

# DRAINAGE FEASIBILITY STUDY

## FOR

# WILDWOOD HILLS MOBILE HOME PARK

February 07, 2017

**Project Location:**

2727 W Hwy 66  
Flagstaff, AZ 86001

**Prepared For:**

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**Prepared By:**



*EXPIRES: 6/30/2017*

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*EXPIRES 3/31/2018*

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## WOODSON

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**WES Project No. 116050**

# WILDWOOD HILLS MHP

## FEASIBILITY DRAINAGE STUDY

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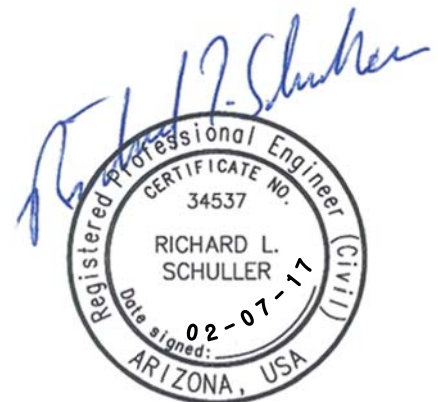
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### **1. INTRODUCTION**

The purpose of this report is to analyze the offsite drainage which impacts Wildwood Hills Mobile Home Park (MHP) to determine potential flow attenuation strategies on the parcel located upstream/west of Wildwood Hills to assist with their historical and on-going drainage flooding issues. For the purpose of this study, Wildwood Hills MHP will be referred as the subject site hereafter.

The study area is located in Section 19, Township 21N, and Range 07E, located south of Route 66, north of I-40 and east of Woody Mountain Road. Please refer to Appendix for the Vicinity map.

The contributing watershed area is comprised of the Vintage 37 acre parcel located west of Woody Mountain Road, Presidio in the Pines and the Woody Mountain Campground located east of Woody Mountain Road, Hidden Hollow Manufactured Homes and Rail Road Springs located north of Rte 66 and others located in west Flagstaff at Woody Mountain Road and West Old Route 66.

### **2. FLOOD ZONE**

The site is located in Zone X per FEMA's FIRM 04005C6816G. There is no designated floodplain or floodway through the site or the upstream watershed area. However the parcels downstream of Wildwood Hills MHP (Kit Carson RV Park) is in Zone A. Please refer to Appendix for floodzone exhibit.

Zone X is defined as the areas of minimal flood hazard, which are the areas outside the SFHA and higher than the elevation of the 0.2-percent-annual-chance flood.

Zone A is defined as areas subjected to inundation by the 1-percent-annual-chance flood event generally determined using approximate methodologies. Because detailed hydraulic analyses have not been performed, no Base Flood Elevations (BFEs) or flood depths are established for this zone.

### **3. PREVIOUS DRAINAGE STUDIES**

The subject site and its offsite watershed area were included in a previous drainage study for Presidio in the Pines (Presidio) and a flood study for Kit Carson RV Park (KCRVP). The hydrologic analysis from these studies has been used as the starting point to develop a HEC-1 model for the current study. Excerpts from these studies are included in Appendix for reference.

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### 4. EXISTING DRAINAGE CONDITION

As a part of this feasibility study, a site visit was performed by Woodson Engineering and Surveying, Inc. to examine the existing drainage conditions including offsite drainage patterns, drainage conveyances, potential detention areas, conveyance conditions at Wildwood Hills MHP and the downstream discharge conditions thru KCRVP to Route 66.

Wildwood Hills MHP receives offsite flows from 2 directions, a northern and a southern branch. Flow generated by the Woody Mountain campground, the northern portion of Presidio, the Vintage 37 acre parcel and others located in west Flagstaff at Woody Mountain Road and West Old Route 66 discharge into the northern branch. Flow generated by the middle portion of Presidio and some area from southwest of the Woody Mountain campground discharges into the southern branch.

The flow from the northern branch reaches a small existing pond located on the west boundary of MHP at a natural flow concentration point. Based on the pond size, it appears that the pond may detain flows generated by smaller storms only. Once the pond fills up, the flow enters the MHP at the west perimeter via two (2) rock/grouted channels located on north and south sides of unit 9. These channels will be referred to as north and south grouted channels hereafter. The channels have grouted rock walls with earthen and/or grouted bottom and the depth varies throughout its length. During the site visit, measurements were taken at the most constrained sections to calculate the channel capacity.

The flow from the aforementioned channels enters the street in front of unit 9 and then reaches a confluence channel located north of unit 23. This channel is smaller in size than the north and the south channels. The confluence channel passes under decks of some of the units and thus decreases further in size. The flow conveyed by this channel then enters onsite streets and eventually reaches east boundary of the MHP where it enters KCRVP.

The flow from the south branch enters the MHP, traverses through onsite streets and then enters KCRVP on the east boundary of the MHP. This is also the confluence point of northern and southern branches. The onsite streets have inverted crowns and some have concrete valley gutters at the center to convey flow.

The offsite watershed area is comprised of both developed and undeveloped areas. Per the drainage report for Presidio, the development has proposed required storm water management facilities to limit the post developed flow rate to be equal to or less than the pre developed flows (please see the drainage map referenced from Presidio included in the Appendix). The Vintage 37 acre parcel located west of Woody Mountain Road was a part of the 2006 Woody burn area. To reflect the existing condition, current analysis uses curve numbers for the post burn condition.

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The flow from the Vintage 37 acre parcel crosses Woody Mountain Road via two existing culvert crossings: a 24"x36" cmp located at the intersection of old Rte 66 and Woody Mountain Road and a 4'x3' RCBC located north of the roundabout in Woody Mountain Road.

Drainage area Sub-1 discharges flow into the 24"x36" cmp which connects into an existing inlet on east side of Woody Mountain Road. The inlet discharges into an existing culvert which appears to be 18" cmp. The flow is then conveyed by roadside ditch and then discharges into Woody Mountain Campground parcels. The flow generated by old Rte 66 which does not have any curb and gutter also discharges into roadside ditches and reaches the Woody Mountain campground parcels.

Drainage area Sub-2 discharges into an existing 24" cmp that crosses Rte 66 (located about 1060' east of Woody Mountain road and old Rte 66 intersection) and discharges flow on south side of Rte 66 into the easterly Woody Mountain Campground parcel.

Drainage area Sub-1A discharges into the existing 4'x3' RCBC under Woody Mountain road which then discharges into an onsite stormdrain system in Presidio. Flow from one of the Presidio's onsite detention basin drains into the same stormdrain system which then discharges into the Woody Mountain campground parcels. The size of the stormdrain system at its outlet is a 30" cmp. In addition to the aforementioned drainage systems, the flow generated by the Woody Mountain campground parcels discharge into the northern branch of Wildwood Hills MHP.

Please see Appendix for drainage area map for location and flow at concentration points for north and south branches.

## **5. HYDROLOGIC ANALYSIS**

The hydrologic analysis was performed in accordance with the City of Flagstaff (COF) Stormwater Management Design Manual (SWDM). COF's GIS contours (2' interval) were utilized to delineate drainage areas. This study includes the 100-yr storm event analysis only.

### **5.1 RAINFALL DATA**

Rainfall depths are referenced from COF SWDM Table 3-2 (please see following table). With the watershed area being less than 1 square mile, 6-hour storm duration and 6-hour rainfall depths are used for hydrologic analysis.

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**TABLE 1: RAINFALL DEPTHS**

Storm Duration Table 3-2	Duration (hr)	100-year Intensity (in/hr)	100-year Depth (in)
5-min	0.083	8.52	0.71
10-min	0.167	6.66	1.11
15-min	0.25	5.48	1.37
30-min	0.5	3.58	1.79
1-hour	1	2.21	2.21
2-hour	2	1.28	2.56
3-hour	3	0.92	2.76
6-hour	6	0.53	3.18

### 5.2 SOILS DATA

Soils information has been referenced from the USDA’s Web Soil Survey for “Oak Creek-San Francisco Peaks Area”. The soils in the study area are found to be Hydrologic Soil Group Type C or Type D. The curve numbers for various land use/cover are referenced from the National Engineering Handbook (NEH), Chapter 9. For undeveloped drainage areas, SCS curve numbers for Ponderosa pine forest in “fair condition” is used and the curve numbers are referenced from the Flood Study for KCRVP. For developed drainage areas, the curve numbers are selected based on the average lot size. For the drainage areas west of Woody Mountain road which were in burnt area, curve numbers for open area (with less than 50% of grass cover) are used. Please see the Appendix for excerpts from the NEH for the referenced curve numbers.

### 5.3 TIME OF CONCENTRATION (T<sub>c</sub>)

T<sub>c</sub> calculations were performed per the COF’s SWDM Section 3.1.6. Please see Appendix for T<sub>c</sub> calculations. The overland length flow is limited to be no more than 100’. Minimum T<sub>c</sub> of 10 mins and 6 mins are used for undeveloped and developed drainage areas respectively if the calculated T<sub>c</sub> is lower than the minimum T<sub>c</sub>.

### 5.4 RUNOFF METHODOLOGY

The US Army Corps of Engineers’ HEC-1, Version 4.1. and SCS curve number methodology is used to develop the hydrologic model per SWDM’s Section 3.3. As mentioned already, flow from the northern portion of Presidio discharges into the existing pond along the west perimeter of Wildwood Hills MHP. Thus, the hydrologic model from Presidio is incorporated into the current analysis to compute flows impacting Wildwood Hills MHP. Also drainage areas downstream of Wildwood Hills MHP are referenced from the Flood study for KCRVP to show the comprehensive

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drainage network in the area and to compare the difference in flows in the existing condition to the flows after the attenuation facilities are proposed. The runoff methodology used for this current study is in concurrence with both of the reference studies and the runoff methodology used by those studies.

### 5.5 HEC-1 ANALYSIS

After inclusion of drainage areas from Presidio and the drainage areas downstream of Wildwood Hills MHP i.e KCRV into the current analysis, additional Combination Points (CPs) are also added to the model for other tributary areas to determine the flow at the existing pond on the west perimeter of Wildwood Hills MHP and on the east perimeter where flows exit Wildwood Hills. Curve numbers are adjusted to reflect any changes from reference studies including revising the curve numbers for the drainage areas in the burnt area. Please refer to drainage map included in Appendix for drainage area delineation and summary of flows.

## 6. HYDRAULIC ANALYSIS

### 6.1 EXISTING DRAINAGE FACILITIES

As the first step to develop flow attenuation strategies, the flow capacity of the existing drainage facilities in Wildwood Hills MHP have been analyzed based on the field measurements taken during site visit. Please see the Appendix for flow capacity calculations and drainage map for the table listing the existing channel capacities.

### 6.2 FLOW ATTENUATION OPTIONS

Among the existing channels in Wildwood Hills MHP, the channel with the least flow capacity (i.e. the confluence channel) may dictate the size of any flow attenuation facilities and the allowable flow from them. The 100 yr flow rate at the upstream point of the MHP where a detention basin is being planned is 191 cfs. Following are some of the alternative detention design options that were studied to determine the flow released from the detention basin.

**TABLE 2: DETENTION BASIN ALTERNATIVES**

<b>Alternative ID with Basin Volume</b>	<b>Flow released from the Detention Basin (cfs)</b>
Alternative-1 :Volume =1.75 ac-ft	160 cfs
Alternative-2 :Volume =2.25 ac-ft	141 cfs
Alternative-3 :Volume =4.97 ac-ft	78 cfs
Alternative-4 :Volume =9.00 ac-ft	20 cfs

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Alternative 1 & 2 are not desired as they do not provide much relief to the flow released into the Wildwood Hills MHP. Alternative 4 was done to determine the volume of detention basin needed to bring the outflow from the detention basin to the capacity of the confluence channel (18 cfs). However, given the steep terrain west of Wildwood Hills, a detention basin of this volume is not feasible to grade and also leads to embankment of about 10'-12' which is not recommended on back of the Wildwood Hills MHP. With Alternative 3, a more natural looking basin has been designed to blend with the terrain. There is more than one inflow point to the existing pond along the west perimeter of Wildwood Hills MHP. The pond that follows natural terrain can help maintain the existing flow pattern and can efficiently capture flow from multiple inflow points. This report includes cost estimate and grading for Alternative 3 only.

## 7. DETENTION BASIN

The detention basin has been designed per the SWDM guidelines with a benched configuration. The basin is 6' deep for the "live storage" or detention portion with an addition permanent pool depth of 4' occurring below the detention level. To increase the functionality of the basin, the permanent pool allows the basin to function as a unique site amenity with aquatic features designed and then maintained with appropriate measures such as aeration. The detention basin analysis does not include the dead storage volume. The basin outlet will have 2-27" pipes above the permanent pool elevation and will directly discharge into the onsite channel. The outlet is sized to maintain at least 0.5' of freeboard. Please see Exhibit-3 included in Appendix for detention basin grading. With the proposed amenities in the basin, it will be maintained per the Operations and Maintenance (O&M) Manual provided with final design.

Since the outflow from the detention basin (78 cfs) is more than the existing confluence channel capacity (18 cfs), the onsite channels could be upsized with an onsite improvement project. The north and the south rock/grouted channels may be removed and one of them can be replaced with a rectangular concrete channel. Given the narrow space available between units, a concrete rectangular channel (6' wide and 2.5' in ht.) may be proposed for onsite channel. This is the concept shown for this report. As an alternate, to maintain flow in two channels to match the existing condition, the south grouted channel can be upgraded to convey the flow released from the detention basin, one pipe going each to one channel. Then the confluence channel may be upgraded to a rectangular concrete channel as well (6' wide and 2.5' in ht.). Any existing landscaping, decks or other peripherals of units that are in conflict with the new rectangular channels would be removed and replaced as feasible.

In the existing condition, the confluence channel releases flow into onsite streets which eventually drains into KCRVP. The proposed rectangular concrete confluence channel will maintain the same

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alignment as the existing grouted channel and releases flow into onsite streets to match the existing flow pattern.

As an alternative to the open channels, a storm drain system may be opted in the onsite streets. However given the onsite street grades and the size of the pipe to convey the flow from the detention basin, to daylight the storm drain, either it has to be extended into KCRVP or some open channel grading work may be required in KCRVP. This alternative has not being studied in detail in this report nor is the cost of this alternative included in the cost estimate.

The proposed flow attenuation options address flooding issues caused due to the flow released into northern branch only. Per coordination with the City, it appears that the southern branch seems to have some flooding issues due to some retaining walls built on site. If a stormdrain system is opted in lieu of improving onsite channels, a stormdrain lateral could be connected to it to intercept surface flows to alleviate any flooding caused due to the flows in the southern branch. Neither the scope nor the cost estimate of this study include any improvements to address flooding caused due to flow from southern branch. Though the proposed flow attenuation facilities do not completely reduce the flows to the capacity of the existing drainage/conveyance facilities, the flows are significantly lower than the allowable or pre developed flows. Please see the following table for flows with and without the proposed detention basin.

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**TABLE 3: FLOW SUMMARY**

CP ID	COMBINING BASINS/CPs	FLOW RATE Q100 (CFS) WITHOUT DETENTION BASIN@ WILDWOOD HILLS MHP	FLOW RATE Q100 (CFS) WITH NEW DETENTION BASIN @WILDWOOD HILLS MHP
CP-1A	SUB-1,2,2A	42	42
CP-30	SUB-1A,1B,3A, B-4,B-4A,B1A,B4B,B3	$112^2/93^3/124^4$	124
CP-2A	CP-1A+CP-30 +SUB-3B	191	191
DET OUT	FLOW FROM DETENTION	-	78
CP-3A	CP-2A+CP-3C	247	112
CP-11 <sup>5</sup>	SEE NOTE <sup>1</sup>	$456^2/420^3$	419
CP-4A <sup>5</sup>	CP-3A+SUB-1	251	116
CP-4B <sup>5</sup>	CP11+SUB-4	433	432
CP-4C <sup>5</sup>	CP-4A+CP-4B	641	532
CP-5 <sup>5</sup>	CP-4+SUB-5	695	555

Note 1: TOO MANY BASINS TO LIST. PLEASE REFER TO PRESIDIO DRAINAGE STUDY

Note 2: PRE-DEVELOPED FLOWS-REFERENCED FROM PRESIDIO DRAINAGE STUDY

Note 3: POST-DEVELOPED FLOWS-REFERENCED FROM PRESIDIO DRAINAGE STUDY

Note 4: THIS INCLUDES FLOW FROM BURN AREA WITH REVISED CURVE NUMBERS

Note 5: THESE COMBINATION POINTS ARE ADDED FOR INFORMATION ONLY  
AS THESE ARE DOWNSTREAM OF WILDWOOD HILLS. THERE ARE OTHER  
AREAS THAT ARE NOT A PART OF SUBJECT DRAINAGE STUDY THAT CONTRIBUTE  
FLOW TO THESE COMBINATION POINTS

## 8. OPINION OF PROBABLE COST

As a part of this study, opinion of probable cost has been prepared to estimate the cost associated with the construction of the basin and the onsite conveyance facilities. The cost estimate is broken down into basin and conveyance. The cost of the proposed improvements within campground

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parcels (detention basins and outlet structure) is included under basin improvements and the cost of the onsite channels and any associated removal/reconstruction is included under conveyance cost. Please see Appendix for the estimate.

## 9. CONCLUSIONS

- I. To reduce flows from the west of Woody Mountain Road to Wildwood Hills MHP, some areas of Timber Sky that naturally drain east will be routed west as recommended by the City with Timber Sky improvements.
- II. The drainage areas from the 2006 burn area use an existing burn condition for the curve numbers for the hydrologic analysis. This a conservative approach as the vegetation will eventually be re-established and the curve number will drop significantly.
- III. With the proposed flow attenuation facilities, the flow in the north branch will be routed through the proposed detention basin and then through the upgraded onsite conveyance facilities, which will an onsite project. The location of the onsite channels is maintained to match the existing flow pattern.
- IV. The proposed detention based is at the same location as the existing small pond which is a natural concentration point with more than one inflow points. The proposed detention basins blends with the natural terrain and maintains the same flow pattern as in existing condition. The permanent pool provides an additional site amenity.
- V. Though the proposed flow attenuation facilities do not completely reduce the flows to the capacity of existing drainage/conveyance facilities, the flows are significantly lower than the existing condition flows.
- VI. Any remove/replace of existing unit peripherals should be coordinated with the residents/owners of the units.
- VII. The size of the proposed facilities uses City's 2-foot contours and is considered a preliminary design. Also the existing capacity calculations are based on field measurements taken during site visit and per surveyed cross sections. Final design should be done using detailed survey.
- VIII. The proposed flow attenuation options address flooding issues related to the north branch only. South branch flooding has been discussed briefly and the cost of improvements included in the report does not include any improvements to alleviate flooding caused due to flows in south branch.

## **APPENDIX A: FIGURES**

VICINITY MAP

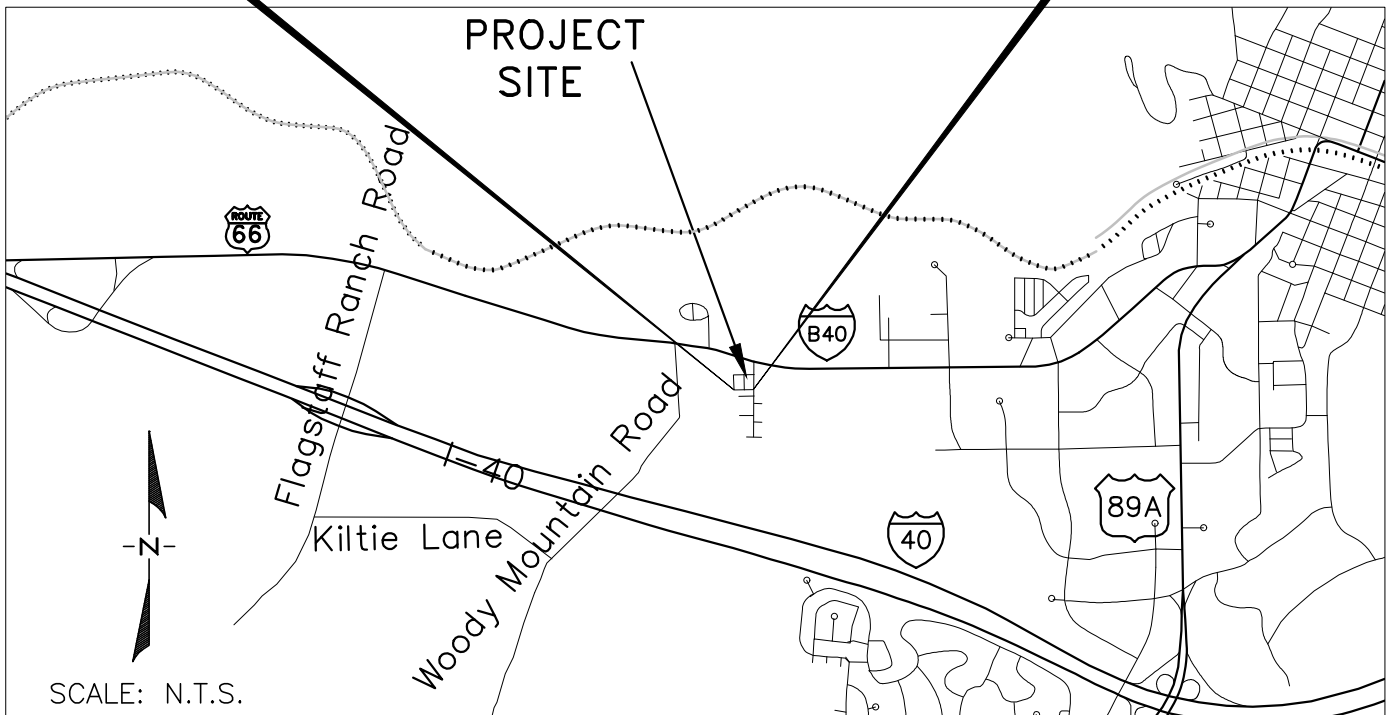
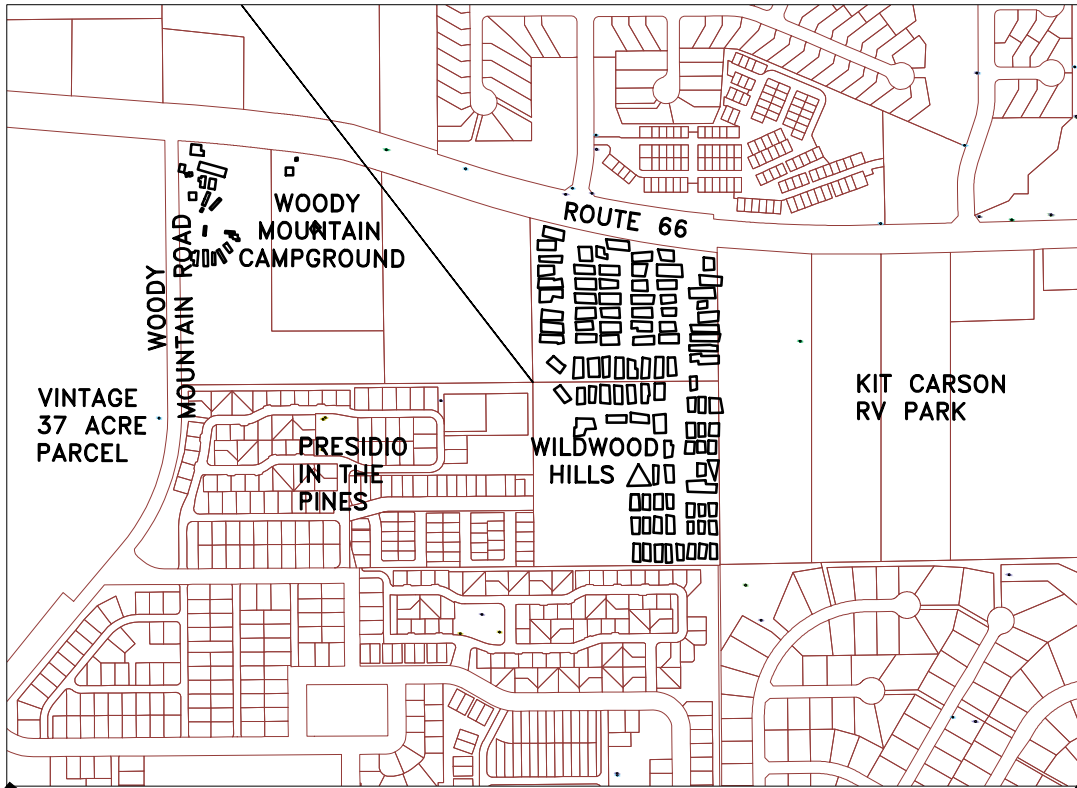
FEMA FIRM

WEB SOIL SUVEY MAP

EXHIBIT-1: DRAINAGE MAP- EXISTING CONDITION

EXHIBIT-2: FLOW ATTENUATION FACILITIES MAP

EXHIBIT-3: DETENTION BASIN GRADING AND CROSS SECTION



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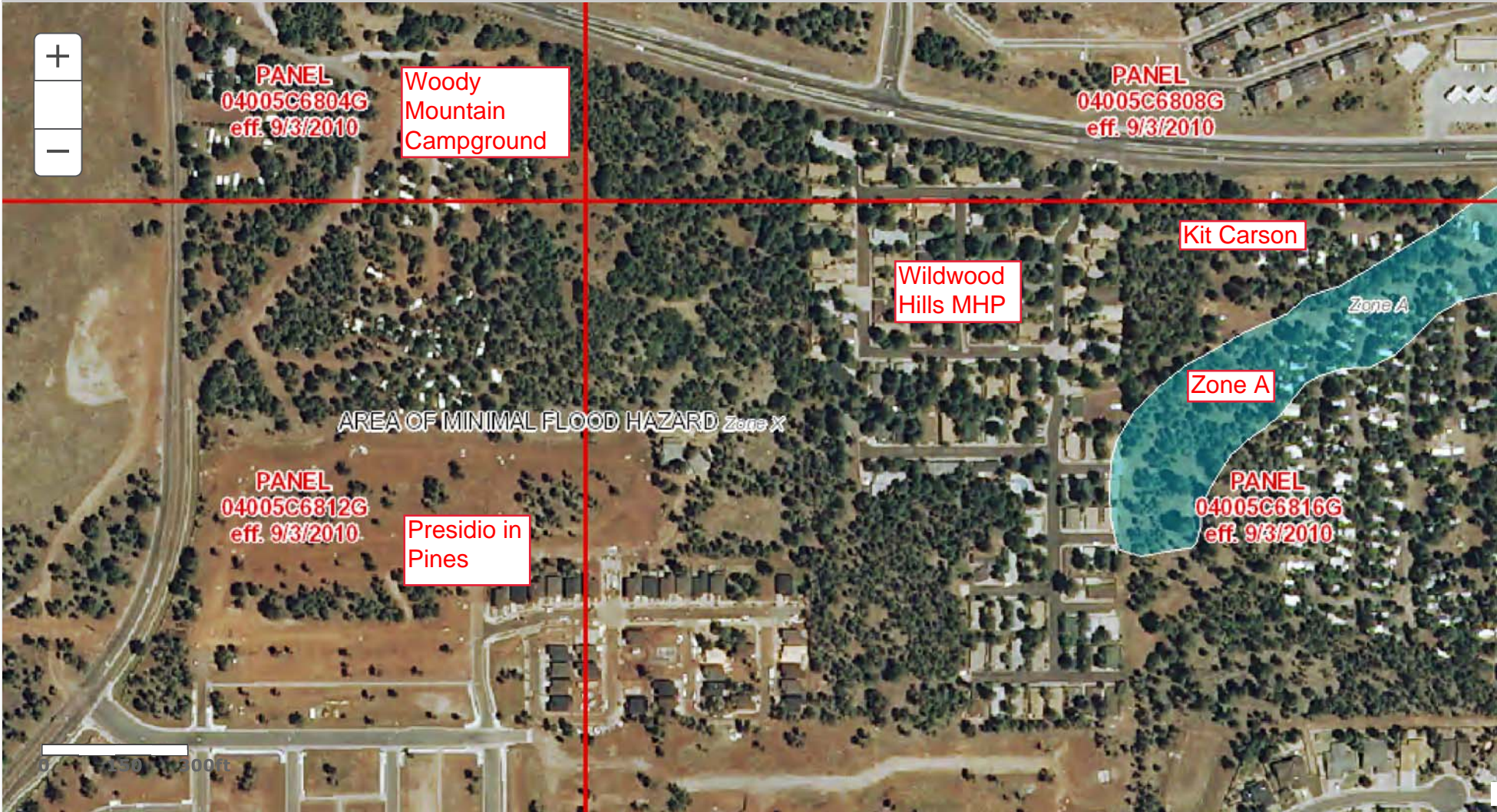
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**WILDWOOD HILLS**  
 VICINITY MAP  
 FLAGSTAFF, AZ

# Home ▾ FEMA's National Flood Hazard Layer (Official)

Details | Basemap | Share | Print | Measure | Find address or p



Wildwood Hills MHP: FEMA Flood Zones Exhibit

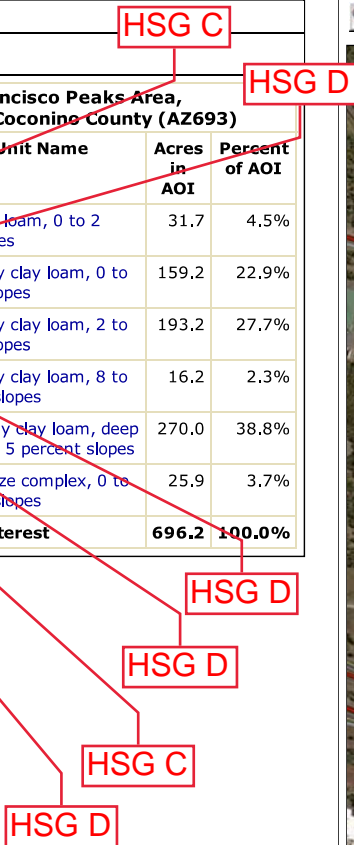
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Search

Map Unit Legend

**Oak Creek-San Francisco Peaks Area,  
Arizona, Part of Coconino County (AZ693)**

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
1	Jacques clay loam, 0 to 2 percent slopes	31.7	4.5%
2	Brolliar stony clay loam, 0 to 2 percent slopes	159.2	22.9%
2A	Brolliar stony clay loam, 2 to 8 percent slopes	193.2	27.7%
2B	Brolliar stony clay loam, 8 to 30 percent slopes	16.2	2.3%
12	Brolliar cobbly clay loam, deep variant, 0 to 5 percent slopes	270.0	38.8%
15A	Tortugas-Daze complex, 0 to 15 percent slopes	25.9	3.7%
<b>Totals for Area of Interest</b>		<b>696.2</b>	<b>100.0%</b>



Soil Map

Scale (not to scale)

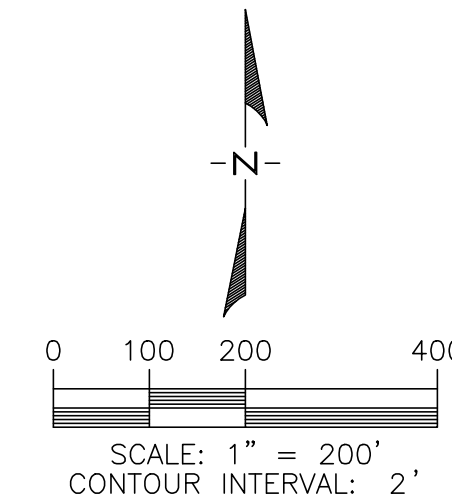
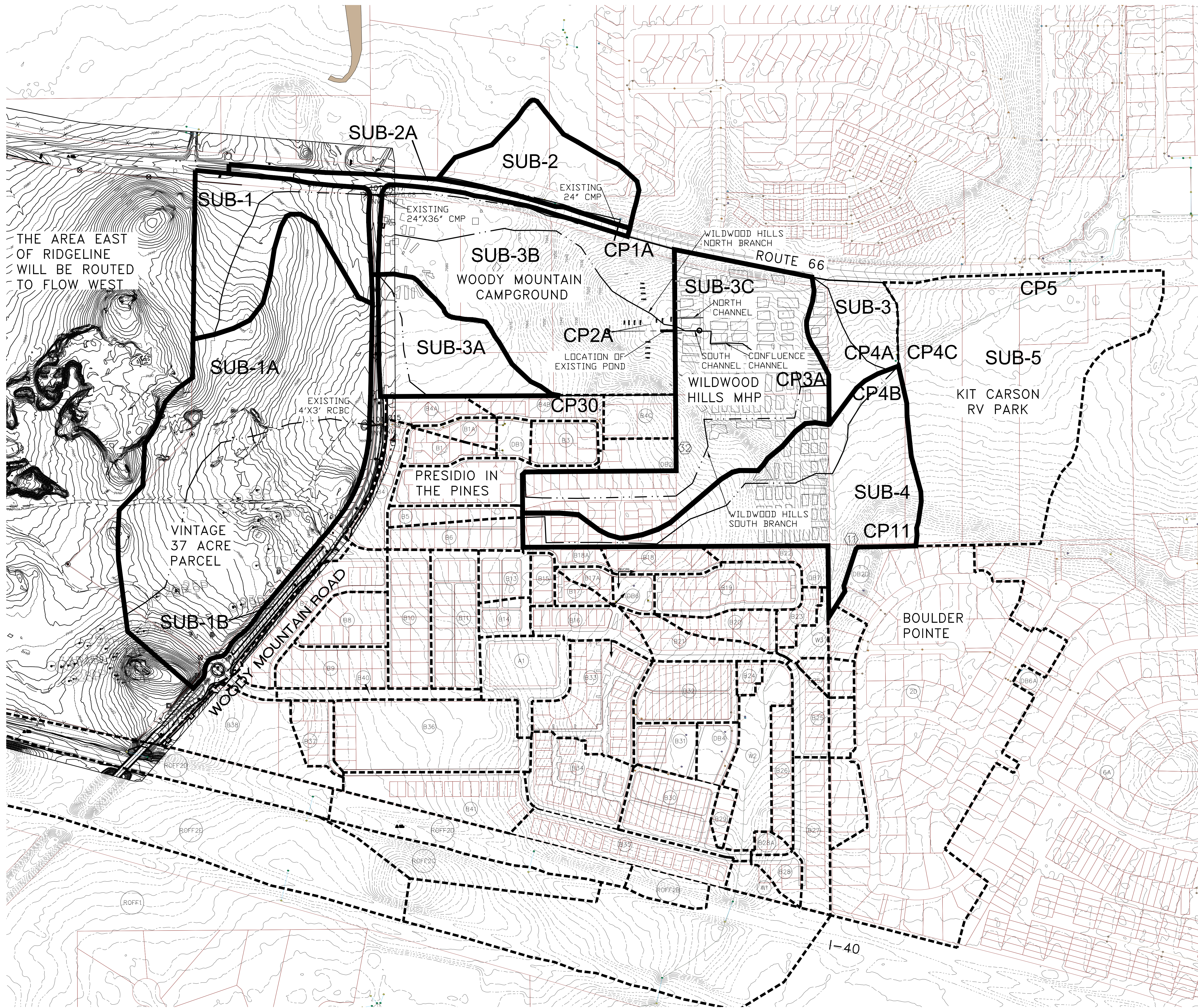


**Warning: Soil Map may not be valid at this scale.**

You have zoomed in beyond the scale at which the soil map for this area is intended to be used. Mapping of soils is done at a particular scale. The soil your AOI were mapped at 1:24,000. The design of map units and the level of detail shown in the resulting soil map are dependent on that map scale. Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps areas of contrasting soils that could have been shown at a more detailed scale.

Soil Data Available <span style="float: right;">✕</span>			
Name	Area Symbol	Data Availability	Version
Oak Creek-San Francisco Peaks Area, Arizona, Part of Coconino County	AZ693	Tabular and Spatial, incomplete	Survey Area: Version 5, Sep 14, 2014 Tabular: Version 4, Sep 14, 2014 Spatial: Version 2, Dec 17, 2013

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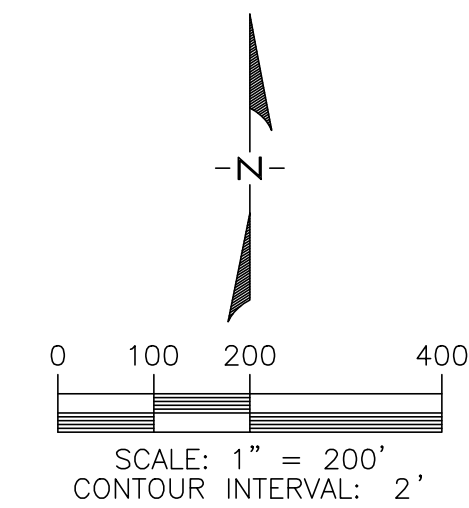
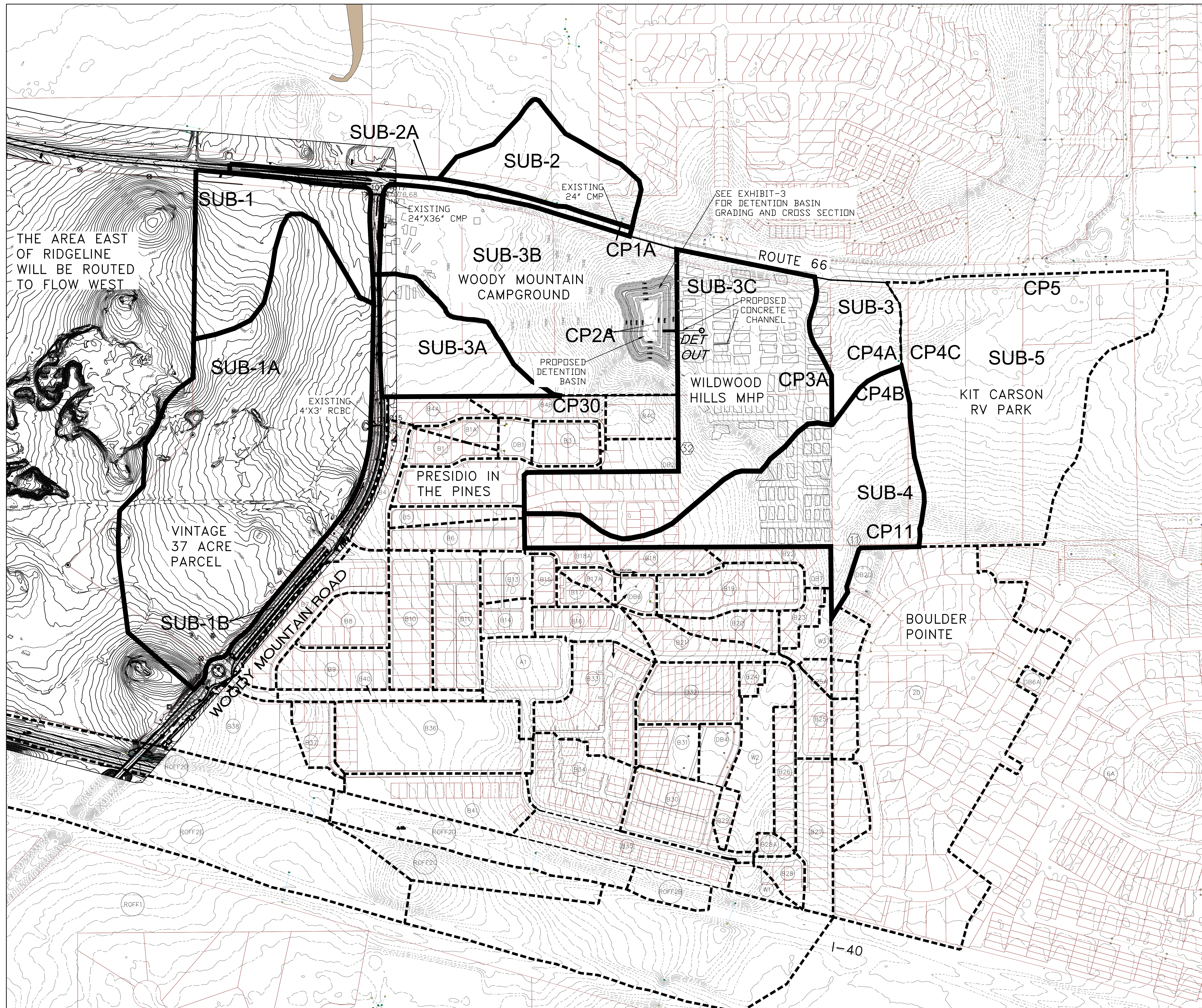
- DRAINAGE AREA
- REFERENCED DRAINAGE AREA
- TRAVEL PATH
- SUB-1 DRAINAGE AREA ID
- CP1 COMBINATION POINT ID
- B3 REFERENCED DRAINAGE AREA ID
- 32 REFERENCED COMBINATION POINT ID

NOTE: TOPOGRAPHY USED FOR BASIN DELINEATION AND DETENTION BASIN GRADING IS BASED ON CITY OF FLAGSTAFF'S 2-FOOT GIS CONTOURS.

CHANNEL ID	CAPACITY (CFS)
NORTH CHANNEL	33
SOUTH CHANNEL	33
CONFLUENCE CHANNEL	18.5

CP ID	COMBINING BASINS/CPs	FLOW RATE Q100 (CFS) WITHOUT DETENTION BASIN@ WILDWOOD HILLS MHP
CP-1A	SUB-1,2,2A	42
CP-30	SUB-1A,1B,3A, B-4, B-4A,B1A,B4B,B3	112 <sup>2</sup> /93 <sup>3</sup> /124 <sup>4</sup>
CP-2A	CP-1A+CP-30 +SUB-3B	191
DET OUT	FLOW FROM DETENTION	-
CP-3A	CP-2A+CP-3C	247
CP-11 <sup>5</sup>	SEE NOTE <sup>7</sup>	456 <sup>2</sup> /420 <sup>3</sup>
CP-4A <sup>5</sup>	CP-3A+SUB-1	251
CP-4B <sup>5</sup>	CP11+SUB-4	433
CP-4C <sup>5</sup>	CP-4A+CP-4B	641
CP-5 <sup>5</sup>	CP-4+SUB-5	695

Note 1: TOO MANY BASINS TO LIST. PLEASE REFER TO PRESIDIO DRAINAGE STUDY  
 Note 2: PRE-DEVELOPED FLOWS-REFERENCED FROM PRESIDIO DRAINAGE STUDY  
 Note 3: POST-DEVELOPED FLOWS-REFERENCED FROM PRESIDIO DRAINAGE STUDY  
 Note 4: THIS INCLUDES FLOW FROM BURR AREA WITH REVISED CURVE NUMBERS  
 Note 5: THESE COMBINATION POINTS ARE ADDED FOR INFORMATION ONLY AS THESE ARE DOWNSTREAM OF WILDWOOD HILLS. THERE ARE OTHER AREAS THAT ARE NOT A PART OF SUBJECT DRAINAGE STUDY THAT CONTRIBUTE FLOW TO THESE COMBINATION POINTS



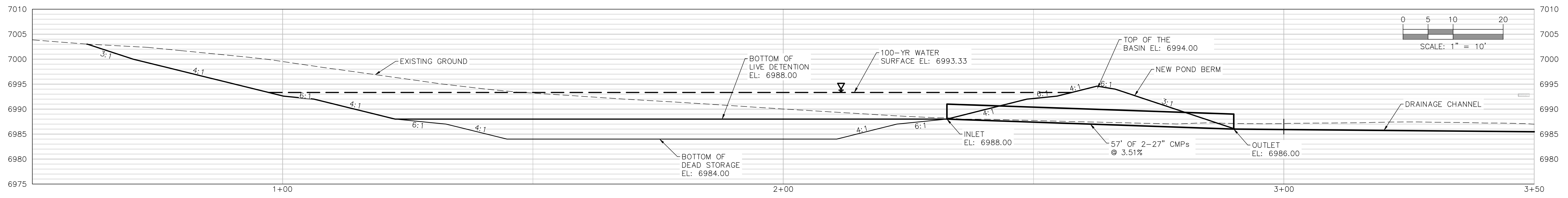
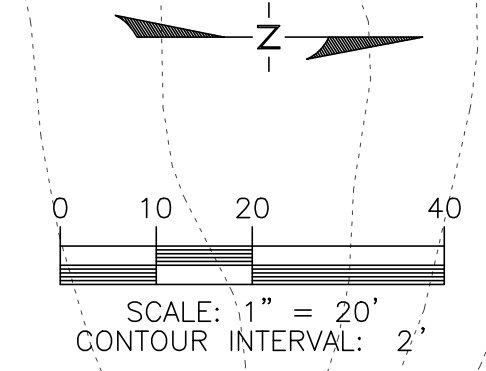
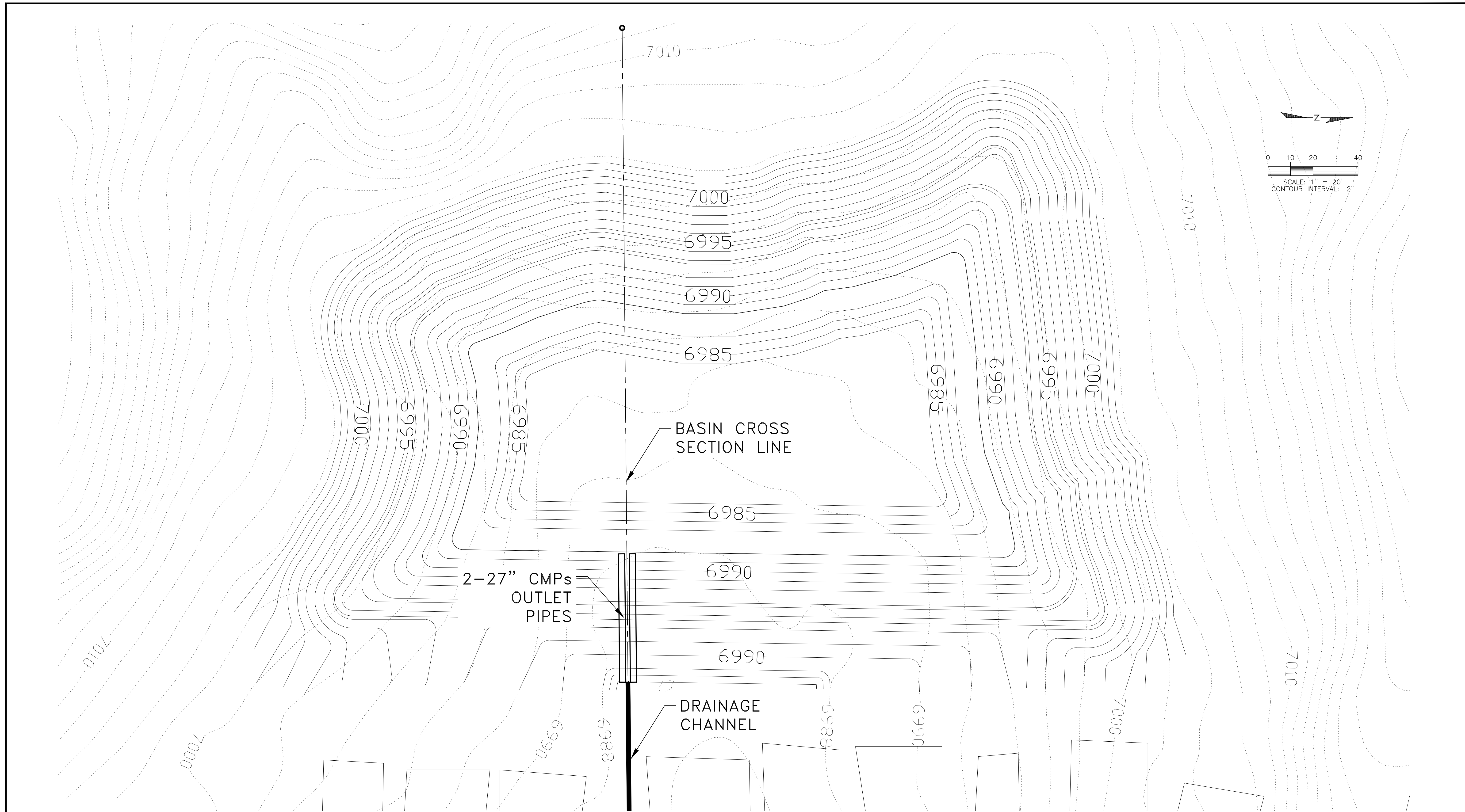
**LEGEND**

- DRAINAGE AREA
- REFERENCED DRAINAGE AREA
- TRAVEL PATH
- SUB-1 DRAINAGE AREA ID
- CP1 COMBINATION POINT ID
- B3 REFERENCED DRAINAGE AREA ID
- 32 REFERENCED COMBINATION POINT ID

NOTE: TOPOGRAPHY USED FOR BASIN DELINEATION AND DETENTION BASIN GRADING IS BASED ON CITY OF FLAGSTAFF'S 2'-FOOT GIS CONTOURS.

CP ID	COMBINING BASINS/CPs	FLOW RATE Q100 (CFS) WITHOUT DETENTION BASIN@ WILDWOOD HILLS MHP	FLOW RATE Q100 (CFS) WITH NEW DETENTION BASIN @WILDWOOD HILLS MHP
CP-1A	SUB-1,2,2A	42	42
CP-30	SUB-1A,1B,3A, B-4, B-4A,B1A,B4B,B3	112 <sup>2</sup> /93 <sup>3</sup> /124 <sup>4</sup>	124
CP-2A	CP-1A+CP-30 +SUB-3B	191	191
DET OUT	FLOW FROM DETENTION	-	78
CP-3A	CP-2A+CP-3C	247	112
CP-11 <sup>5</sup>	SEE NOTE <sup>5</sup>	456 <sup>5</sup> /420 <sup>5</sup>	419
CP-4A <sup>5</sup>	CP-3A+SUB-1	251	116
CP-4B <sup>5</sup>	CP11+SUB-4	433	432
CP-4C <sup>5</sup>	CP-4A+CP-4B	641	532
CP-5 <sup>5</sup>	CP-4+SUB-5	695	555

Note 1: TOO MANY BASINS TO LIST. PLEASE REFER TO PRESIDIO DRAINAGE STUDY  
 Note 2: PRE-DEVELOPED FLOWS-REFERENCED FROM PRESIDIO DRAINAGE STUDY  
 Note 3: POST-DEVELOPED FLOWS-REFERENCED FROM PRESIDIO DRAINAGE STUDY  
 Note 4: THIS INCLUDES FLOW FROM BURN AREA WITH REVISED CURVE NUMBERS  
 Note 5: THESE COMBINATION POINTS ARE ADDED FOR INFORMATION ONLY  
 AS THESE ARE DOWNSTREAM OF WILDWOOD HILLS, THERE ARE OTHER AREAS THAT ARE NOT A PART OF SUBJECT DRAINAGE STUDY THAT CONTRIBUTE FLOW TO THESE COMBINATION POINTS



DETENTION BASIN CROSS SECTION VIEW

## **APPENDIX B: HYDROLOGY**

COMPOSITE CURVE NUMBER CALCULATIONS

TIME OF CONCENTRATION CALCULATIONS

DRAINAGE AREA SUMMARY

HEC-1 OUTPUT-EXISTING CONDITIONS

HEC-1 OUTPUT WITH FLOW ATTENUATION FACILITIES

**Wildwood Hills  
Mobile Home Park**

Calc By: SK  
Date: 01/19/17

**Composite Curve Number (CN) Calculations**

Drainage Area ID	Total Area (ac)	Total Area (sq mi)	Soil Map Symbol	Hydrologic Group	Cover Type	SCS Curve Number	Area for Individual CN	Composite SCS CN
1	7.87	0.012	2A	D	Open Space (<50% grass cover)	89	1.62	86.62
					-	NA	NA	
			12	C	Open Space (<50% grass cover)	86	6.25	
					-	NA	NA	
1A	30.50	0.048	2	D	Open Space (<50% grass cover)	89	14.24	87.40
					-	NA	NA	
			12	C	Open Space (<50% grass cover)	86	16.26	
					-	NA	NA	
Sub-1B	3.11	0.005	2	D	Ponderosa Pine (Fair)	NA	NA	92.75
					Paved Street w/ Open Ditches	93	2.34	
			12	C	Ponderosa Pine (Fair)	NA	NA	
					Paved Street w/ Open Ditches	92	0.77	
Sub-2	5.13	0.008	2	D	Residential - 1/8 Acre	92	0.85	81.67
					2A	D	Residential - 1/8 Acre	
			12	C	Ponderosa Pine (Fair)	65	1.61	
					Open Space (<50% grass cover)	86	1.61	
Sub-2A	2.11	0.003	2A	D	Ponderosa Pine (Fair)	NA	NA	92.35
					Paved Street w/ Open Ditches	93	0.74	
			12	C	Ponderosa Pine (Fair)	NA	NA	
					Paved Street w/ Open Ditches	92	1.37	
Sub-3	3.80	0.006	2A	D	Ponderosa Pine (Fair)	75	0.07	77.80
			15A	D	Ponderosa Pine (Fair)	75	3.10	
					Residential - 1/8 Acre	92	0.63	
Sub-3A	5.53	0.009	12	D	Ponderosa Pine (Fair)	75	2.77	78.50
					Residential - 2 Acre	82	2.77	
Sub-3B	18.48	0.029	2A	D	Ponderosa Pine (Fair)	75	8.72	73.10
					12	C	Ponderosa Pine (Fair)	
					Residential - 2 Acre	77	4.38	
			15A	D	Ponderosa Pine (Fair)	75	0.99	
Sub-3C	16.34	0.026	2A	D	Ponderosa Pine (Fair)	75	3.15	88.29
					Residential - 1/8 Acre	92	3.72	
			12	C	Residential - 1/8 Acre	90	3.56	
			15A	D	Residential - 1/8 Acre	92	5.91	
Sub-4	13.46	0.021	2A	D	Ponderosa Pine (Fair)	75	7.37	81.06
					Residential - 1/8 Acre	92	3.44	
			12	C	Residential - 1/8 Acre	90	1.54	
			15A	D	Ponderosa Pine (Fair)	75	1.11	

**Wildwood Hills**  
**Time of Concentration Calculations (TR55)**

Calc By: SK  
 Date: 01/19/17

**Sub-1**

**Sheet Flow**

Input Data	
Elev Start [ft]	7106
Elev End [ft]	7105
Length [ft]	70
n (Short Grass)	0.15
OUTPUT	
S [ft/ft]	0.01
Tt [hr]	0.178

**Shallow Concentrated Flow**

Unpaved	
Elev Start [ft]	7105
Elev End [ft]	7095
Length [ft]	335
OUTPUT	
S [ft/ft]	0.0299
V [ft/s]	2.79
Tt [min]	2.00
Tt [hr]	0.033

**Open Channel Flow**

INPUT DATA:	
Elev Start [ft]	7095
Elev End [ft]	7077
Length [ft]	695
Bottom Width [ft]	6.00
Left Side Slope [ft]	15.00
Right Side Slope [ft]	20.00
Manning's n	0.040
Channel Slope [ft/ft]	0.0259
Depth [ft]	1.00
OUTPUT	
Top Width [ft]	41.00
Area [sf]	23.50
Wetted Perimeter [ft]	41.06
Hydraulic Radius	0.57
Velocity [fps]	4.12
Flow [cfs]	96.9
Tt [min]	2.81
Tt [hr]	0.047

Tc [hr]	0.258
Tc [min]	15.47
SCS Lag [hr]	0.155

**Wildwood Hills**  
**Time of Concentration Calculations (TR55)**

Calc By: SK  
 Date: 01/19/17

**Sub-1A**

**Sheet Flow**

Input Data	
Elev Start [ft]	7113
Elev End [ft]	7111
Length [ft]	98
n (Woods-Light Underbrush)	0.15
OUTPUT	
S [ft/ft]	0.02
Tt [hr]	0.202

**Shallow Concentrated Flow**

Unpaved	
Elev Start [ft]	7111
Elev End [ft]	7098
Length [ft]	561
Output	
S [ft/ft]	0.0232
V [ft/s]	2.46
Tt [min]	3.81
Tt [hr]	0.063

**Open Channel Flow**

INPUT DATA:	
Elev Start [ft]	7098
Elev End [ft]	7070
Length [ft]	904
Bottom Width [ft]	15.00
Left Side Slope [ft]	15.00
Right Side Slope [ft]	10.00
Manning's n	0.040
Channel Slope [ft/ft]	0.0310
Depth [ft]	1.00
OUTPUT DATA:	
Top Width [ft]	40.00
Area [sf]	27.50
Wetted Perimeter [ft]	40.08
Hydraulic Radius	0.69
Velocity [fps]	5.09
Flow [cfs]	139.9
Tt [min]	2.96
Tt [hr]	0.049

Tc [hr]	0.314
Tc [min]	18.87
SCS Lag [hr]	0.189

**Wildwood Hills**  
**Time of Concentration Calculations (TR55)**

Calc By: SK  
 Date: 01/19/17

Sub-1B

**Sheet Flow**

<b>Input Data</b>	
Elev Start [ft]	7131
Elev End [ft]	7130
Length [ft]	24
n (Asphalt)	0.011
<b>OUTPUT</b>	
S [ft/ft]	0.04
Tt [hr]	0.006

**Shallow Concentrated Flow**

<b>Unpaved</b>	
Elev Start [ft]	7130
Elev End [ft]	7113
Length [ft]	490
<b>Output</b>	
S [ft/ft]	0.0347
V [ft/s]	3.01
Tt [min]	2.72
Tt [hr]	0.045

**Open Channel Flow**

<b>INPUT DATA:</b>	
Elev Start [ft]	7113
Elev End [ft]	7076
Length [ft]	1223
Bottom Width [ft]	1.50
Left Side Slope [ft]	1.00
Right Side Slope [ft]	0.50
Manning's n	0.020
Channel Slope [ft/ft]	0.0303
Depth [ft]	1.00
<b>OUTPUT DATA:</b>	
Top Width [ft]	3.00
Area [sf]	2.25
Wetted Perimeter [ft]	4.03
Hydraulic Radius	0.56
Velocity [fps]	8.76
Flow [cfs]	19.7
Tt [min]	2.33
Tt [hr]	0.039

Tc [hr]	0.090
Tc [min]	6.00 (Min. 6 min)
SCS Lag [hr]	0.054

**Wildwood Hills**  
**Time of Concentration Calculations (TR55)**

Calc By: SK  
 Date: 01/19/17

Sub-2A

**Sheet Flow**

Input Data	
Elev Start [ft]	7087.5
Elev End [ft]	7087
Length [ft]	24
n (Asphalt)	0.011
OUTPUT	
S [ft/ft]	0.02
Tt [hr]	0.008

**Shallow Concentrated Flow**

Unpaved	
Elev Start [ft]	7087
Elev End [ft]	7080
Length [ft]	452
Output	
S [ft/ft]	0.0155
V [ft/s]	2.01
Tt [min]	3.75
Tt [hr]	0.063

**Open Channel Flow**

INPUT DATA:	
Elev Start [ft]	7080
Elev End [ft]	7040
Length [ft]	988
Bottom Width [ft]	5.00
Left Side Slope [ft]	10.00
Right Side Slope [ft]	12.00
Manning's n	0.020
Channel Slope [ft/ft]	0.0405
Depth [ft]	1.00
OUTPUT DATA:	
Top Width [ft]	27.00
Area [sf]	16.00
Wetted Perimeter [ft]	27.09
Hydraulic Radius	0.59
Velocity [fps]	10.52
Flow [cfs]	168.4
Tt [min]	1.56
Tt [hr]	0.026

Tc [hr]	0.097
Tc [min]	10.00 (Min. 10 min)
SCS Lag [hr]	0.058

**Wildwood Hills**  
**Time of Concentration Calculations (TR55)**

Calc By: SK  
 Date: 01/19/17

Sub-2

**Sheet Flow**

<b>Input Data</b>	
Elev Start [ft]	7076
Elev End [ft]	7075
Length [ft]	33
n (short grass)	0.15
<b>OUTPUT</b>	
S [ft/ft]	0.03
Tt [hr]	0.072

**Shallow Concentrated Flow**

<b>Unpaved</b>	
Elev Start [ft]	7075
Elev End [ft]	7060
Length [ft]	389
<b>Output</b>	
S [ft/ft]	0.0386
V [ft/s]	3.17
Tt [min]	2.05
Tt [hr]	0.034

**Open Channel Flow**

<b>INPUT DATA:</b>	
Elev Start [ft]	7060
Elev End [ft]	7040
Length [ft]	375
Bottom Width [ft]	2.00
Left Side Slope [ft]	5.00
Right Side Slope [ft]	5.00
Manning's n	0.040
Channel Slope [ft/ft]	0.0533
Depth [ft]	1.00
<b>OUTPUT DATA:</b>	
Top Width [ft]	12.00
Area [sf]	7.00
Wetted Perimeter [ft]	12.20
Hydraulic Radius	0.57
Velocity [fps]	5.92
Flow [cfs]	41.5
Tt [min]	1.05
Tt [hr]	0.018

Tc [hr]	0.124
Tc [min]	7.42
SCS Lag [hr]	0.074

**Wildwood Hills**  
**Time of Concentration Calculations (TR55)**

Calc By: SK  
 Date: 01/19/17

Sub-3

**Sheet Flow**

Input Data	
Elev Start [ft]	7001
Elev End [ft]	6998
Length [ft]	80
n (short grass)	0.15
OUTPUT	
S [ft/ft]	0.04
Tt [hr]	0.134

**Shallow Concentrated Flow**

Unpaved	
Elev Start [ft]	6998
Elev End [ft]	6964
Length [ft]	404
Output	
S [ft/ft]	0.0842
V [ft/s]	4.68
Tt [min]	1.44
Tt [hr]	0.024

**Open Channel Flow**

INPUT DATA:	
Elev Start [ft]	6964
Elev End [ft]	6962
Length [ft]	104
Bottom Width [ft]	2.00
Left Side Slope [ft]	20.00
Right Side Slope [ft]	20.00
Manning's n	0.040
Channel Slope [ft/ft]	0.0192
Depth [ft]	1.00
OUTPUT DATA:	
Top Width [ft]	42.00
Area [sf]	22.00
Wetted Perimeter [ft]	42.05
Hydraulic Radius	0.52
Velocity [fps]	3.34
Flow [cfs]	73.6
Tt [min]	0.52
Tt [hr]	0.009

Tc [hr]	0.167
Tc [min]	10.02
SCS Lag [hr]	0.100

**Wildwood Hills**  
**Time of Concentration Calculations (TR55)**

Calc By: SK  
Date: 01/19/17

Sub-3A

**Sheet Flow**

Input Data	
Elev Start [ft]	7083
Elev End [ft]	7081
Length [ft]	92
n (short grass)	0.15
OUTPUT	
S [ft/ft]	0.02
Tt [hr]	0.187

**Shallow Concentrated Flow**

Unpaved	
Elev Start [ft]	7081
Elev End [ft]	7070
Length [ft]	506
Output	
S [ft/ft]	0.0217
V [ft/s]	2.38
Tt [min]	3.55
Tt [hr]	0.059

Tc [hr]	0.246
Tc [min]	14.76
SCS Lag [hr]	0.148

**Wildwood Hills**  
**Time of Concentration Calculations (TR55)**

Calc By: SK  
 Date: 01/19/17

Sub-3B

**Sheet Flow**

<b>Input Data</b>	
Elev Start [ft]	7081
Elev End [ft]	7080
Length [ft]	99
n (short grass)	0.15
<b>OUTPUT</b>	
S [ft/ft]	0.01
Tt [hr]	0.269

**Shallow Concentrated Flow**

<b>Unpaved</b>	
Elev Start [ft]	7080
Elev End [ft]	7076
Length [ft]	384
<b>Output</b>	
S [ft/ft]	0.0104
V [ft/s]	1.65
Tt [min]	3.89
Tt [hr]	0.065

**Open Channel Flow**

<b>INPUT DATA:</b>	
Elev Start [ft]	7076
Elev End [ft]	6962
Length [ft]	912
Bottom Width [ft]	5.00
Left Side Slope [ft]	20.00
Right Side Slope [ft]	20.00
Manning's n	0.040
Channel Slope [ft/ft]	0.1250
Depth [ft]	2.00
<b>OUTPUT DATA:</b>	
Top Width [ft]	85.00
Area [sf]	90.00
Wetted Perimeter [ft]	85.10
Hydraulic Radius	1.06
Velocity [fps]	13.63
Flow [cfs]	1227.1
Tt [min]	1.11
Tt [hr]	0.019

Tc [hr]	0.353
Tc [min]	21.16
SCS Lag [hr]	0.212

**Wildwood Hills**  
**Time of Concentration Calculations (TR55)**

Calc By: SK  
Date: 01/19/17

Sub-3C

**Sheet Flow**

Input Data	
Elev Start [ft]	7062
Elev End [ft]	7061
Length [ft]	80
n (short grass)	0.15
OUTPUT	
S [ft/ft]	0.01
Tt [hr]	0.209

**Shallow Concentrated Flow**

Paved	
Elev Start [ft]	7061
Elev End [ft]	7042
Length [ft]	653
Output	
S [ft/ft]	0.0291
V [ft/s]	3.47
Tt [min]	3.14
Tt [hr]	0.052

**Open Channel Flow**

INPUT DATA:	
Elev Start [ft]	7042
Elev End [ft]	7004
Length [ft]	386
Bottom Width [ft]	5.00
Left Side Slope [ft]	25.00
Right Side Slope [ft]	25.00
Manning's n	0.035
Channel Slope [ft/ft]	0.0984
Depth [ft]	1.00
OUTPUT DATA:	
Top Width [ft]	55.00
Area [sf]	30.00
Wetted Perimeter [ft]	55.04
Hydraulic Radius	0.55
Velocity [fps]	8.89
Flow [cfs]	266.7
Tt [min]	0.72
Tt [hr]	0.012

**Wildwood Hills**  
**Time of Concentration Calculations (TR55)**

Calc By: SK  
Date: 01/19/17

**Open Channel Flow**

**INPUT DATA:**

Elev Start [ft]	7004
Elev End [ft]	6968
Length [ft]	644
Bottom Width [ft]	2.00
Left Side Slope [ft]	5.00
Right Side Slope [ft]	5.00
Manning's n	0.016
Channel Slope [ft/ft]	0.0559
Depth [ft]	0.25

**OUTPUT DATA:**

Top Width [ft]	4.50
Area [sf]	0.81
Wetted Perimeter [ft]	4.55
Hydraulic Radius	0.18
Velocity [fps]	6.96
Flow [cfs]	5.7
Tt [min]	1.54
Tt [hr]	0.026

Tc [hr]	0.299
Tc [min]	17.92
SCS Lag [hr]	0.179

**Wildwood Hills**  
**Time of Concentration Calculations (TR55)**

Calc By: SK  
 Date: 01/19/17

Sub-4

**Sheet Flow**

Input Data	
Elev Start [ft]	7061
Elev End [ft]	7060
Length [ft]	90
n (short grass)	0.15
OUTPUT	
S [ft/ft]	0.01
Tt [hr]	0.240

**Shallow Concentrated Flow**

Paved	
Elev Start [ft]	7060
Elev End [ft]	6974
Length [ft]	1471
Output	
S [ft/ft]	0.0585
V [ft/s]	4.91
Tt [min]	4.99
Tt [hr]	0.083

**Open Channel Flow**

INPUT DATA:	
Elev Start [ft]	6974
Elev End [ft]	6962
Length [ft]	564
Bottom Width [ft]	5.00
Left Side Slope [ft]	25.00
Right Side Slope [ft]	25.00
Manning's n	0.040
Channel Slope [ft/ft]	0.0213
Depth [ft]	1.00
OUTPUT DATA:	
Top Width [ft]	55.00
Area [sf]	30.00
Wetted Perimeter [ft]	55.04
Hydraulic Radius	0.55
Velocity [fps]	3.62
Flow [cfs]	108.5
Tt [min]	2.60
Tt [hr]	0.043

Tc [hr]	0.367
Tc [min]	22.00
SCS Lag [hr]	0.220

**Wildwood Hills  
Mobile Home Park  
Drainage Area Summary**

Calc By: SK  
Date: 01/19/17

Drainage Area ID	Area		CN	Tc	Tlag=0.6*Tc
	acres	sq.miles			
Sub-1	7.87	0.012	86.62	15.47	0.155
Sub-1A	30.50	0.048	87.40	18.87	0.189
Sub-1B	3.11	0.005	92.75	6	0.060
Sub-2	5.13	0.008	81.67	7.42	0.074
Sub-2A	2.11	0.003	92.35	10	0.100
Sub-3	3.80	0.006	77.80	10.02	0.100
Sub-3A	5.53	0.009	78.50	14.76	0.148
Sub-3B	18.48	0.029	73.10	21.16	0.212
Sub-3C	16.34	0.026	88.29	17.92	0.179
Sub-4	13.46	0.021	81.06	22	0.220

```

1*****
*
*
*   FLOOD HYDROGRAPH PACKAGE (HEC-1) *
*       JAN 1997 *
*       VERSION 4.1 *
*
*   RUN DATE 26JAN17 TIME 17:43:22 *
*
*****

```

```

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

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```

X   X  XXXXXXXX  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  XXXXXXXX  XXXXX      XXX

```

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

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.

THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION

NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY, DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION

KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

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

\*\*\* FREE \*\*\*

\*DIAGRAM

```

1   ID   WILDWOOD HILLS
2   ID   Existing-Conditions HEC-1 Model
3   ID   100-year, 6-hour Model
4   ID   Woodson Engineering and Surveying Inc
5   ID   January 2017
6   ID   Original Model for Presidio in the Pines
7   ID   by TRC-BV Engineering
8   ID   November 2, 2004
9   ID   EXISTING CONDITION (WITHOUT DETENTION@WILWOOD HILLS MHP)
10  IT   5      0      0      300
11  IO   5      0      0
12  IN   5      0      0
*
13  KK   SUB-1
14  BA   0.012
15  PH   1      0.96   0.71   1.37   2.21   2.56   2.76   3.18
16  LS   0      86.62
17  UD   0.155
*
18  KK   RTRCH1
19  KM   ROUTE HYDROGRAPH FROM SUB-1 TO CP1

```

20	RS	8	FLOW	-1					
21	RC	0.050	0.035	0.050	1145	0.054			
22	RX	0	31	47	63	73	126	155	180
23	RY	48	46	44	43	43	46	48	54

\*

24	KK	SUB-2							
25	BA	0.008							
26	LS	0	81.67						
27	UD	0.074							

\*

28	KK	SUB-2A							
29	BA	0.003							
30	LS	0	92.35						
31	UD	0.1							

\*

32	KK	CP1A							
33	KM	COMBINE ROUTED HYDROGRAPHS FROM SUB-1, SUB-2 & SUB-2A							
34	HC	3							

\*

35	KK	RTRCH2							
36	KM	ROUTE HYDROGRAPH FROM CP1 TO CP2							
37	RS	8	FLOW	-1					
38	RC	0.050	0.035	0.050	465	0.073			
39	RX	0	35	52	87	117	157	203	248
40	RY	106	102	100	97	97	100	104	106

\*

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HEC-1 INPUT

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

41	KK	SUB-3B							
42	KM	RUNOFF FROM SUB-3B							
43	BA	.029							
44	LS	0	73.10						
45	UD	.212							

\*

46	KK	BASIN4							
47	KM	RUNOFF FROM BASIN 4							
48	BA	.002							
49	LS	0	83.56						
50	UD	.086							

\*

51	KK	RCP26							
52	KM	ROUTE CP26 TO CP27							
53	RK	400	0.01	0.016	0	21	10	10	

\*

54	KK	BASIN4A							
55	KM	RUNOFF FROM BASIN 4A							
56	BA	.002							
57	LS	0	86.0						
58	UD	.136							

\*

59	KK	CP27							
60	KM	COMBINE BASINS RCP26 & BASIN4A							
61	HC	2							

\*

```

62      KK  BASIN1A
63      KM  RUNOFF FROM BASIN 1A
64      BA  .001
65      LS  0    90.4
66      UD  .054
        *

67      KK  CP28
68      KM  COMBINE BASINS BASIN1A & CP27
69      HC  2
        *

70      KK  DB1
71      KM  DETENTION BASIN 1
72      RS  1    STOR    0
73      SV  0.0  0.02  0.09  0.15  0.23  0.31  0.39  0.40
74      SE  7052.8 7053.0 7053.5 7054.0 7054.5 7055.0 7055.5 7055.52
75      SQ  0.0  0.21  1.30  3.16  4.14  4.93  5.61  5.63
        *

```

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HEC-1 INPUT

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

```

76      KK  RDB1
77      KM  ROUTE DB1 TO CP30
78      RK  320  0.01  0.013  0  CIRC  0.5
        *

79      KK  BASIN4B
80      KM  RUNOFF FROM BASIN 4B
81      BA  .002
82      LS  0    87.81
83      UD  .071
        *

84      KK  BASIN3
85      KM  RUNOFF FROM BASIN 3
86      BA  .002
87      LS  0    90.80
88      UD  .071
        *

89      KK  SUB-1A
90      KM  SUB-1A IN PREVIOUS STUDIES WAS ROFF3
91      KM  RUNOFF FROM SUB-1A
92      BA  .048
93      LS  0    87.40
94      UD  .189
        *

95      KK  RSUB-1A
96      KM  ROUTE SUB-1A TO CP30
97      RK  1200  0.01  0.013  0  CIRC  2.5
        *

98      KK  SUB-1B
99      KM  RUNOFF FROM SUB-1B
100     BA  .005
101     LS  0    92.75
102     UD  .06
        *

103     KK  SUB-3A
104     KM  RUNOFF FROM SUB-3A
105     BA  .009

```

106 LS 0 78.50  
 107 UD .148  
 \*  
 108 KK CP30  
 109 KM COMBINE BASINS 3, 4B, DB1, & SUB-1A, SUB-1B  
 110 HC 6  
 \*

1

HEC-1 INPUT

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

111 KK RTRCH3  
 112 KM ROUTE HYDROGRAPH FROM CP30 TO CP2  
 113 RS 8 FLOW -1  
 114 RC 0.050 0.035 0.050 510 0.090  
 115 RX 0 17 33 62 87 93 105 150  
 116 RY 102 100 98 97 97 98 100 102  
 \*

117 KK CP2A  
 118 KM COMBINE ROUTED HYDROGRAPHS FROM CP30 &,CP1A WITH SUB-3B  
 119 HC 3  
 \*

120 KK RTRCH4  
 121 KM ROUTE HYDROGRAPH FROM CP2 TO CP3  
 122 RS 8 FLOW -1  
 123 RC 0.050 0.035 0.050 755 0.021  
 124 RX 0 33 50 114 169 210 260 288  
 125 RY 88 86 84 82 82 84 86 88  
 \*

126 KK SUB-3C  
 127 KM RUNOFF FROM SUB-3C  
 128 BA .026  
 129 LS 0 88.29  
 130 UD .179  
 \*

131 KK BASIN5  
 132 KM RUNOFF FROM BASIN 5  
 133 BA .001  
 134 LS 0 92.15  
 135 UD .085  
 \*

136 KK RBASIN5  
 137 KM ROUTE BASIN5 TO CP29  
 138 RK 182 0.01 0.016 0 21 10 10  
 \*

139 KK BASIN1  
 140 KM RUNOFF FROM BASIN 1  
 141 BA .002  
 142 LS 0 75.5  
 143 UD .050  
 \*

144 KK RBASIN1  
 145 KM ROUTE BASIN1 TO CP29  
 146 RK 100 0.02 0.016 0 21 10 10  
 \*

1

HEC-1 INPUT

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

```

147      KK  BASIN2
148      KM  RUNOFF FROM BASIN 2
149      BA  .004
150      LS  0   90.82
151      UD  .072
          *

152      KK  CP29
153      KM  COMBINE BASINS 1, 2, & 5 AT CP29
154      HC  3
          *

155      KK  RCP29
156      KM  ROUTE CP29 TO DB2
157      RK  400  0.02  0.016      0      27      10      10
          *

158      KK  DB2
159      KM  DETENTION BASIN 2
160      RS  1   STOR      0
161      SV  0.0  0.03  0.10  0.20  0.31  0.45  0.62  0.71
162      SE  7030.5  7031.0  7032.0  7033.0  7034.0  7035.0  7036.0  7036.5
163      SQ  0.0  0.3  0.7  0.9  1.1  1.25  1.39  1.46
          *

164      KK  RDB2
165      KM  ROUTE DB2 TO CP32
166      RK  100  0.08  0.032      0      10      6      6
          *

167      KK  BASIN4C
168      KM  RUNOFF FROM BASIN 4C
169      BA  .002
170      LS  0   76.8
171      UD  .054
          *

172      KK  CP32
173      KM  COMBINE BASIN BASIN4C AND DB2
174      HC  2
          *

175      KK  RTRCH5
176      KM  ROUTE HYDROGRAPH FROM CP32 TO CP3
177      RS  8   FLOW      -1
178      RC  0.050  0.035  0.050      670  0.090
179      RX  0   5   10   12   16   22   29   35
180      RY  98  97.6  97.4  97.3  97.3  97.4  97.6  98
          *

```

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HEC-1 INPUT

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

```

181      KK  CP3A
182      KM  COMBINE SUB-3C WITH ROUTED HYDROGRAPHS FROM CP32 WITH CP2A
183      HC  3
          *

184      KK  RTRCH6
185      KM  ROUTE HYDROGRAPH FROM CP3 TO CP4
186      RS  8   FLOW      -1
187      RC  0.050  0.035  0.050      470  0.017

```

188 RX 0 8 16 30 52 77 100 123  
 189 RY 68 67 66.5 66 66 66.5 67 68  
 \*

190 KK SUB3  
 191 BA 0.006  
 192 LS 0 77.80  
 193 UD 0.100  
 \*

194 KK CP4A  
 195 KM COMBINE ROUTED HYDROGRAPH FROM CP3 WITH SUB-3 HYDROGRAPH  
 196 HC 2  
 \*

197 KK ROFF2F  
 198 KM RUNOFF FROM BASIN ROFF2F  
 199 BA .010  
 200 LS 0 83.91  
 201 UD .105  
 \*

202 KK RROFF2F  
 203 KM ROUTE ROFF2F THRU CHANNEL TO PT7R  
 204 RK 3200 0.03 0.032 0 10 6 6  
 \*

205 KK ROFF2E  
 206 KM RUNOFF FROM BASIN ROFF2E  
 207 BA .021  
 208 LS 0 81.12  
 209 UD .220  
 \*

210 KK RROFF2E  
 211 KM ROUTE ROFF2E THRU CHANNEL TO PT7R  
 212 RK 1500 0.03 0.032 0 10 6 6  
 \*

213 KK ROFF1  
 214 KM RUNOFF FROM BASIN ROFF1  
 215 BA .423  
 216 LS 0 78.91  
 217 UD .538  
 \*

1

HEC-1 INPUT

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

218 KK CP33  
 219 KM COMBINE RROFF2F, RROFF2E & ROFF1  
 220 HC 3  
 \*

221 KK RCP33  
 222 KM ROUTE CP33 THRU CHANNEL TO PT8R  
 223 RK 447 0.03 0.032 0 10 6 6  
 \*

224 KK ROFF2C  
 225 KM RUNOFF FROM BASIN ROFF2C  
 226 BA .005  
 227 LS 0 80.99  
 228 UD .131  
 \*

229 KK RROFF2C  
 230 KM ROUTE ROFF2C THRU CHANNEL TO CP2D  
 231 RK 117 0.03 0.032 0 10 6 6  
 \*

232 KK ROFF2G  
 233 KM RUNOFF FROM BASIN ROFF2G  
 234 BA .007  
 235 LS 0 88.55  
 236 UD .292  
 \*

237 KK RROFF2G  
 238 KM ROUTE ROFF2G THRU CHANNEL TO CP2D(WORST CASE)  
 239 RK 1750 0.03 0.032 0 10 6 6  
 \*

240 KK ROFF2D  
 241 KM RUNOFF FROM BASIN ROFF2D  
 242 BA .006  
 243 LS 0 89.39  
 244 UD .164  
 \*

245 KK BASIN38  
 246 KM RUNOFF FROM BASIN 38  
 247 BA .005  
 248 LS 0 76.80  
 249 UD .070  
 \*

250 KKRBASIN38  
 251 KM ROUTE BASIN 38 THRU OFF2D TO CP2D  
 252 RK 1280 0.03 0.032 0 10 6 6  
 \*

1

HEC-1 INPUT

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

253 KK CP2D  
 254 KM COMBINE RROFF2C, ROFF2D, RROFF2G, RBASIN38  
 255 HC 4  
 \*

256 KK RCP2D  
 257 KM ROUTE RCP2D THRU 24" PIPE TO CP2B  
 258 RK 400 0.01 0.013 0 CIRC 2.0  
 \*

259 KK ROFF2B  
 260 KM RUNOFF FROM BASIN ROFF2B  
 261 BA .0010  
 262 LS 0 88.55  
 263 UD .052  
 \*

264 KK CP2B  
 265 KM COMBINE RCP2D & ROFF2B  
 266 HC 2  
 \*

267 KK RCP2B  
 268 KM ROUTE CP2B THRU 24" PIPE TO PT8B  
 269 RK 130 0.01 0.013 0 CIRC 2.0

\*

270 KK ROFF2A  
 271 KM RUNOFF FROM BASIN ROFF2A  
 272 BA .022  
 273 LS 0 81.62  
 274 UD .201

\*

275 KK RROFF2A  
 276 KM ROUTE ROFF2A THRU CHANNEL TO CP20  
 277 RK 100 0.03 0.032 0 10 6 6

\*

278 KK WASH1  
 279 KM RUNOFF FROM BASIN WASH1  
 280 BA .001  
 281 LS 0 77  
 282 UD .050

\*

283 KK CP20  
 284 KM COMBINE RCP33, WASH1, RROFF2A, RCP2B  
 285 HC 4

\*

HEC-1 INPUT

1

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

286 KK RCP20  
 287 KM ROUTE CP20 THRU CHANNEL TO CP23  
 288 RK 930 0.03 0.032 0 10 6 6

\*

289 KK BASIN37  
 290 KM RUNOFF FROM BASIN37  
 291 BA .003  
 292 LS 0 80.57  
 293 UD .098

\*

294 KKRBASIN37  
 295 KM ROUTE BASIN37 TO CP16  
 296 RK 800 0.04 0.016 0 27 10 10

\*

297 KK BASIN36  
 298 KM RUNOFF FROM BASIN 36  
 299 BA .012  
 300 LS 0 94.97  
 301 UD .153

\*

302 KK CP16  
 303 KM COMBINE RBASIN37 AND BASIN36  
 304 HC 2

\*

305 KK RCP16  
 306 KM ROUTE CP16 TO CP17  
 307 RK 200 0.04 0.016 0 30 10 10

\*

308 KK BASIN41  
 309 KM RUNOFF FROM BASIN41

```

310      BA      .005
311      LS       0   79.02
312      UD      .070
      *

313      KK      CP17
314      KM      COMBINE RCP16 AND BASIN41
315      HC       2
      *

316      KK      RCP17
317      KM      ROUTE CP17 THRU BASIN35 TO CP19
318      RK      760   0.01   0.016   0   30   10   10
      *

```

1

HEC-1 INPUT

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

```

319      KK      BASIN35
320      KM      RUNOFF FROM BASIN 35
321      BA      .004
322      LS       0   88.99
323      UD      .155
      *

324      KK      BASIN28
325      KM      RUNOFF FROM BASIN 28
326      BA      .001
327      LS       0   86.80
328      UD      .082
      *

329      KK      CP19
330      KM      COMBINE BASIN41, BASINS 35 & 28
331      HC       3
      *

332      KK      RCP19
333      KM      ROUTE CP19 THRU BASIN 30 TO CP21
334      RK      300   0.03   0.016   0   27   10   10
      *

335      KK      BASIN39
336      KM      RUNOFF FROM BASIN 39
337      BA      .001
338      LS       0   98
339      UD      .050
      *

340      KKR      BASIN39
341      KM      ROUTE BASIN39 TO CP12
342      RK      900   0.03   0.016   0   44   10   10
      *

343      KK      BASIN40
344      KM      RUNOFF FROM BASIN 40
345      BA      .002
346      LS       0   98
347      UD      .089
      *

348      KK      CP12
349      KM      COMBINE RBASIN30 & BASIN 40 AT CP12
350      HC       2
      *

```

351 KK RCP12  
 352 KM ROUTE CP12 TO CP13  
 353 RK 585 0.01 0.016 0 39 10 10  
 \*

1

HEC-1 INPUT

PAGE 11

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

354 KKAMPHITHEATER  
 355 KM RUNOFF FROM AMP  
 356 BA .004  
 357 LS 0 76.14  
 358 UD .050  
 \*

359 KK BASIN14  
 360 KM RUNOFF FROM BASIN 14  
 361 BA .001  
 362 LS 0 91.88  
 363 UD .065  
 \*

364 KK CP13  
 365 KM COMBINE RCP12, BASIN14 & AMPHITHEATER  
 366 HC 3  
 \*

367 KK RCP13  
 368 KM ROUTE CP13 TO CP14  
 369 RK 350 0.04 0.016 0 39 10 10  
 \*

370 KK BASIN16  
 371 KM RUNOFF FROM BASIN 16  
 372 BA .003  
 373 LS 0 91.40  
 374 UD .087  
 \*

375 KK CP14  
 376 KM COMBINE RCP13 & BASIN16 AT CP14  
 377 HC 2  
 \*

378 KK RCP14  
 379 KM ROUTE CP14 THRU CP18  
 380 RK 520 0.01 0.016 0 27 10 10  
 \*

381 KK BASIN33  
 382 KM RUNOFF FROM BASIN 33  
 383 BA .006  
 384 LS 0 93.41  
 385 UD .066  
 \*

386 KK BASIN34  
 387 KM RUNOFF FROM BASIN 34  
 388 BA .005  
 389 LS 0 88.11  
 390 UD .057  
 \*

1

HEC-1 INPUT

PAGE 12

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

```

391      KK      CP18
392      KM      COMBINE RCP14, BASIN33 & BASIN34 AT CP18
393      HC      3
          *

394      KK      RCP18
395      KM      ROUTE CP18 THRU BASIN 30 TO CP21
396      RK      340    0.01    0.016      0      27      10      10
          *

397      KK      BASIN30
398      KM      RUNOFF FROM BASIN30
399      BA      .004
400      LS      0      92.91
401      UD      .066
          *

402      KK      CP21
403      KM      COMBINE RCP19, RCP18 & BASIN30 AT CP21
404      HC      3
          *

405      KK      RCP21
406      KM      ROUTE CP21 TO CP31
407      RK      50     0.02    0.025      0      27      10      10
          *

408      KK      BASIN31
409      KM      RUNOFF FROM BASIN 31
410      BA      .001
411      LS      0      92.60
412      UD      .064
          *

413      KK      CP31
414      KM      COMBINE RCP21 & BASIN31 AT CP31
415      HC      2
          *

416      KK      DB4
417      KM      DETENTION BASIN 4 (KEY OUTLET)
418      RS      1      STOR      0
419      SV      0.0    0.7     1.5     2.4     3.3     4.2     4.7
420      SE      7005.0 7006.0 7007.0 7008.0 7009.0 7010.0 7010.5
421      SQ      0.0    0.7     2.1     6.9     12.5    16.0    17.5
          *

422      KK      RDB4
423      KM      ROUTE DB4 TO CP22
424      RK      250    0.02    0.013      0      CIRC     2.0
          *

```

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HEC-1 INPUT

PAGE 13

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

```

425      KK      BASIN32
426      KM      RUNOFF FROM BASIN 32
427      BA      .004
428      LS      0      92.60
429      UD      .071
          *

```

```

430      KK      CP22
431      KM      COMBINE BASINS 32 & RDB4 AT CP22
432      HC      2
         *

433      KK      RCP22
434      KM      ROUTE CP22 THRU CHANNEL TO CP23
435      RK      275      0.03      0.032      0      10      6      6
         *

436      KK      BASIN29
437      KM      RUNOFF FROM BASIN 29
438      BA      .001
439      LS      0      92
440      UD      .050
         *

441      KKR      BASIN29
442      KM      ROUTE BASIN29 THRU CHANNEL TO CP23
443      RK      600      0.03      0.032      0      10      6      6
         *

444      KKB      BASIN28A
445      KM      RUNOFF FROM BASIN 28A
446      BA      .001
447      LS      0      90.97
448      UD      .050
         *

449      KKR      BASIN28A
450      KM      ROUTE BASIN28A THRU CHANNEL TO CP23
451      RK      800      0.03      0.032      0      10      6      6
         *

452      KK      BASIN26
453      KM      RUNOFF FROM BASIN 26
454      BA      .002
455      LS      0      91.84
456      UD      .085
         *

457      KKR      BASIN26
458      KM      ROUTE BASIN26 THRU CHANNEL TO CP23
459      RK      200      0.03      0.032      0      10      6      6
         *

460      KK      BASIN24
461      KM      RUNOFF FROM BASIN 24
462      BA      .001
463      LS      0      92.30
464      UD      .050
         *

465      KKR      BASIN24
466      KM      ROUTE BASIN24 THRU CHANNEL TO CP23
467      RK      100      0.03      0.032      0      10      6      6
         *

468      KK      WASH2
469      KM      RUNOFF FROM BASIN WASH2
470      BA      .005
471      LS      0      76.75

```

1

HEC-1 INPUT

PAGE 14

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

```

472      UD      .106
         *

473      KK      CP23
474      KM      COMBINE RCP20, RCP22, RBASIN29, RBASIN28A, RBASIN26, RBASIN24 & WASH2
475      HC      7
         *

476      KK      RCP23
477      KM      ROUTE CP23 THRU CULVERT TO CP24
478      RK      100    0.03    0.032    0    20    3    3
         *

479      KK      BASIN27
480      KM      RUNOFF FROM BASIN27 - MODIFIED TO INCLUDE RUNOFF FROM BOULDER POINTE
481      BA      .006
482      LS      0    86.23
483      UD      .073
         *

484      KKR      BASIN27
485      KM      ROUTE BASIN27 TO CP25
486      RK      425    0.01    0.016    0    26    10    10
         *

487      KK      BASIN25
488      KM      RUNOFF FROM BASIN 25 - MODIFIED TO INCLUDE RUNOFF FROM BOULDER POINTE
489      BA      .003
490      LS      0    88.10
491      UD      .107
         *

492      KK      CP25
493      KM      COMBINE RBASIN27 & BASIN25 AT CP25
494      HC      2
         *

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                                         HEC-1 INPUT
                                         PAGE 15

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

495      KK      BASIN21
496      KM      RUNOFF FROM BASIN 21
497      BA      .003
498      LS      0    92.60
499      UD      .125
         *

500      KK      CP24
501      KM      COMBINE CP15, CP25 & RCP23
502      HC      3
         *

503      KK      RCP24
504      KM      ROUTE CP24 THRU CHANNEL TO CP11
505      RK      400    0.03    0.032    0    10    6    6
         *

506      KK      BASIN9
507      KM      RUNOFF FROM BASIN 9
508      BA      .003
509      LS      0    91.85
510      UD      .116
         *

511      KK      RBASIN9

```

```

512      KM      ROUTE BASIN 9 THRU BASIN8 TO CP1
513      RK      260    0.01  0.016    0    27    10    10
          *

514      KK      BASIN8
515      KM      RUNOFF FROM BASIN 8
516      BA      .003
517      LS      0    86.6
518      UD      .078
          *

519      KK      CP1
520      KM      COMBINE RBASIN9 & BASIN 8
521      HC      2
          *

522      KK      RCP1
523      KM      ROUTE CP1 THRU BASIN7 TO CP2
524      RK      160    0.02  0.016    0    27    10    10
          *

525      KK      BASIN7
526      KM      RUNOFF FROM BASIN 7
527      BA      .005
528      LS      0    89.15
529      UD      .138
          *

530      KK      CP2
531      KM      COMBINE RCP1 & BASIN7
532      HC      2
          *

533      KK      RCP2
534      KM      ROUTE CP2 THRU BASIN10 TO CP3
535      RK      185    0.05  0.016    0    36    10    10
          *

536      KK      BASIN10
537      KM      RUNOFF FROM BASIN10
538      BA      .004
539      LS      0    91.85
540      UD      .127
          *

541      KK      CP3
542      KM      COMBINE RCP2 & BASIN10
543      HC      2
          *

544      KK      RCP3
545      KM      ROUTE CP3 THRU BASIN11 TO CP4
546      RK      215    0.03  0.016    0    36    10    10
          *

547      KK      BASIN11
548      KM      RUNOFF FROM BASIN11
549      BA      .005
550      LS      0    92.60
551      UD      .125
          *

```

1

HEC-1 INPUT

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

552 KK CP4  
 553 KM COMBINE RCP4 & BASIN11  
 554 HC 2  
 \*  
  
 555 KK RCP4  
 556 KM ROUTE CP4 THRU BASIN13 TO CP5  
 557 RK 200 0.03 0.016 0 36 10 10  
 \*  
  
 558 KK BASIN13  
 559 KM RUNOFF FROM BASIN13  
 560 BA .002  
 561 LS 0 91.75  
 562 UD .096  
 \*

1

HEC-1 INPUT

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

563 KK BASIN6  
 564 KM RUNOFF FROM BASIN 6  
 565 BA .003  
 566 LS 0 92.32  
 567 UD .089  
 \*  
  
 568 KK CP5  
 569 KM COMBINE RCP4, BASIN13 & BASIN6  
 570 HC 3  
 \*  
  
 571 KK RCP5  
 572 KM ROUTE CP5 TO CP6  
 573 RK 475 0.02 0.016 0 24 10 10  
 \*  
  
 574 KKBASIN18A  
 575 KM RUNOFF FROM BASIN 18A  
 576 BA .001  
 577 LS 0 88.10  
 578 UD .052  
 \*  
  
 579 KK CP6  
 580 KM COMBINE RCP5 & BASIN18A  
 581 HC 2  
 \*  
  
 582 KK CP6  
 583 KM DIVERT FLOW TO CP10  
 584 DT DIVCP6  
 585 DI 0 38  
 586 DQ 0 4  
 \*  
  
 587 KKBASIN17A  
 588 KM RUNOFF FROM BASIN 17A  
 589 BA .001  
 590 LS 0 92.60  
 591 UD .050  
 \*  
  
 592 KK BASIN15  
 593 KM RUNOFF FROM BASIN15

594 BA .001  
 595 LS 0 92.60  
 596 UD .075  
 \*

1

HEC-1 INPUT

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

597 KKRBASIN15  
 598 KM ROUTE BASIN 15 THRU BASIN17 TO CP8  
 599 RK 255 0.02 0.016 0 24 10 10  
 \*

600 KK BASIN17  
 601 KM RUNOFF FROM BASIN17  
 602 BA .001  
 603 LS 0 92.60  
 604 UD .050  
 \*

605 KK CP8  
 606 KM COMBINE RBASIN15 & BASIN17  
 607 HC 2  
 \*

608 KK RCP8  
 609 KM ROUTE CP8 TO CP7  
 610 RK 40 0.02 0.016 0 24 10 10  
 \*

611 KK CP7  
 612 KM COMBINE BASINS BASIN17A & CP6  
 613 HC 3  
 \*

614 KK DB6  
 615 KM DETENTION BASIN 6 (KEY OUTLET)  
 616 RS 1 STOR 0  
 617 SV 0.0 0.1 0.2 0.4 0.5 0.7 1.0  
 618 SE 7034.0 7035.0 7036.0 7037.0 7038.0 7039.0 7040.0  
 619 SQ 0.0 0.8 1.25 3.44 4.89 21.87 89.53  
 \*

620 KK RDB6  
 621 KM ROUTE DB6 TO CP10  
 622 RK 800 0.02 0.016 0 24 10 10  
 \*

623 KK BASIN18  
 624 KM RETRIEVE DIVERSION FROM CP6  
 625 DR DIVCP6  
 \*

626 KK BASIN18  
 627 KM RUNOFF FROM BASIN 18  
 628 BA .002  
 629 LS 0 88.25  
 630 UD .099  
 \*

1

HEC-1 INPUT

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

631 KK BASIN18

```

632      KM      COMBINE DIVCP6 & BASIN18
633      HC        2
        *

634      KKR      BASIN18
635      KM      ROUTE BASIN18 THRU BASIN 19 TO CP10
636      RK      700    0.04    0.016    0    24    10    10
        *

637      KK      BASIN19
638      KM      RUNOFF FROM BASIN 19
639      BA      .004
640      LS      0    92.60
641      UD      .123
        *

642      KK      BASIN20
643      KM      RUNOFF FROM BASIN 20
644      BA      .002
645      LS      0    92.60
646      UD      .081
        *

647      KK      CP10
648      KM      COMBINE RCP6, RBASIN18, BASIN19 & BASIN20
649      HC        4
        *

650      KK      DB7
651      KM      DETENTION BASIN 1
652      RS      1    STOR    0
653      SV      0.0    0.01    0.04    0.10    0.14    0.17
654      SE      6998.0  6999.0  7000.0  7001.0  7001.5  7002.0
655      SQ      0.0    0.75    2.12    3.9    31.6    81.4
        *

656      KK      RDB7
657      KM      ROUTE DB7 TO CP11
658      RK      50    0.03    0.032    0    10    6    6
        *

659      KKB      BASIN25A
660      KM      RUNOFF FROM BASIN 25A - MODIFIED TO INCLUDE RUNOFF FROM BOULDER POINTE
661      BA      .002
662      LS      0    86.75
663      UD      .050
        *

```

1

HEC-1 INPUT

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

```

664      KK      BASIN22
665      KM      RUNOFF FROM BASIN 22
666      BA      .002
667      LS      0    88.25
668      UD      .064
        *

669      KK      BASIN23
670      KM      RUNOFF FROM BASIN 23
671      BA      .001
672      LS      0    88.25
673      UD      .050
        *

```

674 KK WASH3  
 675 KM RUNOFF FROM WASH3 - MODIFIED TO INCLUDE RUNOFF FROM BOULDER POINTE  
 676 BA .002  
 677 LS 0 77  
 678 UD .050  
 \*

679 KK SUB6A  
 680 KM RUNOFF FROM SUBAREA 6A IN BOULDER POINTE  
 681 BA .016  
 682 LS 0 86.33  
 683 UD .45  
 \*

684 KK DB6A  
 685 KM DETENTION BASIN FOR SUBAREA 6A IN BOULDER POINTE  
 686 RS 1 STOR 0  
 687 SV 0.0 0.0002 0.006 0.175 0.379 0.618  
 688 SE 7022.0 7023.9 7024.0 7025.0 7026.0 7027.0  
 689 SQ 0.0 0.0 0.0 1.7 5.8 13.3  
 \*

690 KK SUB2D  
 691 KM RUNOFF FROM SUBBASIN 2D IN BOULDER POINTE  
 692 BA .04  
 693 LS 0 85.0  
 694 UD .522  
 \*

695 KK CPBP  
 696 KM COMBINE DB6A AND SUBBASIN 2D  
 697 HC 2  
 \*

698 KK DB2D  
 699 KM DETENTION BASIN FOR SUBBASIN 2D IN BOULDER POINTE  
 700 RS 1 STOR 0  
 701 SV 0.0 0.285 0.570 0.866 1.184 1.525 1.888  
 702 SE 6991.0 6992.0 6993.0 6994.0 6995.0 6996.0 6997.0  
 703 SQ 0.0 3.0 8.5 17.72 29.84 44.15 182.3  
 \*

1

HEC-1 INPUT

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

704 KK CP11  
 705 KM COMBINE RCP24, RDB7, WASH3, BASINS 25, 23 & 22, AND DB2D  
 706 HC 7  
 \*

707 KK RTRCH7  
 708 KM ROUTE HYDROGRAPH FROM CP11 TO CP4  
 709 RS 8 FLOW -1  
 710 RC 0.050 0.035 0.050 961 0.023  
 711 RX 0 26 35 55 97 136 235 255  
 712 RY 80 78 76 74 74 76 78 80  
 \*

713 KK SUB4  
 714 BA 0.021  
 715 LS 0 81.06  
 716 UD 0.22  
 \*

717 KK CP4B

```

718      KM      ADD ROUTED HYDROGRAPH FROM CP11 TO SUB4 HYDROGRAPH
719      HC      2
      *

720      KK      CP4C
721      KM      ADD CP4A HYDROGRAPH TO CP4B HYDROGRAPH
722      HC      2
      *

723      KK      RTRCH8
724      KM      ROUTE HYDROGRAPH FROM CP4 TO CP5
725      RS      8      FLOW      -1
726      RC      0.050  0.035  0.050  880  0.009
727      RX      0      27      61      87      146      227      315      431
728      RY      68      66      60      59      59      60      62      66
      *

729      KK      SUB5
730      BA      0.034
731      LS      0      90.13
732      UD      0.099
      *

733      KK      CP5
734      KM      COMBINE ROUTED HYDROGRAPH FROM CP4 WITH SUB5 HYDROGRAPH
735      HC      2
      *
736      ZZ

```

1

SCHEMATIC DIAGRAM OF STREAM NETWORK

```

INPUT LINE      (V) ROUTING      (--->) DIVERSION OR PUMP FLOW
NO.      (.) CONNECTOR      (<---) RETURN OF DIVERTED OR PUMPED FLOW

13      SUB-1
      V
      V
18      RTRCH1
      .
      .
24      .      SUB-2
      .      .
      .      .
28      .      .      SUB-2A
      .      .      .
      .      .      .
32      CP1A.....
      V
      V
35      RTRCH2
      .
      .
41      .      SUB-3B
      .      .
      .      .
46      .      .      BASIN4
      .      .      V
      .      .      V
51      .      .      RCP26
      .      .      .
      .      .      .
54      .      .      .      BASIN4A
      .      .      .      .
      .      .      .      .
59      .      .      CP27.....

```

62	.	.	.	BASIN1A	.	.	.	.	.
67	.	.	CP28	.....	.	.	.	.	.
	.	.	V		.	.	.	.	.
70	.	.	V		.	.	.	.	.
	.	.	DB1		.	.	.	.	.
	.	.	V		.	.	.	.	.
76	.	.	V		.	.	.	.	.
	.	.	RDB1		.	.	.	.	.
79	.	.	.	BASIN4B	.	.	.	.	.
84	.	.	.	.	BASIN3	.	.	.	.
89	.	.	.	.	.	.	SUB-1A	.	.
	.	.	.	.	.	.	V	.	.
95	.	.	.	.	.	.	V	.	.
	.	.	.	.	.	.	RSUB-1A	.	.
98	.	.	.	.	.	.	.	SUB-1B	.
103	.	.	.	.	.	.	.	.	SUB-3A
108	.	.	CP30	.....	.	.	.	.	.
	.	.	V		.	.	.	.	.
111	.	.	V		.	.	.	.	.
	.	.	RTRCH3		.	.	.	.	.
117	CP2A	.....	.		.	.	.	.	.
	V		.		.	.	.	.	.
120	RTRCH4		.		.	.	.	.	.
126	.	SUB-3C	.		.	.	.	.	.
131	.	.	BASIN5		.	.	.	.	.
	.	.	V		.	.	.	.	.
136	.	.	V		.	.	.	.	.
	.	.	RBASIN5		.	.	.	.	.
139	.	.	.	BASIN1	.	.	.	.	.
	.	.	.	V	.	.	.	.	.
144	.	.	.	V	RBASIN1	.	.	.	.
	.	.	.	.	.	.	.	.	.
147	.	.	.	.	BASIN2	.	.	.	.
	.	.	.	.	.	.	.	.	.
152	.	.	CP29	.....	.	.	.	.	.
	.	.	V		.	.	.	.	.
155	.	.	V		.	.	.	.	.
	.	.	RCP29		.	.	.	.	.

	.	.	V	
	.	.	V	
158	.	.	DB2	
	.	.	V	
	.	.	V	
164	.	.	RDB2	
	.	.	.	
167	.	.	.	BASIN4C
	.	.	.	.
	.	.	.	.
172	.	.	CP32.....	
	.	.	V	
	.	.	V	
175	.	.	RTRCH5	
	.	.	.	
	.	.	.	
181	CP3A.....	.	.	
	V	.	.	
	V	.	.	
184	RTRCH6	.	.	
	.	.	.	
190	.	SUB3	.	
	.	.	.	
	.	.	.	
194	CP4A.....	.	.	
	.	.	.	
197	.	ROFF2F	.	
	.	V	.	
	.	V	.	
202	.	RROFF2F	.	
	.	.	.	
	.	.	.	
205	.	.	ROFF2E	
	.	.	V	
	.	.	V	
210	.	.	RROFF2E	
	.	.	.	
	.	.	.	
213	.	.	.	ROFF1
	.	.	.	.
	.	.	.	.
218	.	CP33.....	.	
	.	V	.	
	.	V	.	
221	.	RCP33	.	
	.	.	.	
	.	.	.	
224	.	.	ROFF2C	
	.	.	V	
	.	.	V	
229	.	.	RROFF2C	
	.	.	.	
	.	.	.	
232	.	.	.	ROFF2G
	.	.	.	V
	.	.	.	V
237	.	.	.	RROFF2G
	.	.	.	.
	.	.	.	.
240	.	.	.	ROFF2D
	.	.	.	.
	.	.	.	.
245	.	.	.	.
	.	.	.	BASIN38

	.	.	.	.	.	V
	.	.	.	.	.	V
250	.	.	.	.	.	RBASIN38
	.	.	.	.	.	.
	.	.	.	.	.	.
253	.	.	CP2D.....	.	.	.
	.	.	V	.	.	.
	.	.	V	.	.	.
256	.	.	RCP2D	.	.	.
	.	.	.	.	.	.
	.	.	.	.	.	.
259	.	.	.	ROFF2B	.	.
	.	.	.	.	.	.
	.	.	.	.	.	.
264	.	.	CP2B.....	.	.	.
	.	.	V	.	.	.
	.	.	V	.	.	.
267	.	.	RCP2B	.	.	.
	.	.	.	.	.	.
	.	.	.	.	.	.
270	.	.	.	ROFF2A	.	.
	.	.	.	V	.	.
	.	.	.	V	.	.
275	.	.	.	RROFF2A	.	.
	.	.	.	.	.	.
	.	.	.	.	.	.
278	.	.	.	.	WASH1	.
	.	.	.	.	.	.
	.	.	.	.	.	.
283	.	CP20.....	.	.	.	.
	.	V	.	.	.	.
	.	V	.	.	.	.
286	.	RCP20	.	.	.	.
	.	.	.	.	.	.
	.	.	.	.	.	.
289	.	BASIN37	.	.	.	.
	.	V	.	.	.	.
	.	V	.	.	.	.
294	.	RBASIN37	.	.	.	.
	.	.	.	.	.	.
	.	.	.	.	.	.
297	.	.	BASIN36	.	.	.
	.	.	.	.	.	.
	.	.	.	.	.	.
302	.	CP16.....	.	.	.	.
	.	V	.	.	.	.
	.	V	.	.	.	.
305	.	RCP16	.	.	.	.
	.	.	.	.	.	.
	.	.	.	.	.	.
308	.	.	BASIN41	.	.	.
	.	.	.	.	.	.
	.	.	.	.	.	.
313	.	CP17.....	.	.	.	.
	.	V	.	.	.	.
	.	V	.	.	.	.
316	.	RCP17	.	.	.	.
	.	.	.	.	.	.
	.	.	.	.	.	.
319	.	.	BASIN35	.	.	.
	.	.	.	.	.	.
	.	.	.	.	.	.
324	.	.	.	.	BASIN28	.
	.	.	.	.	.	.
	.	.	.	.	.	.
329	.	CP19.....	.	.	.	.

```

.      .      V
.      .      V
332    .      .      RCP19
.      .      .
.      .      .
335    .      .      .      BASIN39
.      .      .      .      V
.      .      .      .      V
340    .      .      .      RBASIN39
.      .      .      .
.      .      .      .
343    .      .      .      .      BASIN40
.      .      .      .      .
.      .      .      .      .
348    .      .      .      .      CP12.....
.      .      .      .      V
.      .      .      .      V
351    .      .      .      .      RCP12
.      .      .      .      .
.      .      .      .      .
354    .      .      .      .      AMPHITHE
.      .      .      .      .
.      .      .      .      .
359    .      .      .      .      .      BASIN14
.      .      .      .      .      .
.      .      .      .      .      .
364    .      .      .      .      CP13.....
.      .      .      .      V
.      .      .      .      V
367    .      .      .      .      RCP13
.      .      .      .      .
.      .      .      .      .
370    .      .      .      .      .      BASIN16
.      .      .      .      .      .
.      .      .      .      .      .
375    .      .      .      .      .      CP14.....
.      .      .      .      .      V
.      .      .      .      .      V
378    .      .      .      .      .      RCP14
.      .      .      .      .      .
.      .      .      .      .      .
381    .      .      .      .      .      .      BASIN33
.      .      .      .      .      .      .
.      .      .      .      .      .      .
386    .      .      .      .      .      .      .      BASIN34
.      .      .      .      .      .      .      .
.      .      .      .      .      .      .      .
391    .      .      .      .      .      .      .      CP18.....
.      .      .      .      .      .      .      V
.      .      .      .      .      .      .      V
394    .      .      .      .      .      .      .      RCP18
.      .      .      .      .      .      .      .
.      .      .      .      .      .      .      .
397    .      .      .      .      .      .      .      .      BASIN30
.      .      .      .      .      .      .      .      .
.      .      .      .      .      .      .      .      .
402    .      .      .      .      .      .      .      .      CP21.....
.      .      .      .      .      .      .      .      V
.      .      .      .      .      .      .      .      V
405    .      .      .      .      .      .      .      .      RCP21
.      .      .      .      .      .      .      .      .
.      .      .      .      .      .      .      .      .
408    .      .      .      .      .      .      .      .      .      BASIN31
.      .      .      .      .      .      .      .      .      .
.      .      .      .      .      .      .      .      .      .
413    .      .      .      .      .      .      .      .      .      CP31.....

```

416	.	.	V							
	.	.	V							
	.	.	DB4							
	.	.	V							
422	.	.	V							
	.	.	RDB4							
	.	.	.							
425	.	.	.	BASIN32						
	.	.	.	.						
	.	.	.	.						
430	.	.	CP22.....							
	.	.	V							
	.	.	V							
433	.	.	RCP22							
	.	.	.							
	.	.	.							
436	.	.	.	BASIN29						
	.	.	.	V						
	.	.	.	V						
441	.	.	.	RBASIN29						
	.	.	.	.						
	.	.	.	.						
444	.	.	.	.	BASIN28A					
	.	.	.	.	V					
	.	.	.	.	V					
449	.	.	.	.	RBASIN28					
	.	.	.	.	.					
	.	.	.	.	.					
452	.	.	.	.	.	BASIN26				
	.	.	.	.	.	V				
	.	.	.	.	.	V				
457	.	.	.	.	.	RBASIN26				
	.	.	.	.	.	.				
	.	.	.	.	.	.				
460	.	.	.	.	.	.	BASIN24			
	.	.	.	.	.	.	V			
	.	.	.	.	.	.	V			
465	.	.	.	.	.	.	RBASIN24			
	.	.	.	.	.	.	.			
	.	.	.	.	.	.	.			
468	.	.	.	.	.	.	.	WASH2		
	.	.	.	.	.	.	.	.		
	.	.	.	.	.	.	.	.		
473	.	.	CP23.....							
	.	.	V							
	.	.	V							
476	.	.	RCP23							
	.	.	.							
	.	.	.							
479	.	.	.	BASIN27						
	.	.	.	V						
	.	.	.	V						
484	.	.	.	RBASIN27						
	.	.	.	.						
	.	.	.	.						
487	.	.	.	.	BASIN25					
	.	.	.	.	.					
	.	.	.	.	.					
492	.	.	.	CP25.....						
	.	.	.	.						
	.	.	.	.						
495	.	.	.	.	BASIN21					
	.	.	.	.	.					
	.	.	.	.	.					
500	.	.	.	CP24.....						

```

.      V
.      V
503    RCP24
.
.
506    .      BASIN9
.      V
.      V
511    RBASIN9
.
.
514    .      BASIN8
.      .
.      .
519    CP1.....
.      V
.      V
522    RCP1
.
.
525    .      BASIN7
.      .
.      .
530    CP2.....
.      V
.      V
533    RCP2
.
.
536    .      BASIN10
.      .
.      .
541    CP3.....
.      V
.      V
544    RCP3
.
.
547    .      BASIN11
.      .
.      .
552    CP4.....
.      V
.      V
555    RCP4
.
.
558    .      BASIN13
.      .
.      .
563    .      BASIN6
.      .
.      .
568    CP5.....
.      V
.      V
571    RCP5
.
.
574    .      BASIN18A
.      .
.      .
579    CP6.....
.
.
584    .-----> DIVCP6

```

```

582      .      .      CP6
      .      .      .
587      .      .      .      BASIN17A
      .      .      .      .
592      .      .      .      .      BASIN15
      .      .      .      .      V
      .      .      .      .      V
597      .      .      .      .      RBASIN15
      .      .      .      .      .
600      .      .      .      .      .      BASIN17
      .      .      .      .      .      .
605      .      .      .      .      .      CP8.....
      .      .      .      .      .      V
      .      .      .      .      .      V
608      .      .      .      .      .      RCP8
      .      .      .      .      .      .
611      .      .      .      CP7.....
      .      .      .      .      V
      .      .      .      .      V
614      .      .      .      .      DB6
      .      .      .      .      V
      .      .      .      .      V
620      .      .      .      .      RDB6
      .      .      .      .      .
625      .      .      .      .      .      <----- DIVCP6
623      .      .      .      .      BASIN18
      .      .      .      .      .
626      .      .      .      .      .      BASIN18
      .      .      .      .      .      .
631      .      .      .      .      .      BASIN18.....
      .      .      .      .      .      V
      .      .      .      .      .      V
634      .      .      .      .      .      RBASIN18
      .      .      .      .      .      .
637      .      .      .      .      .      BASIN19
      .      .      .      .      .      .
642      .      .      .      .      .      .      BASIN20
      .      .      .      .      .      .      .
647      .      .      .      .      .      CP10.....
      .      .      .      .      .      V
      .      .      .      .      .      V
650      .      .      .      .      .      DB7
      .      .      .      .      .      V
      .      .      .      .      .      V
656      .      .      .      .      .      RDB7
      .      .      .      .      .      .
659      .      .      .      .      .      BASIN25A
      .      .      .      .      .      .
664      .      .      .      .      .      .      BASIN22
      .      .      .      .      .      .      .
669      .      .      .      .      .      .      BASIN23
      .      .      .      .      .      .      .

```



WILDWOOD HILLS  
Existing-Conditions HEC-1 Model  
100-year, 6-hour Model  
Woodson Engineering and Surveying Inc  
January 2017  
Original Model for Presidio in the Pines  
by TRC-BV Engineering  
November 2, 2004  
EXISTING CONDITION (WITHOUT DETENTION@WILWOOD HILLS MHP)

11 IO            OUTPUT CONTROL VARIABLES

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

IT                HYDROGRAPH TIME DATA

NMIN            5    MINUTES IN COMPUTATION INTERVAL  
IDATE           1    0    STARTING DATE  
ITIME           0000    STARTING TIME  
NQ              300    NUMBER OF HYDROGRAPH ORDINATES  
NDDATE          2    0    ENDING DATE  
NDTIME          0055    ENDING TIME  
ICENT           19    CENTURY MARK

COMPUTATION INTERVAL    .08 HOURS  
TOTAL TIME BASE        24.92 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

\*\*\* FDKRUT WARNING TIME STEP CALCULATION FAILED TO CONVERGE. STABILITY PROBLEMS MAY RESULT

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WARNING --- ROUTED OUTFLOW (    83. ) IS GREATER THAN MAXIMUM OUTFLOW (    81. ) IN STORAGE-OUTFLOW TABLE

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

TIME OF STAGE +	OPERATION	STATION	PEAK	TIME OF	AVERAGE FLOW FOR MAXIMUM PERIOD			BASIN	MAXIMUM	MAX
			FLOW	PEAK	6-HOUR	24-HOUR	72-HOUR	AREA	STAGE	
	HYDROGRAPH AT									
+		SUB-1	24.	3.25	2.	1.	1.	.01		
	ROUTED TO									
+		RTRCH1	24.	3.25	2.	1.	1.	.01		
+										43.23
3.25										
	HYDROGRAPH AT									
+		SUB-2	16.	3.17	1.	0.	0.	.01		
	HYDROGRAPH AT									
+		SUB-2A	9.	3.17	1.	0.	0.	.00		
	3 COMBINED AT									
+		CP1A	42.	3.17	4.	1.	1.	.02		
	ROUTED TO									
+		RTRCH2	42.	3.25	4.	1.	1.	.02		
+										97.19
3.25										
	HYDROGRAPH AT									
+		SUB-3B	25.	3.33	3.	1.	1.	.03		
	HYDROGRAPH AT									
+		BASIN4	4.	3.17	0.	0.	0.	.00		
	ROUTED TO									
+		RCP26	4.	3.17	0.	0.	0.	.00		
	HYDROGRAPH AT									
+		BASIN4A	4.	3.17	0.	0.	0.	.00		
	2 COMBINED AT									
+		CP27	9.	3.17	1.	0.	0.	.00		
	HYDROGRAPH AT									
+		BASIN1A	3.	3.08	0.	0.	0.	.00		
	2 COMBINED AT									
+		CP28	11.	3.17	1.	0.	0.	.01		
	ROUTED TO									
+		DB1	4.	3.42	1.	0.	0.	.01		
+										7054.40
3.42										
	ROUTED TO									
+		RDB1	4.	3.42	1.	0.	0.	.01		
	HYDROGRAPH AT									
+		BASIN4B	5.	3.08	0.	0.	0.	.00		
	HYDROGRAPH AT									
+		BASIN3	6.	3.08	0.	0.	0.	.00		
	HYDROGRAPH AT									
+		SUB-1A	95.	3.25	10.	2.	2.	.05		

+	ROUTED TO	RSUB-1A	93.	3.25	10.	2.	2.	.05	
+	HYDROGRAPH AT	SUB-1B	18.	3.08	1.	0.	0.	.00	
+	HYDROGRAPH AT	SUB-3A	13.	3.25	1.	0.	0.	.01	
+	6 COMBINED AT	CP30	124.	3.25	14.	4.	3.	.07	
+	ROUTED TO	RTRCH3	124.	3.25	14.	4.	3.	.07	97.52
+	3 COMBINED AT	CP2A	191.	3.25	22.	5.	5.	.12	
+	ROUTED TO	RTRCH4	188.	3.25	22.	5.	5.	.12	82.65
+	HYDROGRAPH AT	SUB-3C	55.	3.25	6.	1.	1.	.03	
+	HYDROGRAPH AT	BASIN5	3.	3.17	0.	0.	0.	.00	
+	ROUTED TO	RBASIN5	3.	3.17	0.	0.	0.	.00	
+	HYDROGRAPH AT	BASIN1	4.	3.08	0.	0.	0.	.00	
+	ROUTED TO	RBASIN1	3.	3.08	0.	0.	0.	.00	
+	HYDROGRAPH AT	BASIN2	12.	3.08	1.	0.	0.	.00	
+	3 COMBINED AT	CP29	18.	3.08	1.	0.	0.	.01	
+	ROUTED TO	RCP29	17.	3.17	1.	0.	0.	.01	
+	ROUTED TO	DB2	1.	3.83	1.	0.	0.	.01	7035.26
+	ROUTED TO	RDB2	1.	3.83	1.	0.	0.	.01	
+	HYDROGRAPH AT	BASIN4C	4.	3.08	0.	0.	0.	.00	
+	2 COMBINED AT	CP32	4.	3.08	1.	0.	0.	.01	
+	ROUTED TO	RTRCH5	5.	3.17	1.	0.	0.	.01	



+		ROFF2B	3.	3.08	0.	0.	0.	.00
	2 COMBINED AT							
+		CP2B	37.	3.25	5.	1.	1.	.02
	ROUTED TO							
+		RCP2B	37.	3.25	5.	1.	1.	.02
	HYDROGRAPH AT							
+		ROFF2A	32.	3.25	4.	1.	1.	.02
	ROUTED TO							
+		RROFF2A	32.	3.25	4.	1.	1.	.02
	HYDROGRAPH AT							
+		WASH1	2.	3.08	0.	0.	0.	.00
	4 COMBINED AT							
+		CP20	347.	3.58	73.	18.	18.	.50
	ROUTED TO							
+		RCP20	345.	3.58	73.	18.	18.	.50
	HYDROGRAPH AT							
+		BASIN37	6.	3.17	0.	0.	0.	.00
	ROUTED TO							
+		RBASIN37	5.	3.17	0.	0.	0.	.00
	HYDROGRAPH AT							
+		BASIN36	34.	3.17	3.	1.	1.	.01
	2 COMBINED AT							
+		CP16	39.	3.17	4.	1.	1.	.02
	ROUTED TO							
+		RCP16	38.	3.17	4.	1.	1.	.02
	HYDROGRAPH AT							
+		BASIN41	9.	3.17	1.	0.	0.	.00
	2 COMBINED AT							
+		CP17	47.	3.17	5.	1.	1.	.02
	ROUTED TO							
+		RCP17	44.	3.17	5.	1.	1.	.02
	HYDROGRAPH AT							
+		BASIN35	9.	3.17	1.	0.	0.	.00
	HYDROGRAPH AT							
+		BASIN28	3.	3.17	0.	0.	0.	.00
	3 COMBINED AT							
+		CP19	55.	3.17	6.	1.	1.	.03
	ROUTED TO							
+		RCP19	54.	3.25	6.	1.	1.	.03
	HYDROGRAPH AT							
+		BASIN39	4.	3.08	0.	0.	0.	.00
	ROUTED TO							
+		RBASIN39	4.	3.08	0.	0.	0.	.00
	HYDROGRAPH AT							

+		BASIN40	7.	3.17	1.	0.	0.	.00
	2 COMBINED AT							
+		CP12	11.	3.17	1.	0.	0.	.00
	ROUTED TO							
+		RCP12	10.	3.17	1.	0.	0.	.00
	HYDROGRAPH AT							
+		AMPHITHE	7.	3.08	0.	0.	0.	.00
	HYDROGRAPH AT							
+		BASIN14	3.	3.08	0.	0.	0.	.00
	3 COMBINED AT							
+		CP13	19.	3.08	2.	0.	0.	.01
	ROUTED TO							
+		RCP13	19.	3.17	2.	0.	0.	.01
	HYDROGRAPH AT							
+		BASIN16	9.	3.17	1.	0.	0.	.00
	2 COMBINED AT							
+		CP14	28.	3.17	2.	1.	1.	.01
	ROUTED TO							
+		RCP14	28.	3.17	2.	1.	1.	.01
	HYDROGRAPH AT							
+		BASIN33	21.	3.08	2.	0.	0.	.01
	HYDROGRAPH AT							
+		BASIN34	16.	3.08	1.	0.	0.	.00
	3 COMBINED AT							
+		CP18	60.	3.08	5.	1.	1.	.02
	ROUTED TO							
+		RCP18	58.	3.17	5.	1.	1.	.02
	HYDROGRAPH AT							
+		BASIN30	14.	3.08	1.	0.	0.	.00
	3 COMBINED AT							
+		CP21	124.	3.17	12.	3.	3.	.05
	ROUTED TO							
+		RCP21	124.	3.17	12.	3.	3.	.05
	HYDROGRAPH AT							
+		BASIN31	3.	3.08	0.	0.	0.	.00
	2 COMBINED AT							
+		CP31	127.	3.17	12.	3.	3.	.05
	ROUTED TO							
+		DB4	16.	3.75	9.	3.	3.	.05
+								
3.75								
	ROUTED TO							
+		RDB4	16.	3.75	9.	3.	3.	.05
	HYDROGRAPH AT							
+		BASIN32	13.	3.08	1.	0.	0.	.00

7009.87

+	2 COMBINED AT							
		CP22	17.	3.17	10.	3.	3.	.06
	ROUTED TO							
+		RCP22	17.	3.50	10.	3.	3.	.06
	HYDROGRAPH AT							
+		BASIN29	4.	3.08	0.	0.	0.	.00
	ROUTED TO							
+		RBASIN29	3.	3.17	0.	0.	0.	.00
	HYDROGRAPH AT							
+		BASIN28A	4.	3.08	0.	0.	0.	.00
	ROUTED TO							
+		RBASIN28	3.	3.17	0.	0.	0.	.00
	HYDROGRAPH AT							
+		BASIN26	6.	3.17	0.	0.	0.	.00
	ROUTED TO							
+		RBASIN26	6.	3.17	0.	0.	0.	.00
	HYDROGRAPH AT							
+		BASIN24	4.	3.08	0.	0.	0.	.00
	ROUTED TO							
+		RBASIN24	4.	3.08	0.	0.	0.	.00
	HYDROGRAPH AT							
+		WASH2	8.	3.17	1.	0.	0.	.00
	7 COMBINED AT							
+		CP23	365.	3.58	84.	22.	21.	.57
	ROUTED TO							
+		RCP23	365.	3.58	84.	22.	21.	.57
	HYDROGRAPH AT							
+		BASIN27	15.	3.08	1.	0.	0.	.01
	ROUTED TO							
+		RBASIN27	15.	3.17	1.	0.	0.	.01
	HYDROGRAPH AT							
+		BASIN25	8.	3.17	1.	0.	0.	.00
	2 COMBINED AT							
+		CP25	23.	3.17	2.	0.	0.	.01
	HYDROGRAPH AT							
+		BASIN21	9.	3.17	1.	0.	0.	.00
	3 COMBINED AT							
+		CP24	371.	3.58	87.	22.	22.	.58
	ROUTED TO							
+		RCP24	370.	3.58	87.	22.	22.	.58
	HYDROGRAPH AT							
+		BASIN9	9.	3.17	1.	0.	0.	.00
	ROUTED TO							
+		RBASIN9	8.	3.17	1.	0.	0.	.00

+	HYDROGRAPH AT	BASIN8	8.	3.17	1.	0.	0.	.00
+	2 COMBINED AT	CP1	16.	3.17	1.	0.	0.	.01
+	ROUTED TO	RCP1	16.	3.17	1.	0.	0.	.01
+	HYDROGRAPH AT	BASIN7	12.	3.17	1.	0.	0.	.00
+	2 COMBINED AT	CP2	28.	3.17	2.	1.	1.	.01
+	ROUTED TO	RCP2	28.	3.17	2.	1.	1.	.01
+	HYDROGRAPH AT	BASIN10	11.	3.17	1.	0.	0.	.00
+	2 COMBINED AT	CP3	39.	3.17	3.	1.	1.	.02
+	ROUTED TO	RCP3	38.	3.17	3.	1.	1.	.02
+	HYDROGRAPH AT	BASIN11	14.	3.17	1.	0.	0.	.00
+	2 COMBINED AT	CP4	53.	3.17	5.	1.	1.	.02
+	ROUTED TO	RCP4	52.	3.17	5.	1.	1.	.02
+	HYDROGRAPH AT	BASIN13	6.	3.17	0.	0.	0.	.00
+	HYDROGRAPH AT	BASIN6	9.	3.17	1.	0.	0.	.00
+	3 COMBINED AT	CP5	67.	3.17	6.	1.	1.	.02
+	ROUTED TO	RCP5	66.	3.17	6.	2.	1.	.02
+	HYDROGRAPH AT	BASIN18A	3.	3.08	0.	0.	0.	.00
+	2 COMBINED AT	CP6	68.	3.17	6.	2.	1.	.03
+	DIVERSION TO	DIVCP6	7.	3.17	1.	0.	0.	.03
+	HYDROGRAPH AT	CP6	61.	3.17	6.	1.	1.	.03
+	HYDROGRAPH AT	BASIN17A	4.	3.08	0.	0.	0.	.00
+	HYDROGRAPH AT	BASIN15	3.	3.08	0.	0.	0.	.00



+		SUB6A	18.	3.50	3.	1.	1.	.02	
	ROUTED TO								
+		DB6A	12.	3.92	3.	1.	1.	.02	7026.76
+									
3.92									
	HYDROGRAPH AT								
+		SUB2D	39.	3.58	7.	2.	2.	.04	
	2 COMBINED AT								
+		CPBP	49.	3.67	11.	3.	3.	.06	
	ROUTED TO								
+		DB2D	37.	4.00	10.	3.	3.	.06	6995.51
+									
4.00									
	7 COMBINED AT								
+		CP11	419.	3.58	107.	28.	27.	.68	
	ROUTED TO								
+		RTRCH7	419.	3.67	107.	28.	27.	.68	75.16
+									
3.67									
	HYDROGRAPH AT								
+		SUB4	28.	3.33	3.	1.	1.	.02	
	2 COMBINED AT								
+		CP4B	432.	3.58	111.	28.	27.	.70	
	2 COMBINED AT								
+		CP4C	639.	3.33	140.	36.	35.	.86	
	ROUTED TO								
+		RTRCH8	650.	3.33	140.	36.	35.	.86	60.28
+									
3.33									
	HYDROGRAPH AT								
+		SUB5	97.	3.17	8.	2.	2.	.03	
	2 COMBINED AT								
+		CP5	693.	3.33	148.	38.	37.	.90	
+									
1									

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

ISTAQ	ELEMENT	DT	PEAK	TIME TO PEAK	VOLUME	INTERPOLATED TO COMPUTATION INTERVAL			
						DT	PEAK	TIME TO PEAK	VOLUME
		(MIN)	(CFS)	(MIN)	(IN)	(MIN)	(CFS)	(MIN)	(IN)
RCP26	MANE	.70	4.38	190.83	1.63	5.00	4.30	190.00	1.63

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1735E+00 EXCESS= .0000E+00 OUTFLOW= .1737E+00 BASIN STORAGE= .2919E-09 PERCENT  
ERROR= -.1

RDB1	MANE	.33	3.95	205.78	1.81	5.00	3.94	205.00	1.81
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CONTINUITY SUMMARY (AC-FT) - INFLOW= .4835E+00 EXCESS= .0000E+00 OUTFLOW= .4835E+00 BASIN STORAGE= .1222E-08 PERCENT  
ERROR= .0

RSUB-1A	MANE	.57	94.55	195.84	1.92	5.00	92.96	195.00	1.93
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CONTINUITY SUMMARY (AC-FT) - INFLOW= .4922E+01 EXCESS= .0000E+00 OUTFLOW= .4923E+01 BASIN STORAGE= .4157E-11 PERCENT  
ERROR= .0

RBASIN5	MANE	.36	3.04	190.19	2.34	5.00	3.03	190.00	2.34
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CONTINUITY SUMMARY (AC-FT) - INFLOW= .1247E+00 EXCESS= .0000E+00 OUTFLOW= .1247E+00 BASIN STORAGE= .1421E-10 PERCENT  
ERROR= .0

RBASIN1	MANE	.25	3.47	185.32	1.10	5.00	3.38	185.00	1.11
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CONTINUITY SUMMARY (AC-FT) - INFLOW= .1177E+00 EXCESS= .0000E+00 OUTFLOW= .1177E+00 BASIN STORAGE= .1001E-11 PERCENT  
ERROR= .0

RCP29	MANE	.39	18.15	186.01	1.92	5.00	17.43	190.00	1.92
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CONTINUITY SUMMARY (AC-FT) - INFLOW= .7157E+00 EXCESS= .0000E+00 OUTFLOW= .7159E+00 BASIN STORAGE= .1944E-09 PERCENT  
ERROR= .0

RDB2	MANE	.18	1.29	235.35	1.92	5.00	1.29	235.00	1.92
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CONTINUITY SUMMARY (AC-FT) - INFLOW= .7179E+00 EXCESS= .0000E+00 OUTFLOW= .7178E+00 BASIN STORAGE= .6276E-07 PERCENT  
ERROR= .0

RROFF2F	MANE	3.06	21.38	195.63	1.66	5.00	20.45	195.00	1.66
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CONTINUITY SUMMARY (AC-FT) - INFLOW= .8813E+00 EXCESS= .0000E+00 OUTFLOW= .8840E+00 BASIN STORAGE= .4257E-06 PERCENT  
ERROR= -.3

RROFF2E	MANE	1.40	28.04	200.84	1.46	5.00	28.04	200.00	1.45
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CONTINUITY SUMMARY (AC-FT) - INFLOW= .1630E+01 EXCESS= .0000E+00 OUTFLOW= .1631E+01 BASIN STORAGE= .2528E-07 PERCENT  
ERROR= -.1

RCP33	MANE	.23	317.53	220.31	1.32	5.00	317.46	220.00	1.33
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CONTINUITY SUMMARY (AC-FT) - INFLOW= .3207E+02 EXCESS= .0000E+00 OUTFLOW= .3207E+02 BASIN STORAGE= .1518E-06 PERCENT  
ERROR= .0

RROFF2C	MANE	.27	8.51	190.43	1.45	5.00	8.35	190.00	1.45
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CONTINUITY SUMMARY (AC-FT) - INFLOW= .3858E+00 EXCESS= .0000E+00 OUTFLOW= .3857E+00 BASIN STORAGE= .3433E-11 PERCENT  
ERROR= .0

RROFF2G MANE 1.99 11.36 205.52 2.02 5.00 11.36 205.00 2.02

CONTINUITY SUMMARY (AC-FT) - INFLOW= .7534E+00 EXCESS= .0000E+00 OUTFLOW= .7542E+00 BASIN STORAGE= .7116E-07 PERCENT  
ERROR= -.1

RBASIN38 MANE 1.62 7.93 192.80 1.18 5.00 7.76 190.00 1.18

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3147E+00 EXCESS= .0000E+00 OUTFLOW= .3159E+00 BASIN STORAGE= .2028E-07 PERCENT  
ERROR= -.4

RCP2D MANE .19 35.80 195.36 1.73 5.00 35.61 195.00 1.73

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2124E+01 EXCESS= .0000E+00 OUTFLOW= .2124E+01 BASIN STORAGE= .4710E-08 PERCENT  
ERROR= .0

RCP2B MANE .18 36.88 195.12 1.74 5.00 36.87 195.00 1.74

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2233E+01 EXCESS= .0000E+00 OUTFLOW= .2233E+01 BASIN STORAGE= .1586E-08 PERCENT  
ERROR= .0

RROFF2A MANE .09 32.33 195.19 1.49 5.00 32.12 195.00 1.49

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1748E+01 EXCESS= .0000E+00 OUTFLOW= .1748E+01 BASIN STORAGE= .2360E-11 PERCENT  
ERROR= .0

RCP20 MANE .53 346.30 216.14 1.35 5.00 344.66 215.00 1.35

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3613E+02 EXCESS= .0000E+00 OUTFLOW= .3614E+02 BASIN STORAGE= .5032E-06 PERCENT  
ERROR= .0

RBASIN37 MANE .70 5.66 191.49 1.42 5.00 5.34 190.00 1.42

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2269E+00 EXCESS= .0000E+00 OUTFLOW= .2272E+00 BASIN STORAGE= .5088E-09 PERCENT  
ERROR= -.1

RCP16 MANE .17 38.86 190.31 2.38 5.00 38.40 190.00 2.38

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1901E+01 EXCESS= .0000E+00 OUTFLOW= .1901E+01 BASIN STORAGE= .2570E-09 PERCENT  
ERROR= .0

RCP17 MANE .71 46.75 191.81 2.11 5.00 44.06 190.00 2.12

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2254E+01 EXCESS= .0000E+00 OUTFLOW= .2255E+01 BASIN STORAGE= .5177E-08 PERCENT  
ERROR= -.1

RCP19 MANE .24 55.42 190.60 2.10 5.00 54.33 195.00 2.10

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2798E+01 EXCESS= .0000E+00 OUTFLOW= .2798E+01 BASIN STORAGE= .3153E-08 PERCENT  
ERROR= .0

RBASIN39	MANE	1.02	4.29	186.78	2.95	5.00	3.65	185.00	2.95
----------	------	------	------	--------	------	------	------	--------	------

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1568E+00 EXCESS= .0000E+00 OUTFLOW= .1571E+00 BASIN STORAGE= .1087E-08 PERCENT  
ERROR= -.2

RCP12	MANE	.70	10.49	191.34	2.95	5.00	10.45	190.00	2.95
-------	------	-----	-------	--------	------	------	-------	--------	------

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4709E+00 EXCESS= .0000E+00 OUTFLOW= .4716E+00 BASIN STORAGE= .4566E-08 PERCENT  
ERROR= -.1

RCP13	MANE	.31	19.40	185.86	1.97	5.00	19.09	190.00	1.97
-------	------	-----	-------	--------	------	------	-------	--------	------

CONTINUITY SUMMARY (AC-FT) - INFLOW= .8390E+00 EXCESS= .0000E+00 OUTFLOW= .8390E+00 BASIN STORAGE= .2597E-08 PERCENT  
ERROR= .0

RCP14	MANE	.63	27.85	190.38	2.05	5.00	27.78	190.00	2.06
-------	------	-----	-------	--------	------	------	-------	--------	------

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1204E+01 EXCESS= .0000E+00 OUTFLOW= .1204E+01 BASIN STORAGE= .1123E-07 PERCENT  
ERROR= .0

RCP18	MANE	.41	60.10	186.04	2.15	5.00	58.17	190.00	2.15
-------	------	-----	-------	--------	------	------	-------	--------	------

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2522E+01 EXCESS= .0000E+00 OUTFLOW= .2522E+01 BASIN STORAGE= .1064E-07 PERCENT  
ERROR= .0

RCP21	MANE	.06	124.20	190.08	2.15	5.00	124.10	190.00	2.15
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CONTINUITY SUMMARY (AC-FT) - INFLOW= .5842E+01 EXCESS= .0000E+00 OUTFLOW= .5841E+01 BASIN STORAGE= .2505E-08 PERCENT  
ERROR= .0

RDB4	MANE	.19	15.55	225.37	2.02	5.00	15.55	225.00	2.02
------	------	-----	-------	--------	------	------	-------	--------	------

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5606E+01 EXCESS= .0000E+00 OUTFLOW= .5606E+01 BASIN STORAGE= .2330E-03 PERCENT  
ERROR= .0

RCP22	MANE	.28	16.96	190.54	2.05	5.00	16.92	210.00	2.05
-------	------	-----	-------	--------	------	------	-------	--------	------

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6113E+01 EXCESS= .0000E+00 OUTFLOW= .6113E+01 BASIN STORAGE= .3413E-03 PERCENT  
ERROR= .0

RBASIN29	MANE	.98	3.71	187.23	2.33	5.00	3.08	190.00	2.33
----------	------	-----	------	--------	------	------	------	--------	------

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1240E+00 EXCESS= .0000E+00 OUTFLOW= .1243E+00 BASIN STORAGE= .1016E-08 PERCENT  
ERROR= -.2

RBASIN28 MANE 1.27 3.49 188.30 2.24 5.00 3.12 190.00 2.23

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1189E+00 EXCESS= .0000E+00 OUTFLOW= .1192E+00 BASIN STORAGE= .3199E-08 PERCENT  
ERROR= -.3

RBASIN26 MANE .37 6.02 190.32 2.31 5.00 6.01 190.00 2.31

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2463E+00 EXCESS= .0000E+00 OUTFLOW= .2464E+00 BASIN STORAGE= .1408E-10 PERCENT  
ERROR= .0

RBASIN24 MANE .31 3.79 185.28 2.35 5.00 3.72 185.00 2.36

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1255E+00 EXCESS= .0000E+00 OUTFLOW= .1255E+00 BASIN STORAGE= .2131E-11 PERCENT  
ERROR= .0

RCP23 MANE .18 365.23 215.24 1.43 5.00 365.07 215.00 1.43

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4320E+02 EXCESS= .0000E+00 OUTFLOW= .4320E+02 BASIN STORAGE= .1479E-03 PERCENT  
ERROR= .0

RBASIN27 MANE .51 14.85 186.13 1.83 5.00 14.72 190.00 1.84

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5853E+00 EXCESS= .0000E+00 OUTFLOW= .5858E+00 BASIN STORAGE= .2367E-09 PERCENT  
ERROR= -.1

RCP24 MANE .29 370.35 215.60 1.44 5.00 369.76 215.00 1.44

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4449E+02 EXCESS= .0000E+00 OUTFLOW= .4449E+02 BASIN STORAGE= .9536E-03 PERCENT  
ERROR= .0

RBASIN9 MANE .42 8.64 190.76 2.31 5.00 8.43 190.00 2.32

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3696E+00 EXCESS= .0000E+00 OUTFLOW= .3697E+00 BASIN STORAGE= .4332E-10 PERCENT  
ERROR= .0

RCP1 MANE .27 15.83 190.17 2.09 5.00 15.78 190.00 2.09

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6678E+00 EXCESS= .0000E+00 OUTFLOW= .6678E+00 BASIN STORAGE= .5839E-10 PERCENT  
ERROR= .0

RCP2 MANE .16 27.78 190.17 2.08 5.00 27.62 190.00 2.08

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1220E+01 EXCESS= .0000E+00 OUTFLOW= .1220E+01 BASIN STORAGE= .8024E-10 PERCENT  
ERROR= .0

RCP3 MANE .27 38.59 190.25 2.14 5.00 38.29 190.00 2.14

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1714E+01 EXCESS= .0000E+00 OUTFLOW= .1714E+01 BASIN STORAGE= .1868E-09 PERCENT  
ERROR= .0

RCP4 MANE .13 52.63 190.31 2.20 5.00 52.16 190.00 2.21

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2350E+01 EXCESS= .0000E+00 OUTFLOW= .2350E+01 BASIN STORAGE= .2461E-09 PERCENT  
ERROR= .0

RCP5 MANE .43 66.69 190.55 2.23 5.00 65.52 190.00 2.23

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2975E+01 EXCESS= .0000E+00 OUTFLOW= .2975E+01 BASIN STORAGE= .1404E-08 PERCENT  
ERROR= .0

RBASIN15 MANE .42 3.16 186.15 2.38 5.00 3.06 190.00 2.39

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1270E+00 EXCESS= .0000E+00 OUTFLOW= .1270E+00 BASIN STORAGE= .1544E-10 PERCENT  
ERROR= .0

RCP8 MANE .12 6.81 185.15 2.38 5.00 6.77 185.00 2.39

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2543E+00 EXCESS= .0000E+00 OUTFLOW= .2543E+00 BASIN STORAGE= .5657E-11 PERCENT  
ERROR= .0

RDB6 MANE .61 60.10 195.93 2.03 5.00 58.02 195.00 2.04

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3142E+01 EXCESS= .0000E+00 OUTFLOW= .3143E+01 BASIN STORAGE= .1388E-05 PERCENT  
ERROR= .0

RBASIN18 MANE .48 12.35 190.78 5.04 5.00 11.91 190.00 5.05

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5374E+00 EXCESS= .0000E+00 OUTFLOW= .5377E+00 BASIN STORAGE= .9610E-09 PERCENT  
ERROR= -.1

RDB7 MANE .13 82.77 195.11 2.26 5.00 82.68 195.00 2.26

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4452E+01 EXCESS= .0000E+00 OUTFLOW= .4452E+01 BASIN STORAGE= .1403E-06 PERCENT  
ERROR= .0

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

```

1*****
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1)
*   JAN 1997
*   VERSION 4.1
*
* RUN DATE 07FEB17 TIME 09:47:57
*
*****

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

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

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

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE. THE DEFINITION OF -AMSK- 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

\*\*\* FREE \*\*\*

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*DIAGRAM
1 ID WILDWOOD HILLS
2 ID Existing-Conditions HEC-1 Model
3 ID 100-year, 6-hour Model
4 ID Woodson Engineering and Surveying Inc
5 ID January 2017
6 ID Original Model for Presidio in the Pines
7 ID by TRC-BV Engineering (November 2, 2004)
8 ID PROPOSED CONDITION (WITH DETENTION@WILWOOD HILLS MHP)
9 IT 5 0 0 300
10 IO 5 0 0
11 IN 5 0 0
*
12 KK SUB-1
13 BA 0.012
14 PH 1 0.96 0.71 1.37 2.21 2.56 2.76 3.18
15 LS 0 86.62
16 UD 0.155
*
17 KK RTRCH1
18 KM ROUTE HYDROGRAPH FROM SUB-1 TO CP1
19 RS 8 FLOW -1
20 RC 0.050 0.035 0.050 1145 0.054
21 RX 0 31 47 63 73 126 155 180
22 RY 48 46 44 43 43 46 48 54
*
23 KK SUB-2
24 BA 0.008
25 LS 0 81.67
26 UD 0.074
*
27 KK SUB-2A

```

```

28      BA    0.003
29      LS     0   92.35
30      UD     0.1
      *

31      KK    CP1A
32      KM      COMBINE ROUTED HYDROGRAPHS FROM SUB-1,SUB-2 & SUB-2A
33      HC       3
      *

34      KK    RTRCH2
35      KM      ROUTE HYDROGRAPH FROM CP1 TO CP2
36      RS       8   FLOW      -1
37      RC    0.050  0.035  0.050   465  0.073
38      RX     0    35    52    87    117    157    203    248
39      RY    106    102    100    97    97    100    104    106
      *

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HEC-1 INPUT

PAGE 2

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

```

40      KK    SUB-3B
41      KM      RUNOFF FROM SUB-3B
42      BA     .029
43      LS     0   73.10
44      UD     .212
      *

45      KK    BASIN4
46      KM      RUNOFF FROM BASIN 4
47      BA     .002
48      LS     0   83.56
49      UD     .086
      *

50      KK    RCP26
51      KM      ROUTE CP26 TO CP27
52      RK    400  0.01  0.016    0    21    10    10
      *

53      KK    BASIN4A
54      KM      RUNOFF FROM BASIN 4A
55      BA     .002
56      LS     0   86.0
57      UD     .136
      *

58      KK    CP27
59      KM      COMBINE BASINS RCP26 & BASIN4A
60      HC       2
      *

61      KK    BASIN1A
62      KM      RUNOFF FROM BASIN 1A
63      BA     .001
64      LS     0   90.4
65      UD     .054
      *

66      KK    CP28
67      KM      COMBINE BASINS BASIN1A & CP27
68      HC       2
      *

69      KK    DB1
70      KM      DETENTION BASIN 1
71      RS     1   STOR      0
72      SV    0.0  0.02  0.09  0.15  0.23  0.31  0.39  0.40
73      SE  7052.8  7053.0  7053.5  7054.0  7054.5  7055.0  7055.5  7055.52
74      SQ    0.0  0.21  1.30  3.16  4.14  4.93  5.61  5.63
      *

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HEC-1 INPUT

PAGE 3

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

```

75      KK      RDB1
76      KM      ROUTE DB1 TO CP30
77      RK      320      0.01      0.013      0      CIRC      0.5
          *

78      KK      BASIN4B
79      KM      RUNOFF FROM BASIN 4B
80      BA      .002
81      LS      0      87.81
82      UD      .071
          *

83      KK      BASIN3
84      KM      RUNOFF FROM BASIN 3
85      BA      .002
86      LS      0      90.80
87      UD      .071
          *

88      KK      SUB-1A
89      KM      SUB-1A IN PREVIOUS STUDIES WAS ROFF3
90      KM      RUNOFF FROM SUB-1A
91      BA      .048
92      LS      0      87.40
93      UD      .189
          *

94      KK      RSUB-1A
95      KM      ROUTE SUB-1A TO CP30
96      RK      1200      0.01      0.013      0      CIRC      2.5
          *

97      KK      SUB-1B
98      KM      RUNOFF FROM SUB-1B
99      BA      .005
100     LS      0      92.75
101     UD      .06
          *

102     KK      SUB-3A
103     KM      RUNOFF FROM SUB-3A
104     BA      .009
105     LS      0      78.50
106     UD      .148
          *

107     KK      CP30
108     KM      COMBINE BASINS 3, 4B, DB1, & SUB-1A, SUB-1B
109     HC      6
          *

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1

HEC-1 INPUT

PAGE 4

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

```

110     KK      RTRCH3
111     KM      ROUTE HYDROGRAPH FROM CP30 TO CP2
112     RS      8      FLOW      -1
113     RC      0.050      0.035      0.050      510      0.090
114     RX      0      17      33      62      87      93      105      150
115     RY      102      100      98      97      97      98      100      102
          *

116     KK      CP2A
117     KM      COMBINE ROUTED HYDROGRAPHS FROM CP30 & ,CP1A WITH SUB-3B
118     HC      3
          *

119     KK      DBWWH
120     KM      DETENTION BASIN AT WILDWOOD HILLS-Sce-5
121     RS      1      STOR      0
122     SV      0.0      0.63      1.32      2.09      2.93      3.89      4.97
123     SE      6988.0      6989.0      6990.0      6991.0      6992.0      6993.0      6994.0

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124 SQ 0.0 9.32 32.31 52.41 64.90 75.34 84.51  
\*

125 KK RTRCH4  
126 KM ROUTE HYDROGRAPH FROM CP2 TO CP3  
127 RS 8 FLOW -1  
128 RC 0.050 0.035 0.050 755 0.021  
129 RX 0 33 50 114 169 210 260 288  
130 RY 88 86 84 82 82 84 86 88  
\*

131 KK SUB-3C  
132 KM RUNOFF FROM SUB-3C  
133 BA .026  
134 LS 0 88.29  
135 UD .179  
\*

136 KK BASIN5  
137 KM RUNOFF FROM BASIN 5  
138 BA .001  
139 LS 0 92.15  
140 UD .085  
\*

141 KK RBASIN5  
142 KM ROUTE BASIN5 TO CP29  
143 RK 182 0.01 0.016 0 21 10 10  
\*

144 KK BASIN1  
145 KM RUNOFF FROM BASIN 1  
146 BA .002  
147 LS 0 75.5  
148 UD .050  
\*

1

HEC-1 INPUT

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

149 KK RBASIN1  
150 KM ROUTE BASIN1 TO CP29  
151 RK 100 0.02 0.016 0 21 10 10  
\*

152 KK BASIN2  
153 KM RUNOFF FROM BASIN 2  
154 BA .004  
155 LS 0 90.82  
156 UD .072  
\*

157 KK CP29  
158 KM COMBINE BASINS 1, 2, & 5 AT CP29  
159 HC 3  
\*

160 KK RCP29  
161 KM ROUTE CP29 TO DB2  
162 RK 400 0.02 0.016 0 27 10 10  
\*

163 KK DB2  
164 KM DETENTION BASIN 2  
165 RS 1 STOR 0  
166 SV 0.0 0.03 0.10 0.20 0.31 0.45 0.62 0.71  
167 SE 7030.5 7031.0 7032.0 7033.0 7034.0 7035.0 7036.0 7036.5  
168 SQ 0.0 0.3 0.7 0.9 1.1 1.25 1.39 1.46  
\*

169 KK RDB2  
170 KM ROUTE DB2 TO CP32  
171 RK 100 0.08 0.032 0 10 6 6  
\*

```

172 KK BASIN4C
173 KM RUNOFF FROM BASIN 4C
174 BA .002
175 LS 0 76.8
176 UD .054
*

177 KK CP32
178 KM COMBINE BASIN BASIN4C AND DB2
179 HC 2
*

180 KK RTRCH5
181 KM ROUTE HYDROGRAPH FROM CP32 TO CP3
182 RS 8 FLOW -1
183 RC 0.050 0.035 0.050 670 0.090
184 RX 0 5 10 12 16 22 29 35
185 RY 98 97.6 97.4 97.3 97.3 97.4 97.6 98
*

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HEC-1 INPUT

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

```

186 KK CP3A
187 KM COMBINE SUB-3C WITH ROUTED HYDROGRAPHS FROM CP32 WITH CP2A
188 HC 3
*

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189 KK RTRCH6
190 KM ROUTE HYDROGRAPH FROM CP3 TO CP4
191 RS 8 FLOW -1
192 RC 0.050 0.035 0.050 470 0.017
193 RX 0 8 16 30 52 77 100 123
194 RY 68 67 66.5 66 66 66.5 67 68
*

```

```

195 KK SUB3
196 BA 0.006
197 LS 0 77.80
198 UD 0.100
*

```

```

199 KK CP4A
200 KM COMBINE ROUTED HYDROGRAPH FROM CP3 WITH SUB-3 HYDROGRAPH
201 HC 2
*

```

```

202 KK ROFF2F
203 KM RUNOFF FROM BASIN ROFF2F
204 BA .010
205 LS 0 83.91
206 UD .105
*

```

```

207 KK RROFF2F
208 KM ROUTE ROFF2F THRU CHANNEL TO PT7R
209 RK 3200 0.03 0.032 0 10 6 6
*

```

```

210 KK ROFF2E
211 KM RUNOFF FROM BASIN ROFF2E
212 BA .021
213 LS 0 81.12
214 UD .220
*

```

```

215 KK RROFF2E
216 KM ROUTE ROFF2E THRU CHANNEL TO PT7R
217 RK 1500 0.03 0.032 0 10 6 6
*

```

```

218 KK ROFF1
219 KM RUNOFF FROM BASIN ROFF1

```

220 BA .423  
 221 LS 0 78.91  
 222 UD .538

\*

HEC-1 INPUT

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

223 KK CP33  
 224 KM COMBINE RROFF2F, RROFF2E & ROFF1  
 225 HC 3

\*

226 KK RCP33  
 227 KM ROUTE CP33 THRU CHANNEL TO PT8R  
 228 RK 447 0.03 0.032 0 10 6 6

\*

229 KK ROFF2C  
 230 KM RUNOFF FROM BASIN ROFF2C  
 231 BA .005  
 232 LS 0 80.99  
 233 UD .131

\*

234 KK RROFF2C  
 235 KM ROUTE ROFF2C THRU CHANNEL TO CP2D  
 236 RK 117 0.03 0.032 0 10 6 6

\*

237 KK ROFF2G  
 238 KM RUNOFF FROM BASIN ROFF2G  
 239 BA .007  
 240 LS 0 88.55  
 241 UD .292

\*

242 KK RROFF2G  
 243 KM ROUTE ROFF2G THRU CHANNEL TO CP2D(WORST CASE)  
 244 RK 1750 0.03 0.032 0 10 6 6

\*

245 KK ROFF2D  
 246 KM RUNOFF FROM BASIN ROFF2D  
 247 BA .006  
 248 LS 0 89.39  
 249 UD .164

\*

250 KK BASIN38  
 251 KM RUNOFF FROM BASIN 38  
 252 BA .005  
 253 LS 0 76.80  
 254 UD .070

\*

255 KKRBASIN38  
 256 KM ROUTE BASIN 38 THRU OFF2D TO CP2D  
 257 RK 1280 0.03 0.032 0 10 6 6

\*

HEC-1 INPUT

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

258 KK CP2D  
 259 KM COMBINE RROFF2C, ROFF2D, RROFF2G, RBASIN38  
 260 HC 4

\*

261 KK RCP2D  
 262 KM ROUTE RCP2D THRU 24" PIPE TO CP2B  
 263 RK 400 0.01 0.013 0 CIRC 2.0

\*

```

264      KK  ROFF2B
265      KM  RUNOFF FROM BASIN ROFF2B
266      BA  .0010
267      LS  0   88.55
268      UD  .052
      *

269      KK  CP2B
270      KM  COMBINE RCP2D & ROFF2B
271      HC  2
      *

272      KK  RCP2B
273      KM  ROUTE CP2B THRU 24" PIPE TO PT8B
274      RK  130  0.01  0.013  0   CIRC  2.0
      *

275      KK  ROFF2A
276      KM  RUNOFF FROM BASIN ROFF2A
277      BA  .022
278      LS  0   81.62
279      UD  .201
      *

280      KK  RROFF2A
281      KM  ROUTE ROFF2A THRU CHANNEL TO CP20
282      RK  100  0.03  0.032  0   10   6   6
      *

283      KK  WASH1
284      KM  RUNOFF FROM BASIN WASH1
285      BA  .001
286      LS  0   77
287      UD  .050
      *

288      KK  CP20
289      KM  COMBINE RCP33, WASH1, RROFF2A, RCP2B
290      HC  4
      *

291      KK  RCP20
292      KM  ROUTE CP20 THRU CHANNEL TO CP23
293      RK  930  0.03  0.032  0   10   6   6
      *

294      KK  BASIN37
295      KM  RUNOFF FROM BASIN37
296      BA  .003
297      LS  0   80.57
298      UD  .098
      *

299      KKRBASIN37
300      KM  ROUTE BASIN37 TO CP16
301      RK  800  0.04  0.016  0   27   10  10
      *

302      KK  BASIN36
303      KM  RUNOFF FROM BASIN 36
304      BA  .012
305      LS  0   94.97
306      UD  .153
      *

307      KK  CP16
308      KM  COMBINE RBASIN37 AND BASIN36
309      HC  2
      *

```

1

HEC-1 INPUT

PAGE 9

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

310 KK RCP16  
 311 KM ROUTE CP16 TO CP17  
 312 RK 200 0.04 0.016 0 30 10 10  
 \*

313 KK BASIN41  
 314 KM RUNOFF FROM BASIN41  
 315 BA .005  
 316 LS 0 79.02  
 317 UD .070  
 \*

318 KK CP17  
 319 KM COMBINE RCP16 AND BASIN41  
 320 HC 2  
 \*

321 KK RCP17  
 322 KM ROUTE CP17 THRU BASIN35 TO CP19  
 323 RK 760 0.01 0.016 0 30 10 10  
 \*

1

HEC-1 INPUT

PAGE 10

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

324 KK BASIN35  
 325 KM RUNOFF FROM BASIN 35  
 326 BA .004  
 327 LS 0 88.99  
 328 UD .155  
 \*

329 KK BASIN28  
 330 KM RUNOFF FROM BASIN 28  
 331 BA .001  
 332 LS 0 86.80  
 333 UD .082  
 \*

334 KK CP19  
 335 KM COMBINE BASIN41, BASINS 35 & 28  
 336 HC 3  
 \*

337 KK RCP19  
 338 KM ROUTE CP19 THRU BASIN 30 TO CP21  
 339 RK 300 0.03 0.016 0 27 10 10  
 \*

340 KK BASIN39  
 341 KM RUNOFF FROM BASIN 39  
 342 BA .001  
 343 LS 0 98  
 344 UD .050  
 \*

345 KKRBASIN39  
 346 KM ROUTE BASIN39 TO CP12  
 347 RK 900 0.03 0.016 0 44 10 10  
 \*

348 KK BASIN40  
 349 KM RUNOFF FROM BASIN 40  
 350 BA .002  
 351 LS 0 98  
 352 UD .089  
 \*

353 KK CP12  
 354 KM COMBINE RBASIN30 & BASIN 40 AT CP12  
 355 HC 2  
 \*

356 KK RCP12

357 KM ROUTE CP12 TO CP13  
 358 RK 585 0.01 0.016 0 39 10 10  
 \*

HEC-1 INPUT

1

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

359 KKAMPHITHEATER  
 360 KM RUNOFF FROM AMP  
 361 BA .004  
 362 LS 0 76.14  
 363 UD .050  
 \*  
 364 KK BASIN14  
 365 KM RUNOFF FROM BASIN 14  
 366 BA .001  
 367 LS 0 91.88  
 368 UD .065  
 \*  
 369 KK CP13  
 370 KM COMBINE RCP12, BASIN14 & AMPHITHEATER  
 371 HC 3  
 \*

372 KK RCP13  
 373 KM ROUTE CP13 TO CP14  
 374 RK 350 0.04 0.016 0 39 10 10  
 \*

375 KK BASIN16  
 376 KM RUNOFF FROM BASIN 16  
 377 BA .003  
 378 LS 0 91.40  
 379 UD .087  
 \*

380 KK CP14  
 381 KM COMBINE RCP13 & BASIN16 AT CP14  
 382 HC 2  
 \*

383 KK RCP14  
 384 KM ROUTE CP14 THRU CP18  
 385 RK 520 0.01 0.016 0 27 10 10  
 \*

386 KK BASIN33  
 387 KM RUNOFF FROM BASIN 33  
 388 BA .006  
 389 LS 0 93.41  
 390 UD .066  
 \*

391 KK BASIN34  
 392 KM RUNOFF FROM BASIN 34  
 393 BA .005  
 394 LS 0 88.11  
 395 UD .057  
 \*

HEC-1 INPUT

1

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

396 KK CP18  
 397 KM COMBINE RCP14, BASIN33 & BASIN34 AT CP18  
 398 HC 3  
 \*

399 KK RCP18  
 400 KM ROUTE CP18 THRU BASIN 30 TO CP21  
 401 RK 340 0.01 0.016 0 27 10 10

```

*
402      KK  BASIN30
403      KM  RUNOFF FROM BASIN30
404      BA  .004
405      LS  0   92.91
406      UD  .066
*

407      KK  CP21
408      KM  COMBINE RCP19, RCP18 & BASIN30 AT CP21
409      HC  3
*

410      KK  RCP21
411      KM  ROUTE CP21 TO CP31
412      RK  50  0.02  0.025      0      27      10      10
*

413      KK  BASIN31
414      KM  RUNOFF FROM BASIN 31
415      BA  .001
416      LS  0   92.60
417      UD  .064
*

418      KK  CP31
419      KM  COMBINE RCP21 & BASIN31 AT CP31
420      HC  2
*

421      KK  DB4
422      KM  DETENTION BASIN 4 (KEY OUTLET)
423      RS  1   STOR      0
424      SV  0.0   0.7   1.5   2.4   3.3   4.2   4.7
425      SE 7005.0 7006.0 7007.0 7008.0 7009.0 7010.0 7010.5
426      SQ  0.0   0.7   2.1   6.9   12.5  16.0  17.5
*

427      KK  RDB4
428      KM  ROUTE DB4 TO CP22
429      RK  250  0.02  0.013      0   CIRC      2.0
*

1
                                     HEC-1 INPUT
                                     PAGE 13

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

430      KK  BASIN32
431      KM  RUNOFF FROM BASIN 32
432      BA  .004
433      LS  0   92.60
434      UD  .071
*

435      KK  CP22
436      KM  COMBINE BASINS 32 & RDB4 AT CP22
437      HC  2
*

438      KK  RCP22
439      KM  ROUTE CP22 THRU CHANNEL TO CP23
440      RK  275  0.03  0.032      0   10      6      6
*

441      KK  BASIN29
442      KM  RUNOFF FROM BASIN 29
443      BA  .001
444      LS  0   92
445      UD  .050
*

446      KK  RBASIN29
447      KM  ROUTE BASIN29 THRU CHANNEL TO CP23
448      RK  600  0.03  0.032      0   10      6      6

```

```

*
449      KKBASIN28A
450      KM      RUNOFF FROM BASIN 28A
451      BA      .001
452      LS      0    90.97
453      UD      .050
*

454      KKBASIN28A
455      KM      ROUTE BASIN28A THRU CHANNEL TO CP23
456      RK      800    0.03    0.032    0    10    6    6
*

457      KK BASIN26
458      KM      RUNOFF FROM BASIN 26
459      BA      .002
460      LS      0    91.84
461      UD      .085
*

462      KKBASIN26
463      KM      ROUTE BASIN26 THRU CHANNEL TO CP23
464      RK      200    0.03    0.032    0    10    6    6
*

1
                                     HEC-1 INPUT
                                     PAGE 14

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

465      KK BASIN24
466      KM      RUNOFF FROM BASIN 24
467      BA      .001
468      LS      0    92.30
469      UD      .050
*

470      KKBASIN24
471      KM      ROUTE BASIN24 THRU CHANNEL TO CP23
472      RK      100    0.03    0.032    0    10    6    6
*

473      KK WASH2
474      KM      RUNOFF FROM BASIN WASH2
475      BA      .005
476      LS      0    76.75
477      UD      .106
*

478      KK CP23
479      KM      COMBINE RCP20, RCP22, RBASIN29, RBASIN28A, RBASIN26, RBASIN24 & WASH2
480      HC      7
*

481      KK RCP23
482      KM      ROUTE CP23 THRU CULVERT TO CP24
483      RK      100    0.03    0.032    0    20    3    3
*

484      KK BASIN27
485      KM      RUNOFF FROM BASIN27 - MODIFIED TO INCLUDE RUNOFF FROM BOULDER POINTE
486      BA      .006
487      LS      0    86.23
488      UD      .073
*

489      KKBASIN27
490      KM      ROUTE BASIN27 TO CP25
491      RK      425    0.01    0.016    0    26    10    10
*

492      KK BASIN25
493      KM      RUNOFF FROM BASIN 25 - MODIFIED TO INCLUDE RUNOFF FROM BOULDER POINTE
494      BA      .003
495      LS      0    88.10

```

496 UD .107  
 \*  
 497 KK CP25  
 498 KM COMBINE RBASIN27 & BASIN25 AT CP25  
 499 HC 2  
 \*

1

HEC-1 INPUT

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

500 KK BASIN21  
 501 KM RUNOFF FROM BASIN 21  
 502 BA .003  
 503 LS 0 92.60  
 504 UD .125  
 \*  
 505 KK CP24  
 506 KM COMBINE CP15, CP25 & RCP23  
 507 HC 3  
 \*  
 508 KK RCP24  
 509 KM ROUTE CP24 THRU CHANNEL TO CP11  
 510 RK 400 0.03 0.032 0 10 6 6  
 \*  
 511 KK BASIN9  
 512 KM RUNOFF FROM BASIN 9  
 513 BA .003  
 514 LS 0 91.85  
 515 UD .116  
 \*  
 516 KK RBASIN9  
 517 KM ROUTE BASIN 9 THRU BASIN8 TO CP1  
 518 RK 260 0.01 0.016 0 27 10 10  
 \*  
 519 KK BASIN8  
 520 KM RUNOFF FROM BASIN 8  
 521 BA .003  
 522 LS 0 86.6  
 523 UD .078  
 \*  
 524 KK CP1  
 525 KM COMBINE RBASIN9 & BASIN 8  
 526 HC 2  
 \*  
 527 KK RCP1  
 528 KM ROUTE CP1 THRU BASIN7 TO CP2  
 529 RK 160 0.02 0.016 0 27 10 10  
 \*  
 530 KK BASIN7  
 531 KM RUNOFF FROM BASIN 7  
 532 BA .005  
 533 LS 0 89.15  
 534 UD .138  
 \*

1

HEC-1 INPUT

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

535 KK CP2  
 536 KM COMBINE RCP1 & BASIN7  
 537 HC 2  
 \*  
 538 KK RCP2

539 KM ROUTE CP2 THRU BASIN10 TO CP3  
 540 RK 185 0.05 0.016 0 36 10 10  
 \*

541 KK BASIN10  
 542 KM RUNOFF FROM BASIN10  
 543 BA .004  
 544 LS 0 91.85  
 545 UD .127  
 \*

546 KK CP3  
 547 KM COMBINE RCP2 & BASIN10  
 548 HC 2  
 \*

549 KK RCP3  
 550 KM ROUTE CP3 THRU BASIN11 TO CP4  
 551 RK 215 0.03 0.016 0 36 10 10  
 \*

552 KK BASIN11  
 553 KM RUNOFF FROM BASIN11  
 554 BA .005  
 555 LS 0 92.60  
 556 UD .125  
 \*

557 KK CP4  
 558 KM COMBINE RCP4 & BASIN11  
 559 HC 2  
 \*

560 KK RCP4  
 561 KM ROUTE CP4 THRU BASIN13 TO CP5  
 562 RK 200 0.03 0.016 0 36 10 10  
 \*

563 KK BASIN13  
 564 KM RUNOFF FROM BASIN13  
 565 BA .002  
 566 LS 0 91.75  
 567 UD .096  
 \*

1

HEC-1 INPUT

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

568 KK BASIN6  
 569 KM RUNOFF FROM BASIN 6  
 570 BA .003  
 571 LS 0 92.32  
 572 UD .089  
 \*

573 KK CP5  
 574 KM COMBINE RCP4, BASIN13 & BASIN6  
 575 HC 3  
 \*

576 KK RCP5  
 577 KM ROUTE CP5 TO CP6  
 578 RK 475 0.02 0.016 0 24 10 10  
 \*

579 KKBASIN18A  
 580 KM RUNOFF FROM BASIN 18A  
 581 BA .001  
 582 LS 0 88.10  
 583 UD .052  
 \*

584 KK CP6  
 585 KM COMBINE RCP5 & BASIN18A

```

586      HC      2
      *

587      KK      CP6
588      KM      DIVERT FLOW TO CP10
589      DT      DIVCP6
590      DI      0      38
591      DQ      0      4
      *

592      KKBASIN17A
593      KM      RUNOFF FROM BASIN 17A
594      BA      .001
595      LS      0      92.60
596      UD      .050
      *

597      KK BASIN15
598      KM      RUNOFF FROM BASIN15
599      BA      .001
600      LS      0      92.60
601      UD      .075
      *

```

HEC-1 INPUT

1

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

```

602      KKRBASIN15
603      KM      ROUTE BASIN 15 THRU BASIN17 TO CP8
604      RK      255      0.02      0.016      0      24      10      10
      *

605      KK BASIN17
606      KM      RUNOFF FROM BASIN17
607      BA      .001
608      LS      0      92.60
609      UD      .050
      *

610      KK      CP8
611      KM      COMBINE RBASIN15 & BASIN17
612      HC      2
      *

613      KK      RCP8
614      KM      ROUTE CP8 TO CP7
615      RK      40      0.02      0.016      0      24      10      10
      *

616      KK      CP7
617      KM      COMBINE BASINS BASIN17A & CP6
618      HC      3
      *

619      KK      DB6
620      KM      DETENTION BASIN 6 (KEY OUTLET)
621      RS      1      STOR      0
622      SV      0.0      0.1      0.2      0.4      0.5      0.7      1.0
623      SE      7034.0      7035.0      7036.0      7037.0      7038.0      7039.0      7040.0
624      SQ      0.0      0.8      1.25      3.44      4.89      21.87      89.53
      *

625      KK      RDB6
626      KM      ROUTE DB6 TO CP10
627      RK      800      0.02      0.016      0      24      10      10
      *

628      KK BASIN18
629      KM      RETRIEVE DIVERSION FROM CP6
630      DR      DIVCP6
      *

631      KK BASIN18
632      KM      RUNOFF FROM BASIN 18

```

633 BA .002  
 634 LS 0 88.25  
 635 UD .099  
 \*

1

HEC-1 INPUT

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

636 KK BASIN18  
 637 KM COMBINE DIVCP6 & BASIN18  
 638 HC 2  
 \*

639 KKR BASIN18  
 640 KM ROUTE BASIN18 THRU BASIN 19 TO CP10  
 641 RK 700 0.04 0.016 0 24 10 10  
 \*

642 KK BASIN19  
 643 KM RUNOFF FROM BASIN 19  
 644 BA .004  
 645 LS 0 92.60  
 646 UD .123  
 \*

647 KK BASIN20  
 648 KM RUNOFF FROM BASIN 20  
 649 BA .002  
 650 LS 0 92.60  
 651 UD .081  
 \*

652 KK CP10  
 653 KM COMBINE RCP6, RBASIN18, BASIN19 & BASIN20  
 654 HC 4  
 \*

655 KK DB7  
 656 KM DETENTION BASIN 1  
 657 RS 1 STOR 0  
 658 SV 0.0 0.01 0.04 0.10 0.14 0.17  
 659 SE 6998.0 6999.0 7000.0 7001.0 7001.5 7002.0  
 660 SQ 0.0 0.75 2.12 3.9 31.6 81.4  
 \*

661 KK RDB7  
 662 KM ROUTE DB7 TO CP11  
 663 RK 50 0.03 0.032 0 10 6 6  
 \*

664 KKBASIN25A  
 665 KM RUNOFF FROM BASIN 25A - MODIFIED TO INCLUDE RUNOFF FROM BOULDER POINTE  
 666 BA .002  
 667 LS 0 86.75  
 668 UD .050  
 \*

1

HEC-1 INPUT

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

669 KK BASIN22  
 670 KM RUNOFF FROM BASIN 22  
 671 BA .002  
 672 LS 0 88.25  
 673 UD .064  
 \*

674 KK BASIN23  
 675 KM RUNOFF FROM BASIN 23  
 676 BA .001  
 677 LS 0 88.25  
 678 UD .050  
 \*

679 KK WASH3  
 680 KM RUNOFF FROM WASH3 - MODIFIED TO INCLUDE RUNOFF FROM BOULDER POINTE  
 681 BA .002  
 682 LS 0 77  
 683 UD .050  
 \*

684 KK SUB6A  
 685 KM RUNOFF FROM SUBAREA 6A IN BOULDER POINTE  
 686 BA .016  
 687 LS 0 86.33  
 688 UD .45  
 \*

689 KK DB6A  
 690 KM DETENTION BASIN FOR SUBAREA 6A IN BOULDER POINTE  
 691 RS 1 STOR 0  
 692 SV 0.0 0.0002 0.006 0.175 0.379 0.618  
 693 SE 7022.0 7023.9 7024.0 7025.0 7026.0 7027.0  
 694 SQ 0.0 0.0 0.0 1.7 5.8 13.3  
 \*

695 KK SUB2D  
 696 KM RUNOFF FROM SUBBASIN 2D IN BOULDER POINTE  
 697 BA .04  
 698 LS 0 85.0  
 699 UD .522  
 \*

700 KK CPBP  
 701 KM COMBINE DB6A AND SUBBASIN 2D  
 702 HC 2  
 \*

703 KK DB2D  
 704 KM DETENTION BASIN FOR SUBBASIN 2D IN BOULDER POINTE  
 705 RS 1 STOR 0  
 706 SV 0.0 0.285 0.570 0.866 1.184 1.525 1.888  
 707 SE 6991.0 6992.0 6993.0 6994.0 6995.0 6996.0 6997.0  
 708 SQ 0.0 3.0 8.5 17.72 29.84 44.15 182.3  
 \*

1

HEC-1 INPUT

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

709 KK CP11  
 710 KM COMBINE RCP24, RDB7, WASH3, BASINS 25, 23 & 22, AND DB2D  
 711 HC 7  
 \*

712 KK RTRCH7  
 713 KM ROUTE HYDROGRAPH FROM CP11 TO CP4  
 714 RS 8 FLOW -1  
 715 RC 0.050 0.035 0.050 961 0.023  
 716 RX 0 26 35 55 97 136 235 255  
 717 RY 80 78 76 74 74 76 78 80  
 \*

718 KK SUB4  
 719 BA 0.021  
 720 LS 0 81.06  
 721 UD 0.22  
 \*

722 KK CP4B  
 723 KM ADD ROUTED HYDROGRAPH FROM CP11 TO SUB4 HYDROGRAPH  
 724 HC 2  
 \*

725 KK CP4C  
 726 KM ADD CP4A HYDROGRAPH TO CP4B HYDROGRAPH  
 727 HC 2  
 \*

```

728      KK  RTRCH8
729      KM          ROUTE HYDROGRAPH FROM CP4 TO CP5
730      RS      8      FLOW      -1
731      RC  0.050  0.035  0.050   880  0.009
732      RX      0      27      61      87      146      227      315      431
733      RY      68      66      60      59      59      60      62      66
          *

734      KK  SUB5
735      BA  0.034
736      LS      0      90.13
737      UD  0.099
          *

738      KK  CP5
739      KM          COMBINE ROUTED HYDROGRAPH FROM CP4 WITH SUB5 HYDROGRAPH
740      HC      2
          *
741      ZZ

```

1

SCHEMATIC DIAGRAM OF STREAM NETWORK

```

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

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

12    SUB-1
      V
      V
17    RTRCH1
      .
      .
23    .      SUB-2
      .      .
      .      .
27    .      .      SUB-2A
      .      .      .
      .      .      .
31    CP1A.....
      V
      V
34    RTRCH2
      .
      .
40    .      SUB-3B
      .      .
      .      .
45    .      .      BASIN4
      .      .      V
      .      .      V
50    .      .      RCP26
      .      .      .
      .      .      .
53    .      .      .      BASIN4A
      .      .      .      .
      .      .      .      .
58    .      .      .      CP27.....
      .      .      .      .
      .      .      .      .
61    .      .      .      BASIN1A
      .      .      .      .
      .      .      .      .
66    .      .      .      CP28.....
      .      .      .      V
      .      .      .      V
69    .      .      .      DB1
      .      .      .      V
      .      .      .      V
75    .      .      .      RDB1
      .      .      .      .
      .      .      .      .
78    .      .      .      BASIN4B
      .      .      .      .
      .      .      .      .

```



```

195 . SUB3
. .
. .
199 CP4A.....
. .
202 . ROFF2F
. V
. V
207 . RROFF2F
. .
. .
210 . ROFF2E
. V
. V
215 . RROFF2E
. .
. .
218 . ROFF1
. .
. .
223 . CP33.....
. V
. V
226 . RCP33
. .
. .
229 . ROFF2C
. V
. V
234 . RROFF2C
. .
. .
237 . ROFF2G
. V
. V
242 . RROFF2G
. .
. .
245 . ROFF2D
. .
. .
250 . BASIN38
. V
. V
255 . RBASIN38
. .
. .
258 . CP2D.....
. V
. V
261 . RCP2D
. .
. .
264 . ROFF2B
. .
. .
269 . CP2B.....
. V
. V
272 . RCP2B
. .
. .
275 . ROFF2A
. V
. V
280 . RROFF2A
. .
. .
283 . WASH1
. .
. .
288 . CP20.....
. V
. V

```

291	.	RCP20	.	.
	.	.	.	.
294	.	BASIN37	.	.
	.	V	.	.
	.	V	.	.
299	.	RBASIN37	.	.
	.	.	.	.
302	.	BASIN36	.	.
	.	.	.	.
307	.	CP16.....	.	.
	.	V	.	.
	.	V	.	.
310	.	RCP16	.	.
	.	.	.	.
313	.	BASIN41	.	.
	.	.	.	.
318	.	CP17.....	.	.
	.	V	.	.
	.	V	.	.
321	.	RCP17	.	.
	.	.	.	.
324	.	BASIN35	.	.
	.	.	.	.
329	.	BASIN28	.	.
	.	.	.	.
334	.	CP19.....	.	.
	.	V	.	.
	.	V	.	.
337	.	RCP19	.	.
	.	.	.	.
340	.	BASIN39	.	.
	.	V	.	.
	.	V	.	.
345	.	RBASIN39	.	.
	.	.	.	.
348	.	BASIN40	.	.
	.	.	.	.
353	.	CP12.....	.	.
	.	V	.	.
	.	V	.	.
356	.	RCP12	.	.
	.	.	.	.
359	.	AMPHITHE	.	.
	.	.	.	.
364	.	BASIN14	.	.
	.	.	.	.
369	.	CP13.....	.	.
	.	V	.	.
	.	V	.	.
372	.	RCP13	.	.
	.	.	.	.
375	.	BASIN16	.	.
	.	.	.	.
380	.	CP14.....	.	.
	.	V	.	.
	.	V	.	.
383	.	RCP14	.	.
	.	.	.	.
	.	.	.	.

386	.	.	.	.	BASIN33	.	.	.
	.	.	.	.	.	.	.	.
391	.	.	.	.	.	.	BASIN34	.
	.	.	.	.	.	.	.	.
396	.	.	.	.	CP18	.....	.	.
	.	.	.	.	V	.	.	.
	.	.	.	.	V	.	.	.
399	.	.	.	.	RCP18	.	.	.
	.	.	.	.	.	.	.	.
402	.	.	.	.	.	.	BASIN30	.
	.	.	.	.	.	.	.	.
407	.	.	.	.	CP21	.....	.	.
	.	.	.	.	V	.	.	.
	.	.	.	.	V	.	.	.
410	.	.	.	.	RCP21	.	.	.
	.	.	.	.	.	.	.	.
413	.	.	.	.	BASIN31	.	.	.
	.	.	.	.	.	.	.	.
418	.	.	.	.	CP31	.....	.	.
	.	.	.	.	V	.	.	.
	.	.	.	.	V	.	.	.
421	.	.	.	.	DB4	.	.	.
	.	.	.	.	V	.	.	.
	.	.	.	.	V	.	.	.
427	.	.	.	.	RDB4	.	.	.
	.	.	.	.	.	.	.	.
430	.	.	.	.	BASIN32	.	.	.
	.	.	.	.	.	.	.	.
435	.	.	.	.	CP22	.....	.	.
	.	.	.	.	V	.	.	.
	.	.	.	.	V	.	.	.
438	.	.	.	.	RCP22	.	.	.
	.	.	.	.	.	.	.	.
441	.	.	.	.	BASIN29	.	.	.
	.	.	.	.	V	.	.	.
	.	.	.	.	V	.	.	.
446	.	.	.	.	RBASIN29	.	.	.
	.	.	.	.	.	.	.	.
449	.	.	.	.	BASIN28A	.	.	.
	.	.	.	.	V	.	.	.
	.	.	.	.	V	.	.	.
454	.	.	.	.	RBASIN28	.	.	.
	.	.	.	.	.	.	.	.
457	.	.	.	.	BASIN26	.	.	.
	.	.	.	.	V	.	.	.
	.	.	.	.	V	.	.	.
462	.	.	.	.	RBASIN26	.	.	.
	.	.	.	.	.	.	.	.
465	.	.	.	.	BASIN24	.	.	.
	.	.	.	.	V	.	.	.
	.	.	.	.	V	.	.	.
470	.	.	.	.	RBASIN24	.	.	.
	.	.	.	.	.	.	.	.
473	.	.	.	.	.	.	.	WASH2
	.	.	.	.	.	.	.	.
478	.	.	.	.	CP23	.....	.	.
	.	.	.	.	V	.	.	.
	.	.	.	.	V	.	.	.
481	.	.	.	.	RCP23	.	.	.
	.	.	.	.	.	.	.	.
	.	.	.	.	.	.	.	.

484	.	.	BASIN27	
	.	.	V	
	.	.	V	
489	.	.	RBASIN27	
	.	.	.	
492	.	.	.	BASIN25
	.	.	.	.
497	.	.	CP25.....	.
	.	.	.	.
500	.	.	.	BASIN21
	.	.	.	.
505	.	.	CP24.....	.
	.	.	V	
	.	.	V	
508	.	.	RCP24	
	.	.	.	
511	.	.	BASIN9	
	.	.	V	
	.	.	V	
516	.	.	RBASIN9	
	.	.	.	
519	.	.	.	BASIN8
	.	.	.	.
524	.	.	CP1.....	.
	.	.	V	
	.	.	V	
527	.	.	RCP1	
	.	.	.	
530	.	.	.	BASIN7
	.	.	.	.
535	.	.	CP2.....	.
	.	.	V	
	.	.	V	
538	.	.	RCP2	
	.	.	.	
541	.	.	.	BASIN10
	.	.	.	.
546	.	.	CP3.....	.
	.	.	V	
	.	.	V	
549	.	.	RCP3	
	.	.	.	
552	.	.	.	BASIN11
	.	.	.	.
557	.	.	CP4.....	.
	.	.	V	
	.	.	V	
560	.	.	RCP4	
	.	.	.	
563	.	.	.	BASIN13
	.	.	.	.
568	.	.	.	BASIN6
	.	.	.	.
573	.	.	CP5.....	.
	.	.	V	
	.	.	V	
576	.	.	RCP5	
	.	.	.	
	.	.	.	

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579 . . . . . BASIN18A
. . . . .
584 . . . . . CP6.....
. . . . .
589 . . . . . -----> DIVCP6
587 . . . . . CP6
. . . . .
592 . . . . . BASIN17A
. . . . .
597 . . . . . BASIN15
. . . . . V
. . . . . V
602 . . . . . RBASIN15
. . . . .
605 . . . . . BASIN17
. . . . .
610 . . . . . CP8.....
. . . . . V
. . . . . V
613 . . . . . RCP8
. . . . .
616 . . . . . CP7.....
. . . . . V
. . . . . V
619 . . . . . DB6
. . . . . V
. . . . . V
625 . . . . . RDB6
. . . . .
630 . . . . . <----- DIVCP6
628 . . . . . BASIN18
. . . . .
631 . . . . . BASIN18
. . . . .
636 . . . . . BASIN18.....
. . . . . V
. . . . . V
639 . . . . . RBASIN18
. . . . .
642 . . . . . BASIN19
. . . . .
647 . . . . . BASIN20
. . . . .
652 . . . . . CP10.....
. . . . . V
. . . . . V
655 . . . . . DB7
. . . . . V
. . . . . V
661 . . . . . RDB7
. . . . .
664 . . . . . BASIN25A
. . . . .
669 . . . . . BASIN22
. . . . .
674 . . . . . BASIN23
. . . . .
679 . . . . . WASH3

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. . . . .
684 . . . . . SUB6A
. . . . . V
. . . . . V
689 . . . . . DB6A
. . . . .
. . . . .
695 . . . . . SUB2D
. . . . .
. . . . .
700 . . . . . CPBP.....
. . . . . V
. . . . . V
703 . . . . . DB2D
. . . . .
. . . . .
709 . . . . . CP11.....
. . . . . V
. . . . . V
712 . . . . . RTRCH7
. . . . .
. . . . .
718 . . . . . SUB4
. . . . .
. . . . .
722 . . . . . CP4B.....
. . . . .
. . . . .
725 . . . . . CP4C.....
. . . . . V
. . . . . V
728 . . . . . RTRCH8
. . . . .
. . . . .
734 . . . . . SUB5
. . . . .
. . . . .
738 . . . . . CP5.....

```

(\*\*\*) RUNOFF ALSO COMPUTED AT THIS LOCATION

```

1*****
*                               *
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
*       JAN 1997                *
*       VERSION 4.1              *
* RUN DATE 07FEB17 TIME 09:47:57 *
*                               *
*****

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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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WILDWOOD HILLS  
Existing-Conditions HEC-1 Model  
100-year, 6-hour Model  
Woodson Engineering and Surveying Inc  
January 2017  
Original Model for Presidio in the Pines  
by TRC-BV Engineering (November 2, 2004)  
PROPOSED CONDITION (WITH DETENTION@WILWOOD HILLS MHP)

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

```

```

IT        HYDROGRAPH TIME DATA
          NMIN       5  MINUTES IN COMPUTATION INTERVAL
          IDATE      1  0  STARTING DATE
          ITIME      0000 STARTING TIME
          NQ         300 NUMBER OF HYDROGRAPH ORDINATES
          NDDATE     2  0  ENDING DATE

```

NDTIME 0055 ENDING TIME  
 ICENT 19 CENTURY MARK

COMPUTATION INTERVAL .08 HOURS  
 TOTAL TIME BASE 24.92 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

\*\*\* FDKRUT WARNING TIME STEP CALCULATION FAILED TO CONVERGE. STABILITY PROBLEMS MAY RESULT

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WARNING --- ROUTED OUTFLOW ( 83.) IS GREATER THAN MAXIMUM OUTFLOW ( 81.) IN STORAGE-OUTFLOW TABLE

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			BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
				6-HOUR	24-HOUR	72-HOUR			
+	HYDROGRAPH AT								
+		SUB-1	24.	3.25	2.	1.	1.	.01	
+	ROUTED TO								
+		RTRCH1	24.	3.25	2.	1.	1.	.01	43.23 3.25
+	HYDROGRAPH AT								
+		SUB-2	16.	3.17	1.	0.	0.	.01	
+	HYDROGRAPH AT								
+		SUB-2A	9.	3.17	1.	0.	0.	.00	
+	3 COMBINED AT								
+		CP1A	42.	3.17	4.	1.	1.	.02	
+	ROUTED TO								
+		RTRCH2	42.	3.25	4.	1.	1.	.02	97.19 3.25
+	HYDROGRAPH AT								
+		SUB-3B	25.	3.33	3.	1.	1.	.03	
+	HYDROGRAPH AT								
+		BASIN4	4.	3.17	0.	0.	0.	.00	

+	ROUTED TO	RCP26	4.	3.17	0.	0.	0.	.00		
+	HYDROGRAPH AT	BASIN4A	4.	3.17	0.	0.	0.	.00		
+	2 COMBINED AT	CP27	9.	3.17	1.	0.	0.	.00		
+	HYDROGRAPH AT	BASIN1A	3.	3.08	0.	0.	0.	.00		
+	2 COMBINED AT	CP28	11.	3.17	1.	0.	0.	.01		
+	ROUTED TO	DB1	4.	3.42	1.	0.	0.	.01	7054.40	3.42
+	ROUTED TO	RDB1	4.	3.42	1.	0.	0.	.01		
+	HYDROGRAPH AT	BASIN4B	5.	3.08	0.	0.	0.	.00		
+	HYDROGRAPH AT	BASIN3	6.	3.08	0.	0.	0.	.00		
+	HYDROGRAPH AT	SUB-1A	95.	3.25	10.	2.	2.	.05		
+	ROUTED TO	RSUB-1A	93.	3.25	10.	2.	2.	.05		
+	HYDROGRAPH AT	SUB-1B	18.	3.08	1.	0.	0.	.00		
+	HYDROGRAPH AT	SUB-3A	13.	3.25	1.	0.	0.	.01		
+	6 COMBINED AT	CP30	124.	3.25	14.	4.	3.	.07		
+	ROUTED TO	RTRCH3	124.	3.25	14.	4.	3.	.07	97.52	3.25
+	3 COMBINED AT	CP2A	191.	3.25	22.	5.	5.	.12		
+	ROUTED TO	DBWWH	78.	3.58	22.	5.	5.	.12	6993.33	3.58
+	ROUTED TO	RTRCH4	80.	3.58	22.	5.	5.	.12	82.38	3.58
+	HYDROGRAPH AT	SUB-3C	55.	3.25	6.	1.	1.	.03		
+	HYDROGRAPH AT	BASIN5	3.	3.17	0.	0.	0.	.00		
+	ROUTED TO	RBASIN5	3.	3.17	0.	0.	0.	.00		
+	HYDROGRAPH AT	BASIN1	4.	3.08	0.	0.	0.	.00		
+	ROUTED TO	RBASIN1	3.	3.08	0.	0.	0.	.00		
+	HYDROGRAPH AT	BASIN2	12.	3.08	1.	0.	0.	.00		

+	3 COMBINED AT	CP29	18.	3.08	1.	0.	0.	.01		
	ROUTED TO									
+		RCP29	17.	3.17	1.	0.	0.	.01		
	ROUTED TO									
+		DB2	1.	3.83	1.	0.	0.	.01		
+									7035.26	3.92
	ROUTED TO									
+		RDB2	1.	3.83	1.	0.	0.	.01		
	HYDROGRAPH AT									
+		BASIN4C	4.	3.08	0.	0.	0.	.00		
	2 COMBINED AT									
+		CP32	4.	3.08	1.	0.	0.	.01		
	ROUTED TO									
+		RTRCH5	5.	3.17	1.	0.	0.	.01		
+									97.45	3.17
	3 COMBINED AT									
+		CP3A	112.	3.33	29.	7.	7.	.16		
	ROUTED TO									
+		RTRCH6	113.	3.42	29.	7.	7.	.16		
+									66.67	3.42
	HYDROGRAPH AT									
+		SUB3	10.	3.17	1.	0.	0.	.01		
	2 COMBINED AT									
+		CP4A	116.	3.42	29.	7.	7.	.16		
	HYDROGRAPH AT									
+		ROFF2F	22.	3.17	2.	0.	0.	.01		
	ROUTED TO									
+		RROFF2F	20.	3.25	2.	0.	0.	.01		
	HYDROGRAPH AT									
+		ROFF2E	28.	3.33	3.	1.	1.	.02		
	ROUTED TO									
+		RROFF2E	28.	3.33	3.	1.	1.	.02		
	HYDROGRAPH AT									
+		ROFF1	299.	3.67	60.	15.	14.	.42		
	3 COMBINED AT									
+		CP33	318.	3.67	65.	16.	16.	.45		
	ROUTED TO									
+		RCP33	317.	3.67	65.	16.	16.	.45		
	HYDROGRAPH AT									
+		ROFF2C	9.	3.17	1.	0.	0.	.00		
	ROUTED TO									
+		RROFF2C	8.	3.17	1.	0.	0.	.00		
	HYDROGRAPH AT									
+		ROFF2G	11.	3.33	2.	0.	0.	.01		
	ROUTED TO									
+		RROFF2G	11.	3.42	2.	0.	0.	.01		
	HYDROGRAPH AT									
+		ROFF2D	13.	3.25	1.	0.	0.	.01		
	HYDROGRAPH AT									
+		BASIN38	8.	3.17	1.	0.	0.	.00		

+	ROUTED TO	RBASIN38	8.	3.17	1.	0.	0.	.00
+	4 COMBINED AT	CP2D	36.	3.25	4.	1.	1.	.02
+	ROUTED TO	RCP2D	36.	3.25	4.	1.	1.	.02
+	HYDROGRAPH AT	ROFF2B	3.	3.08	0.	0.	0.	.00
+	2 COMBINED AT	CP2B	37.	3.25	5.	1.	1.	.02
+	ROUTED TO	RCP2B	37.	3.25	5.	1.	1.	.02
+	HYDROGRAPH AT	ROFF2A	32.	3.25	4.	1.	1.	.02
+	ROUTED TO	RROFF2A	32.	3.25	4.	1.	1.	.02
+	HYDROGRAPH AT	WASH1	2.	3.08	0.	0.	0.	.00
+	4 COMBINED AT	CP20	347.	3.58	73.	18.	18.	.50
+	ROUTED TO	RCP20	345.	3.58	73.	18.	18.	.50
+	HYDROGRAPH AT	BASIN37	6.	3.17	0.	0.	0.	.00
+	ROUTED TO	RBASIN37	5.	3.17	0.	0.	0.	.00
+	HYDROGRAPH AT	BASIN36	34.	3.17	3.	1.	1.	.01
+	2 COMBINED AT	CP16	39.	3.17	4.	1.	1.	.02
+	ROUTED TO	RCP16	38.	3.17	4.	1.	1.	.02
+	HYDROGRAPH AT	BASIN41	9.	3.17	1.	0.	0.	.00
+	2 COMBINED AT	CP17	47.	3.17	5.	1.	1.	.02
+	ROUTED TO	RCP17	44.	3.17	5.	1.	1.	.02
+	HYDROGRAPH AT	BASIN35	9.	3.17	1.	0.	0.	.00
+	HYDROGRAPH AT	BASIN28	3.	3.17	0.	0.	0.	.00
+	3 COMBINED AT	CP19	55.	3.17	6.	1.	1.	.03
+	ROUTED TO	RCP19	54.	3.25	6.	1.	1.	.03
+	HYDROGRAPH AT	BASIN39	4.	3.08	0.	0.	0.	.00
+	ROUTED TO	RBASIN39	4.	3.08	0.	0.	0.	.00



+		BASIN29	4.	3.08	0.	0.	0.	.00
	ROUTED TO							
+		RBASIN29	3.	3.17	0.	0.	0.	.00
	HYDROGRAPH AT							
+		BASIN28A	4.	3.08	0.	0.	0.	.00
	ROUTED TO							
+		RBASIN28	3.	3.17	0.	0.	0.	.00
	HYDROGRAPH AT							
+		BASIN26	6.	3.17	0.	0.	0.	.00
	ROUTED TO							
+		RBASIN26	6.	3.17	0.	0.	0.	.00
	HYDROGRAPH AT							
+		BASIN24	4.	3.08	0.	0.	0.	.00
	ROUTED TO							
+		RBASIN24	4.	3.08	0.	0.	0.	.00
	HYDROGRAPH AT							
+		WASH2	8.	3.17	1.	0.	0.	.00
	7 COMBINED AT							
+		CP23	365.	3.58	84.	22.	21.	.57
	ROUTED TO							
+		RCP23	365.	3.58	84.	22.	21.	.57
	HYDROGRAPH AT							
+		BASIN27	15.	3.08	1.	0.	0.	.01
	ROUTED TO							
+		RBASIN27	15.	3.17	1.	0.	0.	.01
	HYDROGRAPH AT							
+		BASIN25	8.	3.17	1.	0.	0.	.00
	2 COMBINED AT							
+		CP25	23.	3.17	2.	0.	0.	.01
	HYDROGRAPH AT							
+		BASIN21	9.	3.17	1.	0.	0.	.00
	3 COMBINED AT							
+		CP24	371.	3.58	87.	22.	22.	.58
	ROUTED TO							
+		RCP24	370.	3.58	87.	22.	22.	.58
	HYDROGRAPH AT							
+		BASIN9	9.	3.17	1.	0.	0.	.00
	ROUTED TO							
+		RBASIN9	8.	3.17	1.	0.	0.	.00
	HYDROGRAPH AT							
+		BASIN8	8.	3.17	1.	0.	0.	.00
	2 COMBINED AT							
+		CP1	16.	3.17	1.	0.	0.	.01
	ROUTED TO							
+		RCP1	16.	3.17	1.	0.	0.	.01
	HYDROGRAPH AT							
+		BASIN7	12.	3.17	1.	0.	0.	.00
	2 COMBINED AT							
+		CP2	28.	3.17	2.	1.	1.	.01
	ROUTED TO							

+		RCP2	28.	3.17	2.	1.	1.	.01		
	HYDROGRAPH AT									
+		BASIN10	11.	3.17	1.	0.	0.	.00		
	2 COMBINED AT									
+		CP3	39.	3.17	3.	1.	1.	.02		
	ROUTED TO									
+		RCP3	38.	3.17	3.	1.	1.	.02		
	HYDROGRAPH AT									
+		BASIN11	14.	3.17	1.	0.	0.	.00		
	2 COMBINED AT									
+		CP4	53.	3.17	5.	1.	1.	.02		
	ROUTED TO									
+		RCP4	52.	3.17	5.	1.	1.	.02		
	HYDROGRAPH AT									
+		BASIN13	6.	3.17	0.	0.	0.	.00		
	HYDROGRAPH AT									
+		BASIN6	9.	3.17	1.	0.	0.	.00		
	3 COMBINED AT									
+		CP5	67.	3.17	6.	1.	1.	.02		
	ROUTED TO									
+		RCP5	66.	3.17	6.	2.	1.	.02		
	HYDROGRAPH AT									
+		BASIN18A	3.	3.08	0.	0.	0.	.00		
	2 COMBINED AT									
+		CP6	68.	3.17	6.	2.	1.	.03		
	DIVERSION TO									
+		DIVCP6	7.	3.17	1.	0.	0.	.03		
	HYDROGRAPH AT									
+		CP6	61.	3.17	6.	1.	1.	.03		
	HYDROGRAPH AT									
+		BASIN17A	4.	3.08	0.	0.	0.	.00		
	HYDROGRAPH AT									
+		BASIN15	3.	3.08	0.	0.	0.	.00		
	ROUTED TO									
+		RBASIN15	3.	3.17	0.	0.	0.	.00		
	HYDROGRAPH AT									
+		BASIN17	4.	3.08	0.	0.	0.	.00		
	2 COMBINED AT									
+		CP8	7.	3.08	1.	0.	0.	.00		
	ROUTED TO									
+		RCP8	7.	3.08	1.	0.	0.	.00		
	3 COMBINED AT									
+		CP7	69.	3.17	6.	2.	2.	.03		
	ROUTED TO									
+		DB6	61.	3.25	6.	2.	2.	.03		
+									7039.58	3.25
	ROUTED TO									
+		RDB6	58.	3.25	6.	2.	2.	.03		
	HYDROGRAPH AT									
+		BASIN18	7.	3.17	1.	0.	0.	.00		



```

+
      SUB5      97.    3.17      8.      2.      2.      .03
+
2 COMBINED AT
+
1      CP5      555.    3.50     148.    38.     37.     .90

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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		VOLUME
							PEAK	TIME TO PEAK	
		(MIN)	(CFS)	(MIN)	(IN)	(MIN)	(CFS)	(MIN)	(IN)
RCP26	MANE	.70	4.38	190.83	1.63	5.00	4.30	190.00	1.63

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1735E+00 EXCESS= .0000E+00 OUTFLOW= .1737E+00 BASIN STORAGE= .2919E-09 PERCENT ERROR= -.1

RDB1	MANE	.33	3.95	205.78	1.81	5.00	3.94	205.00	1.81
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CONTINUITY SUMMARY (AC-FT) - INFLOW= .4835E+00 EXCESS= .0000E+00 OUTFLOW= .4835E+00 BASIN STORAGE= .1222E-08 PERCENT ERROR= .0

RSUB-1A	MANE	.57	94.55	195.84	1.92	5.00	92.96	195.00	1.93
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CONTINUITY SUMMARY (AC-FT) - INFLOW= .4922E+01 EXCESS= .0000E+00 OUTFLOW= .4923E+01 BASIN STORAGE= .4157E-11 PERCENT ERROR= .0

RBASIN5	MANE	.36	3.04	190.19	2.34	5.00	3.03	190.00	2.34
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CONTINUITY SUMMARY (AC-FT) - INFLOW= .1247E+00 EXCESS= .0000E+00 OUTFLOW= .1247E+00 BASIN STORAGE= .1421E-10 PERCENT ERROR= .0

RBASIN1	MANE	.25	3.47	185.32	1.10	5.00	3.38	185.00	1.11
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CONTINUITY SUMMARY (AC-FT) - INFLOW= .1177E+00 EXCESS= .0000E+00 OUTFLOW= .1177E+00 BASIN STORAGE= .1001E-11 PERCENT ERROR= .0

RCP29	MANE	.39	18.15	186.01	1.92	5.00	17.43	190.00	1.92
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CONTINUITY SUMMARY (AC-FT) - INFLOW= .7157E+00 EXCESS= .0000E+00 OUTFLOW= .7159E+00 BASIN STORAGE= .1944E-09 PERCENT ERROR= .0

RDB2	MANE	.18	1.29	235.35	1.92	5.00	1.29	235.00	1.92
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CONTINUITY SUMMARY (AC-FT) - INFLOW= .7179E+00 EXCESS= .0000E+00 OUTFLOW= .7178E+00 BASIN STORAGE= .6276E-07 PERCENT ERROR= .0

RROFF2F	MANE	3.06	21.38	195.63	1.66	5.00	20.45	195.00	1.66
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CONTINUITY SUMMARY (AC-FT) - INFLOW= .8813E+00 EXCESS= .0000E+00 OUTFLOW= .8840E+00 BASIN STORAGE= .4257E-06 PERCENT ERROR= -.3

RROFF2E	MANE	1.40	28.04	200.84	1.46	5.00	28.04	200.00	1.45
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CONTINUITY SUMMARY (AC-FT) - INFLOW= .1630E+01 EXCESS= .0000E+00 OUTFLOW= .1631E+01 BASIN STORAGE= .2528E-07 PERCENT ERROR= -.1

RCP33	MANE	.23	317.53	220.31	1.32	5.00	317.46	220.00	1.33
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CONTINUITY SUMMARY (AC-FT) - INFLOW= .3207E+02 EXCESS= .0000E+00 OUTFLOW= .3207E+02 BASIN STORAGE= .1518E-06 PERCENT ERROR= .0

RROFF2C	MANE	.27	8.51	190.43	1.45	5.00	8.35	190.00	1.45
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CONTINUITY SUMMARY (AC-FT) - INFLOW= .3858E+00 EXCESS= .0000E+00 OUTFLOW= .3857E+00 BASIN STORAGE= .3433E-11 PERCENT ERROR= .0

RROFF2G MANE 1.99 11.36 205.52 2.02 5.00 11.36 205.00 2.02

CONTINUITY SUMMARY (AC-FT) - INFLOW= .7534E+00 EXCESS= .0000E+00 OUTFLOW= .7542E+00 BASIN STORAGE= .7116E-07 PERCENT ERROR= -.1

RBASIN38 MANE 1.62 7.93 192.80 1.18 5.00 7.76 190.00 1.18

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3147E+00 EXCESS= .0000E+00 OUTFLOW= .3159E+00 BASIN STORAGE= .2028E-07 PERCENT ERROR= -.4

RCP2D MANE .19 35.80 195.36 1.73 5.00 35.61 195.00 1.73

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2124E+01 EXCESS= .0000E+00 OUTFLOW= .2124E+01 BASIN STORAGE= .4710E-08 PERCENT ERROR= .0

RCP2B MANE .18 36.88 195.12 1.74 5.00 36.87 195.00 1.74

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2233E+01 EXCESS= .0000E+00 OUTFLOW= .2233E+01 BASIN STORAGE= .1586E-08 PERCENT ERROR= .0

RROFF2A MANE .09 32.33 195.19 1.49 5.00 32.12 195.00 1.49

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1748E+01 EXCESS= .0000E+00 OUTFLOW= .1748E+01 BASIN STORAGE= .2360E-11 PERCENT ERROR= .0

RCP20 MANE .53 346.30 216.14 1.35 5.00 344.66 215.00 1.35

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3613E+02 EXCESS= .0000E+00 OUTFLOW= .3614E+02 BASIN STORAGE= .5032E-06 PERCENT ERROR= .0

RBASIN37 MANE .70 5.66 191.49 1.42 5.00 5.34 190.00 1.42

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2269E+00 EXCESS= .0000E+00 OUTFLOW= .2272E+00 BASIN STORAGE= .5088E-09 PERCENT ERROR= -.1

RCP16 MANE .17 38.86 190.31 2.38 5.00 38.40 190.00 2.38

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1901E+01 EXCESS= .0000E+00 OUTFLOW= .1901E+01 BASIN STORAGE= .2570E-09 PERCENT ERROR= .0

RCP17 MANE .71 46.75 191.81 2.11 5.00 44.06 190.00 2.12

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2254E+01 EXCESS= .0000E+00 OUTFLOW= .2255E+01 BASIN STORAGE= .5177E-08 PERCENT ERROR= -.1

RCP19 MANE .24 55.42 190.60 2.10 5.00 54.33 195.00 2.10

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2798E+01 EXCESS= .0000E+00 OUTFLOW= .2798E+01 BASIN STORAGE= .3153E-08 PERCENT ERROR= .0

RBASIN39 MANE 1.02 4.29 186.78 2.95 5.00 3.65 185.00 2.95

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1568E+00 EXCESS= .0000E+00 OUTFLOW= .1571E+00 BASIN STORAGE= .1087E-08 PERCENT ERROR= -.2

RCP12 MANE .70 10.49 191.34 2.95 5.00 10.45 190.00 2.95

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4709E+00 EXCESS= .0000E+00 OUTFLOW= .4716E+00 BASIN STORAGE= .4566E-08 PERCENT ERROR= -.1

RCP13	MANE	.31	19.40	185.86	1.97	5.00	19.09	190.00	1.97
CONTINUITY SUMMARY (AC-FT) - INFLOW= .8390E+00 EXCESS= .0000E+00 OUTFLOW= .8390E+00 BASIN STORAGE= .2597E-08 PERCENT ERROR= .0									
RCP14	MANE	.63	27.85	190.38	2.05	5.00	27.78	190.00	2.06
CONTINUITY SUMMARY (AC-FT) - INFLOW= .1204E+01 EXCESS= .0000E+00 OUTFLOW= .1204E+01 BASIN STORAGE= .1123E-07 PERCENT ERROR= .0									
RCP18	MANE	.41	60.10	186.04	2.15	5.00	58.17	190.00	2.15
CONTINUITY SUMMARY (AC-FT) - INFLOW= .2522E+01 EXCESS= .0000E+00 OUTFLOW= .2522E+01 BASIN STORAGE= .1064E-07 PERCENT ERROR= .0									
RCP21	MANE	.06	124.20	190.08	2.15	5.00	124.10	190.00	2.15
CONTINUITY SUMMARY (AC-FT) - INFLOW= .5842E+01 EXCESS= .0000E+00 OUTFLOW= .5841E+01 BASIN STORAGE= .2505E-08 PERCENT ERROR= .0									
RDB4	MANE	.19	15.55	225.37	2.02	5.00	15.55	225.00	2.02
CONTINUITY SUMMARY (AC-FT) - INFLOW= .5606E+01 EXCESS= .0000E+00 OUTFLOW= .5606E+01 BASIN STORAGE= .2330E-03 PERCENT ERROR= .0									
RCP22	MANE	.28	16.96	190.54	2.05	5.00	16.92	210.00	2.05
CONTINUITY SUMMARY (AC-FT) - INFLOW= .6113E+01 EXCESS= .0000E+00 OUTFLOW= .6113E+01 BASIN STORAGE= .3413E-03 PERCENT ERROR= .0									
RBASIN29	MANE	.98	3.71	187.23	2.33	5.00	3.08	190.00	2.33
CONTINUITY SUMMARY (AC-FT) - INFLOW= .1240E+00 EXCESS= .0000E+00 OUTFLOW= .1243E+00 BASIN STORAGE= .1016E-08 PERCENT ERROR= -.2									
RBASIN28	MANE	1.27	3.49	188.30	2.24	5.00	3.12	190.00	2.23
CONTINUITY SUMMARY (AC-FT) - INFLOW= .1189E+00 EXCESS= .0000E+00 OUTFLOW= .1192E+00 BASIN STORAGE= .3199E-08 PERCENT ERROR= -.3									
RBASIN26	MANE	.37	6.02	190.32	2.31	5.00	6.01	190.00	2.31
CONTINUITY SUMMARY (AC-FT) - INFLOW= .2463E+00 EXCESS= .0000E+00 OUTFLOW= .2464E+00 BASIN STORAGE= .1408E-10 PERCENT ERROR= .0									
RBASIN24	MANE	.31	3.79	185.28	2.35	5.00	3.72	185.00	2.36
CONTINUITY SUMMARY (AC-FT) - INFLOW= .1255E+00 EXCESS= .0000E+00 OUTFLOW= .1255E+00 BASIN STORAGE= .2131E-11 PERCENT ERROR= .0									
RCP23	MANE	.18	365.23	215.24	1.43	5.00	365.07	215.00	1.43
CONTINUITY SUMMARY (AC-FT) - INFLOW= .4320E+02 EXCESS= .0000E+00 OUTFLOW= .4320E+02 BASIN STORAGE= .1479E-03 PERCENT ERROR= .0									
RBASIN27	MANE	.51	14.85	186.13	1.83	5.00	14.72	190.00	1.84
CONTINUITY SUMMARY (AC-FT) - INFLOW= .5853E+00 EXCESS= .0000E+00 OUTFLOW= .5858E+00 BASIN STORAGE= .2367E-09 PERCENT ERROR= -.1									
RCP24	MANE	.29	370.35	215.60	1.44	5.00	369.76	215.00	1.44

CONTINUITY SUMMARY (AC-FT) -	INFLOW=	.4449E+02	EXCESS=	.0000E+00	OUTFLOW=	.4449E+02	BASIN STORAGE=	.9536E-03	PERCENT ERROR=	.0
RBASIN9	MANE	.42	8.64	190.76	2.31	5.00	8.43	190.00	2.32	
CONTINUITY SUMMARY (AC-FT) -	INFLOW=	.3696E+00	EXCESS=	.0000E+00	OUTFLOW=	.3697E+00	BASIN STORAGE=	.4332E-10	PERCENT ERROR=	.0
RCP1	MANE	.27	15.83	190.17	2.09	5.00	15.78	190.00	2.09	
CONTINUITY SUMMARY (AC-FT) -	INFLOW=	.6678E+00	EXCESS=	.0000E+00	OUTFLOW=	.6678E+00	BASIN STORAGE=	.5839E-10	PERCENT ERROR=	.0
RCP2	MANE	.16	27.78	190.17	2.08	5.00	27.62	190.00	2.08	
CONTINUITY SUMMARY (AC-FT) -	INFLOW=	.1220E+01	EXCESS=	.0000E+00	OUTFLOW=	.1220E+01	BASIN STORAGE=	.8024E-10	PERCENT ERROR=	.0
RCP3	MANE	.27	38.59	190.25	2.14	5.00	38.29	190.00	2.14	
CONTINUITY SUMMARY (AC-FT) -	INFLOW=	.1714E+01	EXCESS=	.0000E+00	OUTFLOW=	.1714E+01	BASIN STORAGE=	.1868E-09	PERCENT ERROR=	.0
RCP4	MANE	.13	52.63	190.31	2.20	5.00	52.16	190.00	2.21	
CONTINUITY SUMMARY (AC-FT) -	INFLOW=	.2350E+01	EXCESS=	.0000E+00	OUTFLOW=	.2350E+01	BASIN STORAGE=	.2461E-09	PERCENT ERROR=	.0
RCP5	MANE	.43	66.69	190.55	2.23	5.00	65.52	190.00	2.23	
CONTINUITY SUMMARY (AC-FT) -	INFLOW=	.2975E+01	EXCESS=	.0000E+00	OUTFLOW=	.2975E+01	BASIN STORAGE=	.1404E-08	PERCENT ERROR=	.0
RBASIN15	MANE	.42	3.16	186.15	2.38	5.00	3.06	190.00	2.39	
CONTINUITY SUMMARY (AC-FT) -	INFLOW=	.1270E+00	EXCESS=	.0000E+00	OUTFLOW=	.1270E+00	BASIN STORAGE=	.1544E-10	PERCENT ERROR=	.0
RCP8	MANE	.12	6.81	185.15	2.38	5.00	6.77	185.00	2.39	
CONTINUITY SUMMARY (AC-FT) -	INFLOW=	.2543E+00	EXCESS=	.0000E+00	OUTFLOW=	.2543E+00	BASIN STORAGE=	.5657E-11	PERCENT ERROR=	.0
RDB6	MANE	.61	60.10	195.93	2.03	5.00	58.02	195.00	2.04	
CONTINUITY SUMMARY (AC-FT) -	INFLOW=	.3142E+01	EXCESS=	.0000E+00	OUTFLOW=	.3143E+01	BASIN STORAGE=	.1388E-05	PERCENT ERROR=	.0
RBASIN18	MANE	.48	12.35	190.78	5.04	5.00	11.91	190.00	5.05	
CONTINUITY SUMMARY (AC-FT) -	INFLOW=	.5374E+00	EXCESS=	.0000E+00	OUTFLOW=	.5377E+00	BASIN STORAGE=	.9610E-09	PERCENT ERROR=	-.1
RDB7	MANE	.13	82.77	195.11	2.26	5.00	82.68	195.00	2.26	
CONTINUITY SUMMARY (AC-FT) -	INFLOW=	.4452E+01	EXCESS=	.0000E+00	OUTFLOW=	.4452E+01	BASIN STORAGE=	.1403E-06	PERCENT ERROR=	.0

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

## **APPENDIX C: HYDRAULICS**

EXISTING NORTH CHANNEL CAPACITY

EXISTING SOUTH CHANNEL CAPACITY

EXISTING CONFLUENCE CHANNEL CAPACITY

PROPOSED RECTANGULAR CONCRETE CHANNEL CAPACITY

# Channel Report

## North Channel Capacity

### User-defined

Invert Elev (ft) = 6986.00  
Slope (%) = 1.00  
N-Value = 0.030

### Highlighted

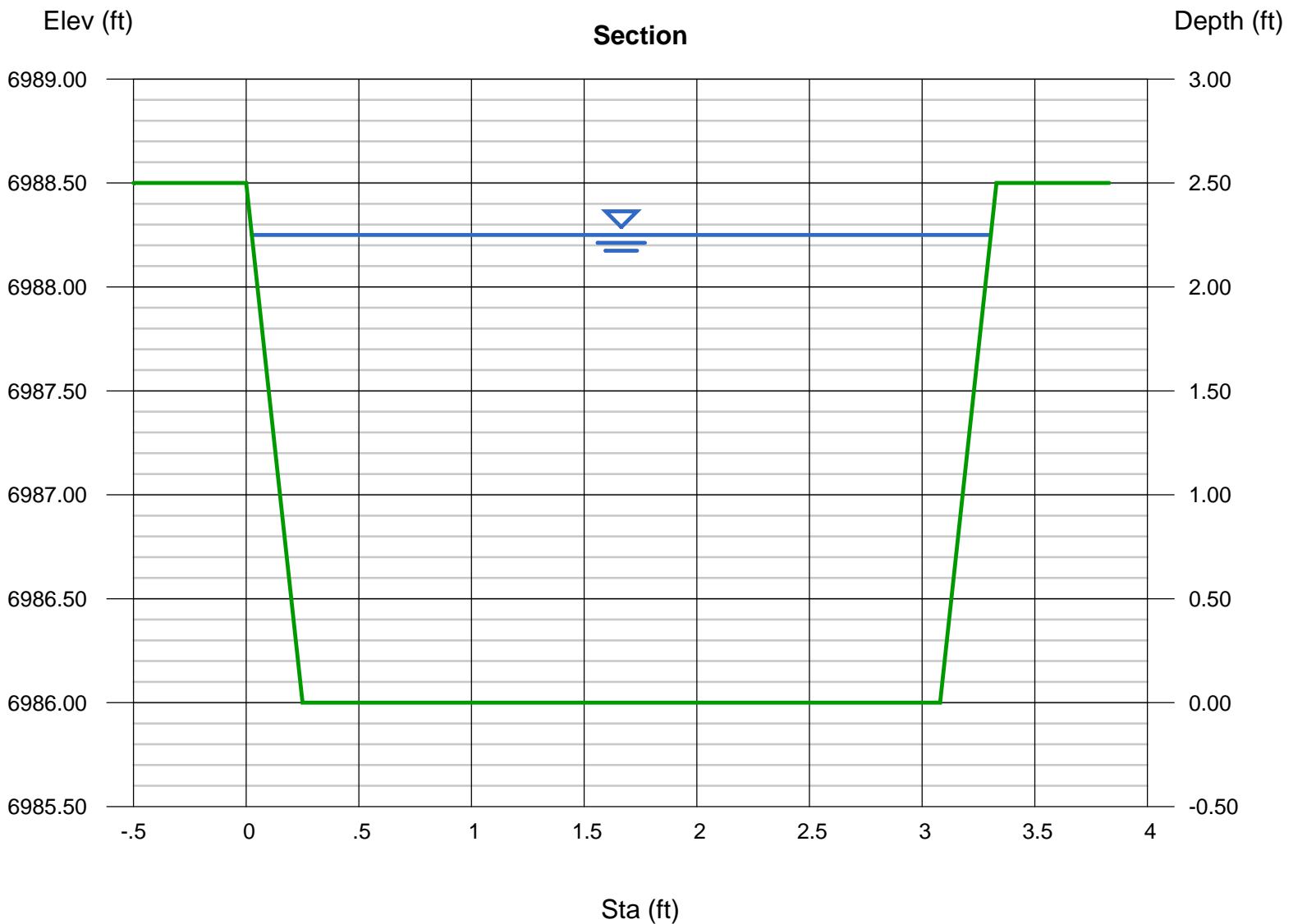
Depth (ft) = 2.25  
Q (cfs) = 32.61  
Area (sqft) = 6.87  
Velocity (ft/s) = 4.74  
Wetted Perim (ft) = 7.35  
Crit Depth, Yc (ft) = 1.58  
Top Width (ft) = 3.28  
EGL (ft) = 2.60

### Calculations

Compute by: Known Depth  
Known Depth (ft) = 2.25

### (Sta, El, n)-(Sta, El, n)...

(0.00, 6988.50)-(0.25, 6986.00, 0.030)-(3.08, 6986.00, 0.030)-(3.33, 6988.50, 0.030)



# Channel Report

## South Channel Capacity (at Downstream End)

### User-defined

Invert Elev (ft) = 6986.00  
Slope (%) = 1.00  
N-Value = 0.030

### Highlighted

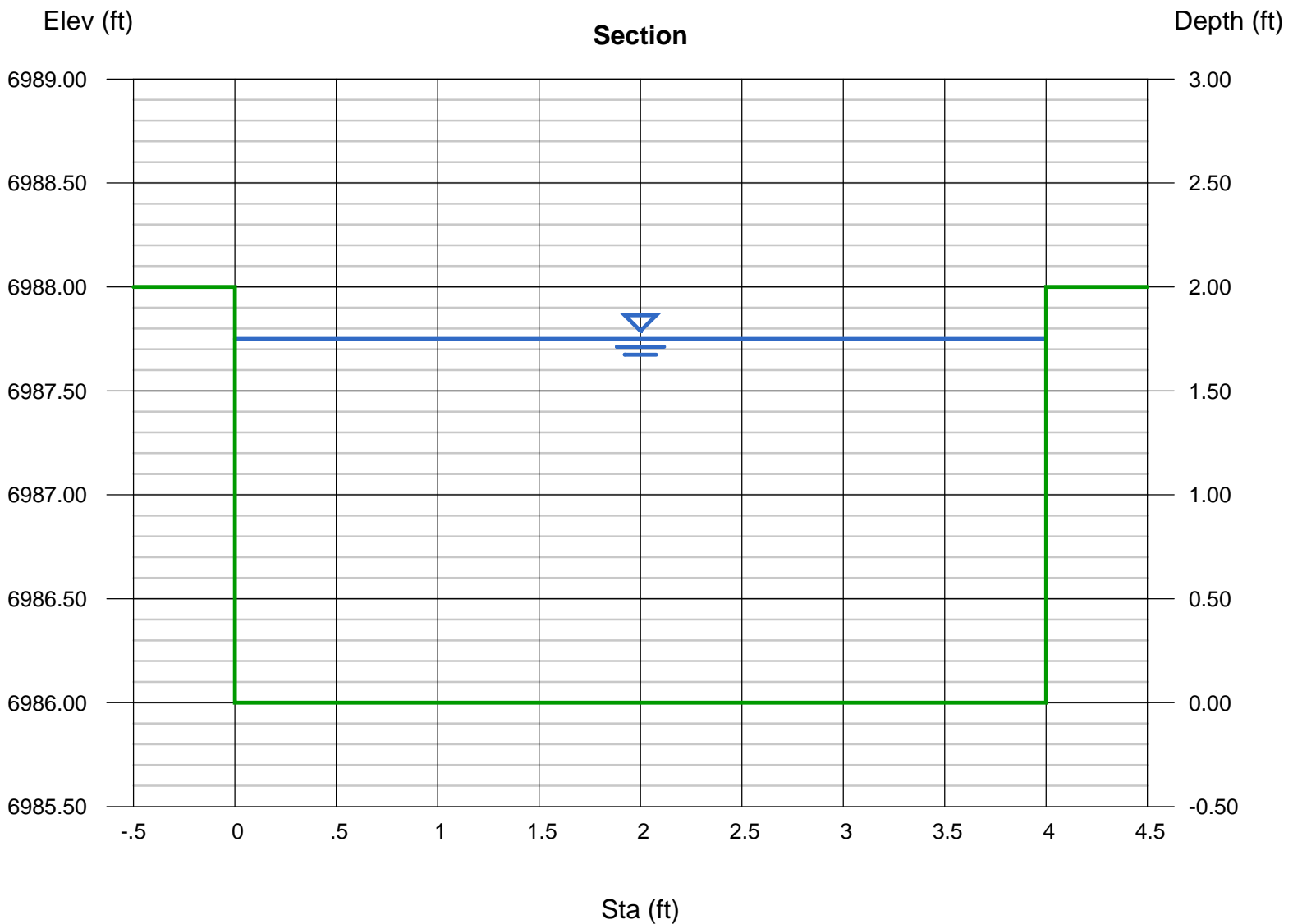
Depth (ft) = 1.75  
Q (cfs) = 33.17  
Area (sqft) = 7.00  
Velocity (ft/s) = 4.74  
Wetted Perim (ft) = 7.50  
Crit Depth, Yc (ft) = 1.29  
Top Width (ft) = 4.00  
EGL (ft) = 2.10

### Calculations

Compute by: Known Depth  
Known Depth (ft) = 1.75

### (Sta, El, n)-(Sta, El, n)...

(0.00, 6988.00)-(4.00, 6986.00, 0.030)-(4.00, 6988.00, 0.030)



# Channel Report

## Confluence Channel Capacity

### User-defined

Invert Elev (ft) = 6974.00  
Slope (%) = 1.00  
N-Value = 0.030

### Highlighted

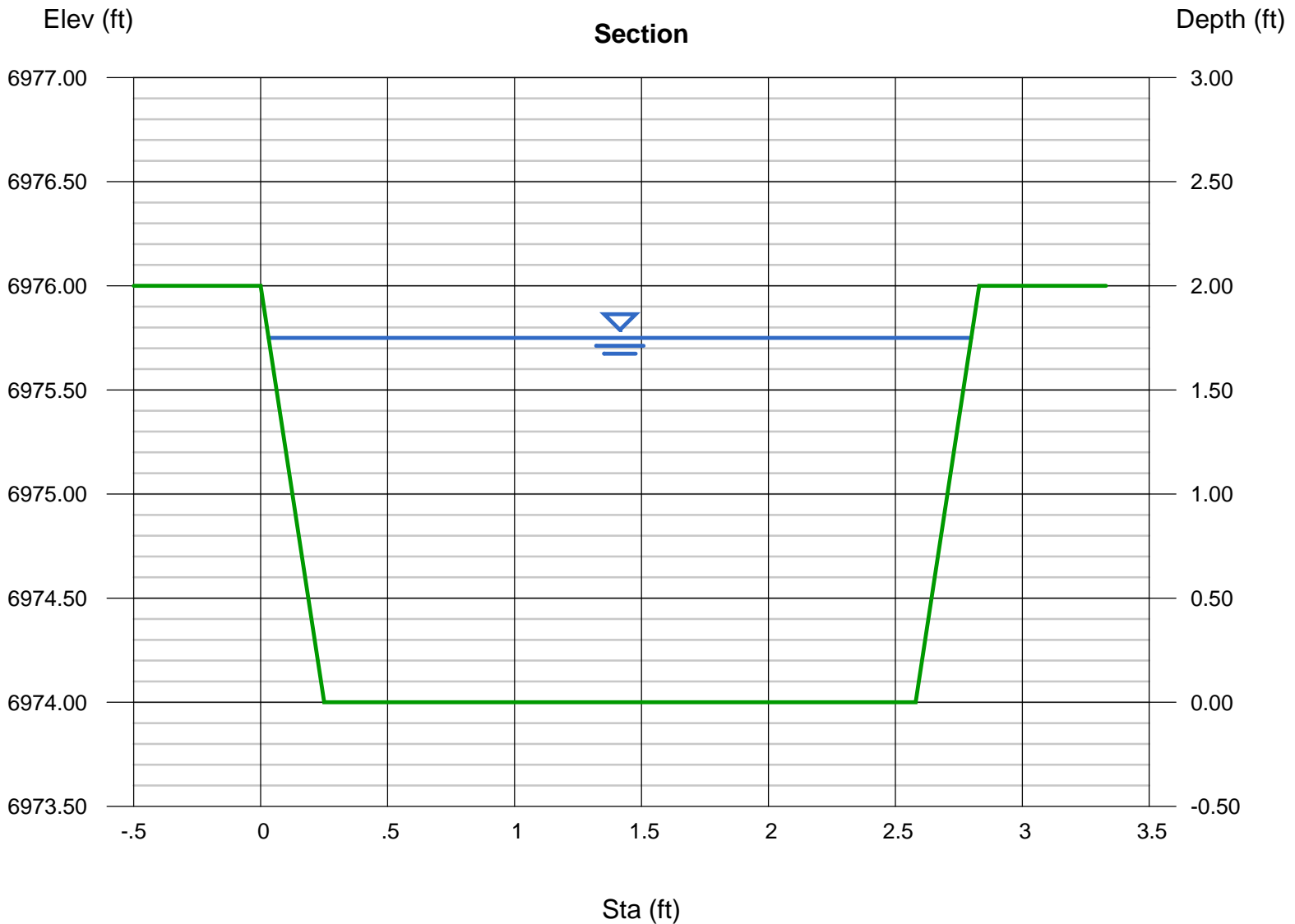
Depth (ft) = 1.75  
Q (cfs) = 18.45  
Area (sqft) = 4.46  
Velocity (ft/s) = 4.14  
Wetted Perim (ft) = 5.86  
Crit Depth, Yc (ft) = 1.23  
Top Width (ft) = 2.77  
EGL (ft) = 2.02

### Calculations

Compute by: Known Depth  
Known Depth (ft) = 1.75

### (Sta, El, n)-(Sta, El, n)...

(0.00, 6976.00)-(0.25, 6974.00, 0.030)-(2.58, 6974.00, 0.030)-(2.83, 6976.00, 0.030)



# Channel Report

## Rectangular Concrete Channel at outlet of Detention Basin (Q=78 cfs)

### Rectangular

Bottom Width (ft) = 5.00  
Total Depth (ft) = 3.00

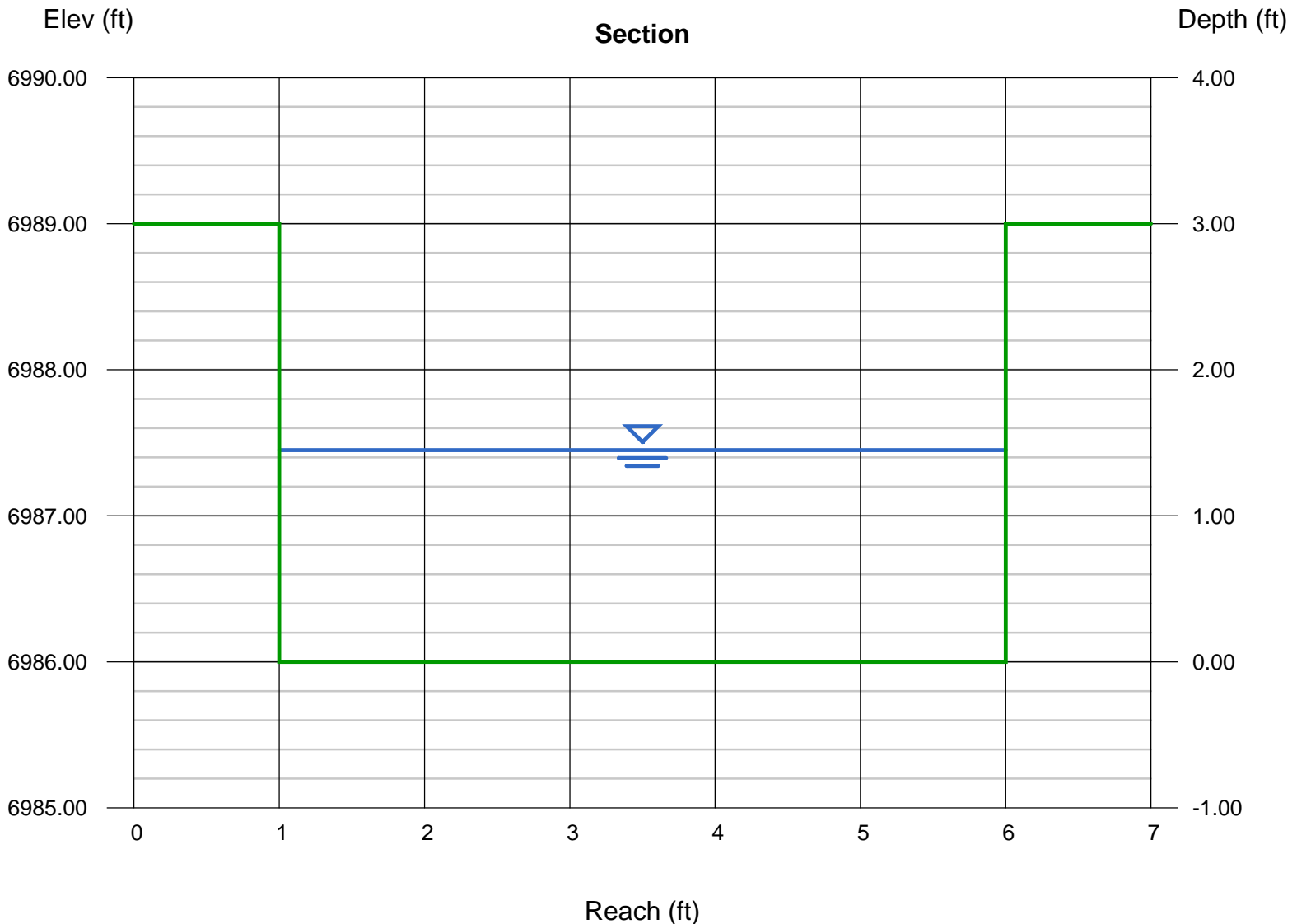
Invert Elev (ft) = 6986.00  
Slope (%) = 1.00  
N-Value = 0.013

### Calculations

Compute by: Known Q  
Known Q (cfs) = 78.00

### Highlighted

Depth (ft) = 1.45  
Q (cfs) = 78.00  
Area (sqft) = 7.25  
Velocity (ft/s) = 10.76  
Wetted Perim (ft) = 7.90  
Crit Depth, Yc (ft) = 1.97  
Top Width (ft) = 5.00  
EGL (ft) = 3.25



**APPENDIX D: OPINION OF PROBABLE COST**

**WILDWOOD HILLS DRAINAGE IMPROVEMENTS  
 OPINION OF PROBABLE COST  
 DETENTION BASIN**

Item No.	Item Description - BASIN	Unit	Quantity	Price	Amount
1	CLEARING AND GRUBBING	L.SUM	1	\$10,000.00	\$10,000.00
2	EARTHWORK/BASIN GRADING	CU.YD.	13,988	\$15.00	\$209,820.00
3	HAUL ROAD GRADING	SQ.YD.	625	\$10.00	\$6,250.00
4	HAUL ROAD (3" AGRREGATE BASE)	SQ.YD.	625	\$15.00	\$9,375.00
5	SEEDING (COF GRASS MIX)	ACRE	1	\$1,000.00	\$1,000.00
6	EROSION CONTROL (SWPPP)	L.SUM	1	\$5,000.00	\$5,000.00
7	BASIN OUTLET STRUCTURE	EACH	1	\$ 7,500.00	\$7,500.00

**Total Construction** **\$248,945.00**

ENGINEERING DESIGN	L.SUM	1	\$20,000.00	\$20,000.00
CONSTRUCTION CONTINGENCIES (10%)	L.SUM	1	\$24,894.50	\$24,894.50
CONSTRUCTION ADMINISTRATION (5%)	L.SUM	1	\$12,447.25	\$12,447.25

THIS ESTIMATE IS BASED ON THE CONCEPT EXHIBITS FOR THE PROJECT DATED 01/24/2017.

THIS OPINION OF PROBABLE COST IS MADE ON THE BASIS OF OUR EXPERIENCE AND QUALIFICATIONS AND REPRESENTS OUR BEST JUDGEMENT. HOWEVER, SINCE SO MANY ASPECTS OF COSTS ARE BEYOND OUR CONTROL, WE CANNOT AND DO NOT GUARANTEE THAT COSTS WILL NOT VARY FROM THIS OPC.

**Subtotal** **\$57,341.75**

**Basin Improvements Cost** **\$306,286.75**

Item No.	Item Description - CONVEYANCE	Unit	Quantity	Price	Amount
1	REMOVAL OF EXISTING CHANNELS	L.FT.	330	\$5.00	\$1,650.00
2	MISCELLANEOUS DEMOLITION & RECONSTRUCTION	L.SUM	1	\$40,000.00	\$40,000.00
3	REMOVAL OF HOUSING UNITS	EACH	-	\$175,000.00	\$0.00
4	CONCRETE CHANNEL	L.FT.	200	\$150.00	\$30,000.00

**Total Construction** **\$71,650.00**

ENGINEERING DESIGN	L.SUM	1	\$20,000.00	\$20,000.00
CONSTRUCTION CONTINGENCIES (20%)	L.SUM	1	\$14,330.00	\$14,330.00
CONSTRUCTION ADMINISTRATION (5%)	L.SUM	1	\$3,582.50	\$3,582.50

THIS ESTIMATE IS BASED ON THE CONCEPT EXHIBITS FOR THE PROJECT DATED 01/24/2017.

THIS OPINION OF PROBABLE COST IS MADE ON THE BASIS OF OUR EXPERIENCE AND QUALIFICATIONS AND REPRESENTS OUR BEST JUDGEMENT. HOWEVER, SINCE SO MANY ASPECTS OF COSTS ARE BEYOND OUR CONTROL, WE CANNOT AND DO NOT GUARANTEE THAT COSTS WILL NOT VARY FROM THIS OPC.

**Subtotal** **\$37,912.50**

**Conveyance Improvements Cost** **\$109,562.50**

## **APPENDIX E: REFERENCE STUDIES**

EXCERPTS FROM DRAINAGE STUDY FROM PRESIDIO IN PINES  
EXCERPTS FROM FLOOD STUDY FOR KIT CARSON RV PARK (KCRVP)



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**FLOOD STUDY  
OF A PORTION OF THE  
SOUTH FORK OF THE  
CLAY AVENUE WASH  
FOR  
KIT CARSON RV PARK  
FLAGSTAFF, ARIZONA**

September 13, 2006  
EEC # 406014

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### FIGURES (APPENDIX A)

Figure 1: Location Map (8.5" x 11")

Figure 2: FEMA Firmette (11" x 17")

Figure 3: Hydrology Exhibit (24" x 36")

Figure 4: Hydraulics Exhibit (24" x 36")

### APPENDICES

Appendix A: Figures

Appendix B: Hydrologic Calculations

Appendix C: Hydraulic Calculations

## **I. INTRODUCTION**

This report presents the results of floodplain, floodway, and erosion setback delineations for a portion of the South Fork of the Clay Avenue Wash (SFCAW) in Flagstaff, AZ (Figure 1). In particular, the study is intended to delineate the floodplain, floodway, and Level I erosion setbacks and establish base flood elevations for the SFCAW within the limits of the Kit Carson RV Park (KC RV Park).

As seen in Figure 2, the reach of the SFCAW in question is currently designated as a Zone A Special Flood Hazard Area on the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) Panel 040020 0006C. Zone A is defined as follows:

Areas of 100-year flood; base flood elevations and flood hazard factors not determined.

As such, approximate limits have been defined for the 100-year floodplain, but no base flood elevations or floodway limits have been established. The City of Flagstaff will require that these detailed hydraulic parameters be determined for the SFCAW within the KC RV Park before subdivision of the RV park property is approved. This study is intended to satisfy this requirement in advance of application for subdivision approval.

The KC RV Park lies downstream from the Presidio in the Pines (Presidio) and Boulder Pointe at Woodlands Village (Boulder Pointe) subdivisions and the Wildwood Hills Campground. The two subdivisions discharge rainfall runoff into the SFCAW through detention basins at their downstream boundaries, and the campground discharges directly into a short tributary to the SFCAW, at the KC RV Park boundary, with no detention. The drainage reports for the Presidio and Boulder Pointe Units 6, 7, and 8 include hydrologic analyses of the subdivisions and the upstream watersheds that drain into and through them. The Presidio hydrologic analysis was used as the starting point for the hydrologic model presented herein. As described below in Section II, the drainage basins within Boulder Pointe, the Wildwood Hills Campground, the KC RV Park, and other as-yet undeveloped property were added to the developed-conditions 100-year, 6-hour HEC-1 model for the Presidio to determine the existing-conditions 100-year, 6-hour flow rates for the SFCAW within the KC RV Park property.

Like the hydrologic modeling, the hydraulic modeling presented herein was developed using the analysis presented in the Presidio drainage report as its starting point. The hydraulic model for the Presidio extended downstream from the Presidio boundary into the KC RV Park. The locations and river stations of the cross sections from the Presidio hydraulic model that lie within the KC RV Park were reproduced for the model shown herein. However, the cross sections were re-generated using updated topographic data from the City of Flagstaff GIS system.

## **II. HYDROLOGIC ANALYSIS**

The hydrologic analysis was performed in accordance with the City of Flagstaff Stormwater Management Design Manual (City Drainage Manual) and the Coconino County Drainage Design Criteria Manual (County Drainage Manual). As mentioned above, the hydrologic model was built onto that for the Presidio, which was run using the US Army Corps of Engineers' HEC-1, Version 4.1. Figure 3 shows the drainage basins that contribute runoff to the SFCAW within the KC RV Park and indicates by linetype the basins that were included in previous models and those that were added during the development of the model presented herein. Because the total area encompassed in the model is less than 1.0 square mile, the 100-year, 6-hour storm event was modeled using the SCS Type II rainfall pattern. The associated rainfall depth of 3.18 inches was

taken from Table 3-2 of the County Drainage Manual and matches the depth used in the Presidio model. The drainage basins within Boulder Pointe were added to the model as appropriate, and the areas, SCS curve numbers, and times of concentration ( $T_c$ 's) for the basins were taken from the drainage reports for Boulder Pointe Units 6, 7, and 8. The stage/storage/discharge rating tables for the two detention basins within Boulder Pointe that discharge into the SFCAW upstream from the KC RV Park were taken from the same reports. It should be noted that the drainage reports for Boulder Pointe Units 6, 7, and 8 reported peak discharge rates for the 100-year, 24-hour storm event as opposed to the 100-year, 6-hour event. Therefore, the peak discharge rates reported herein differ from those shown in the Boulder Pointe reports.

Figure 3 shows the soil type boundaries and land uses within the study watershed. For the portions of the watershed not encompassed by the Presidio and Boulder Pointe models, the SCS curve numbers for ponderosa pine forest were taken from the Arizona Department of Water Resources (ADWR) "Oak Creek Flood Warning System Hydrology Report, TR 90-4," September 1990 (Oak Creek Hydrology Report) assuming a "Fair" cover condition (30-70%). SCS curve numbers for other conditions were taken from "TR-55 Urban Hydrology for Small Watersheds," June 1986 (TR-55 Manual). In the Presidio hydrologic model, the SCS curve number for Drainage Basin ROFF3, which lies to the west of Woody Mountain Road, reflects a ponderosa pine cover. Although this area was burned in the Woody Fire in the summer of this year and subsequently clear cut, it is assumed herein that vegetation in the area will ultimately be re-established. Therefore, the SCS curve number for Drainage Basin ROFF3 was not modified to reflect the current condition of bare earth. Similarly, the SCS curve number for Drainage Basin 1, which was added in the development of the model presented herein, reflects a ponderosa pine cover based upon the assumption that this cover will ultimately be re-established.

$T_c$ 's for the drainage basins were calculated using the method described in Section 3.1.6 of the City Drainage Manual, assuming that sheet flow, shallow/concentrated flow, open channel flow, and gutter flow regimes would occur as described in the TR-55 Manual. However, per an October 10, 2005, meeting with the City regarding another project, the length of sheet flow was limited to 100 feet for each drainage area, and the roughness coefficient used in the travel time calculations for sheet flow across wooded areas with light underbrush was reduced from 0.40 to 0.13.

The hydrologic parameters for the basins that were added to the Presidio and Boulder Pointe models are shown in Appendix B along with the HEC-1 output for the 100-year, 6-hour storm event. As seen in the HEC-1 output, the 100-year, 6-hour peak discharge rates for the SFCAW within the KC RV Park vary from 420 to 637 cubic feet per second (cfs).

### **III. HYDRAULIC ANALYSIS**

The US Army Corps of Engineers' HEC-RAS, Version 3.1.3 was used to delineate the floodplain and floodway boundaries and to determine base flood elevations for the SFCAW within the KC RV Park. Input information and the results of the hydraulic analysis are shown in Figure 4. As Figure 4 shows, the SFCAW enters the KC RV Park at its southwest corner, just downstream from detention basins in the Presidio and Boulder Pointe, and exits the RV park near its northeast corner via a single-barrel 4'x8' concrete box culvert (CBC) under Route 66. Near the southwest corner of the KC RV Park, the SFCAW is relatively steep (3.5-6%) and has steep banks (near 25%), resulting in a narrow floodplain. Near the northeast corner of the RV park, on the other hand, the SFCAW has a longitudinal slope less than 1% and very shallow

sideslopes which, combined with a backwater effect from Route 66, result in a much wider floodplain.

The Federal Highway Administration's HY-8, Version 6.1 was used to analyze the flow through the Route 66 CBC and across the roadway deck for the 637-cfs peak discharge rate reported in Section II above to establish the water surface elevation for the SFCAW where it leaves the KC RV Park. The HY-8 output is provided as the first section in Appendix C. As the HY-8 output shows, the overtopping water surface elevation was estimated to be 6958.21', which represents a maximum flow depth of approximately 1.21' over the top of Route 66.

The model used to delineate the floodplain boundaries for the SFCAW was run under a subcritical flow regime. This is consistent with the requirements established by FEMA and outlined in its guidance document entitled "Guidelines and Specifications for Flood Hazard Mapping Partners." Although many portions of the SFCAW exhibit tendencies toward supercritical flow (Froude Number at or near 1.0), it has been shown that natural watercourses typically cannot sustain the high velocities associated with supercritical flow. Instead, the flows in steep washes will tend to approach or pass through critical flow but then jump back into a subcritical regime, which is more sustainable. The locations of these hydraulic jumps are unpredictable; therefore, the conservative approach is to model the entire wash using a subcritical regime. This results in the highest possible values for base flood elevation as opposed to those that would be generated using mixed or supercritical flow regimes.

On the other hand, the model used to delineate the floodway boundaries for the SFCAW was run under a mixed flow regime. This allows the modeler to consider increases in both water surface elevation and energy grade line when defining the floodway. For this study, the encroachments into the floodplain were first estimated using Encroachment Method 5 in HEC-RAS. In this method, the modeler defines maximum allowable rises in water surface elevation and energy grade line, based upon an equal reduction in conveyance capacity on either side of the wash. The results of the Method 5 run were then fine-tuned using Encroachment Method 1, wherein the modeler specifies exact encroachment stations on either side of the wash. This gives the modeler more control over the outcome of the analysis.

The output from the HEC-RAS analyses is also shown in Appendix C. The first section of HEC-RAS output shows the results of the floodplain analysis. The second shows the results of the floodway analysis. For each analysis, the output includes a summary table of the results; profiles of the SFCAW; and cross sections showing existing ground, water surfaces, energy grade lines, Manning's roughness coefficient (n) values, and bank stations. As the cross sections show, no distinct tops of bank exist for many of the sections. Where this occurs, the bank stations were established based upon perceived changes in roughness characteristics (e.g., the transition from the grassy wash to the ponderosa forest). The bank stations were moved in for the floodway analysis to allow encroachment beyond the roughness-based bank stations used in the floodplain model; however, the 'horizontal variation in n values' option was used in HEC-RAS so that the roughness distributions for the cross sections are the same for the two analyses.

In addition to the floodplain and floodway boundaries, Figure 4 shows the Level I erosion setback boundaries for the SFCAW per Arizona State Standard 5-96. Per Standard 5-96, the Level I erosion setback is taken as the distance, in feet, equal to the square root of the 100-year peak discharge rate, in cfs, measured from the floodway boundary. This boundary provides an indication of the area within which erosion protection would be necessary if development were to occur. Ultimately, however, the need for erosion protection will be determined based upon

the proposed grading for the subdivision within the KC RV Park property and the resultant hydraulic characteristics of the SFCAW.

#### **IV. CONCLUSIONS**

Within the Kit Carson RV Park, the South Fork of the Clay Avenue Wash currently lies within Special Flood Hazard Area, Zone A. Per Title 12, Floodplain Regulations, of the City of Flagstaff Code, the City considers the entire width of the Zone A floodplain to be a regulatory floodway and, therefore, prohibits any fill and/or vertical construction within its boundaries. This study presents detailed floodplain and floodway boundaries and base flood elevations for the SFCAW within the KC RV Park. Once these detailed parameters for the SFCAW are approved by the City, development may occur in the areas between the floodplain and floodway boundaries (the flood fringe) according to the regulations cited in City of Flagstaff Code, Title 12, Section 12-01-001-0006.1, Development Standards in Flood Fringe Areas. This section includes requirements for anchoring, construction material selection, lowest floor elevations, flood proofing of structures, structural fill compaction and slopes, and utility installation.

This study also presents Level I erosion setback boundaries for the SFCAW within the KC RV Park, which indicate areas of high erosion potential. As in all cases where development is proposed adjacent to a significant watercourse, a detailed hydraulic analysis should be performed, based upon the proposed grading, and erosion protection should be provided as necessary.

#### **V. REFERENCES**

- City of Flagstaff Stormwater Management Design Manual*, City of Flagstaff Engineering Division, Stormwater Management Section, July 2000.
- Coconino County Drainage Design Criteria*, Coconino County Public Works Department, January 2001.
- Drainage Report – Boulder Pointe at Woodlands Village Unit 6, Flagstaff, Coconino County, Arizona*, Civil Design & Engineering, Inc., last revised May 16, 2000.
- Drainage Report for Boulder Pointe at Woodlands Village Unit 7*, Mogollon Engineering & Surveying Inc., January 10, 2001.
- Drainage Report for Boulder Pointe at Woodlands Village Unit 8*, Mogollon Engineering & Surveying Inc., March 29, 2001.
- Federal Highway Administration Culvert Analysis (HY-8) Version 6.1*, Federal Highway Administration, June 1996.
- Flood Hydrograph Package (HEC-1) Version 4.1*, U.S. Army Corps of Engineers Hydrologic Engineering Center, June 1998.
- Guidelines and Specifications for Flood Hazard Mapping Partners*, Federal Emergency Management Agency, April 2003.
- Guidelines and Specifications for Flood Hazard Mapping Partners*, Federal Emergency Management Agency, April 2003.
- Master Drainage Plan Report Addendum #1 for Presidio in the Pines*, TRC-BV Engineering Nevada, December 2004.
- River Analysis System (HEC-RAS) Version 3.1.3*, U.S. Army Corps of Engineers Hydrologic Engineering Center, May 2005.
- TR-55 Urban Hydrology for Small Watersheds*, Natural Resources Conservation Service, Conservation Engineering Division, June 1986.

## **APPENDIX A**

### **FIGURES**

