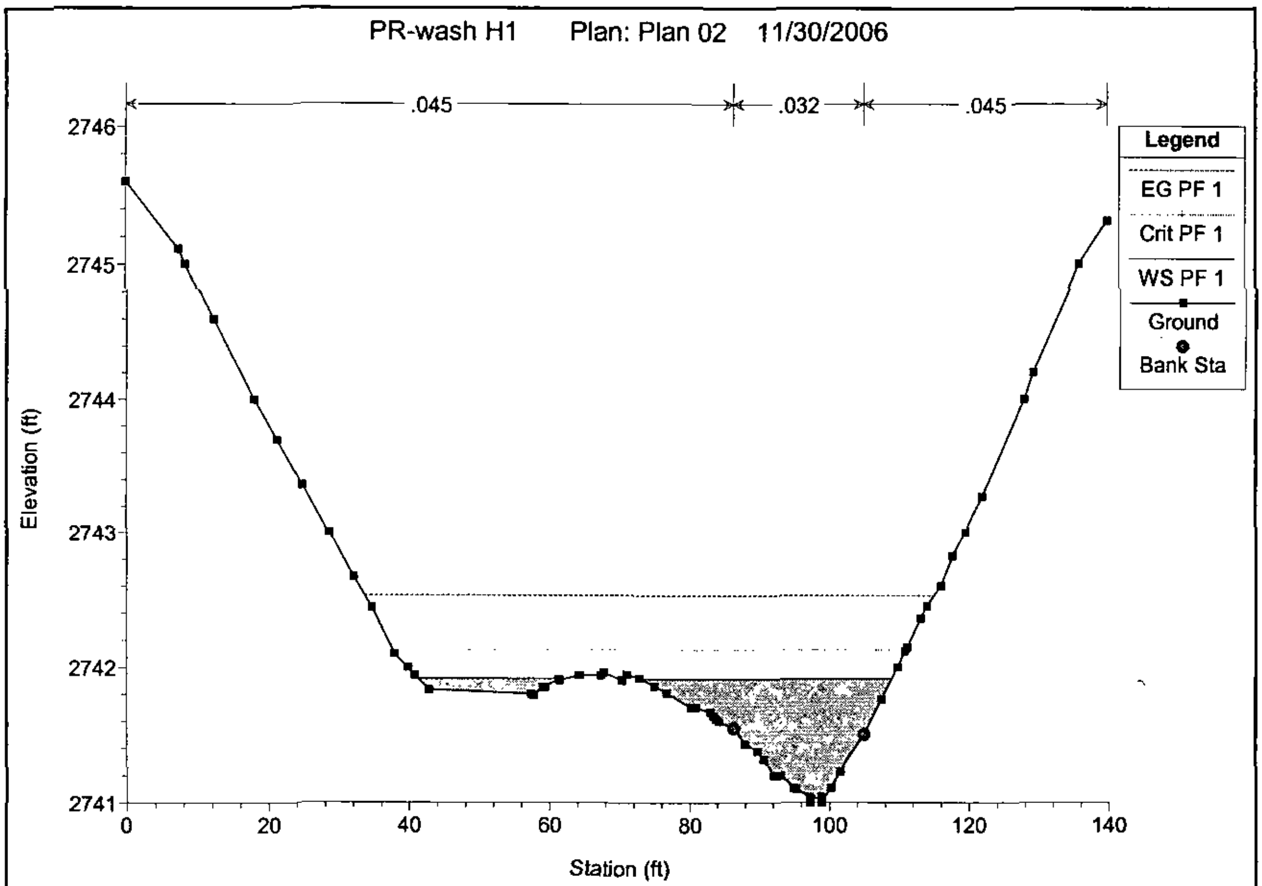
WASH HI-DEVELOPED

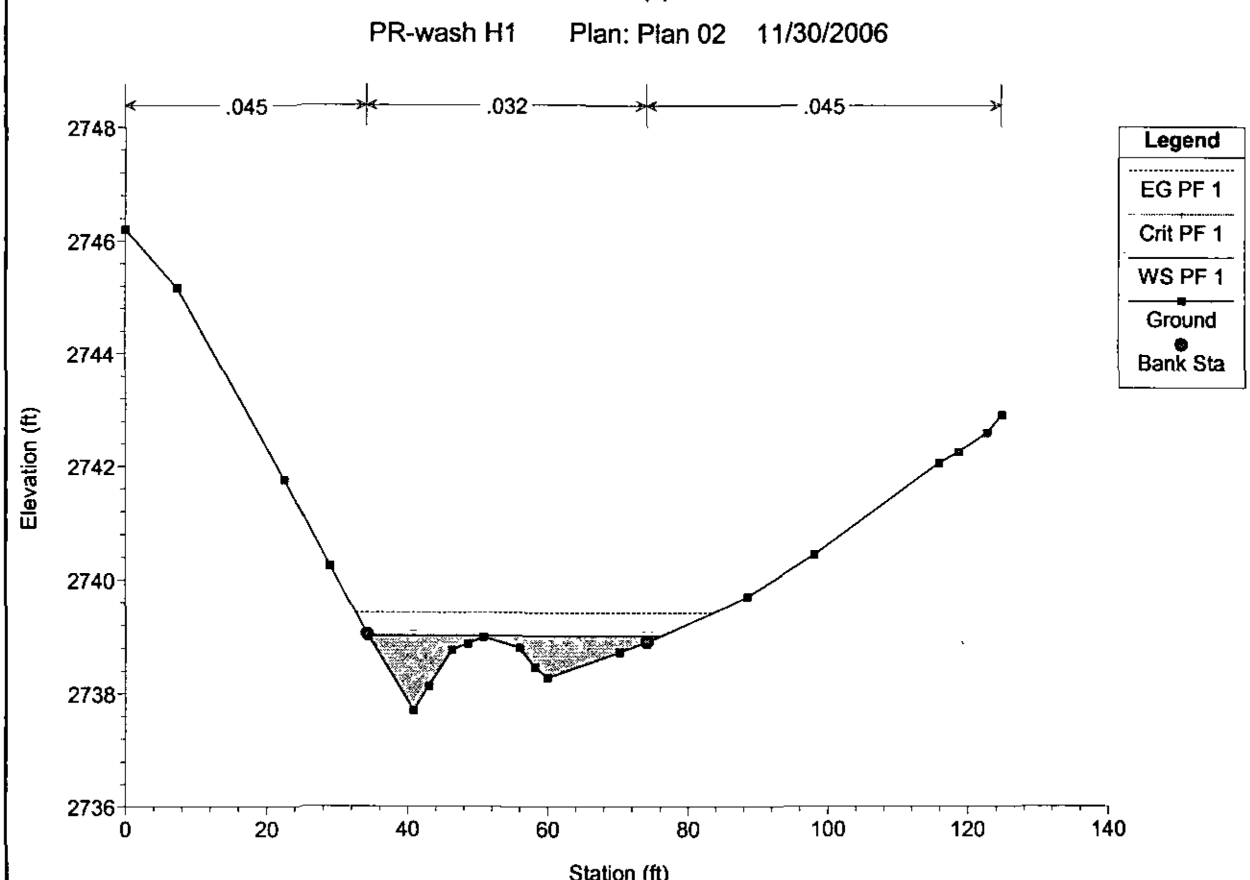
HEC-RAS Plan: Plan 02 River: RIVER-1 Reach: Reach-1 Profile: PF 1

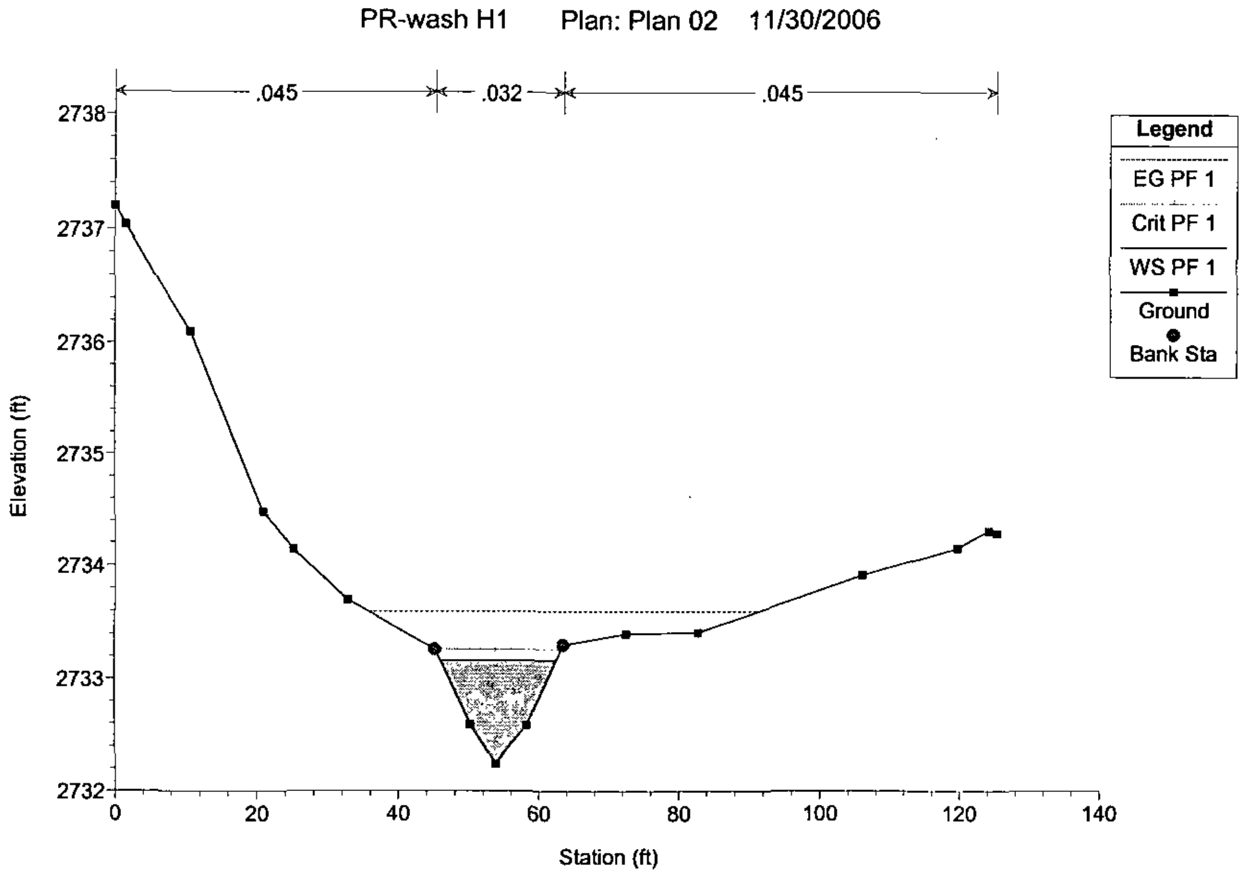
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	6	PF 1	50.00	2749.88	2751.43	2751.61	2752.10	0.028975	6.55	7.63	9.59	1.29
Reach-1	5	PF 1	50.00	2745.29	2746.49	2746.65	2747.06	0.033158	6.03	8.30	13.57	1.36
Reach-1	4.5	PF 1	91.00	2741.00	2741.91	2742.13	2742.53	0.034303	6.58	17.51	57.55	1.41
Reach-1	4	PF 1	*91.00*	*2737.70*	*2739.02*	*2739.11*	2739.42	0.035703	5.11	17.90	41.74	1.35
Reach-1	3	PF 1	45.00	2732.24	2733.16	2733.26	2733.59	0.031634	5.27	8.54	16.64	1.30
Reach-1	2	PF 1	98.00	2725.11	2726.61	2726.75	2727.13	0.033641	5.76	17.00	30.31	1.35
Reach-1	1.5	PF 1	98.00	2723.00	2723.94	2723.99	2724.34	0.019163	5.19	20.16	34.23	1.07
Reach-1	1	PF 1	98.00	2720.27	2720.86	2720.84	2721.03	0.029054	3.57	29.60	75.03	1.14

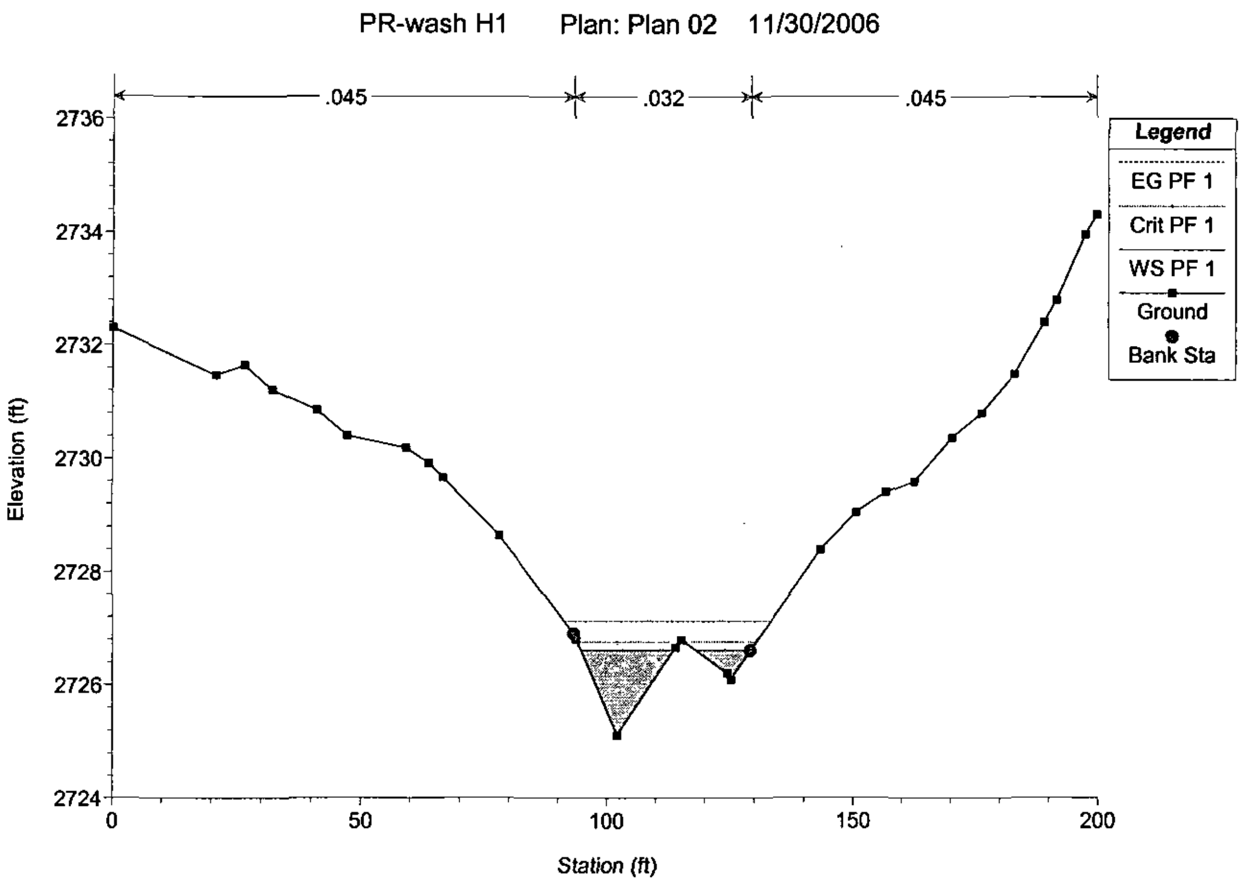

PR-wash H1 Plan: Plan 02 11/30/2006
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
2757
2756
2755
2754
2753
2752
2751
2750
2749
0
20
40
60
80

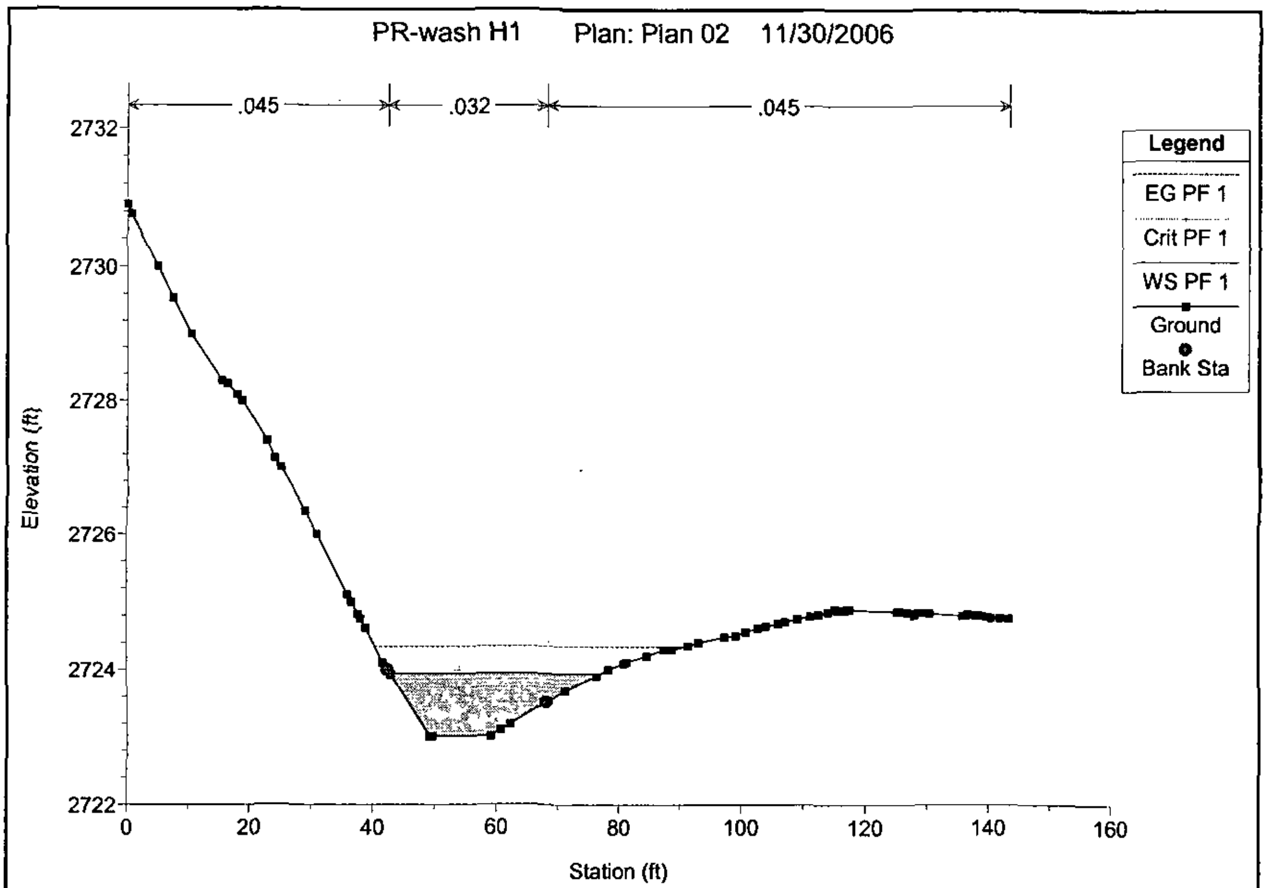

PR-wash H1 Plan: Plan 02 11/30/2006
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
2752
2751
2750
2749
2748
2747
2746
2745
0
20
40
60
80
100


PR-wash H1 Plan: Plan 02 11/30/2006
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
2741
2742
2743
2744
2745
2746
0
20
40
60
80
100
120
140


PR-wash H1 Plan: Plan 02 11/30/2006
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
2736
2738
2740
2742
2744
2746
2748
0
20
40
60
80
100
120
140


PR-wash H1 Plan: Plan 02 11/30/2006
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
2738
2737
2736
2735
2734
2733
2732
0
20
40
60
80
100
120
140


PR-wash H1 Plan: Plan 02 11/30/2006
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
2736
2734
2732
2730
2728
2726
2724
0
50
100
150
200



PR-wash H1 Plan: Plan 02 11/30/2006
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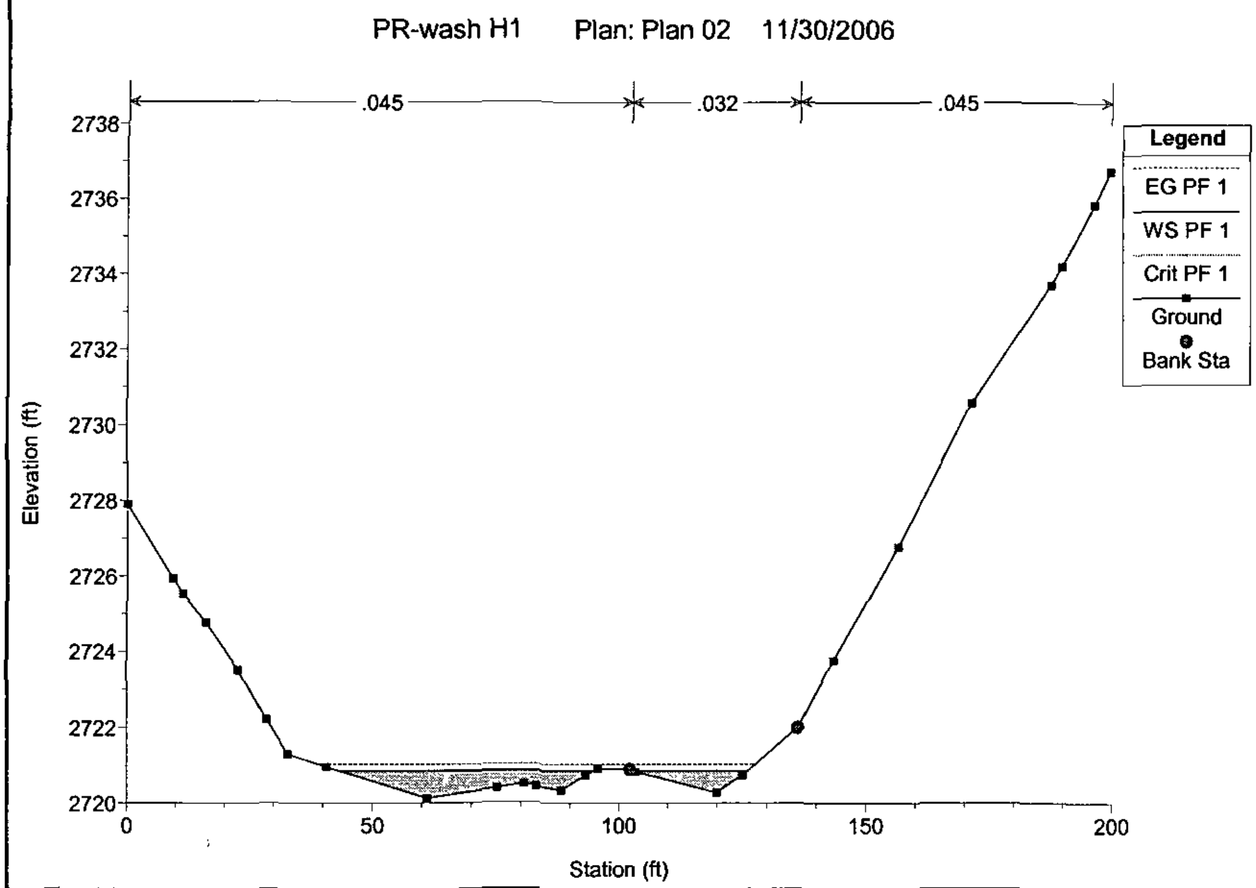
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

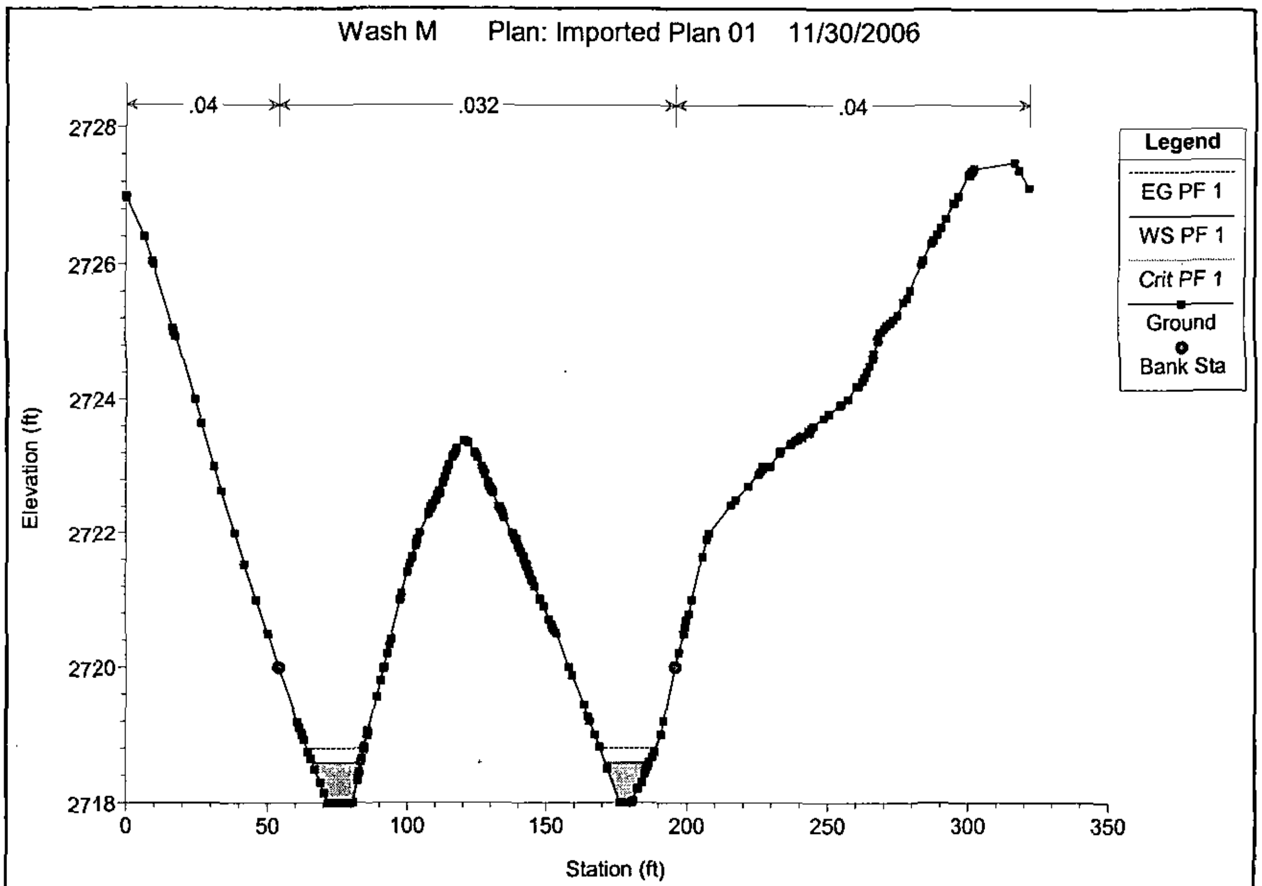


PR-wash H1 Plan: Plan 02 11/30/2006
.045
.032
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

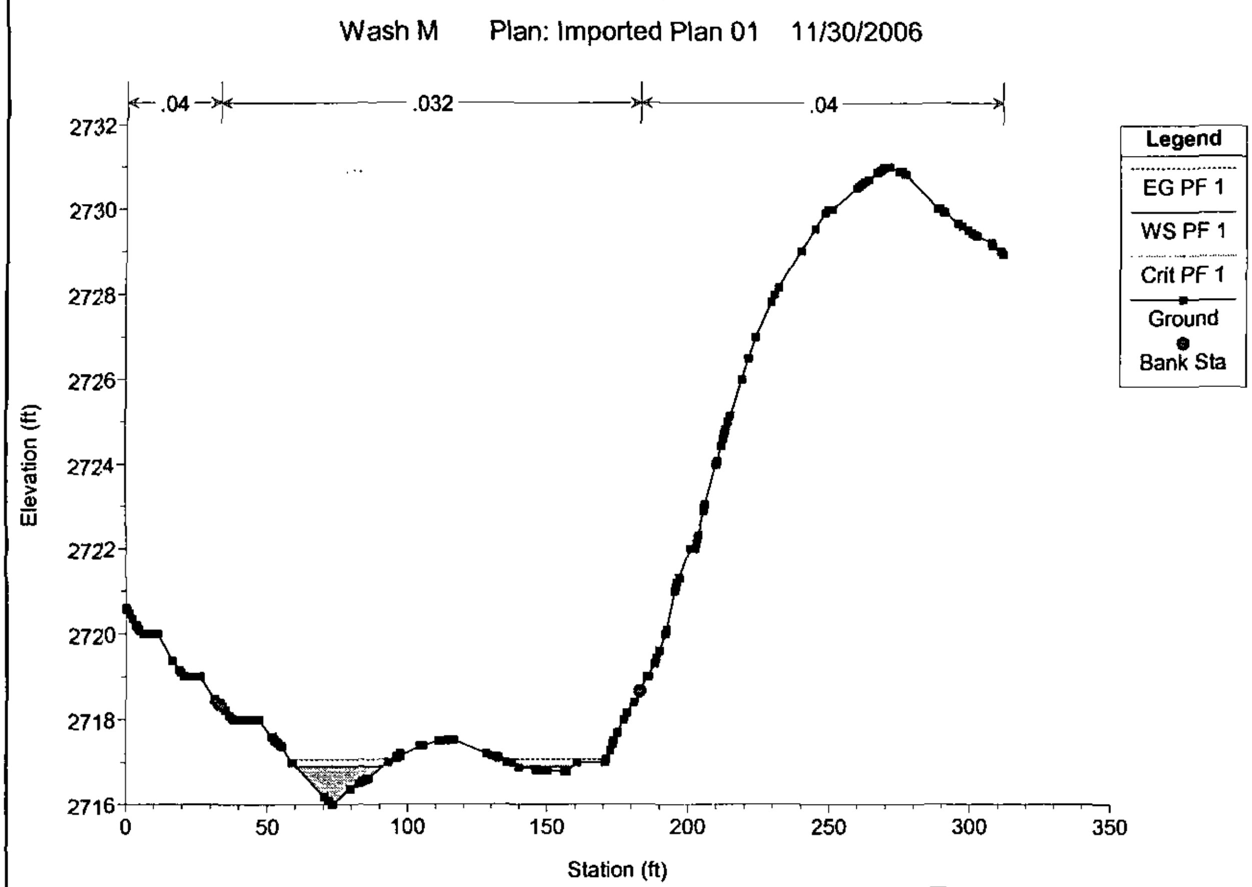
WASH M DEVELOPED

HEC-RAS Plan: Imported Pla River: RIVER-1 Reach: Reach-1 Profile: PF 1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	3	PF 1	50.00	2718.00	2718.59	2718.59	2718.80	0.020606	3.69	13.55	32.76	1.01
Reach-1	2	PF 1	51.00	2716.00	2716.91	2716.91	2717.07	0.023781	3.26	15.64	50.85	1.04
Reach-1	1	PF 1	52.00	2715.00	2715.37	2715.37	2715.51	0.023315	3.00	17.32	62.76	1.01

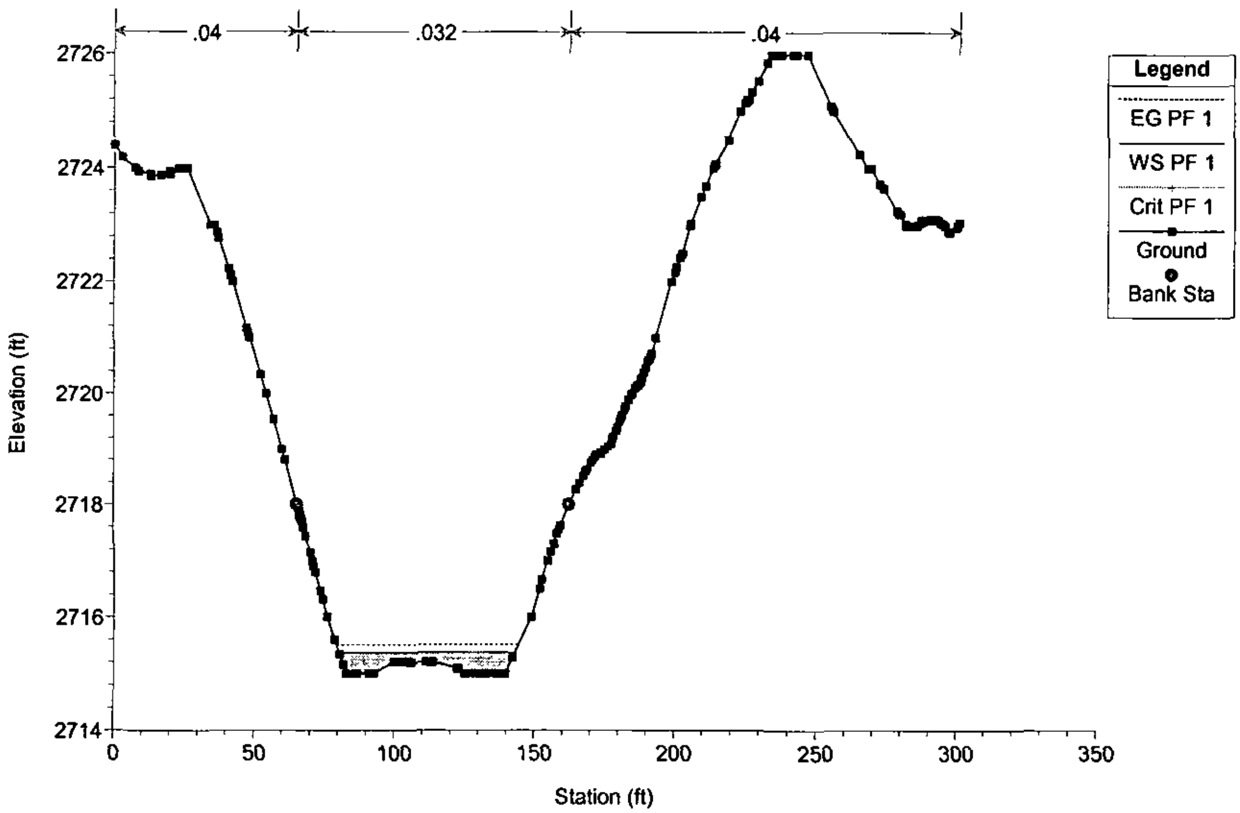


Wash M Plan: Imported Plan 01 11/30/2006
.04
.032
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
2718
2720
2722
2724
2726
2728
0
50
100
150
200
250
300
350



Wash M Plan: Imported Plan 01 11/30/2006
.04
.032
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
2716
2718
2720
2722
2724
2726
2728
2730
2732
0
50
100
150
200
250
300
350

Wash M Plan: Imported Plan 01 11/30/2006



Storage Rating Curves

WOOD/PATEL

CIVIL ENGINEERS * HYDROLOGISTS * LAND SURVEYORS * CONSTRUCTION MANAGERS

Project: *Sereno Canyon*
Location: *City of Scottsdale*
Reference: *Rectangular Weir Equation*

W/P#: *042054*
Date: *12/12/2006*

$$\boxed{Q = CLH^{3/2}}$$

Where:

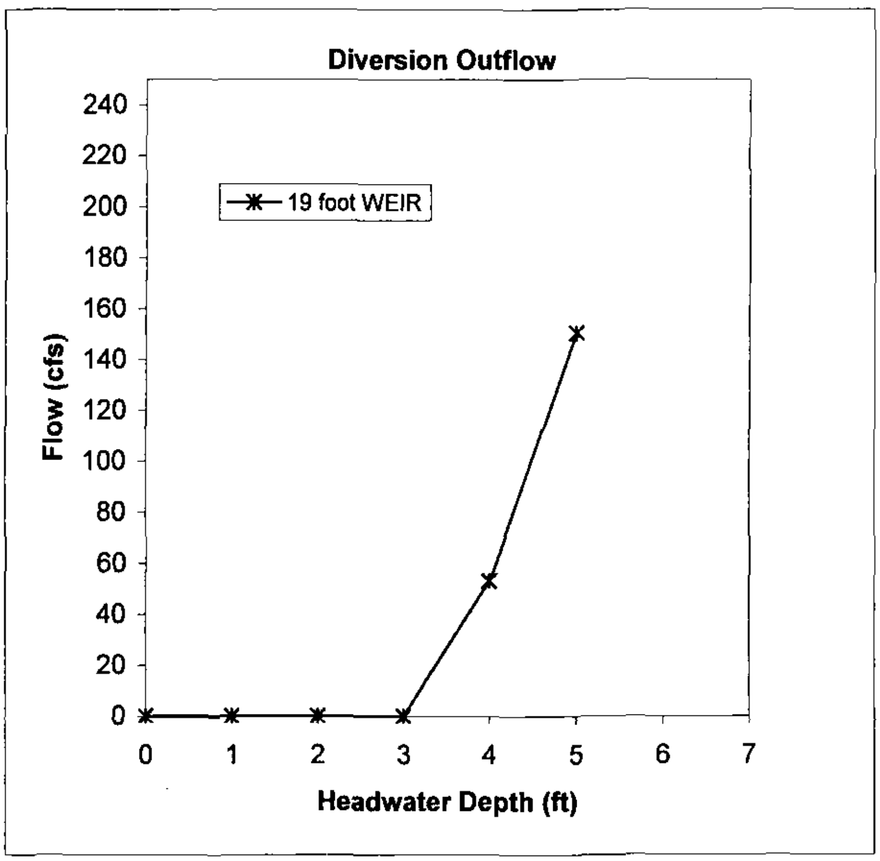
C = Weir Coefficient =	2.80	
L = Length of Weir =	10.00	ft
H = Head above Weir =	1.50	ft
Q = Weir Flow =	51.44	cfs

* The above equation is used to determine the rating curves for weir flow

Project: *Sereno Canyon* **W/P#:** *042054*
Location: *City of Scottsdale* **Date:** *12/12/2006*

Rating Curve for Diversion BAS E1-2

19	foot WEIR
Headwater Depth	Flow
ft	cfs
0	0
1	0
2	0
3	0
4	53
5	150



WOOD/PATEL

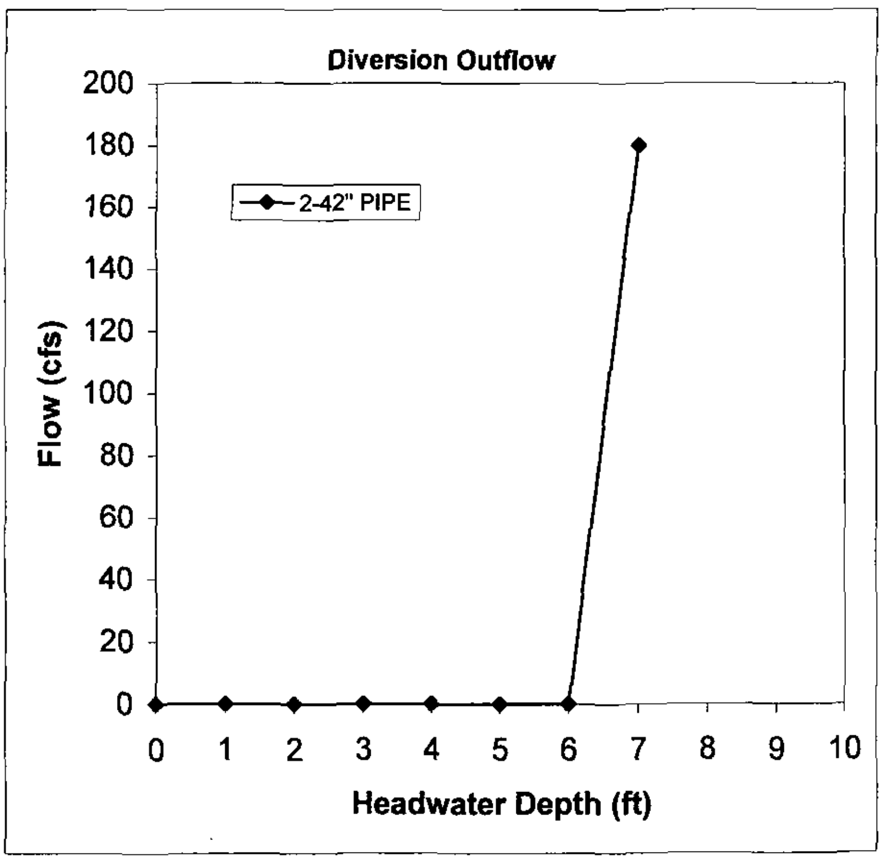
CIVIL ENGINEERS * HYDROLOGISTS * LAND SURVEYORS * CONSTRUCTION MANAGERS

Project: *Sereno Canyon Phase 1* **W/P#:** *062654*
Location: *City of Scottsdale* **Date:** *12/12/2006*

Rating Curve for Diversion BAS E2-1

* Rating curve based on HEC-5 Chart 2

2-42" PIPE	
Headwater Depth	Flow
ft	cfs
0	0
1	0
2	0
3	0
4	0
5	0
6	0
7	180



WOOD/PATEL

CIVIL ENGINEERS * HYDROLOGISTS * LAND SURVEYORS * CONSTRUCTION MANAGERS

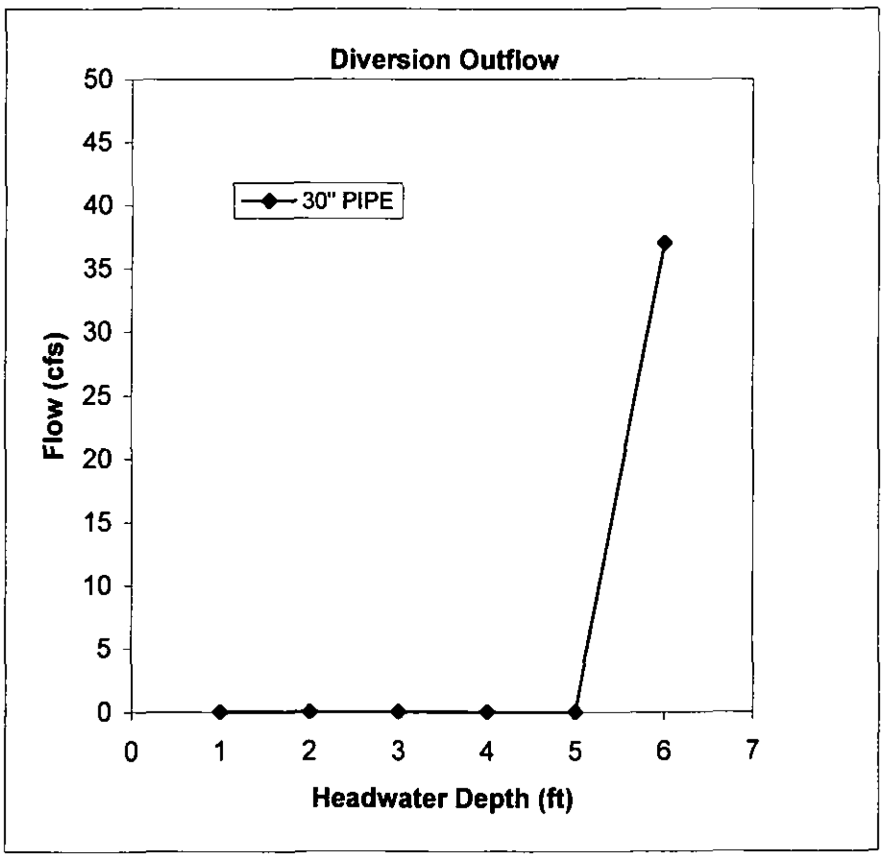
Project: *Sereno Canyon Phase 1* **W/P#:** *062654*

Location: *City of Scottsdale* **Date:** *12/12/2006*

Rating Curve for Diversion BAS F1-1

* Rating curve based on HEC-5 Chart 2

30" PIPE	
Headwater Depth	Flow
ft	cfs
0	0
1	0
2	0
3	0
4	37



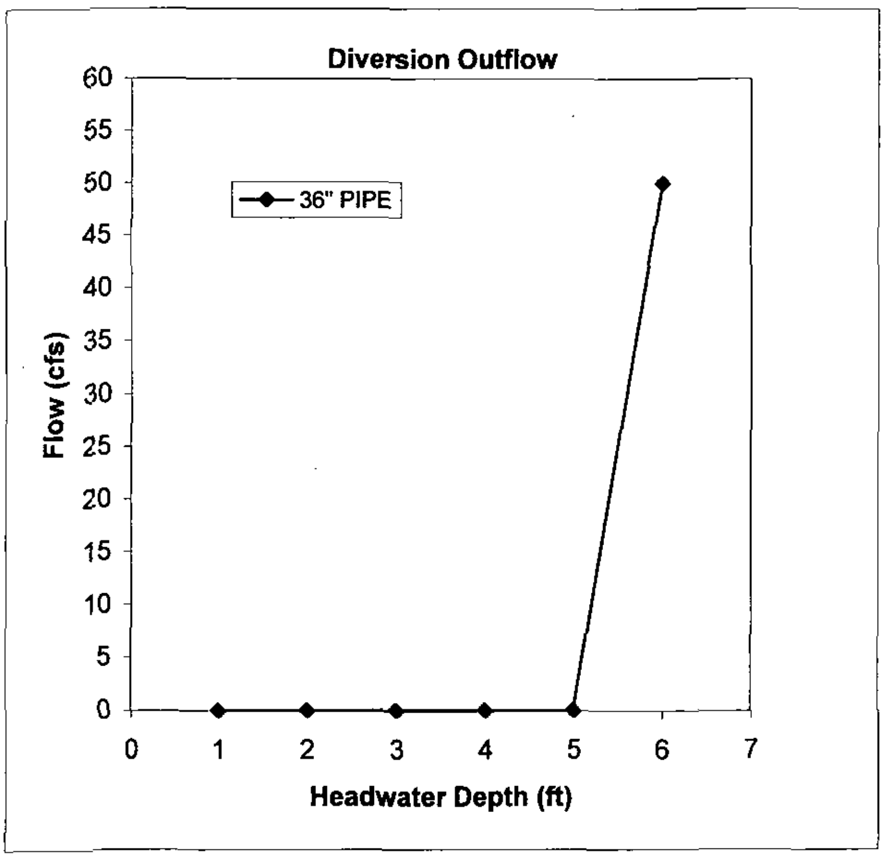
Project: *Sereno Canyon Phase 1* **W/P#:** *062654*

Location: *City of Scottsdale* **Date:** *12/12/2006*

Rating Curve for Diversion BAS F1-2

* Rating curve based on HEC-5 Chart 2

36" PIPE	
Headwater Depth	Flow
ft	cfs
0	0
1	0
2	0
3	0
4	50



WOOD/PATEL

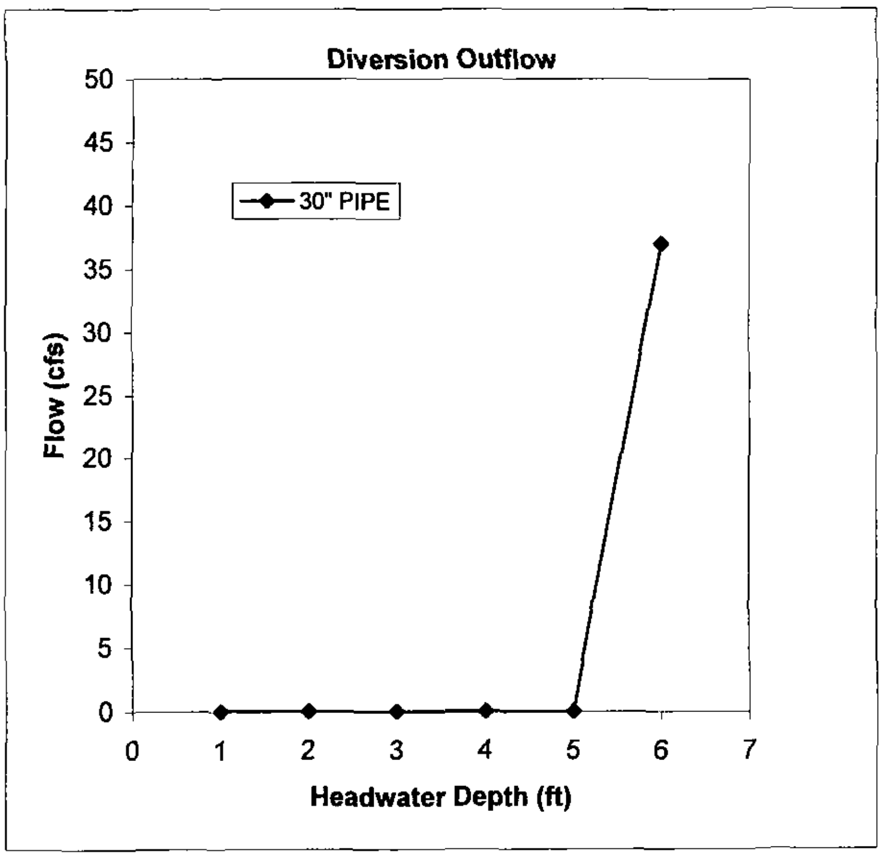
CIVIL ENGINEERS * HYDROLOGISTS * LAND SURVEYORS * CONSTRUCTION MANAGERS

Project: *Sereno Canyon Phase 1* **W/P#:** *062654*
Location: *City of Scottsdale* **Date:** *12/12/2006*

Rating Curve for Diversion BAS F1-3

* Rating curve based on HEC-5 Chart 2

30" PIPE	
Headwater Depth	Flow
ft	cfs
0	0
1	0
2	0
3	0
4	37
5	45



WOOD/PATEL

CIVIL ENGINEERS * HYDROLOGISTS * LAND SURVEYORS * CONSTRUCTION MANAGERS

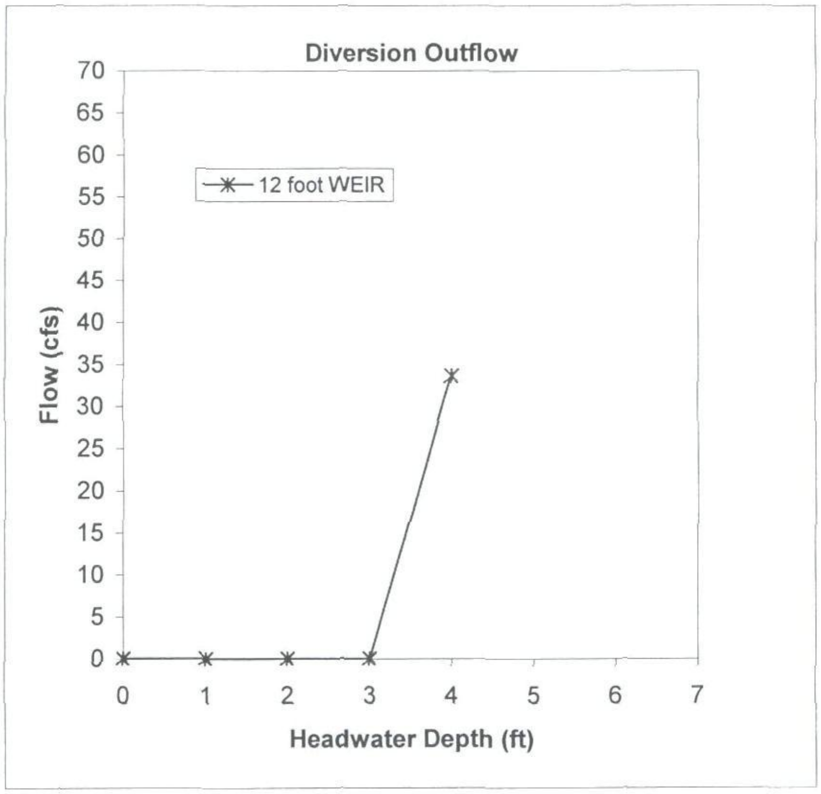
Project: *Sereno Canyon Phase 1* **W/P#:** *062654*
Location: *City of Scottsdale* **Date:** *12/12/2006*

Rating Curve for Diversion BAS F1-4

WEIR EQUATION: $\boxed{Q = CLH^{\frac{3}{2}}}$

Q = Discharge in cfs
C= weir coefficient = 2.8
L= Length of the weir in ft
H= Headwater depth in ft

12	***foot* WEIR**
Headwater Depth	Flow
ft	cfs
0	0
1	0
2	0
3	0
4	34



WOOD/PATEL

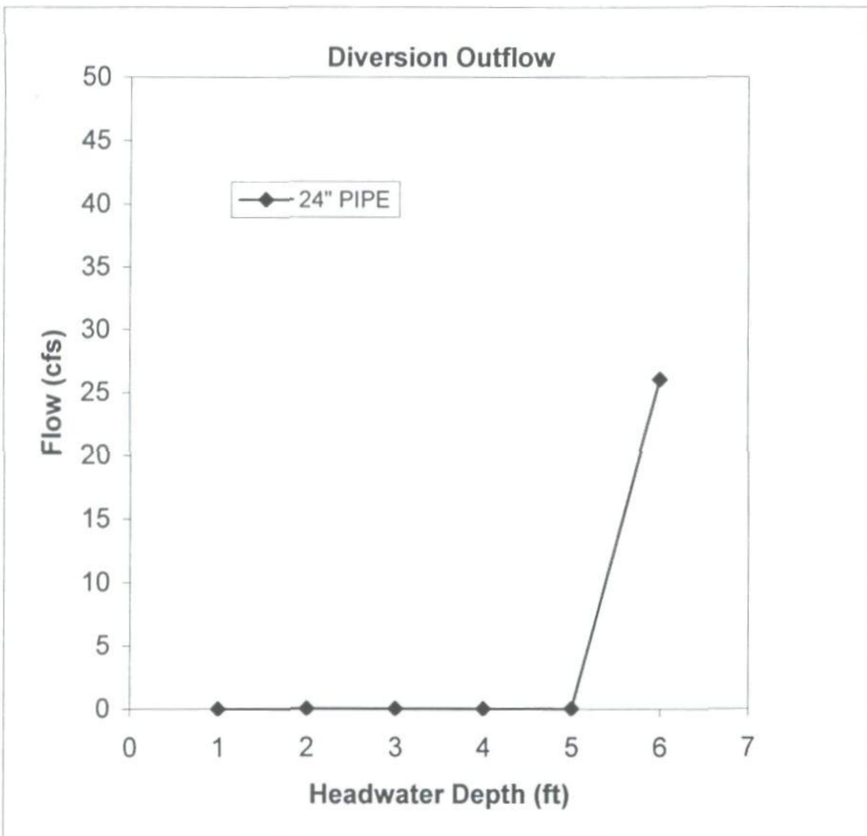
CIVIL ENGINEERS * HYDROLOGISTS * LAND SURVEYORS * CONSTRUCTION MANAGERS

Project: *Sereno Canyon Phase 1* **W/P#:** *062654*
Location: *City of Scottsdale* **Date:** *12/12/2006*

Rating Curve for Diversion BAS F2-1

* Rating curve based on HEC-5 Chart 2

24" PIPE	
Headwater Depth	Flow
ft	cfs
0	0
1	0
2	0
3	0
4	26



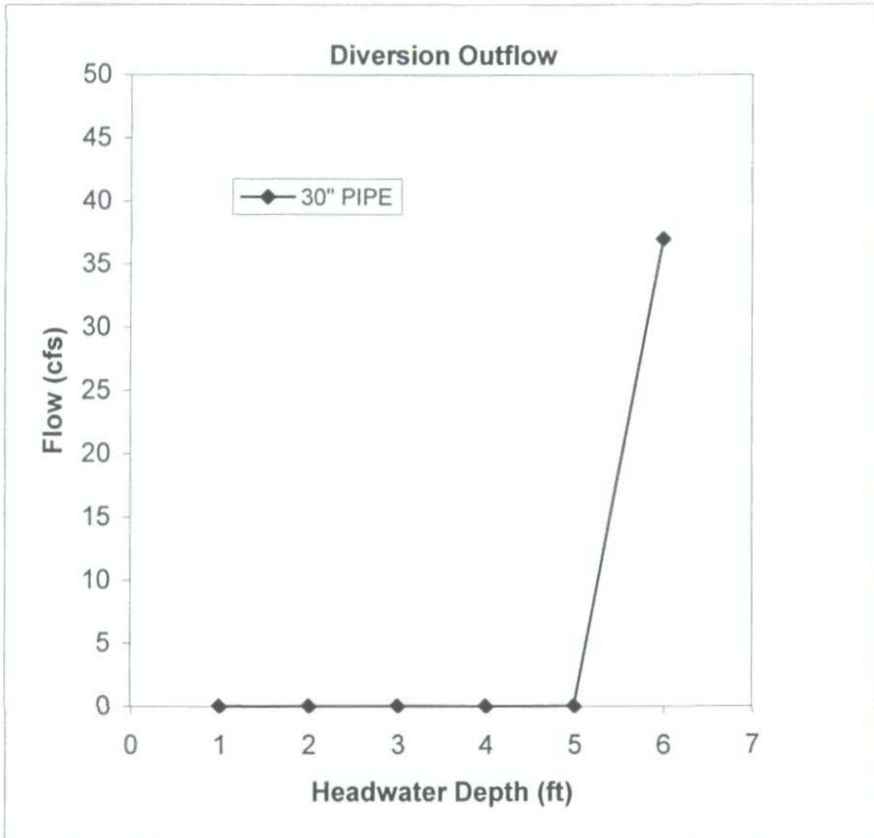
Project: *Sereno Canyon Phase 1* **W/P#:** *062654*

Location: *City of Scottsdale* **Date:** *12/12/2006*

Rating Curve for Diversion BAS F2-2

* Rating curve based on HEC-5 Chart 2

30" PIPE	
Headwater Depth	Flow
ft	cfs
0	0
1	0
2	0
3	0
4	37



WOOD/PATEL

CIVIL ENGINEERS * HYDROLOGISTS * LAND SURVEYORS * CONSTRUCTION MANAGERS

Project: *Sereno Canyon Phase 1* **W/P#:** *062654*

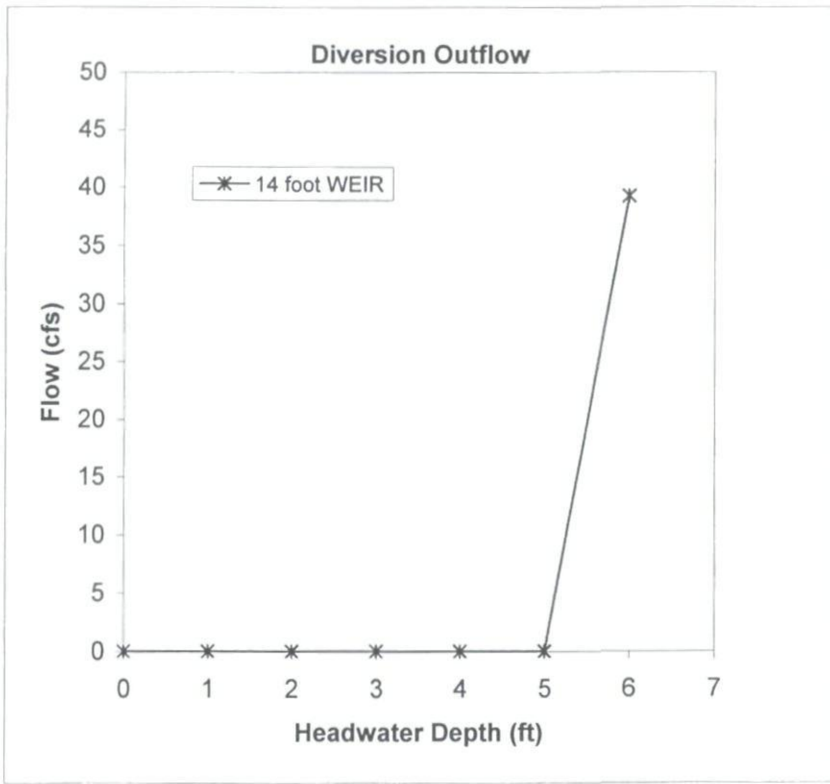
Location: *City of Scottsdale* **Date:** *12/12/2006*

Rating Curve for Diversion BAS F3-1

WEIR EQUATION: $\boxed{Q = CLH^{\frac{3}{2}}}$

Q = Discharge in cfs
C= weir coefficient = 2.8
L= Length of the weir in ft
H= Headwater depth in ft

14	foot WEIR
Headwater Depth	Flow
ft	cfs
0	0
1	0
2	0
3	0
4	0
5	0
6	39



WOOD/PATEL

CIVIL ENGINEERS * HYDROLOGISTS * LAND SURVEYORS * CONSTRUCTION MANAGERS

Project: *Sereno Canyon Phase 1* **W/P#:** *062654*

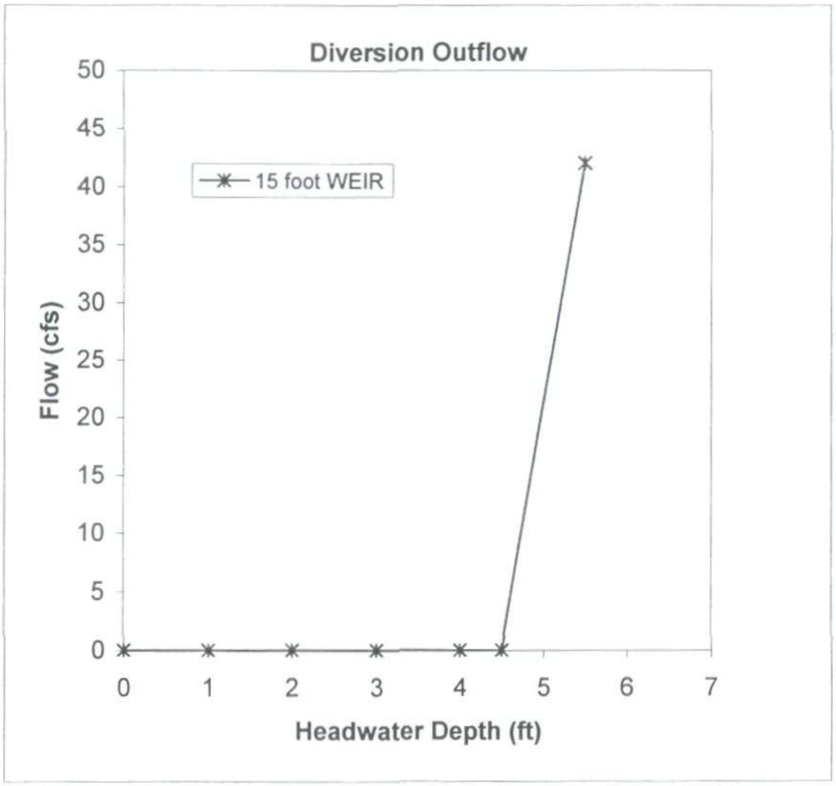
Location: *City of Scottsdale* **Date:** *12/12/2006*

Rating Curve for Diversion BAS G-1

WEIR EQUATION: $\boxed{Q = CLH^{\frac{3}{2}}}$

Q = Discharge in cfs
C= weir coefficient = 2.8
L= Length of the weir in ft
H= Headwater depth in ft

15	foot WEIR
Headwater Depth	Flow
ft	cfs
0	0
1	0
2	0
3	0
4	0
4.5	0
5.5	42



WOOD/PATEL

CIVIL ENGINEERS * HYDROLOGISTS * LAND SURVEYORS * CONSTRUCTION MANAGERS

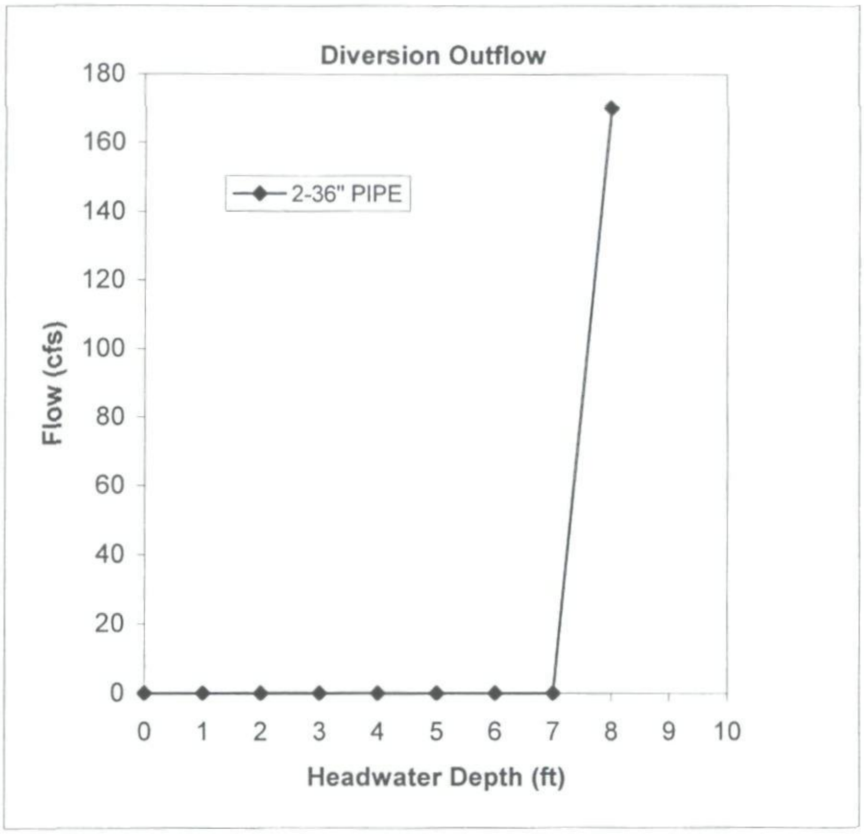
Project: *Sereno Canyon Phase 1* **W/P#:** *062654*

Location: City of Scottsdale **Date:** *12/12/2006*

Rating Curve for Diversion BAS H1-1

* Rating curve based on HEC-5 Chart 2

2-36" PIPE	
Headwater Depth	Flow
ft	cfs
0	0
1	0
2	0
3	0
4	0
5	0
6	0
7	0
8	170



WOOD/PATEL

CIVIL ENGINEERS * HYDROLOGISTS * LAND SURVEYORS * CONSTRUCTION MANAGERS

Project: *Sereno Canyon Phase 1* **W/P#:** *062654*

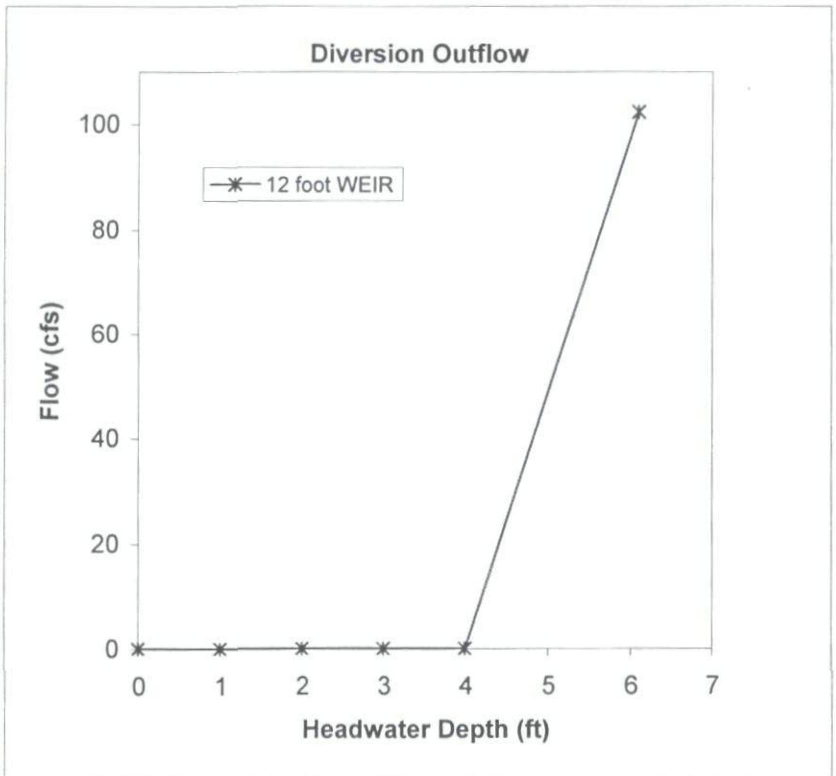
Location: *City of Scottsdale* **Date:** *12/12/2006*

Rating Curve for Diversion BAS H1-2

WEIR EQUATION: $\boxed{Q = CLH^{\frac{3}{2}}}$

Q = Discharge in cfs
C= weir coefficient = 2.8
L= Length of the weir in ft
H= Headwater depth in ft

12	foot WEIR
Headwater Depth	Flow
ft	cfs
0	0
1	0
2	0
3	0
4	0
6.1	102



Project: *Sereno Canyon Phase 1* **W/P#:** *062654*

Location: *City of Scottsdale* **Date:** *12/12/2006*

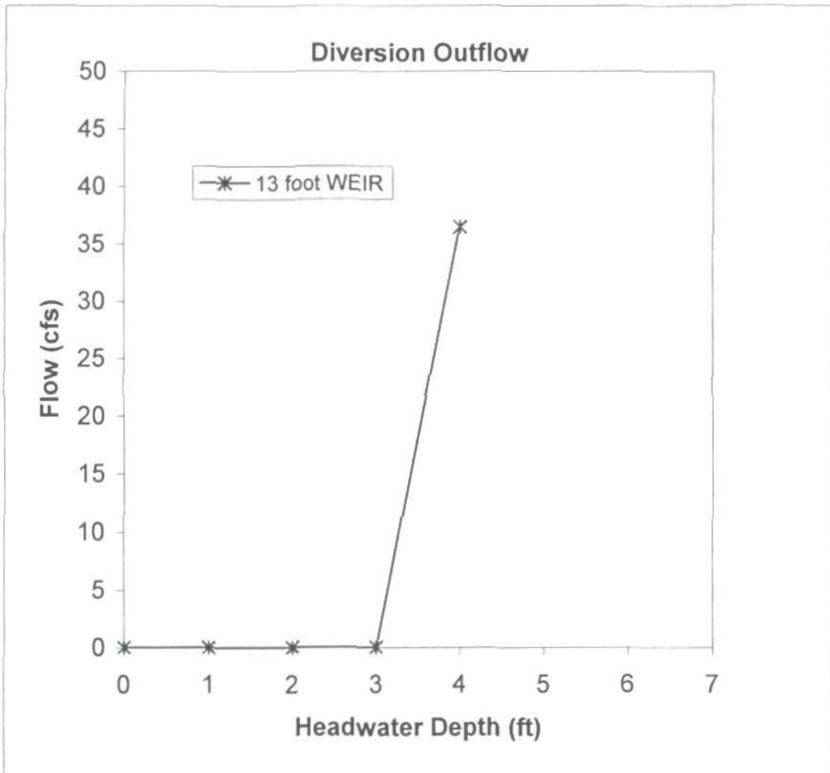
Rating Curve for Diversion BAS L

WEIR EQUATION:

$$\boxed{Q = CLH^{\frac{3}{2}}}$$

Q = Discharge in cfs
C= weir coefficient = 2.8
L= Length of the weir in ft
H= Headwater depth in ft

13	**foot WEIR**
Headwater Depth	Flow
ft	cfs
0	0
1	0
2	0
3	0
4	36



WOOD/PATEL

CIVIL ENGINEERS * HYDROLOGISTS * LAND SURVEYORS * CONSTRUCTION MANAGERS

Project: *Sereno Canyon Phase 1* **W/P#:** *062654*

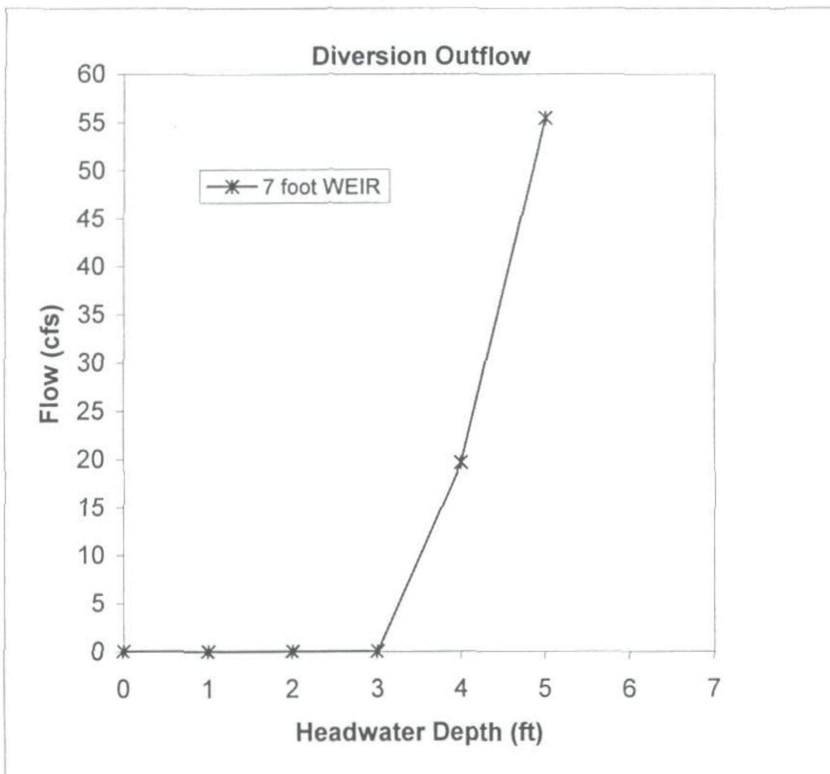
Location: *City of Scottsdale* **Date:** *12/12/2006*

Rating Curve for Diversion BAS M

WEIR EQUATION: $\boxed{Q = CLH^{\frac{3}{2}}}$

Q = Discharge in cfs
C= *weir coefficient* = 2.8
L= Length of the weir in ft
H= Headwater depth in ft

7	**foot WEIR**
Headwater Depth	Flow
ft	cfs
0	0
1	0
2	0
3	0
4	20
5	55



WOOD/PATEL

CIVIL ENGINEERS * HYDROLOGISTS * LAND SURVEYORS * CONSTRUCTION MANAGERS

Project: *Sereno Canyon Phase 1* **W/P#:** *062654*

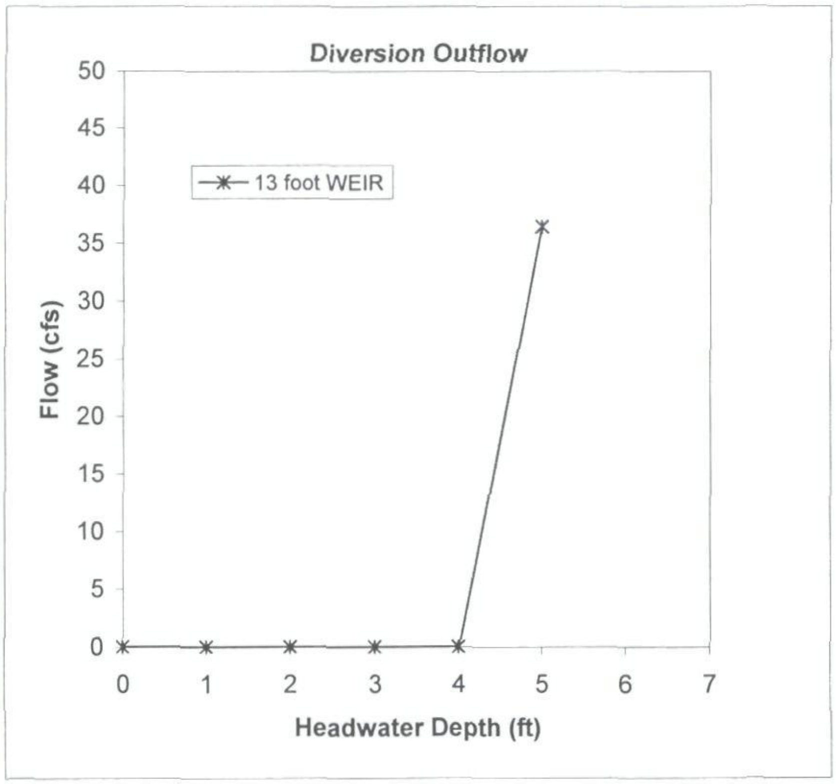
Location: *City of Scottsdale* **Date:** *12/12/2006*

Rating Curve for Diversion BAS N

WEIR EQUATION: $\boxed{Q = CLH^{\frac{3}{2}}}$

Q = Discharge in cfs
C= weir coefficient = 2.8
L= Length of the weir in ft
H= Headwater depth in ft

13	foot WEIR
Headwater Depth	Flow
ft	cfs
0	0
1	0
2	0
3	0
4	0
5	36



Culvert Summary/HY8 Output Files

Project: *SERENO CANYON PHASE 1*
Location: City of Scottsdale
Date: 05-Feb-07

Project Number: 062654
Project Engineer: Geoff Brownell,P.E

CULVERT MODELING SUMMARY TABLE

							HY8 CULVERT MODELING			RIP RAP					
Structure ID	Sturcutre ID per Plan	Culvert Size	Max Flow Width (ft)	HEC-1 ID	Design Q_{100} (cfs)	HEC-1 Design Headwater Elevation(ft)	Design Headwater Elevation (ft)	Tailwater Depth (ft)	Exit Velocity (ft/s)	Minimum D_{50} (in)	Design D_{50} (in)	Apron Length (ft)	Min Apron Width (ft)	Max Apron Width (ft)	Thickness (in)
A**	SD-010-A	1-24" CMP	2.0	H1b	15	NA	2734.75	1.25	6.24	3.21	9	8	5	8	18
B*	SD-010-B	2-36" CMP	6.0	B-H1-1	91	2745.6	2739.22	1.33	8.25	5.50	9	11	11	11	18
C	SD-010-C	1-24" CMP	2.0	NA	14	NA	2758.07	0.41	7.54	4.64	9	7	4	8	18
D	SD-020-D	1-18" CMP	1.5	NA	8	NA	2753.79	0.39	5.79	2.75	9	7	5	9	18
E	SD-020-E	1-24" CMP	2.0	NA	12	NA	2746.85	0.48	7.26	4.32	9	11	4	8	18
F	SD-020-F	1-24" CMP	2.0	NA	10	NA	2741.64	0.44	6.15	3.12	9	8	4	8	18
G	SD-020-G	1-18" CMP	1.5	NA	8	NA	2734.58	1.52	4.53	1.52	9	4	5	7	18
H	SD-020-H	1-24" CMP	2.0	NA	12	NA	2734.16	0.49	5.85	2.81	9	7	6	10	18
I*	SD-020-I	1-30" CMP	2.5	B-F1-1	30	2728.5	2729.26	0.66	7.68	4.80	9	9	8	11	18
J	SD-020-J	1-18" CMP	1.5	NA	1	NA	2707.27	0.12	2.97	NA	9	2	2	4	18
K*	SD-020-K	1-24" CMP	2.0	B-F2-1	15	2703.3	2704.25	1.84	8.49	5.80	9	27	5	8	18
L*	SD-030-L	2-42" CMP	8.0	B-E2-1	138	2702.8	2698.80	1.62	9.05	6.54	9	13	15	14	18
M*	SD-030-M	1-36" CMP	2.5	B-F1-3	45	2699.8	2700.05	0.95	9.67	7.40	9	19	7	11	18
N	SD-050-N	1-30" CMP	2.5	NA	17	NA	2719.59	1.08	6.07	3.04	9	10	8	11	18
O	SD-050-O	1-30" CMP	2.5	NA	28	NA	2724.87	0.68	7.39	4.47	9	8	6	8	18
P	SD-050-P	1-18" CMP	1.5	NA	8	NA	2726.35	0.39	5.79	2.75	9	7	6	6	18
Q	SD-050-Q	1-18" CMP	1.5	NA	8	NA	2726.75	0.39	5.79	2.75	9	7	4	6	18
R	SD-050-R	1-18" CMP	1.5	NA	1	NA	NA	NA	NA	NA	9	2	2	4	18
S*	SD-060-S	1-24" CMP	2.0	B-F2-2	21	2684.5	2685.64	1.95	6.77	3.77	9	16	6	10	18
T	SD-070-T	1-24" CMP	2.0	NA	12	NA	2745.36	0.44	6.48	3.46	9	7	4	7	18
U	SD-080-U	1-24" CMP	2.0	NA	13	NA	2739.43	0.45	6.06	3.02	9	6	6	9	18
V	SD-080-V	1-18" CMP	1.5	NA	5	NA	2744.59	0.20	4.79	1.77	9	4	5	7	18
W	SD-090-W	1-18" CMP	1.5	NA	2	NA	2748.21	0.18	7.10	4.14	9	9	2	6	18
X*	SD-100-X	1-36" CMP	3.0	B-F1-2	44	2711.8	2712.88	0.94	8.10	5.31	9	13	9	11	18
Y	SD-100-Y	1-24" CMP	2.0	NA	14	NA	2706.61	0.53	6.24	3.21	9	8	6	9	18
1.0	SD-1	2-22.5"x36.25" RGRCP	3.8	B-H1-2	98	2726.1	2727.22	10.25	9.98	7.86	9	44	7	8	18

Notes:

1) ** Structures modeled in HEC-1. Design headwater per plan refers to ponding elevation calculated by HEC-1.*

2) *Structures modeled using flows from Rational Method.*

CURRENT DATE: 09-08-2006
CURRENT TIME: 10:10:02

FILE DATE: 09-08-2006
FILE NAME: A

FHWA CULVERT ANALYSIS
HY-8, VERSION 6.1

CULV NO.	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
	INLET ELEV. (ft)	OUTLET ELEV. (ft)	CULVERT LENGTH (ft)	BARRELS SHAPE MATERIAL	SPAN (ft)	RISE (ft)	MANNING n	INLET TYPE
1	2732.50	2728.00	127.08	1 CSP	2.00	2.00	.032	CONVENTIONAL
2								
3								
4								
5								
6								

SUMMARY OF CULVERT FLOWS (cfs) FILE: A DATE: 09-08-2006

ELEV (ft)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
2732.50	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2733.05	1.4	1.4	0.0	0.0	0.0	0.0	0.0	0.00	1
2733.27	2.8	2.8	0.0	0.0	0.0	0.0	0.0	0.00	1
2733.47	4.2	4.2	0.0	0.0	0.0	0.0	0.0	0.00	1
2733.64	5.6	5.6	0.0	0.0	0.0	0.0	0.0	0.00	1
2733.81	7.0	7.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2733.97	8.4	8.4	0.0	0.0	0.0	0.0	0.0	0.00	1
2734.12	9.8	9.8	0.0	0.0	0.0	0.0	0.0	0.00	1
2734.27	11.2	11.2	0.0	0.0	0.0	0.0	0.0	0.00	1
2734.43	12.6	12.6	0.0	0.0	0.0	0.0	0.0	0.00	1
2734.75	14.0	14.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2735.20	18.4	18.4	0.0	0.0	0.0	0.0	0.0	OVERTOPPING	

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: A DATE: 09-08-2006

HEAD ELEV (ft)	HEAD ERROR (ft)	TOTAL FLOW (cfs)	FLOW ERROR (cfs)	% FLOW ERROR
2732.50	0.000	0.00	0.00	0.00
2733.05	0.000	1.40	0.00	0.00
2733.27	0.000	2.80	0.00	0.00
2733.47	0.000	4.20	0.00	0.00
2733.64	0.000	5.60	0.00	0.00
2733.81	0.000	7.00	0.00	0.00
2733.97	0.000	8.40	0.00	0.00
2734.12	0.000	9.80	0.00	0.00
2734.27	0.000	11.20	0.00	0.00
2734.43	0.000	12.60	0.00	0.00
2734.75	0.000	14.00	0.00	0.00

<1> TOLERANCE (ft) = 0.010 <2> TOLERANCE (%) = 1.000

CURRENT DATE: 09-08-2006 FILE DATE: 09-08-2006
CURRENT TIME: 10:10:02 FILE NAME: A

PERFORMANCE CURVE FOR CULVERT 1 - 1(2.00 (ft) BY 2.00 (ft)) CSP

DIS-CHARGE FLOW (cfs)	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRIT. DEPTH (ft)	OUTLET DEPTH (ft)	TW DEPTH (ft)	OUTLET VEL. (fps)	TW VEL. (fps)
0.00	2732.50	0.00	0.00	0-NF	0.00	0.00	0.00	0.90	0.00	0.00
1.40	2733.05	0.55	0.55	1-S2n	0.38	0.41	0.31	0.99	4.44	2.03
2.80	2733.27	0.77	0.77	1-S2n	0.54	0.58	0.48	1.04	4.78	2.62
4.20	2733.46	0.96	0.96	1-S2n	0.67	0.71	0.61	1.08	5.15	3.03
5.60	2733.64	1.14	1.14	1-S2n	0.78	0.83	0.63	1.11	6.60	3.35
7.00	2733.81	1.31	1.31	1-S2n	0.88	0.93	0.73	1.14	6.67	3.61
8.40	2733.96	1.46	1.46	1-S2n	0.98	1.03	0.97	1.16	5.56	3.85
9.80	2734.12	1.62	1.62	1-S2n	1.08	1.12	1.02	1.19	6.12	4.05
11.20	2734.27	1.77	1.77	1-S2n	1.17	1.20	1.10	1.21	6.33	4.23
12.60	2734.43	1.93	1.93	1-S2n	1.27	1.27	1.17	1.23	6.59	4.40
14.00	2734.75	2.09	2.25	2-M2c	1.36	1.34	1.34	1.25	6.24	4.55

El. inlet face invert 2732.50 ft El. outlet invert 2728.00 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

***** SITE DATA ***** CULVERT INVERT **************

INLET STATION	0.00 ft
INLET ELEVATION	2732.50 ft
OUTLET STATION	127.00 ft
OUTLET ELEVATION	2728.00 ft
NUMBER OF BARRELS	1
SLOPE (V/H)	0.0354
CULVERT LENGTH ALONG SLOPE	127.08 ft

***** CULVERT DATA SUMMARY ************************

BARREL SHAPE	CIRCULAR
BARREL DIAMETER	2.00 ft
BARREL MATERIAL	CORRUGATED ALUMINUM
BARREL MANNING'S n	0.032
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	SQUARE EDGE WITH HEADWALL
INLET DEPRESSION	NONE

CURRENT DATE: 09-08-2006
CURRENT TIME: 10:10:02

FILE DATE: 09-08-2006
FILE NAME: A

TAILWATER

******* REGULAR CHANNEL CROSS SECTION ****************

BOTTOM WIDTH	7.00 ft
SIDE SLOPE H/V (X:1)	5.0
CHANNEL SLOPE V/H (ft/ft)	0.050
MANNING'S n (.01-0.1)	0.032
CHANNEL INVERT ELEVATION	2728.90 ft
CULVERT NO.1 OUTLET INVERT ELEVATION	2728.00 ft

******* UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

FLOW (cfs)	W.S.E. (ft)	FROUDE NUMBER	DEPTH (ft)	VEL. (f/s)	SHEAR (psf)
0.00	2728.90	0.000	0.00	0.00	0.00
1.40	2728.99	1.179	0.09	2.03	0.29
2.80	2729.04	1.239	0.14	2.62	0.43
4.20	2729.08	1.272	0.18	3.03	0.55
5.60	2729.11	1.293	0.21	3.35	0.65
7.00	2729.14	1.309	0.24	3.61	0.74
8.40	2729.16	1.323	0.26	3.85	0.82
9.80	2729.19	1.333	0.29	4.05	0.89
11.20	2729.21	1.341	0.31	4.23	0.97
12.60	2729.23	1.348	0.33	4.40	1.03
14.00	2729.25	1.354	0.35	4.55	1.10

ROADWAY OVERTOPPING DATA

ROADWAY SURFACE	PAVED
EMBANKMENT TOP WIDTH	35.00 ft
CREST LENGTH	50.00 ft
OVERTOPPING CREST ELEVATION	2735.20 ft

URRENT DATE: 11-27-2006
URRENT TIME: 17:14:15

FILE DATE: 11-27-2006
FILE NAME: B

FHWA CULVERT ANALYSIS
HY-8, VERSION 6.1

CULV NO.	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
	INLET ELEV. (ft)	OUTLET ELEV. (ft)	CULVERT LENGTH (ft)	BARRELS SHAPE MATERIAL	SPAN (ft)	RISE (ft)	MANNING n	INLET TYPE
1	2735.50	2732.00	125.55	2 CSP	3.00	3.00	.032	CONVENTIONAL
2								
3								
4								
5								
6								

UMMARY OF CULVERT FLOWS (cfs) FILE: B DATE: 11-27-2006

ELEV (ft)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
2735.50	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2736.40	9.1	9.1	0.0	0.0	0.0	0.0	0.0	0.00	1
2736.77	18.2	18.2	0.0	0.0	0.0	0.0	0.0	0.00	1
2737.10	27.3	27.3	0.0	0.0	0.0	0.0	0.0	0.00	1
2737.41	36.4	36.4	0.0	0.0	0.0	0.0	0.0	0.00	1
2737.69	45.5	45.5	0.0	0.0	0.0	0.0	0.0	0.00	1
2737.96	54.6	54.6	0.0	0.0	0.0	0.0	0.0	0.00	1
2738.49	63.7	63.7	0.0	0.0	0.0	0.0	0.0	0.00	1
2738.72	72.8	72.8	0.0	0.0	0.0	0.0	0.0	0.00	1
2738.96	81.9	81.9	0.0	0.0	0.0	0.0	0.0	0.00	1
2739.22	91.0	91.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2742.50	121.5	121.5	0.0	0.0	0.0	0.0	0.0	OVERTOPPING	

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: B DATE: 11-27-2006

HEAD ELEV (ft)	HEAD ERROR (ft)	TOTAL FLOW (cfs)	FLOW ERROR (cfs)	% FLOW ERROR
2735.50	0.000	0.00	0.00	0.00
2736.40	0.000	9.10	0.00	0.00
2736.77	0.000	18.20	0.00	0.00
2737.10	0.000	27.30	0.00	0.00
2737.41	0.000	36.40	0.00	0.00
2737.69	0.000	45.50	0.00	0.00
2737.96	0.000	54.60	0.00	0.00
2738.49	0.000	63.70	0.00	0.00
2738.72	0.000	72.80	0.00	0.00
2738.96	0.000	81.90	0.00	0.00
2739.22	0.000	91.00	0.00	0.00

<1> TOLERANCE (ft) = 0.010   <2> TOLERANCE (%) = 1.000

CURRENT DATE: 11-27-2006
CURRENT TIME: 17:14:15

FILE DATE: 11-27-2006
FILE NAME: B

PERFORMANCE CURVE FOR CULVERT 1 - 2(3.00 (ft) BY 3.00 (ft)) CSP

DIS-CHARGE FLOW (cfs)	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRIT. DEPTH (ft)	OUTLET DEPTH (ft)	TW DEPTH (ft)	OUTLET VEL. (fps)	TW VEL. (fps)
0.00	2735.50	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	0.00
9.10	2736.40	0.90	0.90	1-S2n	0.64	0.66	0.56	0.42	4.97	3.07
18.20	2736.77	1.27	1.27	1-S2n	0.91	0.95	0.85	0.60	5.53	3.76
27.30	2737.10	1.60	1.60	1-S2n	1.12	1.17	1.07	0.74	6.00	4.22
36.40	2737.40	1.90	1.90	1-S2n	1.32	1.36	1.26	0.86	6.47	4.56
45.50	2737.68	2.18	2.18	1-S2n	1.50	1.53	1.43	0.96	6.83	4.85
54.60	2737.96	2.46	2.46	1-S2n	1.68	1.68	1.58	1.05	7.22	5.09
63.70	2738.49	2.73	2.99	2-M2c	1.86	1.83	1.83	1.13	7.06	5.31
72.80	2738.72	3.00	3.22	2-M2c	2.04	1.96	1.96	1.20	7.47	5.50
81.90	2738.96	3.29	3.46	2-M2c	2.24	2.08	2.08	1.27	7.82	5.68
91.00	2739.22	3.60	3.72	2-M2c	2.49	2.19	2.19	1.33	8.25	5.84

El. inlet face invert 2735.50 ft   El. outlet invert 2732.00 ft
El. inlet throat invert 0.00 ft   El. inlet crest 0.00 ft

**** SITE DATA ***** CULVERT INVERT **************

INLET STATION	0.00 ft
INLET ELEVATION	2735.50 ft
OUTLET STATION	125.50 ft
OUTLET ELEVATION	2732.00 ft
NUMBER OF BARRELS	2
SLOPE (V/H)	0.0279
CULVERT LENGTH ALONG SLOPE	125.55 ft

***** CULVERT DATA SUMMARY ************************

BARREL SHAPE	CIRCULAR
BARREL DIAMETER	3.00 ft
BARREL MATERIAL	CORRUGATED ALUMINUM
BARREL MANNING'S n	0.032
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	SQUARE EDGE WITH HEADWALL
INLET DEPRESSION	NONE

CURRENT DATE: 11-27-2006
CURRENT TIME: 17:14:15

FILE DATE: 11-27-2006
FILE NAME: B

TAILWATER

******* REGULAR CHANNEL CROSS SECTION ****************

BOTTOM WIDTH	5.00 ft
SIDE SLOPE H/V (X:1)	5.0
CHANNEL SLOPE V/H (ft/ft)	0.020
MANNING'S n (.01-0.1)	0.032
CHANNEL INVERT ELEVATION	2732.00 ft
CULVERT NO.1 OUTLET INVERT ELEVATION	2732.00 ft

******* UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

FLOW (cfs)	W.S.E. (ft)	FROUDE NUMBER	DEPTH (ft)	VEL. (f/s)	SHEAR (psf)
0.00	2732.00	0.000	0.00	0.00	0.00
9.10	2732.42	0.837	0.42	3.07	0.52
18.20	2732.60	0.853	0.60	3.76	0.75
27.30	2732.74	0.862	0.74	4.22	0.93
36.40	2732.86	0.868	0.86	4.56	1.07
45.50	2732.96	0.873	0.96	4.85	1.20
54.60	2733.05	0.878	1.05	5.09	1.31
63.70	2733.13	0.881	1.13	5.31	1.41
72.80	2733.20	0.884	1.20	5.50	1.50
81.90	2733.27	0.887	1.27	5.68	1.59
91.00	2733.33	0.890	1.33	5.84	1.67

ROADWAY OVERTOPPING DATA

ROADWAY SURFACE	PAVED
EMBANKMENT TOP WIDTH	20.00 ft
CREST LENGTH	50.00 ft
OVERTOPPING CREST ELEVATION	2742.50 ft

CURRENT DATE: 09-03-2006
CURRENT TIME: 13:48:45

FILE DATE: 09-03-2006
FILE NAME: C

FHWA CULVERT ANALYSIS
HY-8, VERSION 6.1

CULV NO.	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
	INLET ELEV. (ft)	OUTLET ELEV. (ft)	CULVERT LENGTH (ft)	BARRELS SHAPE MATERIAL	SPAN (ft)	RISE (ft)	MANNING n	INLET TYPE
1	2756.00	2752.00	85.09	1 CSP	2.00	2.00	.032	CONVENTIONAL
2								
3								
4								
5								
6								

SUMMARY OF CULVERT FLOWS (cfs) FILE: C DATE: 09-03-2006

ELEV (ft)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
2756.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2756.54	1.4	1.4	0.0	0.0	0.0	0.0	0.0	0.00	1
2756.76	2.8	2.8	0.0	0.0	0.0	0.0	0.0	0.00	1
2756.95	4.2	4.2	0.0	0.0	0.0	0.0	0.0	0.00	1
2757.13	5.6	5.6	0.0	0.0	0.0	0.0	0.0	0.00	1
2757.30	7.0	7.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2757.45	8.4	8.4	0.0	0.0	0.0	0.0	0.0	0.00	1
2757.61	9.8	9.8	0.0	0.0	0.0	0.0	0.0	0.00	1
2757.76	11.2	11.2	0.0	0.0	0.0	0.0	0.0	0.00	1
2757.91	12.6	12.6	0.0	0.0	0.0	0.0	0.0	0.00	1
2758.07	14.0	14.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2762.00	25.7	25.7	0.0	0.0	0.0	0.0	0.0	OVERTOPPING	

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: C DATE: 09-03-2006

HEAD ELEV (ft)	HEAD ERROR (ft)	TOTAL FLOW (cfs)	FLOW ERROR (cfs)	% FLOW ERROR
2756.00	0.000	0.00	0.00	0.00
2756.54	0.000	1.40	0.00	0.00
2756.76	0.000	2.80	0.00	0.00
2756.95	0.000	4.20	0.00	0.00
2757.13	0.000	5.60	0.00	0.00
2757.30	0.000	7.00	0.00	0.00
2757.45	0.000	8.40	0.00	0.00
2757.61	0.000	9.80	0.00	0.00
2757.76	0.000	11.20	0.00	0.00
2757.91	0.000	12.60	0.00	0.00
2758.07	0.000	14.00	0.00	0.00

<1> TOLERANCE (ft) = 0.010 <2> TOLERANCE (%) = 1.000

CURRENT DATE: 09-03-2006
CURRENT TIME: 13:48:45

FILE DATE: 09-03-2006
FILE NAME: C

PERFORMANCE CURVE FOR CULVERT 1 - 1(2.00 (ft) BY 2.00 (ft)) CSP

DIS-CHARGE FLOW (cfs)	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRIT. DEPTH (ft)	OUTLET DEPTH (ft)	TW DEPTH (ft)	OUTLET VEL. (fps)	TW VEL. (fps)
0.00	2756.00	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	0.00
1.40	2756.54	0.54	0.54	1-S2n	0.35	0.41	0.21	0.11	8.57	2.25
2.80	2756.76	0.76	0.76	1-S2n	0.50	0.58	0.38	0.17	6.67	2.87
4.20	2756.95	0.95	0.95	1-S2n	0.62	0.71	0.51	0.21	6.53	3.29
5.60	2757.13	1.13	1.13	1-S2n	0.72	0.83	0.63	0.25	6.60	3.62
7.00	2757.30	1.30	1.30	1-S2n	0.82	0.93	0.73	0.28	6.67	3.88
8.40	2757.45	1.45	1.45	1-S2n	0.90	1.03	0.83	0.31	6.82	4.11
9.80	2757.61	1.61	1.61	1-S2n	0.99	1.12	0.92	0.34	6.99	4.32
11.20	2757.76	1.76	1.76	1-S2n	1.07	1.20	1.00	0.36	7.13	4.50
12.60	2757.91	1.91	1.91	1-S2n	1.15	1.27	1.07	0.39	7.35	4.66
14.00	2758.07	2.07	2.07	5-S2n	1.23	1.34	1.14	0.41	7.54	4.82

El. inlet face invert 2756.00 ft El. outlet invert 2752.00 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

***** SITE DATA ***** CULVERT INVERT **************

INLET STATION	0.00 ft
INLET ELEVATION	2756.00 ft
OUTLET STATION	85.00 ft
OUTLET ELEVATION	2752.00 ft
NUMBER OF BARRELS	1
SLOPE (V/H)	0.0471
CULVERT LENGTH ALONG SLOPE	85.09 ft

***** CULVERT DATA SUMMARY ************************

BARREL SHAPE	CIRCULAR
BARREL DIAMETER	2.00 ft
BARREL MATERIAL	CORRUGATED ALUMINUM
BARREL MANNING'S n	0.032
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	SQUARE EDGE WITH HEADWALL
INLET DEPRESSION	NONE

CURRENT DATE: 09-03-2006
CURRENT TIME: 13:48:45

FILE DATE: 09-03-2006
FILE NAME: C

TAILWATER

******* REGULAR CHANNEL CROSS SECTION ****************

BOTTOM WIDTH	5.00 ft
SIDE SLOPE H/V (X:1)	5.0
CHANNEL SLOPE V/H (ft/ft)	0.050
MANNING'S n (.01-0.1)	0.032
CHANNEL INVERT ELEVATION	2752.00 ft
CULVERT NO.1 OUTLET INVERT ELEVATION	2752.00 ft

******* UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

FLOW (cfs)	W.S.E. (ft)	FROUDE NUMBER	DEPTH (ft)	VEL. (f/s)	SHEAR (psf)
0.00	2752.00	0.000	0.00	0.00	0.00
1.40	2752.11	1.187	0.11	2.25	0.35
2.80	2752.17	1.236	0.17	2.87	0.52
4.20	2752.21	1.263	0.21	3.29	0.66
5.60	2752.25	1.279	0.25	3.62	0.77
7.00	2752.28	1.291	0.28	3.88	0.88
8.40	2752.31	1.300	0.31	4.11	0.97
9.80	2752.34	1.307	0.34	4.32	1.06
11.20	2752.36	1.313	0.36	4.50	1.14
12.60	2752.39	1.318	0.39	4.66	1.21
14.00	2752.41	1.322	0.41	4.82	1.28

ROADWAY OVERTOPPING DATA

ROADWAY SURFACE	PAVED
EMBANKMENT TOP WIDTH	24.00 ft
CREST LENGTH	50.00 ft
OVERTOPPING CREST ELEVATION	2762.00 ft

CURRENT DATE: 09-03-2006
CURRENT TIME: 13:49:29

FILE DATE: 09-03-2006
FILE NAME: D

FHWA CULVERT ANALYSIS
HY-8, VERSION 6.1

CULV NO.	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
	INLET ELEV. (ft)	OUTLET ELEV. (ft)	CULVERT LENGTH (ft)	BARRELS SHAPE MATERIAL	SPAN (ft)	RISE (ft)	MANNING n	INLET TYPE
1	2752.00	2748.00	139.06	1 CSP	1.50	1.50	.032	CONVENTIONAL
2								
3								
4								
5								
6								

SUMMARY OF CULVERT FLOWS (cfs)   FILE: D   DATE: 09-03-2006

ELEV (ft)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
2752.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2752.52	0.8	0.8	0.0	0.0	0.0	0.0	0.0	0.00	1
2752.74	1.6	1.6	0.0	0.0	0.0	0.0	0.0	0.00	1
2752.91	2.4	2.4	0.0	0.0	0.0	0.0	0.0	0.00	1
2753.07	3.2	3.2	0.0	0.0	0.0	0.0	0.0	0.00	1
2753.22	4.0	4.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2753.34	4.8	4.8	0.0	0.0	0.0	0.0	0.0	0.00	1
2753.47	5.6	5.6	0.0	0.0	0.0	0.0	0.0	0.00	1
2753.59	6.4	6.4	0.0	0.0	0.0	0.0	0.0	0.00	1
2753.73	7.2	7.2	0.0	0.0	0.0	0.0	0.0	0.00	1
2753.79	8.0	8.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2756.00	9.1	9.1	0.0	0.0	0.0	0.0	0.0	OVERTOPPING	

SUMMARY OF ITERATIVE SOLUTION ERRORS   FILE: D   DATE: 09-03-2006

HEAD ELEV (ft)	HEAD ERROR (ft)	TOTAL FLOW (cfs)	FLOW ERROR (cfs)	% FLOW ERROR
2752.00	0.000	0.00	0.00	0.00
2752.52	0.000	0.80	0.00	0.00
2752.74	0.000	1.60	0.00	0.00
2752.91	0.000	2.40	0.00	0.00
2753.07	0.000	3.20	0.00	0.00
2753.22	0.000	4.00	0.00	0.00
2753.34	0.000	4.80	0.00	0.00
2753.47	0.000	5.60	0.00	0.00
2753.59	0.000	6.40	0.00	0.00
2753.73	0.000	7.20	0.00	0.00
2753.79	0.000	8.00	0.00	0.00

<1> TOLERANCE (ft) = 0.010   <2> TOLERANCE (%) = 1.000

CURRENT DATE: 09-03-2006
CURRENT TIME: 13:49:29

FILE DATE: 09-03-2006
FILE NAME: D

PERFORMANCE CURVE FOR CULVERT 1 - 1(1.50 (ft) BY 1.50 (ft)) CSP

DIS-CHARGE FLOW (cfs)	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRIT. DEPTH (ft)	OUTLET DEPTH (ft)	TW DEPTH (ft)	OUTLET VEL. (fps)	TW VEL. (fps)
0.00	2752.00	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	0.00
0.80	2752.52	0.45	0.52	2-M2c	0.33	0.33	0.33	0.10	2.84	1.37
1.60	2752.74	0.63	0.74	2-M2c	0.48	0.47	0.47	0.16	3.37	1.75
2.40	2752.91	0.80	0.91	2-M2c	0.59	0.58	0.58	0.20	3.76	2.01
3.20	2753.07	0.95	1.07	2-M2c	0.70	0.68	0.68	0.23	4.13	2.21
4.00	2753.22	1.09	1.22	2-M2c	0.79	0.76	0.76	0.27	4.42	2.38
4.80	2753.34	1.22	1.34	2-M2c	0.89	0.84	0.84	0.29	4.72	2.52
5.60	2753.47	1.36	1.47	2-M2c	0.99	0.91	0.91	0.32	4.98	2.65
6.40	2753.59	1.49	1.59	2-M2c	1.10	0.97	0.97	0.34	5.27	2.76
7.20	2753.73	1.64	1.73	2-M2c	1.23	1.04	1.04	0.37	5.52	2.86
8.00	2753.79	1.79	0.82	2-M2c	1.50	1.09	1.09	0.39	5.79	2.95

El. inlet face invert 2752.00 ft El. outlet invert 2748.00 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

***** SITE DATA ***** CULVERT INVERT **************

INLET STATION	0.00 ft
INLET ELEVATION	2752.00 ft
OUTLET STATION	139.00 ft
OUTLET ELEVATION	2748.00 ft
NUMBER OF BARRELS	1
SLOPE (V/H)	0.0288
CULVERT LENGTH ALONG SLOPE	139.06 ft

***** CULVERT DATA SUMMARY ************************

BARREL SHAPE	CIRCULAR
BARREL DIAMETER	1.50 ft
BARREL MATERIAL	CORRUGATED ALUMINUM
BARREL MANNING'S n	0.032
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	SQUARE EDGE WITH HEADWALL
INLET DEPRESSION	NONE

CURRENT DATE: 09-03-2006
CURRENT TIME: 13:49:29

FILE DATE: 09-03-2006
FILE NAME: D

TAILWATER

******* REGULAR CHANNEL CROSS SECTION ****************

BOTTOM WIDTH	5.00 ft
SIDE SLOPE H/V (X:1)	5.0
CHANNEL SLOPE V/H (ft/ft)	0.020
MANNING'S n (.01-0.1)	0.032
CHANNEL INVERT ELEVATION	2748.00 ft
CULVERT NO.1 OUTLET INVERT ELEVATION	2748.00 ft

******* UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

FLOW (cfs)	W.S.E. (ft)	FROUDE NUMBER	DEPTH (ft)	VEL. (f/s)	SHEAR (psf)
0.00	2748.00	0.000	0.00	0.00	0.00
0.80	2748.10	0.746	0.10	1.37	0.13
1.60	2748.16	0.778	0.16	1.75	0.20
2.40	2748.20	0.795	0.20	2.01	0.25
3.20	2748.23	0.805	0.23	2.21	0.29
4.00	2748.27	0.813	0.27	2.38	0.33
4.80	2748.29	0.819	0.29	2.52	0.37
5.60	2748.32	0.824	0.32	2.65	0.40
6.40	2748.34	0.828	0.34	2.76	0.43
7.20	2748.37	0.831	0.37	2.86	0.46
8.00	2748.39	0.834	0.39	2.95	0.49

ROADWAY OVERTOPPING DATA

ROADWAY SURFACE	PAVED
EMBANKMENT TOP WIDTH	24.00 ft
CREST LENGTH	50.00 ft
OVERTOPPING CREST ELEVATION	2756.00 ft

CURRENT DATE: 09-03-2006
CURRENT TIME: 13:50:33

FILE DATE: 09-03-2006
FILE NAME: E

FHWA CULVERT ANALYSIS
HY-8, VERSION 6.1

CULV NO.	SITE DATA: INLET ELEV. (ft)	OUTLET ELEV. (ft)	CULVERT LENGTH (ft)	CULVERT SHAPE, MATERIAL, INLET: BARRELS SHAPE MATERIAL	SPAN (ft)	RISE (ft)	MANNING n	INLET TYPE
1	2745.00	2742.60	59.05	1 CSP	2.00	2.00	.032	CONVENTIONAL
2								
3								
4								
5								
6								

SUMMARY OF CULVERT FLOWS (cfs) FILE: E DATE: 09-03-2006

ELEV (ft)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
2745.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2745.51	1.2	1.2	0.0	0.0	0.0	0.0	0.0	0.00	1
2745.70	2.4	2.4	0.0	0.0	0.0	0.0	0.0	0.00	1
2745.88	3.6	3.6	0.0	0.0	0.0	0.0	0.0	0.00	1
2746.04	4.8	4.8	0.0	0.0	0.0	0.0	0.0	0.00	1
2746.19	6.0	6.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2746.32	7.2	7.2	0.0	0.0	0.0	0.0	0.0	0.00	1
2746.46	8.4	8.4	0.0	0.0	0.0	0.0	0.0	0.00	1
2746.59	9.6	9.6	0.0	0.0	0.0	0.0	0.0	0.00	1
2746.72	10.8	10.8	0.0	0.0	0.0	0.0	0.0	0.00	1
2746.85	12.0	12.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2749.00	22.7	22.7	0.0	0.0	0.0	0.0	0.0	OVERTOPPING	

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: E DATE: 09-03-2006

HEAD ELEV (ft)	HEAD ERROR (ft)	TOTAL FLOW (cfs)	FLOW ERROR (cfs)	% FLOW ERROR
2745.00	0.000	0.00	0.00	0.00
2745.51	0.000	1.20	0.00	0.00
2745.70	0.000	2.40	0.00	0.00
2745.88	0.000	3.60	0.00	0.00
2746.04	0.000	4.80	0.00	0.00
2746.19	0.000	6.00	0.00	0.00
2746.32	0.000	7.20	0.00	0.00
2746.46	0.000	8.40	0.00	0.00
2746.59	0.000	9.60	0.00	0.00
2746.72	0.000	10.80	0.00	0.00
2746.85	0.000	12.00	0.00	0.00

<1> TOLERANCE (ft) = 0.010 <2> TOLERANCE (%) = 1.000

CURRENT DATE: 09-03-2006
CURRENT TIME: 13:50:33

FILE DATE: 09-03-2006
FILE NAME: E

PERFORMANCE CURVE FOR CULVERT 1 - 1(2.00 (ft) BY 2.00 (ft)) CSP

DIS-CHARGE FLOW (cfs)	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRIT. DEPTH (ft)	OUTLET DEPTH (ft)	TW DEPTH (ft)	OUTLET VEL. (fps)	TW VEL. (fps)
0.00	2745.00	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	0.00
1.20	2745.51	0.51	0.51	1-S2n	0.33	0.37	0.27	0.13	4.53	1.59
2.40	2745.70	0.70	0.70	1-S2n	0.48	0.53	0.47	0.20	4.21	2.01
3.60	2745.88	0.88	0.88	1-S2n	0.60	0.66	0.46	0.25	6.57	2.30
4.80	2746.04	1.04	1.04	1-S2n	0.69	0.77	0.57	0.29	6.51	2.52
6.00	2746.19	1.19	1.19	1-S2n	0.78	0.86	0.66	0.33	6.59	2.70
7.20	2746.33	1.33	1.33	1-S2n	0.86	0.95	0.75	0.37	6.69	2.86
8.40	2746.46	1.46	1.46	1-S2n	0.94	1.03	0.83	0.40	6.82	3.00
9.60	2746.59	1.59	1.59	1-S2n	1.02	1.10	0.90	0.43	6.96	3.12
10.80	2746.72	1.72	1.72	1-S2n	1.09	1.18	0.98	0.46	7.09	3.23
12.00	2746.85	1.85	1.85	1-S2n	1.17	1.24	1.04	0.48	7.26	3.33

El. inlet face invert 2745.00 ft   El. outlet invert 2742.60 ft
El. inlet throat invert 0.00 ft   El. inlet crest 0.00 ft

***** SITE DATA ***** CULVERT INVERT **************

INLET STATION	0.00 ft
INLET ELEVATION	2745.00 ft
OUTLET STATION	59.00 ft
OUTLET ELEVATION	2742.60 ft
NUMBER OF BARRELS	1
SLOPE (V/H)	0.0407
CULVERT LENGTH ALONG SLOPE	59.05 ft

***** CULVERT DATA SUMMARY ************************

BARREL SHAPE	CIRCULAR
BARREL DIAMETER	2.00 ft
BARREL MATERIAL	CORRUGATED ALUMINUM
BARREL MANNING'S n	0.032
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	SQUARE EDGE WITH HEADWALL
INLET DEPRESSION	NONE

CURRENT DATE: 09-03-2006
CURRENT TIME: 13:50:33

FILE DATE: 09-03-2006
FILE NAME: E

TAILWATER

******* REGULAR CHANNEL CROSS SECTION ****************

BOTTOM WIDTH	5.00 ft
SIDE SLOPE H/V (X:1)	5.0
CHANNEL SLOPE V/H (ft/ft)	0.020
MANNING'S n (.01-0.1)	0.032
CHANNEL INVERT ELEVATION	2742.60 ft
CULVERT NO.1 OUTLET INVERT ELEVATION	2742.60 ft

******* UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

FLOW (cfs)	W.S.E. (ft)	FROUDE NUMBER	DEPTH (ft)	VEL. (f/s)	SHEAR (psf)
0.00	2742.60	0.000	0.00	0.00	0.00
1.20	2742.73	0.765	0.13	1.59	0.17
2.40	2742.80	0.795	0.20	2.01	0.25
3.60	2742.85	0.810	0.25	2.30	0.31
4.80	2742.89	0.819	0.29	2.52	0.37
6.00	2742.93	0.826	0.33	2.70	0.42
7.20	2742.97	0.831	0.37	2.86	0.46
8.40	2743.00	0.835	0.40	3.00	0.50
9.60	2743.03	0.838	0.43	3.12	0.54
10.80	2743.06	0.841	0.46	3.23	0.57
12.00	2743.08	0.844	0.48	3.33	0.61

ROADWAY OVERTOPPING DATA

ROADWAY SURFACE	PAVED
EMBANKMENT TOP WIDTH	24.00 ft
CREST LENGTH	50.00 ft
OVERTOPPING CREST ELEVATION	2749.00 ft

CURRENT DATE: 09-03-2006
CURRENT TIME: 13:51:07

FILE DATE: 09-03-2006
FILE NAME: F

FHWA CULVERT ANALYSIS
HY-8, VERSION 6.1

C U L V NO.	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
	INLET ELEV. (ft)	OUTLET ELEV. (ft)	CULVERT LENGTH (ft)	BARRELS SHAPE MATERIAL	SPAN (ft)	RISE (ft)	MANNING n	INLET TYPE
1	2740.00	2737.80	68.54	1 CSP	2.00	2.00	.032	CONVENTIONAL
2								
3								
4								
5								
6								

SUMMARY OF CULVERT FLOWS (cfs) FILE: F DATE: 09-03-2006

ELEV (ft)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
2740.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2740.48	1.0	1.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2740.65	2.0	2.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2740.80	3.0	3.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2740.94	4.0	4.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2741.07	5.0	5.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2741.19	6.0	6.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2741.31	7.0	7.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2741.42	8.0	8.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2741.53	9.0	9.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2741.64	10.0	10.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2744.00	21.0	21.0	0.0	0.0	0.0	0.0	0.0	OVERTOPPING	

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: F DATE: 09-03-2006

HEAD ELEV (ft)	HEAD ERROR (ft)	TOTAL FLOW (cfs)	FLOW ERROR (cfs)	% FLOW ERROR
2740.00	0.000	0.00	0.00	0.00
2740.48	0.000	1.00	0.00	0.00
2740.65	0.000	2.00	0.00	0.00
2740.80	0.000	3.00	0.00	0.00
2740.94	0.000	4.00	0.00	0.00
2741.07	0.000	5.00	0.00	0.00
2741.19	0.000	6.00	0.00	0.00
2741.31	0.000	7.00	0.00	0.00
2741.42	0.000	8.00	0.00	0.00
2741.53	0.000	9.00	0.00	0.00
2741.64	0.000	10.00	0.00	0.00

<1> TOLERANCE (ft) = 0.010 <2> TOLERANCE (%) = 1.000

CURRENT DATE: 09-03-2006 FILE DATE: 09-03-2006
CURRENT TIME: 13:51:07 FILE NAME: F

PERFORMANCE CURVE FOR CULVERT 1 - 1(2.00 (ft) BY 2.00 (ft)) CSP

DIS-CHARGE FLOW (cfs)	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRIT. DEPTH (ft)	OUTLET DEPTH (ft)	TW DEPTH (ft)	OUTLET VEL. (fps)	TW VEL. (fps)
0.00	2740.00	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	0.00
1.00	2740.48	0.48	0.48	1-S2n	0.32	0.33	0.23	0.12	6.27	1.49
2.00	2740.65	0.65	0.65	1-S2n	0.46	0.48	0.38	0.18	4.75	1.89
3.00	2740.80	0.80	0.80	1-S2n	0.57	0.60	0.50	0.23	4.79	2.17
4.00	2740.94	0.94	0.94	1-S2n	0.67	0.69	0.59	0.27	5.10	2.38
5.00	2741.07	1.07	1.07	1-S2n	0.75	0.79	0.69	0.30	5.23	2.55
6.00	2741.19	1.19	1.19	1-S2n	0.83	0.86	0.76	0.33	5.45	2.70
7.00	2741.31	1.31	1.31	1-S2n	0.91	0.93	0.83	0.36	5.65	2.84
8.00	2741.42	1.42	1.42	1-S2n	0.98	1.01	0.91	0.39	5.78	2.95
9.00	2741.53	1.53	1.53	1-S2n	1.05	1.07	0.97	0.42	5.98	3.06
10.00	2741.64	1.64	1.64	1-S2n	1.12	1.13	1.03	0.44	6.15	3.16

El. inlet face invert 2740.00 ft El. outlet invert 2737.80 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

***** SITE DATA ***** CULVERT INVERT **************

INLET STATION	0.00 ft
INLET ELEVATION	2740.00 ft
OUTLET STATION	68.50 ft
OUTLET ELEVATION	2737.80 ft
NUMBER OF BARRELS	1
SLOPE (V/H)	0.0321
CULVERT LENGTH ALONG SLOPE	68.54 ft

***** CULVERT DATA SUMMARY ************************

BARREL SHAPE	CIRCULAR
BARREL DIAMETER	2.00 ft
BARREL MATERIAL	CORRUGATED ALUMINUM
BARREL MANNING'S n	0.032
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	SQUARE EDGE WITH HEADWALL
INLET DEPRESSION	NONE

CURRENT DATE: 09-03-2006
CURRENT TIME: 13:51:07

FILE DATE: 09-03-2006
FILE NAME: F

TAILWATER

******* REGULAR CHANNEL CROSS SECTION ****************

BOTTOM WIDTH	5.00 ft
SIDE SLOPE H/V (X:1)	5.0
CHANNEL SLOPE V/H (ft/ft)	0.020
MANNING'S n (.01-0.1)	0.032
CHANNEL INVERT ELEVATION	2737.80 ft
CULVERT NO.1 OUTLET INVERT ELEVATION	2737.80 ft

******* UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

FLOW (cfs)	W.S.E. (ft)	FROUDE NUMBER	DEPTH (ft)	VEL. (f/s)	SHEAR (psf)
0.00	2737.80	0.000	0.00	0.00	0.00
1.00	2737.92	0.757	0.12	1.49	0.15
2.00	2737.98	0.788	0.18	1.89	0.22
3.00	2738.03	0.803	0.23	2.17	0.28
4.00	2738.07	0.813	0.27	2.38	0.33
5.00	2738.10	0.820	0.30	2.55	0.38
6.00	2738.13	0.826	0.33	2.70	0.42
7.00	2738.16	0.830	0.36	2.84	0.45
8.00	2738.19	0.834	0.39	2.95	0.49
9.00	2738.22	0.837	0.42	3.06	0.52
10.00	2738.24	0.839	0.44	3.16	0.55

ROADWAY OVERTOPPING DATA

ROADWAY SURFACE	PAVED
EMBANKMENT TOP WIDTH	24.00 ft
CREST LENGTH	50.00 ft
OVERTOPPING CREST ELEVATION	2744.00 ft

CURRENT DATE: 09-03-2006
CURRENT TIME: 13:51:39

FILE DATE: 09-03-2006
FILE NAME: G

FHWA CULVERT ANALYSIS
HY-8, VERSION 6.1

CULV NO.	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
	INLET ELEV. (ft)	OUTLET ELEV. (ft)	CULVERT LENGTH (ft)	BARRELS SHAPE MATERIAL	SPAN (ft)	RISE (ft)	MANNING n	INLET TYPE
1	2732.60	2730.00	116.33	1 CSP	1.50	1.50	.032	CONVENTIONAL
2								
3								
4								
5								
6								

SUMMARY OF CULVERT FLOWS (cfs)   FILE: G   DATE: 09-03-2006

ELEV (ft)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
2732.60	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2733.10	0.8	0.8	0.0	0.0	0.0	0.0	0.0	0.00	1
2733.32	1.6	1.6	0.0	0.0	0.0	0.0	0.0	0.00	1
2733.50	2.4	2.4	0.0	0.0	0.0	0.0	0.0	0.00	1
2733.66	3.2	3.2	0.0	0.0	0.0	0.0	0.0	0.00	1
2733.80	4.0	4.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2733.93	4.8	4.8	0.0	0.0	0.0	0.0	0.0	0.00	1
2734.07	5.6	5.6	0.0	0.0	0.0	0.0	0.0	0.00	1
2734.25	6.4	6.4	0.0	0.0	0.0	0.0	0.0	0.00	1
2734.49	7.2	7.2	0.0	0.0	0.0	0.0	0.0	0.00	1
2734.58	8.0	8.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2736.40	15.1	15.1	0.0	0.0	0.0	0.0	0.0	OVERTOPPING	

SUMMARY OF ITERATIVE SOLUTION ERRORS   FILE: G   DATE: 09-03-2006

HEAD ELEV (ft)	HEAD ERROR (ft)	TOTAL FLOW (cfs)	FLOW ERROR (cfs)	% FLOW ERROR
2732.60	0.000	0.00	0.00	0.00
2733.10	0.000	0.80	0.00	0.00
2733.32	0.000	1.60	0.00	0.00
2733.50	0.000	2.40	0.00	0.00
2733.66	0.000	3.20	0.00	0.00
2733.80	0.000	4.00	0.00	0.00
2733.93	0.000	4.80	0.00	0.00
2734.07	0.000	5.60	0.00	0.00
2734.25	0.000	6.40	0.00	0.00
2734.49	0.000	7.20	0.00	0.00
2734.58	0.000	8.00	0.00	0.00

<1> TOLERANCE (ft) = 0.010   <2> TOLERANCE (%) = 1.000

CURRENT DATE: 09-03-2006
CURRENT TIME: 13:51:39

FILE DATE: 09-03-2006
FILE NAME: G

PERFORMANCE CURVE FOR CULVERT 1 - 1(1.50 (ft) BY 1.50 (ft)) CSP

DIS-CHARGE FLOW (cfs)	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRIT. DEPTH (ft)	OUTLET DEPTH (ft)	TW DEPTH (ft)	OUTLET VEL. (fps)	TW VEL. (fps)
0.00	2732.60	0.00	0.00	0-NF	0.00	0.00	0.00	1.20	0.00	0.00
0.80	2733.10	0.45	0.50	3-M1t	0.35	0.33	1.29	1.29	0.50	1.71
1.60	2733.32	0.64	0.72	3-M1t	0.51	0.47	1.33	1.33	0.97	2.20
2.40	2733.50	0.80	0.90	3-M1t	0.63	0.58	1.36	1.36	1.42	2.53
3.20	2733.66	0.95	1.06	3-M1t	0.75	0.68	1.39	1.39	1.86	2.79
4.00	2733.80	1.09	1.20	3-M1t	0.86	0.76	1.42	1.42	2.33	3.01
4.80	2733.93	1.23	1.33	3-M1t	0.97	0.84	1.44	1.44	2.77	3.19
5.60	2734.07	1.36	1.47	3-M1t	1.09	0.91	1.46	1.46	3.21	3.35
6.40	2734.26	1.50	1.65	3-M1t	1.24	0.97	1.49	1.49	3.64	3.50
7.20	2734.49	1.64	1.89	3-M1f	1.50	1.04	1.50	1.50	4.07	3.63
8.00	2734.58	1.80	1.98	3-M1f	1.50	1.09	1.50	1.52	4.53	3.75

El. inlet face invert 2732.60 ft El. outlet invert 2730.00 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

***** SITE DATA ***** CULVERT INVERT **************

INLET STATION	0.00 ft
INLET ELEVATION	2732.60 ft
OUTLET STATION	116.30 ft
OUTLET ELEVATION	2730.00 ft
NUMBER OF BARRELS	1
SLOPE (V/H)	0.0224
CULVERT LENGTH ALONG SLOPE	116.33 ft

***** CULVERT DATA SUMMARY ************************

BARREL SHAPE	CIRCULAR
BARREL DIAMETER	1.50 ft
BARREL MATERIAL	CORRUGATED ALUMINUM
BARREL MANNING'S n	0.032
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	SQUARE EDGE WITH HEADWALL
INLET DEPRESSION	NONE

CURRENT DATE: 09-03-2006
CURRENT TIME: 13:51:39

FILE DATE: 09-03-2006
FILE NAME: G

TAILWATER

******* REGULAR CHANNEL CROSS SECTION ****************

BOTTOM WIDTH	5.00 ft
SIDE SLOPE H/V (X:1)	5.0
CHANNEL SLOPE V/H (ft/ft)	0.040
MANNING'S n (.01-0.1)	0.032
CHANNEL INVERT ELEVATION	2731.20 ft
CULVERT NO.1 OUTLET INVERT ELEVATION	2730.00 ft

******* UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

FLOW (cfs)	W.S.E. (ft)	FROUDE NUMBER	DEPTH (ft)	VEL. (f/s)	SHEAR (psf)
0.00	2731.20	0.000	0.00	0.00	0.00
0.80	2731.29	1.030	0.09	1.71	0.22
1.60	2731.33	1.078	0.13	2.20	0.32
2.40	2731.36	1.103	0.16	2.53	0.41
3.20	2731.39	1.121	0.19	2.79	0.48
4.00	2731.42	1.133	0.22	3.01	0.55
4.80	2731.44	1.142	0.24	3.19	0.61
5.60	2731.46	1.149	0.26	3.35	0.66
6.40	2731.49	1.156	0.29	3.50	0.71
7.20	2731.50	1.161	0.30	3.63	0.76
8.00	2731.52	1.165	0.32	3.75	0.81

ROADWAY OVERTOPPING DATA

ROADWAY SURFACE	PAVED
EMBANKMENT TOP WIDTH	35.00 ft
CREST LENGTH	50.00 ft
OVERTOPPING CREST ELEVATION	2736.40 ft

CURRENT DATE: 09-03-2006
CURRENT TIME: 13:52:09

FILE DATE: 09-03-2006
FILE NAME: H

FHWA CULVERT ANALYSIS
HY-8, VERSION 6.1

C U L V NO.	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
	INLET ELEV. (ft)	OUTLET ELEV. (ft)	CULVERT LENGTH (ft)	BARRELS SHAPE MATERIAL	SPAN (ft)	RISE (ft)	MANNING n	INLET TYPE
1	2731.80	2731.40	62.50	1 CSP	2.00	2.00	.032	CONVENTIONAL
2								
3								
4								
5								
6								

SUMMARY OF CULVERT FLOWS (cfs) FILE: H DATE: 09-03-2006

ELEV (ft)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
2731.80	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2732.41	1.2	1.2	0.0	0.0	0.0	0.0	0.0	0.00	1
2732.68	2.4	2.4	0.0	0.0	0.0	0.0	0.0	0.00	1
2732.90	3.6	3.6	0.0	0.0	0.0	0.0	0.0	0.00	1
2733.09	4.8	4.8	0.0	0.0	0.0	0.0	0.0	0.00	1
2733.27	6.0	6.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2733.39	7.2	7.2	0.0	0.0	0.0	0.0	0.0	0.00	1
2733.62	8.4	8.4	0.0	0.0	0.0	0.0	0.0	0.00	1
2733.81	9.6	9.6	0.0	0.0	0.0	0.0	0.0	0.00	1
2733.97	10.8	10.8	0.0	0.0	0.0	0.0	0.0	0.00	1
2734.16	12.0	12.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2736.00	17.3	17.3	0.0	0.0	0.0	0.0	0.0	OVERTOPPING	

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: H DATE: 09-03-2006

HEAD ELEV (ft)	HEAD ERROR (ft)	TOTAL FLOW (cfs)	FLOW ERROR (cfs)	% FLOW ERROR
2731.80	0.000	0.00	0.00	0.00
2732.41	0.000	1.20	0.00	0.00
2732.68	0.000	2.40	0.00	0.00
2732.90	0.000	3.60	0.00	0.00
2733.09	0.000	4.80	0.00	0.00
2733.27	0.000	6.00	0.00	0.00
2733.39	0.000	7.20	0.00	0.00
2733.62	0.000	8.40	0.00	0.00
2733.81	0.000	9.60	0.00	0.00
2733.97	0.000	10.80	0.00	0.00
2734.16	0.000	12.00	0.00	0.00

<1> TOLERANCE (ft) = 0.010 <2> TOLERANCE (%) = 1.000

CURRENT DATE: 09-03-2006 FILE DATE: 09-03-2006
CURRENT TIME: 13:52:09 FILE NAME: H

PERFORMANCE CURVE FOR CULVERT 1 - 1(2.00 (ft) BY 2.00 (ft)) CSP

DIS-CHARGE FLOW (cfs)	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRIT. DEPTH (ft)	OUTLET DEPTH (ft)	TW DEPTH (ft)	OUTLET VEL. (fps)	TW VEL. (fps)
0.00	2731.80	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	0.00
1.20	2732.41	0.54	0.61	2-M2c	0.54	0.37	0.37	0.13	2.95	1.59
2.40	2732.68	0.74	0.88	2-M2c	0.78	0.53	0.53	0.20	3.56	2.01
3.60	2732.89	0.91	1.09	2-M2c	0.99	0.66	0.66	0.25	3.98	2.30
4.80	2733.09	1.07	1.29	2-M2c	1.18	0.77	0.77	0.29	4.32	2.52
6.00	2733.27	1.22	1.47	2-M2c	1.37	0.86	0.86	0.33	4.63	2.70
7.20	2733.39	1.36	1.59	2-M2c	1.60	0.95	0.95	0.37	4.90	2.86
8.40	2733.62	1.49	1.82	2-M2c	2.00	1.03	1.03	0.40	5.15	3.00
9.60	2733.81	1.63	2.01	2-M2c	2.00	1.10	1.10	0.43	5.41	3.12
10.80	2733.97	1.76	2.17	2-M2c	2.00	1.18	1.18	0.46	5.62	3.23
12.00	2734.16	1.89	2.36	2-M2c	2.00	1.24	1.24	0.49	5.85	3.33

El. inlet face invert 2731.80 ft El. outlet invert 2731.40 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

***** SITE DATA ***** CULVERT INVERT **************

INLET STATION	0.00 ft
INLET ELEVATION	2731.80 ft
OUTLET STATION	62.50 ft
OUTLET ELEVATION	2731.40 ft
NUMBER OF BARRELS	1
SLOPE (V/H)	0.0064
CULVERT LENGTH ALONG SLOPE	62.50 ft

***** CULVERT DATA SUMMARY ************************

BARREL SHAPE	CIRCULAR
BARREL DIAMETER	2.00 ft
BARREL MATERIAL	CORRUGATED ALUMINUM
BARREL MANNING'S n	0.032
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	SQUARE EDGE WITH HEADWALL
INLET DEPRESSION	NONE

CURRENT DATE: 09-03-2006　　FILE DATE: 09-03-2006
CURRENT TIME: 13:52:09　　FILE NAME: H

TAILWATER

******* REGULAR CHANNEL CROSS SECTION ****************

BOTTOM WIDTH	5.00 ft
SIDE SLOPE H/V (X:1)	5.0
CHANNEL SLOPE V/H (ft/ft)	0.020
MANNING'S n (.01-0.1)	0.032
CHANNEL INVERT ELEVATION	2731.40 ft
CULVERT NO.1 OUTLET INVERT ELEVATION	2731.40 ft

******* UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

FLOW (cfs)	W.S.E. (ft)	FROUDE NUMBER	DEPTH (ft)	VEL. (f/s)	SHEAR (psf)
0.00	2731.40	0.000	0.00	0.00	0.00
1.20	2731.53	0.765	0.13	1.59	0.17
2.40	2731.60	0.795	0.20	2.01	0.25
3.60	2731.65	0.810	0.25	2.30	0.31
4.80	2731.69	0.819	0.29	2.52	0.37
6.00	2731.73	0.826	0.33	2.70	0.42
7.20	2731.77	0.831	0.37	2.86	0.46
8.40	2731.80	0.835	0.40	3.00	0.50
9.60	2731.83	0.838	0.43	3.12	0.54
10.80	2731.86	0.841	0.46	3.23	0.57
12.00	2731.89	0.844	0.49	3.33	0.61

ROADWAY OVERTOPPING DATA

ROADWAY SURFACE	PAVED
EMBANKMENT TOP WIDTH	24.00 ft
CREST LENGTH	50.00 ft
OVERTOPPING CREST ELEVATION	2736.00 ft

URRENT DATE: 11-27-2006
URRENT TIME: 17:21:45

FILE DATE: 11-27-2006
FILE NAME: I

FHWA CULVERT ANALYSIS
HY-8, VERSION 6.1

CULV NO.	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
	INLET ELEV. (ft)	OUTLET ELEV. (ft)	CULVERT LENGTH (ft)	BARRELS SHAPE MATERIAL	SPAN (ft)	RISE (ft)	MANNING n	INLET TYPE
1	2725.50	2724.50	62.21	1 CSP	2.50	2.50	.032	CONVENTIONAL
2								
3								
4								
5								
6								

UMMARY OF CULVERT FLOWS (cfs) FILE: I DATE: 11-27-2006

ELEV (ft)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
2725.50	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2726.35	3.0	3.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2726.73	6.0	6.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2727.03	9.0	9.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2727.31	12.0	12.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2727.56	15.0	15.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2727.81	18.0	18.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2728.08	21.0	21.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2728.33	24.0	24.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2728.35	27.0	27.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2729.26	30.0	30.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2731.00	36.6	36.6	0.0	0.0	0.0	0.0	0.0	OVERTOPPING	

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: I DATE: 11-27-2006

HEAD ELEV (ft)	HEAD ERROR (ft)	TOTAL FLOW (cfs)	FLOW ERROR (cfs)	% FLOW ERROR
2725.50	0.000	0.00	0.00	0.00
2726.35	0.000	3.00	0.00	0.00
2726.73	0.000	6.00	0.00	0.00
2727.03	0.000	9.00	0.00	0.00
2727.31	0.000	12.00	0.00	0.00
2727.56	0.000	15.00	0.00	0.00
2727.81	0.000	18.00	0.00	0.00
2728.08	0.000	21.00	0.00	0.00
2728.33	0.000	24.00	0.00	0.00
2728.35	0.000	27.00	0.00	0.00
2729.26	0.000	30.00	0.00	0.00

<1> TOLERANCE (ft) = 0.010 <2> TOLERANCE (%) = 1.000

CURRENT DATE: 11-27-2006
CURRENT TIME: 17:21:45

FILE DATE: 11-27-2006
FILE NAME: I

PERFORMANCE CURVE FOR CULVERT 1 - 1(2.50 (ft) BY 2.50 (ft)) CSP

DIS-CHARGE FLOW (cfs)	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRIT. DEPTH (ft)	OUTLET DEPTH (ft)	TW DEPTH (ft)	OUTLET VEL. (fps)	TW VEL. (fps)
0.00	2725.50	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	0.00
3.00	2726.35	0.78	0.85	2-M2c	0.62	0.56	0.56	0.18	3.64	2.37
6.00	2726.73	1.10	1.23	2-M2c	0.90	0.80	0.80	0.27	4.39	3.00
9.00	2727.04	1.38	1.54	2-M2c	1.13	1.00	1.00	0.34	4.91	3.42
12.00	2727.31	1.64	1.81	2-M2c	1.35	1.16	1.16	0.40	5.40	3.74
15.00	2727.56	1.88	2.06	2-M2c	1.55	1.30	1.30	0.45	5.81	4.01
18.00	2727.81	2.11	2.31	2-M2c	1.77	1.43	1.43	0.50	6.19	4.24
21.00	2728.08	2.35	2.58	2-M2c	2.04	1.55	1.55	0.54	6.56	4.44
24.00	2728.33	2.59	2.83	2-M2c	2.50	1.66	1.66	0.58	6.93	4.62
27.00	2728.35	2.85	2.78	2-M2c	2.50	1.77	1.77	0.62	7.27	4.78
30.00	2729.26	3.13	3.76	2-M2c	2.50	1.86	1.86	0.66	7.68	4.93

El. inlet face invert 2725.50 ft El. outlet invert 2724.50 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

***** SITE DATA ***** CULVERT INVERT **************

INLET STATION	0.00 ft
INLET ELEVATION	2725.50 ft
OUTLET STATION	62.20 ft
OUTLET ELEVATION	2724.50 ft
NUMBER OF BARRELS	1
SLOPE (V/H)	0.0161
CULVERT LENGTH ALONG SLOPE	62.21 ft

***** CULVERT DATA SUMMARY ************************

BARREL SHAPE	CIRCULAR
BARREL DIAMETER	2.50 ft
BARREL MATERIAL	CORRUGATED ALUMINUM
BARREL MANNING'S n	0.032
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	SQUARE EDGE WITH HEADWALL
INLET DEPRESSION	NONE

CURRENT DATE: 11-27-2006 FILE DATE: 11-27-2006
CURRENT TIME: 17:21:45 FILE NAME: I

TAILWATER

******* REGULAR CHANNEL CROSS SECTION ****************

BOTTOM WIDTH	6.00 ft
SIDE SLOPE H/V (X:1)	5.0
CHANNEL SLOPE V/H (ft/ft)	0.030
MANNING'S n (.01-0.1)	0.032
CHANNEL INVERT ELEVATION	2724.50 ft
CULVERT NO.1 OUTLET INVERT ELEVATION	2724.50 ft

******* UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

FLOW (cfs)	W.S.E. (ft)	FROUDE NUMBER	DEPTH (ft)	VEL. (f/s)	SHEAR (psf)
0.00	2724.50	0.000	0.00	0.00	0.00
3.00	2724.68	0.979	0.18	2.37	0.34
6.00	2724.77	1.014	0.27	3.00	0.51
9.00	2724.84	1.032	0.34	3.42	0.64
12.00	2724.90	1.043	0.40	3.74	0.75
15.00	2724.95	1.051	0.45	4.01	0.85
18.00	2725.00	1.057	0.50	4.24	0.94
21.00	2725.04	1.062	0.54	4.44	1.02
24.00	2725.08	1.066	0.58	4.62	1.09
27.00	2725.12	1.069	0.62	4.78	1.16
30.00	2725.16	1.072	0.66	4.93	1.23

ROADWAY OVERTOPPING DATA

ROADWAY SURFACE	PAVED
EMBANKMENT TOP WIDTH	24.00 ft
CREST LENGTH	50.00 ft
OVERTOPPING CREST ELEVATION	2731.00 ft

CURRENT DATE: 09-03-2006 FILE DATE: 09-03-2006
CURRENT TIME: 13:03:17 FILE NAME: J

FHWA CULVERT ANALYSIS
HY-8, VERSION 6.1

CULV NO.	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
	INLET ELEV. (ft)	OUTLET ELEV. (ft)	CULVERT LENGTH (ft)	BARRELS SHAPE MATERIAL	SPAN (ft)	RISE (ft)	MANNING n	INLET TYPE
1	2706.70	2705.20	57.82	1 CSP	1.50	1.50	.032	CONVENTIONAL
2								
3								
4								
5								
6								

SUMMARY OF CULVERT FLOWS (cfs) FILE: J DATE: 09-03-2006

ELEV (ft)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
2706.70	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2706.96	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.00	1
2706.99	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.00	1
2707.18	0.3	0.3	0.0	0.0	0.0	0.0	0.0	0.00	1
2707.05	0.4	0.4	0.0	0.0	0.0	0.0	0.0	0.00	1
2707.10	0.5	0.5	0.0	0.0	0.0	0.0	0.0	0.00	1
2707.14	0.6	0.6	0.0	0.0	0.0	0.0	0.0	0.00	1
2707.18	0.7	0.7	0.0	0.0	0.0	0.0	0.0	0.00	1
2707.22	0.8	0.8	0.0	0.0	0.0	0.0	0.0	0.00	1
2707.25	0.9	0.9	0.0	0.0	0.0	0.0	0.0	0.00	1
2707.27	1.0	1.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2710.50	10.1	10.1	0.0	0.0	0.0	0.0	0.0	OVERTOPPING	

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: J DATE: 09-03-2006

HEAD ELEV (ft)	HEAD ERROR (ft)	TOTAL FLOW (cfs)	FLOW ERROR (cfs)	% FLOW ERROR
2706.70	0.000	0.00	0.00	0.00
2706.96	0.000	0.10	0.00	0.00
2706.99	0.000	0.20	0.00	0.00
2707.18	0.000	0.30	0.00	0.00
2707.05	0.000	0.40	0.00	0.00
2707.10	0.000	0.50	0.00	0.00
2707.14	0.000	0.60	0.00	0.00
2707.18	0.000	0.70	0.00	0.00
2707.22	0.000	0.80	0.00	0.00
2707.25	0.000	0.90	0.00	0.00
2707.27	0.000	1.00	0.00	0.00

<1> TOLERANCE (ft) = 0.010 <2> TOLERANCE (%) = 1.000

CURRENT DATE: 09-03-2006 FILE DATE: 09-03-2006
CURRENT TIME: 13:03:17 FILE NAME: J

PERFORMANCE CURVE FOR CULVERT 1 - 1(1.50 (ft) BY 1.50 (ft)) CSP

DIS-CHARGE FLOW (cfs)	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRIT. DEPTH (ft)	OUTLET DEPTH (ft)	TW DEPTH (ft)	OUTLET VEL. (fps)	TW VEL. (fps)
0.00	2706.70	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	0.00
0.10	2706.96	0.26	0.13	2-M2c	0.10	0.09	0.09	0.03	1.30	0.63
0.20	2706.99	0.29	0.27	2-M2c	0.17	0.16	0.16	0.05	2.18	0.82
0.30	2707.18	0.32	0.48	2-M2c	0.20	0.19	0.19	0.06	3.53	0.96
0.40	2707.05	0.34	0.35	2-M2c	0.23	0.22	0.22	0.07	2.38	1.07
0.50	2707.10	0.37	0.40	2-M2c	0.27	0.25	0.25	0.08	2.49	1.16
0.60	2707.14	0.40	0.44	2-M2c	0.30	0.28	0.28	0.09	2.56	1.24
0.70	2707.18	0.42	0.48	2-M2c	0.32	0.31	0.31	0.10	2.68	1.31
0.80	2707.22	0.45	0.52	2-M2c	0.34	0.33	0.33	0.10	2.84	1.37
0.90	2707.25	0.47	0.55	2-M2c	0.36	0.35	0.35	0.11	2.98	1.43
1.00	2707.27	0.50	0.57	2-M2c	0.38	0.37	0.37	0.12	2.97	1.49

El. inlet face invert 2706.70 ft El. outlet invert 2705.20 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

***** SITE DATA ***** CULVERT INVERT **************

INLET STATION	0.00 ft
INLET ELEVATION	2706.70 ft
OUTLET STATION	57.80 ft
OUTLET ELEVATION	2705.20 ft
NUMBER OF BARRELS	1
SLOPE (V/H)	0.0260
CULVERT LENGTH ALONG SLOPE	57.82 ft

***** CULVERT DATA SUMMARY ************************

BARREL SHAPE	CIRCULAR
BARREL DIAMETER	1.50 ft
BARREL MATERIAL	CORRUGATED ALUMINUM
BARREL MANNING'S n	0.032
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	SQUARE EDGE WITH HEADWALL
INLET DEPRESSION	NONE

CURRENT DATE: 09-03-2006
CURRENT TIME: 13:03:17

FILE DATE: 09-03-2006
FILE NAME: J

TAILWATER

******* REGULAR CHANNEL CROSS SECTION ****************

BOTTOM WIDTH	5.00 ft
SIDE SLOPE H/V (X:1)	5.0
CHANNEL SLOPE V/H (ft/ft)	0.020
MANNING'S n (.01-0.1)	0.032
CHANNEL INVERT ELEVATION	2705.20 ft
CULVERT NO.1 OUTLET INVERT ELEVATION	2705.20 ft

******* UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

FLOW (cfs)	W.S.E. (ft)	FROUDE NUMBER	DEPTH (ft)	VEL. (f/s)	SHEAR (psf)
0.00	2705.20	0.000	0.00	0.00	0.00
0.10	2705.23	0.634	0.03	0.63	0.04
0.20	2705.25	0.673	0.05	0.82	0.06
0.30	2705.26	0.695	0.06	0.96	0.07
0.40	2705.27	0.710	0.07	1.07	0.09
0.50	2705.28	0.722	0.08	1.16	0.10
0.60	2705.29	0.732	0.09	1.24	0.11
0.70	2705.30	0.739	0.10	1.31	0.12
0.80	2705.30	0.746	0.10	1.37	0.13
0.90	2705.31	0.752	0.11	1.43	0.14
1.00	2705.32	0.757	0.12	1.49	0.15

ROADWAY OVERTOPPING DATA

ROADWAY SURFACE	PAVED
EMBANKMENT TOP WIDTH	20.00 ft
CREST LENGTH	50.00 ft
OVERTOPPING CREST ELEVATION	2710.50 ft

CURRENT DATE: 11-27-2006
CURRENT TIME: 17:22:09

FILE DATE: 11-27-2006
FILE NAME: K

FHWA CULVERT ANALYSIS
HY-8, VERSION 6.1

CULV NO.	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
	INLET ELEV. (ft)	OUTLET ELEV. (ft)	CULVERT LENGTH (ft)	BARRELS SHAPE MATERIAL	SPAN (ft)	RISE (ft)	MANNING n	INLET TYPE
1	2700.50	2696.70	77.09	1 CSP	1.50	1.50	.032	CONVENTIONAL
2								
3								
4								
5								
6								

SUMMARY OF CULVERT FLOWS (cfs) FILE: K DATE: 11-27-2006

ELEV (ft)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
2700.50	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2701.10	1.5	1.5	0.0	0.0	0.0	0.0	0.0	0.00	1
2701.40	3.0	3.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2701.66	4.5	4.5	0.0	0.0	0.0	0.0	0.0	0.00	1
2701.91	6.0	6.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2702.18	7.5	7.5	0.0	0.0	0.0	0.0	0.0	0.00	1
2702.60	9.0	9.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2702.84	10.5	10.5	0.0	0.0	0.0	0.0	0.0	0.00	1
2703.25	12.0	12.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2703.72	13.5	13.5	0.0	0.0	0.0	0.0	0.0	0.00	1
2704.25	15.0	15.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2705.50	16.3	16.3	0.0	0.0	0.0	0.0	0.0	OVERTOPPING	

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: K DATE: 11-27-2006

HEAD ELEV (ft)	HEAD ERROR (ft)	TOTAL FLOW (cfs)	FLOW ERROR (cfs)	% FLOW ERROR
2700.50	0.000	0.00	0.00	0.00
2701.10	0.000	1.50	0.00	0.00
2701.40	0.000	3.00	0.00	0.00
2701.66	0.000	4.50	0.00	0.00
2701.91	0.000	6.00	0.00	0.00
2702.18	0.000	7.50	0.00	0.00
2702.60	0.000	9.00	0.00	0.00
2702.84	0.000	10.50	0.00	0.00
2703.25	0.000	12.00	0.00	0.00
2703.72	0.000	13.50	0.00	0.00
2704.25	0.000	15.00	0.00	0.00

<1> TOLERANCE (ft) = 0.010

<2> TOLERANCE (%) = 1.000

CURRENT DATE: 11-27-2006 FILE DATE: 11-27-2006
CURRENT TIME: 17:22:09 FILE NAME: K

PERFORMANCE CURVE FOR CULVERT 1 - 1(1.50 (ft) BY 1.50 (ft)) CSP

DIS-CHARGE FLOW (cfs)	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRIT. DEPTH (ft)	OUTLET DEPTH (ft)	TW DEPTH (ft)	OUTLET VEL. (fps)	TW VEL. (fps)
0.00	2700.50	0.00	0.00	0-NF	0.00	0.00	0.00	1.30	0.00	0.00
1.50	2701.10	0.60	0.60	1-S2n	0.40	0.46	0.26	1.45	7.24	1.71
3.00	2701.40	0.90	0.90	1-S1f	0.58	0.65	0.80	1.53	3.13	2.17
4.50	2701.66	1.16	1.16	1-S1f	0.73	0.81	1.00	1.58	3.60	2.47
6.00	2701.91	1.41	1.41	1-S1f	0.86	0.94	1.10	1.63	4.31	2.70
7.50	2702.18	1.68	1.68	1-S1f	1.01	1.06	1.20	1.68	4.95	2.90
9.00	2702.60	1.99	2.10	3-M1f	1.17	1.16	1.50	1.72	5.09	3.06
10.50	2702.84	2.34	2.32	3-M1f	1.50	1.24	1.50	1.75	5.94	3.20
12.00	2703.25	2.75	2.57	3-M1f	1.50	1.31	1.50	1.79	6.79	3.33
13.50	2703.72	3.22	2.86	3-M1f	1.50	1.37	1.50	1.82	7.64	3.45
15.00	2704.25	3.75	3.18	3-M1f	1.50	1.44	1.50	1.84	8.49	3.56

El. inlet face invert 2700.50 ft El. outlet invert 2696.70 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

***** SITE DATA ***** CULVERT INVERT **************

INLET STATION	0.00 ft
INLET ELEVATION	2700.50 ft
OUTLET STATION	77.00 ft
OUTLET ELEVATION	2696.70 ft
NUMBER OF BARRELS	1
SLOPE (V/H)	0.0494
CULVERT LENGTH ALONG SLOPE	77.09 ft

***** CULVERT DATA SUMMARY ************************

BARREL SHAPE	CIRCULAR
BARREL DIAMETER	1.50 ft
BARREL MATERIAL	CORRUGATED ALUMINUM
BARREL MANNING'S n	0.032
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	SQUARE EDGE WITH HEADWALL
INLET DEPRESSION	NONE

CURRENT DATE: 11-27-2006
CURRENT TIME: 17:22:09

FILE DATE: 11-27-2006
FILE NAME: K

TAILWATER

****** REGULAR CHANNEL CROSS SECTION ****************

BOTTOM WIDTH	5.00 ft
SIDE SLOPE H/V (X:1)	5.0
CHANNEL SLOPE V/H (ft/ft)	0.020
MANNING'S n (.01-0.1)	0.032
CHANNEL INVERT ELEVATION	2698.00 ft
CULVERT NO.1 OUTLET INVERT ELEVATION	2696.70 ft

******* UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

FLOW (cfs)	W.S.E. (ft)	FROUDE NUMBER	DEPTH (ft)	VEL. (f/s)	SHEAR (psf)
0.00	2698.00	0.000	0.00	0.00	0.00
1.50	2698.15	0.775	0.15	1.71	0.19
3.00	2698.23	0.803	0.23	2.17	0.28
4.50	2698.28	0.817	0.28	2.47	0.35
6.00	2698.33	0.826	0.33	2.70	0.42
7.50	2698.38	0.832	0.38	2.90	0.47
9.00	2698.42	0.837	0.42	3.06	0.52
10.50	2698.45	0.841	0.45	3.20	0.56
12.00	2698.49	0.844	0.49	3.33	0.61
13.50	2698.52	0.847	0.52	3.45	0.64
15.00	2698.54	0.849	0.54	3.56	0.68

ROADWAY OVERTOPPING DATA

ROADWAY SURFACE	PAVED
EMBANKMENT TOP WIDTH	20.00 ft
CREST LENGTH	50.00 ft
OVERTOPPING CREST ELEVATION	2705.50 ft

URRENT DATE: 11-27-2006
URRENT TIME: 17:24:48

FILE DATE: 11-27-2006
FILE NAME: L

FHWA CULVERT ANALYSIS
HY-8, VERSION 6.1

C U L V NO.	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
	INLET ELEV. (ft)	OUTLET ELEV. (ft)	CULVERT LENGTH (ft)	BARRELS SHAPE MATERIAL	SPAN (ft)	RISE (ft)	MANNING n	INLET TYPE
1	2693.50	2693.00	65.80	2 CSP	3.50	3.50	.031	CONVENTIONAL
2								
3								
4								
5								
6								

UMMARY OF CULVERT FLOWS (cfs) FILE: L DATE: 11-27-2006

ELEV (ft)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
2693.50	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2694.71	13.8	13.8	0.0	0.0	0.0	0.0	0.0	0.00	1
2695.27	27.6	27.6	0.0	0.0	0.0	0.0	0.0	0.00	1
2695.71	41.4	41.4	0.0	0.0	0.0	0.0	0.0	0.00	1
2696.11	55.2	55.2	0.0	0.0	0.0	0.0	0.0	0.00	1
2696.48	69.0	69.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2696.86	82.8	82.8	0.0	0.0	0.0	0.0	0.0	0.00	1
2697.19	96.6	96.6	0.0	0.0	0.0	0.0	0.0	0.00	1
2697.63	110.4	110.4	0.0	0.0	0.0	0.0	0.0	0.00	1
2698.05	124.2	124.2	0.0	0.0	0.0	0.0	0.0	0.00	1
2698.80	138.0	138.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2700.00	159.2	159.2	0.0	0.0	0.0	0.0	0.0	OVERTOPPING	

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: L DATE: 11-27-2006

HEAD ELEV (ft)	HEAD ERROR (ft)	TOTAL FLOW (cfs)	FLOW ERROR (cfs)	% FLOW ERROR
2693.50	0.000	0.00	0.00	0.00
2694.71	0.000	13.80	0.00	0.00
2695.27	0.000	27.60	0.00	0.00
2695.71	0.000	41.40	0.00	0.00
2696.11	0.000	55.20	0.00	0.00
2696.48	0.000	69.00	0.00	0.00
2696.86	0.000	82.80	0.00	0.00
2697.19	0.000	96.60	0.00	0.00
2697.63	0.000	110.40	0.00	0.00
2698.05	0.000	124.20	0.00	0.00
2698.80	0.000	138.00	0.00	0.00

<1> TOLERANCE (ft) = 0.010 <2> TOLERANCE (%) = 1.000

CURRENT DATE: 11-27-2006 FILE DATE: 11-27-2006
CURRENT TIME: 17:24:48 FILE NAME: L

PERFORMANCE CURVE FOR CULVERT 1 - 2(3.50 (ft) BY 3.50 (ft)) CSP

DIS-CHARGE FLOW (cfs)	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRIT. DEPTH (ft)	OUTLET DEPTH (ft)	TW DEPTH (ft)	OUTLET VEL. (fps)	TW VEL. (fps)
0.00	2693.50	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	0.00
13.80	2694.71	1.10	1.21	2-M2c	1.02	0.78	0.78	0.52	4.30	3.47
27.60	2695.27	1.55	1.77	2-M2c	1.48	1.12	1.12	0.75	5.18	4.23
41.40	2695.71	1.94	2.21	2-M2c	1.88	1.39	1.39	0.92	5.80	4.73
55.20	2696.11	2.30	2.61	2-M2c	2.26	1.61	1.61	1.05	6.38	5.11
69.00	2696.48	2.63	2.98	2-M2c	2.70	1.82	1.82	1.17	6.85	5.42
82.80	2696.86	2.96	3.36	2-M2c	3.50	2.00	2.00	1.28	7.30	5.69
96.60	2697.19	3.29	3.69	2-M2c	3.50	2.17	2.17	1.37	7.73	5.93
110.40	2697.63	3.62	4.13	2-M2c	3.50	2.32	2.32	1.46	8.17	6.14
124.20	2698.05	3.98	4.55	2-M2c	3.50	2.47	2.47	1.54	8.56	6.33
138.00	2698.80	4.36	5.30	2-M2c	3.50	2.59	2.59	1.62	9.05	6.51

El. inlet face invert 2693.50 ft El. outlet invert 2693.00 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

***** SITE DATA ***** CULVERT INVERT **************

INLET STATION	0.00 ft
INLET ELEVATION	2693.50 ft
OUTLET STATION	65.80 ft
OUTLET ELEVATION	2693.00 ft
NUMBER OF BARRELS	2
SLOPE (V/H)	0.0076
CULVERT LENGTH ALONG SLOPE	65.80 ft

***** CULVERT DATA SUMMARY ************************

BARREL SHAPE	CIRCULAR
BARREL DIAMETER	3.50 ft
BARREL MATERIAL	CORRUGATED ALUMINUM
BARREL MANNING'S n	0.031
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	SQUARE EDGE WITH HEADWALL
INLET DEPRESSION	NONE

CURRENT DATE: 11-27-2006
CURRENT TIME: 17:24:48

FILE DATE: 11-27-2006
FILE NAME: L

TAILWATER

****** REGULAR CHANNEL CROSS SECTION ****************

BOTTOM WIDTH	5.00 ft
SIDE SLOPE H/V (X:1)	5.0
CHANNEL SLOPE V/H (ft/ft)	0.020
MANNING'S n (.01-0.1)	0.032
CHANNEL INVERT ELEVATION	2693.00 ft
CULVERT NO.1 OUTLET INVERT ELEVATION	2693.00 ft

******* UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

FLOW (cfs)	W.S.E. (ft)	FROUDE NUMBER	DEPTH (ft)	VEL. (f/s)	SHEAR (psf)
0.00	2693.00	0.000	0.00	0.00	0.00
13.80	2693.52	0.847	0.52	3.47	0.65
27.60	2693.75	0.862	0.75	4.23	0.93
41.40	2693.92	0.871	0.92	4.73	1.14
55.20	2694.05	0.878	1.05	5.11	1.31
69.00	2694.17	0.883	1.17	5.42	1.46
82.80	2694.28	0.887	1.28	5.69	1.59
96.60	2694.37	0.891	1.37	5.93	1.71
110.40	2694.46	0.895	1.46	6.14	1.82
124.20	2694.54	0.898	1.54	6.33	1.93
138.00	2694.62	0.901	1.62	6.51	2.02

ROADWAY OVERTOPPING DATA

ROADWAY SURFACE	PAVED
EMBANKMENT TOP WIDTH	35.00 ft
CREST LENGTH	50.00 ft
OVERTOPPING CREST ELEVATION	2700.00 ft

URRENT DATE: 11-28-2006
URRENT TIME: 09:15:58

FILE DATE: 11-28-2006
FILE NAME: M

FHWA CULVERT ANALYSIS
HY-8, VERSION 6.1

CULV NO.	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
	INLET ELEV. (ft)	OUTLET ELEV. (ft)	CULVERT LENGTH (ft)	BARRELS SHAPE MATERIAL	SPAN (ft)	RISE (ft)	MANNING n	INLET TYPE
1	2696.50	2693.50	68.27	1 CSP	3.00	3.00	.032	CONVENTIONAL
2								
3								
4								
5								
6								

UMMARY OF CULVERT FLOWS (cfs) FILE: M DATE: 11-28-2006

ELEV (ft)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
2696.50	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2697.37	4.5	4.5	0.0	0.0	0.0	0.0	0.0	0.00	1
2697.74	9.0	9.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2698.07	13.5	13.5	0.0	0.0	0.0	0.0	0.0	0.00	1
2698.37	18.0	18.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2698.65	22.5	22.5	0.0	0.0	0.0	0.0	0.0	0.00	1
2698.91	27.0	27.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2699.18	31.5	31.5	0.0	0.0	0.0	0.0	0.0	0.00	1
2699.45	36.0	36.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2699.74	40.5	40.5	0.0	0.0	0.0	0.0	0.0	0.00	1
2700.04	45.0	45.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2702.50	67.9	67.9	0.0	0.0	0.0	0.0	0.0	OVERTOPPING	

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: M DATE: 11-28-2006

HEAD ELEV (ft)	HEAD ERROR (ft)	TOTAL FLOW (cfs)	FLOW ERROR (cfs)	% FLOW ERROR
2696.50	0.000	0.00	0.00	0.00
2697.37	0.000	4.50	0.00	0.00
2697.74	0.000	9.00	0.00	0.00
2698.07	0.000	13.50	0.00	0.00
2698.37	0.000	18.00	0.00	0.00
2698.65	0.000	22.50	0.00	0.00
2698.91	0.000	27.00	0.00	0.00
2699.18	0.000	31.50	0.00	0.00
2699.45	0.000	36.00	0.00	0.00
2699.74	0.000	40.50	0.00	0.00
2700.04	0.000	45.00	0.00	0.00

<1> TOLERANCE (ft) = 0.010 <2> TOLERANCE (%) = 1.000

CURRENT DATE: 11-28-2006 FILE DATE: 11-28-2006
CURRENT TIME: 09:15:58 FILE NAME: M

PERFORMANCE CURVE FOR CULVERT 1 - 1(3.00 (ft) BY 3.00 (ft)) CSP

DIS-CHARGE FLOW (cfs)	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRIT. DEPTH (ft)	OUTLET DEPTH (ft)	TW DEPTH (ft)	OUTLET VEL. (fps)	TW VEL. (fps)
0.00	2696.50	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	0.00
4.50	2697.37	0.87	0.87	1-S2n	0.56	0.65	0.45	0.28	6.47	2.47
9.00	2697.74	1.24	1.24	1-S2n	0.80	0.94	0.74	0.42	6.55	3.06
13.50	2698.07	1.57	1.57	1-S2n	0.99	1.17	0.87	0.52	7.97	3.45
18.00	2698.37	1.87	1.87	1-S2n	1.16	1.35	1.05	0.60	8.13	3.75
22.50	2698.65	2.15	2.15	1-S2n	1.31	1.52	1.22	0.67	8.30	3.99
27.00	2698.91	2.41	2.41	1-S2n	1.45	1.67	1.37	0.74	8.56	4.20
31.50	2699.18	2.68	2.68	1-S2n	1.59	1.82	1.52	0.80	8.78	4.39
36.00	2699.45	2.95	2.95	1-S2n	1.73	1.94	1.64	0.85	9.08	4.55
40.50	2699.74	3.24	3.24	5-S2n	1.87	2.07	1.77	0.91	9.34	4.70
45.00	2700.05	3.55	3.55	5-S2n	2.01	2.18	1.88	0.95	9.67	4.84

El. inlet face invert 2696.50 ft El. outlet invert 2693.50 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

**** SITE DATA ***** CULVERT INVERT **************

INLET STATION	0.00 ft
INLET ELEVATION	2696.50 ft
OUTLET STATION	68.20 ft
OUTLET ELEVATION	2693.50 ft
NUMBER OF BARRELS	1
SLOPE (V/H)	0.0440
CULVERT LENGTH ALONG SLOPE	68.27 ft

***** CULVERT DATA SUMMARY ************************

BARREL SHAPE	CIRCULAR
BARREL DIAMETER	3.00 ft
BARREL MATERIAL	CORRUGATED ALUMINUM
BARREL MANNING'S n	0.032
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	SQUARE EDGE WITH HEADWALL
INLET DEPRESSION	NONE

CURRENT DATE: 11-28-2006
CURRENT TIME: 09:15:58

FILE DATE: 11-28-2006
FILE NAME: M

TAILWATER

******* REGULAR CHANNEL CROSS SECTION ****************

BOTTOM WIDTH	5.00 ft
SIDE SLOPE H/V (X:1)	5.0
CHANNEL SLOPE V/H (ft/ft)	0.020
MANNING'S n (.01-0.1)	0.032
CHANNEL INVERT ELEVATION	2693.50 ft
CULVERT NO.1 OUTLET INVERT ELEVATION	2693.50 ft

******* UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

FLOW (cfs)	W.S.E. (ft)	FROUDE NUMBER	DEPTH (ft)	VEL. (f/s)	SHEAR (psf)
0.00	2693.50	0.000	0.00	0.00	0.00
4.50	2693.78	0.817	0.28	2.47	0.35
9.00	2693.92	0.837	0.42	3.06	0.52
13.50	2694.02	0.847	0.52	3.45	0.64
18.00	2694.10	0.853	0.60	3.75	0.75
22.50	2694.17	0.858	0.67	3.99	0.84
27.00	2694.24	0.862	0.74	4.20	0.92
31.50	2694.30	0.865	0.80	4.39	1.00
36.00	2694.35	0.868	0.85	4.55	1.07
40.50	2694.41	0.871	0.91	4.70	1.13
45.00	2694.45	0.873	0.95	4.84	1.19

ROADWAY OVERTOPPING DATA

ROADWAY SURFACE	PAVED
EMBANKMENT TOP WIDTH	20.00 ft
CREST LENGTH	50.00 ft
OVERTOPPING CREST ELEVATION	2702.50 ft

CURRENT DATE: 09-05-2006
CURRENT TIME: 08:26:43

FILE DATE: 09-05-2006
FILE NAME: N

FHWA CULVERT ANALYSIS
HY-8, VERSION 6.1

C U L V NO.	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
	INLET ELEV. (ft)	OUTLET ELEV. (ft)	CULVERT LENGTH (ft)	BARRELS SHAPE MATERIAL	SPAN (ft)	RISE (ft)	MANNING n	INLET TYPE
1	2717.00	2716.30	121.80	1 CSP	2.50	2.50	.032	CONVENTIONAL
2								
3								
4								
5								
6								

SUMMARY OF CULVERT FLOWS (cfs) FILE: N DATE: 09-05-2006

ELEV (ft)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
2717.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2717.72	1.7	1.7	0.0	0.0	0.0	0.0	0.0	0.00	1
2717.97	3.4	3.4	0.0	0.0	0.0	0.0	0.0	0.00	1
2718.24	5.1	5.1	0.0	0.0	0.0	0.0	0.0	0.00	1
2718.46	6.8	6.8	0.0	0.0	0.0	0.0	0.0	0.00	1
2718.66	8.5	8.5	0.0	0.0	0.0	0.0	0.0	0.00	1
2718.85	10.2	10.2	0.0	0.0	0.0	0.0	0.0	0.00	1
2719.03	11.9	11.9	0.0	0.0	0.0	0.0	0.0	0.00	1
2719.23	13.6	13.6	0.0	0.0	0.0	0.0	0.0	0.00	1
2719.43	15.3	15.3	0.0	0.0	0.0	0.0	0.0	0.00	1
2719.59	17.0	17.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2722.00	26.3	26.3	0.0	0.0	0.0	0.0	0.0	OVERTOPPING	

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: N DATE: 09-05-2006

HEAD ELEV (ft)	HEAD ERROR (ft)	TOTAL FLOW (cfs)	FLOW ERROR (cfs)	% FLOW ERROR
2717.00	0.000	0.00	0.00	0.00
2717.72	0.000	1.70	0.00	0.00
2717.97	0.000	3.40	0.00	0.00
2718.24	0.000	5.10	0.00	0.00
2718.46	0.000	6.80	0.00	0.00
2718.66	0.000	8.50	0.00	0.00
2718.85	0.000	10.20	0.00	0.00
2719.03	0.000	11.90	0.00	0.00
2719.23	0.000	13.60	0.00	0.00
2719.43	0.000	15.30	0.00	0.00
2719.59	0.000	17.00	0.00	0.00

<1> TOLERANCE (ft) = 0.010

<2> TOLERANCE (%) = 1.000

CURRENT DATE: 09-05-2006
CURRENT TIME: 08:26:43

FILE DATE: 09-05-2006
FILE NAME: N

PERFORMANCE CURVE FOR CULVERT 1 - 1(2.50 (ft) BY 2.50 (ft)) CSP

DIS-CHARGE FLOW (cfs)	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRIT. DEPTH (ft)	OUTLET DEPTH (ft)	TW DEPTH (ft)	OUTLET VEL. (fps)	TW VEL. (fps)
0.00	2717.00	0.00	0.00	0-NF	0.00	0.00	0.00	0.50	0.00	0.00
1.70	2717.72	0.63	0.72	3-M1t	0.61	0.41	0.66	0.66	1.62	1.79
3.40	2717.97	0.83	0.97	3-M2t	0.88	0.59	0.74	0.74	2.78	2.26
5.10	2718.24	1.02	1.24	3-M2t	1.10	0.74	0.80	0.80	3.73	2.57
6.80	2718.46	1.19	1.46	3-M2t	1.31	0.86	0.86	0.86	4.55	2.81
8.50	2718.66	1.35	1.66	2-M2c	1.50	0.97	0.97	0.90	4.84	3.01
10.20	2718.85	1.50	1.85	2-M2c	1.71	1.06	1.06	0.95	5.13	3.18
11.90	2719.03	1.64	2.03	2-M2c	1.94	1.15	1.15	0.98	5.39	3.33
13.60	2719.23	1.78	2.23	2-M2c	2.50	1.24	1.24	1.02	5.60	3.46
15.30	2719.43	1.92	2.43	2-M2c	2.50	1.32	1.32	1.05	5.85	3.58
17.00	2719.59	2.05	2.59	2-M2c	2.50	1.39	1.39	1.08	6.07	3.69

El. inlet face invert 2717.00 ft El. outlet invert 2716.30 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

***** SITE DATA ***** CULVERT INVERT **************

INLET STATION	0.00 ft
INLET ELEVATION	2717.00 ft
OUTLET STATION	121.80 ft
OUTLET ELEVATION	2716.30 ft
NUMBER OF BARRELS	1
SLOPE (V/H)	0.0057
CULVERT LENGTH ALONG SLOPE	121.80 ft

***** CULVERT DATA SUMMARY ************************

BARREL SHAPE	CIRCULAR
BARREL DIAMETER	2.50 ft
BARREL MATERIAL	CORRUGATED ALUMINUM
BARREL MANNING'S n	0.032
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	SQUARE EDGE WITH HEADWALL
INLET DEPRESSION	NONE

CURRENT DATE: 09-05-2006
CURRENT TIME: 08:26:43

FILE DATE: 09-05-2006
FILE NAME: N

TAILWATER

******* REGULAR CHANNEL CROSS SECTION ****************

BOTTOM WIDTH	5.00 ft
SIDE SLOPE H/V (X:1)	5.0
CHANNEL SLOPE V/H (ft/ft)	0.020
MANNING'S n (.01-0.1)	0.032
CHANNEL INVERT ELEVATION	2716.80 ft
CULVERT NO.1 OUTLET INVERT ELEVATION	2716.30 ft

******* UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

FLOW (cfs)	W.S.E. (ft)	FROUDE NUMBER	DEPTH (ft)	VEL. (f/s)	SHEAR (psf)
0.00	2716.80	0.000	0.00	0.00	0.00
1.70	2716.96	0.780	0.16	1.79	0.20
3.40	2717.04	0.808	0.24	2.26	0.30
5.10	2717.10	0.821	0.30	2.57	0.38
6.80	2717.16	0.829	0.36	2.81	0.44
8.50	2717.20	0.835	0.40	3.01	0.50
10.20	2717.25	0.840	0.45	3.18	0.56
11.90	2717.28	0.844	0.48	3.33	0.60
13.60	2717.32	0.847	0.52	3.46	0.65
15.30	2717.35	0.849	0.55	3.58	0.69
17.00	2717.38	0.852	0.58	3.69	0.73

ROADWAY OVERTOPPING DATA

ROADWAY SURFACE	PAVED
EMBANKMENT TOP WIDTH	20.00 ft
CREST LENGTH	50.00 ft
OVERTOPPING CREST ELEVATION	2722.00 ft

CURRENT DATE: 09-03-2006
CURRENT TIME: 13:56:06

FILE DATE: 09-03-2006
FILE NAME: O

FHWA CULVERT ANALYSIS
HY-8, VERSION 6.1

CULV NO.	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
	INLET ELEV. (ft)	OUTLET ELEV. (ft)	CULVERT LENGTH (ft)	BARRELS SHAPE MATERIAL	SPAN (ft)	RISE (ft)	MANNING n	INLET TYPE
1	2721.80	2717.80	107.57	1 CSP	2.50	2.50	.032	CONVENTIONAL
2								
3								
4								
5								
6								

SUMMARY OF CULVERT FLOWS (cfs) FILE: O DATE: 09-03-2006

ELEV (ft)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
2721.80	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2722.53	2.8	2.8	0.0	0.0	0.0	0.0	0.0	0.00	1
2722.83	5.6	5.6	0.0	0.0	0.0	0.0	0.0	0.00	1
2723.10	8.4	8.4	0.0	0.0	0.0	0.0	0.0	0.00	1
2723.35	11.2	11.2	0.0	0.0	0.0	0.0	0.0	0.00	1
2723.57	14.0	14.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2723.79	16.8	16.8	0.0	0.0	0.0	0.0	0.0	0.00	1
2724.01	19.6	19.6	0.0	0.0	0.0	0.0	0.0	0.00	1
2724.24	22.4	22.4	0.0	0.0	0.0	0.0	0.0	0.00	1
2724.47	25.2	25.2	0.0	0.0	0.0	0.0	0.0	0.00	1
2724.87	28.0	28.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2727.25	39.4	39.4	0.0	0.0	0.0	0.0	0.0	OVERTOPPING	

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: O DATE: 09-03-2006

HEAD ELEV (ft)	HEAD ERROR (ft)	TOTAL FLOW (cfs)	FLOW ERROR (cfs)	% FLOW ERROR
2721.80	0.000	0.00	0.00	0.00
2722.53	0.000	2.80	0.00	0.00
2722.83	0.000	5.60	0.00	0.00
2723.10	0.000	8.40	0.00	0.00
2723.35	0.000	11.20	0.00	0.00
2723.57	0.000	14.00	0.00	0.00
2723.79	0.000	16.80	0.00	0.00
2724.01	0.000	19.60	0.00	0.00
2724.24	0.000	22.40	0.00	0.00
2724.47	0.000	25.20	0.00	0.00
2724.87	0.000	28.00	0.00	0.00

<1> TOLERANCE (ft) = 0.010 <2> TOLERANCE (%) = 1.000

CURRENT DATE: 09-03-2006
CURRENT TIME: 13:56:06

FILE DATE: 09-03-2006
FILE NAME: O

PERFORMANCE CURVE FOR CULVERT 1 - 1(2.50 (ft) BY 2.50 (ft)) CSP

DIS-CHARGE FLOW (cfs)	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRIT. DEPTH (ft)	OUTLET DEPTH (ft)	TW DEPTH (ft)	OUTLET VEL. (fps)	TW VEL. (fps)
0.00	2721.80	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	0.00
2.80	2722.53	0.73	0.73	1-S2n	0.50	0.54	0.44	0.19	4.72	2.42
5.60	2722.83	1.03	1.03	1-S2n	0.70	0.78	0.58	0.29	6.45	3.04
8.40	2723.10	1.30	1.30	1-S2n	0.87	0.96	0.76	0.36	6.66	3.45
11.20	2723.35	1.55	1.55	1-S2n	1.02	1.11	0.91	0.42	6.87	3.77
14.00	2723.58	1.78	1.78	1-S2n	1.15	1.26	1.06	0.47	7.07	4.03
16.80	2723.80	2.00	2.00	1-S2n	1.28	1.38	1.18	0.52	7.36	4.25
19.60	2724.01	2.21	2.21	1-S2n	1.41	1.50	1.30	0.56	7.59	4.44
22.40	2724.24	2.44	2.44	1-S2n	1.54	1.60	1.40	0.60	7.89	4.61
25.20	2724.47	2.67	2.67	5-S2n	1.67	1.71	1.61	0.64	7.57	4.77
28.00	2724.87	2.91	3.07	2-M2c	1.81	1.80	1.80	0.68	7.39	4.91

El. inlet face invert 2721.80 ft El. outlet invert 2717.80 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

***** SITE DATA ***** CULVERT INVERT **************

INLET STATION	0.00 ft
INLET ELEVATION	2721.80 ft
OUTLET STATION	107.50 ft
OUTLET ELEVATION	2717.80 ft
NUMBER OF BARRELS	1
SLOPE (V/H)	0.0372
CULVERT LENGTH ALONG SLOPE	107.57 ft

***** CULVERT DATA SUMMARY ************************

BARREL SHAPE	CIRCULAR
BARREL DIAMETER	2.50 ft
BARREL MATERIAL	CORRUGATED ALUMINUM
BARREL MANNING'S n	0.032
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	SQUARE EDGE WITH HEADWALL
INLET DEPRESSION	NONE

CURRENT DATE: 09-03-2006
CURRENT TIME: 13:56:06

FILE DATE: 09-03-2006
FILE NAME: O

TAILWATER

******* REGULAR CHANNEL CROSS SECTION ****************

BOTTOM WIDTH	5.00 ft
SIDE SLOPE H/V (X:1)	5.0
CHANNEL SLOPE V/H (ft/ft)	0.030
MANNING'S n (.01-0.1)	0.032
CHANNEL INVERT ELEVATION	2717.80 ft
CULVERT NO.1 OUTLET INVERT ELEVATION	2717.80 ft

******* UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

FLOW (cfs)	W.S.E. (ft)	FROUDE NUMBER	DEPTH (ft)	VEL. (f/s)	SHEAR (psf)
0.00	2717.80	0.000	0.00	0.00	0.00
2.80	2717.99	0.971	0.19	2.42	0.36
5.60	2718.09	1.001	0.29	3.04	0.54
8.40	2718.16	1.016	0.36	3.45	0.67
11.20	2718.22	1.025	0.42	3.77	0.79
14.00	2718.27	1.032	0.47	4.03	0.88
16.80	2718.32	1.037	0.52	4.25	0.97
19.60	2718.36	1.042	0.56	4.44	1.06
22.40	2718.41	1.045	0.60	4.61	1.13
25.20	2718.44	1.048	0.64	4.77	1.20
28.00	2718.48	1.051	0.68	4.91	1.27

ROADWAY OVERTOPPING DATA

ROADWAY SURFACE	PAVED
EMBANKMENT TOP WIDTH	20.00 ft
CREST LENGTH	50.00 ft
OVERTOPPING CREST ELEVATION	2727.25 ft

CURRENT DATE: 09-03-2006
CURRENT TIME: 13:58:16

FILE DATE: 09-03-2006
FILE NAME: P

FHWA CULVERT ANALYSIS
HY-8, VERSION 6.1

CULV NO.	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
	INLET ELEV. (ft)	OUTLET ELEV. (ft)	CULVERT LENGTH (ft)	BARRELS SHAPE MATERIAL	SPAN (ft)	RISE (ft)	MANNING n	INLET TYPE
1	2724.50	2722.00	69.05	1 CSP	1.50	1.50	.032	CONVENTIONAL
2								
3								
4								
5								
6								

SUMMARY OF CULVERT FLOWS (cfs) FILE: P DATE: 09-03-2006

ELEV (ft)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
2724.50	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2724.94	0.8	0.8	0.0	0.0	0.0	0.0	0.0	0.00	1
2725.13	1.6	1.6	0.0	0.0	0.0	0.0	0.0	0.00	1
2725.29	2.4	2.4	0.0	0.0	0.0	0.0	0.0	0.00	1
2725.44	3.2	3.2	0.0	0.0	0.0	0.0	0.0	0.00	1
2725.58	4.0	4.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2725.72	4.8	4.8	0.0	0.0	0.0	0.0	0.0	0.00	1
2725.99	5.6	5.6	0.0	0.0	0.0	0.0	0.0	0.00	1
2726.12	6.4	6.4	0.0	0.0	0.0	0.0	0.0	0.00	1
2726.22	7.2	7.2	0.0	0.0	0.0	0.0	0.0	0.00	1
2726.35	8.0	8.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2728.75	11.0	11.0	0.0	0.0	0.0	0.0	0.0	OVERTOPPING	

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: P DATE: 09-03-2006

HEAD ELEV (ft)	HEAD ERROR (ft)	TOTAL FLOW (cfs)	FLOW ERROR (cfs)	% FLOW ERROR
2724.50	0.000	0.00	0.00	0.00
2724.94	0.000	0.80	0.00	0.00
2725.13	0.000	1.60	0.00	0.00
2725.29	0.000	2.40	0.00	0.00
2725.44	0.000	3.20	0.00	0.00
2725.58	0.000	4.00	0.00	0.00
2725.72	0.000	4.80	0.00	0.00
2725.99	0.000	5.60	0.00	0.00
2726.12	0.000	6.40	0.00	0.00
2726.22	0.000	7.20	0.00	0.00
2726.35	0.000	8.00	0.00	0.00

<1> TOLERANCE (ft) = 0.010 <2> TOLERANCE (%) = 1.000

CURRENT DATE: 09-03-2006
CURRENT TIME: 13:58:16

FILE DATE: 09-03-2006
FILE NAME: P

PERFORMANCE CURVE FOR CULVERT 1 - 1(1.50 (ft) BY 1.50 (ft)) CSP

DIS-CHARGE FLOW (cfs)	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRIT. DEPTH (ft)	OUTLET DEPTH (ft)	TW DEPTH (ft)	OUTLET VEL. (fps)	TW VEL. (fps)
0.00	2724.50	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	0.00
0.80	2724.94	0.44	0.44	1-S2n	0.31	0.33	0.23	0.10	4.58	1.37
1.60	2725.13	0.63	0.63	1-S2n	0.45	0.47	0.37	0.16	4.63	1.75
2.40	2725.29	0.79	0.79	1-S2n	0.56	0.58	0.48	0.20	4.89	2.01
3.20	2725.44	0.94	0.94	1-S2n	0.65	0.68	0.58	0.23	5.10	2.21
4.00	2725.58	1.08	1.08	1-S2n	0.74	0.76	0.66	0.27	5.29	2.38
4.80	2725.72	1.22	1.22	1-S2n	0.83	0.84	0.74	0.29	5.54	2.52
5.60	2725.99	1.35	1.49	2-M2c	0.91	0.91	0.91	0.32	4.98	2.65
6.40	2726.12	1.49	1.62	2-M2c	1.00	0.97	0.97	0.34	5.27	2.76
7.20	2726.22	1.63	1.72	2-M2c	1.10	1.04	1.04	0.37	5.52	2.86
8.00	2726.35	1.79	1.85	2-M2c	1.21	1.09	1.09	0.39	5.79	2.95

El. inlet face invert 2724.50 ft El. outlet invert 2722.00 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

**** SITE DATA ***** CULVERT INVERT **************

INLET STATION	0.00 ft
INLET ELEVATION	2724.50 ft
OUTLET STATION	69.00 ft
OUTLET ELEVATION	2722.00 ft
NUMBER OF BARRELS	1
SLOPE (V/H)	0.0362
CULVERT LENGTH ALONG SLOPE	69.05 ft

***** CULVERT DATA SUMMARY ************************

BARREL SHAPE	CIRCULAR
BARREL DIAMETER	1.50 ft
BARREL MATERIAL	CORRUGATED ALUMINUM
BARREL MANNING'S n	0.032
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	SQUARE EDGE WITH HEADWALL
INLET DEPRESSION	NONE

CURRENT DATE: 09-03-2006
CURRENT TIME: 13:58:16

FILE DATE: 09-03-2006
FILE NAME: P

TAILWATER

******* REGULAR CHANNEL CROSS SECTION ****************

BOTTOM WIDTH	5.00 ft
SIDE SLOPE H/V (X:1)	5.0
CHANNEL SLOPE V/H (ft/ft)	0.020
MANNING'S n (.01-0.1)	0.032
CHANNEL INVERT ELEVATION	2722.00 ft
CULVERT NO.1 OUTLET INVERT ELEVATION	2722.00 ft

******* UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

FLOW (cfs)	W.S.E. (ft)	FROUDE NUMBER	DEPTH (ft)	VEL. (f/s)	SHEAR (psf)
0.00	2722.00	0.000	0.00	0.00	0.00
0.80	2722.10	0.746	0.10	1.37	0.13
1.60	2722.16	0.778	0.16	1.75	0.20
2.40	2722.20	0.795	0.20	2.01	0.25
3.20	2722.23	0.805	0.23	2.21	0.29
4.00	2722.27	0.813	0.27	2.38	0.33
4.80	2722.29	0.819	0.29	2.52	0.37
5.60	2722.32	0.824	0.32	2.65	0.40
6.40	2722.34	0.828	0.34	2.76	0.43
7.20	2722.37	0.831	0.37	2.86	0.46
8.00	2722.39	0.834	0.39	2.95	0.49

ROADWAY OVERTOPPING DATA

ROADWAY SURFACE	PAVED
EMBANKMENT TOP WIDTH	20.00 ft
CREST LENGTH	50.00 ft
OVERTOPPING CREST ELEVATION	2728.75 ft

CURRENT DATE: 09-03-2006
CURRENT TIME: 14:00:48

FILE DATE: 09-03-2006
FILE NAME: Q

FHWA CULVERT ANALYSIS
HY-8, VERSION 6.1

C U L V NO.	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
	INLET ELEV. (ft)	OUTLET ELEV. (ft)	CULVERT LENGTH (ft)	BARRELS SHAPE MATERIAL	SPAN (ft)	RISE (ft)	MANNING n	INLET TYPE
1	2724.90	2722.00	73.76	1 CSP	1.50	1.50	.032	CONVENTIONAL
2								
3								
4								
5								
6								

SUMMARY OF CULVERT FLOWS (cfs) FILE: Q DATE: 09-03-2006

ELEV (ft)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
2724.90	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2725.34	0.8	0.8	0.0	0.0	0.0	0.0	0.0	0.00	1
2725.53	1.6	1.6	0.0	0.0	0.0	0.0	0.0	0.00	1
2725.69	2.4	2.4	0.0	0.0	0.0	0.0	0.0	0.00	1
2725.84	3.2	3.2	0.0	0.0	0.0	0.0	0.0	0.00	1
2725.98	4.0	4.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2726.11	4.8	4.8	0.0	0.0	0.0	0.0	0.0	0.00	1
2726.25	5.6	5.6	0.0	0.0	0.0	0.0	0.0	0.00	1
2726.52	6.4	6.4	0.0	0.0	0.0	0.0	0.0	0.00	1
2726.65	7.2	7.2	0.0	0.0	0.0	0.0	0.0	0.00	1
2726.75	8.0	8.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2728.75	10.7	10.7	0.0	0.0	0.0	0.0	0.0	OVERTOPPING	

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: Q DATE: 09-03-2006

HEAD ELEV (ft)	HEAD ERROR (ft)	TOTAL FLOW (cfs)	FLOW ERROR (cfs)	% FLOW ERROR
2724.90	0.000	0.00	0.00	0.00
2725.34	0.000	0.80	0.00	0.00
2725.53	0.000	1.60	0.00	0.00
2725.69	0.000	2.40	0.00	0.00
2725.84	0.000	3.20	0.00	0.00
2725.98	0.000	4.00	0.00	0.00
2726.11	0.000	4.80	0.00	0.00
2726.25	0.000	5.60	0.00	0.00
2726.52	0.000	6.40	0.00	0.00
2726.65	0.000	7.20	0.00	0.00
2726.75	0.000	8.00	0.00	0.00

<1> TOLERANCE (ft) = 0.010

<2> TOLERANCE (%) = 1.000

CURRENT DATE: 09-03-2006 FILE DATE: 09-03-2006
CURRENT TIME: 14:00:48 FILE NAME: Q

PERFORMANCE CURVE FOR CULVERT 1 - 1(1.50 (ft) BY 1.50 (ft)) CSP

DIS-CHARGE FLOW (cfs)	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRIT. DEPTH (ft)	OUTLET DEPTH (ft)	TW DEPTH (ft)	OUTLET VEL. (fps)	TW VEL. (fps)
0.00	2724.90	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	0.00
0.80	2725.34	0.44	0.44	1-S2n	0.31	0.33	0.23	0.10	4.58	1.37
1.60	2725.53	0.63	0.63	1-S2n	0.44	0.47	0.37	0.16	4.63	1.75
2.40	2725.69	0.79	0.79	1-S2n	0.54	0.58	0.48	0.20	4.89	2.01
3.20	2725.84	0.94	0.94	1-S2n	0.64	0.68	0.58	0.23	5.10	2.21
4.00	2725.98	1.08	1.08	1-S2n	0.72	0.76	0.66	0.27	5.29	2.38
4.80	2726.11	1.21	1.21	1-S2n	0.81	0.84	0.74	0.29	5.54	2.52
5.60	2726.25	1.35	1.35	1-S2n	0.89	0.91	0.81	0.32	5.74	2.65
6.40	2726.52	1.49	1.62	2-M2c	0.98	0.97	0.97	0.34	5.27	2.76
7.20	2726.65	1.63	1.75	2-M2c	1.06	1.04	1.04	0.37	5.52	2.86
8.00	2726.75	1.79	1.85	2-M2c	1.16	1.09	1.09	0.39	5.79	2.95

El. inlet face invert 2724.90 ft El. outlet invert 2722.00 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

***** SITE DATA ***** CULVERT INVERT **************

INLET STATION	0.00 ft
INLET ELEVATION	2724.90 ft
OUTLET STATION	73.70 ft
OUTLET ELEVATION	2722.00 ft
NUMBER OF BARRELS	1
SLOPE (V/H)	0.0393
CULVERT LENGTH ALONG SLOPE	73.76 ft

***** CULVERT DATA SUMMARY ************************

BARREL SHAPE	CIRCULAR
BARREL DIAMETER	1.50 ft
BARREL MATERIAL	CORRUGATED ALUMINUM
BARREL MANNING'S n	0.032
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	SQUARE EDGE WITH HEADWALL
INLET DEPRESSION	NONE

CURRENT DATE: 09-03-2006 FILE DATE: 09-03-2006
CURRENT TIME: 14:00:48 FILE NAME: Q

TAILWATER

******* REGULAR CHANNEL CROSS SECTION ****************

BOTTOM WIDTH	5.00 ft
SIDE SLOPE H/V (X:1)	5.0
CHANNEL SLOPE V/H (ft/ft)	0.020
MANNING'S n (.01-0.1)	0.032
CHANNEL INVERT ELEVATION	2722.00 ft
CULVERT NO.1 OUTLET INVERT ELEVATION	2722.00 ft

******* UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

FLOW (cfs)	W.S.E. (ft)	FROUDE NUMBER	DEPTH (ft)	VEL. (f/s)	SHEAR (psf)
0.00	2722.00	0.000	0.00	0.00	0.00
0.80	2722.10	0.746	0.10	1.37	0.13
1.60	2722.16	0.778	0.16	1.75	0.20
2.40	2722.20	0.795	0.20	2.01	0.25
3.20	2722.23	0.805	0.23	2.21	0.29
4.00	2722.27	0.813	0.27	2.38	0.33
4.80	2722.29	0.819	0.29	2.52	0.37
5.60	2722.32	0.824	0.32	2.65	0.40
6.40	2722.34	0.828	0.34	2.76	0.43
7.20	2722.37	0.831	0.37	2.86	0.46
8.00	2722.39	0.834	0.39	2.95	0.49

ROADWAY OVERTOPPING DATA

ROADWAY SURFACE	PAVED
EMBANKMENT TOP WIDTH	20.00 ft
CREST LENGTH	50.00 ft
OVERTOPPING CREST ELEVATION	2728.75 ft

CURRENT DATE: 11-27-2006 FILE DATE: 11-27-2006
CURRENT TIME: 17:25:36 FILE NAME: S

FHWA CULVERT ANALYSIS
HY-8, VERSION 6.1

C U L V NO.	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
	INLET ELEV. (ft)	OUTLET ELEV. (ft)	CULVERT LENGTH (ft)	BARRELS SHAPE MATERIAL	SPAN (ft)	RISE (ft)	MANNING n	INLET TYPE
1	2681.50	2678.70	80.05	1 CSP	2.00	2.00	.031	CONVENTIONAL
2								
3								
4								
5								
6								

SUMMARY OF CULVERT FLOWS (cfs) FILE: S DATE: 11-27-2006

ELEV (ft)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
2681.50	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2682.16	2.1	2.1	0.0	0.0	0.0	0.0	0.0	0.00	1
2682.47	4.2	4.2	0.0	0.0	0.0	0.0	0.0	0.00	1
2682.73	6.3	6.3	0.0	0.0	0.0	0.0	0.0	0.00	1
2682.97	8.4	8.4	0.0	0.0	0.0	0.0	0.0	0.00	1
2683.19	10.5	10.5	0.0	0.0	0.0	0.0	0.0	0.00	1
2683.43	12.6	12.6	0.0	0.0	0.0	0.0	0.0	0.00	1
2683.80	14.7	14.7	0.0	0.0	0.0	0.0	0.0	0.00	1
2684.01	16.8	16.8	0.0	0.0	0.0	0.0	0.0	0.00	1
2684.30	18.9	18.9	0.0	0.0	0.0	0.0	0.0	0.00	1
2685.64	21.0	21.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2687.00	32.3	32.3	0.0	0.0	0.0	0.0	0.0	OVERTOPPING	

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: S DATE: 11-27-2006

HEAD ELEV (ft)	HEAD ERROR (ft)	TOTAL FLOW (cfs)	FLOW ERROR (cfs)	% FLOW ERROR
2681.50	0.000	0.00	0.00	0.00
2682.16	0.000	2.10	0.00	0.00
2682.47	0.000	4.20	0.00	0.00
2682.73	0.000	6.30	0.00	0.00
2682.97	0.000	8.40	0.00	0.00
2683.19	0.000	10.50	0.00	0.00
2683.43	0.000	12.60	0.00	0.00
2683.80	0.000	14.70	0.00	0.00
2684.01	0.000	16.80	0.00	0.00
2684.30	0.000	18.90	0.00	0.00
2685.64	0.000	21.00	0.00	0.00

<1> TOLERANCE (ft) = 0.010 <2> TOLERANCE (%) = 1.000

CURRENT DATE: 11-27-2006
CURRENT TIME: 17:25:36

FILE DATE: 11-27-2006
FILE NAME: S

PERFORMANCE CURVE FOR CULVERT 1 - 1(2.00 (ft) BY 2.00 (ft)) CSP

DIS-CHARGE FLOW (cfs)	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRIT. DEPTH (ft)	OUTLET DEPTH (ft)	TW DEPTH (ft)	OUTLET VEL. (fps)	TW VEL. (fps)
0.00	2681.50	0.00	0.00	0-NF	0.00	0.00	0.00	1.30	0.00	0.00
2.10	2682.16	0.66	0.66	1-S2n	0.46	0.49	0.39	1.48	4.79	1.92
4.20	2682.47	0.96	0.96	1-S2n	0.66	0.71	0.51	1.57	6.53	2.42
6.30	2682.73	1.23	1.23	1-S2n	0.82	0.88	0.68	1.64	6.62	2.74
8.40	2682.97	1.47	1.47	1-S2n	0.97	1.03	0.83	1.70	6.82	3.00
10.50	2683.19	1.69	1.69	1-S2n	1.11	1.16	1.10	1.75	5.95	3.20
12.60	2683.43	1.93	1.93	1-S2n	1.24	1.27	1.17	1.80	6.59	3.38
14.70	2683.80	2.17	2.30	3-M1t	1.39	1.38	1.84	1.84	4.84	3.54
16.80	2684.01	2.43	2.51	3-M1t	1.55	1.47	1.88	1.88	5.52	3.68
18.90	2684.30	2.72	2.80	3-M1t	1.79	1.56	1.92	1.92	6.15	3.80
21.00	2685.64	3.04	4.14	3-M2t	2.00	1.63	1.95	1.95	6.77	3.92

El. inlet face invert 2681.50 ft El. outlet invert 2678.70 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

**** SITE DATA ***** CULVERT INVERT **************

INLET STATION	0.00 ft
INLET ELEVATION	2681.50 ft
OUTLET STATION	80.00 ft
OUTLET ELEVATION	2678.70 ft
NUMBER OF BARRELS	1
SLOPE (V/H)	0.0350
CULVERT LENGTH ALONG SLOPE	80.05 ft

***** CULVERT DATA SUMMARY ************************

BARREL SHAPE	CIRCULAR
BARREL DIAMETER	2.00 ft
BARREL MATERIAL	CORRUGATED ALUMINUM
BARREL MANNING'S n	0.031
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	SQUARE EDGE WITH HEADWALL
INLET DEPRESSION	NONE

CURRENT DATE: 11-27-2006
CURRENT TIME: 17:25:36

FILE DATE: 11-27-2006
FILE NAME: S

TAILWATER

******* REGULAR CHANNEL CROSS SECTION ****************

BOTTOM WIDTH	5.00 ft
SIDE SLOPE H/V (X:1)	5.0
CHANNEL SLOPE V/H (ft/ft)	0.020
MANNING'S n (.01-0.1)	0.032
CHANNEL INVERT ELEVATION	2680.00 ft
CULVERT NO.1 OUTLET INVERT ELEVATION	2678.70 ft

******* UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

FLOW (cfs)	W.S.E. (ft)	FROUDE NUMBER	DEPTH (ft)	VEL. (f/s)	SHEAR (psf)
0.00	2680.00	0.000	0.00	0.00	0.00
2.10	2680.18	0.790	0.18	1.92	0.23
4.20	2680.27	0.815	0.27	2.42	0.34
6.30	2680.34	0.827	0.34	2.74	0.43
8.40	2680.40	0.835	0.40	3.00	0.50
10.50	2680.45	0.841	0.45	3.20	0.56
12.60	2680.50	0.845	0.50	3.38	0.62
14.70	2680.54	0.849	0.54	3.54	0.67
16.80	2680.58	0.852	0.58	3.68	0.72
18.90	2680.61	0.854	0.61	3.80	0.77
21.00	2680.65	0.856	0.65	3.92	0.81

ROADWAY OVERTOPPING DATA

ROADWAY SURFACE	PAVED
EMBANKMENT TOP WIDTH	20.00 ft
CREST LENGTH	50.00 ft
OVERTOPPING CREST ELEVATION	2687.00 ft

CURRENT DATE: 09-03-2006
CURRENT TIME: 14:09:06

FILE DATE: 09-03-2006
FILE NAME: T

FHWA CULVERT ANALYSIS
HY-8, VERSION 6.1

C U L V NO.	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
	INLET ELEV. (ft)	OUTLET ELEV. (ft)	CULVERT LENGTH (ft)	BARRELS SHAPE MATERIAL	SPAN (ft)	RISE (ft)	MANNING n	INLET TYPE
1	2743.50	2740.00	96.76	1 CSP	2.00	2.00	.032	CONVENTIONAL
2								
3								
4								
5								
6								

SUMMARY OF CULVERT FLOWS (cfs) FILE: T DATE: 09-03-2006

ELEV (ft)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
2743.50	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2744.01	1.2	1.2	0.0	0.0	0.0	0.0	0.0	0.00	1
2744.21	2.4	2.4	0.0	0.0	0.0	0.0	0.0	0.00	1
2744.38	3.6	3.6	0.0	0.0	0.0	0.0	0.0	0.00	1
2744.54	4.8	4.8	0.0	0.0	0.0	0.0	0.0	0.00	1
2744.69	6.0	6.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2744.83	7.2	7.2	0.0	0.0	0.0	0.0	0.0	0.00	1
2744.96	8.4	8.4	0.0	0.0	0.0	0.0	0.0	0.00	1
2745.09	9.6	9.6	0.0	0.0	0.0	0.0	0.0	0.00	1
2745.23	10.8	10.8	0.0	0.0	0.0	0.0	0.0	0.00	1
2745.36	12.0	12.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2747.50	21.0	21.0	0.0	0.0	0.0	0.0	0.0	OVERTOPPING	

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: T DATE: 09-03-2006

HEAD ELEV (ft)	HEAD ERROR (ft)	TOTAL FLOW (cfs)	FLOW ERROR (cfs)	% FLOW ERROR
2743.50	0.000	0.00	0.00	0.00
2744.01	0.000	1.20	0.00	0.00
2744.21	0.000	2.40	0.00	0.00
2744.38	0.000	3.60	0.00	0.00
2744.54	0.000	4.80	0.00	0.00
2744.69	0.000	6.00	0.00	0.00
2744.83	0.000	7.20	0.00	0.00
2744.96	0.000	8.40	0.00	0.00
2745.09	0.000	9.60	0.00	0.00
2745.23	0.000	10.80	0.00	0.00
2745.36	0.000	12.00	0.00	0.00

<1> TOLERANCE (ft) = 0.010 <2> TOLERANCE (%) = 1.000

CURRENT DATE: 09-03-2006
CURRENT TIME: 14:09:06

FILE DATE: 09-03-2006
FILE NAME: T

PERFORMANCE CURVE FOR CULVERT 1 - 1(2.00 (ft) BY 2.00 (ft)) CSP

DIS-CHARGE FLOW (cfs)	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRIT. DEPTH (ft)	OUTLET DEPTH (ft)	TW DEPTH (ft)	OUTLET VEL. (fps)	TW VEL. (fps)
0.00	2743.50	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	0.00
1.20	2744.01	0.51	0.51	1-S2n	0.34	0.37	0.27	0.12	4.53	1.81
2.40	2744.21	0.71	0.71	1-S2n	0.49	0.53	0.43	0.18	4.89	2.30
3.60	2744.38	0.88	0.88	1-S2n	0.61	0.66	0.56	0.22	4.99	2.63
4.80	2744.54	1.04	1.04	1-S2n	0.71	0.77	0.57	0.26	6.51	2.89
6.00	2744.69	1.19	1.19	1-S2n	0.81	0.86	0.66	0.30	6.59	3.11
7.20	2744.83	1.33	1.33	1-S2n	0.89	0.95	0.75	0.33	6.69	3.29
8.40	2744.96	1.46	1.46	1-S2n	0.97	1.03	0.83	0.36	6.82	3.45
9.60	2745.10	1.60	1.60	1-S2n	1.06	1.10	1.00	0.39	6.09	3.60
10.80	2745.23	1.73	1.73	1-S2n	1.14	1.18	1.08	0.41	6.27	3.72
12.00	2745.36	1.86	1.86	1-S2n	1.22	1.24	1.14	0.44	6.48	3.85

El. inlet face invert 2743.50 ft El. outlet invert 2740.00 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

***** SITE DATA ***** CULVERT INVERT **************

INLET STATION	0.00 ft
INLET ELEVATION	2743.50 ft
OUTLET STATION	96.70 ft
OUTLET ELEVATION	2740.00 ft
NUMBER OF BARRELS	1
SLOPE (V/H)	0.0362
CULVERT LENGTH ALONG SLOPE	96.76 ft

***** CULVERT DATA SUMMARY ************************

BARREL SHAPE	CIRCULAR
BARREL DIAMETER	2.00 ft
BARREL MATERIAL	CORRUGATED ALUMINUM
BARREL MANNING'S *n*	0.032
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	SQUARE EDGE WITH HEADWALL
INLET DEPRESSION	NONE

CURRENT DATE: 09-03-2006
CURRENT TIME: 14:09:06

FILE DATE: 09-03-2006
FILE NAME: T

TAILWATER

******* REGULAR CHANNEL CROSS SECTION ****************

BOTTOM WIDTH	5.00 ft
SIDE SLOPE H/V (X:1)	5.0
CHANNEL SLOPE V/H (ft/ft)	0.030
MANNING'S n (.01-0.1)	0.032
CHANNEL INVERT ELEVATION	2740.00 ft
CULVERT NO.1 OUTLET INVERT ELEVATION	2740.00 ft

******* UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

FLOW (cfs)	W.S.E. (ft)	FROUDE NUMBER	DEPTH (ft)	VEL. (f/s)	SHEAR (psf)
0.00	2740.00	0.000	0.00	0.00	0.00
1.20	2740.12	0.926	0.12	1.81	0.22
2.40	2740.18	0.963	0.18	2.30	0.33
3.60	2740.22	0.983	0.22	2.63	0.42
4.80	2740.26	0.995	0.26	2.89	0.49
6.00	2740.30	1.004	0.30	3.11	0.56
7.20	2740.33	1.011	0.33	3.29	0.62
8.40	2740.36	1.016	0.36	3.45	0.67
9.60	2740.39	1.020	0.39	3.60	0.72
10.80	2740.41	1.024	0.41	3.72	0.77
12.00	2740.44	1.027	0.44	3.85	0.81

ROADWAY OVERTOPPING DATA

ROADWAY SURFACE	PAVED
EMBANKMENT TOP WIDTH	20.00 ft
CREST LENGTH	50.00 ft
OVERTOPPING CREST ELEVATION	2747.50 ft

CURRENT DATE: 09-03-2006 FILE DATE: 09-03-2006
CURRENT TIME: 14:12:24 FILE NAME: U

FHWA CULVERT ANALYSIS
HY-8, VERSION 6.1

CULV NO.	SITE DATA: INLET ELEV. (ft)	OUTLET ELEV. (ft)	CULVERT LENGTH (ft)	CULVERT SHAPE, MATERIAL, INLET: BARRELS SHAPE MATERIAL	SPAN (ft)	RISE (ft)	MANNING n	INLET TYPE
1	2737.20	2735.60	98.01	1 CSP	2.00	2.00	.032	CONVENTIONAL
2								
3								
4								
5								
6								

SUMMARY OF CULVERT FLOWS (cfs) FILE: U DATE: 09-03-2006

ELEV (ft)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
2737.20	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2737.80	1.3	1.3	0.0	0.0	0.0	0.0	0.0	0.00	1
2738.05	2.6	2.6	0.0	0.0	0.0	0.0	0.0	0.00	1
2738.25	3.9	3.9	0.0	0.0	0.0	0.0	0.0	0.00	1
2738.44	5.2	5.2	0.0	0.0	0.0	0.0	0.0	0.00	1
2738.61	6.5	6.5	0.0	0.0	0.0	0.0	0.0	0.00	1
2738.76	7.8	7.8	0.0	0.0	0.0	0.0	0.0	0.00	1
2738.92	9.1	9.1	0.0	0.0	0.0	0.0	0.0	0.00	1
2739.07	10.4	10.4	0.0	0.0	0.0	0.0	0.0	0.00	1
2739.25	11.7	11.7	0.0	0.0	0.0	0.0	0.0	0.00	1
2739.46	13.0	13.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2741.00	16.8	16.8	0.0	0.0	0.0	0.0	0.0	OVERTOPPING	

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: U DATE: 09-03-2006

HEAD ELEV (ft)	HEAD ERROR (ft)	TOTAL FLOW (cfs)	FLOW ERROR (cfs)	% FLOW ERROR
2737.20	0.000	0.00	0.00	0.00
2737.80	0.000	1.30	0.00	0.00
2738.05	0.000	2.60	0.00	0.00
2738.25	0.000	3.90	0.00	0.00
2738.44	0.000	5.20	0.00	0.00
2738.61	0.000	6.50	0.00	0.00
2738.76	0.000	7.80	0.00	0.00
2738.92	0.000	9.10	0.00	0.00
2739.07	0.000	10.40	0.00	0.00
2739.25	0.000	11.70	0.00	0.00
2739.46	0.000	13.00	0.00	0.00

<1> TOLERANCE (ft) = 0.010 <2> TOLERANCE (%) = 1.000

CURRENT DATE: 09-03-2006 FILE DATE: 09-03-2006
CURRENT TIME: 14:12:24 FILE NAME: U

PERFORMANCE CURVE FOR CULVERT 1 - 1(2.00 (ft) BY 2.00 (ft)) CSP

DIS-CHARGE FLOW (cfs)	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRIT. DEPTH (ft)	OUTLET DEPTH (ft)	TW DEPTH (ft)	OUTLET VEL. (fps)	TW VEL. (fps)
0.00	2737.20	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	0.00
1.30	2737.80	0.55	0.60	2-M2c	0.44	0.39	0.39	0.12	2.99	1.86
2.60	2738.05	0.76	0.85	2-M2c	0.64	0.56	0.56	0.19	3.63	2.37
3.90	2738.26	0.94	1.06	2-M2c	0.79	0.69	0.69	0.23	4.08	2.70
5.20	2738.43	1.11	1.23	2-M2c	0.93	0.80	0.80	0.27	4.41	2.97
6.50	2738.61	1.27	1.41	2-M2c	1.06	0.90	0.90	0.31	4.75	3.19
7.80	2738.76	1.42	1.56	2-M2c	1.19	0.99	0.99	0.34	5.01	3.37
9.10	2738.92	1.56	1.72	2-M2c	1.32	1.07	1.07	0.38	5.30	3.54
10.40	2739.08	1.70	1.88	2-M2c	1.47	1.15	1.15	0.40	5.55	3.68
11.70	2739.25	1.84	2.05	2-M2c	1.64	1.23	1.23	0.43	5.79	3.82
13.00	2739.46	1.99	2.26	2-M2c	2.00	1.29	1.29	0.45	6.06	3.94

El. inlet face invert 2737.20 ft El. outlet invert 2735.60 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

***** SITE DATA ***** CULVERT INVERT **************

INLET STATION	0.00 ft
INLET ELEVATION	2737.20 ft
OUTLET STATION	98.00 ft
OUTLET ELEVATION	2735.60 ft
NUMBER OF BARRELS	1
SLOPE (V/H)	0.0163
CULVERT LENGTH ALONG SLOPE	98.01 ft

***** CULVERT DATA SUMMARY ************************

BARREL SHAPE	CIRCULAR
BARREL DIAMETER	2.00 ft
BARREL MATERIAL	CORRUGATED ALUMINUM
BARREL MANNING'S n	0.032
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	SQUARE EDGE WITH HEADWALL
INLET DEPRESSION	NONE

CURRENT DATE: 09-03-2006
CURRENT TIME: 14:12:24

FILE DATE: 09-03-2006
FILE NAME: U

TAILWATER

******* REGULAR CHANNEL CROSS SECTION ****************

BOTTOM WIDTH	5.00 ft
SIDE SLOPE H/V (X:1)	5.0
CHANNEL SLOPE V/H (ft/ft)	0.030
MANNING'S n (.01-0.1)	0.032
CHANNEL INVERT ELEVATION	2735.60 ft
CULVERT NO.1 OUTLET INVERT ELEVATION	2735.60 ft

******* UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

FLOW (cfs)	W.S.E. (ft)	FROUDE NUMBER	DEPTH (ft)	VEL. (f/s)	SHEAR (psf)
0.00	2735.60	0.000	0.00	0.00	0.00
1.30	2735.72	0.930	0.12	1.86	0.23
2.60	2735.79	0.968	0.19	2.37	0.35
3.90	2735.83	0.986	0.23	2.70	0.44
5.20	2735.88	0.998	0.27	2.97	0.51
6.50	2735.91	1.007	0.31	3.19	0.58
7.80	2735.94	1.013	0.34	3.37	0.64
9.10	2735.98	1.019	0.38	3.54	0.70
10.40	2736.00	1.023	0.40	3.68	0.75
11.70	2736.03	1.027	0.43	3.82	0.80
13.00	2736.05	1.030	0.45	3.94	0.85

ROADWAY OVERTOPPING DATA

ROADWAY SURFACE	PAVED
EMBANKMENT TOP WIDTH	20.00 ft
CREST LENGTH	50.00 ft
OVERTOPPING CREST ELEVATION	2741.00 ft

CURRENT DATE: 09-08-2006
CURRENT TIME: 10:23:57

FILE DATE: 09-08-2006
FILE NAME: V

FHWA CULVERT ANALYSIS
HY-8, VERSION 6.1

CULV NO.	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
	INLET ELEV. (ft)	OUTLET ELEV. (ft)	CULVERT LENGTH (ft)	BARRELS SHAPE MATERIAL	SPAN (ft)	RISE (ft)	MANNING n	INLET TYPE
1	2743.00	2742.10	94.50	1 CSP	1.50	1.50	.031	CONVENTIONAL
2								
3								
4								
5								
6								

SUMMARY OF CULVERT FLOWS (cfs) FILE: V DATE: 09-08-2006

ELEV (ft)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
2743.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2743.41	0.5	0.5	0.0	0.0	0.0	0.0	0.0	0.00	1
2743.57	1.0	1.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2743.70	1.5	1.5	0.0	0.0	0.0	0.0	0.0	0.00	1
2743.86	2.0	2.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2743.96	2.5	2.5	0.0	0.0	0.0	0.0	0.0	0.00	1
2744.08	3.0	3.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2744.19	3.5	3.5	0.0	0.0	0.0	0.0	0.0	0.00	1
2744.31	4.0	4.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2744.43	4.5	4.5	0.0	0.0	0.0	0.0	0.0	0.00	1
2744.59	5.0	5.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2747.50	8.5	8.5	0.0	0.0	0.0	0.0	0.0	OVERTOPPING	

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: V DATE: 09-08-2006

HEAD ELEV (ft)	HEAD ERROR (ft)	TOTAL FLOW (cfs)	FLOW ERROR (cfs)	% FLOW ERROR
2743.00	0.000	0.00	0.00	0.00
2743.41	0.000	0.50	0.00	0.00
2743.57	0.000	1.00	0.00	0.00
2743.70	0.000	1.50	0.00	0.00
2743.86	0.000	2.00	0.00	0.00
2743.96	0.000	2.50	0.00	0.00
2744.08	0.000	3.00	0.00	0.00
2744.19	0.000	3.50	0.00	0.00
2744.31	0.000	4.00	0.00	0.00
2744.43	0.000	4.50	0.00	0.00
2744.59	0.000	5.00	0.00	0.00

<1> TOLERANCE (ft) = 0.010 <2> TOLERANCE (%) = 1.000

CURRENT DATE: 09-08-2006
CURRENT TIME: 10:23:57

FILE DATE: 09-08-2006
FILE NAME: V

PERFORMANCE CURVE FOR CULVERT 1 - 1(1.50 (ft) BY 1.50 (ft)) CSP

DIS- CHARGE FLOW (cfs)	HEAD- WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRIT. DEPTH (ft)	OUTLET DEPTH (ft)	TW DEPTH (ft)	OUTLET VEL. (fps)	TW VEL. (fps)
0.00	2743.00	0.00	0.00	0-NF	0.00	0.00	0.00	-0.10	0.00	0.00
0.50	2743.41	0.38	0.41	2-M2c	0.34	0.25	0.25	-0.02	2.49	1.16
1.00	2743.57	0.51	0.57	2-M2c	0.49	0.37	0.37	0.02	2.97	1.49
1.50	2743.70	0.63	0.70	2-M2c	0.61	0.46	0.46	0.05	3.29	1.71
2.00	2743.86	0.73	0.86	2-M2c	0.72	0.53	0.53	0.08	3.59	1.89
2.50	2743.96	0.83	0.96	2-M2c	0.82	0.60	0.60	0.10	3.80	2.04
3.00	2744.08	0.93	1.08	2-M2c	0.92	0.65	0.65	0.13	4.04	2.17
3.50	2744.19	1.02	1.19	2-M2c	1.03	0.71	0.71	0.15	4.24	2.28
4.00	2744.31	1.10	1.31	2-M2c	1.15	0.76	0.76	0.17	4.42	2.38
4.50	2744.43	1.19	1.43	2-M2c	1.32	0.81	0.81	0.18	4.62	2.47
5.00	2744.59	1.27	1.59	2-M2c	1.50	0.86	0.86	0.20	4.79	2.55

El. inlet face invert 2743.00 ft El. outlet invert 2742.10 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

***** SITE DATA ***** CULVERT INVERT **************

INLET STATION	0.00 ft
INLET ELEVATION	2743.00 ft
OUTLET STATION	94.50 ft
OUTLET ELEVATION	2742.10 ft
NUMBER OF BARRELS	1
SLOPE (V/H)	0.0095
CULVERT LENGTH ALONG SLOPE	94.50 ft

***** CULVERT DATA SUMMARY ************************

BARREL SHAPE	CIRCULAR
BARREL DIAMETER	1.50 ft
BARREL MATERIAL	CORRUGATED ALUMINUM
BARREL MANNING'S n	0.031
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	SQUARE EDGE WITH HEADWALL
INLET DEPRESSION	NONE

CURRENT DATE: 09-08-2006
CURRENT TIME: 10:23:57

FILE DATE: 09-08-2006
FILE NAME: V

TAILWATER

******* REGULAR CHANNEL CROSS SECTION ****************

BOTTOM WIDTH	5.00 ft
SIDE SLOPE H/V (X:1)	5.0
CHANNEL SLOPE V/H (ft/ft)	0.020
MANNING'S n (.01-0.1)	0.032
CHANNEL INVERT ELEVATION	2742.00 ft
CULVERT NO.1 OUTLET INVERT ELEVATION	2742.10 ft

******* UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

FLOW (cfs)	W.S.E. (ft)	FROUDE NUMBER	DEPTH (ft)	VEL. (f/s)	SHEAR (psf)
0.00	2742.00	0.000	0.00	0.00	0.00
0.50	2742.08	0.722	0.08	1.16	0.10
1.00	2742.12	0.757	0.12	1.49	0.15
1.50	2742.15	0.775	0.15	1.71	0.19
2.00	2742.18	0.788	0.18	1.89	0.22
2.50	2742.20	0.796	0.20	2.04	0.25
3.00	2742.23	0.803	0.23	2.17	0.28
3.50	2742.25	0.809	0.25	2.28	0.31
4.00	2742.27	0.813	0.27	2.38	0.33
4.50	2742.28	0.817	0.28	2.47	0.35
5.00	2742.30	0.820	0.30	2.55	0.38

ROADWAY OVERTOPPING DATA

ROADWAY SURFACE	PAVED
EMBANKMENT TOP WIDTH	20.00 ft
CREST LENGTH	50.00 ft
OVERTOPPING CREST ELEVATION	2747.50 ft

CURRENT DATE: 09-03-2006
CURRENT TIME: 14:21:10

FILE DATE: 09-03-2006
FILE NAME: W

FHWA CULVERT ANALYSIS
HY-8, VERSION 6.1

CULV NO.	SITE DATA: INLET ELEV. (ft)	OUTLET ELEV. (ft)	CULVERT LENGTH (ft)	CULVERT SHAPE, MATERIAL, INLET: BARRELS SHAPE MATERIAL	SPAN (ft)	RISE (ft)	MANNING n	INLET TYPE
1	2747.50	2745.10	57.65	1 CSP	1.50	1.50	.032	CONVENTIONAL
2								
3								
4								
5								
6								

SUMMARY OF CULVERT FLOWS (cfs) FILE: W DATE: 09-03-2006

ELEV (ft)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
2747.50	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2747.78	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.00	1
2747.83	0.4	0.4	0.0	0.0	0.0	0.0	0.0	0.00	1
2747.89	0.6	0.6	0.0	0.0	0.0	0.0	0.0	0.00	1
2747.94	0.8	0.8	0.0	0.0	0.0	0.0	0.0	0.00	1
2747.99	1.0	1.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2748.03	1.2	1.2	0.0	0.0	0.0	0.0	0.0	0.00	1
2748.08	1.4	1.4	0.0	0.0	0.0	0.0	0.0	0.00	1
2748.12	1.6	1.6	0.0	0.0	0.0	0.0	0.0	0.00	1
2748.17	1.8	1.8	0.0	0.0	0.0	0.0	0.0	0.00	1
2748.21	2.0	2.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2751.00	10.9	10.9	0.0	0.0	0.0	0.0	0.0	OVERTOPPING	

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: W DATE: 09-03-2006

HEAD ELEV (ft)	HEAD ERROR (ft)	TOTAL FLOW (cfs)	FLOW ERROR (cfs)	% FLOW ERROR
2747.50	0.000	0.00	0.00	0.00
2747.78	0.000	0.20	0.00	0.00
2747.83	0.000	0.40	0.00	0.00
2747.89	0.000	0.60	0.00	0.00
2747.94	0.000	0.80	0.00	0.00
2747.99	0.000	1.00	0.00	0.00
2748.03	0.000	1.20	0.00	0.00
2748.08	0.000	1.40	0.00	0.00
2748.12	0.000	1.60	0.00	0.00
2748.17	0.000	1.80	0.00	0.00
2748.21	0.000	2.00	0.00	0.00

<1> TOLERANCE (ft) = 0.010 <2> TOLERANCE (%) = 1.000

CURRENT DATE: 09-03-2006
CURRENT TIME: 14:21:10

FILE DATE: 09-03-2006
FILE NAME: W

PERFORMANCE CURVE FOR CULVERT 1 - 1(1.50 (ft) BY 1.50 (ft)) CSP

DIS-CHARGE FLOW (cfs)	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRIT. DEPTH (ft)	OUTLET DEPTH (ft)	TW DEPTH (ft)	OUTLET VEL. (fps)	TW VEL. (fps)
0.00	2747.50	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	0.00
0.20	2747.78	0.28	0.28	1-S2n	0.15	0.16	0.06	0.05	3.39	0.82
0.40	2747.83	0.33	0.33	1-S2n	0.21	0.22	0.12	0.07	4.51	1.07
0.60	2747.89	0.39	0.39	1-S2n	0.26	0.28	0.18	0.09	6.87	1.24
0.80	2747.94	0.44	0.44	1-S2n	0.31	0.33	0.23	0.11	4.58	1.37
1.00	2747.99	0.49	0.49	1-S2n	0.34	0.37	0.27	0.12	4.64	1.49
1.20	2748.03	0.53	0.53	1-S2n	0.37	0.40	0.30	0.13	4.69	1.59
1.40	2748.08	0.58	0.58	1-S2n	0.40	0.44	0.34	0.15	4.72	1.67
1.60	2748.12	0.62	0.62	1-S2n	0.43	0.47	0.37	0.16	4.63	1.75
1.80	2748.17	0.67	0.67	1-S2n	0.46	0.50	0.40	0.17	4.72	1.83
2.00	2748.21	0.71	0.71	1-S2n	0.49	0.53	0.43	0.18	4.79	1.89

El. inlet face invert 2747.50 ft   El. outlet invert 2745.10 ft
El. inlet throat invert 0.00 ft   El. inlet crest 0.00 ft

***** SITE DATA ***** CULVERT INVERT **************

INLET STATION	0.00 ft
INLET ELEVATION	2747.50 ft
OUTLET STATION	57.60 ft
OUTLET ELEVATION	2745.10 ft
NUMBER OF BARRELS	1
SLOPE (V/H)	0.0417
CULVERT LENGTH ALONG SLOPE	57.65 ft

***** CULVERT DATA SUMMARY ************************

BARREL SHAPE	CIRCULAR
BARREL DIAMETER	1.50 ft
BARREL MATERIAL	CORRUGATED ALUMINUM
BARREL MANNING'S n	0.032
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	SQUARE EDGE WITH HEADWALL
INLET DEPRESSION	NONE

CURRENT DATE: 09-03-2006 FILE DATE: 09-03-2006
CURRENT TIME: 14:21:10 FILE NAME: W

TAILWATER

******* REGULAR CHANNEL CROSS SECTION ****************

BOTTOM WIDTH	5.00 ft
SIDE SLOPE H/V (X:1)	5.0
CHANNEL SLOPE V/H (ft/ft)	0.020
MANNING'S n (.01-0.1)	0.032
CHANNEL INVERT ELEVATION	2745.10 ft
CULVERT NO.1 OUTLET INVERT ELEVATION	2745.10 ft

******* UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

FLOW (cfs)	W.S.E. (ft)	FROUDE NUMBER	DEPTH (ft)	VEL. (f/s)	SHEAR (psf)
0.00	2745.10	0.000	0.00	0.00	0.00
0.20	2745.15	0.673	0.05	0.82	0.06
0.40	2745.17	0.710	0.07	1.07	0.09
0.60	2745.19	0.732	0.09	1.24	0.11
0.80	2745.21	0.746	0.11	1.37	0.13
1.00	2745.22	0.757	0.12	1.49	0.15
1.20	2745.23	0.765	0.13	1.59	0.17
1.40	2745.25	0.772	0.15	1.67	0.18
1.60	2745.26	0.778	0.16	1.75	0.20
1.80	2745.27	0.783	0.17	1.83	0.21
2.00	2745.28	0.788	0.18	1.89	0.22

ROADWAY OVERTOPPING DATA

ROADWAY SURFACE	PAVED
EMBANKMENT TOP WIDTH	20.00 ft
CREST LENGTH	50.00 ft
OVERTOPPING CREST ELEVATION	2751.00 ft

URRENT DATE: 11-27-2006
URRENT TIME: 17:25:57

FILE DATE: 11-27-2006
FILE NAME: X

FHWA CULVERT ANALYSIS
HY-8, VERSION 6.1

C U L V NO.	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
	INLET ELEV. (ft)	OUTLET ELEV. (ft)	CULVERT LENGTH (ft)	BARRELS SHAPE MATERIAL	SPAN (ft)	RISE (ft)	MANNING n	INLET TYPE
1	2708.50	2708.00	60.50	1 CSP	3.00	3.00	.032	CONVENTIONAL
2								
3								
4								
5								
6								

UMMARY OF CULVERT FLOWS (cfs) FILE: X DATE: 11-27-2006

ELEV (ft)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
2708.50	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2709.51	4.4	4.4	0.0	0.0	0.0	0.0	0.0	0.00	1
2709.97	8.8	8.8	0.0	0.0	0.0	0.0	0.0	0.00	1
2710.33	13.2	13.2	0.0	0.0	0.0	0.0	0.0	0.00	1
2710.67	17.6	17.6	0.0	0.0	0.0	0.0	0.0	0.00	1
2710.98	22.0	22.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2711.28	26.4	26.4	0.0	0.0	0.0	0.0	0.0	0.00	1
2711.60	30.8	30.8	0.0	0.0	0.0	0.0	0.0	0.00	1
2711.95	35.2	35.2	0.0	0.0	0.0	0.0	0.0	0.00	1
2712.20	39.6	39.6	0.0	0.0	0.0	0.0	0.0	0.00	1
2712.88	44.0	44.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2714.00	51.1	51.1	0.0	0.0	0.0	0.0	0.0	OVERTOPPING	

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: X DATE: 11-27-2006

HEAD ELEV (ft)	HEAD ERROR (ft)	TOTAL FLOW (cfs)	FLOW ERROR (cfs)	% FLOW ERROR
2708.50	0.000	0.00	0.00	0.00
2709.51	0.000	4.40	0.00	0.00
2709.97	0.000	8.80	0.00	0.00
2710.33	0.000	13.20	0.00	0.00
2710.67	0.000	17.60	0.00	0.00
2710.98	0.000	22.00	0.00	0.00
2711.28	0.000	26.40	0.00	0.00
2711.60	0.000	30.80	0.00	0.00
2711.95	0.000	35.20	0.00	0.00
2712.20	0.000	39.60	0.00	0.00
2712.88	0.000	44.00	0.00	0.00

<1> TOLERANCE (ft) = 0.010 <2> TOLERANCE (%) = 1.000

CURRENT DATE: 11-27-2006
CURRENT TIME: 17:25:57

FILE DATE: 11-27-2006
FILE NAME: X

PERFORMANCE CURVE FOR CULVERT 1 - 1(3.00 (ft) BY 3.00 (ft)) CSP

DIS-CHARGE FLOW (cfs)	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRIT. DEPTH (ft)	OUTLET DEPTH (ft)	TW DEPTH (ft)	OUTLET VEL. (fps)	TW VEL. (fps)
0.00	2708.50	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	0.00
4.40	2709.51	0.91	1.01	2-M2c	0.85	0.65	0.65	0.28	3.97	2.45
8.80	2709.97	1.28	1.47	2-M2c	1.23	0.93	0.93	0.41	4.71	3.04
13.20	2710.33	1.60	1.83	2-M2c	1.56	1.15	1.15	0.51	5.28	3.43
17.60	2710.67	1.90	2.17	2-M2c	1.87	1.33	1.33	0.59	5.79	3.73
22.00	2710.98	2.17	2.48	2-M2c	2.21	1.51	1.51	0.67	6.18	3.97
26.40	2711.28	2.43	2.78	2-M2c	3.00	1.65	1.65	0.73	6.62	4.18
30.80	2711.60	2.69	3.10	2-M2c	3.00	1.80	1.80	0.79	6.96	4.36
35.20	2711.95	2.96	3.45	2-M2c	3.00	1.92	1.92	0.84	7.37	4.52
39.60	2712.20	3.24	3.70	2-M2c	3.00	2.04	2.04	0.90	7.72	4.67
44.00	2712.88	3.53	4.38	2-M2c	3.00	2.16	2.16	0.94	8.10	4.81

El. inlet face invert 2708.50 ft El. outlet invert 2708.00 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

***** SITE DATA ***** CULVERT INVERT **************

INLET STATION	0.00 ft
INLET ELEVATION	2708.50 ft
OUTLET STATION	60.50 ft
OUTLET ELEVATION	2708.00 ft
NUMBER OF BARRELS	1
SLOPE (V/H)	0.0083
CULVERT LENGTH ALONG SLOPE	60.50 ft

***** CULVERT DATA SUMMARY ************************

BARREL SHAPE	CIRCULAR
BARREL DIAMETER	3.00 ft
BARREL MATERIAL	CORRUGATED ALUMINUM
BARREL MANNING'S n	0.032
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	SQUARE EDGE WITH HEADWALL
INLET DEPRESSION	NONE

CURRENT DATE: 11-27-2006 FILE DATE: 11-27-2006
CURRENT TIME: 17:25:57 FILE NAME: X

TAILWATER

****** REGULAR CHANNEL CROSS SECTION ****************

BOTTOM WIDTH	5.00 ft
SIDE SLOPE H/V (X:1)	5.0
CHANNEL SLOPE V/H (ft/ft)	0.020
MANNING'S n (.01-0.1)	0.032
CHANNEL INVERT ELEVATION	2708.00 ft
CULVERT NO.1 OUTLET INVERT ELEVATION	2708.00 ft

******* UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

FLOW (cfs)	W.S.E. (ft)	FROUDE NUMBER	DEPTH (ft)	VEL. (f/s)	SHEAR (psf)
0.00	2708.00	0.000	0.00	0.00	0.00
4.40	2708.28	0.816	0.28	2.45	0.35
8.80	2708.41	0.836	0.41	3.04	0.51
13.20	2708.51	0.846	0.51	3.43	0.64
17.60	2708.59	0.853	0.59	3.73	0.74
22.00	2708.67	0.857	0.67	3.97	0.83
26.40	2708.73	0.861	0.73	4.18	0.91
30.80	2708.79	0.864	0.79	4.36	0.99
35.20	2708.84	0.867	0.84	4.52	1.05
39.60	2708.90	0.870	0.90	4.67	1.12
44.00	2708.94	0.873	0.94	4.81	1.18

ROADWAY OVERTOPPING DATA

ROADWAY SURFACE	PAVED
EMBANKMENT TOP WIDTH	20.00 ft
CREST LENGTH	50.00 ft
OVERTOPPING CREST ELEVATION	2714.00 ft

CURRENT DATE: 09-03-2006
CURRENT TIME: 14:59:45

FILE DATE: 09-03-2006
FILE NAME: Y

FHWA CULVERT ANALYSIS
HY-8, VERSION 6.1

CULV NO.	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
	INLET ELEV. (ft)	OUTLET ELEV. (ft)	CULVERT LENGTH (ft)	BARRELS SHAPE MATERIAL	SPAN (ft)	RISE (ft)	MANNING n	INLET TYPE
1	2704.50	2703.00	93.01	1 CSP	2.00	2.00	.032	CONVENTIONAL
2								
3								
4								
5								
6								

SUMMARY OF CULVERT FLOWS (cfs) FILE: Y DATE: 09-03-2006

ELEV (ft)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
2704.50	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2705.11	1.4	1.4	0.0	0.0	0.0	0.0	0.0	0.00	1
2705.39	2.8	2.8	0.0	0.0	0.0	0.0	0.0	0.00	1
2705.60	4.2	4.2	0.0	0.0	0.0	0.0	0.0	0.00	1
2705.79	5.6	5.6	0.0	0.0	0.0	0.0	0.0	0.00	1
2705.97	7.0	7.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2706.13	8.4	8.4	0.0	0.0	0.0	0.0	0.0	0.00	1
2706.31	9.8	9.8	0.0	0.0	0.0	0.0	0.0	0.00	1
2706.49	11.2	11.2	0.0	0.0	0.0	0.0	0.0	0.00	1
2706.71	12.6	12.6	0.0	0.0	0.0	0.0	0.0	0.00	1
2706.60	14.0	14.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2708.00	16.3	16.3	0.0	0.0	0.0	0.0	0.0	OVERTOPPING	

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: Y DATE: 09-03-2006

HEAD ELEV (ft)	HEAD ERROR (ft)	TOTAL FLOW (cfs)	FLOW ERROR (cfs)	% FLOW ERROR
2704.50	0.000	0.00	0.00	0.00
2705.11	0.000	1.40	0.00	0.00
2705.39	0.000	2.80	0.00	0.00
2705.60	0.000	4.20	0.00	0.00
2705.79	0.000	5.60	0.00	0.00
2705.97	0.000	7.00	0.00	0.00
2706.13	0.000	8.40	0.00	0.00
2706.31	0.000	9.80	0.00	0.00
2706.49	0.000	11.20	0.00	0.00
2706.71	0.000	12.60	0.00	0.00
2706.60	0.000	14.00	0.00	0.00

<1> TOLERANCE (ft) = 0.010 <2> TOLERANCE (%) = 1.000

CURRENT DATE: 09-03-2006 FILE DATE: 09-03-2006
CURRENT TIME: 14:59:45 FILE NAME: Y

PERFORMANCE CURVE FOR CULVERT 1 - 1(2.00 (ft) BY 2.00 (ft)) CSP

DIS-CHARGE FLOW (cfs)	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRIT. DEPTH (ft)	OUTLET DEPTH (ft)	TW DEPTH (ft)	OUTLET VEL. (fps)	TW VEL. (fps)
0.00	2704.50	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	0.00
1.40	2705.11	0.57	0.61	2-M2c	0.46	0.41	0.41	0.15	3.06	1.67
2.80	2705.38	0.79	0.88	2-M2c	0.66	0.58	0.58	0.22	3.69	2.12
4.20	2705.60	0.98	1.10	2-M2c	0.83	0.71	0.71	0.27	4.17	2.42
5.60	2705.79	1.16	1.29	2-M2c	0.97	0.83	0.83	0.32	4.53	2.65
7.00	2705.97	1.33	1.47	2-M2c	1.12	0.93	0.93	0.36	4.86	2.84
8.40	2706.13	1.48	1.63	2-M2c	1.26	1.03	1.03	0.40	5.15	3.00
9.80	2706.31	1.64	1.81	2-M2c	1.40	1.12	1.12	0.44	5.44	3.14
11.20	2706.49	1.79	1.99	2-M2c	1.57	1.20	1.20	0.47	5.69	3.27
12.60	2706.71	1.94	2.21	2-M2c	2.00	1.27	1.27	0.50	5.98	3.38
14.00	2706.61	2.11	1.87	2-M2c	2.00	1.34	1.34	0.53	6.24	3.49

El. inlet face invert 2704.50 ft El. outlet invert 2703.00 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

***** SITE DATA ***** CULVERT INVERT **************	
INLET STATION	0.00 ft
INLET ELEVATION	2704.50 ft
OUTLET STATION	93.00 ft
OUTLET ELEVATION	2703.00 ft
NUMBER OF BARRELS	1
SLOPE (V/H)	0.0161
CULVERT LENGTH ALONG SLOPE	93.01 ft

***** CULVERT DATA SUMMARY ************************	
BARREL SHAPE	CIRCULAR
BARREL DIAMETER	2.00 ft
BARREL MATERIAL	CORRUGATED ALUMINUM
BARREL MANNING'S n	0.032
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	SQUARE EDGE WITH HEADWALL
INLET DEPRESSION	NONE

CURRENT DATE: 09-03-2006 FILE DATE: 09-03-2006
CURRENT TIME: 14:59:45 FILE NAME: Y

TAILWATER

******* REGULAR CHANNEL CROSS SECTION ****************

BOTTOM WIDTH	5.00 ft
SIDE SLOPE H/V (X:1)	5.0
CHANNEL SLOPE V/H (ft/ft)	0.020
MANNING'S n (.01-0.1)	0.032
CHANNEL INVERT ELEVATION	2703.00 ft
CULVERT NO.1 OUTLET INVERT ELEVATION	2703.00 ft

******* UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

FLOW (cfs)	W.S.E. (ft)	FROUDE NUMBER	DEPTH (ft)	VEL. (f/s)	SHEAR (psf)
0.00	2703.00	0.000	0.00	0.00	0.00
1.40	2703.15	0.772	0.15	1.67	0.18
2.80	2703.22	0.801	0.22	2.12	0.27
4.20	2703.27	0.815	0.27	2.42	0.34
5.60	2703.32	0.824	0.32	2.65	0.40
7.00	2703.36	0.830	0.36	2.84	0.45
8.40	2703.40	0.835	0.40	3.00	0.50
9.80	2703.44	0.839	0.44	3.14	0.54
11.20	2703.47	0.842	0.47	3.27	0.58
12.60	2703.50	0.845	0.50	3.38	0.62
14.00	2703.53	0.847	0.53	3.49	0.66

ROADWAY OVERTOPPING DATA

ROADWAY SURFACE	PAVED
EMBANKMENT TOP WIDTH	20.00 ft
CREST LENGTH	50.00 ft
OVERTOPPING CREST ELEVATION	2708.00 ft

URRENT DATE: 12-08-2006 FILE DATE: 12-08-2006
URRENT TIME: 08:00:30 FILE NAME: 1

FHWA CULVERT ANALYSIS
HY-8, VERSION 6.1

C U L V NO.	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
	INLET ELEV. (ft)	OUTLET ELEV. (ft)	CULVERT LENGTH (ft)	BARRELS SHAPE MATERIAL	SPAN (ft)	RISE (ft)	MANNING n	INLET TYPE
1	2721.00	2710.70	279.69	2 RCP	2.50	2.50	.013	CONVENTIONAL
2								
3								
4								
5								
6								

UMMARY OF CULVERT FLOWS (cfs) FILE: 1 DATE: 12-08-2006

ELEV (ft)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
2721.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2721.91	9.8	9.8	0.0	0.0	0.0	0.0	0.0	0.00	1
2722.45	19.6	19.6	0.0	0.0	0.0	0.0	0.0	0.00	1
2722.87	29.4	29.4	0.0	0.0	0.0	0.0	0.0	0.00	1
2723.25	39.2	39.2	0.0	0.0	0.0	0.0	0.0	0.00	1
2723.64	49.0	49.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2724.06	58.8	58.8	0.0	0.0	0.0	0.0	0.0	0.00	1
2724.56	68.6	68.6	0.0	0.0	0.0	0.0	0.0	0.00	1
2725.14	78.4	78.4	0.0	0.0	0.0	0.0	0.0	0.00	1
2725.95	88.2	88.2	0.0	0.0	0.0	0.0	0.0	0.00	1
2727.22	98.0	98.0	0.0	0.0	0.0	0.0	0.0	0.00	1
2728.00	103.5	103.5	0.0	0.0	0.0	0.0	0.0	OVERTOPPING	

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: 1 DATE: 12-08-2006

HEAD ELEV (ft)	HEAD ERROR (ft)	TOTAL FLOW (cfs)	FLOW ERROR (cfs)	% FLOW ERROR
2721.00	0.000	0.00	0.00	0.00
2721.91	0.000	9.80	0.00	0.00
2722.45	0.000	19.60	0.00	0.00
2722.87	0.000	29.40	0.00	0.00
2723.25	0.000	39.20	0.00	0.00
2723.64	0.000	49.00	0.00	0.00
2724.06	0.000	58.80	0.00	0.00
2724.56	0.000	68.60	0.00	0.00
2725.14	0.000	78.40	0.00	0.00
2725.95	0.000	88.20	0.00	0.00
2727.22	0.000	98.00	0.00	0.00

<1> TOLERANCE (ft) = 0.010 <2> TOLERANCE (%) = 1.000

CURRENT DATE: 12-08-2006 FILE DATE: 12-08-2006
CURRENT TIME: 08:00:30 FILE NAME: 1

PERFORMANCE CURVE FOR CULVERT 1 - 2(2.50 (ft) BY 2.50 (ft)) RCP

DIS-CHARGE FLOW (cfs)	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRIT. DEPTH (ft)	OUTLET DEPTH (ft)	TW DEPTH (ft)	OUTLET VEL. (fps)	TW VEL. (fps)
0.00	2721.00	0.00	0.00	0-NF	0.00	0.00	0.00	8.80	0.00	0.00
9.80	2721.91	0.91	0.91	1-S1f	0.40	0.73	0.90	9.22	3.07	3.25
19.60	2722.45	1.45	1.45	1-S1f	0.58	1.04	1.20	9.42	4.21	4.07
29.40	2722.87	1.87	1.87	1-S1f	0.73	1.29	1.40	9.57	5.20	4.61
39.20	2723.25	2.25	2.25	1-S1f	0.84	1.50	1.70	9.70	5.52	5.02
49.00	2723.63	2.63	2.63	1-S1f	0.95	1.68	1.80	9.81	6.48	5.36
58.80	2724.06	3.06	3.06	1-S1f	1.05	1.84	2.00	9.91	6.98	5.65
68.60	2724.56	3.56	2.77	4-FFt	1.15	1.99	1.15	10.01	15.56	5.90
78.40	2725.14	4.14	3.80	4-FFt	1.24	2.10	1.24	10.09	16.06	6.13
88.20	2725.95	4.81	4.95	4-FFt	1.34	2.20	2.50	10.18	8.98	6.33
98.00	2727.22	5.57	6.22	4-FFt	1.43	2.30	2.50	10.25	9.98	6.52

El. inlet face invert 2721.00 ft El. outlet invert 2710.70 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

***** SITE DATA ***** CULVERT INVERT **************

INLET STATION	0.00 ft
INLET ELEVATION	2721.00 ft
OUTLET STATION	279.50 ft
OUTLET ELEVATION	2710.70 ft
NUMBER OF BARRELS	2
SLOPE (V/H)	0.0369
CULVERT LENGTH ALONG SLOPE	279.69 ft

***** CULVERT DATA SUMMARY ************************

BARREL SHAPE	CIRCULAR
BARREL DIAMETER	2.50 ft
BARREL MATERIAL	CONCRETE
BARREL MANNING'S n	0.013
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	SQUARE EDGE WITH HEADWALL
INLET DEPRESSION	NONE

CURRENT DATE: 12-08-2006
CURRENT TIME: 08:00:30

FILE DATE: 12-08-2006
FILE NAME: 1

TAILWATER

****** REGULAR CHANNEL CROSS SECTION ****************

BOTTOM WIDTH	6.00 ft
SIDE SLOPE H/V (X:1)	3.0
CHANNEL SLOPE V/H (ft/ft)	0.020
MANNING'S n (.01-0.1)	0.032
CHANNEL INVERT ELEVATION	2719.50 ft
CULVERT NO.1 OUTLET INVERT ELEVATION	2710.70 ft

******* UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

FLOW (cfs)	W.S.E. (ft)	FROUDE NUMBER	DEPTH (ft)	VEL. (f/s)	SHEAR (psf)
0.00	2719.50	0.000	0.00	0.00	0.00
9.80	2719.92	0.890	0.42	3.25	0.52
19.60	2720.11	0.914	0.61	4.07	0.77
29.40	2720.27	0.926	0.77	4.61	0.96
39.20	2720.40	0.934	0.90	5.02	1.12
49.00	2720.51	0.939	1.01	5.36	1.26
58.80	2720.61	0.943	1.11	5.65	1.39
68.60	2720.71	0.946	1.21	5.90	1.51
78.40	2720.79	0.949	1.29	6.13	1.62
88.20	2720.88	0.952	1.38	6.33	1.72
98.00	2720.95	0.954	1.45	6.52	1.81

ROADWAY OVERTOPPING DATA

ROADWAY SURFACE	PAVED
EMBANKMENT TOP WIDTH	50.00 ft
CREST LENGTH	50.00 ft
OVERTOPPING CREST ELEVATION	2728.00 ft

Rip Rap Design Calculations

LOOSE RIP-RAP GRADATION (INCHES)

PERCENT FINER BY WEIGHT	SCREEN SIZE				
	TYPE I	TYPE IA	TYPE II	TYPE III	TYPE IV
15	4	6	7	8	12
50	9	12	15	18	24
85	14	18	23	27	36
100	18	24	30	36	48

INSTALL LOOSE RIP-RAP PER M.A.G. SPEC. 220

INSTALL "MIRAFI 140 NL" FILTER FABRIC OR APPROVED EQUAL UNDER ALL LOOSE RIP-RAP

Riprap Design Spreadsheet

References: *US DOT, FHWA, Highways in the River Environment*
Hydraulic and Environmental Design Considerations
May 1975, pVI-24.

US DOT, FHWA, Hydraulic Design of Energy Dissipaters
for Culverts and Channel. Sept. 1983, pII-5-II-9.

FCDMC, Drainage Design Manual for Maricpa County
Arizona, Vol. II - Hydraulics. January 1996, p5.75-5.77.

Project Name: *SERENO CANYON PHASE 1* **Structure ID:** **A****
Project #: 062654 **Culvert Size:** 1-24" CMP

1. Riprap Size D50

Max. flow width Wo =	2.00 ft	
Max. culvert flow depth h =	1.36 ft	
Tailwater depth TW =	1.25 ft	normal
Exit Velocity Ve =	6.24 fps	
Tailwater velocity Vd =	4.55 fps	normal
Wash bottom width =	5.00 ft	
Computed Riprap Size D50 =	3.2 in	
Design Riprap Size D50 =	9 in	
Sieve Size =	TYPE I	

2. Riprap Sizes D15 and D85

Design Riprap Size D15 =	**4 in**
Design Riprap Size D85 =	**14 in**

3. Riprap Apron Length

Riprap Apron Length = **8 ft**

4. Riprap Apron Width

Min. Riprap Apron Width =	**5 ft**
Max. Riprap Apron Width =	**8 ft**

5. Riprap Thickness

Riprap Thickness = **18 in**

6. Total Riprap Volume

Riprap Rock Volume = 3 CY

Please note fields highlighted are input values from the Culvert Modeling Summary

* Indicates the structure was modeled in HEC-1.
** Indicates the structure was modeled using flows calculated by HEC-1.

Riprap Design Spreadsheet

References: *US DOT, FHWA, Highways in the River Environment Hydraulic and Environmental Design Considerations May 1975, pVI-24.*

US DOT, FHWA, Hydraulic Design of Energy Dissipaters for Culverts and Channel. Sept. 1983, pII-5-II-9.

FCDMC, Drainage Design Manual for Maricpa County Arizona, Vol. II - Hydraulics. January 1996, p5.75-5.77.

Project Name: *SERENO CANYON PHASE 1* **Structure ID:** **B***
Project #: 062654 **Culvert Size:** 2-36" CMP

1. Riprap Size D50

Max. flow width Wo =	6.00 ft	
Max. culvert flow depth h =	2.49 ft	
Tailwater depth TW =	1.33 ft	normal
Exit Velocity Ve =	8.25 fps	
Tailwater velocity Vd =	5.84 fps	normal
Wash bottom width =	6.00 ft	
Computed Riprap Size D50 =	5.5 in	
Design Riprap Size D50 =	9 in	
Sieve Size =	TYPE I	

2. Riprap Sizes D15 and D85

Design Riprap Size D15 =	4 in
Design Riprap Size D85 =	14 in

3. Riprap Apron Length

Riprap Apron Length = 11 ft

4. Riprap Apron Width

Min. Riprap Apron Width =	11 ft
Max. Riprap Apron Width =	11 ft

5. Riprap Thickness

Riprap Thickness = 18 in

6. Total Riprap Volume

Riprap Rock Volume = 7 CY

Please note fields highlighted are input values from the Culvert Modeling Summary

* Indicates the structure was modeled in HEC-1.
** Indicates the structure was modeled using flows calculated by HEC-1.

Riprap Design Spreadsheet

References: *US DOT, FHWA, Highways in the River Environment Hydraulic and Environmental Design Considerations May 1975, pVI-24.*

US DOT, FHWA, Hydraulic Design of Energy Dissipaters for Culverts and Channel. Sept. 1983, pII-5-II-9.

FCDMC, Drainage Design Manual for Maricpa County Arizona, Vol. II - Hydraulics. January 1996, p5.75-5.77.

Project Name: *SERENO CANYON PHASE 1* **Structure ID:** **C**
Project #: 062654 **Culvert Size:** 1-24" CMP

1. Riprap Size D50

Max. flow width Wo =	2.00	ft	
Max. culvert flow depth h =	1.23	ft	
Tailwater depth TW =	0.41	ft	normal
Exit Velocity Ve =	7.54	fps	
Tailwater velocity Vd =	4.82	fps	normal
Wash bottom width =	6.00	ft	
Computed Riprap Size D50 =	4.6	in	
Design Riprap Size D50 =	9	in	
Sieve Size =	TYPE I		

2. Riprap Sizes D15 and D85

Design Riprap Size D15 =	**4**	in
Design Riprap Size D85 =	**14**	in

3. Riprap Apron Length

Riprap Apron Length =	**7**	ft

4. Riprap Apron Width

Min. Riprap Apron Width =	**4**	ft
Max. Riprap Apron Width =	**8**	ft

5. Riprap Thickness

Riprap Thickness =	**18**	in

6. Total Riprap Volume

Riprap Rock Volume =	3	CY

Please note fields highlighted are input values from the Culvert Modeling Summary

* Indicates the structure was modeled in HEC-1.
** Indicates the structure was modeled using flows calculated by HEC-1.

Riprap Design Spreadsheet

References: *US DOT, FHWA, Highways in the River Environment Hydraulic and Environmental Design Considerations May 1975, pVI-24.*

US DOT, FHWA, Hydraulic Design of Energy Dissipaters for Culverts and Channel. Sept. 1983, pII-5-II-9.

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Project Name: *SERENO CANYON PHASE 1* **Structure ID:** **D**
Project #: *062654* **Culvert Size:** 1-18" CMP

1. Riprap Size D50

Max. flow width Wo =	1.50	ft	
Max. culvert flow depth h =	1.50	ft	
Tailwater depth TW =	0.39	ft	normal
Exit Velocity Ve =	5.79	fps	
Tailwater velocity Vd =	2.95	fps	normal
Wash bottom width =	6.00	ft	
Computed Riprap Size D50 =	2.8	in	
Design Riprap Size D50 =	9	in	
Sieve Size =	TYPE I		

2. Riprap Sizes D15 and D85

Design Riprap Size D15 =	**4**	in
Design Riprap Size D85 =	**14**	in

3. Riprap Apron Length

Riprap Apron Length =	7	ft

4. Riprap Apron Width

Min. Riprap Apron Width =	**5**	ft
Max. Riprap Apron Width =	**9**	ft

5. Riprap Thickness

Riprap Thickness =	**18**	in

6. Total Riprap Volume

Riprap Rock Volume =	3	CY

Please note fields highlighted are input values from the Culvert Modeling Summary

* Indicates the structure was modeled in HEC-1.
** Indicates the structure was modeled using flows calculated by HEC-1.

Riprap Design Spreadsheet

References: *US DOT, FHWA, Highways in the River Environment Hydraulic and Environmental Design Considerations May 1975, pVI-24.*

US DOT, FHWA, Hydraulic Design of Energy Dissipaters for Culverts and Channel. Sept. 1983, pII-5-II-9.

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Project Name: *SERENO CANYON PHASE 1* **Structure ID:** **F**
Project #: 062654 **Culvert Size:** 1-24" CMP

1. Riprap Size D50

Max. flow width Wo =	2.00	ft	
Max. culvert flow depth h =	1.12	ft	
Tailwater depth TW =	0.44	ft	normal
Exit Velocity Ve =	6.15	fps	
Tailwater velocity Vd =	3.16	fps	normal
Wash bottom width =	6.00	ft	
Computed Riprap Size D50 =	3.1	in	
Design Riprap Size D50 =	9	in	
Sieve Size =	TYPE I		

2. Riprap Sizes D15 and D85

Design Riprap Size D15 = 4 in
Design Riprap Size D85 = 14 in

3. Riprap Apron Length

Riprap Apron Length = 8 ft

4. Riprap Apron Width

Min. Riprap Apron Width = 4 ft
Max. Riprap Apron Width = 8 ft

5. Riprap Thickness

Riprap Thickness = 18 in

6. Total Riprap Volume

Riprap Rock Volume = 3 CY

Please note fields highlighted are input values from the Culvert Modeling Summary

* Indicates the structure was modeled in HEC-1.
** Indicates the structure was modeled using flows calculated by HEC-1.

Riprap Design Spreadsheet

References: *US DOT, FHWA, Highways in the River Environment Hydraulic and Environmental Design Considerations May 1975, pVI-24.*

US DOT, FHWA, Hydraulic Design of Energy Dissipaters for Culverts and Channel. Sept. 1983, pII-5-II-9.

FCDMC, Drainage Design Manual for Maricpa County Arizona, Vol. II - Hydraulics. January 1996, p5.75-5.77.

Project Name: *SERENO CANYON PHASE 1* **Structure ID:** **E**
Project #: 062654 **Culvert Size:** 1-24" CMP

1. Riprap Size D50

Max. flow width Wo =	2.00	ft	
Max. culvert flow depth h =	1.17	ft	
Tailwater depth TW =	0.48	ft	normal
Exit Velocity Ve =	7.26	fps	
Tailwater velocity Vd =	3.33	fps	normal
Wash bottom width =	6.00	ft	
Computed Riprap Size D50 =	4.3	in	
Design Riprap Size D50 =	9	in	
Sieve Size =	TYPE I		

2. Riprap Sizes D15 and D85

Design Riprap Size D15 = 4 in
Design Riprap Size D85 = 14 in

3. Riprap Apron Length

Riprap Apron Length = 11 ft

4. Riprap Apron Width

Min. Riprap Apron Width = 4 ft
Max. Riprap Apron Width = 8 ft

5. Riprap Thickness

Riprap Thickness = 18 in

6. Total Riprap Volume

Riprap Rock Volume = 4 CY

Please note fields highlighted are input values from the Culvert Modeling Summary

* Indicates the structure was modeled in HEC-1.
** Indicates the structure was modeled using flows calculated by HEC-1.

Riprap Design Spreadsheet

References: *US DOT, FHWA, Highways in the River Environment Hydraulic and Environmental Design Considerations May 1975, pVI-24.*

US DOT, FHWA, Hydraulic Design of Energy Dissipaters for Culverts and Channel. Sept. 1983, pII-5-II-9.

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Project Name: *SERENO CANYON PHASE 1* **Structure ID:** **G**
Project #: 062654 **Culvert Size:** 1-18" CMP

1. Riprap Size D50

Max. flow width Wo =	1.50 ft	
Max. culvert flow depth h =	1.50 ft	
Tailwater depth TW =	1.52 ft	normal
Exit Velocity Ve =	4.53 fps	
Tailwater velocity Vd =	3.75 fps	normal
Wash bottom width =	6.00 ft	
Computed Riprap Size D50 =	1.5 in	
Design Riprap Size D50 =	9 in	
Sieve Size =	TYPE I	

2. Riprap Sizes D15 and D85

Design Riprap Size D15 =	**4 in**
Design Riprap Size D85 =	**14 in**

3. Riprap Apron Length

Riprap Apron Length =	**4 ft**

4. Riprap Apron Width

Min. Riprap Apron Width =	**5 ft**
Max. Riprap Apron Width =	**7 ft**

5. Riprap Thickness

Riprap Thickness =	**18 in**

6. Total Riprap Volume

Riprap Rock Volume =	**1 CY**

Please note fields highlighted are input values from the Culvert Modeling Summary

* Indicates the structure was modeled in HEC-1.
** Indicates the structure was modeled using flows calculated by HEC-1.

Riprap Design Spreadsheet

References: *US DOT, FHWA, Highways in the River Environment Hydraulic and Environmental Design Considerations May 1975, pVI-24.*

US DOT, FHWA, Hydraulic Design of Energy Dissipaters for Culverts and Channel. Sept. 1983, pII-5-II-9.

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Project Name: *SERENO CANYON PHASE 1* **Structure ID:** **H**
Project #: 062654 **Culvert Size:** 1-24" CMP

1. Riprap Size D50

Max. flow width Wo =	2.00	ft	
Max. culvert flow depth h =	2.00	ft	
Tailwater depth TW =	0.49	ft	normal
Exit Velocity Ve =	5.85	fps	
Tailwater velocity Vd =	3.33	fps	normal
Wash bottom width =	6.00	ft	
Computed Riprap Size D50 =	2.8	in	
Design Riprap Size D50 =	9	in	
Sieve Size =	TYPE I		

2. Riprap Sizes D15 and D85

Design Riprap Size D15 =	4	in
Design Riprap Size D85 =	14	in

3. Riprap Apron Length

Riprap Apron Length =	7	ft

4. Riprap Apron Width

Min. Riprap Apron Width =	6	ft
Max. Riprap Apron Width =	10	ft

5. Riprap Thickness

Riprap Thickness =	18	in

6. Total Riprap Volume

Riprap Rock Volume =	3	CY

Please note fields highlighted are input values from the Culvert Modeling Summary

* Indicates the structure was modeled in HEC-1.
** Indicates the structure was modeled using flows calculated by HEC-1.

Riprap Design Spreadsheet

References: *US DOT, FHWA, Highways in the River Environment Hydraulic and Environmental Design Considerations May 1975, pVI-24.*

US DOT, FHWA, Hydraulic Design of Energy Dissipaters for Culverts and Channel. Sept. 1983, pII-5-II-9.

FCDMC, Drainage Design Manual for Maricpa County Arizona, Vol. II - Hydraulics. January 1996, p5.75-5.77.

Project Name: *SERENO CANYON PHASE 1* **Structure ID:** **I***
Project #: 062654 **Culvert Size:** 1-30" CMP

1. Riprap Size D50

Max. flow width Wo =	2.50	ft	
Max. culvert flow depth h =	2.50	ft	
Tailwater depth TW =	0.66	ft	normal
Exit Velocity Ve =	7.68	fps	
Tailwater velocity Vd =	4.93	fps	normal
Wash bottom width =	6.00	ft	
Computed Riprap Size D50 =	4.8	in	
Design Riprap Size D50 =	9	in	
Sieve Size =	TYPE I		

2. Riprap Sizes D15 and D85

Design Riprap Size D15 =	**4**	in
Design Riprap Size D85 =	**14**	in

3. Riprap Apron Length

Riprap Apron Length =	**9**	ft

4. Riprap Apron Width

Min. Riprap Apron Width =	**8**	ft
Max. Riprap Apron Width =	**11**	ft

5. Riprap Thickness

Riprap Thickness =	**18**	in

6. Total Riprap Volume

Riprap Rock Volume =	5	CY

Please note fields highlighted are input values from the Culvert Modeling Summary

* Indicates the structure was modeled in HEC-1.
** Indicates the structure was modeled using flows calculated by HEC-1.

Riprap Design Spreadsheet

References: *US DOT, FHWA, Highways in the River Environment Hydraulic and Environmental Design Considerations May 1975, pVI-24.*

US DOT, FHWA, Hydraulic Design of Energy Dissipaters for Culverts and Channel. Sept. 1983, pII-5-II-9.

FCDMC, Drainage Design Manual for Maricpa County Arizona, Vol. II - Hydraulics. January 1996, p5.75-5.77.

Project Name: *SERENO CANYON PHASE 1* **Structure ID:** **K***
Project #: 062654 **Culvert Size:** 1-24" CMP

1. Riprap Size D50

Max. flow width Wo =	2.00	ft	
Max. culvert flow depth h =	1.50	ft	
Tailwater depth TW =	1.84	ft	normal
Exit Velocity Ve =	8.49	fps	
Tailwater velocity Vd =	3.56	fps	normal
Wash bottom width =	5.00	ft	
Computed Riprap Size D50 =	5.8	in	
Design Riprap Size D50 =	9	in	
Sieve Size =	TYPE I		

2. Riprap Sizes D15 and D85

Design Riprap Size D15 = 4 in
Design Riprap Size D85 = 14 in

3. Riprap Apron Length

Riprap Apron Length = 27 ft

4. Riprap Apron Width

Min. Riprap Apron Width = 5 ft
Max. Riprap Apron Width = 8 ft

5. Riprap Thickness

Riprap Thickness = 18 in

6. Total Riprap Volume
Riprap Rock Volume = 10 CY

Please note fields highlighted are input values from the Culvert Modeling Summary

* Indicates the structure was modeled in HEC-1.
** Indicates the structure was modeled using flows calculated by HEC-1.

Riprap Design Spreadsheet

References: *US DOT, FHWA, Highways in the River Environment Hydraulic and Environmental Design Considerations May 1975, pVI-24.*

US DOT, FHWA, Hydraulic Design of Energy Dissipaters for Culverts and Channel. Sept. 1983, pII-5-II-9.

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Project Name: *SERENO CANYON PHASE 1* **Structure ID:** **J**
Project #: 062654 **Culvert Size:** 1-18" CMP

1. Riprap Size D50

Max. flow width Wo =	1.50	ft	
Max. culvert flow depth h =	0.38	ft	
Tailwater depth TW =	0.12	ft	normal
Exit Velocity Ve =	2.97	fps	
Tailwater velocity Vd =	1.49	fps	normal
Wash bottom width =	6.00	ft	
Computed Riprap Size D50 =	0.0	in	
Design Riprap Size D50 =	9	in	
Sieve Size =	TYPE I		

2. Riprap Sizes D15 and D85

Design Riprap Size D15 = 4 in
Design Riprap Size D85 = 14 in

3. Riprap Apron Length

Riprap Apron Length = 2 ft

4. Riprap Apron Width

Min. Riprap Apron Width = 2 ft
Max. Riprap Apron Width = 4 ft

5. Riprap Thickness

Riprap Thickness = 18 in

6. Total Riprap Volume

Riprap Rock Volume = 0 CY

Please note fields highlighted are input values from the Culvert Modeling Summary

* Indicates the structure was modeled in HEC-1.
** Indicates the structure was modeled using flows calculated by HEC-1.

Riprap Design Spreadsheet

References: *US DOT, FHWA, Highways in the River Environment Hydraulic and Environmental Design Considerations May 1975, pVI-24.*

US DOT, FHWA, Hydraulic Design of Energy Dissipaters for Culverts and Channel. Sept. 1983, pII-5-II-9.

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Project Name: *SERENO CANYON PHASE 1* **Structure ID:** **L***
Project #: 062654 **Culvert Size:** 2-42" CMP

1. Riprap Size D50

Max. flow width Wo =	8.00	ft	
Max. culvert flow depth h =	3.50	ft	
Tailwater depth TW =	1.62	ft	normal
Exit Velocity Ve =	9.05	fps	
Tailwater velocity Vd =	6.51	fps	normal
Wash bottom width =	7.00	ft	
Computed Riprap Size D50 =	6.5	in	
Design Riprap Size D50 =	9	in	
Sieve Size =	TYPE I		

2. Riprap Sizes D15 and D85

Design Riprap Size D15 =	4	in
Design Riprap Size D85 =	14	in

3. Riprap Apron Length

Riprap Apron Length =	13	ft

4. Riprap Apron Width

Min. Riprap Apron Width =	15	ft
Max. Riprap Apron Width =	14	ft

5. Riprap Thickness

Riprap Thickness =	18	in

6. Total Riprap Volume

Riprap Rock Volume =	10	CY

Please note fields highlighted are input values from the Culvert Modeling Summary

* Indicates the structure was modeled in HEC-1.
** Indicates the structure was modeled using flows calculated by HEC-1.

Riprap Design Spreadsheet

References: *US DOT, FHWA, Highways in the River Environment Hydraulic and Environmental Design Considerations May 1975, pVI-24.*

US DOT, FHWA, Hydraulic Design of Energy Dissipaters for Culverts and Channel. Sept. 1983, pII-5-II-9.

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Project Name: *SERENO CANYON PHASE 1* **Structure ID:** **M***
Project #: 062654 **Culvert Size:** 1-36" CMP

1. Riprap Size D50

Max. flow width Wo =	2.50	ft	
Max. culvert flow depth h =	2.01	ft	
Tailwater depth TW =	0.95	ft	normal
Exit Velocity Ve =	9.67	fps	
Tailwater velocity Vd =	4.84	fps	normal
Wash bottom width =	7.00	ft	
Computed Riprap Size D50 =	7.4	in	
Design Riprap Size D50 =	9	in	
Sieve Size =	TYPE I		

2. Riprap Sizes D15 and D85

Design Riprap Size D15 = 4 in
Design Riprap Size D85 = 14 in

3. Riprap Apron Length

Riprap Apron Length = 19 ft

4. Riprap Apron Width

Min. Riprap Apron Width = 7 ft
Max. Riprap Apron Width = 11 ft

5. Riprap Thickness

Riprap Thickness = 18 in

6. Total Riprap Volume
Riprap Rock Volume = 9 CY

Please note fields highlighted are input values from the Culvert Modeling Summary

* Indicates the structure was modeled in HEC-1.
** Indicates the structure was modeled using flows calculated by HEC-1.

Riprap Design Spreadsheet

References: *US DOT, FHWA, Highways in the River Environment Hydraulic and Environmental Design Considerations May 1975, pVI-24.*

US DOT, FHWA, Hydraulic Design of Energy Dissipaters for Culverts and Channel. Sept. 1983, pII-5-II-9.

FCDMC, Drainage Design Manual for Maricpa County Arizona, Vol. II - Hydraulics. January 1996, p5.75-5.77.

Project Name: *SERENO CANYON PHASE 1* **Structure ID:** **N**
Project #: 062654 **Culvert Size:** 1-30" CMP

1. Riprap Size D50

Max. flow width Wo =	2.50	ft	
Max. culvert flow depth h =	2.50	ft	
Tailwater depth TW =	1.08	ft	normal
Exit Velocity Ve =	6.07	fps	
Tailwater velocity Vd =	3.69	fps	normal
Wash bottom width =	6.00	ft	
Computed Riprap Size D50 =	3.0	in	
Design Riprap Size D50 =	9	in	
Sieve Size =	TYPE I		

2. Riprap Sizes D15 and D85

Design Riprap Size D15 =	**4**	in
Design Riprap Size D85 =	**14**	in

3. Riprap Apron Length

Riprap Apron Length =	**10**	ft

4. Riprap Apron Width

Min. Riprap Apron Width =	**8**	ft
Max. Riprap Apron Width =	**11**	ft

5. Riprap Thickness

Riprap Thickness =	**18**	in

6. Total Riprap Volume

Riprap Rock Volume =	5	CY

Please note fields highlighted are input values from the Culvert Modeling Summary

* Indicates the structure was modeled in HEC-1.
** Indicates the structure was modeled using flows calculated by HEC-1.

Riprap Design Spreadsheet

References: *US DOT, FHWA, Highways in the River Environment Hydraulic and Environmental Design Considerations May 1975, pVI-24.*

US DOT, FHWA, Hydraulic Design of Energy Dissipaters for Culverts and Channel. Sept. 1983, pII-5-II-9.

FCDMC, Drainage Design Manual for Maricpa County Arizona, Vol. II - Hydraulics. January 1996, p5.75-5.77.

Project Name: *SERENO CANYON PHASE 1* **Structure ID:** O
Project #: 062654 **Culvert Size:** 1-30" CMP

1. Riprap Size D50

Max. flow width Wo =	2.50	ft	
Max. culvert flow depth h =	1.81	ft	
Tailwater depth TW =	0.68	ft	normal
Exit Velocity Ve =	7.39	fps	
Tailwater velocity Vd =	4.91	fps	normal
Wash bottom width =	4.00	ft	
Computed Riprap Size D50 =	4.5	in	
Design Riprap Size D50 =	9	in	
Sieve Size =	TYPE I		

2. Riprap Sizes D15 and D85

Design Riprap Size D15 =	4	in
Design Riprap Size D85 =	14	in

3. Riprap Apron Length

Riprap Apron Length =	8	ft

4. Riprap Apron Width

Min. Riprap Apron Width =	6	ft
Max. Riprap Apron Width =	8	ft

5. Riprap Thickness

Riprap Thickness =	18	in

6. Total Riprap Volume

Riprap Rock Volume =	3	CY

Please note fields highlighted are input values from the Culvert Modeling Summary

* Indicates the structure was modeled in HEC-1.
** Indicates the structure was modeled using flows calculated by HEC-1.

Riprap Design Spreadsheet

References: *US DOT, FHWA, Highways in the River Environment Hydraulic and Environmental Design Considerations May 1975, pVI-24.*

US DOT, FHWA, Hydraulic Design of Energy Dissipaters for Culverts and Channel. Sept. 1983, pII-5-II-9.

FCDMC, Drainage Design Manual for Maricpa County Arizona, Vol. II - Hydraulics. January 1996, p5.75-5.77.

Project Name: *SERENO CANYON PHASE 1* **Structure ID:** **P**
Project #: 062654 **Culvert Size:** 1-18" CMP

1. Riprap Size D50

Max. flow width Wo =	1.50	ft	
Max. culvert flow depth h =	1.21	ft	
Tailwater depth TW =	0.39	ft	normal
Exit Velocity Ve =	5.79	fps	
Tailwater velocity Vd =	2.95	fps	normal
Wash bottom width =	4.00	ft	
Computed Riprap Size D50 =	2.8	in	
Design Riprap Size D50 =	9	in	
Sieve Size =	TYPE I		

2. Riprap Sizes D15 and D85

Design Riprap Size D15 =	4	in
Design Riprap Size D85 =	14	in

3. Riprap Apron Length

Riprap Apron Length =	7	ft

4. Riprap Apron Width

Min. Riprap Apron Width =	4	ft
Max. Riprap Apron Width =	6	ft

5. Riprap Thickness

Riprap Thickness =	18	in

6. Total Riprap Volume

Riprap Rock Volume =	2	CY

Please note fields highlighted are input values from the Culvert Modeling Summary

* Indicates the structure was modeled in HEC-1.
** Indicates the structure was modeled using flows calculated by HEC-1.

Riprap Design Spreadsheet

References: *US DOT, FHWA, Highways in the River Environment Hydraulic and Environmental Design Considerations May 1975, pVI-24.*

US DOT, FHWA, Hydraulic Design of Energy Dissipaters for Culverts and Channel. Sept. 1983, pII-5-II-9.

FCDMC, Drainage Design Manual for Maricpa County Arizona, Vol. II - Hydraulics. January 1996, p5.75-5.77.

Project Name: *SERENO CANYON PHASE 1* **Structure ID:** Q
Project #: 062654 **Culvert Size:** 1-18" CMP

1. Riprap Size D50

Max. flow width Wo =	1.50	ft	
Max. culvert flow depth h =	1.16	ft	
Tailwater depth TW =	0.39	ft	normal
Exit Velocity Ve =	5.79	fps	
Tailwater velocity Vd =	2.95	fps	normal
Wash bottom width =	4.00	ft	
Computed Riprap Size D50 =	2.8	in	
Design Riprap Size D50 =	9	in	
Sieve Size =	TYPE I		

2. Riprap Sizes D15 and D85

Design Riprap Size D15 = 4 in
Design Riprap Size D85 = 14 in

3. Riprap Apron Length

Riprap Apron Length = 7 ft

4. Riprap Apron Width

Min. Riprap Apron Width = 4 ft
Max. Riprap Apron Width = 6 ft

5. Riprap Thickness

Riprap Thickness = 18 in

6. Total Riprap Volume

Riprap Rock Volume = 2 CY

Please note fields highlighted are input values from the Culvert Modeling Summary

* Indicates the structure was modeled in HEC-1.
** Indicates the structure was modeled using flows calculated by HEC-1.

Riprap Design Spreadsheet

References: *US DOT, FHWA, Highways in the River Environment Hydraulic and Environmental Design Considerations May 1975, pVI-24.*

US DOT, FHWA, Hydraulic Design of Energy Dissipaters for Culverts and Channel. Sept. 1983, pII-5-II-9.

FCDMC, Drainage Design Manual for Maricpa County Arizona, Vol. II - Hydraulics. January 1996, p5.75-5.77.

Project Name: *SERENO CANYON PHASE 1* **Structure ID:** **S***
Project #: 062654 **Culvert Size:** 1-24" CMP

1. Riprap Size D50

Max. flow width Wo =	2.00	ft	
Max. culvert flow depth h =	2.00	ft	
Tailwater depth TW =	1.95	ft	normal
Exit Velocity Ve =	6.77	fps	
Tailwater velocity Vd =	3.92	fps	normal
Wash bottom width =	6.00	ft	
Computed Riprap Size D50 =	3.8	in	
Design Riprap Size D50 =	9	in	
Sieve Size =	TYPE I		

2. Riprap Sizes D15 and D85

Design Riprap Size D15 =	4	in
Design Riprap Size D85 =	14	in

3. Riprap Apron Length

Riprap Apron Length =	16	ft

4. Riprap Apron Width

Min. Riprap Apron Width =	6	ft
Max. Riprap Apron Width =	10	ft

5. Riprap Thickness

Riprap Thickness =	18	in

6. Total Riprap Volume

Riprap Rock Volume =	7	CY

Please note fields highlighted are input values from the Culvert Modeling Summary

* Indicates the structure was modeled in HEC-1.
** Indicates the structure was modeled using flows calculated by HEC-1.

Riprap Design Spreadsheet

References: *US DOT, FHWA, Highways in the River Environment Hydraulic and Environmental Design Considerations May 1975, pVI-24.*

US DOT, FHWA, Hydraulic Design of Energy Dissipaters for Culverts and Channel. Sept. 1983, pII-5-II-9.

FCDMC, Drainage Design Manual for Maricpa County Arizona, Vol. II - Hydraulics. January 1996, p5.75-5.77.

Project Name: *SERENO CANYON PHASE 1* **Structure ID:** **T**
Project #: 062654 **Culvert Size:** 1-24" CMP

1. Riprap Size D50

Max. flow width Wo =	2.00	ft	
Max. culvert flow depth h =	1.22	ft	
Tailwater depth TW =	0.44	ft	normal
Exit Velocity Ve =	6.48	fps	
Tailwater velocity Vd =	3.85	fps	normal
Wash bottom width =	5.00	ft	
Computed Riprap Size D50 =	3.5	in	
Design Riprap Size D50 =	9	in	
Sieve Size =	TYPE I		

2. Riprap Sizes D15 and D85

Design Riprap Size D15 =	4	in
Design Riprap Size D85 =	14	in

3. Riprap Apron Length

Riprap Apron Length = 7 ft

4. Riprap Apron Width

Min. Riprap Apron Width =	4	ft
Max. Riprap Apron Width =	7	ft

5. Riprap Thickness

Riprap Thickness = 18 in

6. Total Riprap Volume

Riprap Rock Volume = 2 CY

Please note fields highlighted are input values from the Culvert Modeling Summary

* Indicates the structure was modeled in HEC-1.
** Indicates the structure was modeled using flows calculated by HEC-1.

Riprap Design Spreadsheet

References: *US DOT, FHWA, Highways in the River Environment Hydraulic and Environmental Design Considerations May 1975, pVI-24.*

US DOT, FHWA, Hydraulic Design of Energy Dissipaters for Culverts and Channel. Sept. 1983, pII-5-II-9.

FCDMC, Drainage Design Manual for Maricpa County Arizona, Vol. II - Hydraulics. January 1996, p5.75-5.77.

Project Name: *SERENO CANYON PHASE 1* **Structure ID:** **U**
Project #: 062654 **Culvert Size:** 1-24" CMP

1. Riprap Size D50

Max. flow width Wo =	2.00	ft	
Max. culvert flow depth h =	2.00	ft	
Tailwater depth TW =	0.45	ft	normal
Exit Velocity Ve =	6.06	fps	
Tailwater velocity Vd =	3.94	fps	normal
Wash bottom width =	5.00	ft	
Computed Riprap Size D50 =	3.0	in	
Design Riprap Size D50 =	9	in	
Sieve Size =	TYPE I		

2. Riprap Sizes D15 and D85

Design Riprap Size D15 = 4 in
Design Riprap Size D85 = 14 in

3. Riprap Apron Length

Riprap Apron Length = 6 ft

4. Riprap Apron Width

Min. Riprap Apron Width = 6 ft
Max. Riprap Apron Width = 9 ft

5. Riprap Thickness

Riprap Thickness = 18 in

6. Total Riprap Volume

Riprap Rock Volume = 2 CY

Please note fields highlighted are input values from the Culvert Modeling Summary

* Indicates the structure was modeled in HEC-1.
** Indicates the structure was modeled using flows calculated by HEC-1.

Riprap Design Spreadsheet

References: *US DOT, FHWA, Highways in the River Environment Hydraulic and Environmental Design Considerations May 1975, pVI-24.*

US DOT, FHWA, Hydraulic Design of Energy Dissipaters for Culverts and Channel. Sept. 1983, pII-5-II-9.

FCDMC, Drainage Design Manual for Maricpa County Arizona, Vol. II - Hydraulics. January 1996, p5.75-5.77.

Project Name: *SERENO CANYON PHASE 1* **Structure ID:** **V**
Project #: *062654* **Culvert Size:** 1-18" CMP

1. Riprap Size D50

Max. flow width Wo =	1.50	ft	
Max. culvert flow depth h =	1.50	ft	
Tailwater depth TW =	0.20	ft	normal
Exit Velocity Ve =	4.79	fps	
Tailwater velocity Vd =	2.55	fps	normal
Wash bottom width =	5.00	ft	
Computed Riprap Size D50 =	1.8	in	
Design Riprap Size D50 =	9	in	
Sieve Size =	TYPE I		

2. Riprap Sizes D15 and D85

Design Riprap Size D15 =	4	in
Design Riprap Size D85 =	14	in

3. Riprap Apron Length

Riprap Apron Length =	4	ft

4. Riprap Apron Width

Min. Riprap Apron Width =	5	ft
Max. Riprap Apron Width =	7	ft

5. Riprap Thickness

Riprap Thickness =	18	in

6. Total Riprap Volume

Riprap Rock Volume =	1	CY

Please note fields highlighted are input values from the Culvert Modeling Summary

* Indicates the structure was modeled in HEC-1.
** Indicates the structure was modeled using flows calculated by HEC-1.

Riprap Design Spreadsheet

References: *US DOT, FHWA, Highways in the River Environment Hydraulic and Environmental Design Considerations May 1975, pVI-24.*

US DOT, FHWA, Hydraulic Design of Energy Dissipaters for Culverts and Channel. Sept. 1983, pII-5-II-9.

FCDMC, Drainage Design Manual for Maricpa County Arizona, Vol. II - Hydraulics. January 1996, p5.75-5.77.

Project Name: *SERENO CANYON PHASE 1* **Structure ID:** **W**
Project #: 062654 **Culvert Size:** 1-18" CMP

1. Riprap Size D50

Max. flow width Wo =	1.50	ft	
Max. culvert flow depth h =	0.49	ft	
Tailwater depth TW =	0.18	ft	normal
Exit Velocity Ve =	7.10	fps	
Tailwater velocity Vd =	1.89	fps	normal
Wash bottom width =	5.00	ft	
Computed Riprap Size D50 =	4.1	in	
Design Riprap Size D50 =	9	in	
Sieve Size =	TYPE I		

2. Riprap Sizes D15 and D85

Design Riprap Size D15 = **4** in
Design Riprap Size D85 = **14** in

3. Riprap Apron Length

Riprap Apron Length = **9** ft

4. Riprap Apron Width

Min. Riprap Apron Width = **2** ft
Max. Riprap Apron Width = **6** ft

5. Riprap Thickness

Riprap Thickness = **18** in

6. Total Riprap Volume

Riprap Rock Volume = **2** CY

Please note fields highlighted are input values from the Culvert Modeling Summary

* Indicates the structure was modeled in HEC-1.
** Indicates the structure was modeled using flows calculated by HEC-1.

Riprap Design Spreadsheet

References: *US DOT, FHWA, Highways in the River Environment*
Hydraulic and Environmental Design Considerations
May 1975, pVI-24.

US DOT, FHWA, Hydraulic Design of Energy Dissipaters
for Culverts and Channel. Sept. 1983, pII-5-II-9.

FCDMC, Drainage Design Manual for Maricpa County
Arizona, Vol. II - Hydraulics. January 1996, p5.75-5.77.

Project Name: *SERENO CANYON PHASE 1* **Structure ID:** **X***
Project #: 062654 **Culvert Size:** 1-36" CMP

1. Riprap Size D50

Max. flow width Wo =	3.00	ft	
Max. culvert flow depth h =	3.00	ft	
Tailwater depth TW =	0.94	ft	normal
Exit Velocity Ve =	8.10	fps	
Tailwater velocity Vd =	4.81	fps	normal
Wash bottom width =	5.00	ft	
Computed Riprap Size D50 =	5.3	in	
Design Riprap Size D50 =	9	in	
Sieve Size =	TYPE I		

2. Riprap Sizes D15 and D85

Design Riprap Size D15 =	4	in
Design Riprap Size D85 =	14	in

3. Riprap Apron Length

Riprap Apron Length =	13	ft

4. Riprap Apron Width

Min. Riprap Apron Width =	9	ft
Max. Riprap Apron Width =	11	ft

5. Riprap Thickness

Riprap Thickness =	18	in

6. Total Riprap Volume

Riprap Rock Volume =	7	CY

Please note fields highlighted are input values from the Culvert Modeling Summary

* Indicates the structure was modeled in HEC-1.
** Indicates the structure was modeled using flows calculated by HEC-1.

Riprap Design Spreadsheet

References: *US DOT, FHWA, Highways in the River Environment Hydraulic and Environmental Design Considerations May 1975, pVI-24.*

US DOT, FHWA, Hydraulic Design of Energy Dissipaters for Culverts and Channel. Sept. 1983, pII-5-II-9.

FCDMC, Drainage Design Manual for Maricpa County Arizona, Vol. II - Hydraulics. January 1996, p5.75-5.77.

Project Name: *SERENO CANYON PHASE 1* **Structure ID:** **Y**
Project #: 062654 **Culvert Size:** 1-24" CMP

1. Riprap Size D50

Max. flow width Wo =	2.00	ft	
Max. culvert flow depth h =	2.00	ft	
Tailwater depth TW =	0.53	ft	normal
Exit Velocity Ve =	6.24	fps	
Tailwater velocity Vd =	3.49	fps	normal
Wash bottom width =	5.00	ft	
Computed Riprap Size D50 =	3.2	in	
Design Riprap Size D50 =	9	in	
Sieve Size =	TYPE I		

2. Riprap Sizes D15 and D85

Design Riprap Size D15 =	**4**	**in**
Design Riprap Size D85 =	**14**	**in**

3. Riprap Apron Length

Riprap Apron Length =	**8**	**ft**

4. Riprap Apron Width

Min. Riprap Apron Width =	**6**	**ft**
Max. Riprap Apron Width =	**9**	**ft**

5. Riprap Thickness

Riprap Thickness =	**18**	**in**

6. Total Riprap Volume

Riprap Rock Volume =	**3**	**CY**

Please note fields highlighted are input values from the Culvert Modeling Summary

* Indicates the structure was modeled in HEC-1.
** Indicates the structure was modeled using flows calculated by HEC-1.

Riprap Design Spreadsheet

References: *US DOT, FHWA, Highways in the River Environment Hydraulic and Environmental Design Considerations May 1975, pVI-24.*

US DOT, FHWA, Hydraulic Design of Energy Dissipaters for Culverts and Channel. Sept. 1983, pII-5-II-9.

FCDMC, Drainage Design Manual for Maricpa County Arizona, Vol. II - Hydraulics. January 1996, p5.75-5.77.

Project Name: *SERENO CANYON PHASE 1* **Structure ID:** **1**
Project #: 062654 **Culvert Size:** 2-22.5"x36.25" RGR

1. Riprap Size D50

Max. flow width Wo =	3.75	ft	
Max. culvert flow depth h =	1.43	ft	
Tailwater depth TW =	10.25	ft	normal
Exit Velocity Ve =	9.98	fps	
Tailwater velocity Vd =	6.52	fps	normal
Wash bottom width =	5.00	ft	
Computed Riprap Size D50 =	7.9	in	
Design Riprap Size D50 =	9	in	
Sieve Size =	TYPE I		

2. Riprap Sizes D15 and D85

Design Riprap Size D15 =	4	in
Design Riprap Size D85 =	14	in

3. Riprap Apron Length

Riprap Apron Length =	44	ft

4. Riprap Apron Width

Min. Riprap Apron Width =	7	ft
Max. Riprap Apron Width =	8	ft

5. Riprap Thickness

Riprap Thickness =	18	in

6. Total Riprap Volume

Riprap Rock Volume =	18	CY

Please note fields highlighted are input values from the Culvert Modeling Summary

* Indicates the structure was modeled in HEC-1.
** Indicates the structure was modeled using flows calculated by HEC-1.

Drop Inlet Hydraulic Calculations

WOOD/PATEL

CIVIL ENGINEERS * HYDROLOGISTS * LAND SURVEYORS * CONSTRUCTION MANAGERS

Project: Sereno Canyon Phase 1
Location: City of Scottsdale
Date: 30-Jan-07

Project Number: 062654
Project Engineer: Geoff Brownell, P.E.

Equation: Q = V * A

A= 0.5*F*(E+W)

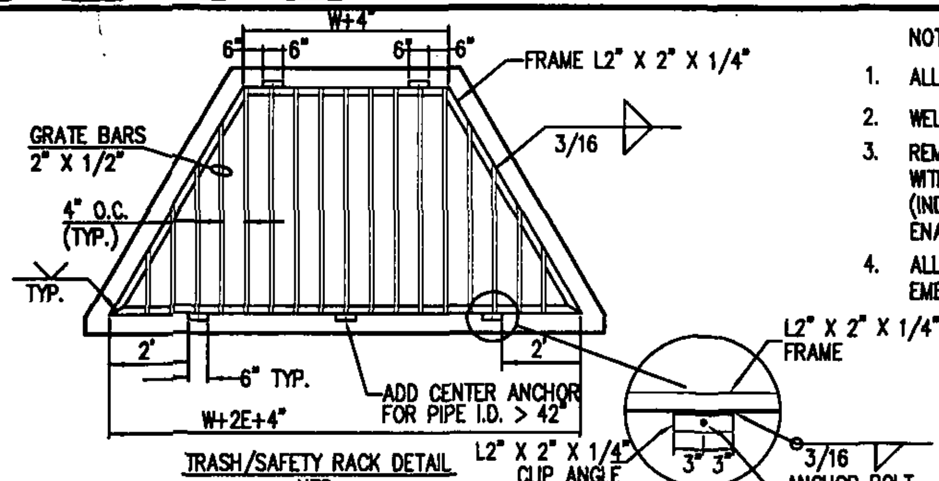
Q= Flow in cfs
V= Velocity in fps
A= Area in Sq.ft

F, E, W= Dimensions from detail (see next sheet)

Table: Drop Inlet Hydraulic Calculations

Culvert ID (from plans)	ID (from report)	Q (cfs)	E	F	W	A (sq.ft)	V	V in Culvert	F.O.S. (*in addition to 50% clogging factor)
L	E2-1	138	2.31	4.0	10.50	25.63	5.39	9.05	1.7
I	F1-1	30	1.75	3.0	3.50	7.88	3.81	7.68	2.0
X	F1-2	44	2.00	3.5	4.00	10.50	4.19	8.1	1.9
K	F2-1	15	1.50	2.5	3.00	5.63	2.67	8.49	3.2
S	F2-2	21	1.50	2.5	3.00	5.63	3.73	6.77	1.8
M	F1-3	45	2.00	3.5	4.00	10.50	4.29	9.67	2.3
B	H1-1	91	2.00	3.5	9.17	19.54	4.66	8.25	1.8
1	H1-2	98	2.00	3.5	9.17	19.54	5.02	9.98	2.0

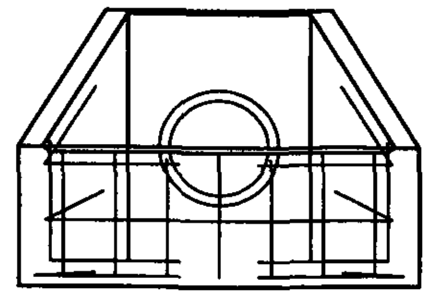
* 50% clogging factor used for estimating area



TRASH/SAFETY RACK DETAIL
NTS

NOTES:

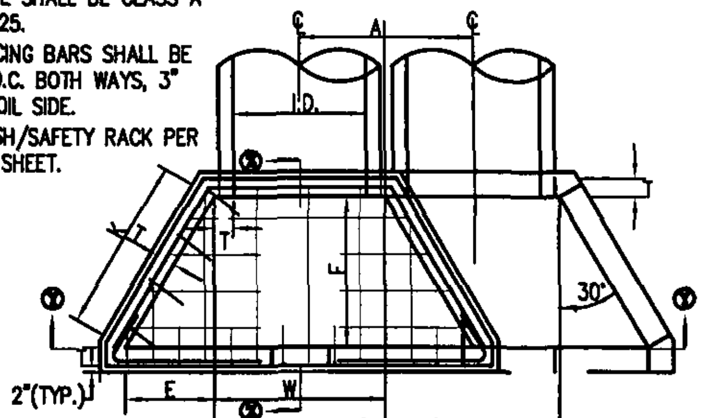
1. ALL STEEL SHALL BE IN ACCORDANCE TO ASTM A-36.
2. WELDING SHALL BE IN ACCORDANCE WITH AWS. SPECIFICATIONS.
3. REMOVE ALL SCALE FROM GRATE. METAL SPRAY OR PAINT WITH ONE COAT ZINC CHROMATE OR RED LEAD PRIMER (INDUSTRIAL QUALITY). OVERCOAT WITH GRAY INDUSTRIAL ENAMEL PER M.A.G. SPEC. 790.
4. ALL ANCHOR BOLTS SHALL BE 5/8"ø ANCHOR BOLTS EMBEDDED 4" (MINIMUM) INTO EPOXY GROUT.



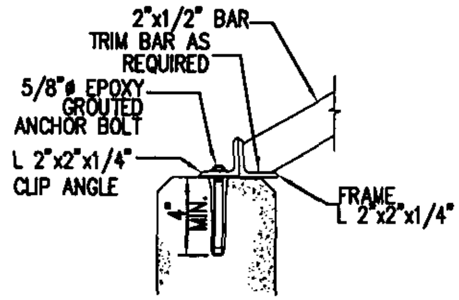
ELEVATION
NTS

NOTES:

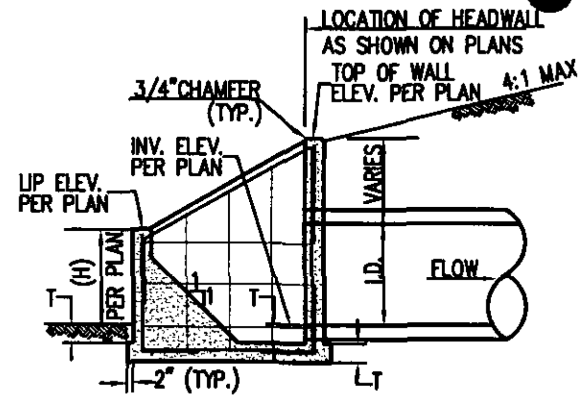
1. HIGH POINT OF HEADWALL SHALL NOT PROJECT MORE THAN 3" ABOVE SLOPE.
2. ALL CONCRETE SHALL BE CLASS A PER SECT. 725.
3. ALL REINFORCING BARS SHALL BE NO. 5, 12" O.C. BOTH WAYS, 3" CLEAR ON SOIL SIDE.
4. INSTALL TRASH/SAFETY RACK PER DETAIL THIS SHEET.



PLAN
NTS

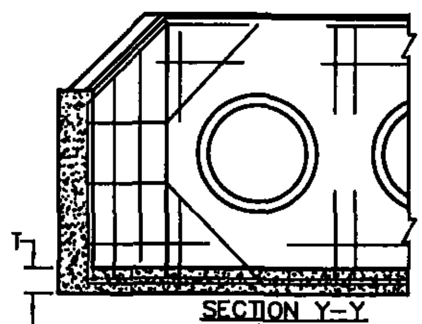


ANCHOR BOLT DETAIL
FOR TRASH/SAFETY RACK
NTS



SECTION Z-Z
NTS

DIMENSIONS								
I.D.	W		A	E	F	K	T	H
	SINGLE	DOUBLE						
18"	2'-6"	5'-2"	2'-8"	1'-2"	2'-0"	2'-3 3/4"	6"	PER PLAN
24"	3'-0"	6'-6"	3'-6"	1'-6"	2'-6"	2'-10 1/2"	6"	PER PLAN
30"	3'-6"	7'-10"	4'-4"	1'-9"	3'-0"	3'-5 1/2"	6"	PER PLAN
36"	4'-0"	9'-2"	5'-2"	2'-0"	3'-6"	4'-0 1/2"	6"	PER PLAN
42"	4'-6"	10'-6"	6'-0"	2'-3 3/4"	4'-0"	4'-7 1/2"	6"	PER PLAN



SECTION Y-Y
NTS

HEADWALL DROP INLET (MODIFIED M.A.G. 501-5)

Weir Wall Calculations

Project: *SERENO CANYON PHASE 1*
Location: *City of Scottsdale*
Date: *12-Dec-06*
References: *Drainage Design Manual for Maricopa County, Volume II-Hydraulics*

Project Number: *062654*
Project Engineer: *Geoff Brownell, P.E*

WEIR WALL CALCULATIONS

Equation 3.10 in Volume II, Hydraulics
Q (cfs)= $CLh^{3/2}$
C= 2.80

						WEIR FLOW - RATING CURVE			WEIR FLOW - ACTUAL DESIGN		
Detention Basin	**Elevation of Bottom of Basin**	**Height of Weir Wall (ft)**	**Elevation of Top of Weir Wall (ft)**	**HEC-1 Water Surface Elevation (ft)**	**d (depth of water over weir)**	**h (ft)**	**Flow (cfs)**	**Length of Weir Wall (ft)**	**h (ft)**	**HEC-1 Resulting Flow (cfs)**	**Required Length of Weir Wall (ft)**
F1-4	2676.0	3.0	2679.0	2679.94	0.94	1.0	34	12.0	0.9	32	***12.5***
F3-1	2704.0	5.0	2709.0	2709.69	0.69	1.0	39	14.0	0.7	27	***16.8***
G-1	2722.0	4.0	2726.0	2726.80	0.80	1.00	42.00	15.00	0.8	33	***16.5***
H1-2	2721.0	4.0	2725.0	2725.97	0.97	1.00	101.00	36.00	1.0	98	***36.6***
L-1	2722.0	3.0	2725.0	2725.77	0.77	1.00	36.00	13.00	0.8	28	***14.8***
M-1	2713.0	3.0	2716.0	2717.66	1.66	2.00	55.00	7.00	1.7	43	***7.2***
N-1	2688.0	4.0	2692.0	2692.48	0.48	1.00	36.00	13.00	0.5	17	***18.3***

Orifice Plate Calculation

WOOD/PATEL

CIVIL ENGINEERS * HYDROLOGISTS * LAND SURVEYORS * CONSTRUCTION MANAGERS

Project: *Sereno Canyon Phase 1* **W/P#:** *062654*
Location: *City of Scottsdale* **Date:** *12/12/2006*
Reference: *Orifice Equation*
Basin Depth: *3'*

$$\boxed{Q = CA\sqrt{2gh}}$$

Where:

C = Orifice Coefficient =	0.60	
d = Diamter of Orfice =	6.00	in
A = Cross-sectional area of orifice =	0.20	Sq.ft
H = Depth above Orifice =	0.75	ft
Q = Orifice Flow =	0.82	cfs

Time to Drain 2 ac-ft = 29.55 hours

WOOD/PATEL

CIVIL ENGINEERS * HYDROLOGISTS * LAND SURVEYORS * CONSTRUCTION MANAGERS

Project: *Sereno Canyon Phase 1* **W/P#:** *062654*
Location: *City of Scottsdale* **Date:** *12/12/2006*
Reference: *Orifice Equation*
Basin Depth: *3'*

$$\boxed{Q = CA\sqrt{2gh}}$$

Where:

C = Orifice Coefficient =	0.60	
d = Diamter of Orfice =	6.00	in
A = Cross-sectional area of orifice =	0.20	Sq.ft
H = Depth above Orifice =	2.25	ft
Q = Orifice Flow =	1.42	cfs

Time to Drain 2 ac-ft = 17.06 hours

Project: *Sereno Canyon Phase 1* **W/P#:** *062654*
Location: *City of Scottsdale* **Date:** *12/12/2006*
Reference: *Orifice Equation*
Basin Depth: *4'*

$$\boxed{Q = CA\sqrt{2gh}}$$

Where:

C = Orifice Coefficient =	0.60	
d = Diamter of Orfice =	6.00	in
A = Cross-sectional area of orifice =	0.20	Sq.ft
H = Depth above Orifice =	1.25	ft
Q = Orifice Flow =	1.06	cfs
Time to Drain 2 ac-ft =	22.89	hours

WOOD/PATEL

CIVIL ENGINEERS * HYDROLOGISTS * LAND SURVEYORS * CONSTRUCTION MANAGERS

Project: *Sereno Canyon Phase 1* **W/P#:** *062654*
Location: *City of Scottsdale* **Date:** *12/12/2006*
Reference: *Orifice Equation*
Basin Depth: *4'*

$$\boxed{Q = CA\sqrt{2gh}}$$

Where:

C = Orifice Coefficient =	0.60	
d = Diamter of Orfice =	6.00	in
A = Cross-sectional area of orifice =	0.20	Sq.ft
H = Depth above Orifice =	3.25	ft
Q = Orifice Flow =	1.70	cfs
Time to Drain 2 ac-ft =	14.2	hours

Project: *Sereno Canyon Phase 1*
W/P#: *062654*
Location: *City of Scottsdale*
Date: *12/12/2006*
Reference: *Orifice Equation*
Basin Depth: *4.5'*

$$\boxed{Q = CA\sqrt{2gh}}$$

Where:

C = Orifice Coefficient =	0.60	
d = Diamter of Orfice =	6.00	in
A = Cross-sectional area of orifice =	0.20	Sq.ft
H = Depth above Orifice =	1.50	ft
Q = Orifice Flow =	1.16	cfs
Time to Drain 2 ac-ft =	20.9	hours

Project: *Sereno Canyon Phase 1*

W/P#: *062654*

Location: *City of Scottsdale*

Date: *12/12/2006*

Reference: *Orifice Equation*

Basin Depth: *4.5'*

$$\boxed{Q = CA\sqrt{2gh}}$$

Where:

C = Orifice Coefficient =	0.60	
d = Diamter of Orfice =	6.00	in
A = Cross-sectional area of orifice =	0.20	Sq.ft
H = Depth above Orifice =	3.75	ft
Q = Orifice Flow =	1.83	cfs
Time to Drain 2 ac-ft =	13.22	hours

WOOD/PATEL

CIVIL ENGINEERS * HYDROLOGISTS * LAND SURVEYORS * CONSTRUCTION MANAGERS

Project: *Sereno Canyon Phase 1* **W/P#:** *062654*
Location: *City of Scottsdale* **Date:** *12/12/2006*
Reference: *Orifice Equation*
Basin Depth: *5'*

$$\boxed{Q = CA\sqrt{2gh}}$$

Where:

C = Orifice Coefficient =	0.60	
d = Diamter of Orfice =	6.00	in
A = Cross-sectional area of orifice =	0.20	Sq.ft
H = Depth above Orifice =	1.75	ft
Q = Orifice Flow =	1.25	cfs
Time to Drain 2 ac-ft =	19.35	hours

WOOD/PATEL

CIVIL ENGINEERS * HYDROLOGISTS * LAND SURVEYORS * CONSTRUCTION MANAGERS

Project: *Sereno Canyon Phase 1* **W/P#:** *062654*
Location: *City of Scottsdale* **Date:** *12/12/2006*
Reference: *Orifice Equation*
Basin Depth: *5'*

$$\boxed{Q = CA\sqrt{2gh}}$$

Where:

C = Orifice Coefficient =	0.60	
d = Diamter of Orfice =	6.00	in
A = Cross-sectional area of orifice =	0.20	Sq.ft
H = Depth above Orifice =	4.75	ft
Q = Orifice Flow =	2.06	cfs
Time to Drain 2 ac-ft =	11.74	hours

WOOD/PATEL

CIVIL ENGINEERS * HYDROLOGISTS * LAND SURVEYORS * CONSTRUCTION MANAGERS

Project: *Sereno Canyon Phase 1*
W/P#: *062654*
Location: *City of Scottsdale*
Date: *12/12/2006*
Reference: *Orifice Equation*
Basin Depth: *6.5'*

$$\boxed{Q = CA\sqrt{2gh}}$$

Where:

C = Orifice Coefficient =	0.60	
d = Diamter of Orfice =	6.00	in
A = Cross-sectional area of orifice =	0.20	Sq.ft
H = Depth above Orifice =	2.50	ft
Q = Orifice Flow =	1.50	cfs
Time to Drain 2 ac-ft =	16.19	hours

WOOD/PATEL

CIVIL ENGINEERS * HYDROLOGISTS * LAND SURVEYORS * CONSTRUCTION MANAGERS

Project: *Sereno Canyon Phase 1*
W/P#: *062654*
Location: *City of Scottsdale*
Date: *12/12/2006*
Reference: *Orifice Equation*
Basin Depth: *6.5'*

$$\boxed{Q = CA\sqrt{2gh}}$$

Where:

C = Orifice Coefficient =	0.60	
d = Diamter of Orfice =	6.00	in
A = Cross-sectional area of orifice =	0.20	Sq.ft
H = Depth above Orifice =	5.75	ft
Q = Orifice Flow =	2.27	cfs
Time to Drain 2 ac-ft =	10.67	hours

WOOD/PATEL

CIVIL ENGINEERS * HYDROLOGISTS * LAND SURVEYORS * CONSTRUCTION MANAGERS

Project: *Sereno Canyon Phase 1* **W/P#:** *062654*

Location: *City of Scottsdale* **Date:** *12/12/2006*

Reference: *Orifice Equation*

Basin Depth: *7.5'*

$$\boxed{Q = CA\sqrt{2gh}}$$

Where:

C = Orifice Coefficient =	0.60	
d = Diamter of Orfice =	6.00	in
A = Cross-sectional area of orifice =	0.20	Sq.ft
H = Depth above Orifice =	3.00	ft
Q = Orifice Flow =	1.64	cfs
Time to Drain 2 ac-ft =	14.78	hours

WOOD/PATEL

CIVIL ENGINEERS * HYDROLOGISTS * LAND SURVEYORS * CONSTRUCTION MANAGERS

Project: *Sereno Canyon Phase 1*
W/P#: *062654*
Location: *City of Scottsdale*
Date: *12/12/2006*
Reference: *Orifice Equation*
Basin Depth: *7.5'*

$$\boxed{Q = CA\sqrt{2gh}}$$

Where:

C = Orifice Coefficient =	0.60	
d = Diamter of Orfice =	6.00	in
A = Cross-sectional area of orifice =	0.20	Sq.ft
H = Depth above Orifice =	6.75	ft
Q = Orifice Flow =	2.46	cfs
Time to Drain 2 ac-ft =	9.851	hours

Street Capacities

Street Capacity Computations

4" Roll Curb

Description: Calculation of Local Street Flow Conveyance Capacity for Local Street

References: Federal Highway Administration, Hydraulic Engineering Circular No. 22, "Drainage of Highway Pavements", November 1996

Local Residential Street (A-A) 10 YR

Date: 09/11/06

Known Values:

Depth of Flow = 0.33 ft

Cross Slope = 0.02 ft/ft

Street Width (F/C to F/C) = 22 ft ← 22' F/C to F/C cross section

Manning's "n" Value= 0.015

Calculated Values:

Referenced Equations:

$Q = 0.56 * (S_x^{1.67}) * (S^{0.5}) * (T^{2.67}) / n$ for flow below crown (FHWA Procedure)

$Q = 1.486 * A * (R^{0.67}) * (S^{0.5}) / n$ for flow above crown (Manning's equation)

where Q = flow rate, cfs; T = width of flow, ft
S_x = cross slope, ft/ft; A = conveyance area, sq ft
S = longitudinal slope, ft/ft; R = hydraulic radius, ft

Longitudinal Slope ft/ft	Conveyance Area sq ft	Velocity fps	Full Street Flow Capacity (1) cfs	1/2 Street Flow Without Overtopping, cfs (1)(2)	1/2 Street Flow with Overtopping, cfs (1)(3)
0.0050	4.84	2.49	12	2	6
0.0055	4.84	2.61	13	2	6
0.0060	4.84	2.73	13	3	7
0.0065	4.84	2.84	14	3	7
0.0070	4.84	2.95	14	3	7
0.0075	4.84	3.05	15	3	7
0.0080	4.84	3.15	15	3	8
0.0085	4.84	3.25	16	3	8
0.0090	4.84	3.34	16	3	8
0.0095	4.84	3.43	17	3	8
0.0097	4.84	3.47	17	3	8
0.0102	4.84	3.56	17	3	9
0.0107	4.84	3.64	18	3	9
0.0110	4.84	3.69	18	3	9
0.0115	4.84	3.78	18	4	9
0.0121	4.84	3.87	19	4	9
0.0126	4.84	3.95	19	4	10
0.0131	4.84	4.03	20	4	10
0.0136	4.84	4.11	20	4	10
0.0148	4.84	4.28	21	4	10
0.0153	4.84	4.36	21	4	11
0.0310	4.84	6.20	30	6	15
0.0330	4.84	6.40	31	6	15
0.0350	4.84	6.59	32	6	16
0.0370	4.84	6.77	33	6	16
0.0470	4.84	7.63	37	7	18

Notes:
1.) Street flow capacity does not include local gutter depression effect.
2.) Half-street flow capacity is limited to the lower of the crown elevation or top of curb elevation.
3.) Includes flows above the crown elevation up to the specified flow depth elevation.

Street Capacity Computations

4" Roll Curb

Description: Calculation of Local Street Flow Conveyance Capacity for Local Street

References: Federal Highway Administration, Hydraulic Engineering Circular No. 22, "Drainage of Highway Pavements", November 1996

Local Residential Street (A-A) 100 YR

Date: 09/11/06

Known Values:

Depth of Flow = 0.67 ft

Cross Slope = 0.02 ft/ft

Street Width (**F/C to F/C**) = 22 ft ← 22' F/C to F/C cross section

Manning's "n" Value= 0.015

Calculated Values:

Referenced Equations:

$Q = 0.56 * (S_x^{1.67}) * (S^{0.5}) * (T^{2.67}) / n$ for flow below crown (FHWA Procedure)

$Q = 1.486 * A * (R^{0.67}) * (S^{0.5}) / n$ for flow above crown (Manning's equation)

where Q = flow rate, cfs; T = width of flow, ft; S_x = cross slope, ft/ft; A = conveyance area, sq ft; S = longitudinal slope, ft/ft; R = hydraulic radius, ft

Longitudinal Slope ft/ft	*Conveyance Area sq ft*	*Velocity fps*	*Full Street Flow Capacity (1) cfs*	*1/2 Street Flow Without Overtopping, cfs (1)(2)*	*1/2 Street Flow with Overtopping, cfs (1)(3)*
0.0050	12.32	4.56	56	2	28
0.0055	12.32	4.79	59	2	29
0.0060	12.32	5.00	62	3	31
0.0065	12.32	5.20	64	3	32
0.0070	12.32	5.40	67	3	33
0.0075	12.32	5.59	69	3	34
0.0080	12.32	5.77	71	3	36
0.0085	12.32	5.95	73	3	37
0.0090	12.32	6.12	75	3	38
0.0095	12.32	6.29	78	3	39
0.0097	12.32	6.36	78	3	39
0.0102	12.32	6.52	80	3	40
0.0107	12.32	6.68	82	3	41
0.0110	12.32	6.77	83	3	42
0.0115	12.32	6.92	85	4	43
0.0121	12.32	7.10	87	4	44
0.0126	12.32	7.25	89	4	45
0.0131	12.32	7.39	91	4	46
0.0136	12.32	7.53	93	4	46
0.0148	12.32	7.85	97	4	48
0.0310	12.32	11.37	140	6	70
0.0330	12.32	11.73	144	6	72
0.0370	12.32	12.42	153	6	76
0.0470	12.32	14.00	172	7	86
0.0570	12.32	15.41	190	8	95
0.0670	12.32	16.71	206	8	103

Notes:

1.) Street flow capacity does not include local gutter depression effect.

2.) Half-street flow capacity is limited to the lower of the crown elevation or top of curb elevation.

3.) Includes flows above the crown elevation up to the specified flow depth elevation.

Street Capacity Computations

4" Roll Curb

Description: Calculation of Local Street Flow Conveyance Capacity for Local Street

References: Federal Highway Administration, Hydraulic Engineering Circular No. 22, "Drainage of Highway Pavements", November 1996

Local Residential With Median (B-B) 10YR

Date: 09/11/06

Known Values:

Depth of Flow = 0.33 ft

Cross Slope = 0.02 ft/ft

Street Width (F/C to F/C) = 30 ft ← 15' F/C to F/C superelevated roadway

Manning's "n" Value= 0.015

Calculated Values:

Referenced Equations:

$Q = 0.56 * (S_x^{1.67}) * (S^{0.5}) * (T^{2.67}) / n$ for flow below crown (FHWA Procedure)

$Q = 1.486 * A * (R^{0.67}) * (S^{0.5}) / n$ for flow above crown (Manning's equation)

where Q = flow rate, cfs; T = width of flow, ft; S_x = cross slope, ft/ft; A = conveyance area, sq ft; S = longitudinal slope, ft/ft; R = hydraulic radius, ft

Longitudinal Slope ft/ft	*Conveyance Area sq ft*	*Velocity fps*	*Full Street Flow Capacity (1) cfs*	*1/2 Street Flow Without Overtopping, cfs (1)(2)*	*1/2 Street Flow with Overtopping, cfs (1)(3)*
0.0041	5.40	1.98	11	5	5
0.0046	5.40	2.10	11	5	6
0.0051	5.40	2.21	12	5	6
0.0056	5.40	2.32	13	6	6
0.0061	5.40	2.42	13	6	7
0.0066	5.40	2.51	14	6	7
0.0071	5.40	2.61	14	6	7
0.0076	5.40	2.70	15	7	7
0.0081	5.40	2.78	15	7	8
0.0086	5.40	2.87	15	7	8
0.0091	5.40	2.95	16	7	8
0.0096	5.40	3.03	16	7	8
0.0101	5.40	3.11	17	8	8
0.0106	5.40	3.19	17	8	9
0.0111	5.40	3.26	18	8	9
0.0116	5.40	3.33	18	8	9
0.0121	5.40	3.40	18	8	9
0.0126	5.40	3.47	19	8	9
0.0131	5.40	3.54	19	9	10
0.0148	5.40	3.76	20	9	10
0.0153	5.40	3.83	21	9	10
0.0253	5.40	4.92	27	12	13
0.0353	5.40	5.81	31	14	16
0.0453	5.40	6.59	36	16	18
0.0553	5.40	7.28	39	18	20
0.0653	5.40	7.91	43	19	21

Notes:

1.) Street flow capacity does not include local gutter depression effect.

2.) Half-street flow capacity is limited to the lower of the crown elevation or top of curb elevation.

3.) Includes flows above the crown elevation up to the specified flow depth elevation.

Street Capacity Computations

4" Roll Curb

Description: Calculation of Local Street Flow Conveyance Capacity for Local Street

References: Federal Highway Administration, Hydraulic Engineering Circular No. 22, "Drainage of Highway Pavements", November 1996

Local Residential Street With Median (B-B)

100 YR

Date: 09/11/06

Known Values:

Depth of Flow = 0.5 ft

Cross Slope = 0.02 ft/ft

Street Width (F/C to F/C) = 30 ft ← 15' F/C to F/C superelevated roadway

Manning's "n" Value= 0.015

Calculated Values:

Referenced Equations:

$Q = 0.56 * (S_x^{1.67}) * (S^{0.5}) * (T^{2.67}) / n$ for flow below crown (FHWA Procedure)

$Q = 1.486 * A * (R^{0.67}) * (S^{0.5}) / n$ for flow above crown (Manning's equation)

where Q = flow rate, cfs; T = width of flow, ft
S_x = cross slope, ft/ft; A = conveyance area, sq ft
S = longitudinal slope, ft/ft; R = hydraulic radius, ft

Longitudinal Slope ft/ft	*Conveyance Area sq ft*	*Velocity fps*	*Full Street Flow Capacity (1) cfs*	*1/2 Street Flow Without Overtopping, cfs (1)(2)*	*1/2 Street Flow with Overtopping, cfs (1)(3)*
0.0041	10.50	3.07	32	5	16
0.0046	10.50	3.25	34	5	17
0.0051	10.50	3.42	36	5	18
0.0056	10.50	3.59	38	6	19
0.0061	10.50	3.75	39	6	20
0.0066	10.50	3.90	41	6	20
0.0071	10.50	4.04	42	6	21
0.0076	10.50	4.18	44	7	22
0.0081	10.50	4.32	45	7	23
0.0086	10.50	4.45	47	7	23
0.0091	10.50	4.57	48	7	24
0.0096	10.50	4.70	49	7	25
0.0101	10.50	4.82	51	8	25
0.0106	10.50	4.94	52	8	26
0.0111	10.50	5.05	53	8	27
0.0116	10.50	5.17	54	8	27
0.0121	10.50	5.28	55	8	28
0.0126	10.50	5.38	57	8	28
0.0131	10.50	5.49	58	9	29
0.0148	10.50	5.83	61	9	31
0.0153	10.50	5.93	62	9	31
0.0253	10.50	7.63	80	12	40
0.0353	10.50	9.01	95	14	47
0.0453	10.50	10.21	107	16	54
0.0553	10.50	11.28	118	18	59
0.0653	10.50	12.25	129	19	64

Notes:
1.) Street flow capacity does not include local gutter depression effect.
2.) Half-street flow capacity is limited to the lower of the crown elevation or top of curb elevation.
3.) Includes flows above the crown elevation up to the specified flow depth elevation.

Street Capacity Computations

6" Vertical Curb

Description: Calculation of Local Street Flow Conveyance Capacity for Local Street

References: Federal Highway Administration, Hydraulic Engineering Circular No. 22, "Drainage of Highway Pavements", November 1996

Minor Collector Without Median (C-C) 10YR

Date: 09/11/06

Known Values:

Depth of Flow = 0.5 ft

Cross Slope = 0.02 ft/ft

Street Width (F/C to F/C) = 25 ft ← 25' F/C to F/C

Manning's "n" Value= 0.015

Calculated Values:

Referenced Equations:

$Q = 0.56 * (S_x^{1.67}) * (S^{0.5}) * (T^{2.67}) / n$ for flow below crown (FHWA Procedure)

$Q = 1.486 * A * (R^{0.67}) * (S^{0.5}) / n$ for flow above crown (Manning's equation)

where Q = flow rate, cfs; T = width of flow, ft; S_x = cross slope, ft/ft; A = conveyance area, sq ft; S = longitudinal slope, ft/ft; R = hydraulic radius, ft

Longitudinal Slope ft/ft	*Conveyance Area sq ft*	*Velocity fps*	*Full Street Flow Capacity (1) cfs*	*1/2 Street Flow Without Overtopping, cfs (1)(2)*	*1/2 Street Flow with Overtopping, cfs (1)(3)*
0.0041	9.38	3.20	30	3	15
0.0046	9.38	3.39	32	3	16
0.0051	9.38	3.57	33	3	17
0.0056	9.38	3.74	35	3	18
0.0061	9.38	3.91	37	4	18
0.0066	9.38	4.06	38	4	19
0.0071	9.38	4.21	40	4	20
0.0076	9.38	4.36	41	4	20
0.0081	9.38	4.50	42	4	21
0.0086	9.38	4.64	43	4	22
0.0091	9.38	4.77	45	4	22
0.0096	9.38	4.90	46	5	23
0.0101	9.38	5.03	47	5	24
0.0106	9.38	5.15	48	5	24
0.0111	9.38	5.27	49	5	25
0.0116	9.38	5.39	50	5	25
0.0121	9.38	5.50	52	5	26
0.0126	9.38	5.61	53	5	26
0.0131	9.38	5.72	54	5	27
0.0148	9.38	6.08	57	6	29
0.0153	9.38	6.19	58	6	29
0.0253	9.38	7.95	75	7	37
0.0353	9.38	9.40	88	9	44
0.0453	9.38	10.64	100	10	50
0.0553	9.38	11.76	110	11	55
0.0653	9.38	12.78	120	12	60

Notes:

1.) Street flow capacity does not include local gutter depression effect.

2.) Half-street flow capacity is limited to the lower of the crown elevation or top of curb elevation.

3.) Includes flows above the crown elevation up to the specified flow depth elevation.

Street Capacity Computations

6" Vertical Curb

Description:	Calculation of Local Street Flow Conveyance Capacity for Local Street
References:	Federal Highway Administration, Hydraulic Engineering Circular No. 22, "Drainage of Highway Pavements", November 1996
	Minor Collector Without Median (C-C) — 100 YR
Date:	09/11/06

Known Values:

Depth of Flow = 0.67 ft

Cross Slope = 0.02 ft/ft

Street Width (F/C to F/C) = 25 ft ← 25' F/C to F/C

Manning's "n" Value= 0.015

Calculated Values:

Referenced Equations:

$Q = 0.56 * (S_x^{1.67}) * (S^{0.5}) * (T^{2.67}) / n$ *for flow below crown (FHWA Procedure)*

$Q = 1.486 * A * (R^{0.67}) * (S^{0.5}) / n$ for flow above crown (Manning's equation)

where Q = flow rate, cfs; T = width of flow, ft

S_x = cross slope, ft/ft; A = conveyance area, sq ft

S = longitudinal slope, ft/ft; R = hydraulic radius, ft

Longitudinal Slope ft/ft	Conveyance Area sq ft	Velocity fps	Full Street Flow Capacity[1] cfs	1/2 Street Flow Without Overtopping, cfs[1][2]	1/2 Street Flow with Overtopping, cfs[1][3]
0.0041	13.63	4.08	56	3	28
0.0046	13.63	4.32	59	3	29
0.0051	13.63	4.55	62	3	31
0.0056	13.63	4.77	65	3	32
0.0061	13.63	4.97	68	4	34
0.0066	13.63	5.17	70	4	35
0.0071	13.63	5.37	73	4	37
0.0076	13.63	5.55	76	4	38
0.0081	13.63	5.73	78	4	39
0.0086	13.63	5.91	80	4	40
0.0091	13.63	6.08	83	4	41
0.0096	13.63	6.24	85	5	43
0.0101	13.63	6.40	87	5	44
0.0106	13.63	6.56	89	5	45
0.0111	13.63	6.71	91	5	46
0.0116	13.63	6.86	93	5	47
0.0121	13.63	7.01	95	5	48
0.0126	13.63	7.15	97	5	49
0.0131	13.63	7.29	99	5	50
0.0148	13.63	7.75	106	6	53
0.0153	13.63	7.88	107	6	54
0.0253	13.63	10.13	138	7	69
0.0353	13.63	11.97	163	9	82
0.0453	13.63	13.56	185	10	92
0.0553	13.63	14.98	204	11	102
0.0653	13.63	16.28	222	12	111

Notes:

1.) Street flow capacity does not include local gutter depression effect.

2.) Half-street flow capacity is limited to the lower of the crown elevation or top of curb elevation.

3.) Includes flows above the crown elevation up to the specified flow depth elevation.

Street Capacity Computations

6" Vertical Curb

Description: Calculation of Local Street Flow Conveyance Capacity for Local Street

References: Federal Highway Administration, Hydraulic Engineering Circular No. 22, "Drainage of Highway Pavements", November 1996

Minor Collector With Median (D-D) 10YR

Date: 09/11/06

Known Values:

Depth of Flow = 0.5 ft

Cross Slope = 0.02 ft/ft

Street Width (F/C to F/C) = 32 ft ← 16' F/C to F/C superelevated roadway

Manning's "n" Value= 0.015

Calculated Values:

Referenced Equations:

$Q = 0.56 * (S_x^{1.67}) * (S^{0.5}) * (T^{2.67}) / n$ for flow below crown (FHWA Procedure)

$Q = 1.486 * A * (R^{0.67}) * (S^{0.5}) / n$ for flow above crown (Manning's equation)

where Q = flow rate, cfs; T = width of flow, ft

S_x = cross slope, ft/ft; A = conveyance area, sq ft

S = longitudinal slope, ft/ft; R = hydraulic radius, ft

Longitudinal Slope ft/ft	Conveyance Area sq ft	Velocity fps	Full Street Flow Capacity (1) cfs	1/2 Street Flow Without Overtopping, cfs (1)(2)	1/2 Street Flow with Overtopping, cfs (1)(3)
0.0041	10.88	3.02	33	6	16
0.0046	10.88	3.19	35	6	17
0.0051	10.88	3.36	37	6	18
0.0056	10.88	3.52	38	7	19
0.0061	10.88	3.68	40	7	20
0.0066	10.88	3.83	42	7	21
0.0071	10.88	3.97	43	8	22
0.0076	10.88	4.11	45	8	22
0.0081	10.88	4.24	46	8	23
0.0086	10.88	4.37	48	8	24
0.0091	10.88	4.49	49	8	24
0.0096	10.88	4.61	50	9	25
0.0101	10.88	4.73	51	9	26
0.0106	10.88	4.85	53	9	26
0.0111	10.88	4.96	54	9	27
0.0116	10.88	5.07	55	10	28
0.0121	10.88	5.18	56	10	28
0.0126	10.88	5.29	58	10	29
0.0131	10.88	5.39	59	10	29
0.0148	10.88	5.73	62	11	31
0.0153	10.88	5.83	63	11	32
0.0253	10.88	7.49	82	14	41
0.0353	10.88	8.85	96	17	48
0.0453	10.88	10.02	109	19	55
0.0553	10.88	11.08	121	21	60
0.0653	10.88	12.04	131	23	65

Notes:

1.) Street flow capacity does not include local gutter depression effect.

2.) Half-street flow capacity is limited to the lower of the crown elevation or top of curb elevation.

3.) Includes flows above the crown elevation up to the specified flow depth elevation.

Street Capacity Computations

6" Vertical Curb

Description: Calculation of Local Street Flow Conveyance Capacity for Local Street

References: Federal Highway Administration, Hydraulic Engineering Circular No. 22, "Drainage of Highway Pavements", November 1996

Minor Collector With Median (D-D)

100 YR

Date: 09/11/06

Known Values:

Depth of Flow = 0.67 ft

Cross Slope = 0.02 ft/ft

Street Width (F/C to F/C) = 32 ft ← 16' F/C to F/C superelevated roadway

Manning's "n" Value= 0.015

Calculated Values:

Referenced Equations:

$Q = 0.56 * (S_x^{1.67}) * (S^{0.5}) * (T^{2.67}) / n$ for flow below crown (FHWA Procedure)

$Q = 1.486 * A * (R^{0.67}) * (S^{0.5}) / n$ for flow above crown (Manning's equation)

where Q = flow rate, cfs; T = width of flow, ft
S_x = cross slope, ft/ft; A = conveyance area, sq ft
S = longitudinal slope, ft/ft; R = hydraulic radius, ft

Longitudinal Slope ft/ft	*Conveyance Area sq ft*	*Velocity fps*	*Full Street Flow Capacity (1) cfs*	*1/2 Street Flow Without Overtopping, cfs (1)(2)*	*1/2 Street Flow with Overtopping, cfs (1)(3)*
0.0041	16.32	3.93	64	6	32
0.0046	16.32	4.16	68	6	34
0.0051	16.32	4.38	72	6	36
0.0056	16.32	4.59	75	7	37
0.0061	16.32	4.79	78	7	39
0.0066	16.32	4.99	81	7	41
0.0071	16.32	5.17	84	8	42
0.0076	16.32	5.35	87	8	44
0.0081	16.32	5.52	90	8	45
0.0086	16.32	5.69	93	8	46
0.0091	16.32	5.86	96	8	48
0.0096	16.32	6.01	98	9	49
0.0101	16.32	6.17	101	9	50
0.0106	16.32	6.32	103	9	52
0.0111	16.32	6.47	106	9	53
0.0116	16.32	6.61	108	10	54
0.0121	16.32	6.75	110	10	55
0.0126	16.32	6.89	112	10	56
0.0131	16.32	7.02	115	10	57
0.0148	16.32	7.47	122	11	61
0.0153	16.32	7.59	124	11	62
0.0253	16.32	9.76	159	14	80
0.0353	16.32	11.53	188	17	94
0.0453	16.32	13.06	213	19	107
0.0553	16.32	14.43	236	21	118
0.0653	16.32	15.68	256	23	128

Notes:

1.) Street flow capacity does not include local gutter depression effect.

2.) Half-street flow capacity is limited to the lower of the crown elevation or top of curb elevation.

3.) Includes flows above the crown elevation up to the specified flow depth elevation.

Depressed Curb Opening Calculations

Project: *Sereno Canyon Phase 1* Project Number: *062654*
Location: *City of Scottsdale* Project Engineer: *Geoff Brownell, P.E*
Date: *08-Sep-06*
References: *Drainage Design Manual for Maricopa County, Volume II-Hydraulics*
City of Scottsdale Design Standards and Policies Manual, Sep 2006

DEPRESSED CURB OPENING CALCULATIONS

Equation 3.10 in Volume II, Hydraulics

Q(cfs)= $CLh^{3/2}$
C= 2.80
h (ft)= 0.67 (4" roll curb, 100-yr. design)

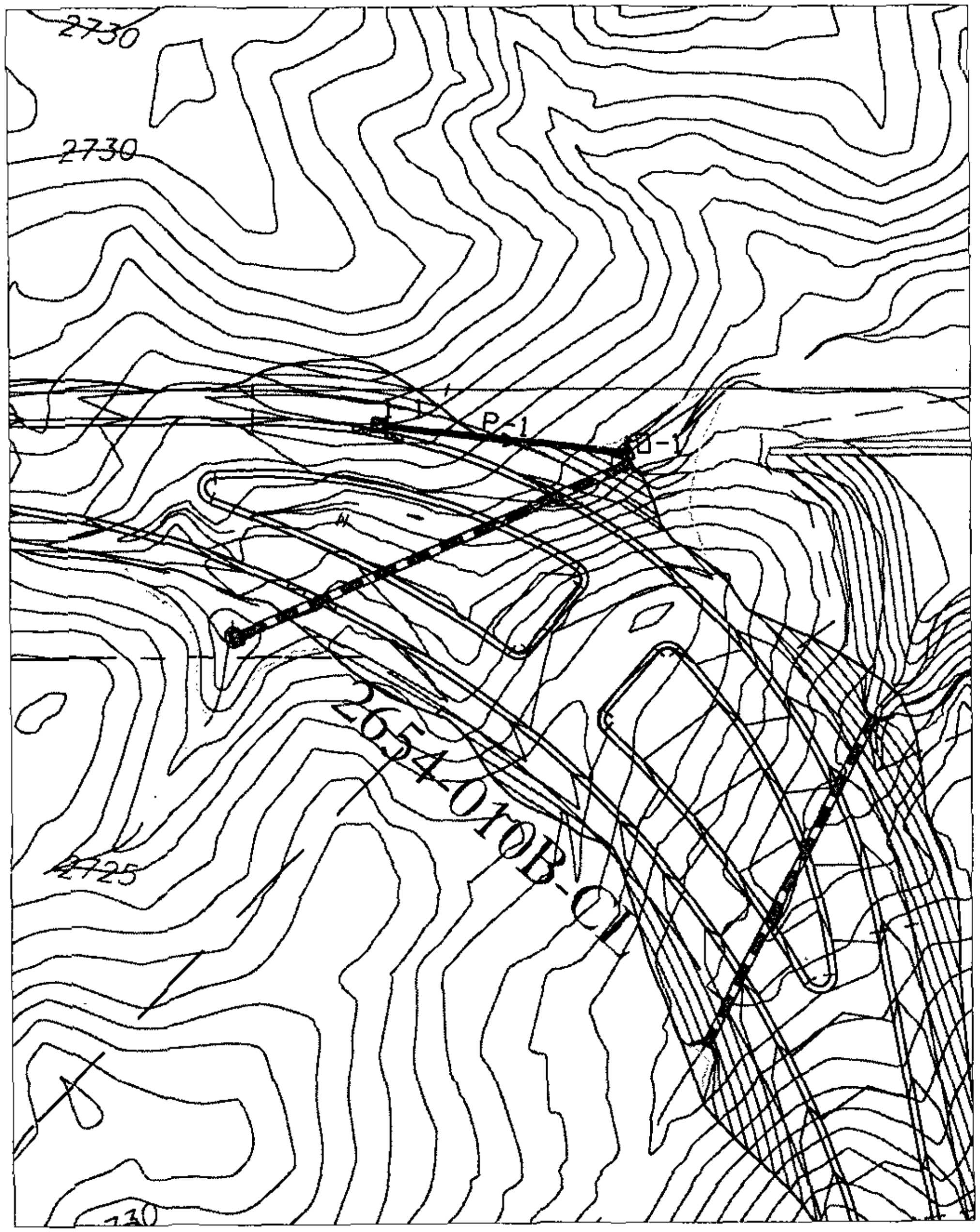
		FULL STREET		HALF STREET	
Depressed Curb Location (Concentration Point)	**Curb Type**	**Q_{100} Full Street (cfs)**	**Required depressed curb length(1) (ft)**	**Q_{100} Half Street (cfs)**	**Required depressed curb length(1) (ft)**
S2	4 in roll	3.0	2.5	na	na
S3	4 in roll	3.0	2.5	1.5	1.2
S4	4 in roll	2.0	1.6	1.0	0.8
S5	4 in roll	na		6.0	4.9
S6	4 in roll	na		4.0	3.3
S8	4 in roll	1.0	0.8	na	
S9	4 in roll	1.0	0.8	0.5	0.4
S10	4 in roll	4.0	3.3	2.0	1.6
S11	4 in roll	3.0	2.5	1.5	1.2
S12	4 in roll	2.0	1.6	1.0	0.8
S13	4 in roll	na		3.0	2.5
S14	4 in roll	5.0	4.1	na	
S15	4 in roll	na		3.0	2.5
S16	4 in roll	1.0	0.8	0.5	0.4
S17	4 in roll	na		2.0	1.6
S18	4 in roll	na		2.0	1.6
S21	4 in roll	na		3.0	2.5
S22	4 in roll	na		2.0	1.6
S23	4 in roll	3.0	2.5	1.5	1.2
S24	4 in roll	2.0	1.6	1.0	0.8
S25	4 in roll	1.0	0.8	0.5	0.4
S26	4 in roll	5.0	4.1	2.5	2.1
S27	4 in roll	3.0	2.5	1.5	1.2

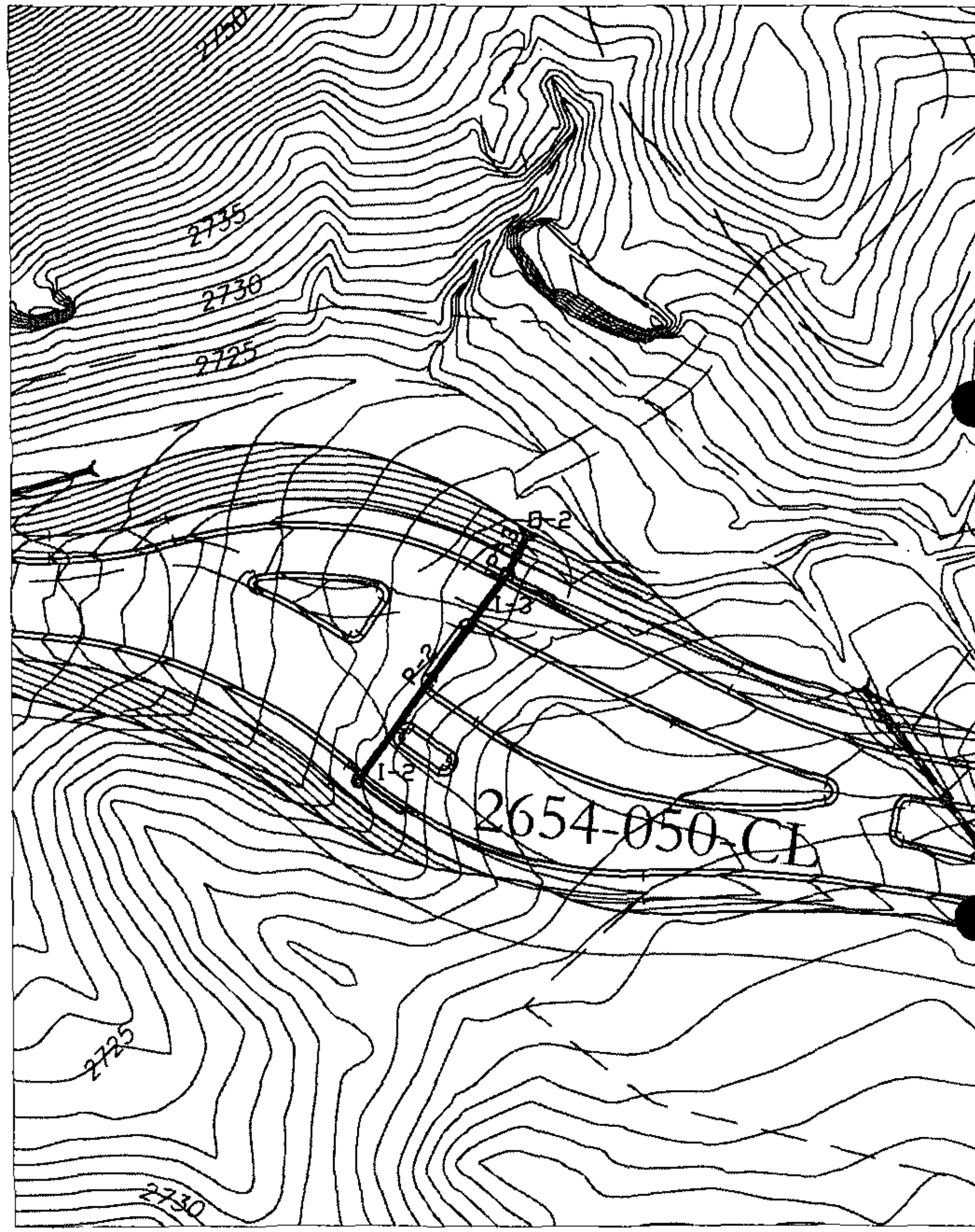
Notes

(1) Depressed curb design includes a 20% clogging factor.

na - Not Applicable

StormCAD Results





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STORM DRAIN PLAN VIEW
SERENO CANYON - PHASE 1

SCOTTSDALE, ARIZONA

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09/07/06

Scenario: 100-yr

Combined Pipe\Node Report

Label	Upstream Node	Downstream Node	Length (ft)	Section Size	Mannings n	Full Capacity (cfs)	Average Velocity (ft/s)	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	Constructed Slope (ft/ft)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)	Total System Flow (cfs)
P-1	I-1	O-1	71.00	18 inch	0.013	15.27	6.71	2,717.80	2,716.30	0.021127	2,718.46	2,716.75	3.00
P-2	I-2	I-3	91.01	24 inch	0.013	23.71	6.48	2,727.00	2,726.00	0.010988	2,727.91	2,727.75	6.66
P-3	I-3	O-2	15.69	24 inch	0.013	54.18	14.13	2,725.90	2,725.00	0.057361	2,727.19	2,725.84	12.85

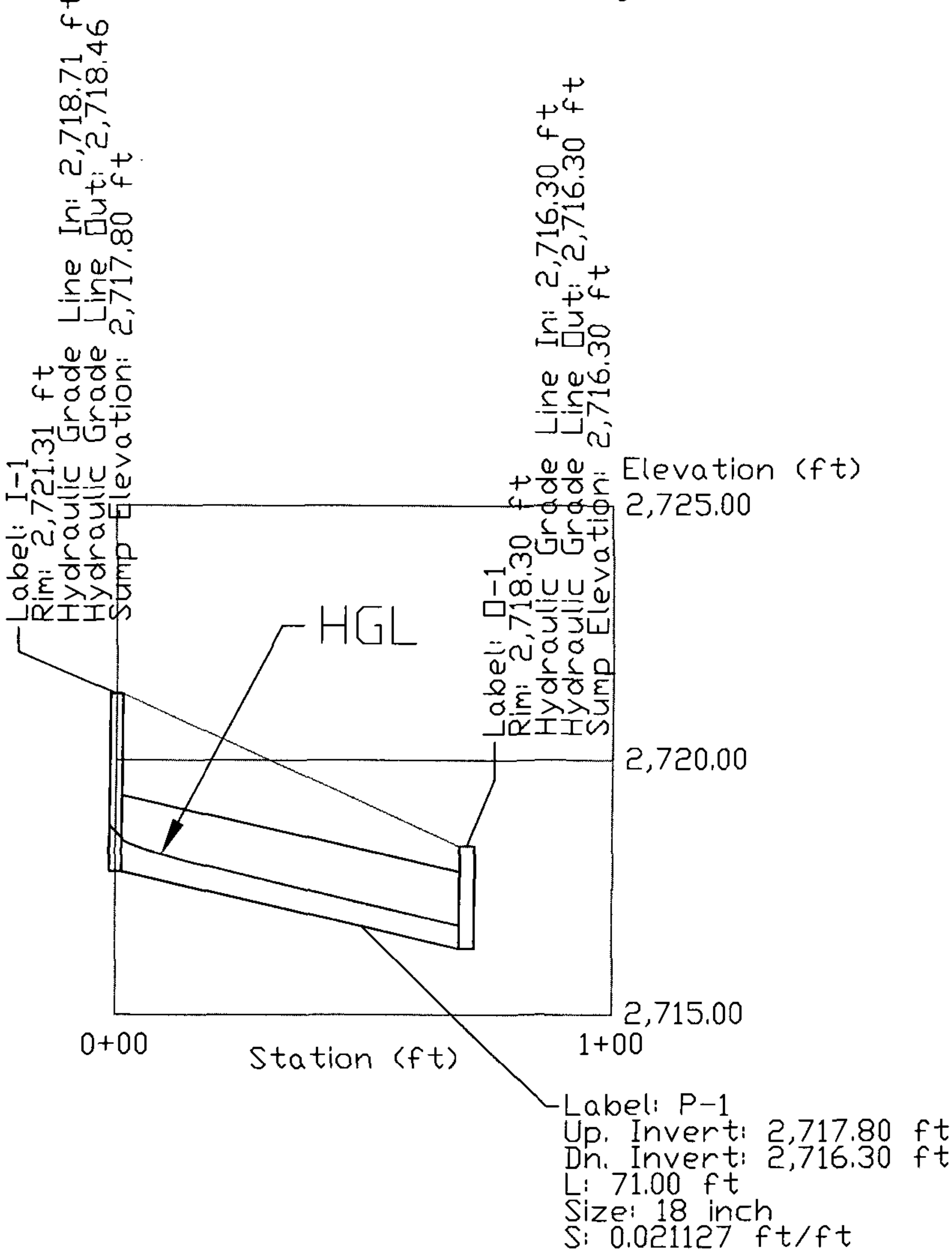
Scenario: 100-yr

Inlet Report

Label	Rim Elevation (ft)	Inlet	Inlet Location	Additional Carryover (cfs)	Total System Flow (cfs)	Capture Efficiency (%)	Bypassed Additional Flow (cfs)	Curb Opening Length (ft)	Gutter Cross Slope (ft/ft)	Gutter Width (ft)	Mannings n	Road Cross Slope (ft/ft)	Total Flow (cfs)	Total Intercepted Flow (cfs)	Gutter Ditch Depth (ft)	Gutter Ditch Spread (ft)	Hydraulic Grade Line In (ft)
I-1	2,721.31	Curb MAG 533, M1 (30 Sump	In Sag	3.00	3.00	100.0	0.00	2.40	0.058	1.42		0.020	3.00	3.00	0.46	20.53	2,718.71
I-3	2,730.32	Curb MAG 533, M1 (30 Sump	On Grade	7.00	12.85	88.5	0.80	16.00	0.058	1.42	0.012	0.020	12.85	6.20	0.34	14.15	2,727.75
I-2	2,730.47	Curb MAG 533, M1 (30 Sump	On Grade	8.00	6.66	83.2	1.34	16.00	0.058	1.42	0.012	0.020	6.66	6.66	0.34	14.52	2,728.27

Profile: I1 - O1

Scenario: 100-yr



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STORM DRAIN PROFILES
SERENO CANYON - PHASE 1
SCOTTSDALE, ARIZONA

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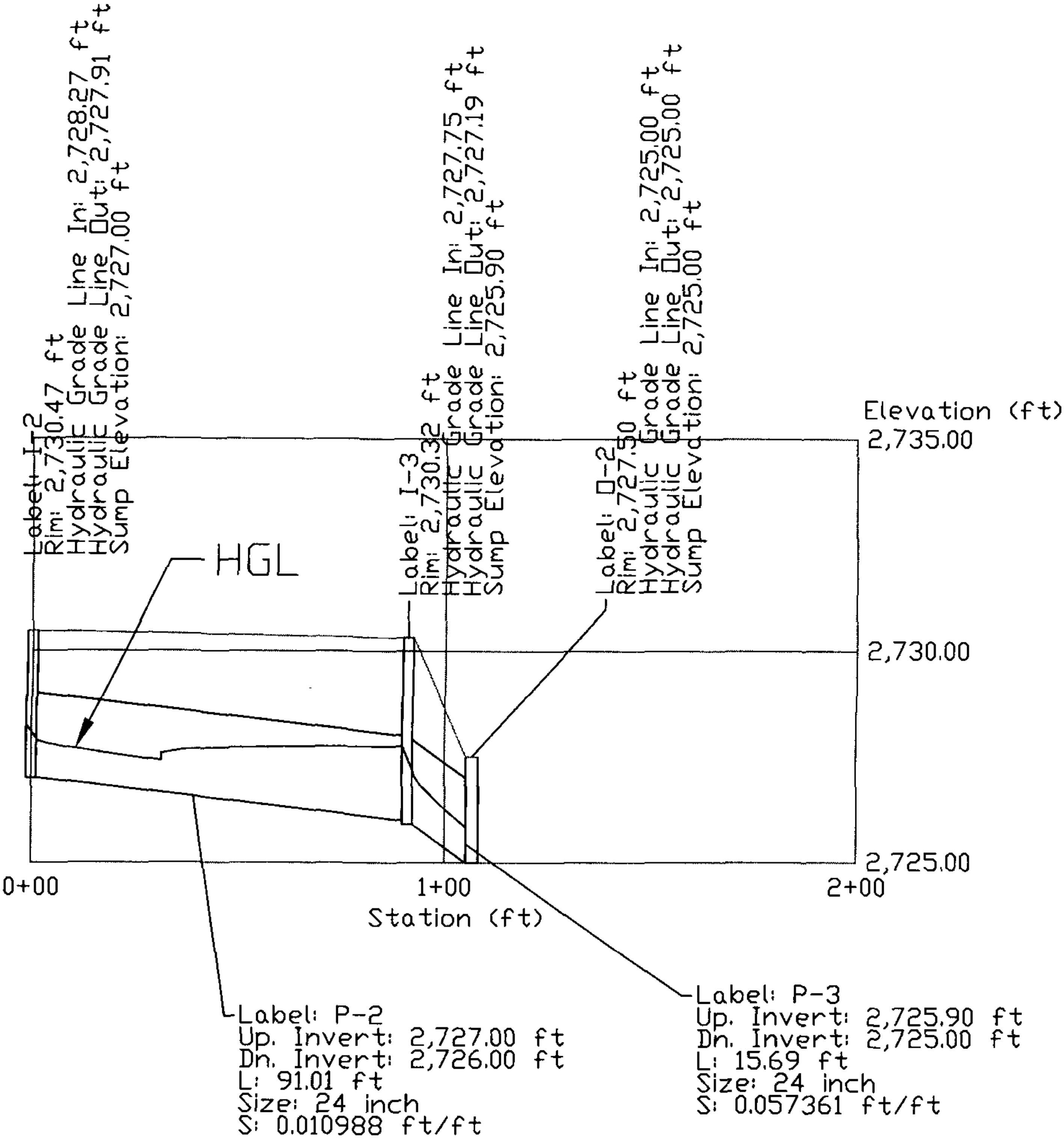
Profile: I2 - O2

Scenario: 100-yr



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SERENO CANYON - PHASE 1

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09/07/06

Scour Anaylsis

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: **Sereno Canyon Offsite Utility** **Location:** Offsite SWR Acess O1.1

Input Data:

Q100 = 58 cfs

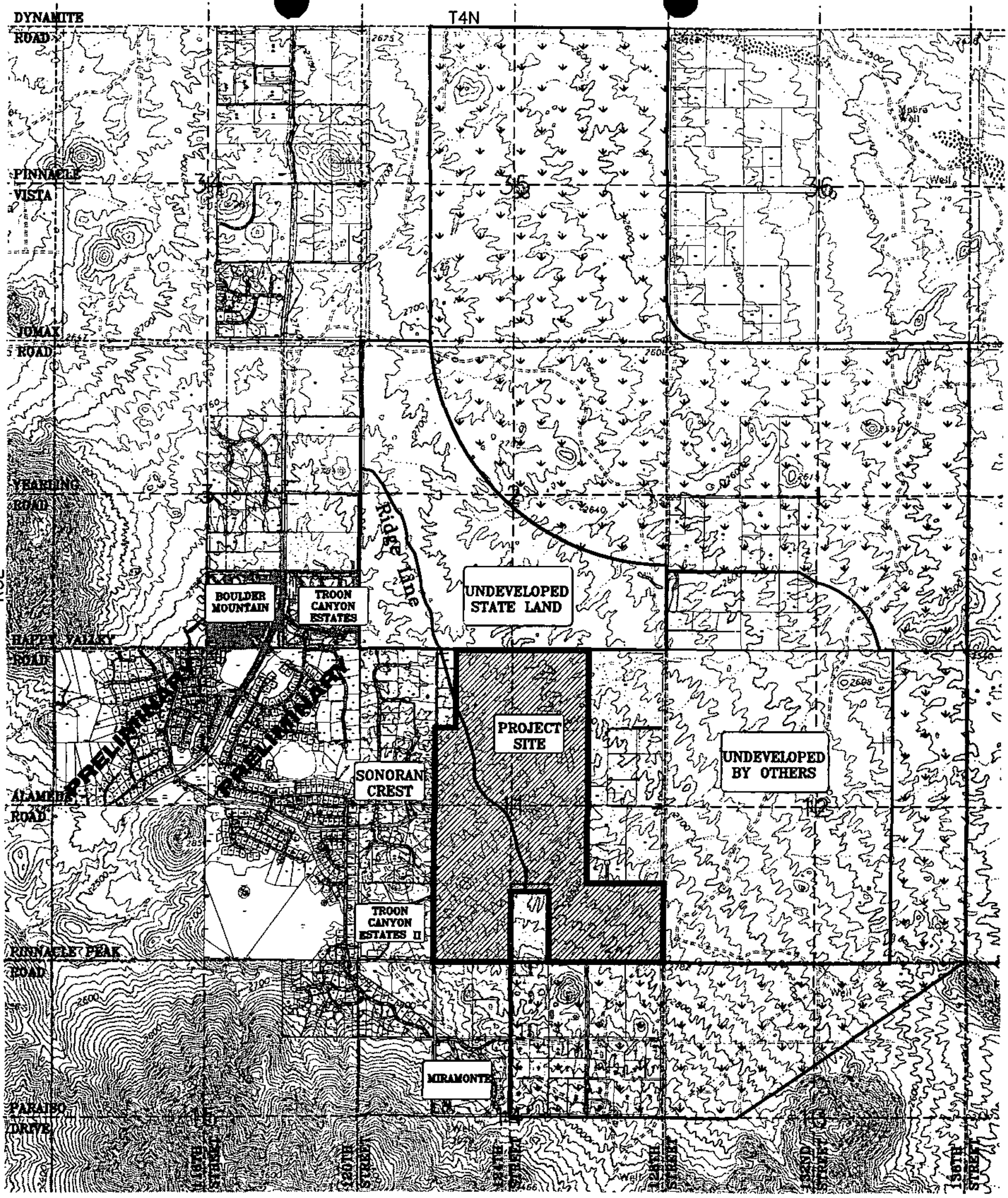
Ds =	1.03 ft	for straight channel
Ds =	1.34 ft	otherwise

Recommended Scour Depth : 3 ft

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

PLATE 1

Vicinity Map



LEGEND

- Project Boundry
- Existing 5 Foot Contours
- Project Site
- McDowell Sonoran Preserve

2500 0 1250 2500

1 inch = 2500 ft.

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Plate 1
"Vicinity Map"

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PLATE 2

Phasing Map

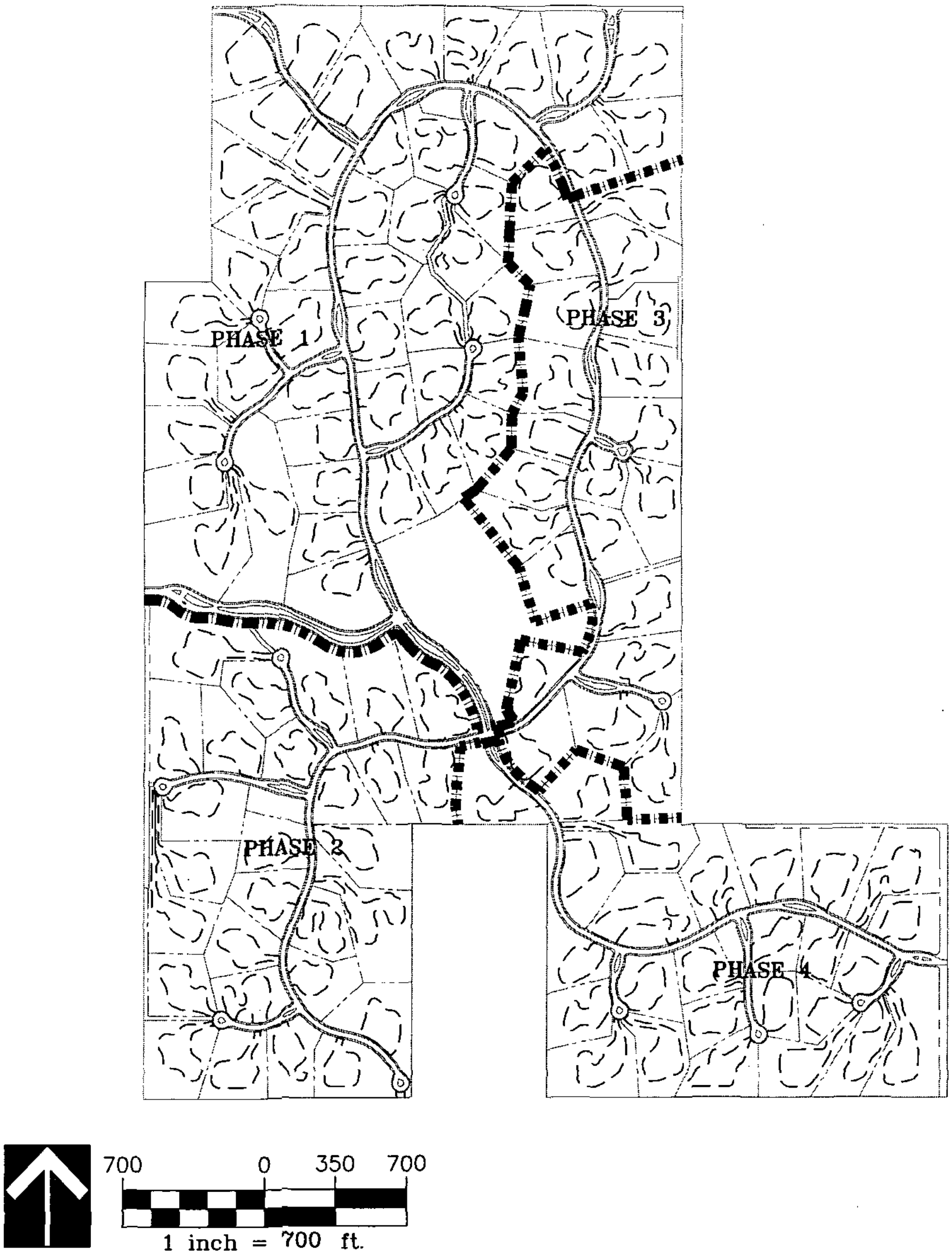

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Plate 2

"Phasing Map"

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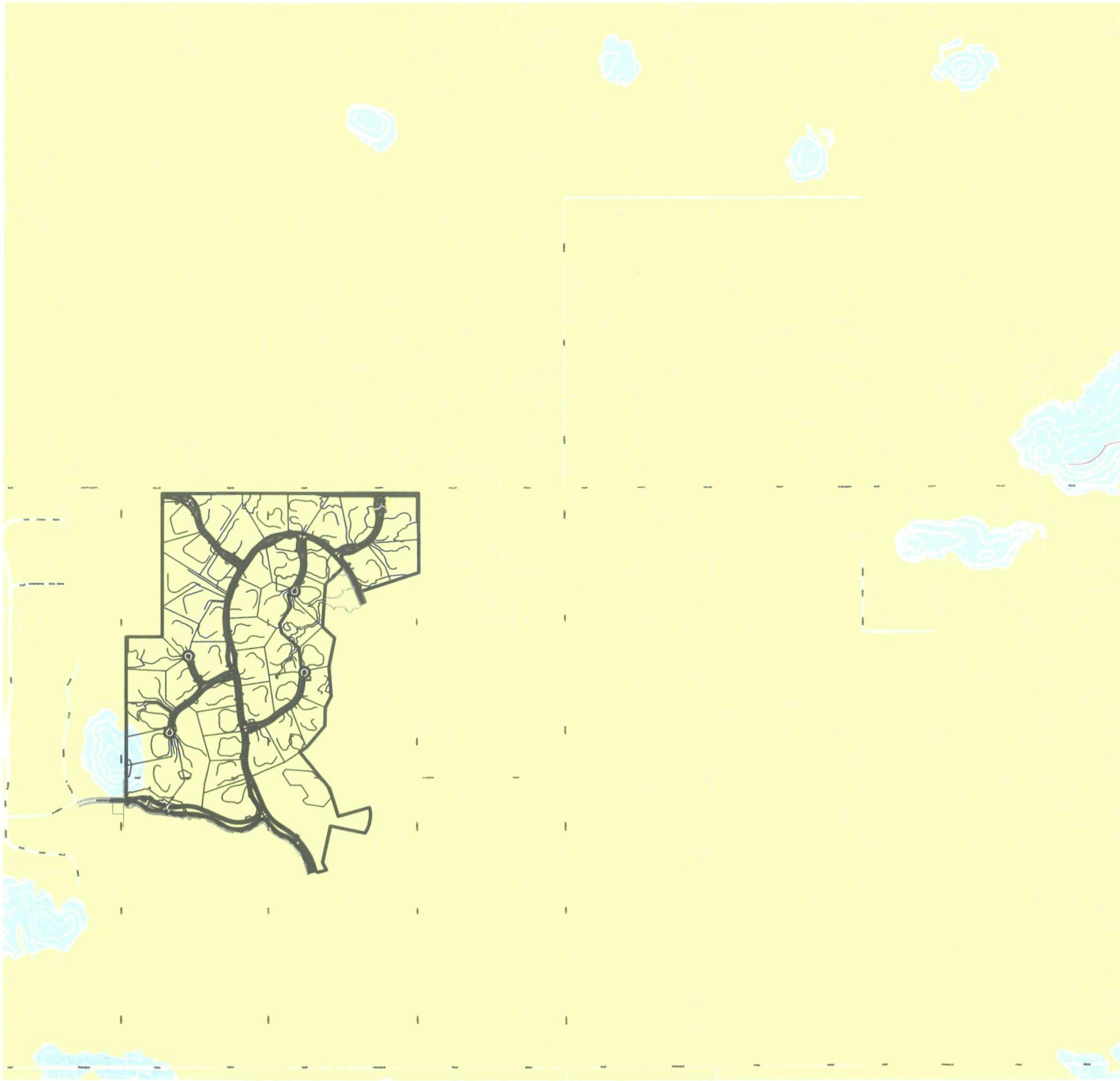
PLATE 3

ESL Classification



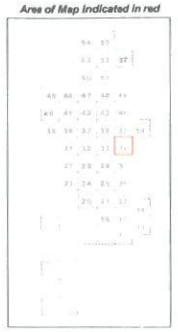
ESL Landforms and Protected Peaks and Ridges

City Limits
Section Boundary
Streets

Landforms
Lower Desert
Upper Desert
Hillside

Elevation
50' Contour
20' Contour

Protected Peaks and Ridges
Peak or Ridge Line



Official Detail Map
Map 34

Data Source: City of Scottsdale

0 400 800 1200 1600
Scale In Feet

Map Produced By:
City of Scottsdale
Planning Systems/
Geographic Information Systems

Adopted: December 11, 2001
Per Resolution Number 5868
Ordinance Number 3395
Effective Date: January 31, 2002

1000 0 500 1000
Horz. 1 in. = 1000 ft.

PLATE 3
ESL CLASSIFICATION

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PLATE 4

Soils Classification Map

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PHASE I

Plate 4

"Soils Classification"

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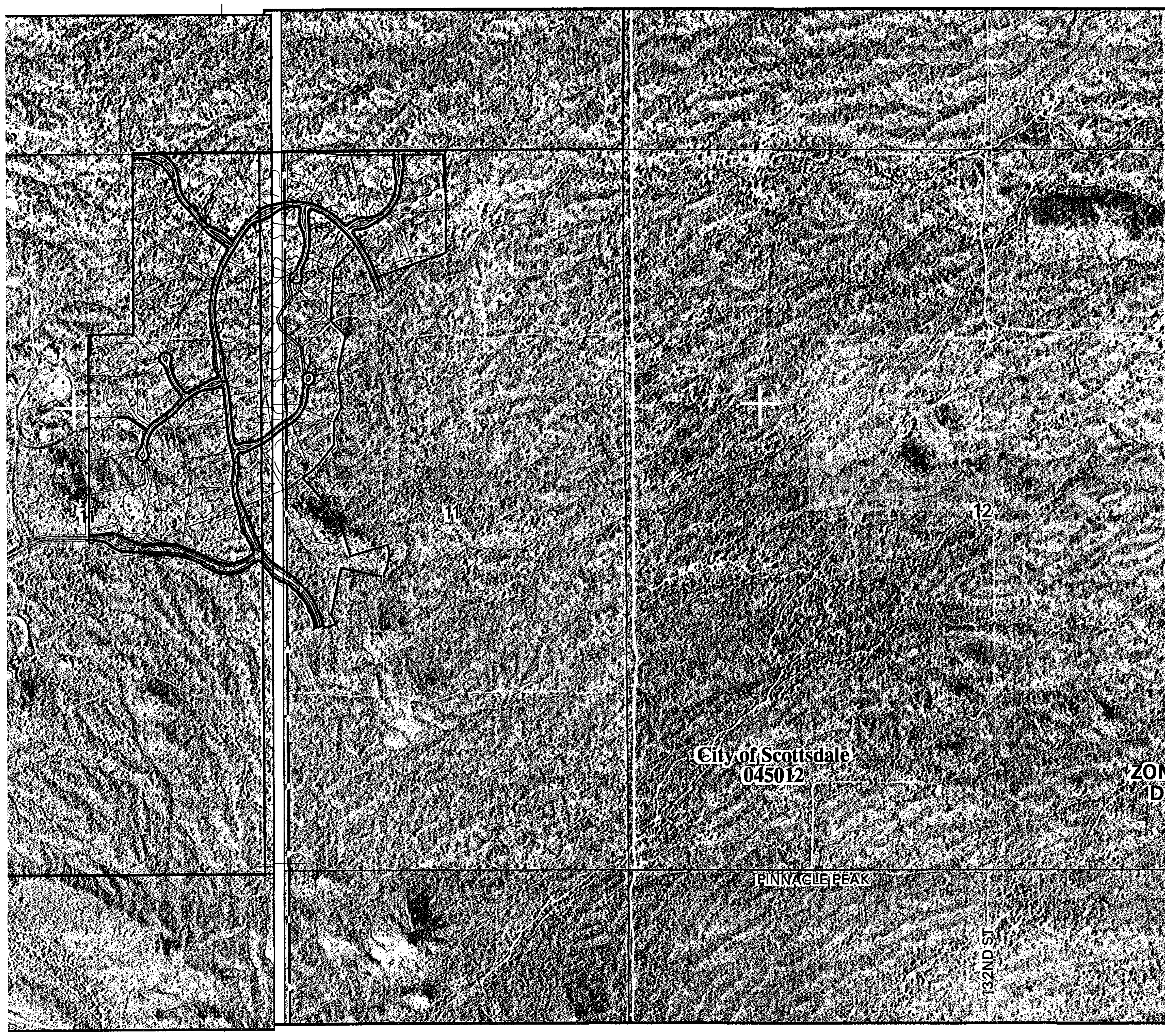
PLATE 5

Flood Insurance Rate Map (FIRM)



MAP SCALE 1" = 1000'

0 1000 2000 FEET

0 300 600 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1260F

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

PANEL 1260 OF 4350

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
MARICOPA COUNTY	040037	1260	F
SCOTTSDALE, CITY OF	045012	1260	F

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

MAP NUMBER
04013C1260F

MAP REVISED
SEPTEMBER 30, 2005

Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

MAP SCALE 1" = 1000'

0 1000 2000 FEET

0 300 600 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1255G

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

PANEL 1255 OF 4350

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
SCOTTSDALE, CITY OF	045012	1255	G

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

MAP NUMBER
04013C1255G

MAP REVISED
SEPTEMBER 30, 2005

Federal Emergency Management Agency

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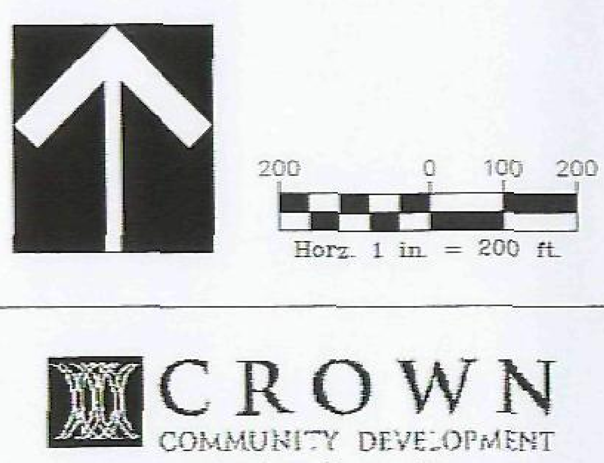
PLATE 6

Color Topographic Aerial Photograph



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SERENO CANYON
PHASE I
Plate 6
"Topographic Aerial"

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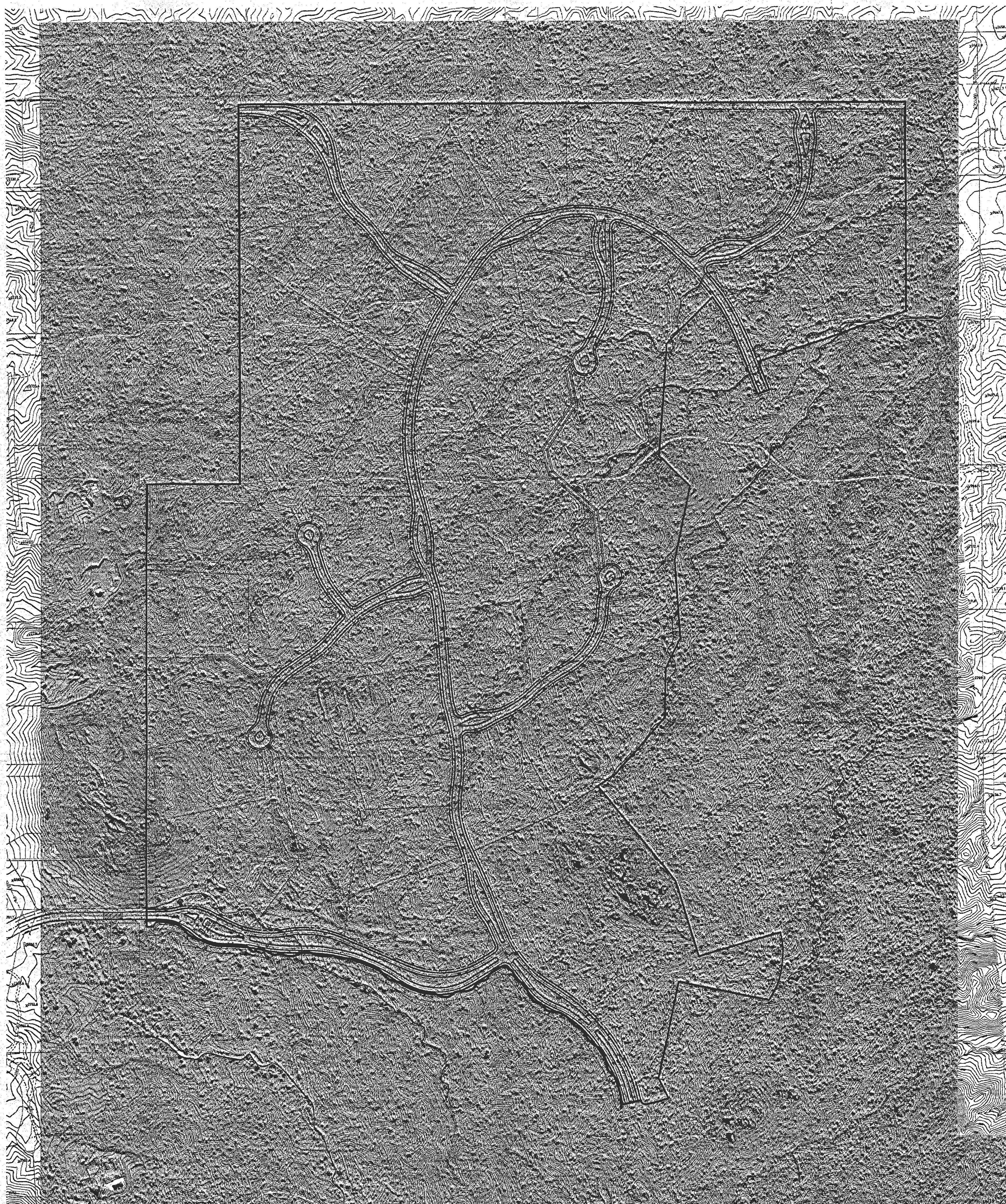
PLATE 7

Off-Site Watershed Area Map

PLATE 8

Section 404 Washes



LEGEND

PRELIMINARY SECTION 404 JURISDICTIONAL DELINEATION. A REQUEST FOR VERIFICATION HAS BEEN SUBMITTED TO THE A.C.O.E. FOR REVIEW AND APPROVAL.

200 0 100 200
1 inch = 200 ft.

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PHASE I
Plate 8
"404 Washes"

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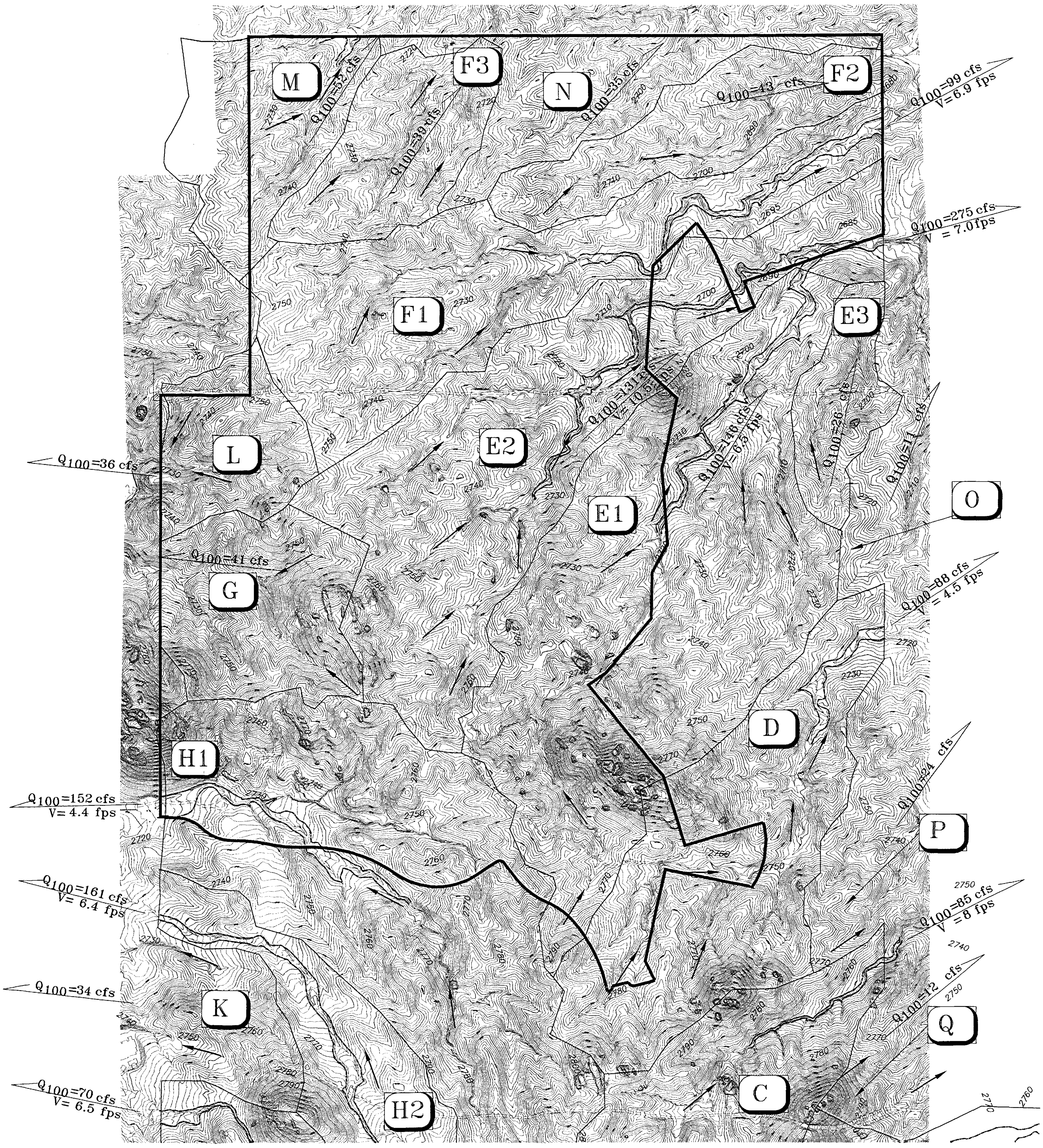
PLATE 9

Pre-Development Drainage Site Plan



LEGEND

H2 HEC-1 SUB-BASIN ID AND CONCENTRATION POINT

PROJECT BOUNDARY

SUB-BASIN BOUNDARY

2790 EXISTING 1 FOOT CONTOURS LABEL

FLOWLINE

FLOW ARROW

FLOODPLAIN BOUNDARY

Q100=41 cfs V=5 fps PRE-DEVELOPMENT PEAK FLOW AND CORRESPONDING VELOCITY

200 0 100 200

1 inch = 200 ft.

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PHASE I

Plate 9

"Pre-Development Drainage Site Plan"

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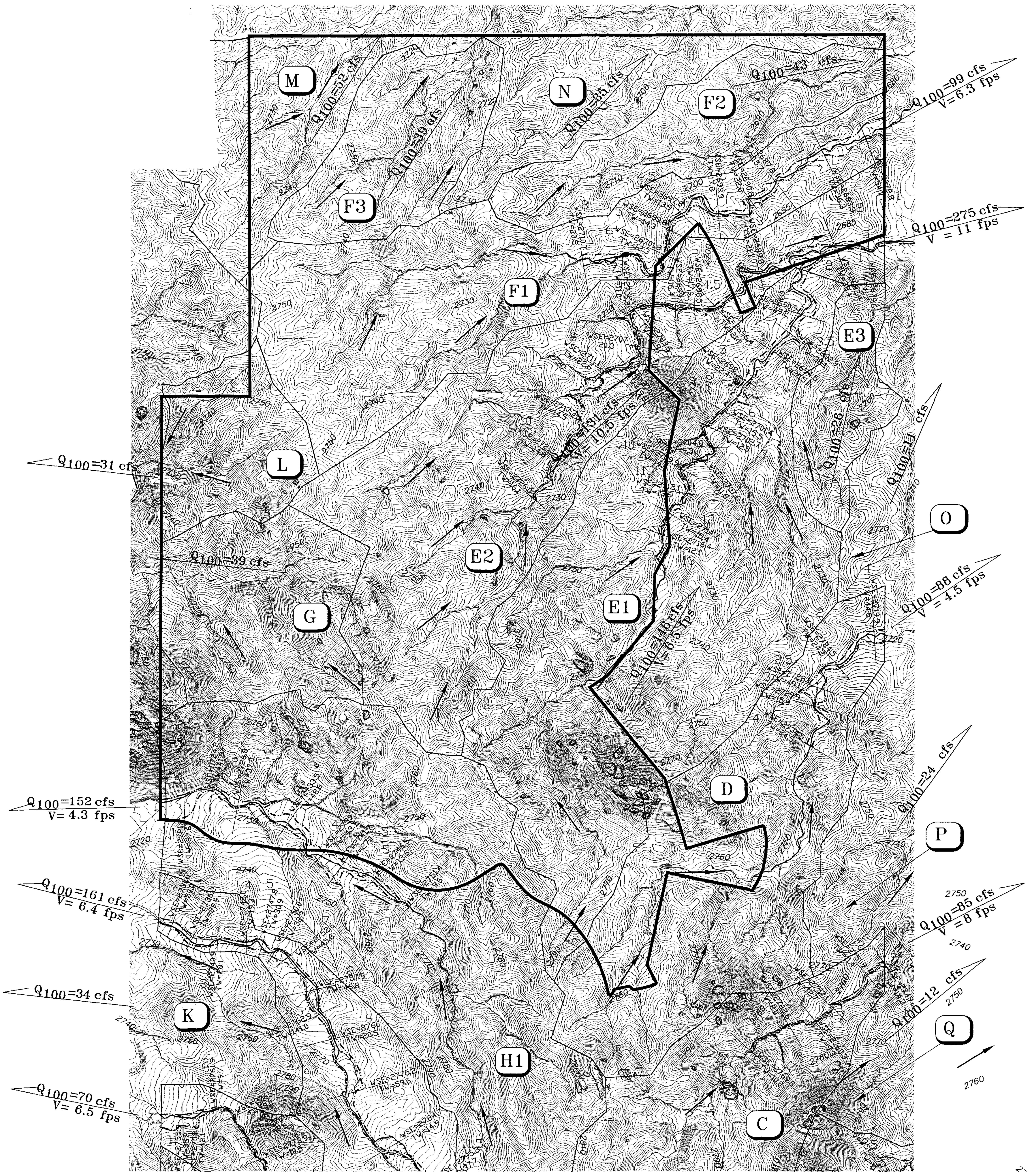
PLATE 10

Pre-Development Grading and Drainage Plan



LEGEND

H2	HEC-1 SUB-BASIN ID AND CONCENTRATION POINT		PROJECT BOUNDARY
	SUB-BASIN BOUNDARY	2790	EXISTING 1 FOOT CONTOUR LABEL
	FLOWLINE		FLOW ARROW
	FLOODPLAIN BOUNDARY		
	404 WASH	3 WSE=2762.70 TW=61.10	HEC-RAS CROSS SECTION WITH RIVER STATION, WATER SURFACE ELEVATION AND TOP WIDTH
Q_{100}=41 cfs V= 5 fps	PRE-DEVELOPMENT PEAK FLOW AND CORRESPONDING VELOCITY		

200 0 100 200
1 in. = 200 ft.

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PHASE I

Plate 10

"Pre-Development Grading and Drainage Site Plan"

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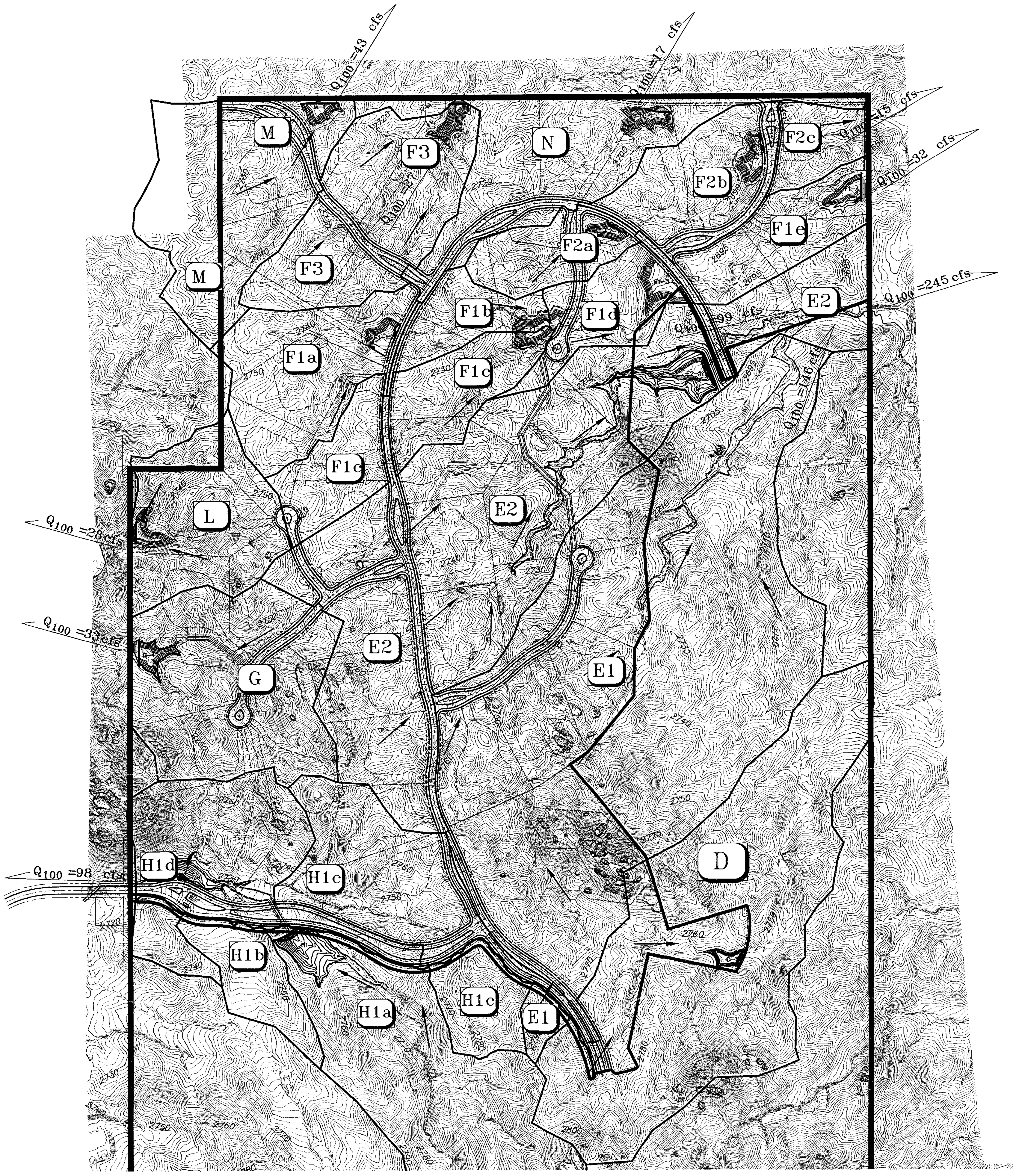
PLATE 11

Post-Development Drainage Site Plan



1 inch = 200 ft.

LEGEND

H2	HEC-1 SUB-BASIN ID AND CONCENTRATION POINT
	SUB-BASIN BOUNDARY
	FLOWLINE
	FLOODPLAIN BOUNDARY
Q_{100}=41 cfs	POST-DEVELOPMENT PEAK FLOW
	PROJECT BOUNDARY
2790	EXISTING 1 FOOT CONTOURS LABEL
	FLOW ARROW
	DETENTION BASIN

CROWN COMMUNITY DEVELOPMENT
A Henry Crown Company

SERENO CANYON

PHASE I

Plate II

"Post-Development Drainage Site Plan"

WOOD/PATEL

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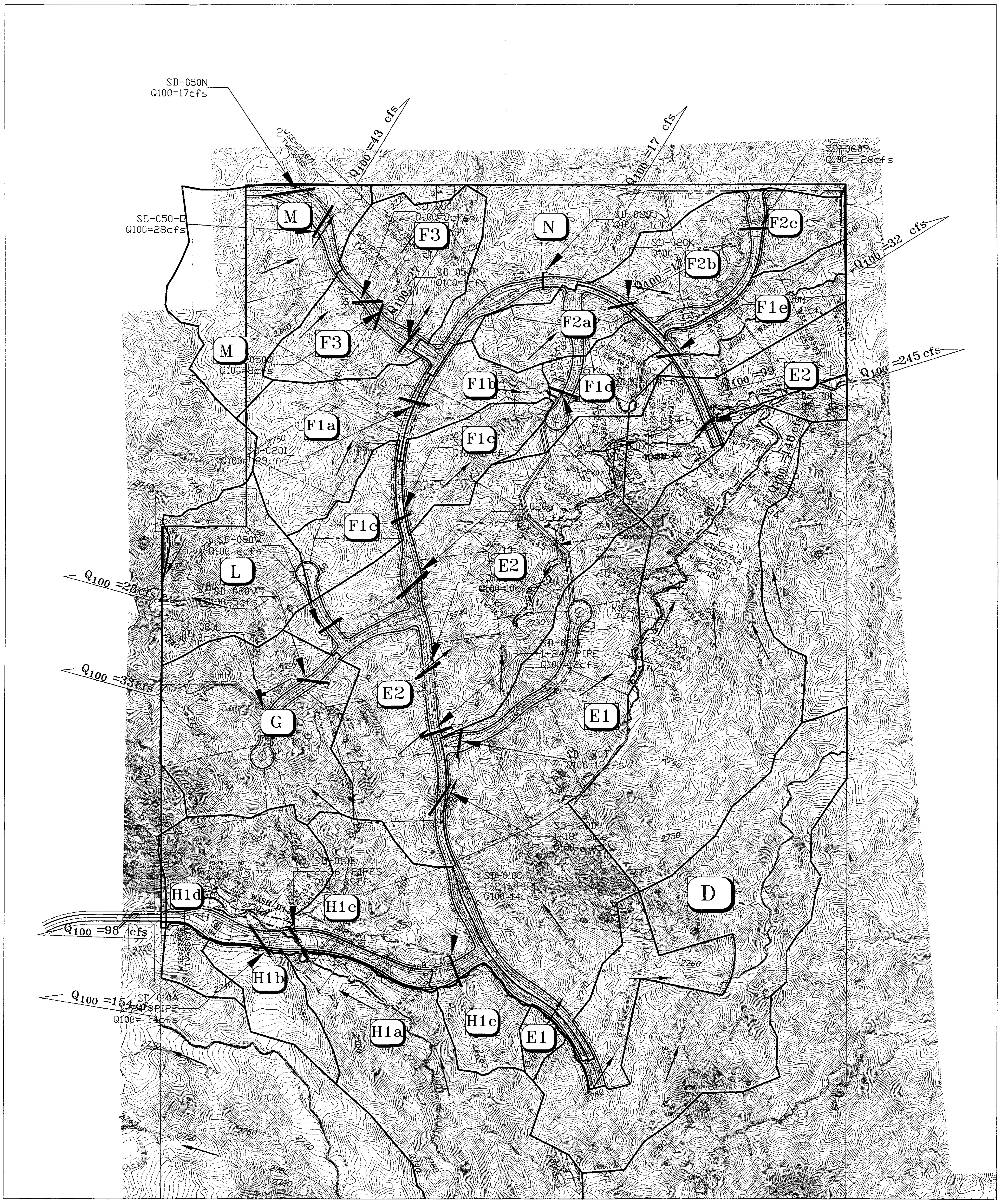
PLATE 12

Post-Development Grading and Drainage Plan



LEGEND

H2	HEC-1 SUB-BASIN ID AND CONCENTRATION POINT		PROJECT BOUNDARY
	SUB-BASIN BOUNDARY	2790	EXISTING 1 FOOT CONTOUR LABEL
	FLOWLINE		FLOW ARROW
	FLOODPLAIN BOUNDARY		
	404 WASH	3 WSE=2762.70 TW=61.10	HEC-RAS CROSS SECTION WITH RIVER STATION, WATER SURFACE ELEVATION AND TOP WIDTH
Q_{100}=41 cfs	POST-DEVELOPMENT PEAK FLOW		
	PROPOSED STORM DRAIN LOCATION		PHASE 1 BOUNDARY

200 0 100 200
1 in. = 200 ft.

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COMMUNITY DEVELOPMENT
A Henry Crown Company

SERENO CANYON
PHASE I
Plate 12
"Post-Development Grading and Drainage Site Plan"

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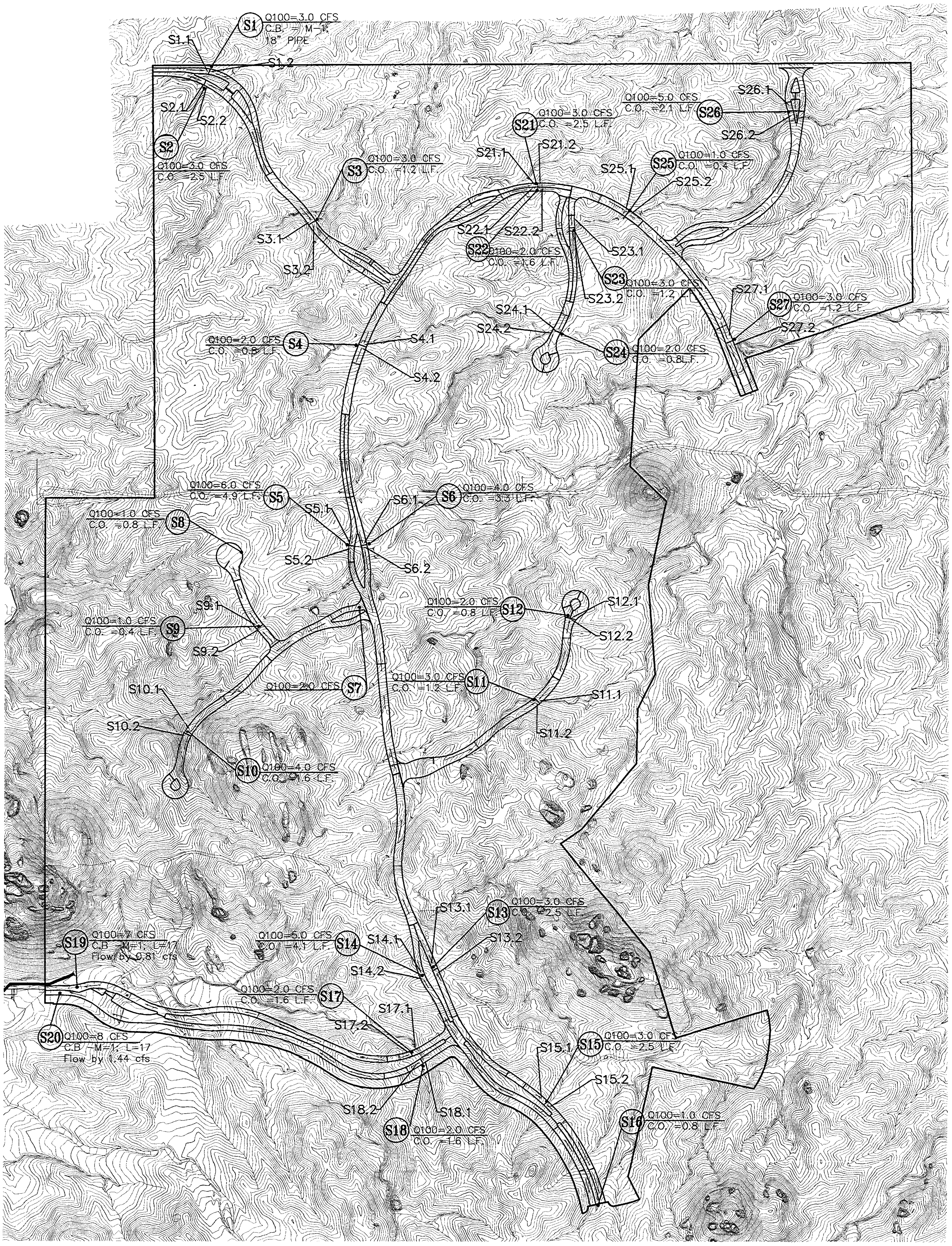
PLATE 13

On-Site Roadway Drainage Map



LEGEND

(S1)	CONCENTRATION POINT	——	PROJECT BOUNDARY
S1.1	BASIN LABEL	C.B.	CATCH BASIN
C.O.	REQUIRED CURB OPENING (5' MIN. PER PLANS)		
→	DIRECTION OF FLOW		

150 0 75 150
1 inch = 150 ft.

N

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Plate 13

"On-Site Roadway Drainage Map"

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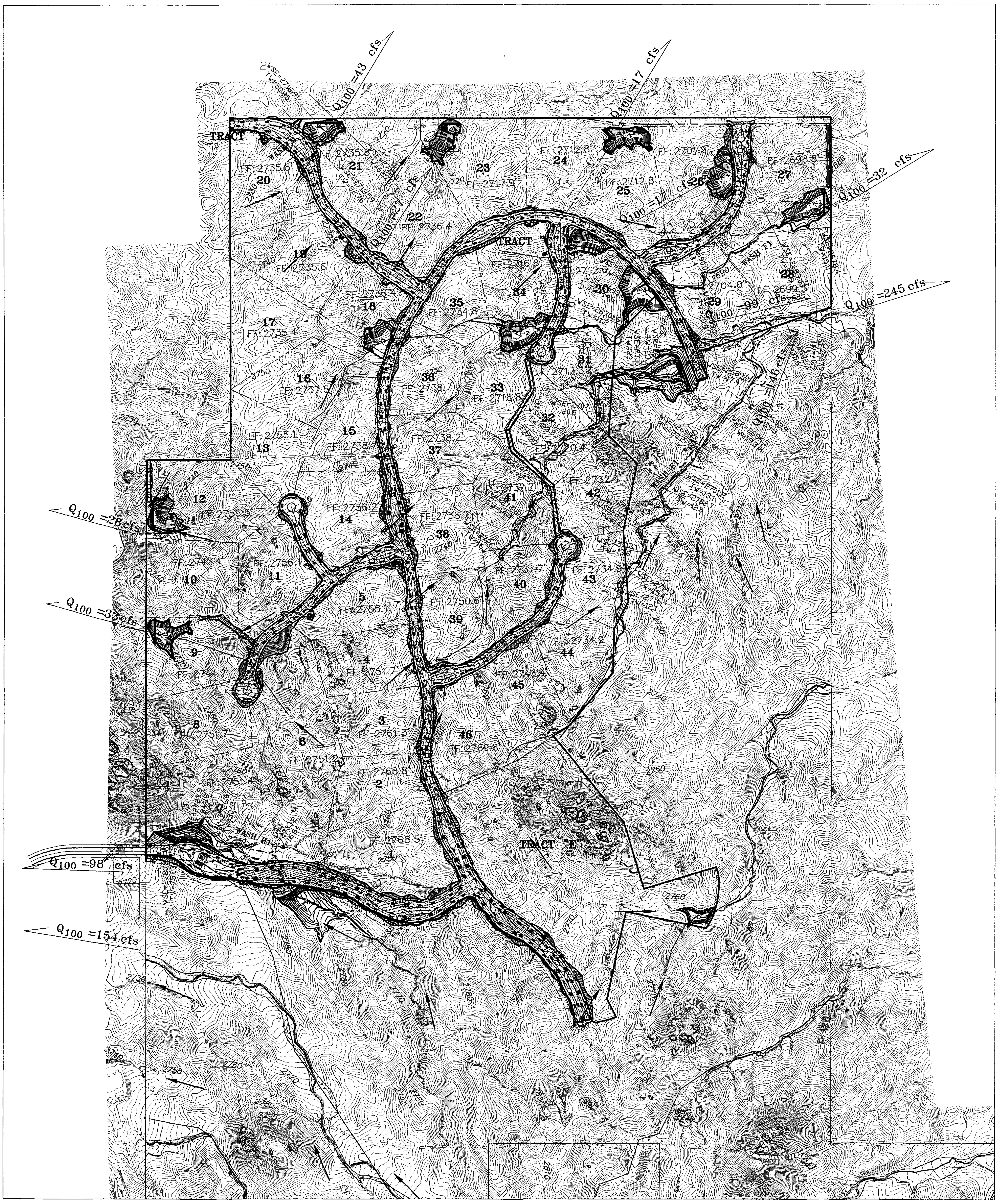
PLATE 14

Minimum Finished Floor Elevations



LEGEND

FLOWLINE	PROJECT BOUNDARY
FLOODPLAIN BOUNDARY	EXISTING 1 FOOT CONTOUR LABEL (2790)
404 WASH	FLOW ARROW
POST-DEVELOPMENT PEAK FLOW (Q_{100}=41 cfs)	HEC-RAS CROSS SECTION WITH RIVER STATION, WATER SURFACE ELEVATION AND TOP WIDTH (WSE=2762.70 TW=61.10)
DETENTION BASIN	

3

200 0 100 200
1 in. = 200 ft.

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PHASE I
Plate 14
"Minimum Finished Floor Elevations"

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