APPENDIX G

Stand-Alone Detention Basin Alternative

MacKay & Somps
ENGINEERS PLANNERS SURVEYORS
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TECHNICAL MEMORANDUM

Date:	September 15, 2010
To:	Bob Shattuck, Lennar Communities
From:	Craig Zoller, MacKay & Somps
TM No.:	Technical Memorandum No. 15
Subject:	Stand-Alone Detention Basin Alternative SunCreek Specific Plan Rancho Cordova, CA
Job No.:	7991-10
Task No.:	Task B.7

A. Introduction

The Regional Master Drainage Study for SunCreek Specific Plan (SunCreek SDMP) divided the SunCreek Specific Plan Area (Plan Area) into twelve separate watersheds. Each watershed is designed to drain to a hydro-modification basin that provides water quality treatment, summertime nuisance runoff retention and peak runoff attenuation for storms up to the 100-year, 10-day event.

Three of the twelve watershed boundaries extend beyond the Plan Area boundaries. The SunCreek SDMP "Baseline Conditions" model included these "off-site" sub-watersheds as future development areas and connected them hydraulically to their watershed's hydro-modification basin. Therefore, the SunCreek SDMP watersheds that have contributing off-site areas are oversized to accommodate the future development of these off-site areas. The SunCreek SDMP assumed these off-site areas will develop utilizing the SunCreek detention for peak flow attenuation, hydro-modification flow duration control and water quality storage.

The intent of this technical memorandum is to document the size of these three basins (Basin's 3, 5 and 7) if these three off-site areas were to mitigate their peak flow, hydro-modification and water quality impacts within their own development ("on-site") and not in the SunCreek basins.

B. Methodology

Building on the storm drainage Sac-Calc 'Baseline Conditions' modeling contained in the SunCreek SDMP, the approach to this analysis is briefly summarized as follows:

1. Prepare a revised watershed map that creates three additional sub-watersheds for the 'off-site' areas. Connect these 'off-site' sub-watershed areas to the open space preserve with a dedicated pipe that is sized to convey undeveloped flows.
2. Revise the SDMP 'Baseline Conditions' model to determine the hydro-modification basin sizes as if the Plan Area was to develop as a Stand-Alone Project that provides water quality treatment, summertime nuisance retention and peak flow attenuation for only the portion of the development within it's boundary.
3. Compare the hydro-modification basin sizes calculated with the Stand-Alone Detention Basin Alternative to the SDMP 'Baseline Conditions' hydro-modification basins. If these three off-site watershed areas are to be included in the final basin sizing for SunCreek, then the increase in hydro-modification basin volume from the Stand-Alone Detention Basin Alternative would represent the proportionate share of the costs to accommodate the off-site sub-watersheds into the 'Baseline Conditions' hydro-modification basins.

C. Analysis

In accordance with the methodology outlined above, the following analysis was performed:

The SDMP 'Baseline Condition' model was revised to a new Stand-Alone Detention Basin Model and included new upstream off-site, undeveloped grassland, sub-watershed areas. The Stand-Alone Detention Basin Model was run, routing each of the three upstream off-site areas runoff through dedicated pipelines to the open space preserve, effectively passing the upstream off-site existing condition runoff through the Plan Area. The Stand-Alone Detention Basin Model hydro-modification basin sizes where compared to the hydro-modification basin sizes from the SDMP 'Baseline Conditions' model. Reference **Figure 1: Revised Detention Basin Sheds No. 3 and No. 5** and **Figure 2: Revised Detention Basin Shed No. 9**; to review the reconfigured portion of the SDMP for this Alternative.

D. Summary of Results

The SDMP 'Baseline Conditions' Alternative provides water quality treatment, summertime nuisance flow retention and hydro-modification detention for three upstream off-site areas. **Table 1: Hydro-modification Basin Fair Share Contributions** summarizes the increases in water quality treatment, summertime nuisance flow retention and hydro-modification basin volumes attributed to each of the upstream off-site areas.

Table 1: Hydro-modification Basin Offsite Shed Area's Fair Share Contribution

Basin No. 3	Stand-Alone (AF)	Baseline Conditions (AF)	Offsite Shed Area's % Share of Baseline
Shed Area (Acres)	56.0	76.9	27.2
Water Quality	1.6	2.2	27.3
Summertime Nuisance Flow (per day)	0.09	0.12	25.0
10-Year, 24-Hour Storm	4.7	11.5	59.1
100-Year, 10-Day Storm	9.6	21.3	54.9

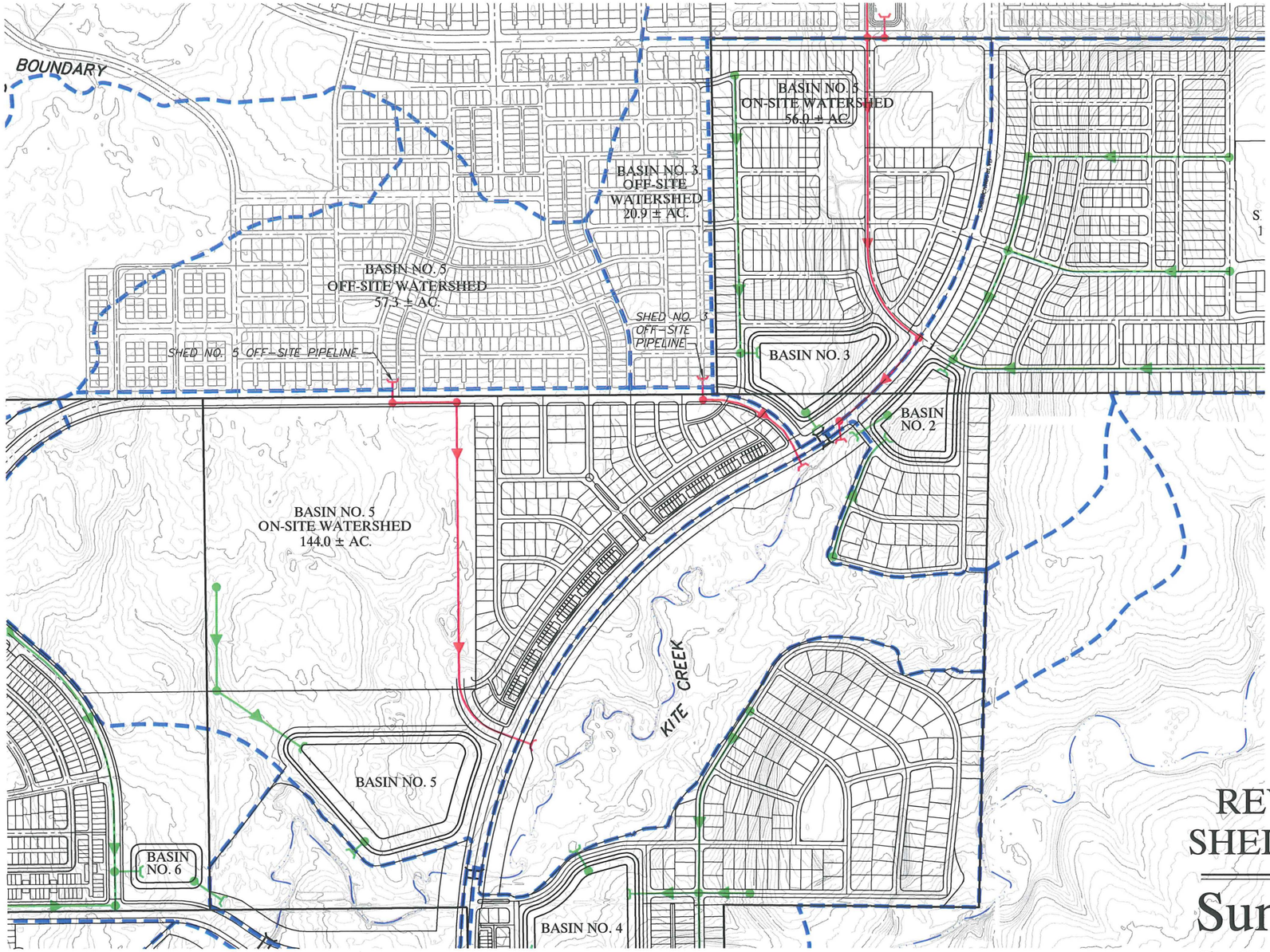
Basin No. 5	Stand-Alone (AF)	Baseline Conditions (AF)	Offsite Shed Area's % Share of Baseline
Shed Area (Acres)	144.0	201.3	28.5
Water Quality	4.1	5.7	28.1
Summertime Nuisance Flow (per day)	0.22	0.31	29.0
10-Year, 24-Hour Storm	11.4	27.7	58.8
100-Year, 10-Day Storm	22.7	42.0	46.0

Basin No. 9	Stand-Alone (AF)	Baseline Conditions (AF)	Offsite Shed Area's % Share of Baseline
Shed Area (Acres)	54.0	82.2	34.3
Water Quality	1.5	2.3	34.8
Summertime Nuisance Flow (per day)	0.08	0.13	38.5
10-Year, 24-Hour Storm	4.0	10.9	63.3
100-Year, 10-Day Storm	7.7	16.8	54.2

E. Conclusion

The SDMP 'Baseline Condition Alternative' provides water quality treatment, summertime nuisance flow retention and peak flow attenuation for three off-site areas. This analysis provides the revised sizing of these basins if the off-site areas were to mitigate their own peak flow, hydro-modification and water quality impacts. The conclusions also provide a basis for preparing fair share agreements to include the developed runoff generated from these off-site areas in the Plan Area's hydro-modification basins if that eventuality occurs.

Appendix A



0' 600' 1200'

Legend

- PROPOSED CHANNEL
- EXISTING CHANNEL
- PROPOSED STORM DRAIN
- PROPOSED STORM DRAIN (DEDICATED TO OPEN SPACE)
- PROPOSED STORM DRAIN (INCLUDES OFFSITE DEVELOPED FLOWS)
- DEVELOPED SHED BOUNDARY

FIGURE 1
REVISED DETENTION BASIN SHEDS NO. 3 AND NO. 5 EXHIBIT

SunCreek Specific Plan

City of Rancho Cordova, California

September 2010

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7991-00

9-15-2010 17:41:17 L:\Sacramento\7991\00\Master Plans\Drainage\7991-Tech Memo 15.dwg
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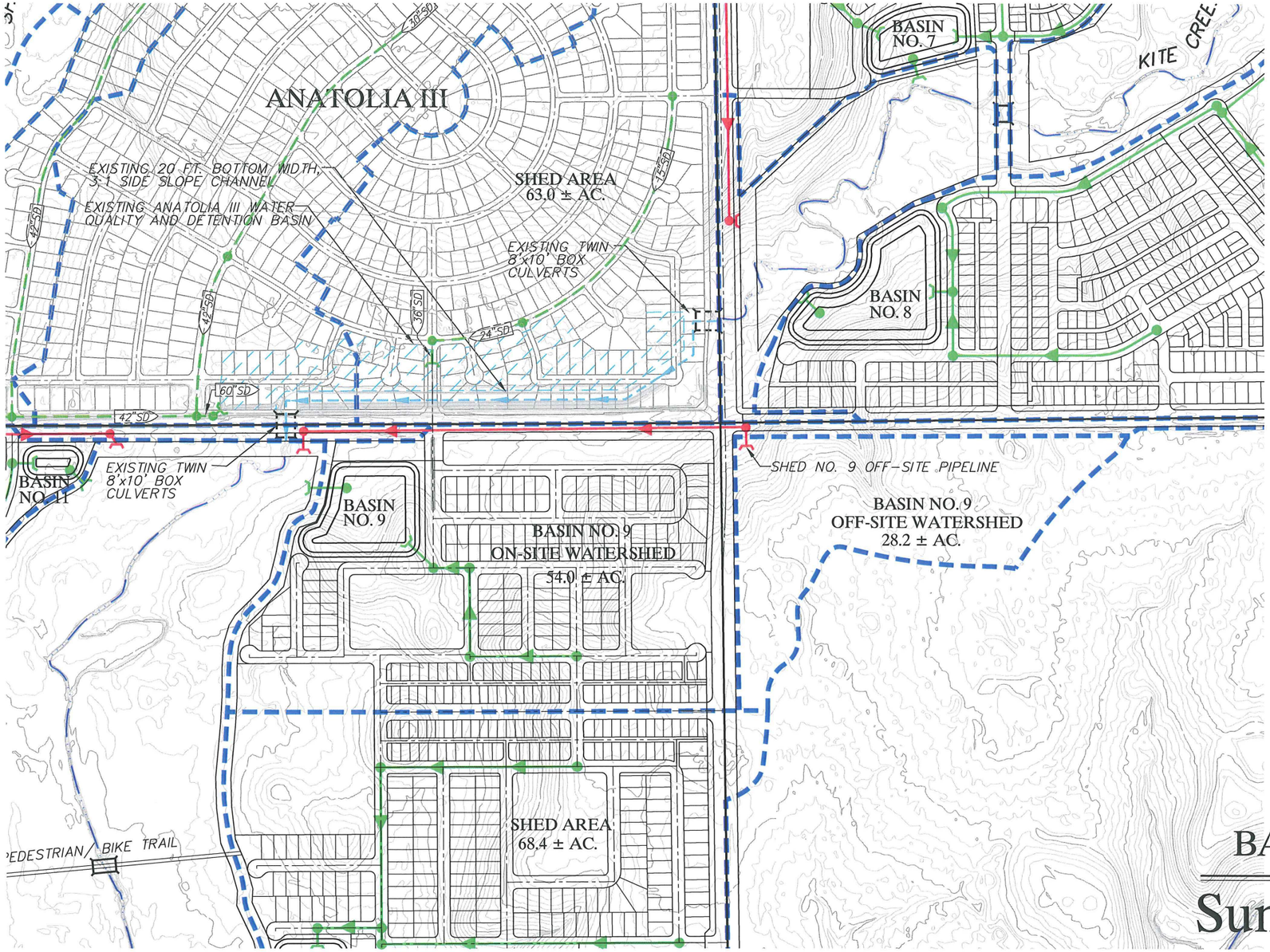

Legend

- PROPOSED CHANNEL
- EXISTING CHANNEL
- PROPOSED STORM DRAIN
- PROPOSED STORM DRAIN (DEDICATED TO OPEN SPACE)
- PROPOSED STORM DRAIN (INCLUDES OFFSITE DEVELOPED FLOWS)
- DEVELOPED SHED BOUNDARY

FIGURE 2
REVISED DETENTION BASIN SHED NO. 9 EXHIBIT

SunCreek Specific Plan

City of Rancho Cordova, California

September 2010

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7991-00

Sac-Calc Results

Sacramento Hydrologic Calculator Report

September 15, 2010 16:10

Project Title: Basin n Proposed Conditions
Method: Sacramento County HEC-1 method
Comments: Proposed Conditions. with local detention - Baseline Condition 10 yr and 100 yr 24 hour storrms Revise tributaries to detention basins 3, 5, and 9
Date: 8/6/2008
Prepared by: KEC

Watershed Hydrologic Summary Data

Watershed	Area (acres)	Mean Elevation (ft)	Lag Times		Basin "n"		Loss Rates		Percent Impervious	
			Method	Lag Time (min)	Method	Basin "n"	Method	Loss Rate (in/hr)	Method	Impervious Area (%)
KCOS1	16.8	203.5	Basin "n"	-	Specified	0.07	Computed	-	Computed	-
KCDV2	120.2	199.7	Basin "n"	-	Specified	0.043	Computed	-	Computed	-
KCDV3	56	185	Basin "n"	-	Computed	-	Computed	-	Computed	-
KCDV5	144	175	Basin "n"	-	Specified	0.051	Computed	-	Computed	-
KCDV4	134.1	174	Basin "n"	-	Specified	0.044	Computed	-	Computed	-
KCDV7	52	153.5	Basin "n"	-	Specified	0.037	Computed	-	Computed	-
KCDV8	126.2	152.9	Basin "n"	-	Specified	0.043	Computed	-	Computed	-
KCDV9	54	144.2	Basin "n"	-	Specified	.051	Computed	-	Computed	-
KCOS02	54.9	166.3	Basin "n"	-	Specified	0.07	Computed	-	Computed	-
KCOS03	17.7	153	Basin "n"	-	Specified	0.07	Computed	-	Computed	-
OSKC05	102.3	181.5	Basin "n"	-	Specified	0.07	Computed	-	Computed	-
KCDV06	106.9	166.5	Basin "n"	-	Specified	0.039	Computed	-	Computed	-
KCOS04	29.3	145.2	Basin "n"	-	Specified	.070	Computed	-	Computed	-
KCOS06	20.3	166	Basin "n"	-	Specified	0.07	Computed	-	Computed	-
KCA3	297.3	151	Basin "n"	-	Specified	0.049	Computed	-	Computed	-
KCOS11	11.1	157.5	Basin "n"	-	Specified	0.07	Computed	-	Computed	-
KCDV11	13.8	145.1	Basin "n"	-	Specified	0.044	Computed	-	Computed	-
KCDV10	68.4	140.1	Basin "n"	-	Specified	0.045	Computed	-	Computed	-
KCDV12	96.8	138.3	Basin "n"	-	Specified	.042	Computed	-	Computed	-
KCOS12	65	156.5	Basin "n"	-	Specified	0.070	Computed	-	Computed	-
KCOS13	21	154	Basin "n"	-	Specified	0.070	Computed	-	Computed	-
KCOS14	14	145.5	Basin "n"	-	Specified	.115	Computed	-	Computed	-
KCOS15	68.2	122.5	Basin "n"	-	Specified	0.07	Computed	-	Computed	-
KCOS3A	168.5	213	Basin "n"	-	Specified	0.07	Computed	-	Computed	-
EXKC13	73.3	140	Basin "n"	-	Computed	-	Computed	-	Computed	-
EXKC14	95.1	120	Basin "n"	-	Computed	-	Computed	-	Computed	-
LCDV00	559.6	239.5	Basin "n"	-	Specified	0.115	Computed	-	Computed	-
LCDV02	630.9	226	Basin "n"	-	Specified	0.115	Computed	-	Computed	-
LCDV04	821.1	194	Basin "n"	-	Specified	0.115	Computed	-	Computed	-
LCDV10	777.5	163.5	Basin "n"	-	Specified	0.115	Computed	-	Specified	0
DVLC01	88.4	218.4	Basin "n"	-	Specified	0.05	Computed	-	Computed	-
KC3	20.9	183.5	Basin "n"	-	Specified	0.07	Computed	-	Computed	-
KC5	57.3	184.5	Basin "n"	-	Specified	0.07	Computed	-	Computed	-
KC9	28.2	160.5	Basin "n"	-	Specified	0.070	Computed	-	Computed	-

Basin "n" Method Data for Lag Time Computation

Watershed	Channel Length (ft)	Centroid Length (ft)	Slope (ft/ft)	Channelization	Land Use Impervious Area Percent (% or acres)																
					95	90	85	80	75	70	60	50	40	30	25	20	15	10	5	2	1	1*
KCOS1	1576	850	0.0159	Undeveloped	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				Developed	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KCDV2	3940	750	0.0156	Undeveloped	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				Developed	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KCDV3	1920	444	0.0042	Undeveloped	2.6	6.8					8.1	21.4							12.9	4.2		
				Developed	0	0					0	0							0	0		
KCDV5	4464	1907	0.0103	Undeveloped	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				Developed	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KCDV4	3297	917	0.003	Undeveloped	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				Developed	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KCDV7	1655	580	0.0091	Undeveloped	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				Developed	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KCDV8	4054	2363	0.0081	Undeveloped	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				Developed	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KCDV9	4360	2120	.0083	Undeveloped	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				Developed	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KCOS02	3900	2145	.005	Undeveloped	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				Developed	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KCOS03	2089	586	.0048	Undeveloped	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				Developed	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OSKC05	4804	2082	.0081	Undeveloped	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				Developed	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KCDV06	3313	1851	.0063	Undeveloped	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				Developed	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KCOS04	2745	1385	005	Undeveloped	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				Developed	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KCOS06	2377	1387	0027	Undeveloped	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				Developed	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KCA3	7016	3899	.006	Undeveloped	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				Developed	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KCOS11	726	572	.0069	Undeveloped	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				Developed	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KCDV11	850	322	.0213	Undeveloped	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				Developed	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KCDV10	2474	1482	.0178	Undeveloped	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				Developed	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KCDV12	3407	1720	.0119	Undeveloped	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				Developed	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KCOS12	2632	1237	.0057	Undeveloped	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				Developed	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KCOS13	1370	566	.0088	Undeveloped	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				Developed	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KCOS14	1990	1076	.0085	Undeveloped	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				Developed	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KCOS15	3317	1334	.0027	Undeveloped	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				Developed	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KCOS3A	3787	1555	.0132	Undeveloped	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				Developed	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
EXKC13	4651	2747	0105	Undeveloped																100		
				Developed																0		
EXKC14	79700	3064	.003	Undeveloped																100		
				Developed																0		
LCDV00	11854	5528	.0041	Undeveloped	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				Developed	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LCDV02	11176	6192	.0054	Undeveloped	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				Developed	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LCDV04	14480	4400	.0055	Undeveloped	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				Developed	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LCDV10	12751	5366	.007	Undeveloped	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				Developed	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DVLC01	2203	1102	.0108	Undeveloped	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				Developed	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KC3	1371	693	.0124	Undeveloped	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				Developed	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KC5	2074	1553	.013	Undeveloped	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

				Developed	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KC9	1927	1115	0.0161	Undeveloped	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				Developed	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Refer to the Drainage manual for Land Use Impervious Area Percent

*Dense Oaks, Shrubs, Vines

Infiltration Loss Rate Data

Watershed	Soil Cover Group	Land Use Impervious Area Percent (% or acres) 95	90	85	80	75	70	60	50	40	30	25	20	15	10	5	2	1	1*
KCOS1	B																		
	C																4.8		
	D																12		
KCDV2	B																		
	C	1.1						26.2	12.2							8.2	2.2		
	D	2						36.7	21.6							2.2	7.8		
KCDV3	B																		
	C																		
	D	2.6	6.8					8.1	21.4							12.9	4.2		
KCDV5	B																		
	C															1.1			
	D	7.2					3.7	25.9	81.2							23.7	1.2		
KCDV4	B																		
	C																4.7		
	D						6.4	57.5	6.4	41						14	5.3		
KCDV7	B																		
	C	2.6														1			
	D	4.2	12.4				11.6	15.7								4.5			
KCDV8	B																		
	C	1.6																	
	D	5						58.9	37.2							18.3	5.2		
KCDV9	B																		
	C																		
	D	16.2	2.5						24.5	1						9.8			
KCOS02	B																		
	C																16.3		
	D																38.6		
KCOS03	B																		
	C																12.7		
	D																5		
OSKC05	B																		
	C																		
	D																102.3		
KCDV06	B																		
	C	0.9																	
	D	23					10.9	53.9								5.5	12.7		
KCOS04	B																		
	C																20.4		
	D																8.9		
KCOS06	B																		
	C																		
	D																20.3		
KCA3	B																		
	C								120							0.6	26.3		
	D								78.4							4.4	67.6		
KCOS11	B																		
	C																5.9		
	D																5.2		
KCDV11	B																		
	C																		
	D	2.1							8.9							2.8			
KCDV10	B																		
	C																		
	D	5	5						13.2	32.5						8	4.7		
KCDV12	B																		
	C	1.5															1		
	D	5.5	24						23.2	24.9						15.8	1.3		
KCOS12	B																		
	C																27.1		
	D																37.9		
	B																		

KCOS13	C																1.3		
	D																19.7		
KCOS14	B																		
	C																		
	D																14		
KCOS15	B																		
	C																		
	D																68.2		
KCOS3A	B																		
	C																32.6		
	D																135.9		
EXKC13	B																		
	C																6.5		
	D																66.8		
EXKC14	B																		
	C																4.1		
	D																91		
LCDV00	B																		
	C																307.2		
	D																252.4		
LCDV02	B																		
	C																182.3		
	D																448.6		
LCDV04	B																		
	C																99.4		
	D																721.7		
LCDV10	B																		
	C																637.9		
	D																139.6		
DVLC01	B																		
	C							1.8	23.8							2.8	4.5		
	D							23.6	8.2								23.7		
KC3	B																		
	C																		
	D																20.9		
KC5	B																		
	C																		
	D																57.3		
KC9	B																		
	C																		
	D																28.2		

Refer to the help file for Land Use Impervious Area Percent

*Dense Oaks, Shrubs, Vines

Hydrograph Routing – Muskingum–Cunge (Standard)

Routing ID	Route From	Route To	Channel Type	Length (ft)	Slope (ft/ft)	Width or Diameter (ft)	Side Slope (H:V)	Mannings "n"
R1	DET03	JKC3	Pipe	2814	0.005	3	3:1	0.015
R6A	OSKC05	J06	Trapezoidal	555	0.007	20	4:1	0.030
R4	J03	J04	Trapezoidal	2319	0.0048	30	4:1	0.014
R5	J04	J05	Trapezoidal	2582	0.0039	20	3:1	0.015
R7	J06	J7	Trapezoidal	2058	0.0025	20	3:1	0.025
R2A	KCOS1	J02	Trapezoidal	1510	0.0159	05	3:1	0.03
R2	J1	J02	Trapezoidal	644	0.0047	5	3:1	0.03
R3	J02	J03	Trapezoidal	3485	.0313	5	3:1	0.03
R6	J05	J06	Trapezoidal	2283	0.0031	20	3:1	0.03
R8	J7	J08	Trapezoidal	95	0.0025	10	1:1	0.025
R8A	KCOS11	J08	Pipe	1147	0.005	3		0.015
R9	J08	J9	Trapezoidal	3214	0.0019	20	3:1	0.03
R10B	KCOS12	J08	Trapezoidal	524	0.005	20	3:1	0.03
R10C	KCOS13	J10C	Trapezoidal	1398	0.005	10	3:1	0.03
R10D	J10C	J10	Pipe	2907	0.0034	4		0.015
R3A	KCOS3A	JKC3	Pipe	2628	0.005	5		0.015
R10	J10	J11	Trapezoidal	1028	0.0022	15	2.5:1	0.07
R11	J11	J12	Trapezoidal	2966	0.0022	15	2.5:1	0.07
R21A	J20	R21B	Trapezoidal	6000	0.0032	20	4:1	0.03
R21B	R21A	J21	Trapezoidal	5933	0.0032	20	4:1	0.03
R22	J21	J22	Trapezoidal	7495	0.0055	20	3:1	0.03
R23	J22		Trapezoidal	1171	0.0026	10	2:1	0.03
R20	LCDV00	J20A	Trapezoidal	2721	.0026	20	3:1	0.015
R20B	J20A	J20	Trapezoidal	2119	0.00566	20	3:1	0.07
KC3R	KC3	J1	Pipe	818	.005	4		0.013
KC5R	KC5	JKC5	Pipe	2330	0.005	4		0.013
KC9R	KC9	JKC9	Pipe	1972	0.005	4		0.013

Detention Basin Data

Detention Basin	Initial Condition		Pond Storage Relation										Outlet Data			
													Elev. (ft)	Area (sq ft)	Q Coef.	Exponent
A3DET	Elevation (ft)	0	Elevation (ft)	127.4	128.5	128.5	130.5	131.5					124.41	.54	.61	0.5
			Area (ac)	6.38	6.61	6.89	7.23	7.81					128.50	84	2.6	1.5
	Pump Data															
	Pump Hydrograph Name			Pump 1		Pump 2		Pump 3		Pump 4		Pump 5				
			Pump Discharge (cfs)													
			Elevation at which Pump Turns On (ft)													
			Elevation at which Pump Turns Off (ft)													

Detention Basin	Initial Condition		Pond Storage Relation										Outlet Data			
													Elev. (ft)	Area (sq ft)	Q Coef.	Exponent
DET02	Elevation (ft)	172	Elevation (ft)	172	173	174	175	176	177	178	179	180	181	172.875	2.41	.61	0.5
			Area (ac)	2.108	2.249	2.395	2.546	2.701	2.861	3.025	3.194	3.368	3.546	180.5	230	2.6	1.5
	Pump Data															
	Pump Hydrograph Name			Pump 1		Pump 2		Pump 3		Pump 4		Pump 5				
			Pump Discharge (cfs)													
			Elevation at which Pump Turns On (ft)													
			Elevation at which Pump Turns Off (ft)													

Detention Basin	Initial Condition		Pond Storage Relation										Outlet Data			
													Elev. (ft)	Area (sq ft)	Q Coef.	Exponent
DET03	Elevation (ft)	171.5	Elevation (ft)	171.5	172.5	173.5	174.5	175.5	176.5	177.5	178.5	179		171.91	.545	.61	0.5
			Area (ac)	1.435	1.552	1.674	1.8	1.931	2.066	2.206	2.351	2.425		178.5	190	2.6	1.5
	Pump Data															
	Pump Hydrograph Name			Pump 1		Pump 2		Pump 3		Pump 4		Pump 5				
			Pump Discharge (cfs)													
			Elevation at which Pump Turns On (ft)													
			Elevation at which Pump Turns Off (ft)													

Detention Basin	Initial Condition		Pond Storage Relation										Outlet Data			
													Elev. (ft)	Area (sq ft)	Q Coef.	Exponent
DET04	Elevation (ft)	162	Elevation (ft)	162	163	164	165	166	167	168	169	170	170.5	162.875	2.41	.61	0.5
			Area (ac)	3.636	3.821	4.011	4.205	4.404	4.608	4.816	5.028	5.245	5.356	170	251	2.6	1.5
	Pump Data															
	Pump Hydrograph Name			Pump 1		Pump 2		Pump 3		Pump 4		Pump 5				
			Pump Discharge (cfs)													
			Elevation at which Pump Turns On (ft)													
			Elevation at which Pump Turns Off (ft)													

Detention Basin	Initial Condition		Pond Storage Relation										Outlet Data			
													Elev. (ft)	Area (sq ft)	Q Coef.	Exponent
	Elevation	159	Elevation (ft)	159	160	161	162	163	164	165	166			159.5	1.57	.61	0.5

	(ft)		Area (ac)	3.954	4.147	4.344	4.546	4.753	4.964	5.18	5.4			165.5	315	2.6	1.5

DET05	Pump Data					
	Pump Hydrograph Name		Pump 1	Pump 2	Pump 3	Pump 4	Pump 5
		Pump Discharge (cfs)					
		Elevation at which Pump Turns On (ft)					
		Elevation at which Pump Turns Off (ft)					

Detention Basin	Initial Condition		Pond Storage Relation										Outlet Data			
													Elev. (ft)	Area (sq ft)	Q Coef.	Exponent
DET06	Elevation (ft)	146.5	Elevation (ft)	146.5	147.5	148.5	149.5	150.5	151.5	152.5	153.5	154		147	1.57	.61	0.5
			Area (ac)	3.143	3.315	3.492	3.673	3.859	4.05	4.245	4.444	4.546		153.5	170	2.6	1.5

DET06	Pump Data					
	Pump Hydrograph Name		Pump 1	Pump 2	Pump 3	Pump 4	Pump 5
		Pump Discharge (cfs)					
		Elevation at which Pump Turns On (ft)					
		Elevation at which Pump Turns Off (ft)					

Detention Basin	Initial Condition		Pond Storage Relation										Outlet Data			
													Elev. (ft)	Area (sq ft)	Q Coef.	Exponent
DET07	Elevation (ft)	139.5	Elevation (ft)	139.5	140.5	143.5	141.5	142.5	144.5	145.5	146.5	147		140.	1.57	.61	0.5
			Area (ac)	1.042	1.142	1.246	1.356	1.469	1.588	1.711	1.839	1.904		146.5	135	2.6	1.5

DET07	Pump Data					
	Pump Hydrograph Name		Pump 1	Pump 2	Pump 3	Pump 4	Pump 5
		Pump Discharge (cfs)					
		Elevation at which Pump Turns On (ft)					
		Elevation at which Pump Turns Off (ft)					

Detention Basin	Initial Condition		Pond Storage Relation										Outlet Data			
													Elev. (ft)	Area (sq ft)	Q Coef.	Exponent
DET08	Elevation (ft)	137.5	Elevation (ft)	137.5	138.5	139.5	140.5	141.5	142.5	143.5	144.5	145.5	146	138.375	2.41	.61	0.5
			Area (ac)	2.748	2.909	3.075	3.246	3.42	3.6	3.784	3.973	4.166	4.264	145.5	235	2.6	1.5

DET08	Pump Data					
	Pump Hydrograph Name		Pump 1	Pump 2	Pump 3	Pump 4	Pump 5
		Pump Discharge (cfs)					
		Elevation at which Pump Turns On (ft)					
		Elevation at which Pump Turns Off (ft)					

Detention Basin	Initial Condition		Pond Storage Relation										Outlet Data			
													Elev. (ft)	Area (sq ft)	Q Coef.	Exponent
DET09	Elevation (ft)	130.5	Elevation (ft)	130.5	131.5	132.5	133.5	134.5	135.5	136.5	137.5	138.5		131.	.785	.61	0.5
			Area (ac)	1.322	1.435	1.552	1.674	1.8	1.931	2.066	2.206	2.351		138	130	2.6	1.5

DET09	Pump Data					
	Pump Hydrograph Name		Pump 1	Pump 2	Pump 3	Pump 4	Pump 5
		Pump Discharge (cfs)					
		Elevation at which Pump Turns					

			On (ft)													
			Elevation at which Pump Turns Off (ft)													

Detention Basin	Initial Condition		Pond Storage Relation										Outlet Data			
													Elev. (ft)	Area (sq ft)	Q Coef.	Exponent
DET11	Elevation (ft)	130.5	Elevation (ft)	132.5	133.5	134.5	135.5	136.5	137.5	138.5	139.5			133	.785	.61	0.5
			Area (ac)	0.119	0.154	0.194	0.239	0.288	0.342	0.4	0.463			139	50	2.6	1.5

Pump Data						
Pump Hydrograph Name		Pump 1	Pump 2	Pump 3	Pump 4	Pump 5
	Pump Discharge (cfs)					
	Elevation at which Pump Turns On (ft)					
	Elevation at which Pump Turns Off (ft)					

Detention Basin	Initial Condition		Pond Storage Relation										Outlet Data			
													Elev. (ft)	Area (sq ft)	Q Coef.	Exponent
DET10	Elevation (ft)	127.5	Elevation (ft)	127.5	128.5	129.5	130.5	131.5	132.5	133.5	134.5	135.5	136	128.0	1.57	.61	0.5
			Area (ac)	0.946	1.042	1.142	1.246	1.356	1.469	1.588	1.711	1.839	1.904	135.5	150	2.6	1.5

Pump Data						
Pump Hydrograph Name		Pump 1	Pump 2	Pump 3	Pump 4	Pump 5
	Pump Discharge (cfs)					
	Elevation at which Pump Turns On (ft)					
	Elevation at which Pump Turns Off (ft)					

Detention Basin	Initial Condition		Pond Storage Relation										Outlet Data			
													Elev. (ft)	Area (sq ft)	Q Coef.	Exponent
DET12	Elevation (ft)	127.5	Elevation (ft)	127.5	128.5	129.5	130.5	131.5	132.5	133.5	134.5	135		128.0	2.355	.61	0.5
			Area (ac)	2.321	2.47	2.623	2.78	2.942	3.109	3.28	3.456	3.546		134.5	200	2.6	1.5

Pump Data						
Pump Hydrograph Name		Pump 1	Pump 2	Pump 3	Pump 4	Pump 5
	Pump Discharge (cfs)					
	Elevation at which Pump Turns On (ft)					
	Elevation at which Pump Turns Off (ft)					

Detention Basin	Initial Condition		Pond Storage Relation										Outlet Data			
													Elev. (ft)	Area (sq ft)	Q Coef.	Exponent
DET01	Elevation (ft)	207.5	Elevation (ft)	207.5	208.5	209.5	210.5	211.5	212.5	213.5	214.5	215.5	216.5	208.125	1.23	.61	0.5
			Area (ac)	1.214	1.322	1.435	1.552	1.674	1.8	1.931	2.066	2.206	2.351	216	190	2.6	1.5

Pump Data						
Pump Hydrograph Name		Pump 1	Pump 2	Pump 3	Pump 4	Pump 5
	Pump Discharge (cfs)					
	Elevation at which Pump Turns On (ft)					
	Elevation at which Pump Turns Off (ft)					

View HEC-1 output

Sacramento method results
(Project: Basin n Proposed Conditions)
(100-year, 10-day rainfall)

ID	Peak flow (cfs)	Time of peak (hours)	Basin area (sq. mi)	Peak stage (feet)	Peak storage (ac-ft)	Diversion volume (ac-ft)
OSKC05	58.	153:11	.16			
R6A	58.	153:14	.16			
KCOS06	13.	152:48	.03			
KCOS02	30.	153:12	.09			
KCOS1	11.	153:01	.03			
R2A	11.	153:07	.03			
KCDV2	82.	153:00	.19			
DET02	26.	154:13	.19	178.	15.	.00
KC3	13.	153:01	.03			
KC3R	13.	153:03	.03			
KCDV3	37.	153:03	.09			
DET03	5.8	154:48	.09	178.	11.	
R1	5.8	154:56	.09			
KCOS3A	100.	153:06	.26			
R3A	100.	153:10	.26			
JKC3	105.	153:10	.35			
J1	142.	153:09	.57			
R2	142.	153:11	.57			
J02	153.	153:10	.60			
R3	153.	153:15	.60			
KCDV4	89.	153:02	.21			
DET04	24.	154:23	.21	167.	21.	
J03	206.	153:15	.89			
R4	206.	153:19	.89			
KCOS03	11.	153:02	.03			
KCDV5	93.	153:04	.23			
DET05	18.	154:45	.23	165.	27.	
KC5	35.	153:03	.09			
KC5R	35.	153:07	.09			
JKC5	52.	153:09	.31			
J04	266.	153:15	1.24			
R5	265.	153:19	1.24			
KCOS04	19.	153:00	.05			
KCDV06	73.	153:02	.17			
DET06	17.	154:27	.17	152.	19.	.00

J05	292.	153:18	1.45			
R6	292.	153:23	1.45			
KCDV7	37.	153:00	.08			
DET07	15.	154:06	.08	144.	5.1	.00
KCDV8	83.	153:03	.20			
DET08	25.	154:27	.20	143.	18.	.00
J06	394.	153:20	1.92			
R7	394.	153:24	1.92			
KCOS15	39.	153:10	.11			
KCA3	171.	153:12	.46			
A3DET	162.	153:26	.46	129.	13.	
KCOS11	7.1	153:00	.02			
R8A	7.1	153:03	.02			
KCOS12	38.	153:05	.10			
R10B	38.	153:08	.10			
KCDV11	9.7	152:47	.02			
DET11	6.5	153:09	.02	136.	.6	.00
KCDV9	35.	153:05	.08			
DET09	8.7	154:41	.08	136.	9.0	.00
KC9	18.	153:02	.04			
KC9R	18.	153:06	.04			
JKC9	26.	153:07	.13			
J08	233.	153:16	.73			
R9	231.	153:28	.73			
J9	267.	153:25	.84			
KCOS14	8.0	153:11	.02			
KCOS13	14.	153:01	.03			
R10C	13.	153:08	.03			
J10C	21.	153:09	.05			
R10D	21.	153:16	.05			
KCDV10	46.	153:01	.11			
DET10	17.	154:13	.11	133.	6.6	.00
KCDV12	66.	153:01	.15			
DET12	23.	154:17	.15	132.	11.	.00
J10	327.	153:24	1.15			
R10	325.	153:28	1.15			
EXKC13	48.	153:00	.11			
J11	353.	153:26	1.27			
R11	349.	153:39	1.27			
EXKC14	28.	155:29	.15			
J12	368.	153:40	1.42			

LCDV02	233.	154:22	.99			
DVLC01	59.	153:01	.14			
DET01	15.	154:19	.14	215.	12.	.00
LCDV00	200.	154:25	.87			
R20	200.	154:31	.87			
J20A	215.	154:30	1.01			
R20B	215.	154:40	1.01			
J20	445.	154:30	2.00			
R21A	444.	154:46	2.00			
R21B	444.	155:01	2.00			
LCDV04	312.	154:19	1.28			
J21	728.	154:44	3.28			
R22	728.	154:57	3.28			
LCDV10	280.	154:18	1.21			
J22	982.	154:45	4.50			
R23	982.	154:47	4.50			

View HEC-1 output

Sacramento method results
(Project: Basin n Proposed Conditions)
(100-year, 1-day rainfall)

ID	Peak flow (cfs)	Time of peak (hours)	Basin area (sq. mi)	Peak stage (feet)	Peak storage (ac-ft)	Diversion volume (ac-ft)
KCOS15	82.	12:30	.11			
KCA3	336.	12:34	.46			
A3DET	276.	12:46	.46	130.	15.	
OSKC05	116.	12:33	.16			
R6A	116.	12:34	.16			
KCOS06	60.	12:04	.03			
KCOS02	61.	12:34	.09			
KCOS1	31.	12:14	.03			
R2A	31.	12:18	.03			
KCDV2	253.	12:11	.19			
DET02	27.	13:42	.19	178.	16.	
KC3	40.	12:13	.03			
KC3R	40.	12:14	.03			
KCDV3	88.	12:19	.09			
DET03	5.6	17:19	.09	177.	10.	
R1	5.6	17:25	.09			
KCOS3A	224.	12:25	.26			
R3A	224.	12:28	.26			
JKC3	228.	12:28	.35			
J1	276.	12:28	.57			
R2	276.	12:29	.57			
J02	297.	12:28	.60			
R3	297.	12:32	.60			
KCDV4	238.	12:15	.21			
DET04	24.	15:04	.21	167.	21.	
J03	379.	12:33	.89			
R4	378.	12:36	.89			
KCOS03	29.	12:17	.03			
KCDV5	217.	12:21	.23			
DET05	18.	15:47	.23	165.	25.	
KC5	87.	12:20	.09			
KC5R	86.	12:23	.09			
JKC5	99.	12:23	.31			
J04	474.	12:34	1.24			
R5	472.	12:38	1.24			

KCOS04	74.	12:07	.05			
KCDV06	193.	12:15	.17			
DET06	17.	15:20	.17	152.	18.	
J05	504.	12:37	1.45			
R6	500.	12:42	1.45			
KCDV7	138.	12:06	.08			
DET07	16.	13:07	.08	144.	6.0	.00
KCDV8	201.	12:19	.20			
DET08	26.	14:33	.20	143.	18.	.00
J06	653.	12:41	1.92			
R7	649.	12:45	1.92			
J7	925.	12:45	2.38			
R8	924.	12:45	2.38			
KCOS11	23.	12:10	.02			
R8A	23.	12:13	.02			
KCOS12	89.	12:23	.10			
R10B	89.	12:25	.10			
KCDV11	43.	12:04	.02			
DET11	8.0	12:34	.02	137.	1.0	.00
KCDV9	79.	12:23	.08			
DET09	8.6	15:28	.08	136.	8.8	
KC9	47.	12:17	.04			
KC9R	47.	12:20	.04			
JKC9	53.	12:20	.13			
J08	1025.	12:44	2.65			
R9	1005.	12:52	2.65			
J9	1059.	12:51	2.76			
KCOS14	16.	12:32	.02			
KCOS13	40.	12:13	.03			
R10C	39.	12:18	.03			
J10C	51.	12:19	.05			
R10D	51.	12:26	.05			
KCDV10	137.	12:12	.11			
DET10	19.	13:37	.11	134.	7.7	
KCDV12	178.	12:14	.15			
DET12	24.	13:52	.15	132.	13.	.00
J10	1129.	12:51	3.07			
R10	1113.	12:54	3.07			
EXKC13	151.	12:11	.11			
J11	1145.	12:54	3.19			
R11	1106.	13:04	3.19			

EXKC14	34.	15:09	.15			
J12	1122.	13:04	3.33			
LCDV02	314.	13:52	.99			
DVLC01	170.	12:13	.14			
DET01	15.	14:28	.14	215.	12.	
LCDV00	269.	13:55	.87			
R20	269.	14:01	.87			
J20A	284.	14:01	1.01			
R20B	284.	14:09	1.01			
J20	591.	14:01	2.00			
R21A	590.	14:14	2.00			
R21B	588.	14:28	2.00			
LCDV04	421.	13:49	1.28			
J21	944.	14:15	3.28			
R22	943.	14:27	3.28			
LCDV10	386.	13:47	1.21			
J22	1263.	14:15	4.50			
R23	1262.	14:17	4.50			

(10-year, 1-day rainfall)

ID	Peak flow (cfs)	Time of peak (hours)	Basin area (sq. mi)	Peak stage (feet)	Peak storage (ac-ft)	Diversion volume (ac-ft)
KCOS15	44.	12:30	.11			
KCA3	184.	12:34	.46			
A3DET	142.	12:51	.46	129.	12.	
OSKC05	63.	12:33	.16			
R6A	63.	12:35	.16			
KCOS06	30.	12:04	.03			
KCOS02	33.	12:33	.09			
KCOS1	16.	12:14	.03			
R2A	16.	12:19	.03			
KCDV2	132.	12:11	.19			
DET02	21.	13:36	.19	176.	9.9	
KC3	21.	12:13	.03			
KC3R	21.	12:14	.03			
KCDV3	47.	12:19	.09			
DET03	4.4	15:37	.09	175.	6.2	
R1	4.4	15:46	.09			
KCOS3A	119.	12:25	.26			
R3A	119.	12:29	.26			
JKC3	122.	12:29	.35			

J1	154.	12:28	.57			
R2	153.	12:30	.57			
J02	165.	12:29	.60			
R3	165.	12:34	.60			
KCDV4	127.	12:15	.21			
DET04	18.	14:03	.21	165.	13.	
J03	214.	12:34	.89			
R4	213.	12:38	.89			
KCOS03	15.	12:17	.03			
KCDV5	117.	12:21	.23			
DET05	14.	15:23	.23	163.	15.	
KC5	46.	12:20	.09			
KC5R	46.	12:24	.09			
JKC5	56.	12:24	.31			
J04	266.	12:36	1.24			
R5	266.	12:41	1.24			
KCOS04	37.	12:07	.05			
KCDV06	103.	12:15	.17			
DET06	13.	14:39	.17	150.	11.	
J05	287.	12:40	1.45			
R6	284.	12:47	1.45			
KCDV7	72.	12:06	.08			
DET07	13.	13:10	.08	143.	3.6	.00
KCDV8	108.	12:19	.20			
DET08	20.	14:05	.20	141.	12.	.00
J06	375.	12:45	1.92			
R7	373.	12:50	1.92			
J7	515.	12:50	2.38			
R8	515.	12:50	2.38			
KCOS11	12.	12:10	.02			
R8A	12.	12:13	.02			
KCOS12	47.	12:23	.10			
R10B	47.	12:26	.10			
KCDV11	22.	12:04	.02			
DET11	6.0	12:27	.02	135.	.5	
KCDV9	43.	12:22	.08			
DET09	6.8	15:03	.08	134.	5.4	
KC9	25.	12:17	.04			
KC9R	25.	12:20	.04			
JKC9	30.	12:20	.13			
J08	570.	12:49	2.65			

R9	562.	12:58	2.65			
J9	590.	12:58	2.76			
KCOS14	8.7	12:32	.02			
KCOS13	21.	12:13	.03			
R10C	21.	12:20	.03			
J10C	27.	12:21	.05			
R10D	27.	12:28	.05			
KCDV10	72.	12:12	.11			
DET10	15.	13:28	.11	131.	4.4	
KCDV12	95.	12:14	.15			
DET12	19.	13:43	.15	131.	7.7	.00
J10	637.	12:57	3.07			
R10	630.	13:02	3.07			
EXKC13	78.	12:11	.11			
J11	652.	13:01	3.19			
R11	634.	13:14	3.19			
EXKC14	20.	15:11	.15			
J12	644.	13:14	3.33			
LCDV02	182.	13:54	.99			
DVLC01	90.	12:13	.14			
DET01	12.	13:49	.14	212.	7.0	
LCDV00	155.	13:57	.87			
R20	155.	14:03	.87			
J20A	166.	14:03	1.01			
R20B	166.	14:14	1.01			
J20	344.	14:03	2.00			
R21A	343.	14:19	2.00			
R21B	342.	14:36	2.00			
LCDV04	245.	13:51	1.28			
J21	546.	14:23	3.28			
R22	546.	14:37	3.28			
LCDV10	218.	13:49	1.21			
J22	720.	14:26	4.50			
R23	720.	14:28	4.50			